

Automation PC 910

User's manual

Version: **1.51 (June 2018)**
Model no.: **MAAPC900-ENG**

Translation of the original manual

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Appendix A 527

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Chapter 1 • General information

Information:

This user's manual is not intended for end customers! It is the responsibility of the **machine** manufacturer or system provider to provide the **safety** guidelines relevant to end customers in the operating instructions for the end customer in the respective local language.

1 Manual history

Version	Date	Change
0.10 Preliminary	2012-06-12	<ul style="list-style-type: none"> • First version
1.00	2012-11-26	<ul style="list-style-type: none"> • Updated chapter 4 "Software" on page 246. • Updated chapter 7 "Servicing and maintenance" on page 498. • Updated "Appendix A" on page 527. • Modified "Organization of safety notices" on page 20. Updated descriptions for cautions and warnings. • Revised terminology in German edition. • Updated the following sections in chapter "Technical data": "Temperature specifications" on page 31, "Block diagrams" on page 52, "Humidity specifications" on page 41. • Updated the following sections in chapter "Commissioning": "Mounting orientations" on page 227, "Spacing for air circulation" on page 229, "Grounding concept" on page 231. • 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 98 and "HM76 CPU boards " on page 100. • Updated the following drives: "5AC901.CSSD-00" on page 128, "5AC901.CSSD-01" on page 130, "5AC901.CSSD-02" on page 132, "5AC901.CCFA-00" on page 161. • Updated the following interface options: "5AC901.ICAN-00" on page 176, "5AC901.IHDA-00" on page 182, "5AC901.ISRM-00" on page 184. • Updated section "Monitor/Panel options" on page 197. • Updated heat sink 5AC901.HS01-00, see "5AC901.HS0x-00" on page 114. • Modified section "System components / Configuration" on page 27. • Updated bus units 5AC901.BX01-01 and 5AC901.BX02-01, see "Bus units" on page 110. • Updated "CFast cards" on page 438. • Updated USB media drive, see "5MD900.USB2-02" on page 462.
1.05	2013-03-19	<ul style="list-style-type: none"> • Updated the following sections in chapter 2 "Technical data": "Monitor/Panel option" on page 73, "Slide-in slot 1" on page 78, "Uninterruptible power supply (UPS)" on page 208. • Updated the following drives: "5AC901.CHDD-01" on page 123, "5MMHDD.0500-00" on page 125, "5AC901.CHDD-99" on page 162. • Updated the service life of the battery, see "Battery" on page 77. • Updated sections "BIOS options" on page 246 and "Upgrade information" on page 387 in chapter 4 "Software". • Updated sections "Replacing the battery" on page 498, "Installing PCI/PCIe cards" on page 513 and "Connecting an external device to the mainboard" on page 522 in 7 "Servicing and maintenance". • Modified tables "Umgebungstemperatur mit Lüfter" on page and "Umgebungstemperatur ohne Lüfter" on page . • Updated "Internal supply cable" on page 494.
1.10	2013-06-12	<ul style="list-style-type: none"> • Updated system unit "5PC910.SX05-00" on page 92. • Updated fan kit "5AC901.FA05-00" on page 119. • Updated front covers 5AC901.FF01-01, 5AC901.FF02-01, 5AC901.FF05-00 and 5AC901.FF05-01 on page 223. • Updated slide-in compact drive "5AC901.CSSD-03" on page 134. • Updated replacement SSDs "5MMSSD.0060-00" on page 146, "5MMSSD.0060-01" on page 148 and "5MMSSD.0180-00" on page 154. • Updated slide-in drives "5AC901.SDVW-00" on page 163 and "5AC901.SSCA-00" on page 166. • Updated bus units 5AC901.BX05-00, 5AC901.BX05-01 and 5AC901.BX05-02 on page 110. • Updated PCI RAID system "5ACPCI.RAIC-06" on page 168. • Updated the replacement fan kits on page 495. • Updated section "Slide-in slot 2" on page 79. • Updated chapter 5 "Standards and certifications" on page 430. • Updated section "Configuring a SATA RAID set using the internal RAID controller" on page 240. • Updated sections "Slide-in 1 features" on page 270 and "Slide-in 2 features" on page 272 in BIOS. • Revised section "Installing and connecting the UPS battery unit" on page 516. • Revised section "Power management" on page 42. • Modified Fig. 158 "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 316. • Updated the BIOS version to V1.13, see "BIOS options" on page 246.

Table 1: Manual history

Version	Date	Change
1.05	2013-07-30	<ul style="list-style-type: none"> Updated section "Fan control" on page 40. Updated UPS cable 5CAUPS.0010-01, see "5CAUPS.xxxx-01" on page 221. Updated B&R USB flash drive 5MMUSB.4096-01, see "USB flash drives" on page 457. Updated slide-in compact drive "5AC901.CSSD-04" on page 137. Updated replacement SSD "5MMSSD.0128-01" on page 151. Updated UPS IF option "5AC901.IUPS-01" on page 211 and UPS battery unit "5AC901.BUPS-01" on page 217. Updated replacement disk tray "5AC901.FRAME-00" on page 469. Updated tightening torque of locating screws in section "Cables" on page 470. Updated 5AC901.BX02-02 and 5AC901.BX05-03 in section "Bus units" on page 110. Updated sections "B&R Automation Device Interface (ADI) Development Kit" on page 425 and "B&R Automation Device Interface (ADI) .NET SDK" on page 426. Updated HM76 CPU boards 5PC900.TS77-09 and 5PC900.TS77-10 in section "5PC900.TS77-0x" on page 100.
1.20	2014-04-14	<ul style="list-style-type: none"> Revised sections "IF option 1 slot" on page 72 and "IF option 2 slot" on page 72. Updated following section in "Windows 7": "Installing on the internal RAID controller (QM77)" on page 405. Updated following section in "Windows XP Professional": "Installing on the internal RAID controller (QM77) or in AHCI mode" on page 410. Updated information about the discontinuation of support for the operating system "Windows XP Professional" on page 409. Revised section "Automation Runtime" on page 413. 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 431 and "DNV GL certification" on page 432 in chapter 5 "Standards and certifications". Updated the BIOS version to V1.15, see "BIOS options" on page 246. Updated front covers 5AC901.FF01-02, 5AC901.FF02-02 and 5AC901.FF05-02 on page 223. Updated monitor/panel option "5AC901.LSD3-00" on page 202. Updated ready relay IF option "5AC901.IRDY-00" on page 190. Updated slide-in compact drive "5AC901.CSSD-05" on page 140. Updated replacement SSD "5MMSSD.0256-00" on page 156. Corrected technical data for ambient temperature and humidity for the following drives: "5AC901.CSSD-03" on page 134, "5AC901.CSSD-04" on page 137, "5MMSSD.0060-01" on page 148, "5MMSSD.0128-01", "5MMSSD.0256-00" on page 156. Updated "Line filter" on page 496. Updated SDL3 cables "5CASD3.xxxx-00" on page 487. Updated service life diagram for the "5AC901.BUPS-00" and "5AC901.BUPS-01" battery units.
1.21	2014-05-27	<ul style="list-style-type: none"> Corrected technical data for bus units with PCI Express slots – PCIe standard and bus speed, see "Technical data" on page 112. Corrected Fig. 158 "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 316. Documented new revision of CFAST cards, see "CFAST cards" on page 438.
1.22	2014-08-25	<ul style="list-style-type: none"> Corrected Fig. X "1-slot APC variant - Power calculation table" on page , Fig. X "2-slot APC variant - Power calculation table" on page and Tab. 19 "5-slot APC variant - Power calculation table" on page 49. Corrected Fig. 5 "Voltage supply for system units" on page 42.
1.25	2015-02-11	<ul style="list-style-type: none"> Updated 5AC901.ISIO-00 interface option, see "Interface options" on page 172. Updated "Windows Embedded 8.1 Industry Pro" on page 400. 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 228. Updated section "Known problems / Issues" on page 245. Updated the BIOS version to V1.19, see "BIOS options" on page 246. Updated section "Automation Runtime" on page 413. Updated 5CFAST.032G-10, 5CFAST.064G-10 and 5CFAST.128G-10 CFAST cards, see "CFAST cards" on page 438. Updated section "Fan control" on page 40.
1.30	2015-09-30	<ul style="list-style-type: none"> Updated terminal block 0TB2104.8000 for ready relay, see "0TB2104.8000" on page 436. Updated SDL cable 5CASDL.0008-00, see "SDL cables" on page 473. Updated "B&R KCF Editor". Updated "HMI Service Center" on page 429 (5SWUTI.0001-000). Documented new revision of bus unit 5AC901.BX02-02, see "Bus units" on page 110. Updated figure "Grounding concept" on page 231. Revised section "SDL3 - LED status indicators" on page 204. Updated section "B&R Automation Device Interface (ADI) Control Center" on page 423. Updated "Humidity specifications" on page 41. Updated MTCX controller, see "Maintenance Controller Extended (MTCX)" on page 527. Updated section "DNV GL certification" on page 432. Updated Debian 8 section, see "Debian (GNU/Linux)" on page . Updated POWERLINK IF option "5AC901.IPLK-00" on page 186. Revised overview of "Windows Embedded 8.1 Industry Pro", "Windows 7" and "Windows Embedded Standard 7".

Table 1: Manual history

Version	Date	Change
1.31	2015-11-12	<ul style="list-style-type: none"> Updated slide-in compact drive "5AC901.CSSD-06" on page 143. Updated replacement SSD "5MMSSD.0512-00" on page 159. Updated OTG1000.02 Technology Guard (HID), see "Automation Runtime" on page 413. Updated slide-in compact drive "5AC901.CHDD-99" on page 162.
1.32	2016-01-28	<ul style="list-style-type: none"> Updated the BIOS version to V1.23, see "BIOS options" on page 246. Correct PCI slot assignment n "PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards" on page 316.
1.35	2016-04-14	<ul style="list-style-type: none"> Renamed SO-DIMM 1 and SO-DIMM 2 to CPU board sensor 3 and CPU board sensor 4, see "Temperature sensor locations" on page 39. Updated "Humidity specifications" on page 41. Updated drives "5AC901.CHDD-01" on page 123 and "5MMHDD.0500-00" on page 125. 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 LTSB" on page 397. Updated section "General instructions for performing temperature testing" on page 232 in chapter 3 "Commissioning". Updated PCI RAID controller "5ACPCI.RAIC-06" on page 168. Updated SDL3 cable 5CASD3.0030-00, see "SDL3/SDL4 cables" on page 487. Updated section "Power supply +24 VDC" on page 65.
1.36	2016-08-02	<ul style="list-style-type: none"> Updated "Device interfaces - Overview" on page 63. Documented new covers 5AC901.FF01-03, 5AC901.FF02-03 and 5AC901.FF05-03 on page 223. Updated Ethernet interface option "5AC901.IETH-00" on page 195. Updated PCIe plug-in card "5ACPCE.ETH1-00" on page 451. Updated chapter 5 "Standards and certifications" as well as "EAC" on page 431, "KC" on page 432 and "RCM" on page 432. Updated section 3.14 "Uninterruptible power supply (UPS)". Corrected I/O address and IRQ of IF option 1 (COM E) and IF option 2 (COM F) on page 173.

Table 1: Manual history

Version	Date	Change
1.40	2016-10-05	<ul style="list-style-type: none"> • Updated PCIe plug-in card "5ACPCE.ETH4-00" on page 454. • Documented new CPU boards 5PC900.TS17-00, 5PC900.TS17-01 and 5PC900.TS17-02 on page 102. • Updated main memory "5MMDDR.xxxx-04" on page 109. • Updated data in sections "Temperature specifications", "Power management", "Block diagrams" and operating systems 397. • Updated section "CFast cards" on page 438.
1.45	2017-06-12	<ul style="list-style-type: none"> • Documented interface option "5AC901.ICAN-01" on page 179. • Documented CPU board "5PC900.TS17-03" on page 106. • Documented heat sink "5AC901.HS00-02" on page 115. • Updated data in sections "Maximum ambient temperature for worst-case operation", "Power management" and "Humidity specifications". • Updated the following sections for "Automation Runtime": <ul style="list-style-type: none"> ◦ "Automation Runtime Windows (ARwin) with QM170/HM170 CPU boards" on page 414 ◦ "Automation Runtime Embedded (ARemb) with QM170/HM170 CPU boards" on page 414 • Updated CFast card 5CFAST.256G-10, see "CFast cards" on page 438. • Documented USB flash drive "5MMUSB.032G-02" on page 459. • Updated the following sections in chapter Software: <ul style="list-style-type: none"> ◦ "B&R Automation Device Interface (ADI) Control Center" on page 423 ◦ "B&R Automation Device Interface (ADI) Development Kit" on page 425 ◦ "B&R Automation Device Interface (ADI) .NET SDK" on page 426 ◦ "B&R Key Editor" on page 427 ◦ "Save & Exit" on page 306 • Updated section "DNV GL certification" on page 432.
1.50	2018-02-12	<ul style="list-style-type: none"> • Documented CPU board 5PC900.TS17-04, see "QM170 CPU boards" on page 102. • Documented SDL4 transmitter "5AC901.LSD4-00" on page 205. • Documented UPS cable 5CAUPS.0013-01, see "5CAUPS.xxxx-01" on page 221. • Documented BIOS TS17, see "BIOS TS17" on page 317. • Updated the following sections: <ul style="list-style-type: none"> ◦ "Trusted Platform Module (TPM)" on page 79 ◦ "Windows 10 IoT Enterprise 2016 LTSB" on page 394 ◦ "Repairs, complaints and replacement parts" on page 526 • Revised section "Installation" on page 225. • Updated the following sections: <ul style="list-style-type: none"> ◦ "Safety guidelines" on page 17 ◦ "B&R Automation Device Interface (ADI) Control Center" on page 423 ◦ "B&R Automation Device Interface (ADI) Development Kit" on page 425 ◦ B&R Automation Device Interface (ADI) .NET SDK ◦ "B&R Key Editor" on page 427 ◦ "5CASDL.0xxx-03" on page 479 ◦ "5CASDL.0xx0-13" on page 483
1.51	2018-06-19	<ul style="list-style-type: none"> • Updated the following section: <ul style="list-style-type: none"> ◦ "B&R Hypervisor" on page 417 ◦ "mapp Technology" on page 418 • Updated the following sections: <ul style="list-style-type: none"> ◦ "Grounding" on page 65 ◦ "Grounding concept" on page 231 ◦ Important information concerning installation/commissioning ◦ "Power button" on page 76 ◦ "Automation Runtime" on page 413

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 uninterruptible power supplies from B&R 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 impairment or loss of any kind without the implementation of exceptionally stringent safety precautions. In particular, this includes the use of these devices to monitor nuclear reactions in nuclear power plants, 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 must always be placed on or stored in a suitable medium (ESD packaging, conductive foam, etc.). Metallic surfaces are not suitable storage surfaces!
- Components must not be subjected to electrostatic discharge (e.g. caused by charged plastics).
- Observe a minimum distance of 10 cm from monitors and television sets.
- Measuring instruments and equipment must be grounded.
- Probe tips of galvanically isolated measuring instruments must be temporarily discharged on suitably grounded surfaces before taking measurements.

Individual components

- ESD protective measures for individual components are thoroughly implemented at B&R (conductive floors, footwear, arm bands, etc.).
- Increased ESD protective measures for individual components are not required for handling B&R products at customer locations.

2.3 Policies and procedures

Electronic devices are never completely failsafe. If the programmable logic controller, operating/monitoring device or uninterruptible power supply fails, the user is responsible for ensuring that other connected devices such as motors are brought to a safe state.

When using programmable logic controllers or operating/monitoring devices as **control** systems in connection 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, etc.) must be observed in accordance with applicable national and international regulations. This also applies to 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 to perform these **tasks** (e.g. IEC 60364). National accident prevention regulations must be observed.

The **safety** notices, information about connection conditions (nameplate and documentation) and limit values specified in the technical data must be read carefully before installation and commissioning and are to be observed in all cases.

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

- Devices are not ready for use immediately upon delivery. They must be installed and wired according to the requirements of this documentation in order for **EMC** limit values to be observed.
- Installation must be performed according to this documentation using suitable equipment and tools.
- Devices are only permitted to be installed by qualified personnel and when the power is switched off. 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. wire cross sections, fuses, protective **ground** connections).

2.6 Operation

2.6.1 Protection against touching electrical parts

To operate programmable logic controllers, operating/monitoring devices and uninterruptible power supplies, certain components must carry dangerous voltage levels over 42 VDC. Touching one of these components **can** result in a life-threatening electric shock. This could lead to death, severe injury or damage to property.

Before switching on programmable logic controllers, operating/monitoring devices or the uninterruptible power supply, it must be ensured that the housing is properly connected to **ground** (PE rail). **Ground** connections must also be established when the operating/monitoring **device** or uninterruptible power supply is connected for test purposes or only being operated for a short period of time!

Before switching on the **device**, all voltage-carrying components 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) and uninterruptible power supplies in very dusty environments must be avoided. The collection of dust on devices **can** affect functionality and may prevent sufficient cooling, especially in systems with active cooling (fans).

The presence of corrosive gases **can** also result in impaired functionality. In combination 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. The presence of corrosive gases is indicated by blackened copper surfaces and cable ends on existing installations.

When operated in dusty or moist environments that could potentially impair functionality, operating/monitoring devices such as the **Automation Panel** and **Power Panel** are protected on the front against the ingress of dust or moisture when installed properly (e.g. cutout installation). The back of all devices must be protected from the ingress of dust and moisture, however; any collected dust must be removed 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 storage **device** (e.g. diskette, CD-ROM, **USB** flash drive, etc.), network connection or the **Internet**. The user is responsible for assessing these risks, implementing preventive measures such as virus protection programs, **firewalls**, etc. and making sure that **software** is obtained only from trusted sources.

2.7 Environmentally friendly disposal

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

2.7.1 Separation of materials

It is necessary to separate out the different materials so that devices **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/Paper packaging	Paper/Cardboard recycling
Plastic packaging material	Plastic recycling

Table 2: Environmentally friendly disposal

Disposal must take place in accordance with applicable legal regulations.

2.8 Security concept

To protect plants, systems, machines and networks against cyber threats, it is necessary to implement (and continuously maintain) an integrated security concept that is state of the art. B&R products and solutions form only one part of such a concept.

The user is responsible for preventing unauthorized access to his plants, systems, machines and networks. Systems, machines and components should only be connected to the corporate network or **Internet** if and to the extent necessary and appropriate protective measures (e.g. use of **firewalls** and network segmentation) have been taken.

B&R products and solutions are constantly being developed further to make them even more secure. B&R strongly recommends that updates be performed as soon as the corresponding updates are available and that only the latest product versions are used. Using outdated or unsupported versions **can** increase the risk of cyber threats.

2.9 Third-party **software** updates

This product contains third-party **software** (e.g. drivers, etc.). B&R only assumes warranty for updates/patches to the third-party **software** if they have been officially released by B&R. Otherwise, updates/patches are undertaken at your own risk.

2.10 Administrator accounts

A user with administrator rights has extensive access and manipulation options available on the system.

Therefore, make sure that your administrator accounts are adequately secured to prevent unauthorized changes. Use secure passwords and a standard user account for regular operation. Further measures such as the use of security guidelines are to be applied as needed.

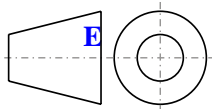
3 Organization of safety notices

Safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
Warning!	Failure to observe these safety guidelines and notices can result in severe injury or substantial damage to property.
Caution!	Failure to observe these safety guidelines and notices can result in injury or damage to property.
Information:	These instructions are important for avoiding malfunctions.

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

4 Guidelines



European dimension standards apply to all dimension diagrams.

All dimensions are specified in mm.

Unless otherwise specified, the following general tolerances apply:

Range of nominal size	General tolerance per DIN ISO 2768 (medium)
Up to 6 mm	±0.1 mm
6 to 30 mm	±0.2 mm
30 to 120 mm	±0.3 mm
120 to 400 mm	±0.5 mm
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	496
5AC901.FI01-00	APC910 air filter - For 1-slot APC910 - 1 pieces	495
5AC901.FI02-00	APC910 air filter - For 2-slot APC910 - 1 pieces	495
5AC901.FI05-00	APC910 air filter - For 5-slot APC910 - 1 pieces	495
5AC901.FRAME-00	APC910 slide-in compact tray	469
5ACPCE.ETH1-00	PCIe carte - 1x ETH 10/100/1000 - For APC910/PPC900	451
5ACPCE.ETH4-00	PCIe card - 4-port ETH 10/100/1000 - For APC910/PPC900	454
5CAMSC.0001-00	Internal supply cable	494
5SWUTI.0001-000	HMI Service Center USB flash drive - Hardware diagnostic software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC2200/PPC2200 - For APC3100/PPC3100 - For APC51x/PP500 - For Automation Panel 800/900 - For Automation Panel 1000/5000	429
B&R Linux 8		
5SWLIN.0540-MUL	B&R Linux 8 - 32-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	421
5SWLIN.0640-MUL	B&R Linux 8 - 64-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	421
5SWLIN.0649-MUL	B&R Linux 8 - 64-bit - Multilingual - APC910 chipset QM170/HM170/CM236 - Installation (without Recovery DVD) - Only available with a new device	421
B&R Linux 9		
5SWLIN.0740-MUL	B&R Linux 9 - 64-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	419
5SWLIN.0749-MUL	B&R Linux 9 - 64-bit - Multilingual - APC910 chipset QM170/HM170/CM236 - Installation (without Recovery DVD) - Only available with a new device	419
Batteries		
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell	437
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell	437
Buseinheiten		
5AC901.BX01-00	APC910 1-slot bus - 1 PCI	111
5AC901.BX01-01	APC910 1-slot bus - 1 PCI Express x8	111
5AC901.BX02-00	APC910 2-slot bus - 2 PCI	111
5AC901.BX02-01	APC910 2-slot bus - 1 PCI - 1 PCI Express x8	111
5AC901.BX02-02	APC910 2-slot bus - 2 PCI Express x4	111
5AC901.BX05-00	APC910 5-slot bus - 5 PCI	111
5AC901.BX05-01	APC910 5-slot bus - 4 PCI - 1 PCI Express x8	111
5AC901.BX05-02	APC910 5-slot bus - 2 PCI - 1 PCI Express x8 - 2 PCI Express x1	111
5AC901.BX05-03	APC910 5-slot bus - 2 PCI Express x4 - 3 PCI Express x1	111
CFast cards		
5CFAST.016G-00	CFast card, 16 GB SLC	440
5CFAST.032G-00	CFast card, 32 GB SLC	440
5CFAST.2048-00	CFast card, 2 GB SLC	440
5CFAST.4096-00	CFast card, 4 GB SLC	440
5CFAST.8192-00	CFast card, 8 GB SLC	440
CFast-Karten		
5CFAST.032G-10	CFast card, 32 GB MLC ≤Rev. F0	445
5CFAST.064G-10	CFast card, 64 GB MLC ≤Rev. D0	445
5CFAST.128G-10	CFast card, 128 GB MLC ≤Rev. D0	445
5CFAST.256G-10	CFast card, 256 GB MLC	445
CPU boards		
5PC900.TS17-00	CPU board Intel Core i5 6440EQ - Quad core - Chipset QM170 - 2.7 GHz active - For APC910	102
5PC900.TS17-01	CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910	104
5PC900.TS17-02	CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.7 GHz passive - For APC910	104
5PC900.TS17-03	CPU Board Intel Xeon E3-1515MV5 - Quad core - Chipset CM236 - 2.8 GHz active - For APC910	106
5PC900.TS17-04	CPU board Intel Core i7 6820EQ - Quad core - Chipset QM170 - 2.8 GHz active - For APC910	102
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - QM77 chipset - For APC910	98
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - QM77 chipset - For APC910	98
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - QM77 chipset - For APC910	98
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - QM77 chipset - For APC910	98
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - QM77 chipset - For APC910	98
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - QM77 chipset - For APC910	98
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - QM77 chipset - For APC910	98
5PC900.TS77-07	CPU board Intel Celeron 847E 1.1 GHz - Dual core - HM76 chipset - For APC910	100
5PC900.TS77-08	CPU board Intel Celeron 827E 1.4 GHz - Single core - HM76 chipset - For APC910	100
5PC900.TS77-09	CPU board Intel Celeron 1020E 2.2 GHz - Dual core - HM76 chipset - For APC910	100
5PC900.TS77-10	CPU board Intel Celeron 1047UE 1.4 GHz - Dual core - HM76 chipset - For APC910	100
DVI cables		
5CADVI.0018-00	DVI-D cable - 1.8 m	470
5CADVI.0050-00	DVI-D cable - 5 m	470
5CADVI.0100-00	DVI-D cable - 10 m	470
Drives		
5AC901.CCFA-00	CFast adapter - For slide-in compact slot	161
5AC901.CHDD-00	250 GB hard disk - Slide-in compact - SATA	120
5AC901.CHDD-01	500 GB hard disk - Slide-in compact - SATA	123

Model number	Short description	Page
5AC901.CHDD-99	Slide-in compact kit	162
5AC901.CSSD-00	32 GB SSD SLC - Slide-in compact - SATA	128
5AC901.CSSD-01	60 GB SSD MLC - Slide-in compact - SATA	130
5AC901.CSSD-02	180 GB SSD MLC - Slide-in compact - SATA	132
5AC901.CSSD-03	60 GB SSD MLC - Slide-in compact - SATA	134
5AC901.CSSD-04	128 GB SSD MLC - Slide-in compact - SATA	137
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	140
5AC901.CSSD-06	512 GB SSD MLC - Slide-in compact - Toshiba - SATA	143
5AC901.SDVW-00	DVD drive - DVD-R/RW/DVD+R/RW - Slide-in	163
5AC901.SSCA-00	Slide-in compact adapter - For slide-in compact drives	166
5ACPCI.RAIC-06	PCI RAID System 2x 500 GB - SATA	168
5MMHDD.0500-00	500 GB hard disk - SATA	125
5MMSSD.0060-00	60 GB SSD MLC - Intel - SATA	146
5MMSSD.0060-01	60 GB SSD MLC - Intel - SATA	148
5MMSSD.0128-01	128 GB SSD MLC - Toshiba - SATA	151
5MMSSD.0180-00	180 GB SSD MLC - Intel - SATA	154
5MMSSD.0256-00	256 GB SSD MLC - Toshiba - SATA	156
5MMSSD.0512-00	512 GB SSD MLC - Toshiba - SATA	159
	Fan kit	
5AC901.FA01-00	APC910 fan kit - For 5PC910.SX01-00	116
5AC901.FA02-00	APC910 fan kit - For 5PC910.SX02-00	118
5AC901.FA05-00	APC910 fan kit - For 5PC910.SX05-00 system unit	119
	Front cover	
5AC901.FF01-00	Front cover for 1-slot APC910 - Orange	223
5AC901.FF01-01	Front cover for 1-slot APC910 - Dark gray	223
5AC901.FF01-02	Front cover for 1-slot APC910 - Dark gray - Without logo	223
5AC901.FF01-03	Front cover for 1-slot APC910 - Orange - Without logo	223
5AC901.FF02-00	Front cover for 2-slot APC910 - Orange	223
5AC901.FF02-01	Front cover for 2-slot APC910 - Dark gray	223
5AC901.FF02-02	Front cover for 2-slot APC910 - Dark gray - Without logo	223
5AC901.FF02-03	Front cover for 2-slot APC910 - Orange - Without logo	223
5AC901.FF05-00	Front cover for 5-slot APC910 - Orange	223
5AC901.FF05-01	Front cover for 5-slot APC910 - Dark gray	223
5AC901.FF05-02	Front cover for 5-slot APC910 - Dark gray - Without logo	223
5AC901.FF05-03	Front cover for 5-slot APC910 - Orange - Without logo	223
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	114
5AC901.HS00-01	APC910 active heat sink QM170/HM170	114
5AC901.HS00-02	APC910 active heat sink CM236	115
5AC901.HS01-00	APC910 heat sink, passive	114
5AC901.HS01-01	APC910 passive heat sink QM170/HM170	114
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/485 interface - For APC910/PPC900/APC3100/PPC3100	172
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100	176
5AC901.ICAN-01	Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100	179
5AC901.IETH-00	Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/APC3100/PPC3100	195
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100	182
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100	186
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100	190
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100	192
5AC901.ISRM-00	Interface card - 2 MB RAM - For APC910/PPC900/APC3100/PPC3100	184
	Main memory	
5MMDDR.016G-04	SO-DIMM DDR4, 16384 MB	109
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	108
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	108
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	108
5MMDDR.4096-04	SO-DIMM DDR4, 4096 MB	109
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	108
5MMDDR.8192-04	SO-DIMM DDR4, 8192 MB	109
	Monitor/Panel options	
5AC901.LDPO-00	DisplayPort transmitter	197
5AC901.LSD3-00	SDL3 transmitter	202
5AC901.LSD4-00	SDL4 transmitter	205
5AC901.LSDL-00	SDL/DVI transmitter	199
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of display unit with touch screen, 1.8 m	492
9A0014.05	RS232 extension cable for remote operation of display unit with touch screen, 5 m	492
9A0014.10	RS232 extension cable for remote operation of display unit with touch screen, 10 m	492
	SDL cables	
5CASDL.0008-00	SDL cable - 0.8 m	473
5CASDL.0018-00	SDL cable - 1.8 m	473
5CASDL.0050-00	SDL cable - 5 m	473
5CASDL.0100-00	SDL cable - 10 m	473
5CASDL.0150-00	SDL cable - 15 m	473

Model number	Short description	Page
5CASDL.0200-00	SDL cable - 20 m	473
5CASDL.0250-00	SDL cable - 25 m	473
5CASDL.0300-00	SDL cable - 30 m	473
SDL cables 45° connection		
5CASDL.0018-01	SDL cable - 45 degree connector - 1.8 m	476
5CASDL.0050-01	SDL cable - 45 degree connector - 5 m	476
5CASDL.0100-01	SDL cable - 45 degree connector - 10 m	476
5CASDL.0150-01	SDL cable - 45 degree connector - 15 m	476
SDL cables flex		
5CASDL.0018-03	SDL flex cable - 1.8 m	479
5CASDL.0050-03	SDL flex cable - 5 m	479
5CASDL.0100-03	SDL flex cable - 10 m	479
5CASDL.0150-03	SDL flex cable - 15 m	479
5CASDL.0200-03	SDL flex cable - 20 m	479
5CASDL.0250-03	SDL flex cable - 25 m	479
5CASDL.0300-03	SDL flex cable - 30 m	479
5CASDL.0300-13	SDL flex cable with extender - 30 m	483
5CASDL.0400-13	SDL flex cable with extender - 40 m	483
5CASDL.0430-13	SDL flex cable with extender - 43 m	483
SDL3/SDL4 cables		
5CASD3.0030-00	SDL3/SDL4 cable - 3 m	487
5CASD3.0050-00	SDL3/SDL4 cable - 5 m	487
5CASD3.0100-00	SDL3/SDL4 cable - 10 m	487
5CASD3.0150-00	SDL3/SDL4 cable - 15 m	487
5CASD3.0200-00	SDL3/SDL4 cable - 20 m	487
5CASD3.0300-00	SDL3/SDL4 cable - 30 m	487
5CASD3.0500-00	SDL3/SDL4 cable - 50 m	487
5CASD3.1000-00	SDL3/SDL4 cable - 100 m	487
System units		
5PC910.SX01-00	1-slot APC910 system unit	80
5PC910.SX02-00	2-slot APC910 system unit	86
5PC910.SX05-00	5-slot APC910 system unit	92
Technology Guard		
0TG1000.01	Technology Guard (MSD)	413
0TG1000.02	Technology Guard (HID)	413
1TG4600.10-5	Automation Runtime Windows, TG license	413
1TG4601.06-5	Automation Runtime Embedded, TG license	413
Terminal blocks		
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm ²	434
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	434
0TB2104.8000	Connector 24 VDC - 4-pin female - Screw clamp terminal block 2.5 mm ²	436
USB accessories		
5A5003.03	Front cover for drives - 5A5003.02 - 5MD900.USB2	467
5MD900.USB2-02	USB 2.0 drive combination - DVD-R/RW, DVD+R/RW - CompactFlash slot	462
5MMUSB.032G-02	USB 3.0 flash drive 32 GB MLC	459
5MMUSB.2048-01	USB 2.0 flash drive 2048 MB B&R	457
5MMUSB.4096-01	USB 2.0 flash drive 4096 MB B&R	457
USB cables		
5CAUSB.0018-00	USB 2.0 connection cable - Type A - type B connector - 1.8 m	490
5CAUSB.0050-00	USB 2.0 connection cable - Type A - type B connector - 5 m	490
Uninterruptible power supplies		
5AC901.BUPS-00	Battery unit 4.5 Ah - For UPS 5AC901.IUPS-00	213
5AC901.BUPS-01	Battery unit 2.2 Ah - For UPS 5AC901.IUPS-01	217
5AC901.IUPS-00	UPS - For 4.5 Ah battery	209
5AC901.IUPS-01	UPS - For 2.2 Ah battery	211
5CAUPS.0005-01	UPS cable - 0.5 m - For 5AC901.IUPS-xx	221
5CAUPS.0010-01	UPS cable - 1 m - For 5AC901.IUPS-xx	221
5CAUPS.0013-01	UPS cable - 1.3 m - For 5AC901.IUPS-xx	221
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	221
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	397
5SWW10.0249-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Multilingual - APC910 chipset QM170/HM170 - License (without Recovery DVD) - Only available with a new device	397
5SWW10.0640-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Value - Multilingual - APC910 chipset QM77/HM76 - CPU Celeron/i3/i5 - License (without Recovery DVD) - Only available with a new device	394
5SWW10.0649-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Value - Multilingual - APC910 chipset QM170/HM170 - CPU Celeron/i3/i5 - License (without Recovery DVD) - Only available with a new device	394
5SWW10.0740-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - High End - Multilingual - APC910 chipset QM77/HM76 - CPU i7 - License (without Recovery DVD) - Only available with a new device	394
5SWW10.0749-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - High End - Multilingual - APC910 chipset QM170/CM236 - CPU i7/E3 - License (without Recovery DVD) - Only available with a new device	394
Windows 7 Professional/Ultimate		
5SWWI7.1100-ENG	Windows 7 Professional SP1 - 32-bit - English - DVD	403
5SWWI7.1100-GER	Windows 7 Professional SP1 - 32-bit - German - DVD	403

Model number	Short description	Page
5SWWI7.1200-ENG	Windows 7 Professional SP1 - 64-bit - English - DVD	403
5SWWI7.1200-GER	Windows 7 Professional SP1 - 64-bit - German - DVD	403
5SWWI7.1300-MUL	Windows 7 Ultimate SP1 - 32-bit - Multilingual - DVD	403
5SWWI7.1400-MUL	Windows 7 Ultimate SP1 - 64-bit - Multilingual - DVD	403
Windows Embedded 8.1 Industry Professional		
5SWWI8.0340-MUL	Windows Embedded 8.1 Industry Pro - 32-bit - Multilingual - For APC910 QM77/HM76 - License	400
5SWWI8.0440-MUL	Windows Embedded 8.1 Industry Pro - 64-bit - Multilingual - For APC910 QM77/HM76 - License	400
Windows Embedded Standard 2009		
5SWWXP.0740-ENG	Windows Embedded Standard 2009 - English - For PPC900 with QM77/HM76 chipset - License	411
Windows Embedded Standard 7		
5SWWI7.1540-ENG	Windows Embedded Standard 7 SP1 - 32-bit - English - For APC910 with QM77/HM76 chipset - License	406
5SWWI7.1640-ENG	Windows Embedded Standard 7 SP1 - 64-bit - English - For APC910 with QM77/HM76 chipset - License	406
5SWWI7.1740-MUL	Windows Embedded Standard 7 Premium SP1 - 32-bit - Multilingual - For APC910 with QM77/HM76 chipset - License	406
5SWWI7.1840-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with QM77/HM76 chipset - License	406
5SWWI7.1849-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with chipset QM170/HM170/CM236 - License	406
Windows XP Professional		
5SWWXP.0600-ENG	Windows XP Professional SP3 - English - CD	409
5SWWXP.0600-GER	Windows XP Professional SP3 - German - CD	409
5SWWXP.0600-MUL	Windows XP Professional SP3 - Multilingual - CD	409

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 and Generation 6 - Skylake)
- Up to 16 [GB](#) main memory (dual-channel memory support) for QM77/HM76
- Up to 32 [GB](#) main memory (dual-channel memory support) for QM170/HM170/CM236
- Powerful graphics (Intel HD graphics up to Intel Iris Pro)
- 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
- TPM 2.0 [safety](#) for QM170/HM170/CM236

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. For additional information, see section "[Maximum ambient temperature for worst-case operation](#)" on page 32.

³⁾ A fan kit is only mandatory when using heat sink 5AC901.HS00-0x. If a fan kit is not used, it is important to consider the more limited ambient temperature specifications (see "[Maximum ambient temperature for worst-case operation](#)" on page 32).

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.TS77-01 5PC900.TS77-02 5PC900.TS77-03 5PC900.TS77-04 5PC900.TS77-05 5PC900.TS77-06	HM76 CPU boards 5PC900.TS77-07 5PC900.TS77-08 5PC900.TS77-09 5PC900.TS77-10	QM170 CPU boards 5PC900.TS17-00 5PC900.TS17-04	HM170 CPU boards 5PC900.TS17-01 5PC900.TS17-02
Heat sink		Select 1			
		5AC901.HS00-00 (5PC900.TS77-0x) 5AC901.HS00-01 (5PC900.TS17-00, -01, -02, -04) 5AC901.HS00-02 (5PC900.TS17-03)			
Fan kit		Select 1			
		5AC901.FA01-00	5AC901.FA02-00	5AC901.FA05-00	
Main memory		Select max. 2			
		QM77/HM76 CPU boards 5MMDDR.1024-03 5MMDDR.2048-03 5MMDDR.4096-03 5MMDDR.8192-03		QM170/HM170/CM236 CPU boards 5MMDDR.4096-04 5MMDDR.8192-04 5MMDDR.016G-04	

Figure 1: Configuration - Base system with a fan kit

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 ¹⁾ 5PC900.TS77-01 5PC900.TS77-02 5PC900.TS77-03 5PC900.TS77-04 5PC900.TS77-05 5PC900.TS77-06	HM76 CPU boards ¹⁾ 5PC900.TS77-07 5PC900.TS77-08 5PC900.TS77-09 5PC900.TS77-10	HM170 CPU boards ²⁾ 5PC900.TS17-01 5PC900.TS17-02
Heat sink	Select 1		
	5AC901.HS01-00 (5PC900.TS77-0x) 5AC901.HS01-01 (5PC900.TS17-01, -02)		
Main memory	Select max. 2		
	QM77/HM76 CPU boards 5MDDR.1024-03 5MDDR.2048-03 5MDDR.4096-03 5MDDR.8192-03	QM170/HM170/CM236 CPU boards 5MDDR.4096-04 5MDDR.8192-04 5MDDR.016G-04	
1) Main memory frequency of 5PC900.TS77-0x CPU boards limited to 1067 MHz when operating without a fan kit. 2) When operated without a fan kit <ul style="list-style-type: none"> • CPU board 5PC900.TS17-01 is limited to a maximum CPU frequency of 1900 MHz. • CPU board 5PC900.TS17-02 is limited to a maximum CPU frequency of 1700 MHz. 			

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.FF01-03	5AC901.FF02-00 5AC901.FF02-01 5AC901.FF02-02 5AC901.FF02-03	5AC901.FF05-00 5AC901.FF05-01 5AC901.FF05-02 5AC901.FF05-03
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
			
RAID system	Select 1		
	5ACPCI.RAIC-06 (uses 1 PCI slot) 5MMHDD.0500-00		
IF options	Select max. 2 as an option ²⁾		
	5AC901.I485-00 5AC901.ICAN-00 5AC901.ICAN-01	5AC901.IHDA-00 5AC901.IRDY-00 5AC901.IPLK-00	5AC901.ISIO-00 5AC901.ISRM-00 5AC901.IETH-00
Monitor/Panel options		Optional, select 1	
			
UPS	Select 1 of each		
	UPS modul³⁾ 5AC901.IUPS-00 5AC901.IUPS-01	Battery unit + 5AC901.BUPS-00 + 5AC901.BUPS-01	UPS cable 5CAUPS.0005-01 5CAUPS.0010-01 5CAUPS.0013-01 5CAUPS.0030-01
CFAST cards	Select 1		
	5CFAST.2048-00 5CFAST.4096-00 5CFAST.8192-00	5CFAST.016G-00 5CFAST.032G-00	5CFAST.032G-10 5CFAST.064G-10 5CFAST.128G-10 5CFAST.256G-10
PCIe cards	Select 1 ⁴⁾		
	5ACPCI.ETH1-00 5ACPCI.ETH4-00		
USB accessories	Select as an option		
	5MMUSB.2048-01 5MMUSB.4096-01 5MMUSB.032G-02		
Terminal blocks	Select 1		
	Power connectors 0TB103.9 0TB103.91		
Operating systems	Select 1 ⁵⁾		
	Windows 7 5SWWI7.1100-ENG 5SWWI7.1100-GER 5SWWI7.1300-MUL 5SWWI7.1200-ENG 5SWWI7.1200-GER 5SWWI7.1400-MUL	Windows Embedded Standard 7 5SWWI7.1540-ENG 5SWWI7.1640-ENG 5SWWI7.1740-MUL 5SWWI7.1840-MUL 5SWWI7.1849-MUL	Automation Runtime 0TG1000.01 0TG1000.02 1TG4600.10-5 1TG4601.06-5
	Windows 10 5SWW10.0240-MUL 5SWW10.0249-MUL 5SWW10.0640-MUL 5SWW10.0649-MUL 5SWW10.0740-MUL 5SWW10.0749-MUL	Windows Embedded Standard 2009 5SWWXP.0740-ENG	Windows XP 5SWWXP.0600-ENG 5SWWXP.0600-GER 5SWWXP.0600-MUL
		Windows Embedded 8.1 Industry 5SWWI8.0340-MUL 5SWWI8.0440-MUL	B&R Linux 8 (GNU/Linux) 5SWLIN.0540-MUL 5SWLIN.0640-MUL 5SWLIN.0649-MUL
		B&R Linux 9 (GNU/Linux) 5SWLIN.0740-MUL 5SWLIN.0749-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, see section "Device interfaces" of chapter 2 "Technical data".
 3) The UPS module can only be operated in the IF option 1 slot.
 4) Required = PCIe bus
 5) Only the following 64-bit operating systems are supported by 5PC900.TS17-0x CPU boards:
 • Windows 7 • Windows 10 IoT Enterprise 2016 LTSC
 • Windows Embedded Standard 7 • B&R Linux 8
 • Windows 10 IoT Enterprise 2015 LTSC • B&R Linux 9

Figure 3: Accessory and software configuration

2 Complete system

2.1 Environmental characteristics

2.1.1 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 achieved in typical applications, e.g. in Microsoft Windows. Testing and evaluation in this regard must be performed on-site by the user in each individual case (temperatures can be read in BIOS or using the B&R Control Center).

Information regarding worst-case conditions of QM77/HM76 CPU boards

- 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

Information regarding worst-case conditions for QM170/HM170/CM236 CPU boards

- Thermal Analysis Tool (TAT V5) from Intel for simulating a 100% processor load
- BurnInTest tool (BurnInTest V6.0 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

2.1.1.1 Maximum ambient temperature for worst-case operation

Operation with a fan kit on QM77/HM76 CPU boards

Information:

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

All values apply to non-condensing operation.

		Operation with a fan kit and 5AC901.HS00-00 heat sink											Location of sensor(s)
		i7 3615QE	i7 3612QE	i7 3555LE	i7 3517UE	i5 3610ME	i3 3120ME	i3 3217UE	CM 847E	CM 827E	CM 1020E	CM 1047UE	
All temperature values in degrees Celsius (°C) at 500 meters 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 for worst-case operation		50	55	55	55	55	55	55	55	55	55	55	
What else can also be operated at the max. ambient temperature, or is there a limitation?													
System units	5PC910.SX01-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Power supply
	5PC910.SX02-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5PC910.SX05-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Main memory	5MMDR.1024-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5MMDR.2048-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5MMDR.4096-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5MMDR.8192-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5MMDR.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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
5AC901.CCFA-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Slide-in drives	5AC901.SDVW-00	40	40	40	40	40	40	40	40	40	40	40	Slide-in drive
	5AC901.SSCA-00 ¹⁾	-	-	-	-	-	-	-	-	-	-	-	
RAID system	5ACPCI.RAIC-06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
Interface options	5AC901.I485-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Interface option
	5AC901.ICAN-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.ICAN-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IHDA-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.ISRM-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IPLK-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IRDY-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.ISIO-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IUPS-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IUPS-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.IETH-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Monitor/Panel options	5AC901.LDPO-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Monitor/Panel option
	5AC901.LSDL-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.LSD3-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.LSD4-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CFast cards	5CFAST.xxxx-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5CFAST.xxxx-10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
PCIe cards	5ACPCE.ETH1-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5ACPCE.ETH4-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

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 on QM77/HM76 CPU boards

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 values apply to non-condensing operation.

		Operation without a fan kit and with 5AC901.HS01-00 heat sink											Location of sensor(s)
		i7 3615QE	i7 3612QE	i7 3555LE	i7 3517UE	i5 3610ME	i3 3120ME	i3 3217UE	CM 847E	CM 827E	CM 1020E	CM 1047UE	
All temperature values in degrees Celsius (°C) at 500 meters 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 for typical operation		-	35	40	50	35	35	50	50	50	35	50	
What else can also be operated at the max. ambient temperature, or is there a limitation?													
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	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.CHDD-00	-	✓	✓	45	✓	✓	45	45	45	✓	45	
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.ICAN-01	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	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	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	5AC901.LSD4-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CFast cards	5CFAST.xxxx-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5CFAST.xxxx-10	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
PCIe cards	5ACPCE.ETH1-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
	5ACPCE.ETH4-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

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

Table 6: Ambient temperature without a fan kit

Operation of QM170/HM170/CM236 CPU boards with a fan kit

Information:

Heat sink 5AC901.HS00-01 or 5AC901.HS00-02 must be used when operating the Automation PC 910 with a fan kit.

All values apply to non-condensing operation.

		Operation with a fan kit and heat sink 5AC901.HS00-01/5AC901.HS00-02					Location of sensor(s)
		I5 6440EQ 5PC900.TS17-00	I3 6100E 5PC900.TS17-01 @2700	G3900E 5PC900.TS17-02 @2400	E3-1515MV5 5PC900.TS17-03	I7 6820EQ 5PC900.TS17-04	
All temperature values in degrees Celsius (°C) at 500 meters 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 for worst-case operation		50	55	60	50	50	
What else can also be operated at the max. ambient temperature, or is there a limitation?							
System units	5PC910.SX01-00	✓	✓	✓	✓	✓	Power supply
	5PC910.SX02-00	✓	✓	✓	✓	✓	
	5PC910.SX05-00	✓	✓	✓	✓	✓	
Main memory	5MMDDR.4096-04	✓	✓	✓	✓	✓	-
	5MMDDR.8192-04	✓	✓	✓	✓	✓	
	5MMDDR.016G-04	✓	✓	✓	✓	✓	
Slide-in compact drives	5AC901.CHDD-00	✓	50	50	✓	✓	Slide-in compact drive
	5AC901.CHDD-01	✓	50	50	✓	✓	
	5AC901.CSSD-00	✓	✓	✓	✓	✓	
	5AC901.CSSD-01	✓	✓	✓	✓	✓	
	5AC901.CSSD-02	✓	✓	✓	✓	✓	
	5AC901.CSSD-03	✓	✓	✓	✓	✓	
	5AC901.CSSD-04	✓	✓	✓	✓	✓	
	5AC901.CSSD-05	✓	✓	✓	✓	✓	
	5AC901.CSSD-06	✓	✓	✓	✓	✓	
5AC901.CCFA-00	✓	✓	✓	✓	✓		
Slide-in drives	5AC901.SDVW-00	40	40	40	40	40	Slide-in drive
	5AC901.SSCA-00 ¹⁾	-	-	-	-	-	
RAID system	5ACPCI.RAIC-06	✓	✓	✓	✓	✓	-
Interface options	5AC901.I485-00	✓	✓	✓	✓	✓	Interface option
	5AC901.ICAN-00	✓	✓	✓	✓	✓	
	5AC901.ICAN-01	✓	✓	✓	✓	✓	
	5AC901.IHDA-00	✓	✓	✓	✓	✓	
	5AC901.ISRM-00	✓	✓	✓	✓	✓	
	5AC901.IPLK-00	✓	✓	✓	✓	✓	
	5AC901.IRDY-00	✓	✓	✓	✓	✓	
	5AC901.ISIO-00	✓	✓	✓	✓	✓	
	5AC901.IUPS-00	✓	✓	✓	✓	✓	
	5AC901.IUPS-01	✓	✓	✓	✓	✓	
	5AC901.IETH-00	✓	✓	✓	✓	✓	
Monitor/Panel options	5AC901.LDPO-00	✓	✓	✓	✓	✓	Monitor/ Panel option
	5AC901.LSDL-00	✓	✓	✓	✓	✓	
	5AC901.LSD3-00	✓	✓	✓	✓	✓	
	5AC901.LSD4-00	✓	✓	✓	✓	✓	
CFast cards	5CFAST.xxxx-00	✓	✓	✓	✓	✓	-
	5CFAST.xxxx-10	✓	✓	✓	✓	✓	
PCIe cards	5ACPCE.ETH1-00	✓	✓	✓	✓	✓	-
	5ACPCE.ETH4-00	✓	✓	✓	✓	✓	

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

Table 7: Ambient temperature with a fan kit

Operation of QM170/HM170/CM236 CPU boards without a fan kit

Information:

CPU boards 5PC900.TS17-00, 5PC900.TS17-03 and 5PC900.TS17-04 cannot be operated without a fan kit.

Heat sink 5AC901.HS01-01 must be used when operating the Automation PC 910 without a fan kit.

All values apply to non-condensing operation.

		Operation without a fan kit and with 5AC901.HS01-01 heat sink					Location of sensor(s)
		IS 6440EQ 5PC900.TS17-00	I3 6100E 5PC900.TS17-01 @1900	G3900E 5PC900.TS17-02 @1700	E3-1515MV5 5PC900.TS17-03	I7 6820EQ 5PC900.TS17-04	
All temperature values in degrees Celsius (°C) at 500 meters 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 for worst-case operation		-	45	55	-	-	
What else can also be operated at the max. ambient temperature, or is there a limitation?							
System units	5PC910.SX01-00	-	✓	✓	-	-	Power supply
	5PC910.SX02-00	-	✓	✓	-	-	
	5PC910.SX05-00	-	✓	✓	-	-	
Main memory	5MMDR.4096-04	-	✓	✓	-	-	-
	5MMDR.8192-04	-	✓	✓	-	-	
	5MMDR.016G-04	-	✓	✓	-	-	
Slide-in compact drives	5AC901.CHDD-00	-	✓	45	-	-	Slide-in compact drive
	5AC901.CHDD-01	-	✓	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	-	-	Slide-in drive
	5AC901.SSCA-00 ¹⁾	-	-	-	-	-	
RAID system	5ACPCI.RAIC-06	-	✓	✓	-	-	-
Interface options	5AC901.I485-00	-	✓	✓	-	-	Interface option
	5AC901.ICAN-00	-	✓	✓	-	-	
	5AC901.ICAN-01	-	✓	✓	-	-	
	5AC901.IHDA-00	-	40	40	-	-	
	5AC901.ISRM-00	-	✓	✓	-	-	
	5AC901.IPLK-00	-	✓	✓	-	-	
	5AC901.IRDY-00	-	✓	✓	-	-	
	5AC901.ISIO-00	-	✓	✓	-	-	
	5AC901.IUPS-00	-	✓	✓	-	-	
5AC901.IUPS-01	-	✓	✓	-	-		
Monitor/Panel options	5AC901.IETH-00	-	✓	✓	-	-	Monitor/Panel option
	5AC901.LDPO-00	-	✓	✓	-	-	
	5AC901.LSDL-00	-	✓	✓	-	-	
	5AC901.LSD3-00	-	✓	✓	-	-	
CFast cards	5AC901.LSD4-00	-	✓	✓	-	-	-
	5CFast.xxxx-00	-	✓	✓	-	-	
PCIe cards	5CFast.xxxx-10	-	✓	✓	-	-	-
	5ACPCE.ETH1-00	-	✓	✓	-	-	
	5ACPCE.ETH4-00	-	✓	✓	-	-	

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

Table 8: Ambient temperature without a fan kit

2.1.1.1.1 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.

2.1.1.2 Minimum ambient temperature for worst-case operation

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

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

2.1.1.3 Maximum ambient temperature for typical operation

Information regarding typical conditions

- The total power of all **USB** interfaces on the system unit is limited to 20 W.
- 2x Gigabit **Ethernet**
- No permanent 100% processor load and graphics load
- The power consumption of the entire system is limited to 55 W or 60 W. For information about the power consumption of individual components, see 2.2.1 "Power management".

		Operation without a fan kit and with 5AC901.HS01-01 heat sink					Location of sensor(s)
		i5 6440EQ 5PC900.TS17-00	i3 6100E 5PC900.TS17-01 @1900	G3900E 5PC900.TS17-02 @1700	E3-1515MVS 5PC900.TS17-03	i7 6820EQ 5PC900.TS17-04	
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 for typical operation		-	50	60	-	-	
What else can also be operated at the max. ambient temperature, or is there a limitation?							
System units	5PC910.SX01-00	-	✓	✓	-	-	Power supply
	5PC910.SX02-00	-	✓	✓	-	-	
	5PC910.SX05-00	-	✓	✓	-	-	
Main memory	5MMDDR.4096-04	-	✓	✓	-	-	-
	5MMDDR.8192-04	-	✓	✓	-	-	
	5MMDDR.016G-04	-	✓	✓	-	-	
Slide-in compact Drives	5AC901.CHDD-00	-	✓	50	-	-	Slide-in compact drive
	5AC901.CHDD-01	-	✓	50	-	-	
	5AC901.CSSD-00	-	✓	✓	-	-	
	5AC901.CSSD-01	-	✓	✓	-	-	
	5AC901.CSSD-02	-	✓	✓	-	-	
	5AC901.CSSD-03	-	✓	✓	-	-	
	5AC901.CSSD-04	-	✓	✓	-	-	
	5AC901.CSSD-05	-	✓	✓	-	-	
	5AC901.CSSD-06	-	✓	✓	-	-	
5AC901.CCFA-00	-	✓	✓	-	-		
Slide-in drives	5AC901.SDVW-00	-	25	25	-	-	Slide-in drive
	5AC901.SSCA-00 ¹⁾	-	-	-	-	-	
RAID system	5ACPCI.RAIC-06	-	✓	50	-	-	-
Interface options	5AC901.I485-00	-	✓	✓	-	-	Interface option
	5AC901.ICAN-00	-	✓	✓	-	-	
	5AC901.ICAN-01	-	✓	✓	-	-	
	5AC901.IHDA-00	-	40	40	-	-	
	5AC901.ISRM-00	-	✓	✓	-	-	
	5AC901.IPLK-00	-	✓	✓	-	-	
	5AC901.IRDY-00	-	✓	✓	-	-	
	5AC901.ISIO-00	-	✓	✓	-	-	
	5AC901.IUPS-00	-	✓	✓	-	-	
	5AC901.IUPS-01	-	✓	✓	-	-	
5AC901.IETH-00	-	✓	✓	-	-		
Monitor/Panel Options	5AC901.LDPO-00	-	✓	✓	-	-	Monitor/ Panel option
	5AC901.LSDL-00	-	✓	✓	-	-	
	5AC901.LSD3-00	-	✓	✓	-	-	
	5AC901.LSD4-00	-	✓	✓	-	-	
CFast cards	5CFAST.xxxx-00	-	✓	✓	-	-	-
	5CFAST.xxxx-10	-	✓	✓	-	-	
PCIe cards	5ACPCE.ETH1-00	-	✓	✓	-	-	-
	5ACPCE.ETH4-00	-	✓	✓	-	-	

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

Table 9: Ambient temperature without a fan kit

2.1.1.4 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 39](#). The values listed in [Tab. 10 "Temperature sensor locations" on page 39](#) represent the defined maximum temperature for this measurement point. An alarm is not triggered if this temperature is exceeded.

These temperatures ⁴⁾ can be read in various ways in approved operating systems:

- [BIOS](#)
- B&R [Control Center](#)⁵⁾
- B&R ADI Development Kit⁵⁾
- B&R ADI .NET SDK⁵⁾
- B&R HMI Service Center⁵⁾
- B&R HMI Diagnose⁵⁾
- B&R PVI ADI line⁵⁾
- B&R ADI SNMP Agent⁵⁾
- [Automation Runtime Library](#)⁵⁾

In addition, the CFast cards available from B&R for APC910 systems 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.

For applications that do not run in approved operating systems, temperatures can be evaluated using the B&R implementation guide. In addition to the implementation guide, programs in MS-DOS are also available.

⁴⁾ The temperature measured approximates the immediate ambient temperature but may also be influenced by neighboring components.

⁵⁾ Drivers for approved operating systems can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

2.1.1.5 Temperature sensor positions

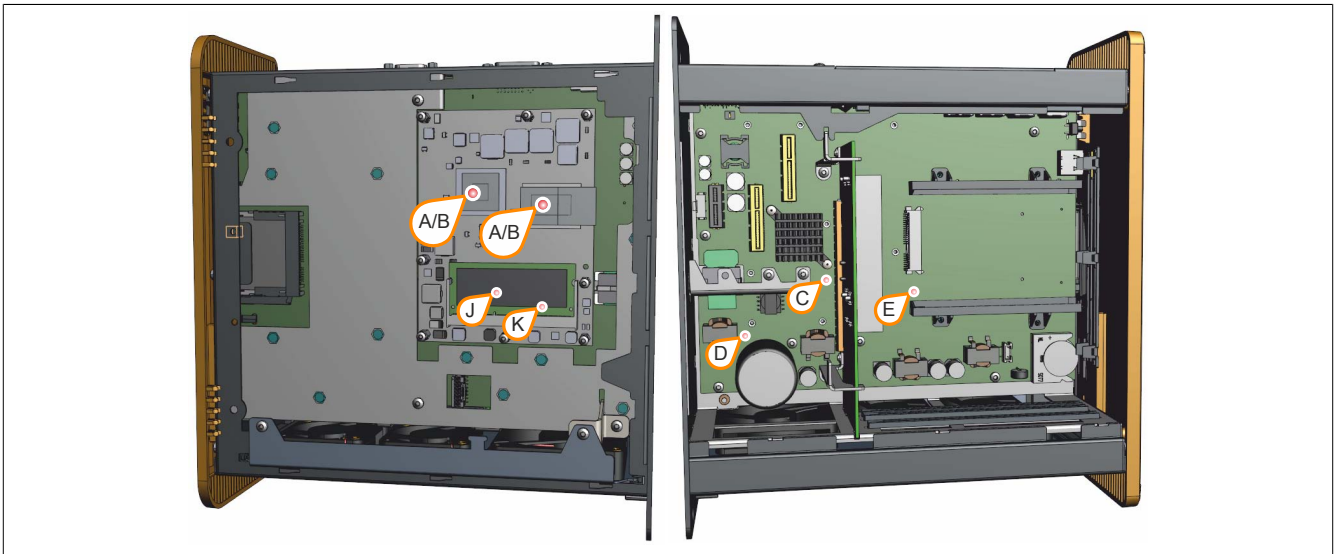


Figure 4: Temperature sensor locations

ADI sensors	Position	Measurement point for	Measurement	Max. specified
CPU board Sensor 1	A	CPU	Temperature of the processor (sensor integrated in the processor) for TS17.	95°C
CPU board Sensor 2			Temperature of the processor (sensor integrated in the processor) for TS77.	
CPU board Sensor 1	B	Board controller	Temperature of the board controller (sensor integrated on the CPU board) TS77.	95°C
CPU board Sensor 2			Temperature of the board controller (sensor integrated on the CPU board) TS17.	
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 10: 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.

2.1.1.6 Fan control

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

Position	Measurement point for	Startup temperature	Max. fan speed at:
A	CPU for TS17	65°C	81°C
	Board controller for TS77		
B	CPU for TS77	65°C	81°C
	Board controller for TS17		
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.LSD4-00: 60°C	5AC901.LDPO-00: 76°C ; 5AC901.LSDL-00: 76°C; 5AC901.LSD3-00: 76°C; 5AC901.LSD4-00: 76°C
J	SO-DIMM 1	60°C	76°C
K	SO-DIMM 2	60°C	76°C

Table 11: 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).

2.1.2 Humidity specifications

The following table shows the minimum and maximum relative humidity values (non-condensing) of the individual components that are relevant to the humidity limitations of the complete system. The lowest and highest common values are always used for this determination.

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%
QM170/HM170/CM236 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%
	5AC901.CHDD-01	8 to 90%	5 to 95%
	5AC901.CSSD-00	5 to 95%	5 to 95%
	5AC901.CSSD-01	5 to 95%	5 to 95%
	5AC901.CSSD-02	5 to 95%	5 to 95%
	5AC901.CSSD-03 ≤ Rev. C0	8 to 90%	8 to 95%
	5AC901.CSSD-03 ≥ Rev. D0	5 to 90%	5 to 95%
	5AC901.CSSD-04 ≤ Rev. C0	8 to 90%	8 to 95%
	5AC901.CSSD-04 ≥ Rev. D0	5 to 90%	5 to 95%
	5AC901.CSSD-05	5 to 90%	5 to 95%
	5AC901.CSSD-06	5 to 90%	5 to 95%
5AC901.CCFA-00	5 to 90%	5 to 95%	5 to 95%
Slide-in drives	5AC901.SDVV-00	8 to 80%	5 to 95%
RAID system	5ACPCI.RAIC-06	8 to 90%	5 to 95%
Interface options	5AC901.I485-00	5 to 90%	5 to 95%
	5AC901.ICAN-00	5 to 90%	5 to 95%
	5AC901.ICAN-01	5 to 90%	5 to 95%
	5AC901.IETH-00	5 to 90%	5 to 95%
	5AC901.IHDA-00	5 to 90%	5 to 95%
	5AC901.ISRM-00	5 to 90%	5 to 95%
	5AC901.IPLK-00	5 to 90%	5 to 95%
	5AC901.IRDY-00	5 to 90%	5 to 95%
	5AC901.ISIO-00	5 to 90%	5 to 95%
	5AC901.IUPS-00	5 to 90%	5 to 95%
5AC901.IUPS-01	5 to 90%	5 to 95%	
Monitor/Panel options	5AC901.LDPO-00	5 to 90%	5 to 95%
	5AC901.LSDL-00	5 to 90%	5 to 95%
	5AC901.LSD3-00	5 to 90%	5 to 95%
	5AC901.LSD4-00	5 to 90%	5 to 95%
Accessories	5MMUSB.2048-01 USB flash drive	10 to 90%	5 to 90%
	5MMUSB.4096-01 USB flash drive	10 to 90%	5 to 90%
	5CFAST.xxxx-00 CFast cards	Max. 85%	Max. 85%
	5CFAST.xxxx-10 CFast cards	10 to 95%	10 to 95%
	5MD900.USB2-02 USB media drive	20 to 80%	5 to 90% / 5 to 95%
	PCIe card 5ACPCE.ETH1-00	5 to 90%	5 to 95%
PCIe card 5ACPCE.ETH4-00	5 to 90%	5 to 95%	

Table 12: Overview of humidity specifications for individual components

The specifications listed correspond to the relative humidity (non-condensing) at an ambient temperature of 30°C. For more detailed information about specific temperature-dependent humidity values, see the technical data for the individual components.

2.2 Electrical characteristics

2.2.1 Power management

2.2.1.1 Power supply - Block diagram

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

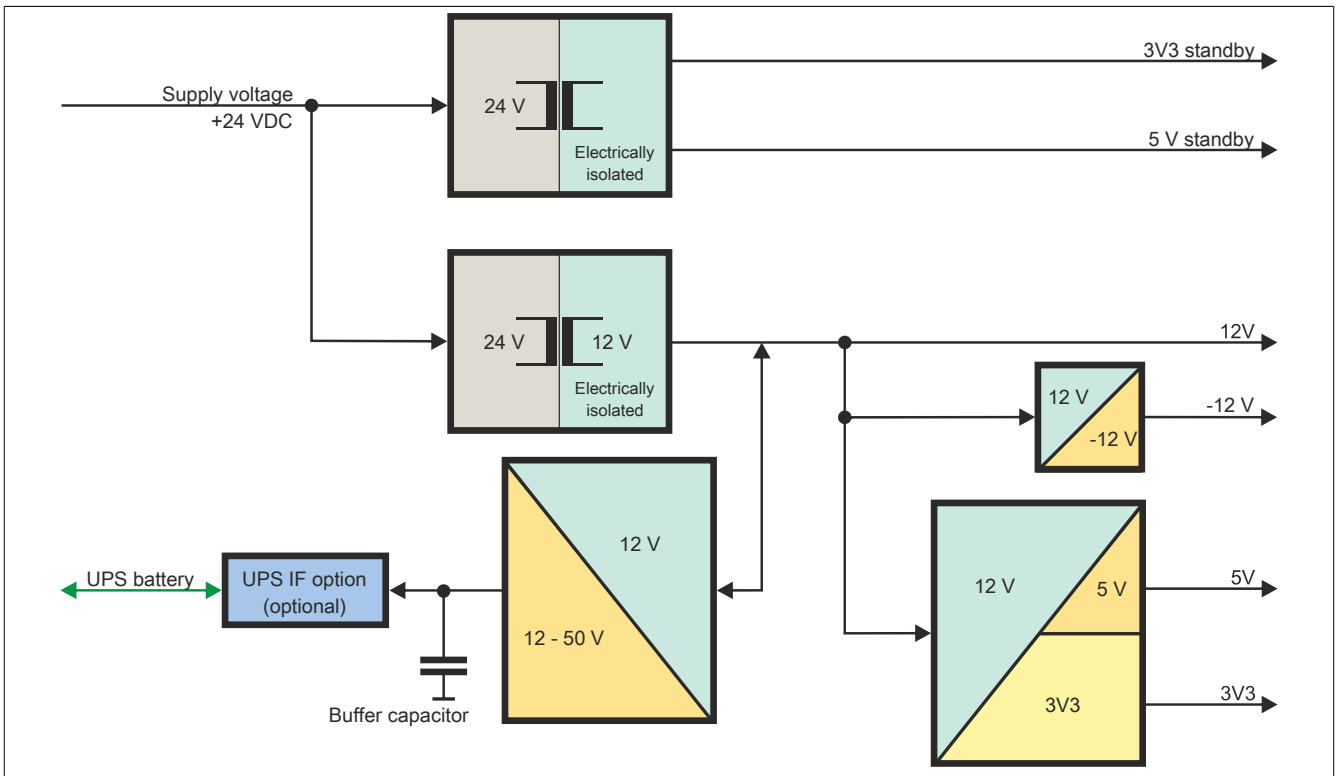


Figure 5: Voltage supply for system units

2.2.1.2 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	
		Maximum possible								130	
Total power supply +12 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 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 13: Power calculation table - 1-slot APC variant

Information:		QM170/HM170/CM236 CPU board							Current system	
		5PC900.TS17-00	5PC900.TS17-01 @2700	5PC900.TS17-01 @1900	5PC900.TS17-02 @2400	5PC900.TS17-02 @1700	5PC900.TS17-03	5PC900.TS17-04	Enter values in this column	
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.		Total power supply power (maximum)							130	
		Maximum possible							130	
		CPU board, permanent consumers	63	43	27	38	25	68	63	
		4096 MB RAM, each 2.5 W, max. 2 pcs.								
		8192 MB RAM, each 3 W, max. 2 pcs.								
		16 GB RAM, each 3.5 W, max. 2 pcs.								
		Fan kit, optional	3	3	3	3	3	3	3	
		UPS IF option 5AC901.IUPS-00 during operation, optional	30	30	30	30	30	30	30	
		UPS IF option 5AC901.IUPS-01 during operation, optional	25	25	25	25	25	25	25	
		External consumers, optional	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			
-12 V	PCI card power rating, optional (max. 1.2 W with or without fan kit) ¹⁾									
	Consumers -12 V ∑									
	Consumers ∑									
Maximum possible at +5 V							45			
+5 V	Slide-in compact (HDD / SSD)	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		
	PCI card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾									
Consumers +5 V ∑										
Maximum possible at 3V3							30			
3V3	System unit, permanent consumers	5	5	5	5	5	5	5		
	CFast card	1	1	1	1	1	1	1		
	Interface 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 ∑										
Total power supply, consumers ∑										

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

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

Table 14: 1-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
CAN IF option	5AC901.ICAN-01	0.5 W	-	-	0.5 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
Gigabit Ethernet IF option	5AC901.IETH-00	-	1 W	-	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
SDL4 transmitter	5AC901.LSD4-00	2.5 W	2 W	-	4.5 W
PCIe cards					
PCIe x1 Ethernet card	5ACPCE.ETH1-00	-	1 W	-	1 W
PCIe x4 Ethernet card	5ACPCE.ETH4-00	-	4 W	-	4 W

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

2.2.1.3 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	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	
	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 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⁾										
	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 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 and monitor/panel options can be found in the table below.

Table 16: Power calculation table - 2-slot APC variant

Information:		QM170/HM170/CM236 CPU board							Current system	
		5PC900.TS17-00	5PC900.TS17-01 @2700	5PC900.TS17-01 @1900	5PC900.TS17-02 @2400	5PC900.TS17-02 @1700	5PC900.TS17-03	5PC900.TS17-04	Enter values in this column	
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.		Total power supply power (maximum)							130	
		Maximum possible							130	
Total power supply +12 V	CPU board, permanent consumers		63	43	27	38	25	68	63	
	4096 MB RAM, each 2.5 W, max. 2 pcs.									
	8192 MB RAM, each 3 W, max. 2 pcs.									
	16 GB RAM, each 3.5 W, max. 2 pcs.									
	Fan kit, optional		3	3	3	3	3	3	3	
	UPS IF option 5AC901.IUPS-00 during operation, optional		30	30	30	30	30	30	30	
	UPS IF option 5AC901.IUPS-01 during operation, optional		25	25	25	25	25	25	25	
	External consumers, optional		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
			Consumers -12 V ∑							
			Consumers ∑							
			Maximum possible at +5 V							45
			Consumers +5 V ∑							
	+5 V	Slide-in compact (HDD / SSD)		4	4	4	4	4	4	4
		Slide-in (DVD / ...)		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		
PCI card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾										
		Consumers +5 V ∑								
		Maximum possible at 3V3							30	
3V3		System unit, permanent consumers		5	5	5	5	5	5	5
	CFast card		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 ∑								
		Total power supply, consumers ∑								

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

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

Table 17: 2-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
CAN IF option	5AC901.ICAN-01	0.5 W	-	-	0.5 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
Gigabit Ethernet IF option	5AC901.IETH-00	-	1 W	-	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
SDL4 transmitter	5AC901.LSD4-00	2.5 W	2 W	-	4.5 W
PCIe cards					
PCIe x1 Ethernet card	5ACPCE.ETH1-00	-	1 W	-	1 W
PCIe x4 Ethernet card	5ACPCE.ETH4-00	-	4 W	-	4 W

Table 18: Interface and monitor/panel options - Power rating table

2.2.1.4 Power calculation with 5PC910.SX05-00

Information:

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

Information:		QM77/HM76 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	5PC900.TS77-09	5PC900.TS77-10	Enter values in this column
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.		Total power supply power (maximum)										130	
		Maximum possible										130	
Total power supply +12 V	CPU board, permanent consumers	53	43	33	25	43	43	25	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	5	
	UPS IF option 5AC901.IUPS-00 during operation, optional	30	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	25	
	External consumers, optional	10	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		
	+5 V	-12 V	PCI card power rating, optional (max. 1.2 W with or without fan kit) ¹⁾										
Consumers -12 V Σ													
Consumers Σ													
Maximum possible at +5 V										45			
Slide-in compact (HDD / SSD)		4	4	4	4	4	4	4	4	4	4	4	
Slide-in (DVD / ...)		4	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	5	
PCI card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾													
Consumers +5 V Σ													
Maximum possible at 3V3										30			
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 power of one PCI/PCIe card per slot (= sum of the power consumption for each voltage range) is not permitted to exceed the max. power rating for operation with or without a fan kit.

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

Table 19: 5-slot APC variant - Power calculation table

Information:		QM170/HM170/CM236 CPU board							Current system
		5PC900.TS77-00	5PC900.TS17-01 @2700	5PC900.TS17-01 @1900	5PC900.TS17-02 @2400	5PC900.TS17-02 @1700	5PC900.TS17-03	5PC900.TS17-04	Enter values in this column
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.		Total power supply power (maximum)							130
		Maximum possible							130
		CPU board, permanent consumers	63	43	27	38	25	68	63
		4096 MB RAM, each 2.5 W, max. 2 pcs.							
		8192 MB RAM, each 3 W, max. 2 pcs.							
		16 GB RAM, each 3.5 W, max. 2 pcs.							
		Fan kit, optional	5	5	5	5	5	5	5
		UPS IF option 5AC901.IUPS-00 during operation, optional	30	30	30	30	30	30	30
		UPS IF option 5AC901.IUPS-01 during operation, optional	25	25	25	25	25	25	25
		External consumers, optional	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		
-12 V	PCI card power rating, optional (max. 1.2 W with or without fan kit) ¹⁾								
	Consumers -12 V ∑								
	Consumers ∑								
Maximum possible at +5 V							45		
+5 V	Slide-in compact (HDD / SSD)	4	4	4	4	4	4		
	Slide-in (DVD / ...)	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		
	PCI card power rating, optional (max. 3 W without fan kit, max. 20 W with fan kit) ¹⁾								
Consumers +5 V ∑									
Maximum possible at 3V3							30		
3V3	System unit, permanent consumers	5	5	5	5	5	5		
	CFast card	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 ∑									
Total power supply, consumers ∑									

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

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

Table 20: 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
CAN IF option	5AC901.ICAN-01	0.5 W	-	-	0.5 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
Gigabit Ethernet IF option	5AC901.IETH-00	-	1 W	-	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
SDL4 transmitter	5AC901.LSD4-00	2.5 W	2 W	-	4.5 W
PCIe cards					
PCIe x1 Ethernet card	5ACPCE.ETH1-00	-	1 W	-	1 W
PCIe x4 Ethernet card	5ACPCE.ETH4-00	-	4 W	-	4 W

Table 21: Interface and monitor/panel options - Power rating table

2.2.2 Block diagrams

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

2.2.2.1 5PC910.SX01-00 system unit + 5AC901.BX01-00 bus unit

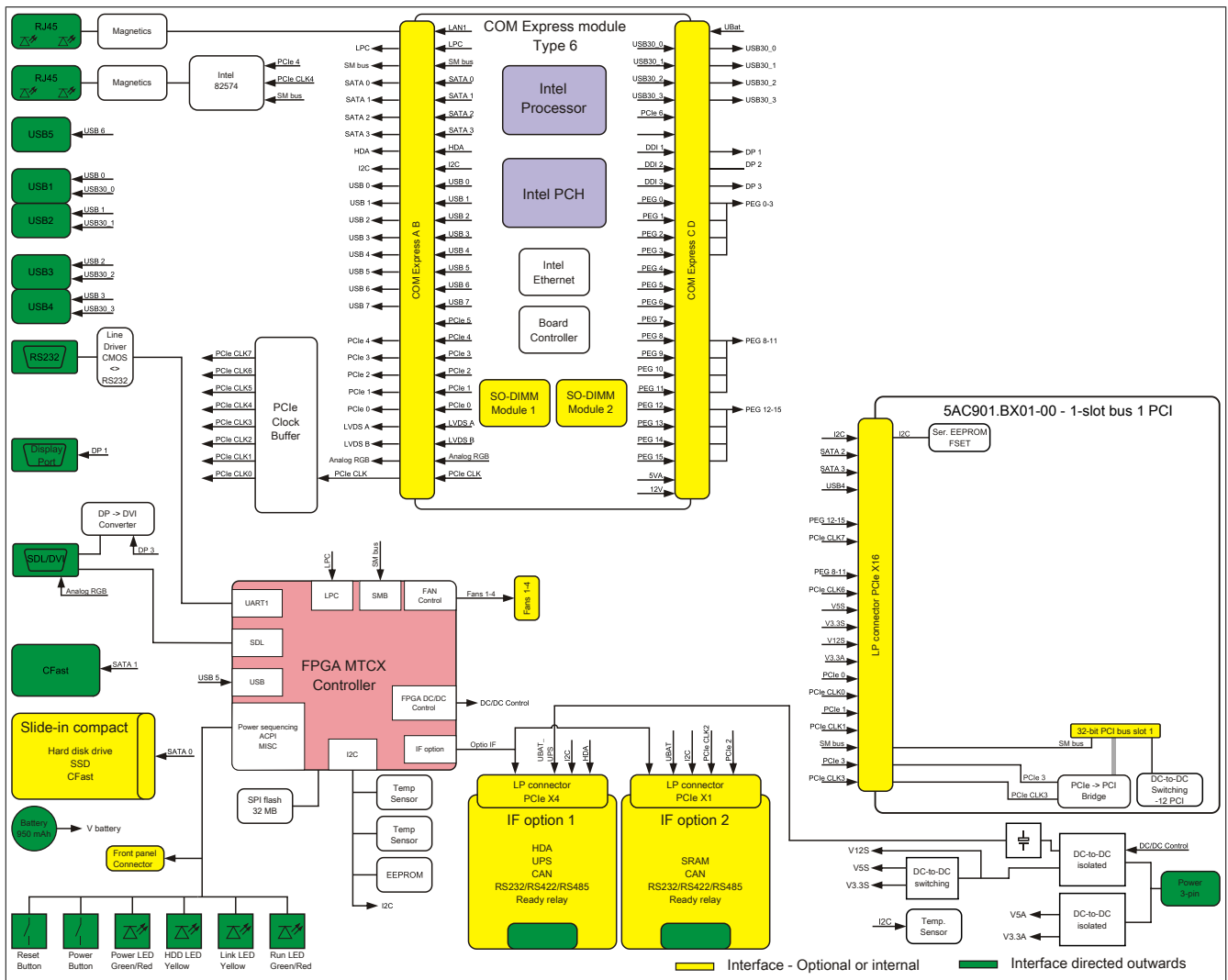


Figure 6: 5PC910.SX01-00 system unit + 5AC901.BX01-00 bus unit - Block diagram

2.2.2.2 5PC910.SX01-00 system unit + 5AC901.BX01-01 bus unit

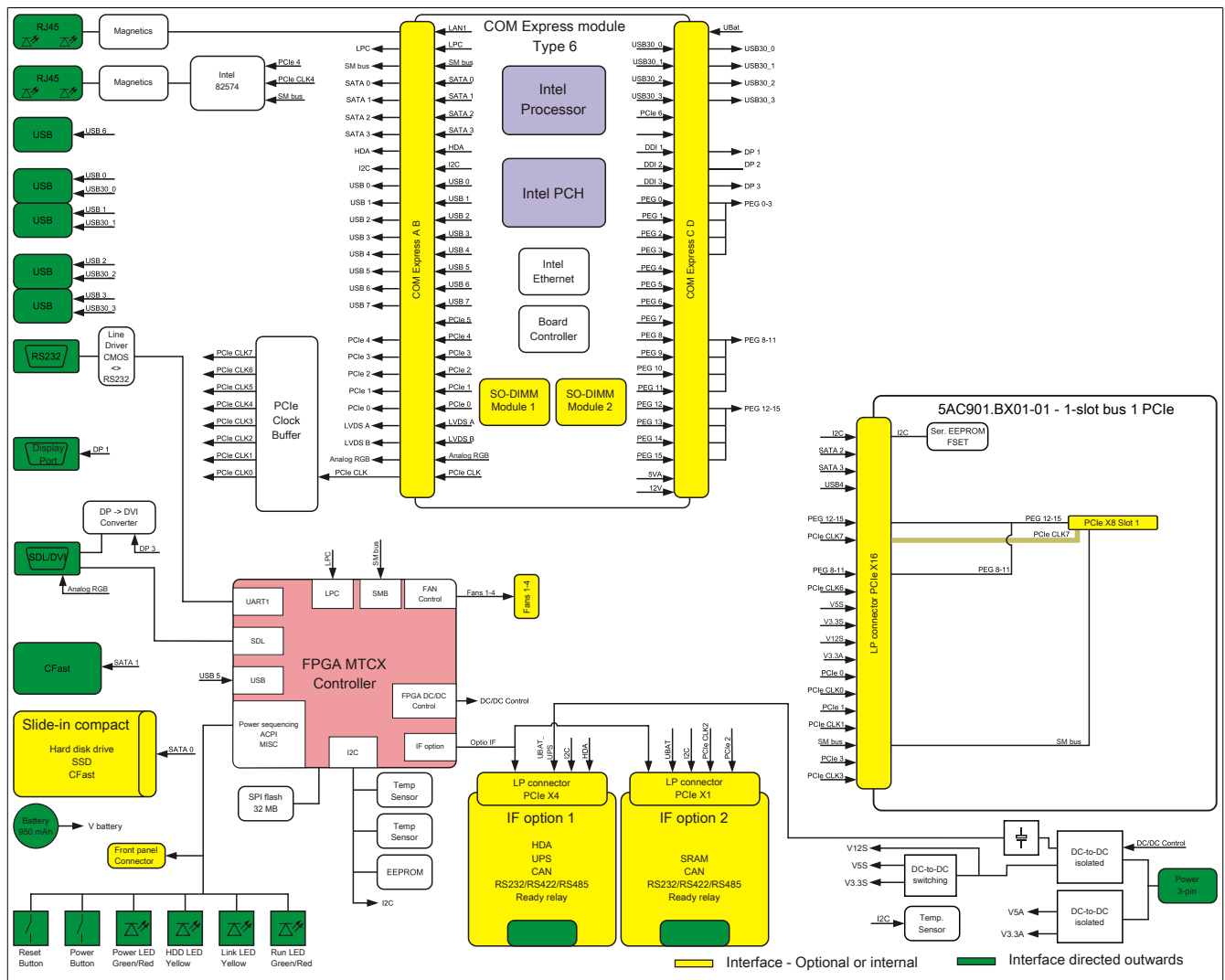


Figure 7: 5PC910.SX01-00 system unit + 5AC901.BX01-01 bus unit - Block diagram

2.2.2.3 5PC910.SX02-00 system unit + 5AC901.BX02-00 bus unit

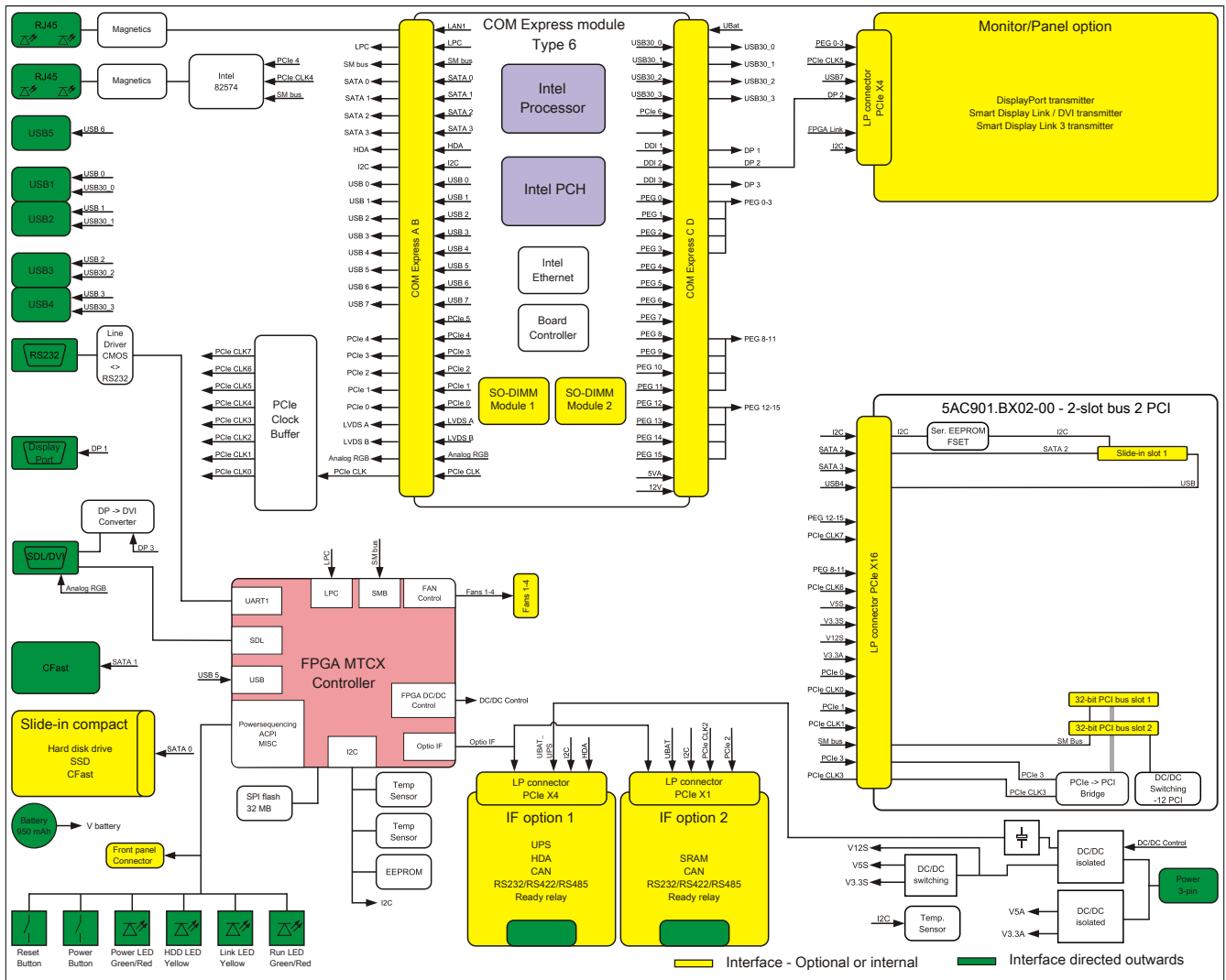


Figure 8: 5PC910.SX02-00 system unit + 5AC901.BX02-00 bus unit - Block diagram

2.2.2.4 5PC910.SX02-00 system unit + 5AC901.BX02-01 bus unit

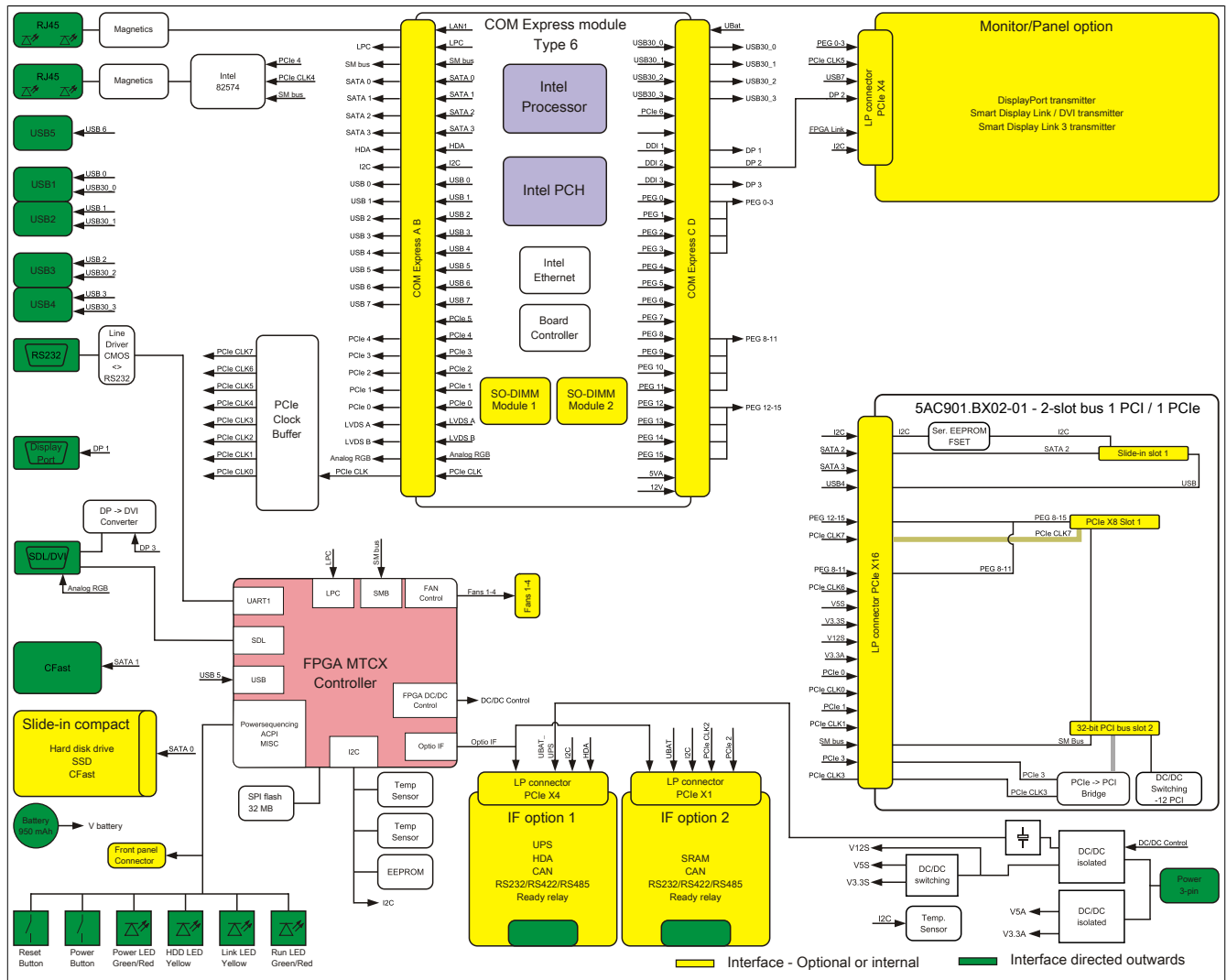


Figure 9: 5PC910.SX02-00 system unit + 5AC901.BX02-01 bus unit - Block diagram

2.2.2.5 5PC910.SX02-00 system unit + 5AC901.BX02-02 bus unit

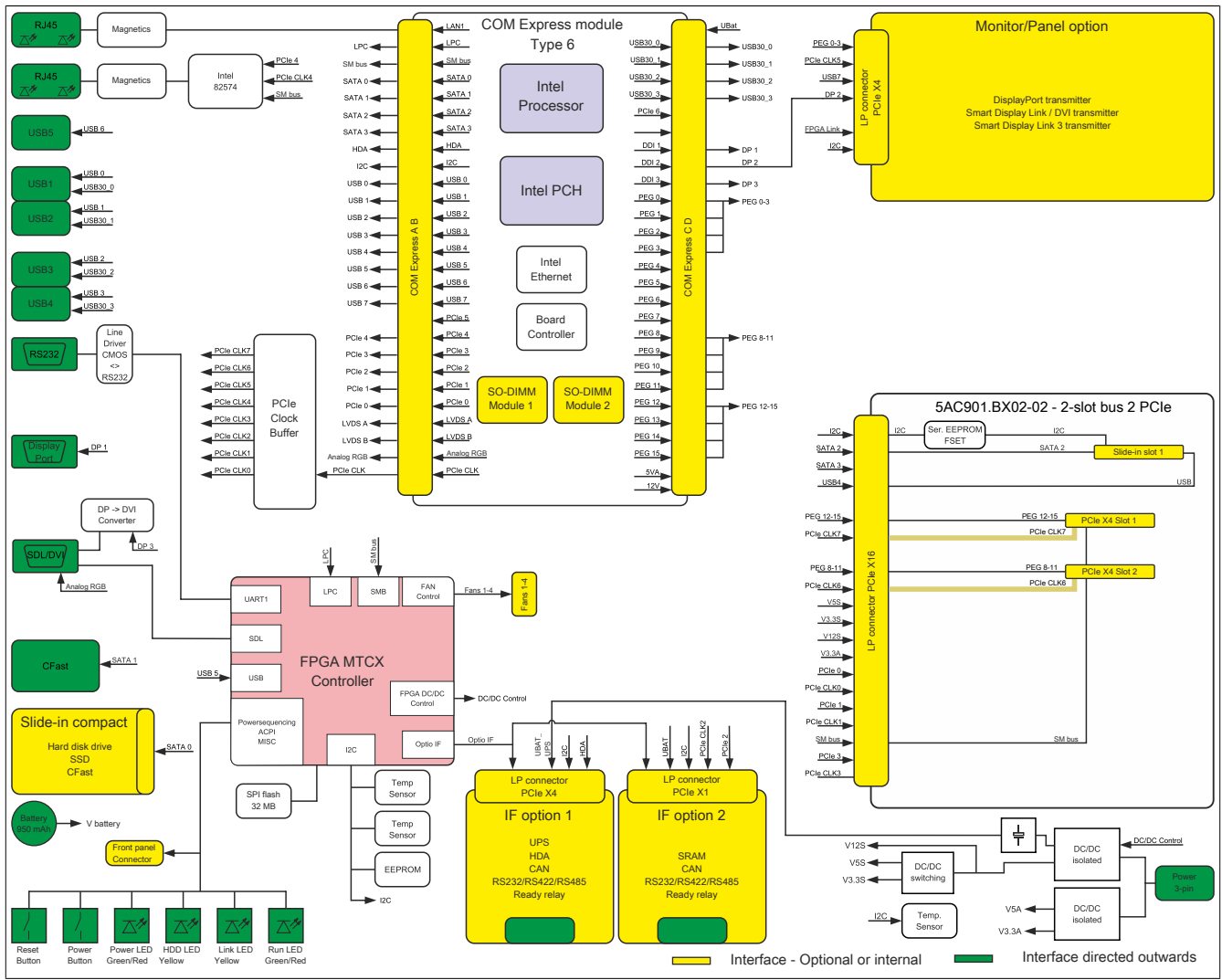


Figure 10: 5PC910.SX02-00 system unit + 5AC901.BX02-02 bus unit - Block diagram

2.2.2.6 5PC910.SX05-00 system unit + 5AC901.BX05-00 bus unit

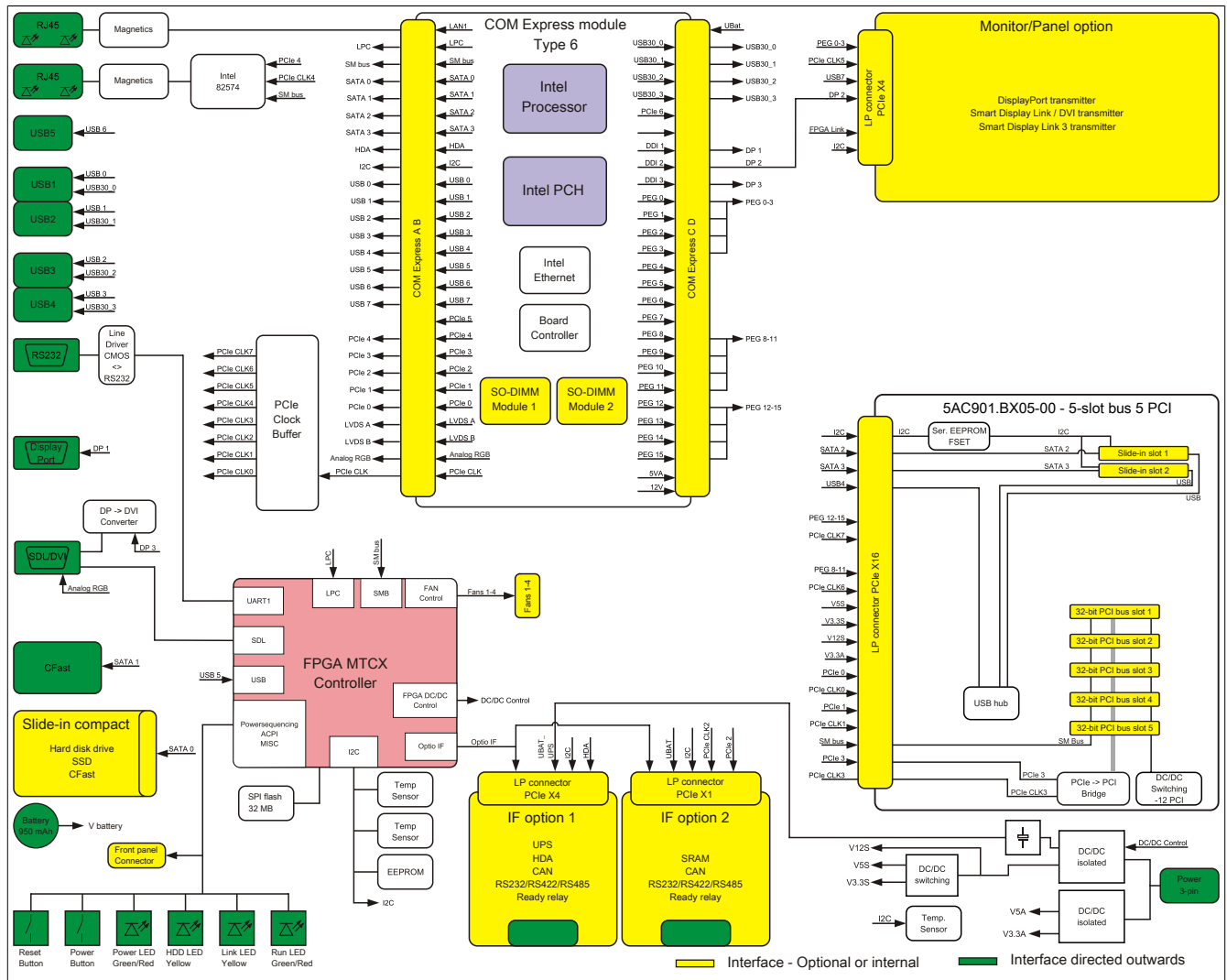


Figure 11: 5PC910.SX05-00 system unit + 5AC901.BX05-00 bus unit - Block diagram

2.2.2.7 5PC910.SX05-00 system unit + 5AC901.BX05-01 bus unit

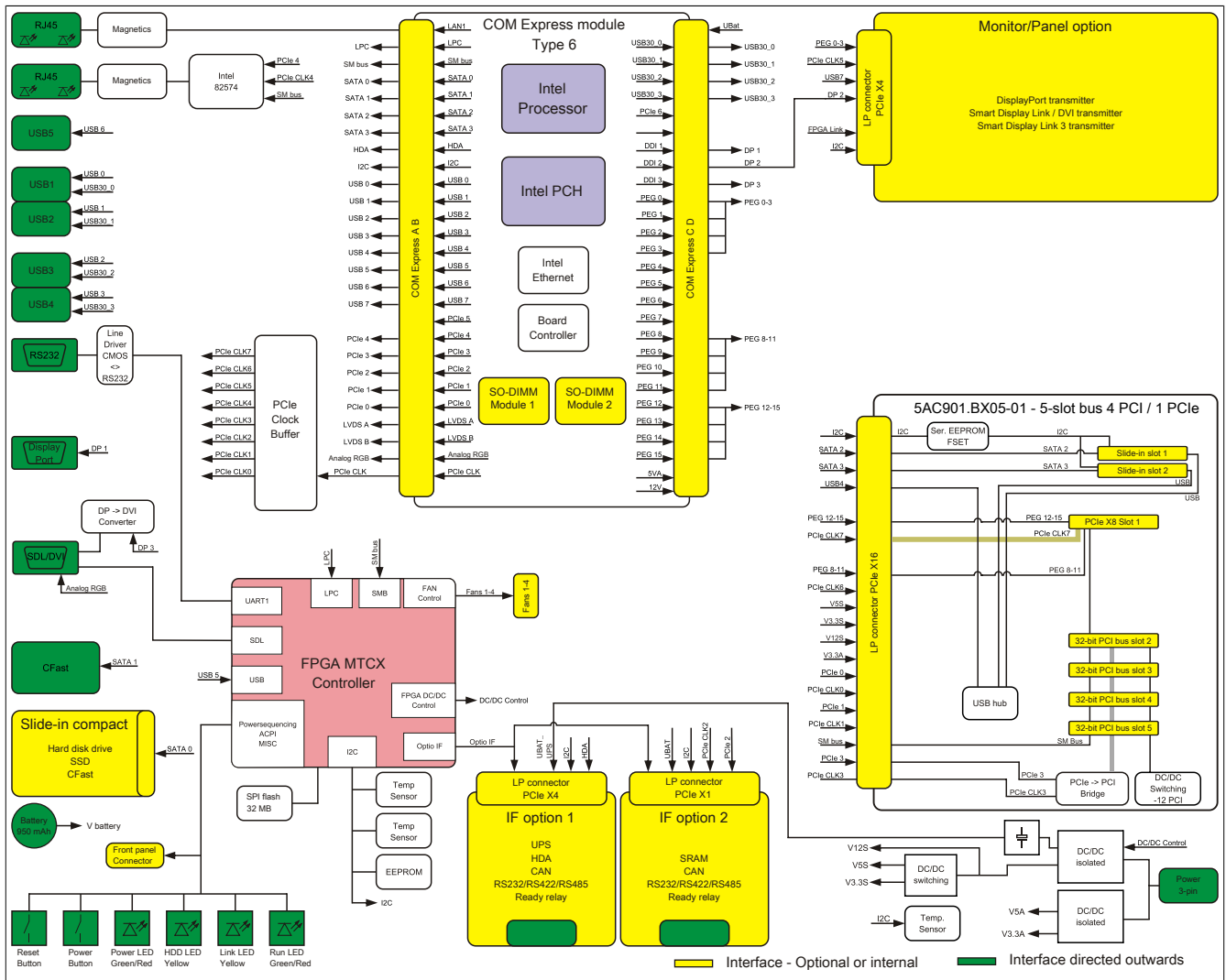


Figure 12: 5PC910.SX05-00 system unit + 5AC901.BX05-01 bus unit - Block diagram

2.2.2.8 5PC910.SX05-00 system unit + 5AC901.BX05-02 bus unit

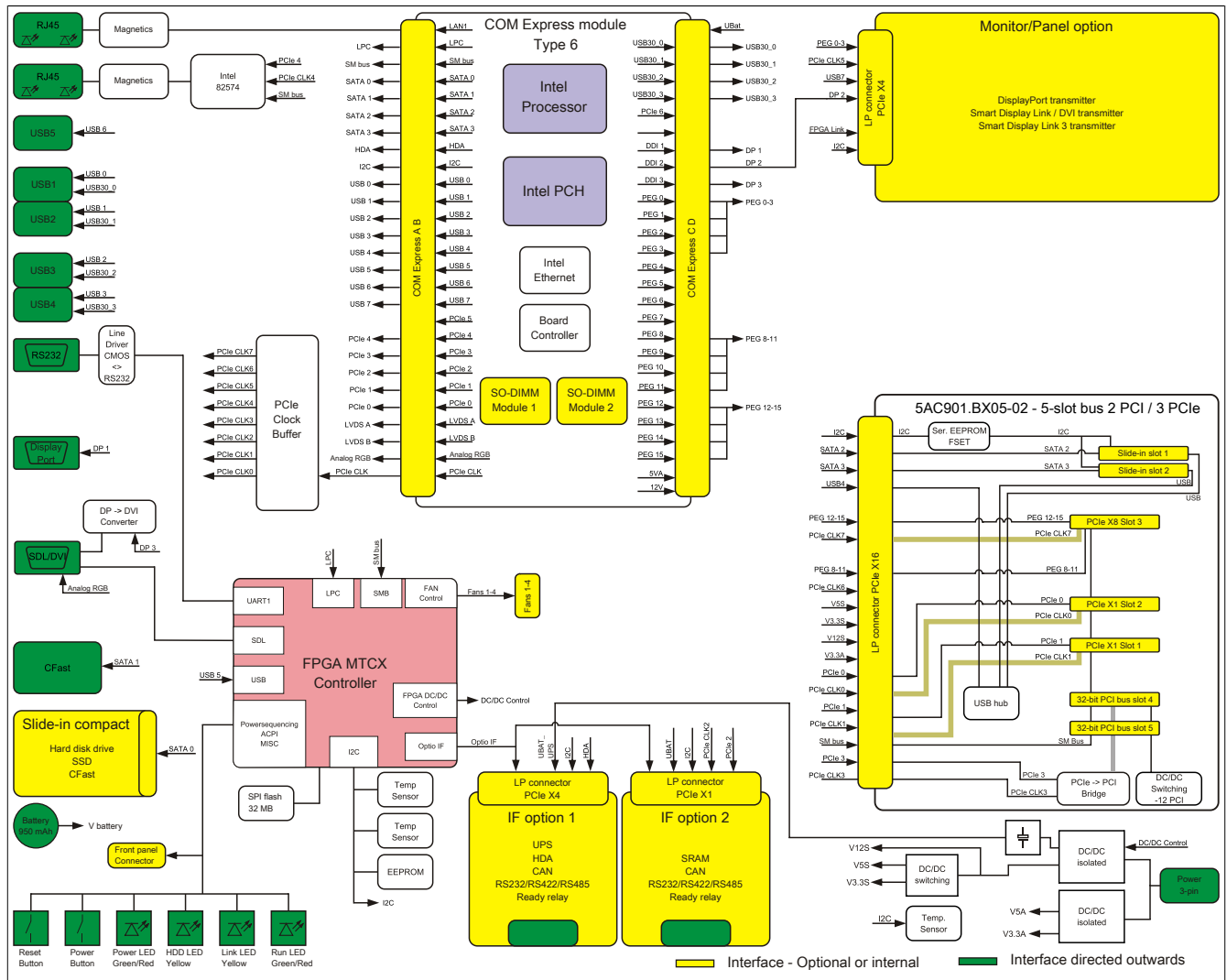


Figure 13: 5PC910.SX05-00 system unit + 5AC901.BX05-02 bus unit - Block diagram

2.2.2.9 5PC910.SX05-00 system unit + 5AC901.BX05-03 bus unit

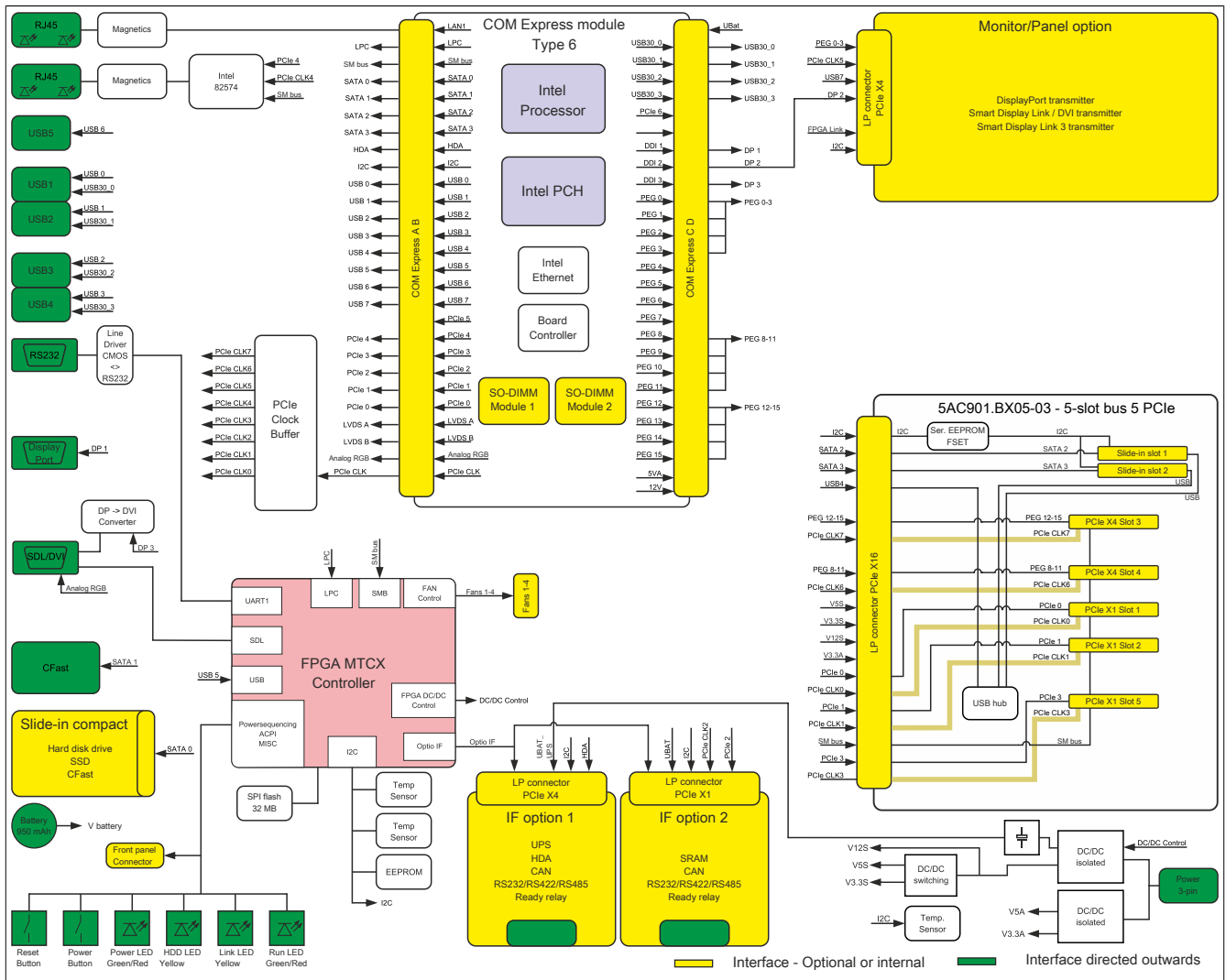


Figure 14: 5PC910.SX05-00 system unit + 5AC901.BX05-03 bus unit - Block diagram

2.2.2.10 Monitor/Panel options

DisplayPort transmitter

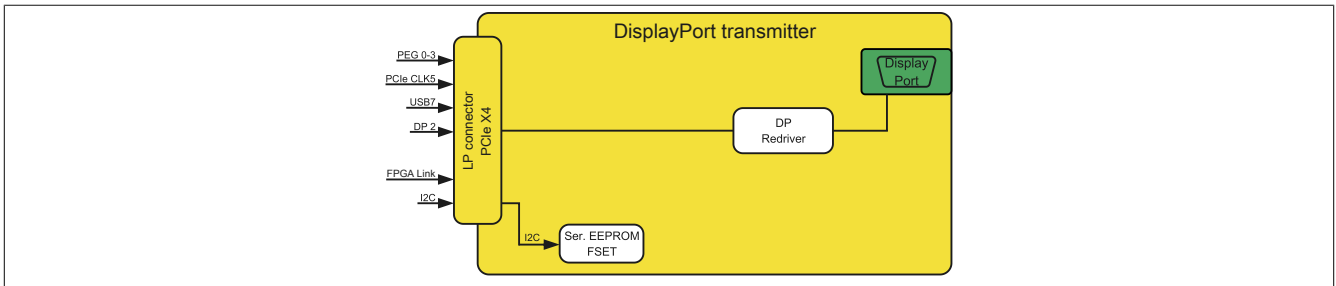


Figure 15: 5AC901.LDPO-00 DisplayPort transmitter - Block diagram

SDL/DVI transmitter

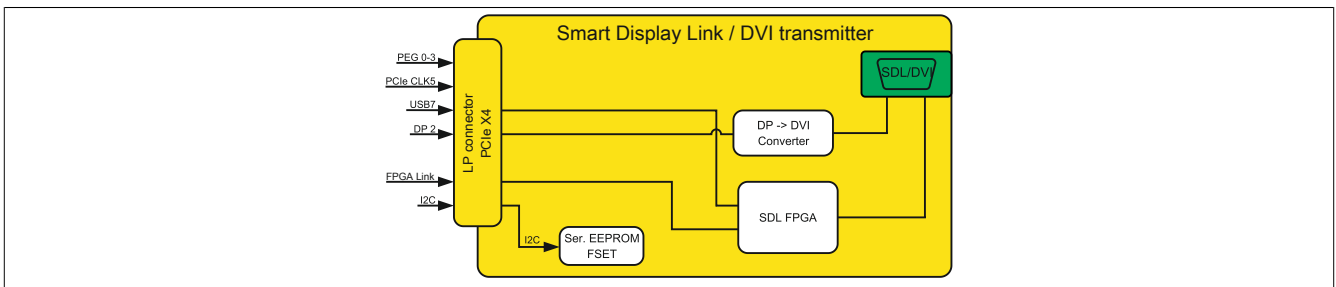


Figure 16: 5AC901.LSDL-00 Smart Display Link / DVI transmitter - Block diagram

SDL3 transmitter

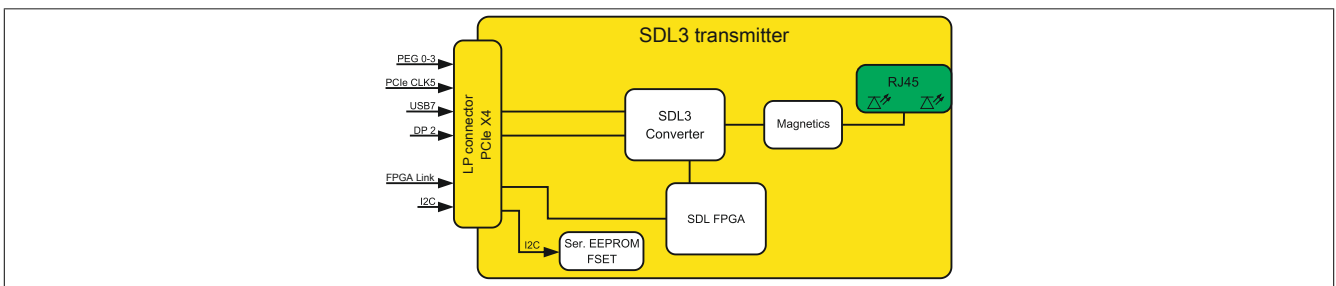


Figure 17: 5AC901.LSD3-00 Smart Display Link 3 transmitter - Block diagram

SDL4 transmitter

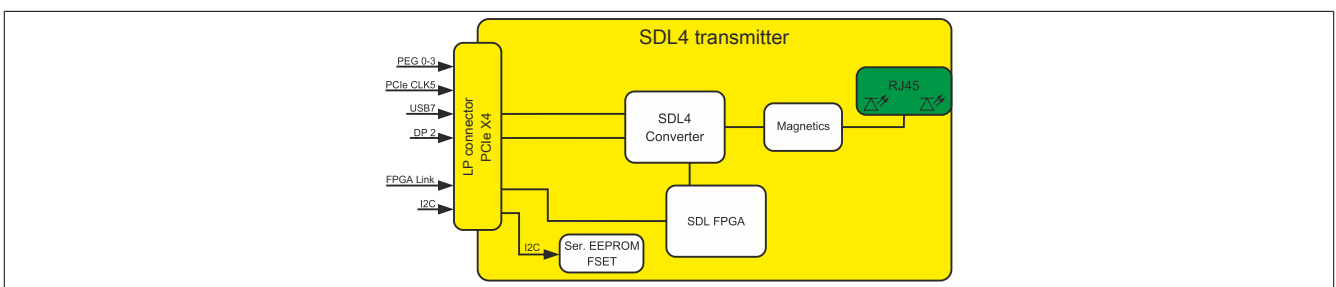


Figure 18: 5AC901.LSD4-00 Smart Display Link 4 transmitter - Block diagram

2.3 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.

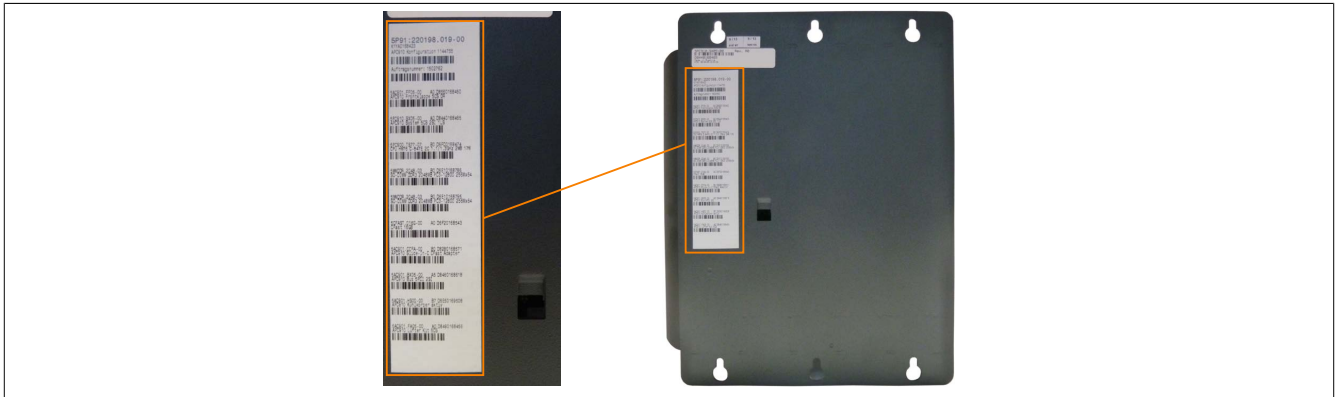


Figure 19: Serial number sticker (back)

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

2.4 Device interfaces and slots

2.4.1 Device interfaces - Overview

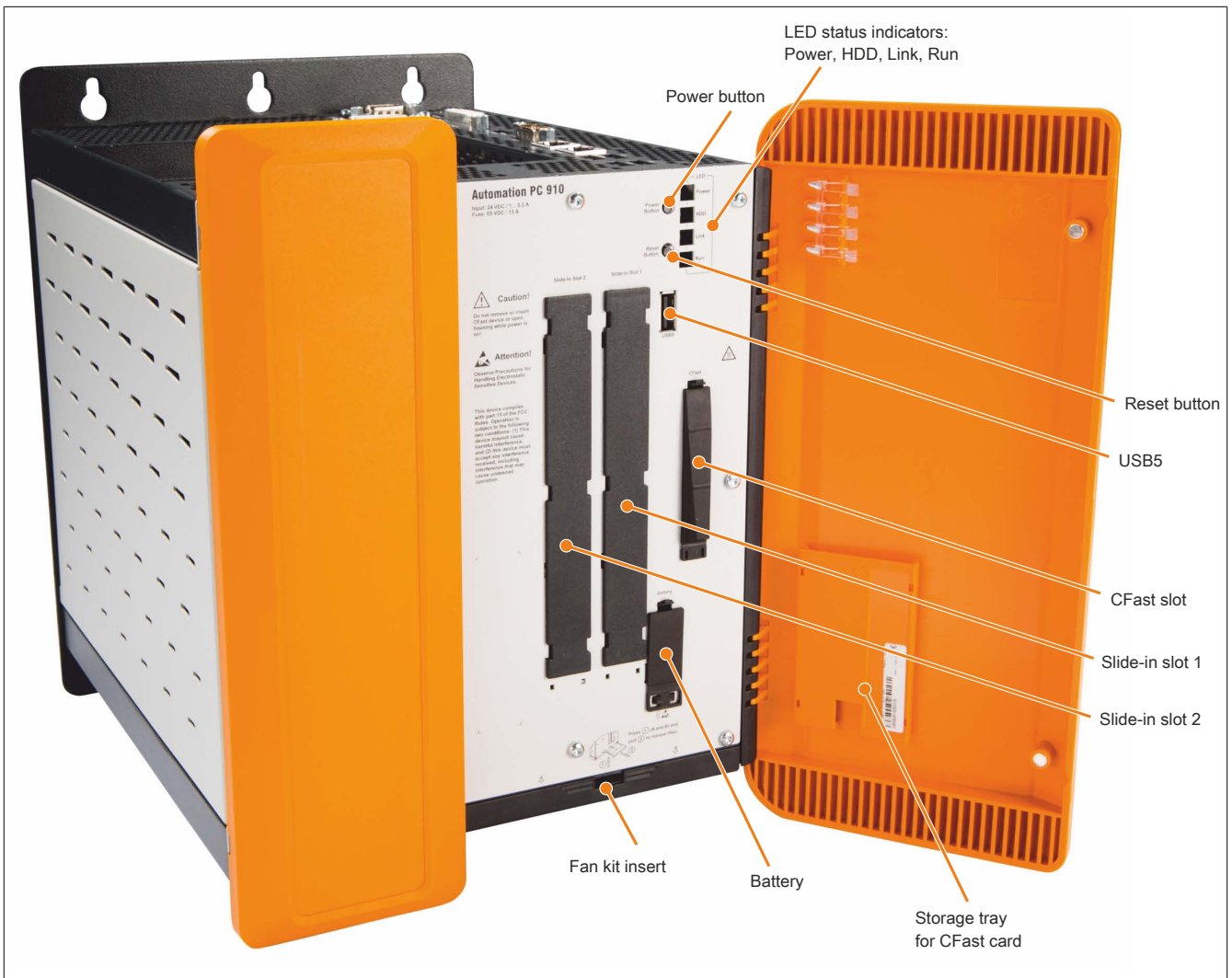


Figure 21: Device interfaces - Overview (front)

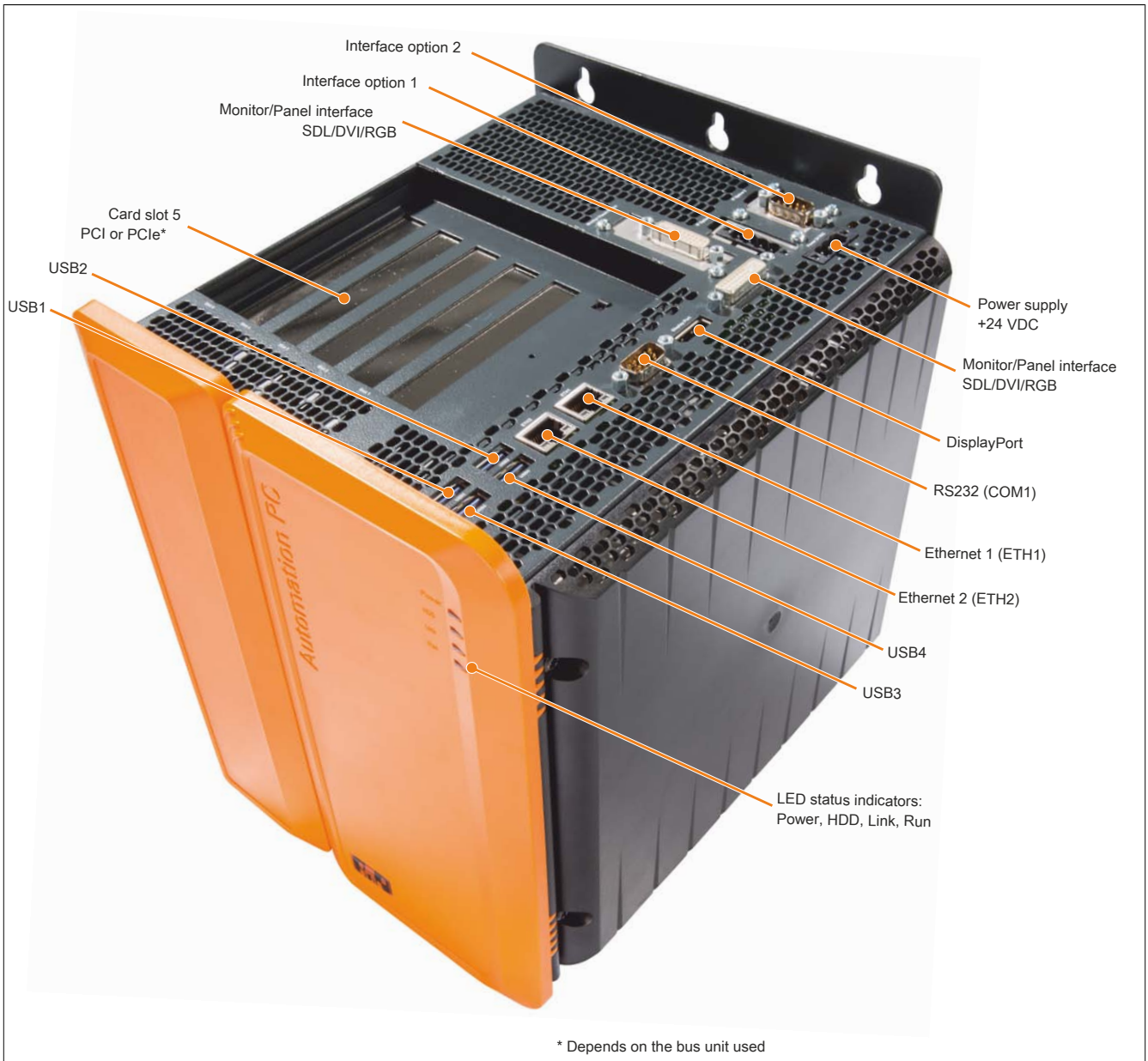


Figure 22: Device interfaces - Overview (top)

2.4.2 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) per 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 22: 24 VDC voltage supply connection

Electrical characteristics	
Nominal voltage	24 VDC ±25%, SELV ¹⁾
Nominal current	Max. 5.5 A ²⁾
Overvoltage category in accordance with EN 61131-2	II
Inrush current	Max. 60 A for <300 µs
Electrical isolation	Yes
Uninterruptible power supply	No

- 1) EN 60950 requirements must be observed.
- 2) Maximum current consumption (24 V / 130 W). This can vary depending on the configuration (see "Power calculation" section). The inrush current must also be taken into consideration when selecting the power supply.

2.4.2.1 Grounding

Caution!

Functional ground (pin 2 of power supply and ground connection) must be connected to the central grounding point (e.g. of the control cabinet or system) using the shorted path with the lowest resistance and largest possible wire cross section. This type of grounding is mandatory to ensure the system functions properly.

The ground connection is located on the bottom of the APC910 system.



Figure 23: 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).

2.4.3 COM1 serial interface

COM1 serial interface ¹⁾	
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

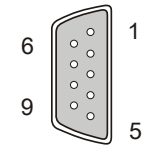


Table 23: COM1 - Pinout

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

2.4.4 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.TS17-00	SDL, DVI, RGB
5PC900.TS17-01	SDL, DVI, RGB
5PC900.TS17-02	SDL, DVI, RGB
5PC900.TS17-03	SDL, DVI, RGB
5PC900.TS17-04	SDL, DVI, RGB
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 24: Panel/Monitor interface - SDL, DVI, RGB

Information:

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

Information:

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

Information:

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

2.4.4.1 USB transfer 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 depends on the USB interface and USB hub on the display device.

2.4.4.2 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

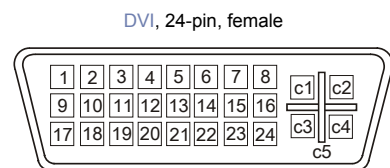


Table 25: DVI interface - Pinout

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 synchronization
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 25: DVI interface - Pinout

1) Protected internally by a multifuse.

2.4.4.3 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 26: Cable lengths and resolutions for SDL transmission

2.4.4.4 Cable lengths and resolutions for DVI transfer

The following table shows the relationship between segment length and maximum resolution depending on the DVI cable:

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 27: Cable lengths and resolutions for DVI transfer

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

2.4.5 DisplayPort interface

DisplayPort	
The following overview lists the video signals available on the DisplayPort output. For details, see the technical data for the CPU board being used.	
CPU board	Video signals with all system unit variants
5PC900.TS17-00	DisplayPort, DVI, HDMI
5PC900.TS17-01	DisplayPort, DVI, HDMI
5PC900.TS17-02	DisplayPort, DVI, HDMI
5PC900.TS17-03	DisplayPort, DVI, HDMI
5PC900.TS17-04	DisplayPort, DVI, HDMI
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

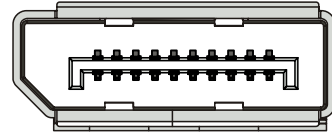


Table 28: DisplayPort

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.

2.4.5.1 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

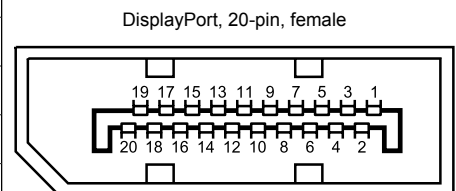
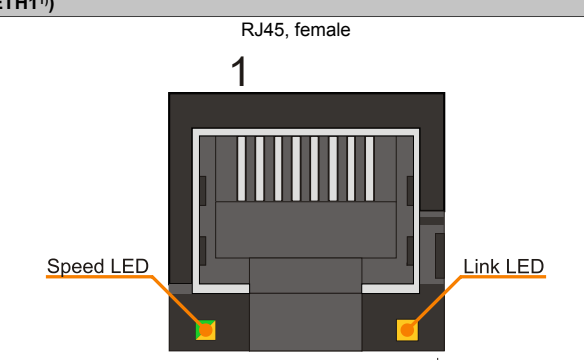


Table 29: DisplayPort - Pinout

2.4.6 Ethernet 1 interface (ETH1)

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

Ethernet 1 interface (ETH1 ¹⁾)		
Controller	Intel 82579 for 5PC900.TS77-0x Intel i219 for 5PC900.TS17-0x	
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 (light)	1000 Mbit/s	-
Link LED	On	Off
Orange (light)	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)



The diagram shows an RJ45 female port labeled '1'. Below the port are two LEDs: a Speed LED (green) and a Link LED (orange). Lines connect the text labels 'Speed LED' and 'Link LED' to their respective physical locations on the port assembly.

Table 30: 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).

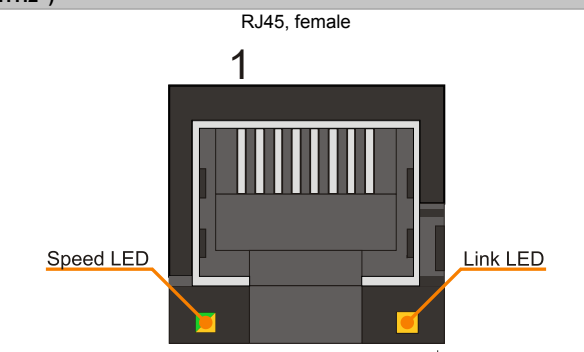
Information:

Only download necessary drivers from the B&R website, not from vendor websites.

2.4.7 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 (light)	1000 Mbit/s	-
Link LED	On	Off
Orange (light)	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)



The diagram shows an RJ45 female port labeled '1'. Below the port are two LEDs: a Speed LED (green) and a Link LED (orange). Lines connect the text labels 'Speed LED' and 'Link LED' to their respective physical locations on the port assembly.

Table 31: 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:

Only download necessary drivers from the B&R website, not from vendor websites.

2.4.8 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. Due to the large number of USB devices available on the market, B&R cannot guarantee their functionality. Functionality is ensured when using the USB devices available from B&R.

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)

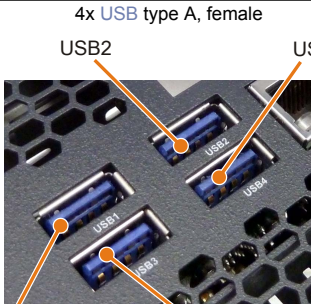


Table 32: USB1, USB2, USB3, USB4 interface

- 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)

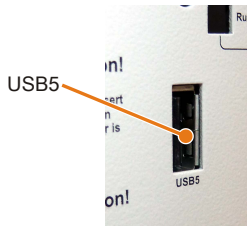


Table 33: USB5 interface

- 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).

2.4.9 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/APC3100/PPC3100
5AC901.ICAN-00 ¹⁾²⁾	Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100
5AC901.ICAN-01 ¹⁾²⁾	Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100
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/APC3100/PPC3100

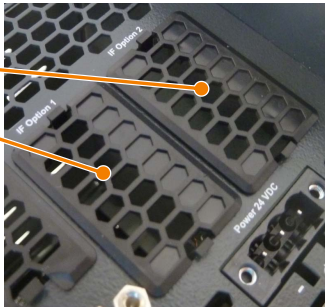


Table 34: IF option 1 slot

- 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 section "Installing interface options" on page 501.

2.4.10 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/APC3100/PPC3100
5AC901.ICAN-00 ¹⁾²⁾	Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100
5AC901.ICAN-01 ¹⁾²⁾	Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100
5AC901.IETH-00	Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/APC3100/PPC3100
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100
5AC901.ISRM-00	Interface card - 2 MB RAM - For APC910/PPC900/APC3100/PPC3100
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100

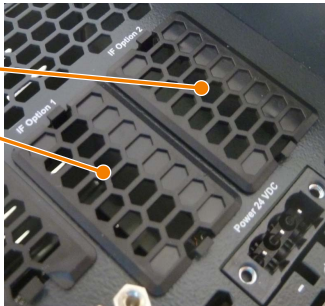


Table 35: IF option 2 slot

- 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 section "Installing interface options" on page 501.

2.4.11 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
5AC901.LSD4-00	SDL4 transmitter

Monitor/Panel option




Table 36: 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 504.

2.4.12 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.

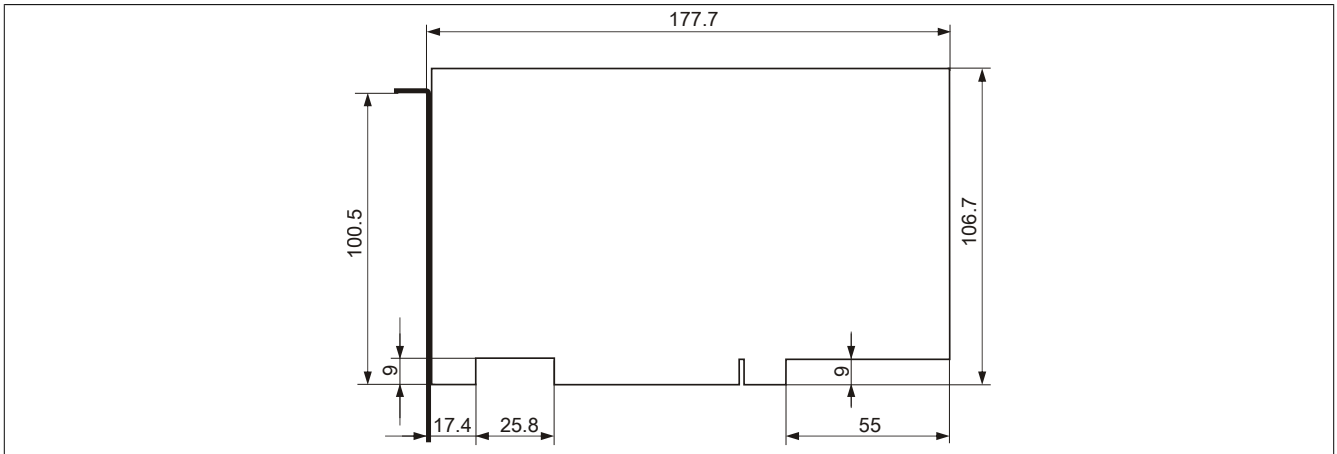


Figure 24: Standard half-size 32-bit PCI card - Dimensions

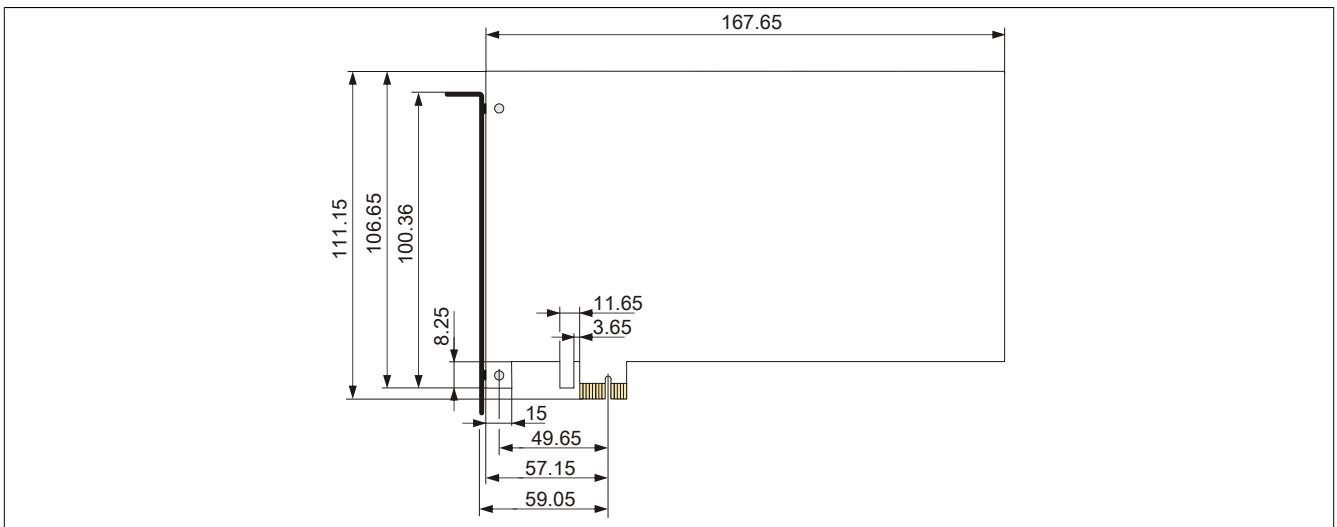


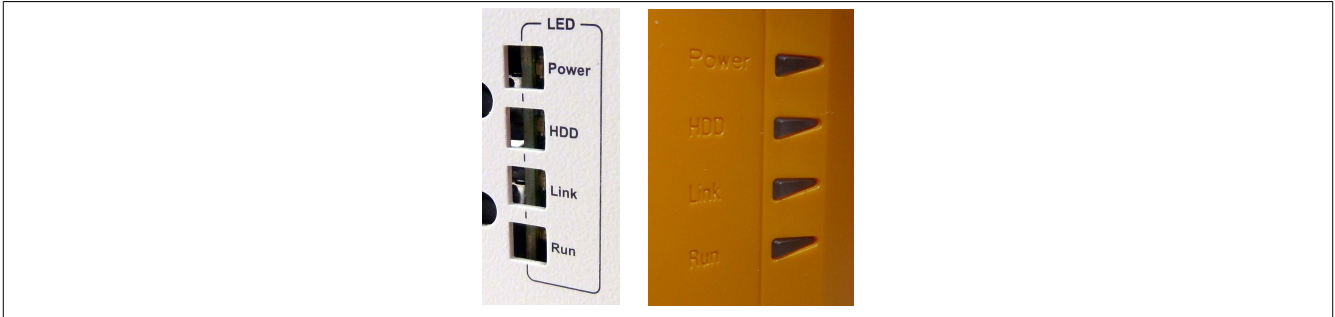
Figure 25: Standard half-size PCIe card - Dimensions

Information:

For information about installing or replacing a PCI/PCIe card, please refer to section ["Installing PCI/PCIe cards"](#) on page 513.

2.4.13 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	[Green grid]
		Blinking	Device booted, battery status "BAD"	[Green grid]
		Information: For more information, see "Battery" on page 77.		
	Red	On	System in standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk)	[Red grid]
		Blinking	MTCX running, battery status "BAD". System in standby mode (S5: Soft-off mode or S4: Hibernation mode suspend-to-disk)	[Red grid]
	Red/Green	Blinking	Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status OK, voltage supply OK	[Red/Green grid]
			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)	[Red/Green grid]
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status BAD, voltage supply OK	[Red/Green grid]
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)			[Red/Green grid]	
Information: An update must be performed again.				
Yellow	On	Voltage supply not OK, system operating from UPS	[Yellow grid]	
HDD	Yellow	On	Indicates drive access (HDD, CFast)	[Yellow grid]
Link	Yellow	On	Indicates an active SDL connection on the male panel connector	[Yellow grid]
		Blinking	Indicates that an active SDL connection has been interrupted by a loss of power to the display unit	[Yellow grid]
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 grid]
	Green	On	Application running Controlled by Automation Runtime (ARemb and ARwin)	[Green grid]
	Red	On	Application in service mode Controlled by Automation Runtime (ARemb and ARwin)	[Red grid]
	Orange	Blinking	Indicates a licensing violation	[Orange grid]

Table 37: LED status indicators - Data

2.4.14 Power button

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

Power button	
<p>The power button can be pressed with a pointed object (e.g. paper clip or tip of a pen).</p> <p>The power button behaves like the power switch on a current desktop PC with an ATX power supply:</p> <p>Press and release ... Switches on the Panel PC, performs the action configured in the operating system for when the power button is pressed (shutdown, sleep, etc.) or switches off the Automation PC.</p> <p>Press and hold ... The ATX power supply switches off the without shutting down the operating system (approx. 4 s - possible data loss!).</p> <p>Pressing the power button does not reset the MTCX processor.</p>	

Table 38: Power button

2.4.15 Reset button

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

Table 39: Reset button

Warning!

A system reset can result in lost data!

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

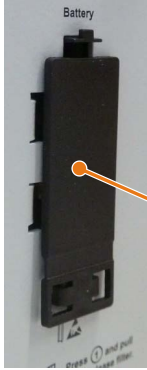


Table 40: Battery

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 41: Battery status

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

2.4.17 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
5CFAST.256G-10	CFast card, 256 GB MLC




Table 42: CFast slot

Warning!

The CFast card is only permitted to be connected or disconnected when the power is switched off.

2.4.18 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 43: 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 507.

2.4.19 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 and available in the following version depending on the CPU board:

- SATA II version (SATA 3 Gbit/s) for TS77 CPU boards
- SATA III version (SATA 6 Gbit/s) for TS17 CPU boards

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

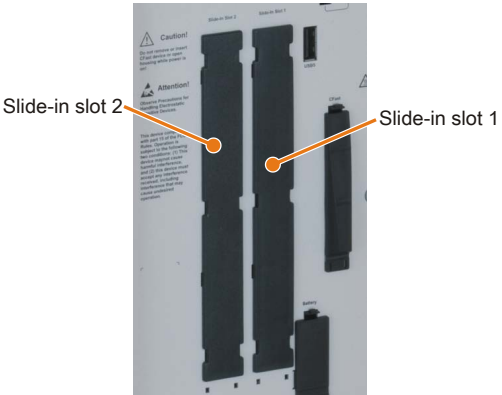


Table 44: Slide-in slot 1

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 510.

2.4.20 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](#) and available in the following version depending on the [CPU](#) board:

- SATA II version (SATA 3 Gbit/s) for TS77 [CPU](#) boards
- SATA III version (SATA 6 Gbit/s) for TS17 [CPU](#) boards

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

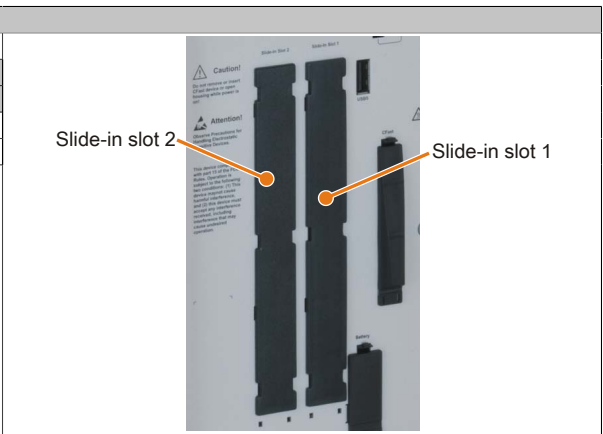


Table 45: Slide-in slot 2

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 510.

2.4.21 Trusted Platform Module (TPM)

Depending on the configuration ordered, a Trusted Platform Module (TPM 2.0) is installed on the [CPU](#) board. A TPM is a chip that adds important security functions to your [device](#), e.g. improved protection of the PC against unauthorized manipulation by third parties. Current operating systems, e.g. Windows 10, support these security functions.

Enabling the Trusted Platform Module

The TPM is disabled by default in [BIOS](#) and [can](#) be enabled in [BIOS](#) under "Advanced" and "Trusted computing". Follow the instructions in [BIOS](#) Setup.

Using the Trusted Platform Module

The TPM [can](#) be used together with "BitLocker" drive encryption in Windows 10, for example. To do this, follow the instructions in the operating system.

Information:

If the password for data encryption is lost, it is not possible to decrypt the data, e.g. after a [BIOS](#) update. Access to the encrypted drive is lost. Passwords must be carefully stored and protected from unauthorized access.

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 223.

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	
	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.TS17-00	CPU board Intel Core i5 6440EQ - Quad core - Chipset QM170 - 2.7 GHz active - For APC910	
5PC900.TS17-01	CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910	
5PC900.TS17-02	CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.7 GHz passive - For APC910	
5PC900.TS17-03	CPU Board Intel Xeon E3-1515MV5 - Quad core - Chipset CM236 - 2.8 GHz active - For APC910	
5PC900.TS17-04	CPU board Intel Core i7 6820EQ - Quad core - Chipset QM170 - 2.8 GHz active - For APC910	
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - Chipset QM77 - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - Chipset QM77 - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - Chipset QM77 - 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.HS00-01	APC910 active heat sink QM170/HM170	
5AC901.HS00-02	APC910 active heat sink CM236	
5AC901.HS01-00	APC910 heat sink, passive	
5AC901.HS01-01	APC910 passive heat sink QM170/HM170	
	Main memory	
5MMDDR.016G-04	SO-DIMM DDR4, 16384 MB	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	

Table 46: 5PC910.SX01-00 - Order data

Model number	Short description	Figure
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	
5MMDDR.4096-04	SO-DIMM DDR4, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	
5MMDDR.8192-04	SO-DIMM DDR4, 8192 MB	
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	
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	
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	
5AC901.FF01-03	Front cover for 1-slot APC910 - Orange - Without logo	
Interface options		
5AC901.I485-00	Interface card - 1x RS232/422/485 interface - For APC910/PPC900/APC3100/PPC3100	
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100	
5AC901.ICAN-01	Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100	
5AC901.IETH-00	Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/APC3100/PPC3100	
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100	
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100	
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100	
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100	
5AC901.ISRM-00	Interface card - 2 MB RAM - For APC910/PPC900/APC3100/PPC3100	
Uninterruptible power supplies		
5AC901.IUPS-00	UPS - For 4.5 Ah battery	
5AC901.IUPS-01	UPS - For 2.2 Ah battery	

Table 46: 5PC910.SX01-00 - Order data

3.1.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

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

Table 47: 5PC910.SX01-00 - Technical data

Model number	5PC910.SX01-00
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
Controller	
Boot loader	BIOS
Real-time clock	
Battery-backed	Yes
Power failure logic	
Controller	MTCX ³⁾
Buffer time	10 ms
Memory	
Type	Depends on the CPU board being used
Memory size	Depends on the CPU board being used
Graphics	
Controller	Depends on the CPU board being used
Interfaces	
COM1	
Type	RS232, modem supported, not electrically isolated
Design	DSUB, 9-pin, male
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
Ethernet	
Quantity	2
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	Depends on the CPU board being used
Panel/Monitor 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%, SELV ⁷⁾
Nominal current	Max. 5.5 A ⁸⁾
Inrush current	Max. 60 A for <300 µs
Overvoltage category per EN 61131-2	II
Electrical isolation	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	IP20 ⁹⁾

Table 47: 5PC910.SX01-00 - Technical data

Model number	5PC910.SX01-00
Environmental conditions	
Temperature	
Operation	Component-dependent ¹⁰⁾
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	Component-dependent
Storage	Component-dependent
Transport	Component-dependent
Vibration ¹¹⁾	
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 ¹¹⁾	
Operation	15 g, 11 ms
Storage	30 g, 6 ms
Transport	30 g, 6 ms
Elevation	
Operation	-300 to 3000 m above sea level ¹²⁾
Mechanical characteristics	
Housing ¹³⁾	
Material	Galvanized plate, plastic
Coating	Anthracite gray
Dimensions	
Width	91 mm
Height	270 mm
Depth	254.75 mm
Weight	2050 g

Table 47: 5PC910.SX01-00 - Technical data

- 1) At 50°C, 8.5 µA for the components being supplied and self-discharge of 40%. If an [interface](#) option with [SRAM](#) or [POWERLINK](#) is installed, the service life is 2½ years.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) Maintenance [Controller Extended](#)
- 4) The SuperSpeed transfer rate (5 Gbit/s) is only possible with [USB 3.0](#).
- 5) The PCI and PCIe slots available depend on the 5AC901.BX01-00 and 5AC901.BX01-01 bus unit being used.
- 6) The [UPS](#) module [can](#) only be operated in the IF option 1 slot.
- 7) [EN 60950](#) requirements must be observed; see section "+24 VDC power supply" of the user's manual.
- 8) Maximum current consumption (24 V / 130 W). This [can](#) vary depending on the configuration (see "Power calculation" section). The inrush current must also be taken into consideration when selecting the power supply.
- 9) Only when all [interface](#) covers and the front cover are closed.
- 10) For detailed information, see the temperature tables in the user's manual.
- 11) Maximum values unless specified otherwise by another individual component. Vibration testing is performed per [EN 60068-2-6](#). Shock testing is performed per [EN 60068-2-27](#).
- 12) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.
- 13) There may be visible deviations in the color and surface appearance depending on the [process](#) or batch.

3.1.1.4 Dimensions

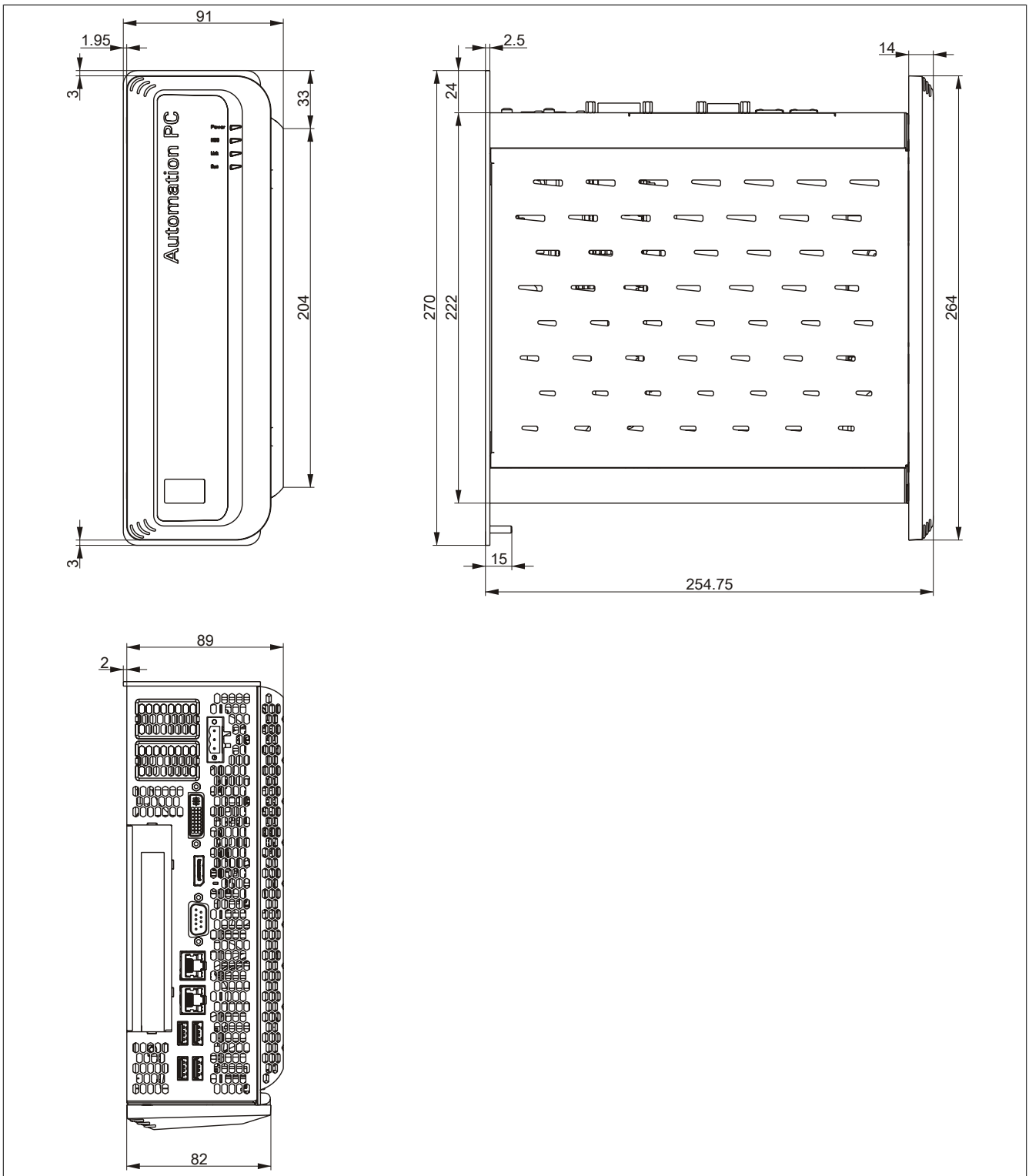


Figure 26: 5PC910.SX01-00 - Dimensions

3.1.1.5 Drilling template

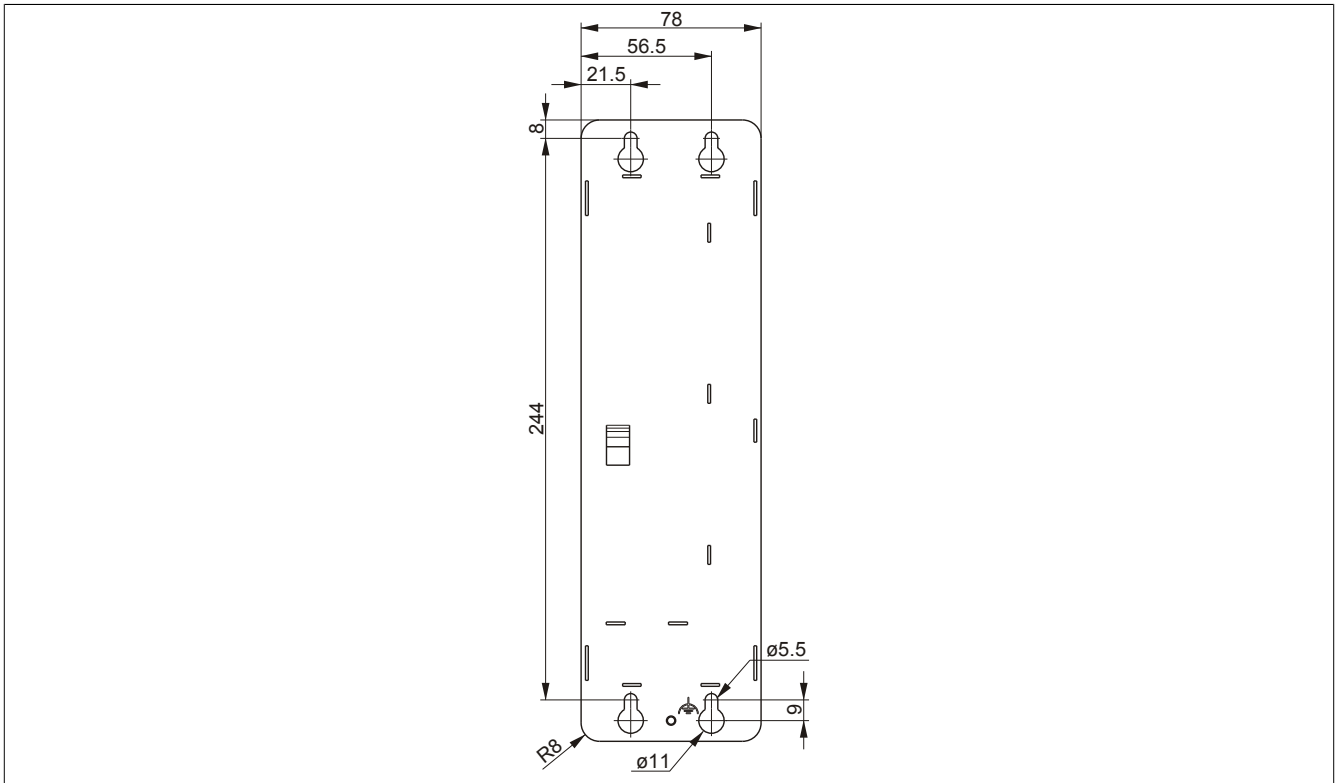


Figure 27: 5PC910.SX01-00 - Drilling template

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	
	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.TS17-00	CPU board Intel Core i5 6440EQ - Quad core - Chipset QM170 - 2.7 GHz active - For APC910	
5PC900.TS17-01	CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910	
5PC900.TS17-02	CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.7 GHz passive - For APC910	
5PC900.TS17-03	CPU Board Intel Xeon E3-1515MV5 - Quad core - Chipset CM236 - 2.8 GHz active - For APC910	
5PC900.TS17-04	CPU board Intel Core i7 6820EQ - Quad core - Chipset QM170 - 2.8 GHz active - For APC910	
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - Chipset QM77 - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - Chipset QM77 - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - Chipset QM77 - 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.HS00-01	APC910 active heat sink QM170/HM170	
5AC901.HS00-02	APC910 active heat sink CM236	
5AC901.HS01-00	APC910 heat sink, passive	
5AC901.HS01-01	APC910 passive heat sink QM170/HM170	
	Main memory	
5MMDDR.016G-04	SO-DIMM DDR4, 16384 MB	
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.4096-04	SO-DIMM DDR4, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	
5MMDDR.8192-04	SO-DIMM DDR4, 8192 MB	
	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 48: 5PC910.SX02-00 - Order data

Model number	Short description	Figure
	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	
5AC901.FF02-03	Front cover for 2-slot APC910 - Orange - Without logo	
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/485 interface - For APC910/PPC900/APC3100/PPC3100	
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100	
5AC901.ICAN-01	Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100	
5AC901.IETH-00	Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/APC3100/PPC3100	
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100	
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100	
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100	
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100	
5AC901.ISRM-00	Interface card - 2 MB RAM - For APC910/PPC900/APC3100/PPC3100	
	Monitor/Panel options	
5AC901.LDPO-00	DisplayPort transmitter	
5AC901.LSD3-00	SDL3 transmitter	
5AC901.LSD4-00	SDL4 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 48: 5PC910.SX02-00 - Order data

3.1.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

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

Table 49: 5PC910.SX02-00 - Technical data

Model number	5PC910.SX02-00
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
Controller	
Boot loader	BIOS
Real-time clock	
Battery-backed	Yes
Power failure logic	
Controller	MTCX ³⁾
Buffer time	10 ms
Memory	
Type	Depends on the CPU board being used
Memory size	Depends on the CPU board being used
Graphics	
Controller	Depends on the CPU board being used
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
Ethernet	
Quantity	2
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	Depends on the CPU board being used
Panel/Monitor 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	Depends on the CPU board being used
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%, SELV ⁷⁾
Nominal current	Max. 5.5 A ⁸⁾
Inrush current	Max. 60 A for <300 µs
Overvoltage category per EN 61131-2	II
Electrical isolation	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	IP20 ⁹⁾

Table 49: 5PC910.SX02-00 - Technical data

Model number	5PC910.SX02-00
Environmental conditions	
Temperature	
Operation	Component-dependent ¹⁰⁾
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	Component-dependent
Storage	Component-dependent
Transport	Component-dependent
Vibration ¹¹⁾	
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 ¹¹⁾	
Operation	15 g, 11 ms
Storage	30 g, 6 ms
Transport	30 g, 6 ms
Elevation	
Operation	-300 to 3000 m above sea level ¹²⁾
Mechanical characteristics	
Housing ¹³⁾	
Material	Galvanized plate, plastic
Coating	Anthracite gray
Dimensions	
Width	130 mm
Height	270 mm
Depth	254.75 mm
Weight	2550 g

Table 49: 5PC910.SX02-00 - Technical data

- 1) 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.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) Maintenance [Controller](#) Extended.
- 4) The SuperSpeed transfer rate (5 Gbit/s) is only possible with [USB 3.0](#).
- 5) The PCI and PCIe slots available depend on the bus unit being used (5AC901.BX02-00, 5AC901.BX02-01 or 5AC901.BX02-02).
- 6) This [UPS](#) module [can](#) only be operated in the IF option 1 slot.
- 7) [EN 60950](#) requirements must be observed; see section "+24 VDC power supply" in the user's manual.
- 8) Maximum current consumption (24 V / 130 W). This [can](#) vary depending on the configuration (see "Power calculation" section). The inrush current must also be taken into consideration when selecting the power supply.
- 9) Only when all [interface](#) covers and the front cover are closed.
- 10) Detailed information [can](#) be found in the temperature tables in the user's manual.
- 11) 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](#).
- 12) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
- 13) There may be visible deviations in the color and surface appearance depending on the [process](#) or batch.

3.1.2.4 Dimensions

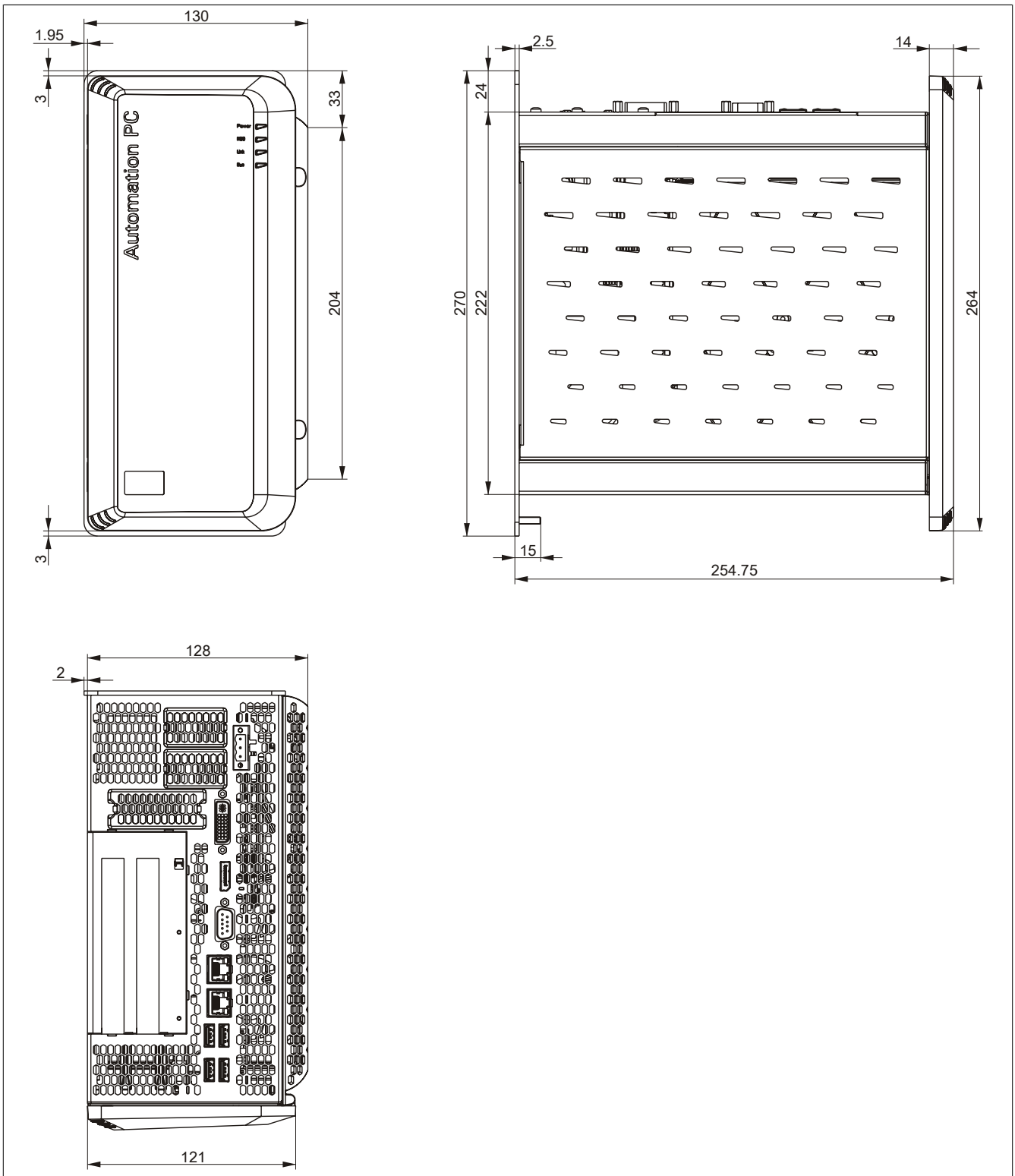


Figure 28: 5PC910.SX02-00 - Dimensions

3.1.2.5 Drilling template

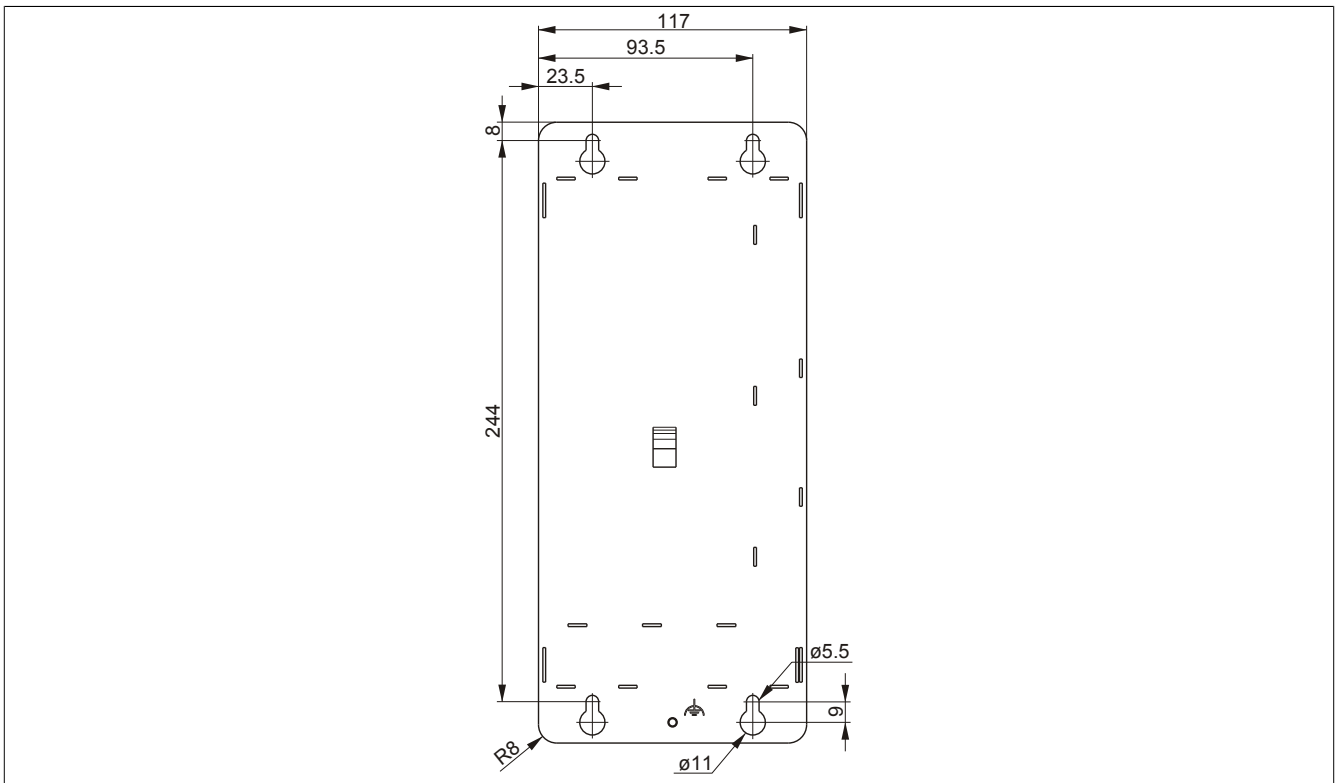


Figure 29: 5PC910.SX02-00 - Drilling template

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	
	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.TS17-00	CPU board Intel Core i5 6440EQ - Quad core - Chipset QM170 - 2.7 GHz active - For APC910	
5PC900.TS17-01	CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910	
5PC900.TS17-02	CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.7 GHz passive - For APC910	
5PC900.TS17-03	CPU Board Intel Xeon E3-1515MV5 - Quad core - Chipset CM236 - 2.8 GHz active - For APC910	
5PC900.TS17-04	CPU board Intel Core i7 6820EQ - Quad core - Chipset QM170 - 2.8 GHz active - For APC910	
5PC900.TS77-00	CPU board Intel Core i7 3615QE 2.3 GHz - Quad core - Chipset QM77 - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - Chipset QM77 - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - Chipset QM77 - 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.HS00-01	APC910 active heat sink QM170/HM170	
5AC901.HS00-02	APC910 active heat sink CM236	
5AC901.HS01-00	APC910 heat sink, passive	
5AC901.HS01-01	APC910 passive heat sink QM170/HM170	
	Main memory	
5MMDDR.016G-04	SO-DIMM DDR4, 16384 MB	
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.4096-04	SO-DIMM DDR4, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	
5MMDDR.8192-04	SO-DIMM DDR4, 8192 MB	
	Terminal blocks	
0TB103.9	Connector 24 VDC - 3-pin female - Screw clamp terminal block 3.31 mm ²	

Table 50: 5PC910.SX05-00 - Order data

Model number	Short description	Figure
0TB103.91	Connector 24 VDC - 3-pin female - Cage clamp terminal block 3.31 mm ²	
	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	
5AC901.FF05-02	Front cover for 5-slot APC910 - Dark gray - Without logo	
5AC901.FF05-03	Front cover for 5-slot APC910 - Orange - Without logo	
	Interface options	
5AC901.I485-00	Interface card - 1x RS232/422/485 interface - For APC910/PPC900/APC3100/PPC3100	
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900/APC3100/PPC3100	
5AC901.ICAN-01	Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100	
5AC901.IETH-00	Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/APC3100/PPC3100	
5AC901.IHDA-00	Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100	
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100	
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100	
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100	
5AC901.ISRM-00	Interface card - 2 MB RAM - For APC910/PPC900/APC3100/PPC3100	
	Monitor/Panel options	
5AC901.LDPO-00	DisplayPort transmitter	
5AC901.LSD3-00	SDL3 transmitter	
5AC901.LSD4-00	SDL4 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 50: 5PC910.SX05-00 - Order data

3.1.3.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

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

Table 51: 5PC910.SX05-00 - Technical data

Model number	5PC910.SX05-00
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
GOST-R	Yes
Controller	
Boot loader	BIOS
Real-time clock	
Battery-backed	Yes
Power failure logic	
Controller	MTCX ²⁾
Buffer time	10 ms
Memory	
Type	Depends on the CPU board being used
Memory size	Depends on the CPU board being used
Graphics	
Controller	Depends on the CPU board being used
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
Ethernet	
Quantity	2
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	Depends on the CPU board being used
Panel/Monitor 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	Depends on the CPU board being used
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 ±25%, SELV ⁶⁾
Nominal current	Max. 5.5 A ⁷⁾
Inrush current	Max. 60 A for <300 µs
Overvoltage category per EN 61131-2	II
Electrical isolation	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Degree of protection per EN 60529	IP20 ⁸⁾

Table 51: 5PC910.SX05-00 - Technical data

Model number	5PC910.SX05-00
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	211 mm
Height	270 mm
Depth	254.75 mm
Weight	2850 g

Table 51: 5PC910.SX05-00 - Technical data

- 1) 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.
- 2) Maintenance [Controller](#) Extended.
- 3) The SuperSpeed transfer rate (5 Gbit/s) is only possible with [USB 3.0](#).
- 4) 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).
- 5) This [UPS](#) module [can](#) only be operated in the IF option 1 slot.
- 6) [EN 60950](#) requirements must be observed; see section "+24 VDC power supply" in the user's manual.
- 7) Maximum current consumption (24 V / 130 W). This [can](#) vary depending on the configuration (see "Power calculation" section). The inrush current must also be taken into consideration when selecting the power supply.
- 8) Only when all [interface](#) covers and the front cover are closed.
- 9) 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.

3.1.3.4 Dimensions

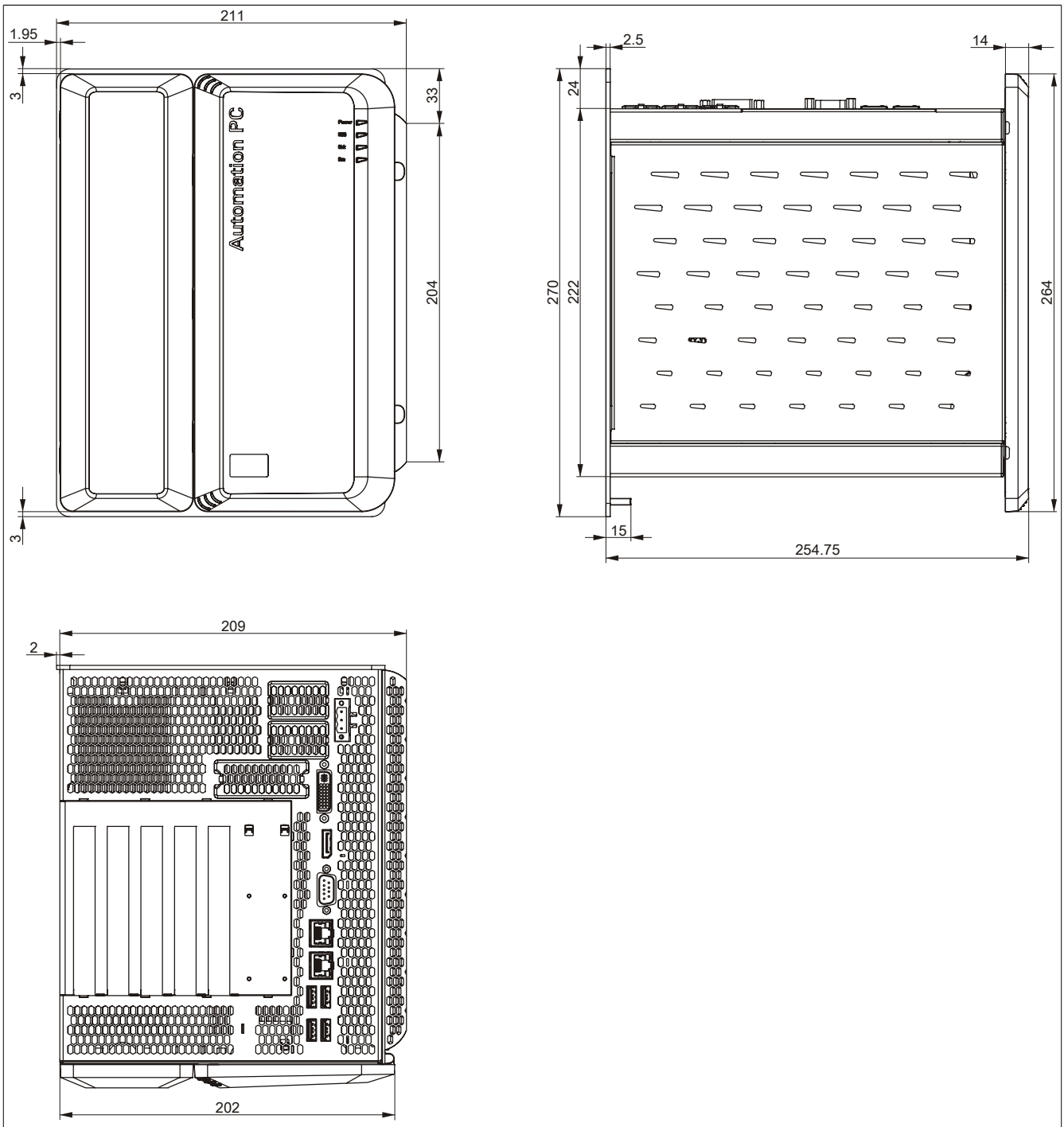


Figure 30: 5PC910.SX05-00 - Dimensions

3.1.3.5 Drilling template

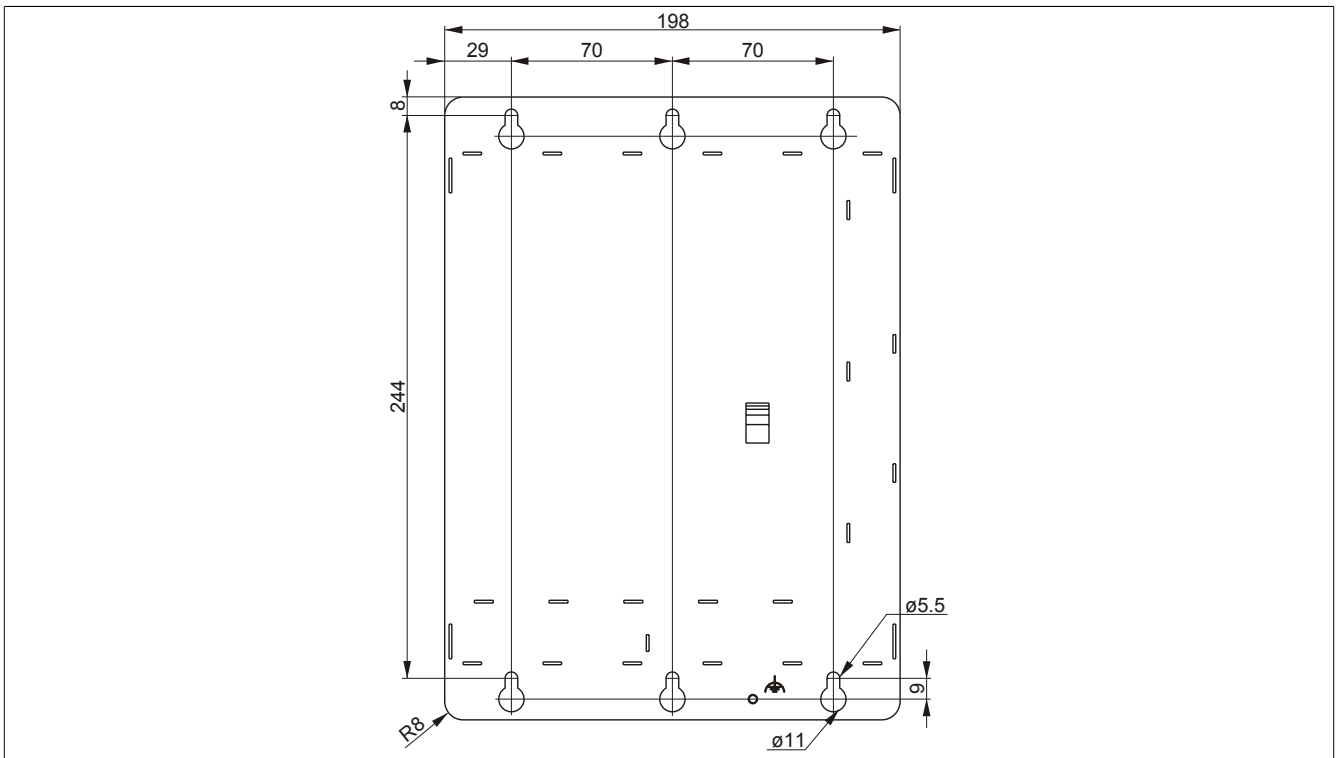


Figure 31: 5PC910.SX05-00 - Drilling template

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 52: 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

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

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							
Certifications							
CE	Yes						
UL	cULus E115267 Industrial control equipment						
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾	-			Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾	-	
GOST-R	Yes						
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		2				
Architecture	22 nm						
Thermal design power (TDP)	45 W	35 W	25 W	17 W	35 W		17 W
Intel Smart Cache	6 MB		4 MB		3 MB		
External bus	DMI, 5 GT/s						
Intel 64 architecture	Yes						
Intel Turbo Boost Technology	2.0					No	
Intel Hyper-Threading Technology	Yes					No	
Intel vPro Technology	Yes					No	
Intel Virtualization Technology (VT-x)	Yes					No	
Intel Virtualization Technology for Directed I/O (VT-d)	Yes					No	
Enhanced Intel SpeedStep Technology	Yes						
Chipset	Intel QM77						
Trusted Platform Module	No						
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		950 MHz		900 MHz		
Color depth	Max. 32-bit						
DirectX support	11						
OpenGL support	4.0						
Resolution	Resolution up to 1920 x 1200 (WUXGA)						
DVI	350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)						
RGB	Version 1.1						
DisplayPort	4x SATA						
Mass memory management	ACPI 4.0 with battery support						
Power management							
Operating conditions							
Pollution degree per EN 61131-2	Pollution degree 2						

Table 53: 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 in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 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 54: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Order data

3.3.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
DNV GL	-			Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾
GOST-R	Yes			
Controller				
Boot loader	Embedded AMI BIOS			

Table 55: 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
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	
Architecture	32 nm		22 nm	
Thermal design power (TDP)	17 W		35 W	17 W
Intel Smart Cache	2 MB	1.5 MB	2 MB	
External bus	DMI, 5 GT/s			
Intel 64 architecture	Yes			
Intel Turbo Boost Technology	No			
Intel Hyper-Threading Technology	No			
Intel vPro Technology	No			
Intel Virtualization Technology (VT-x)	Yes			
Intel Virtualization Technology for Directed I/O (VT-d)	No			
Enhanced Intel SpeedStep Technology	Yes			
Chipset	Intel HM76			
Trusted Platform Module	No			
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		25.6 GB/s	
Graphics				
Controller	Intel HD Graphics 2000		Intel HD Graphics 2500	
Max. dynamic graphics frequency	800 MHz		1 GHz	900 MHz
Color depth	Max. 32-bit			
DirectX support	10.1		11	
OpenGL support	3.1		4.0	
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			
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			

Table 55: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 2) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).

3.4 QM170 CPU boards

3.4.1 5PC900.TS17-00, 04

3.4.1.1 General information

- Intel Core i processor
- Intel QM170 chipset
- 2x DDR4 memory slots
- Intel Gen 9 HD graphics
- AMI BIOS (UEFI)

Information:

A fan kit is required when using CPU boards 5PC900.TS17-00 and 5PC900.TS17-04.

3.4.1.2 Order data


Model number	Short description	Figure
	CPU boards	
5PC900.TS17-00	CPU board Intel Core i5 6440EQ - Quad core - Chipset QM170 - 2.7 GHz active - For APC910	
5PC900.TS17-04	CPU board Intel Core i7 6820EQ - Quad core - Chipset QM170 - 2.8 GHz active - For APC910	
	Required accessories	
	Heat sink	
5AC901.HS00-01	APC910 active heat sink QM170/HM170	
	Main memory	
5MMDDR.016G-04	SO-DIMM DDR4, 16384 MB	
5MMDDR.4096-04	SO-DIMM DDR4, 4096 MB	
5MMDDR.8192-04	SO-DIMM DDR4, 8192 MB	

Table 56: 5PC900.TS17-00, 5PC900.TS17-04 - Order data

3.4.1.3 Technical data

Model number	5PC900.TS17-00		5PC900.TS17-04
Revision	D5	E0	-
General information			
Certifications			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
Controller			
Boot loader	Embedded AMI BIOS		
Processor			
Type	Intel Core i5-6440EQ		Intel Core i7-6820EQ
Clock frequency	2700 MHz		2800 MHz
Number of cores	4		
Architecture	14 nm		
Thermal design power (TDP)	45 W		
Intel Smart Cache	6 MB		8 MB
External bus	DMI3, 8 GT/s		
Intel 64 architecture	Yes		
Intel Turbo Boost Technology	2.0		
Intel Hyper-Threading Technology	No		Yes
Intel vPro Technology	Yes		
Intel Virtualization Technology (VT-x)	Yes		
Intel Virtualization Technology for Directed I/O (VT-d)	Yes		
Enhanced Intel SpeedStep Technology	Yes		
Chipset	Intel QM170		
Trusted Platform Module	No	TPM 2.0	
Real-time clock			
Precision	At 25°C: Typ. 12 ppm (1 second) per day ¹⁾		
Battery-backed	Yes		

Table 57: 5PC900.TS17-00, 5PC900.TS17-00, 5PC900.TS17-04 - Technical data

Model number	5PC900.TS17-00		5PC900.TS17-04
Revision	D5	E0	-
Memory slot			
Number of memory channels	2		
Type	DDR4		
Memory size	Max. 32 GB		
Max. memory bandwidth	34.1 GB/s		
Graphics			
Controller	Intel HD Graphics 530		
Max. dynamic graphics frequency	1 GHz		
Color depth	Max. 32-bit		
DirectX support	12		
OpenGL support	4.4		
Resolution			
DVI	Resolution up to 1920 x 1200 (WUXGA)		
RGB	350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)		
DisplayPort	Version 1.2, resolution up to 4K		
Mass memory management	4x SATA		
Power management	ACPI 5.0 with battery support		
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		

Table 57: 5PC900.TS17-00, 5PC900.TS17-00, 5PC900.TS17-04 - Technical data

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

3.5 HM170 CPU boards

3.5.1 5PC900.TS17-01, -02

3.5.1.1 General information

- Intel Celeron and Intel Core i processors
- Intel HM170 chipset
- 2x DDR4 memory slots
- Intel Gen 9 HD graphics
- AMI BIOS (UEFI)

Information:

When operated without a fan kit

- CPU board 5PC900.TS17-01 is limited to a maximum CPU frequency of 1900 MHz.
- CPU board 5PC900.TS17-02 is limited to a maximum CPU frequency of 1700 MHz.

3.5.1.2 Order data


Model number	Short description	Figure
	CPU boards	
5PC900.TS17-01	CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910	
5PC900.TS17-02	CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.7 GHz passive - For APC910	
	Required accessories	
	Heat sink	
5AC901.HS00-01	APC910 active heat sink QM170/HM170	
5AC901.HS01-01	APC910 passive heat sink QM170/HM170	
	Main memory	
5MMDDR.016G-04	SO-DIMM DDR4, 16384 MB	
5MMDDR.4096-04	SO-DIMM DDR4, 4096 MB	
5MMDDR.8192-04	SO-DIMM DDR4, 8192 MB	

Table 58: 5PC900.TS17-01, 5PC900.TS17-02 - Order data

3.5.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5PC900.TS17-01		5PC900.TS17-02	
Revision	C0	C5	D5	E0
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
Controller				
Boot loader	Embedded AMI BIOS			

Table 59: 5PC900.TS17-01, 5PC900.TS17-01, 5PC900.TS17-02, 5PC900.TS17-02 - Technical data

Model number	5PC900.TS17-01		5PC900.TS17-02	
	C0	C5	D5	E0
Processor	Intel Core i3-6100E		Intel Celeron G3900E	
Type	2700 MHz		2400 MHz	
Clock frequency	2			
Number of cores	14 nm			
Architecture	35 W			
Thermal design power (TDP)	3 MB		2 MB	
Intel Smart Cache	DMI3, 8 GT/s			
External bus	Yes			
Intel 64 architecture	No			
Intel Turbo Boost Technology	Yes		No	
Intel Hyper-Threading Technology	No			
Intel vPro Technology	Yes			
Intel Virtualization Technology (VT-x)	Yes			
Intel Virtualization Technology for Directed I/O (VT-d)	Yes			
Enhanced Intel SpeedStep Technology	Intel HM170			
Chipset	No	TPM 2.0	No	TPM 2.0
Trusted Platform Module	At 25°C: typ. 12 ppm (1 second) per day ¹⁾			
Real-time clock	Yes			
Precision	2			
Battery-backed	DDR4			
Memory slot	Max. 32 GB			
Number of memory channels	34.1 GB/s			
Type	Intel HD Graphics 530		Intel HD Graphics 510	
Memory size	950 MHz			
Max. memory bandwidth	Max. 32-bit			
Graphics	12			
Controller	4.4			
Max. dynamic graphics frequency	Resolution up to 1920 x 1200 (WUXGA)			
Color depth	350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)			
DirectX support	Version 1.2, resolution up to 4K			
OpenGL support	4x SATA			
Resolution	ACPI 5.0 with battery support			
DVI				
RGB				
DisplayPort				
Mass memory management				
Power management				
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			

Table 59: 5PC900.TS17-01, 5PC900.TS17-02, 5PC900.TS17-02, 5PC900.TS17-02 - Technical data

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

3.6 CM236 CPU boards

3.6.1 5PC900.TS17-03

3.6.1.1 General information

- Intel Xeon processor E3
- Intel CM236 chipset
- 2x DDR4 memory slots
- Intel Iris Pro Graphics
- AMI BIOS (UEFI)

Information:

A fan kit is required when using CPU board 5PC900.TS17-03.

Information:

ARwin and ARemb are not permitted to be operated in combination with CPU board 5PC900.TS17-03 CPU.

3.6.1.2 Order data


Model number	Short description	Figure
	CPU boards	
5PC900.TS17-03	CPU Board Intel Xeon E3-1515MV5 - Quad core - Chipset CM236 - 2.8 GHz active - For APC910	
	Required accessories	
	Heat sink	
5AC901.HS00-02	APC910 active heat sink CM236	
	Main memory	
5MMDDR.016G-04	SO-DIMM DDR4, 16384 MB	
5MMDDR.4096-04	SO-DIMM DDR4, 4096 MB	
5MMDDR.8192-04	SO-DIMM DDR4, 8192 MB	

Table 60: 5PC900.TS17-03 - Order data

3.6.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5PC900.TS17-03	
Revision	C5	D0
General information		
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
Controller		
Boot loader	Embedded AMI BIOS	

Table 61: 5PC900.TS17-03, 5PC900.TS17-03 - Technical data

Model number	5PC900.TS17-03	
Revision	C5	D0
Processor		
Type	Intel Xeon E3-1515MV5	
Clock frequency	2800 MHz	
Number of cores	4	
Architecture	14 nm	
Thermal design power (TDP)	45 W	
Intel Smart Cache	8 MB	
External bus	DMI3, 8 GT/s	
Intel 64 architecture	Yes	
Intel Turbo Boost Technology	2.0	
Intel Hyper-Threading Technology	Yes	
Intel vPro Technology	Yes	
Intel Virtualization Technology (VT-x)	Yes	
Intel Virtualization Technology for Directed I/O (VT-d)	Yes	
Enhanced Intel SpeedStep Technology	Yes	
Chipset	Intel CM236	
Trusted Platform Module	No	TPM 2.0
Real-time clock		
Precision	At 25°C: typ. 12 ppm (1 second) per day ¹⁾	
Battery-backed	Yes	
Memory slot		
Number of memory channels	2	
Type	DDR4	
Memory size	Max. 32 GB	
Max. memory bandwidth	34.1 GB/s	
Graphics		
Controller	Intel Iris Pro Graphics P580	
Max. dynamic graphics frequency	1 GHz	
eDRAM ²⁾	128 MB	
Color depth	Max. 32-bit	
DirectX support	12	
OpenGL support	4.4	
Resolution		
DVI	Resolution up to 1920 x 1200 (WUXGA)	
RGB	350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)	
DisplayPort	Version 1.2, resolution up to 4K	
Mass memory management	4x SATA	
Power management	ACPI 5.0 with battery support	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	

Table 61: 5PC900.TS17-03, 5PC900.TS17-03 - Technical data

- 1) At max. specified ambient temperature: typ. 58 ppm (5 seconds) - worst-case 220 ppm (19 seconds).
- 2) eDRAM - Embedded DRAM (graphics memory) is integrated in the CPU.

3.7 Main memory

Information:

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

3.7.1 5MMDDR.xxxx-03

3.7.1.1 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.

3.7.1.2 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 62: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Order data

3.7.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5MMDDR.1024-03	5MMDDR.2048-03	5MMDDR.4096-03	5MMDDR.8192-03
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾			
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾			
GOST-R	Yes			
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)			
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			

Table 63: 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 in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

3.7.2 5MMDDR.xxxx-04

3.7.2.1 General information

These 260-pin DDR4 main memory modules operate with a data rate of 2133 MHz and are available in sizes ranging from 4 GB to 16 GB.

If two main memory modules of identical size (e.g. 4 GB) are connected to the CPU board, then dual-channel memory technology is supported. This technology is not supported if two main memory modules of different sizes (e.g. 4 GB and 8 GB) are connected.

3.7.2.2 Order data


Model number	Short description	Figure
	Main memory	
5MMDDR.4096-04	SO-DIMM DDR4, 4096 MB	
5MMDDR.8192-04	SO-DIMM DDR4, 8192 MB	
5MMDDR.016G-04	SO-DIMM DDR4, 16384 MB	

Table 64: 5MMDDR.4096-04, 5MMDDR.8192-04, 5MMDDR.016G-04 - Order data

3.7.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5MMDDR.4096-04	5MMDDR.8192-04	5MMDDR.016G-04
General information			
Certifications			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
Controller			
Memory			
Type	SO-DIMM DDR4 SDRAM		
Memory size	4 GB	8 GB	16 GB
Construction	260-pin		
Organization	512M x 64-bit	1024M x 64 bits	2048M x 64 bits
Speed	DDR4-2133 (PC3-17066)		
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		

Table 65: 5MMDDR.4096-04, 5MMDDR.8192-04, 5MMDDR.016G-04 - Technical data

3.8 Bus units

3.8.1 5AC901.BX0x-0x

3.8.1.1 General information

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

1-slot bus units



Figure 32: 1-slot bus units

2-slot bus units

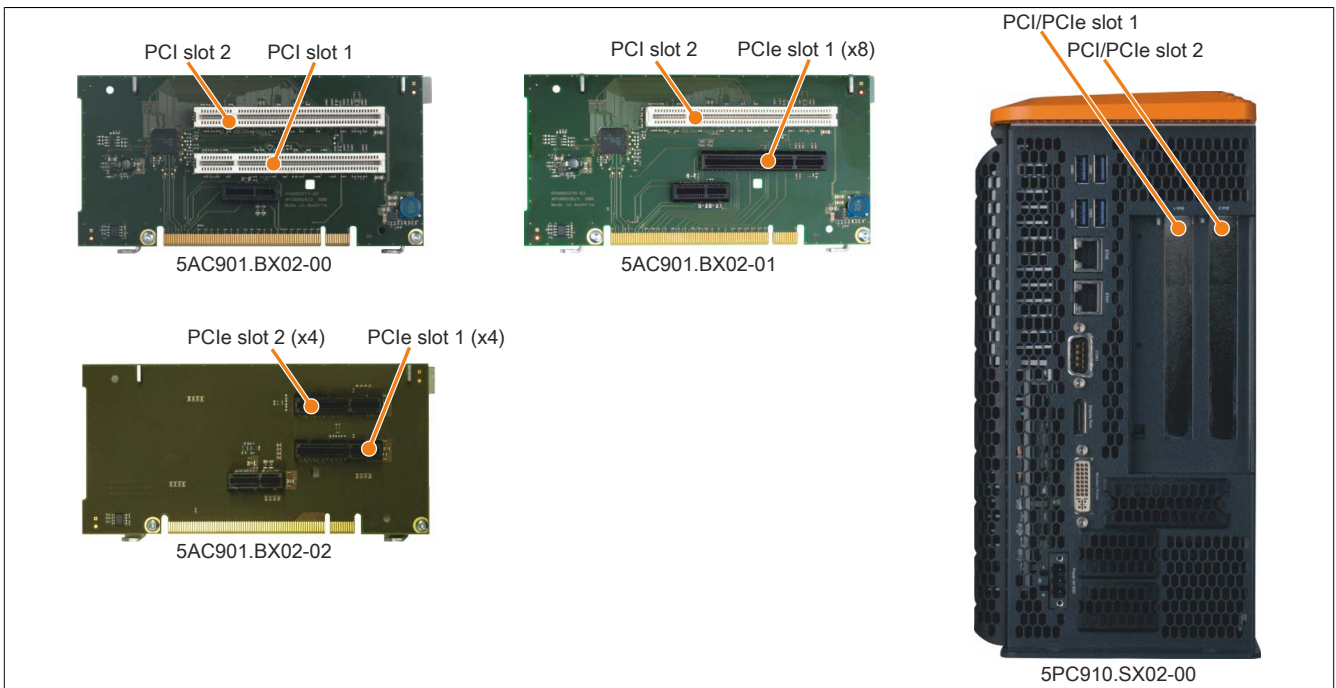


Figure 33: 2-slot bus units

5-slot bus units

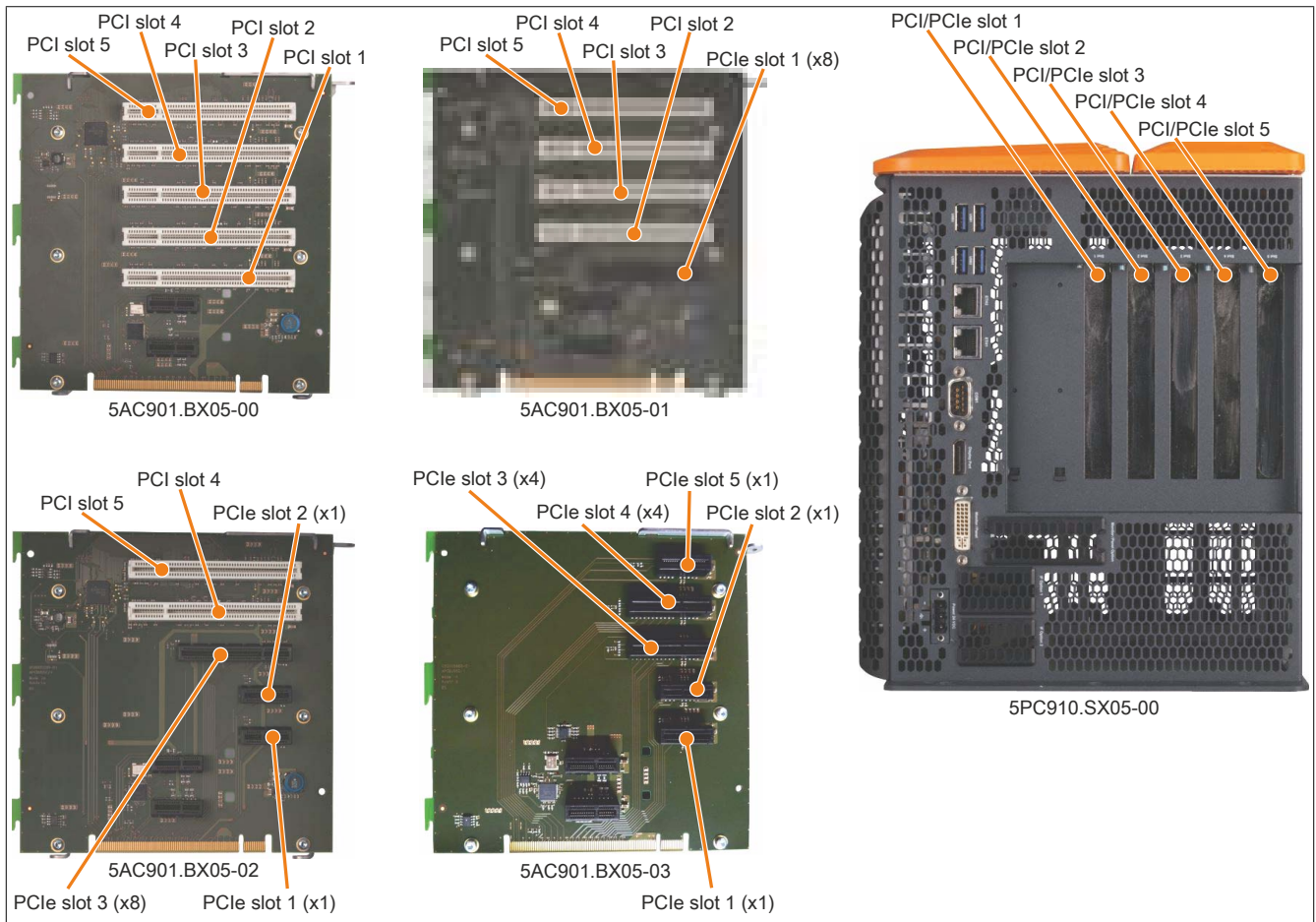


Figure 34: 5-slot bus units

3.8.1.2 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 66: 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

3.8.1.3 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.

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5AC901.BX01-00	5AC901.BX01-01	5AC901.BX02-00	5AC901.BX02-01	5AC901.BX02-02
General information					
Certifications					
CE	Yes				
UL	cULus E115267 Industrial control equipment				
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾				
GOST-R	Yes				
Inserts					
PCI slots					
Quantity	1	-	2	1	-
Type	32-bit	-	32-bit	32-bit	-
Design	PCI half-size	-	PCI half-size	PCI half-size	-
Standard	2.2	-	2.2	2.2	-
Bus speed	33 MHz	-	33 MHz	33 MHz	-
PCIe to PCI bridge	Yes	-	Yes	Yes	-
PCIe slots					
Quantity	-	1	-	1	2
Design	-	PCIe half-size	-	PCIe half-size	PCIe half-size
Standard	-	2.0	-	2.0	2.0
Bus speed	-	x8 (4 GB/s)	-	x8 (4 GB/s)	x4 (2 GB/s) (2x)
Operating conditions					
Pollution degree per EN 61131-2	Pollution degree 2				

Table 67: 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 in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5AC901.BX05-00	5AC901.BX05-01	5AC901.BX05-02	5AC901.BX05-03
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
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	-

Table 68: 5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02, 5AC901.BX05-03 - Technical data

Model number	5AC901.BX05-00	5AC901.BX05-01	5AC901.BX05-02	5AC901.BX05-03
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)
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			

Table 68: 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).

3.9 Heat sinks

3.9.1 5AC901.HS0x-00

3.9.1.1 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.

3.9.1.2 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 - Chipset QM77 - For APC910	
5PC900.TS77-01	CPU board Intel Core i7 3612QE 2.1 GHz - Quad core - Chipset QM77 - For APC910	
5PC900.TS77-02	CPU board Intel Core i7 3555LE 2.5 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-03	CPU board Intel Core i7 3517UE 1.7 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-04	CPU board Intel Core i5 3610ME 2.7 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-05	CPU board Intel Core i3 3120ME 2.4 GHz - Dual core - Chipset QM77 - For APC910	
5PC900.TS77-06	CPU board Intel Core i3 3217UE 1.6 GHz - Dual core - Chipset QM77 - 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 69: 5AC901.HS00-00, 5AC901.HS01-00 - Order data

3.9.2 5AC901.HS0x-01

3.9.2.1 General information

Heat sink 5AC901.HS00-01 has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that have fan kits.

Heat sink 5AC901.HS01-01 has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that do not have fan kits.

3.9.2.2 Order data


Model number	Short description	Figure
	Heat sink	
5AC901.HS00-01	APC910 active heat sink QM170/HM170	
5AC901.HS01-01	APC910 passive heat sink QM170/HM170	
	Required accessories	
	CPU boards	
5PC900.TS17-00	CPU board Intel Core i5 6440EQ - Quad core - Chipset QM170 - 2.7 GHz active - For APC910	
5PC900.TS17-01	CPU board Intel Core i3 6100E - Dual core - Chipset HM170 - 2.7 GHz active, 1.9 GHz passive - For APC910	
5PC900.TS17-02	CPU board Intel Celeron G3900E - Dual core - Chipset HM170 - 2.4 GHz active, 1.7 GHz passive - For APC910	
5PC900.TS17-04	CPU board Intel Core i7 6820EQ - Quad core - Chipset QM170 - 2.8 GHz active - For APC910	

Table 70: 5AC901.HS00-01, 5AC901.HS01-01 - Order data

3.9.3 5AC901.HS00-02

3.9.3.1 General information

Heat sink 5AC901.HS00-02 has cooling fins and heat pipes for improved heat dissipation. It is only used together with system units that have fan kits.

3.9.3.2 Order data


Model number	Short description	Figure
	Heat sink	
5AC901.HS00-02	APC910 active heat sink CM236	
	Required accessories	
	CPU boards	
5PC900.TS17-03	CPU Board Intel Xeon E3-1515MV5 - Quad core - Chipset CM236 - 2.8 GHz active - For APC910	

Table 71: 5AC901.HS00-02 - Order data

3.10 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 518](#).

Information:

For information about installing or replacing a fan kit, please refer to the section ["Replacing fan kits" on page 519](#).

3.10.1 5AC901.FA01-00

3.10.1.1 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

3.10.1.2 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 72: 5AC901.FA01-00 - Order data

3.10.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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	100000 hours at 40°C (50x50x15) 100000 hours at 40°C (70x70x15)
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾
GOST-R	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

Table 73: 5AC901.FA01-00 - Technical data

Model number	5AC901.FA01-00	
Mechanical characteristics		
Dimensions		
Fans		
Width		50 mm 70 mm
Height		50 mm 70 mm
Depth		15 mm 15 mm

Table 73: 5AC901.FA01-00 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

3.10.2 5AC901.FA02-00

3.10.2.1 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

3.10.2.2 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 74: 5AC901.FA02-00 - Order data

3.10.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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	100000 hours at 40°C (50x50x15) 100000 hours at 40°C (70x70x15)
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾
GOST-R	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Mechanical characteristics	
Dimensions	
Fans	
Width	50 mm 70 mm
Height	50 mm 70 mm
Depth	15 mm 15 mm

Table 75: 5AC901.FA02-00 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

3.10.3 5AC901.FA05-00

3.10.3.1 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

3.10.3.2 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 76: 5AC901.FA05-00 - Order data

3.10.3.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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)
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
GOST-R	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Mechanical characteristics	
Dimensions	
Fans	
Width	50 mm 70 mm
Height	50 mm 70 mm
Depth	15 mm 15 mm

Table 77: 5AC901.FA05-00 - Technical data

3.11 Drives

3.11.1 5AC901.CHDD-00

3.11.1.1 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

3.11.1.2 Order data


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

Table 78: 5AC901.CHDD-00 - Order data

3.11.1.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CHDD-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C 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 ±0.2%
Startup time	Typ. 3.6 s (from 0 rpm to read access)
MTBF	550,000 hours 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)

Table 79: 5AC901.CHDD-00 - Technical data

Model number	5AC901.CHDD-00
Positioning time	
Minimum (track to track)	1 ms
Nominal (read access)	14 ms
Maximum (read access)	30 ms
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature ³⁾	
Operation ⁴⁾	0 to 60°C
24-hour operation ⁵⁾	0 to 60°C
Storage	-40 to 70°C
Transport	-40 to 70°C
Relative humidity ⁶⁾	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
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 79: 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.

3.11.1.4 Temperature/Humidity diagram

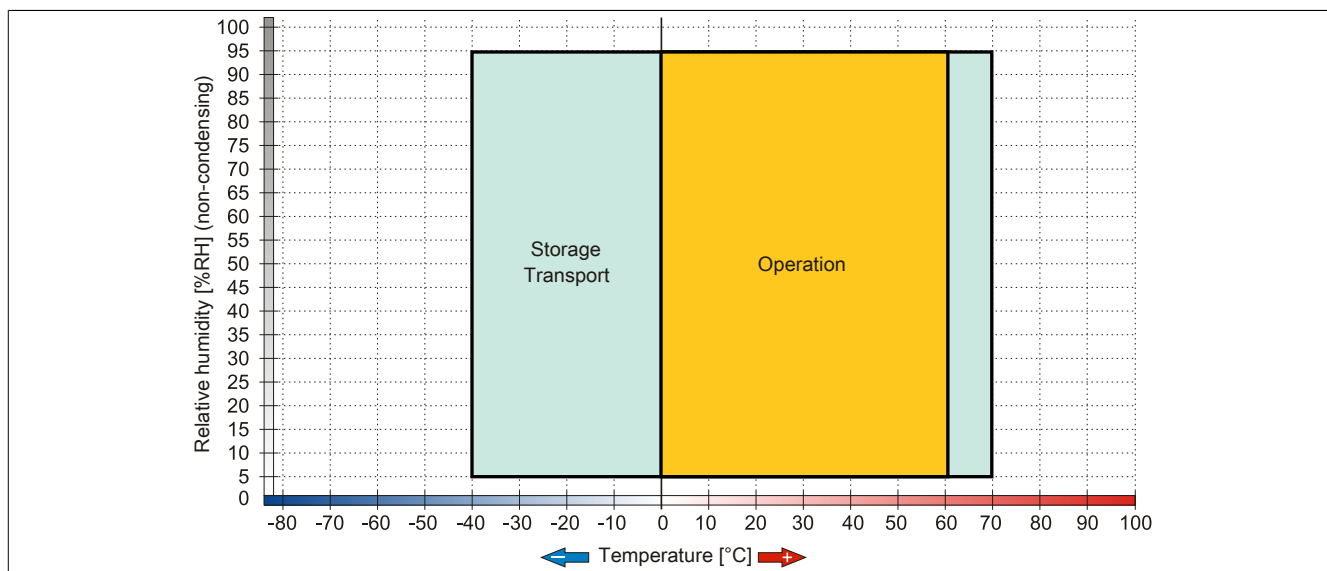


Figure 35: 5AC901.CHDD-00 - Temperature/Humidity diagram

3.11.2 5AC901.CHDD-01

3.11.2.1 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

3.11.2.2 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 80: 5AC901.CHDD-01 - Order data

3.11.2.3 Technical data

Caution!

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

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

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CHDD-01
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
GOST-R	Yes
Hard disk drive	
Capacity	500 GB
Number of heads	2
Number of sectors	976,773,168
Bytes per sector	512 (logical) / 4096 (physical)
Cache	16 MB
Speed	5400 rpm ±0.2%
Startup time	Typ. 3.5 s (from 0 rpm to read access)
Service life	5 years
MTBF	1,000,000 hours 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 access)	11 ms
Maximum (read access)	21 ms

Table 81: 5AC901.CHDD-01 - Technical data

Model number	5AC901.CHDD-01
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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	
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 81: 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.

3.11.2.4 Temperature/Humidity diagram

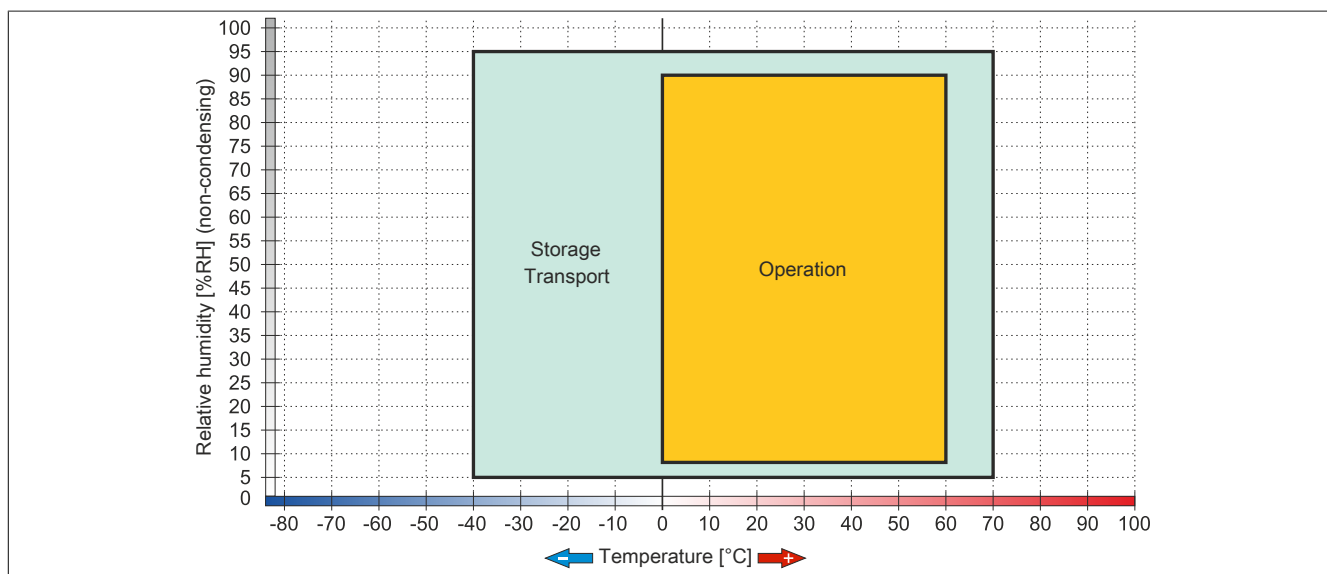


Figure 36: 5AC901.CHDD-01 - Temperature/Humidity diagram

3.11.3 5MMHDD.0500-00

3.11.3.1 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

3.11.3.2 Order data


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

Table 82: 5MMHDD.0500-00 - Order data

3.11.3.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMHDD.0500-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD ¹⁾
GOST-R	Yes
Hard disk drive	
Capacity	500 GB
Number of heads	2
Number of sectors	976,773,168
Bytes per sector	512 (logical) / 4096 (physical)
Cache	16 MB
Speed	5400 rpm ±0.2%
Startup time	Typ. 3.5 s (from 0 rpm to read access)
Service life	5 years
MTBF	1,000,000 hours ²⁾

Table 83: 5MMHDD.0500-00 - Technical data

Model number	5MMHDD.0500-00
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 access)	11 ms
Maximum (read access)	21 ms
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 83: 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.

3.11.3.4 Temperature/Humidity diagram

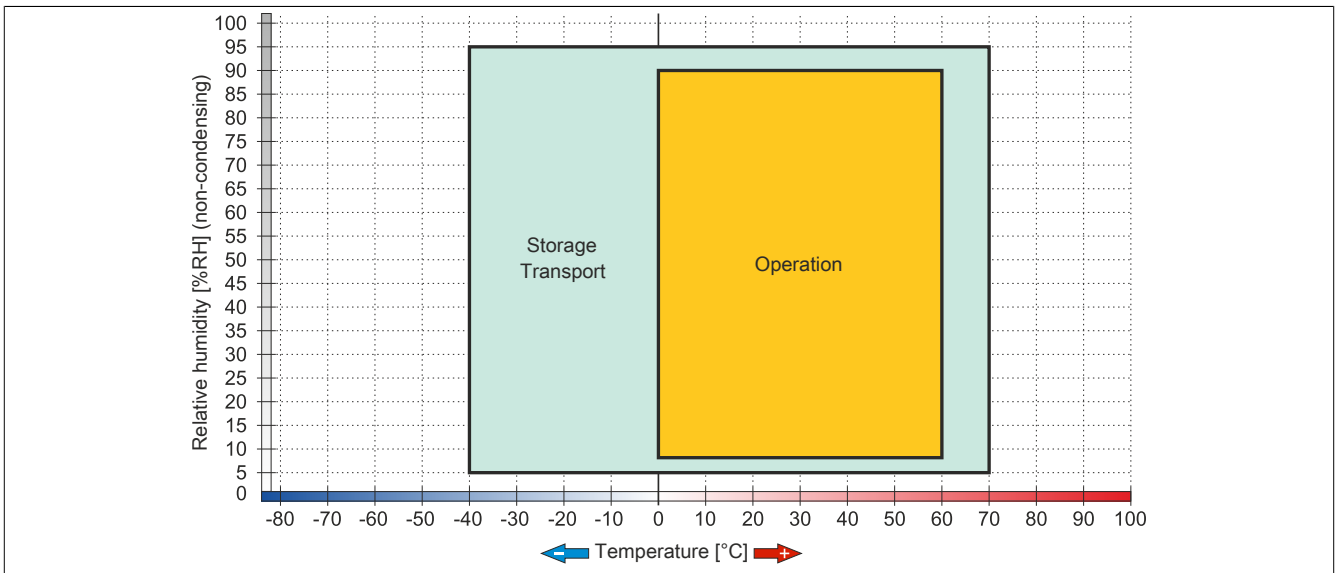


Figure 37: 5MMHDD.0500-00 - Temperature/Humidity diagram

3.11.4 5AC901.CSSD-00

3.11.4.1 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

3.11.4.2 Order data


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

Table 84: 5AC901.CSSD-00 - Order data

3.11.4.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CSSD-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C 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 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

Table 85: 5AC901.CSSD-00 - Technical data

Model number	5AC901.CSSD-00
Error correction coding (ECC)	Yes
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)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 85: 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.

3.11.4.4 Temperature/Humidity diagram

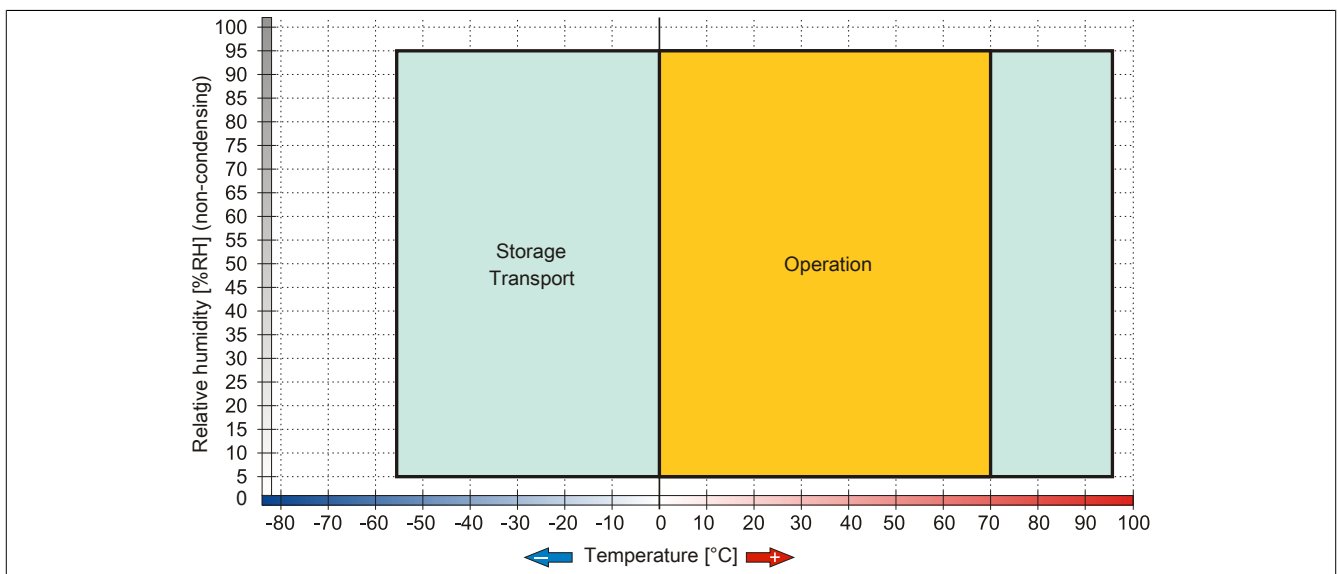


Figure 38: 5AC901.CSSD-00 - Temperature/Humidity diagram

3.11.5 5AC901.CSSD-01

3.11.5.1 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

3.11.5.2 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 86: 5AC901.CSSD-01 - Order data

3.11.5.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CSSD-01
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C 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

Table 87: 5AC901.CSSD-01 - Technical data

Model number	5AC901.CSSD-01
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 87: 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.

3.11.5.4 Temperature/Humidity diagram

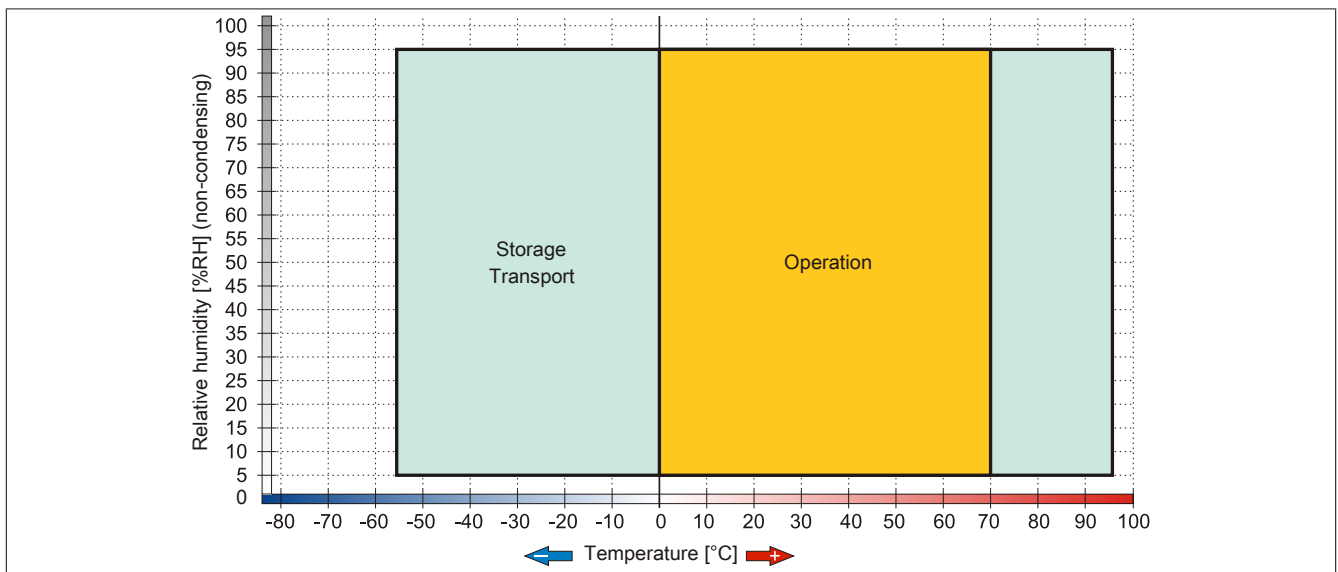


Figure 39: 5AC901.CSSD-01 - Temperature/Humidity diagram

3.11.6 5AC901.CSSD-02

3.11.6.1 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

3.11.6.2 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 88: 5AC901.CSSD-02 - Order data

3.11.6.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CSSD-02
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C 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

Table 89: 5AC901.CSSD-02 - Technical data

Model number	5AC901.CSSD-02
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 89: 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.

3.11.6.4 Temperature/Humidity diagram

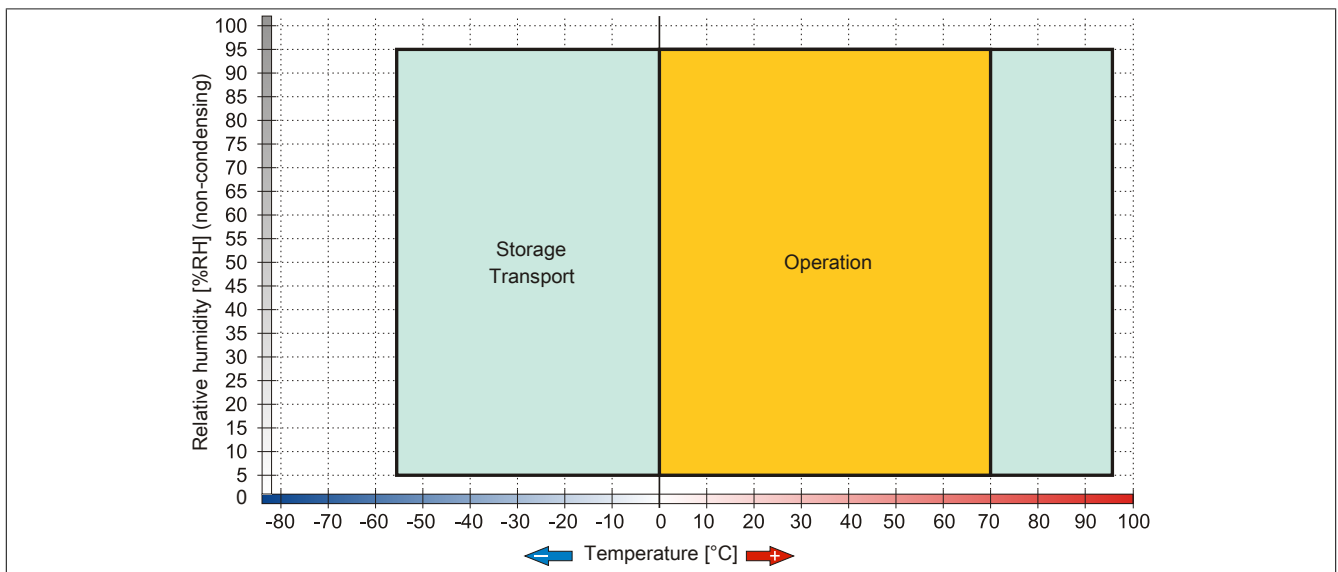


Figure 40: 5AC901.CSSD-02 - Temperature/Humidity diagram

3.11.7 5AC901.CSSD-03

3.11.7.1 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

3.11.7.2 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 90: 5AC901.CSSD-03 - Order data

3.11.7.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CSSD-03		
Revision	C0	D0	F0
General information			
Certifications			
CE		Yes	
UL		cULus E115267 Industrial control equipment	
HazLoc		cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾	
DNV GL		Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾	
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 ³⁾			
4k read		Max. 50,000 (random)	
4k write		Max. 25,000 (random)	

Table 91: 5AC901.CSSD-03, 5AC901.CSSD-03, 5AC901.CSSD-03 - Technical data

Model number	5AC901.CSSD-03		
Revision	C0	D0	F0
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)		
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		
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 91: 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 in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) IOPS: Random read and write input/output operations per second.
- 4) TBW: Terabytes written.
- 5) Slide-in compact installation.

3.11.7.4 Temperature/Humidity diagram

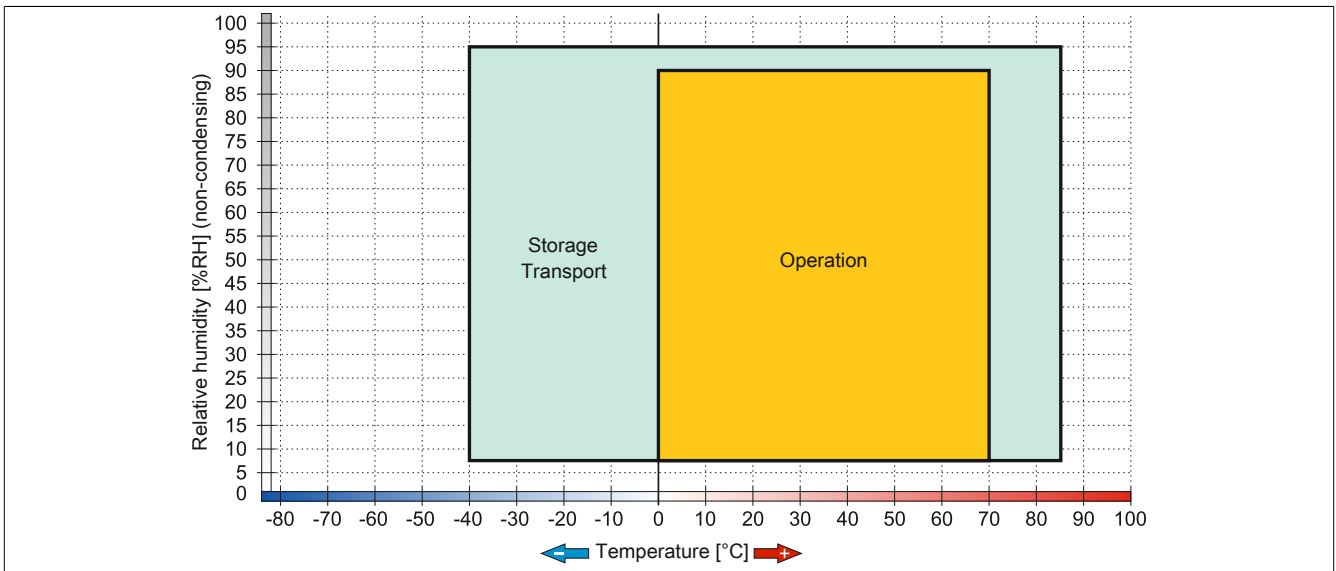


Figure 41: 5AC901.CSSD-03 ≤ Rev. C0 - Temperature/Humidity diagram

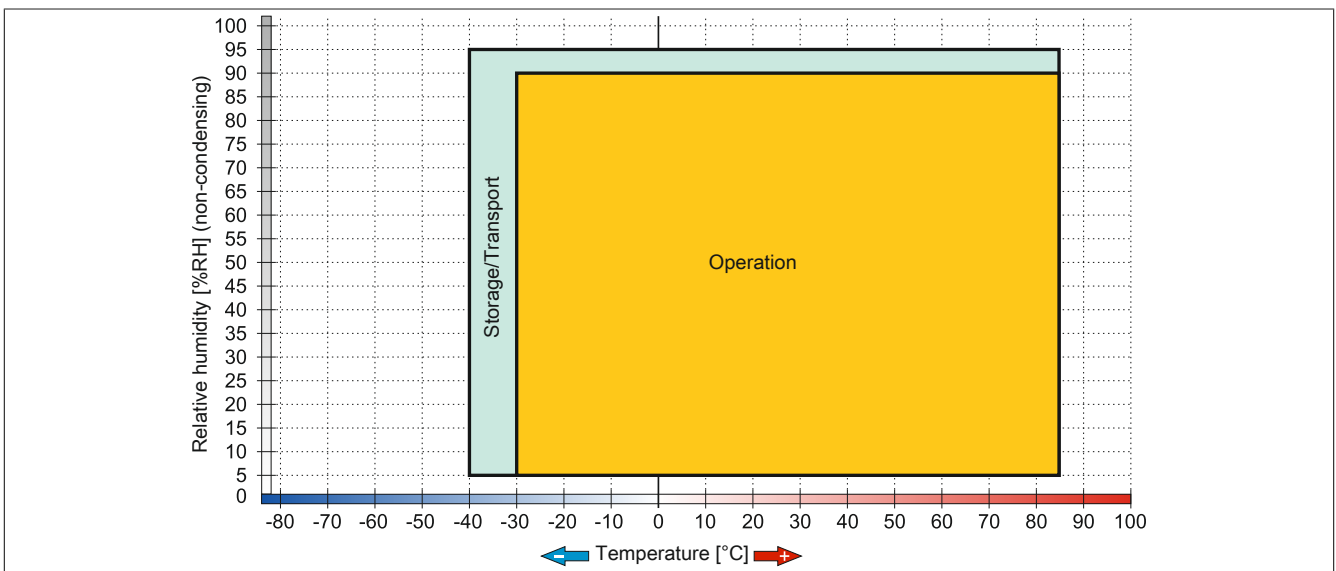


Figure 42: 5AC901.CSSD-03 ≥ Rev. D0 - Temperature/Humidity diagram

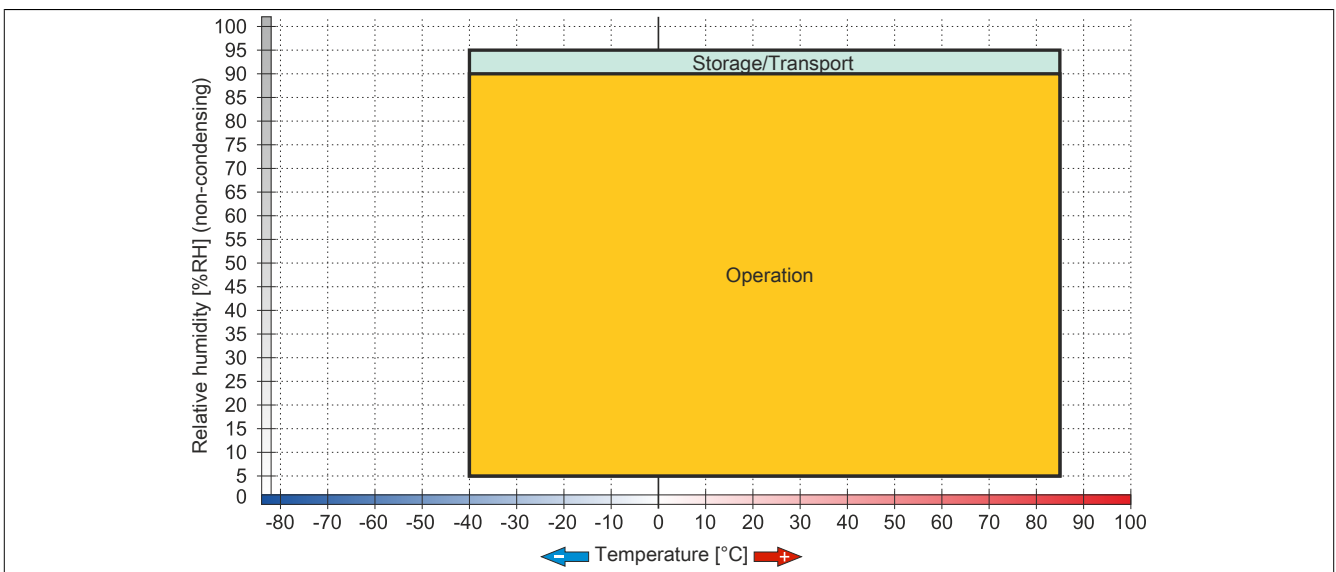


Figure 43: 5AC901.CSSD-03 ≥ Rev. F0 - Temperature/Humidity diagram

3.11.8 5AC901.CSSD-04

3.11.8.1 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

3.11.8.2 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 92: 5AC901.CSSD-04 - Order data

3.11.8.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CSSD-04			
Revision	C0	D0	E0	G0
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾			
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾			
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 ³⁾				
4k read	Max. 80,000 (random)	Max. 85,000 (random)		
4k write	Max. 35,000 (random)			

Table 93: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - Technical data

Technical data • Individual components

Model number	5AC901.CSSD-04			
Revision	C0	D0	E0	G0
Endurance				
MLC flash	Yes			
Guaranteed data volume				
Guaranteed	74 TBW ⁴⁾		100 TBW ⁴⁾	
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)			
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			
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 93: 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 in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) IOPS: Random read and write input/output operations per second.
- 4) TBW: Terabytes written.
- 5) Slide-in compact installation.

3.11.8.4 Temperature/Humidity diagram

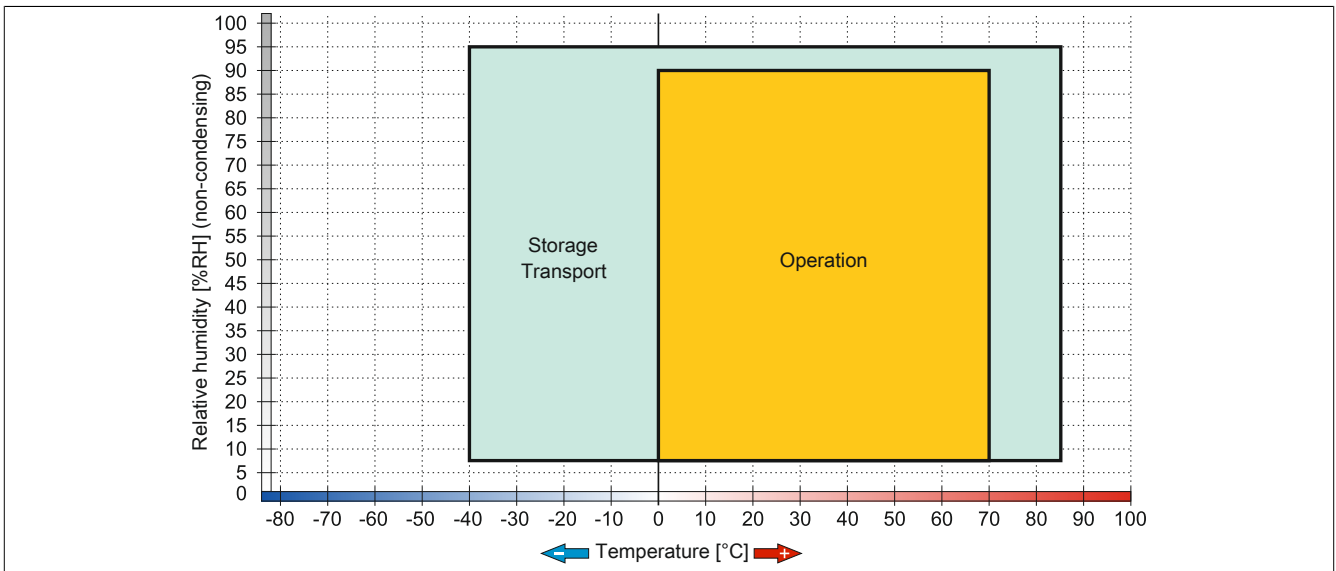


Figure 44: 5AC901.CSSD-04 ≤ Rev. C0 - Temperature/Humidity diagram

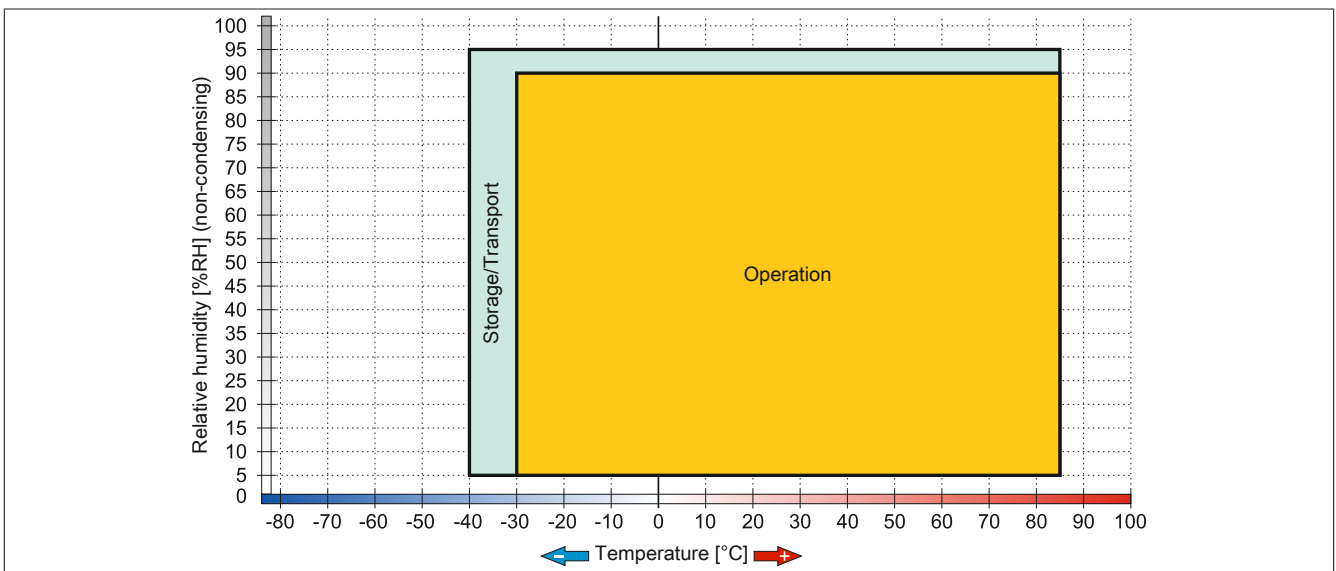


Figure 45: 5AC901.CSSD-04 ≥ Rev. D0 - Temperature/Humidity diagram

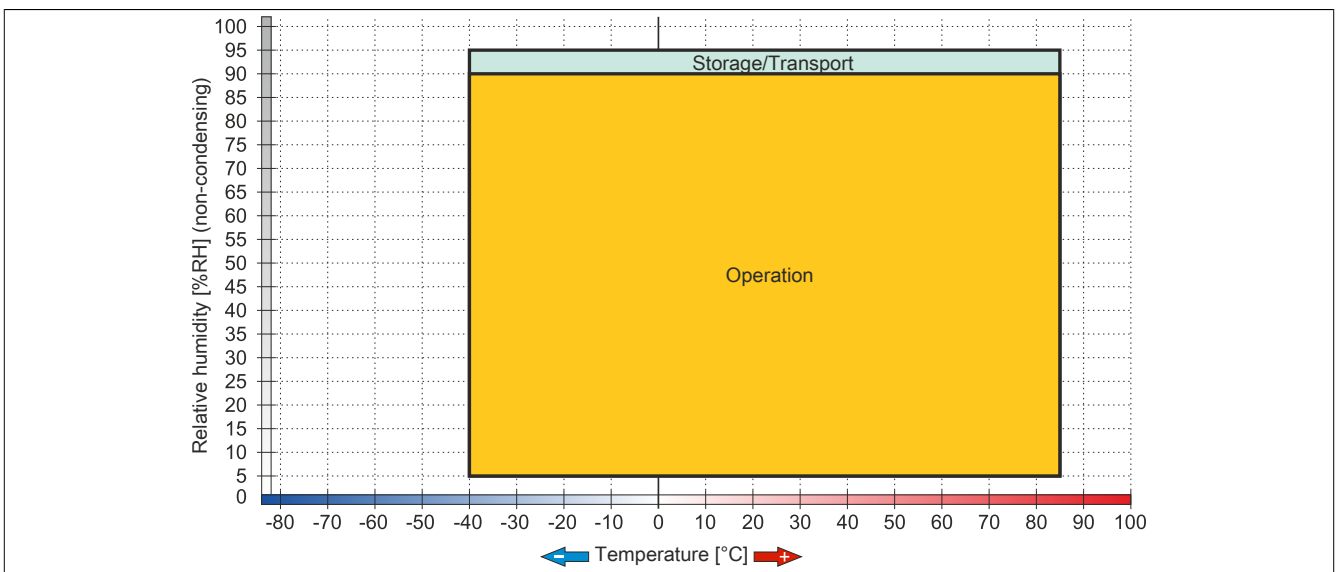


Figure 46: 5AC901.CSSD-04 ≥ Rev. G0 - Temperature/Humidity diagram

3.11.9 5AC901.CSSD-05

3.11.9.1 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

3.11.9.2 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 94: 5AC901.CSSD-05 - Order data

3.11.9.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CSSD-05	
Revision	C0	E0
General information		
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾	
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾	
GOST-R	Yes	
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)	

Table 95: 5AC901.CSSD-05, 5AC901.CSSD-05 - Technical data

Model number	5AC901.CSSD-05	
Revision	C0	E0
Endurance		
MLC flash	Yes	
Guaranteed data volume		
Guaranteed	148 TBW ⁴⁾	200 TBW ⁴⁾
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
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 95: 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 in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) IOPS: Random read and write input/output operations per second.
- 4) TBW: Terabytes written.
- 5) Slide-in compact installation.

3.11.9.4 Temperature/Humidity diagram

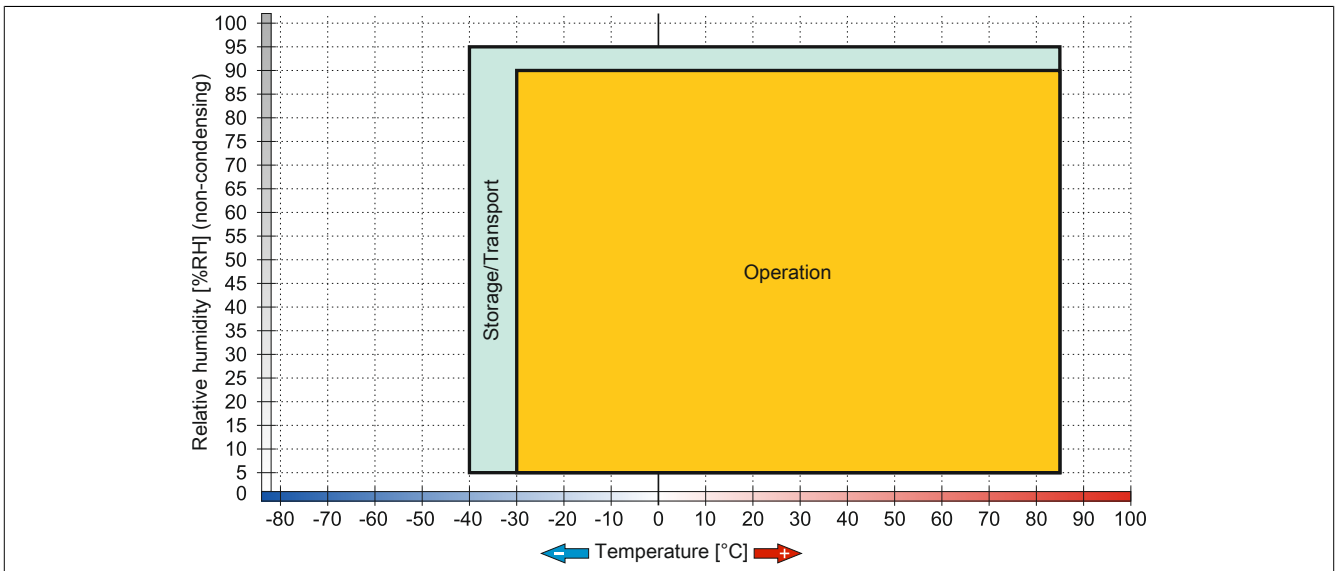


Figure 47: 5AC901.CSSD-05 ≤ Rev. D0 - Temperature/Humidity diagram

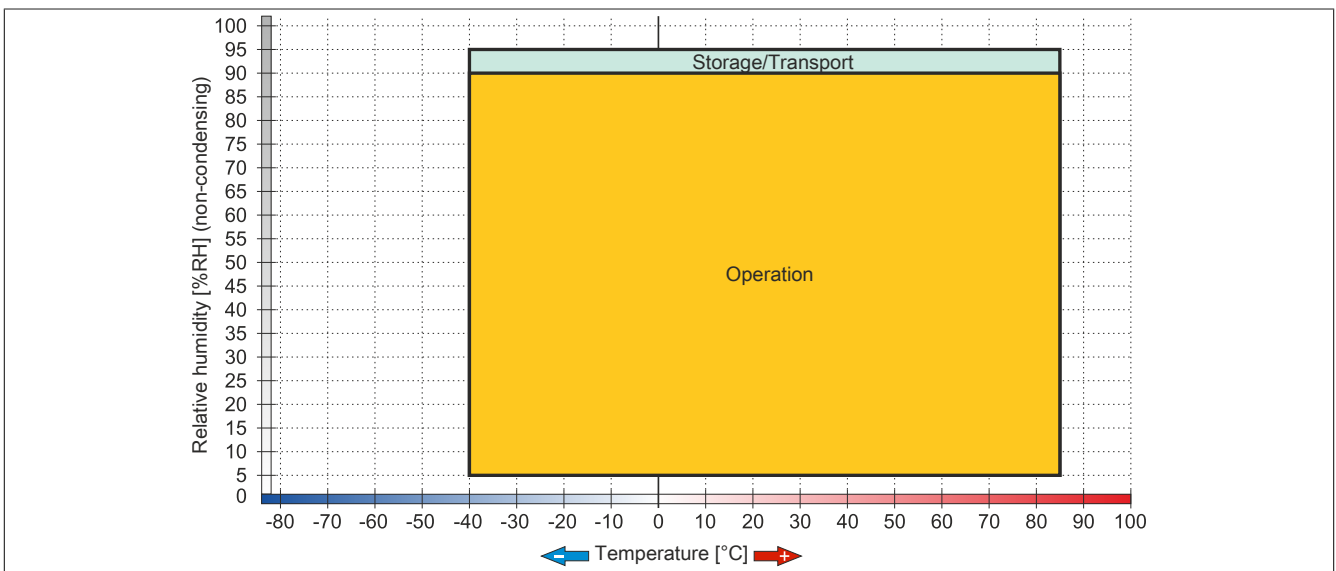


Figure 48: 5AC901.CSSD-05 ≥ Rev. E0 - Temperature/Humidity diagram

3.11.10 5AC901.CSSD-06

3.11.10.1 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

3.11.10.2 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 96: 5AC901.CSSD-06 - Order data

3.11.10.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CSSD-06
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
Solid-state drive	
Capacity	512 GB
Data reliability	<1 unrecoverable error per 10 ¹⁵ bits read
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)

Table 97: 5AC901.CSSD-06 - Technical data

Model number	5AC901.CSSD-06
Endurance	
MLC flash	Yes
Guaranteed data volume	
Guaranteed	400 TBW ⁴⁾
Compatibility	SATA revision 3.1 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ) command
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 12,192 m
Storage	-300 to 12,192 m
Transport	-300 to 12,192 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 97: 5AC901.CSSD-06 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) IOPS: Random read and write input/output operations per second
- 4) TBW: Terabytes written
- 5) Slide-in compact installation.

3.11.10.4 Temperature/Humidity diagram

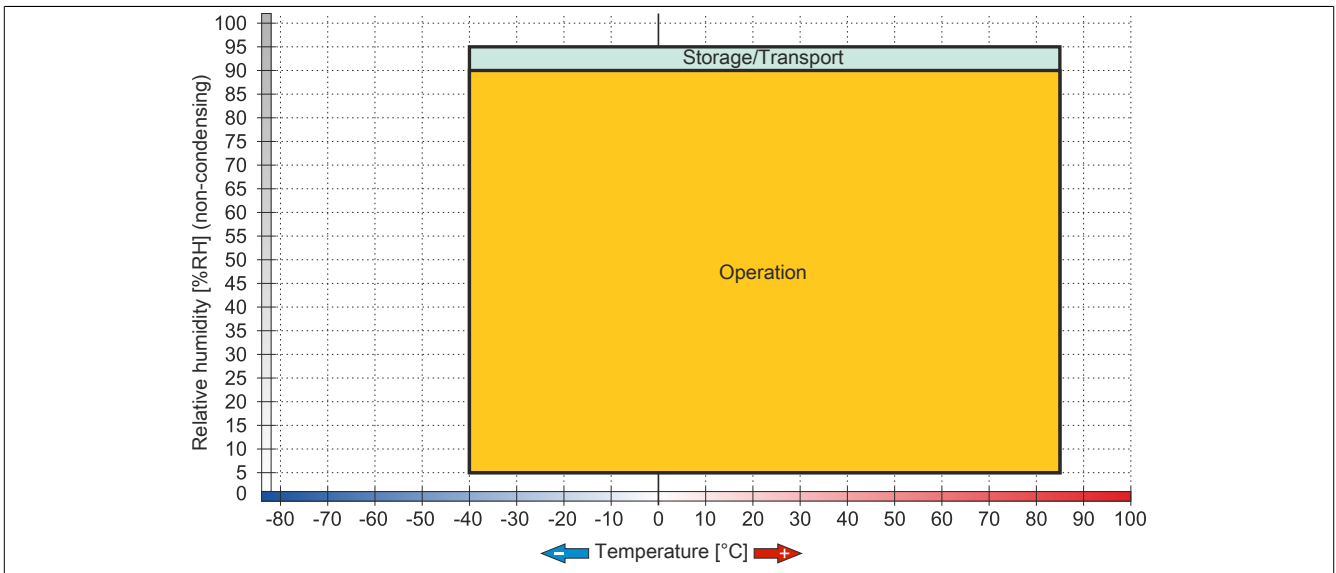


Figure 49: 5AC901.CSSD-06 - Temperature/Humidity diagram

3.11.11 5MMSSD.0060-00

3.11.11.1 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)

3.11.11.2 Order data


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

Table 98: 5MMSSD.0060-00 - Order data

3.11.11.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMSSD.0060-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD 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

Table 99: 5MMSSD.0060-00 - Technical data

Model number	5MMSSD.0060-00
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 99: 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

3.11.11.4 Temperature/Humidity diagram

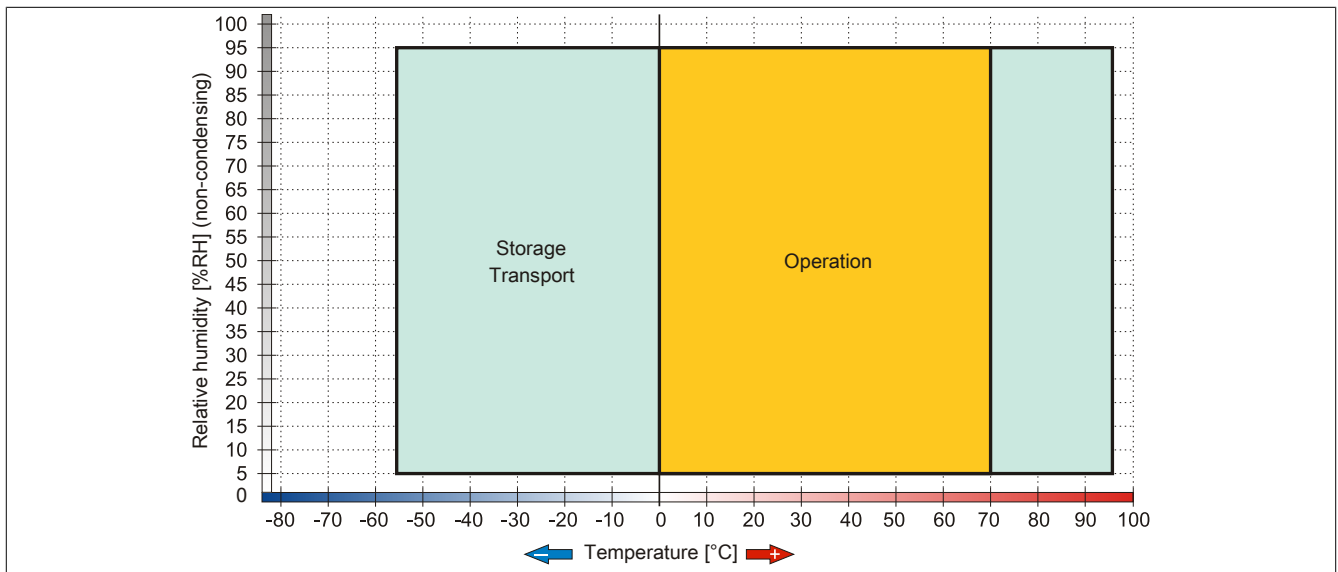


Figure 50: 5MMSSD.0060-00 - Temperature/Humidity diagram

3.11.12 5MMSSD.0060-01

3.11.12.1 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)

3.11.12.2 Order data


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

Table 100: 5MMSSD.0060-01 - Order data

3.11.12.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMSSD.0060-01		
Revision	C0	D0	E0
General information			
Certifications			
CE		Yes	
UL		cULus E115267 Industrial control equipment	
HazLoc		cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD 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 101: 5MMSSD.0060-01, 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data

Model number	5MMSSD.0060-01		
Revision	C0	D0	E0
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		
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 101: 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.

3.11.12.4 Temperature/Humidity diagram

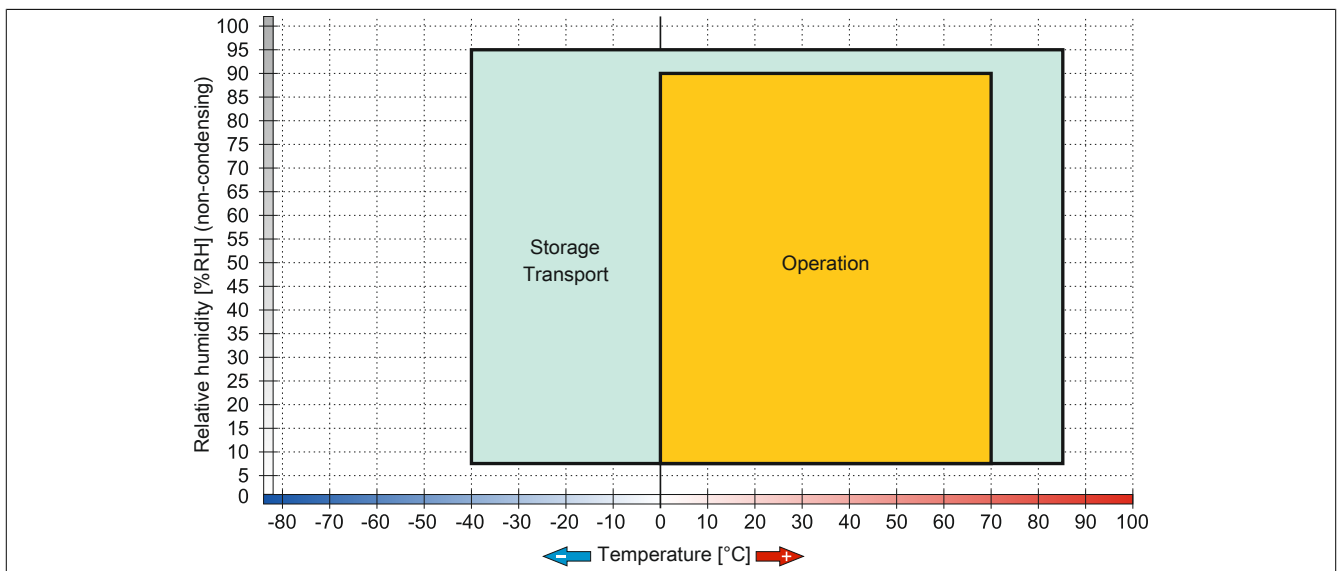


Figure 51: 5MMSSD.0060-01 ≤ Rev. C0 - Temperature/Humidity diagram

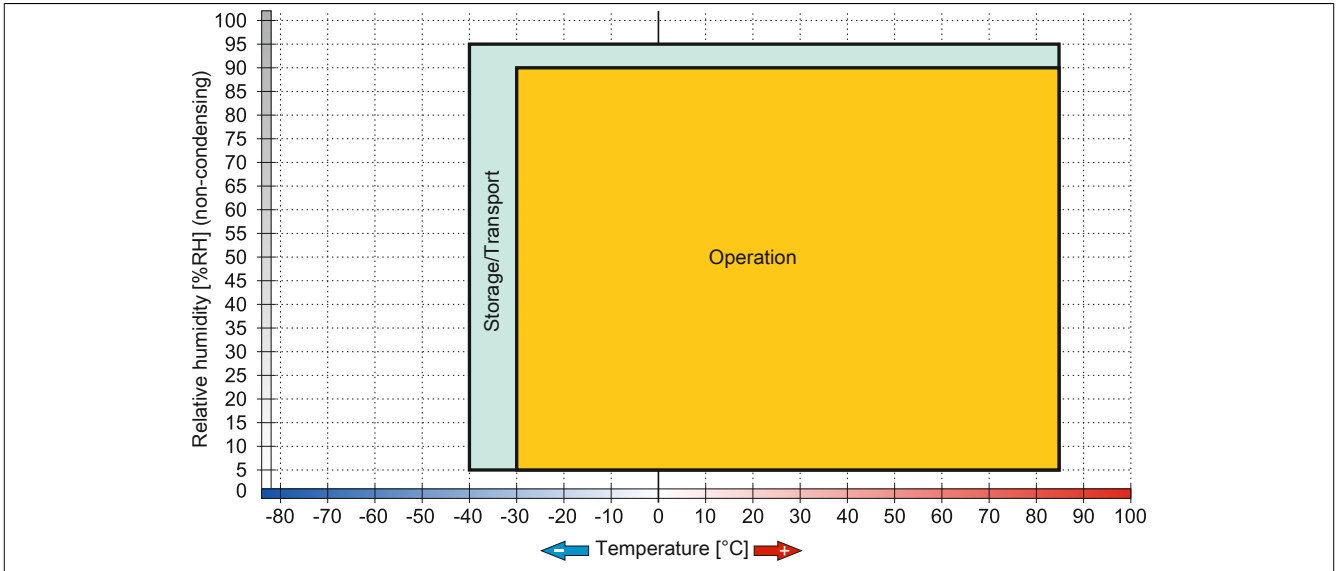


Figure 52: 5MMSSD.0060-01 Rev. D0 - Temperature/Humidity diagram

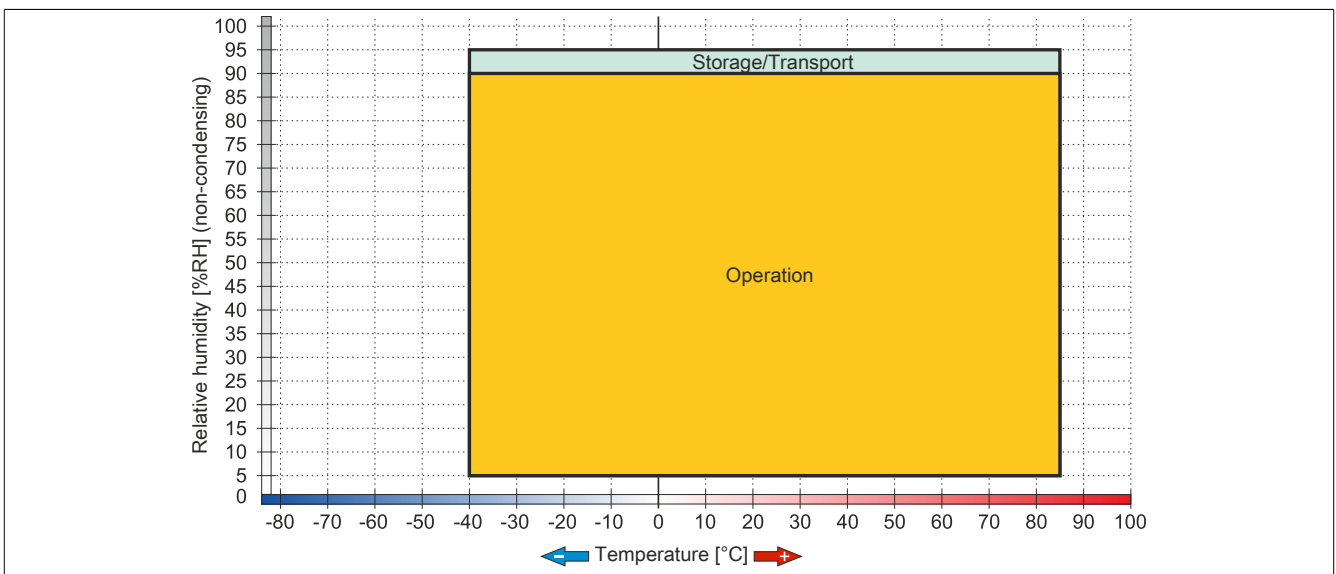


Figure 53: 5MMSSD.0060-01 ≥ Rev. E0 - Temperature/Humidity diagram

3.11.13 5MMSSD.0128-01

3.11.13.1 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)

3.11.13.2 Order data


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

Table 102: 5MMSSD.0128-01 - Order data

3.11.13.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMSSD.0128-01		
Revision	C0	D0	E0
General information			
Certifications			
CE		Yes	
UL		cULus E115267 Industrial control equipment	
HazLoc		cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD 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⁾

Table 103: 5MMSSD.0128-01, 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data

Model number	5MMSSD.0128-01		
Revision	C0	D0	E0
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)		
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		
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 103: 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.

3.11.13.4 Temperature/Humidity diagram

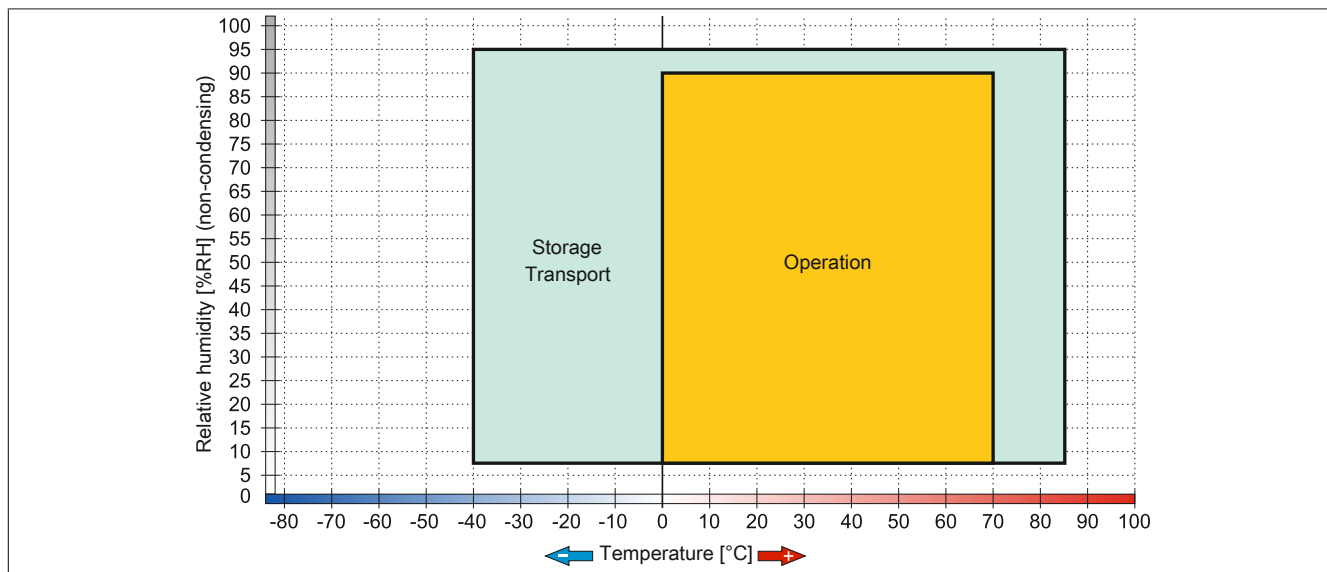


Figure 54: 5MMSSD.0128-01 ≤ Rev. C0 - Temperature/Humidity diagram

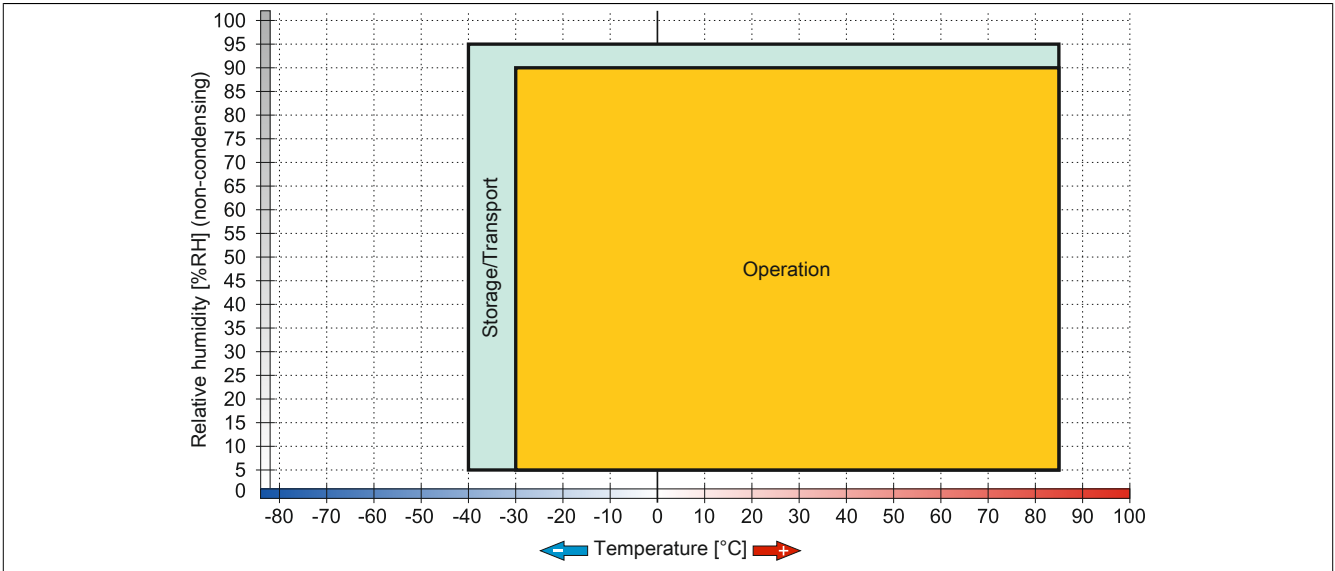


Figure 55: 5MMSSD.0128-01 Rev. D0 - Temperature/Humidity diagram

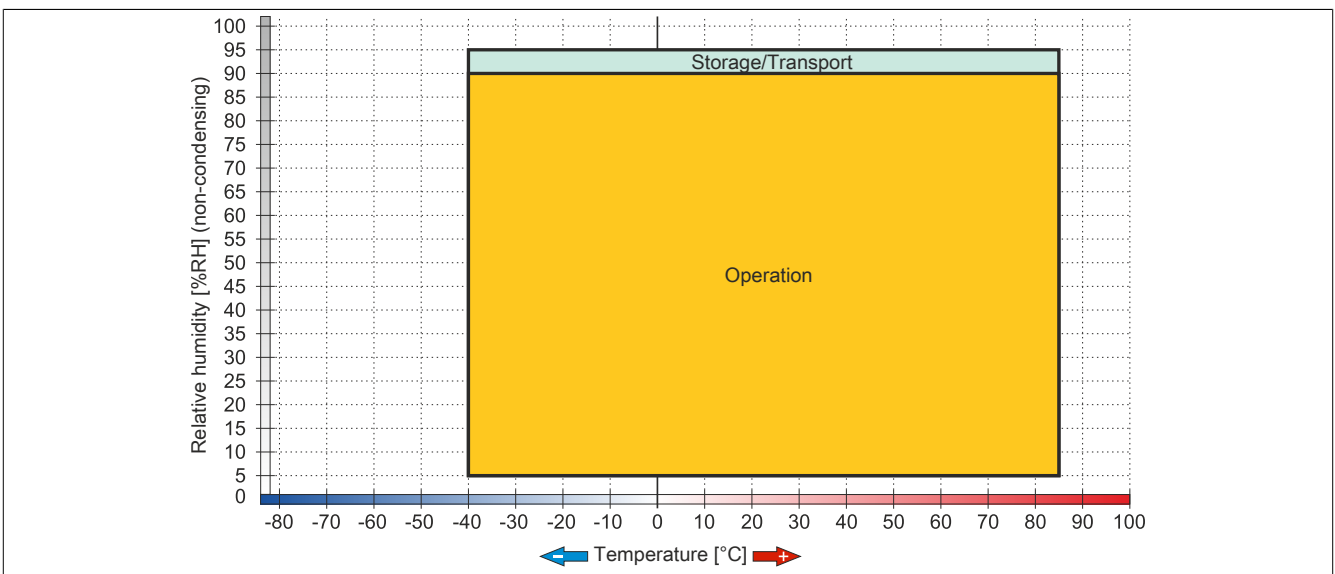


Figure 56: 5MMSSD.0128-01 ≥ Rev. E0 - Temperature/Humidity diagram

3.11.14 5MMSSD.0180-00

3.11.14.1 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)

3.11.14.2 Order data


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

Table 104: 5MMSSD.0180-00 - Order data

3.11.14.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMSSD.0180-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD 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

Table 105: 5MMSSD.0180-00 - Technical data

Model number	5MMSSD.0180-00
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 105: 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

3.11.14.4 Temperature/Humidity diagram

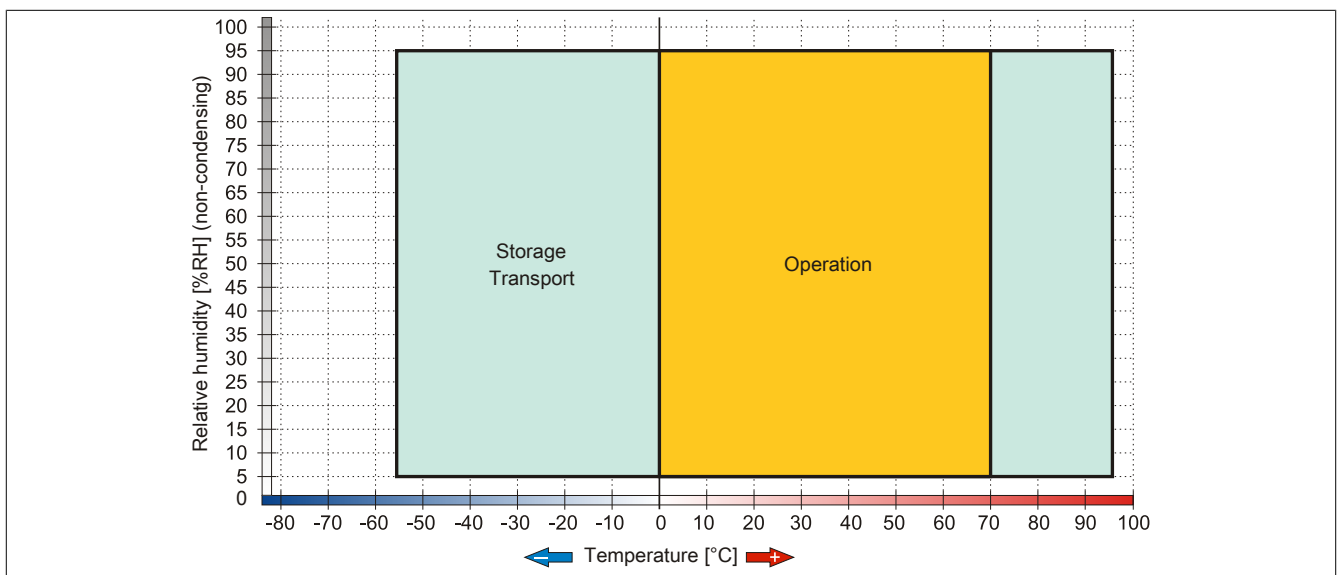


Figure 57: 5MMSSD.0180-00 - Temperature/Humidity diagram

3.11.15 5MMSSD.0256-00

3.11.15.1 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)

3.11.15.2 Order data


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

Table 106: 5MMSSD.0256-00 - Order data

3.11.15.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMSSD.0256-00	
Revision	C0	D0
General information		
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD 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⁾

Table 107: 5MMSSD.0256-00, 5MMSSD.0256-00 - Technical data

Model number	5MMSSD.0256-00	
Revision	C0	D0
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
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 107: 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.

3.11.15.4 Temperature/Humidity diagram

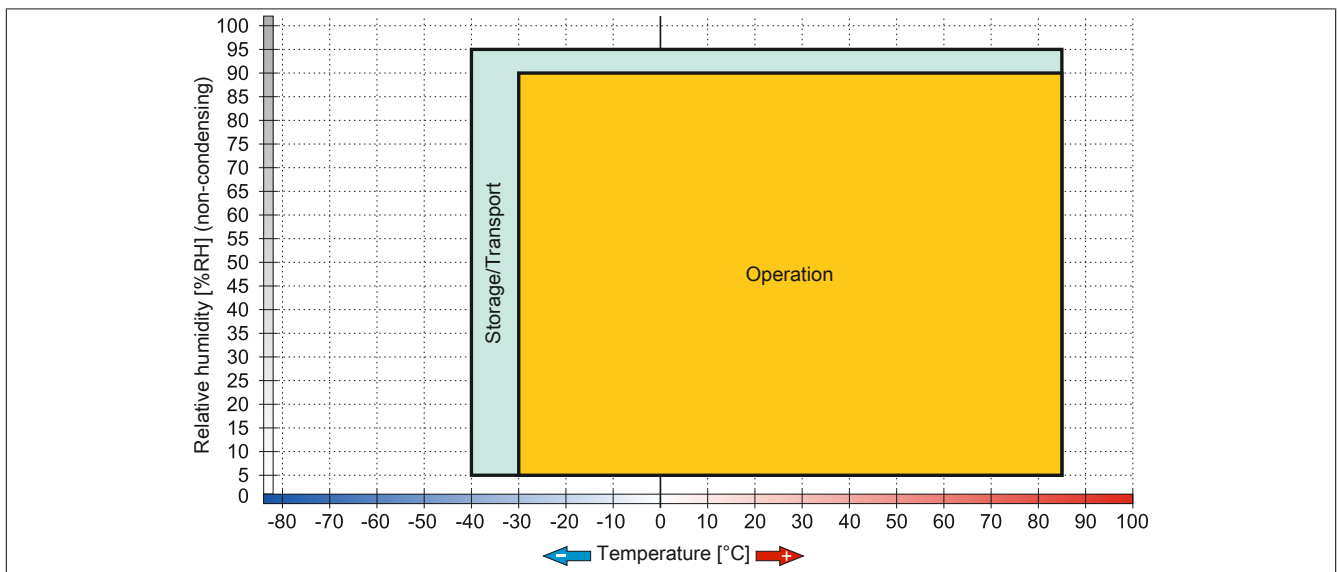


Figure 58: 5MMSSD.0256-00 ≤ C0 - Temperature/Humidity diagram

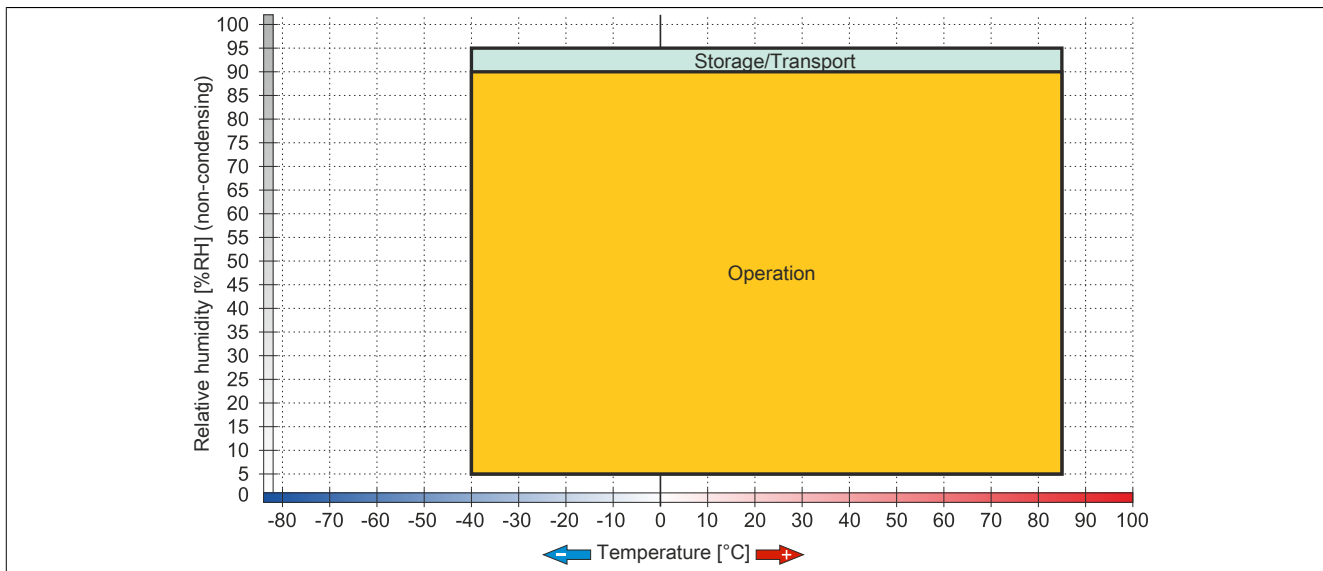


Figure 59: 5MMSSD.0256-00 ≥ D0 - Temperature/Humidity diagram

3.11.16 5MMSSD.0512-00

3.11.16.1 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

3.11.16.2 Order data


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

Table 108: 5MMSSD.0512-00 - Order data

3.11.16.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMSSD.0512-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C 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 109: 5MMSSD.0512-00 - Technical data

Model number	5MMSSD.0512-00
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 109: 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

3.11.16.4 Temperature/Humidity diagram

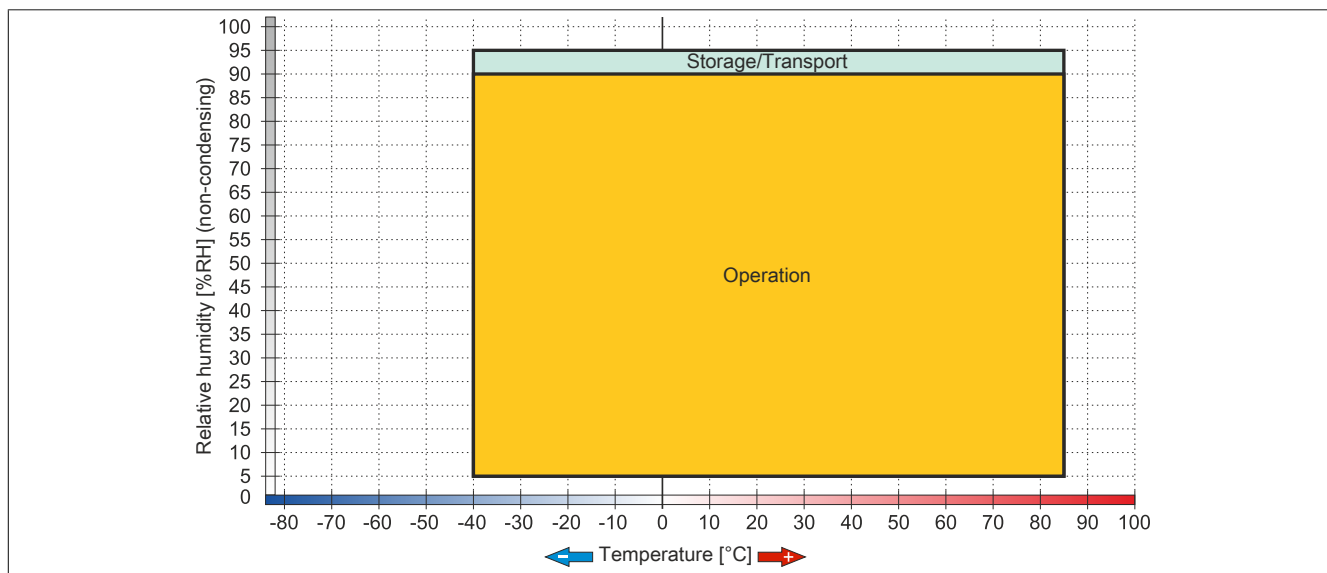


Figure 60: 5MMSSD.0512-00 - Temperature/Humidity diagram

3.11.17 5AC901.CCFA-00

3.11.17.1 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

3.11.17.2 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.256G-10	CFAST card, 256 GB MLC	
5CFAST.4096-00	CFAST card, 4 GB SLC	
5CFAST.8192-00	CFAST card, 8 GB SLC	

Table 110: 5AC901.CCFA-00 - Order data

3.11.17.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.CCFA-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
GOST-R	Yes
Interfaces	
CFAST slot	
Quantity	1
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 111: 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.

3.11.18 5AC901.CHDD-99

3.11.18.1 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.

3.11.18.2 Order data


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

Table 112: 5AC901.CHDD-99 - Order data

3.11.19 5AC901.SDVW-00

3.11.19.1 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

3.11.19.2 Order data


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

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

3.11.19.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.SDVW-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
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)

Table 114: 5AC901.SDVW-00 - Technical data

Model number	5AC901.SDVW-00
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
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
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 114: 5AC901.SDVW-00 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 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 max. ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.
- 5) Surface temperature of drive.

3.11.19.4 Temperature/Humidity diagram

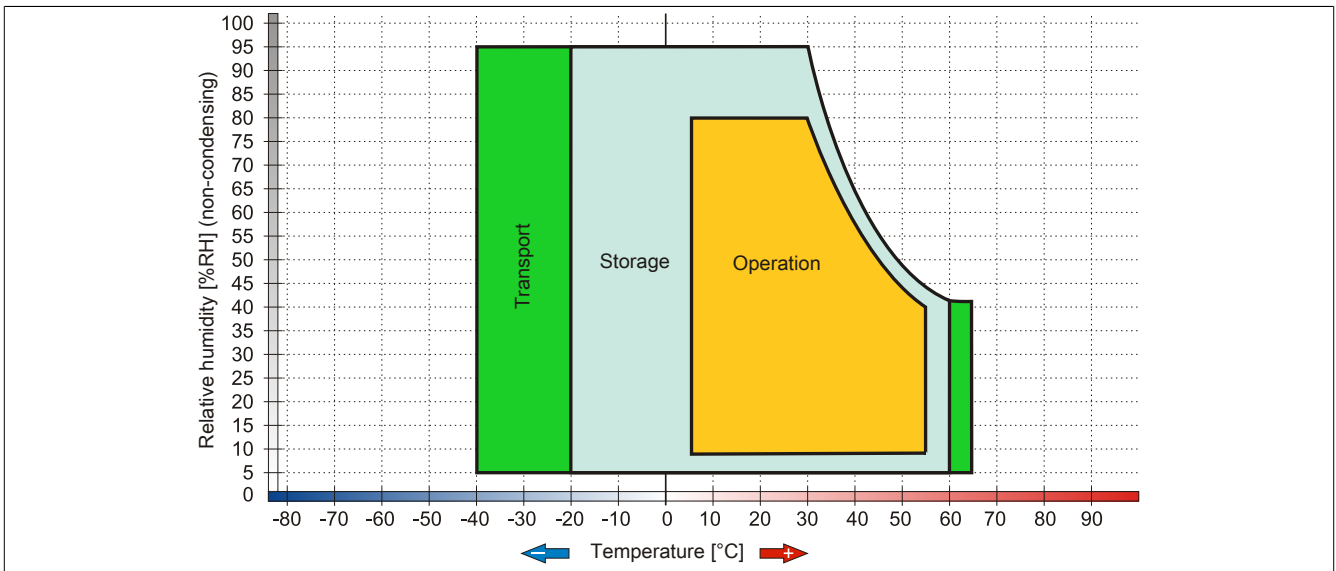


Figure 61: 5AC901.SDVW-00 - Temperature/Humidity diagram

3.11.20 5AC901.SSCA-00

3.11.20.1 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

3.11.20.2 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 115: 5AC901.SSCA-00 - Order data

3.11.20.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.SSCA-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
Inserts	
Slide-in compact drives	1
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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

Table 116: 5AC901.SSCA-00 - Technical data

Model number	5AC901.SSCA-00
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 116: 5AC901.SSCA-00 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

3.11.21 5ACPCI.RAIC-06

3.11.21.1 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

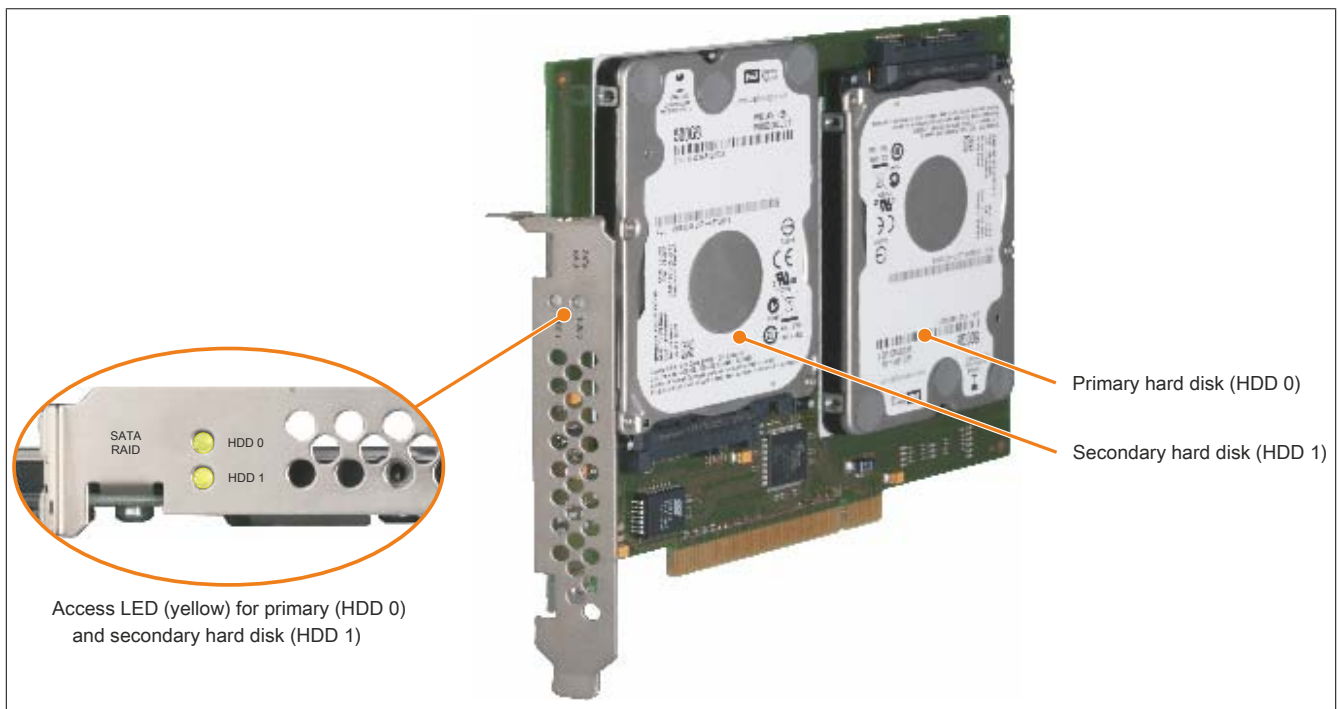


Figure 62: PCI SATA RAID controller

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.

3.11.21.2 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 117: 5ACPCI.RAIC-06 - Order data

3.11.21.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5ACPCI.RAIC-06
General information	
Capacity	2x 500 GB
Number of hard disks	2
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD 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 ±0.2%
Startup time	Typ. 3.5 s (from 0 rpm to read access)
Service life	5 years
MTBF	1,000,000 hours ³⁾
S.M.A.R.T. support	Yes
Interface	
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 access)	11 ms
Maximum (read access)	21 ms
Electrical characteristics	
Power consumption	Typ. 3.8 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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

Table 118: 5ACPCI.RAIC-06 - Technical data

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

Table 118: 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.

3.11.21.4 Temperature/Humidity diagram

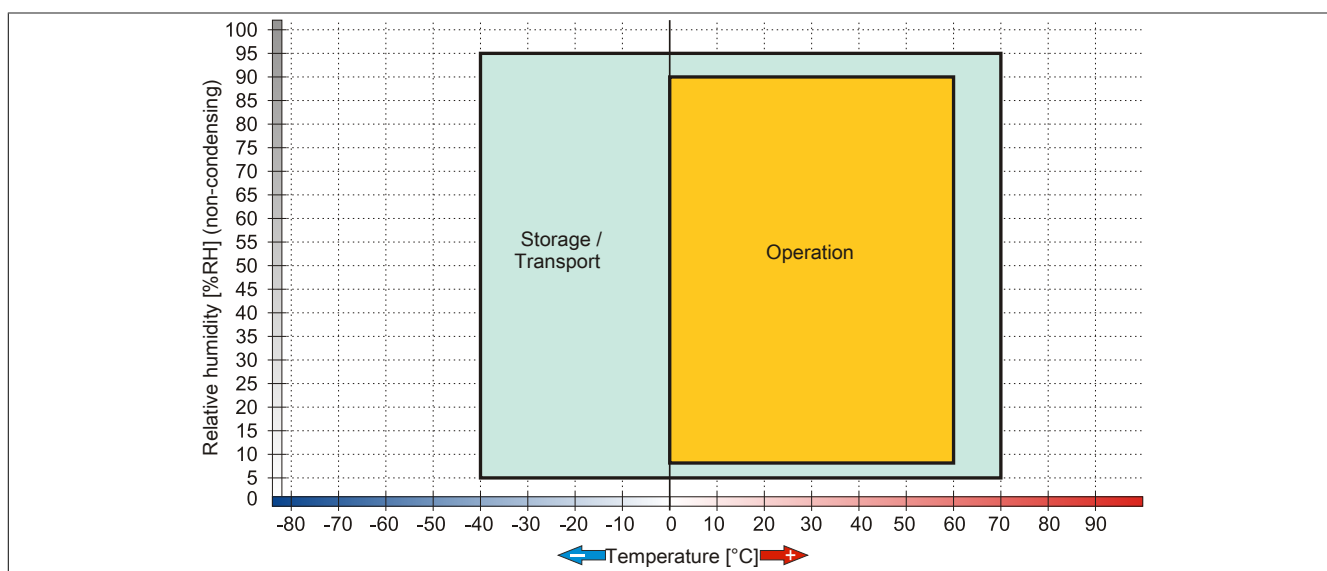


Figure 63: 5ACPCI.RAIC-06 - Temperature/Humidity diagram

3.11.21.5 Driver support

Special drivers are necessary for operating the PCI SATA RAID controller. Drivers for supported and approved operating systems are available for download 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:

Only download necessary drivers from the B&R website, not from vendor websites.

3.11.21.6 Configuration

For information about configuring a SATA RAID set, see chapter 3 "Commissioning", section 5 "Configuring a SATA RAID set" on page 235.

3.11.21.7 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 525.](#)

3.12 Interface options

Information:

It is important to note that not every interface option can be connected in interface slots 1 and 2. For more information, see sections "IF option 1 slot" on page 72 and "IF option 2 slot" on page 72.

Information:

For information about installing or replacing an interface option, see section "Installing interface options" on page 501.

Depending on the IF option being used, it may be necessary to load the default settings in BIOS after installation or replacement (see "Save & Exit" on page 306).

3.12.1 5AC901.I485-00

3.12.1.1 General information

Interface option 5AC901.I485-00 is equipped with an RS232/422/485 interface. The operating mode (RS232/RS422/RS485) is selected automatically depending on the electrical connection.

- 1x RS232/422/485 interface
- Compatible with the APC910/PPC900 and APC3100/PPC3100

3.12.1.2 Order data


Model number	Short description	Figure
5AC901.I485-00	Interface card - 1x RS232/422/485 interface - For APC910/PPC900/APC3100/PPC3100	

Table 119: 5AC901.I485-00 - Order data

3.12.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.I485-00
General information	
B&R ID code	0xD84A
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
Interfaces	
COM	
Type	RS232/RS422/RS485, electrically isolated
Design	DSUB, 9-pin, male
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s

Table 120: 5AC901.I485-00 - Technical data

Model number	5AC901.I485-00
Terminating resistor	Yes
Electrical characteristics	
Power consumption	1 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 120: 5AC901.I485-00 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) For detailed information, see the temperature tables in the user's manual.

3.12.1.3.1 Pinout

COM serial interface		
	RS232	RS422/485
Type	RS232, modem not supported, 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
	1	n.c.
	2	RXD
	3	TXD
	4	n.c.
	5	GND
	6	n.c.
	7	RTS
	8	CTS
	9	n.c.

DSUB, 9-pin, male

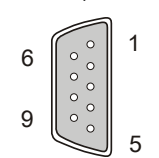


Table 121: COM - Pinout

3.12.1.3.2 I/O address and IRQ

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

Table 122: I/O address and IRQ

3.12.1.3.3 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 123: RS232 - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

RS232 cables	Property
Signal lines Cable cross section Wire insulation Conductor resistance Stranding Shield	4x 0.16 mm ² (26 AWG), tinned copper stranded wire PE ≤82 Ω/km Wires stranded in pairs Paired shield with aluminum foil
Ground line Cable cross section Wire insulation Conductor resistance	1x 0.34 mm ² (22 AWG / 19), tinned copper stranded wire PE ≤59 Ω/km
Outer jacket Material Properties Complete shielding	PUR compound Halogen-free Composed of tinned copper wires

Table 124: RS232 - Cable requirements

3.12.1.3.4 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 cable length as well as the type of cable being used.

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 125: RS422 - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

RS422 cable	Property
Signal lines Cable cross section Wire insulation Conductor resistance Stranding Shield	4x 0.25 mm ² (24 AWG / 19), tinned copper stranded wire PE ≤82 Ω/km Wires stranded in pairs Paired shield with aluminum foil
Ground line Cable cross section Wire insulation Conductor resistance	1x 0.34 mm ² (22 AWG / 19), tinned copper stranded wire PE ≤59 Ω/km
Outer jacket Material Properties Complete shielding	PUR compound Halogen-free Composed of tinned copper wires

Table 126: RS422 - Cable requirements

3.12.1.3.5 Operation as an RS485 interface

The pins of the RS422 default **interface** (1, 4, 6 and 9) must be used for operation. Pins must be connected as shown.

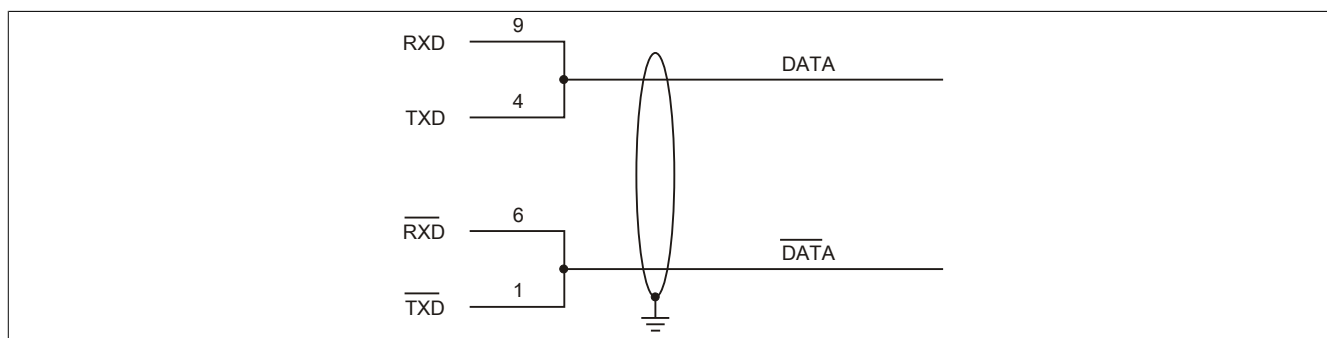


Figure 64: RS232/422/485 interface - Operation in RS485 mode

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** result in greater potential differences between the bus stations, which **can** hinder communication. This **can** be improved by running the **ground** wire with the others.

3.12.1.3.6 RS485 - Bus length and cable type

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

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 127: RS485 - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible to achieve an optimal transfer rate.

RS485 cables	Property
Signal lines Cable cross section Wire insulation Conductor resistance Stranding Shield	4x 0.25 mm ² (24 AWG / 19), tinned copper stranded wire PE ≤82 Ω/km Wires stranded in pairs Paired shield with aluminum foil
Ground line Cable cross section Wire insulation Conductor cross section	1x 0.34 mm ² (22 AWG / 19), tinned copper stranded wire PE ≤59 Ω/km
Outer jacket Material Properties Complete shielding	PUR compound Halogen-free Composed of tinned copper wires

Table 128: RS485 - Cable requirements

3.12.1.3.7 Terminating resistor

A terminating resistor for the serial interface is already integrated in the IF option. The terminating resistor is switched on or off using a switch, but the system unit must be opened to reach it. A switched-on terminating resistor is indicated by a yellow LED.

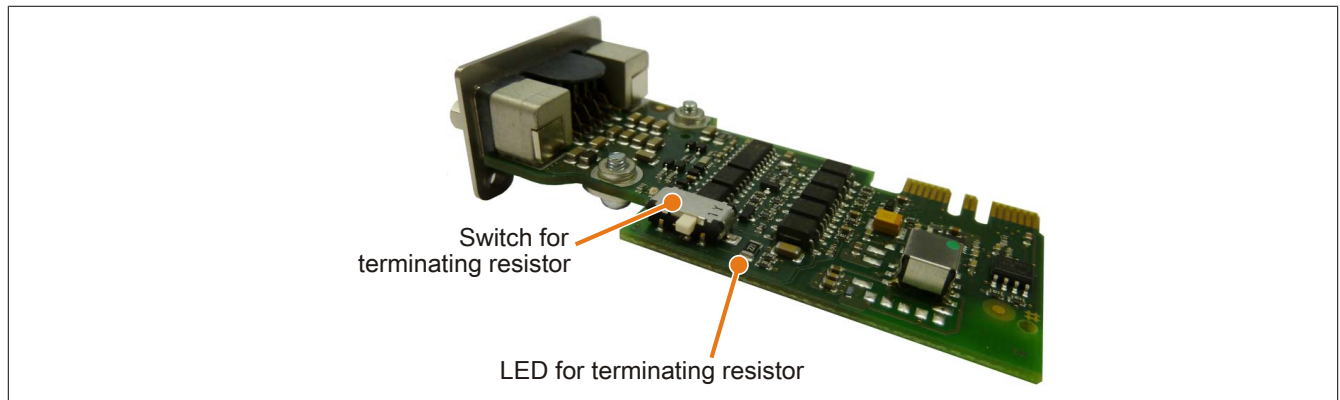


Figure 65: 5AC901.I485-00 - Terminating resistor

3.12.2 5AC901.ICAN-00

3.12.2.1 General information

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

- 1x CAN bus master interface
- Compatible with the APC910/PPC900 and APC3100/PPC3100

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

3.12.2.2 Order data


Model number	Short description	Figure
	Interface options	
5AC901.ICAN-00	Interface card - 1x CAN interface - For APC910/PPC900/ APC3100/PPC3100	

Table 129: 5AC901.ICAN-00 - Order data

3.12.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.ICAN-00
General information	
B&R ID code	0xD84B
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
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
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 55°C ³⁾
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 130: 5AC901.ICAN-00 - Technical data

Model number	5AC901.ICAN-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. 33 g

Table 130: 5AC901.ICAN-00 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) For detailed information, see the temperature tables in the user's manual.

3.12.2.3.1 - Pinout

CAN bus	
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.

DSUB, 9-pin, male

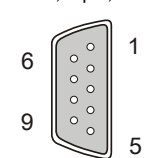


Table 131: 5AC901.ICAN-00 - Pinout

3.12.2.3.2 I/O address and IRQ

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

Table 132: I/O address and IRQ

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

3.12.2.3.3 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 133: CAN - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible 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
Ground 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 jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 134: CAN cable requirements

3.12.2.3.4 CAN driver settings

The **baud rate can** be set either with predefined values or the **bit timing register**. For additional information, see **Automation Help** or the technical description of the B&R CAN driver.

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 135: CAN driver settings

3.12.2.3.5 Terminating resistor

A terminating resistor for the **CAN interface** is already integrated in the IF option. The terminating resistor is switched on or off using a **switch**, but the system unit must be opened to reach it. A switched-on terminating resistor is indicated by a yellow **LED**.

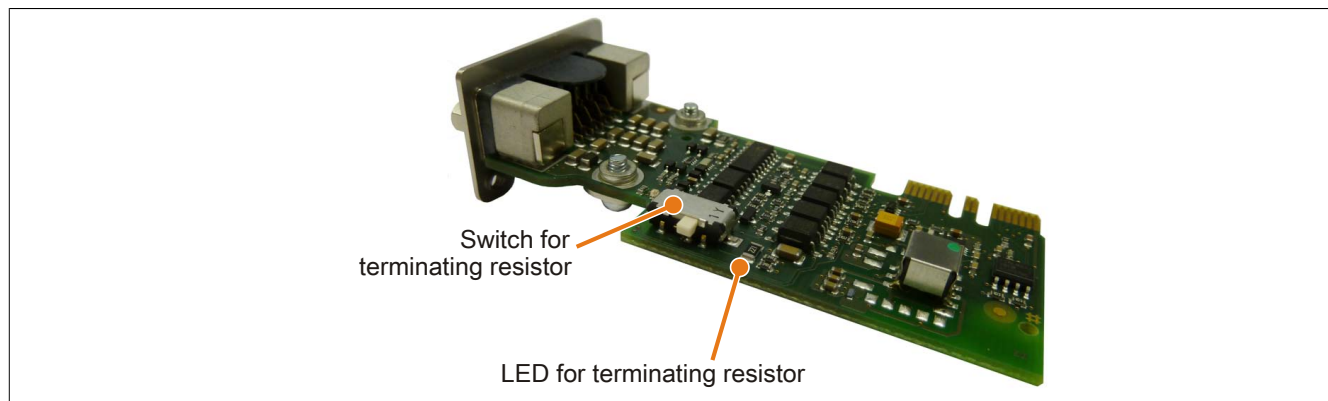


Figure 66: 5AC901.ICAN-00 - Terminating resistor

3.12.2.3.6 Drivers

The **CAN IF** option is supported in PVI for Windows XP Professional and Windows Embedded Standard 2009. **Interface** option 5AC901.ICAN-00 will be supported starting with Windows 7 by PVI V4.2.5 or Windows **CAN** driver V3.0.

3.12.3 5AC901.ICAN-01

3.12.3.1 General information

Interface option 5AC901.ICAN-01 is equipped with a CAN bus master interface.

- 1x CAN bus master interface (SJA1000)
- Compatible with the APC910/PPC900 and APC3100/PPC3100

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

3.12.3.2 Order data


Model number	Short description	Figure
	Interface options	
5AC901.ICAN-01	Interface card - 1x CAN interface (SJA1000) - For APC910/PPC900/APC3100/PPC3100	

Table 136: 5AC901.ICAN-01 - Order data

3.12.3.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.ICAN-01
General information	
B&R ID code	0xD84C
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
Interfaces	
CAN	
Quantity	1
Controller	SJA1000
Design	DSUB, 9-pin, male, electrically isolated
Transfer rate	Max. 1 Mbit/s
Terminating resistor	Yes
Electrical characteristics	
Power consumption	0.5 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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. 33 g

Table 137: 5AC901.ICAN-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) Detailed information can be found in the temperature tables in the user's manual.

3.12.3.3.1 Pinout

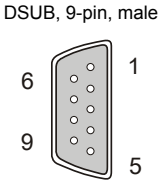
		CAN bus
Type	Electrically isolated	
Transfer rate	Max. 1 Mbit/s	
Bus length	Max. 1000 meters	
Pin	Assignment	
1	n.c.	
2	CAN LOW	
3	GND	
4	n.c.	
5	n.c.	
6	Reserved	
7	CAN HIGH	
8	n.c.	
9	n.c.	

Table 138: 5AC901.ICAN-01 - Pinout

3.12.3.3.2 I/O address and IRQ

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

Table 139: I/O address and IRQ

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

3.12.3.3.3 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 140: CAN - Bus length and transfer rate

The material used for the cable should have all of the following properties or deviate from them as little as possible 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
Ground 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 jacket	
Material	PUR compound
Properties	Halogen-free
Complete shielding	Composed of tinned copper wires

Table 141: CAN cable requirements

3.12.3.3.4 CAN driver settings

The **baud rate** can be set either with predefined values or the **bit timing register**. For additional information, see the technical description of the B&R **CAN driver**.

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 142: CAN driver settings

3.12.3.3.5 Terminating resistor

A terminating resistor for the **CAN interface** is already integrated in the IF option. The terminating resistor is switched on or off using a **switch**, but the system unit must be opened to reach it. A switched-on terminating resistor is indicated by a yellow **LED**.

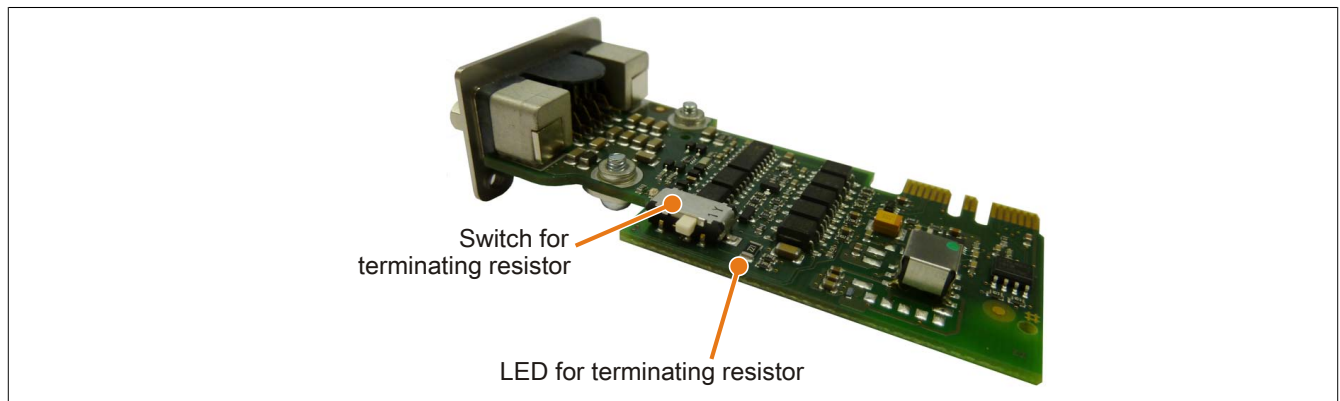


Figure 67: 5AC901.ICAN-01 - Terminating resistor

3.12.3.3.6 Firmware

In order to ensure the functionality of the **interface** option, the following **firmware** version (**MTCX**) or later must be installed on the PC:

- Automation PC 910: V1.21
- Panel PC 900: V1.24

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

For information about **firmware** upgrades, see section "Firmware upgrade" on page 389.

3.12.3.3.7 Drivers

Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

3.12.4 5AC901.IHDA-00

3.12.4.1 General information

Interface option 5AC901.IHDA-00 is equipped with 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/PPC900 and APC3100/PPC3100

Interface option 5AC901.IHDA-00 **can** only be operated in the IF option 1 slot.

3.12.4.2 Order data

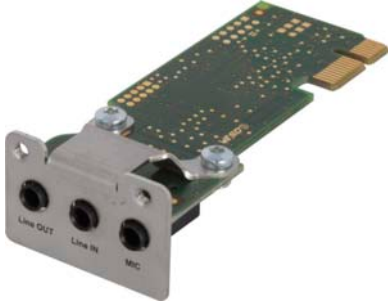
Model number	Short description	Figure
5AC901.IHDA-00	Interface options Interface card - 1x audio interface (1x MIC / 1x Line In / 1x OUT) - For APC910/PPC900/APC3100/PPC3100	

Table 143: 5AC901.IHDA-00 - Order data

3.12.4.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.IHDA-00
General information	
B&R ID code	0xD84E
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
Interfaces	
Audio	
Type	HDA sound
Controller	Realtek ALC 662
Inputs	Microphone, Line In
Outputs	Line Out
Electrical characteristics	
Power consumption	0.4 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 55°C ³⁾
Storage	-20 to 60°C
Transport	-20 to 60°C

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

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) For detailed information, see the temperature tables in the user's manual.

3.12.4.3.1 Pinout

MIC, Line IN, Line OUT	
Controller	Realtek ALC 662
MIC	Connection of a mono microphone via 3.5 mm jack
Line IN	Supply of a stereo Line In signal via 3.5 mm jack
Line OUT	Connection of a stereo playback device (e.g. amplifier) via 3.5 mm jack

3.5 mm female connector



Line OUT Line IN MIC

Table 145: 5AC901.IHDA-00 - Pinout

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

Information:

Only download necessary drivers from the B&R website, not from vendor websites.

3.12.5 5AC901.ISRM-00

3.12.5.1 General information

Interface option 5AC901.ISRM-00 is equipped with 2 MB SRAM.

- 2 MB SRAM
- Compatible with the APC910/PPC900 and APC3100/PPC3100

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

Information:

When writing, reading or accessing the SRAM, "unaligned accesses" are not supported by the Avalon bus (internal bus in the PCI Express core).

3.12.5.2 Order data


Model number	Short description	Figure
	Interface options	
5AC901.ISRM-00	Interface card - 2 MB RAM - For APC910/PPC900/APC3100/PPC3100	

Table 146: 5AC901.ISRM-00 - Order data

3.12.5.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.ISRM-00
General information	
B&R ID code	0xD850
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾
GOST-R	Yes
Controller	
SRAM	
Size	2 MB
Battery-backed	Yes
Remanent variables in power failure mode	256 kB (e.g. for Automation Runtime, see Automation Help)
Electrical characteristics	
Power consumption	2 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 55°C ²⁾
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 147: 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 147: 5AC901.ISRM-00 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) For detailed information, see the temperature tables in the user's manual.

3.12.5.3.1 Drivers

Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com).

3.12.6 5AC901.IPLK-00

3.12.6.1 General information

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

- 1x POWERLINK interface for managing or controlled node
- 2 MB SRAM
- Compatible with the APC910/PPC900 and APC3100/PPC3100

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

Information:

When writing, reading or accessing the SRAM, "unaligned accesses" are not supported by the Avalon bus (internal bus in the PCI Express core).

3.12.6.2 Order data


Model number	Short description	Figure
	Interface options	
5AC901.IPLK-00	Interface card - 1x POWERLINK interface - 2 MB SRAM - For APC910/PPC900/APC3100/PPC3100	

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

3.12.6.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.IPLK-00
General information	
B&R ID code	0xE025
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C 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
Transfer	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
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

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

Model number	5AC901.IPLK-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. 35 g

Table 149: 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.

3.12.6.3.1 Pinout

LEDs are integrated on the [interface](#) option.

POWERLINK			
Wiring		S/STP (Cat 5e)	
Cable length		Max. 100 m (min. Cat 5e)	
LED	Color	Status	Explanation
LED "Link"	Orange (light)	On	Link (POWERLINK network connection available)
		Off	Activity (blinks to indicate active data transfer)

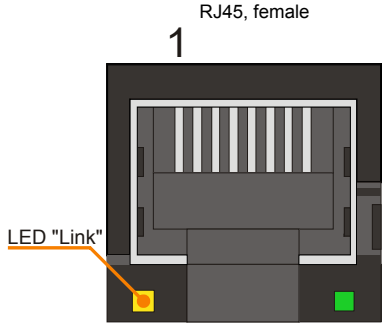


Table 150: 5AC901.IPLK-00 - [POWERLINK](#) interface

3.12.6.3.2 LED "Status/Error"

LED "Status/Error" is a green and red dual LED. The LED states have a different meaning depending on the operating mode.

LED "Status/Error"

POWERLINK - LED "Status/Error"			
LED "Status/Error"	Green-Red	On	POWERLINK LED "Status/Error", see 3.12.6.3.2 "LED "Status/Error"'"
		Off	POWERLINK LED "Status/Error", see 3.12.6.3.2 "LED "Status/Error"'"

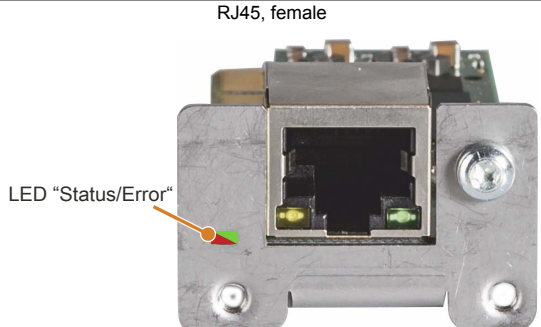


Table 151: 5AC901.IPLK-00 - [POWERLINK](#) LED "Status/Error"

Ethernet mode

In this mode, the [interface](#) is operated as an [Ethernet](#) interface.

Green - Status	Description
On	The interface is being operated as an Ethernet interface.

Table 152: LED "Status/Error" - [Ethernet](#) mode

POWERLINK

Red - Error	Description
On	<p>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:</p> <ul style="list-style-type: none"> • BASIC_ETHERNET • PRE_OPERATIONAL_1 • PRE_OPERATIONAL_2 • READY_TO_OPERATE

Table 153: LED "Status/Error" - POWERLINK - Error

Green - Status	Description
Off NOT_ACTIVE	<p>State The interface is in state NOT_ACTIVE or:</p> <ul style="list-style-type: none"> • Switched off • Starting up • Not configured correctly in Automation Studio • Defective <p>Managing node (MN) The bus is monitored for POWERLINK frames. If a frame is not received within the configured time window (timeout), the interface immediately enters mode PRE_OPERATIONAL_1 (single flash). If POWERLINK communication is detected before the time expires, however, then the MN is not started.</p> <p>Controlled node (CN) The bus is monitored for POWERLINK frames. If a corresponding frame is not received within the configured time frame (timeout), then the module immediately enters mode BASIC_ETHERNET (flickering). If POWERLINK communication is detected before this time expires, however, the interface immediately enters mode PRE_OPERATIONAL_1 (single flash).</p>
Flickering green (approx. 10 Hz) BASIC_ETHERNET	<p>State The interface is in state BASIC_ETHERNET and operated as an Ethernet TCP/IP interface.</p> <p>Managing node (MN) This state can only be exited by resetting the interface.</p> <p>Controlled node (CN) If POWERLINK communication is detected during this state, the interface enters state PRE_OPERATIONAL_1 (single flash).</p>
Single flash (approx. 1 Hz) PRE_OPERATIONAL_1	<p>State The interface is in state PRE_OPERATIONAL_1.</p> <p>Managing node (MN) The MN starts "reduced cycle" operation. Cyclic communication is not yet taking place.</p> <p>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 state PRE_OPERATIONAL_2 (double flash). A solid red LED in this state indicates failure of the MN.</p>

Table 154: LED "Status/Error" - POWERLINK - Status

Green - Status	Description
Double flash (approx. 1 Hz) PRE_OPERATIONAL_2	<p>State The interface is in state PRE_OPERATIONAL_2.</p> <p>Managing node (MN) The MN begins cyclic communication (cyclic input data is not yet evaluated). The CNs are configured in this state.</p> <p>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). A solid red LED in this mode indicates failure of the MN.</p>
Triple flash (approx. 1 Hz) READY_TO_OPERATE	<p>State The interface is in state READY_TO_OPERATE.</p> <p>Managing node (MN) Cyclic and asynchronous communication is taking place. Any received PDO data is ignored.</p> <p>Controlled node (CN) The configuration of the module is completed. Normal cyclic and asynchronous communication is taking place. The transmitted PDO data corresponds to the PDO mapping. Cyclic data is not yet evaluated, however. A solid red LED in this mode indicates failure of the MN.</p>
On OPERATIONAL	<p>State The interface is in state OPERATIONAL. The PDO mapping is active and cyclic data is evaluated.</p>
Blinking (approx. 2.5 Hz) STOPPED	<p>State The interface is in state STOPPED.</p> <p>Managing node (MN) This state is not possible for the MN.</p> <p>Controlled node (CN) No output data is output, and no input data is provided. It is only possible to enter or leave this mode by a corresponding command from the MN.</p>

Table 154: LED "Status/Error" - POWERLINK - Status

System stop error codes

A system stop error **can** occur due to incorrect configuration or defective hardware.

The error code is indicated by the red "Error" **LED** and four **switch-on** phases. Each **switch-on** phase has a duration of either 150 ms or 600 ms. The error code output is repeated cyclically 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 155: System stop error codes

Legend:

- ...150 ms
- ...600 ms
- Pause 2-second pause

3.12.6.3.3 Drivers

The **POWERLINK** IF option is supported by **Automation Runtime** starting with the following versions:

- AR upgrade AR H4.10
- **Automation Studio** V4.1.x.x

3.12.7 5AC901.IRDY-00

3.12.7.1 General information

Ready relay 5AC901.IRDY-00 is switched as soon as the B&R industrial PC has started up and all internal supply voltages are applied. It is possible to connect additional devices to the ready relay; they will also be switched on when the B&R industrial PC starts up.

- 1 normally closed contact, 1 normally open contact
- Compatible with the APC910/PPC900 and APC3100/PPC3100

Terminal block 0TB2104.8000 is not included in delivery and must be ordered separately.

3.12.7.2 Order data


Model number	Short description	Figure
	Interface options	
5AC901.IRDY-00	Interface card - Ready relay - For APC910/PPC900/APC3100/PPC3100	
	Required accessories	
	Terminal blocks	
0TB2104.8000	Connector 24 VDC - 4-pin female - Screw clamp terminal block 2.5 mm ²	

Table 156: 5AC901.IRDY-00 - Order data

3.12.7.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Electrical characteristics	
Power consumption	0.2 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 157: 5AC901.IRDY-00 - Technical data

1) For detailed information, see the temperature tables in the user's manual.

3.12.7.3.1 Pinout

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

Connector, 4-pin, male

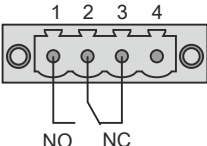


Table 158: 5AC901.IRDY-00 - Pinout

3.12.8 5AC901.ISIO-00

3.12.8.1 General information

The ready relay function of IF option 5AC901.ISIO-00 **can** be controlled using the **MTCX**. Corresponding commands must be issued by the **MTCX** in order to **switch** the ready relay.

In addition to the ready relay function, the reset button, power button and **LED "Power"** on the APC910/PPC900 or APC3100/PPC3100 **can** be made accessible externally.

Unlike IF option 5AC901.IRDY-00, ready relay 5AC901.ISIO-00 is not automatically switched on or off if the power supply to the PC is switched on or off.

The maximum cable length for connecting the reset button, power button and **LED "Power"** is 2 m.

- Connections for the reset button and power buttons on the PC
- Connection for **LED "Power"** on the PC
- 1 normally closed contact, 1 normally open contact of the ready relay
- **Control** of the ready relay functions using **MTCX** commands
- Compatible with the APC910/PPC900 and APC3100/PPC3100

3.12.8.2 Order data


Model number	Short description	Figure
	Interface options	
5AC901.ISIO-00	Interface card - System I/O - For APC910/PPC900/APC3100/PPC3100	

Table 159: 5AC901.ISIO-00 - Order data

3.12.8.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Electrical characteristics	
Power consumption	0.5 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 55°C ¹⁾
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 160: 5AC901.ISIO-00 - Technical data

Model number	5AC901.ISIO-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. 30 g

Table 160: 5AC901.ISIO-00 - Technical data

1) For detailed information, see the temperature tables in the user's manual.

3.12.8.3.1 Pinout

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

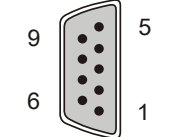
DSUB, 9-pin, female


Table 161: 5AC901.ISIO-00 - Pinout

For information about LED "Power", see section "LED status indicators" on page 75.

For information about the power and reset buttons, see section "Power button" on page 76.

3.12.8.3.2 Firmware

In order to ensure the functionality of the [interface](#) option, the following [firmware](#) version (MTCX) or later must be installed on the PC:

- [Automation PC 910: V1.13](#)
- [Panel PC 900: V1.15](#)

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

For information about [firmware](#) upgrades, see section "Firmware upgrade" on page 389.

3.12.8.3.3 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.

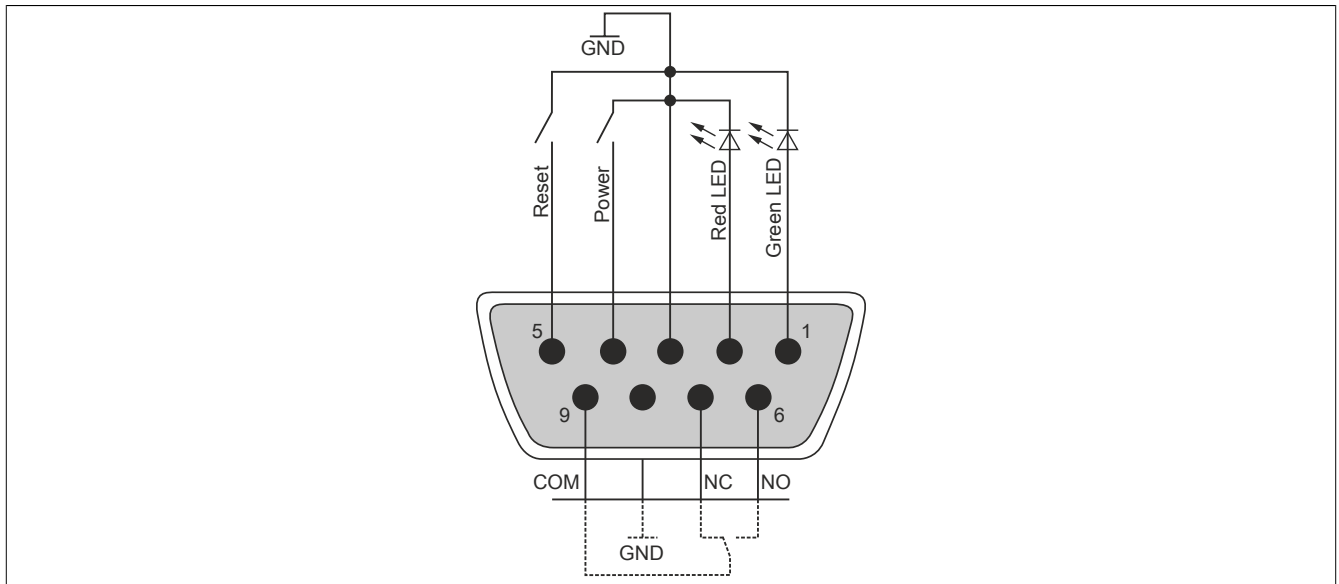


Figure 68: 5AC901.ISIO-00 - Connection example

3.12.9 5AC901.IETH-00

3.12.9.1 General information

Interface option 5AC901.IETH-00 is equipped with a 10/100/1000BASE-T Ethernet interface.

- 1x Ethernet interface 10/100/1000BASE-T
- Compatible with the APC910/PPC900 and APC3100/PPC3100

Interface option 5AC901.IETH-00 can only be operated in the IF option 2 slot.

3.12.9.2 Order data


Model number	Short description	Figure
	Interface options	
5AC901.IETH-00	Interface card - 1x ETH 10/100/1000 - For APC910/PPC900/ APC3100/PPC3100	

Table 162: 5AC901.IETH-00 - Order data

3.12.9.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5AC901.IETH-00
General information	
B&R ID code	EC3C
Diagnostics	
Data transfer	Yes, using LED status indicators
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Interfaces	
Ethernet	
Quantity	1
Controller	Intel I210
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s ¹⁾
Cable length	Max. 100 m between two stations (segment length)
Electrical characteristics	
Power consumption	1 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 55°C
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. 35 g

Table 163: 5AC901.IETH-00 - Technical data

1) Switching takes place automatically.

3.12.9.3.1 Pinout

LEDs are integrated on the [interface](#) option.

Ethernet interface (ETH ¹⁾)		
Controller	Intel I210	
Wiring	S/STP (Cat 5e)	
Transfer rate	10/100/1000 Mbit/s ²⁾	
Cable length	Max. 100 m (min. Cat 5e)	
LED "Speed"	On	Off
Green	100 Mbit/s	10 Mbit/s ³⁾
Orange (light)	1000 Mbit/s	-
LED "Link"	On	Off
Orange (light)	Link (indicates connection to an Ethernet network)	Activity (blinks to indicate active data transfer)

RJ45, female

1

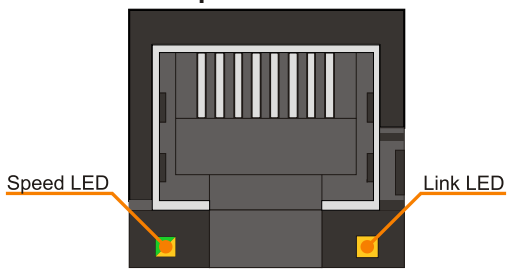


Table 164: 5AC901.IETH-00 - Ethernet interface

- 1) The interfaces, etc. available on the [device](#) or module have been numbered as such for the purpose of clear differentiation. This numbering may deviate from the numbering used by the respective operating system, however.
- 2) Switching takes place automatically.
- 3) The 10 Mbit/s transfer rate / connection only exists if LED "Link" is also lit at the same time.

3.12.9.3.2 Driver support

A special driver is required to operate Intel [Ethernet controller](#) I210. Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com). Windows 7, Windows 10 and B&R Linux are approved operating systems.

Wake-on-LAN (WoL) and PXE booting are not supported.

Information:

Only download necessary drivers from the **B&R website**, not from vendor websites.

3.13 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 504.

After replacement or installation, it may be necessary to load the setup defaults in BIOS (see "[Save & Exit](#)" on page 306).

3.13.1 5AC901.LDPO-00

3.13.1.1 General information

Monitor/Panel option 5AC901.LDPO-00 is equipped with a DisplayPort and [USB 2.0 interface](#).

- [DisplayPort interface](#)
- [USB 2.0 port](#)
- Installation compatible with APC910

3.13.1.2 Order data


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

Table 165: 5AC901.LDPO-00 - Order data

3.13.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.LDPO-00	
General information		
B&R ID code	0xD852	
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
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	Depends on the CPU board being used	
Electrical characteristics		
Power consumption	0.2 W	

Table 166: 5AC901.LDPO-00 - Technical data

Model number	5AC901.LDPO-00
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 166: 5AC901.LDPO-00 - Technical data

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

3.13.1.3.1 DisplayPort interface

DisplayPort	
The following overview lists the video signals available on the DisplayPort output. For details, see the technical data for the CPU board being used.	
Monitor/Panel option	Video signals with all system unit variants
5AC901.LDPO-00	DisplayPort, DVI, HDMI

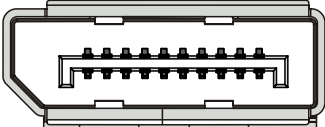


Table 167: DisplayPort interface

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.

3.13.1.3.2 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

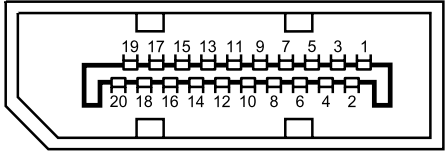


Table 168: DisplayPort - Pinout

3.13.2 5AC901.LSDL-00

3.13.2.1 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

3.13.2.2 Order data


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

Table 169: 5AC901.LSDL-00 - Order data

3.13.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.LSDL-00
General information	
B&R ID code	0xD853
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾
GOST-R	Yes
Interfaces	
Panel/Monitor interface	
Design	DVI-D
Type	SDL/DVI
Electrical characteristics	
Power consumption	1 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 170: 5AC901.LSDL-00 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 2) For detailed information, see the temperature tables in the user's manual.

3.13.2.3.1 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 171: 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.

3.13.2.3.2 USB transfer 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 depends on the USB interface and USB hub on the display device.

3.13.2.3.3 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			

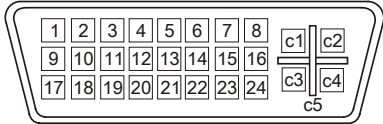


Table 172: DVI interface - Pinout

1) Protected internally by a multifuse.

3.13.2.3.4 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 173: Cable lengths and resolutions for SDL transmission

3.13.2.3.5 Cable lengths and resolutions for DVI transfer

The following table shows the relationship between segment length and maximum resolution depending on the DVI cable:

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 174: Cable lengths and resolutions for DVI transfer

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

3.13.3 5AC901.LSD3-00

3.13.3.1 General information

The 5AC901.LSD3-00 monitor/panel option is equipped with an [SDL3 interface](#).

- [SDL3 interface](#)
- Installation compatible with APC910

3.13.3.1.1 SDL3 mode

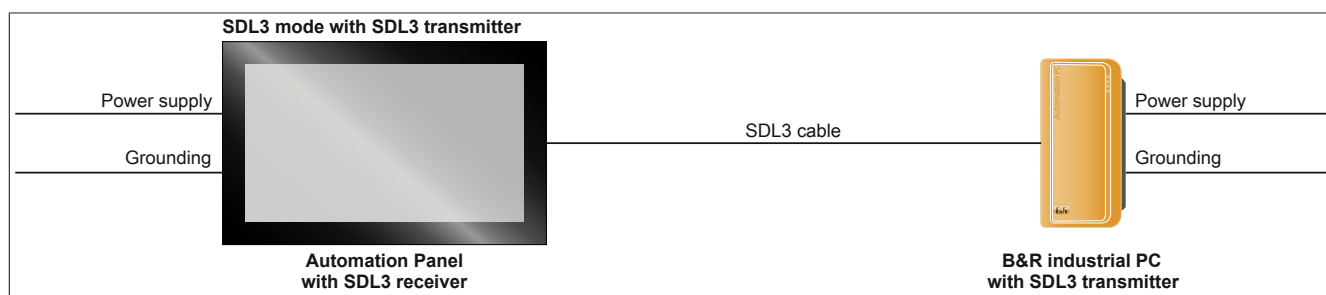
Smart Display Link 3 (SDL3) technology transfers all communication channels between a B&R industrial PC and panel up to 100 m over a standard [Ethernet](#) cable (min. Cat 6a). An RJ45 connector ideal for narrow spaces such as feed-throughs and swing arm system is used to connect to the [device](#).

SDL3 mode with SDL3 transmitter

In the SDL3 operating mode with an SDL3 transmitter in the B&R industrial PC, all communication between the [Automation](#) Panel and B&R industrial PC is handled using a single SDL3 cable.

In addition to display data, information from the [touch screen](#) and matrix keys as well as service and diagnostic data is transferred. The [Automation](#) Panel [can](#) be installed up to 100 m from the B&R industrial PC. [USB 2.0](#) is also transferred over this distance and fully integrated in SDL3. External modules are not necessary for this.

The brightness of the display [can](#) be set 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

Requirements

- [Automation](#) Panel with SDL3 receiver
- B&R industrial PC with [SDL3 interface](#)
- SDL3/SDL4 cable

3.13.3.2 Order data


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

Table 175: 5AC901.LSD3-00 - Order data

3.13.3.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.LSD3-00
General information	
LED status indicators	Status, Link
B&R ID code	0xE400
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Interfaces	
SDL3 Out	
Design	Shielded RJ45
Type	SDL3
Electrical characteristics	
Power consumption	4 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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 176: 5AC901.LSD3-00 - Technical data

1) For detailed information, see the temperature tables in the user's manual.

3.13.3.3.1 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.	
Monitor/Panel option	Video signals
5AC901.LSD3-00	SDL3

Female RJ45 connector

1

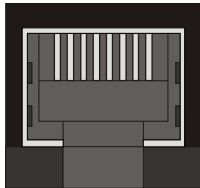


Table 177: SDL3 interface

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.

3.13.3.3.2 Cable lengths and resolutions for SDL3 transfer

The maximum cable length for SDL3 transfers is 100 m with a B&R SDL3/SDL4 cable (regardless of the panel resolution).

3.13.3.3.3 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

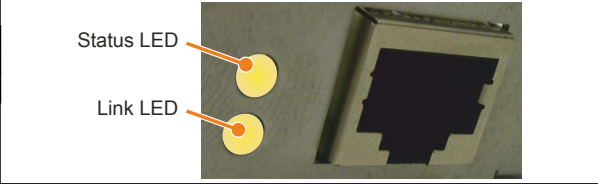


Table 178: SDL3 - LED status indicators

3.13.3.3.4 General limitations / Special considerations

- The USB 2.0 transfer rate is limited to 30 Mbit/s with SDL3.
- The SDL3 transmitter constantly emulates a display using EDID data and hot plugging code; this allows DVI-compatible operation. As a result, improperly displayed images are possible during operation with multiple displays. In Windows, a connected panel is registered by the graphics driver even in the following situations:
 - No cable is connected.
 - A connection has not yet been established between the SDL3 link module and the SDL3 transmitter.

These improperly displayed images can be circumvented by making suitable configurations in BIOS or via the graphics driver.

3.13.4 5AC901.LSD4-00

3.13.4.1 General information

The 5AC901.LSD4-00 monitor/panel option is equipped with an [SDL4 interface](#).

- [SDL4 interface](#)
- Compatible with APC910

3.13.4.1.1 SDL4 operation

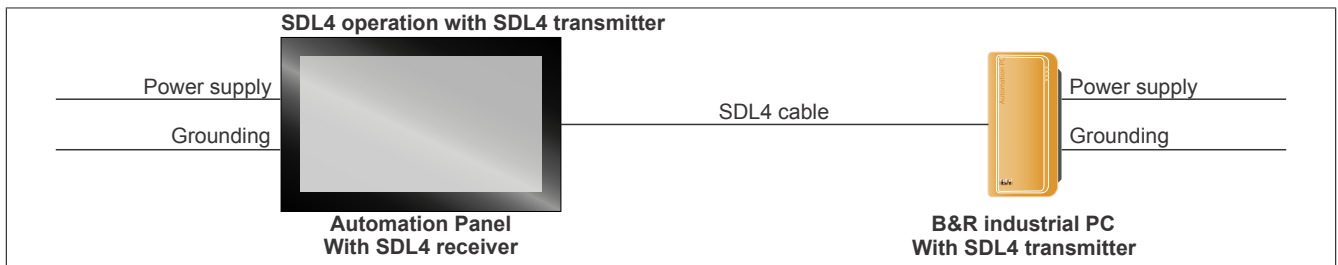
Smart Display Link 4 (SDL4) technology transfers all communication channels between a B&R industrial PC and panel up to 100 m over a standard [Ethernet](#) cable (min. Cat 6a). An RJ45 connector ideal for narrow spaces such as feed-throughs and swing arm system is used to connect to the [device](#).

3.13.4.1.2 SDL4 operation with SDL4 transmitter

In the SDL4 operating mode with an SDL4 transmitter in the B&R industrial PC, all communication between the [Automation Panel](#) and B&R industrial PC is handled using a single SDL4 cable.

In addition to display data, information from the [touch screen](#) and matrix keys as well as service and diagnostic data is transferred. The [Automation Panel](#) can be installed up to 100 m from the B&R industrial PC. [USB 2.0](#) is also transferred over this distance and fully integrated in SDL4. External modules are not necessary for this.

The brightness of the display can be set using the ADI [Control Center](#), for example.



Availability of interfaces on the [Automation Panel](#) with SDL4 receiver:

SDL4 interface ✓ USB1, USB2 ✓ USB 2.0 Power supply ✓ Grounding ✓

Maximum cable length of SDL4: 100 m

Requirements

- [Automation Panel](#) with SDL4 receiver
- B&R industrial PC with [SDL4 interface](#)
- SDL3/SDL4 cable

3.13.4.2 Order data


Model number	Short description	Figure
	Monitor/Panel options	
5AC901.LSD4-00	SDL4 transmitter	

Table 179: 5AC901.LSD4-00 - Order data

3.13.4.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.LSD4-00
General information	
LED status indicators	Status, Link
B&R ID code	0xECCE
Certifications	
CE	Yes
Interfaces	
SDL4 Out	
Design	Shielded RJ45
Type	SDL4
Electrical characteristics	
Power consumption	4.5 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 180: 5AC901.LSD4-00 - Technical data

1) For detailed information, see the temperature tables in the user's manual.

3.13.4.3.1 SDL4 interface

The SDL4 interface is a female RJ45 connector and operated with SDL4 transmission technology.

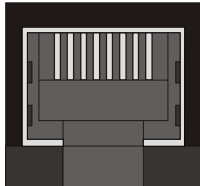
SDL4 interface		RJ45 connector, female 1 
Monitor/Panel option	Video signals	
5AC901.LSD4-00	SDL4	
The following overview shows the possible video signals available on the SDL4 output.		

Table 181: SDL4 interface

Information:

Hot plugging display devices on the SDL4 interface for service purposes is supported by the hardware and graphics drivers of approved operating systems. The female RJ45 connector is specified for 500 connection cycles.

Information:

If a display device with touch screen is connected to the SDL4 interface and then disconnected again during operation (hot plugging), it may be necessary to recalibrate the touch screen.

3.13.4.3.2 Cable lengths and resolutions for SDL4 transfer

The maximum cable length for SDL4 transfers is 100 m with a B&R "SDL3/SDL4 cables" (regardless of the panel resolution).

3.13.4.3.3 SDL4 LEDs

The LEDs are located next to the SDL4 interface.

SDL4 LEDs			
LED	Color	Status	Explanation
Link	Yellow	On	Indicates an active SDL4 connection.
		Off	No active SDL4 connection.
Status	Yellow	On	The SDL4 connection is established and OK.
		Blinking	No active SDL4 connection.

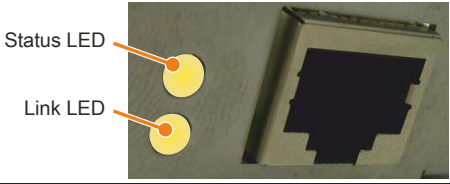


Table 182: SDL4 LEDs

3.13.4.3.4 General limitations

- The USB 2.0 transfer rate is limited to 150 Mbit/s with SDL4.
- The SDL4 transmitter constantly emulates a display using EDID data and hot plugging code; this allows DVI-compatible operation. As a result, improperly displayed images are possible during operation with multiple displays. In Windows, a connected panel is registered by the graphics driver even in the following situations:
 - No cable is connected.
 - A connection has not yet been established between the SDL4 link module and SDL4 transmitter.

These improperly displayed images can be circumvented by making suitable configurations in BIOS or via the graphics driver.

3.14 Uninterruptible power supply (UPS)

With the optionally integrated UPS, the B&R industrial PC ensures that the PC system can complete write operations even after a power failure occurs. If the UPS detects a power failure, it switches to battery operation immediately without interruption. All running programs are properly exited by the UPS software. The possibility of inconsistent data is eliminated (only works if the UPS has already been configured and the driver is enabled).

Information:

- An external panel or monitor is not buffered by the UPS and will fail if a power failure occurs.
- For detailed information about uninterruptible power supplies, see 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 reduced to simply attaching the connection cable to the battery unit installed next to the PC.

Special emphasis was placed on simplified maintenance when designing the battery unit. Batteries are easily accessible from the front and can be replaced in just a few moments when servicing.

3.14.1 Requirements

- A suitable system unit
- UPS IF option 5AC901.IUPS-00 or 5AC901.IUPS-01
- 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!

Battery unit 5AC901.BUPS-00 is only permitted to be operated with UPS IF option 5AC901.IUPS-00!

Battery unit 5AC901.BUPS-01 is only permitted to be operated with UPS IF option 5AC901.IUPS-01!

Information:

For information about installation and connecting to the UPS IF option, see section "Installing and connecting the UPS battery unit" on page 516.

3.14.2 5AC901.IUPS-00

3.14.2.1 General information

UPS IF option 5AC901.IUPS-00 used together with battery unit 5AC901.BUPS-00 allows the B&R industrial PC to be switched off properly without data loss during a power [failure](#).

UPS interface option 5AC901.IUPS-00 can only be operated in the IF option 1 slot.

Warning!

UPS IF option 5AC901.IUPS-00 is only permitted to be operated with battery unit 5AC901.BUPS-00!

Information:

If the system is in standby mode (S5: soft-off mode or S4: hibernation/suspend-to-disk mode), 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 performed (e.g. opening the tray of the built-in slide-in DVD drive).

3.14.2.2 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.0013-01	UPS cable - 1.3 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 183: 5AC901.IUPS-00 - Order data

3.14.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.IUPS-00
General information	
B&R ID code	0xD851
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C 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
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 55°C ³⁾
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 184: 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 184: 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.

3.14.2.3.1 Pinout

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

Connector, 4-pin, male

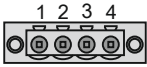


Table 185: 5AC901.IUPS-00/-01 - Pinout

3.14.2.4 Installation

This module is installed using the materials included in delivery. For more information regarding installation, see section "[Installing interface options](#)" on page 501.

3.14.3 5AC901.IUPS-01

3.14.3.1 General information

UPS IF option 5AC901.IUPS-01 used together with battery unit 5AC901.BUPS-01 allows the B&R industrial PC to be switched off properly without data loss during a power **failure**.

UPS interface option 5AC901.IUPS-01 can only be operated in the IF option 1 slot.

Warning!

UPS IF option 5AC901.IUPS-01 is only permitted to be operated with battery unit 5AC901.BUPS-01!

Information:

If the system is in standby mode (S5: soft-off mode or S4: hibernation/suspend-to-disk mode), 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 performed (e.g. opening the tray of the built-in slide-in DVD drive).

3.14.3.2 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.0013-01	UPS cable - 1.3 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 186: 5AC901.IUPS-01 - Order data

3.14.3.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.IUPS-01
General information	
B&R ID code	0xDF84
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C 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
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 55°C ³⁾
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 187: 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 187: 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.

3.14.3.3.1 Pinout

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

Connector, 4-pin, male

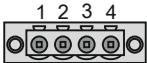


Table 188: 5AC901.IUPS-00/-01 - Pinout

3.14.3.4 Installation

This module is installed using the materials included in delivery. For more information regarding installation, see section "[Installing interface options](#)" on page 501.

3.14.4 5AC901.BUPS-00

3.14.4.1 General information

- Battery unit for UPS IF option 5AC901.IUPS-00
- 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 is subject to wear and should be replaced regularly (after the specified service life at the latest).

Warning!

Battery unit 5AC901.BUPS-00 is only permitted to be operated with UPS IF option 5AC901.IUPS-00!

Information:

If the max. specified temperature limits of the battery unit are overshoot or undershot, the temperature alarm of the battery unit is set. Battery backing is no longer provided if the temperature alarm for the battery unit is active. The battery is also no longer charged since this can result in damage to the battery. This temperature alarm is defined with a hysteresis of 5°C, i.e. the temperature alarm is only cleared again if the minimum temperature limit is again overshoot by this hysteresis or the maximum temperature limit is again undershot by this hysteresis. The temperature or temperature alarm of the battery unit can be read/evaluated using the B&R ADI Library or the B&R implementation guide.

3.14.4.2 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.0013-01	UPS cable - 1.3 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 189: 5AC901.BUPS-00 - Order data

3.14.4.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ²⁾
GOST-R	Yes
Charge duration when battery low	Typ. 7 hours

Table 190: 5AC901.BUPS-00 - Technical data

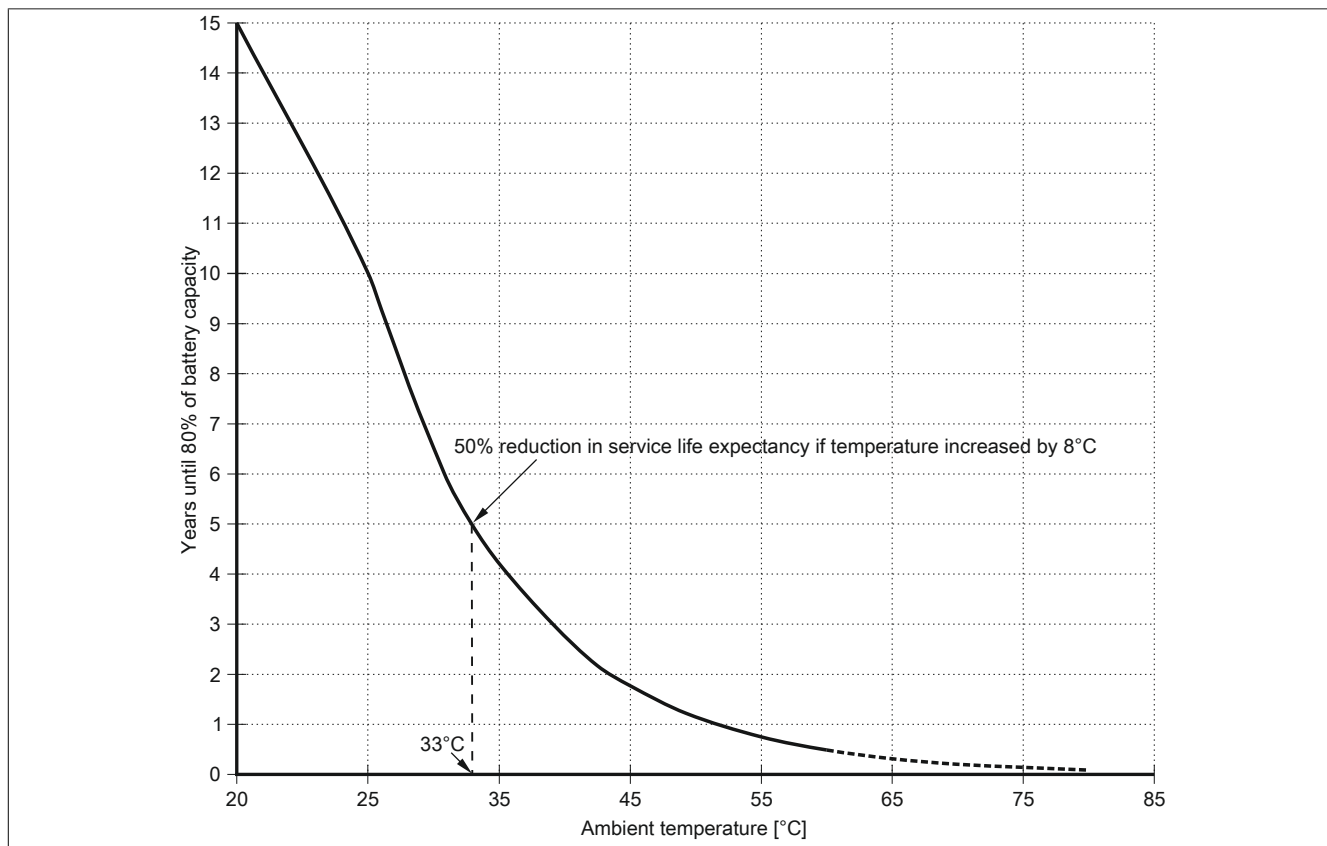
Model number	5AC901.BUPS-00
Electrical characteristics	
Nominal voltage	24 V
Capacity	4.5 Ah
Fuse	Yes
Battery charging data	
Charging current ³⁾	Typ. 1 A
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	-30 to 60°C ⁴⁾
Storage	-65 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
Mechanical characteristics	
Dimensions	
Width	223.2 mm
Height	78.2 mm
Depth	145 mm
Weight	Approx. 4600 g

Table 190: 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.

3.14.4.4 Service life

The following diagram shows the relationship between ambient temperature and service life.



3.14.4.5 Dimensions

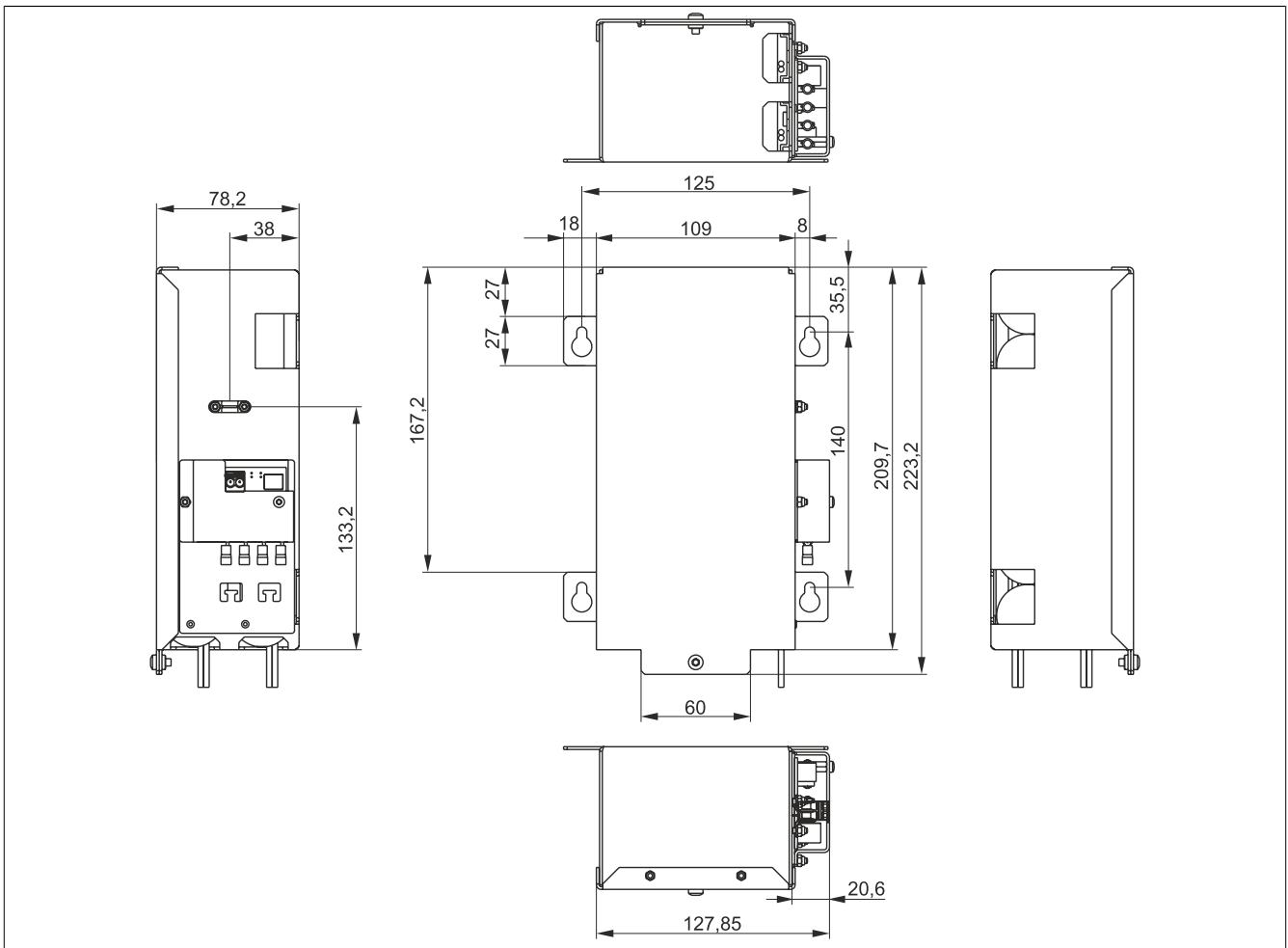


Figure 69: 5AC901.BUPS-00 - Dimensions

3.14.4.6 Drilling template

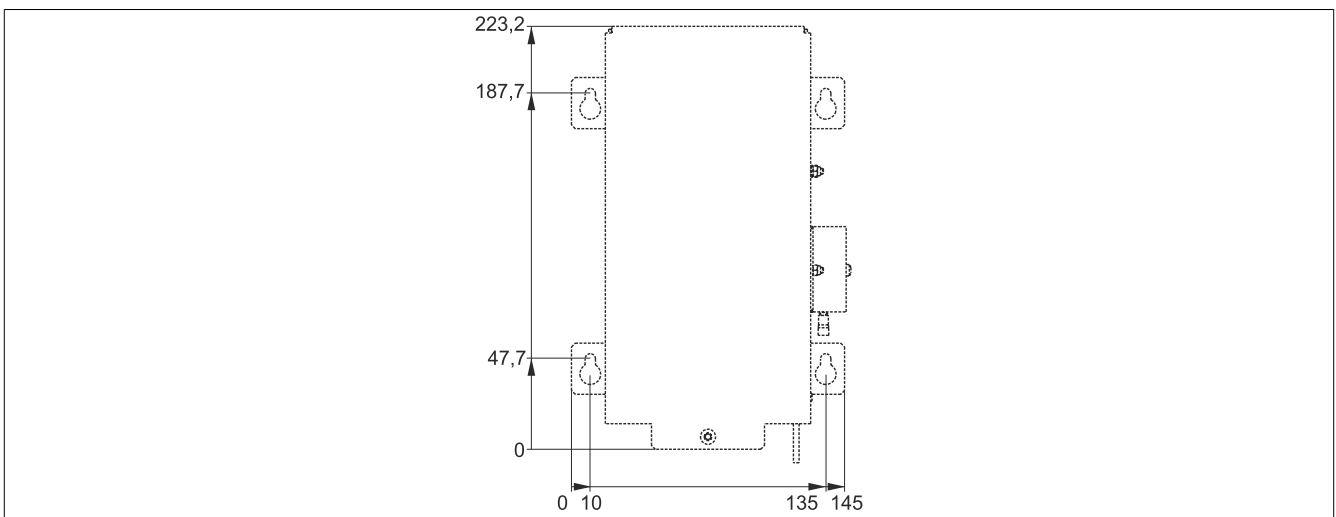


Figure 70: 5AC901.BUPS-00 - Drilling template

3.14.4.7 Installation

For information about installation and connecting to the [UPS IF option](#), see section "[Installing and connecting the UPS battery unit](#)" on page 516.

3.14.4.8 Precautions for handling and use

Spills and leaks:

Further leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is not permitted. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, footwear, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

Waste disposal:

Used batteries and rechargeable 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 inspection, larger spills diluted with water must be disposed of in accordance with applicable regulations.

Handling and storage:

- Store in cool, dry and well-ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage
- Protect 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 in which batteries and rechargeable batteries are stored and transported must be prevented.
- Keep away from fire, sparks and heat.

3.14.5 5AC901.BUPS-01

3.14.5.1 General information

- Battery unit for UPS IF option 5AC901.IUPS-01
- 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 is subject to wear and should be replaced regularly (after the specified service life at the latest).

Warning!

Battery unit 5AC901.BUPS-01 is only permitted to be operated with UPS IF option 5AC901.IUPS-01!

Information:

If the max. specified temperature limits of the battery unit are overshoot or undershot, the temperature alarm of the battery unit is set. Battery backing is no longer provided if the temperature alarm for the battery unit is active. The battery is also no longer charged since this can result in damage to the battery. This temperature alarm is defined with a hysteresis of 5°C, i.e. the temperature alarm is only cleared again if the minimum temperature limit is again overshoot by this hysteresis or the maximum temperature limit is again undershot by this hysteresis. The temperature or temperature alarm of the battery unit can be read/evaluated using the B&R ADI Library or the B&R implementation guide.

3.14.5.2 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.0013-01	UPS cable - 1.3 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 191: 5AC901.BUPS-01 - Order data

3.14.5.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ²⁾
GOST-R	Yes
Charge duration when battery low	Typ. 5 hours

Table 192: 5AC901.BUPS-01 - Technical data

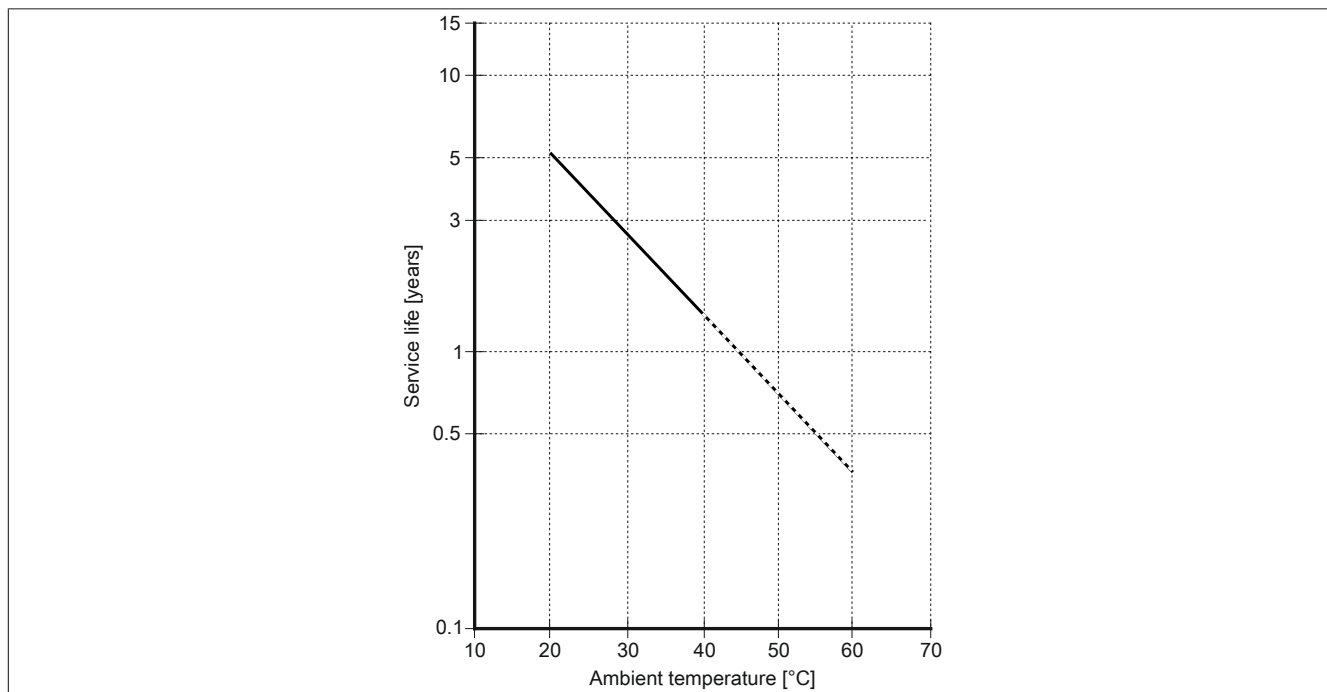
Model number	5AC901.BUPS-01
Electrical characteristics	
Nominal voltage	24 V
Capacity	2.2 Ah
Fuse	Yes
Battery charging data	
Charging current ³⁾	Typ. 0.88 A
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Environmental conditions	
Temperature	
Operation	0 to 40°C ⁴⁾
Storage	-15 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
Mechanical characteristics	
Dimensions	
Width	188 mm
Height	78 mm
Depth	115 mm
Weight	Approx. 2550 g

Table 192: 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.

3.14.5.4 Service life

The following diagram shows the relationship between ambient temperature and service life.



3.14.5.5 Dimensions

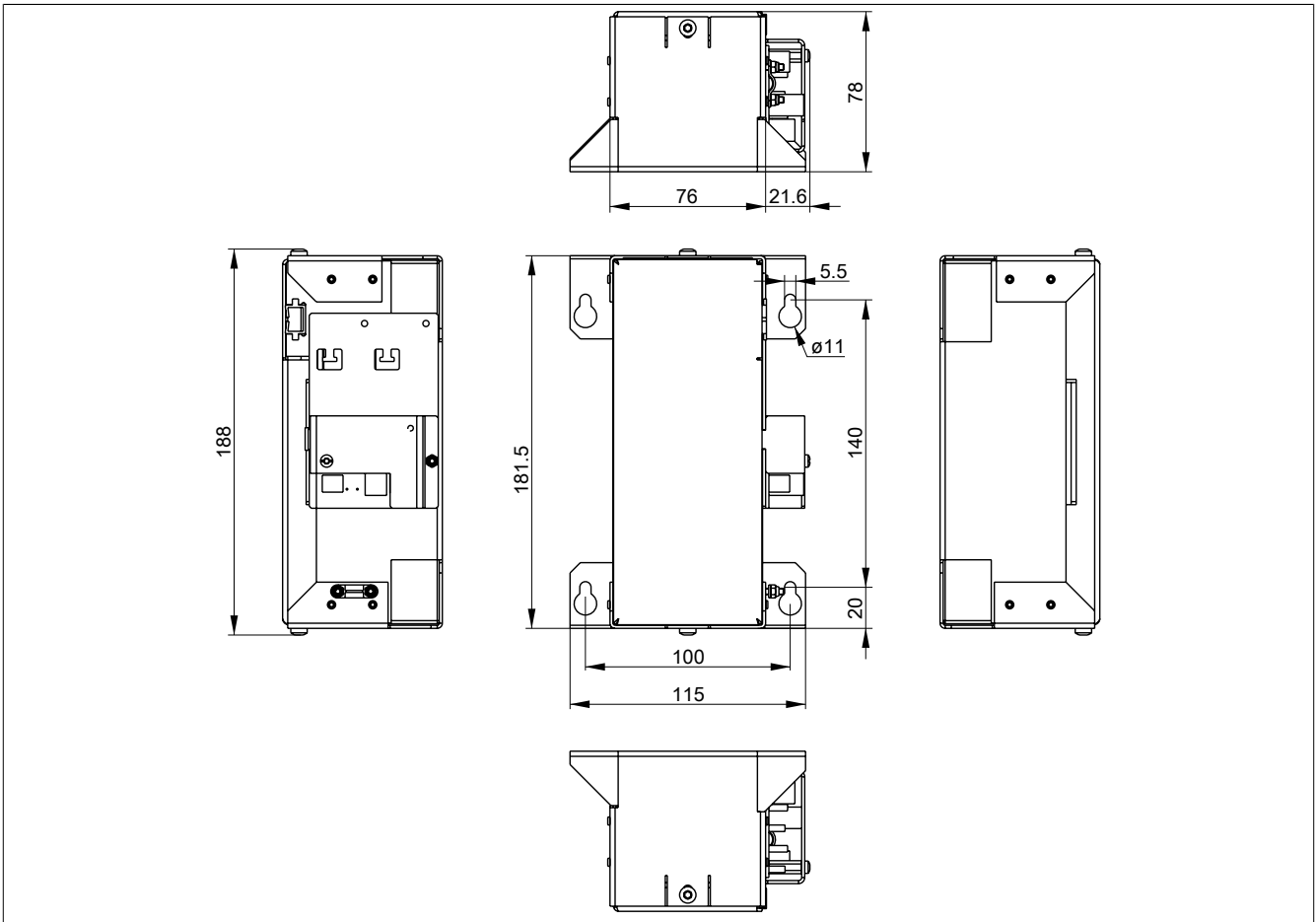


Figure 71: 5AC901.BUPS-01 - Dimensions

3.14.5.6 Drilling template

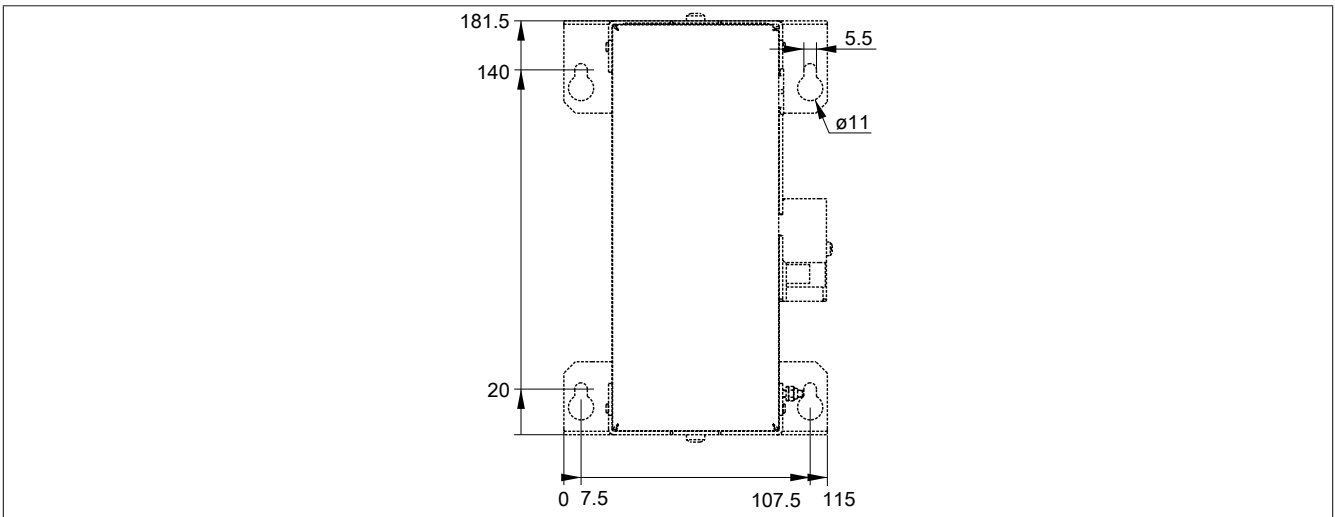


Figure 72: 5AC901.BUPS-01 - Drilling template

3.14.5.7 Installation

For information about installation and connecting to the [UPS IF option](#), see section "[Installing and connecting the UPS battery unit](#)" on page 516.

3.14.5.8 Precautions for handling and use

Spills and leaks:

Further leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is not permitted. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, footwear, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

Waste disposal:

Used batteries and rechargeable 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 inspection, larger spills diluted with water must be disposed of in accordance with applicable regulations.

Handling and storage:

- Store in cool, dry and well-ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage
- Protect 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 in which batteries and rechargeable batteries are stored and transported must be prevented.
- Keep away from fire, sparks and heat.

3.14.6 5CAUPS.xxxx-01

3.14.6.1 General information

The UPS connection cable establishes the connection between the UPS interface option and battery unit.

3.14.6.2 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.0013-01	UPS cable - 1.3 m - For 5AC901.IUPS-xx	
5CAUPS.0030-01	UPS cable - 3 m - For 5AC901.IUPS-xx	

Table 193: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0013-01, 5CAUPS.0030-01 - Order data

3.14.6.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CAUPS.0005-01	5CAUPS.0010-01	5CAUPS.0013-01	5CAUPS.0030-01
General information				
Certifications	Yes			
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C ¹⁾			
GOST-R	Yes		-	Yes
Cable construction				
Wire cross section	2x 0.5 mm ² (AWG 20) 2x 2.5 mm ² (AWG 13)		2x 0.5 mm ² (20 AWG) 2x 2.5 mm ² (13 AWG)	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 jacket				
Material	Thermoplastic PVC-based material			
Color	Window gray (similar to RAL 7040)			
Connector				
Type	Screw clamps, 4-pin ³⁾		Screw clamps, 4-pin ⁴⁾	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			
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			
Environmental conditions				
Temperature				
Moving	-5 to 70°C			
Static	-30 to 70°C			
Mechanical characteristics				
Dimensions				
Length	0.5 m	1 m	1.3 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. 130 g	Approx. 250 g

Table 194: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0013-01, 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.
- 4) 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 line**

3.14.6.4 Installation

For information about connecting the cable to the battery unit, see section "[Installing and connecting the UPS battery unit](#)" on page 516.

3.15 Front covers

3.15.1 5AC901.FF0x-00

3.15.1.1 General information

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

4 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.

3.15.1.2 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.FF01-03	Front cover for 1-slot APC910 - Orange - 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.FF02-03	Front cover for 2-slot APC910 - Orange - 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	
5AC901.FF05-03	Front cover for 5-slot APC910 - Orange - Without logo	

Table 195: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF01-03, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF02-03, 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02, 5AC901.FF05-03 - Order data

3.15.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5AC901.FF01-00	5AC901.FF01-01	5AC901.FF01-02	5AC901.FF01-03	5AC901.FF02-00	5AC901.FF02-01	5AC901.FF02-02	5AC901.FF02-03
General information								
Certifications								
CE	Yes							
UL	cULus E115267 Industrial control equipment							
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾							
GOST-R	Yes			-		Yes		-
Operating conditions								
Pollution degree per EN 61131-2	Pollution degree 2							
Mechanical characteristics								
Housing								
Front cover	Orange plastic (similar to Pantone 144CV)	Dark gray plastic (similar to Pantone 432C)			Orange plastic (similar to Pantone 144CV)	Dark gray plastic (similar to Pantone 432C)		
Material	Plastic							

Table 196: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF01-03, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF02-03 - Technical data

Technical data • Individual components

Model number	5AC901.FF01-00	5AC901.FF01-01	5AC901.FF01-02	5AC901.FF01-03	5AC901.FF02-00	5AC901.FF02-01	5AC901.FF02-02	5AC901.FF02-03
Dimensions								
Width	82 mm				120.9 mm			
Height	264 mm							
Depth	14 mm							
Weight	Approx. 84 g				Approx. 117 g			

Table 196: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF01-03, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF02-03 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

Model number	5AC901.FF05-00	5AC901.FF05-01	5AC901.FF05-02	5AC901.FF05-03
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
GOST-R	Yes	Yes	-	-
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			
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)	Dark gray plastic (similar to Pantone 432C)
Material	Plastic			
Dimensions				
Width	202 mm			
Height	264 mm			
Depth	14 mm			
Weight	Approx. 197 g			

Table 197: 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02, 5AC901.FF05-03 - Technical data

Chapter 3 • Commissioning

1 Installation

Danger!

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

1.1 Important information concerning installation/commissioning

- Checking the delivery
 - When receiving the delivery, check the packaging for any visible transport damage.
 - Any visible transport damage must be documented and reported immediately, or the damage must be confirmed by the shipping/delivery company.
 - Keep the original packaging in the event that goods must be reshipped.

Information:

If a **device** is transported or stored without packaging, it is unprotected against all environmental factors such as impacts, vibration, pressure, moisture, etc. Damaged packaging indicates that environmental conditions have already heavily affected and possibly damaged the **device**.

This **can** result in malfunctions on the **device**, **machine** or manufacturing system.

- Check the packaging contents and any ordered optional accessories for completeness and damage.
- If the packaging contents are incomplete, damaged or do not match your order, inform your local sales office or B&R headquarters immediately.

Danger!

A damaged **device** is subject to unpredictable properties and states. The unintentional installation or operation of a damaged **device** must be prevented. The damaged **device** must be marked as such and removed from the productive environment or sent immediately for repairs.

- The environmental conditions must be observed – see "Environmental characteristics".

Caution!

Before the **device** is put into service, it must slowly be acclimated to room temperature! Subjecting it to thermal radiation is not permitted. If transported at low temperatures or if there are large temperature fluctuations, the **device** is not permitted to be subjected to any type of moisture. Moisture **can** cause short circuits in the electrical circuits and damages the **device**.

- The permissible mounting orientations when installing the **device** must be observed, see see "Mounting orientations".

Caution!

When installed at an angle, the convection of air through the **device** is reduced, which decreases the maximum permissible ambient temperature for operation. If sufficient external cooling is present when the **device** is installed at an angle, the limit of the maximum permissible ambient temperature must be checked in each case. Otherwise, the **device** can become damaged and the certifications and warranty for the **device** nullified.

- The requirements for **device** standards and certifications must be observed, see ["Standards and certifications"](#).
- The **device** is only certified for operation in enclosed rooms.
- The **device** is not permitted to be subjected to direct sunlight.
- Ventilation holes are not permitted to be covered.
- When installed in a closed housing, enough space must be available for air to circulate sufficiently, see [1.4 "Spacing for air circulation"](#).

Information:

Additional space needed to operate or service the **device must be taken into account during installation.**

- The **device** must be installed on a flat, clean and burr-free surface.
- It is important to ensure that the wall or **control** cabinet plate **can** hold four times the total weight of the **device**. If necessary, the interior of the installation cutout must be reinforced in order to strengthen the installation surface.

Caution!

In the event of insufficient load-carrying capacity of the installation surface, inadequate mounting or improper mounting materials, the **device may fall and become damaged.**

- The **device** is not permitted to be positioned next to other heat sources that could cause overheating.
- When connecting cables (**DVI**, **SDL**, **USB**, etc.), the bend radius must be taken into account.
- When connecting built-in or connected peripherals, the instructions in the documentation of the peripheral **device** must be followed.

Caution!

Built-in or connected peripherals (e.g. a **USB drive) are not permitted to bring any voltage into the **device**. Energy regeneration is generally not permitted and **can** damage the **device**.**

- Instructions and regulations on the power supply and functional **ground** must be observed.

1.2 Procedure

1. Drill the necessary holes in the mounting surface. For the exact position of the mounting holes, see the drilling templates.
2. Install 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.

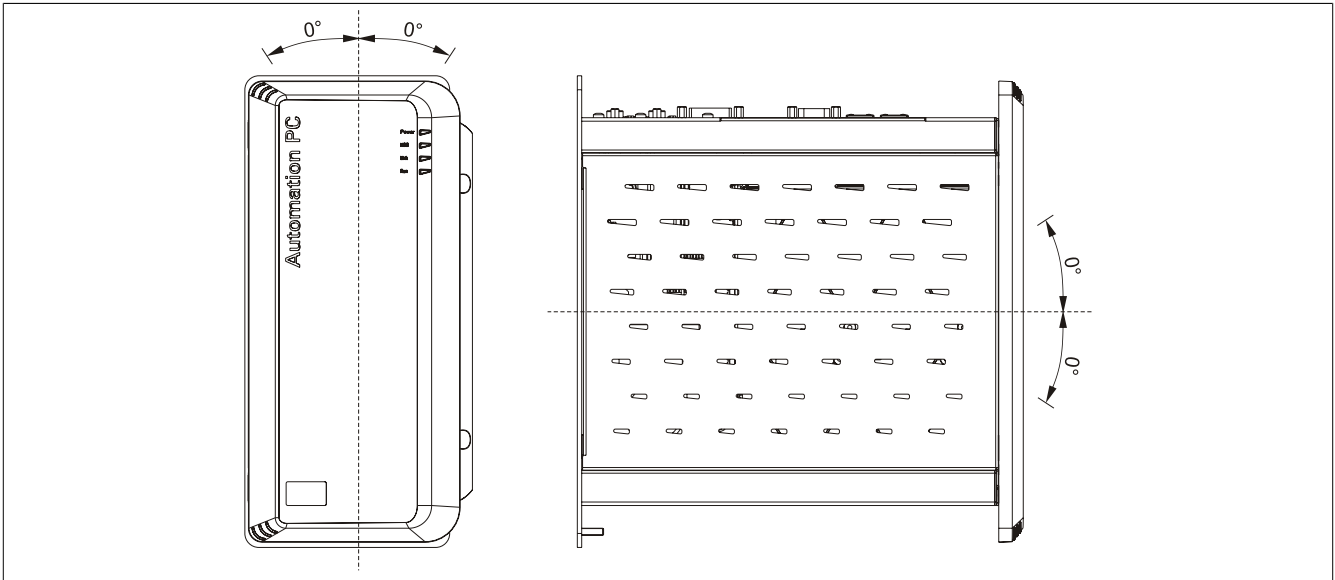


Figure 73: Vertical mounting orientation

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 229.

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.

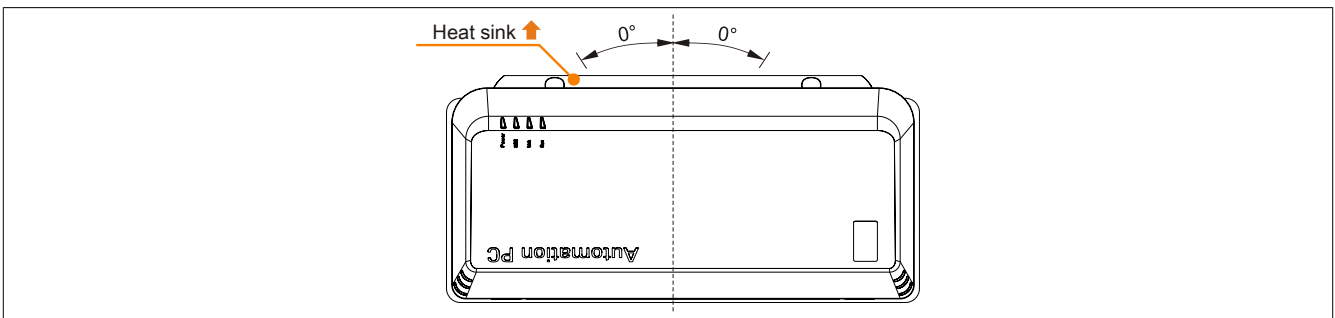


Figure 74: Horizontal mounting orientation

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 229.

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.

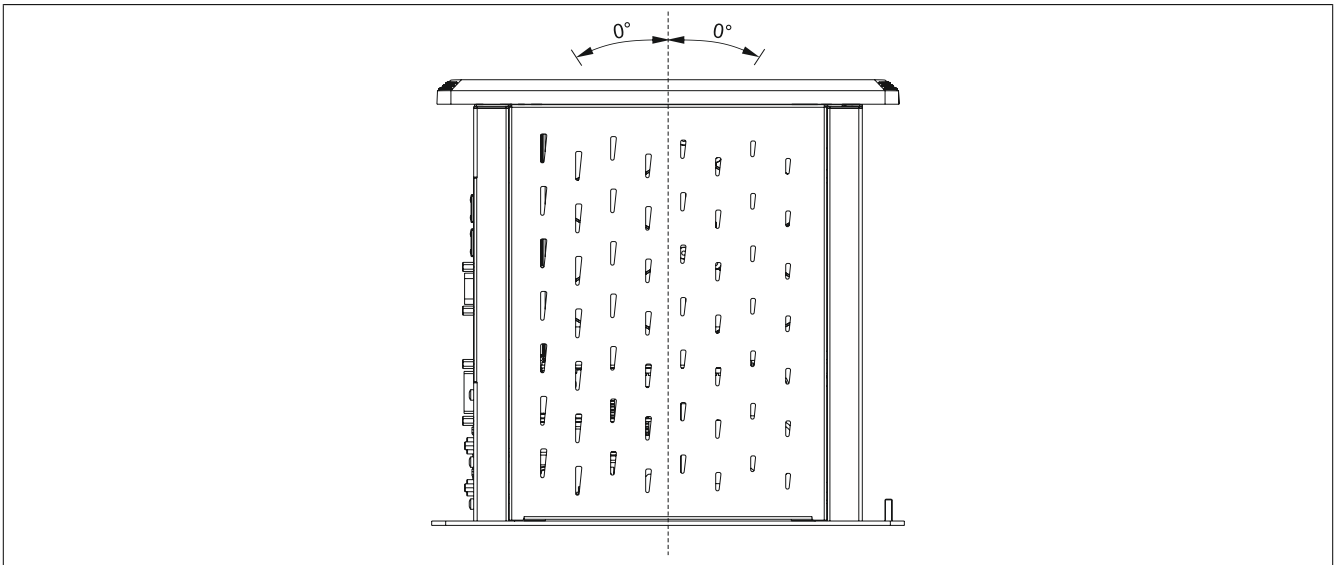


Figure 75: Mounting orientation - Floor-mounted

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 229.

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.

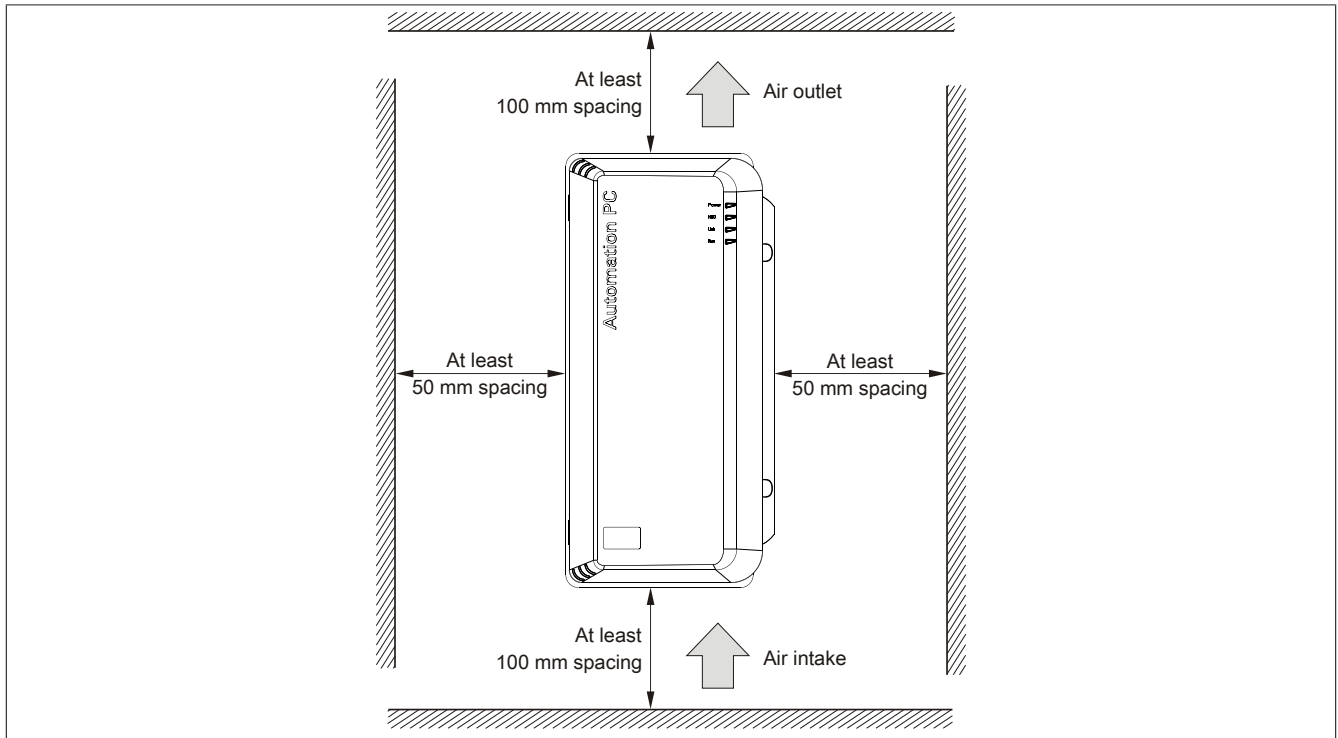


Figure 76: Standard mounting - Spacing

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

The bend radius specifications must be taken into account when installing or connecting cables.

Information:

The maximum tightening torque for the locating screws is 0.5 Nm.

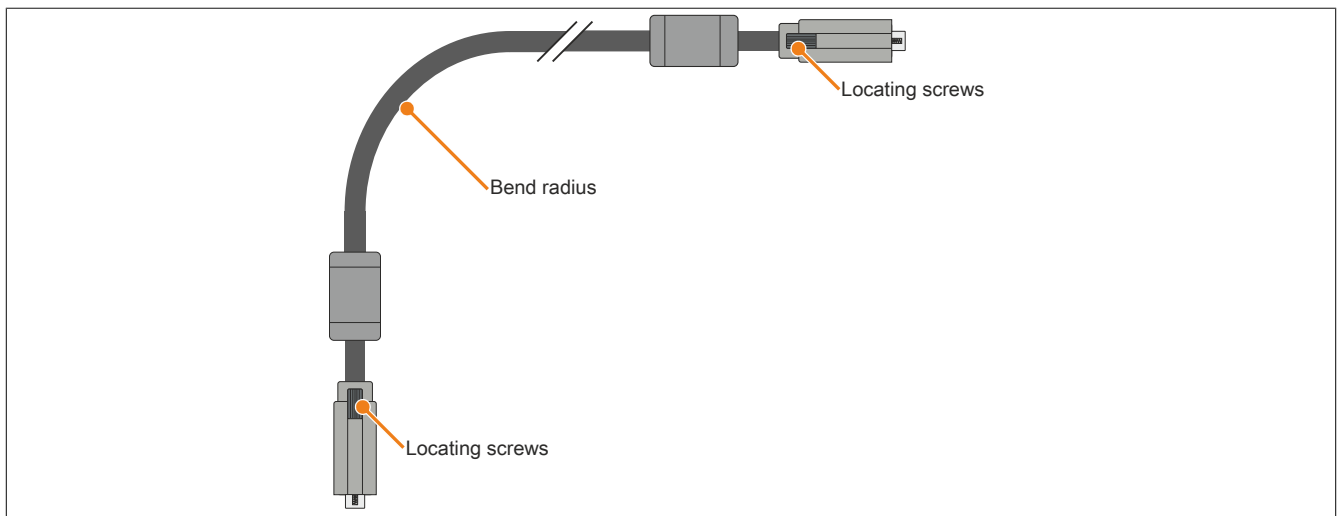


Figure 77: Bend radius - Cable connection

Information:

For the specified bend radius, see 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 to improve immunity to interference, for example, and not necessarily as a protective measure. It therefore serves only to conduct interference, not to provide any kind of protection against electric shock.

This **device** comes equipped with 2 functional **ground** connections:

- Functional **ground** connection for the power supply
- **Ground** connection

To ensure the safe conductance of electrical interference, the following points must be observed:

- Connect the **device** to the central grounding point (e.g. the **control** cabinet or the system) using the shortest path with the lowest resistance.
- A cable with a minimum cross section of 2.5 mm² per connection must be used. If a cable with wire end sleeves is connected to terminal block 0TB103.9 or 0TB103.91, then a cable with maximum 1.5 mm² per connection is possible.
- Observe the line shielding concept. All data cables connected to the **device** must be shielded.

The following **symbol** is used to indicate functional **ground** on the B&R **device**: 

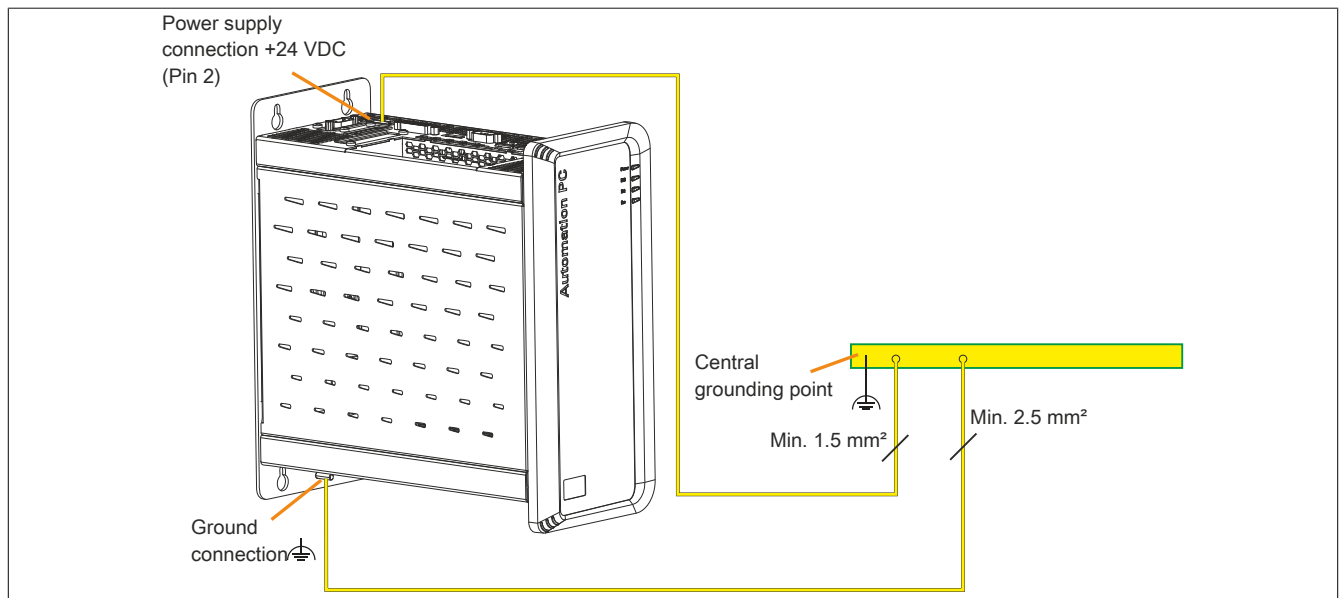


Figure 78: Grounding concept

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 or [Power Panels](#). These instructions only represent guidelines, however.

4.1 Procedure

In order to obtain accurate results, test 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 later, etc.

In addition, a temperature [sensor](#) should be installed for the [device](#) being tested to constantly monitor the ambient temperature. In order to obtain correct values, it should be placed at a distance of approx. 5 to 10 cm from the B&R industrial PC near the air intake (not near the exhaust).

Every B&R industrial PCs and [Power Panel](#) is equipped with internal temperature sensors. They are positioned in different locations depending on the [device](#) family. Their number as well as the temperature limits also vary depending on the [device](#) family.

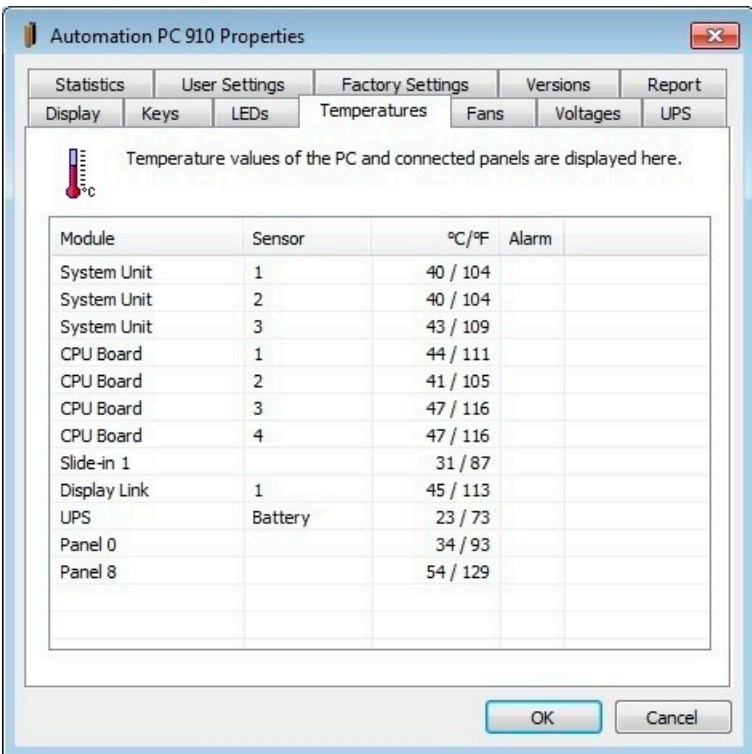
For information about the location of temperature sensors as well as their maximum specified temperatures, see section "Temperature sensor positions" in 2 "[Technical data](#)".

A minimum testing time of 8 hours is recommended for an optimal determination and assessment of the temperature situation.

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 for download 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).



Automation PC 910 Properties

Statistics | User Settings | Factory Settings | Versions | Report
 Display | Keys | LEDs | Temperatures | Fans | Voltages | UPS

Temperature values of the PC and connected panels are displayed here.

Module	Sensor	°C/°F	Alarm
System Unit	1	40 / 104	
System Unit	2	40 / 104	
System Unit	3	43 / 109	
CPU Board	1	44 / 111	
CPU Board	2	41 / 105	
CPU Board	3	47 / 116	
CPU Board	4	47 / 116	
Slide-in 1		31 / 87	
Display Link	1	45 / 113	
UPS	Battery	23 / 73	
Panel 0		34 / 93	
Panel 8		54 / 129	

OK Cancel

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) for developing 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. A corresponding load [can](#) be generated on the system and peripheral devices based on the extent of the [software](#) and existing loopback adapters.

Information:

Loopback adapters are also available from PassMark. For more information, see www.passmark.com.

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

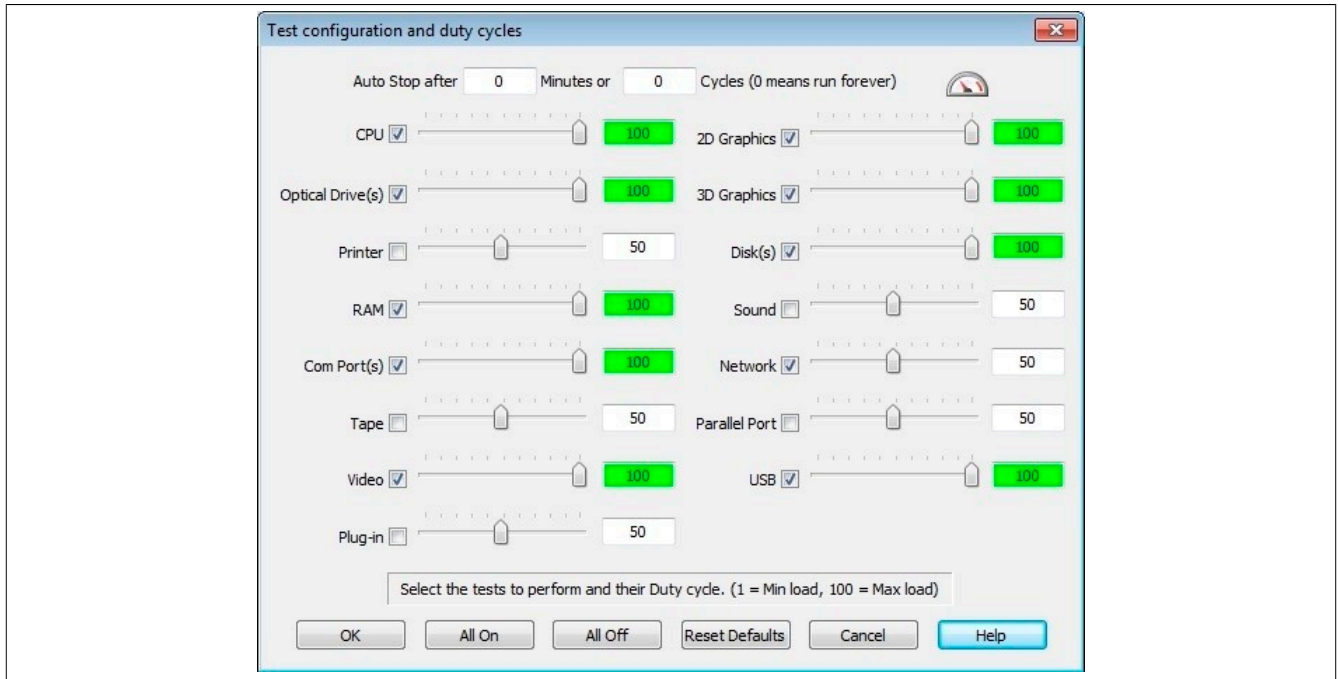


Figure 79: Settings for Passmark BurnInTest Pro V6 and a 2-slot APC910 with DVD

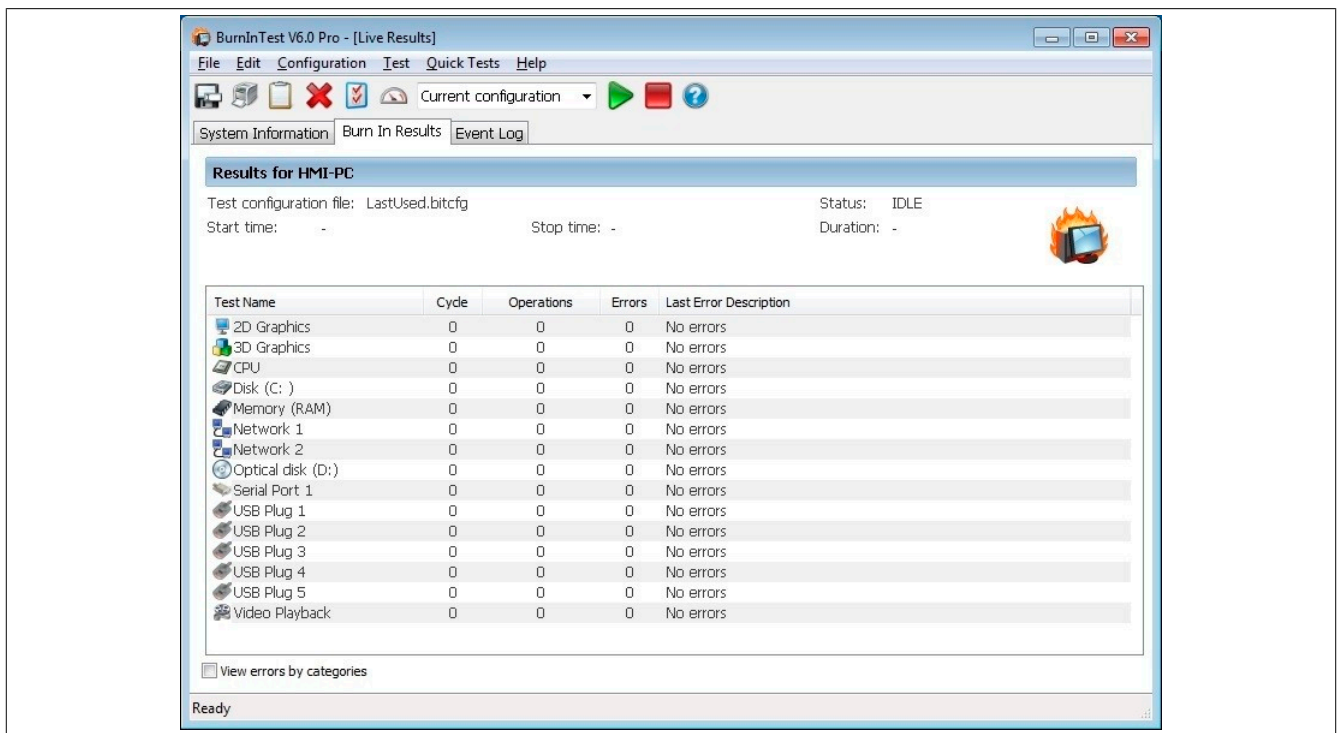


Figure 80: Test overview of a 2-slot APC910 with DVD

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

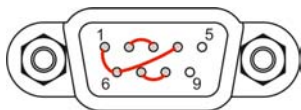
Information:

USB flash drives can also be used if no USB loopback adapters are available. The USB flash drives must be available in Windows as formatted drives. 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 some 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 using the B&R [MTCX](#) Development Kit. In addition to the [MTCX](#) Development Kit, sample programs in EFI are also available.

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 take into account the notes in the implementation guide regarding TODO comments, I/O access functions, etc.

Information:

For current B&R PC series (starting with the APC910), the [MTCX](#) Development Kit [can](#) be downloaded at no cost from the B&R website (www.br-automation.com).

Sample programs and implementation guides for all other B&R series [can](#) be downloaded free of charge 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 chamber, they [can](#) be performed in an office environment, for example. It is necessary to measure the ambient temperature in this case, however. Experience at B&R has shown that temperature values measured on passive systems (systems without a fan kit) [can](#) be calculated linearly based on the ambient temperature. In order to calculate temperature values for systems with a fan kit, the fans must be running. It is also important to take speed, etc. into account.

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. The measurement results for passive devices are therefore unusable. In order to be able to still perform temperature tests in climate-controlled chambers with fans without distorting the results, the fans in the climate chamber must be switched off and a sufficient amount of time (several hours) observed 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.

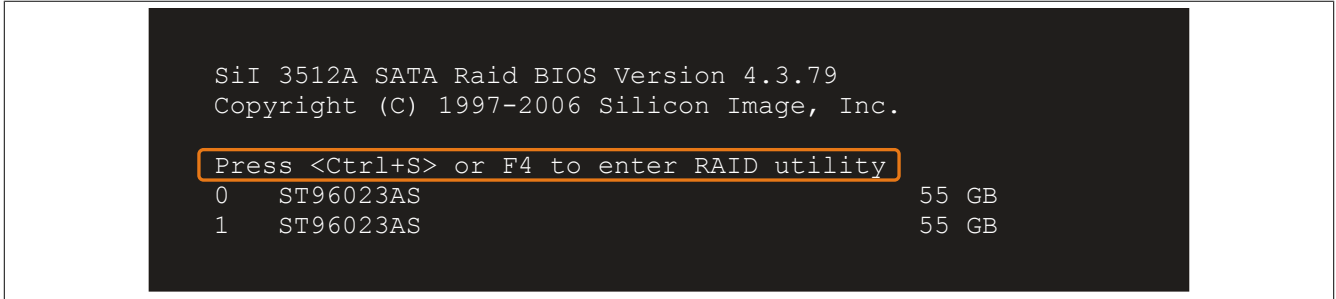


Figure 81: Open the RAID Configuration Utility

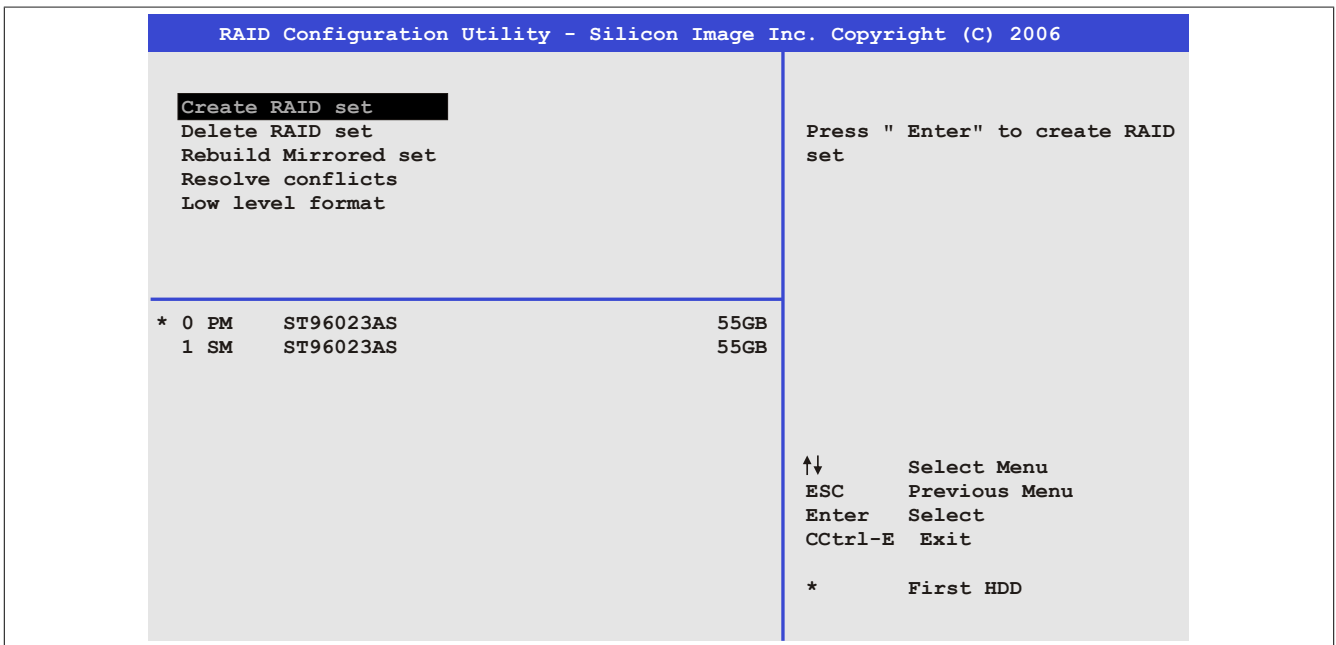


Figure 82: RAID Configuration Utility - Menu

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 198: BIOS-relevant keys in the RAID Configuration Utility

5.1 Create RAID set

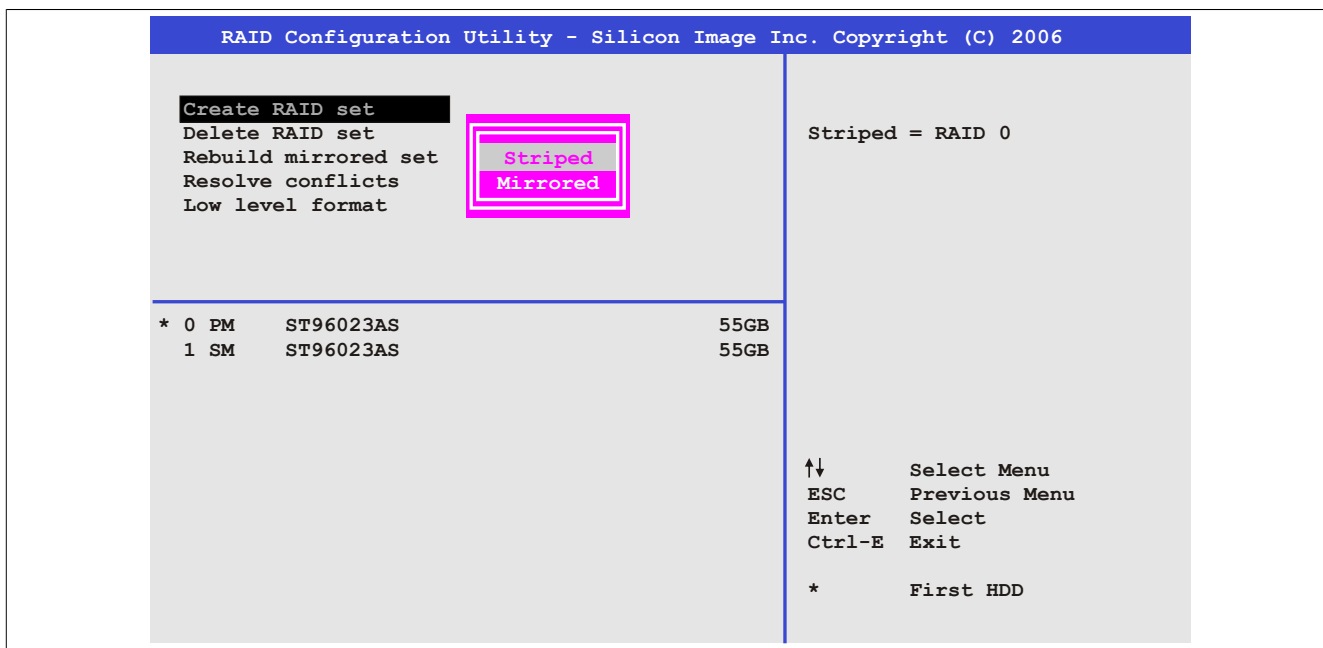


Figure 83: RAID Configuration Utility - Menu

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

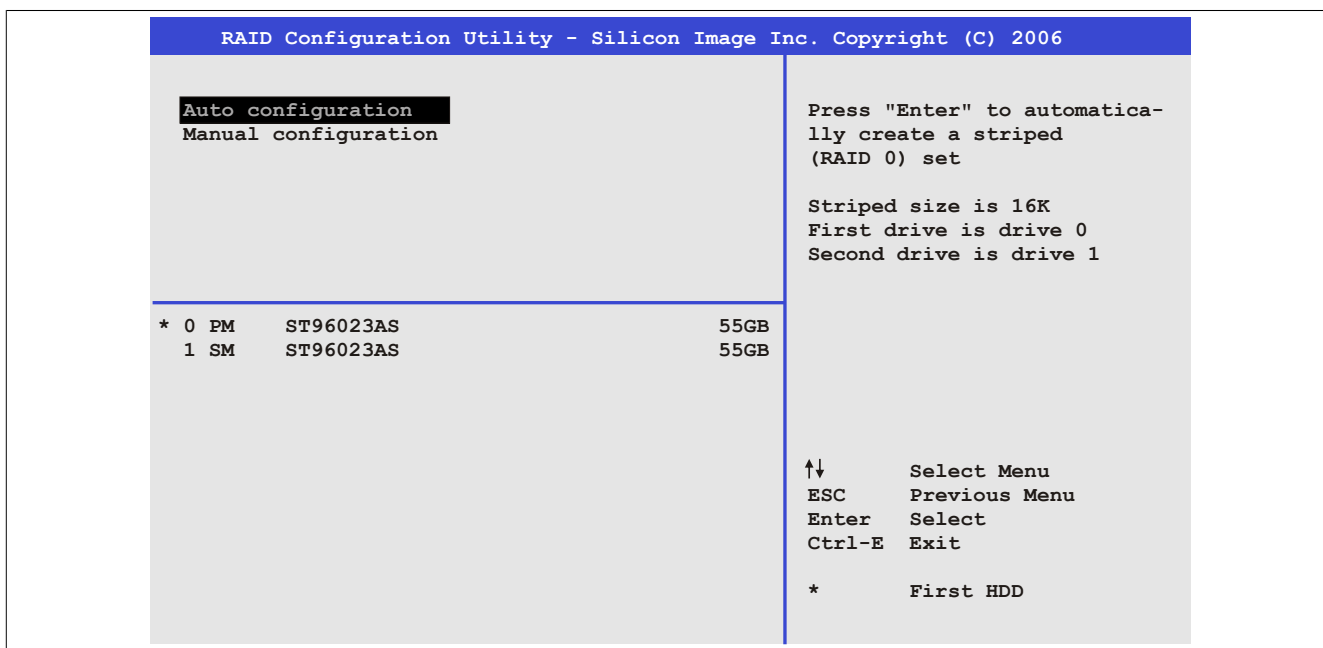


Figure 84: RAID Configuration Utility - Create RAID set - Striped

"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

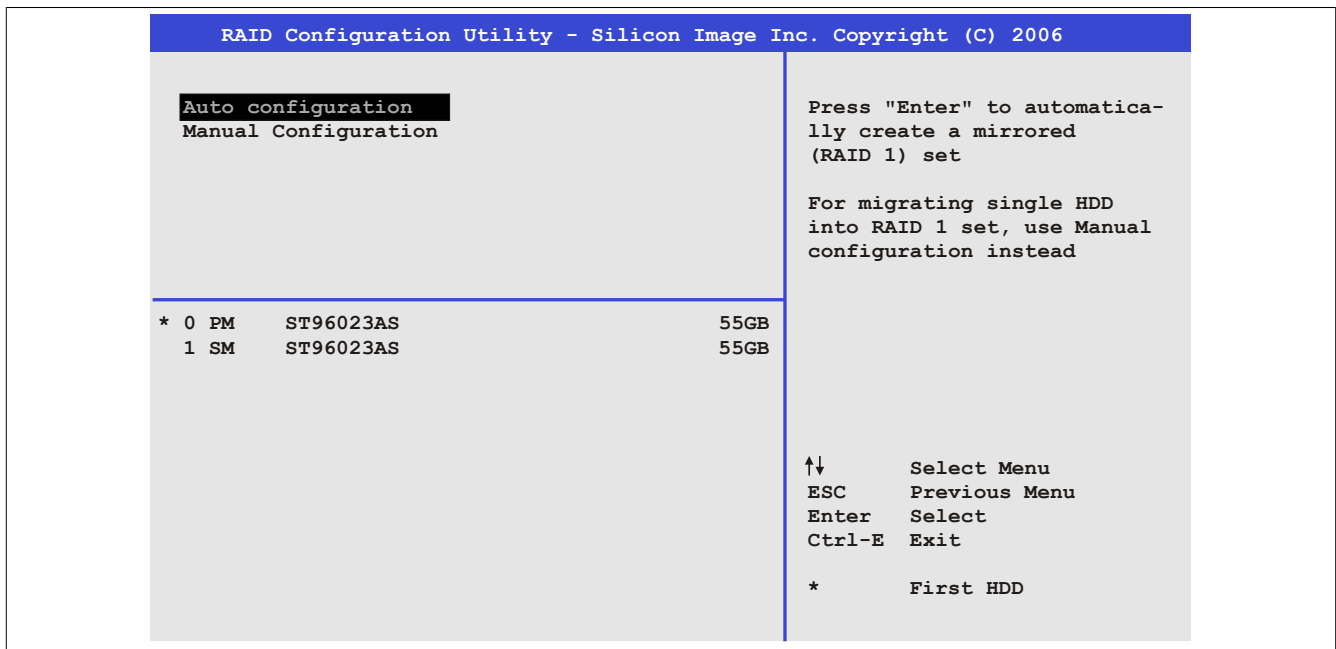


Figure 85: RAID Configuration Utility - Create RAID set - Mirrored

"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

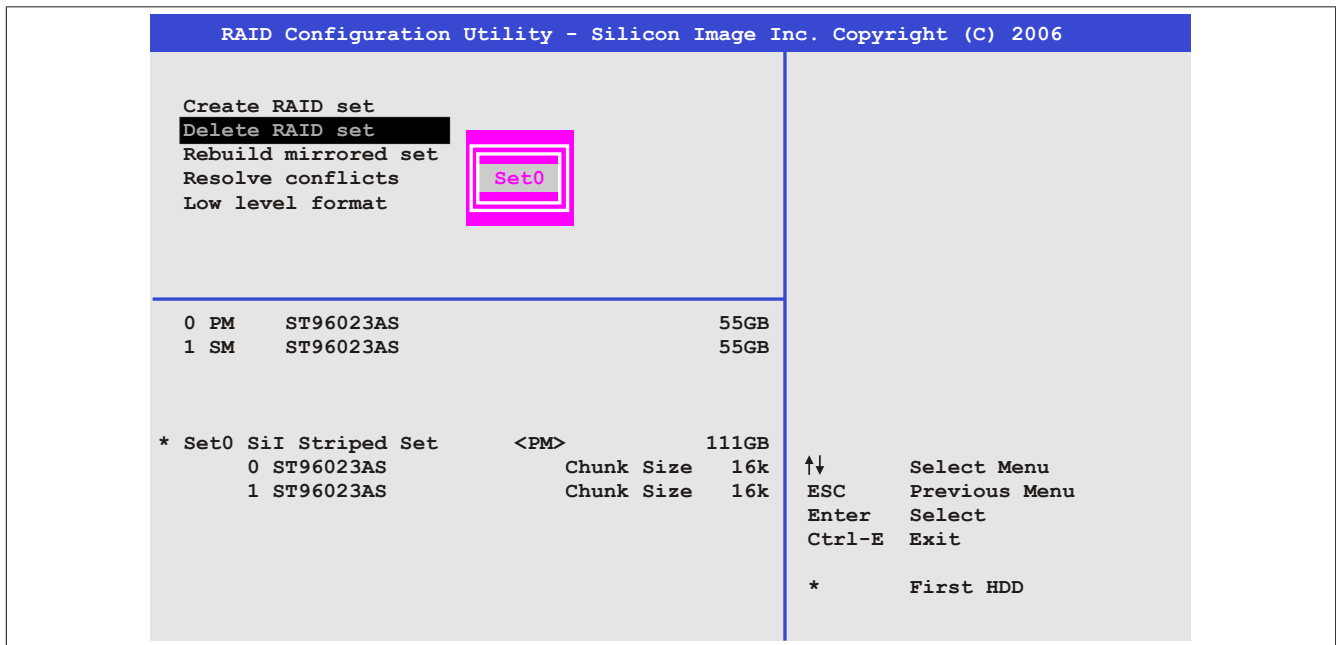


Figure 86: RAID Configuration Utility - Delete RAID set

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

5.5 Rebuild mirrored set

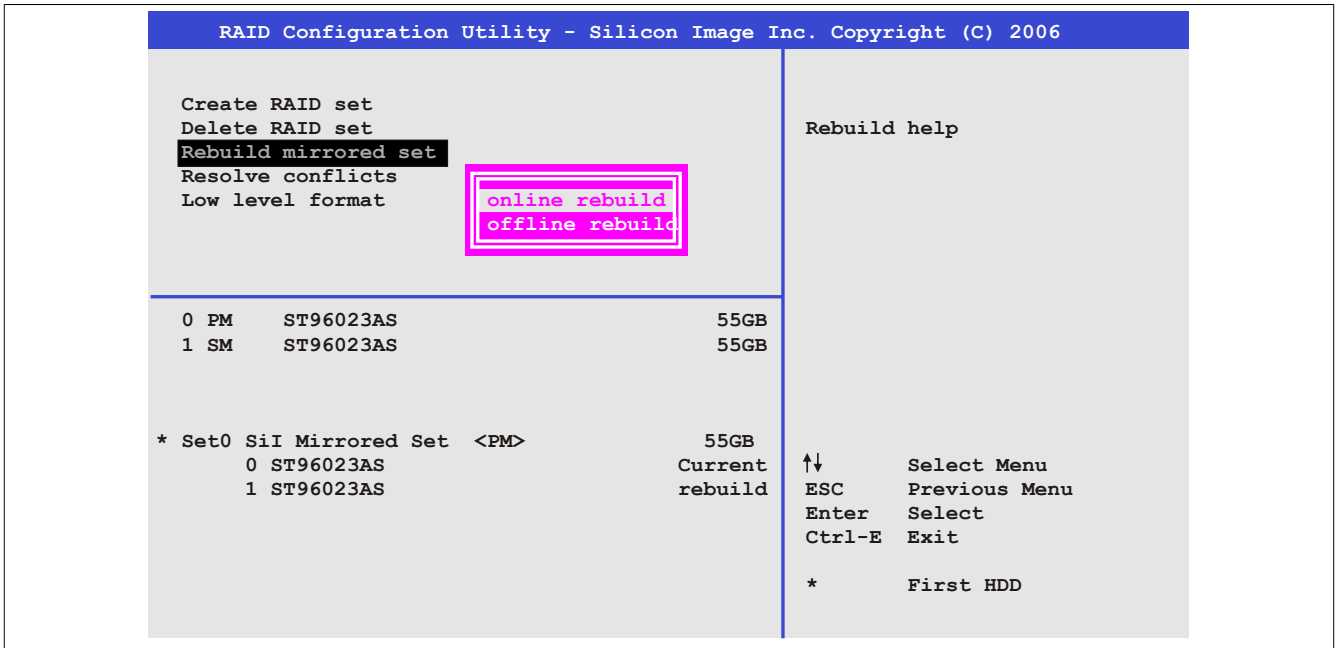


Figure 87: RAID Configuration Utility - Rebuild mirrored set

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

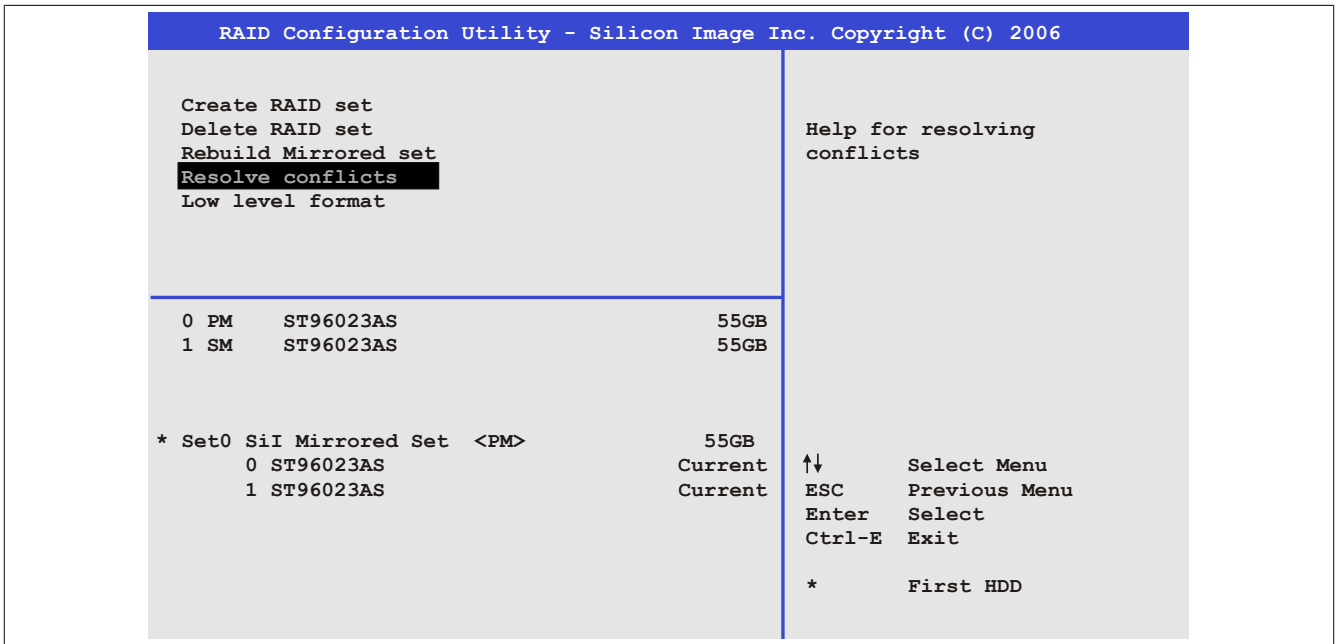


Figure 88: RAID Configuration Utility - Resolve conflicts

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

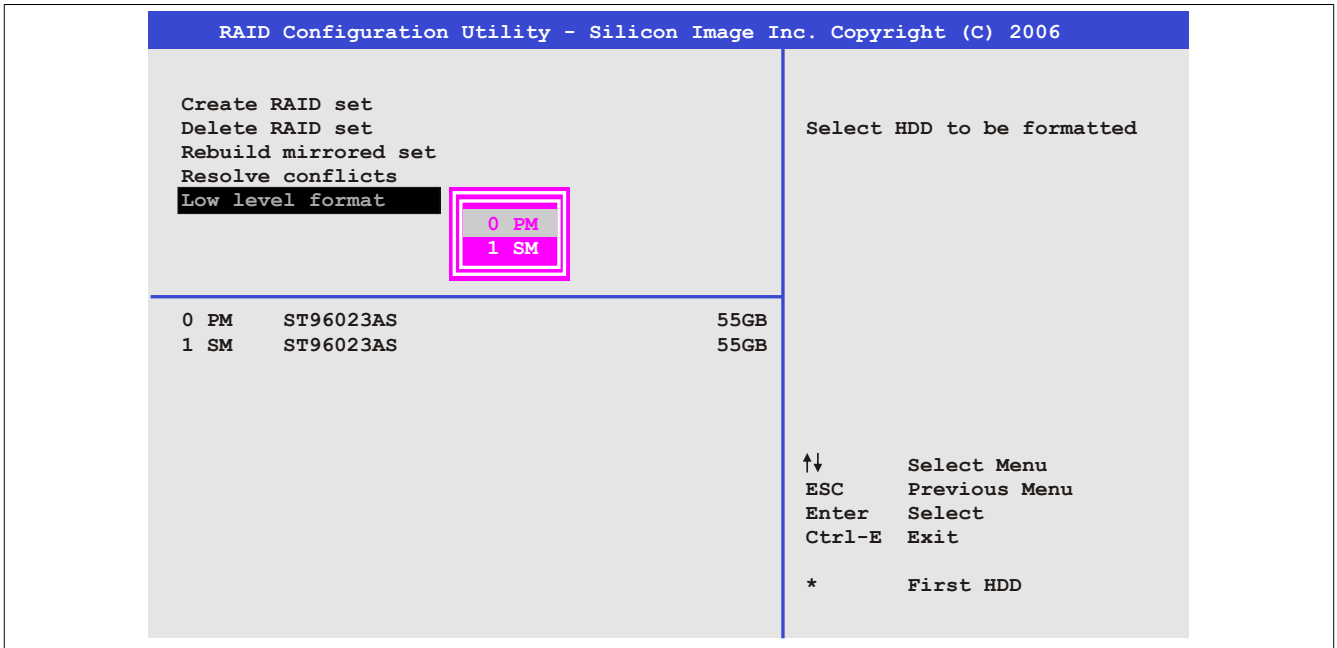


Figure 89: RAID Configuration Utility - Low level format

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/QM170/HM170/CM236 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 90: Configuration Utility - Boot (sample image)

```

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 91: Configuration Utility - Overview (sample image)

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 199: BIOS-relevant keys in the RAID Configuration Utility

6.1 Create RAID volume

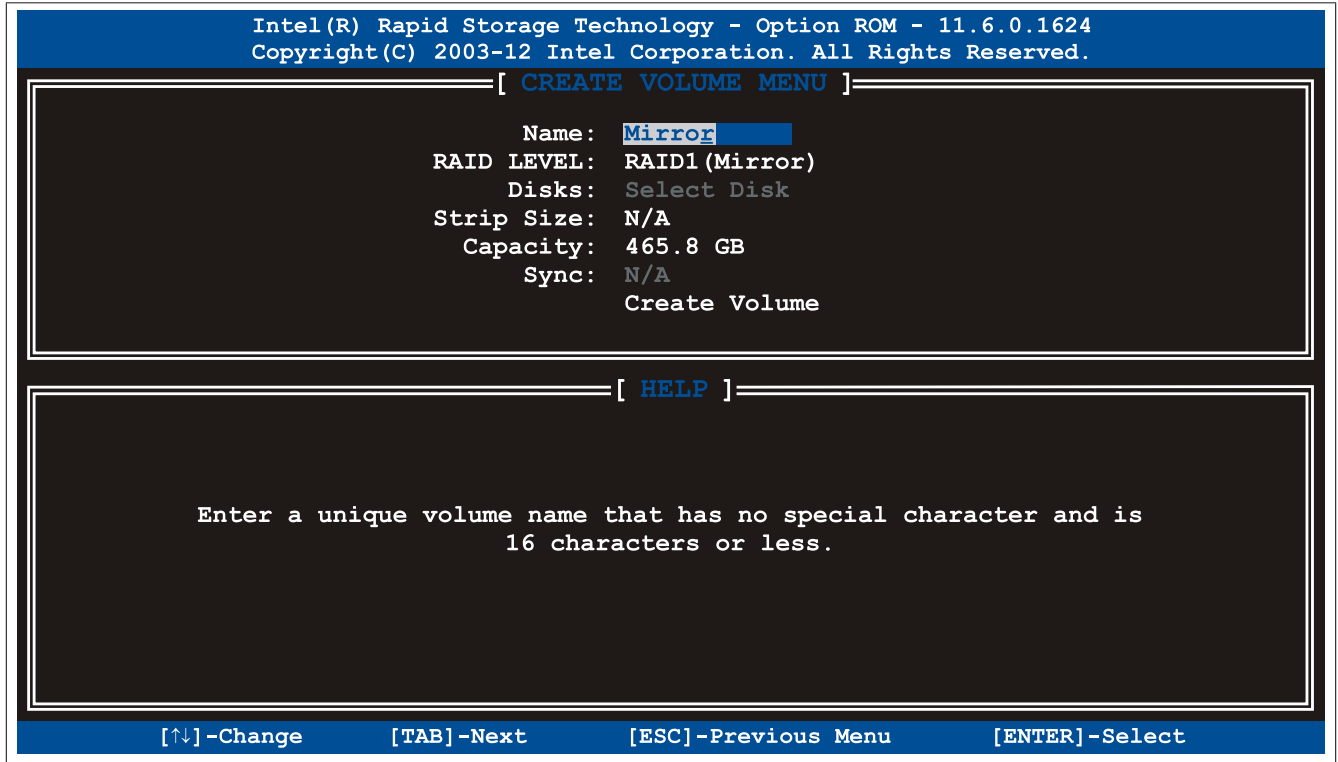


Figure 92: Configuration Utility - Create RAID volume (sample image)

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 200: 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.

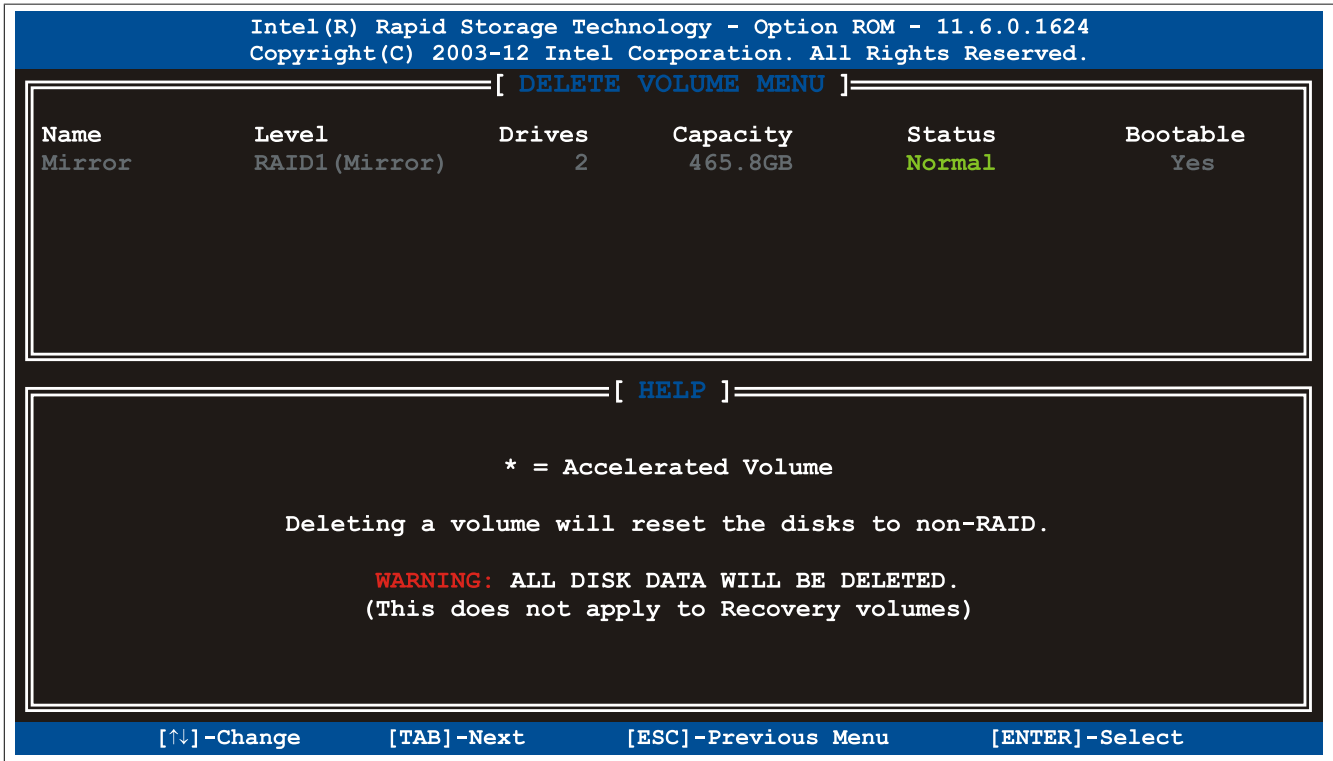


Figure 93: Configuration Utility - Delete RAID volume (sample image)

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.

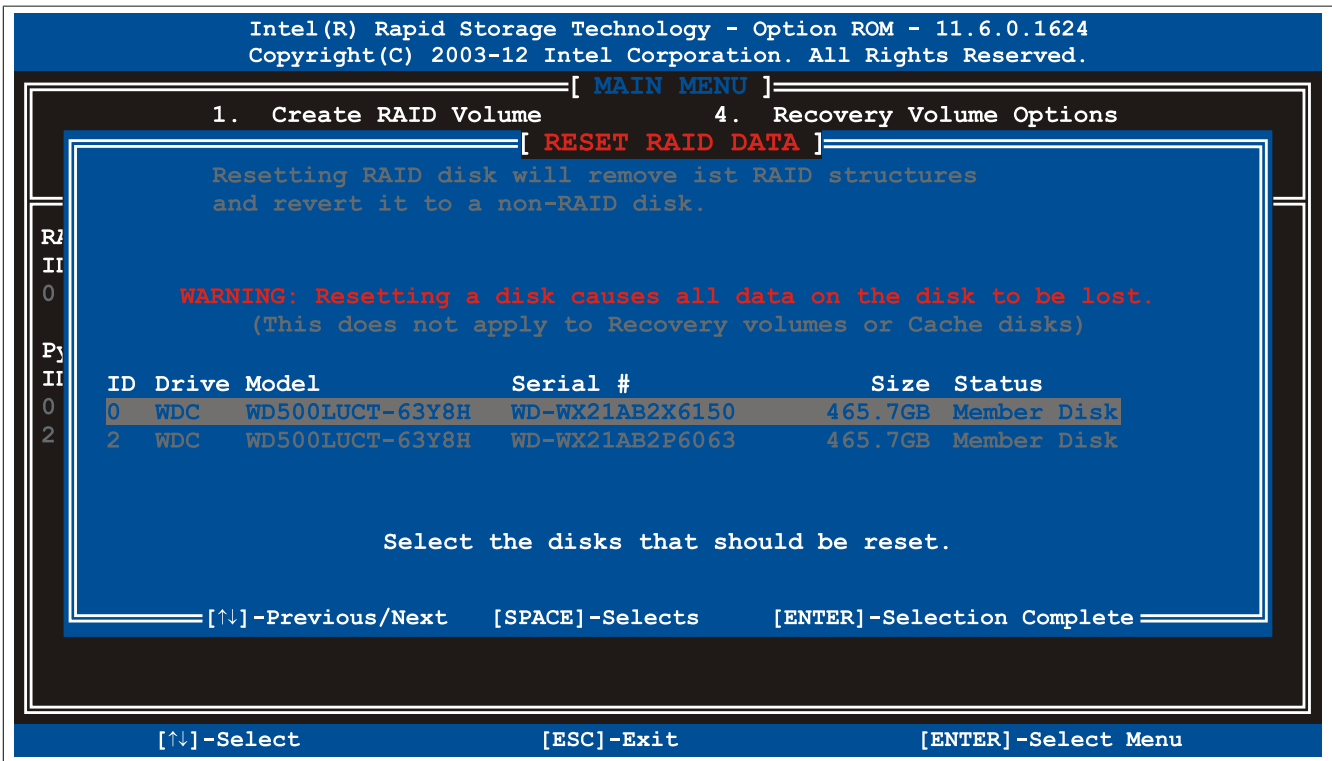


Figure 94: Configuration Utility - Reset disks to non-RAID (sample image)

6.4 Recovery volume options

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

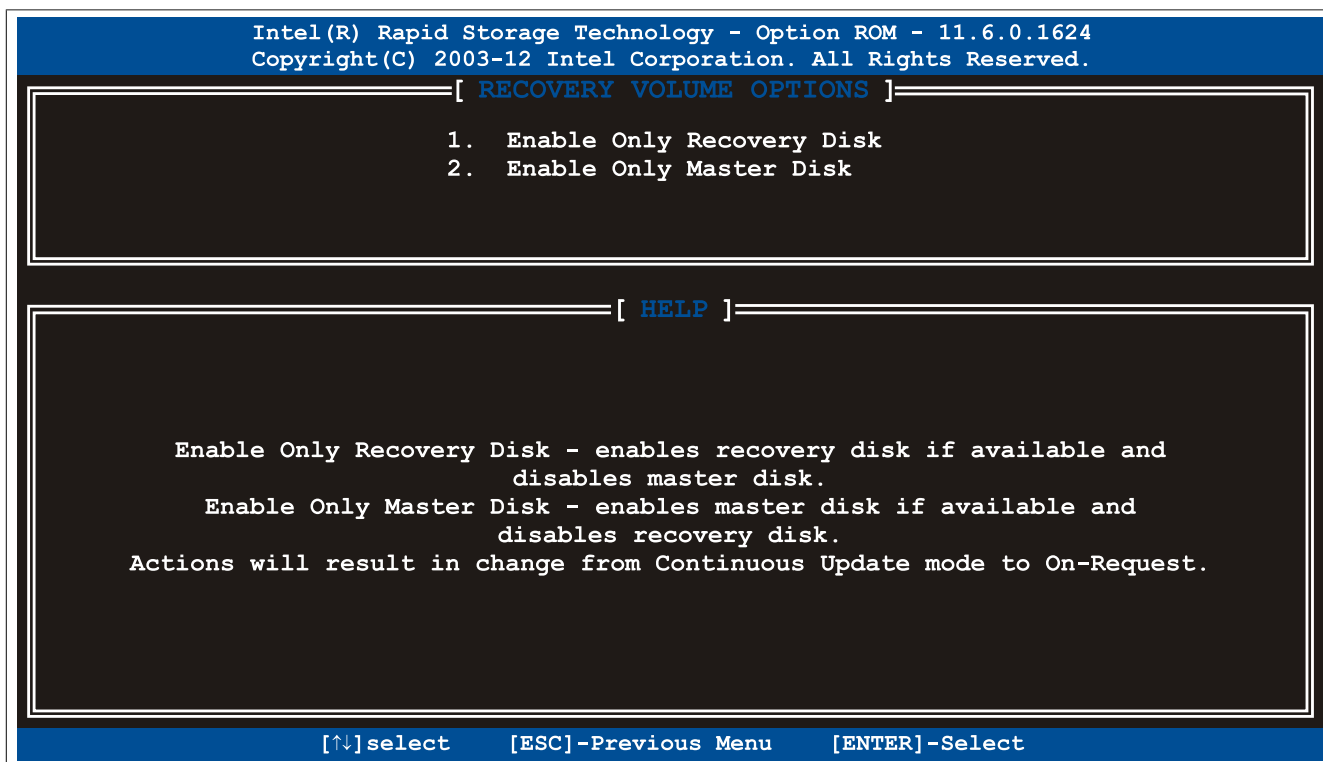


Figure 95: Configuration Utility - Recovery volume options (sample image)

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 with one 5PC900.TS77-xx **CPU** board 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 **USB** 2.0 transfer rate is limited to 150 Mbit/s with SDL4.
- The SDL3/SDL4 transmitter constantly emulates a display using **EDID data** and hot plugging code; this 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
 - A connection has not yet been established between the SDL3/SDL4 link module and the SDL3/SDL4 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.
- The **Automation** PC 910 onboard DisplayPort **interface** only works in combination with **CPU** board 5PC900.TS17-0x beginning with the following revisions:
 - 5PC910.SX01-00 ≥ Rev. I7
 - 5PC910.SX02-00 ≥ Rev. H7
 - 5PC910.SX05-00 ≥ Rev. G7

Chapter 4 • Software

1 BIOS options

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 nonvolatile and remains stored on the B&R industrial PC for a certain amount of time even when the power is switched off (no 24 VDC power 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".

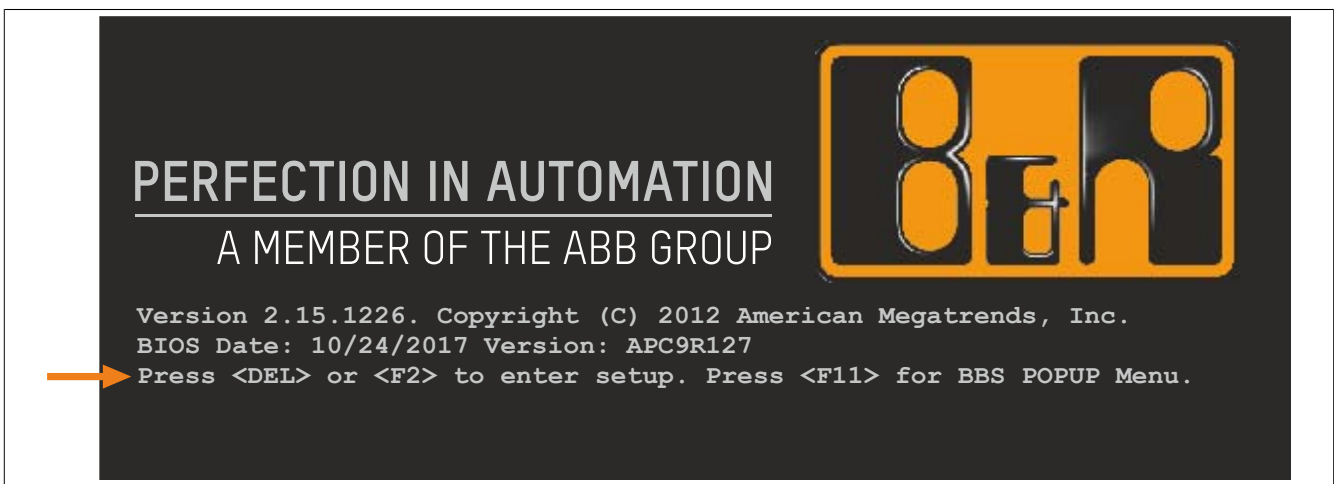


Figure 96: Bootscreen

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.

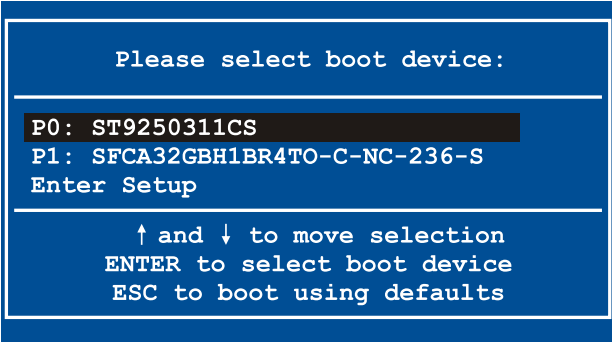
Keys	Function
Del, F2	Opens the main BIOS Setup screen
F12	Network boot
F11	Opens the boot menu. This lists all bootable devices that are connected to the system. Selecting a device with cursor ↑, cursor ↓ and then pressing <ENTER> will boot from that device .
	
<Pause>	Pauses POST . Pressing any other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

Table 201: 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 202: BIOS-relevant keys

1.3 BIOS TS77

Information:

The following diagrams, BIOS menu items and their descriptions refer to BIOS version 1.27. 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.

1.3.1 Main

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

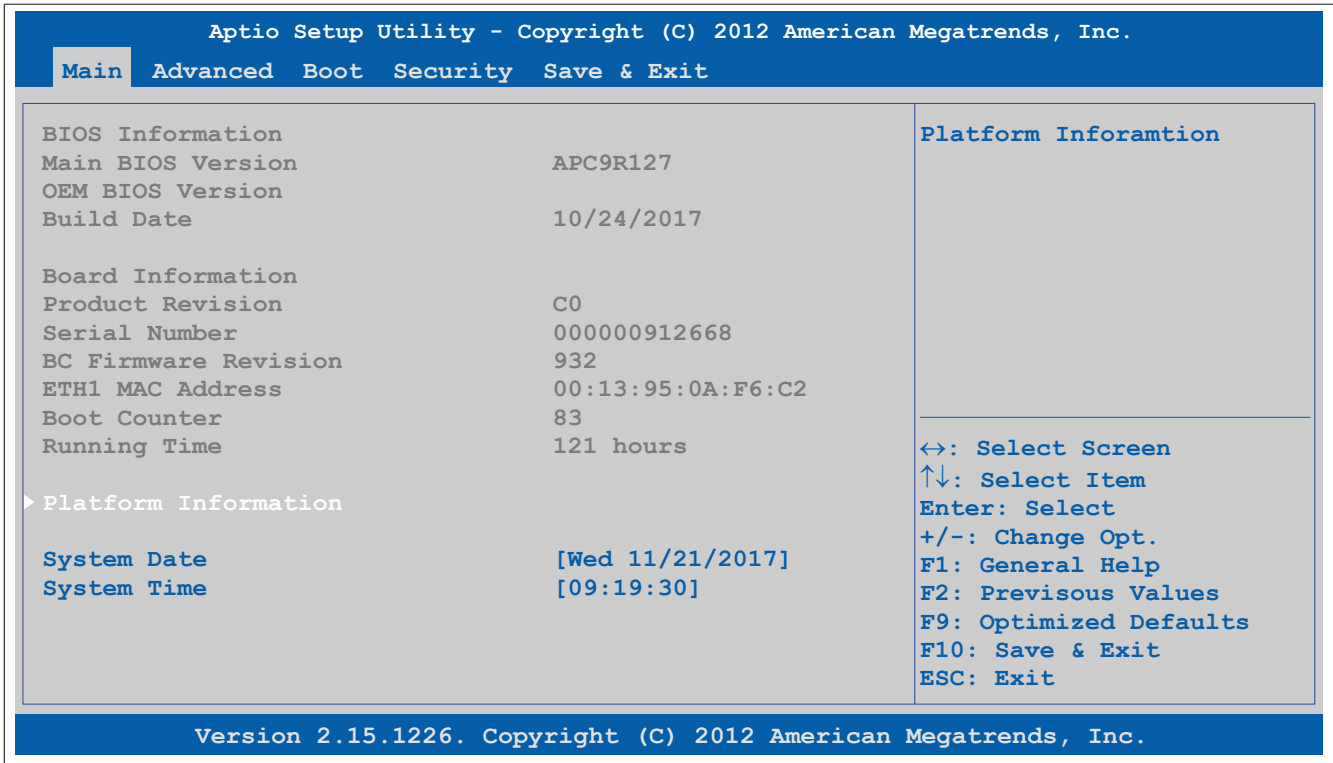


Figure 97: Main

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 318.
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 203: Main - Configuration options

1.3.1.1 Platform information

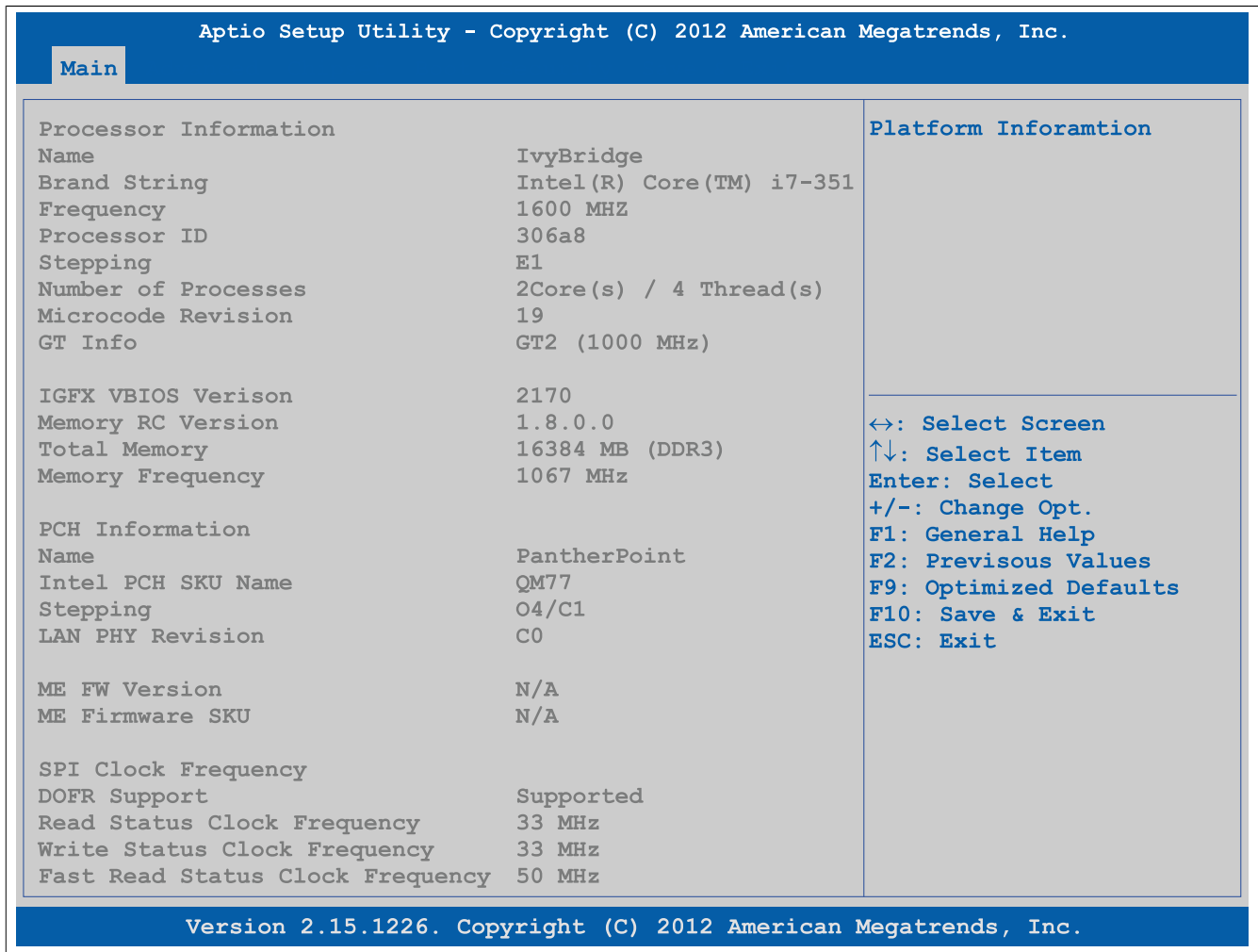


Figure 98: Main - Platform Information

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 204: Main - Platform information - Overview

1.3.2 Advanced

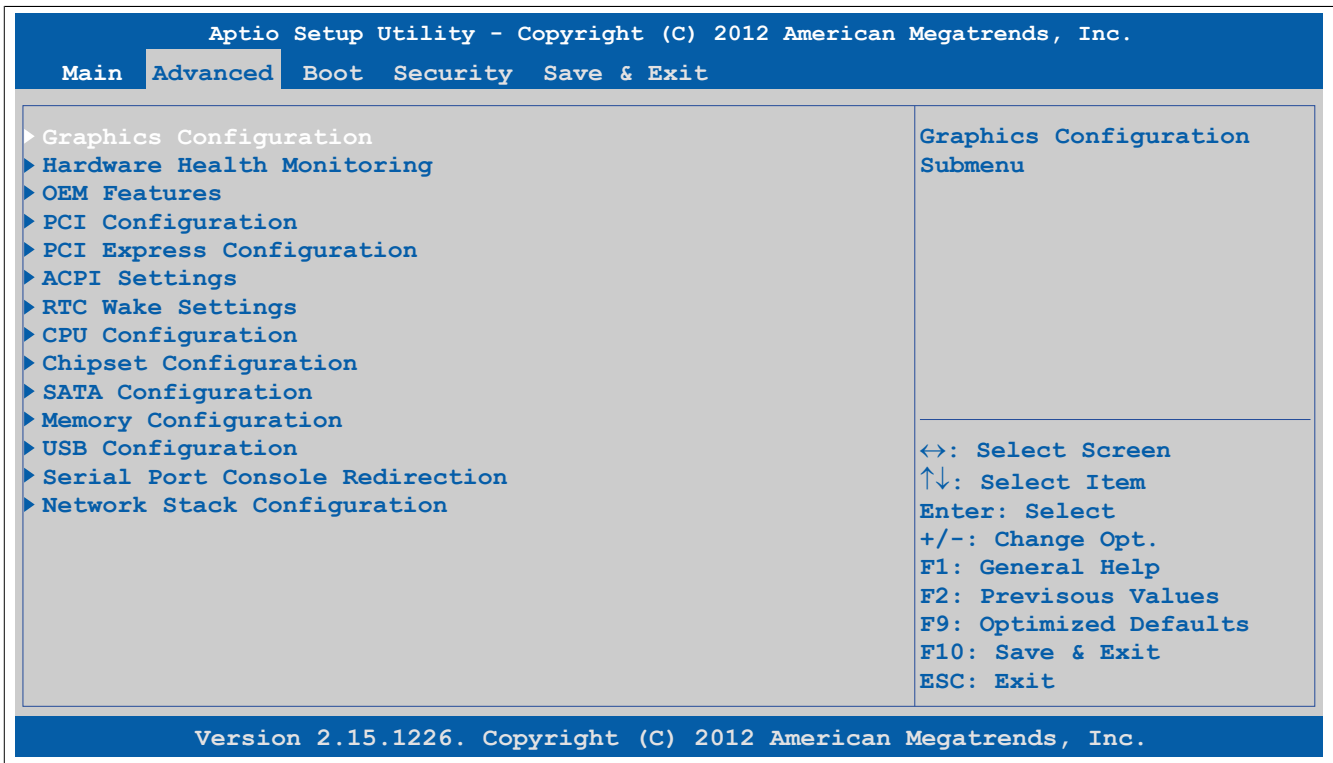


Figure 99: Advanced Übersicht

BIOS setting	Function	Configuration options	Effect
Graphics configuration	Configures graphics settings	Enter	Opens this submenu See "Graphics configuration" on page 251.
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 253.
OEM features	Configures OEM features	Enter	Opens this submenu See "OEM features" on page 254.
PCI configuration	Configures PCI devices	Enter	Opens this submenu See "PCI configuration" on page 275.
PCI express configuration	Configures PCI Express devices	Enter	Opens this submenu See "PCI express configuration" on page 277.
ACPI settings	Configures ACPI settings	Enter	Opens this submenu See "ACPI settings" on page 283.
RTC wake settings	Configures the start time when switched off	Enter	Opens this submenu See "RTC wake settings" on page 284.
CPU configuration	Configures CPU settings	Enter	Opens this submenu See "CPU configuration" on page 285.
Chipset configuration	Configures chipset settings	Enter	Opens this submenu See "Chipset configuration" on page 288.
SATA configuration	Configures SATA settings	Enter	Opens this submenu See "SATA configuration" on page 290.
Memory configuration	Configures main memory settings	Enter	Opens this submenu See "Memory configuration" on page 293.
USB configuration	Configures USB settings	Enter	Opens this submenu See "USB configuration" on page 296.
Serial port console redirection	Configures the remote console	Enter	Opens this submenu See "Serial port console redirection" on page 299.
Network stack configuration	Configures the UEFI network stack	Enter	Opens this submenu See "Network stack configuration" on page 301.

Table 205: Advanced - Overview

1.3.2.1 Graphics configuration

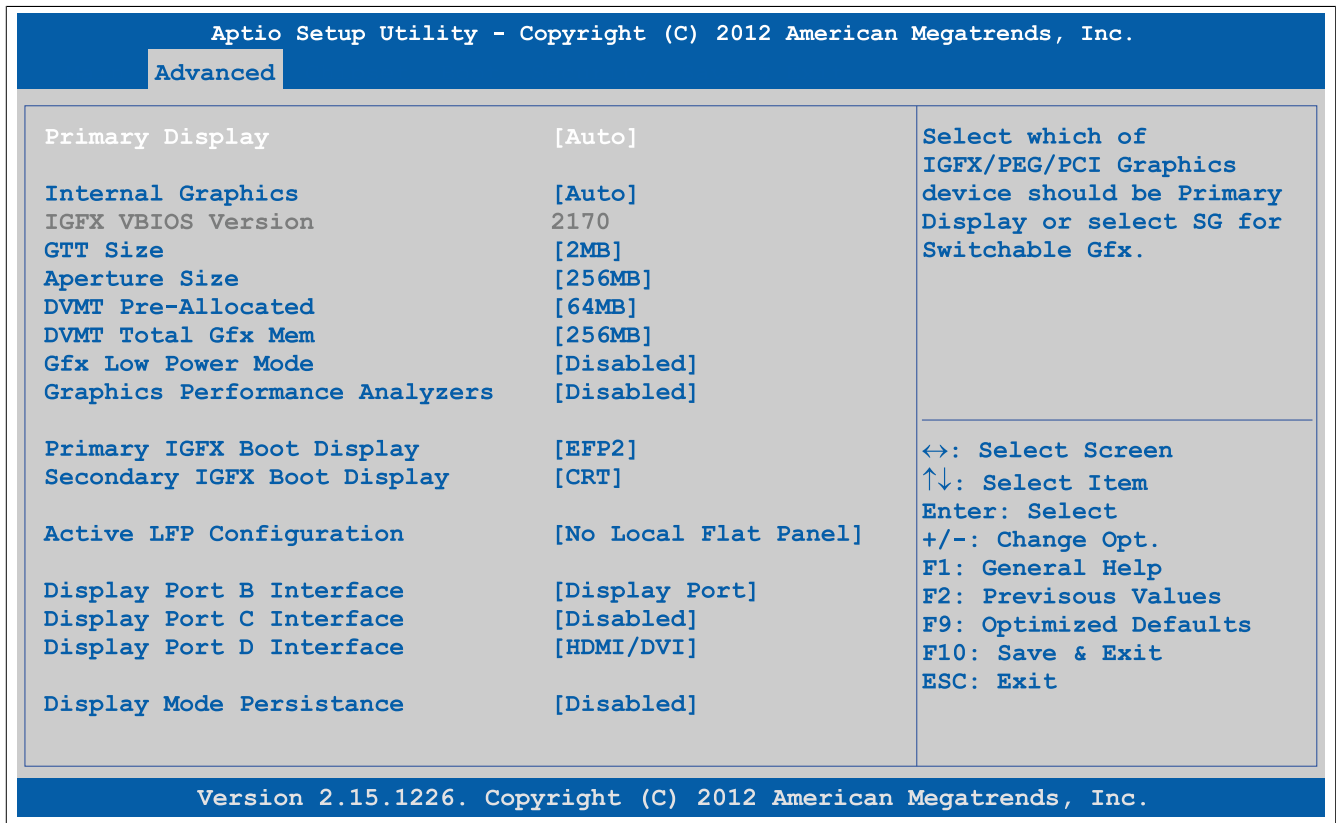


Figure 100: Advanced - Graphics Configuration

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
<p>Information: This option can only be used for SFF.</p>			
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 206: Advanced - Graphics configuration options

BIOS setting	Function	Configuration options	Effect
	<p>Information:</p> <p>The numbering of EFP occurs dynamically depending on the DisplayPort interface (B/C/D).</p>	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	Disabled	Disables this function. Only shows POST on one display.
	<p>Information:</p> <p>The numbering of EFP occurs dynamically depending on the DisplayPort interface (B/C/D).</p> <p>Information:</p> <p>After the BIOS boot screen, nothing more is shown on this display until the graphics driver is reloaded by the operating system.</p>	CRT	Uses the CRT (cathode ray tube) channel
		LFP	Uses the LFP (local flat panel) channel
		EFP	Uses the EFP (external flat panel) channel
		EFP2	Uses the EFP2 (external flat panel 2) channel
		EFP3	Uses the EFP3 (external flat panel 3) channel
Active LFP configuration	Option for selecting the active LFP (local flat panel) channel	No local flat panel	Does not use the LVDS channel
	<p>Information:</p> <p>This option has no effect on the Automation PC 910.</p>	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
		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
		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
		DisplayPort	Configures the monitor/panel interface as a DisplayPort 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 206: Advanced - Graphics configuration options

1.3.2.2 Hardware health monitoring

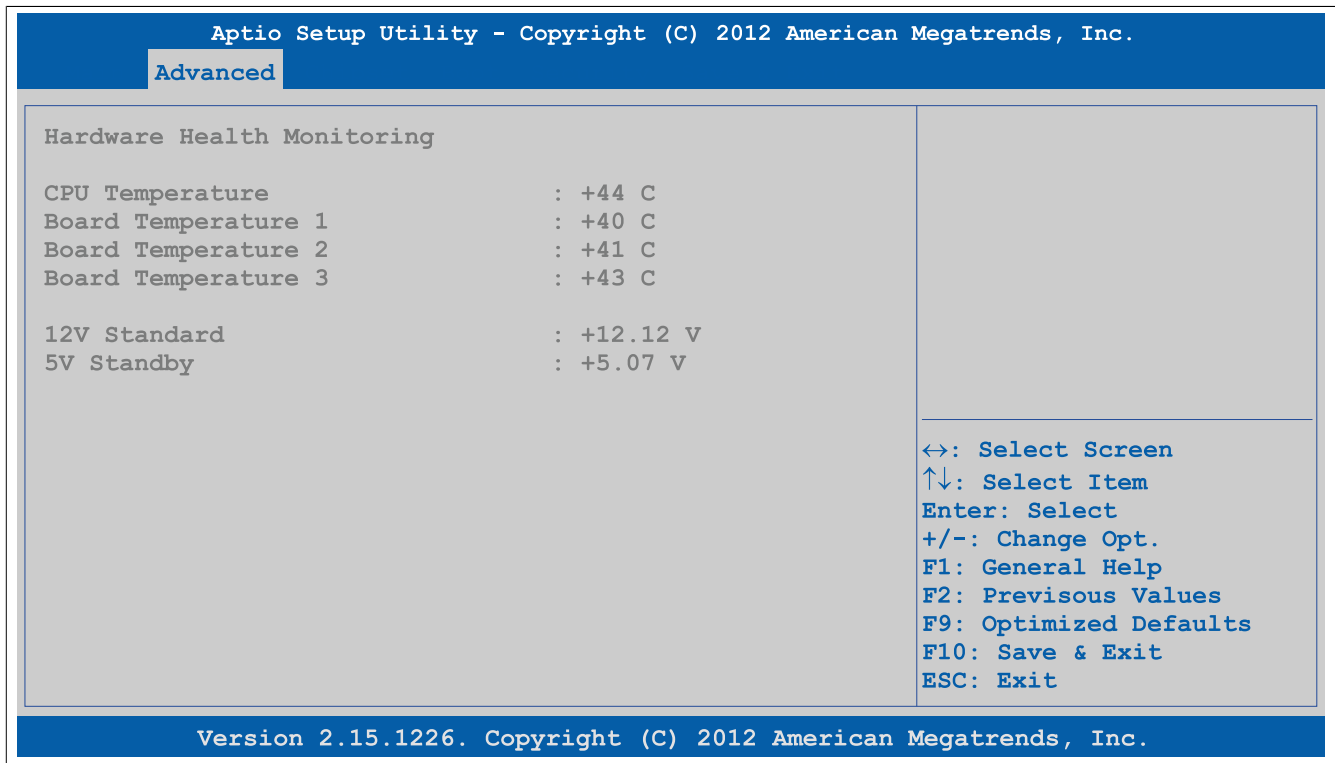


Figure 101: Advanced - Hardware Health Monitoring

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 207: Advanced - Hardware health monitoring

1.3.2.3 OEM features

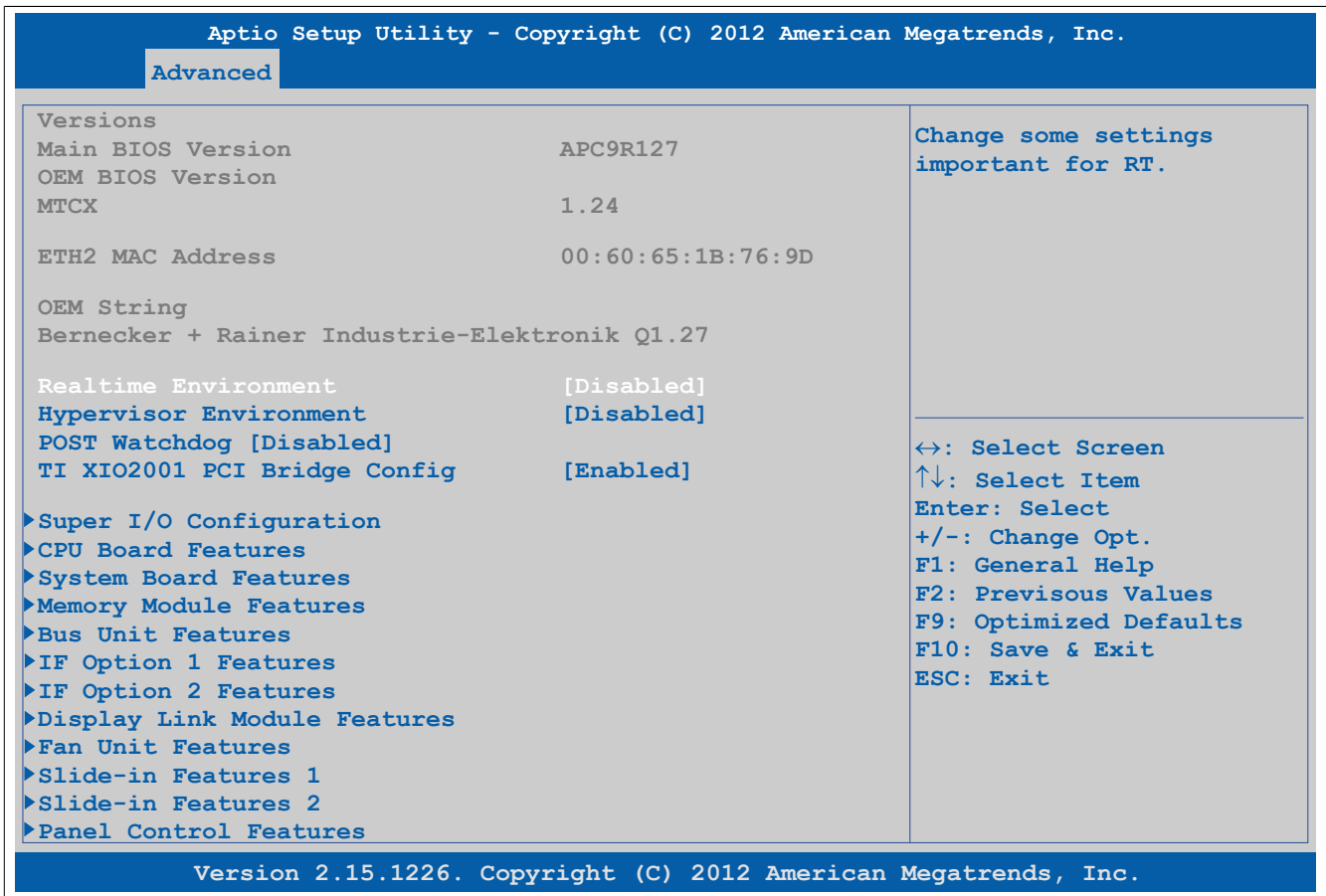


Figure 102: Advanced - OEM Features

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.
Hypervisor environment	This option configures settings for hypervisor operation.	Disabled	Disables this function.
		Enabled	Enables the settings necessary for hypervisor operation, such as Intel Virtualization Technology and VT-d.
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			
TI XIO2001 PCI bridge config	This option is only visible if a bus unit with PCI slot is present in the system and configures the PCIe to PCI bridge on it.	Enabled	Enables this function.
		Disabled	Disables this function.
Super I/O configuration	Configures special interface settings	Enter	Opens this submenu See "Super I/O configuration" on page 255.
CPU board features	Displays device-specific information for the CPU board	Enter	Opens this submenu See "CPU board features" on page 256.
System board features	Displays device-specific information for the system unit	Enter	Opens this submenu See "System board features" on page 258.
Memory module features	Displays device-specific information for the main memory	Enter	Opens this submenu See "Memory module features" on page 261.
Bus unit features	Displays device-specific information for the bus unit	Enter	Opens this submenu See "Bus unit features" on page 262.
IF option 1 features ¹⁾	Displays device-specific information for interface option 1	Enter	Opens this submenu See "IF option 1 features" on page 263.

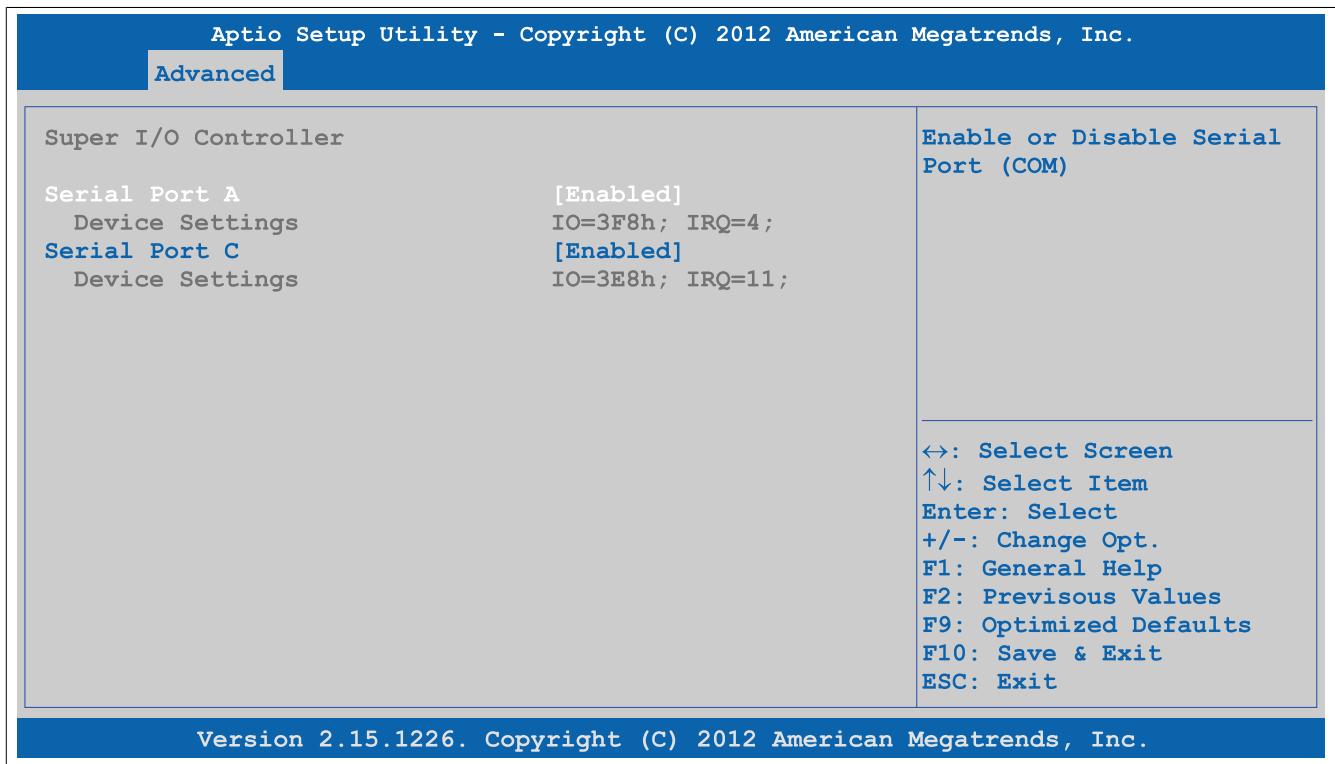
Table 208: Advanced - OEM features screen

BIOS setting	Function	Configuration options	Effect
IF option 2 features ¹⁾	Displays device-specific information for interface option 2	Enter	Opens this submenu See "IF option 2 features" on page 265.
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 266.
Fan unit features ²⁾	Displays device-specific information for the fan kit	Enter	Opens this submenu See "Fan unit features" on page 268.
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 270.
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 272.
Panel control features	Displays device-specific information for the connected panel	Enter	Opens this submenu See "Panel control features" on page 273.

Table 208: 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.

1.3.2.3.1 Super I/O configuration



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Software

Figure 103: 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

Table 209: Advanced - OEM features - Super I/O configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
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 209: 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.

1.3.2.3.2 CPU board features



Figure 104: 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 257.

Table 210: Advanced - OEM features - CPU board features

Temperature values

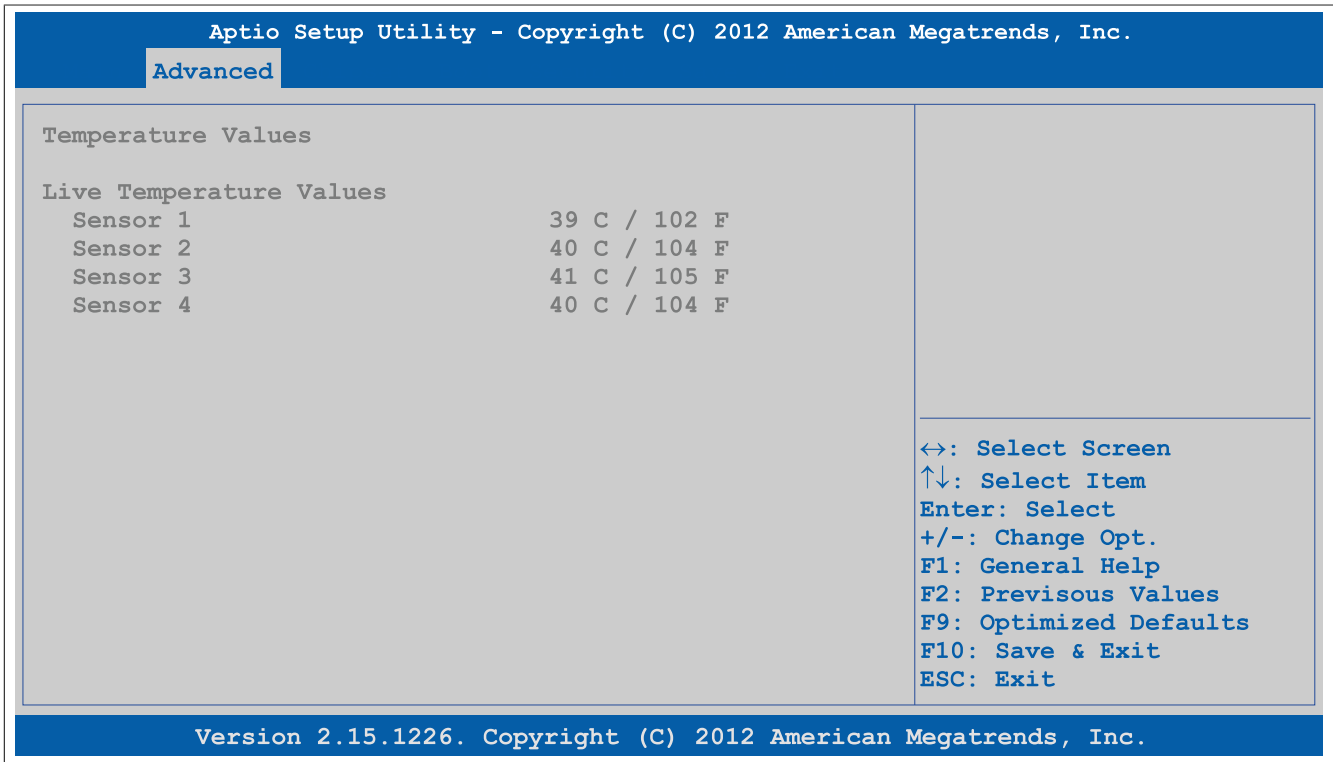


Figure 105: Advanced - OEM Features - CPU Board Features - Temperature Values

BIOS setting	Function	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (board controller) in °C and °F for TS77.	None	-
Sensor 2	Displays the current temperature of sensor 2 (CPU) in °C and °F for TS77.	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 211: 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.

1.3.2.3.3 System board features



Figure 106: 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 259.
Temperature values	Displays current temperature values	Enter	Opens this submenu See " Temperature values " on page 259.
Voltage control	Displays current battery properties	Enter	Opens this submenu See " Voltage values " on page 260.

Table 212: Advanced - OEM features - System board features

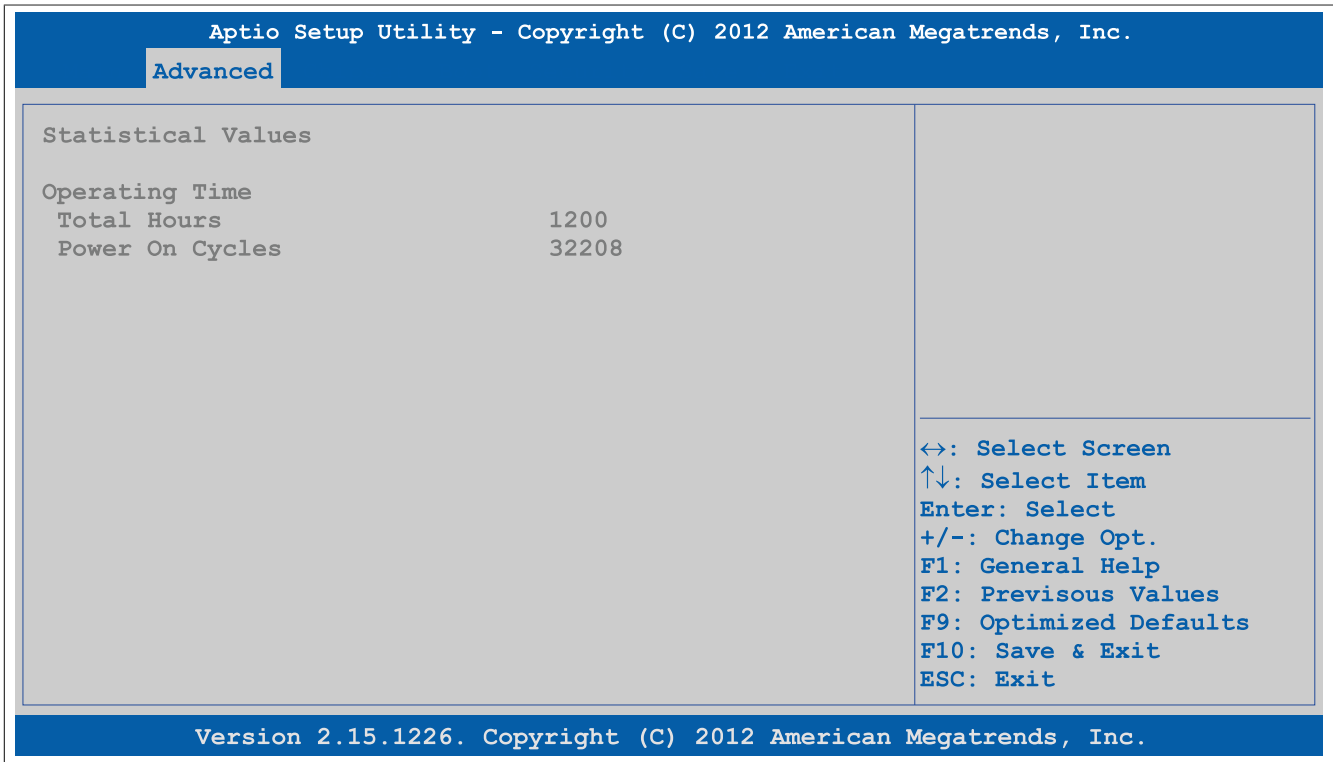
Statistical values

Figure 107: 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 213: Advanced - OEM features - System board features - Statistical values

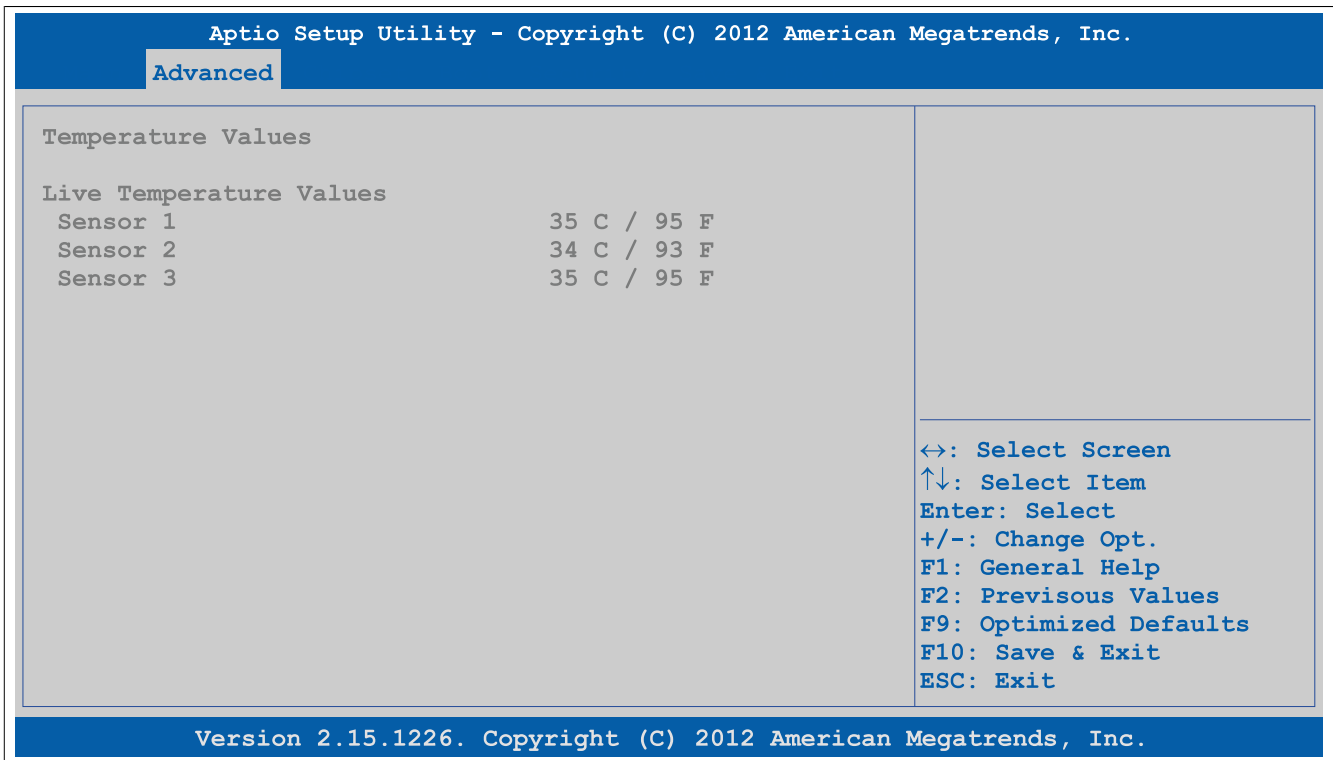
Temperature values

Figure 108: 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 214: Advanced - OEM features - System board features - Temperature values

Voltage values

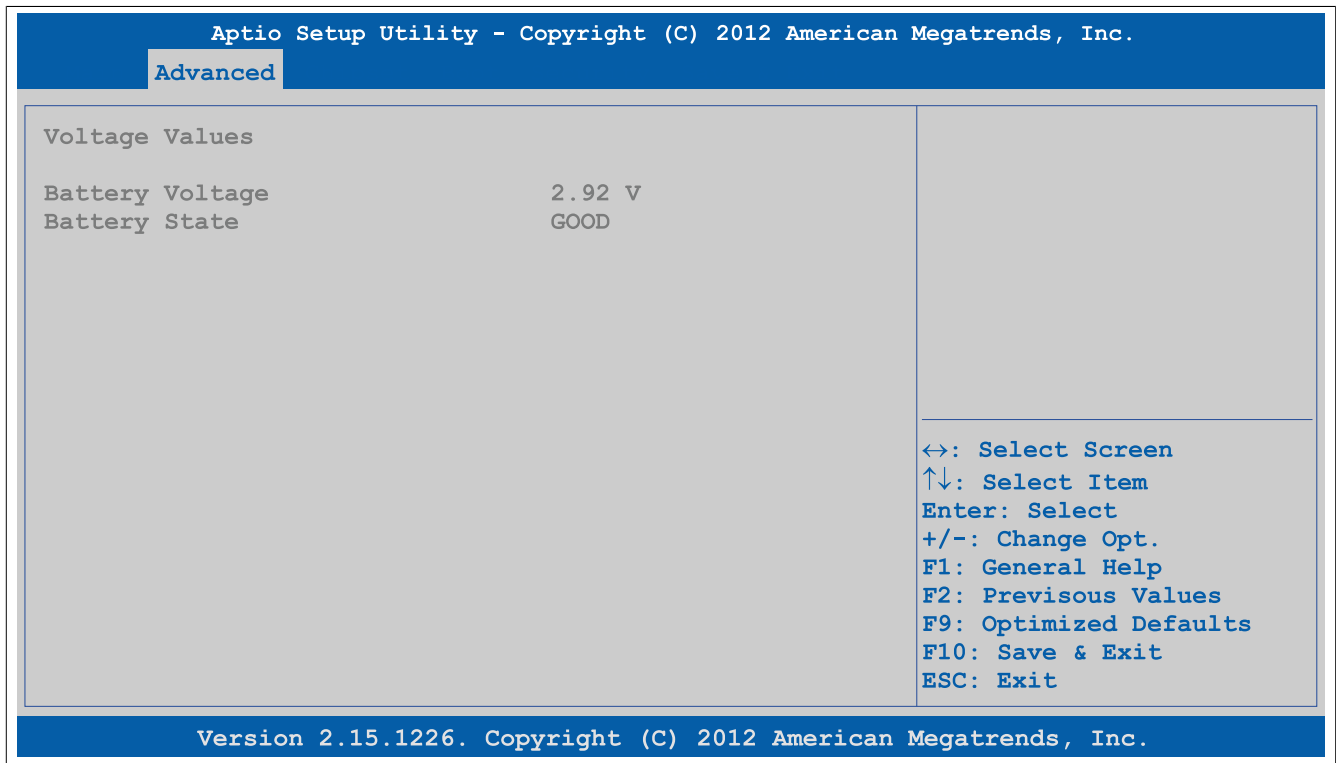


Figure 109: Advanced - OEM Features - System Board Features - Voltage Values

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

1.3.2.3.4 Memory module features

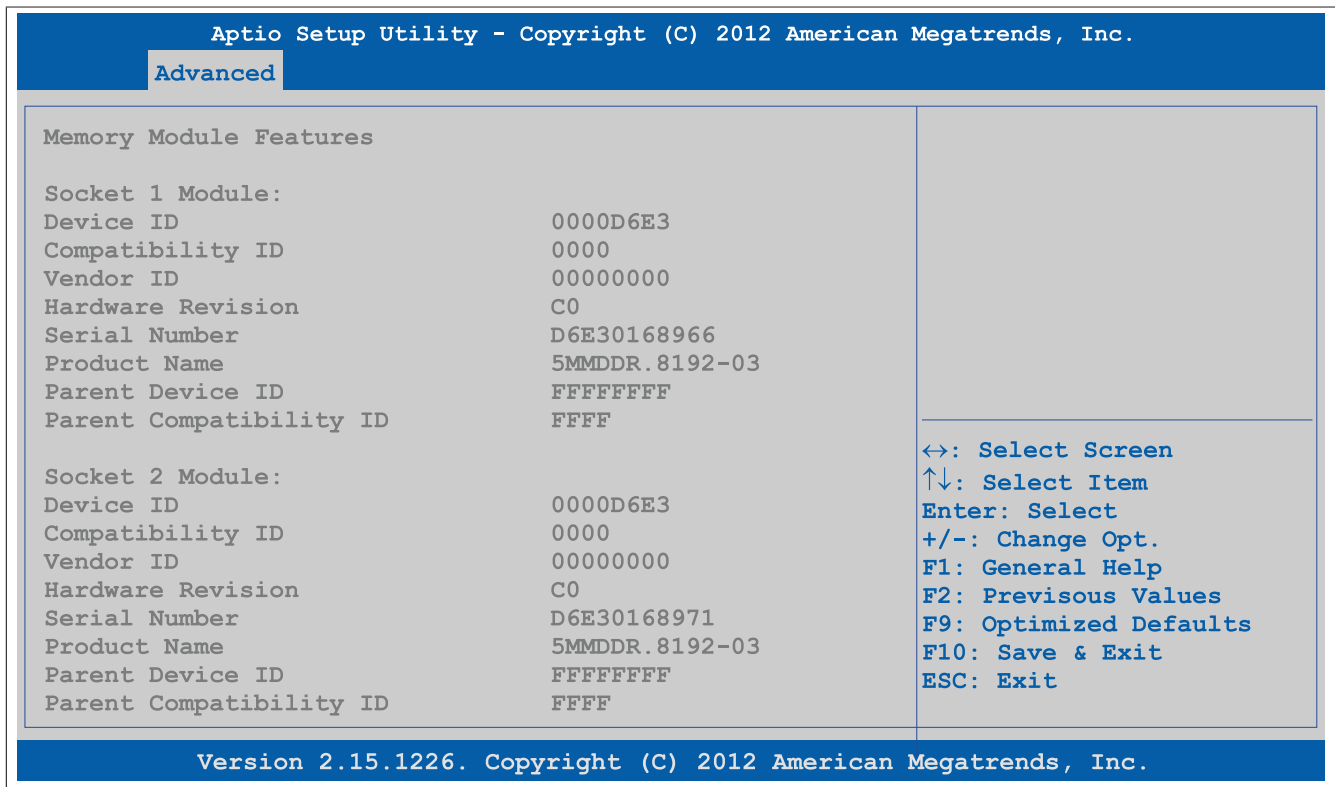


Figure 110: Advanced - OEM Features - Memory Module Features

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 216: Advanced - OEM features - Memory module features

1.3.2.3.5 Bus unit features

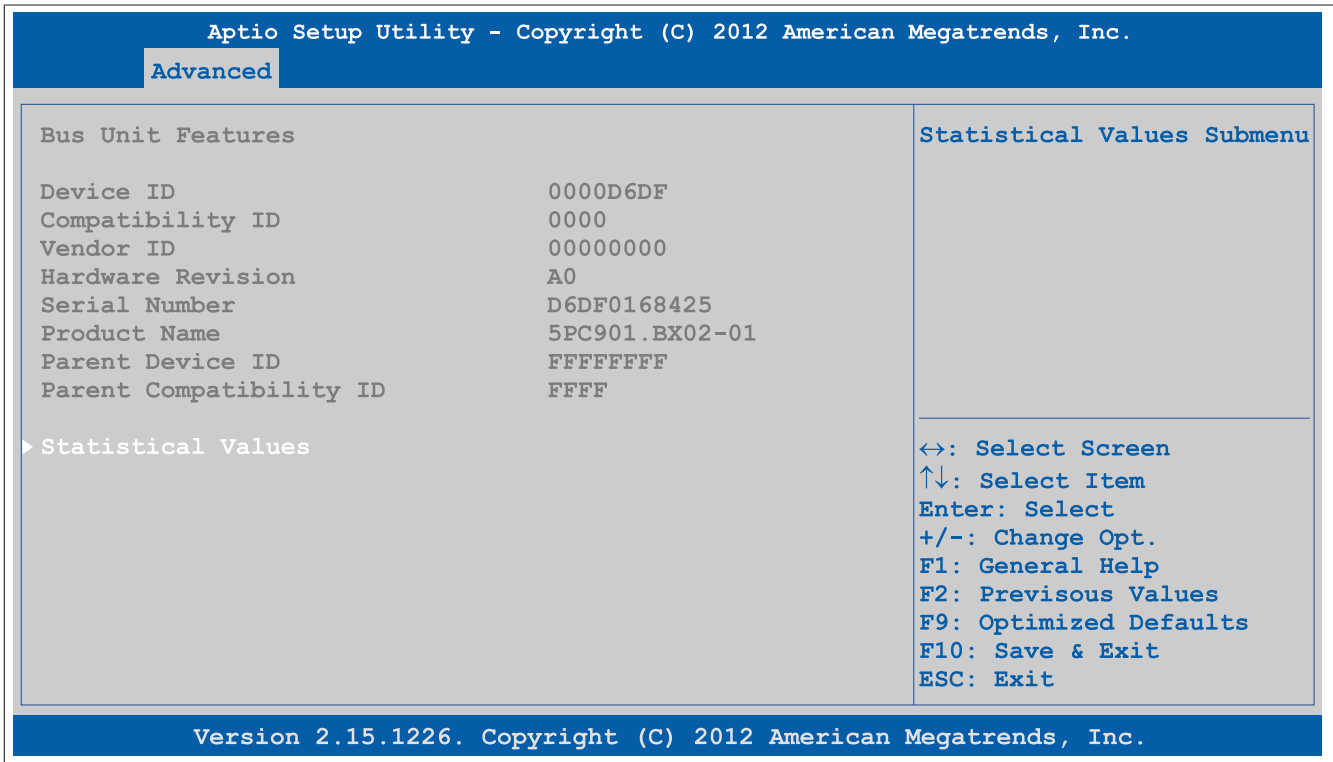


Figure 111: Advanced - OEM Features - Bus Unit Features

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 263.

Table 217: Advanced - OEM features - Bus unit features

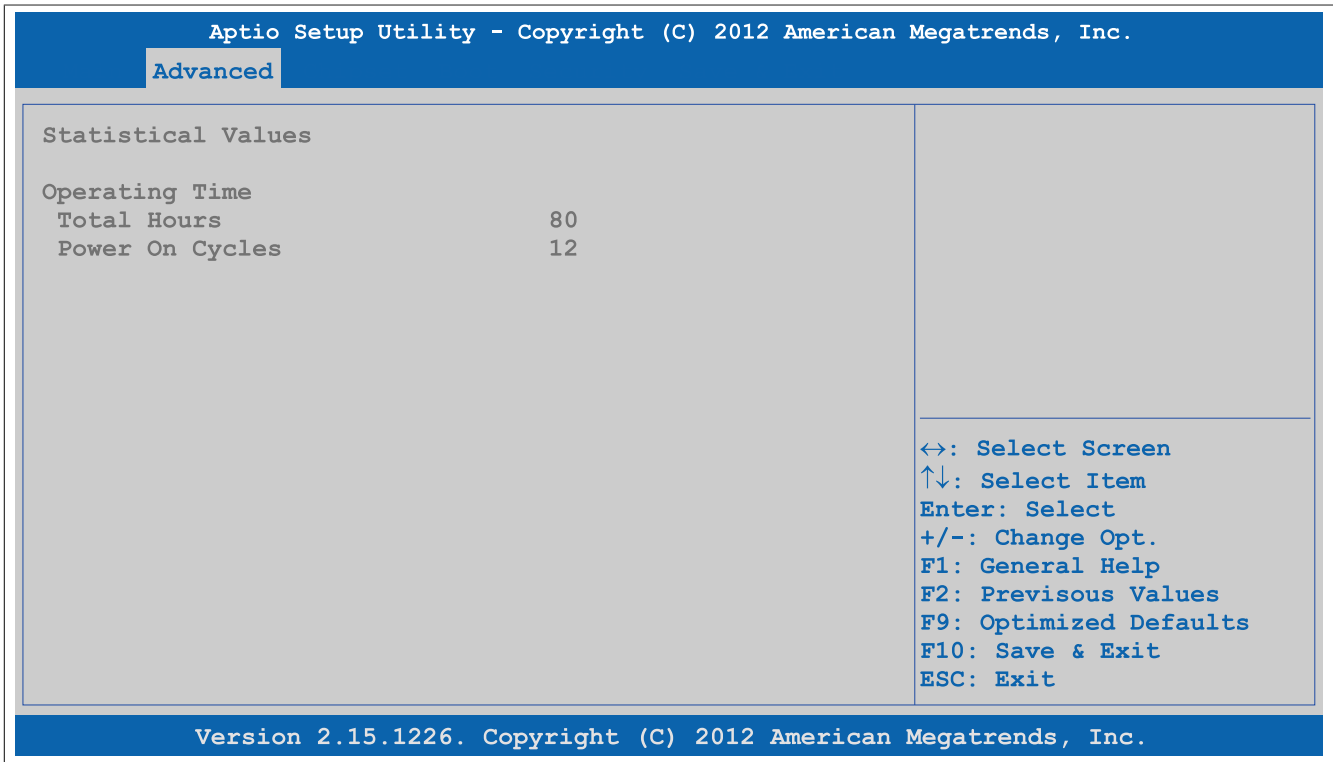
Statistical values

Figure 112: 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 218: Advanced - OEM features - Bus unit features - Statistical values

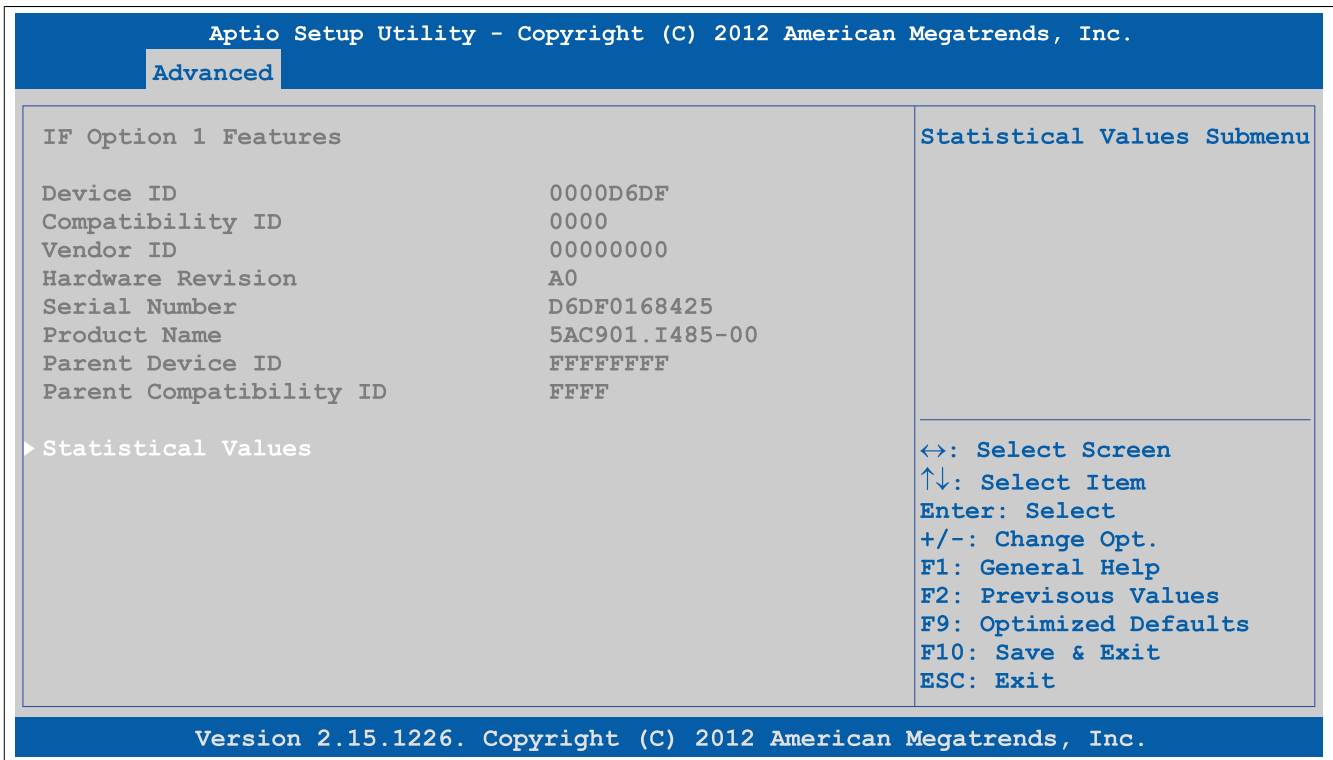
1.3.2.3.6 IF option 1 features

Figure 113: 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 264.

Table 219: Advanced - OEM features - IF option 1 features

Statistical values

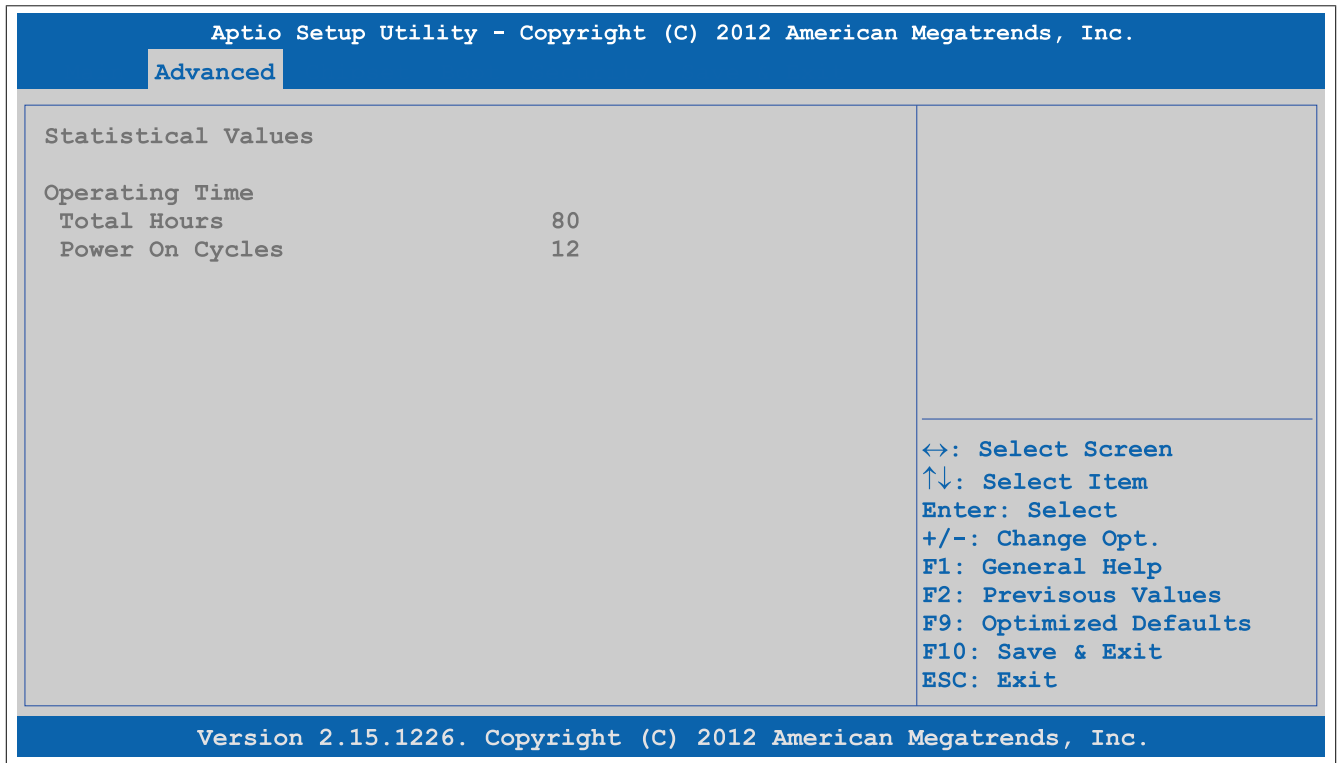


Figure 114: Advanced - OEM features - IF option 1 features - Statistical values

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

1.3.2.3.7 IF option 2 features

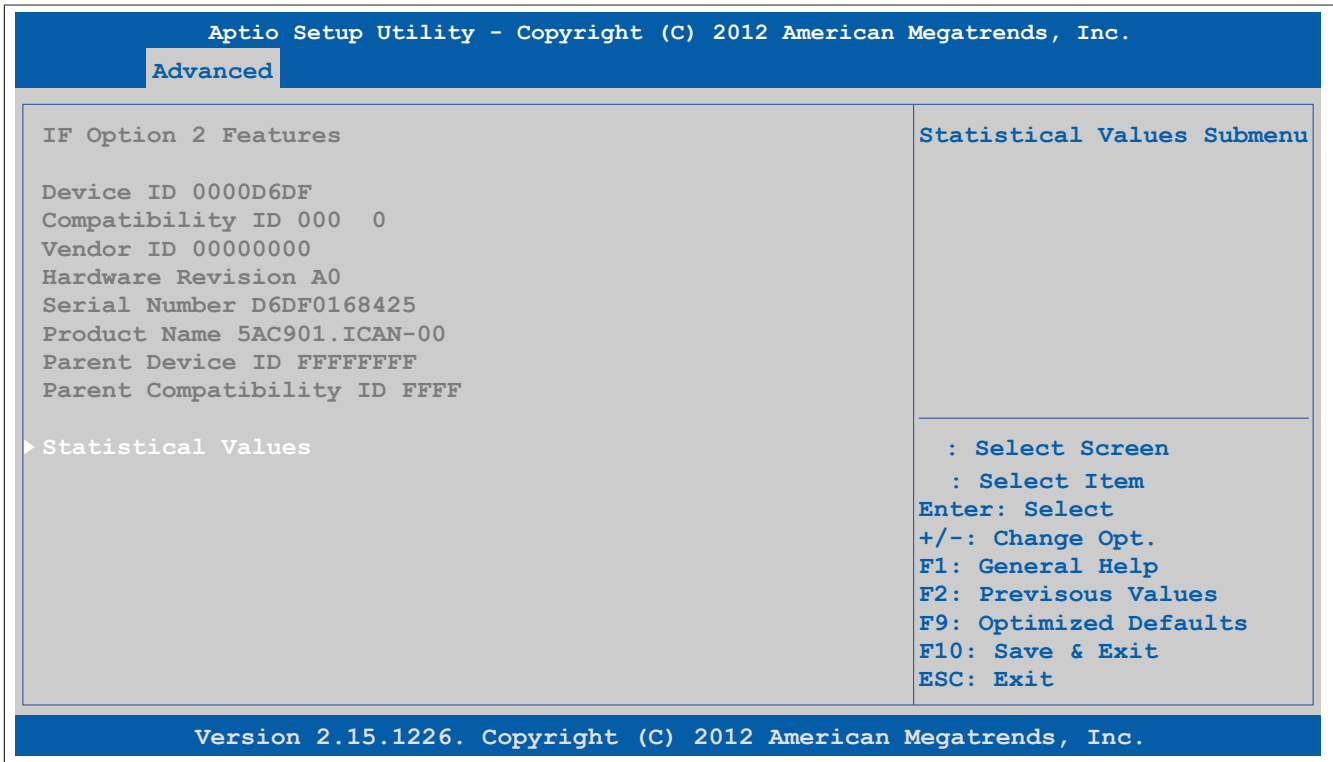


Figure 115: Advanced - OEM features - IF option 2 features

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 266.

Table 221: Advanced - OEM features - IF option 2 features

Statistical values

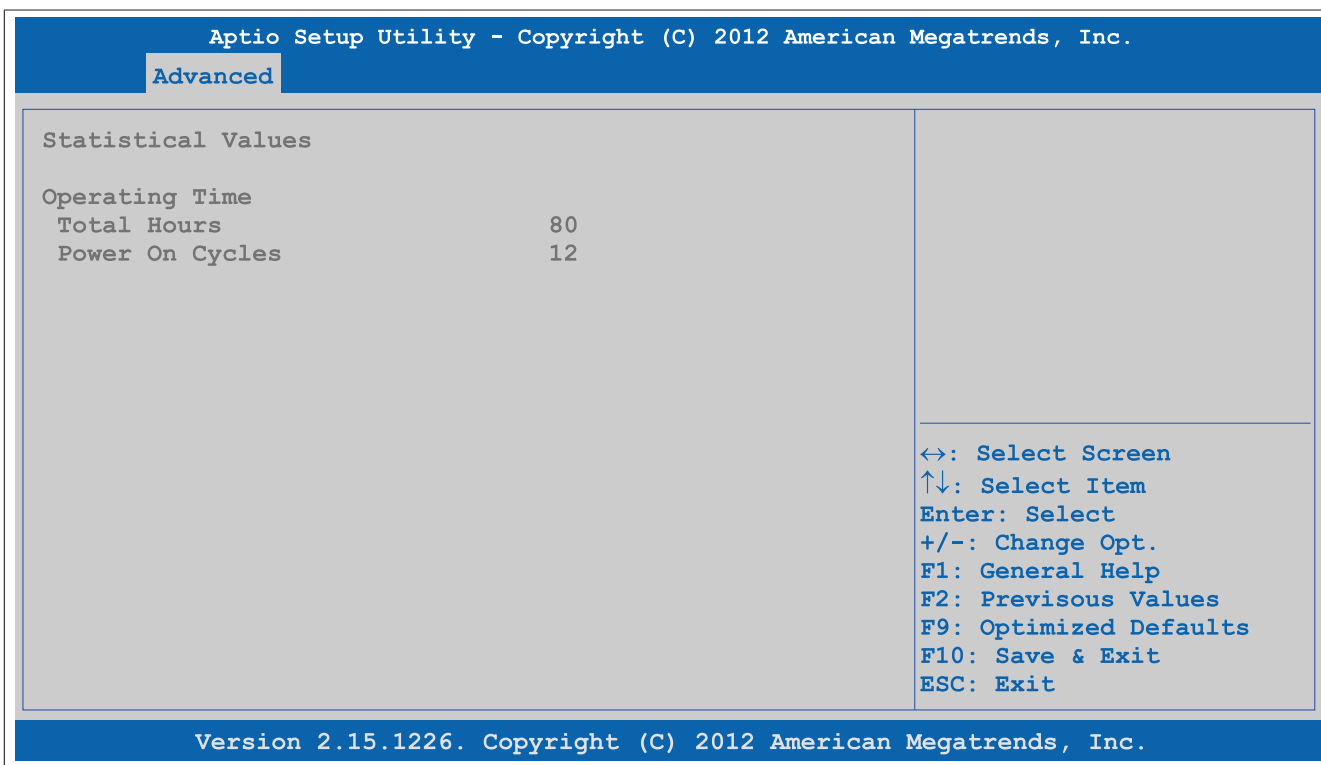


Figure 116: Advanced - OEM features - IF option 2 features - Statistical values

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

1.3.2.3.8 Display link module features



Figure 117: 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	-
Firmware version	Displays the firmware revision of the display link.	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 267.
Temperature values	Displays current temperature values	Enter	Opens this submenu See "Temperature values" on page 268.

Table 223: Advanced - OEM features - Display link module features

Statistical values

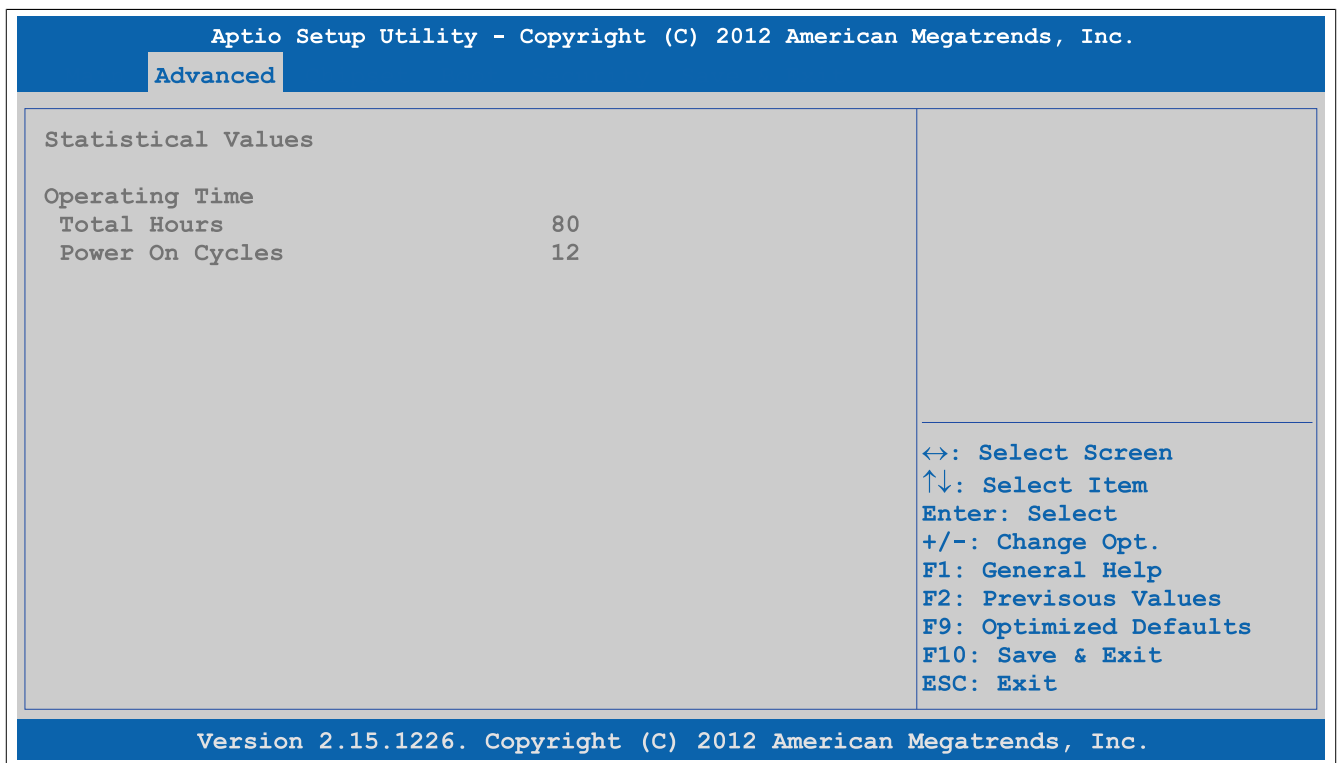


Figure 118: Advanced - OEM features - Display link module features - Statistical values

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

Temperature values

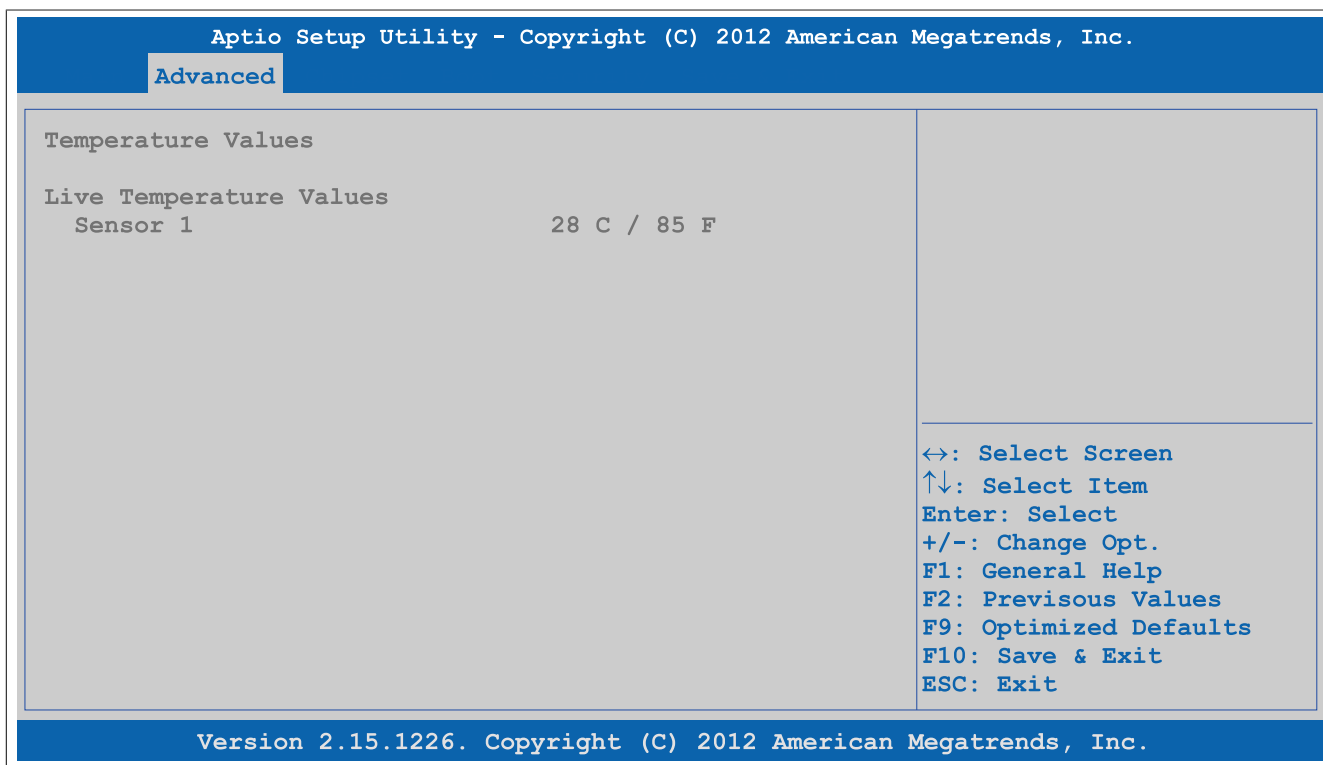


Figure 119: Advanced - OEM features - Display link module features - Temperature values

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

Table 225: Advanced - OEM features - Display link module features - Temperature values

1.3.2.3.9 Fan unit features



Figure 120: Advanced - OEM features - Fan unit features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the fan kit	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of the fan kit	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
Fan control	Option for setting the fan control Information: It is not possible for a manual fan setting to take effect when starting back up from S3 mode. The setting "Auto" is active.	Auto	Automatic fan control
		Minimum	Sets the minimum revolution speed. If the temperature increases, however, the fan adjusts its speed automatically to prevent critical temperatures from being exceeded.
		25%	Sets 25% of the maximum revolution speed
		50%	Sets 50% of the maximum revolution speed
		75%	Sets 75% of the maximum revolution speed
		Maximum	Sets the maximum revolution speed
Statistical values	Displays statistical values	Enter	Opens this submenu See "Statistical values" on page 269.
RPM values	Displays the speed (in rpm) of the individual fans in the fan kit	Enter	Opens this submenu See "RPM values" on page 270.

Table 226: Advanced - OEM features - Fan unit features

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
<u></u>: 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 121: 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 227: Advanced - OEM features - Fan unit features - Statistical values

RPM values

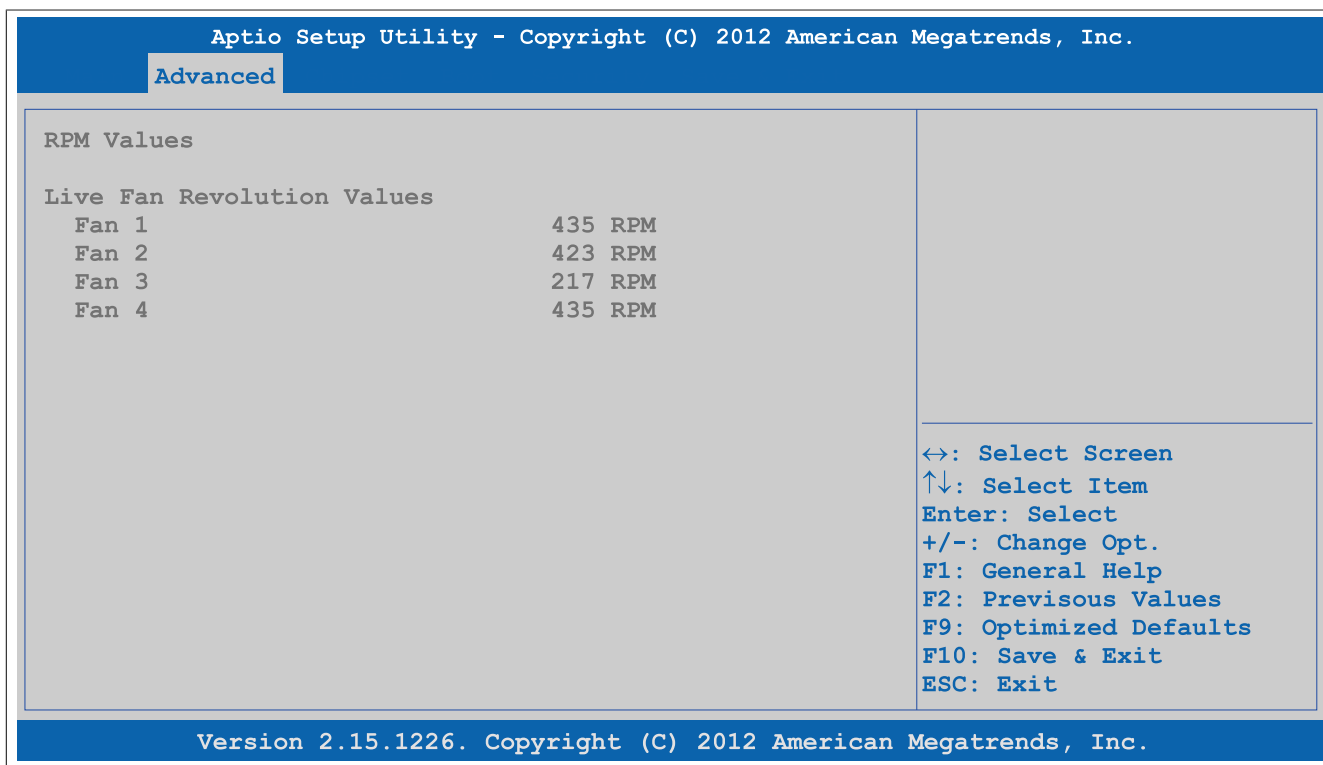


Figure 122: Advanced - OEM features - Fan unit features - RPM values

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

1.3.2.3.10 Slide-in 1 features



Figure 123: 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 271.

Table 229: Advanced - OEM features - Slide-in 1 features

Temperature values

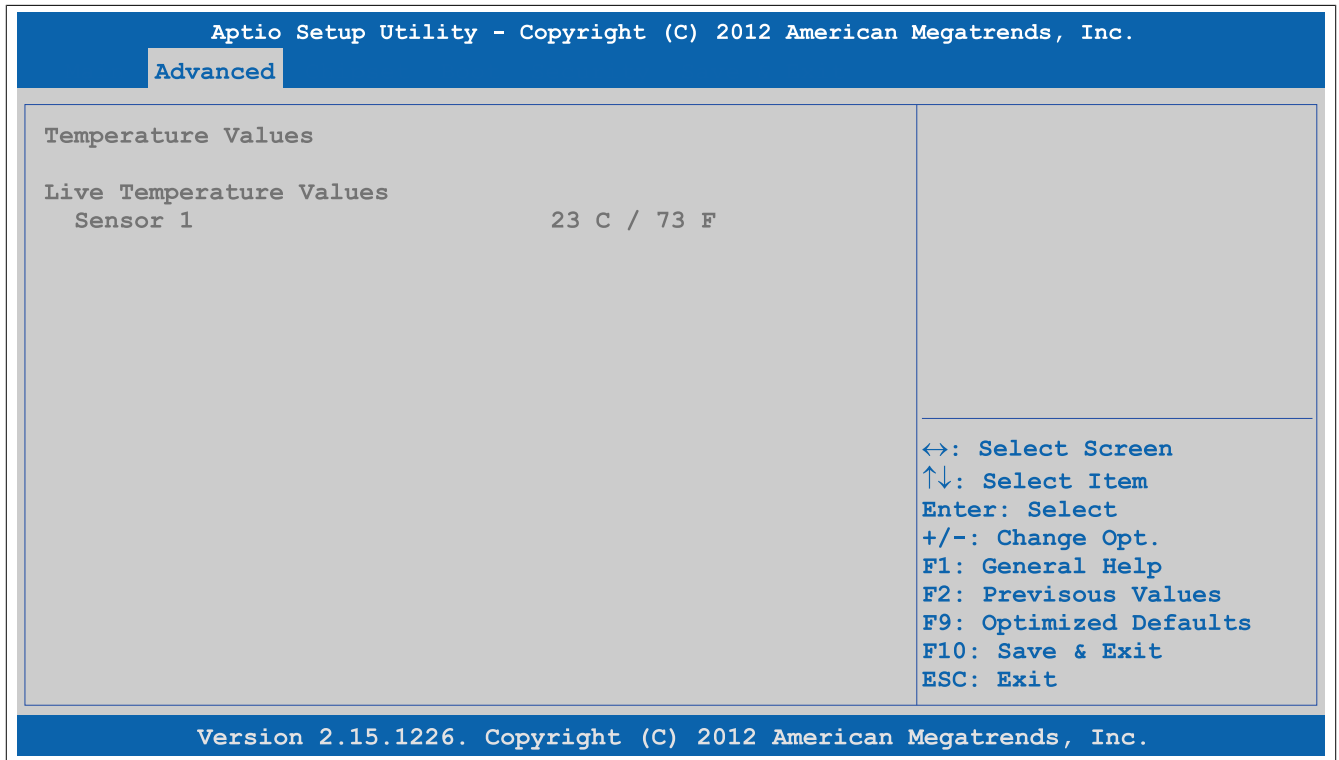


Figure 124: Advanced - OEM features - Slide-in 1 features - Temperature values

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

1.3.2.3.11 Slide-in 2 features

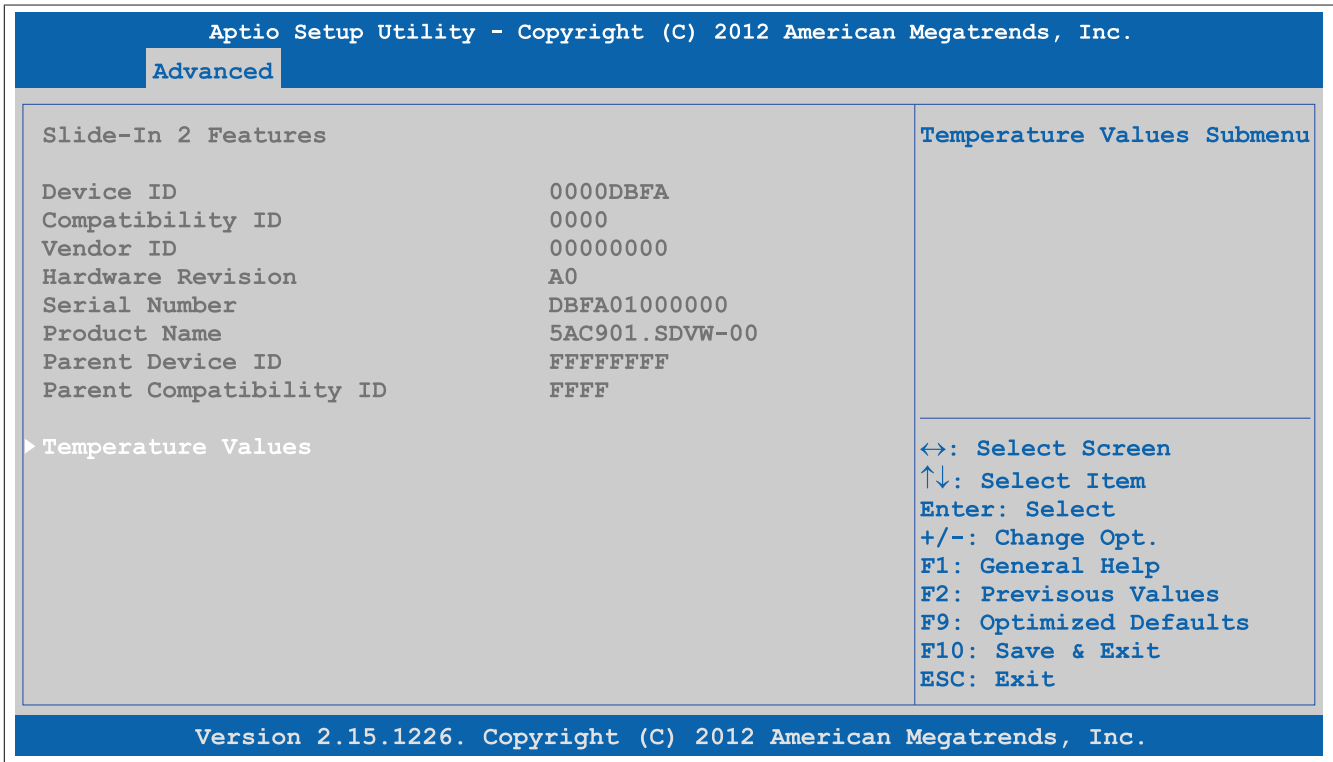


Figure 125: Advanced - OEM features - Slide-in 2 features

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 273.

Table 231: Advanced - OEM features - Slide-in 2 features

Temperature values

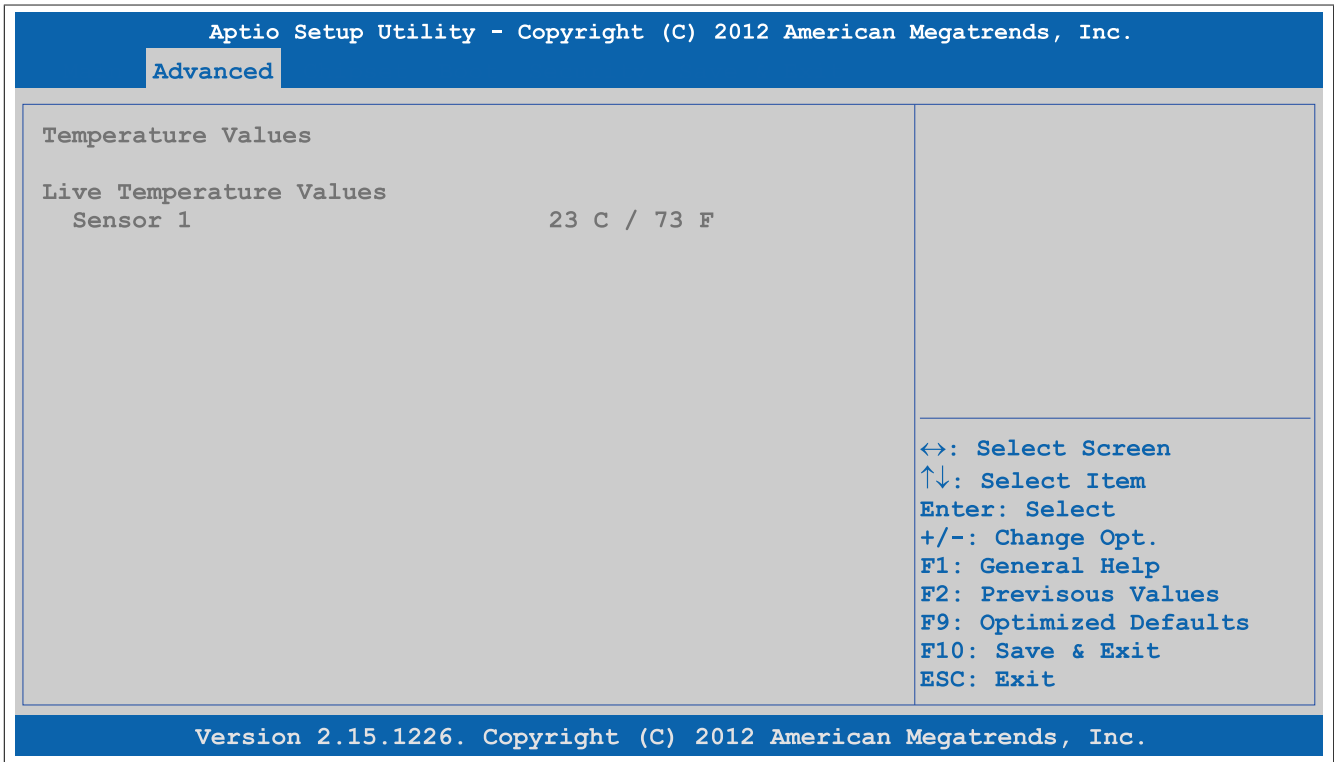


Figure 126: Advanced - OEM features - Slide-in 2 features - Temperature values

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 232: Advanced - OEM features - Slide-in 2 features - Temperature values

1.3.2.3.12 Panel control features

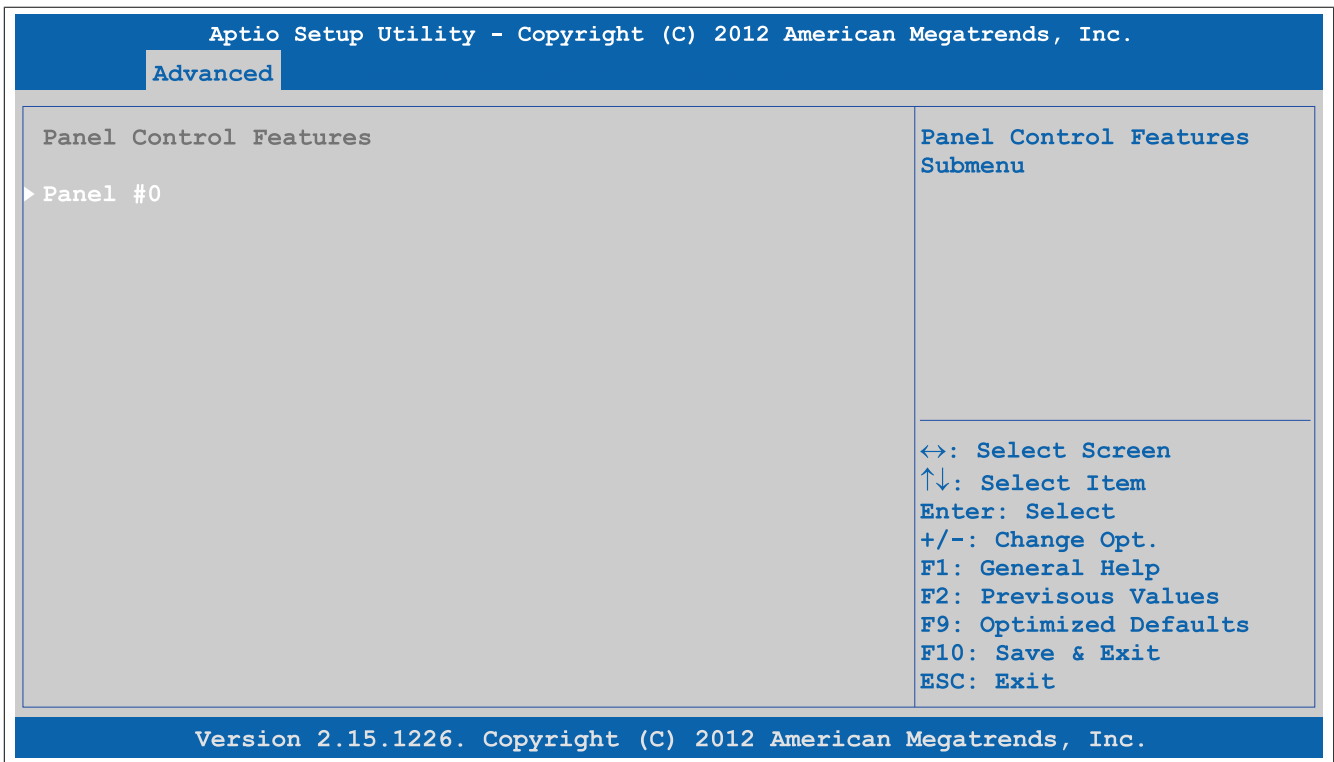


Figure 127: Advanced - OEM Features - Panel Control Features

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 274.

Table 233: Advanced - OEM features - Panel control features

Panel #X

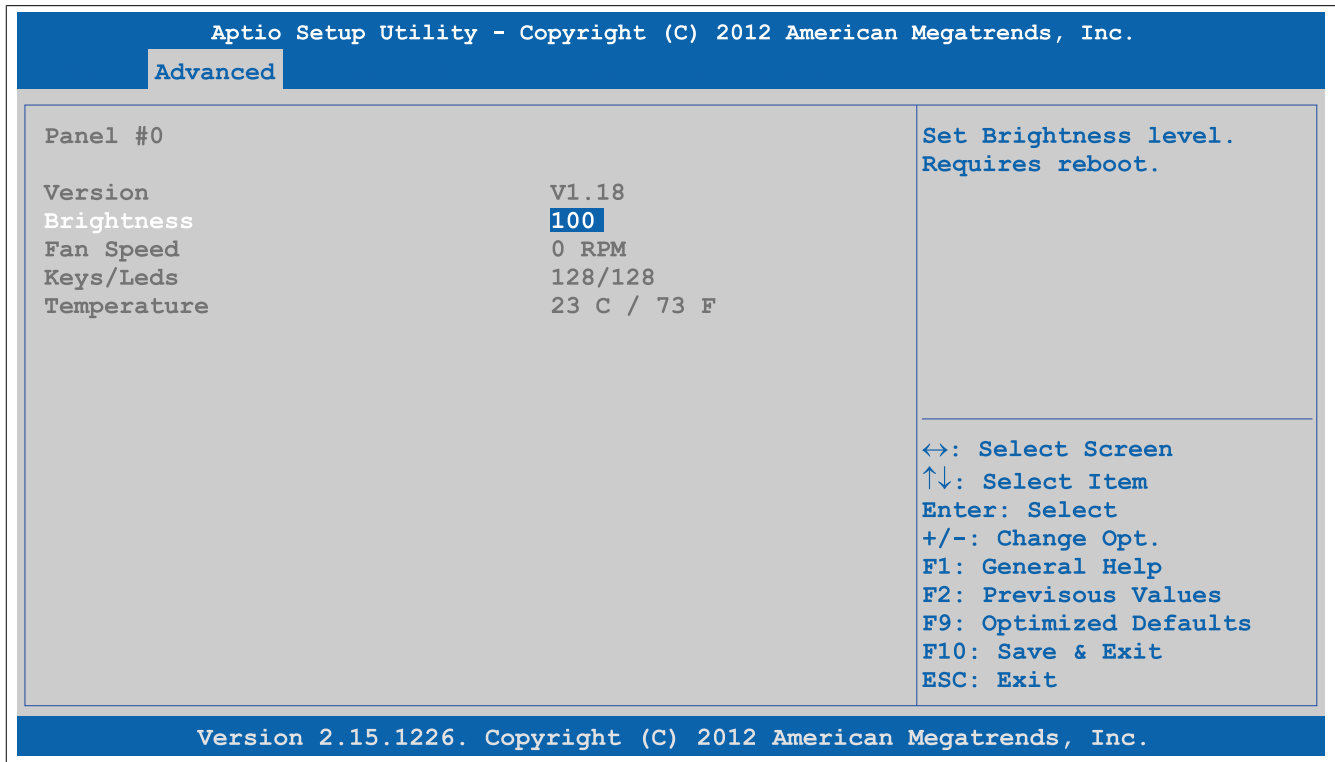


Figure 128: Advanced - OEM Features - Panel Control Features - Panel #x

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 234: Advanced - OEM features - Panel control features - Panel #X

1.3.2.4 PCI configuration

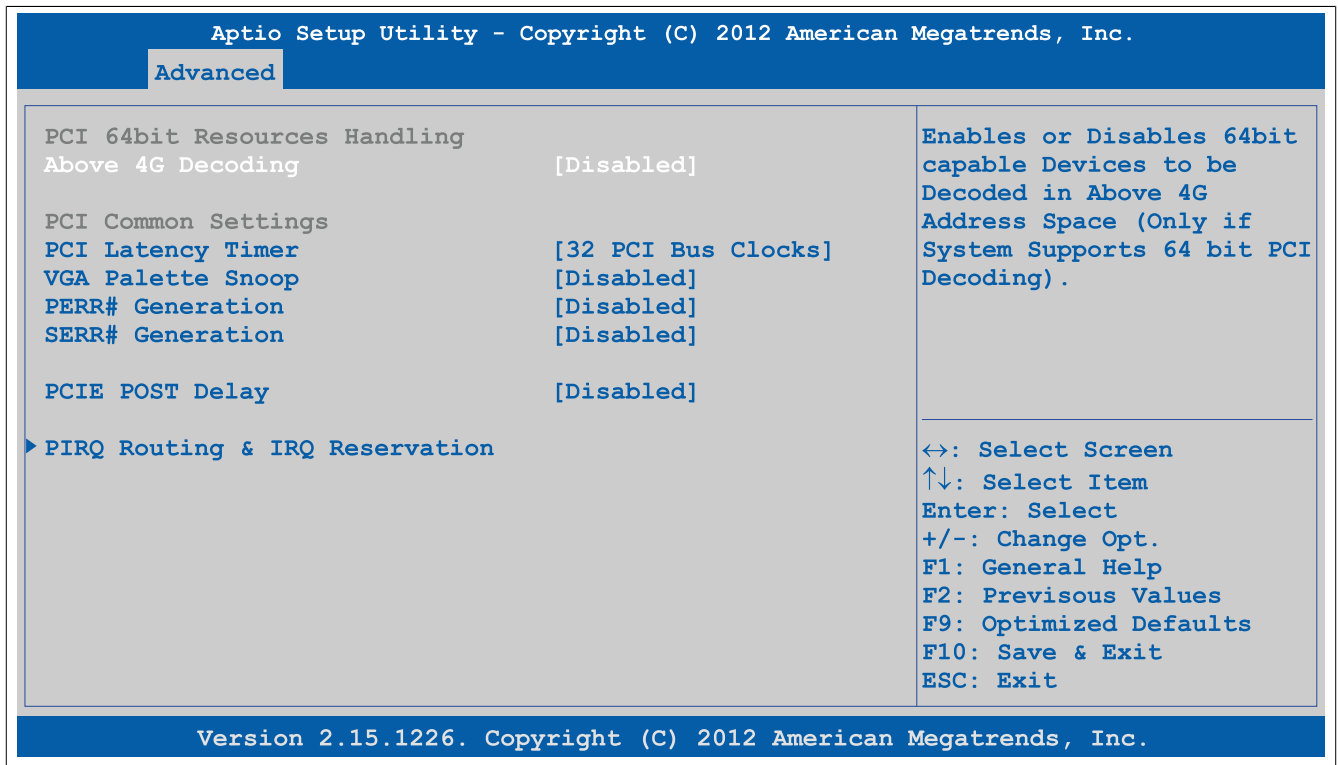


Figure 129: Advanced - PCI Configuration

BIOS setting	Function	Configuration options	Effect
Above 4G decoding	Option for enabling/disabling 64-bit capable devices to decode them in the address space above 4 GB (only if the system supports 64-bit decoding)	Disabled	Disables this function
		Enabled	Enables this function
PCI latency timer	Option for controlling how long (in PCI ticks) one PCI bus card can continue to use the master after another PCI card has requested access	32 PCI bus clocks to 248 PCI bus clocks	Manually sets the value in PCI ticks
VGA palette snoop	Option for supporting graphics cards with 256 colors. This option should only be set to "Enabled" if colors are not displayed correctly.	Disabled	Disables this function
		Enabled	Enables this function
PERR# generation	Option for generating a PERR signal (parity error). This signal indicates a data parity error one cycle after PAR.	Disabled	Disables this function
		Enabled	Enables this function
SERR# generation	Option for generating a SERR signal (system error). This signal indicates a data error or other type of system error when executing a special cycle command.	Disabled	Disables this function
		Enabled	Enables this function
PCIE POST delay	Option for delaying PCIE bus emulation	Disabled	Disables this function
		0.1 s	0.1 s delay before the PCIE bus is scanned
		0.2 s	0.2 s delay before the PCIE bus is scanned
		0.3 s	0.3 s delay before the PCIE bus is scanned
		1 s	1 s delay before the PCIE bus is scanned
		2 s	2 s delay before the PCIE bus is scanned
		3 s	3 s delay before the PCIE bus is scanned
		4 s	4 s delay before the PCIE bus is scanned
		5 s	5 s delay before the PCIE bus is scanned
10 s	10 s delay before the PCIE bus is scanned		
PIRQ routing & IRQ reservation	Configures PIRQ routing	Enter	Opens this submenu See "PIRQ routing & IRQ reservation" on page 276.

Table 235: Advanced - PCI configuration - Configuration options

1.3.2.4.1 PIRQ routing & IRQ reservation

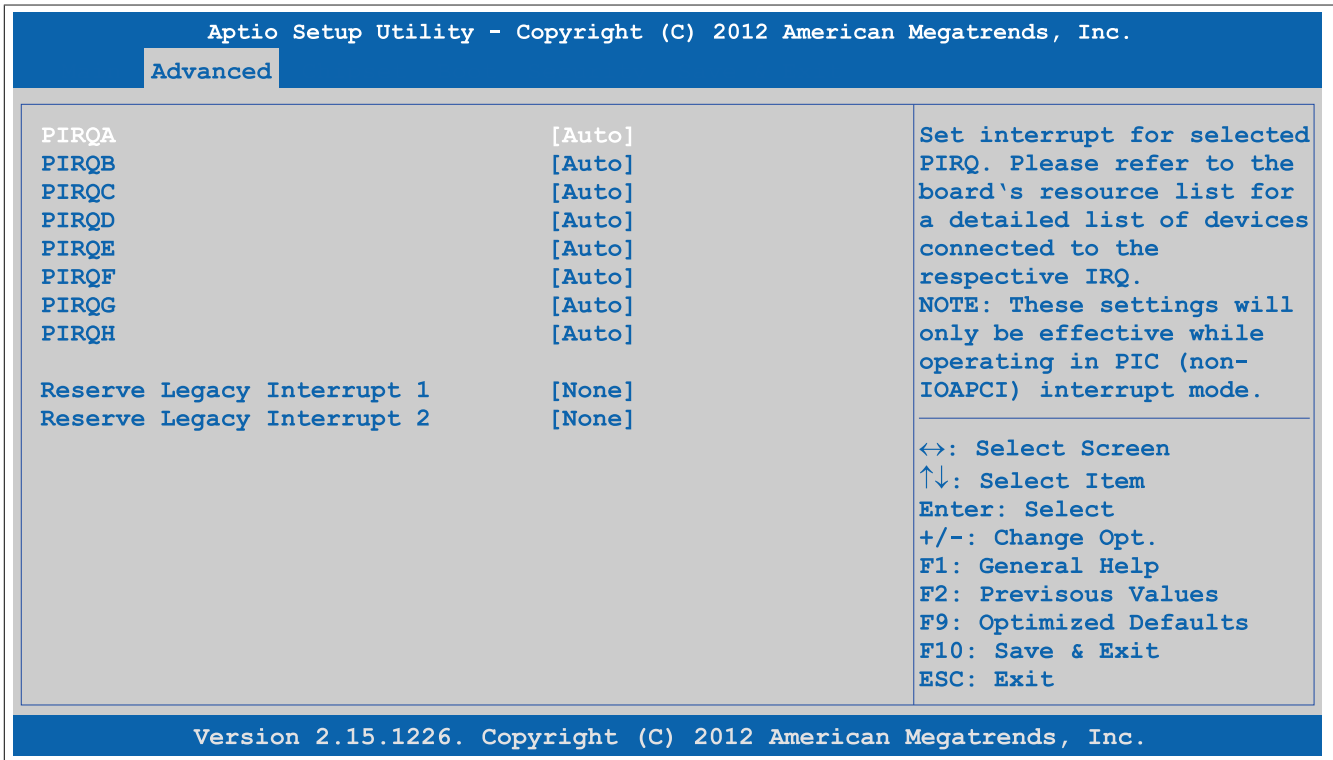


Figure 130: Advanced - PCI Configuration - PIRQ Routing & IRQ Reservation

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

1.3.2.5 PCI express configuration

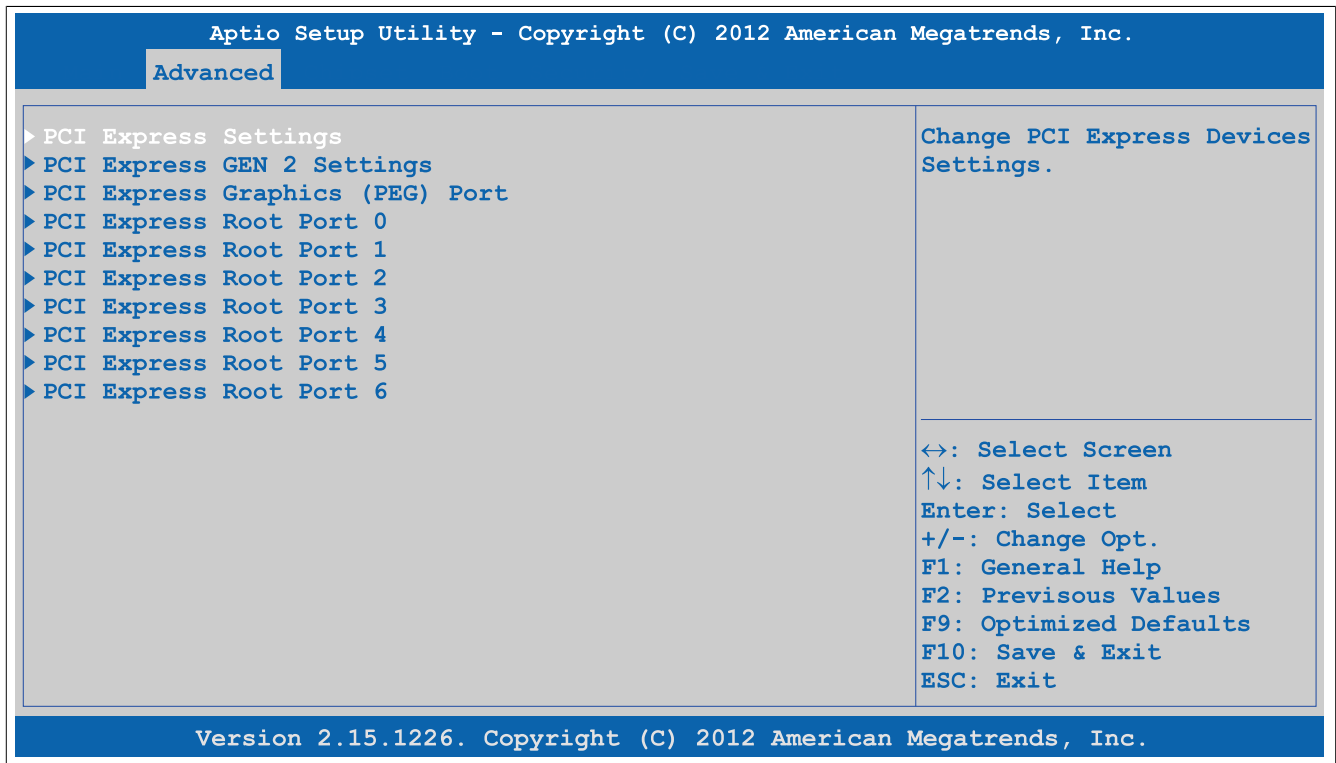


Figure 131: Advanced - PCI Express Configuration

BIOS setting	Function	Configuration options	Effect
PCI Express settings	Configures PCI Express settings	Enter	Opens this submenu See "PCI Express settings" on page 278.
PCI Express GEN 2 settings	Configures PCI Express GEN2 settings	Enter	Opens this submenu See "PCI Express GEN 2 settings" on page 279.
PCI Express graphics (PEG) port	Configures PCI Express graphics settings	Enter	Opens this submenu See "PCI Express graphics (PEG) port" on page 280.
PCI Express root port 0	Configures PCI Express settings on port 0	Enter	Opens this submenu See "PCI Express root port" on page 282.
PCI Express root port 1	Configures PCI Express settings on port 1	Enter	Opens this submenu See "PCI Express root port" on page 282.
PCI Express root port 2	Configures PCI Express settings on port 2	Enter	Opens this submenu See "PCI Express root port" on page 282.
PCI Express root port 3	Configures PCI Express settings on port 3	Enter	Opens this submenu See "PCI Express root port" on page 282.
PCI Express root port 4	Configures PCI Express settings on port 4	Enter	Opens this submenu See "PCI Express root port" on page 282.
PCI Express root port 5	Configures PCI Express settings on port 5	Enter	Opens this submenu See "PCI Express root port" on page 282.
PCI Express root port 6	Configures PCI Express settings on port 6	Enter	Opens this submenu See "PCI Express root port" on page 282.

Table 237: Advanced - PCI Express configuration - Menu

1.3.2.5.1 PCI Express settings

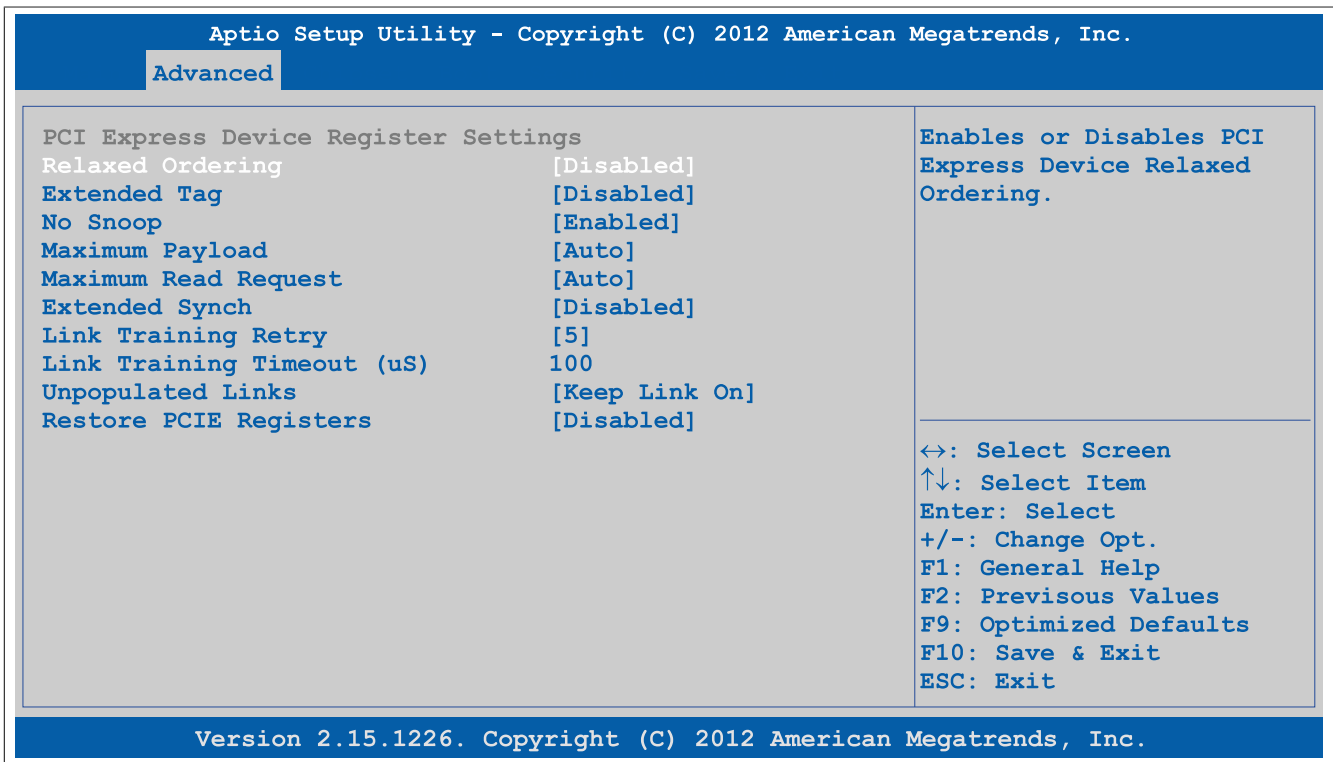


Figure 132: Advanced - PCI Express Configuration - PCI Express Settings

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

1.3.2.5.2 PCI Express GEN 2 settings

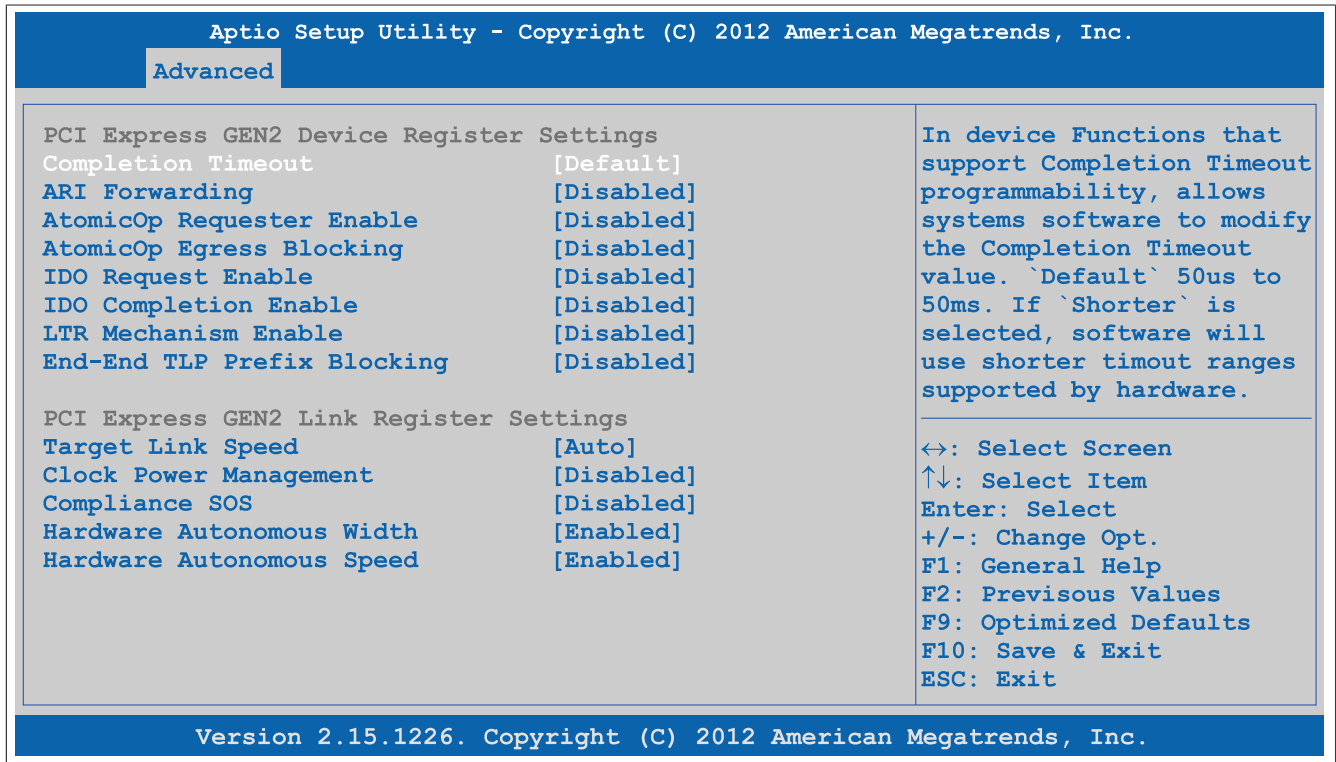


Figure 133: Advanced - PCI Express Configuration - PCI Express GEN 2 Settings

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 239: 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 <i>device</i> 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 <i>device</i> can no longer change the link speed except to correct unstable operation.
		Enabled	Enables this function

Table 239: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options

1.3.2.5.3 PCI Express graphics (PEG) port

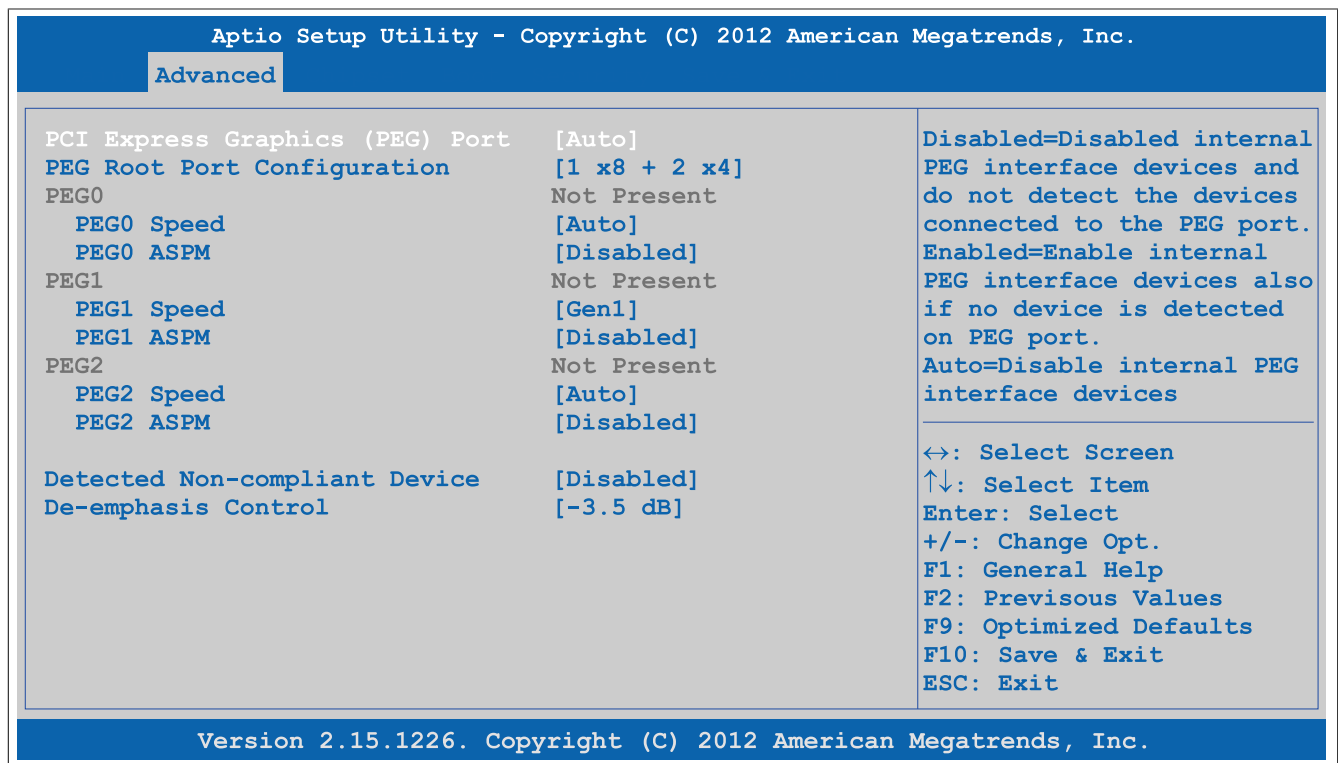


Figure 134: Advanced - PCI Express Configuration - PCI Express Graphics (PEG) Port

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 240: 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	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
PEG1	Displays the mode in which the device connected to the PEG1 port is being operated	None	-
PEG1 speed	Option for setting the maximum transfer rate for the PEG1 port	Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
		Gen3	Maximum transfer rate = 8 GT/s
PEG1 ASPM ¹⁾	Option for configuring a power saving function for the PEG1 port if it does not require full power	Disabled	Disables this function
		Auto	Automatic assignment by BIOS and the operating system
		ASPM L0s	Enables the L0 energy saving function
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
ASPM L0s ³⁾	Option for configuring the L0 power saving function	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
PEG2	Displays the mode in which the device connected to the PEG2 port is being operated	None	-
PEG2 speed	Option for setting the maximum transfer rate for the PEG2 port	Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
		Gen3	Maximum transfer rate = 8 GT/s
PEG2 ASPM ¹⁾	Option for configuring a power saving function for the PEG2 port if it does not require full power	Disabled	Disables this function
		Auto	Automatic assignment by BIOS and the operating system
		ASPM L0s	Enables the L0 energy saving function
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
ASPM L0s ⁴⁾	Option for configuring the L0 power saving function	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
Detect non-compliant device	Option for detecting incompatible PCI Express devices on the PEG port	Disabled	Disables this function
		Enabled	Enables this function. Even incompatible PCI Express devices are detected on the PEG port.
De-emphasis control	Option for configuring de-emphasis on the PEG port	-6 dB	-6 dB de-emphasis
		-3.5 dB	-35 dB de-emphasis

Table 240: 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.

1.3.2.5.4 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.

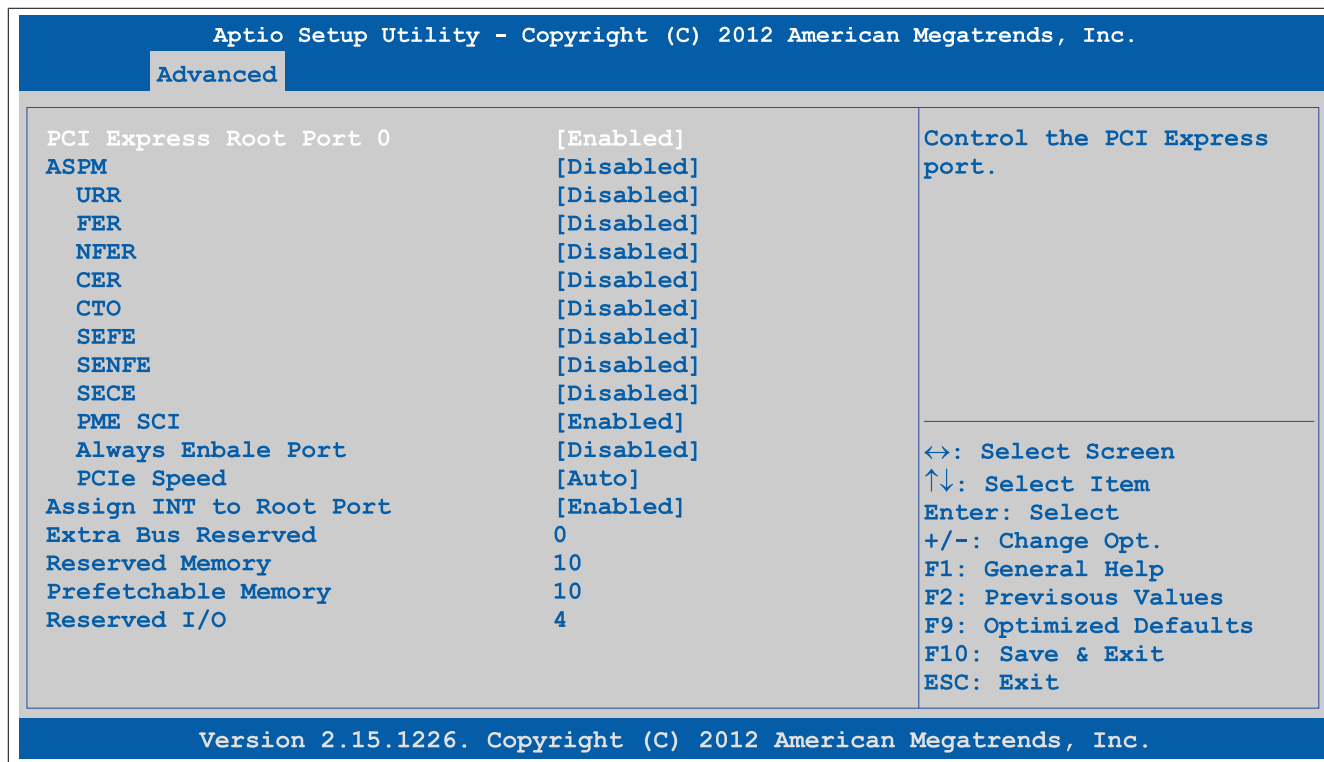


Figure 135: Advanced - PCI Express Configuration - PCI Express Root Port

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	<i>PCI Express completion timer T0</i>	Enabled	Enables this function

Table 241: 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
SENF	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 241: Advanced - PCI Express configuration - PCI Express root port - Configuration options

1.3.2.6 ACPI settings

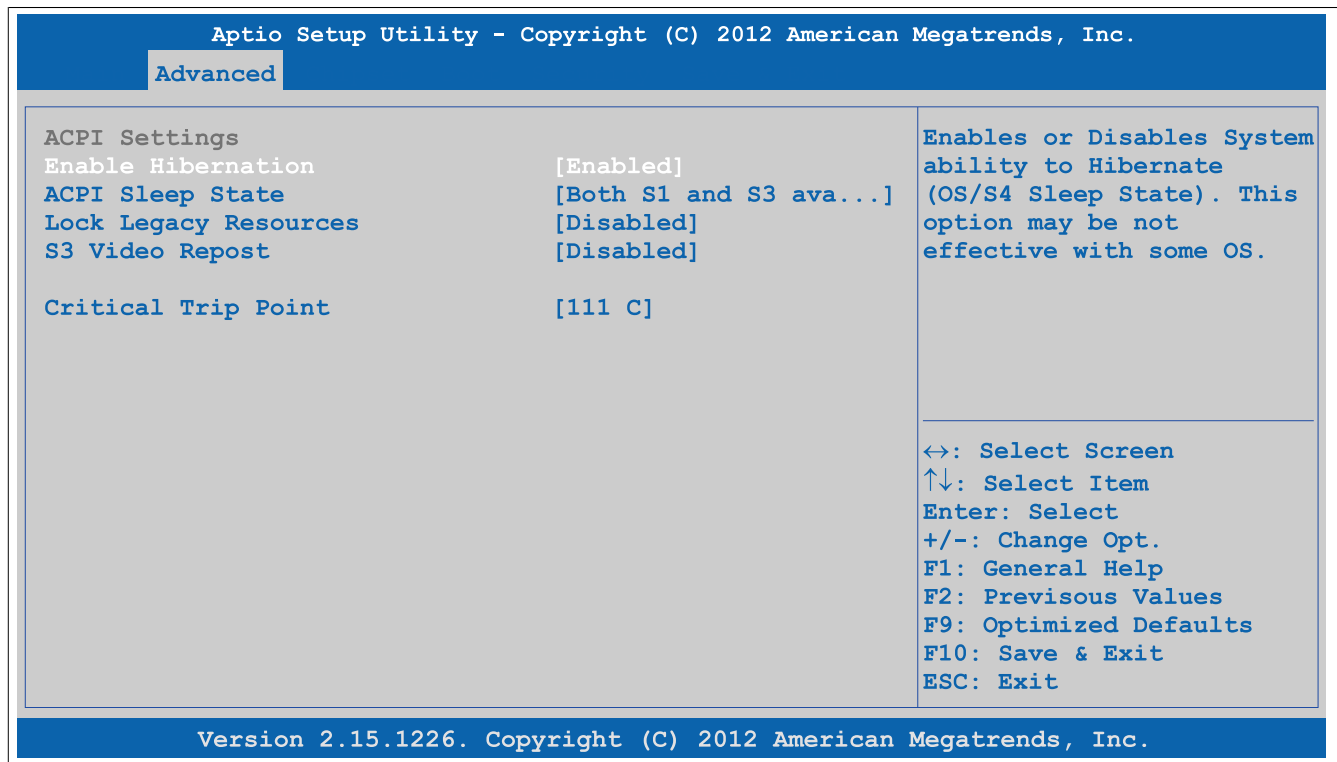


Figure 136: Advanced - ACPI Settings

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 242: Advanced - ACPI settings - Configuration options

1.3.2.7 RTC wake settings

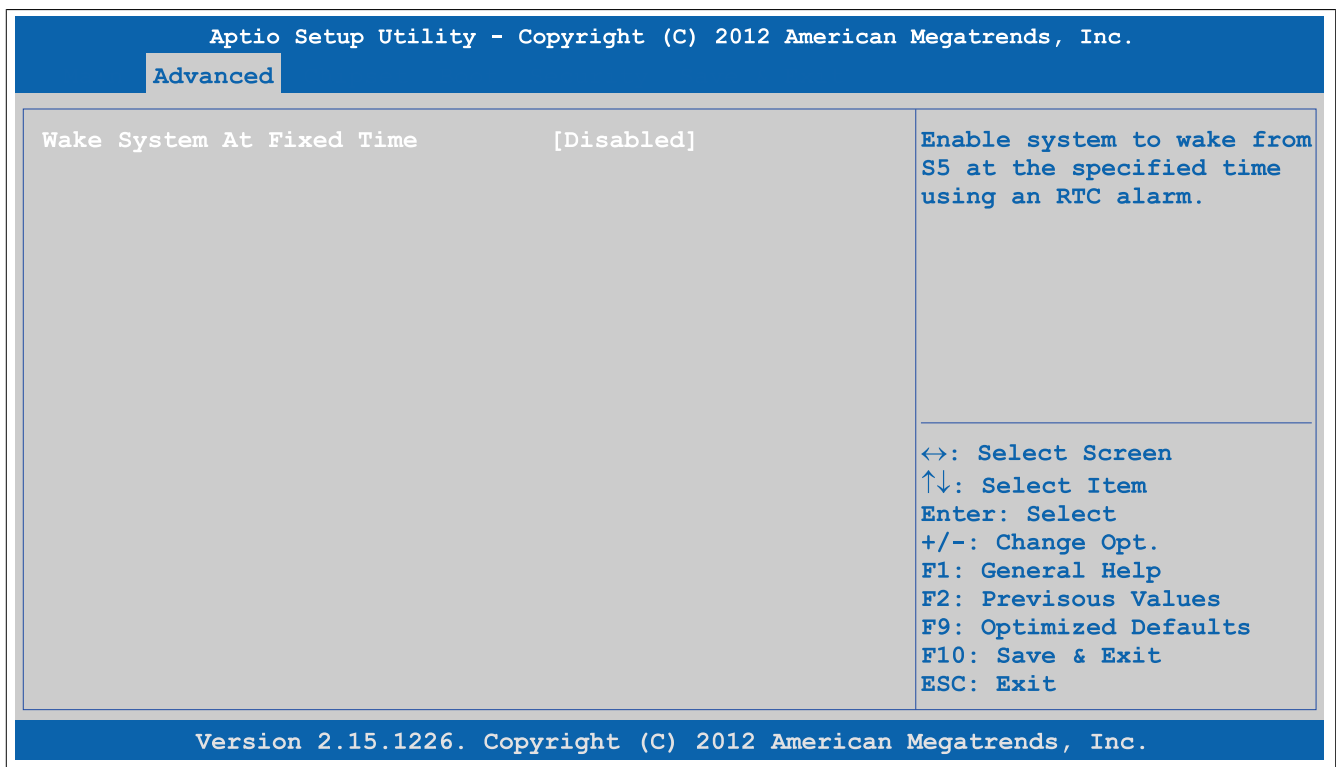


Figure 137: Advanced - RTC Wake Settings

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 243: Advanced - RTC wake settings - Configuration options

1.3.2.8 CPU configuration

Information:

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

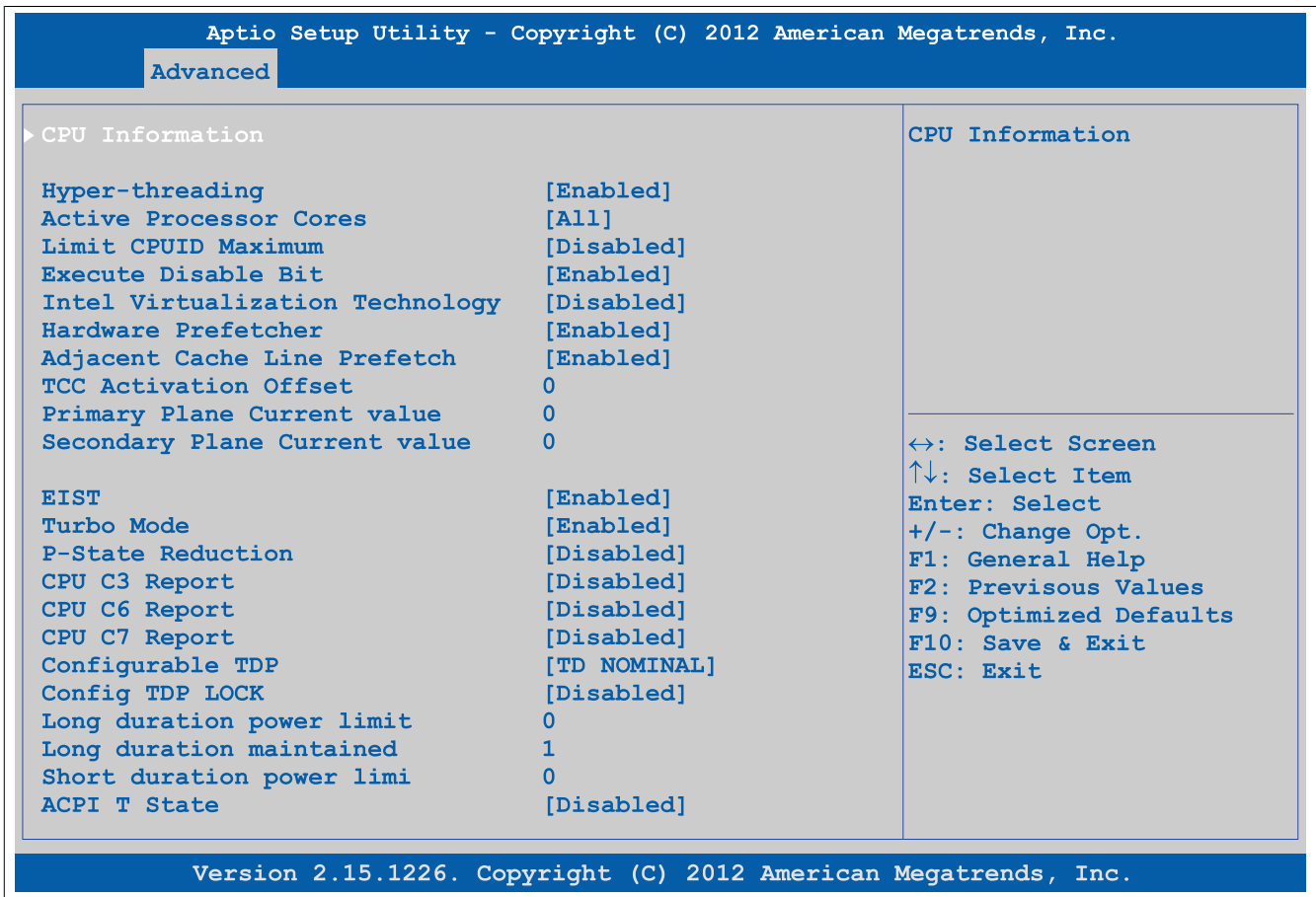


Figure 138: Advanced - CPU Configuration

BIOS setting	Function	Configuration options	Effect
CPU information	Displays CPU properties	Enter	Opens this submenu See "CPU information" on page 287.
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 <i>Disabled</i> 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 244: 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 244: Advanced - [CPU](#) configuration - Configuration options

- 1) TCC = Thermal [control](#) circuit.
- 2) TDP = Thermal design power.

1.3.2.8.1 CPU information

Information:

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

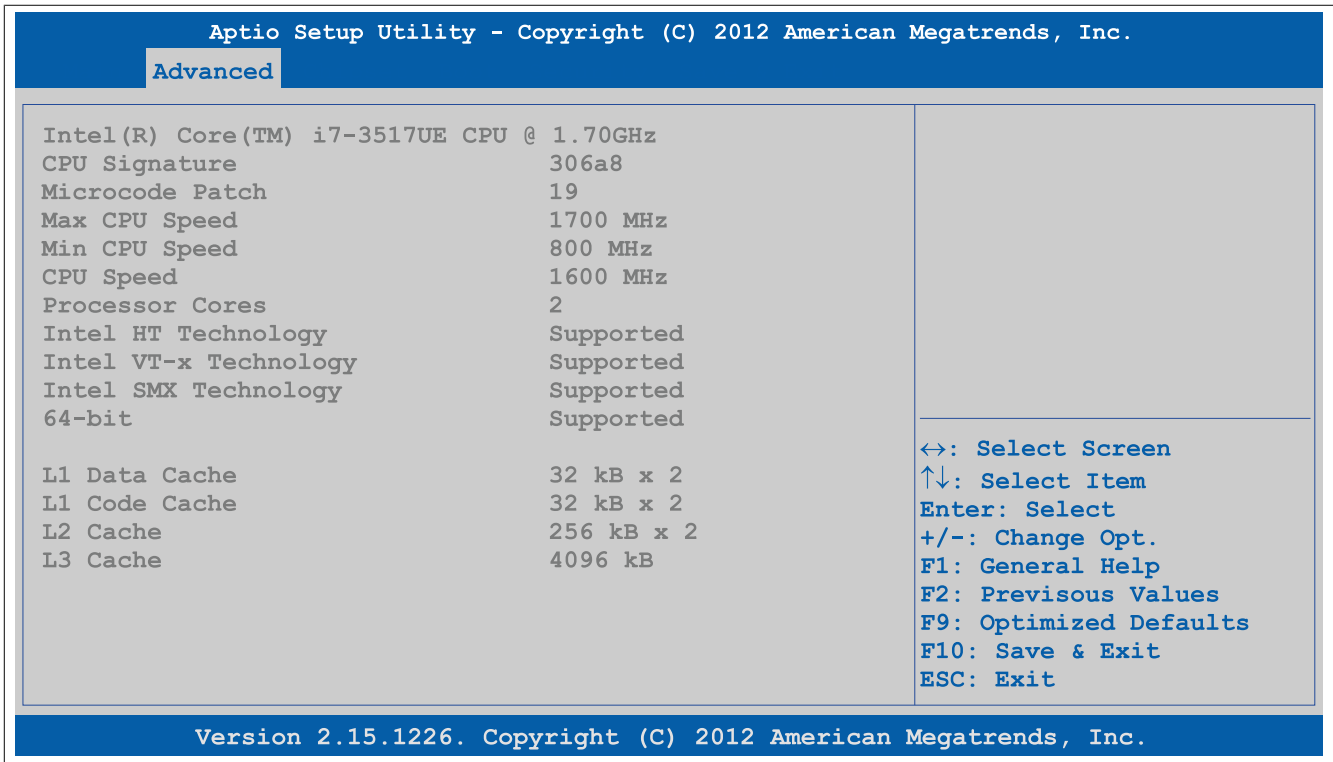


Figure 139: Advanced - CPU Configuration - CPU Information

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

1.3.2.9 Chipset configuration

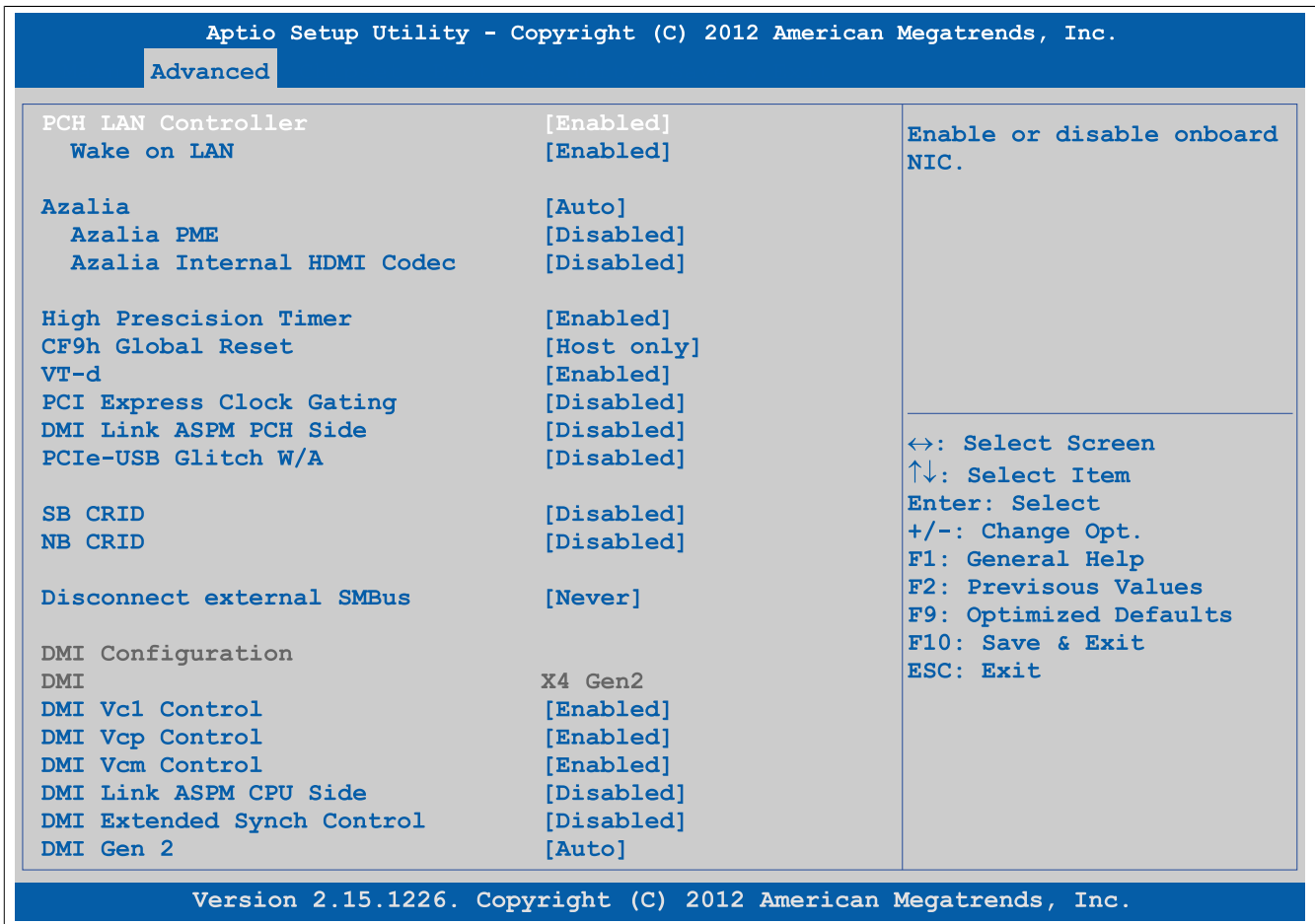


Figure 140: Advanced - Chipset Configuration

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 onboard 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 246: 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 <i>Post</i>	Allows disconnection of the SMBus until EOP (end of <i>POST</i>)
		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.
DMI link ASPM CPU side	Option for enabling/disabling active state power management (ASPM) for the DMI link on the CPU side	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 246: Advanced - Chipset configuration - Configuration options

1.3.2.10 SATA configuration

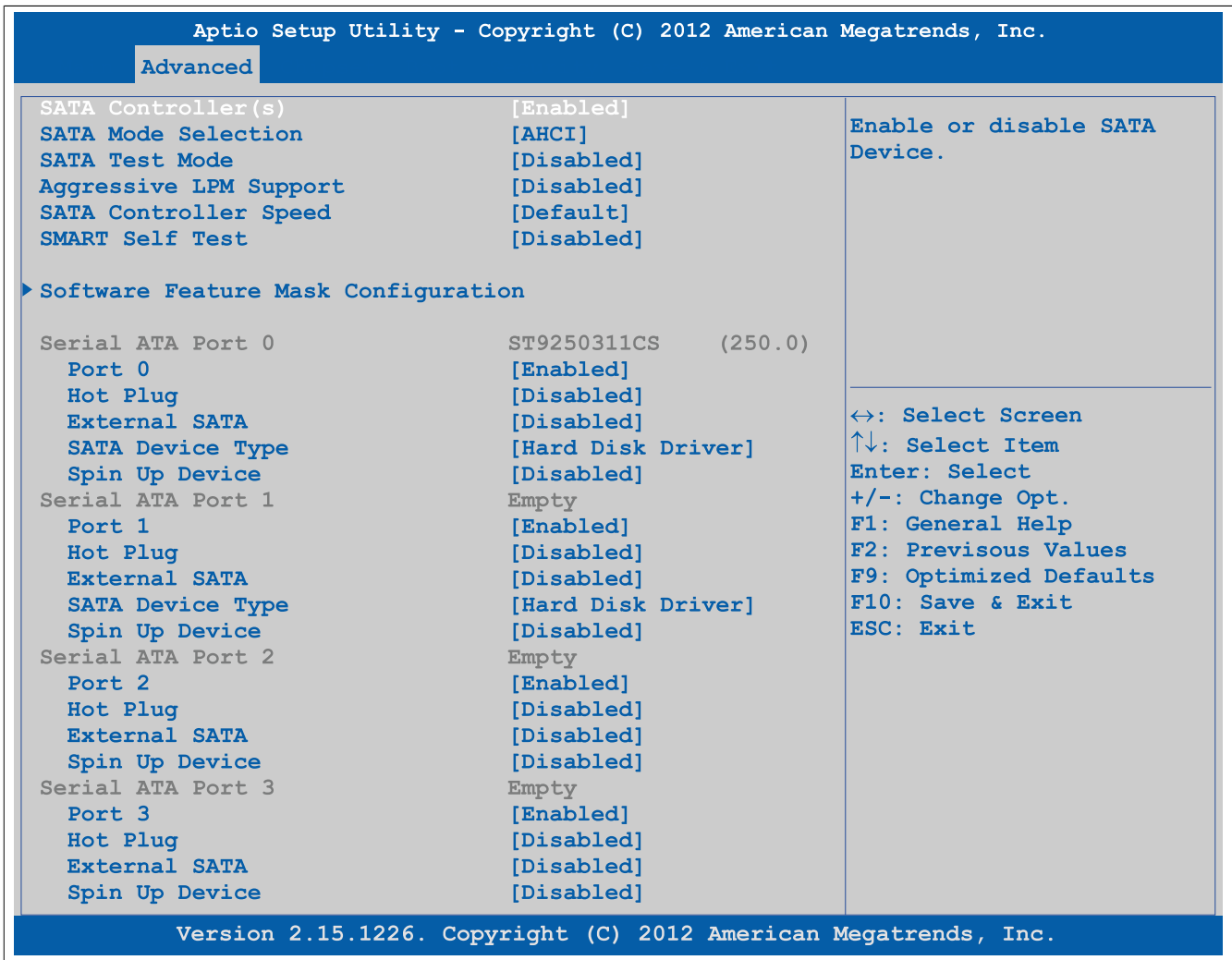


Figure 141: Advanced - SATA Configuration

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 292.

Table 247: Advanced - SATA configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
Alternate ID ¹⁾	Option for enabling/disabling a report of the alternate <i>device</i> ID	Enabled	Enables this function
		Disabled	Disables this function
Serial ATA port 0	Displays the <i>device</i> 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 <i>interface</i> 0	Disabled	Disables hot plugging for SATA <i>interface</i> 0
		Enabled	Enables hot plugging for SATA <i>interface</i> 0. Devices <i>can</i> 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 <i>switch</i> ²⁾	Option for enabling/disabling the report if this port has a mechanical presence <i>switch</i>	Disabled	Disables this function
		Enabled	Enables this function
SATA <i>device</i> 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 <i>device</i>	Option for configuring an initialization sequence for the connected <i>device</i> during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 1	Displays the <i>device</i> 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 <i>interface</i> 1	Disabled	Disables hot plugging for SATA <i>interface</i> 1
		Enabled	Enables hot plugging for SATA <i>interface</i> 1. Devices <i>can</i> 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 <i>switch</i> ²⁾	Option for enabling/disabling the report if this port has a mechanical presence <i>switch</i>	Disabled	Disables this function
		Enabled	Enables this function
SATA <i>device</i> 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 <i>device</i>	Option for configuring an initialization sequence for the connected <i>device</i> during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 2	Displays the <i>device</i> 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 <i>interface</i> 2. Devices <i>can</i> 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 <i>switch</i> ²⁾	Option for enabling/disabling the report if this port has a mechanical presence <i>switch</i>	Disabled	Disables this function
		Enabled	Enables this function
SATA <i>device</i> 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 <i>device</i>	Option for configuring an initialization sequence for the connected <i>device</i> during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 3	Displays the <i>device</i> 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 <i>interface</i> 3. Devices <i>can</i> 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 <i>switch</i> ²⁾	Option for enabling/disabling the report if this port has a mechanical presence <i>switch</i>	Disabled	Disables this function
		Enabled	Enables this function
SATA <i>device</i> 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 <i>device</i>	Option for configuring an initialization sequence for the connected <i>device</i> during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function

Table 247: 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*.

1.3.2.10.1 Software feature mask configuration

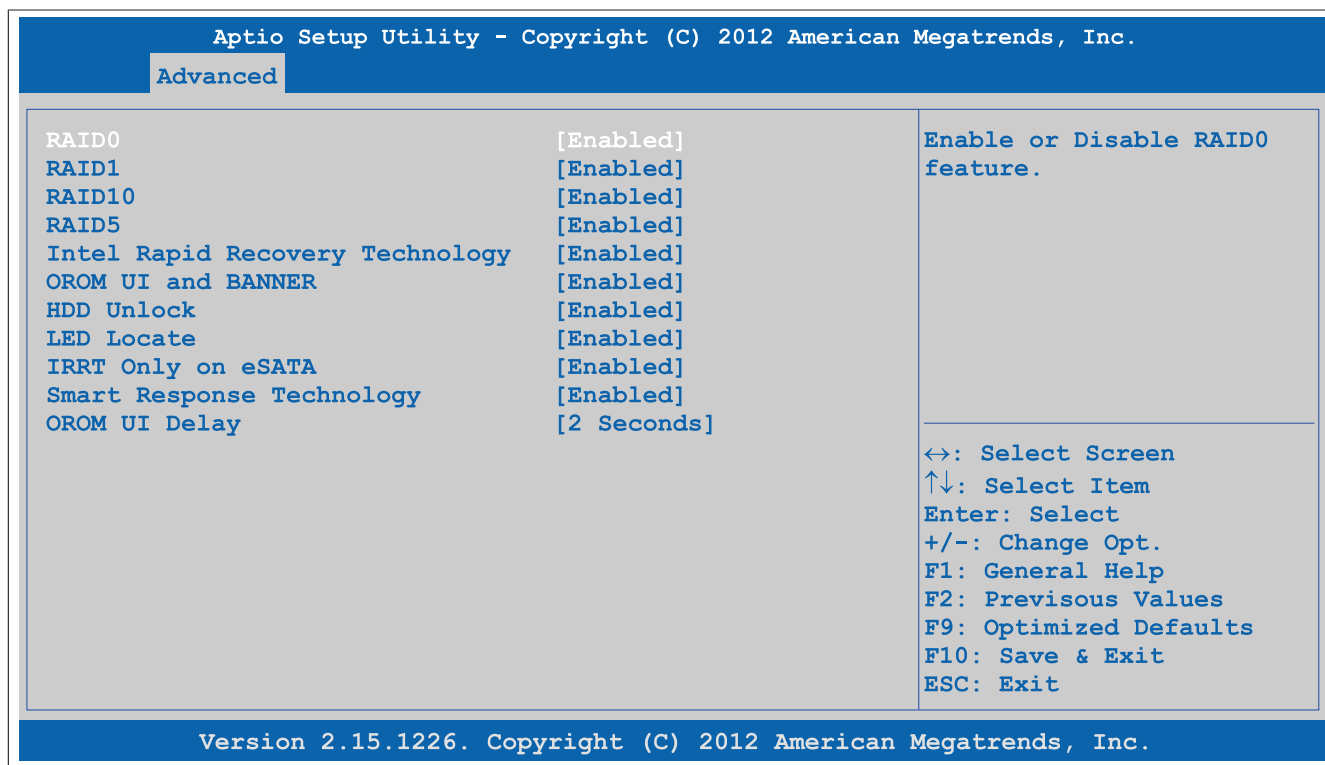


Figure 142: Advanced - SATA Configuration - Software Feature Mask Configuration

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

1) IRRT = Intel Rapid Recovery technology.

1.3.2.11 Memory configuration

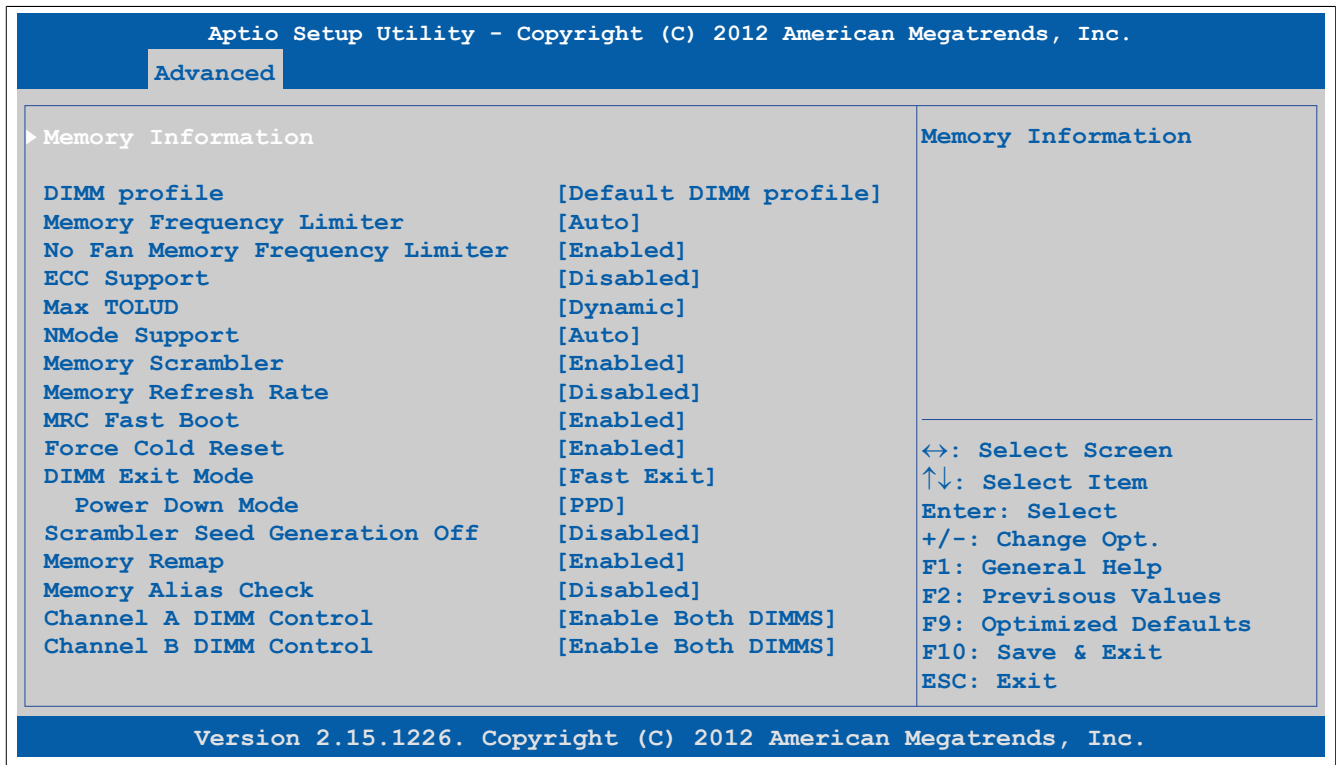


Figure 143: Advanced - Memory Configuration

BIOS setting	Function	Configuration options	Effect
Memory information	Displays main memory properties	Enter	Opens this submenu See "Memory information" on page 294.
DIMM profile	Option for configuring the main memory timing profile	Default DIMM profile	Uses the default profile
		Custom profile	Uses a user-defined profile
		XMP Profile 1	Uses XMP profile 1
		XMP profile 2	Uses XMP profile 2
Custom profile control ¹⁾	Configuration of the main memory timing profile	Enter	Opens this submenu See "Custom profile control" on page 295.
Memory frequency limiter ²⁾	Option for setting the maximum possible main memory frequency	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 249: 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 249: 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.

1.3.2.11.1 Memory information

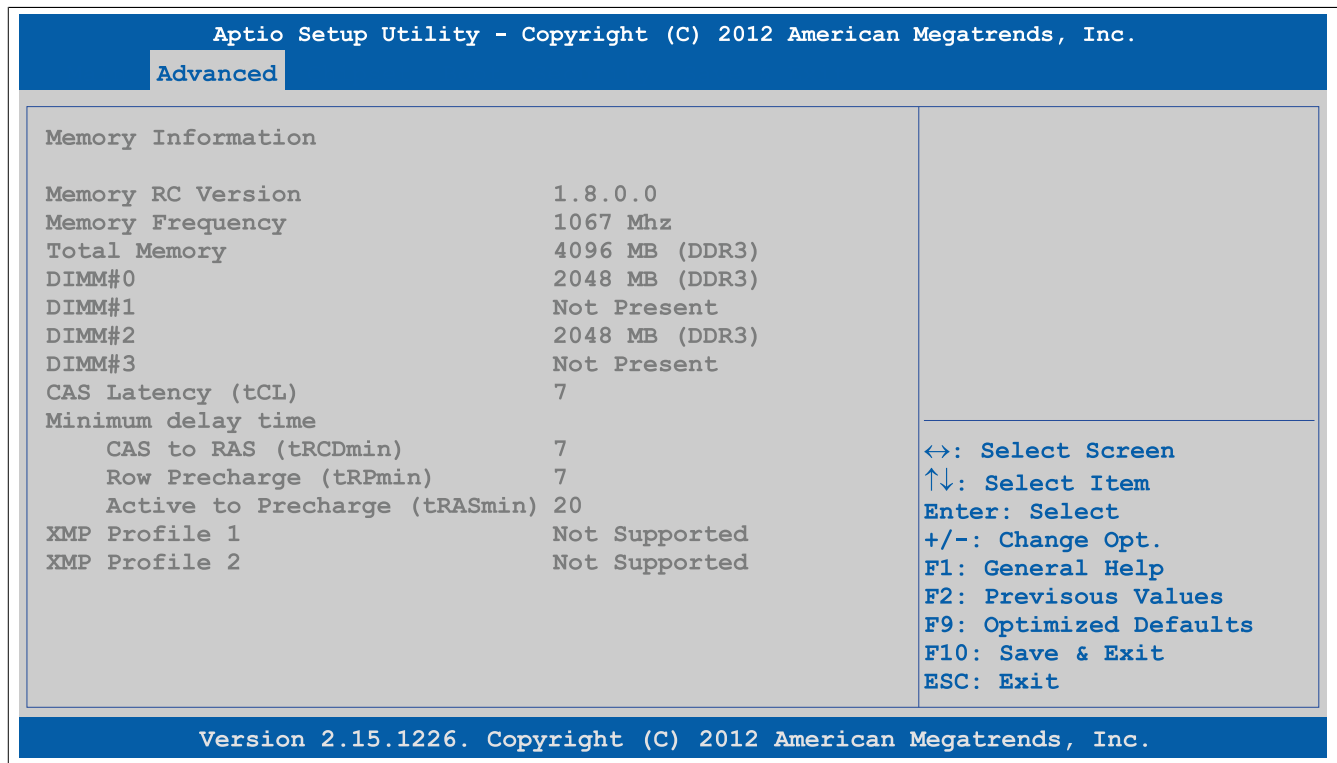


Figure 144: Advanced - Memory Configuration - Memory Information

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	-
Minimum delay time			

Table 250: Advanced - Memory configuration - Memory information

BIOS setting	Function	Configuration options	Effect
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 250: Advanced - Memory configuration - Memory information

1.3.2.11.2 Custom profile control

The screenshot shows the 'Advanced' menu in the Aptio Setup Utility. The title bar reads 'Aptio Setup Utility - Copyright (C) 2012 American Megatrends, Inc.' and the current menu is 'Advanced'. The screen is divided into two main sections: 'Memory Timing Information' and 'Memory Timing Configuration'. The 'Memory Timing Information' section lists various timing parameters and their current values: Memory Frequency (1067 Mhz), CAS Latency (tCL) (7), CAS to RAS (tRCDmin) (7), Row Precharge (tRPmin) (7), Active to Precharge (tRASmin) (20), Write Recovery (tWRmin) (8), Refresh Recovery (tRFCmin) (86), Row Active to Row Activate (tRRD) (4), Internal Write to Read Command (4), Internal Read to Precharge Comma (4), and Four Activate Window (tFAWmin) (20). The 'Memory Timing Configuration' section lists the same parameters with their current values in brackets: Memory Frequency Limit [1067], tCL (7), tRCD (7), tRP (7), tRAS (20), tWR (8), tRFC (86), tRRD (4), tWTR (4), tRTP (4), and tFAW (20). On the right side, there is a legend for navigation: '<->: Select Screen', '↑↓: Select Item', 'Enter: Select', '+/-: Change Opt.', 'F1: General Help', 'F2: Previous Values', 'F9: Optimized Defaults', 'F10: Save & Exit', and 'ESC: Exit'. The bottom status bar reads 'Version 2.15.1226. Copyright (C) 2012 American Megatrends, Inc.'

Figure 145: 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 251: Advanced - Memory configuration - Custom profile control - Configuration options

1.3.2.12 USB configuration

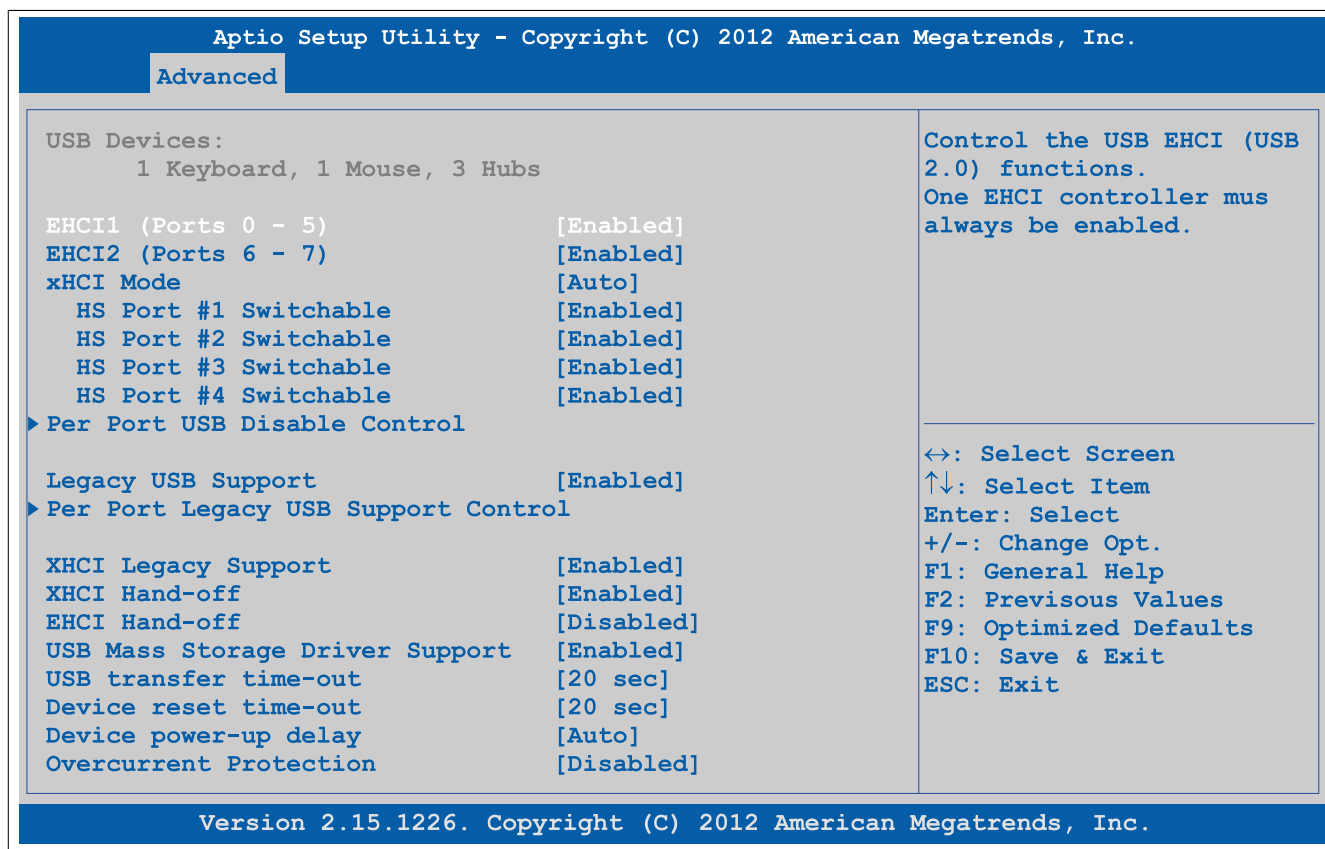


Figure 146: Advanced - USB Configuration

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 297.

Table 252: 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 298.
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 252: Advanced - USB configuration - Configuration options

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

1.3.2.12.1 Per port USB disable control

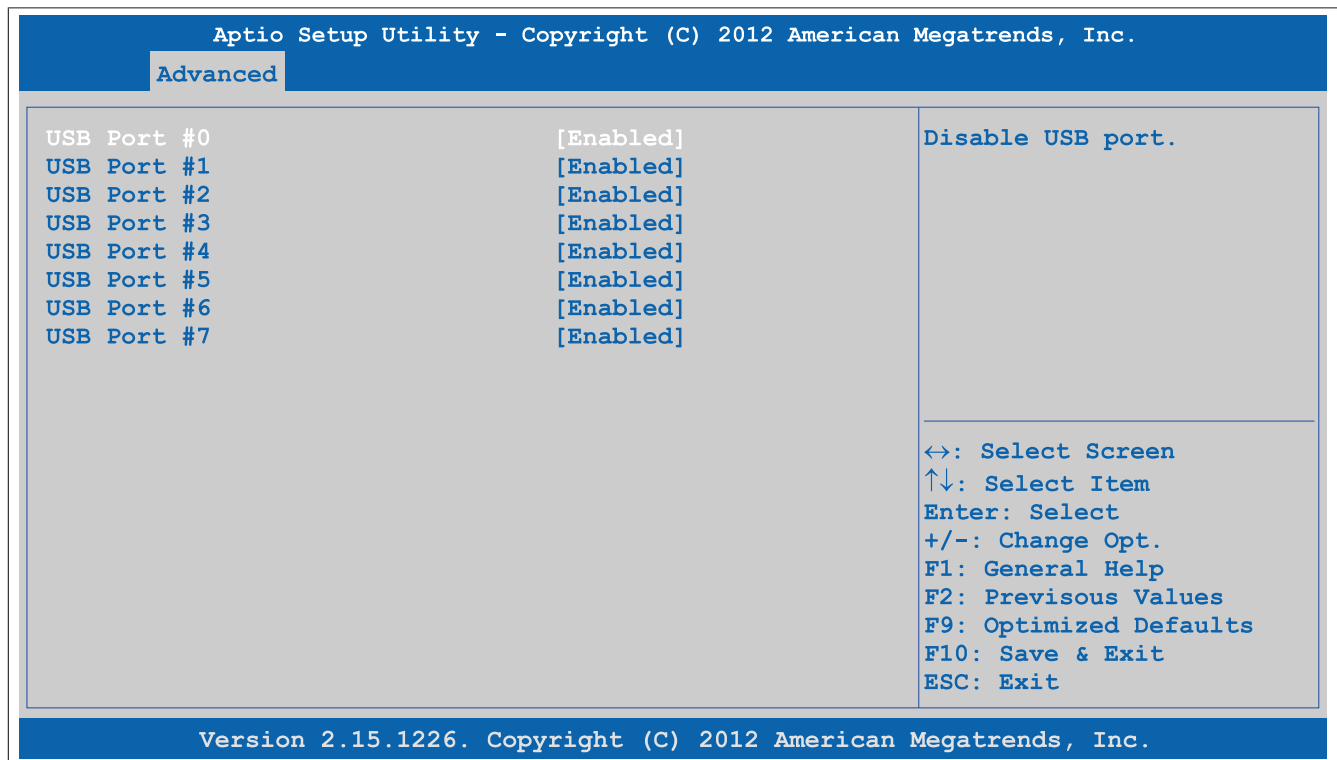


Figure 147: Advanced - USB Configuration - Per Port USB Disable Control

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

1.3.2.12.2 Per port legacy USB support control

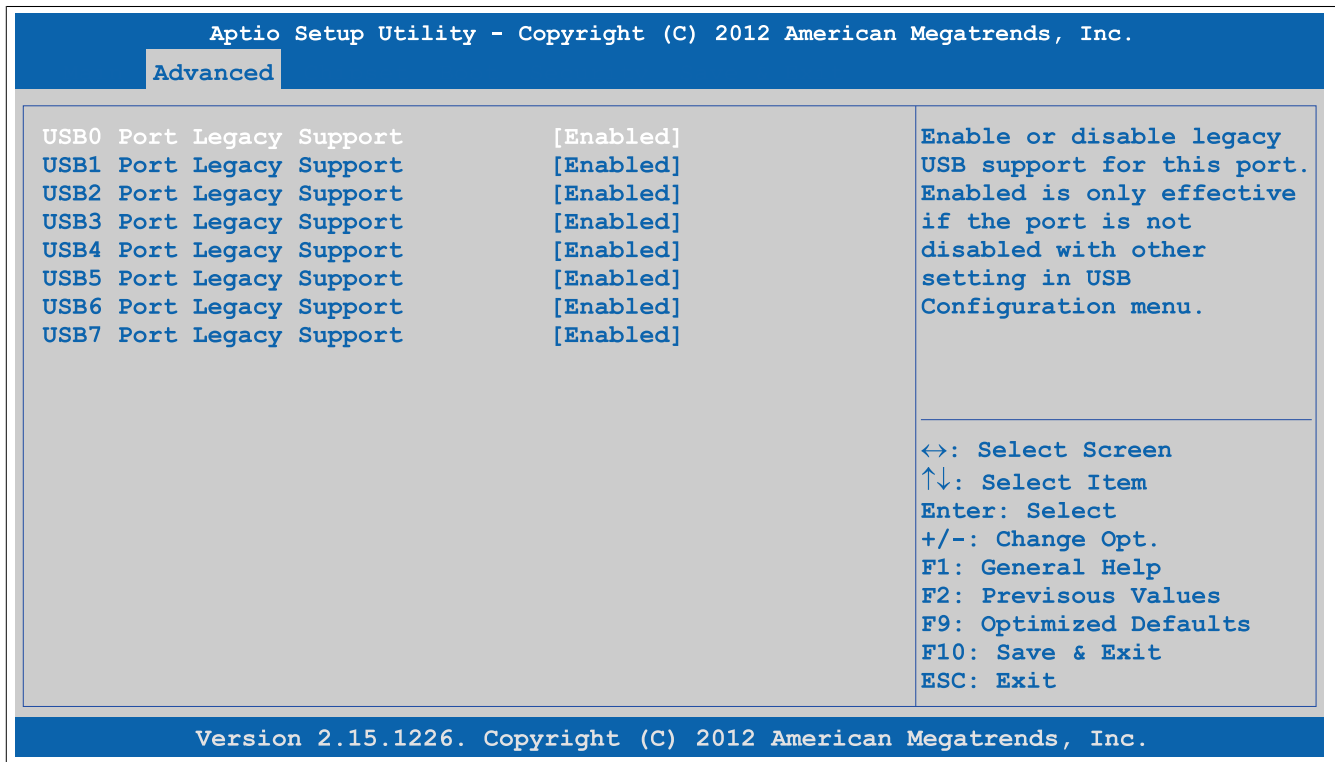


Figure 148: Advanced - USB Configuration - Per Port Legacy USB Support Control

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

1.3.2.13 Serial port console redirection

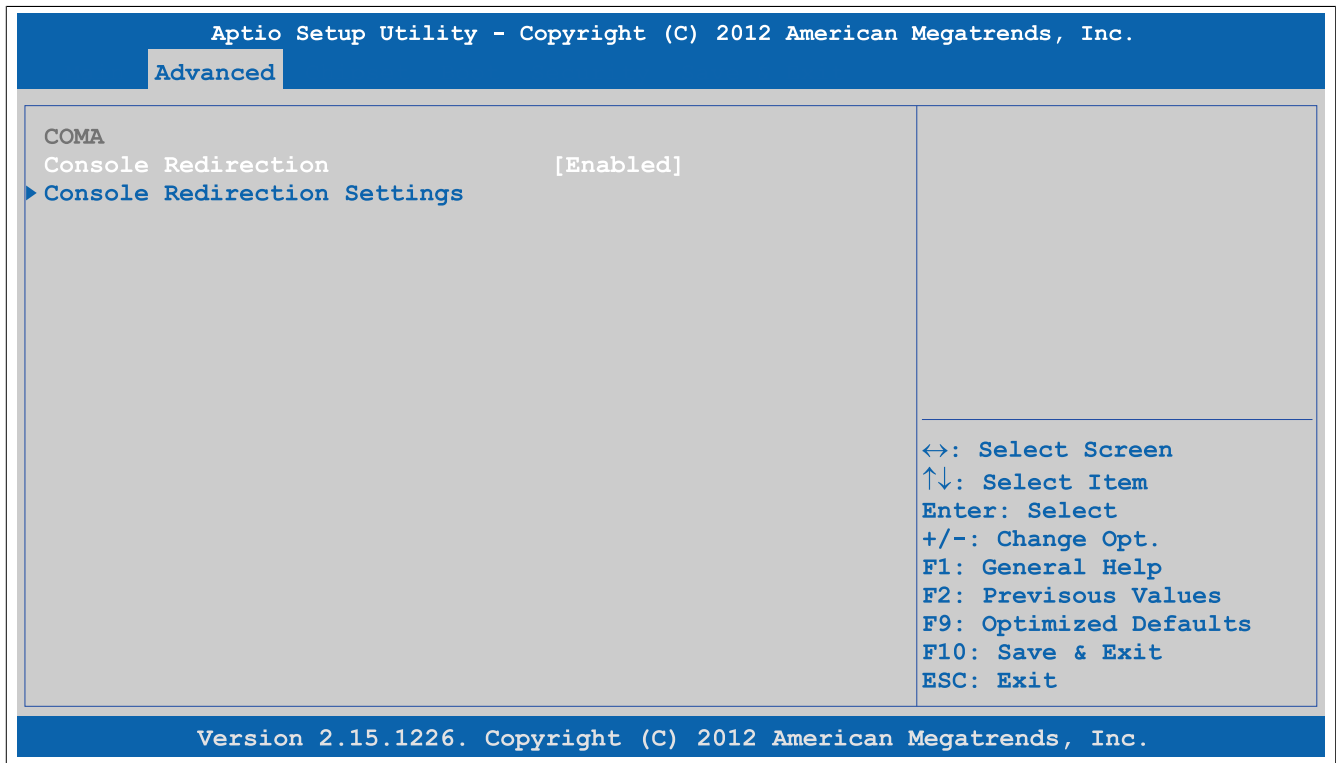


Figure 149: Advanced - Serial Port Console Redirection

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 299.

Table 255: Advanced - Serial port console redirection - Configuration options

1.3.2.13.1 Console redirection settings

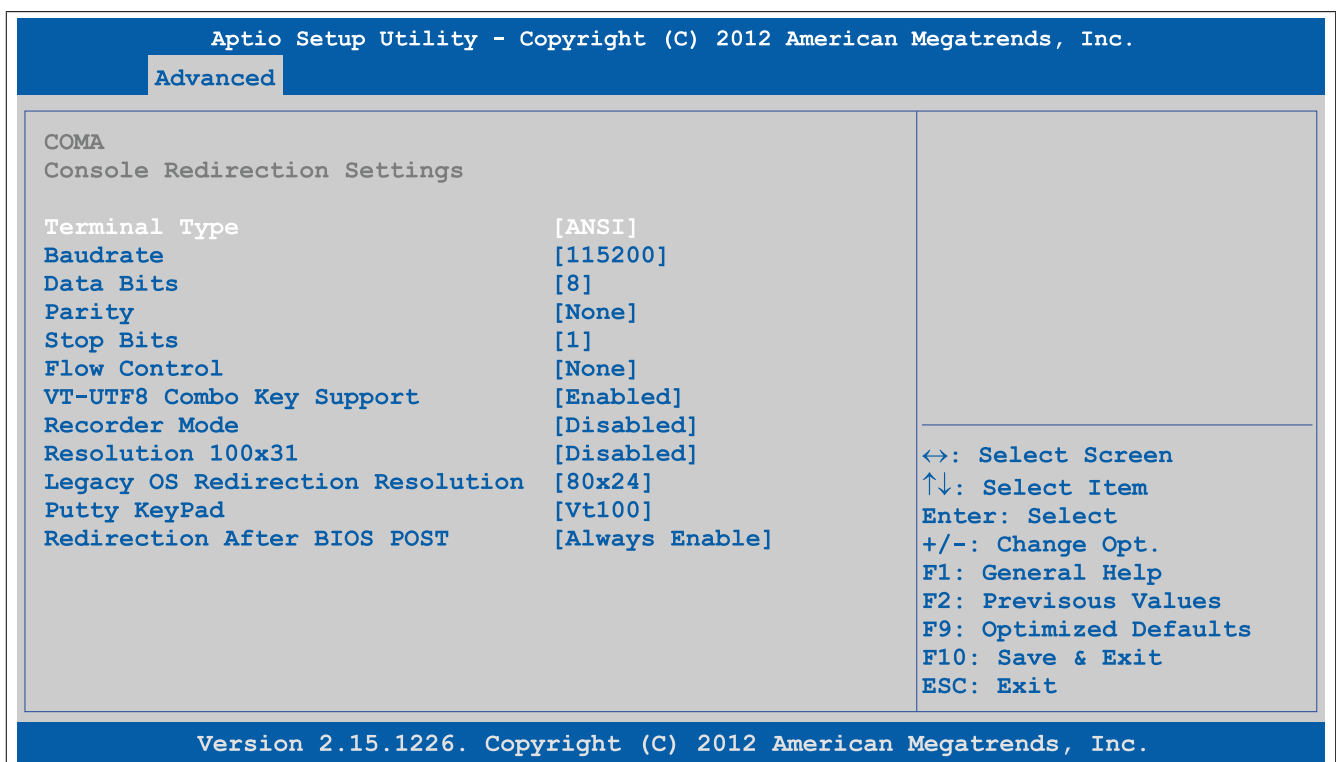


Figure 150: Advanced - Console Redirection - Console Redirection Settings

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
Parity	Option for configuring the parity bit to use for serial communication	8	Character length with 8 bits
		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
Stop bits	Option for configuring the stop bits to use for serial communication	Space	Parity bit always 0
		1	Uses 1 bit as the stop bit
Flow control	Option for configuring the data flow control	2	Uses 2 bits as the stop bit
		None	Disables data flow control
VT-UTF8 combo key support	Option for enabling/disabling VT-UTF8 combo key support for ANSI and VT100 connections	Hardware RTS/CTS	Enables hardware handshake
		Disabled	Disables this function
Recorder mode	Option for enabling/disabling recorder mode	Enabled	Enables this function
		Disabled	Disables this function
Resolution 100x31	Option for enabling/disabling extended terminal resolution	Enabled	Enables this function
		Disabled	Disables 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 256: Advanced - Console redirection - Console redirection settings - Configuration options

1.3.2.14 Network stack configuration

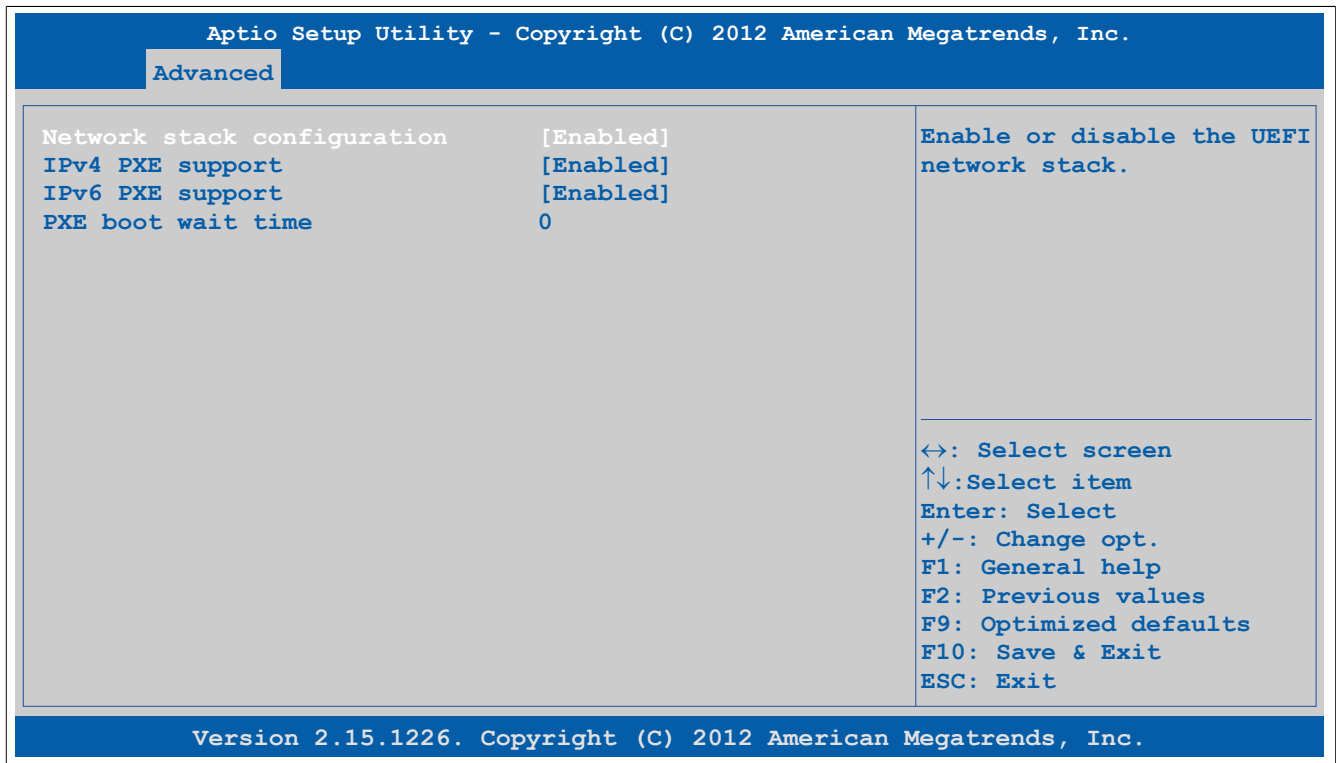


Figure 151: Advanced - Network stack configuration

BIOS setting	Explanation	Configuration options	Effect
Network stack configuration	Option for enabling/disabling the UEFI network stack	Disabled	Disables this function.
		Enabled	Enables this function.
IPv4 PXE support	Option for enabling/disabling IPv4 PXE support.	Enabled	Enables this function.
		Disabled	Disables this function. The IPv4 PXE boot option is not created.
IPv6 PXE support	Option for enabling/disabling IPv6 PXE support.	Enabled	Enables this function.
		Disabled	Disables this function. The IPv6 PXE boot option is not created.
PXE boot wait time	Option to set the wait time to press the Esc key and cancel the PXE boot procedure.	0 to ...	Wait time until ESC is pressed and the boot procedure is aborted.

Table 257: Advanced - Network stack configuration options

1.3.3 Boot

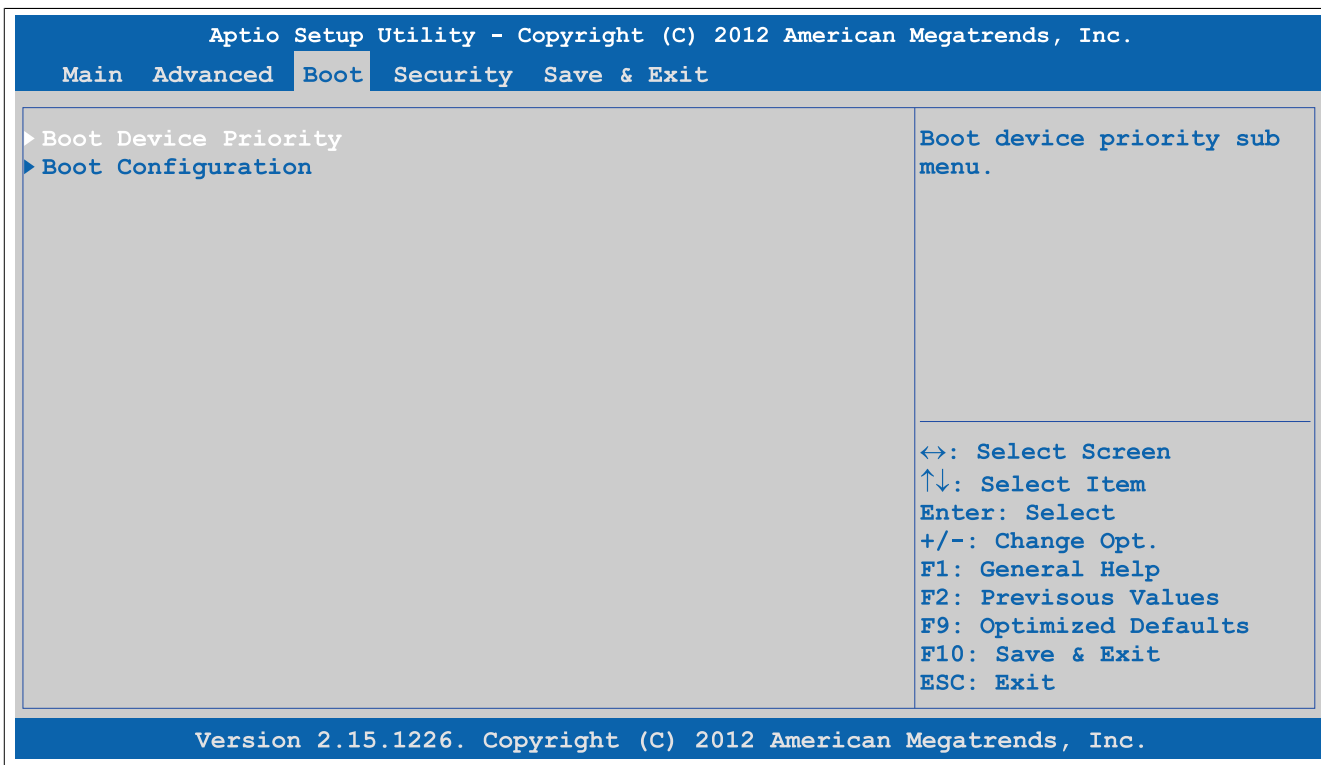


Figure 152: Boot

BIOS setting	Function	Configuration options	Effect
Boot device priority	Configures the boot order	Enter	Opens this submenu See "Boot device priority" on page 302.
Boot configuration	Configures boot properties	Enter	Opens this submenu See "Boot configuration" on page 303.

Table 258: Boot - Overview

1.3.3.1 Boot device priority

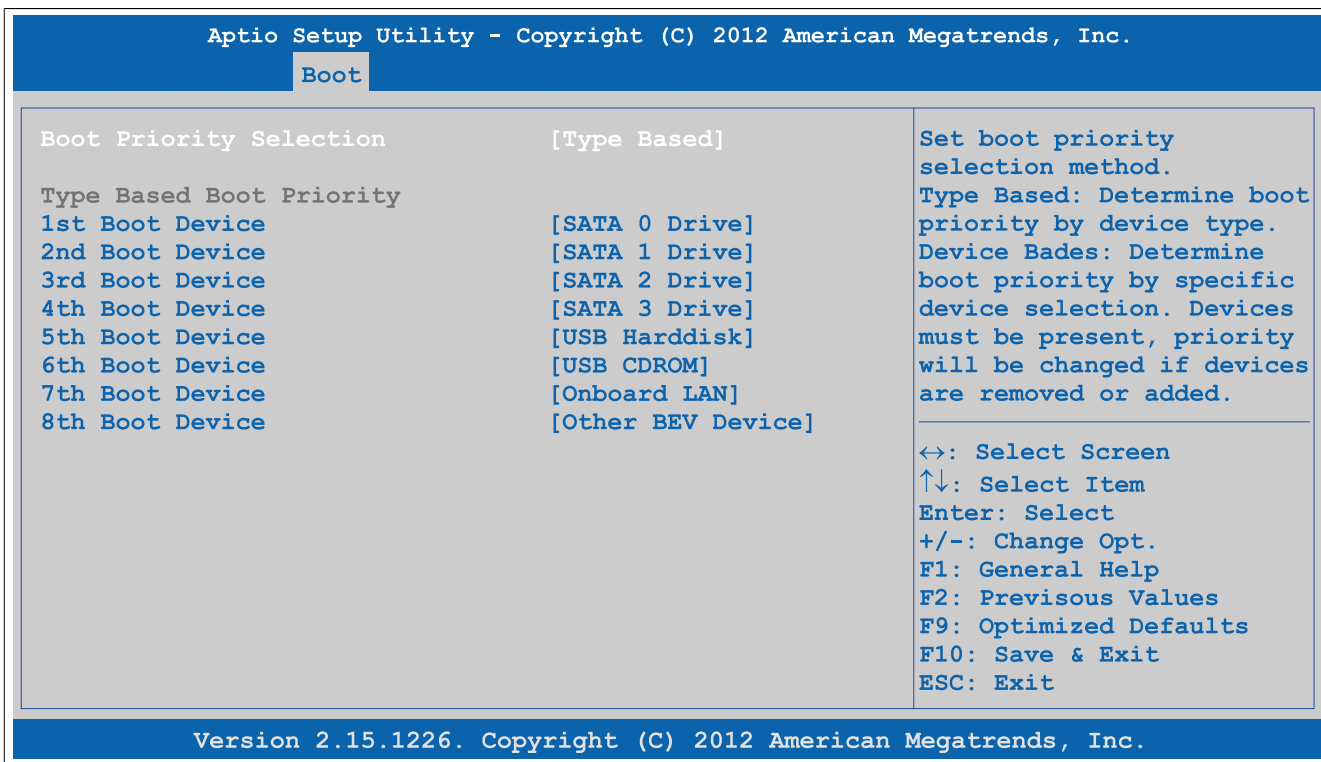


Figure 153: Boot - Boot Device Priority

BIOS setting	Function	Configuration options	Effect
Boot priority selection	Option for determining the method for how drives should be booted	Device based	Only lists devices that are recognized by the system. The order of devices in this list can be changed. Information: It is only possible to use either "Device based" or "Type based". Using both together is not permitted.
		Type based	The boot sequence of a device type list can be changed. It is also possible to add device types that are not connected to this list. Information: It is only possible to use either "Device based" or "Type based". Using both together is not permitted.
1st boot device 2nd boot device 3rd boot device 4th boot device 5th boot device 6th boot device 7th boot device 8th boot device	Option for selecting drives to be used for booting	Disabled, SATA 0 drive, SATA 1 drive, SATA 2 drive, SATA 3 drive, USB floppy, USB hard disk, USB CDROM, Onboard LAN, External LAN, Other BEV device	Specifies the desired boot sequence

Table 259: Boot - Boot device priority - Configuration options

1.3.3.2 Boot configuration

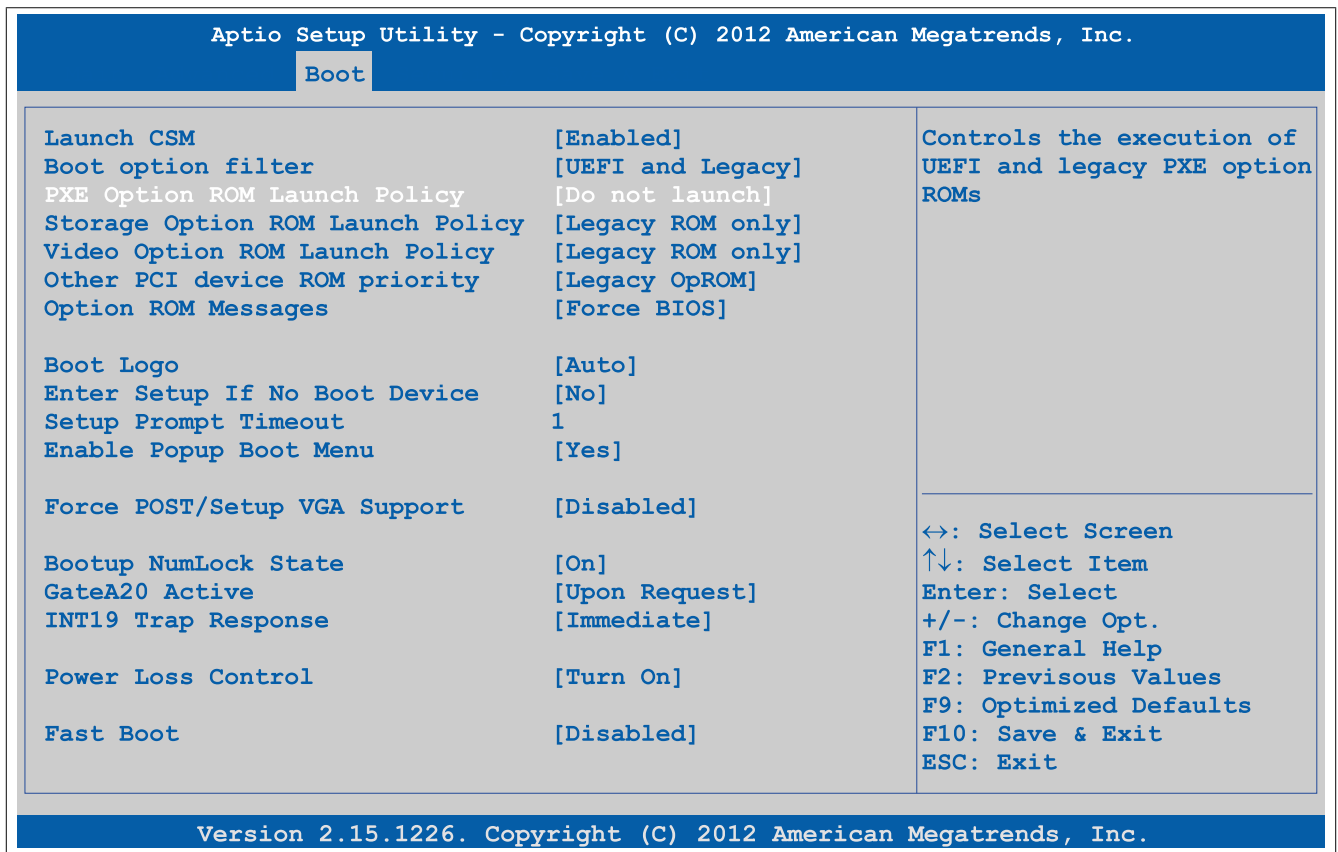


Figure 154: Boot - Boot Configuration

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 260: 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 260: Boot - Boot configuration - Configuration options

1.3.4 Security

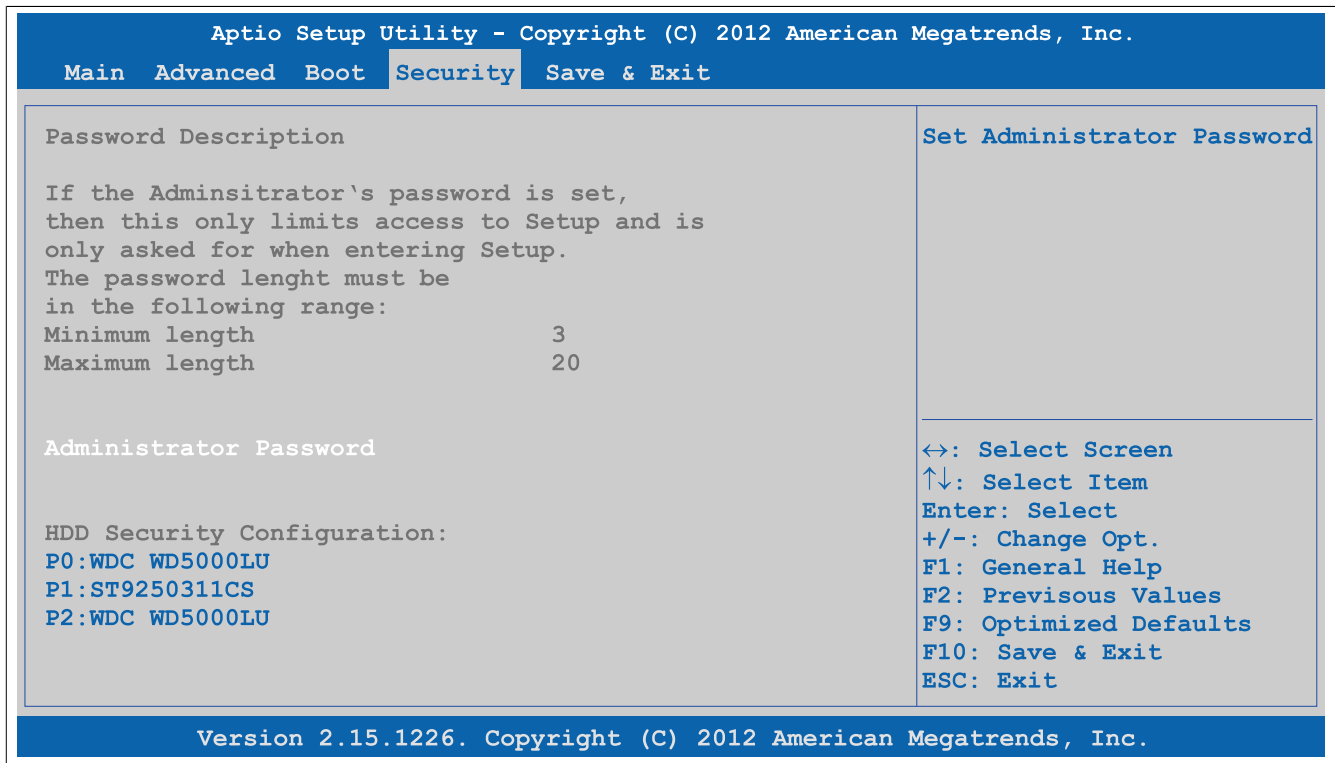


Figure 155: Security

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

Table 261: Security menu - Configuration options

1.3.4.1 HDD user password

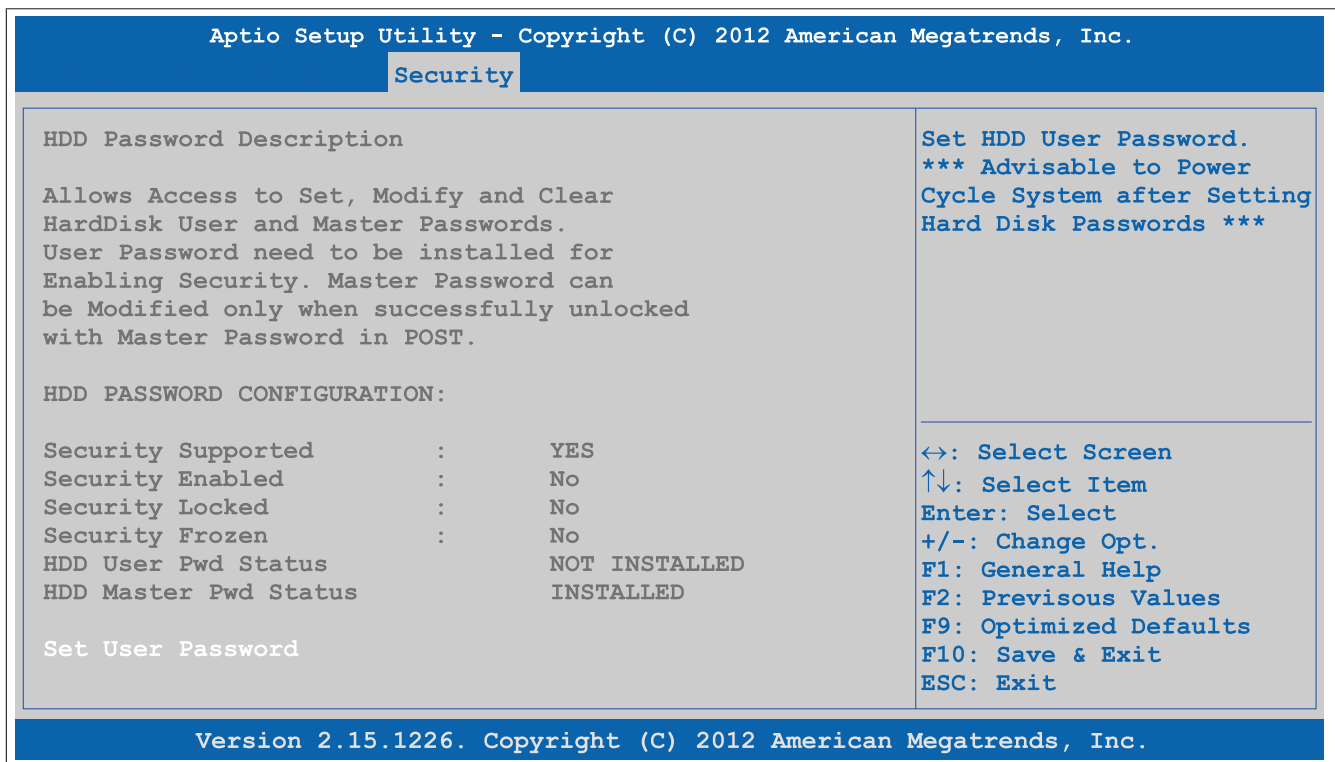


Figure 156: Security - HDD user password

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

Table 262: Security - HDD user password - Configuration options

1.3.5 Save & Exit

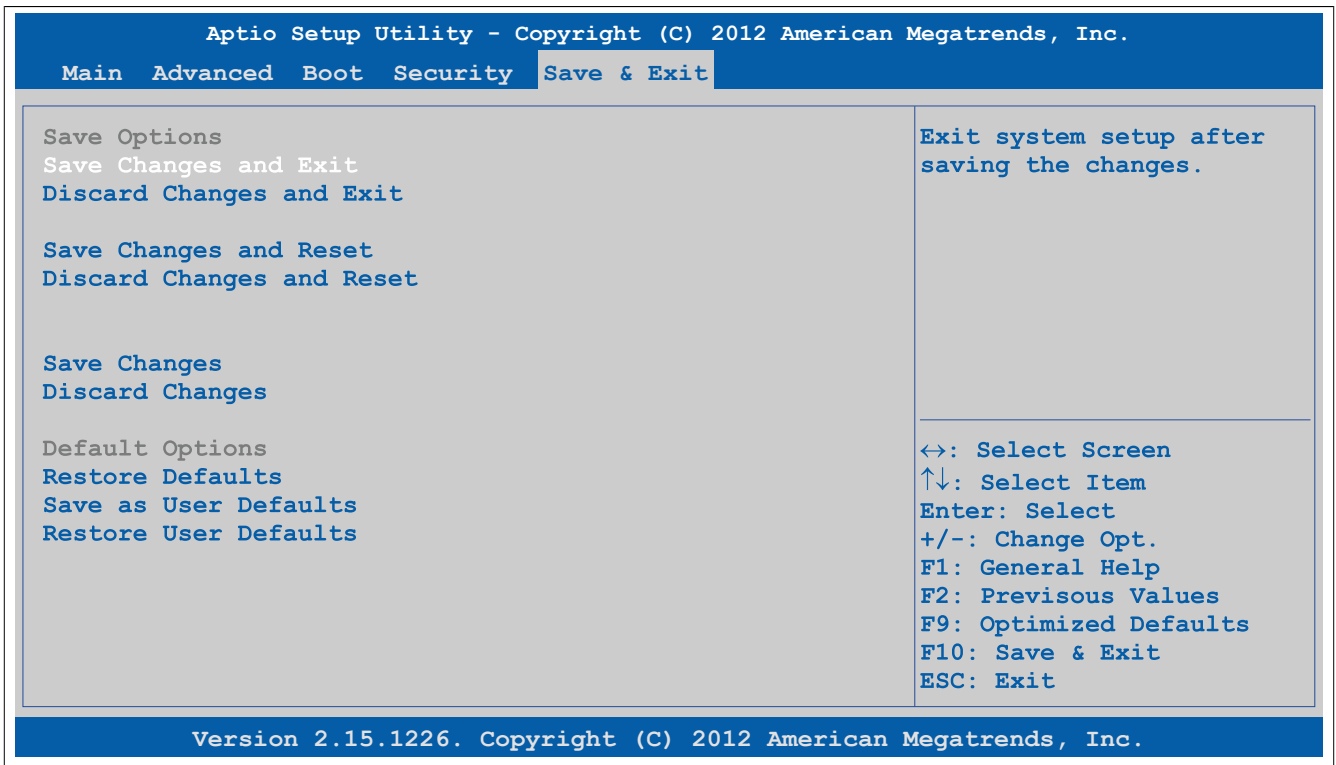


Figure 157: Save & Exit

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	
Save as user defaults	This option saves the custom BIOS settings as new default values. Information: This option can only be used with a 5PC900.TS17-0x CPU board. BIOS settings are not checked when they are saved or loaded. It is the user's responsibility to check the functionality and plausibility of any changed settings.	Yes/No	

Table 263: Save & Exit menu - Configuration options

BIOS setting	Function	Configuration options	Effect
Restore user defaults	<p>Selecting this option restores the user default values that have been saved for the BIOS settings.</p> <p>Information:</p> <p>This option can only be used with a 5PC900.TS17-0x CPU board.</p> <p>BIOS settings are not checked when they are saved or loaded. It is the user's responsibility to check the functionality and plausibility of any changed settings.</p>	Yes/No	

Table 263: Save & Exit menu - Configuration options

1.3.6 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.

The set BIOS default values are optimized for the respective system and adapted to the system configuration. Every change to the BIOS default values must be checked by the user. Faulty or invalid BIOS settings can lead to malfunctions of the system.

1.3.6.1 Advanced

1.3.6.1.1 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 (depends on the system configuration)	
Display Port C interface	Disabled (depends on the system configuration)	
Display Port D interface	HDMI/DVI (depends on the system configuration)	
Display mode persistence	Disabled	

Table 264: Advanced - Graphics configuration - Overview of profile settings

1.3.6.1.2 OEM features

Setting/Option	Default profile	My setting
Main BIOS version	-	
OEM BIOS version	-	
MTCX	-	
ETH2 MAC address	-	
Realtime environment	Disabled	
Hypervisor environment	Disabled	
POST watchdog	Disabled	
TI XIO2001 PCI bridge config	Enabled	

Table 265: Advanced - OEM features - Overview of profile settings

Super I/O configuration

Setting/Option	Default profile	My setting
Serial port A	Enabled	
Device settings	-	
Serial port C	Enabled	
Device settings	-	

Table 266: Advanced - OEM features - Super I/O configuration - Overview of profile settings

1.3.6.1.3 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	

Table 267: Advanced - PCI configuration - Overview of profile settings

Setting/Option	Default profile	My setting
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 267: Advanced - PCI configuration - Overview of profile settings

1.3.6.1.4 PCI express configuration

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 268: Advanced - PCI Express configuration - PCI Express settings - Overview of profile settings

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 269: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Overview of profile settings

PCI Express graphics (PEG) port

Setting/Option	Default profile	My setting
PCI Express graphics (PEG) port	Auto	
PEG root port configuration	Depends on the system configuration	
PEG0	-	
PEG0 speed	Depends on the system configuration	
PEG0 ASPM	Disabled	
PEG1	-	
PEG1 speed	Depends on the system configuration	
PEG1 ASPM	Disabled	
PEG2	-	
PEG2 speed	Depends on the system configuration	
PEG2 ASPM	Disabled	
Detect non-compliant device	Disabled	
De-emphasis control	-3.5 dB	

Table 270: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Overview of profile settings

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	
Extra bus reserved	0	
Reserved memory	10	
Prefetchable memory	10	
Reserved I/O	4	

Table 271: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings

1.3.6.1.5 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 272: Advanced - ACPI settings - Overview of profile settings

1.3.6.1.6 RTC wake settings

Setting/Option	Default profile	My setting
Wake system at fixed time	Disabled	

Table 273: Advanced - RTC wake settings - Overview of profile settings

1.3.6.1.7 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 274: Advanced - CPU configuration - Overview of profile settings

1.3.6.1.8 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	-	
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 275: Advanced - Chipset configuration - Overview of profile settings

1.3.6.1.9 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 276: Advanced - SATA configuration - Overview of profile settings

1.3.6.1.10 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	
Memory remap	Enabled	
Memory alias check	Disabled	
Channel A DIMM control	Enable both DIMMS	
Channel B DIMM control	Enable both DIMMS	

Table 277: Advanced - Memory configuration - Overview of profile settings

1.3.6.1.11 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 278: Advanced - USB configuration - Overview of profile settings

1.3.6.1.12 Serial port console redirection

Setting/Option	Default profile	My setting
Console redirection	Disabled	

Table 279: Advanced - Serial port console redirection - Overview of profile settings

1.3.6.1.13 Network stack configuration

Setting/Option	Default profile	My setting
Network stack	Disabled	

Table 280: Advanced - Network stack - Overview of profile settings

1.3.6.2 Boot

1.3.6.2.1 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 281: Boot - Boot device priority - Overview of profile settings

1.3.6.2.2 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 282: Boot - Boot configuration - Overview of profile settings

1.3.7 Allocation of resources

1.3.7.1 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 283: RAM address assignments

1) TOM = Top of memory: max. installed DRAM.

1.3.7.2 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
4000h - 40FFh	MTCX (SDL4 update) - BIOS V1.25 and later
4100h - 41FFh	MTCX
FF00h - FF07h	IDE bus master register

Table 284: I/O address assignments

1.3.7.3 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 285: IRQ interrupt assignments in PIC mode

1) Advanced Configuration and Power Interface.

- ... Default setting
- ... Optional setting

1.3.7.4 Interrupt assignments in APIC mode

A total of 23 IRQs are available in APIC (**A**dvanced **P**rogrammable **I**nterrupt **C**ontroller) mode. Enabling this option is only effective if done before the Windows operating system is installed.

IRQ	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	NONE
System timer	•																								
Keyboard		•																							
IRQ cascade			•																						
COM A (COM1)				○	•	○	○	○			○	○	○												
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 286: 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

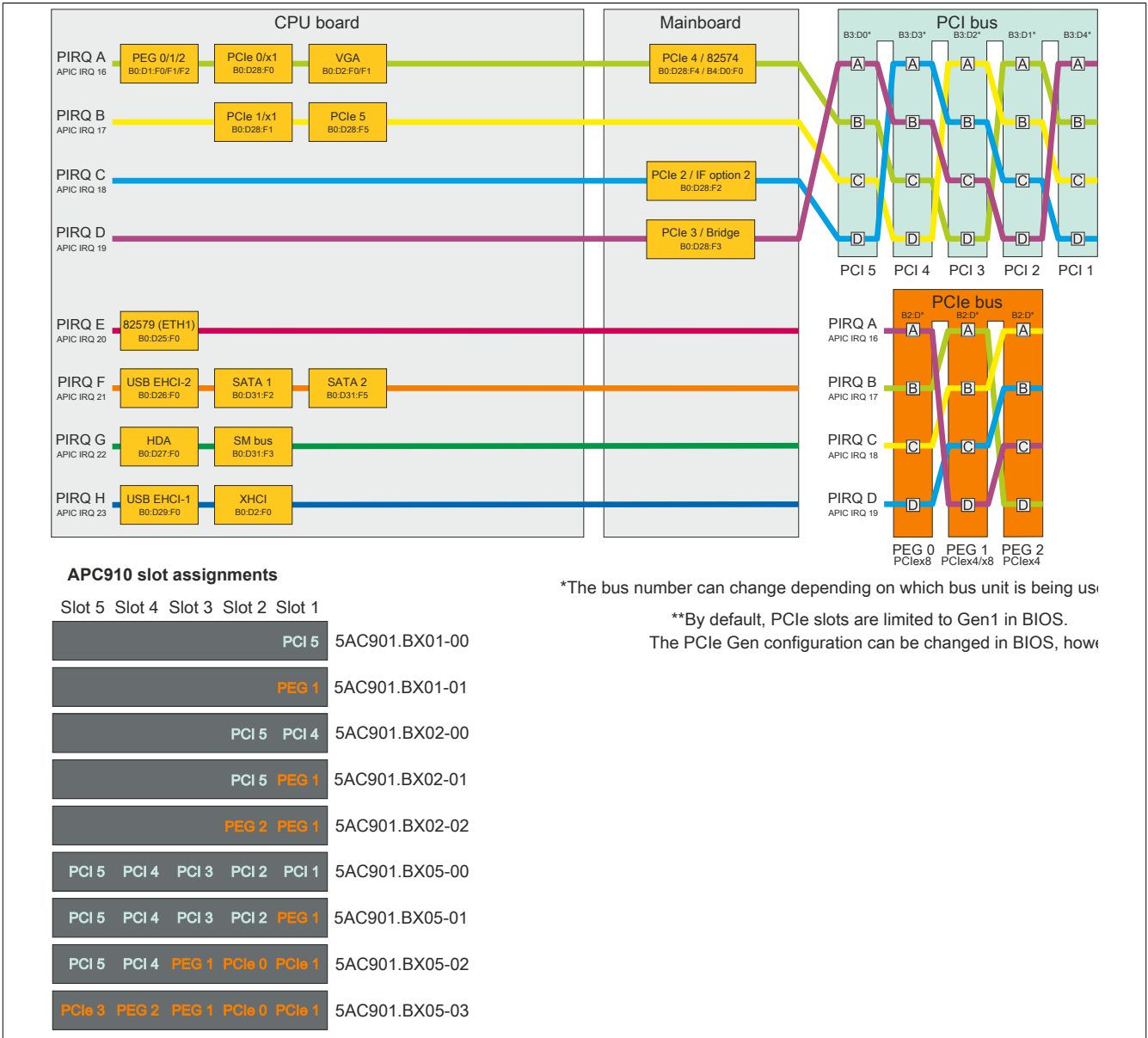


Figure 158: PCI and PCIe routing with enabled APIC for QM77/HM76 CPU boards

1.4 BIOS TS17

Information:

The following figures, BIOS menu options and descriptions refer to BIOS version 1.14. It is therefore possible that these figures or BIOS descriptions do not correspond to the installed BIOS version. In addition, the BIOS menu options depend on the system configuration.

Information:

BIOS default settings are bold and italicized in the tables.

BIOS menu options and descriptions that are not highlighted either depend on the system configuration or are only displayed depending on other BIOS settings.

The set BIOS default values are optimized for the respective system and adapted to the system configuration. Every change to the BIOS default values must be checked by the user. Faulty or invalid BIOS settings can lead to malfunctions of the system.

1.4.1 Main

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



Figure 159: Main

BIOS setting	Explanation	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	-

Table 287: Main - Configuration options

BIOS setting	Explanation	Configuration options	Effect
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 318.
System date	The currently configured system date. The time is backed up by a battery (CMOS battery) after the system has been 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. The time is backed up by a battery (CMOS battery) after the system has been switched off.	Change the system time	Sets the system time in the format Hour:Minute:Second (hh:mm:ss).

Table 287: Main - Configuration options

1.4.1.1 Platform information

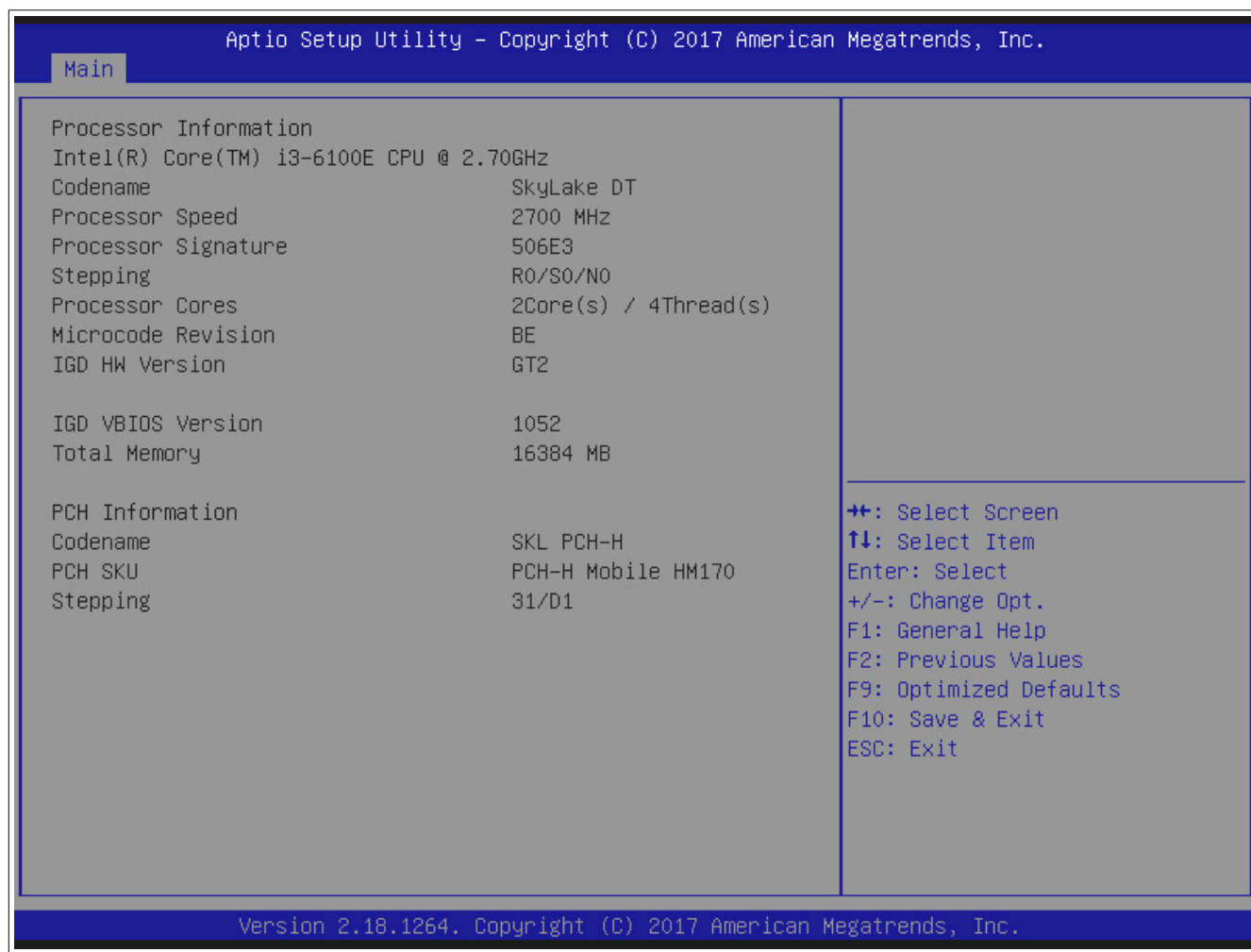


Figure 160: Main - Platform information

BIOS setting	Explanation	Configuration options	Effect
Processor information			
Intel Core i3-6100E CPU @2.70 GHz	Displays the processor type.	None	-
Code name	Displays the processor architecture	None	-
Processor speed	Displays the processor frequency	None	-
Processor signature	Displays the processor signature.	None	-
Stepping	Displays the processor stepping version	None	-
Processor cores	Displays the number of processor cores/threads	None	-
Microcode revision	Displays the processor microcode revision	None	-
IGD HW version	Displays the IGD BIOS version.	None	-
IGD VBIOS version	Displays the IGD VBIOS version	None	-

Table 288: Main - Platform information - Overview

BIOS setting	Explanation	Configuration options	Effect
Total memory	Displays the system memory size	None	-
PCH information			
Code name	Displays the platform controller hub	None	-
PCH SKU	Displays the chipset on the CPU board	None	-
Stepping	Displays the chipset stepping version	None	-

Table 288: Main - Platform information - Overview

1.4.2 Advanced

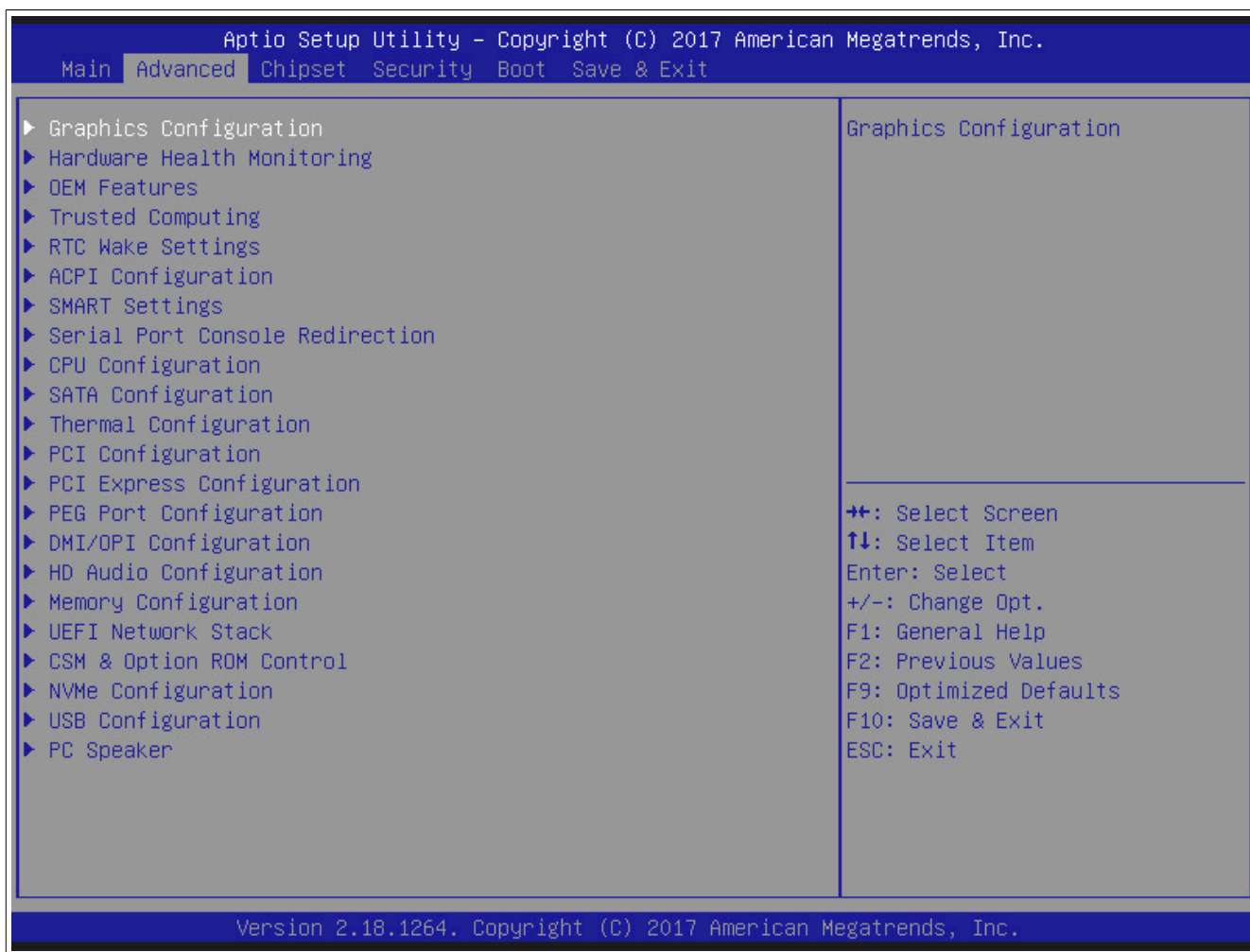


Figure 161: Advanced - Overview

BIOS setting	Explanation	Configuration options	Effect
Graphics configuration	Configures graphics settings	Enter	Opens this submenu See "Graphics configuration" on page 321.
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 324.
OEM features	Configures OEM features.	Enter	Opens this submenu See "OEM features" on page 326.
Trusted computing	Configuration of trusted computing	Enter	Opens this submenu, see "Trusted computing" on page 329.
RTC wake settings	Configures the start time when switched off	Enter	Opens this submenu See "RTC wake settings" on page 330.
ACPI configuration	Configures ACPI settings	Enter	Opens this submenu See "ACPI settings" on page 331.
SMART settings	Configures SMART settings.	Enter	Opens this submenu, see "SMART settings" on page 332.
Serial port console redirection	Configures the remote console	Enter	Opens this submenu See "Serial port console redirection" on page 333.
CPU configuration	Configures CPU settings.	Enter	Opens this submenu See "CPU configuration" on page 336.
SATA configuration	Configures SATA settings.	Enter	Opens this submenu See "SATA configuration" on page 339.
Thermal configuration	Configures the thermal settings.	Enter	Opens this submenu, see "Thermal configuration" on page 342.
PCI configuration	Configures PCI devices	Enter	Opens this submenu See "PCI configuration" on page 344.
PCI express configuration	Configures PCI Express devices	Enter	Opens this submenu See "PCI express configuration" on page 345.
PEG port configuration	Configures PEG port settings.	Enter	Opens this submenu, see "PEG port configuration" on page 352.
DMI/OPI configuration	Configures DMI/OPI settings.	Enter	Opens this submenu, see "DMI configuration" on page 358.

Table 289: Advanced - Overview

BIOS setting	Explanation	Configuration options	Effect
HD audio configuration	Configures HD audio settings.	Enter	Opens this submenu, see "Audio" on page 363.
Memory configuration	Configures main memory settings	Enter	Opens this submenu See "Memory configuration" on page 366.
UEFI network stack	Configures the UEFI network stack.	Enter	Opens this submenu, see "Network stack configuration" on page 367.
CSM & Option ROM control	Configures CSM and ROM settings.	Enter	Opens this submenu, see "CSM configuration" on page 368.
NVMe configuration	Configures NVMe settings.	Enter	Opens this submenu, see "NVMe configuration" on page 369.
USB configuration	Configures USB settings.	Enter	Opens this submenu See "USB configuration" on page 370.
PC speaker	Configures the speaker.	Enter	Opens this submenu, see "Speaker settings" on page 373.

Table 289: Advanced - Overview

1.4.2.1 Graphics configuration

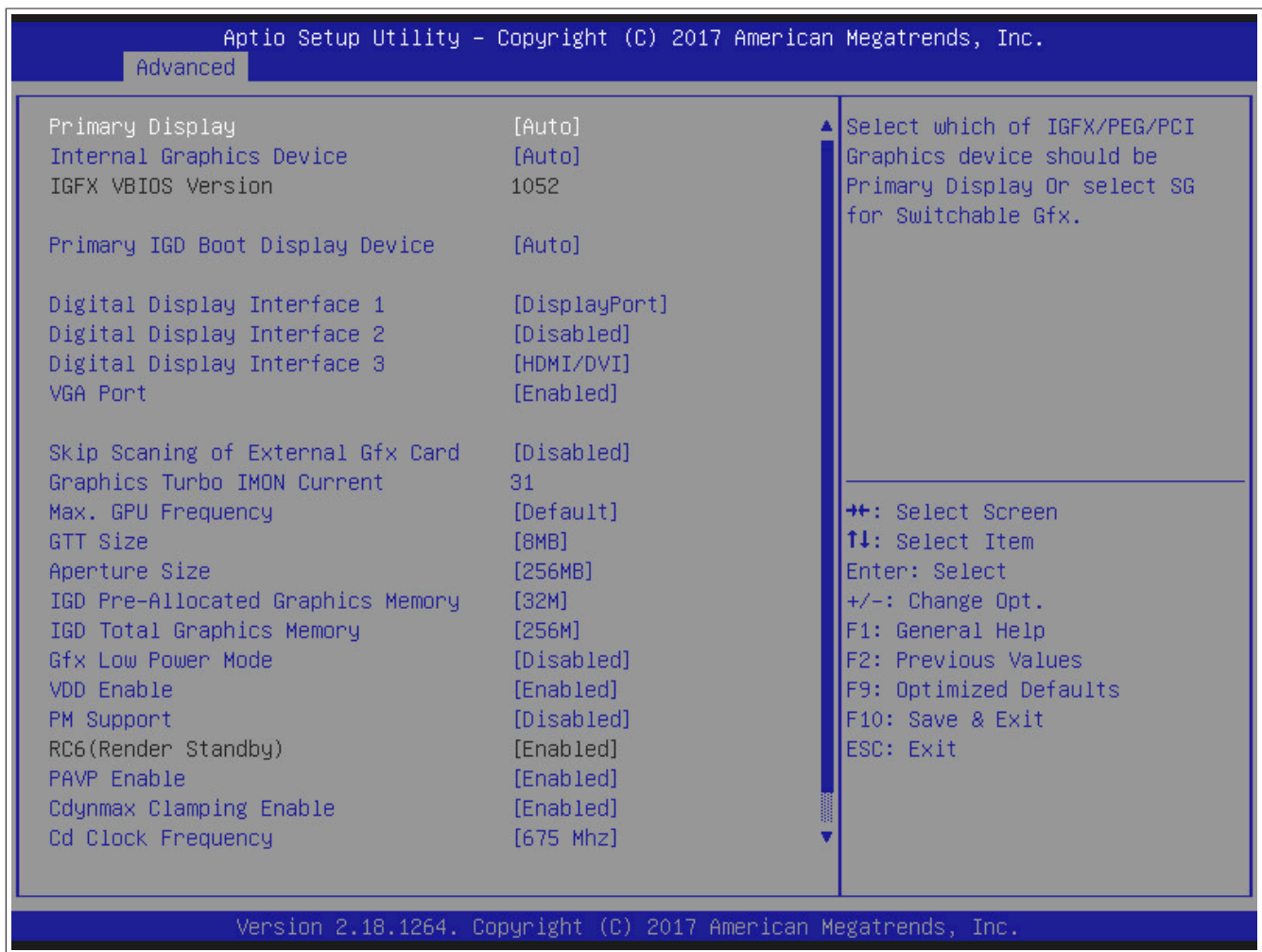


Figure 162: Advanced - Graphics configuration

BIOS setting	Explanation	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/PCIe	Uses the graphics chip of a connected graphics card on the PCI or PCIe bus as the display device.
Internal graphics device	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	-

Table 290: Advanced - Graphics configuration options

BIOS setting	Explanation	Configuration options	Effect
Primary IGD boot display device	Option for defining the primary enabled display device during booting.	Auto	Primary IGD display in POST (automatic selection).
		CRT	The analog RGB is used.
		LFP	The LVDS panel connected to the LVDS interface is used.
		EFP	The EFP (external flat panel) channel is used.
		EFP2	The EFP2 (external flat panel) channel is used.
		EFP3	The EFP3 (external flat panel) channel is used.
Digital display interface 1	Option for selecting the display device that is connected to the DisplayPort interface.	Auto selection	An attempt is made to automatically detect the mode of the connected display device.
		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.
Digital display interface 2	Option for selecting the display device that is connected to the monitor/panel option. The default value depends on the system configuration.	Auto selection	An attempt is made to automatically detect the mode of the connected display device.
		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.
Digital display interface 3	Option for selecting the display device that is connected to the monitor/panel interface.	Auto selection	An attempt is made to automatically detect the mode of the connected display device.
		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 if 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.
VGA port	Option for configuring the VGA port.	Enabled	Enables the VGA interface.
		Disabled	Disables the VGA interface.
Skip scanning of external Gfx card	If enables, a search for external graphics cards on the PEG and PCIe bus does not take place.	Disabled	Disables this function.
Graphics turbo IMON current	Current values supported by Graphics turbo IMON current.	14 to 31	Indicates current Graphics turbo IMON current value 14 to 31.
Max. GPU frequency	Option for limiting the maximum frequency of the GPU.	Default	The maximum frequency of the GPU is the default value.
		800 MHz	The maximum frequency of the GPU is limited to 800 MHz.
		700 MHz	The maximum frequency of the GPU is limited to 700 MHz.
		600 MHz	The maximum frequency of the GPU is limited to 600 MHz.
		500 MHz	The maximum frequency of the GPU is limited to 500 MHz.
GTT size	Option for setting the GTT size	1MB	1 MB GTT.
		2MB	2 MB GTT.
		8MB	8 MB GTT.
Aperture size	Option for configuring the maximum amount of RAM made available to the main memory when graphics memory is full.	128MB	Reserves 128 MB
		256MB	Reserves 256 MB
		512 MB	Reserves 512 MB
IGD pre-allocated graphics memory	Option to set the size of the allocated graphics memory to be used by the IGD.	32M to 2048M	Defines the allocated graphics memory as a value between 32 and 2048 MB.
IGD total graphics memory	Option for setting the amount of memory that can be used for the internal graphics controller. Memory over the permanently allocated 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
VDD enable	Enables/Disables the force VDD enable.	Enabled	Enables this function.
		Disabled	Disables this function.
PM support	Enables/Disables PM support.	Disabled	Disables this function.
		Enabled	Enables this function.
RC6 (render standby)	Enables RC6.	Enabled	The function is active.

Table 290: Advanced - Graphics configuration options

BIOS setting	Explanation	Configuration options	Effect
PAVP enable	Enables/Disables the force PAVP enable.	Enabled	Enables this function.
		Disabled	Disables this function.
Cdynmax clamping enable	Enables/Disables Cdynmax clamping.	Enabled	Enables this function.
		Disabled	Disables this function.
Cd clock frequency	Option for setting the highest supported Cd clock frequency.	337.5 Mhz	337.5 MHz is supported.
		450 Mhz	450 MHz is supported.
		540 Mhz	540 MHz is supported.
		675 Mhz	675 MHz is supported.
Display interface signal integrity settings	Configures display interface signal integrity settings.	Enter	Opens submenu Display interface signal integrity settings

Table 290: Advanced - Graphics configuration options

1.4.2.1.1 Display interface signal integrity settings

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

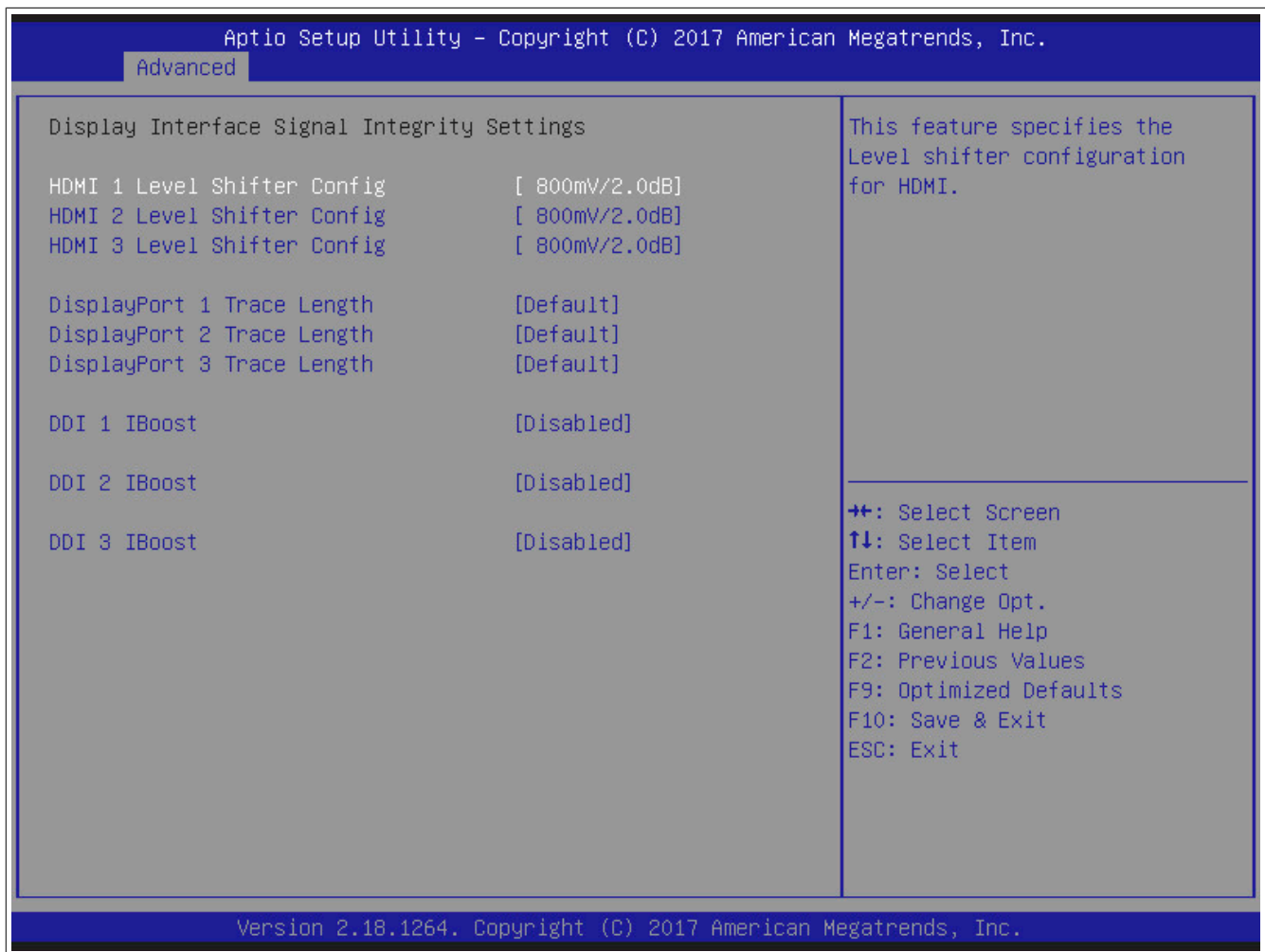


Figure 163: Advanced - Graphics display interface signal integrity settings

BIOS setting	Explanation	Configuration options	Effect
HDMI 1 level shifter config	Function for specifying the level shifter configuration for HDMI 1.	400mV/0.0dB to 800mV/2.0dB to 1200mV/0.0dB	Sets the level shifter configuration from 400mV/0.0dB to 1200mV/0.0dB.
HDMI 2 level shifter config	Function for specifying the level shifter configuration for HDMI 2.	400mV/0.0dB to 800mV/2.0dB to 1200mV/0.0dB	Sets the level shifter configuration from 400mV/0.0dB to 1200mV/0.0dB.
HDMI 3 level shifter config	Function for specifying the level shifter configuration for HDMI 3.	400mV/0.0dB to 800mV/2.0dB to 1200mV/0.0dB	Sets the level shifter configuration from 400mV/0.0dB to 1200mV/0.0dB.
DisplayPort 1 trace length	Option that determines the DisplayPort trace length for the DisplayPort output port.	Default	Uses the default setting of the DisplayPort 1 trace length.
		Short	Uses the short length of the DisplayPort 1 trace length.
		Long	Uses the long length of the DisplayPort 1 trace length.

Table 291: Advanced - Graphics display interface signal integrity - Configuration options

BIOS setting	Explanation	Configuration options	Effect
DisplayPort 2 trace length	Option that determines the DisplayPort trace length for the DisplayPort output port.	Default	Uses the default setting of the DisplayPort 2 trace length.
		Short	Uses the short length of the DisplayPort 2 trace length.
		Long	Uses the long length of the DisplayPort 2 trace length.
DisplayPort 3 trace length	Option that determines the DisplayPort trace length for the DisplayPort output port.	Default	Uses the default setting of the DisplayPort 3 trace length.
		Short	Uses the short length of the DisplayPort 3 trace length.
		Long	Uses the long length of the DisplayPort 3 trace length.
DDI 1 IBoost	If this function is enabled, IBoost is enabled for the selected port at all VSwing / pre-emphasis levels.	Disabled	Disables this function.
		Enabled	Enables this function.
DDI 2 IBoost	If this function is enabled, IBoost is enabled for the selected port at all VSwing / pre-emphasis levels.	Disabled	Disables this function.
		Enabled	Enables this function.
DDI 3 IBoost	If this function is enabled, IBoost is enabled for the selected port at all VSwing / pre-emphasis levels.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 291: Advanced - Graphics display interface signal integrity - Configuration options

1.4.2.2 Hardware health monitoring

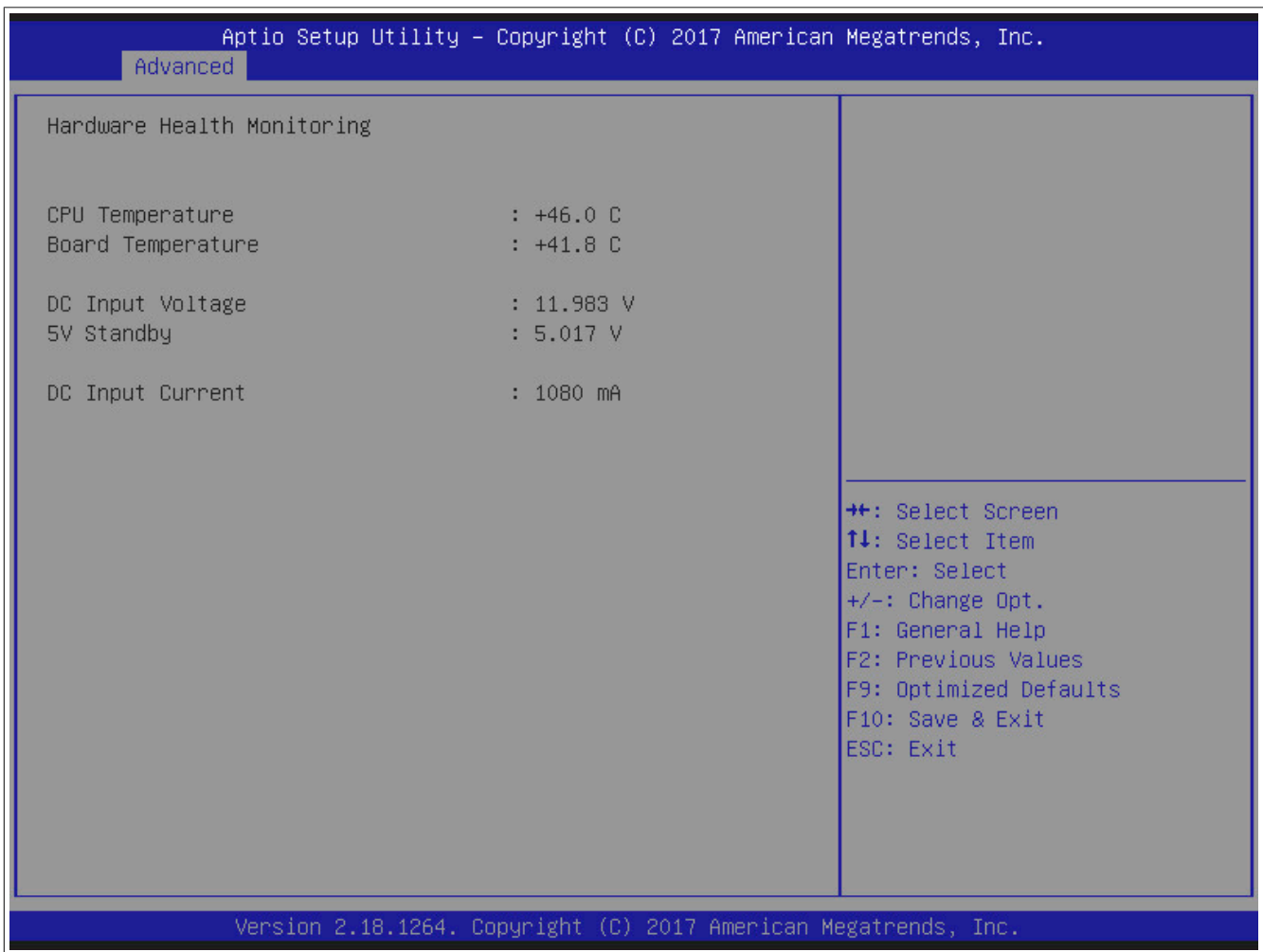


Figure 164: Advanced - Hardware health monitoring

BIOS setting	Explanation	Configuration options	Effect
CPU temperature	Displays the current temperature of the CPU sensor in °C	None	-
Board temperature	Displays the current temperature of the board sensor in °C	None	-
DC input voltage	Displays the current voltage of the 12 volt supply	None	-
5 V standby	Displays the current voltage of the 5 volt supply	None	-
DC input current	Displays the current current in mA.	None	-

Table 292: Advanced - Hardware health monitoring

1.4.2.3 OEM features

Information:

Unspecified BIOS TS17 OEM features are similar to BIOS TS77 features - see "OEM features" on page 254.

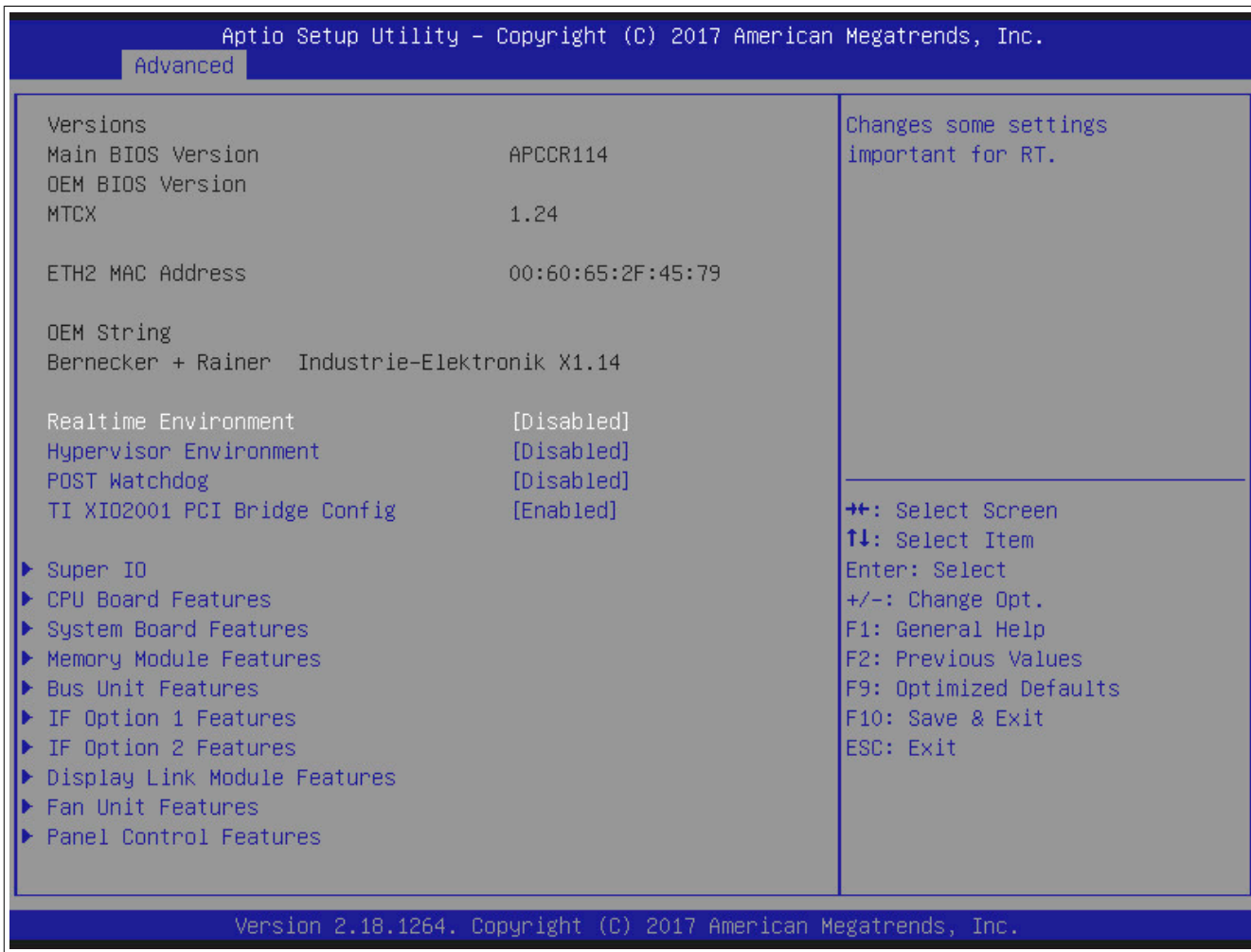


Figure 165: Advanced - OEM features

BIOS setting	Explanation	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.
Hypervisor environment	This option configures settings for hypervisor operation.	Disabled	Disables this function.
		Enabled	Enables the settings necessary for hypervisor operation, such as Intel Virtualization Technology and VT-d.
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
		1min	
		2min	
		5min	
		10min	
30 min			
TI XIO2001 PCI bridge config	This option is only visible if a bus unit with PCI slot is present in the system and configures the PCIe to PCI bridge on it.	Enabled	Enables this function.
		Disabled	Disables this function.
Super I/O	Configures special interface settings.	Enter	Opens this submenu See "Super I/O configuration" on page 255.

Table 293: Advanced - OEM features screen

BIOS setting	Explanation	Configuration options	Effect
CPU board features	Displays <i>device</i> -specific information for the CPU board	Enter	Opens this submenu See "CPU board features" on page 256.
System board features	Displays <i>device</i> -specific information for the system unit.	Enter	Opens this submenu See "System board features" on page 258.
Memory module features	Displays <i>device</i> -specific information for the main memory	Enter	Opens this submenu See "Memory module features" on page 261.
Bus unit features	Displays <i>device</i> -specific information for the bus unit	Enter	Opens this submenu See "Bus unit features" on page 262.
IF option 1 features¹⁾	Displays <i>device</i> -specific information for <i>interface</i> option 1	Enter	Opens this submenu See "IF option 1 features" on page 263.
IF option 2 features¹⁾	Displays <i>device</i> -specific information for <i>interface</i> option 2	Enter	Opens this submenu See "IF option 2 features" on page 265.
Display link module features¹⁾	Displays <i>device</i> -specific information for the monitor/panel option	Enter	Opens this submenu See "Display link module features" on page 266.
Fan unit features²⁾	Displays <i>device</i> -specific information for the fan kit	Enter	Opens this submenu See "Fan unit features" on page 268.
Slide-in features 1³⁾	Displays <i>device</i> -specific information for slide-in drive 1	Enter	Opens this submenu See "Slide-in 1 features" on page 270.
Slide-in features 2³⁾	Displays <i>device</i> -specific information for slide-in drive 2	Enter	Opens this submenu See "Slide-in 2 features" on page 272.
Panel control features	Displays <i>device</i> -specific information for the connected panel	Enter	Opens this submenu See "Panel control features" on page 273.

Table 293: 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.

1.4.2.3.1 CPU board features

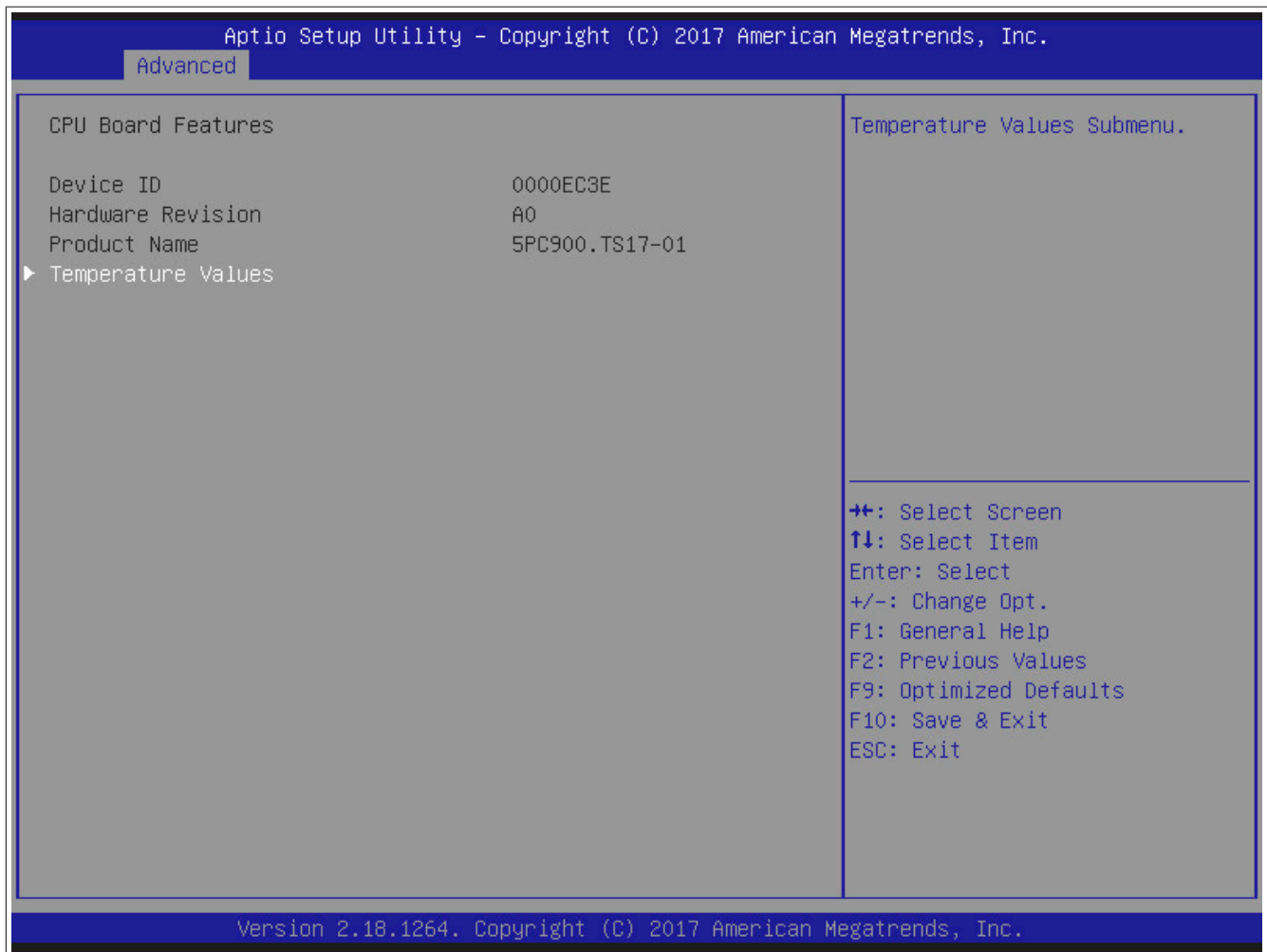


Figure 166: Advanced - OEM features - CPU board features

BIOS setting	Explanation	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 328.

Table 294: Advanced - OEM features - CPU board features

Temperature values

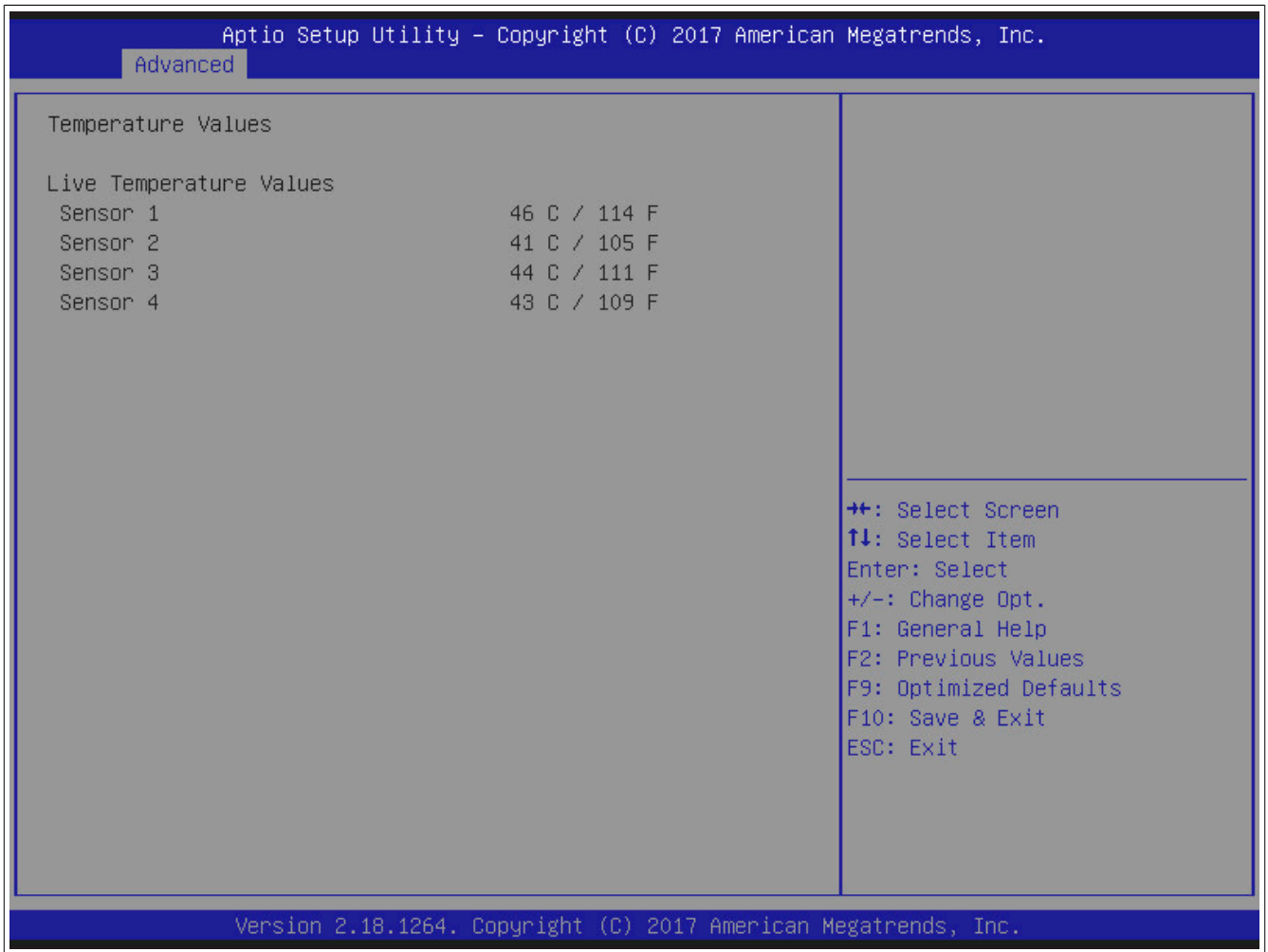


Figure 167: Advanced - OEM features - CPU board features - Temperature values

BIOS setting	Explanation	Configuration options	Effect
Sensor 1	Displays the current temperature of sensor 1 (CPU) in °C and °F for TS17.	None	-
Sensor 2	Displays the current temperature of sensor 2 (board controller) in °C and °F for TS17.	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 295: 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.

1.4.2.4 Trusted computing



Figure 168: Advanced - Total productive maintenance

BIOS setting	Explanation	Configuration options	Effect
TPM20 device found	Displays existing TPM20 devices.	None	-
Security device support	Option for enabling/disabling BIOS support for security devices. The OS does not display the security devices. The TCG EFI protocol and INT1A interface are not available.	Enabled	Enables this function.
		Disable	Disables this function.
Active PCR banks	Displays the active PCR banks.	None	-
Available PCR banks	Displays the available PCR banks.	None	-
SHA-1 PCR bank	Option for enabling/disabling the SHA-1 PCR bank.	Enabled	Enables the SHA-1 PCR bank.
		Disabled	Disables the SHA-1 PCR bank.
SHA256 PCR bank	Option for enabling/disabling the SHA256 PCR bank.	Enabled	Enables the SHA256 PCR bank.
		Disabled	Disables the SHA256 PCR bank.
Pending operation	Planned operation on the security device	None	There are no pending operations.
		TPM clear	Deletes the security device.
Platform hierarchy	Option for enabling/disabling the platform hierarchy.	Enabled	Enables the platform hierarchy.
		Disabled	Disables the platform hierarchy.
Storage hierarchy	Option for enabling/disabling the storage hierarchy.	Enabled	Enables the storage hierarchy.
		Disabled	Disables the storage hierarchy.
Endorsement hierarchy	Option for enabling/disabling the endorsement hierarchy.	Enabled	Enables the endorsement hierarchy.
		Disabled	Disables the endorsement hierarchy.
TPM2.0 UEFI spec version	Value for the TPM2.0 UEFI specification version.	TCG_2	TPM 2.0 specification
		TCG1_2	TPM 1.2 specification
Physical presence spec version	Displays the physical presence spec version	1.3	Notifies the operating system of the PPI spec version 1.3.
		1.2	Notifies the operating system of the PPI spec version 1.2.
TPM 20 InterfaceType	Displays the TPM20 connection type.	TIS	-
Device select	Option for selecting the TPM device.	Auto	Supports TPM 1.2 and TPM 2.0. Default: TPM 2.0.
		TPM1.2	Supports TPM 1.2
		TPM2.0	Supports TPM 2.0

Table 296: Advanced - TPM settings - Configuration options

1.4.2.5 RTC wake settings

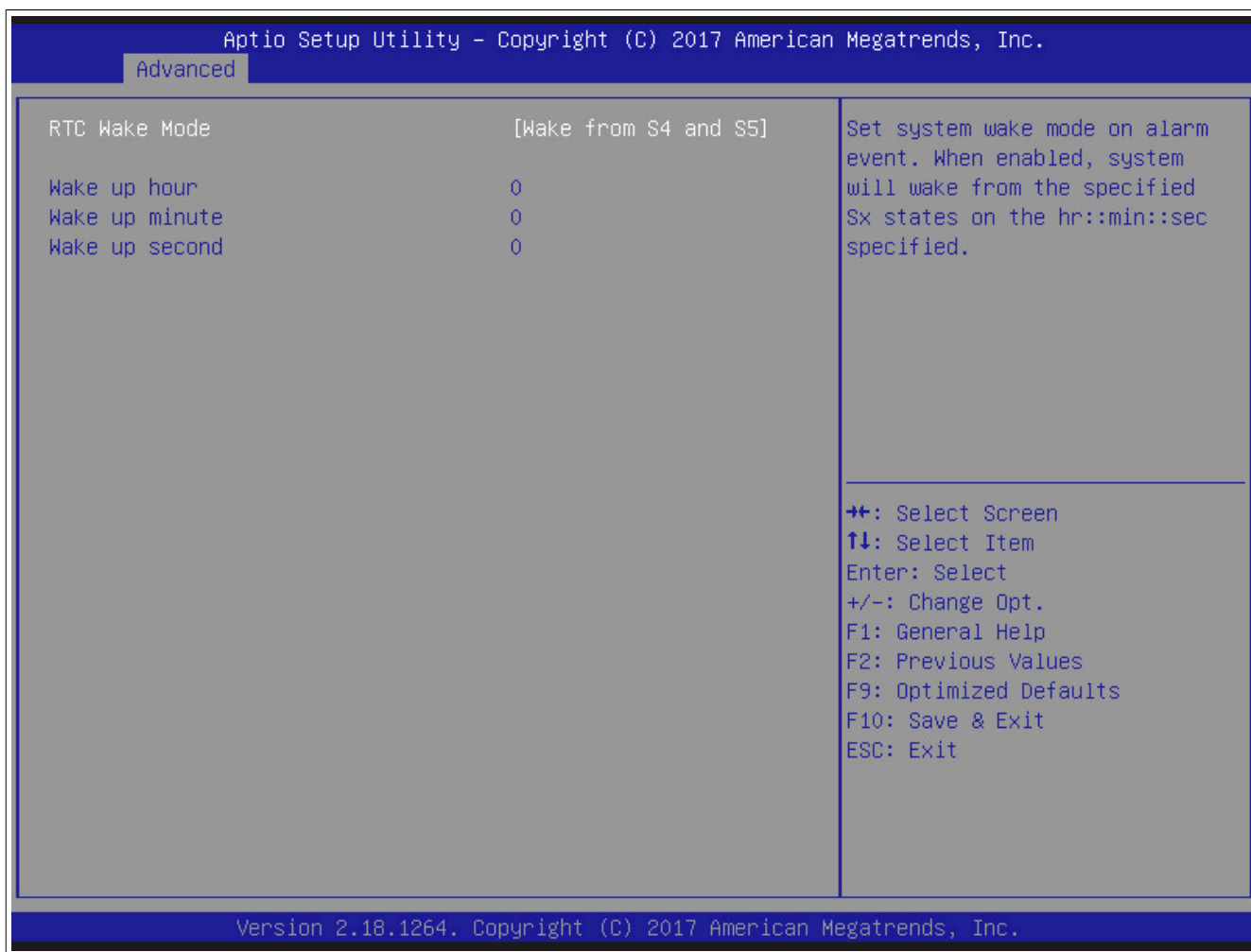


Figure 169: Advanced - RTC wake settings

BIOS setting	Explanation	Configuration options	Effect
RTC wake mode	Option for setting the time (to the second) when the system should boot from a switched-off state (ACPI S5)	Disabled	Disables this function.
		Wake from S4 and S5	The system is enabled from the specified S4 and S5 states at the specified hours:minutes:seconds.
		Wake from S3, S4 and S5	The system is enabled from the specified S3, S4 and S5 states at the specified hours:minutes:seconds.
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 297: Advanced - RTC wake settings - Configuration options

1.4.2.6 ACPI settings

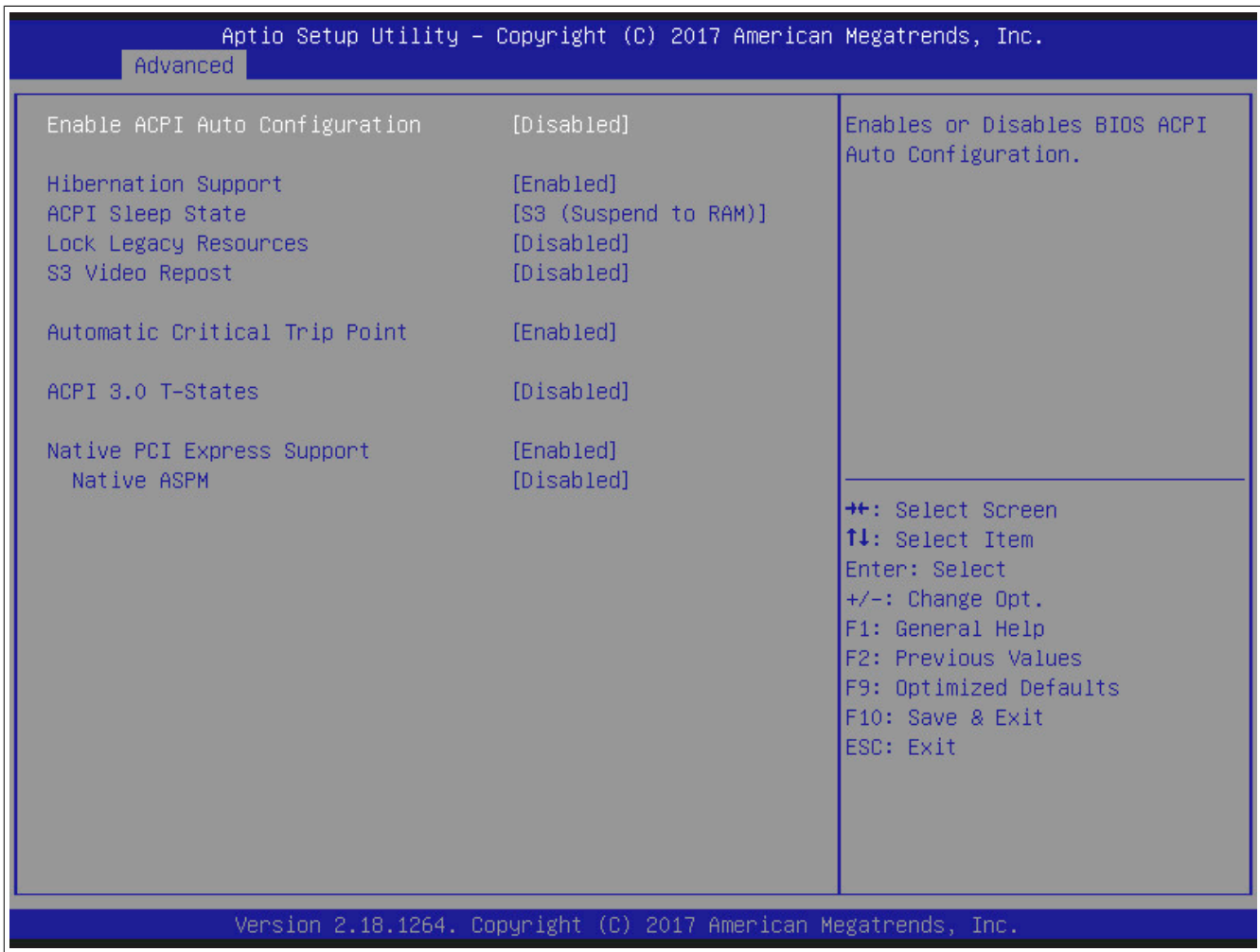


Figure 170: Advanced - ACPI settings

BIOS setting	Explanation	Configuration options	Effect
Enable ACPI auto configuration	Option for enabling/disabling the BIOS ACPI auto configuration function.	Disabled	Disables this function.
		Enabled	Enables this function.
Hibernation support	Option for enabling/disabling hibernation support. 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.
		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.
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.
Automatic critical trip point	Option for configuring a CPU temperature at which the operating system automatically shuts down	Enabled	Configures the critical trip point, the temperature limit at which the ACPI-enabled operating system automatically shuts down to the recommended value.
		Disabled	Configures the critical trip point manually.
Critical trip point value	Option to select the temperature threshold at which the ACPI-enabled operating system will perform a critical shutdown.	71 C	Performs a shutdown at 71°C.
		79 C	Performs a shutdown at 79°C.
		87 C	Performs a shutdown at 87°C.
		95 C	Performs a shutdown at 95°C.
		100 C	Performs a shutdown at 100°C.
		103 C	Performs a shutdown at 103°C.
		111 C	Performs a shutdown at 111°C.
		119 C	Performs a shutdown at 119°C.
ACPI 3.0 T-state	Option for enabling/disabling ACPI 3.0 T-state.	127 C	Performs a shutdown at 127°C.
		Disabled	Disables this function.

Table 298: Advanced - ACPI settings - Configuration options

BIOS setting	Explanation	Configuration options	Effect
Native PCI Express support	Enables/Disables native operating system PCIe support.	Enabled	Enables this function.
		Enabled	Enables this function.
Native ASPM	Enables/Disables native ASPM.	Disabled	Disables this function.
		Disabled	Disables the function so that BIOS controls ASPM support of the PCIe device.
		Enabled	Enables the function so that the operating system controls ASPM support of the PCIe device.

Table 298: Advanced - ACPI settings - Configuration options

1.4.2.7 SMART settings

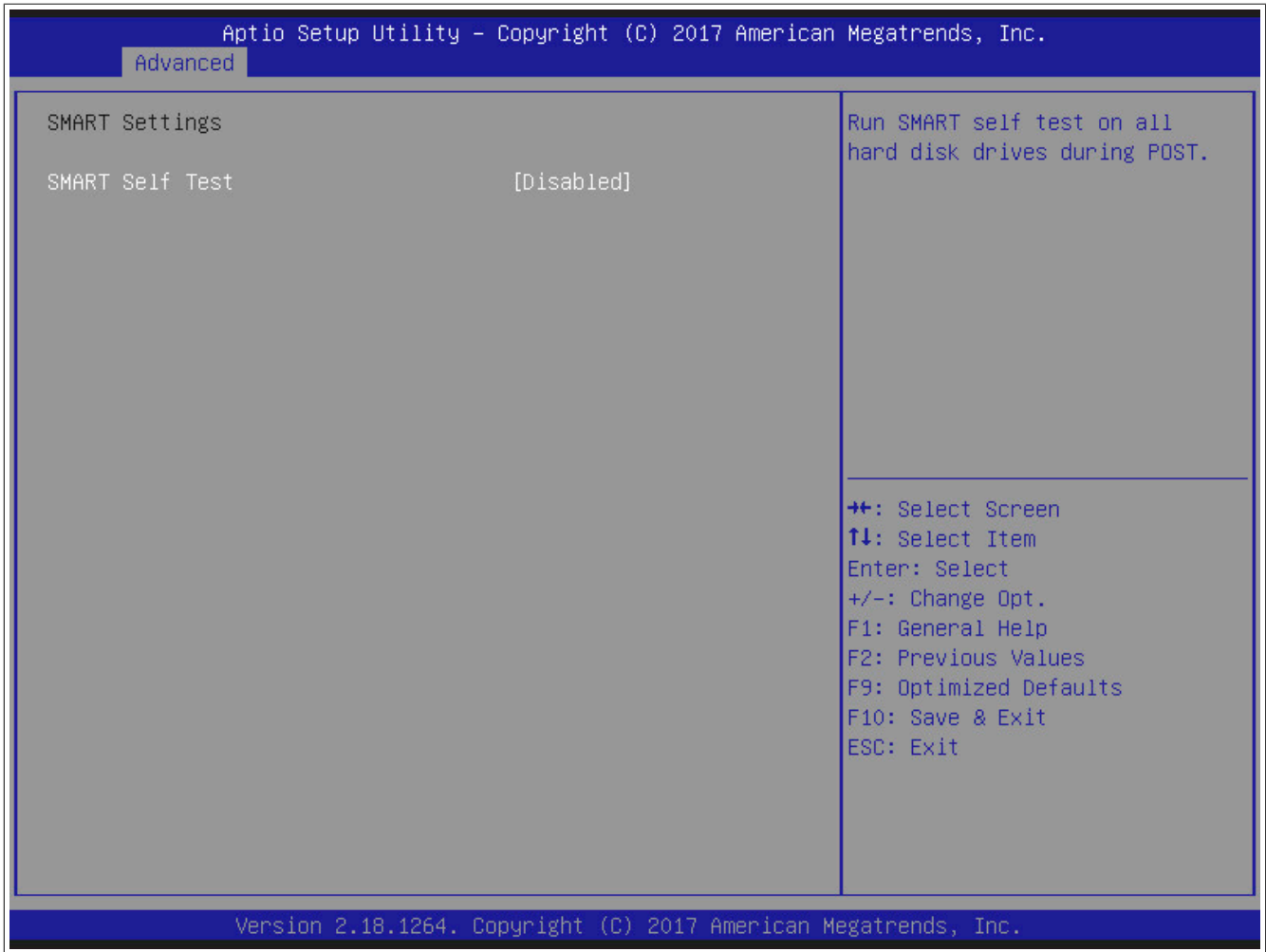


Figure 171: Advanced - SMART settings

BIOS setting	Explanation	Configuration options	Effect
SMART self test	Option for enabling/disabling the self-test on all SMART-enabled memories during POST.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 299: Advanced - SMART settings - Configuration options

1.4.2.8 Serial port console redirection

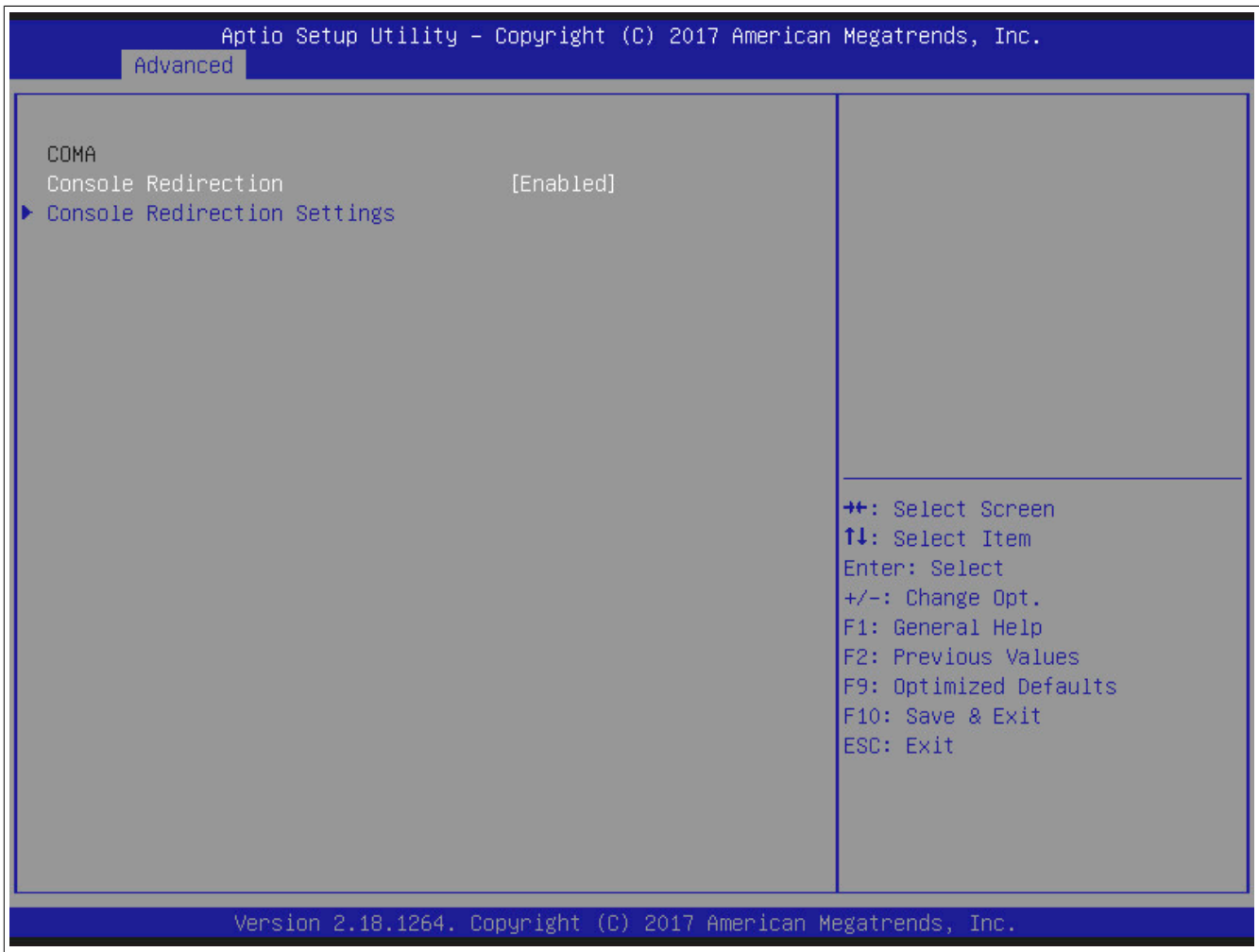


Figure 172: Advanced - Serial port console redirection

BIOS setting	Explanation	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 334.

Table 300: Advanced - Serial port console redirection - Configuration options

1.4.2.8.1 Console redirection settings

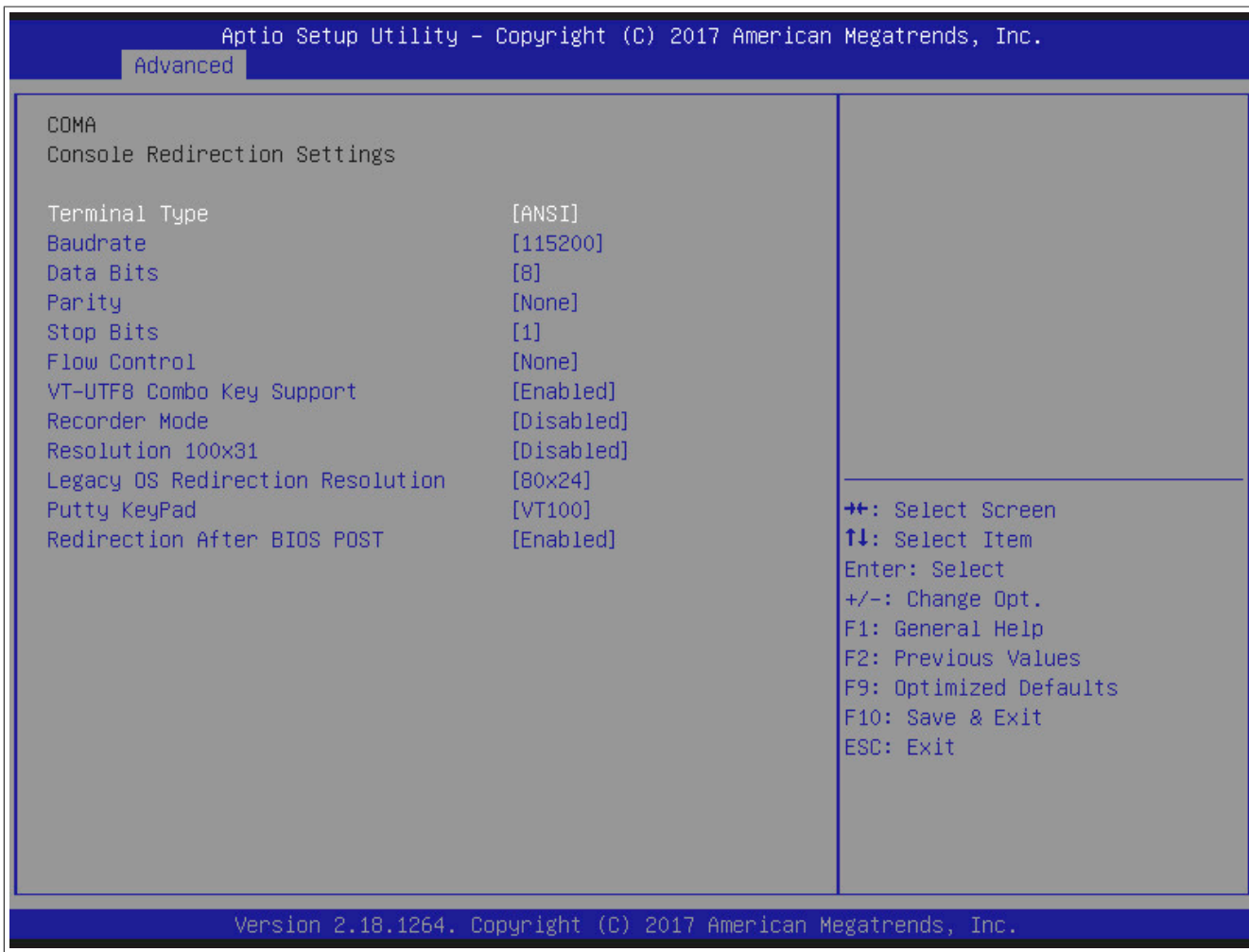


Figure 173: Advanced - Console redirection - Console redirection settings

BIOS setting	Explanation	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 8	Character length with 7 bits 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.

Table 301: Advanced - Console redirection - Console redirection settings - Configuration options

BIOS setting	Explanation	Configuration options	Effect
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	Enable	Keeps redirection enabled permanently
		Bootloader	Enables redirection during system startup and when charging

Table 301: Advanced - Console redirection - Console redirection settings - Configuration options

1.4.2.9 CPU configuration

Information:

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

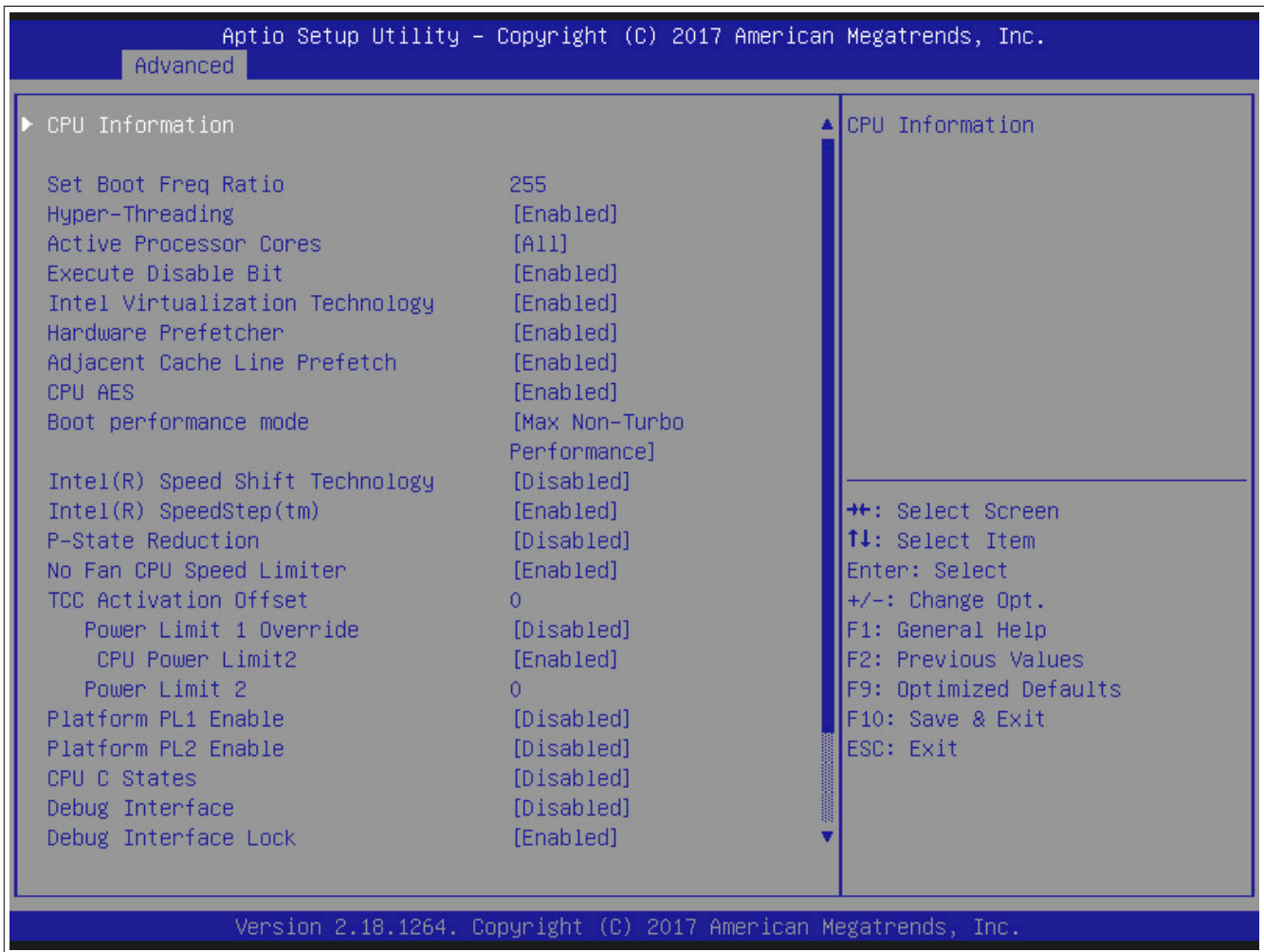


Figure 174: Advanced - CPU configuration

BIOS setting	Explanation	Configuration options	Effect
CPU information	Displays CPU properties	Enter	Opens this submenu See "CPU information" on page 338.
Set boot frequency ratio	Option for setting the maximum CPU frequency.	8 to the max. frequency of the CPU used ... 255	Sets 8 to the max. frequency of the CPU used. The set value x 100 results in the frequency. If the value is invalid, the max. frequency is used.
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, 2, 3	Only uses one processor core
Execute disable bit	Option for enabling/disabling hardware support for prevention of data execution	Disabled	Disables 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.	Enabled	Enables this function.
		Disabled	Disables this function.
Hardware prefetcher	Option for enabling/disabling the hardware prefetcher	Enabled	Allows a virtual machine to use the additional hardware capacity.
		Disabled	Disables this function.
		Enabled	Enables this function. Data is temporarily stored in cache memory to increase performance.

Table 302: Advanced - CPU configuration - Configuration options

BIOS setting	Explanation	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
CPU AES	Option for enabling/disabling the CPU Advanced Encryption Standard (AES) instruction set.	Enabled	Enables this function.
		Disabled	Disables this function.
Boot performance mode	Option for setting the CPU performance.	Max non-turbo performance	Uses max. non-turbo performance.
		Max battery	Uses max. battery performance.
		Turbo performance	Uses turbo performance.
Intel Speed Shift Technology	Option for enabling Intel Speed Shift Technology to make the CCPC v2 interface available and enable hardware-controlled P-states.	Disabled	Disables this function.
		Enabled	Enables this function.
Intel SpeedStep	Option for enabling the function if support for more than 2 frequency ranges is required.	Enabled	Enables this function.
		Disabled	Disables this function.
P-state reduction	Option for reducing CPU performance and power usage.	Disabled	Disables this function.
		By 1, 2, 3, 4, 5, 6, 7, 8	Reduces the performance by the configured value depending on the CPU being used.
No fan CPU speed limiter	Option for automatically throttling down the CPU speed if the system unit has no fan.	Enabled	Enables this function.
		Disabled	Disables this function.
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
Power limit 1 override	If this function is disabled, BIOS programs the default values for power limit 1 and windows for power limit 1.	Disabled	Disables this function.
		Enabled	Enables this function.
CPU power limit 2	Option for enabling/disabling CPU power limit 2 values.	Enabled	Enables this function.
		Disabled	Disables this function.
Power limit 2	Option for selecting power limit 2 in 125 mW steps.	0	0 sets the value to 1.25 x TDP.
	<p>Information:</p> <p>The processor applies control policies to protect packet performance from exceeding this limit.</p>		
Platform PL1 enable	Option for enabling/disabling platform power limit 1 (PL1) programming.	Disabled	Disables this function.
		Enabled	Power limit 1 is used by the processor to limit the average power of a certain time window.
Platform PL2 enable	Option for enabling/disabling platform power limit 2 (PL2) programming.	Disabled	The BIOS programs the default values for platform PL2.
		Enabled	Enables this function.
CPU C states	Option for enabling/disabling CPU C states.	Disabled	Disables this function.
		Enabled	Enables this function.
Debug interface	Option for enabling/disabling CPU debug functions.	Disabled	Disables this function.
		Enabled	Enables this function.
Debug interface lock	Option for locking CPU debug function settings.	Enabled	Enables this function.
		Disabled	Disables this function.

Table 302: Advanced - CPU configuration - Configuration options

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

1.4.2.9.1 CPU information

Information:

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

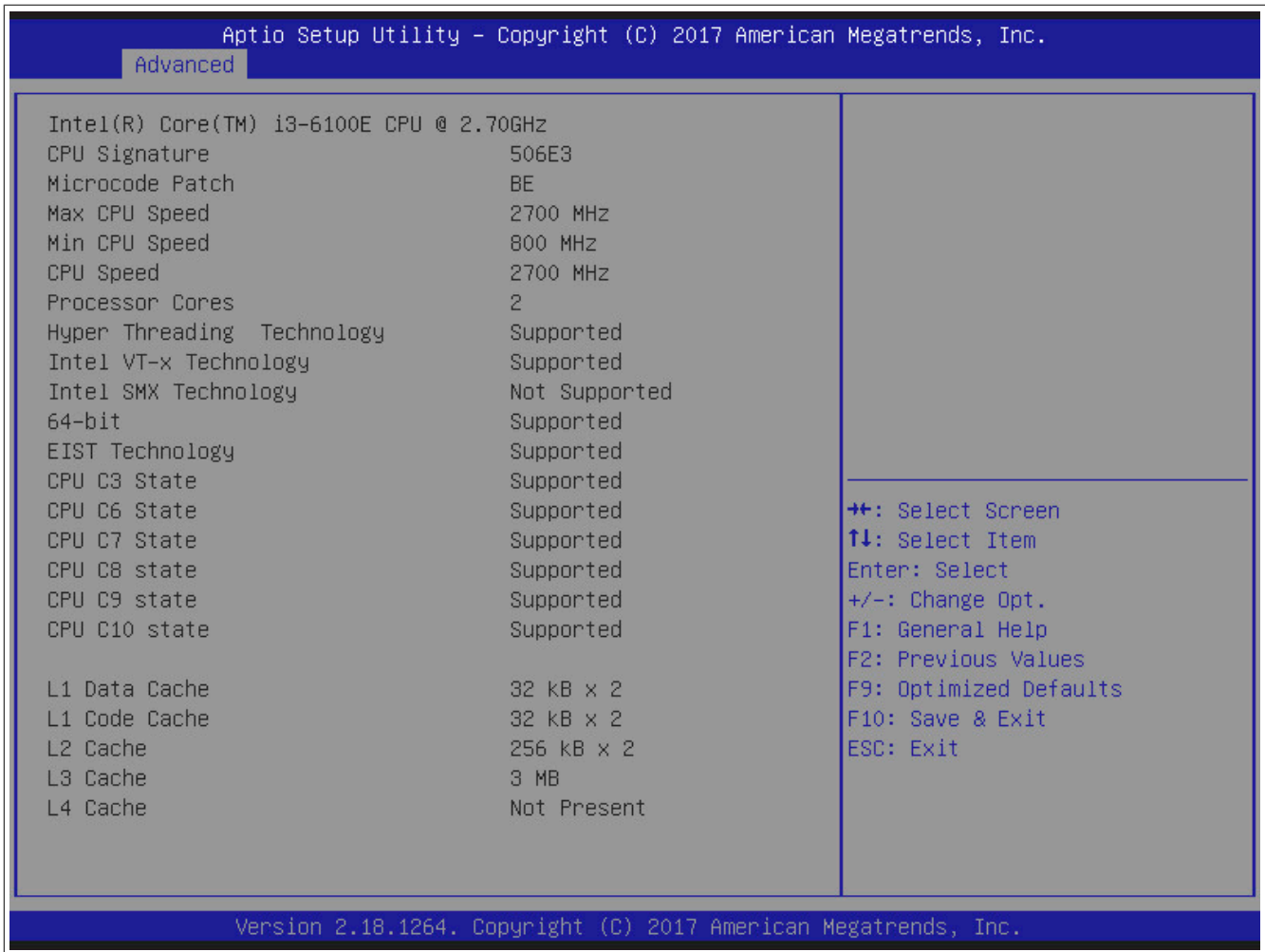


Figure 175: Advanced - CPU configuration - CPU information

BIOS setting	Explanation	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	-
Hyper-Threading Technology	Displays whether the processor supports Hyper-Threading 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	-
EIST Technology	Displays whether the processor supports EIST Technology.	None	-
CPU C3 State	Display of CPU C3 state supported in the operating system.	None	-
CPU C6 State	Display of CPU C6 state supported in the operating system.	None	-
CPU C7 State	Display of CPU C7 state supported in the operating system.	None	-
CPU C8 State	Display of CPU C8 state supported in the operating system.	None	-
CPU C9 State	Display of CPU C9 state supported in the operating system.	None	-

Table 303: Advanced - CPU information

BIOS setting	Explanation	Configuration options	Effect
CPU C10 State	Display of CPU C10 state supported in the operating system.	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	-
L4 cache	Displays the size of the L4 cache.	None	-

Table 303: Advanced - CPU information

1.4.2.10 SATA configuration

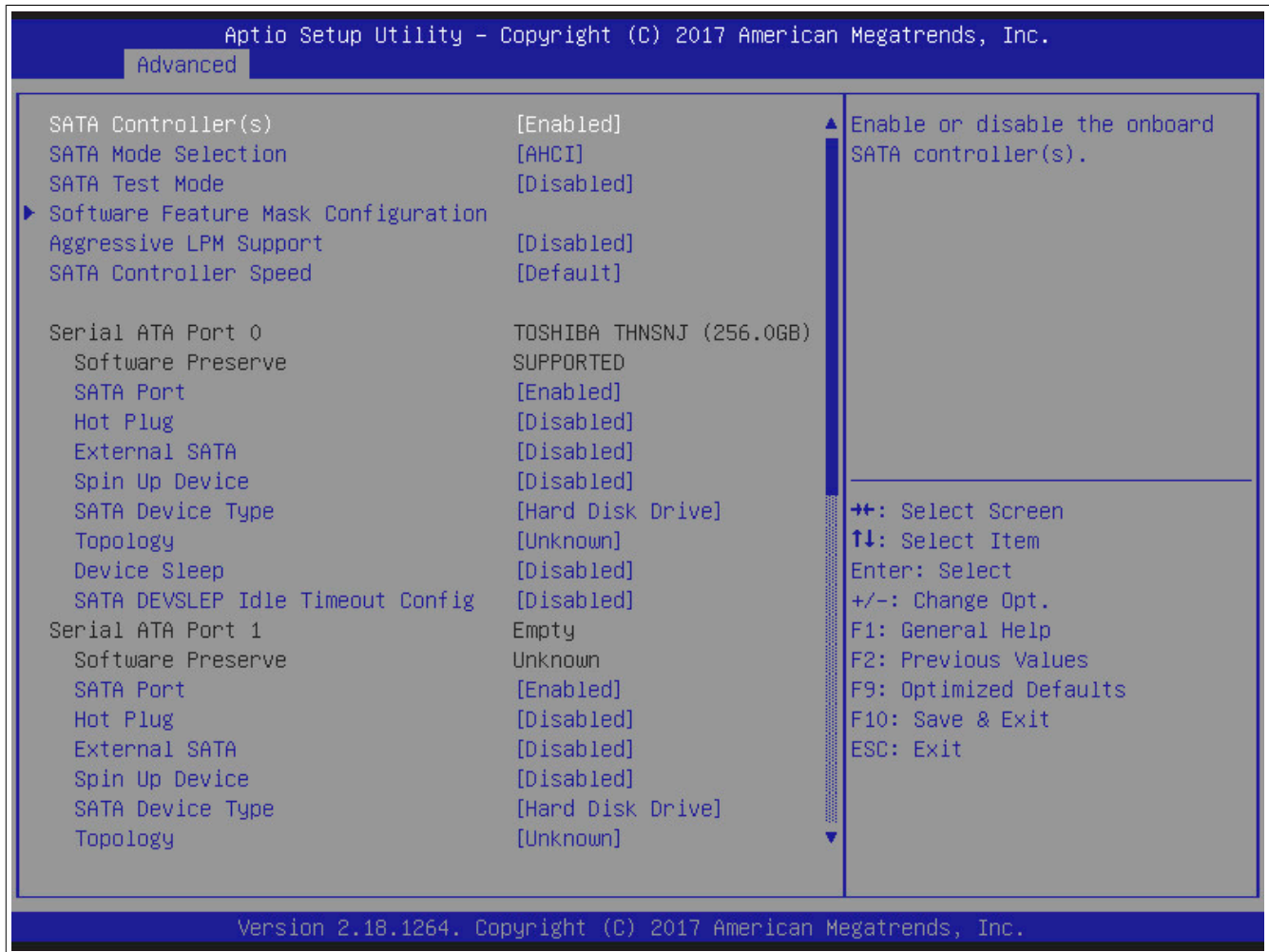


Figure 176: Advanced - SATA configuration

BIOS setting	Explanation	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	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.
Software feature mask configuration	Configuration of various drive settings	Enter	Opens this submenu See "Software feature mask configuration" on page 341.
Aggressive LPM support	Aggressive Link Power Management (ALPM) is a power saving method for SATA drives.	Enabled	Enables this function.
		Disabled	Disables this function.

Table 304: Advanced - SATA configuration - Configuration options

BIOS setting	Explanation	Configuration options	Effect
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.
Serial ATA port 0	Displays the device connected to SATA interface 0	None	Slide-in compact slot
Software preserve		None	-
SATA port	Option for enabling/disabling the SATA interface.	Disabled	Disables the SATA interface.
		Enabled	Enables the SATA interface.
Hot plug	Option for configuring hot plugging for the SATA interface.	Disabled	Disables hot plugging for the SATA interface.
		Enabled	Enables hot plugging for the SATA interface. 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
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.
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.
Topology	Option for selecting the SATA topology.	Unknown	
		ISATA	Selects the ISATA topology.
		Direct connect	Selects the direct connect topology.
		Flex	Selects the flex topology.
Device sleep	Option for enabling/disabling mSATA for RTD3.	Disabled	Disables this function.
		Enabled	Enables this function.
SATA DEVSLEP idle timeout config	Option for enabling/disabling the SATA DTIO configuration.	Disabled	Disables this function.
		Enabled	Enables this function.
Serial ATA port 1	Displays the device connected to SATA interface 1	None	CFast slot
Serial ATA port 2	Displays the device connected to SATA interface 2	None	Slide-in slot 1
Serial ATA port 3	Displays the device connected to SATA interface 3	None	Slide-in slot 2
<p>■ The settings for serial ATA interface 1, serial ATA interface 2 and serial ATA interface 3 are the same as serial ATA interface 0.</p>			

Table 304: Advanced - SATA configuration - Configuration options

1.4.2.10.1 Software feature mask configuration

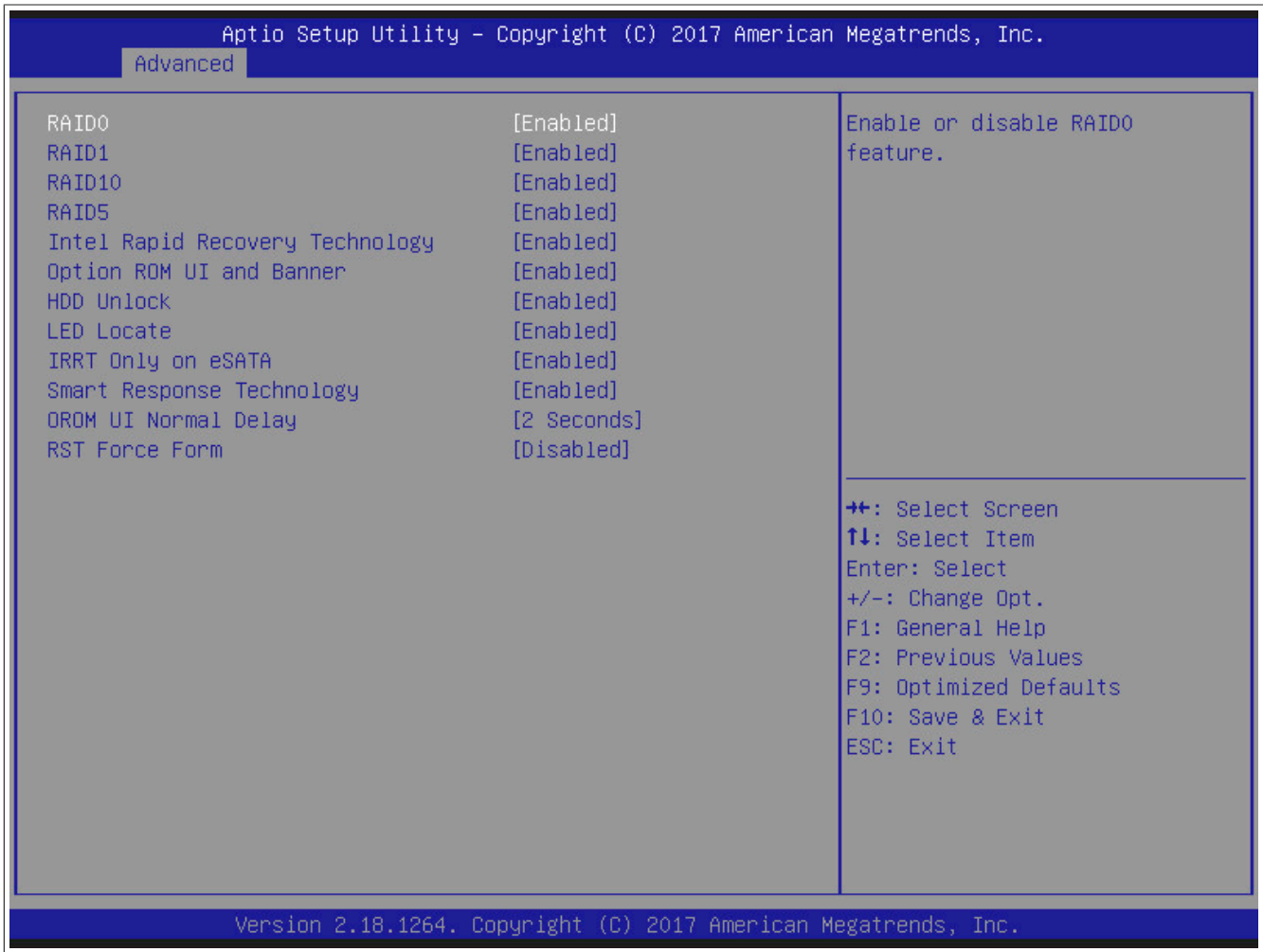


Figure 177: Advanced - SATA configuration - Software feature mask configuration

BIOS setting	Explanation	Configuration options	Effect
RAID0	Option for enabling/disabling a RAID0 system	Enabled	Enables this function.
		Disabled	Disables this function.
RAID1	Option for enabling/disabling a RAID1 system	Enabled	Enables this function.
		Disabled	Disables this function.
RAID10	Option for enabling/disabling a RAID10 system	Enabled	Enables this function.
		Disabled	Disables this function.
RAID5	Option for enabling/disabling a RAID5 system	Enabled	Enables this function.
		Disabled	Disables this function.
Intel Rapid Recovery technology	Option for enabling/disabling Intel Rapid Recovery Technology.	Enabled	Enables this function.
		Disabled	Disables this function.
Option ROM UI and banner	Option for displaying the OROM UI	Enabled	Displays the OROM UI
		Disabled	Does not display the OROM UI or banner
HDD unlock	Option for enabling/disabling the HDD password unlock mechanism in the operating system	Enabled	Enables the HDD password unlock mechanism
		Disabled	Disables the HDD password unlock mechanism
LED locate	Option for displaying the LED/SGPIO when a drive is connected	Enabled	Enables an indicator for when a drive is connected
		Disabled	Disables this function.
IRRT only on eSATA ¹⁾	Option for configuring Intel Rapid Recovery technology.	Enabled	Only IRRT systems can use internal eSATA drives.
		Disabled	Every RAID system can use internal and eSATA drives.
Smart Response technology	Option for enabling/disabling Intel Smart Response Technology.	Enabled	Enables this function.
		Disabled	Disables this function.
OROM UI normal delay	Option for displaying the delay time for the OROM UI splash screen in the normal state.	2 seconds , 4 seconds, 6 seconds, 8 seconds	Setting in seconds.
RST force form	Option for enabling/disabling the form for Intel Rapid Storage Technology.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 305: Advanced - SATA configuration - Software feature mask configuration - Configuration options

1) IRRT = Intel Rapid Recovery technology.

1.4.2.11 Thermal configuration

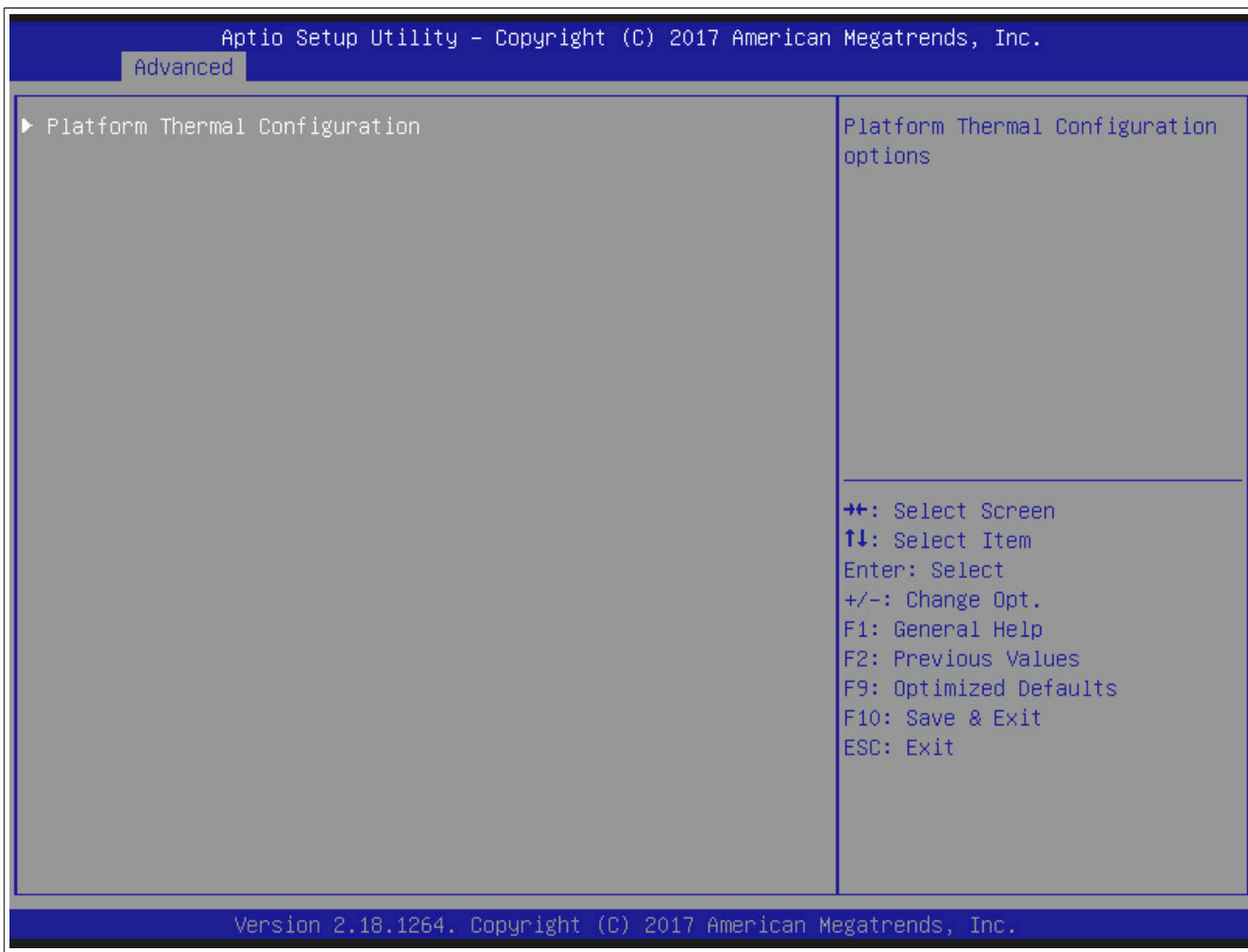


Figure 178: Advanced - Thermal configuration

BIOS setting	Explanation	Configuration options	Effect
Platform thermal configuration	Configures the platform thermal settings.	Enter	Opens submenu Platform thermal configuration settings

Table 306: Advanced - Platform thermal configuration - Configuration options

1.4.2.11.1 Platform thermal configuration settings

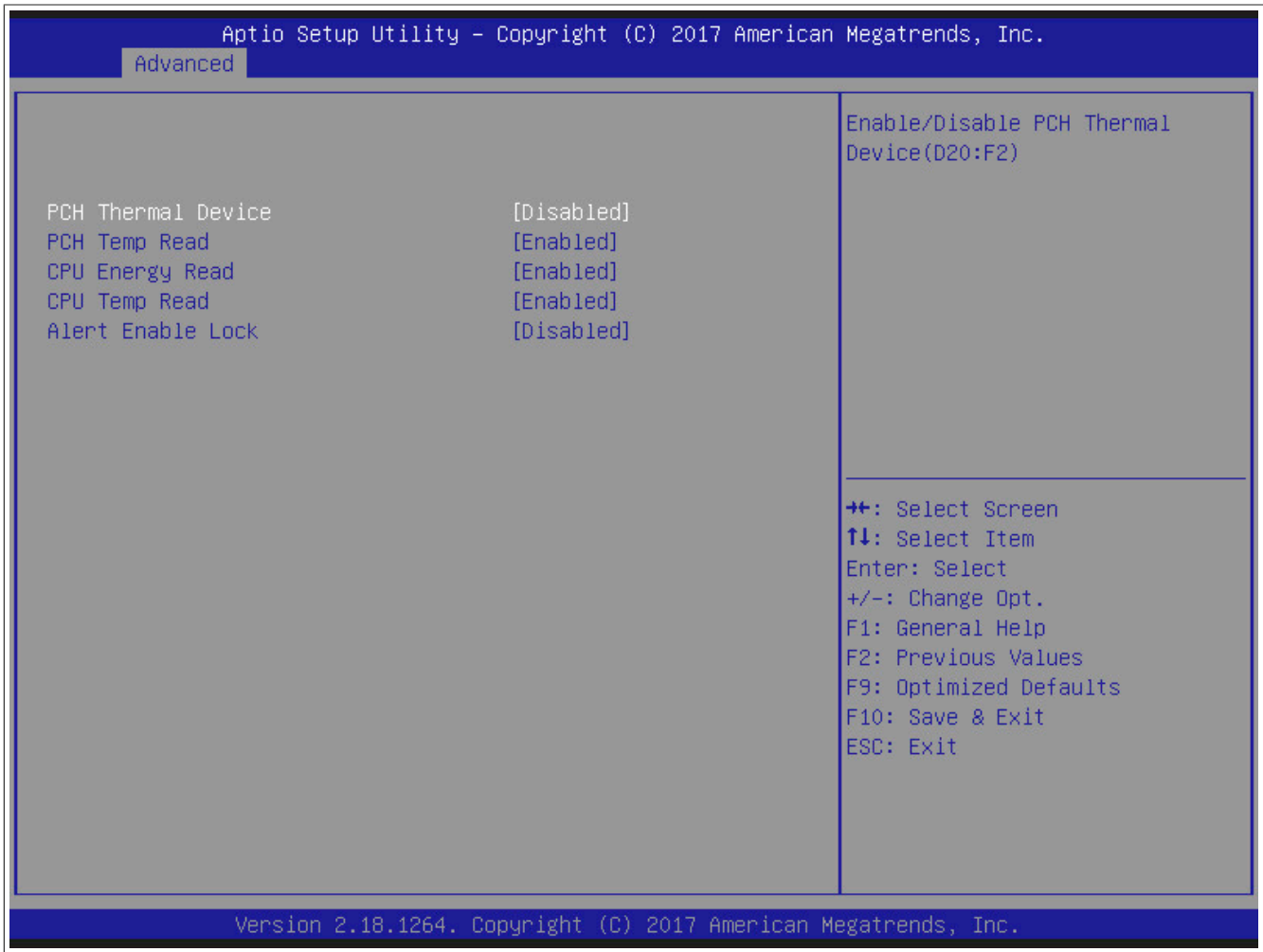


Figure 179: Advanced - Thermal platform

BIOS setting	Explanation	Configuration options	Effect
PCH thermal device	Option for enabling/disabling the PCH thermal device.	Disabled	Disables this function.
		Enabled	Enables this function.
PCH temp read	Option for enabling/disabling PCH temperature reading.	Enabled	Enables this function.
		Disabled	Disables this function.
CPU energy read	Option for enabling/disabling CPU energy reading.	Enabled	Enables this function.
		Disabled	Disables this function.
CPU temp read	Option for enabling/disabling CPU temperature reading.	Enabled	Enables this function.
		Disabled	Disables this function.
Alert enable lock	Option for enabling/disabling the alarm for enabling the lock.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 307: Advanced - Platform thermal configuration settings - Configuration options

1.4.2.12 PCI configuration

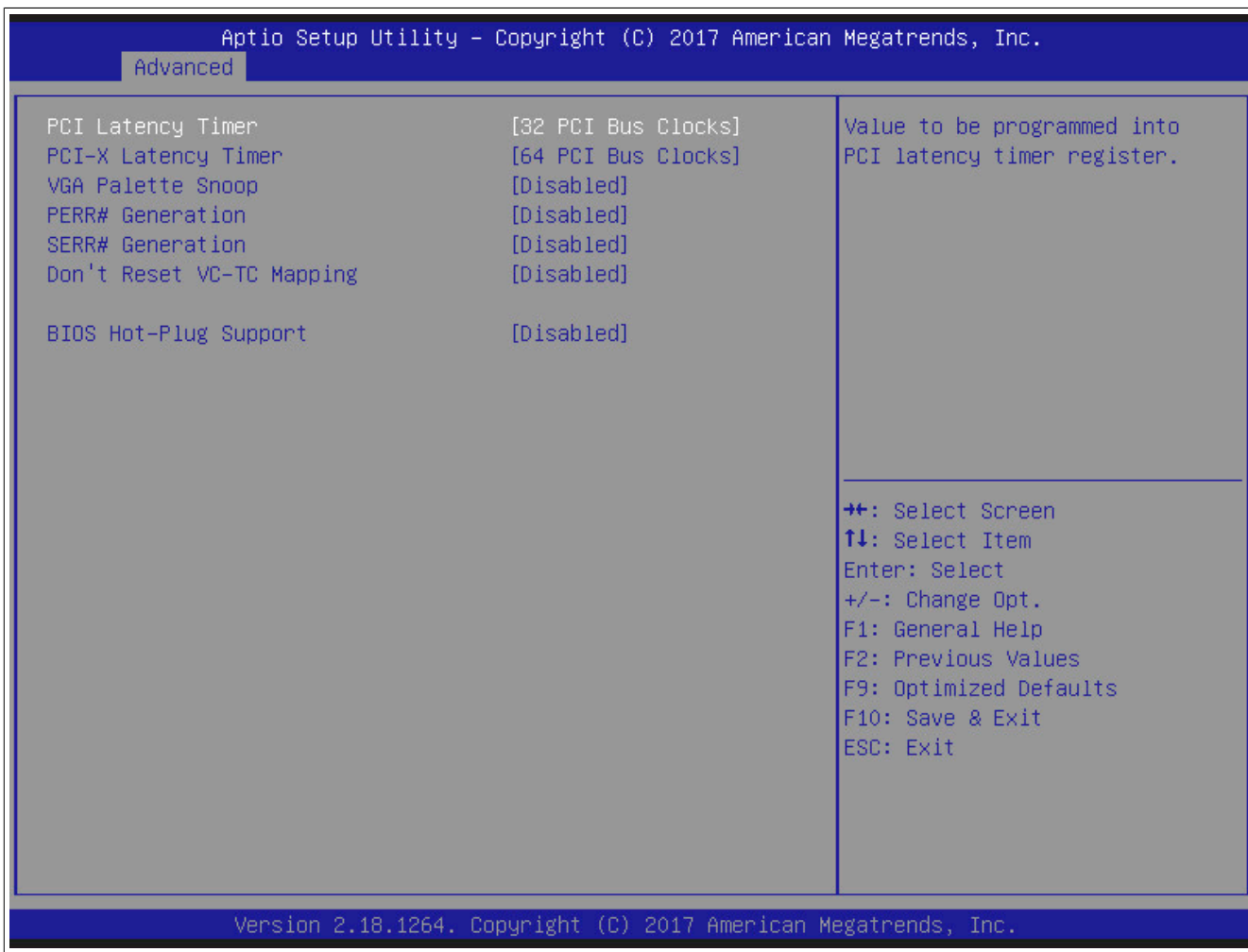


Figure 180: Advanced - PCI configuration

BIOS setting	Explanation	Configuration options	Effect
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
PCI-X latency timer	Option for controlling how long (in PCI-X ticks) one PCI bus card can continue to use the master after another PCI-X card has requested access	32 PCI bus clocks to 64 PCI bus clocks to 248 PCI bus clocks	Manually sets the value in PCI-X ticks.
VGA palette snoop	Option for supporting graphics cards with 256 colors. This option should only be set to "Enabled" if colors are not displayed correctly.	Disabled	Disables this function.
		Enabled	Enables this function.
PERR# generation	Option for generating a PERR signal (parity error). This signal indicates a data parity error one cycle after PAR.	Disabled	Disables this function.
		Enabled	Enables this function.
SERR# generation	Option for generating a SERR signal (system error). This signal indicates a data error or other type of system error when executing a special cycle command.	Disabled	Disables this function.
		Enabled	Enables this function.
Don't reset VC-TC mapping	Option for not resetting the VC-TC mapping.	Disabled	Disables this function.
		Enabled	Enables this function.
BIOS hot-plug support	Option for enabling/disabling BIOS hot plugging support.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 308: Advanced - PCI configuration - Configuration options

1.4.2.13 PCI express configuration

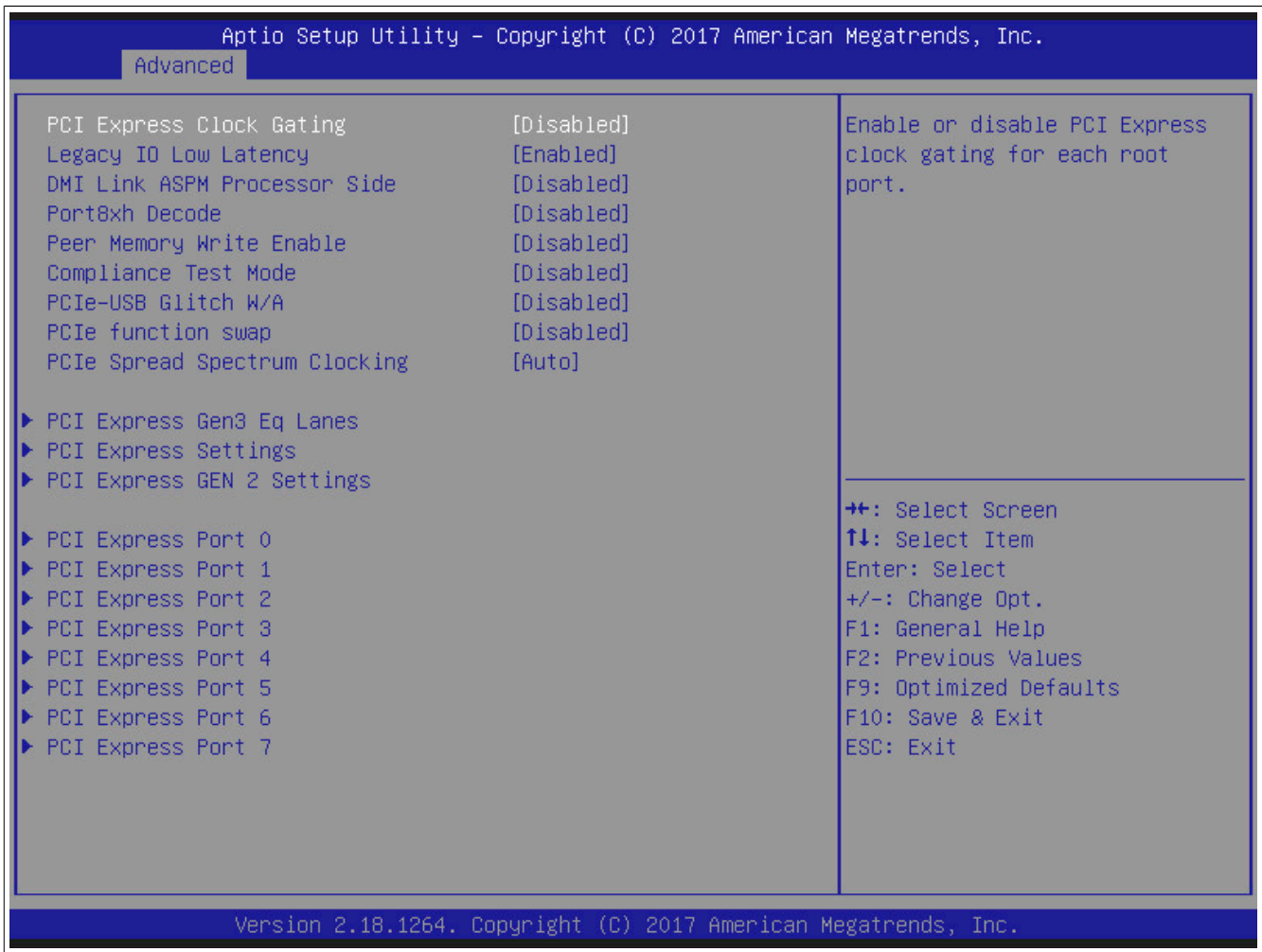


Figure 181: Advanced - PCI express configuration

BIOS setting	Explanation	Configuration options	Effect
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.
Legacy IO low latency	Option for enabling/disabling legacy I/O low latency.	Enabled	Enables this function.
		Disabled	Disables this function.
DMI link ASPM processor side	Option for enabling/disabling active state power management (ASPM) for the DMI link on the processor side.	Disabled	Disables this function.
		Enabled	Enables this function.
Port8xh decode	Option for enabling/disabling Port8xh decode.	Disabled	Disables this function.
		Enabled	Enables this function.
Peer memory write enable	Option for enabling/disabling peer memory write.	Disabled	Disables this function.
		Enabled	Enables this function.
Compliance test mode	This option must be enabled if "Compliance load board" is used.	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.
PCIe function swap	If disabled, prevents PCIe root port function swap. If a function other than 0th is enabled, 0th becomes visible.	Disabled	Disables this function.
		Enabled	Enables this function.
PCIe spread spectrum clocking	Option for specifying the PCIe PII SSC percentage.	Auto	Retains the hardware default, not overwritten by BIOS.
		Disabled	Disables this function.
		0.1% to 2.0%	The range is 0.1% to 2.0%.
PCI Express GEN3 eq lanes settings	Configures PCI Express GEN3 eq settings.	Enter	Opens this submenu See "PCI Express Gen3 eq lanes" on page 346.
PCI Express settings	Configures PCI Express settings.	Enter	Opens this submenu See "PCI Express settings" on page 347.
PCI Express GEN 2 settings	Configures PCI Express GEN 2 settings.	Enter	Opens this submenu See "PCI Express GEN 2 settings" on page 348.

Table 309: Advanced - PCI Express configuration - Menu

BIOS setting	Explanation	Configuration options	Effect
PCI Express root port 0	Configures PCI Express settings on port 0.	Enter	Opens this submenu See "PCI Express ports" on page 350.
PCI Express root port 1	Configures PCI Express settings on port 1.	Enter	Opens this submenu See "PCI Express ports" on page 350.
PCI Express root port 2	Configures PCI Express settings on port 2.	Enter	Opens this submenu See "PCI Express ports" on page 350.
PCI Express root port 3	Configures PCI Express settings on port 3.	Enter	Opens this submenu See "PCI Express ports" on page 350.
PCI Express root port 4	Configures PCI Express settings on port 4.	Enter	Opens this submenu See "PCI Express ports" on page 350.
PCI Express root port 5	Configures PCI Express settings on port 5.	Enter	Opens this submenu See "PCI Express ports" on page 350.
PCI Express root port 6	Configures PCI Express settings on port 6.	Enter	Opens this submenu See "PCI Express ports" on page 350.
PCI Express root port 7	Configures PCI Express settings on port 7.	Enter	Opens this submenu See "PCI Express ports" on page 350.

Table 309: Advanced - PCI Express configuration - Menu

1.4.2.13.1 PCI Express Gen3 eq lanes

Information:

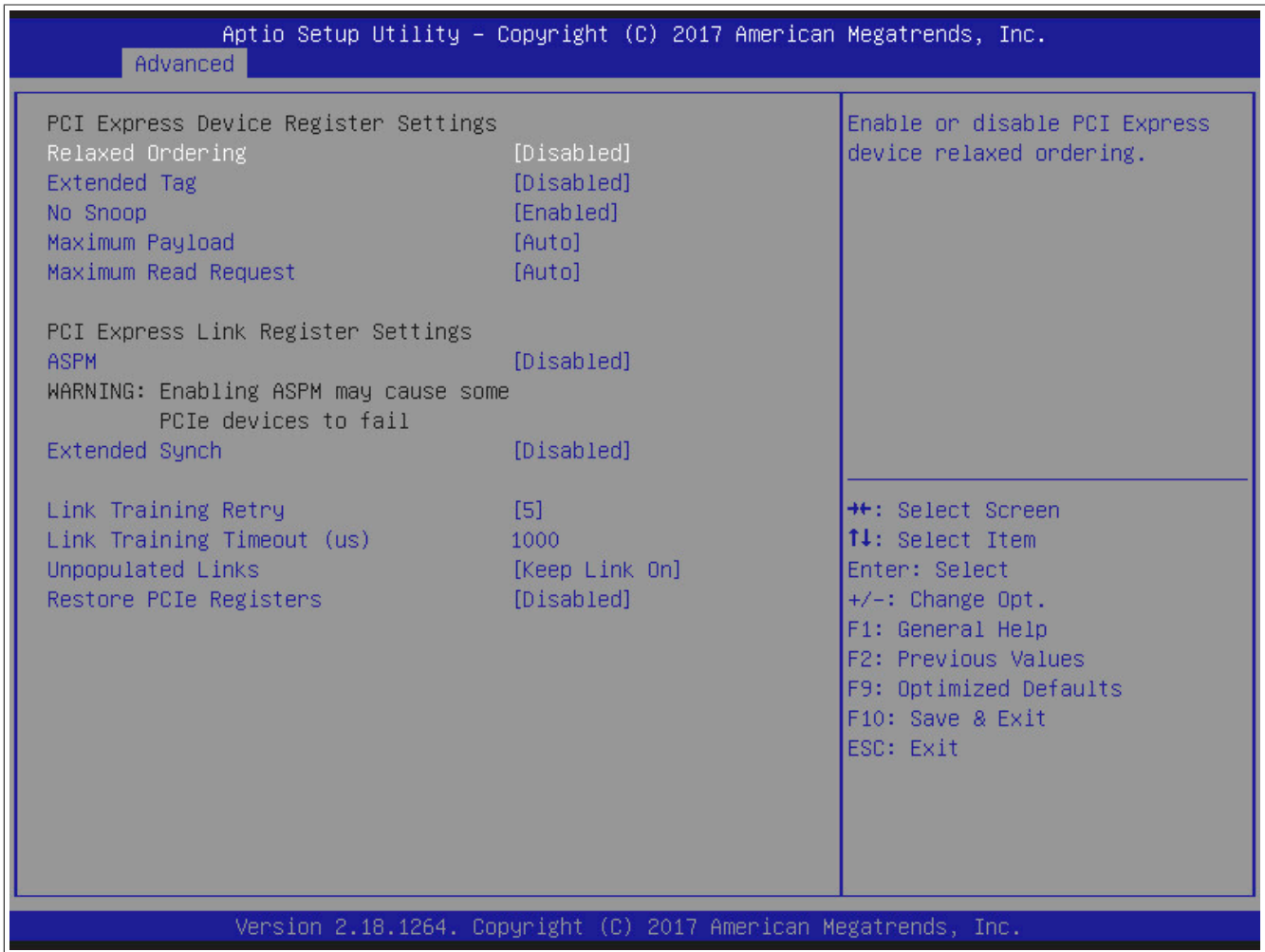
The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.



BIOS setting	Explanation	Configuration options	Effect
Override SW EQ settings	Option for overwriting SW EQ settings.	Enabled	Enables this function.
		Disabled	Disables this function.

Table 310: Advanced - PCI Express GEN3 eq lanes - Configuration options

1.4.2.13.2 PCI Express settings



BIOS setting	Explanation	Configuration options	Effect
PCI Express device register settings:			
Relaxed ordering	Option for enabling/disabling PCI Express device relaxed ordering.	Disabled Enabled	Disables this function. Enables this function.
Extended tag	Option for enabling/disabling the extended tag.	Disabled Enabled	Disables this function. A device can use an 8-bit tag as a work unit.
No snoop	Option for enabling/disabling PCI Express device "No snoop".	Enabled Disabled	Enables this function. Disables this function.
Maximum payload	Option for defining the maximum payload of the PCI Express device.	Auto 128 bytes, 256 bytes, 512 bytes, 1024 bytes, 2048 bytes, 4096 bytes	BIOS is permitted to select the value. The maximum payload is defined.
Maximum read request	Option for defining the maximum read request of the PCI Express device.	Auto 128 bytes, 256 bytes, 512 bytes, 1024 bytes, 2048 bytes, 4096 bytes	BIOS is permitted to select the value. The maximum read request size is defined.
PCI Express link register settings:			
ASPM	Option for setting the PCI Express Active State Power Management settings. Warning! Enabling ASPM can cause some PCIe devices to fail.	Disabled Auto Force L0s	Disables this function. Automatic selection of supported modes of Hask and client. Sets L0s power management.
Extended synch	Option for enabling/disabling the generation of extended synchronization patterns.	Disabled Enabled	Disables this function. Enables this function.
Link training retry	This option defines the number of retries the software needs to retrain the connection if the previous training attempt was unsuccessful.	Disabled 2, 3, 5	Disables this function. The number 2, 3 or 5 must be selected.
Link training timeout (us)	Option for defining how many microseconds the software waits before the link training bit in the link status register is called	10 to 1000 to 10000	The value ranges from 10 to 10000 us.

Table 311: Advanced - PCI Express settings - Configuration options

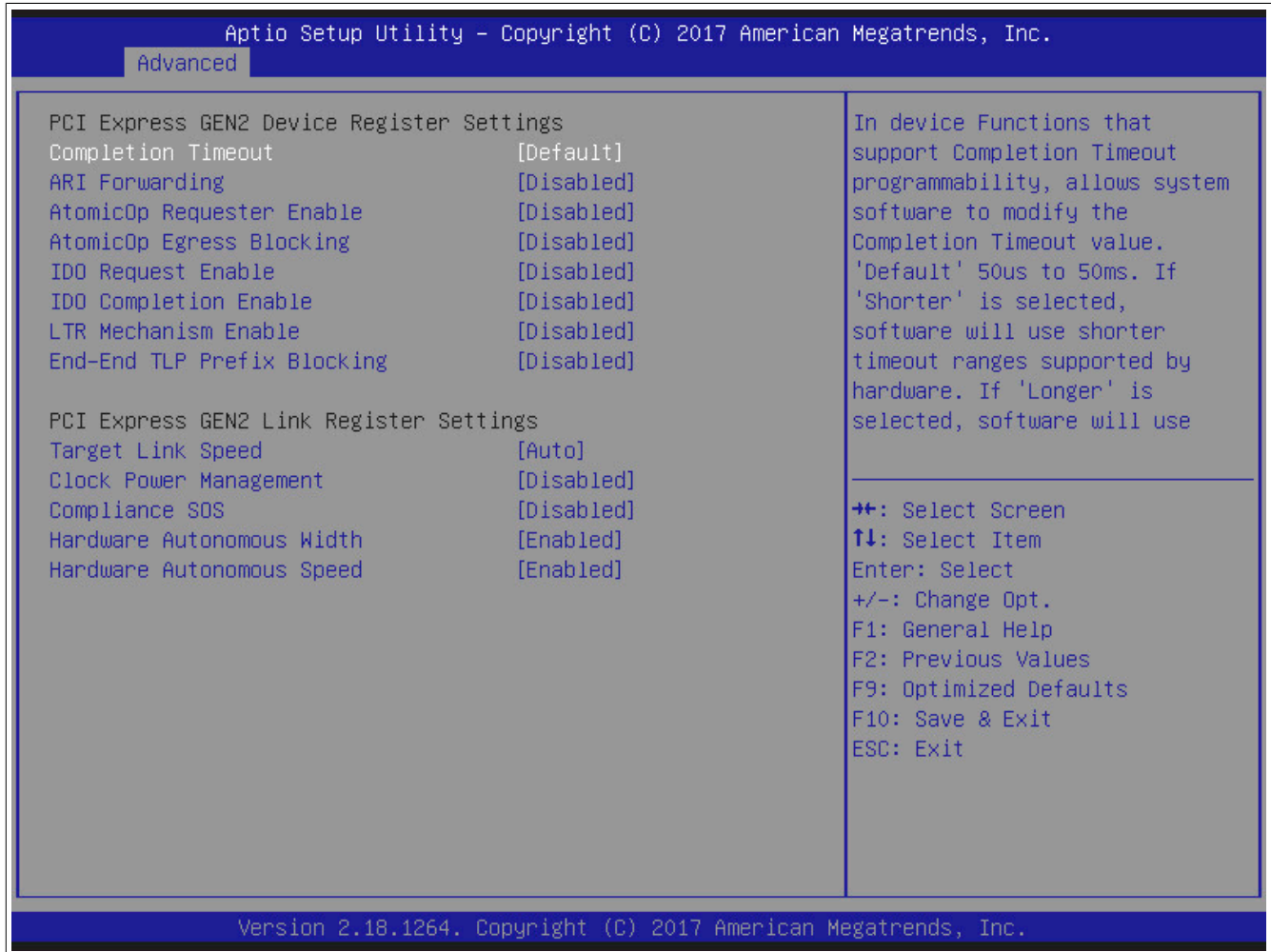
BIOS setting	Explanation	Configuration options	Effect
Unpopulated links	Option for disabling unpopulated links	Keep link on	Links are retained.
		Disabled	The software disables unpopulated express links to save power.
Restore PCIe registers	A non-PCIe-aware operating system cannot be correctly re-initialized after s3 on some devices.	Disabled	Disables this function.
		Enabled	The PCI Express configuration is restored in s3 resume.

Information:

Problems may occur with other hardware after s3 is resumed.

Table 311: Advanced - PCI Express settings - Configuration options

1.4.2.13.3 PCI Express GEN 2 settings



BIOS setting	Explanation	Configuration options	Effect
PCI Express GEN2 device register settings:			
Completion timeout	Device functions that support programmability for completion timeout allow the system software to modify the completion timeout value.	Default	50us to 50ms
		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	Option for enabling/disabling ARI forwarding.	Disabled	Disables this function.
		Enabled	The downstream port disables the traditional device number field if a type configuration request is converted into a configuration requirement of type 0, which enables access to advanced ARI device functions directly under the port.
AtomicOp requester enable	Option for initiating the AtomicOp Requester only in the bus master.	Disabled	Disables this function.
		Enabled	Enables this function. The enable bit is set in the command register.

Table 312: Advanced - PCI Express GEN 2 settings - Configuration options

BIOS setting	Explanation	Configuration options	Effect
AtomicOp egress blocking	Option for enabling/disabling AtomicOp egress blocking	Disabled	Disables this function.
		Enabled	Enables this function. AtomicOp requests via egress ports are blocked.
IDO request enable	Option to permit setting the number of ID-based bit ordering requests (IDO) (Attribute[2], that should be initialized.	Disabled	Disables this function.
		Enabled	Enables this function.
IDO completion enable	Option to permit setting the number of ID-based bit ordering requests (IDO) (Attribute[2], that should be initialized.	Disabled	Disables this function.
		Enabled	Enables this function.
LTR mechanism enable	Option for enabling/disabling latency tolerance reporting (LTR).	Disabled	Disables this function.
		Enabled	Enables this function.
End-End TLP prefix blocking	Option for enabling/disabling blocking of TLPs with End-End TLP prefixes.	Disabled	Disables this function.
		Enabled	Enables this function.
PCI Express GEN2 link register settings:			
Target link speed	Option for setting the upper limit for the target link speed by limiting the values announced by the upstream components in their training sequences.	Auto	Hardware-initialized data is used.
		Force to 2.5 GT/s	The upper limit is set to 2.5 GT/s.
		Force to 5.0 GT/s	The upper limit is set to 5.0 GT/s.
Clock power management	This mechanism can use the CLKREQ# signal to manage the power of the connection clock according to the protocol, defined in a form factor specification.	Disabled	Disables this function.
		Enabled	Enables this function.
Compliance SOS	This option forces LTSSM to send ordered sets between sequences when the compliance pattern of the modified compliance pattern is sent.	Disabled	Disables this function.
		Enabled	Enables this function.
Hardware autonomous width	Option for enabling/disabling hardware autonomous width.	Enabled	Enables this function.
		Disabled	Disables this function. Disables the ability of the hardware to modify the connection width, with the exception of reducing the width to correct an instable connection procedure.
Hardware autonomous speed	Option for enabling/disabling hardware autonomous speed.	Enabled	Enables this function.
		Disabled	Disables this function. Disables the ability of the hardware to modify the connection speed, with the exception of reducing the speed to correct an instable connection procedure.

Table 312: Advanced - PCI Express GEN 2 settings - Configuration options

1.4.2.13.4 PCI Express ports

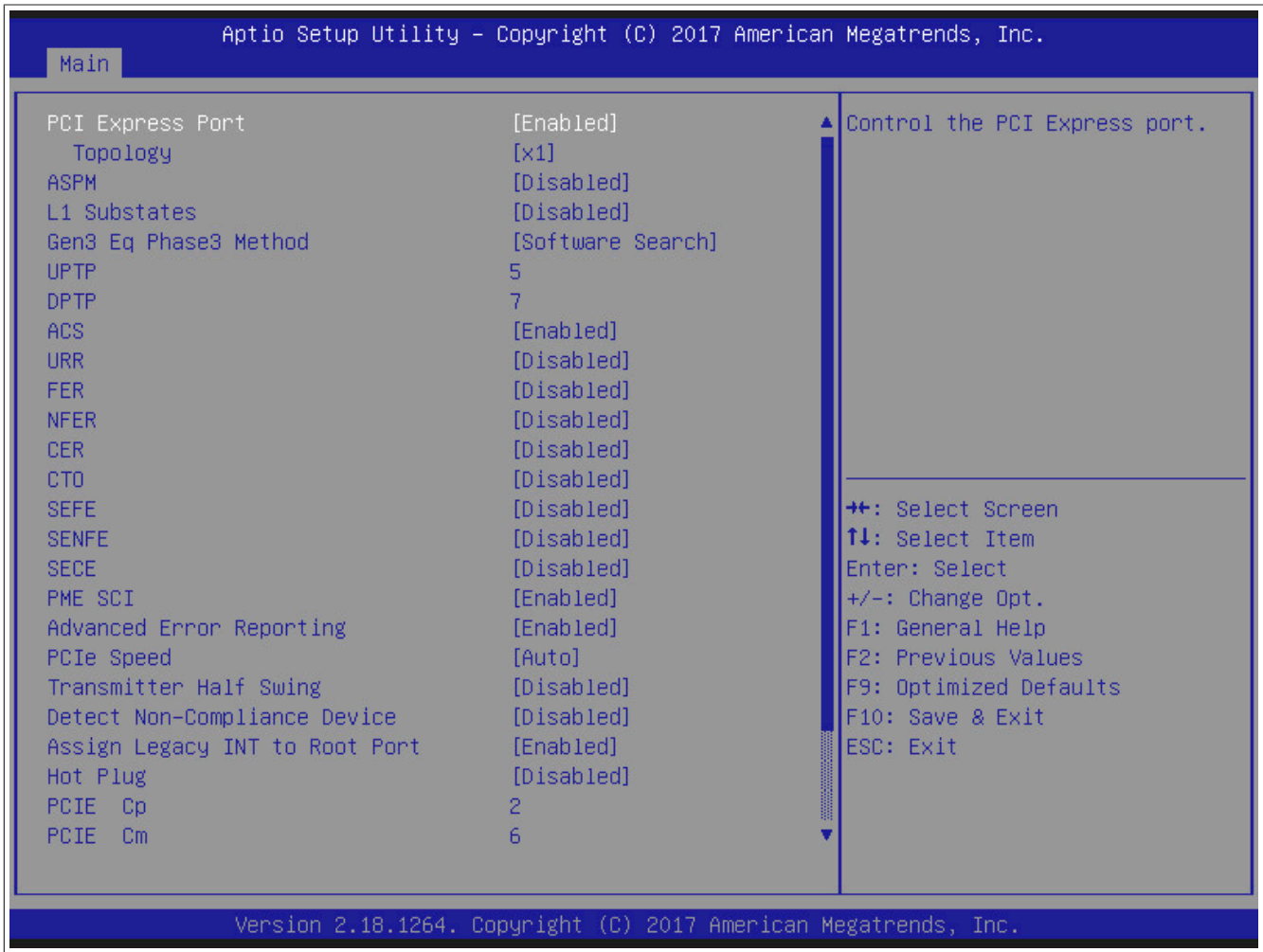


Figure 182: Advanced - PCI Express Port 0-7

BIOS setting	Explanation	Configuration options	Effect
PCI Express port	Option for controlling PCI Express port.	Enabled	Enables this function.
		Disabled	Disables this function.
Topology	Option for identifying whether the SATA topology is ISATA, Flex, DirectConnect or M2.	x1	PCIe x1 bus
		x4	PCIe x4 bus
		SATA Express	SATA Express bus
		M2	M2 bus
ASPM	PCI Express active state power management settings.	Disabled	Disables this function.
		L0s	Enables the L0s energy saving function.
		L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		L0sL1	Enables of L0s and/or L1 power saving function by the PCIe device.
		Auto	Automatic enabling of L0s and/or L1 power saving function by the PCIe device.
L1 substates	PCI Express L1 substates settings.	Disabled	Disables this function.
		L1.1	Enables function L1.1.
		L1.2	Enables function L1.2.
		L1.1 & L1.2	Enables functions L1.1 and L1.2.
Gen3 Eq Phase3 Method	PCIe Gen3 equalization phase 3 method	Software search	Software.
		Hardware	Hardware.
		Static coeff.	Static.
UPTP	Upstream port transmitter presetting.	5	System optimized.
DPTP	Downstream port transmitter presetting.	7	System optimized.
ACS	Option for enabling/disabling access control service extended capability.	Enabled	Enables this function.
		Disabled	Disables this function.
URR	Unsupported Request (UR) reporting Option for reporting unsupported requests. Logging of error messages received by the root port is controlled exclusively by the root control register.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 313: Advanced - PCI Express Port 0-7 - Configuration options

BIOS setting	Explanation	Configuration options	Effect
FER	Fatal error reporting Option for reporting fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Disabled	Disables this function.
		Enabled	Enables this function.
NFER	Non-fatal error reporting Option for reporting non-fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Disabled	Disables this function.
		Enabled	Enables this function.
CER	Correctable error reporting Option for reporting non-fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Disabled	Disables this function.
		Enabled	Enables this function.
CTO	PCI Express completion timer T0 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.
		Enabled	Enables 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.	Disabled	Disables this function.
		Enabled	Enables this function.
SENF	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.	Disabled	Disables this function.
		Enabled	Enables 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.	Disabled	Disables this function.
		Enabled	Enables 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.
Advanced error reporting	Option for enabling/disabling advanced error reporting.	Disabled	Disables this function.
		Enabled	Enables this function.
PCIe speed	Option for setting the PCI Express transfer rate.	Disabled	Disables this function.
		Auto	Automatically sets the transfer rate.
		Gen1	Maximum transfer rate = 2.5 GT/s.
		Gen2	Maximum transfer rate = 5 GT/s.
Transmitter half swing	Option for enabling/disabling transmitter half swing.	Gen3	Maximum transfer rate = 8 GT/s.
		Disabled	Disables this function.
Detect non-compliant device	Option for enabling/disabling detection of non-compliant PCI Express devices.	Enabled	Enables this function.
		Disabled	Disables this function.
Assign legacy INT to root port	Option for enabling/disabling assign legacy INT to root port.	Enabled	Enables this function. It will take more time to the POST time.
		Disabled	Prevents the root port from receiving a virtually wired PCI interrupt.
Hot plug	Option for enabling/disabling PCI Express hot plugging.	Disabled	Disables this function.
		Enabled	Enables this function.
PCIE Cp	Gen3 output setting for physical PCIe lane.	2	System optimized.
PCIE Cm	Gen3 output setting for physical PCIe lane.	6	System optimized.
PCIE LTR	Option for enabling/disabling PCIE latency reporting.	Enabled	Enables this function.
		Disabled	Disables this function.
PCIE LTR Lock	Option for enabling/disabling the PCIE LTR lock.	Disabled	Disables this function.
		Enabled	Enables this function.
Snoop latency override	Option for setting the snoop latency override for PCH PCIE.	Auto	Function operates automatically.
		Manual	Enables this function.
		Disabled	Disables this function.
Non snoop latency override	Option for setting the non snoop latency override for PCH PCIE.	Auto	Function operates automatically.
		Manual	Enables this function.
		Disabled	Disables this function.

Table 313: Advanced - PCI Express Port 0-7 - Configuration options

1.4.2.14 PEG port configuration

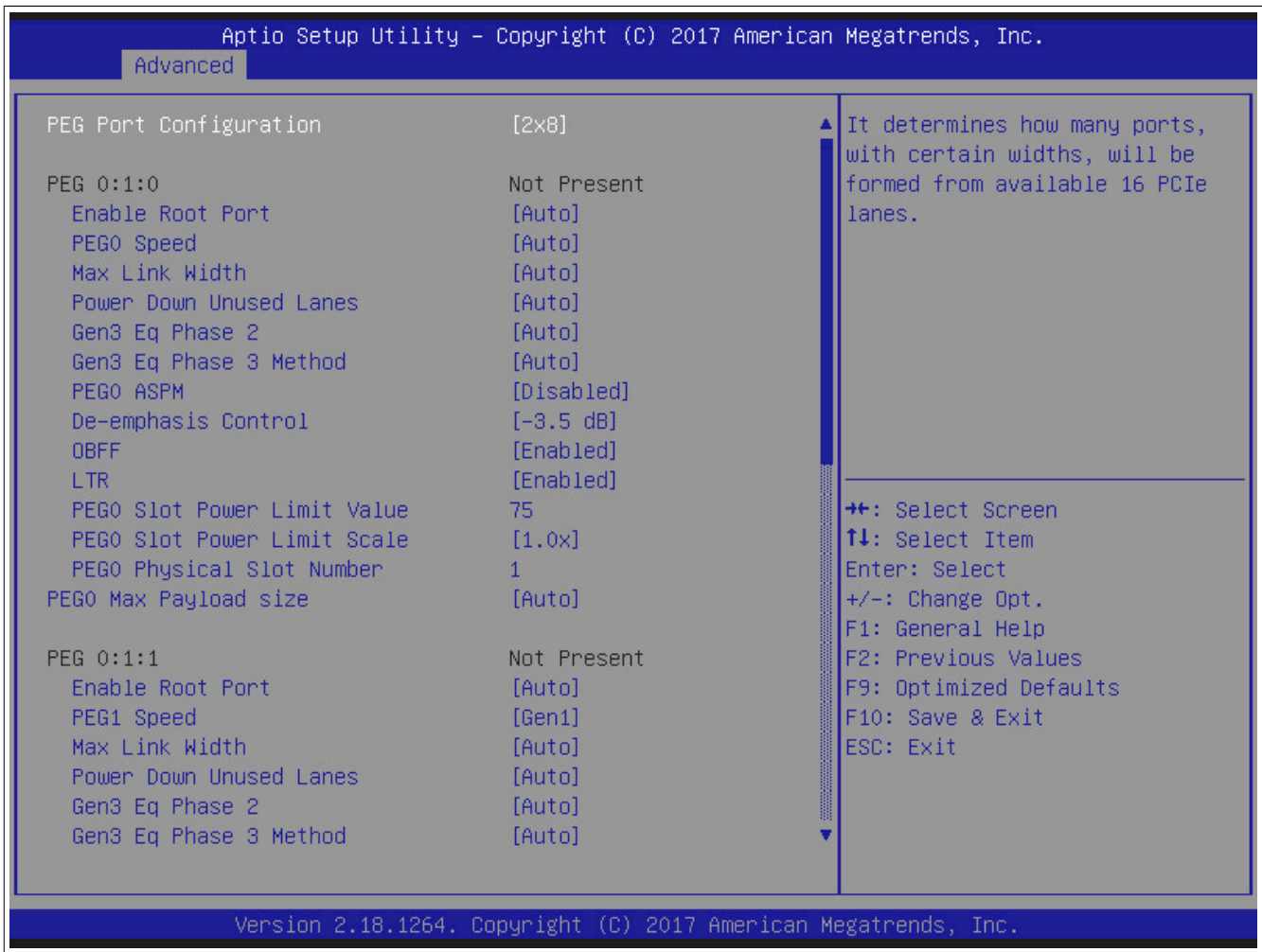


Figure 183: Advanced - PEG port configuration

BIOS setting	Explanation	Configuration options	Effect
PEG port configuration	Option for selecting the root port configuration on the 16 PCIe channels of the PEG port. The default value depends on which bus unit is used.	2x8	2x8 PCIe bus
		1x16	1x16 PCIe bus
		1x8+2x4	1x8 and 2x4 PCIe bus
PEG 0:1:0			PEG 0
Enable root port	Option for enabling/disabling the root port.	Auto	Automatic root port: enabled when client found during POST.
		Enabled	Enables the root port.
		Disabled	Disables the root port.
PEG0 speed	Option for setting the maximum transfer rate for the PEG port. Some older non-conforming PCI Express devices only work if Gen1 is selected. Some Gen2 and Gen3 devices start in Gen1 mode, and their OS driver sets them to Gen2/Gen3.	Auto	Selects the fastest possible transfer rate.
		Gen1	Maximum transfer rate = 2.5 GT/s.
		Gen2	Maximum transfer rate = 5 GT/s.
		Gen3	Maximum transfer rate = 8 GT/s.
Max link width	Option for setting the maximum link width.	Auto	Selects the maximum link width.
		Force X1	Force the PEG Link to redeploy X1.
		Force X2	Force the PEG Link to redeploy X2.
		Force X4	Force the PEG Link to redeploy X4.
		Force X8	Force the PEG Link to redeploy X8.
Power down unused lanes	Option for powering down unused lanes.	Auto	BIOS will power down unused lanes based on the maximum possible connection width.
		Disabled	No energy saving.
Gen3 Eq Phase 2	Option for executing Gen3 equalization phase 2.	Auto	Function operates automatically.
		Enabled	Enables this function.
		Disabled	Disables this function.
Gen3 Eq Phase 3 Method	Option for executing the method for Gen3 equalization phase 3.	Auto	Function operates automatically.
		Enabled	Enables this function.
		Disabled	Disables this function.

Table 314: Advanced - PEG port configuration - Configuration options

BIOS setting	Explanation	Configuration options	Effect
PEG0 ASPM ¹⁾	Option for configuring a power saving function for the PEG0 port if it does not require full power.	Disabled	Disables this function.
		Auto	Automatic assignment by BIOS and the operating system.
		ASPM L0s	Enables the L0 energy saving function.
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		ASPM L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device.
De-emphasis control	Option for configuring de-emphasis on the PEG port.	-3.5 dB	-3.5 dB de-emphasis
		-6 dB	-6 dB de-emphasis
OBFF	Option for enabling/disabling CPU PEG0 OFF.	Enabled	Enables this function.
LTR	Option for enabling/disabling CPU PEG latency reporting.	Disabled	Disables this function.
		Enabled	Enables this function.
PEG0 slot power limit value	Option for configuring the slot power limit value in watts.	0 to 75 to 255	Setting from 0 to 255
PEG0 slot power limit scale	Option for selecting the scaling of the slot power limit value.	1.0x	Set to 1.0x
		0.1x	Set to 0.1x
		0.01x	Sets 0.01x
		0.001x	Set to 0.001x
PEG0 physical slot number	Option for defining the number of the physical slot connected to this port. The number must be globally unique within the housing.	0-8191	The value must be set between 0 and 8191.
PEG0 max payload size	Option for selecting PEG maximum payload size.	Auto	The default device function is selected.
		128 TLP	Sets 128 bytes.
		256 TLP	Sets 256 bytes.
PEG 0:1:1			PEG 1
PEG 0:1:2			PEG 2
The settings for PEG 0:1:1 and PEG 0:1:2 are the same as for PEG 0:1:0.			
Detect non-compliant device	Option for detecting non-conforming PCI Express devices on the PEG port.	Disabled	Disables this function.
		Enabled	Enables this function.
Program PCIe ASPM after OpROM	Option for enabling/disabling PCIe ASPM programming.	Disabled	PCIe ASPM is programmed before the OpROM.
		Enabled	PCIe ASPM is programmed after the OpROM.
Program Static Phase1 Eq	Option for enabling/disabling the program phase presettings/CTLEp.	Enabled	Enables this function.
		Disabled	Disables this function.
Gen3 root port preset value for each lane	Gen3 root port preset value for each lane.	Enter	Opens this submenu See "Gen3 root port preset value for each lane" on page 354.
Gen3 endpoint preset value for each lane	Gen3 endpoint preset value for each lane.	Enter	Opens this submenu See "Gen3 endpoint preset value for each lane" on page 355.
Gen3 endpoint hint value for each lane	Gen3 endpoint hint value for each lane.	Enter	Opens this submenu See "Gen3 endpoint hint value for each lane" on page 356.
Gen3 RxCTLE control	Gen3 RxCTLE control per bundle.	Enter	Opens this submenu See Gen3 RxCTLE control.
Always attempt SW EQ	Option to always attempt SW EQ, even if it has already been done.	Disabled	Disables this function.
		Enabled	Enables this function.
Number of presets to test	Number of presettings to be tested.	Auto	Current default for CPU.
		0-9	Define number from 0 to 9.
		7, 3, 5	Define number as 7, 3 or 5.
SW EQ enable VOC	Option for configuring the jitter and VOC test mode.	Auto	The current default value is enabled automatically.
		Jitter only test mode	Enables jitter only test mode.
		Jitter & VOC test mode	Enables jitter & VOC test mode (default).
Jitter dwell time	Option for setting the PEG Gen3 preset dwell time.	0 to 3000 to 65535	The dwell time can be set from 0 to 65535 usec.
Jitter error target	Option for configuring the jitter error target value.	1 to 2 to 65535	The error target can be set from 1 to 65535.
VOC dwell time	Option for setting the VOC dwell time.	0 to 10000 to 65535	The dwell time can be set from 0 to 65535 usec.
Jitter error target	Option for setting the VOC jitter margin error target value.	1 to 2 to 65535	The VOC margin error target value can be set from 1 to 65535.
Generate BDAT PEG margin data	Option for generating BDAT PCIe margin tables.	Disabled	Disables this function.
		Generate port jitter data	Enables this function. BDAT PCIe margin tables are generated.
PCIe Rx CEM test mode	Option for enabling/disabling PEG RX CEM loopback mode.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 314: Advanced - PEG port configuration - Configuration options

1) ASPM = Active State Power Management.

1.4.2.14.1 Gen3 root port preset value for each lane

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

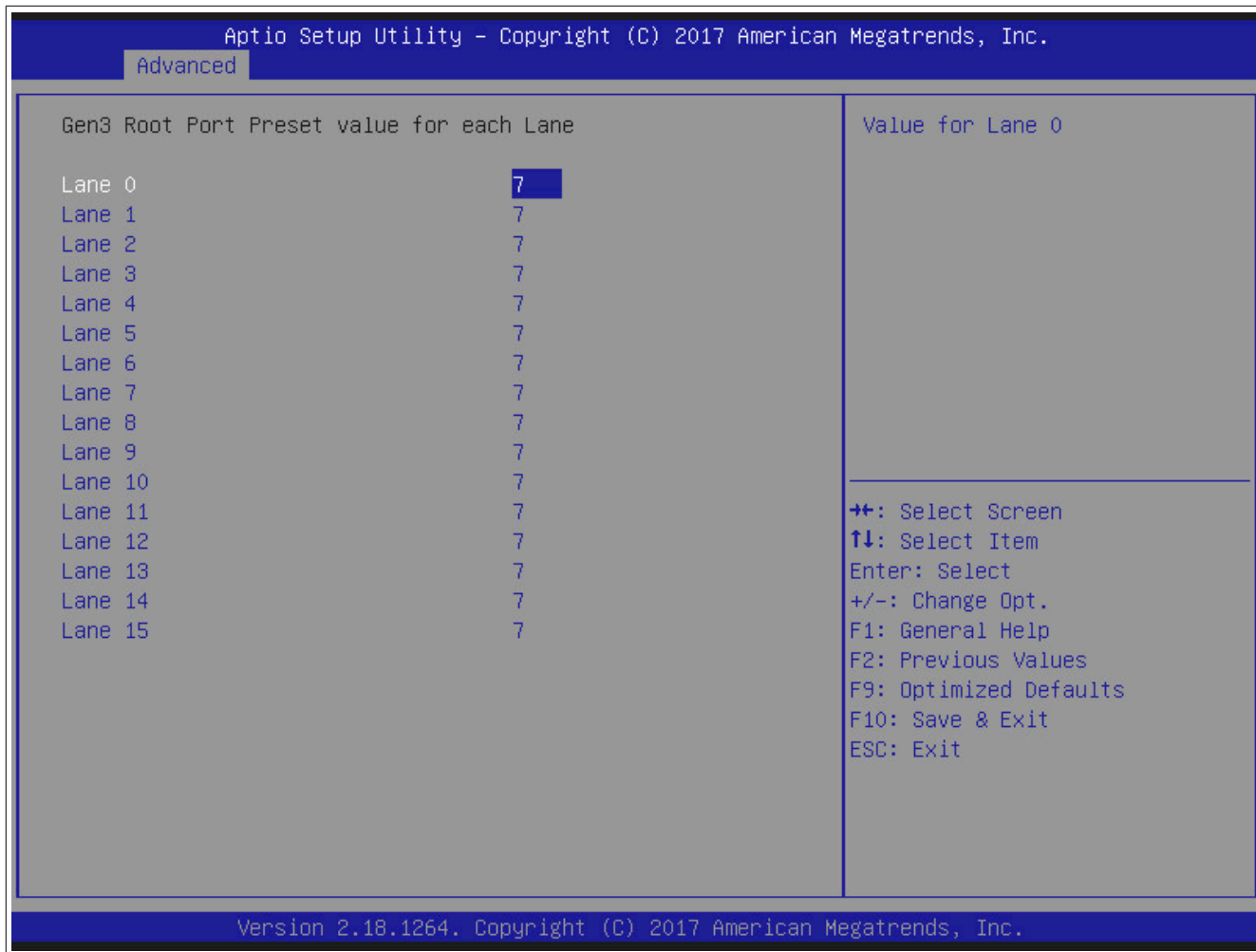


Figure 184: Advanced - PEG Gen3 root port preset value for each lane

1.4.2.14.2 Gen3 endpoint preset value for each lane

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

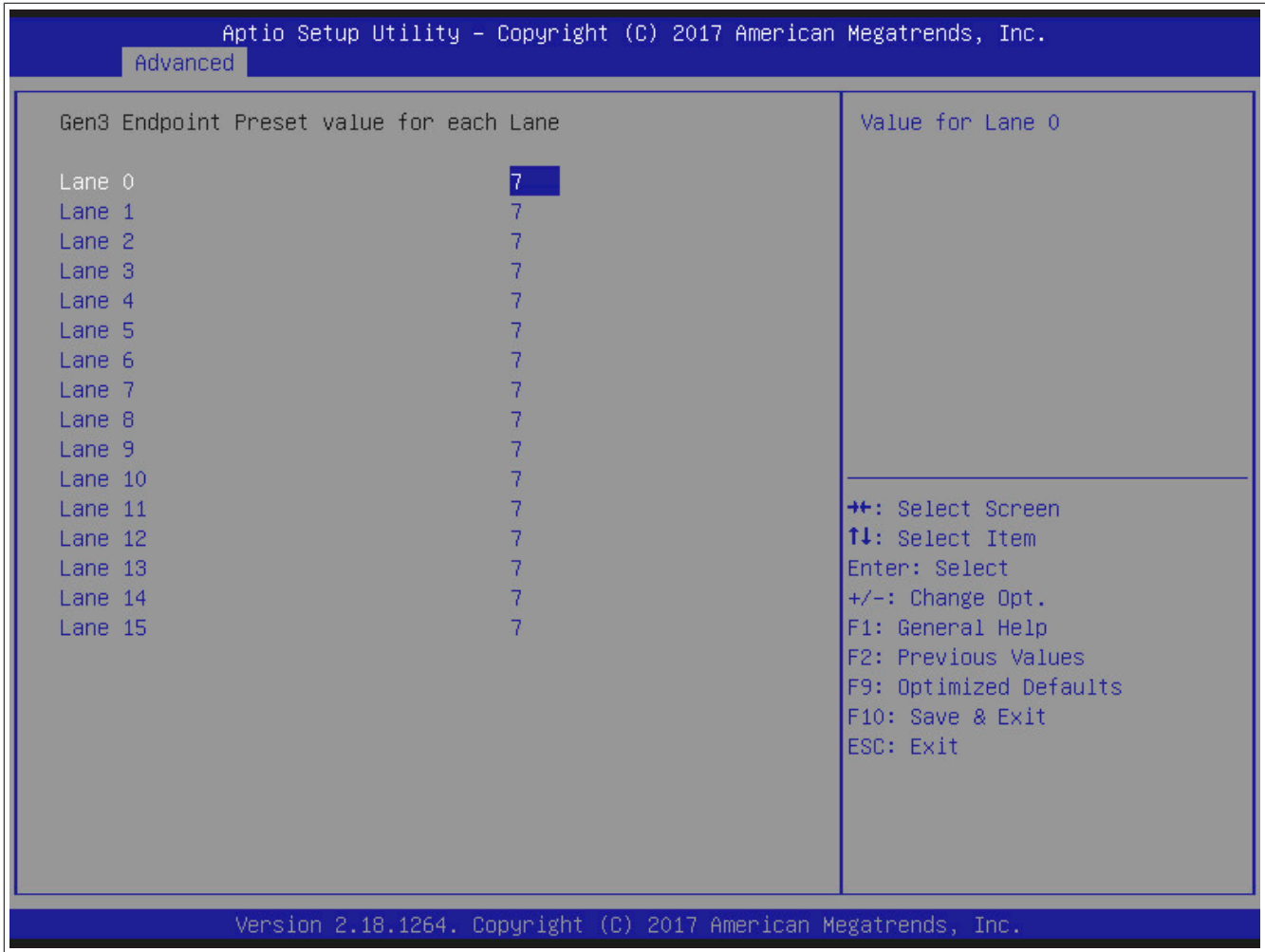


Figure 185: Advanced - PEG Gen3 endpoint preset value for each lane

1.4.2.14.3 Gen3 endpoint hint value for each lane

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

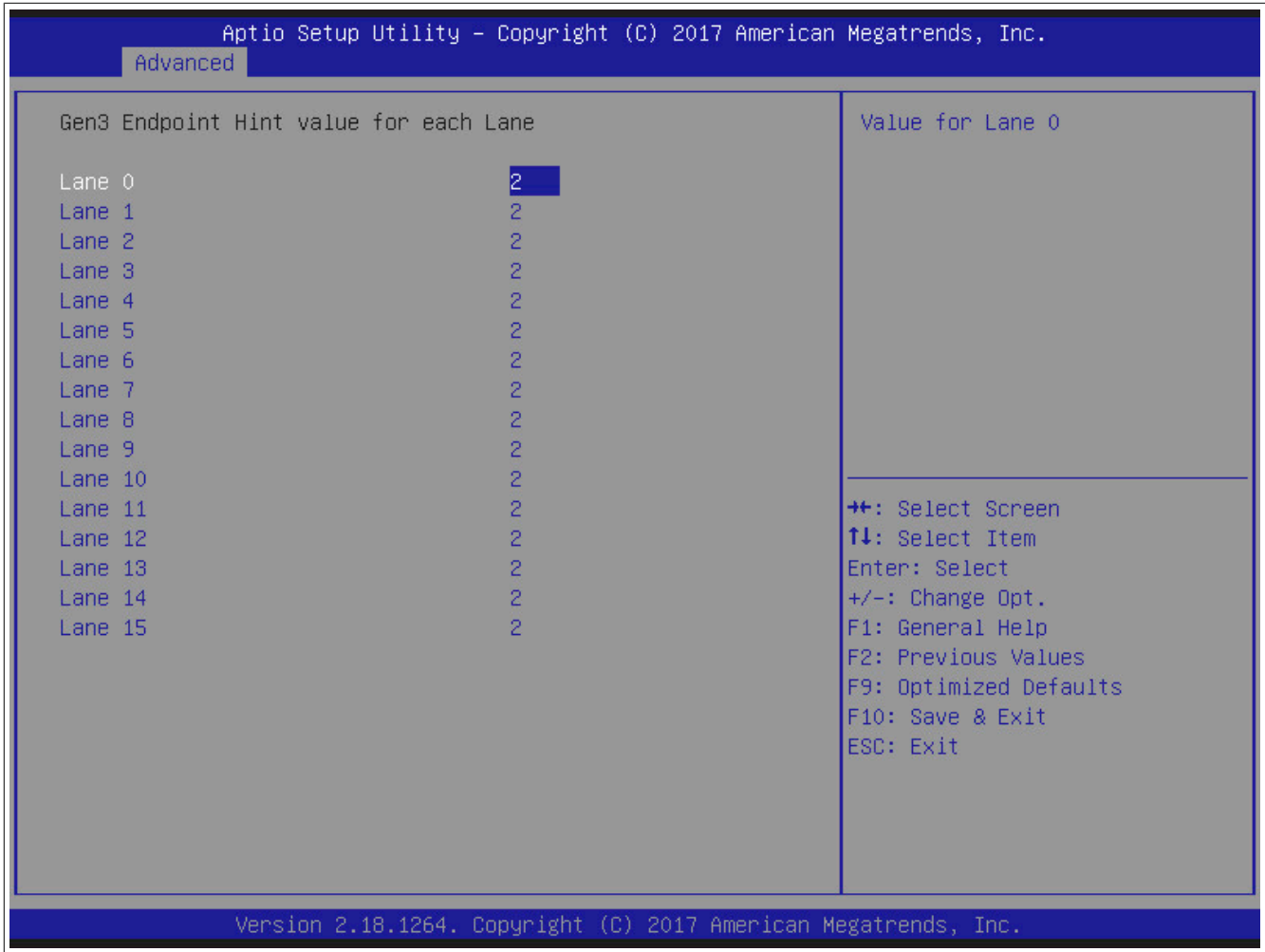


Figure 186: Advanced - PEG Gen3 endpoint hint value for each lane

1.4.2.14.4 Gen3 RxCTLE control

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

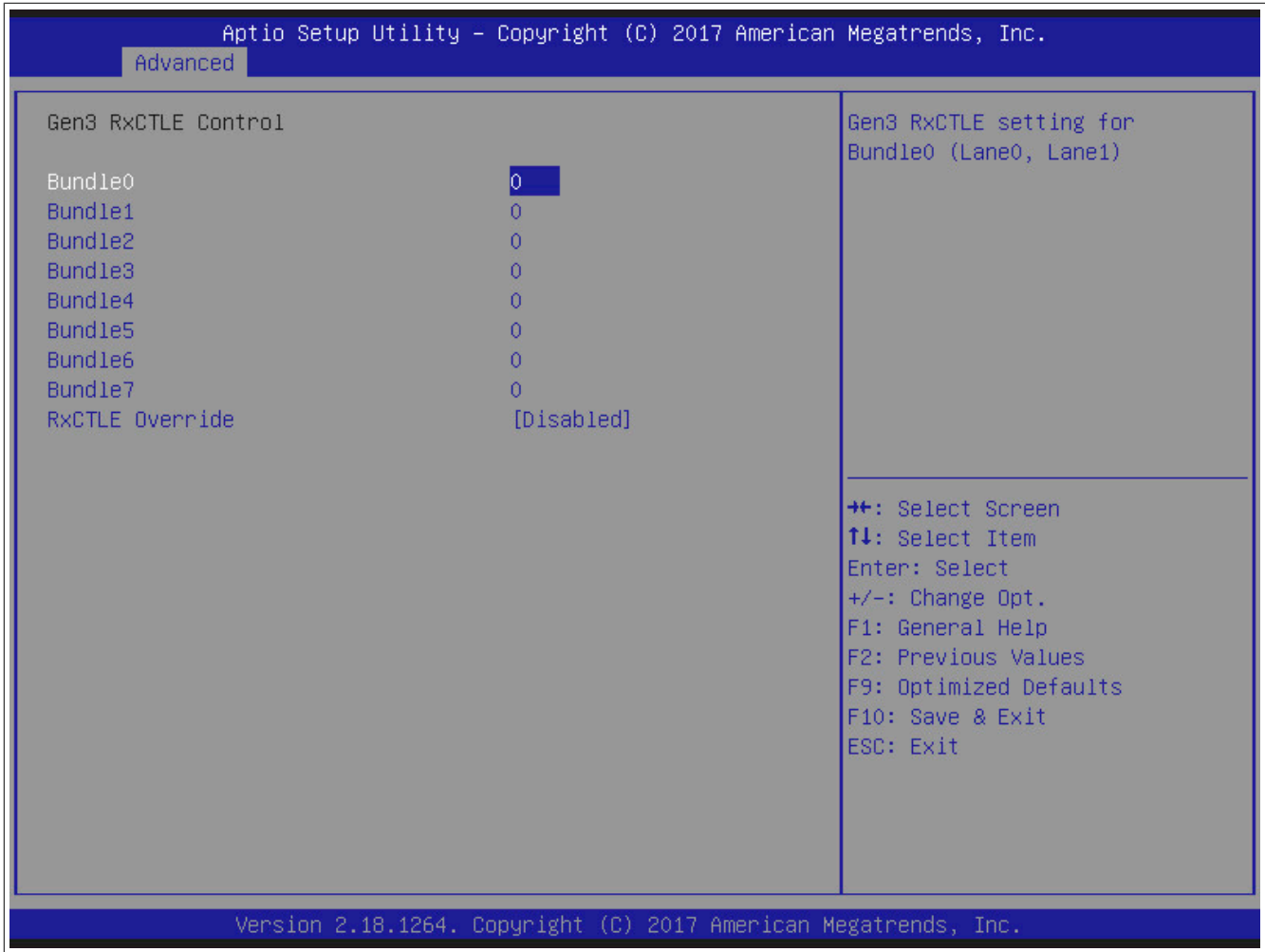


Figure 187: Advanced - PEG Gen3 RxCTLE

1.4.2.15 DMI configuration

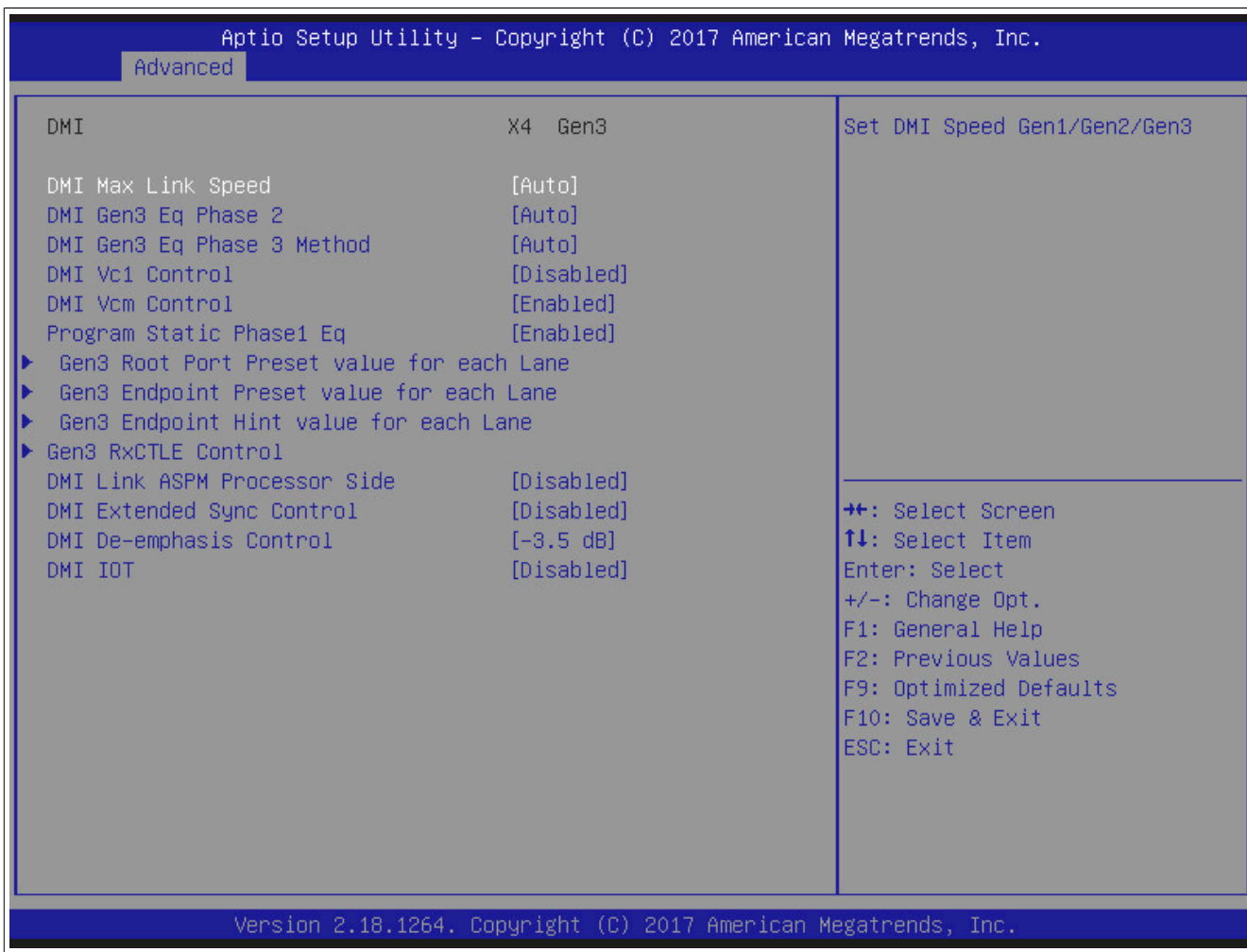


Figure 188: Advanced - DMI/OPI configuration

BIOS setting	Explanation	Configuration options	Effect
DMI max link speed	Option for setting the maximum DMI link transfer rate.	Auto	Selects the fastest possible transfer rate.
		Gen1	Maximum transfer rate = 2.5 GT/s.
		Gen2	Maximum transfer rate = 5 GT/s.
		Gen3	Maximum transfer rate = 8 GT/s.
DMI Gen3 Eq Phase 2	Option for executing Gen3 equalization phase 2.	Auto	Automatic selection.
		Enabled	Enables this function.
		Disabled	Disables this function.
DMI Gen3 Eq Phase 3 Method	Option for selecting the method for Gen3 equalization phase 3.	Auto	Automatic selection.
		Adaptive hardware equalization	Adaptive hardware equalization is enabled.
		Adaptive software equalization	Adaptive software equalization is enabled.
		Static equalization	Static equalization is enabled.
DMI Vc1 control	Option for enabling/disabling DMI Vc1.	Disabled	Disables this function.
		Enabled	Enables this function.
DMI Vcm control	Option for enabling/disabling DMI Vcm.	Enabled	Enables this function.
		Disabled	Disables this function.
Program Static Phase1 Eq	Option for enabling/disabling Program Static Phase1 Eq.	Enabled	Enables this function.
		Disabled	Disables this function.
Gen3 root port preset value for each lane	Gen3 root port preset value for each lane.	Enter	Opens this submenu See "Gen3 root port preset value for each lane" on page 359.
Gen3 endpoint preset value for each lane	Gen3 endpoint preset value for each lane.	Enter	Opens this submenu See "Gen3 endpoint preset value for each lane" on page 360.
Gen3 endpoint hint value for each lane	Gen3 endpoint hint value for each lane.	Enter	Opens this submenu See "Gen3 endpoint hint value for each lane" on page 361.
Gen3 RxCTLE control	Gen3 RxCTLE control per bundle.	Enter	Opens this submenu See "Gen3 RxCTLE control" on page 362.

Table 315: Advanced - DMI configuration - Configuration options

BIOS setting	Explanation	Configuration options	Effect
DMI link ASPM processor side	Option for enabling/disabling active state power management (ASPM) for the DMI link on the processor 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 sync control	Option for enabling/disabling DMI extended synchronization	Disabled	Disables this function.
		Enabled	Enables this function.
DMI de-emphasis control	Option for configuring de-emphasis on the PEG port	-3.5 dB	3.5 dB de-emphasis
		-6 dB	-6 dB de-emphasis
DMI IOT	Option for enabling/disabling DMI IOT.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 315: Advanced - DMI configuration - Configuration options

1.4.2.15.1 Gen3 root port preset value for each lane

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

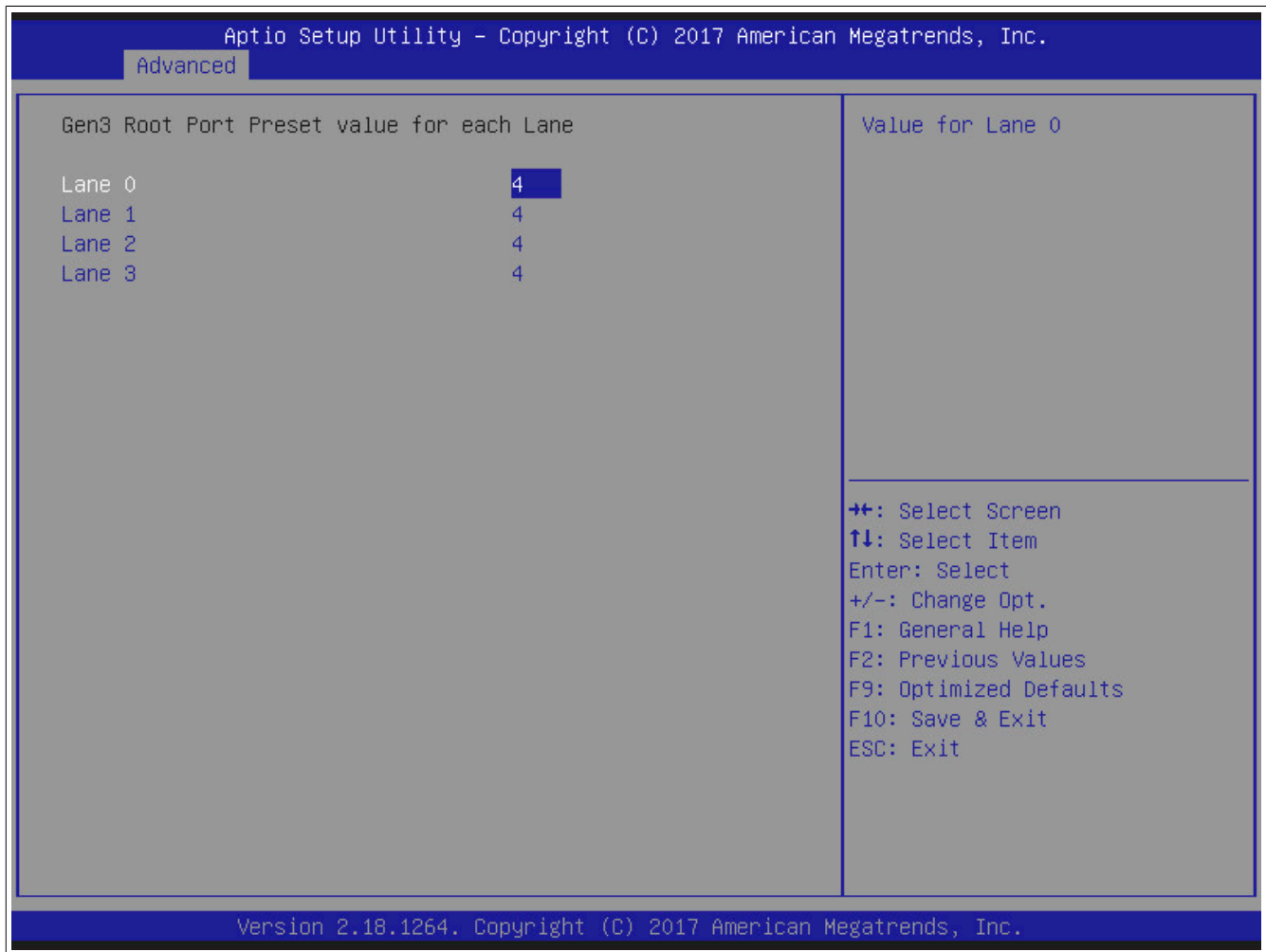


Figure 189: Advanced - Gen3 root port preset value for each lane

1.4.2.15.2 Gen3 endpoint preset value for each lane

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

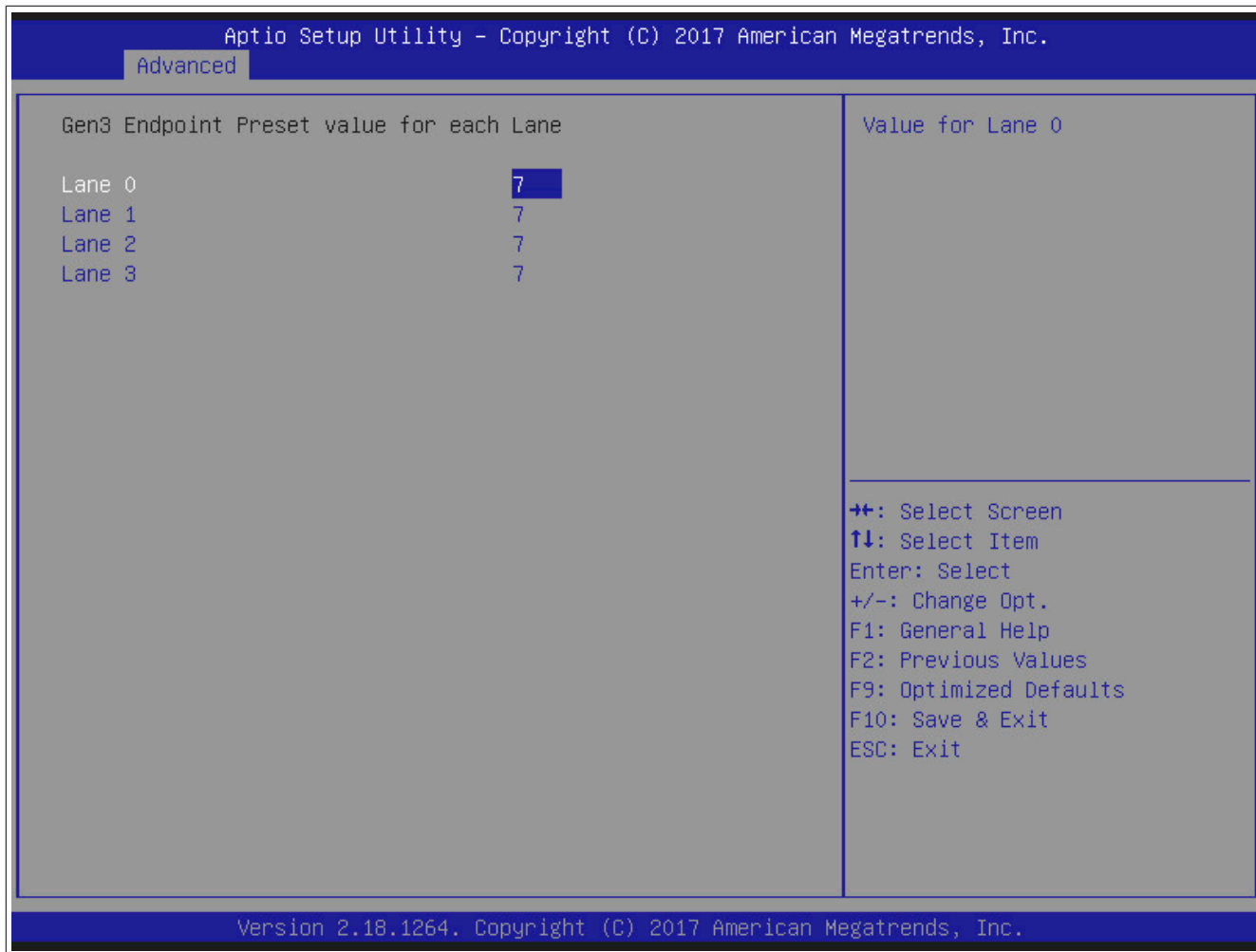


Figure 190: Advanced - Gen3 endpoint preset value for each lane

1.4.2.15.3 Gen3 endpoint hint value for each lane

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

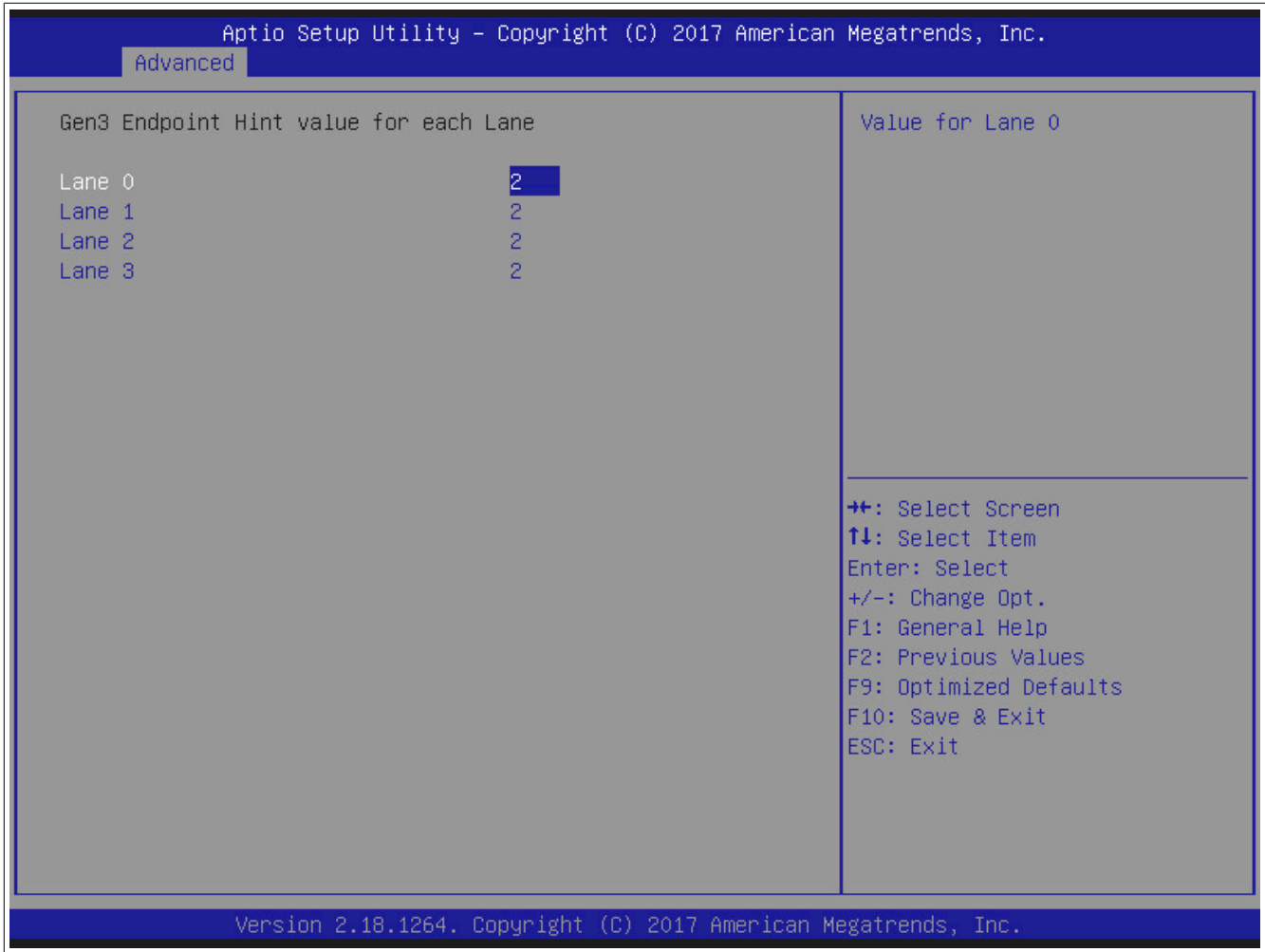


Figure 191: Advanced - Gen3 endpoint hint value for each lane

1.4.2.15.4 Gen3 RxCTLE control

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

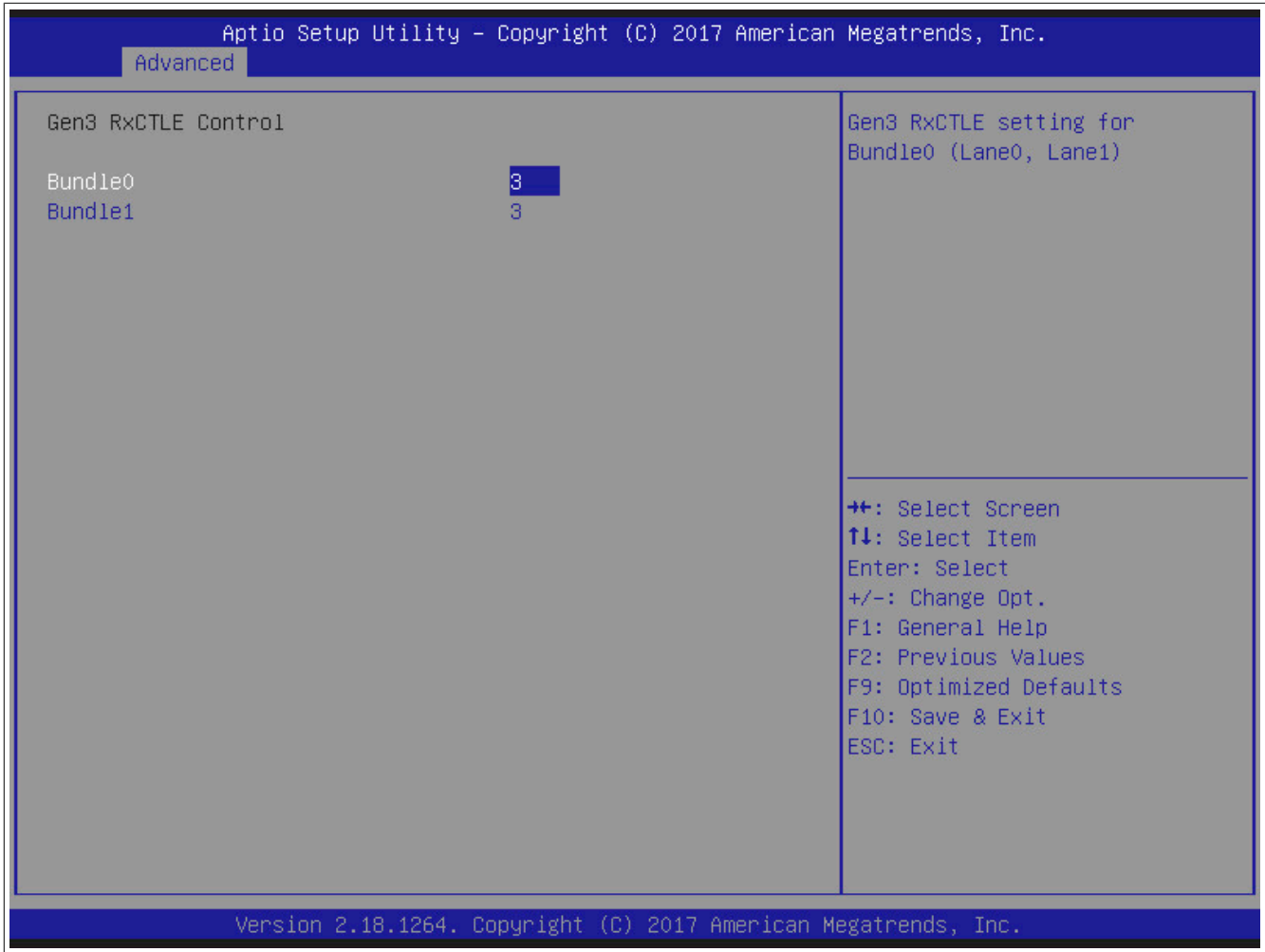


Figure 192: Advanced - Gen3 RxCTLE control

1.4.2.16 Audio



Figure 193: Advanced - HD audio

BIOS setting	Explanation	Configuration options	Effect
HD audio	Option for detecting HD audio devices	Auto	HDA is enabled if available. Otherwise disabled.
		Disabled	HDA is disabled unconditionally.
		Enabled	HDA is enabled if available, otherwise disabled.
Audio DSP	Option for enabling/disabling audio DSP.	Disabled	Disables this function.
		Enabled	Enables this function.
HDA link codec select	Option for selecting the HDA link codec.	Platform onboard	The platform onboard codec is used (a single verb table is installed).
		External kit	External codec kit is used (multiple verb tables are installed).
iDisplay audio disconnect	Option for disconnecting the SDI2 signal in order to hide/disable the iDisplay audio codec.	Disabled	Disables this function.
		Enabled	Enables this function.
PME enable	Option for enabling/disabling power management for the audio controller	Disabled	Disables this function.
		Enabled	Enables this function.
HD audio advanced configuration	HD audio subsystem – Advanced configuration settings	Enter	Opens this submenu See "HD audio advanced configuration" on page 364.
HD audio DSP features configuration	HD audio DSP features configuration (ACPI)	Enter	Opens this submenu See "HD audio DSP features" on page 365.

Table 316: Advanced - HD audio - Configuration options

1.4.2.16.1 HD audio advanced configuration

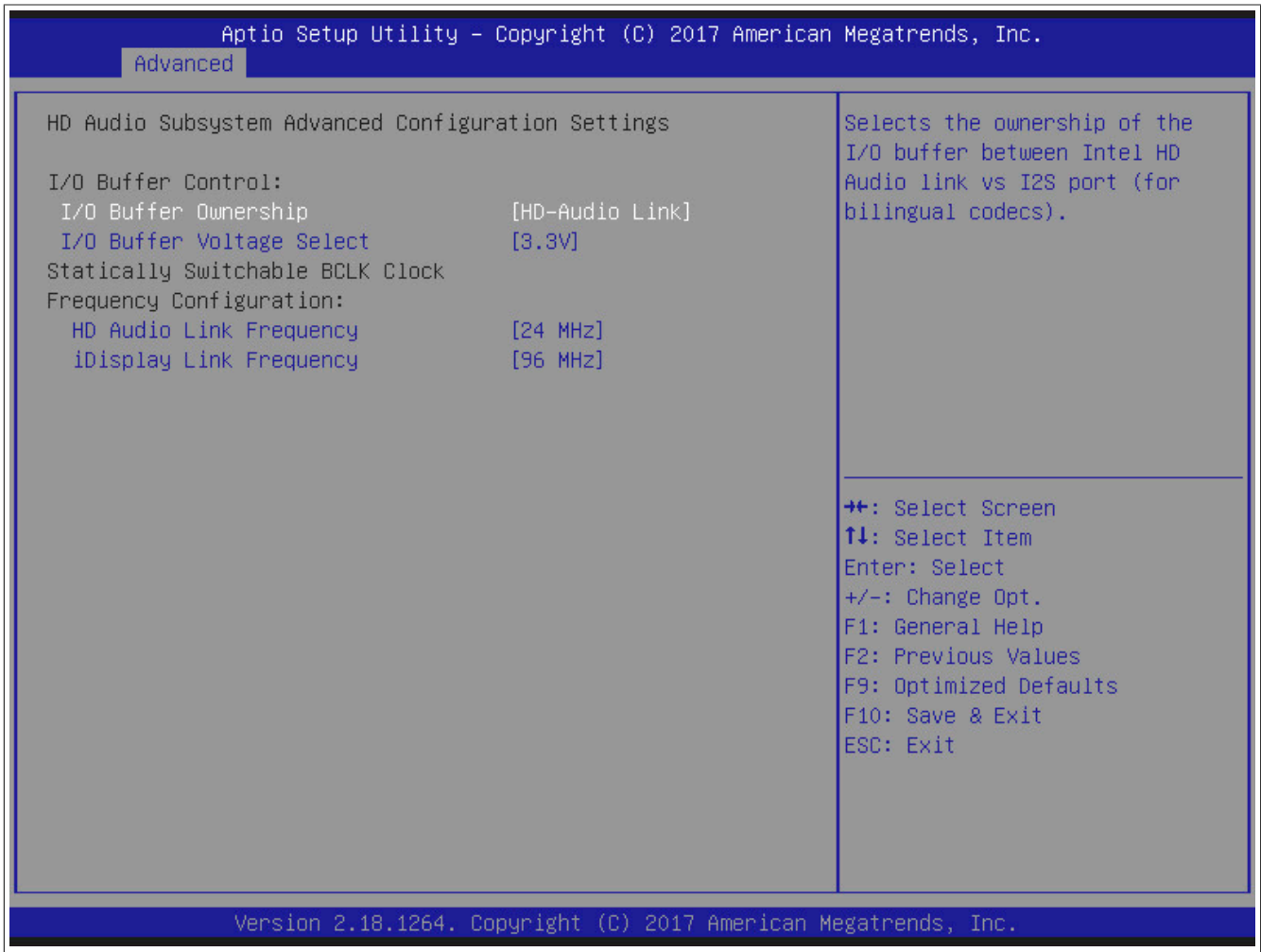


Figure 194: Advanced - HD audio configuration

BIOS setting	Explanation	Configuration options	Effect
I/O buffer control			
I/O buffer ownership	Option for selecting ownership of the I/O buffer between the Intel HD audio connection and the I2S port (for dual-language codecs).	HD audio link HD audio link / I2S port I2S port	HD audio link selected. HD audio link / I2S port selected. I2S port selected.
I/O buffer voltage select	Option for selecting the voltage mode for the I/O buffer.	3.3V 1.8V	The voltage is 3.3 volts. The voltage is 1.8 volts.
Frequency configuration:			
HD audio link frequency	Option for setting the HD audio link frequency. Can only be used if the HDA supports the selected frequency.	6 MHz 12 MHz 24 MHz	Set to 6 MHz. Set to 12 MHz. Set to 24 MHz.
iDisplay link frequency	Option for setting the maximum iDisplay link frequency. Can only be used if the iDisp codec supports the selected frequency.	48 MHz 96 MHz	Set to 48 MHz. Set to 96 MHz.

Table 317: Advanced - HD audio advanced configuration - Configuration options

1.4.2.16.2 HD audio DSP features

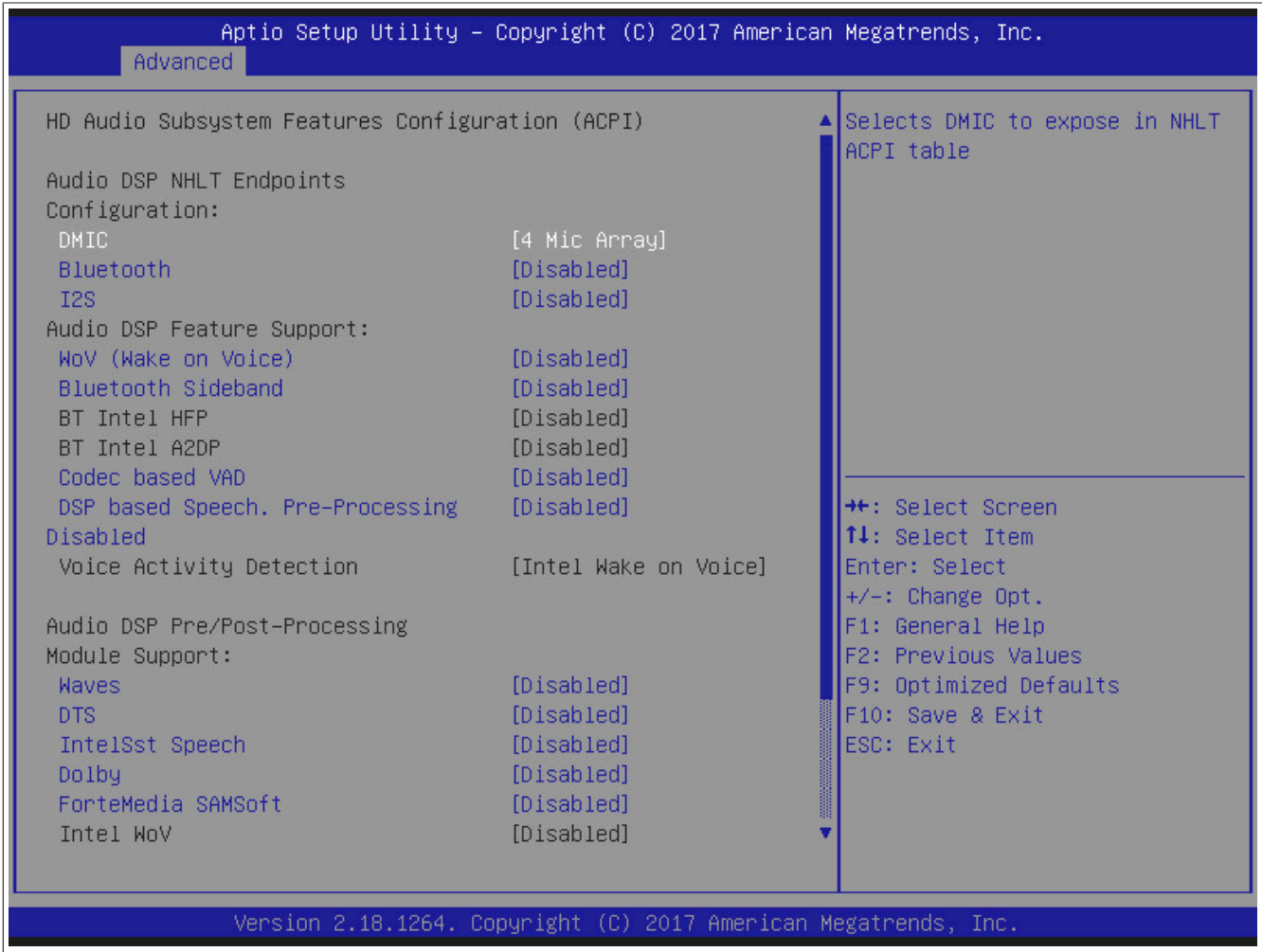


Figure 195: Advanced - Audio DSP features

BIOS setting	Explanation	Configuration options	Effect
Audio DSP NHLT endpoints configuration:			
DMIC	Option for setting the DMIC so it is displayed in the NHLT ACPI table.	Disabled	Disables this function.
		1 mic array	1-microphone array selected.
		2 mic array	2-microphone array selected.
		4 mic array	4-microphone array selected.
Bluetooth	Option for enabling/disabling the Bluetooth endpoint in the NHLT ACPI table.	Disabled	Disables this function.
		Enabled	Enables this function.
I2S	Option for enabling/disabling I2S endpoint in the NHLT ACPI table.	Disabled	Disables this function.
		Enabled	Enables this function.
Audio DSP feature support			
WoV (wake on voice)	Option for enabling/disabling the DSP feature. Bitmask structure:	Disabled	Disables this function.
		Enabled	Enables this function.
Bluetooth sideband	BIT0 - WoV	Disabled	Disables this function.
		Enabled	Enables this function.
Codec-based VAD	BIT2 - Codec-based VAD	Disabled	Disables this function.
		Enabled	Enables this function.
DSP-based speech. Pre-processing disabled	BIT5 - BT Intel HFP BIT6 - BT Intel A2DP	Disabled	Disables this function.
		Enabled	Enables this function.
Audio DSP pre/post-processing module support:			
Waves		Disabled	Disables this function.
		Enabled	Enables this function.
DTS	Option for enabling/disabling support for 3rd-party processing modules (identified by GUID).	Disabled	Disables this function.
		Enabled	Enables this function.
IntelSst speech	WoV feature must be enabled to select relevant WoV files.	Disabled	Disables this function.
		Enabled	Enables this function.
Dolby		Disabled	Disables this function.
		Enabled	Enables this function.

Table 318: Advanced - HD audio DSP features - Configuration options

BIOS setting	Explanation	Configuration options	Effect
ForteMedia SAMSoft	Option for enabling/disabling support for 3rd-party processing modules (identified by GUID). WoV feature must be enabled to select relevant WoV files.	Disabled	Disables this function.
		Enabled	Enables this function.
Sound Research IP		Disabled	Disables this function.
		Enabled	Enables this function.
Conexant preprocess		Disabled	Disables this function.
		Enabled	Enables this function.
Conexant smart amp		Disabled	Disables this function.
		Enabled	Enables this function.
Custom module "Alpha"		Disabled	Disables this function.
		Enabled	Enables this function.
Custom module "Beta"	Disabled	Disables this function.	
	Enabled	Enables this function.	
Custom module "Gamma"	Disabled	Disables this function.	
	Enabled	Enables this function.	

Table 318: Advanced - HD audio DSP features - Configuration options

1.4.2.17 Memory configuration

Information:

The following BIOS settings are system-optimized. They should only be changed by system experts who understand what impact the changes will have.

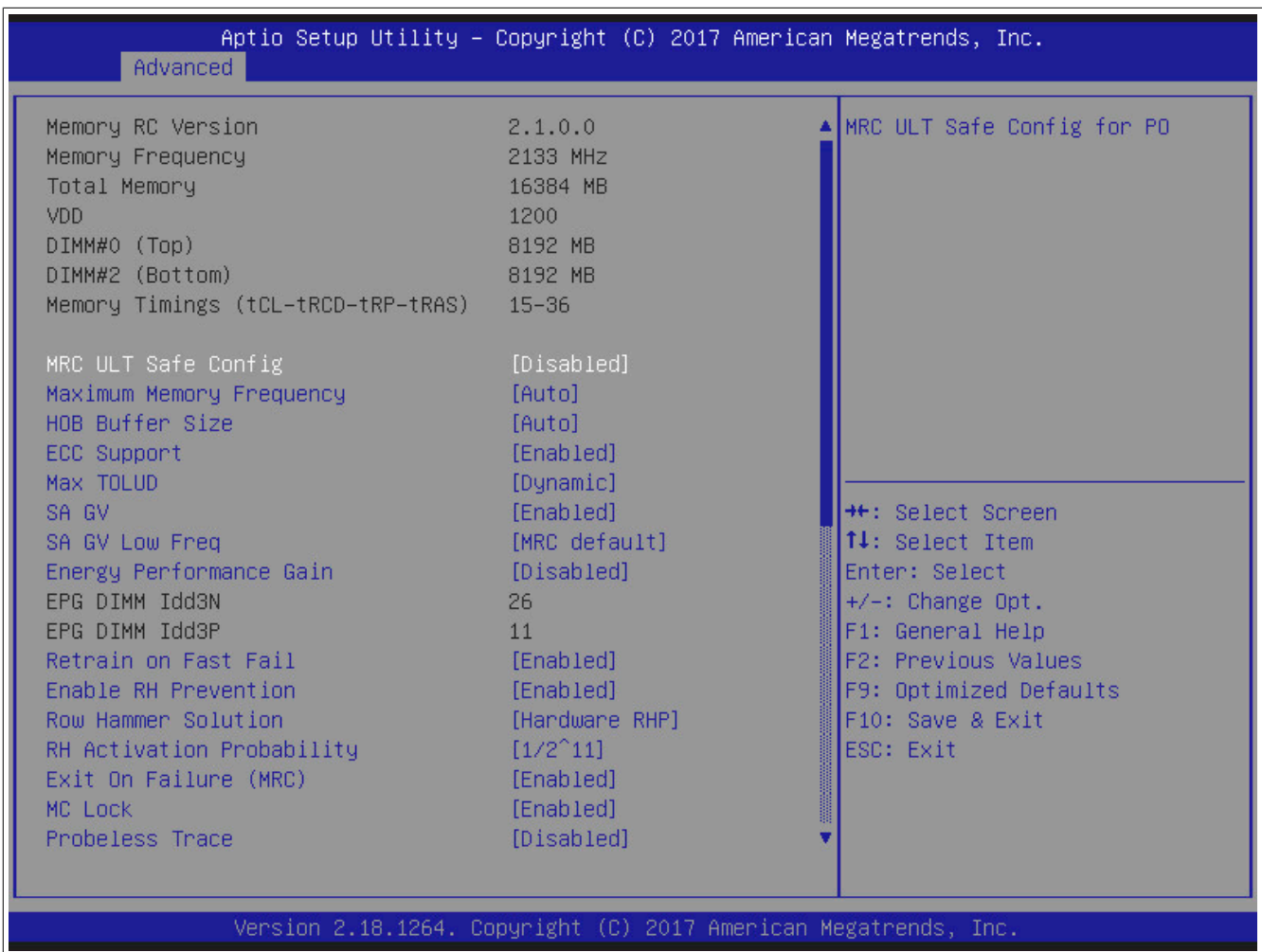


Figure 196: Advanced - Memory configuration

1.4.2.18 Network stack configuration



Figure 197: Advanced - Network stack configuration

BIOS setting	Explanation	Configuration options	Effect
UEFI network stack	Option for enabling/disabling the UEFI network stack	Disabled	Disables this function.
		Enabled	Enables this function.
IPv4 PXE support	Option for enabling/disabling IPv4 PXE support.	Enabled	Enables this function.
		Disabled	Disables this function. The IPv4 PXE boot option is not created.
IPv6 PXE support	Option for enabling/disabling IPv6 PXE support.	Enabled	Enables this function.
		Disabled	Disables this function. The IPv6 PXE boot option is not created.
PXE boot wait time	Option to set the wait time to press the Esc key and cancel the PXE boot procedure.	0 to ...	Wait time until ESC is pressed and the boot procedure is aborted.
Media detect count	Option for defining the frequency at which to scan for new media.	1 to ...	Defines the frequency at which to scan for new media.

Table 319: Advanced - Network stack configuration options

1.4.2.19 CSM configuration

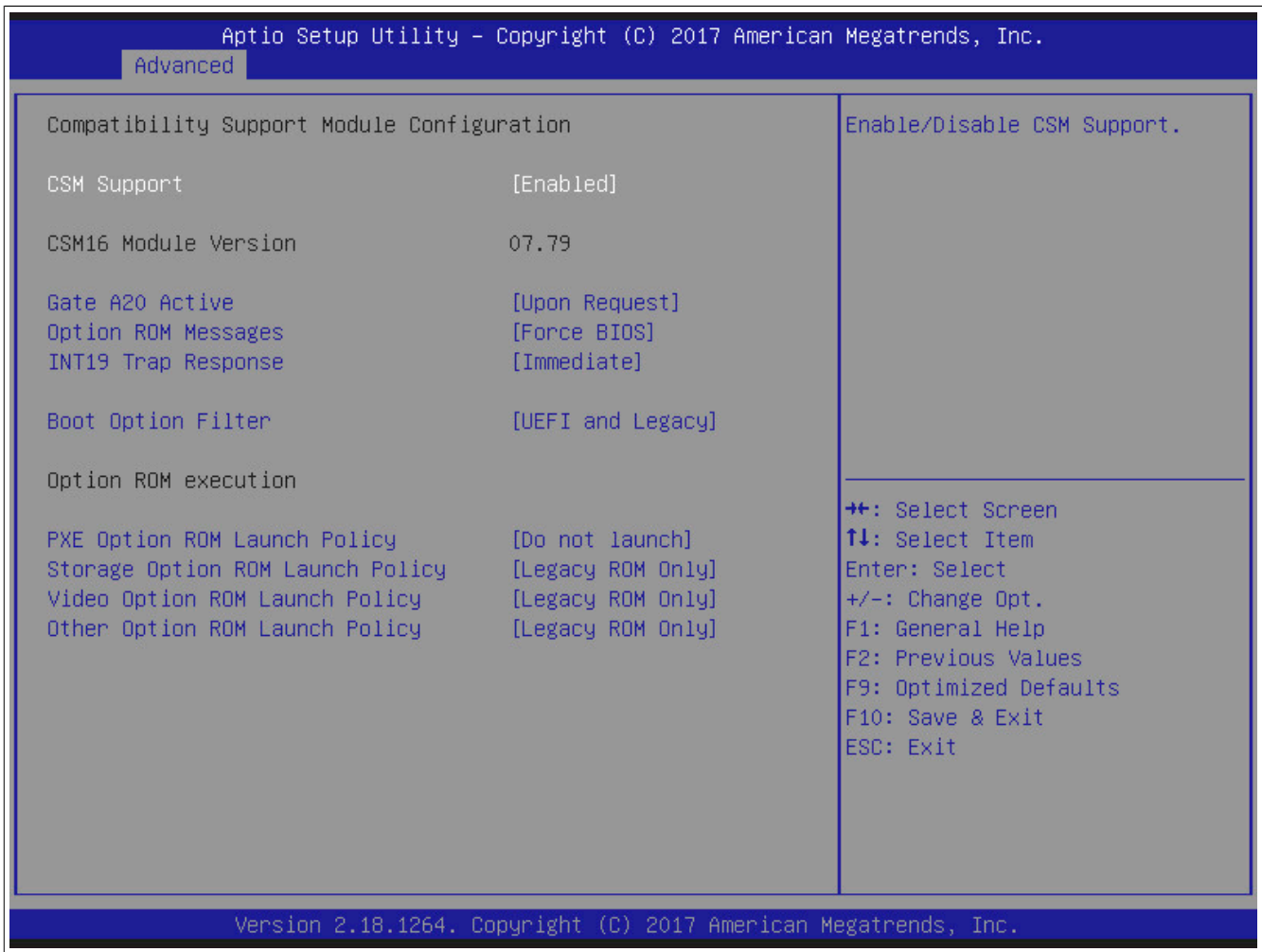


Figure 198: Advanced - CSM configuration

BIOS setting	Explanation	Configuration options	Effect
CSM support	Option for enabling/disabling CSM support	Enabled	Enables this function.
		Disabled	Disables this function.
CSM16 module version	Displays the CSM16 module version.	None	-
Gate A20 active	This option is helpful when a runtime code higher than 1 MB is executed.	Upon request	Gate A20 <i>can</i> be disabled using BIOS services.
		Always	Does not permit the disabling of gate A20.
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.
INT19 trap response	Option for setting the BIOS response to INT19 via Option ROM	Immediate	Execute the trap immediately.
		Postponed	Execute the trap during legacy boot.
Boot option filter	Option for controlling which device system should be booted.	UEFI and legacy	Boots from UEFI and legacy
		Legacy only	Boots from legacy
		UEFI only	Boots from UEFI
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	Legacy ROM only	Boots from legacy ROM
		UEFI ROM only	Boots from UEFI ROM
		Do not launch	Does not boot from Storage Option ROM
Video Option ROM launch policy	Option for booting from Video Option ROM	Legacy ROM only	Boots from legacy ROM
		UEFI ROM only	Boots from UEFI ROM
		Do not launch	Does not boot from Video Option ROM
Other option ROM launch policy	Option for controlling execution of Option ROMs for other PCI/PCI Express devices as network, mass storage device or video.	Legacy ROM only	Boots from legacy OpROM
		UEFI ROM only	Boots from UEFI OpROM
		Do not launch	Does not boot from other OpROMs

Table 320: Advanced - CSM configuration - Configuration options

1.4.2.20 NVMe configuration

Information:

In preparation.

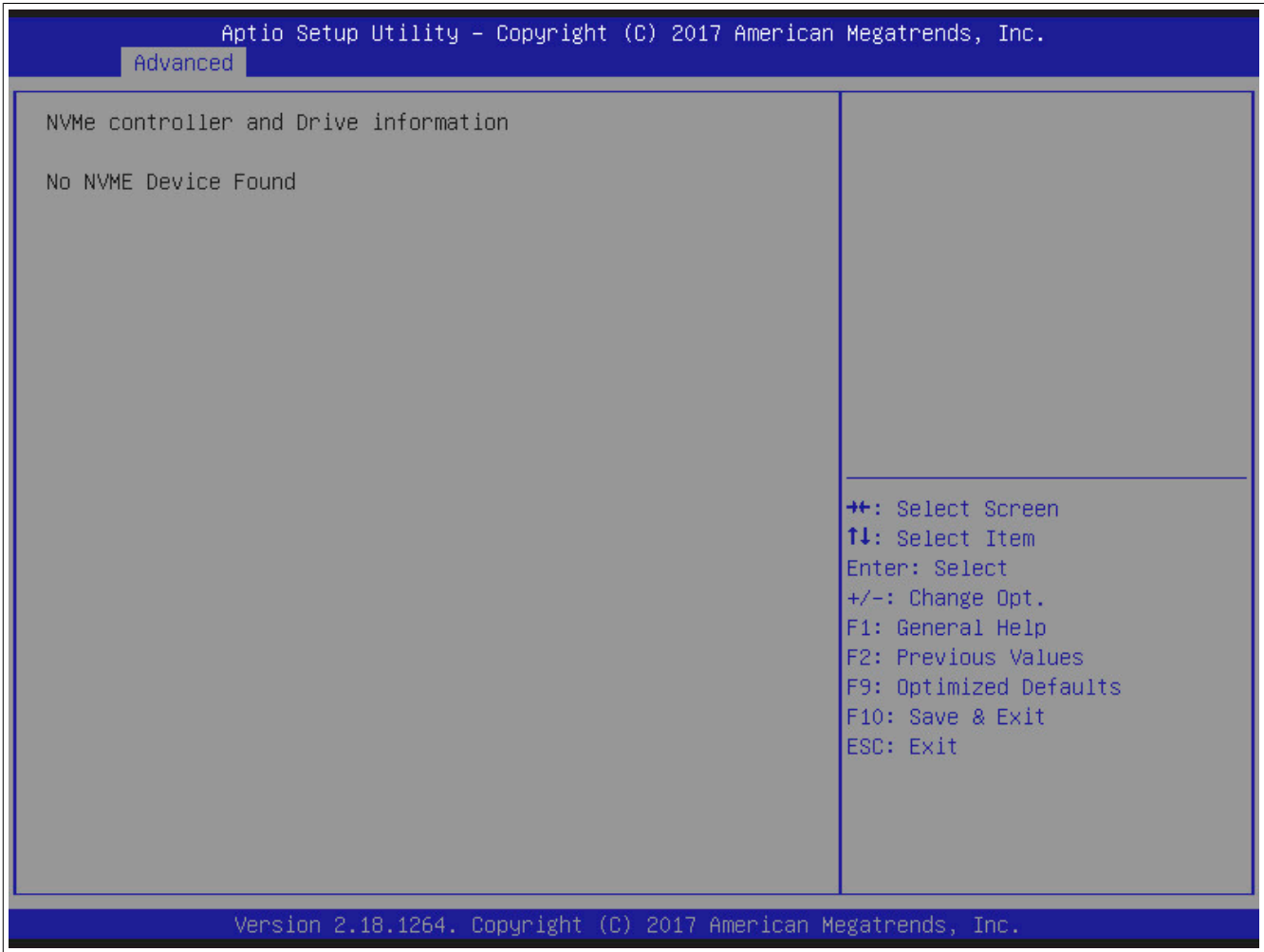


Figure 199: Advanced - NVMe configuration

BIOS setting	Explanation	Configuration options	Effect
NVMe controller and driver information	Displays NVMe devices.	None	-

Table 321: Advanced - NVMe configuration - Configuration options

1.4.2.21 USB configuration

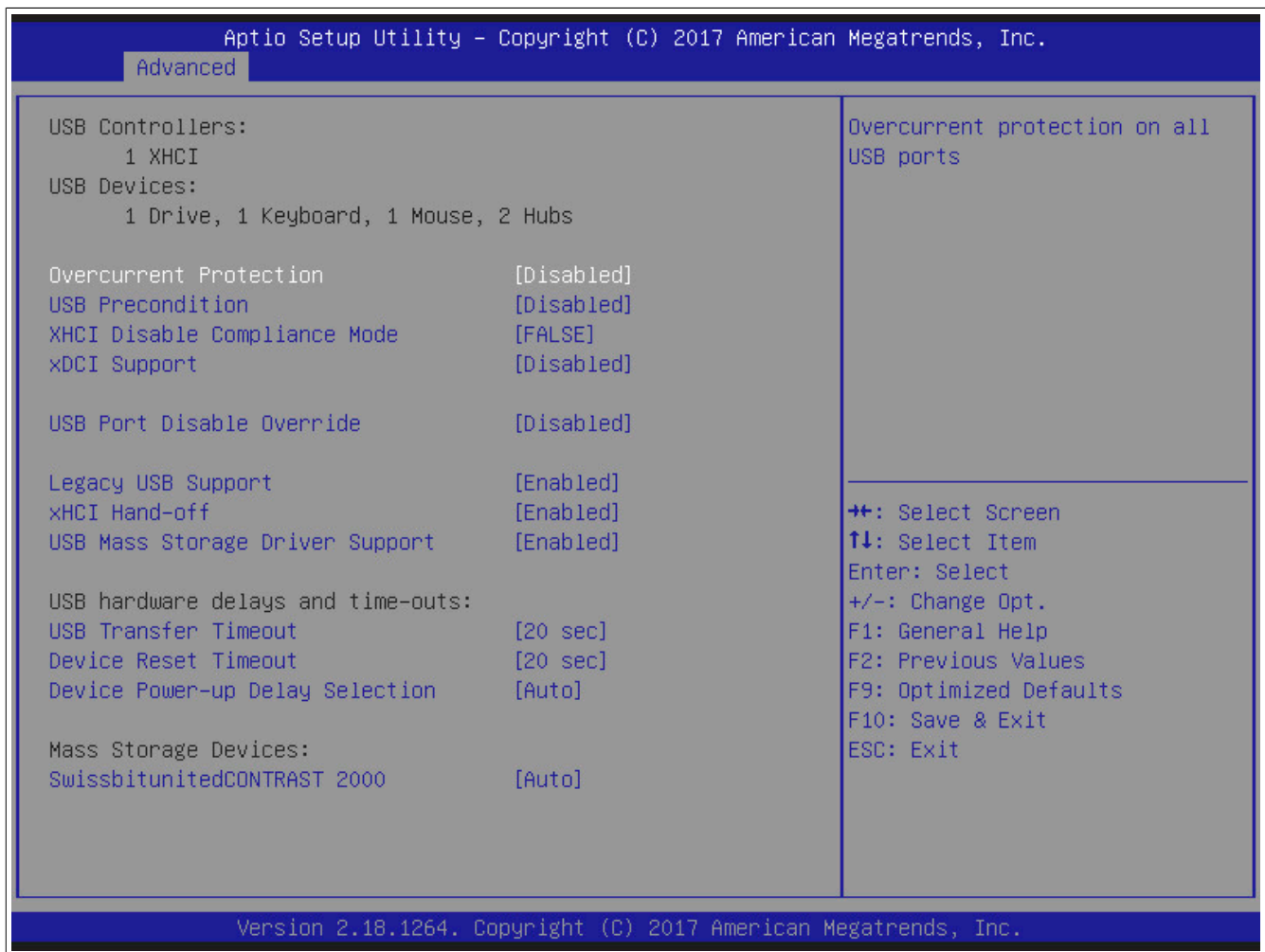


Figure 200: Advanced - USB configuration

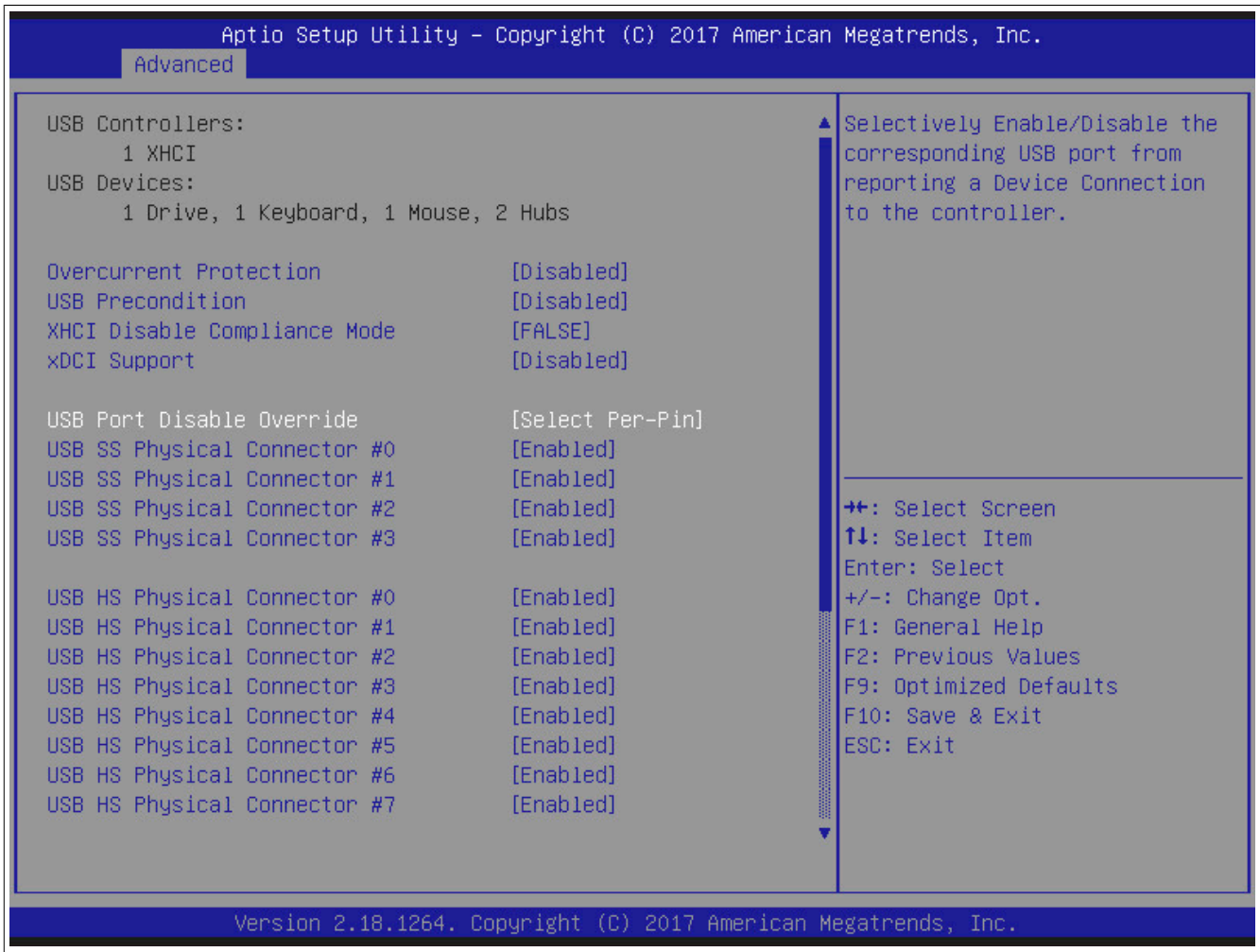


Figure 201: Advanced - USB - USB port select per pin

BIOS setting	Explanation	Configuration options	Effect
Overcurrent protection	Option for configuring overcurrent protection for all USB interfaces	Disabled	Disables this function.
		Enabled	Enables this function.
USB precondition	Option to enable/disable precondition work on USB host controller and root ports for faster enumeration.	Disabled	Disables this function.
		Enabled	Enables this function.
XHCI disable compliance mode	Option for disabling compliance mode.	FALSE	Default is FALSE, i.e. compliance mode is not disabled.
		TRUE	Disables compliance mode.
xDCI support	Option for enabling/disabling xDCI support.	Disabled	Uses USB 2.0 or 1.1 for all USB interfaces
		Enabled	Uses USB 3.0 for all USB 3.0 interfaces
USB port disable override	Option for enabling/disabling the USB port disable override	Disabled	Disables this function.
		Select per pin	Opens submenu USB port disable override select per pin
USB SS physical connector #0	Option for enabling/disabling XHCI (USB 3.0) for the respective port.	Enabled	Enables the XHCI of the USB4 interface.
		Disabled	Disables the XHCI of the USB4 interface.
USB SS physical connector #1	Option for enabling/disabling XHCI (USB 3.0) for the respective port.	Enabled	Enables the XHCI of the USB2 interface.
		Disabled	Disables XHCI of the USB4 interface.
USB SS physical connector #2	Option for enabling/disabling XHCI (USB 3.0) for the respective port.	Enabled	Enables the XHCI of the USB3 interface.
		Disabled	Disables XHCI of the USB3 interface.
USB SS physical connector #3	Option for enabling/disabling XHCI (USB 3.0) for the respective port.	Enabled	Enables the XHCI of the USB1 interface.
		Disabled	Disables the XHCI of the USB1 interface.
USB HS physical connector #0	Option for enabling/disabling EHCI (USB 2.0) for the respective port.	Enabled	Enables the EHCI of the USB4 interface.
		Disabled	Disables the EHCI of the USB4 interface.
USB HS physical connector #1	Option for enabling/disabling EHCI (USB 2.0) for the respective port.	Enabled	Enables the EHCI of the USB2 interface.
		Disabled	Disables the EHCI of the USB2 interface.
USB HS physical connector #2	Option for enabling/disabling EHCI (USB 2.0) for the respective port.	Enabled	Enables the EHCI of the USB3 interface.
		Disabled	Disables the EHCI of the USB3 interface.
USB HS physical connector #3	Option for enabling/disabling EHCI (USB 2.0) for the respective port.	Enabled	Enables the EHCI of the USB1 interface.
		Disabled	Disables the EHCI of the USB1 interface.
USB HS physical connector #4	Option for enabling/disabling EHCI (USB 2.0) for the respective port.	Enabled	Enables the EHCI of the USB on the slide-in.
		Disabled	Disables the EHCI of the USB on the slide-in.
USB HS physical connector #5	Option for enabling/disabling EHCI (USB 2.0) for the respective port.	Enabled	Enables the EHCI of the USB on the monitor/panel interface.
		Disabled	Disables the EHCI of the USB on the monitor/panel interface.

Table 322: Advanced - USB configuration - Configuration options

BIOS setting	Explanation	Configuration options	Effect
		Disabled	Disables the EHCI of the USB on the monitor/panel interface.
USB HS physical connector #6	Option for enabling/disabling EHCI (USB 2.0) for the respective port.	Enabled	Enables the EHCI of the USB5 interface.
		Disabled	Disables the EHCI of the USB5 interface.
USB HS physical connector #7	Option for enabling/disabling EHCI (USB 2.0) for the respective port.	Enabled	Enables the EHCI of the USB on the monitor/panel option.
		Disabled	Disables the EHCI of the USB on the monitor/panel option.
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
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.
USB mass storage driver support	Option for enabling/disabling USB mass storage device support	Enabled	Enables this function.
		Disabled	Disables this function.
USB hardware delays and timeouts:			
USB transfer timeout	Option for setting the timeout value for control, bulk and interrupt transfer.	1 sec, 5 sec, 10 sec, 20 sec	Value in seconds
Device reset timeout	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 selection	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
Mass storage devices:			
Display detected mass storage devices	Displays the mass storage devices.	Auto	Automatic enabling

Table 322: Advanced - USB configuration - Configuration options

1.4.2.22 Speaker settings

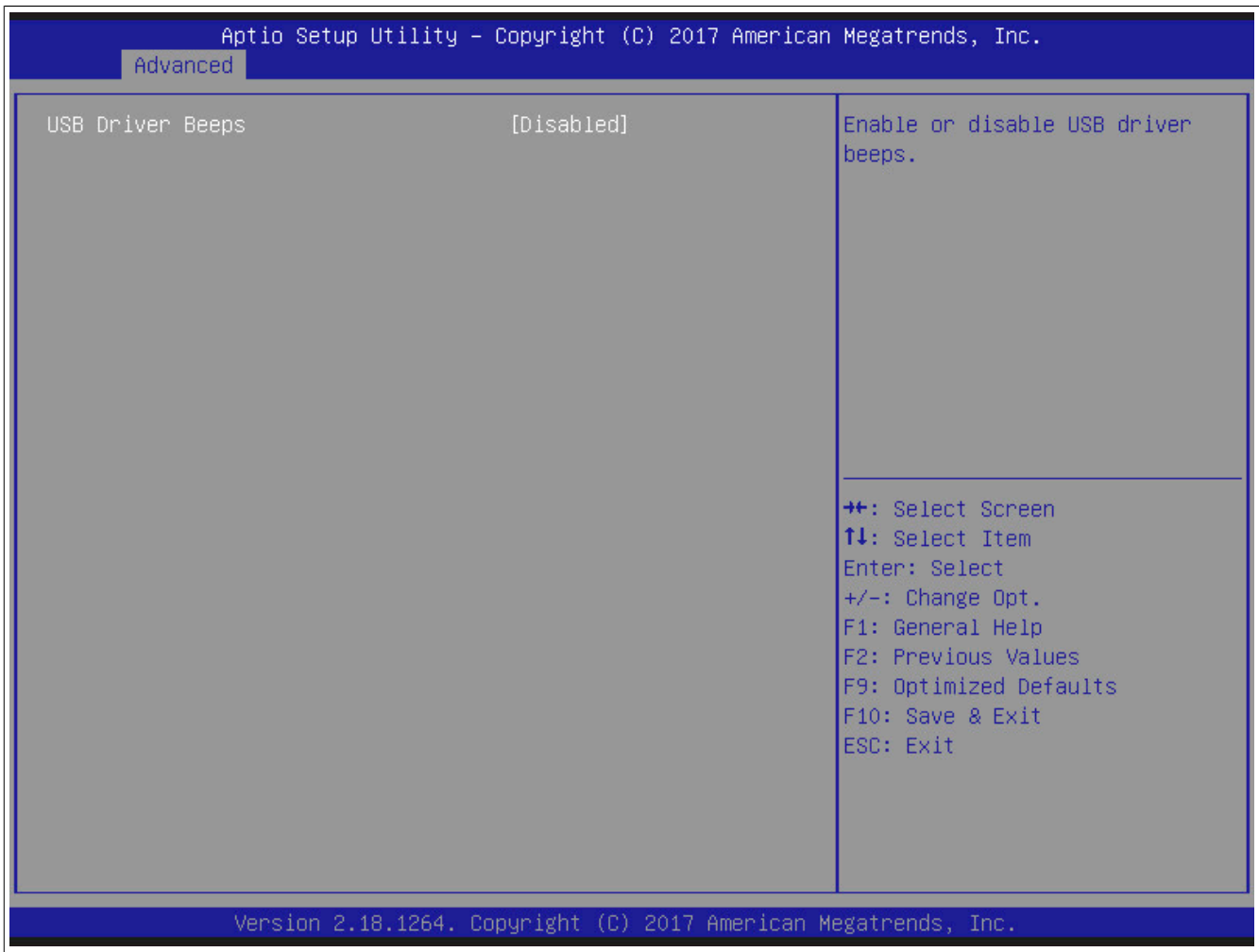


Figure 202: Advanced - PC speaker

BIOS setting	Explanation	Configuration options	Effect
USB driver beeps	Option for enabling/disabling the speaker.	Disabled	Disables this function.
		Enabled	Enables this function.

Table 323: Advanced - Speaker settings - Configuration options

1.4.3 Chipset

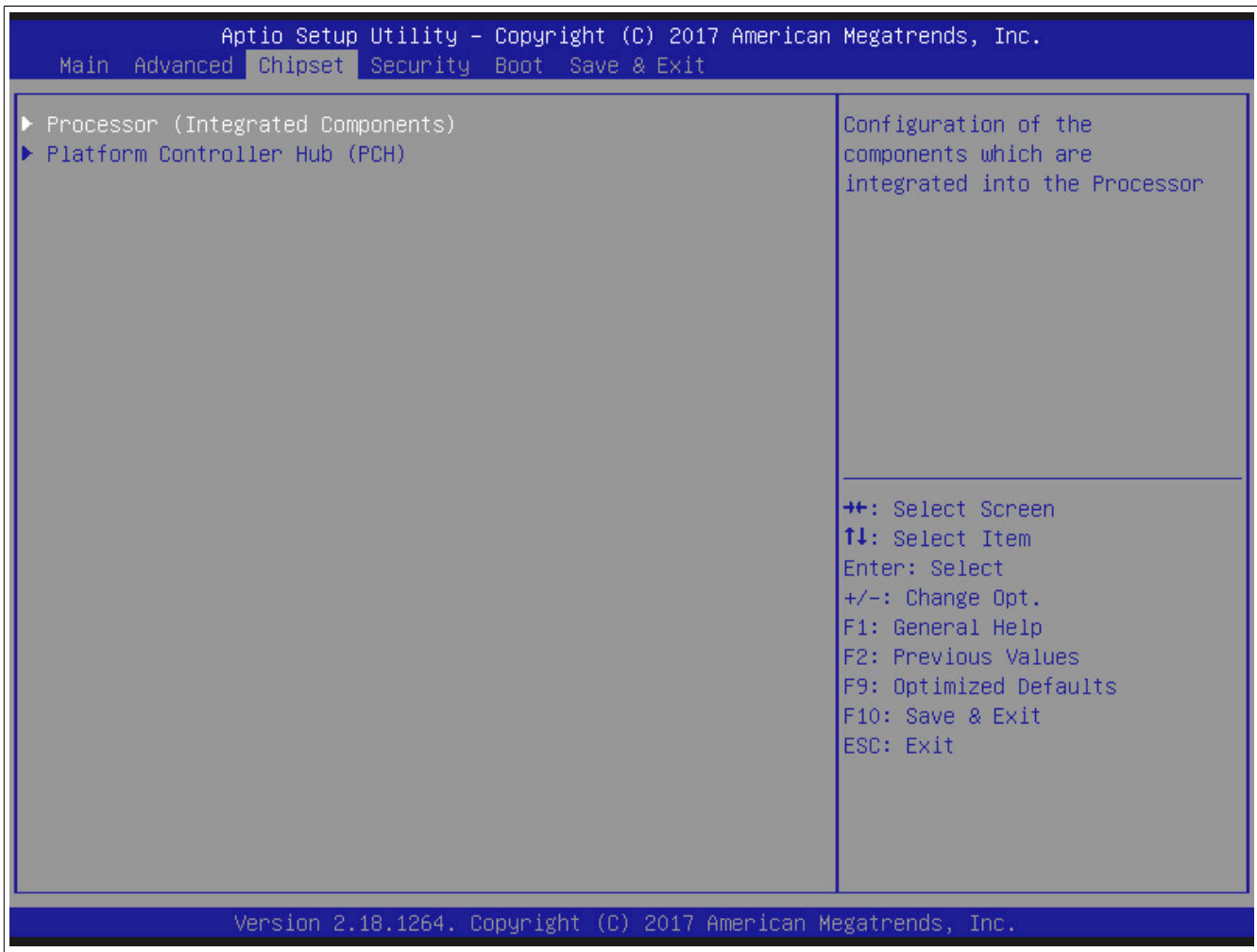


Figure 203: Chipset - Overview

BIOS setting	Explanation	Configuration options	Effect
Processor (Integrated components)	Configuration of components integrated in the processor.	Enter	Opens this submenu See "Processor components - Configuration" on page 375.
Platform controller hub (PCH)	Configuration of the platform controller hub.	Enter	Opens this submenu See "Platform controller hub" on page 376.

Table 324: Boot - Overview

1.4.3.1 Processor components - Configuration

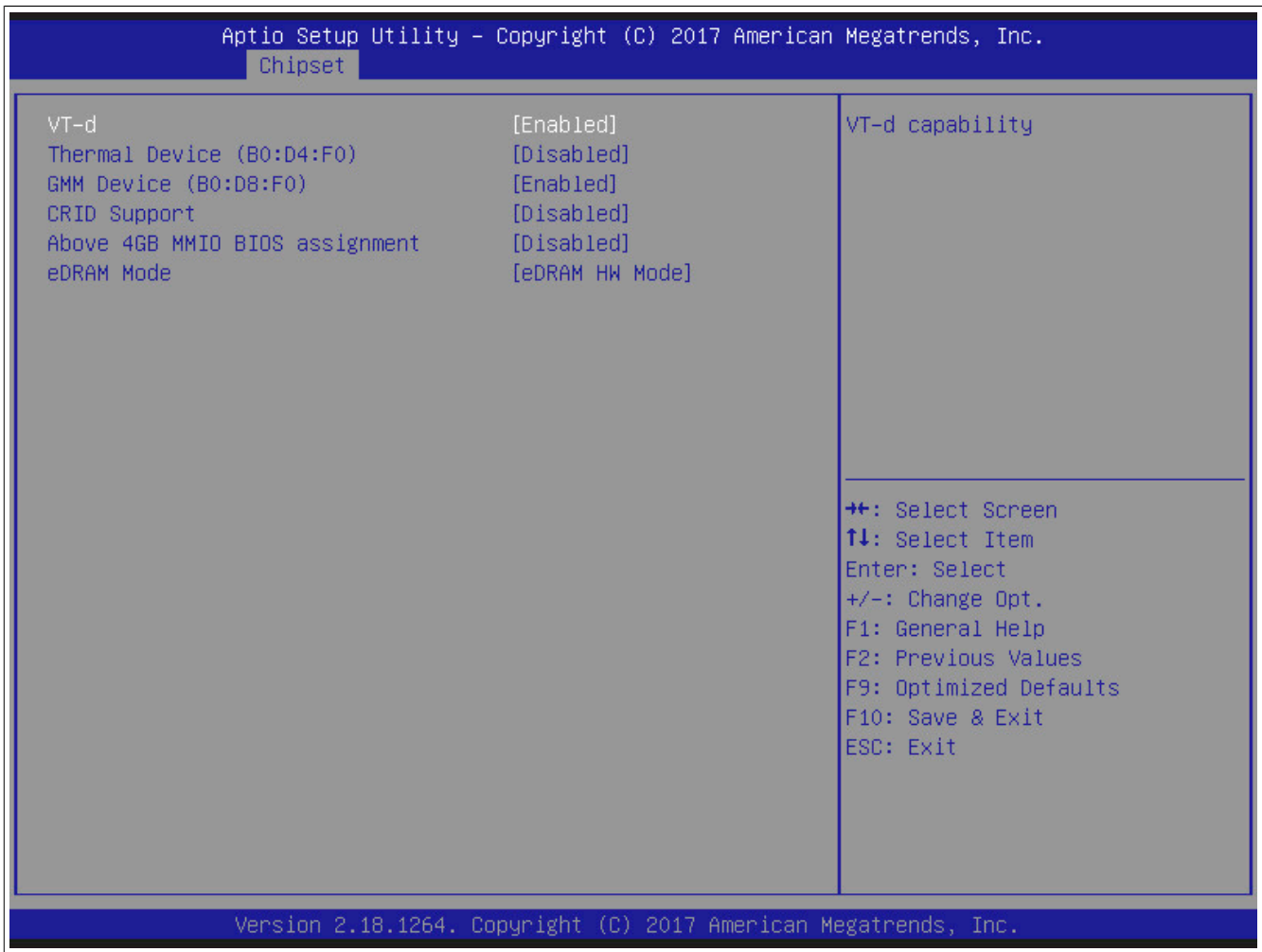


Figure 204: Chipset - Processor components - Configuration

BIOS setting	Explanation	Configuration options	Effect
VT-d	Option for enabling/disabling a virtual machine. Information: A restart is required in order to apply changes made to this setting.	Enabled	Enables this function. Allows a virtual machine to use the additional hardware capacity.
		Disabled	Disables this function.
Thermal device	Option for enabling/disabling the thermal device.	Enabled Disabled	Enables this function. Disables this function.
GMM device	Option for enabling/disabling the GMM module.	Enabled Disabled	Enables this function. Disables this function.
CRID support	Option for enabling/disabling CRID support for Intel SIPP.	Enabled Disabled	Enables this function. Disables this function.
Above 4 GB MMIO BIOS assignment	Option for enabling/disabling memory mapped I/O over 4 GB. This is disabled automatically when the aperture size is set to 2048 MB.	Enabled Disabled	Enables this function. Disables this function.
eDRAM mode	Option for configuring the eDRAMmode.	eDRAM HW mode	eDRAM hardware mode.
		SW mode eDRAM off	Software mode eDRAM off
		SW mode eDRAM on	Software mode eDRAM on

Table 325: Chipset - Processor integrated components - Configuration options

1.4.3.2 Platform controller hub

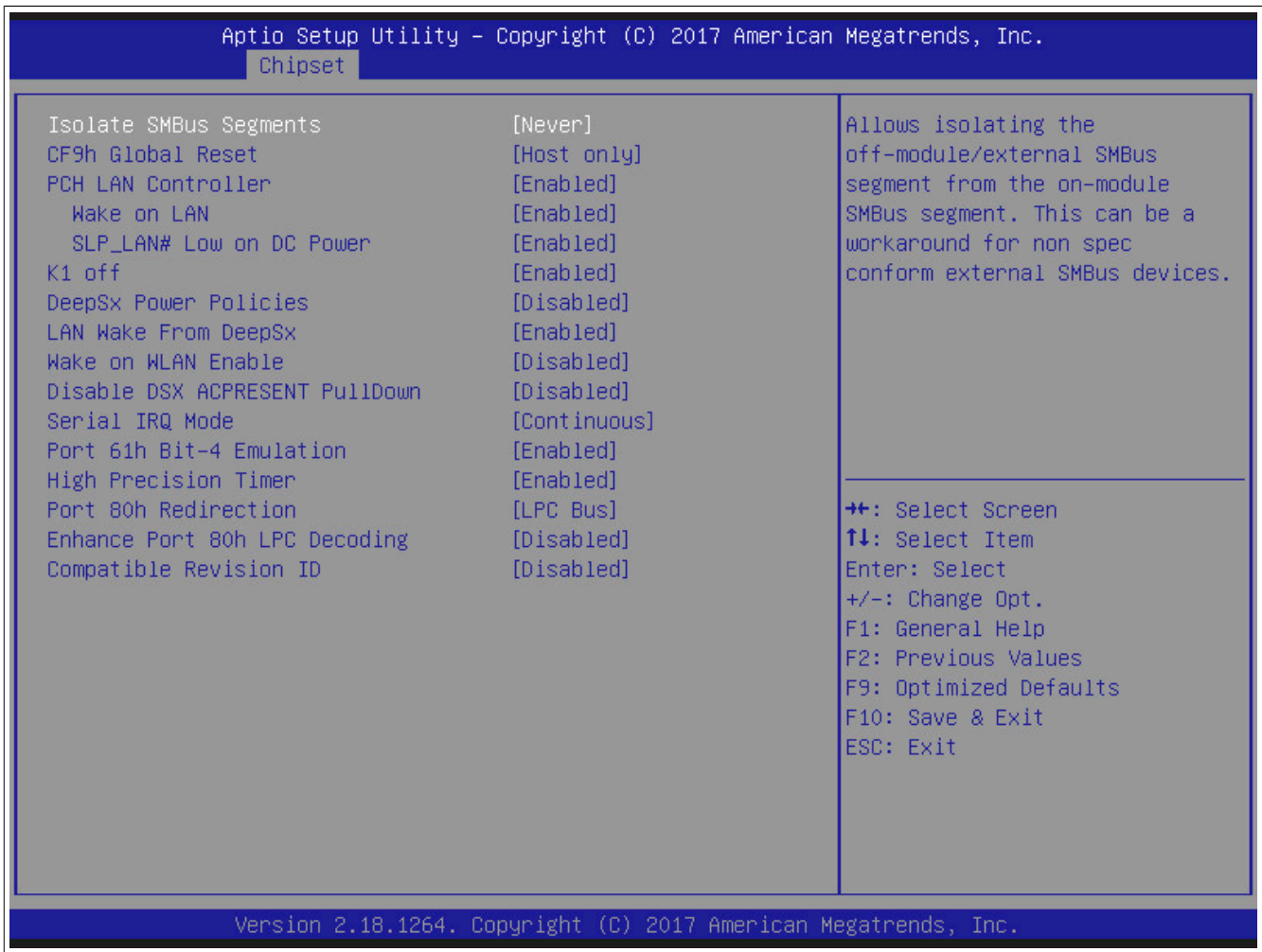


Figure 205: Chipset - Platform

BIOS setting	Explanation	Configuration options	Effect
Isolate SMBus segments	Option for isolating the off-module / external SMBus segments from the on-module SMBus segment. This can be a workaround for external SMBus devices that do not comply with the specifications.	Never	Do not perform option.
		During POST	Perform option during POST .
		Always	Always perform option.
CF9h global reset	Option for setting the restart on the CF9h reset register	Host only	Chipset only
PCH LAN controller	Option for turning the onboard LAN controller (ETH1) on and off	Host+ME	Chipset and management engine
		Enabled	Enables the controller
Wake on LAN	Option for waking the system via the onboard LAN controller (ETH1).	Disabled	Disables the controller
		Enabled	Enables this function. The LAN controller can switch on the system.
SLP_LAN# low on DC power	Option for enabling/disabling SLP_LAN# on low DC power.	Disabled	Disables this function. The LAN controller cannot switch on the system.
		Enabled	Enables this function.
K1 off	Option for enabling/disabling K1 off features (CLKREQ).	Disabled	Disables this function.
		Enabled	Enables this function.
DeepSx power policies	Configure the DeepSx mode configuration.	Disabled	Disables this function.
		Enabled in S5/battery	Enabled in S5/battery.
		Enabled in S4-S5/battery	Enabled in S4-S5/battery.
		Enabled in S3-S4-S5/battery	Enabled in S3-S4-S5/battery.
		Enabled in S5	Enabled in S5.
		Enabled in S4-S5	Enabled in S4-S5.
LAN wake from DeepSx	Enables DeepSx through assertion of LAN_WAKE# pin.	Enabled in S3-S4-S5	Enabled in S3-S4-S5.
		Enabled	Enables this function.
Wake on WLAN enable	Enables this PCI Express wireless LAN to wake the system.	Disabled	Disables this function.
		Enabled	Enables this function.
Disable DSX ACPRESENT PullDown	Disable PCH-internal ACPRESENT PullDown on DeepSx or G3 exit.	Disabled	Disables this function.
		Enabled	Enables this function.
Serial IRQ mode	Configure serial IRQ mode.	Continuous	Serial IRQ mode is configured continuously.

Table 326: Chipset- Platform controller hub - Configuration options

BIOS setting	Explanation	Configuration options	Effect
		Quiet	Serial IRQ mode is configured on request.
Port 61h bit-4 emulation	Emulation of Port 61h bit-4 toggling in SMM.	Enabled	Enables this function.
		Disabled	Disables this function.
High precision timer	Option for enabling/disabling the high-precision event timer.	Enabled	Enables the high-precision timer.
		Disabled	Disables the high-precision timer.
Port 80h redirection	Option for setting where 80h cycles are routed.	LPC bus	80h cycles are routed to the LPC bus.
		PCIe bus	80h cycles are routed to the PCIe bus.
Enhance port 80h LPC decoding	Option for supporting word/dword decoding of Port 80h behind LPC.	Enabled	Enables this function.
		Disabled	Disables this function.
Compatible revision ID	Enable/disable PCH-compatible revision ID feature.	Enabled	Enables this function.
		Disabled	Disables this function.

Table 326: Chipset- Platform controller hub - Configuration options

1.4.4 Security

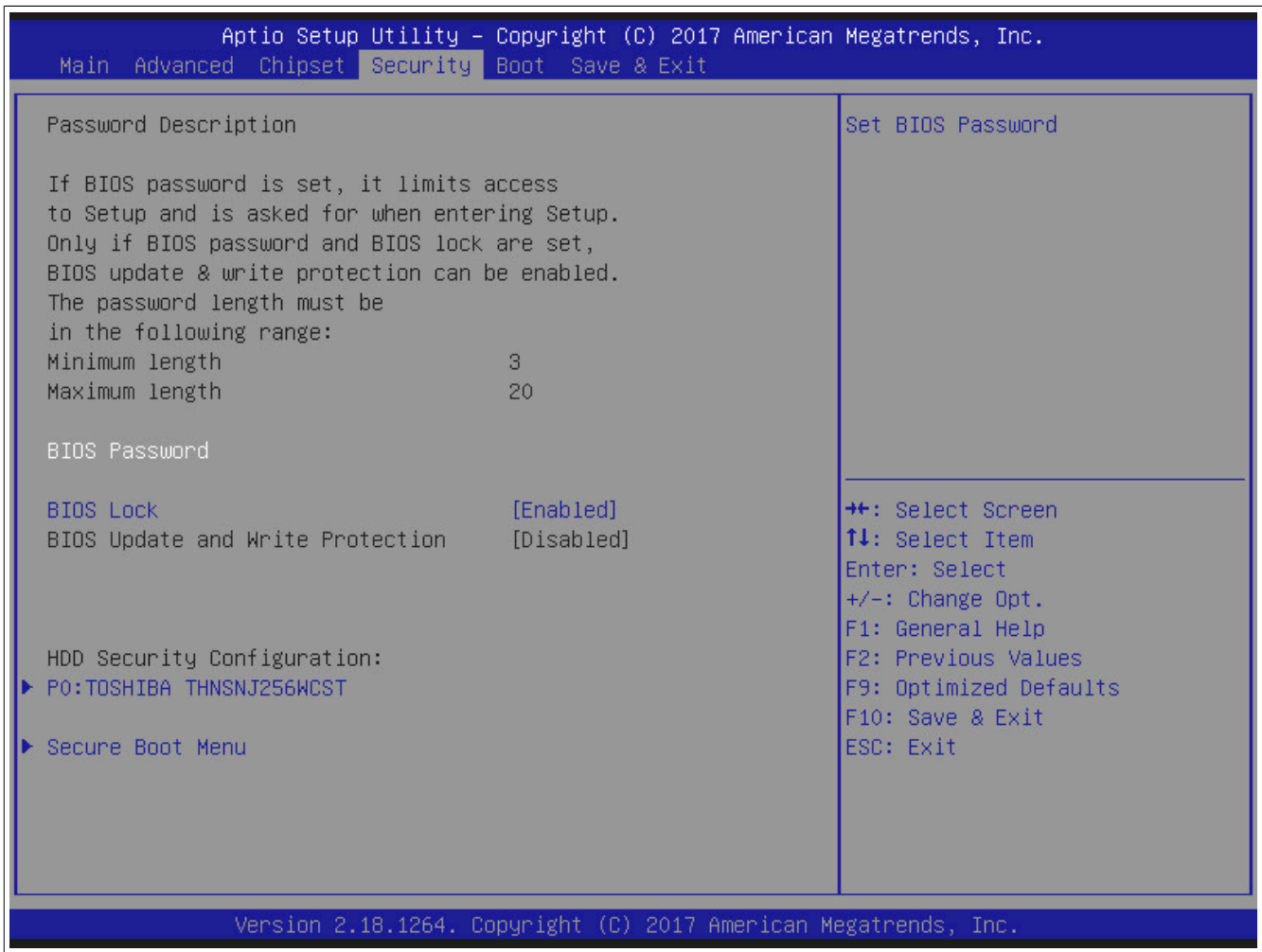


Figure 206: Security

BIOS setting	Explanation	Configuration options	Effect
BIOS password	Option for setting the BIOS and administrator password.	Enter	Password entry.
BIOS lock	Option for enabling/disabling the BIOS lock enable (BLE) and SMM BIOS write protect (SMM_BWP) bits.	Enabled	Write access to BIOS flash memory is only possible via dedicated BIOS SMM interfaces.
		Disabled	Disables this function.
BIOS update and write protection	BIOS update and write protection	Disabled	Function disabled.
		Enabled	The flash memory software requires the BIOS password to complete a write or delete action.
HDD security configuration:	Display a list of detected hard drives that support the security function set.	-	-
Secure Boot menu	Secure Boot menu	Enter	Opens this submenu
Secure Boot	Option for enabling/disabling Secure Boot.	Disabled	Disables this function.
		Enabled	Secure Boot can be enabled if: <ol style="list-style-type: none"> The system is running in user mode with a secure platform key (PK). The CSM function is disabled
Secure Boot mode	Secure Boot mode selector.	Custom	In user-defined mode, users can modify guidelines for execution of images and manage secure boot keys.
		Standard	Factory default keys are installed.
Key management	This option allows experienced users to modify Secure Boot variables.	Enter	Opens this submenu
Provision factory default keys	Option for installing the default Secure Boot keys when the system is in setup mode.	Disabled	Disables this function.
		Enabled	Enables this function.
Delete all Secure Boot variables	Option for deleting all Secure Boot variables.	Yes	All variables are deleted. The change takes effect after the restart.
		No	All variables are not deleted.

Information:
Doing so returns the platform to setup mode.

Table 327: Security menu - Configuration options

BIOS setting	Explanation	Configuration options	Effect
Save all Secure Boot variables	Option for saving the NVRAM content of all secure boot variables to the files (EFI_SIGNATURE_LIST data format) in the root folder of a target file system <i>device</i> .	OK	Save NVRAM content to a target file system <i>device</i> .
Platform key (PK)	Certify factory settings or load key from file with: 1. Public key certificate in: a) EFI_SIGNATURE_LIST b) EFI_CERT_X509 (DER encoded) c) EFI_CERT_RSA2048 (bin) d) EFI_CERT_SHA256 (bin) 2. Authenticated UEFI variable Key source: default, custom, mixed from setup menu	Set new key	Set new key.
		Delete key	Delete key.
Key exchange keys		Set new key	Set new key.
		Append key	Append key.
		Delete key	Delete key.
Authorized signatures		Set new key	Set new key.
		Append key	Append key.
		Delete key	Delete key.
Forbidden signatures		Set new key	Set new key.
		Append key	Append key.
	Delete key	Delete key.	
Authorized timestamps	Set new key	Set new key.	
	Append key	Append key.	

Table 327: Security menu - Configuration options

1.4.5 Boot

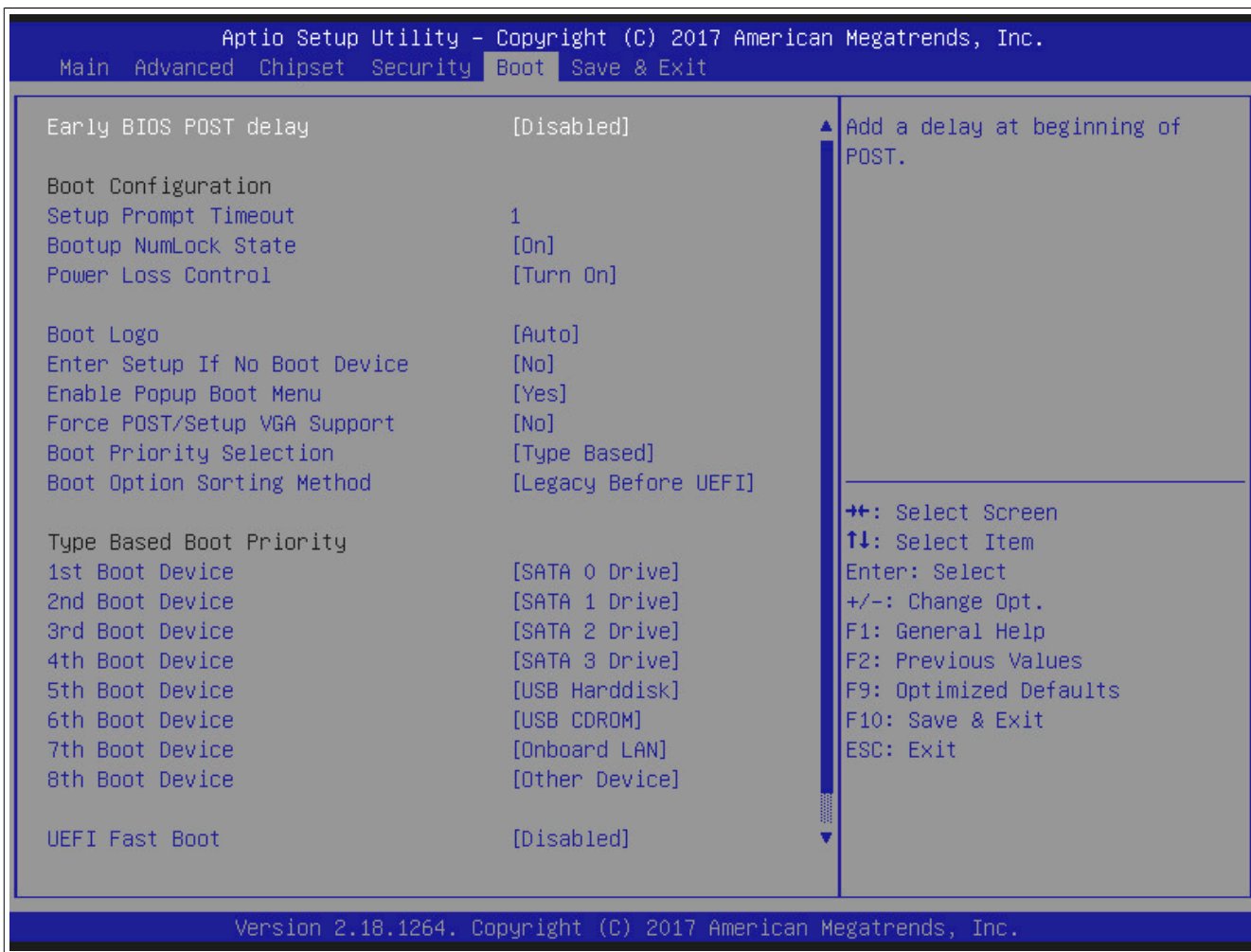


Figure 207: Boot - Boot menu

BIOS setting	Explanation	Configuration options	Effect		
Early BIOS POST delay	A delay at the beginning of the POST can be added here.	Disabled	Disables this function.		
		0.2 sec	Sets a delay of 0.2 seconds.		
		0.5 sec	Sets a delay of 0.5 seconds.		
		1 sec	Sets a delay of 1 second.		
		2 sec	Sets a delay of 2 seconds.		
Boot configuration:		3 sec	Sets a delay of 3 seconds.		
		1 to 65534	Displays the setup activation key for x seconds.		
		65535	Displays the setup activation key for an unlimited amount of time.		
		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.
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		
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		
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	No	Disables this function.		
		Yes	Enables this function.		

Table 328: Boot - Boot configuration - Configuration options

BIOS setting	Explanation	Configuration options	Effect
Boot priority selection	Option for determining the method for how drives should be booted	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.
		UEFI standard	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.
Boot option sorting method	Option for setting the sorting method.	Legacy before UEFI	First try the legacy boot option for a selected device , then try the UEFI boot option for the same device . Then check the next device .
		Legacy first	Try all legacy boot options before the first UEFI boot option.
		UEFI first	Try all UEFI boot options before the first legacy boot option.
		UEFI before legacy	First try the UEFI boot option for a selected device , then try the legacy boot option for the same device . Then check the next device .
Type based boot priority:			
1st boot device	Option for selecting drives to be used for booting.	SATA 0 drive	Specifies the desired boot sequence.
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 device	
		Additional settings: Disabled, Other USB device , NVMe storage, External LAN	
UEFI fast boot	Option for reducing the boot time by skipping some POST procedures.	Enabled	Enables this option
		Disabled	Disables this option
UEFI screenshot capability	UEFI screenshot capability	Disabled	Disables this option
		Enabled	When enabled, press LCtrl + LAlt + F12 to take a screenshot of the current screen. It will be saved as a PNG image in the first writable FAT32 partition.

Table 328: Boot - Boot configuration - Configuration options

1.4.6 Save & Exit

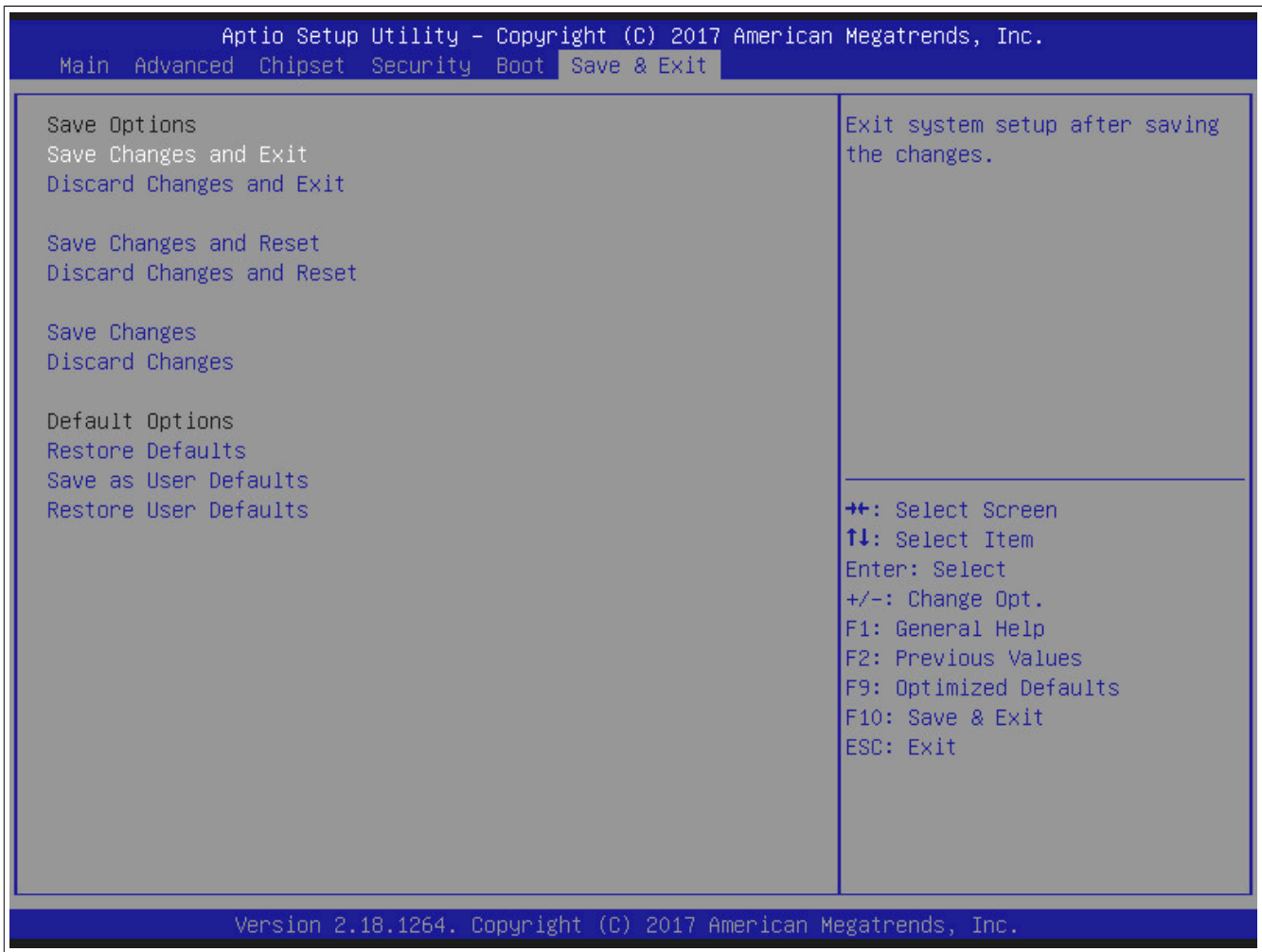


Figure 208: Save & Exit

BIOS setting	Explanation	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	

Table 329: Save & Exit menu - Configuration options

BIOS setting	Explanation	Configuration options	Effect
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	
Save as user defaults	<p>This option saves the custom BIOS settings as new default values.</p> <p>Information:</p> <p>This option can only be used with a 5PC900.TS17-0x CPU board.</p> <p>BIOS settings are not checked when they are saved or loaded. It is the user's responsibility to check the functionality and plausibility of any changed settings.</p>	Yes/No	
Restore user defaults	<p>Selecting this option restores the user default values that have been saved for the BIOS settings.</p> <p>Information:</p> <p>This option can only be used with a 5PC900.TS17-0x CPU board.</p> <p>BIOS settings are not checked when they are saved or loaded. It is the user's responsibility to check the functionality and plausibility of any changed settings.</p>	Yes/No	

Table 329: Save & Exit menu - Configuration options

1.4.7 Allocation of resources

1.4.7.1 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 - 0DFFFFFFh	Expansion area
640 kB – 768 kB	0A0000h - 0BFFFFFFh	Video memory and BIOS
639 kB – 640 kB	09FC00h - 09FFFFFFh	Extended BIOS data
0 – 639 kB	000000h - 09FC00h	Conventional memory

Table 330: RAM address assignments

1) TOM = Top of memory: max. installed DRAM.

1.4.7.2 I/O address assignments

I/O address	Resource
0000h - 00FFh	Motherboard resources
0228h - 022Fh	COM F (IF option 2)
02E8h - 02EFh	COM E (IF option 1)
02F8h - 02FFh	COM B (SDL link module)
0384h - 0385h	CAN controller
03B0h - 03DFh	Video system
03E8h - 03EFh	COM C (onboard SDL)
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
4000h - 40FFh	MTCX (SDL4 update) - BIOS V1.11 and later, when no CAN IF option is available..
4100h - 41FFh	MTCX
FF00h - FF07h	IDE bus master register

Table 331: I/O address assignments

1.4.7.3 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)														•			
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 332: IRQ interrupt assignments in PIC mode

1) Advanced Configuration and Power Interface.

- ... Default setting
- ... Optional setting

1.4.7.4 Interrupt assignments in APIC mode

A total of 23 IRQs are available in APIC (Advanced Programmable Interrupt Controller) 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)														•											
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 333: IRQ interrupt assignments in APIC mode

- 1) Advanced Configuration and Power Interface.
- 2) PIRQ A: For PCIe; PEG 0/1/2, PCI Express root port 0, [VGA controller](#), PCI Express root port 4 (ETH2), GMM (Gaussian mixture model).
- 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; serial ATA [controller](#)
- 8) PIRQ G: For PCIe; Intel High Definition Audio [controller](#), [SMBus controller](#).
- 9) PIRQ H: for PCIe; XHCI [host controller](#), thermal subsystem

- ... Default setting
- ... Optional setting

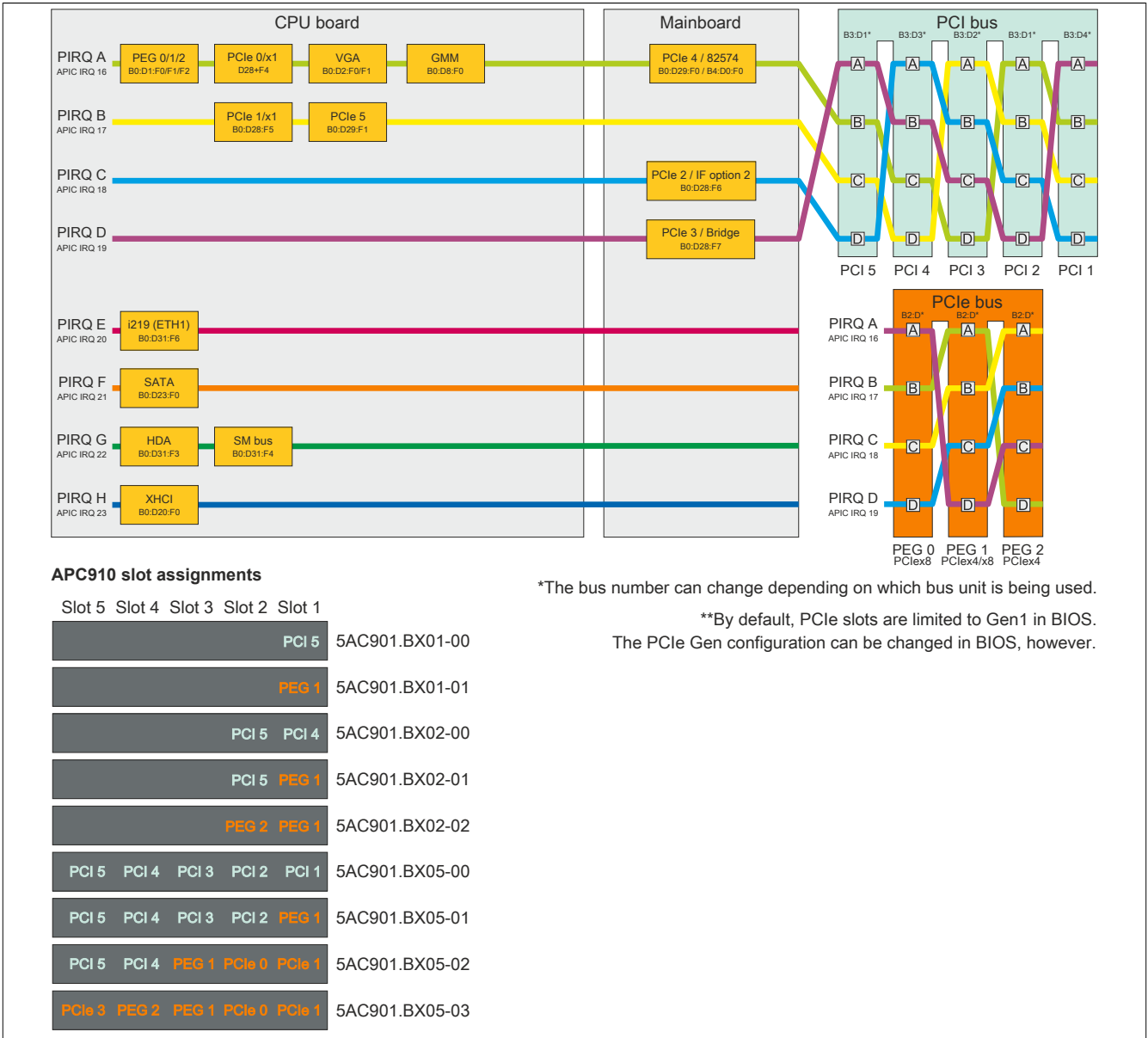


Figure 209: PCI and PCIe routing with enabled APIC for QM170/HM170/CM236 CPU boards

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 (for information about changes, see 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".

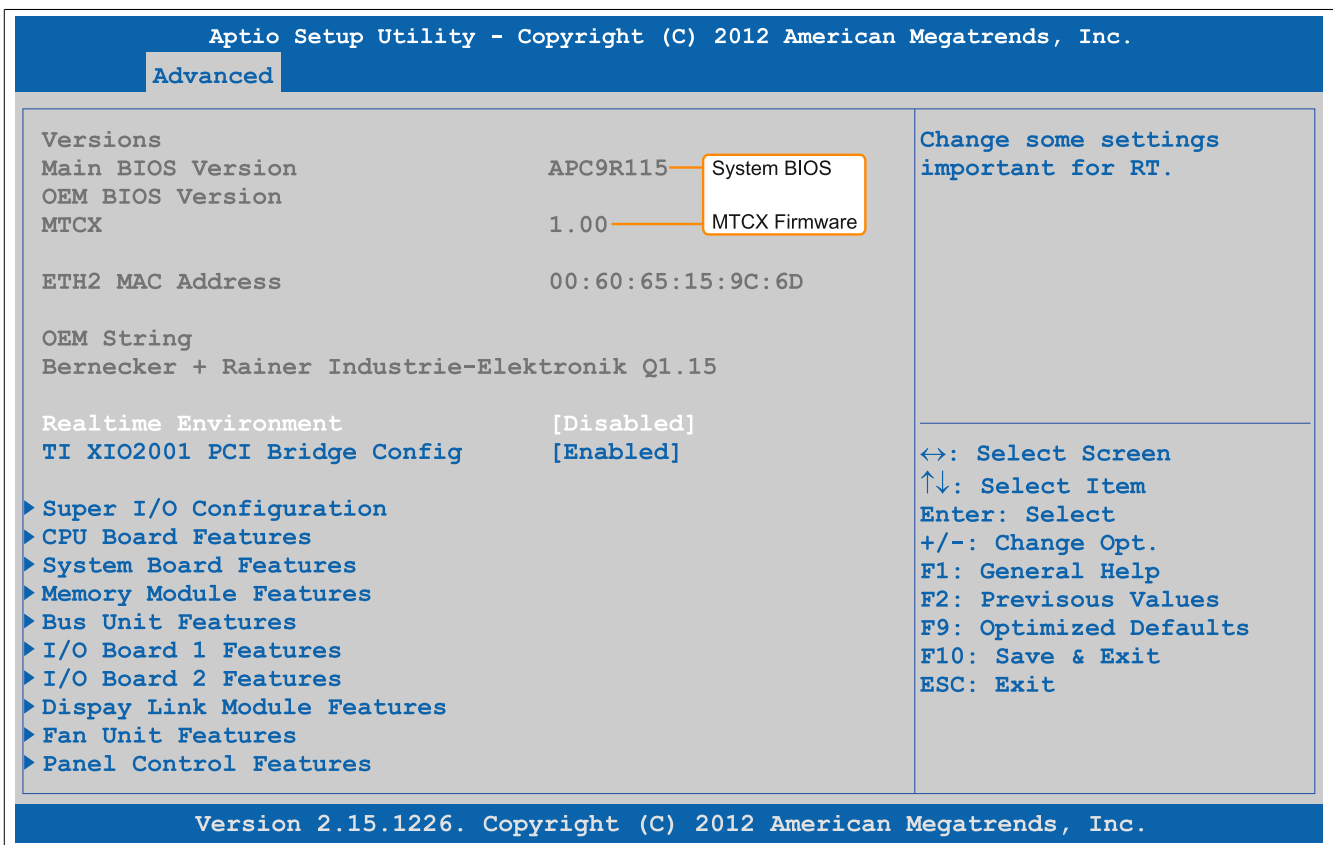


Figure 210: Software version

2.1.2 Procedure with MS-DOS

Caution!

Do not **switch** off or reset the system during an upgrade under any circumstances!

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 390.

Information about creating a **USB** flash drive for a B&R upgrade **can** be found on page 392.

Information about creating a storage **device** for a B&R upgrade **can** be found on page 393.

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".

2.1.3 Procedure in EFI shell

Caution!

The PC is not permitted to be switched off or reset while performing an update!

1. Download the .zip file from the B&R website (www.br-automation.com).
2. Unzip the .zip file and copy the data to a **USB** flash drive formatted in FAT16 or FAT32. Alternatively, a CFast card **can** be used.
3. Reboot the PC and select "UEFI: Built-in EFI shell" as the boot **device** (press key "F11" to open the boot menu).
4. After the EFI shell is booted, "startup.nsh" is executed and the BIOS upgrade is started.
5. The system must be rebooted after a successful upgrade.
6. Reboot and press to enter BIOS Setup and load the setup defaults, then select "Save changes and exit".

2.2 Firmware upgrade

Caution!

Do not **switch** off or reset the system during an upgrade under any circumstances!

The "Firmware upgrade (MTCX, SDLR, AP830, AP9x3, AP1000, AP5000)" software makes it possible to update the firmware for multiple controllers (MTCX, SDLR, AP830, AP9x3, AP1000, AP5000) 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.

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 ADI driver user's manual.

2.3 Creating an MS-DOS boot diskette in Windows XP

1. Insert a blank 1.44 MB HD diskette into the disk drive.
2. Open Windows Explorer.
3. Right-click on the 3½ floppy diskette icon and select "Format".

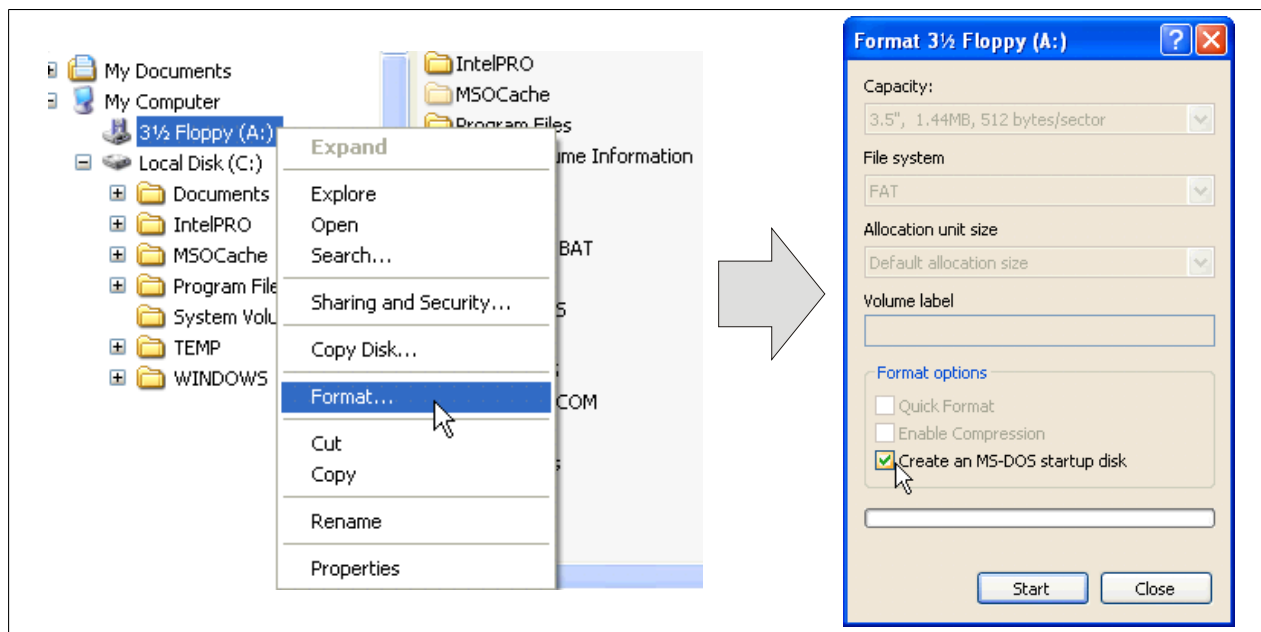


Figure 211: Creating a bootable diskette in Windows XP - Step 1

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

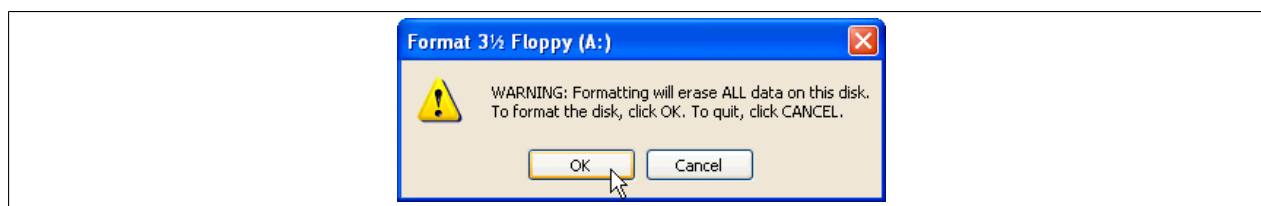


Figure 212: Creating a bootable diskette in Windows XP - Step 2

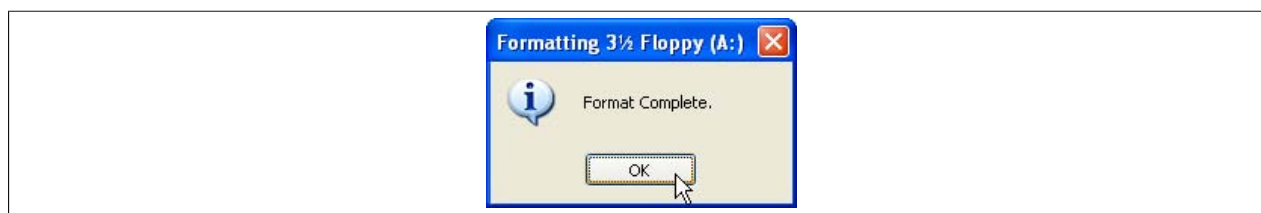


Figure 213: Creating a bootable diskette in Windows XP - Step 3

After creating the startup disk, some of the files must be deleted because of the size of the update.

To do this, all files (hidden system files, etc.) must be visible on the diskette.

In Windows Explorer, go to the "Tools" menu, select "Folder options" and open the "View" tab. Then deselect the option "Hide protected operating system files (Recommended)" (enabled by default) and enable the option "Show hidden files and folders".

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 214: 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 215: Creating a bootable diskette in Windows XP - Step 5

Now all files (selected) except Command.com, IO.sys and MSDOS.sys can be deleted.

2.4 Creating a bootable USB flash drive for B&R upgrade files

When used in connection with a B&R Industrial PC, it is possible to upgrade (e.g. BIOS) from one of the USB flash drives available from B&R. To do this, the USB flash drive must be prepared accordingly. This is done with the B&R Embedded OS Installer, which can be downloaded at no cost from the B&R website (www.br-automation.com).

2.4.1 Requirements

The following is required to create a bootable USB flash drive:

- B&R USB flash drive
- B&R Industrial PC
- USB media drive
- B&R Embedded OS Installer (V3.00 or higher)

2.4.2 Procedure

1. Connect the USB flash drive to the PC.
2. If the drive list is not refreshed automatically, update the list using the **Drives > Refresh** command.
3. Select the desired USB flash drive in the drive list.
4. Change to the **Action** tab and select **Install a B&R update to a USB flash drive** as the type of action.
5. Enter the path to the MS-DOS operating system files. If the files are part of a .zip archive, then click on the button **From .zip file**. If the files are stored in a directory on the hard drive, then click on the button **From folder**.
6. In the **B&R upgrade** text box, it is also possible to enter the path to the .zip file for the B&R upgrade disk and select the file.
7. Click on the **Start action** button in the toolbar.

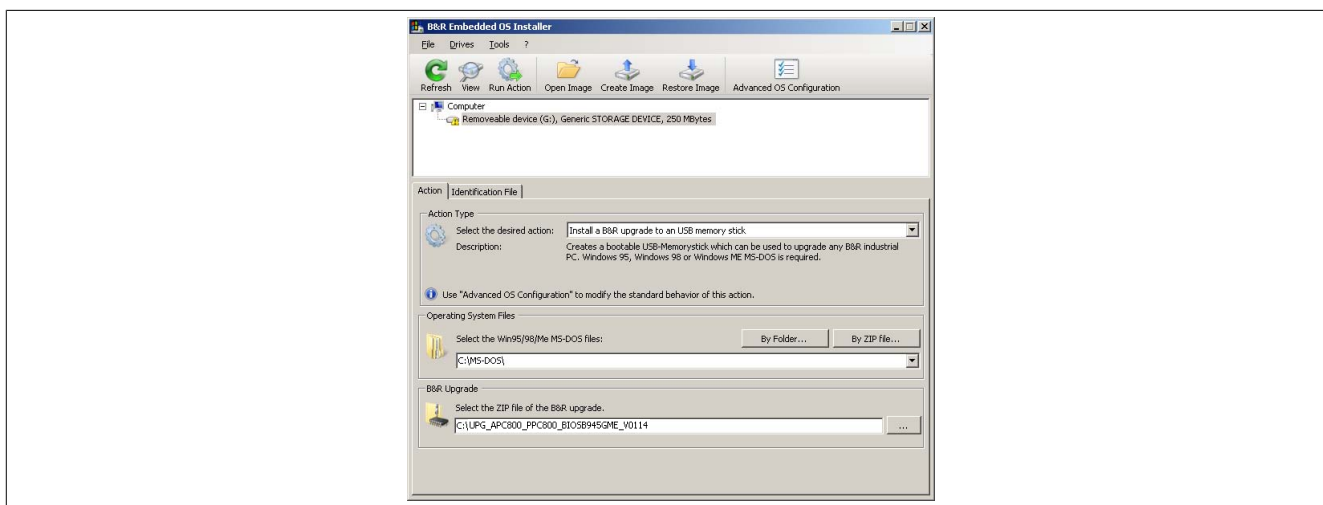


Figure 216: Creating a USB flash drive for B&R upgrade files

2.4.3 How to access MS-DOS

Information about creating an MS-DOS boot diskette can be found in section "Creating an MS-DOS boot diskette in Windows XP" on page 390. The files from the diskette are then copied to the hard drive.

2.5 Creating a bootable mass storage device for B&R upgrade files

When used in connection with a B&R Industrial PC, it is possible to upgrade (e.g. BIOS) from a mass storage device (e.g. CFast card) available from B&R. To do this, the mass storage device must be prepared accordingly. This is done with the B&R Embedded OS Installer, which can be downloaded at no cost from the B&R website (www.br-automation.com).

2.5.1 Requirements

The following is required to create a bootable mass storage device:

- B&R mass storage device (e.g. CFast card)
- PC with CFast slot
- B&R Embedded OS Installer (V3.00 or higher)

2.5.2 Procedure

1. Connect the storage device to the PC.
2. If the drive list is not refreshed automatically, update the list using the **Drives > Refresh** command.
3. Select the desired mass storage device from the list of drives.
4. Change to the **Action** tab and select **Install a B&R update to a mass storage device** as the type of action.
5. Enter the path to the MS-DOS operating system files. If the files are part of a .zip archive, then click on the button **From .zip file**. If the files are stored in a directory on the hard drive, then click on the button **From folder**.
6. In the **B&R upgrade** text box, it is also possible to enter the path to the .zip file for the B&R upgrade disk and select the file.
7. Click on the **Start action** button in the toolbar.

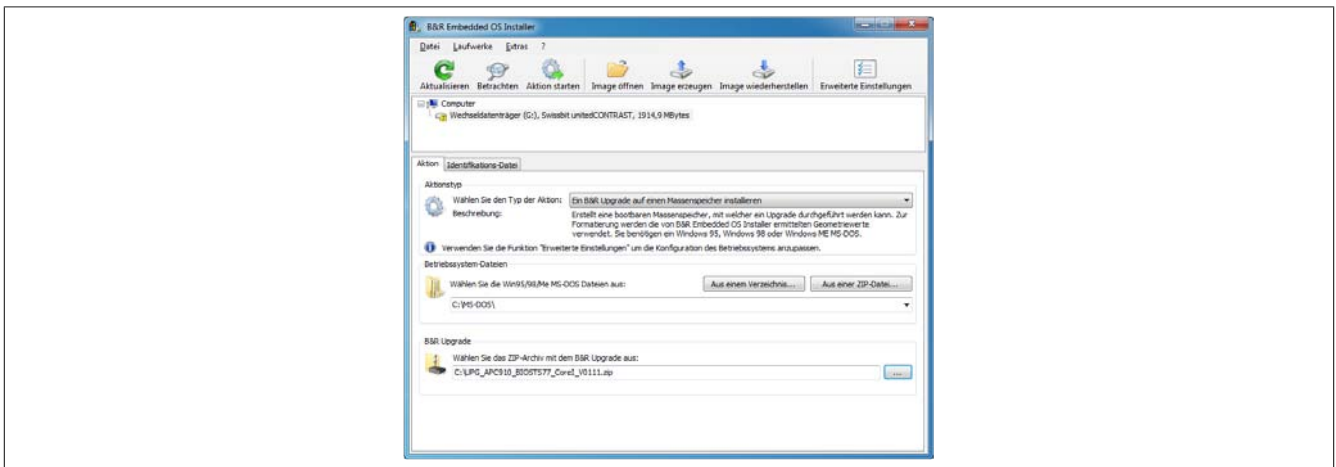


Figure 217: Creating a mass storage device for B&R upgrade files

2.5.3 How to access MS-DOS

Information about creating an MS-DOS boot diskette can be found in section "Creating an MS-DOS boot diskette in Windows XP" on page 390. The files from the diskette are then copied to the hard drive.

3 Windows 10 IoT Enterprise 2016 LTSB

3.1 General information

Windows 10 IoT Enterprise 2016 LTSB is the successor to Windows 10 IoT Enterprise 2015 LTSB 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 2016 LTSB is a version of Windows 10 Enterprise specifically developed for use in industrial applications (Long-Term Servicing Branch).

3.2 Order data


Model number	Short description	Figure
	Windows 10 IoT Enterprise	
5SWW10.0640-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Value - Multilingual - APC910 chipset QM77/HM76 - CPU Celeron/i3/i5 - License (without Recovery DVD) - Only available with a new device	
5SWW10.0740-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - High End - Multilingual - APC910 chipset QM77/HM76 - CPU i7 - License (without Recovery DVD) - Only available with a new device	
5SWW10.0649-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Value - Multilingual - APC910 chipset QM170/HM170 - CPU Celeron/i3/i5 - License (without Recovery DVD) - Only available with a new device	
5SWW10.0749-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - High End - Multilingual - APC910 chipset QM170/CM236 - CPU i7/E3 - License (without Recovery DVD) - Only available with a new device	
	Optional accessories	
	Windows 10 IoT Enterprise	
5SWW10.0800-MUL	Windows 10 IoT Enterprise 2016 LTSB - 64-bit - Language Pack DVD	

Table 334: 5SWW10.0640-MUL, 5SWW10.0740-MUL, 5SWW10.0649-MUL, 5SWW10.0749-MUL - Order data

3.3 Overview

Model number	Edition	Target system	Processor	Chipset	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWW10.0640-MUL	Enterprise LTSB - Value	APC910	Celeron Core i3/i5	QM77 HM76	64-Bit (legacy BIOS boot)	Multilingual	20 GB ¹⁾	2 GB ²⁾
5SWW10.0740-MUL	Enterprise LTSB - High End	APC910	Core i7	QM77 HM76	64-Bit (legacy BIOS boot)	Multilingual	20 GB ¹⁾	2 GB ²⁾
5SWW10.0649-MUL	Enterprise LTSB - Value	APC910	Celeron Core i3/i5	QM170 HM170	64-Bit (legacy BIOS boot)	Multilingual	20 GB ¹⁾	2 GB ²⁾
5SWW10.0749-MUL	Enterprise LTSB - High End	APC910	Core i7 Xeon E3	QM170 CM236	64-Bit (legacy BIOS boot)	Multilingual	20 GB ¹⁾	2 GB ²⁾

- 1) The memory space required by additional language packs is not taken into account in the minimum size specified for the data storage device.
- 2) The specified memory size is the minimum requirement according to Microsoft. B&R recommends using at least 4 GB RAM with 64-bit operating systems, however.

3.4 Features

The list of features shows the most important device functions included in Windows 10 IoT Enterprise 2016 LTSB.

Function	Windows 10 IoT Enterprise 2016 LTSB
Range of functions of Windows 10 Enterprise	✓
Internet Explorer 11, including Enterprise Mode	✓
Multi-touch support	✓
Multilingual support	After installation using language pack DVDs (default language is English)
Page file	Configurable (disabled in image by default by the UWF)
Hibernate file	Configurable (disabled in image by default)
System restore	Configurable (disabled in image by default by the UWF)
SuperFetch	Configurable (disabled in image by default by the UWF)
File indexing service	Configurable (disabled in image by default by the UWF)
Fast boot	Configurable (disabled in image by default by the UWF)
Defragmentation service	✓ (disabled when enabling the UWF)
Additional embedded lockdown functions	
Assigned access	Configurable

Table 335: Features with Windows 10 IoT Enterprise 2016 LTSB.

Function	Windows 10 IoT Enterprise 2016 LTSB
AppLocker	Configurable
Shell Launcher	Configurable
Unified Write Filter	✓
Keyboard Filter	Configurable

Table 335: Features with Windows 10 IoT Enterprise 2016 LTSB.

3.5 Installation

B&R preinstalls Windows 10 IoT Enterprise 2016 LTSB on a suitable data storage [device](#) (64-bit: minimum 20 GB). When switched on for the first time, the system runs through the out-of-box experience (OOBE), which allows different settings to be made (e.g. language, region, keyboard layout, computer name, username, etc.).

Windows 10 IoT Enterprise 2016 LTSB is installed on APC910 devices in legacy [BIOS](#) mode.

3.6 Drivers

The operating system contains all drivers necessary for operation. If an older driver version is installed, the latest version of it [can](#) be downloaded and installed from the B&R website (www.br-automation.com). Note that the Unified Write Filter (UWF) must be disabled for this.

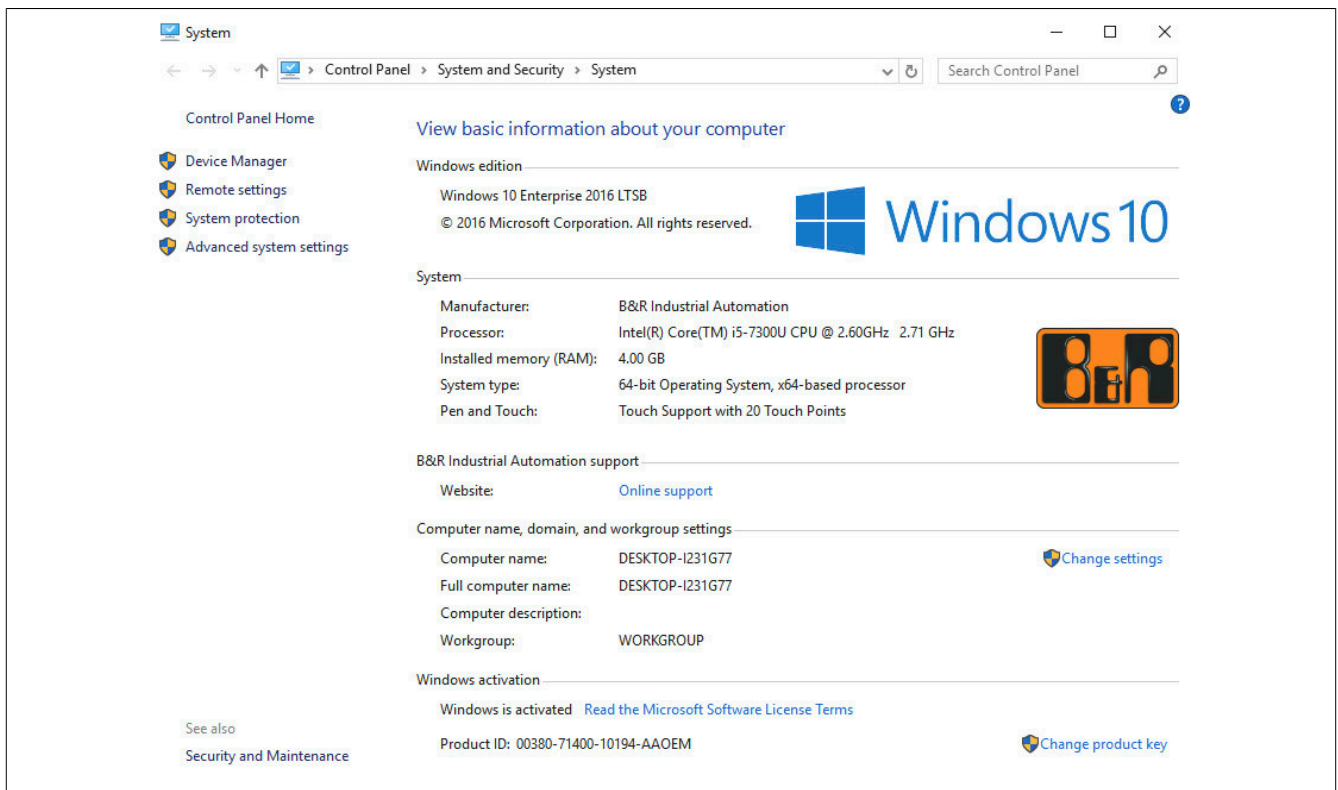
Information:

Only download necessary drivers from the B&R website, not from vendor websites.

3.7 Activation

Windows 10 IoT Enterprise 2016 LTSB must be activated like its predecessor, Windows 10 IoT Enterprise 2015 LTSB. This has already been done at B&R.

The activation status [can](#) be checked in the [Control Panel](#):



The activation performed by B&R is supported by special B&R extensions in the operating system and theoretically should not be lost when modifying hardware (e.g. replacing components in the event of repair) or, in contrast to Windows 10 IoT 2015 LTSB, when reinstalling the system (subject to technical changes by Microsoft).

Information:

It is not necessary to enter a product key for activation.

3.8 Issues and limitations

- Unlike the standard Windows 10 Enterprise edition, Windows 10 IoT Enterprise 2016 LTSB does not include applications such as Cortana, the Microsoft Edge [browser](#) or the Microsoft Store.
- The LTSB version is based on Windows 10 Build 14393 and does not contain any feature updates.

The version installed by B&R includes settings that have been optimized for industrial environments. These are described in detail in the "Windows 10 IoT 2016 LTSB working guide". It [can](#) be downloaded free of charge from the Downloads section of the B&R website (www.br-automation.com) (login required).

Information:

As a result of these settings and the features that are excluded from the LTSB version, the system will behave differently than a standard Windows 10 Enterprise installation.

3.9 Supported display resolutions

In accordance with Microsoft requirements, Windows 10 IoT Enterprise 2016 LTSB requires [SVGA](#) resolution (800 x 600) or higher in order to fully operate the Windows user [interface](#) (including system dialog boxes, apps, etc.). A lower resolution [can](#) be selected for applications.

4 Windows 10 IoT Enterprise 2015 LTSB

4.1 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).

4.2 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	
5SWW10.0249-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Multilingual - APC910 chipset QM170/HM170 - 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 - Multilingual - Recovery DVD	
5SWW10.0400-MUL	Windows 10 IoT Enterprise 2015 LTSB - 64-bit - Language Pack DVD	

Table 336: 5SWW10.0240-MUL, 5SWW10.0249-MUL - Order data

4.3 Overview

Model number	Edition	Target system	Processor	Chipset	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWW10.0240-MUL	Enterprise LTSB - Embedded	APC910	Not relevant	QM77 HM76	64-bit	Multilingual	20 GB ¹⁾	2 GB ²⁾
5SWW10.0249-MUL	Enterprise LTSB - Embedded	APC910	Not relevant	QM170 HM170	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 amount of memory is the minimum requirement according to Microsoft. B&R recommends using at least 4 GB RAM with 64-bit operating systems, however.

4.4 Features

The 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 (disabled in image by default by the UWF)
Hibernate file	Configurable (disabled in image by default)
System restore	Configurable (disabled in image by default by the UWF)
SuperFetch	Configurable (disabled in image by default by the UWF)
File indexing service	Configurable (disabled in image by default by the UWF)
Fast boot	Configurable (disabled in image by default by the UWF)
Defragmentation service	Configurable (disabled in image by default by the UWF)
Additional embedded lockdown functions	
Assigned access	Configurable
AppLocker	Configurable
Shell Launcher	Configurable
Unified Write Filter	✓

Table 337: Features with Windows 10 IoT Enterprise 2015 LTSB.

4.5 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 out-of-box experience (OOBE), which allows different settings to be made (e.g. language, region, keyboard layout, computer name, username, etc.).

4.6 Drivers

The operating system contains all drivers necessary for operation. If an older driver version is installed, the latest version of it [can](#) be downloaded and installed from the B&R website (www.br-automation.com). Note that the Unified Write Filter (UWF) must be disabled for this.

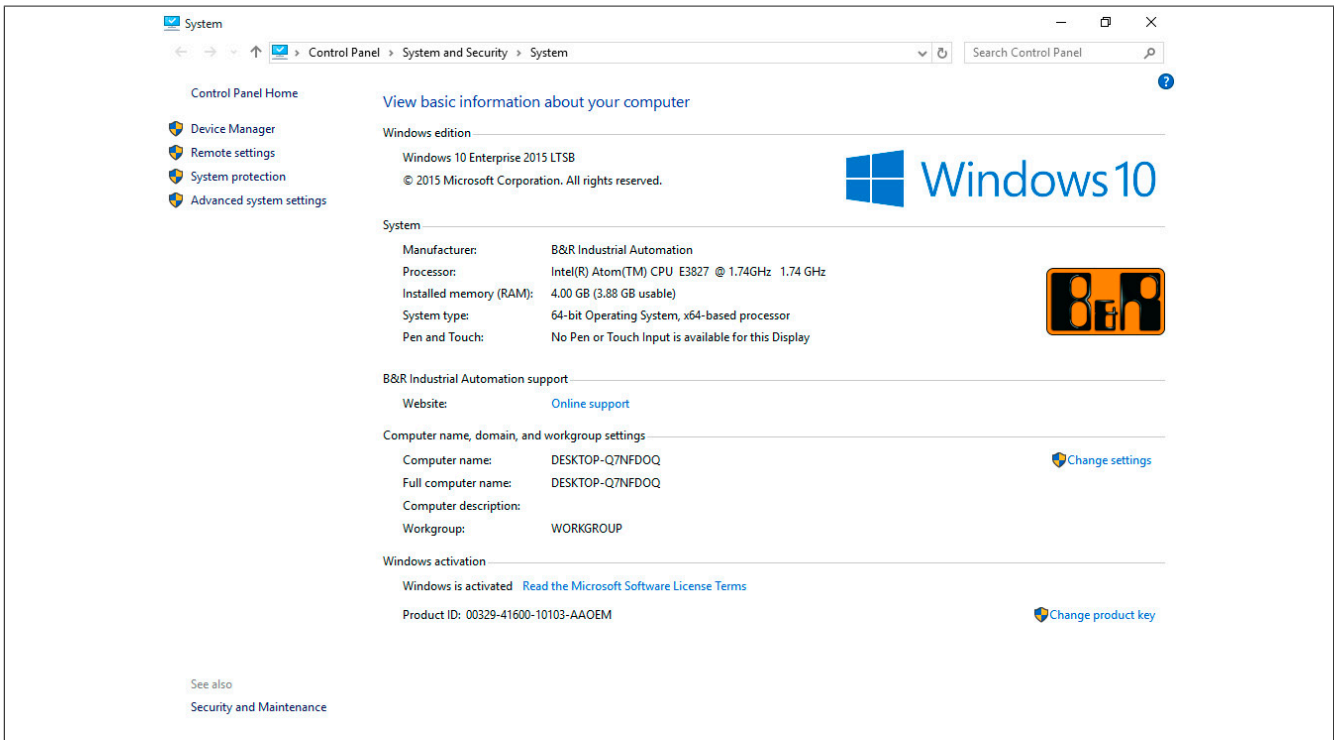
Information:

Only download necessary drivers from the B&R website, not from vendor websites.

4.7 Activation

Windows 10 IoT Enterprise 2015 LTSC must be activated like its predecessor, Windows Embedded 8.1 Industry Pro. This has already been done at B&R.

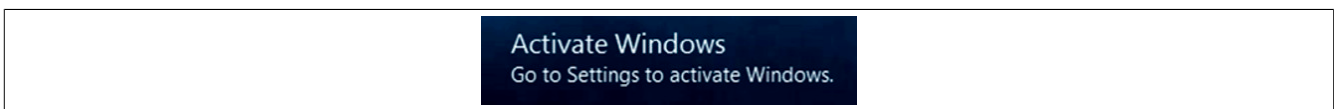
The activation status [can](#) be checked in the [Control Panel](#):



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 LTSC 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](#). For instructions on how to do this, see the Windows [Control Panel](#) under Update & Security > Activation.

Information:

The product key never has to be entered for reactivation.

4.8 Recovery DVD - Content of delivery

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 LTSB. 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 Issues and limitations

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

The version installed by B&R includes settings that have been optimized for industrial environments. These are described in detail in the "Windows 10 IoT 2015 LTSB working guide". It can be downloaded free of charge from the Downloads section of the B&R website (www.br-automation.com) (login required).

Information:

As a result of these settings and the features that are excluded from the LTSB version, the system will behave differently than a standard Windows 10 Enterprise installation.

4.10 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 fully operate the Windows user interface (including system dialog boxes, apps, etc.). A lower resolution can be selected for applications.

5 Windows Embedded 8.1 Industry Pro

5.1 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.

5.2 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 338: 5SWWI8.0340-MUL, 5SWWI8.0440-MUL - Order data

5.3 Overview

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

5.4 Features

The 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 (disabled in image by default by the UWF)
Hibernate file	Configurable (disabled in image by default)
System restore	Configurable (disabled in image by default by the UWF)
SuperFetch	Configurable (disabled in image by default by the UWF)
File indexing service	Configurable (disabled in image by default by the UWF)
Fast boot	Configurable (disabled in image by default by the UWF)
Defragmentation service	Configurable (disabled in image by default by the 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 339: Device functions in Windows Embedded 8.1 Industry Pro

5.5 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 out-of-box experience (OOBE), 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".

5.6 Drivers

The operating system contains all drivers necessary for operation. If an older driver version is installed, the latest version of it [can](#) be downloaded and installed from the B&R website (www.br-automation.com). Note that only the Unified Write Filter (UWF) must be disabled for this.

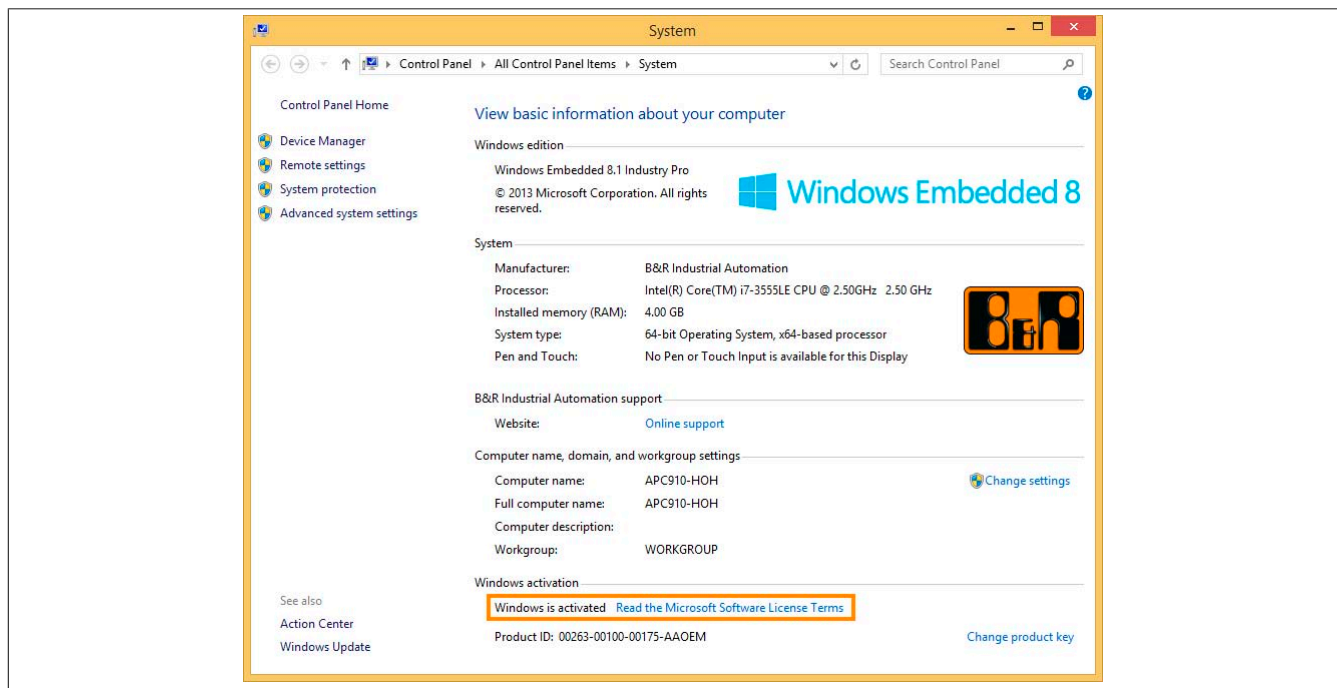
Information:

Only download necessary drivers from the B&R website, not from vendor websites.

5.7 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.

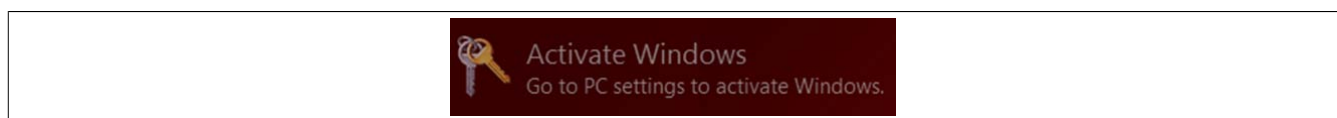
The activation status [can](#) be checked in the [Control Panel](#):



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](#). For instructions, see 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.

5.8 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](#)").

5.9 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 or to allow only certain registry keys to be accessed, for example. 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](#)).

For more information about lockdown functions, see the Microsoft website:

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

5.10 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 fully operate the Windows user [interface](#) (including system dialog boxes, apps, etc.). A lower resolution [can](#) be selected for applications.

6 Windows 7

6.1 General information

Windows 7 offers a wide range of innovative features and performance improvements. The 64-bit variants can 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 provided by Windows 7. Both English and German are available in Windows 7 Professional, while Windows 7 Ultimate supports up to 35 different languages (up to 36 languages starting with 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.

6.2 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 340: 5SWWI7.1100-GER, 5SWWI7.1100-ENG, 5SWWI7.1200-GER, 5SWWI7.1200-ENG, 5SWWI7.1300-MUL, 5SWWI7.1400-MUL - Order data

6.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Architecture	Language	Required storage space on data storage device	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 Core 2 Duo GM45 QM77/HM76 QM170/HM170/ CM236 Bay Trail	SP1	64-bit	German	20 GB	2 GB ²⁾
5SWWI7.1200-ENG	Professional	APC810 APC910 APC2100 PPC800 PPC900 PPC2100	945GME Intel Core 2 Duo GM45 QM77/HM76 QM170/HM170/ CM236 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 Core 2 Duo GM45 QM77/HM76 QM170/HM170/ CM236 Bay Trail	SP1	64-bit	Multilingual	20 GB ³⁾	2 GB ²⁾

Table 341: Windows 7 - Overview

- 1) The specified amount of memory is the minimum requirement according to Microsoft. B&R recommends using at least 2 GB RAM with 32-bit operating systems, however.
- 2) The specified amount of memory is the minimum requirement according to Microsoft. B&R recommends using at least 4 GB RAM with 64-bit operating systems, however.
- 3) The memory used by additional language packs is not taken into account in the minimum size of the disk.

6.4 Installation

B&R preinstalls the required Windows 7 version 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.

6.4.1 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.

6.4.2 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.

6.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Information:

Only download necessary drivers from the B&R website, not from vendor websites.

6.6 Issues and 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).

7 Windows Embedded Standard 7

7.1 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 2 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 in both 32-bit and 64-bit versions⁶⁾. As a result, even demanding applications based on 64-bit technology are supported.

7.2 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	
5SWWI7.1849-MUL	Windows Embedded Standard 7 Premium SP1 - 64-bit - Multilingual - For APC910 with chipset QM170/HM170/CM236 - 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 342: 5SWWI7.1540-ENG, 5SWWI7.1640-ENG, 5SWWI7.1740-MUL, 5SWWI7.1840-MUL, 5SWWI7.1849-MUL - Order data

7.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Architecture	Language	Minimum size of data storage device	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⁾
5SWWI7.1849-MUL	Premium	APC910	QM170 HM170 CM236	SP1	64-bit	Multilingual	16 GB ³⁾	2 GB ²⁾

- 1) The specified memory size is the minimum requirement according to Microsoft. B&R recommends using at least 2 GB RAM with 32-bit operating systems, however.
- 2) The specified memory size is the minimum requirement according to Microsoft. B&R recommends using at least 4 GB RAM with 64-bit operating systems, however.
- 3) The memory space required by additional language packs is not taken into account in the minimum size for the data storage device.

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

7.4 Features

The 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 343: [Device](#) functions in Windows Embedded Standard 7

7.5 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.

7.6 Drivers

The operating system contains all drivers necessary for operation. If an older driver version is installed, the latest version of it [can](#) be downloaded and installed from the B&R website (www.br-automation.com). Note that the "Enhanced Write [Filter](#)" (EWF) must be disabled for this.

7.6.1 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:

Only download necessary drivers from the B&R website, not from vendor websites.

7.7 Supported display resolutions

In accordance with Microsoft requirements, Windows Embedded Standard 7 requires XGA resolution (1024 x 768) or higher in order to fully operate the Windows user interface (including system dialog boxes, etc.). A lower resolution can be selected for applications.

8 Windows XP Professional

8.1 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.

8.2 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 344: 5SWWXP.0600-GER, 5SWWXP.0600-ENG, 5SWWXP.0600-MUL - Order data

8.3 Overview

Model number	Edition	Target system	Chipset	Service pack	Language	Required storage space on data storage device	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

8.4 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.

8.4.1 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.

8.4.2 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.

8.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website (www.br-automation.com).

Information:

Only download necessary drivers from the B&R website, not from vendor websites.

9 Windows Embedded Standard 2009

9.1 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.

9.2 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 345: 5SWWXP.0740-ENG - Order data

9.3 Overview

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

9.4 Features

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 346: **Device** functions in Windows Embedded Standard 2009

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

Table 346: Device functions in Windows Embedded Standard 2009

9.5 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.

9.6 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.

9.7 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.

10 Automation Runtime

10.1 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 relevant programming language 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.).

10.2 Order data


Model number	Short description	Figure
	Technology Guard	
0TG1000.01	Technology Guard (MSD)	
0TG1000.02	Technology Guard (HID)	
1TG4600.10-5	Automation Runtime Windows, TG license	
1TG4601.06-5	Automation Runtime Embedded, TG license	

Table 347: 0TG1000.01, 0TG1000.02, 1TG4600.10-5, 1TG4601.06-5 - Order data

10.3 Automation Runtime Windows (ARwin) with QM77/HM76 CPU boards

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 - 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)

10.4 Automation Runtime Embedded (ARemb) with QM77/HM76 CPU boards

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

Information:

In order to use [Automation Runtime Embedded \(ARemb\)](#), BIOS setting *Advanced - OEM features - Realtime environment* must be set to *Enabled*.

10.5 Automation Runtime Windows (ARwin) with QM170/HM170 CPU boards

System requirements

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

- ARwin upgrade AR A4.33
- ARwin upgrade AR G4.34 for 5PC900.TS17-04
- [Automation Studio](#) V4.3
- Technology Guard

Information:

In order to use [Automation Runtime Windows \(ARwin\)](#), the BIOS setting *Advanced - OEM features - Realtime environment* must be set to *Enabled*.

Information:

For other important information regarding operation of [Automation Runtime](#), see see "[Information regarding Automation Runtime operation](#)" on page 415.

10.6 Automation Runtime Embedded (ARemb) with QM170/HM170 CPU boards

System requirements

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

- ARemb upgrade AR A4.34
- ARemb upgrade AR G4.34 for 5PC900.TS17-04
- [Automation Studio](#) V4.3
- Visual Components Runtime (VC) V4.33
- Technology Guard

Information:

In order to use [Automation Runtime Embedded \(ARemb\)](#), BIOS setting *Advanced - OEM features - Realtime environment* must be set to *Enabled* and *Boot - Boot option sorting method* must be set to *UEFI before legacy*.

Information:

For other important information regarding operation of [Automation Runtime](#), see see "[Information regarding Automation Runtime operation](#)" on page 415.

10.7 Information regarding Automation Runtime operation

Information:

In situations where there is a heavy load on the CPU and GPU simultaneously, it is possible that the specified Thermal Design Power (TDP) of the CPU is exceeded. When this happens, the CPU's internal protective mechanisms will begin limiting the load to the TDP. This means that either the CPU frequency or the graphic frequency (GPU) will be reduced/controlled. In real-time applications, this can result in increased jitter and/or higher cycle times.

This behavior can be influenced by settings in BIOS. The maximum CPU frequency can be set in BIOS under *Advanced - CPU configuration* using option *Set boot freq ratio*. Option *Active processor cores* sets the number of cores being used.

In addition, the maximum frequency of the GPU (Gfx) can be limited in BIOS under *Advanced - Graphics configuration* using option *Max. GPU frequency*. Limiting the CPU and/or GPU frequency reduces power consumption and prevents the TDP from being exceeded.

The optimal settings for real-time operation depend on several factors:

- 1 The CPU variant being used
 - If CPU C-G3900E is used, no further action (BIOS settings) are necessary. For pure ARemb operation, the limiting of active processor cores can be set to 1 in BIOS; this is otherwise recommended.
 - If CPU i3-6100E, i5-6440EQ or i7-6820EQ is used, see item 2. ARemb, ARwin or B&R Hypervisor mode.
- 2 ARemb, ARwin or B&R Hypervisor mode.
 - For pure ARemb operation, the active processor cores must be limited to 1 (see item 4 "Typical ARemb applications").
 - For ARwin or B&R Hypervisor operation, see item 3. Requirements of the respective application.
- 3 Requirements of the respective application:
 - If CPU performance is a priority, then it is recommended to limit the GPU to a minimum. Depending on the CPU variant used, it may also be necessary to somewhat limit the CPU frequency (see point 5 "Typical ARwin or B&R Hypervisor applications").
 - If GPU performance is a priority, then it is recommended to limit the CPU (minimum CPU frequency = 800 MHz). Depending on the CPU variant used, it may also be necessary to somewhat limit the GPU frequency (see point 5 "Typical ARwin or B&R Hypervisor applications").
 - If mid-level performance of the CPU and GPU is desired, then it is recommended to use a moderate limit for both the CPU and GPU (see item 5 "Typical ARwin or B&R Hypervisor applications").
- 4 Typical ARemb applications:
 - Limit active processor cores to 1.
- 5 Typical ARwin or B&R Hypervisor applications:
 - High CPU performance:
 - i3-6100E with 2600 MHz CPU and 500 MHz GPU frequency.
 - i5-6440EQ with 2400 MHz CPU and 500 MHz GPU frequency.
 - i7-6820EQ with 2500 MHz CPU and 500 MHz GPU frequency.
 - High GPU performance:
 - i3-6100E with 2000 MHz CPU and maximum GPU frequency.
 - i5-6440EQ with 1900 MHz CPU and maximum GPU frequency.
 - i7-6820EQ with 2100 MHz CPU and maximum GPU frequency.

- Mid-level CPU and GPU performance:
 - i3-6100E with 2300 MHz CPU and 800 MHz GPU frequency.
 - i5-6440EQ with 2200 MHz CPU and 800 MHz GPU frequency.
 - i7-6820EQ with 2300 MHz CPU and 800 MHz GPU frequency.

10.8 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 later. Earlier versions of Automation Runtime do not require a Technology Guard.

For more information about Technology Guarding, see Automation Help.

11 B&R Hypervisor



The B&R hypervisor allows multiple operating systems to run in parallel on a single [device](#). The operating systems [can](#) communicate with each other via a virtual network.

Intelligent distribution of CPU resources

B&R Hypervisor allows Windows or Linux to run alongside [Automation Runtime](#). This makes it possible to combine a [controller](#) and HMI PC in one [device](#). With B&R Hypervisor, an industrial PC [can](#) also be used as an edge [controller](#). This serves as a [controller](#) and simultaneously transmits pre-processed data to higher-level systems in the cloud via [OPC UA](#).

Virtual network

The hypervisor provides a virtual network connection that allows applications to exchange data between operating systems. Similar to an ordinary [Ethernet interface](#), standard network [protocols](#) are used. In place of a cable, there is a reserved memory area that is not assigned to either operating system.

Maximum flexibility

The user configures the hypervisor and allocates hardware resources in the B&R [Automation Studio software](#) development environment. The configurations are defined separately for each system, providing maximum flexibility in how resources are utilized. Whereas previous parallelization solutions were tailored to a specific Windows version, the B&R Hypervisor is completely independent of the version of the operating systems used.

System requirements

The following minimum [software](#) versions are required to operate B&R Hypervisor on the [Automation PC 910](#) :

- ARemb upgrade AR F4.44
- [Automation Studio V4.4](#)
- APC910 TS77 [BIOS V1.27](#)
- APC910 TS17 [BIOS V1.14](#)
- APC910 [MTCX V1.24](#)

Information:

To operate the B&R Hypervisor, the settings *Advanced - OEM features - Realtime environment and Hypervisor environment* must be set to *Enabled* in [BIOS](#).

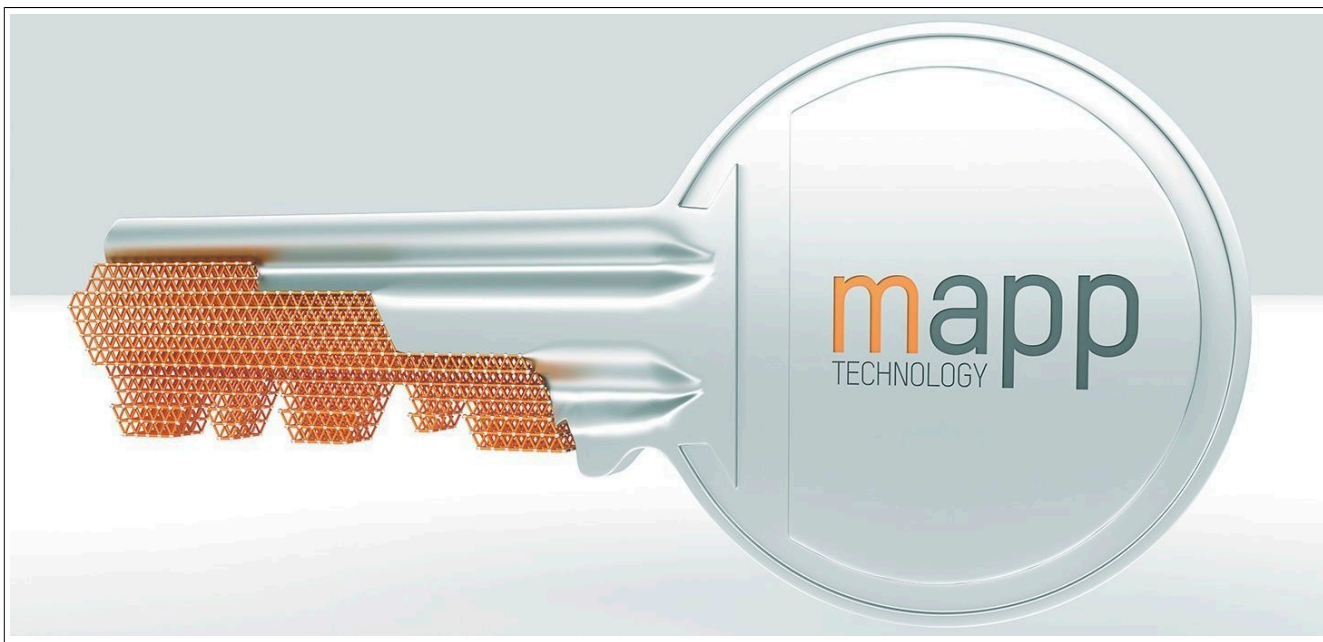
Information:

For other important information regarding operation of [Automation Runtime](#), see see "[Information regarding Automation Runtime operation](#)" on page 415.

Information:

For details about the B&R Hypervisor, see [Automation Help](#).

12 mapp Technology



mapp Technology revolutionizes the creation of **machine** and plant **software**. mapp components – mapps for short – are as easy to use as smartphone apps. Instead of programming user/role systems, alarm systems or axis **control** line by line, the developer of the **machine software** only configures the finished mapps. Complex **algorithms** are easy to master. The programmer **can** fully concentrate on the **machine process**.



Set up all basic functions for a **machine** or system with just a few clicks: recipe system, alarm system, OEE evaluation, user-role system, audit trail system, energy monitoring, database system and much more.

Complex **control algorithms** in the form of easy-to-use **software** blocks. Crane **control**, hydraulics **control**, **filter** design, closed-loop design and much more. Advanced technology made accessible for the average user.

The only HMI solution on the market that works independently of platform and operating system. Modern HTML5-based HMI applications are easily created with ready-made widgets.

Maximum productivity through integrated **safety** technology. mapp **Safety** covers the entire spectrum, including safe axes and robots. Safe **machine** options **can** be enabled or disabled in the field.

mapp Motion provides uniform solutions for all areas of motion **control**: from individual axes to multi-axis systems and even complex robotics and CNC applications.

Information:

For details about mapp Technology, see the B&R website www.br-automation.com or **Automation Help**.

13 B&R Linux 9 (GNU/Linux)

13.1 General information

Linux and GNU/Linux are usually free, Unix-like multi-user operating systems based on the Linux kernel and essentially on GNU [software](#). The wide, also commercial distribution was made possible by the licensing of the Linux kernel under the GPL starting in 1992.

The Linux-based Debian 9 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>.

13.2 Order data


Model number	Short description	Figure
	B&R Linux 9	
5SWLIN.0740-MUL	B&R Linux 9 - 64-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	
5SWLIN.0749-MUL	B&R Linux 9 - 64-bit - Multilingual - APC910 chipset QM170/HM170/CM236 - 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.256G-10	CFast card, 256 GB MLC	
5CFAST.4096-00	CFast card, 4 GB SLC	
5CFAST.8192-00	CFast card, 8 GB SLC	

Table 348: 5SWLIN.0740-MUL, 5SWLIN.0749-MUL - Order data

13.3 Overview

Model number	Target system	Chipset	Architecture	Language	Minimum size of data storage device	Minimum RAM required
5SWLIN.0740-MUL	APC910	QM77 HM76	64-bit	Multilingual	4 GB	1 GB
5SWLIN.0749-MUL	APC910	QM170 HM170 CM236	64-bit	Multilingual	4 GB	4 GB

13.4 Features

- LXDE desktop environment
- Touch driver
- [MTCX](#) driver
- ADI library
- Tool for right-click support via [touch screen](#)
- Virtual keyboard

Detailed information about B&R Linux 9 for B&R devices is available in the Downloads section of the B&R website (www.br-automation.com).

13.5 Installation

B&R preinstalls B&R Linux 9 on the desired storage [device](#) (e.g. CompactFlash card, CFast card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this [process](#).

Debian 9 [can](#) also be downloaded from the Debian website (<http://www.debian.org>). Corresponding instructions are also available on the Debian website.

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).

13.6 Drivers

The operating system contains all drivers necessary for operation.

The most current versions of B&R-specific drivers can be downloaded and installed from the B&R website (www.br-automation.com).

14 B&R Linux 8 (GNU/Linux)

14.1 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 Linux operating system developed by B&R is based on Debian 8, 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>.

14.2 Order data


Model number	Short description	Figure
	B&R Linux 8	
5SWLIN.0540-MUL	B&R Linux 8 - 32-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	
5SWLIN.0640-MUL	B&R Linux 8 - 64-bit - Multilingual - APC910 chipset QM77/HM76 - Installation (without Recovery DVD) - Only available with a new device	
5SWLIN.0649-MUL	B&R Linux 8 - 64-bit - Multilingual - APC910 chipset QM170/HM170/CM236 - 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.256G-10	CFast card, 256 GB MLC	
5CFAST.4096-00	CFast card, 4 GB SLC	
5CFAST.8192-00	CFast card, 8 GB SLC	

Table 349: 5SWLIN.0540-MUL, 5SWLIN.0640-MUL, 5SWLIN.0649-MUL - Order data

14.3 Overview

Model number	Target system	Chipset	Architecture	Language	Minimum size of data storage device	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
5SWLIN.0649-MUL	APC910	QM170 HM170 CM236	64-bit	Multilingual	4 GB	4 GB

14.4 Features

- LXDE desktop environment
- Touch driver
- MTCX driver
- ADI library
- HMI diagnostics tool
- Tool for right-click support via touch screen
- Virtual keyboard

Detailed information about B&R Linux 8 for B&R devices is available in the Downloads section of the B&R website (www.br-automation.com).

14.5 Installation

B&R preinstalls B&R Linux 8 on the desired storage [device](#) (e.g. CompactFlash card,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 also 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 (www.br-automation.com) for the necessary B&R modifications.

14.6 Drivers

The operating system contains all drivers necessary for operation.

The most current versions of B&R-specific drivers [can](#) be downloaded and installed from the B&R website (www.br-automation.com).

15 B&R Automation Device Interface (ADI) Control Center

The [Automation Device Interface \(ADI\)](#) makes it possible to access specific functions of B&R devices. In Windows, the settings for these devices can be viewed and modified using the B&R [Control Center](#) in the [Control Panel](#).

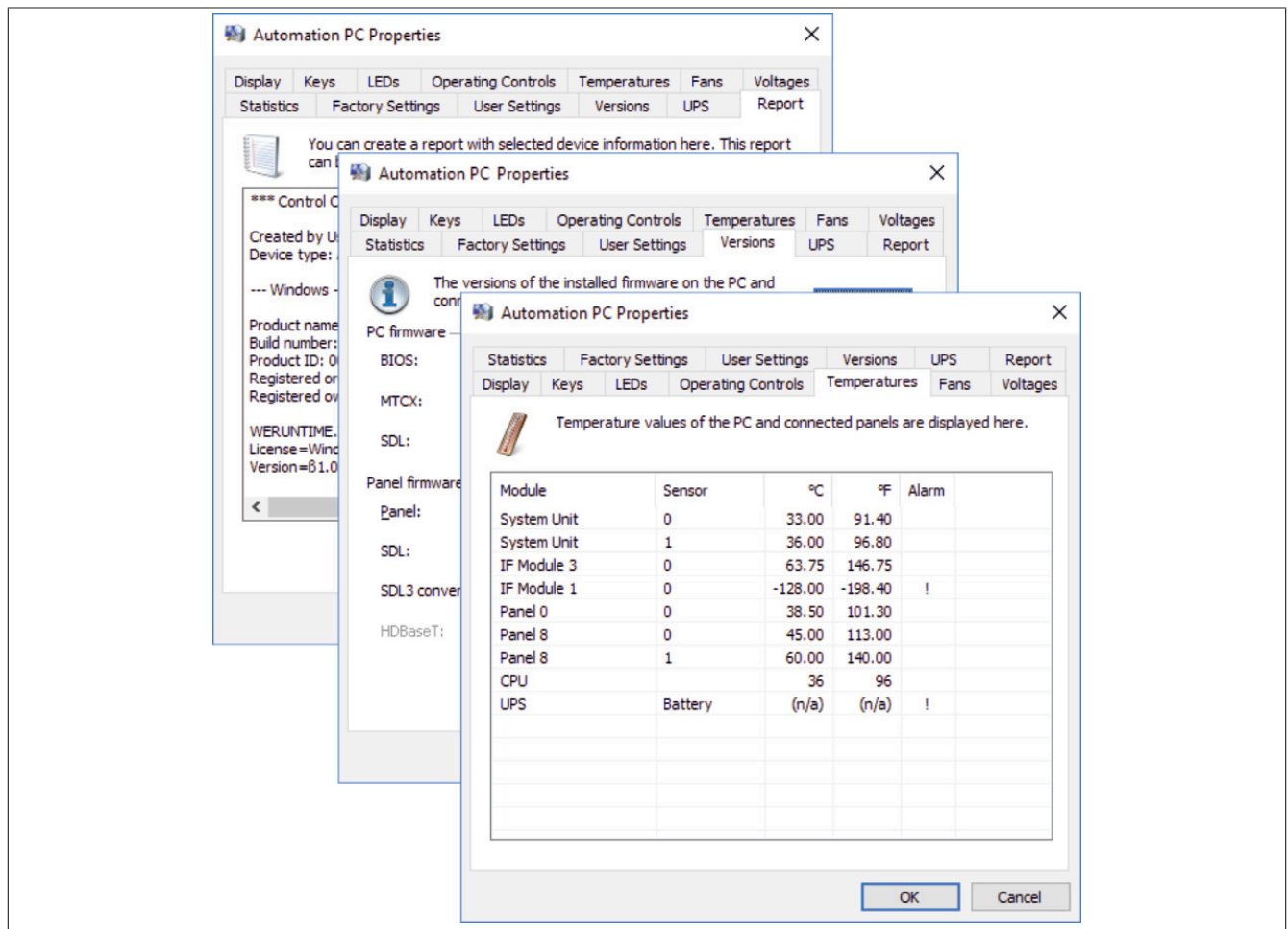


Figure 218: ADI [Control Center](#) screenshots - Examples

Information:

The temperature and voltage values (e.g. [CPU](#) temperature, core voltage, battery voltage) displayed represent uncalibrated values for informational purposes. They cannot be used to draw conclusions about possible hardware alarms or error states. The hardware components being used include automatic diagnostic functions in the event of error.

15.1 Functions

Information:

The functions provided by the [Control Center](#) depend on the [device family](#).

- 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](#) positions
- Reading operating hours (power-on hours)
- Reading user settings 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

For a detailed description of the [Control Center](#), see [Automation Help](#) or the user documentation (depends on the version).

15.2 Installation

The B&R [Automation Device Interface \(ADI\)](#) driver (also includes the [Control Center](#)) and user documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

Information:

The ADI driver is included in most B&R Windows operating systems; it can also be installed on demand.

If a more current ADI driver version exists (see the Downloads section of the B&R website), it can be installed later. Note that the write filter must be disabled during installation.

16 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 Microsoft Visual Studio, for example.

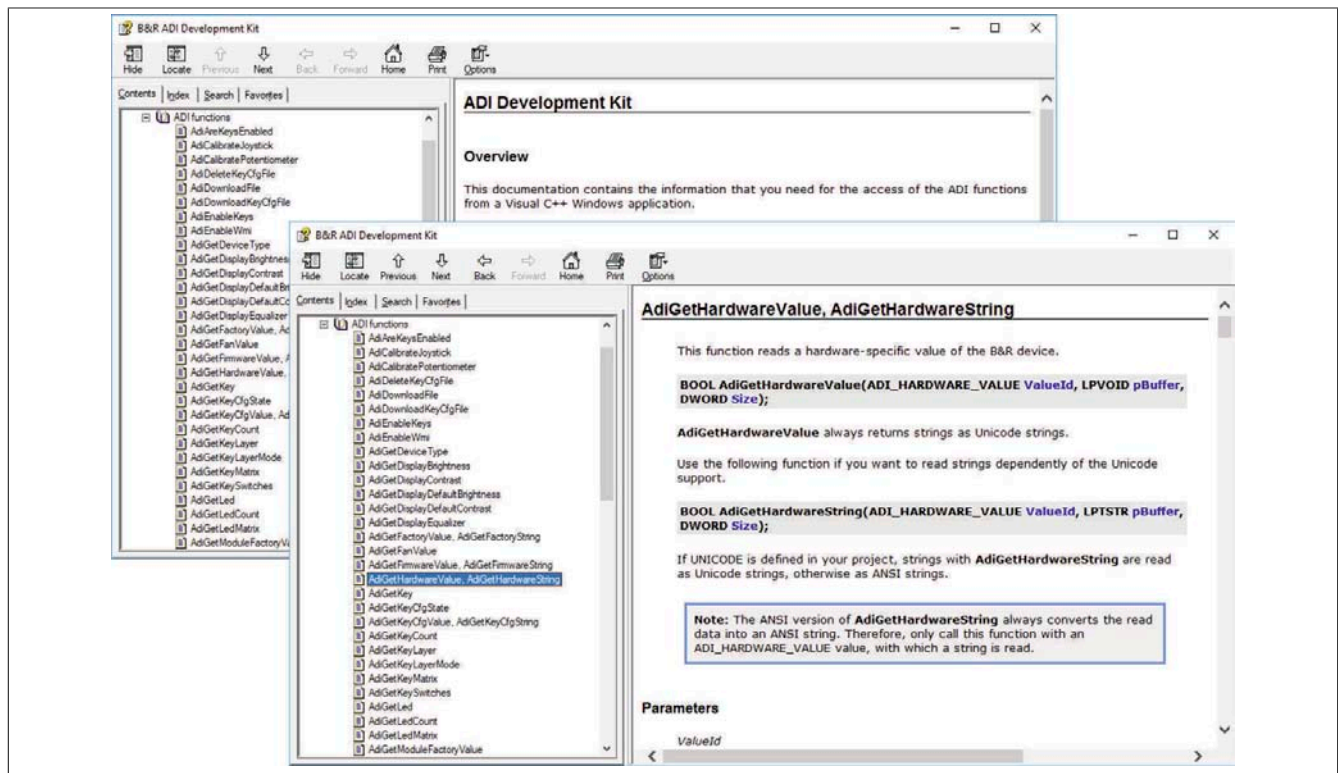


Figure 219: ADI Development Kit Screenshots (Symbolbild)

Features:

- Header files and import libraries
- Help files
- Sample projects
- ADI DLL (for testing applications if no ADI driver is installed)

The appropriate ADI driver must be installed for the specified product family. The ADI driver is already included in the embedded operating system images from B&R.

For a detailed description of how to use ADI functions, see [Automation Help](#).

The B&R Automation Device Interface (ADI) Development Kit can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

17 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 in Microsoft Visual Studio.

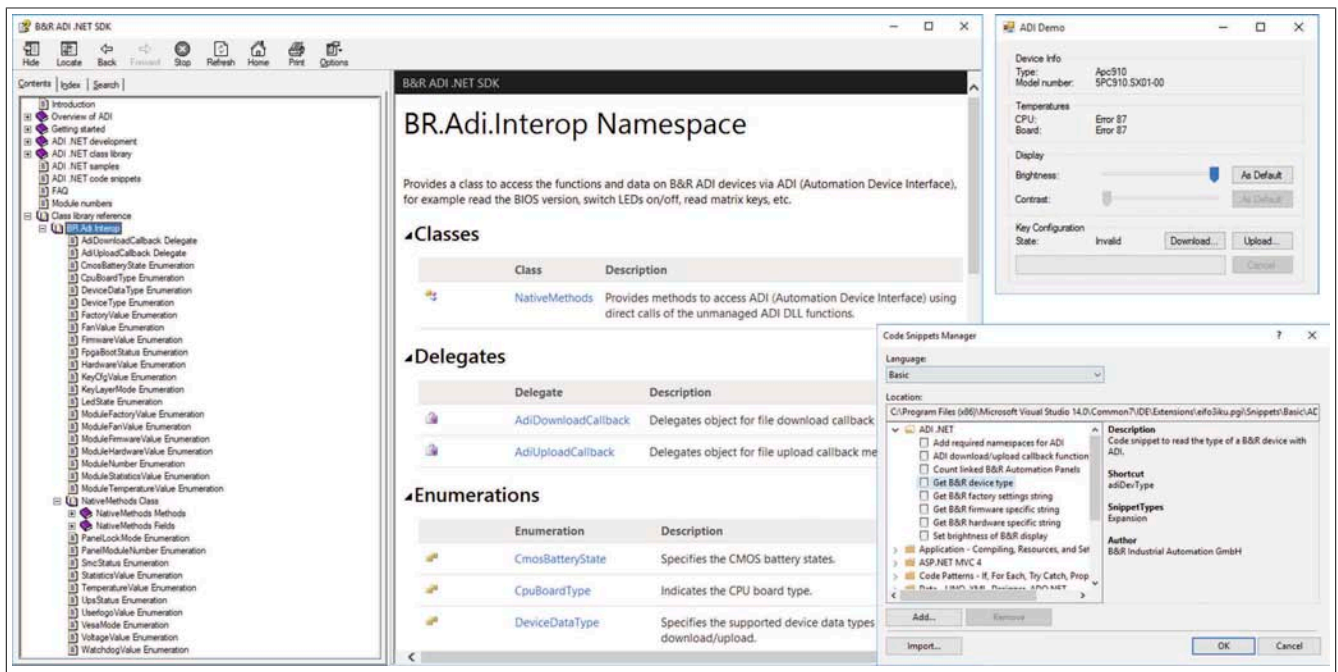


Figure 220: ADI .NET SDK screenshots

Features:

- ADI .NET class library
- Help files (the help documentation is in English)
- Sample projects and code snippets.
- ADI DLL (for testing applications if no ADI driver is installed).

The appropriate ADI driver must be installed for the specified product family. The ADI driver is already included in the embedded operating system images from B&R.

For a detailed description of how to use ADI functions, see [Automation Help](#).

The ADI .NET SDK can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

18 B&R Key Editor

A common panel requirement is to adapt function keys and LEDs directly to the application software. The B&R Key Editor makes this individual adaptation to the application quick and easy.

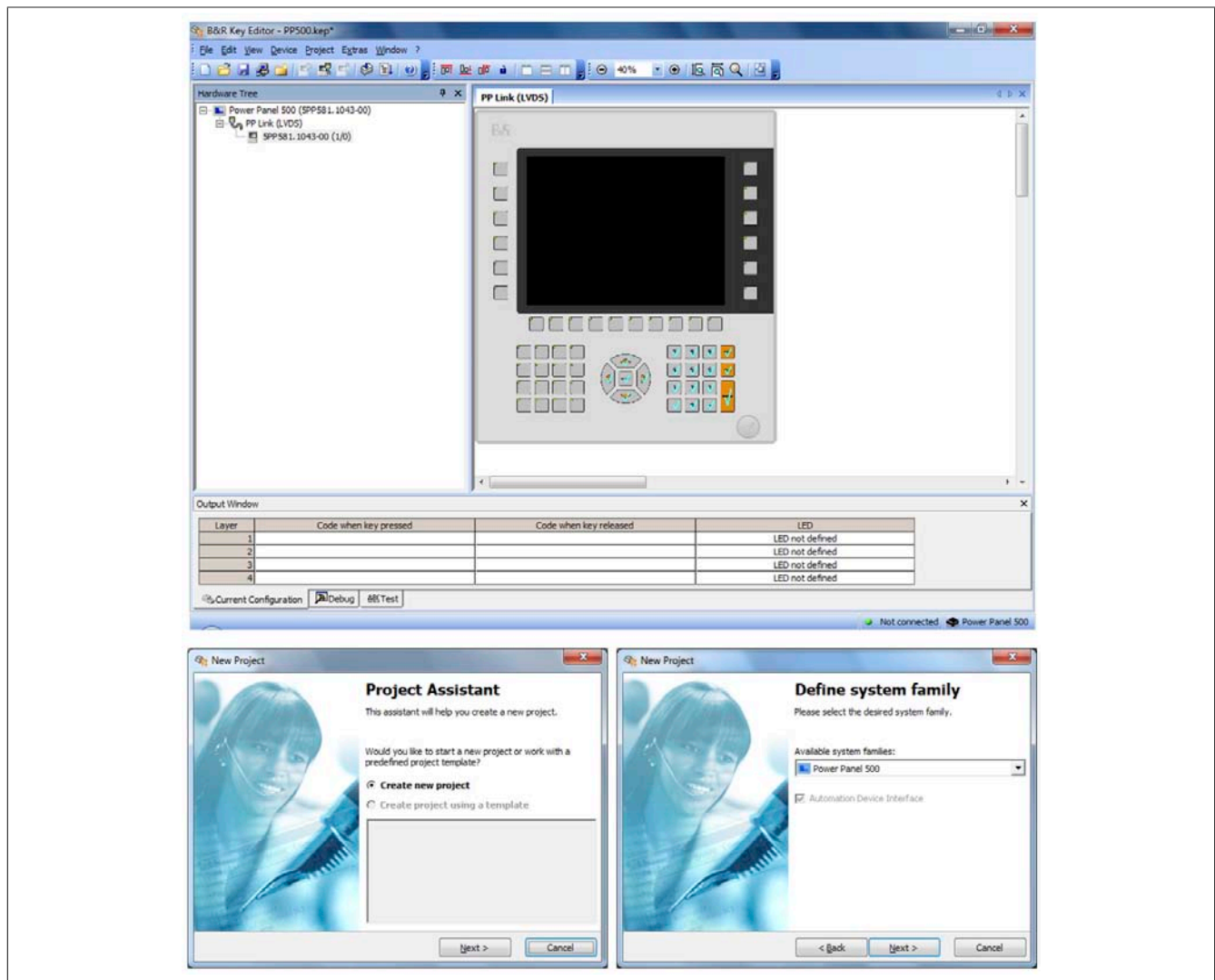


Figure 221: B&R Key Editor screenshots

Features:

- Configuration of normal keyboard keys (A, B, C, etc.)
- Keyboard shortcuts (CTRL+C, SHIFT+DEL, etc.) using a single 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 connecting multiple Automation Panel devices to Automation PCs and Panel PCs.

For a detailed guide on configuring keys and LEDs as well as installing the key configuration on the target system, see the help documentation for the B&R Key Editor. The B&R Key Editor and its help documentation can be downloaded at no cost from the Downloads section of the B&R website (www.br-automation.com).

19 B&R KCF Editor

The B&R KCF Editor can be used as a simple alternative to B&R Key Editor. This tool also allows function keys and LEDs to be adapted to the application software. Unlike the B&R Key Editor, operation takes place in a simple Windows dialog box instead of on a visual representation of the device. This makes it possible to use the B&R KCF Editor for devices that are not yet supported by the B&R Key Editor. The B&R KCF Editor is a portable application and can be launched on the target device without prior installation (directly from a USB flash drive, for example). An installed ADI driver is required to use the software's full range of functions.

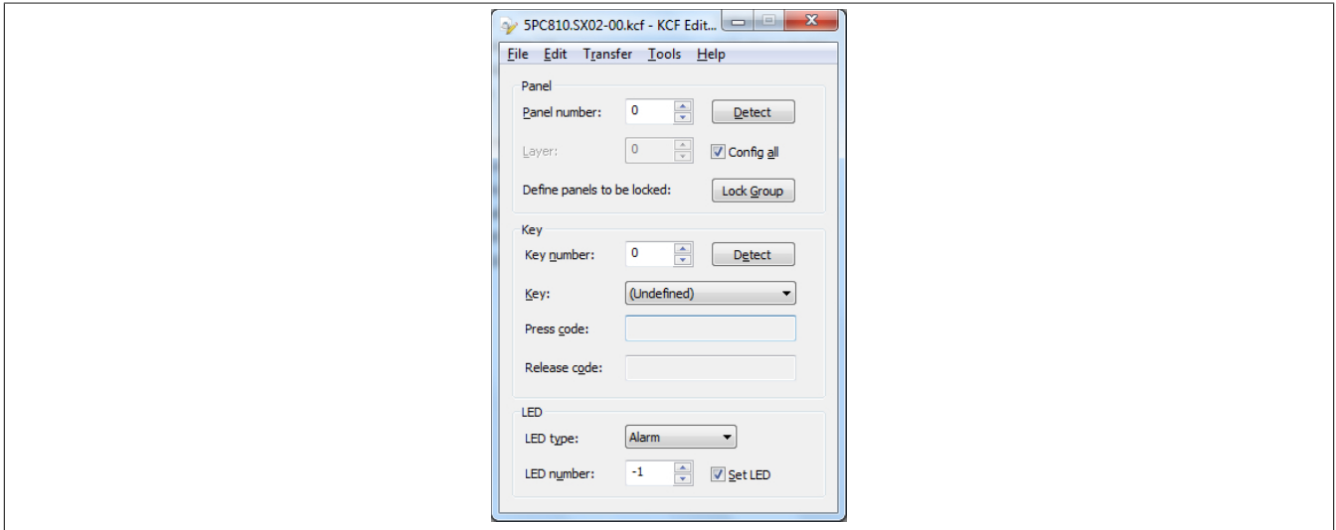


Figure 222: B&R KCF Editor V1.0 screenshot

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 connecting multiple Automation Panel devices to B&R PCs.
- Exporting and importing configurations (INI files)
- Saving configurations as a report (text file)

Additional features if the B&R KCF Editor is executed on the target device⁷⁾

- Panel and key detection
- LED test
- Configuration uploads/downloads

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

20 HMI Service Center

20.1 5SWUTI.0001-000

20.1.1 General information

The HMI Service Center is [software](#) for testing B&R industrial PCs and [Automation](#) Panels. Various categories such as [COM](#) interfaces, network connectivity and [SRAM](#) are tested.

The test system consists of a [USB](#) flash drive with an installed Windows PE operating system and the HMI Service Center.

For details about the HMI Service Center, see the HMI Service Center user's manual. This [can](#) be downloaded for free from the B&R website (www.br-automation.com).

20.1.2 Order data


Model number	Short description	Figure
	Accessories	
5SWUTI.0001-000	HMI Service Center USB flash drive - Hardware diagnostic software - For APC810/PPC800 - For APC910/PPC900 - For APC2100/PPC2100 - For APC2200/PPC2200 - For APC3100/PPC3100 - For APC51x/PP500 - For Automation Panel 800/900 - For Automation Panel 1000/5000	

Table 350: 5SWUTI.0001-000 - Order data

Chapter 5 • Standards and certifications

1 Standards and guidelines

1.1 CE marking



All guidelines applicable to the product and their harmonized EN standards are fulfilled.

1.2 EMC directive

These products meet the requirements of EU directive "[Electromagnetic compatibility 2014/30/EU](#)" and are designed for industrial use:

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

Information:

Declarations of conformity are available on the B&R website under [Downloads - Certificates - Declarations of conformity](#).

2 Certifications

Danger!

A complete system **can** only receive certification if **ALL** of the individual components installed therein have the corresponding certifications. If an individual component is used that **DOES NOT** have a corresponding certification, then the complete system also **DOES NOT** have certification.

Products and services from B&R 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 industrial environments.

Information:

Applicable certifications for the respective product are available on the website, under section "Certifications" of the technical data in the user's manual or in the associated certificates.

2.1 UL certification



Ind.Cont.Eq.
E115267

Products with this mark are tested by Underwriters Laboratories and listed as "industrial [control](#) equipment". This mark is valid for the USA and Canada and simplifies the certification of your machines and manufacturing systems in this economic region.

Underwriters Laboratories (UL) per standard UL 508
Canadian (CSA) standard per C22.2 No. 142-M1987

UL certificates are available on the B&R website under [Downloads - Certificates - UL](#).

It is important to note that the [device](#) is classified as "open type" when used in the area of "Industrial [control](#) equipment" per UL 508. The [device](#) must therefore be installed in a UL508-compliant housing as a requirement for certification or operation per UL 508.

2.2 GOST-R



Products with this mark are tested by an accredited testing laboratory and permitted for import to the Russian Federation (based on EU compliance).

2.3 EAC



Products with this mark are tested by an accredited testing laboratory and permitted for import to the Eurasian Economic Union (based on EU compliance).

2.4 KC



Products with this mark are tested by an accredited testing laboratory and permitted for import to the Korean market (based on EU compliance).

2.5 RCM



Products with this mark are tested by an accredited testing laboratory and certified by the ACMA. This mark is valid in Australia/Oceania and simplifies the certification of your machines and systems in this economic region (based on EU compliance).

2.6 DNV GL certification



Products with this certification have been certified by classification society DNV GL and are suitable for maritime environments. DNV GL certificates (type approval) are generally accepted by other classification societies during ship acceptance procedures.

DNV GL per standard DNVGL-CG-0339 from November 2016
IACS E10
[EN 60945 section 1c](#)

These products are suitable for the following DNV GL environmental conditions (DNV GL classes):

Temperature	B
Moisture	B
Vibration	A
EMC	B
Housing	When installing on board, the guidelines for meeting the required protection level must be observed.

Products used on a ship's bridge must be dimmable using [software](#) in accordance with the regulations and guidelines from the respective classification society.

Windows 7 operating systems are only permitted to be used as embedded variants. For all other B&R-approved operating systems there are no restrictions.

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 497.

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

Model number	Description	DNV 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.SDVV-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

DNV GL certificates with specifications for permitted environmental conditions are available on the B&R website at [Downloads - Certificates - Maritime - DNV GL](#).

Certificates for compass safe distance are available at [Downloads - Certificates - Maritime - Compass safe distance](#).

Chapter 6 • Accessories

The functionality of the following accessories has been tested and approved by B&R in connection with this [device](#). Nevertheless, there may be possible limitations with regard to operation with other individual components as part of the complete system. For the operation of the complete system, all individual specifications of the components must be observed.

All components listed in this manual have been subjected to extensive system and compatibility testing and approved accordingly. B&R cannot guarantee 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 for 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 351: 0TB103.9, 0TB103.91 - Order data

1.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	0TB103.9	0TB103.91
General information		
Certifications	Yes	
CE	cULus E115267	
UL	Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 ¹⁾	
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) 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!)	
Spacing	5.08 mm	

Table 352: 0TB103.9, 0TB103.91 - Technical data

Model number	0TB103.9	0TB103.91
Connection cross section		
AWG wire	26 to 14 AWG	26 to 12 AWG
Wire end sleeves with plastic covering		0.20 to 1.50 mm ²
Solid wires		0.20 to 2.50 mm ²
Fine strand wires	0.20 to 1.50 mm ²	0.20 to 2.50 mm ²
With wire end sleeves		0.20 to 1.50 mm ²
Tightening torque	0.4 Nm	-
Electrical characteristics		
Nominal voltage		300 V
Nominal current ⁴⁾		10 A / contact
Contact resistance		≤5 mΩ
Operating conditions		
Pollution degree per EN 61131-2		Pollution degree 2

Table 352: 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 in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 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

This 1-row, 4-pin TB2104 terminal block is used for ready relay 5AC901.IRDY-00.

2.1.2 Order data


Model number	Short description	Figure
	Terminal blocks	
0TB2104.8000	Connector 24 VDC - 4-pin female - Screw clamp terminal block 2.5 mm ²	

Table 353: 0TB2104.8000 - Order data

2.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	0TB2104.8000
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Terminal block	
Note	Nominal values according to UL
Number of pins	4 (female)
Type of terminal block	Screw clamp terminal block
Cable type	Only copper wires (no aluminum wires!)
Spacing	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
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2

Table 354: 0TB2104.8000 - Technical data

1) The respective limit data of the IF option must be taken into account!

3 Replacement CMOS batteries

3.1 0AC201.91 / 4A0006.00-000

3.1.1 General information

This lithium battery is needed to store BIOS CMOS data and power the real-time clock (RTC).

The battery is subject to wear and must be replaced when the battery power is low (state "Bad").

3.1.2 Order data


Model number	Short description	Figure
	Batteries	
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell	
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell	

Table 355: 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 fire or explosion hazard.

The battery **can** explode if handled improperly. Do not recharge, disassemble or dispose of the battery in fire.

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	0AC201.91	4A0006.00-000
General information		
Storage time		Max. 3 years at 30°C
Certifications		
CE		Yes
UL		cULus E115267 Industrial control equipment
Electrical characteristics		
Capacity		950 mAh
Self-discharge		<1% per year (at 23°C)
Voltage range		3 V
Operating conditions		
Pollution degree per EN 61131-2		Pollution degree 2
Environmental conditions		
Temperature		
Storage		-20 to 60°C
Relative humidity		
Operation		0 to 95%
Storage		0 to 95%
Transport		0 to 95%

Table 356: 0AC201.91, 4A0006.00-000 - Technical data

4 CFast cards

4.1 General information

CFast cards are easily exchangeable data storage devices. Due to their **robustness** against environmental influences (temperature, shock, vibration, etc.), CFast cards are ideal for use as storage media in industrial environments.

CFast cards are a variant of CompactFlash that use the SATA **protocol** instead. CFast cards are not compatible with CompactFlash cards.

4.2 Basic information

CFast cards used in industrial **automation** must be extremely reliable. To achieve this, the following points are very important:

- The flash technology used
- An efficient **algorithm** for maximizing service life
- Good mechanisms for detecting and correcting **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 blocks, SLC flash blocks also have write/erase cycles that are 33 times faster, making CFast cards with SLC flash blocks the preferred choice for industrial environments. These factors are heavily dependent on the actual application, however, so 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 also widely used in this market.

4.2.2 Wear leveling

Wear leveling refers to an **algorithm** that **can** be used to maximize the service life of a CFast card. Different **algorithms** are possible:

- Dynamic wear leveling
- Static wear leveling

The basic idea behind wear leveling is that data is distributed over a broad range of blocks or cells on the data storage **device** so that the same areas are not erased 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 80% of the data storage **device** is already taken up by files, then only 20% **can** be used for wear leveling.

The service life of the CFast card therefore depends on the unused flash blocks.

4.2.2.2 Static wear leveling

Static wear leveling additionally monitors which data is only seldom modified. From time to time, the **controller** moves this data to blocks that have already been written to frequently in order to prevent further wear on those cells.

4.2.3 ECC error correction

Bit errors can result from the inactivity or operation of a certain cell. Error-correcting code (ECC) added by the 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 was introduced to monitor important parameters and detect imminent failures. Critical performance and calibration data is monitored and stored in an effort to predict the probability of error states.

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 completed erase cycles with "Average erase count".
- Calculate the expected service life using the maximum guaranteed write/erase cycles (MLC: 3000, SLC: 100,000).

Example for an MLC CFast card over the period of a week:

$$\text{Expected service life} = \frac{3000 * 1 \text{ week}}{\text{Completed erase cycles}}$$

4.2.6 Dimensions

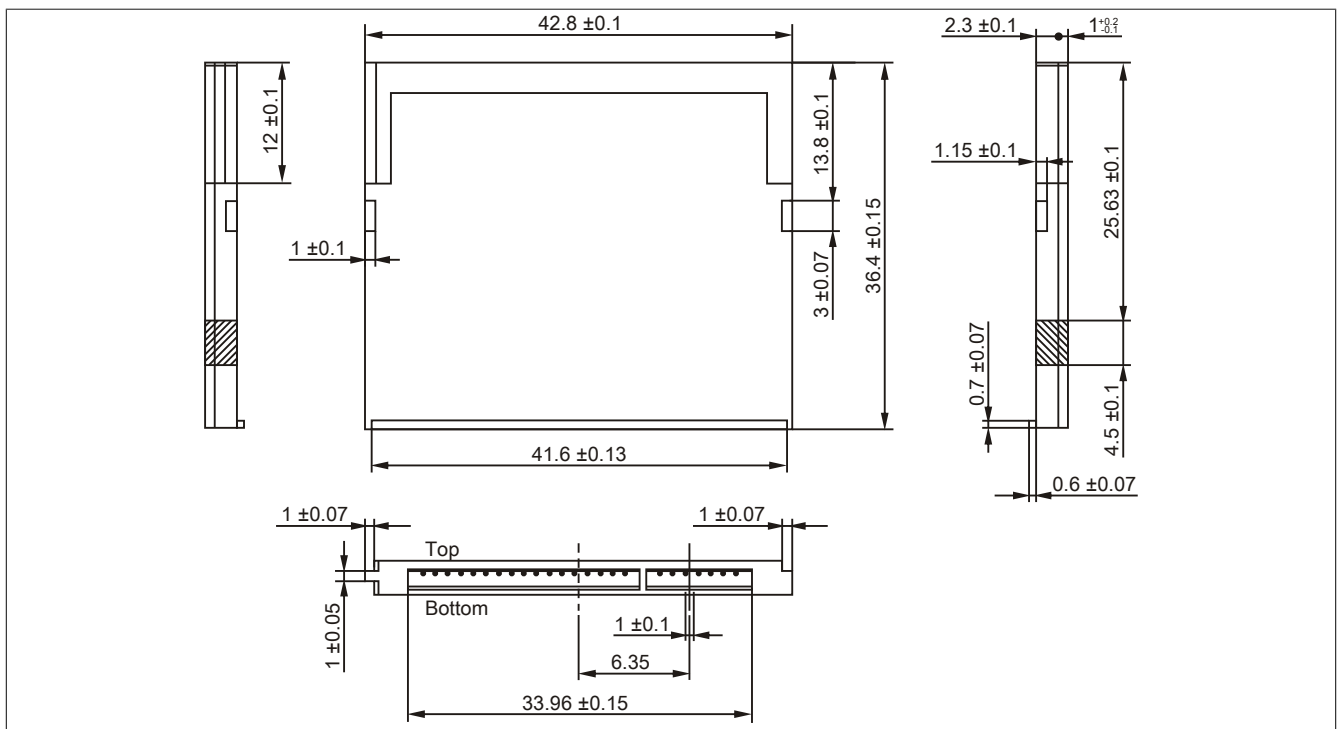


Figure 223: CFast card - Dimensions

4.3 5CFAST.xxxx-00

4.3.1 General information

These CFAST cards are based on single-level cell (SLC) technology and compatible with SATA 2.6. Their dimensions are identical to CompactFlash cards.

4.3.2 Order data


Model number	Short description	Figure
	CFAST cards	
5CFAST.2048-00	CFAST card, 2 GB SLC	
5CFAST.4096-00	CFAST card, 4 GB SLC	
5CFAST.8192-00	CFAST card, 8 GB SLC	
5CFAST.016G-00	CFAST card, 16 GB SLC	
5CFAST.032G-00	CFAST card, 32 GB SLC	

Table 357: 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.

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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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

Table 358: 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
General information					
Certifications					
CE	Yes				
UL	cULus E115267 Industrial control equipment				
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations				
DNV GL	Class I, Division 2, Groups ABCD, T4 Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck)				
GOST-R	Yes				
Endurance					
SLC flash	Yes				
Guaranteed data volume					
Guaranteed	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	APC3100, APC2100, APC910, PPC3100, PPC2100, PPC900				
Operating systems					
Windows 10 IoT Enterprise LTSB 64-bit	No	No	No	No	Yes
Windows Embedded 8.1 Industry Pro 32-bit	No	No	No	Yes	Yes
Windows Embedded 8.1 Industry Pro 64-bit	No	No	No	No	Yes
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				
B&R Linux 8	No	Yes	Yes	Yes	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, non-condensing				
Storage	Max. 85% at 85°C, non-condensing				
Transport	Max. 85% at 85°C, non-condensing				
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 358: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

Accessories • CFAST cards

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 ¹⁾	10 years				
Data reliability	<1 unrecoverable error per 10 ¹⁴ bits read				
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
Certifications					
CE	Yes				
UL	cULus E115267 Industrial control equipment				
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 ²⁾				
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ³⁾				
GOST-R	Yes				
Endurance¹⁾					
SLC flash	Yes				
Guaranteed data volume					
Guaranteed ⁴⁾	185 TBW	371 TBW	745 TBW	1468 TBW	2937 TBW
Erase/Write cycles					
Guaranteed	100,000				
Wear leveling	Static				
S.M.A.R.T. support	Yes				
Support					
Hardware	APC910, PPC900				
Operating systems					
Windows 10 IoT Enterprise LTSC 64-bit	No	No	No	No	Yes
Windows Embedded 8.1 Industry Pro 32-bit	No	No	No	Yes	Yes
Windows Embedded 8.1 Industry Pro 64-bit	No	No	No	No	Yes
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				
B&R Linux 8	No	Yes	Yes	Yes	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				

Table 359: 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
General information					
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 properties					
Dimensions					
Width	42.8 ±0.10 mm				
Length	36.4 ±0.10 mm				
Depth	3.6 ±0.10 mm				
Weight	10 g				

Table 359: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

- 1) Per JEDEC (JESD47), EOL conditions are not permitted to be reached before 18 months. A higher average daily write workload reduces the expected service life and data retention of the data storage device.
- 2) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 3) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 4) TBW = Terabytes written
Sequential access without a file system

4.3.4 Temperature/Humidity diagram

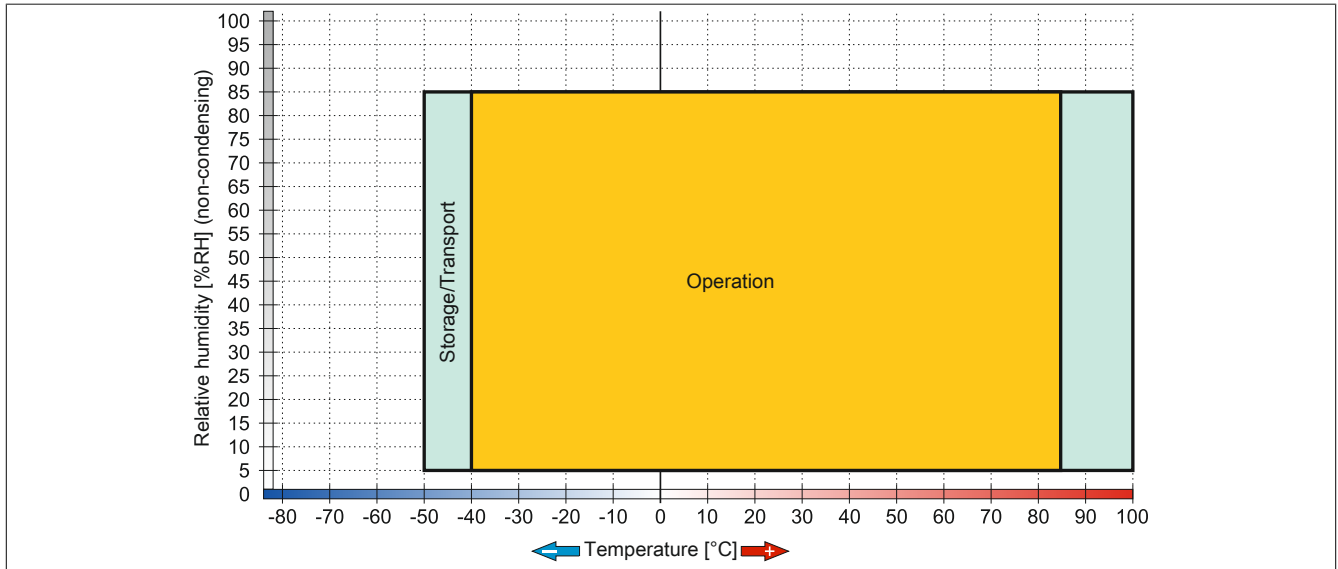


Figure 224: 5CFAST.xxxx-00 ≥Rev. E0 - Temperature/Humidity diagram

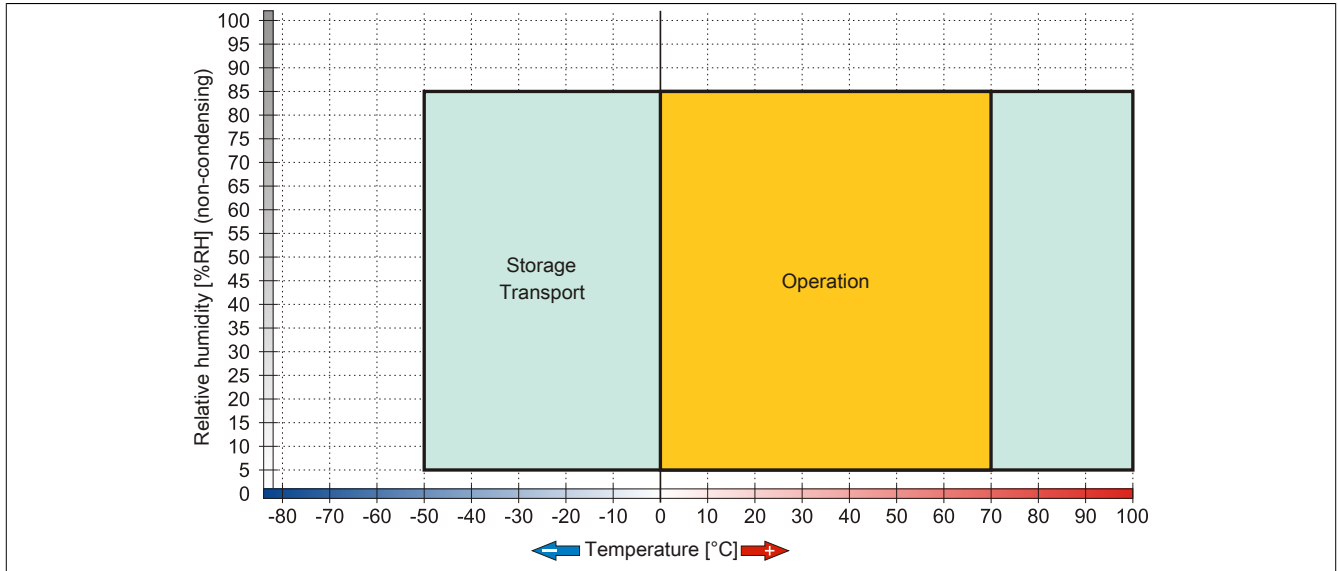


Figure 225: 5CFAST.xxxx-00 ≤ Rev. D0 - Temperature/Humidity diagram

4.4 5CFAST.xxxx-10

4.4.1 General information

These 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 32 GB MLC CFast 32 GB MLC ≥Rev. G0	
5CFAST.064G-10	CFast card, 64 GB MLC ≥Rev. E0	
5CFAST.128G-10	CFast card, 128 GB MLC ≥Rev. E0	
5CFAST.256G-10	CFast card, 256 GB MLC	

Table 360: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Order data


Model number	Short description	Figure
	CFast cards	
5CFAST.032G-10	CFast card, 32 GB MLC ≤Rev. F0	
5CFAST.064G-10	CFast card, 64 GB MLC ≤Rev. D0	
5CFAST.128G-10	CFast card, 128 GB MLC ≤Rev. D0	

Table 361: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Order data

4.4.3 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 specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Product ID	5CFAST.032G-10 ≥Rev. G0	5CFAST.064G-10 ≥Rev. E0	5CFAST.128G-10 ≥Rev. E0	5CFAST.256G-10
General information				
Capacity	32 GB	64 GB	128 GB	256 GB
Data retention ¹⁾	10 years ²⁾			
Data reliability	<1 unrecoverable error per 10 ¹⁶ bits read			
Lifetime monitoring	Yes			
MTBF	>2,000,000 hours (at 25°C)			

Table 362: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Technical data

Accessories • CFAST cards

Product ID	5CFAST.032G-10 ≥Rev. G0	5CFAST.064G-10 ≥Rev. E0	5CFAST.128G-10 ≥Rev. E0	5CFAST.256G-10
General information				
Maintenance	None			
Supported operating modes	SATA 3, SATA 2, SATA 1			
Sequential read				
Maximum	495 MB/s	500 MB/s	500 MB/s	500 MB/s
Sequential write				
Maximum	115 MB/s	100 MB/s	195 MB/s	330 MB/s
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations			
DNV GL	Class I, Division 2, Groups ABCD, T4 ³⁾ Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ⁴⁾			
Endurance¹⁾				
MLC flash	Yes			
Guaranteed data volume				
Guaranteed ⁵⁾	86.4 TBW	172.8 TBW	345.6 TBW	691.2 TBW
Client workload ⁶⁾	39.06 TBW	71.02 TBW	104.17 TBW	159.57 TBW
Erase/Write cycles				
Guaranteed	3000			
Wear leveling	Static			
Error correction coding (ECC)	Yes			
S.M.A.R.T. support	Yes			
Support				
Hardware	APC3100, APC2200, APC2100, APC910, PPC3100, PPC2200, PPC2100, PPC900			
Operating systems				
Windows 10 IoT Enterprise LTSC 64-bit	Yes			
Windows Embedded 8.1 Industry Pro 32-bit	Yes			
Windows Embedded 8.1 Industry Pro 64-bit	Yes			
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			
B&R Linux 8	Yes			
B&R Linux 9	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	≥V4.0.22 or V4.1.6
B&R Embedded OS Installer	≥V3.21			
Environmental conditions				
Temperature				
Operation	-40 to 85°C			
Storage	-40 to 85°C			
Transport	-40 to 85°C			
Relative humidity				
Operation	Max. 85% at 85°C, non-condensing			
Storage	Max. 85% at 85°C, non-condensing			
Transport	Max. 85% at 85°C, non-condensing			
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 362: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Technical data

Product ID	5CFAST.032G-10 ≥Rev. G0	5CFAST.064G-10 ≥Rev. E0	5CFAST.128G-10 ≥Rev. E0	5CFAST.256G-10
General information				
Mechanical properties				
Dimensions				
Width	42.8 ±0.10 mm			
Length	36.4 ±0.10 mm			
Depth	3.6 ±0.10 mm			
Weight	10 g			

Table 362: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10, 5CFAST.256G-10 - Technical data

- 1) Per JEDEC (JESD47), EOL conditions are not permitted to be reached before 18 months. A higher average daily write workload reduces the expected service life and data retention of the data storage [device](#).
- 2) At an ambient temperature of 25°C at the start of service life.
- 3) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 4) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 5) TBW = Terabytes written
Sequential access without a file system
- 6) TBW = Terabytes written
Client workload per standard JEDEC JESD219

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Product ID	5CFAST.032G-10 ≤Rev. F0	5CFAST.064G-10 ≤Rev. D0	5CFAST.128G-10 ≤Rev. D0
General information			
Capacity	32 GB	64 GB	128 GB
Data retention ¹⁾	10 years ²⁾		
Data reliability	<1 unrecoverable error per 10 ¹⁷ bits read		
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
Certifications			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 ³⁾		
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC : B (Bridge and open deck) ⁴⁾		
Endurance¹⁾			
MLC flash	Yes		
Guaranteed data volume			
Guaranteed ⁵⁾	86.4 TBW	172.8 TBW	345.6 TBW
Erase/Write cycles			
Guaranteed	3000		
Wear leveling	Static		
Error correction coding (ECC)	Yes		
S.M.A.R.T. support	Yes		
Support			
Hardware	APC2100, APC910, PPC2100, PPC900		

Table 363: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

Product ID	5CFAST.032G-10 ≤Rev. F0	5CFAST.064G-10 ≤Rev. D0	5CFAST.128G-10 ≤Rev. D0
General information			
Operating systems			
Windows 10 IoT Enterprise LTSC 64-bit		Yes	
Windows Embedded 8.1 Industry Pro 32-bit		Yes	
Windows Embedded 8.1 Industry Pro 64-bit		Yes	
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	
B&R Linux 8		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 properties			
Dimensions			
Width		42.8 ±0.10 mm	
Length		36.4 ±0.10 mm	
Depth		3.6 ±0.10 mm	
Weight		10 g	

Table 363: 5CFAST.032G-10, 5CFAST.064G-10, 5CFAST.128G-10 - Technical data

- 1) Per JEDEC (JESD47), EOL conditions are not permitted to be reached before 18 months. A higher average daily write workload reduces the expected service life and data retention of the data storage device.
- 2) At an ambient temperature of 25°C at the start of service life.
- 3) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 4) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 5) TBW = Terabytes written
Sequential access without a file system

4.4.4 Temperature/Humidity diagrams

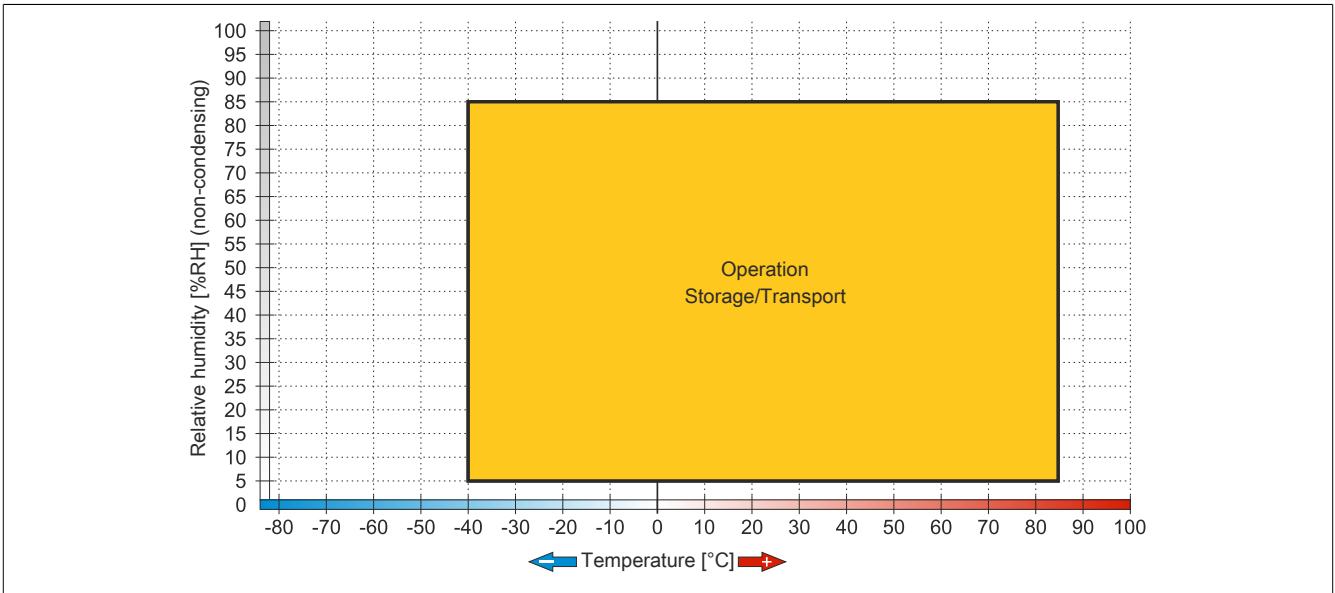


Figure 226: 5CFAST.032G-10 ≥Rev. G0, 5CFAST.064G-10 ≥Rev. E0, 5CFAST.128G-10 ≥Rev. E0, 5CFAST.256G-10 - Temperature/Humidity diagram

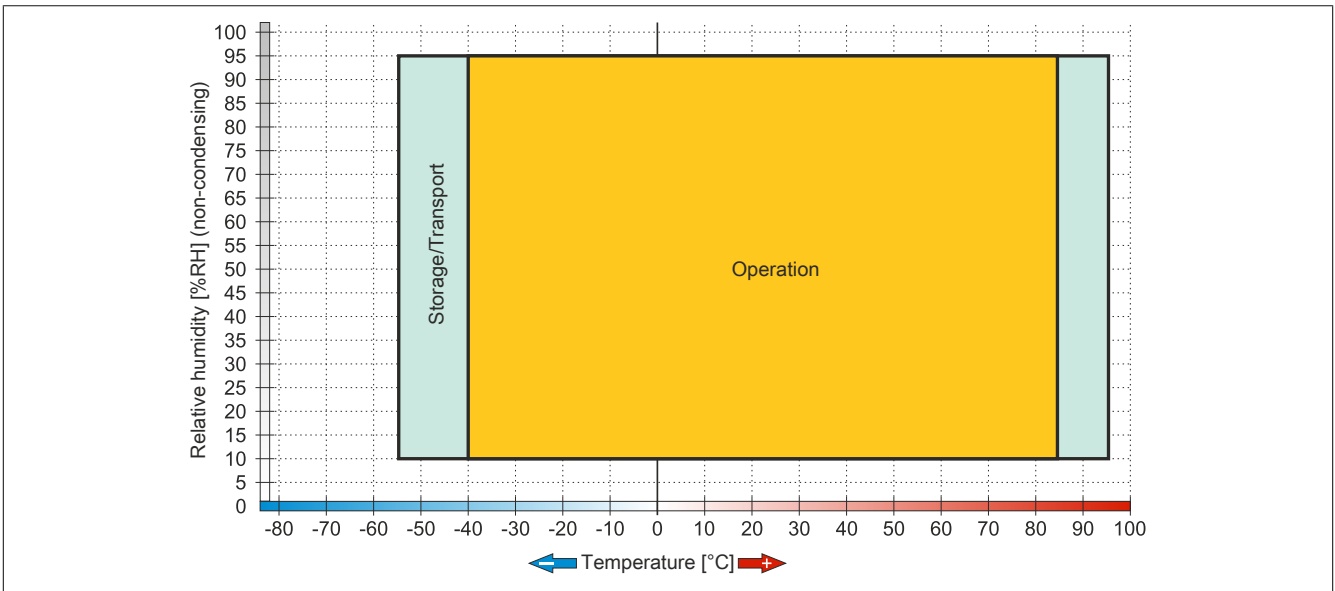


Figure 227: 5CFAST.032G-10 ≤Rev. F0, 5CFAST.064G-10 ≤Rev. D0, 5CFAST.128G-10 ≤Rev. D0 - Temperature/Humidity diagram

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.

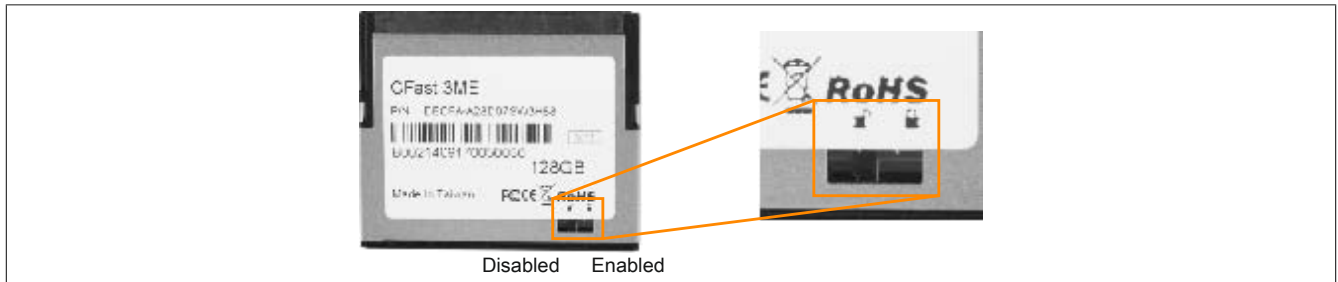


Figure 228: CFast card - Write protection

Write protection is only present on the following CFast cards:

- 5CFAST.032G-10 ≤Rev. F0
- 5CFAST.064G-10 ≤Rev. D0
- 5CFAST.128G-10 ≤Rev. D0

5 PCIe plug-in cards

5.1 5ACPCE.ETH1-00

5.1.1 General information

This PCIe card has a 10/100/1000 Mbit/s network connection and can be used as an additional network interface in a standard single-width PCI Express slot.

- PCIe x1 Ethernet card
- 1x Ethernet interface (10/100/1000 Mbit/s)



Figure 229: 5ACPCE.ETH1-00 - PCIe Ethernet card 10/100/1000

5.1.2 Order data


Model number	Short description	Figure
Accessories		
5ACPCE.ETH1-00	PCIe carte - 1x ETH 10/100/1000 - For APC910/PPC900	

Table 364: 5ACPCE.ETH1-00 - Order data

5.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

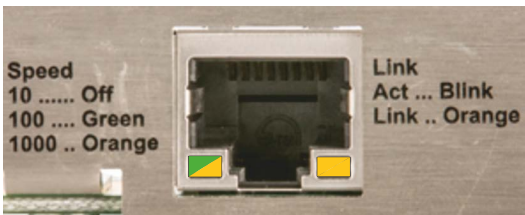
Model number	5ACPCE.ETH1-00
General information	
B&R ID code	DBF3
Diagnostics	
Data transfer	Yes, using status LED
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Interfaces	
Ethernet	
Quantity	1
Controller	Intel I210
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s ¹⁾
Cable length	Max. 100 m between two stations (segment length)
Electrical characteristics	
Power consumption	1 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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
Vibration ³⁾	
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 ³⁾	
Operation	15 g, 11 ms
Storage	30 g, 6 ms
Transport	30 g, 6 ms
Elevation	
Operation	-300 to 3000 m above sea level ²⁾

Table 365: 5ACPCE.ETH1-00 - Technical data

- 1) Switching takes place automatically.
- 2) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.
- 3) Vibration testing is performed per EN 60068-2-6. Shock testing is performed per EN 60068-2-27.

5.1.3.1 Ethernet interface

Ethernet connection		
Controller	Intel I210	
Power supply	PCIe x1 for 3.3 V	
Cabling	S/STP (Cat 5e)	
Transfer rate	10/100/1000 Mbit/s ¹⁾	
Cable length	Max. 100 m (min. Cat5e)	
LED "Speed"	On	Off
Green	100 Mbit/s	10 Mbit/s ²⁾
Orange (light)	1000 Mbit/s	-
LED "Link"	On	Off
Orange (light)	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)



Speed
10 Off
100 ... Green
1000 .. Orange

Link
Act ... Blink
Link .. Orange

Table 366: 5ACPCE.ETH1-00 - Ethernet interface

- 1) Switching takes place automatically.
- 2) The 10 Mbit/s transfer speed / connection only exists if the Link LED is also lit at the same time.

5.1.4 Driver support

A special driver is required to operate Intel Ethernet controller I210. Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com). Windows 7, Windows 10 and B&R Linux are approved operating systems. Wake-on-LAN (WoL) and PXE booting are not supported.

Information:

Only download necessary drivers from the B&R website, not from vendor websites.

5.1.5 Dimensions

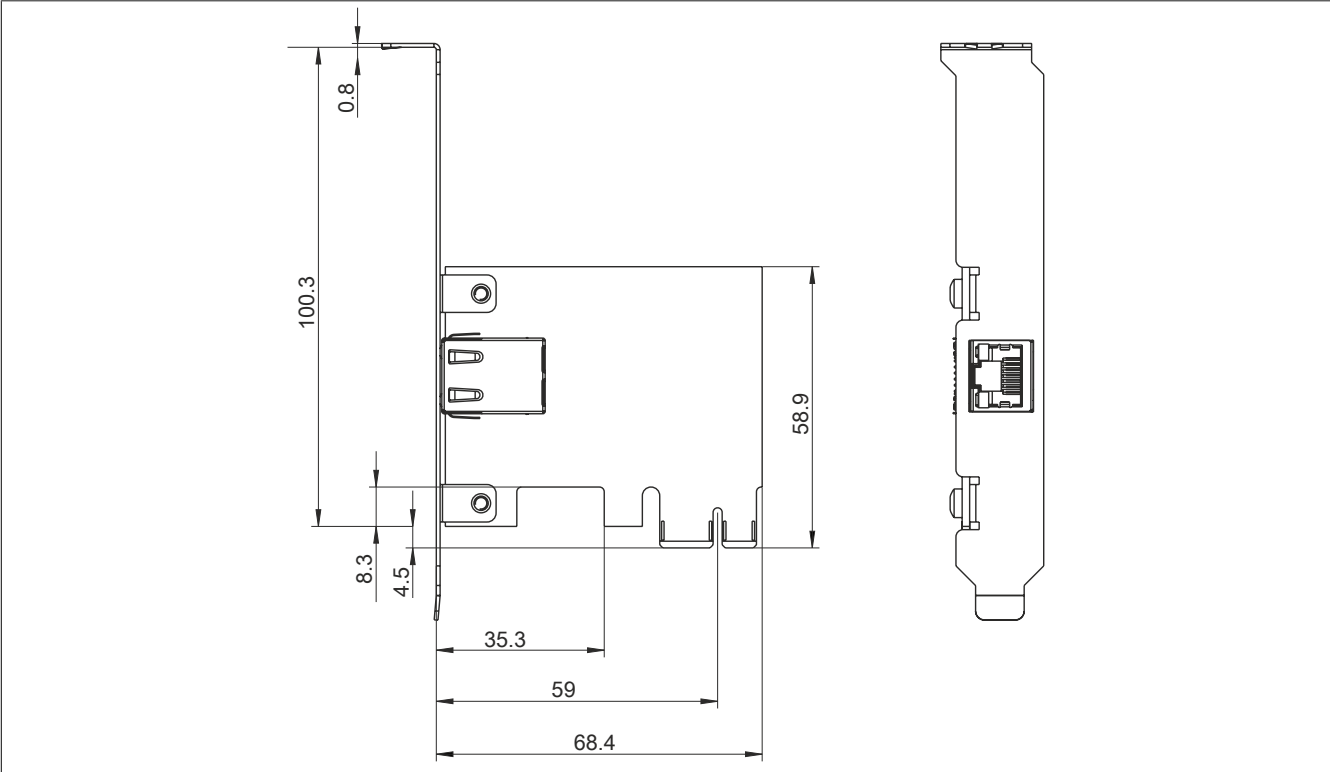


Figure 230: 5ACPCE.ETH1-00 - Dimensions

5.2 5ACPCE.ETH4-00

5.2.1 General information

This PCIe card has 4 10/100/1000 Mbit/s network connections and can be used as an additional network interface in a standard PCI Express x4 slot.

- PCIe x4 Ethernet card
- 4x Ethernet interface (10/100/1000 Mbit/s)

5.2.2 Order data


Model number	Short description	Figure
	Accessories	
5ACPCE.ETH4-00	PCIe card - 4-port ETH 10/100/1000 - For APC910/PPC900	

Table 367: 5ACPCE.ETH4-00 - Order data

5.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this individual component and may deviate from those that apply to the complete system. For the complete system in which this individual component is used, for example, the data specified for that complete system applies.

Model number	5ACPCE.ETH4-00
General information	
B&R ID code	EC3B
Diagnostics	
Data transfer	Yes, using status LED
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
Interfaces	
Ethernet	
Quantity	4
Controller	Intel I350
Design	Shielded RJ45
Transfer rate	10/100/1000 Mbit/s ¹⁾
Cable length	Max. 100 m between two stations (segment length)
Electrical characteristics	
Power consumption	4 W
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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

Table 368: 5ACPCE.ETH4-00 - Technical data

Model number	5ACPCE.ETH4-00
Vibration ³⁾	
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 ³⁾	
Operation	15 g, 11 ms
Storage	30 g, 6 ms
Transport	30 g, 6 ms
Elevation	
Operation	-300 to 3000 m above sea level ²⁾

Table 368: 5ACPCE.ETH4-00 - Technical data

- 1) Switching takes place automatically.
- 2) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.
- 3) Vibration testing is performed per EN 60068-2-6. Shock testing is performed per EN 60068-2-27.

5.2.3.1 Ethernet interface

Ethernet connection		
Controller	Intel I350	
Power supply	PCIe x4 for 3.3 V	
Cabling	S/STP (Cat 5e)	
Transfer rate	10/100/1000 Mbit/s ¹⁾	
Cable length	Max. 100 m (min. Cat5e)	
LED "Speed"	On	Off
Green	100 Mbit/s	10 Mbit/s ²⁾
Orange (light)	1000 Mbit/s	-
LED "Link"	On	Off
Orange (light)	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)

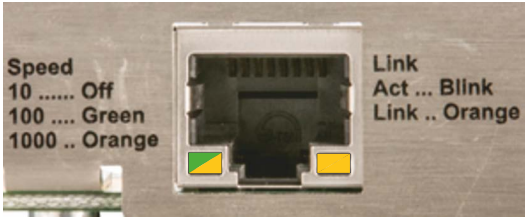


Table 369: 5ACPCE.ETH4-00 - Ethernet interface

- 1) Switching takes place automatically.
- 2) The 10 Mbit/s transfer speed / connection only exists if the Link LED is also lit at the same time.

5.2.4 Driver support

A special driver is required in order to operate Intel Ethernet controller I350. Drivers for approved operating systems are available for download in the Downloads section of the B&R website (www.br-automation.com). Windows 7, Windows 10 and B&R Linux are approved operating systems.

Wake-on-LAN (WoL) and PXE booting are not supported.

Information:

Only download necessary drivers from the B&R website, not from vendor websites.

5.2.5 Dimensions

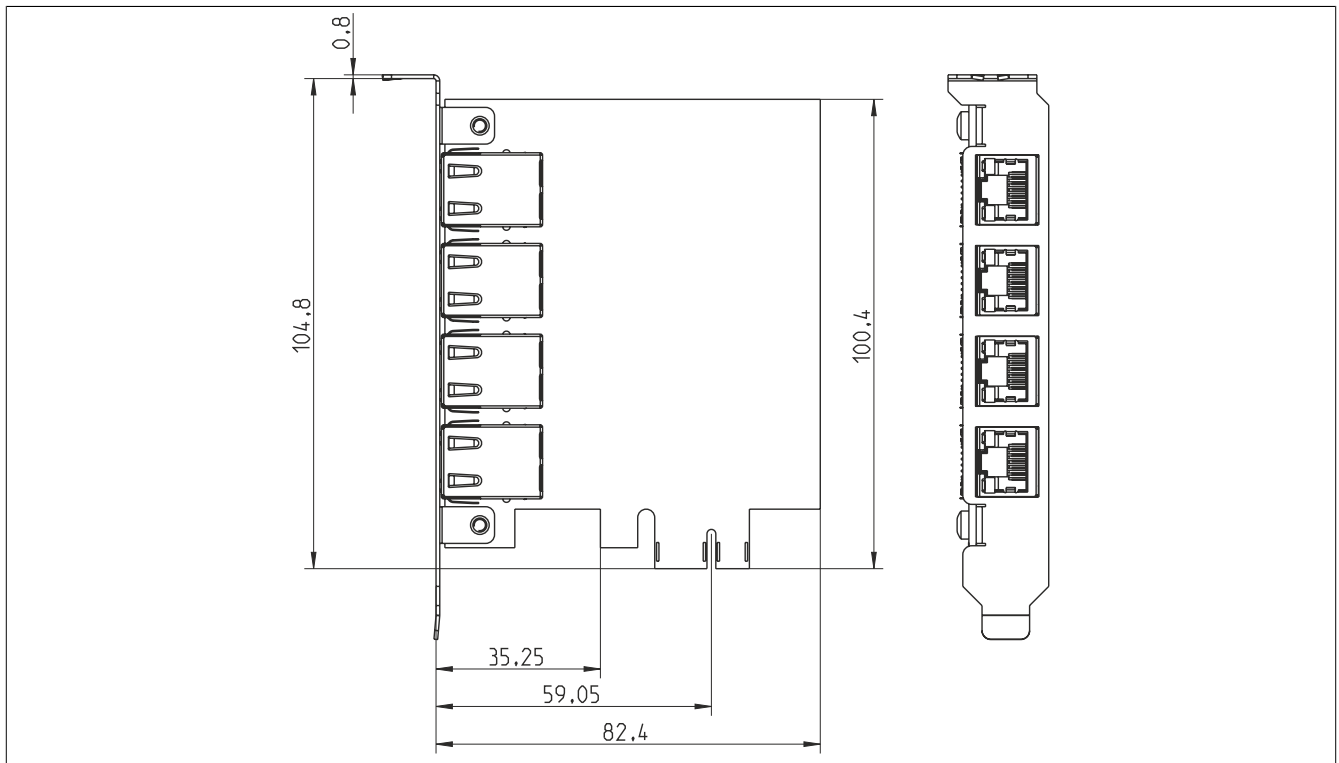


Figure 231: 5ACPCE.ETH4-00 - Dimensions

6 USB flash drives

6.1 5MMUSB.xxxx-01

6.1.1 General information

USB flash drives are easily exchangeable data storage devices. Because of their high-speed data transfer (USB 2.0), USB flash drives are ideal for use as portable storage media. Without requiring additional drivers ("Hot Plug & Play"), the USB flash drive becomes an additional drive where data can be read or written.

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 provide alternative products. The following measures may therefore be necessary in order to also boot from these USB flash drives:

- The USB flash drive must be reformatted or in some cases also repartitioned (set partition as active).
- The USB flash drive must be in the first position of the BIOS boot order; alternatively, the IDE controllers can be disabled in BIOS. This can be avoided in most cases if command "fdisk / mbr" is additionally executed on the USB flash drive.

6.1.2 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 370: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

6.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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	
Certifications		
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 per 10 ¹⁴ bits read	
Connection cycles	>1500	

Table 371: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Model number	5MMUSB.2048-01	5MMUSB.4096-01
Support		
Operating systems		
Windows 10 IoT Enterprise LTSB 64-bit		Yes
Windows Embedded 8.1 Industry Pro 32-bit		Yes
Windows Embedded 8.1 Industry Pro 64-bit		Yes
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 XP Embedded		Yes
Windows 2000		Yes
Windows CE 5.0		Yes
Windows CE 4.2		Yes
B&R Linux 8		Yes
B&R Linux 9		Yes
Electrical characteristics		
Current consumption	Max. 500 µA in sleep mode, max. 120 mA read/write	
Environmental conditions		
Temperature		
Operation	0 to 70°C ²⁾	0 to 70°C ²⁾
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 ²⁾	Max. 3048 m ²⁾
Storage	Max. 12192 m	
Transport	Max. 12192 m	
Mechanical properties		
Dimensions		
Width	17.97 mm	
Length	67.85 mm	
Height	8.35 mm	

Table 371: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

- 1) Indicates data transfer (receiving and transmitting).
- 2) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.

6.1.4 Temperature/Humidity diagram

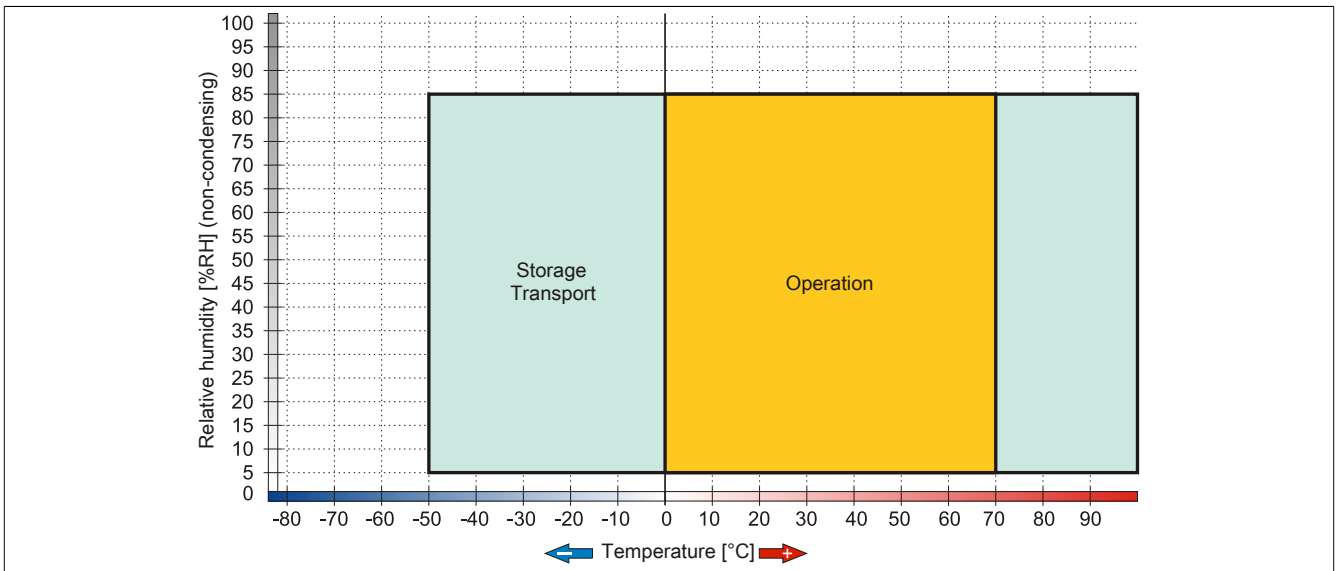


Figure 232: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

6.2 5MMUSB.032G-02

6.2.1 General information

USB flash drives are easily exchangeable data storage devices. Because of their high-speed data transfer (USB 3.0), USB flash drives are ideal for use as portable storage media. Without requiring additional drivers ("Hot Plug & Play"), the USB flash drive becomes an additional drive where data can be read or written. USB 3.0 (XHCI) is supported starting with Windows 7 (USB 3.0 driver required).

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 provide alternative products. The following measures may therefore be necessary in order to also boot from these USB flash drives:

- The USB flash drive must be reformatted or in some cases also repartitioned (set partition as active).
- The USB flash drive must be in the first position of the BIOS boot order; alternatively, the IDE controllers can be disabled in BIOS. This can be avoided in most cases if command "fdisk / mbr" is additionally executed on the USB flash drive.

6.2.2 Order data


Model number	Short description	Figure
5MMUSB.032G-02	USB accessories USB 3.0 flash drive 32 GB MLC	

Table 372: 5MMUSB.032G-02 - Order data

6.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MMUSB.032G-02
General information	
Capacity	32 GB
LED status indicators	1 LED (green) ¹⁾
MTBF	>3,000,000 hours
Type	USB 2.0, USB 3.0
Maintenance	None
Certifications	
CE	Yes
Interfaces	
USB	
Type	USB 2.0, USB 3.0
Connection	To any USB type A interface
Transfer rate	High speed (480 Mbit/s) to SuperSpeed (4 Gbit/s)
Sequential reading	USB 3.0 max. 100 MB/s
Sequential writing	USB 3.0 max. 50 MB/s
Endurance	
MLC flash	Yes
Data reliability	<1 unrecoverable error per 10 ¹⁴ bits read
Connection cycles	>1500
Electrical characteristics	
Current consumption	Max. 67 mA in sleep mode, max. 122 mA read, max. 141 mA write
Environmental conditions	
Temperature	
Operation	0 to 70°C ²⁾
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
Storage	7 to 2000 Hz: 20 g
Transport	7 to 2000 Hz: 20 g
Shock	
Operation	1500g, 0.5 ms
Storage	1500g, 0.5 ms
Transport	1500g, 0.5 ms
Elevation	
Operation	Max. 3048 m ²⁾
Storage	Max. 12192 m
Transport	Max. 12192 m
Mechanical properties	
Dimensions	
Width	16.58 mm
Length	48.30 mm
Height	7.60 mm
Weight	10 g
Manufacturer information	
Manufacturer	Innodisk
Manufacturer's product ID	DEUA1-32GI61BCH88 (USB drive 3ME)

Table 373: 5MMUSB.032G-02 - Technical data

- 1) Indicates data transfer (receiving and transmitting).
- 2) The maximum ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.

6.2.4 Temperature/Humidity diagram

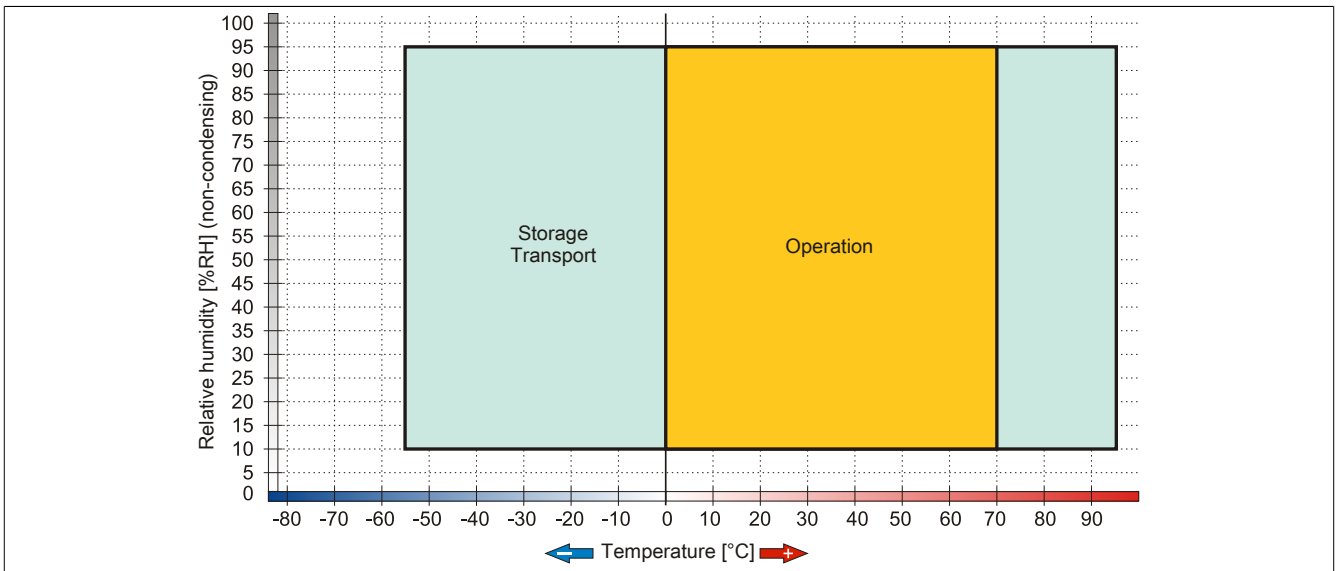


Figure 233: 5MMUSB.032G-02 - Temperature/Humidity diagram

7 USB media drive

7.1 5MD900.USB2-02

7.1.1 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

7.1.2 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	
	Other	
5SWUTI.0000-00	OEM Nero CD-RW Software, only available with a CD writer.	
	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	
	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 374: 5MD900.USB2-02 - Order data

7.1.3 Interfaces

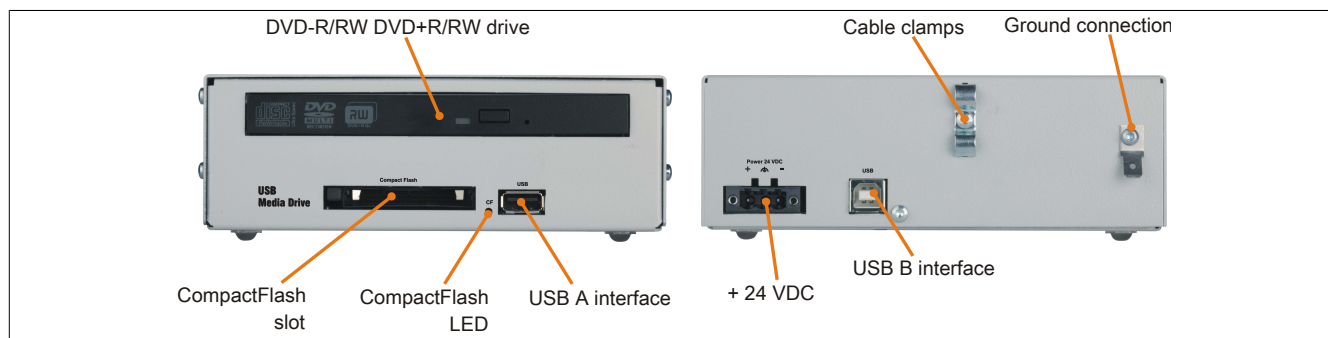


Figure 234: 5MD900.USB2-02 - Interfaces

7.1.4 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5MD900.USB2-02
General information	
Max. cable length	5 m (without hub)
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
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
USB	
Type	USB 2.0
Design	Front: Type A Back: Type B
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 (4.7 GB, 2.6 GB) DVD+R, DVD+R (dual layer), DVD+RW
Laser class	Class 1 laser
Service life	60,000 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 per EN 61131-2	II
Operating conditions	
Degree of protection per EN 60529	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%

Table 375: 5MD900.USB2-02 - Technical data

Model number	5MD900.USB2-02
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 ²⁾	
Operation	Max. 3000 m
Mechanical properties	
Dimensions	
Width	156 mm
Height	52 mm
Depth	140 mm
Weight	Approx. 1100 g (without front cover)

Table 375: 5MD900.USB2-02 - Technical data

- 1) EN 60950 requirements must be observed; see section "+24 VDC power supply" of the user's manual.
- 2) Temperature specifications refer to operation at 500 meters. The max. ambient temperature is typically derated by 1°C per 1000 meters starting at 500 meters above sea level.

7.1.5 Dimensions

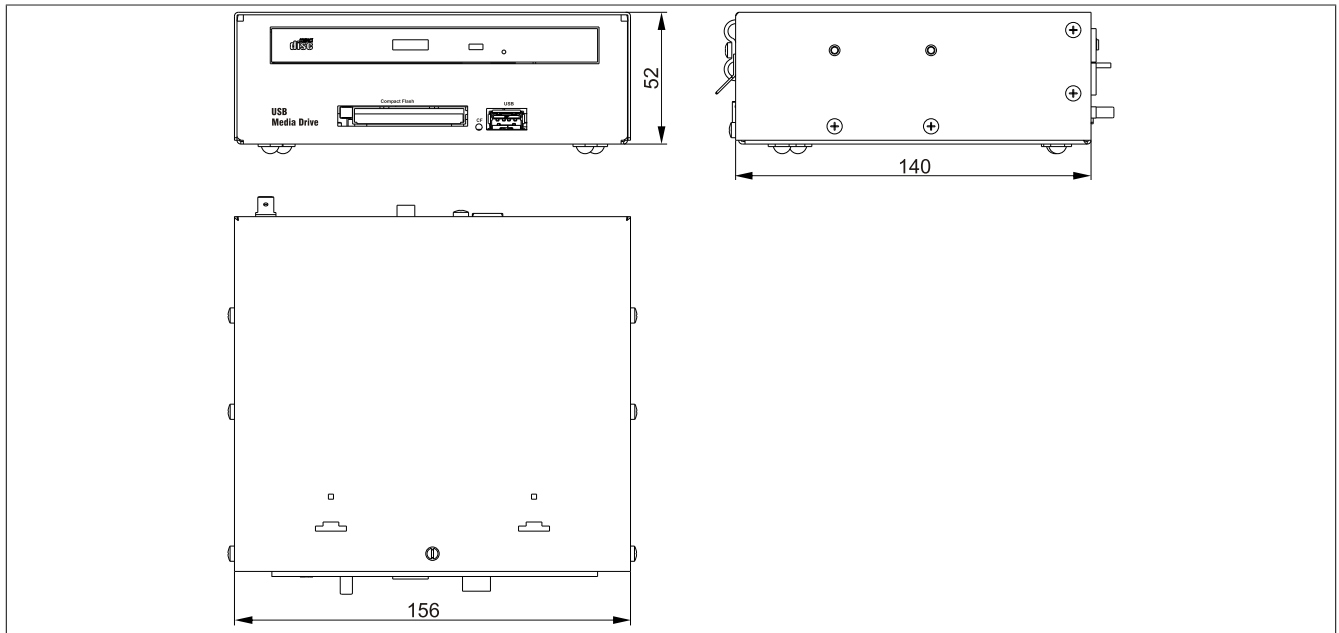


Figure 235: 5MD900.USB2-02 - Dimensions

7.1.6 Dimensions with front cover

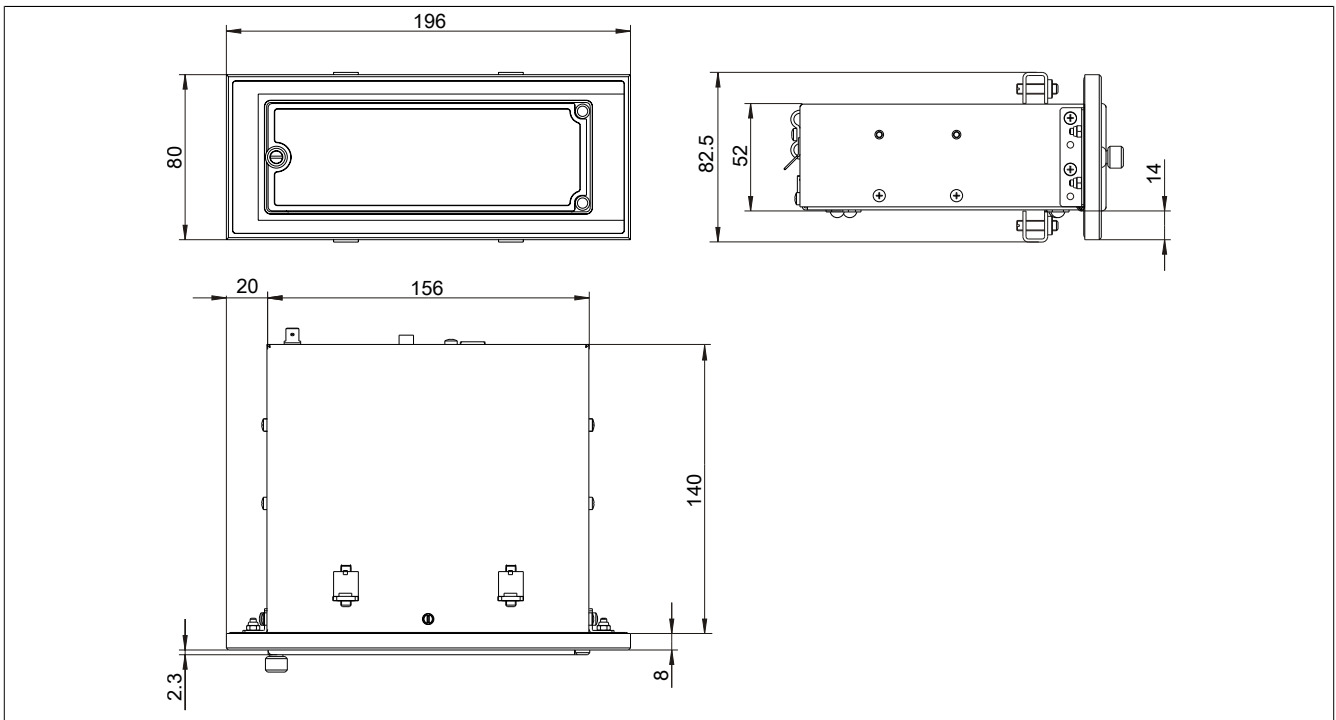


Figure 236: USB media drive with front cover - Dimensions

7.1.7 Cutout installation

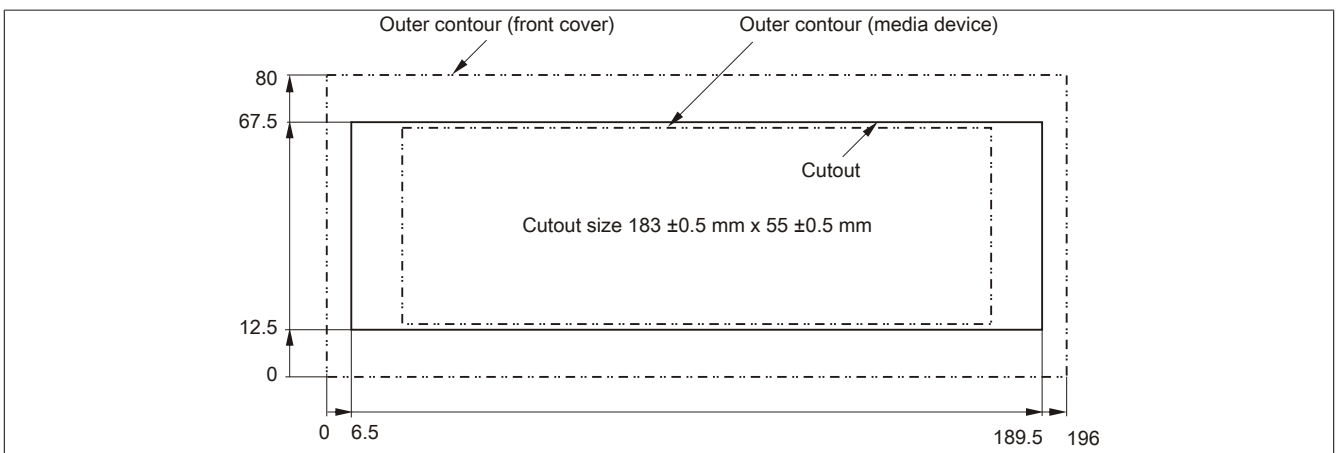


Figure 237: USB media drive with front cover - Installation cutout

7.1.8 Content of delivery

Quantity	Component
1	USB media drive
2	Mounting rail brackets

Table 376: 5MD900.USB2-02 - Content of delivery

7.1.9 Installation

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

7.1.9.1 Mounting orientations

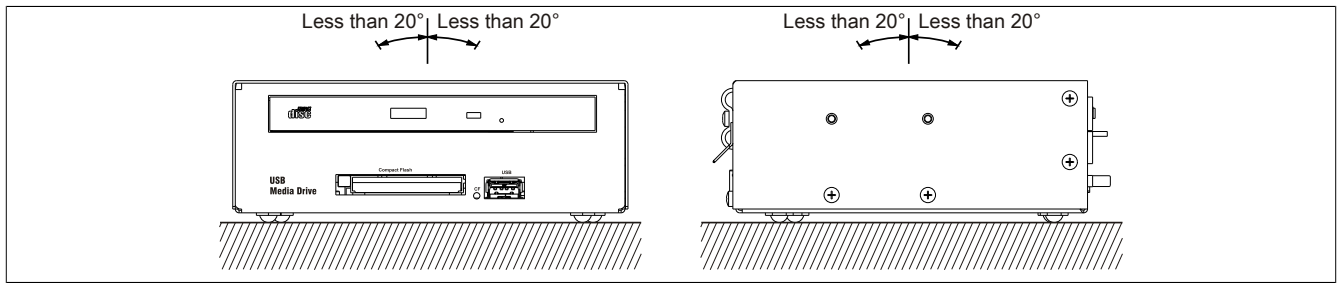


Figure 238: 5MD900.USB2-02 - Mounting orientation

7.2 5A5003.03

7.2.1 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.

7.2.2 Order data


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

Table 377: 5A5003.03 - Order data

7.2.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5A5003.03
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
GOST-R	Yes
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Mechanical properties	
Front	
Keypad overlay	
Light background	Similar to Pantone 427CV
Dimensions	
Width	196 mm
Height	80 mm
Depth	8 mm

Table 378: 5A5003.03 - Technical data

7.2.4 Dimensions

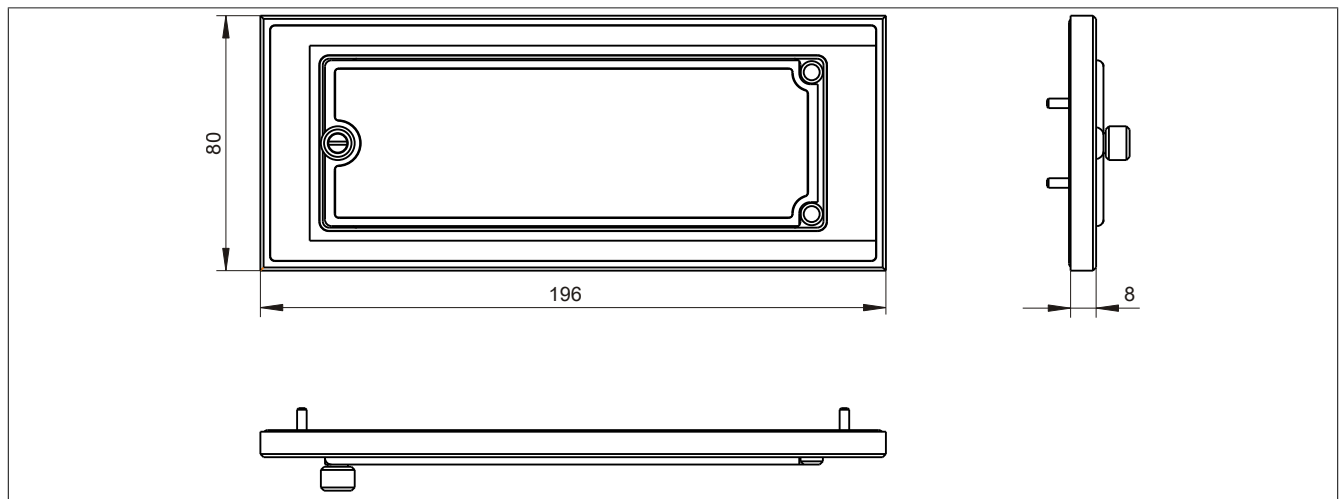


Figure 239: 5A5003.03 - Dimensions

7.2.5 Content of delivery

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

Table 379: 5A5003.03 - Content of delivery

7.2.6 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.

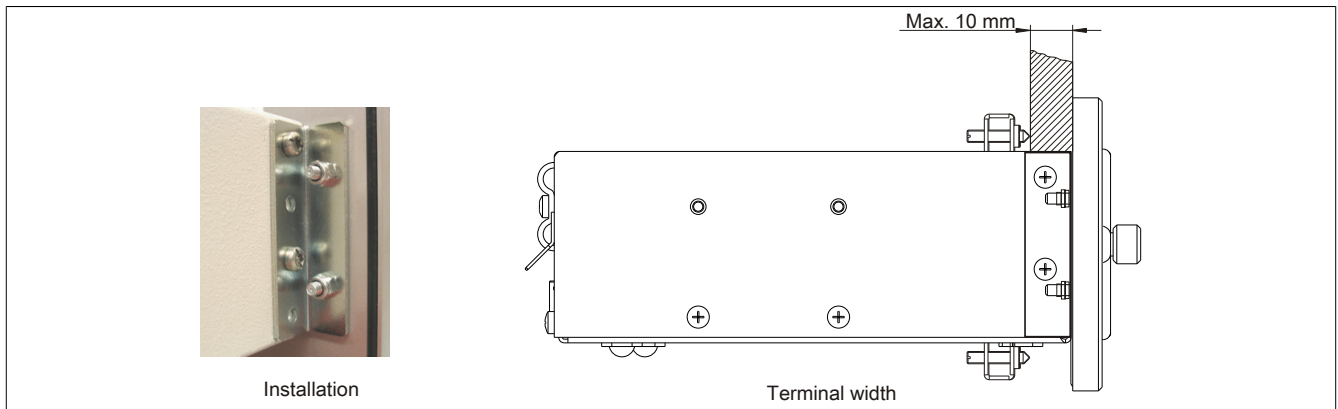


Figure 240: Front cover mounting and installation depth

7.2.6.1 Cutout installation

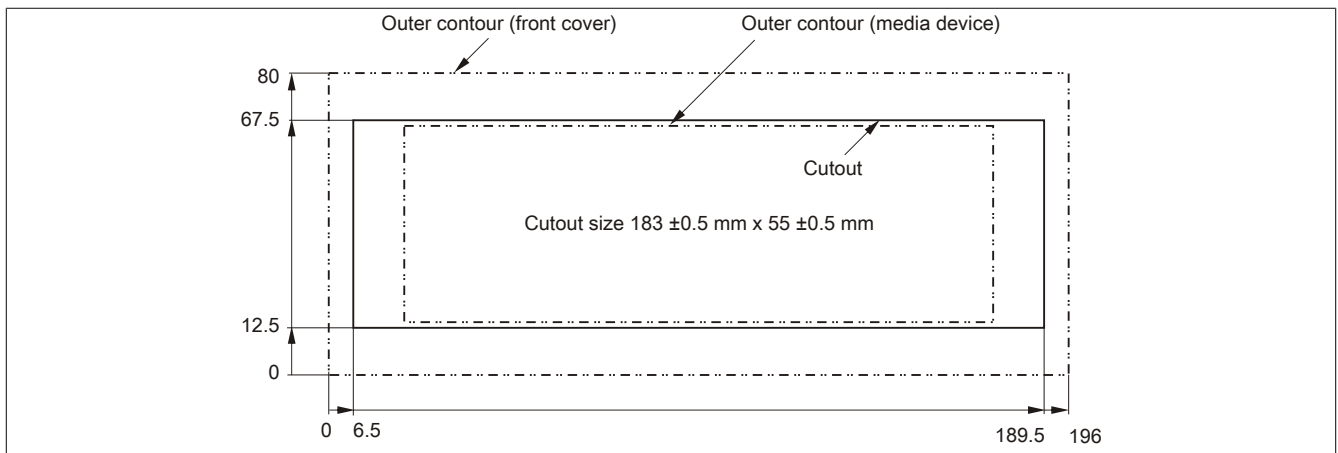


Figure 241: USB media drive with front cover - Installation cutout

8 Replacement disk tray

8.1 5AC901.FRAM-00

8.1.1 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.

8.1.2 Order data


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

Table 380: 5AC901.FRAM-00 - Order data

8.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC901.FRAM-00
General information	
Certifications	
CE	Yes
UL	Not relevant
Mechanical properties	
Dimensions	
Width	117 mm
Height	105.5 mm
Depth	17 mm

Table 381: 5AC901.FRAM-00 - Technical data

8.1.4 Dimensions

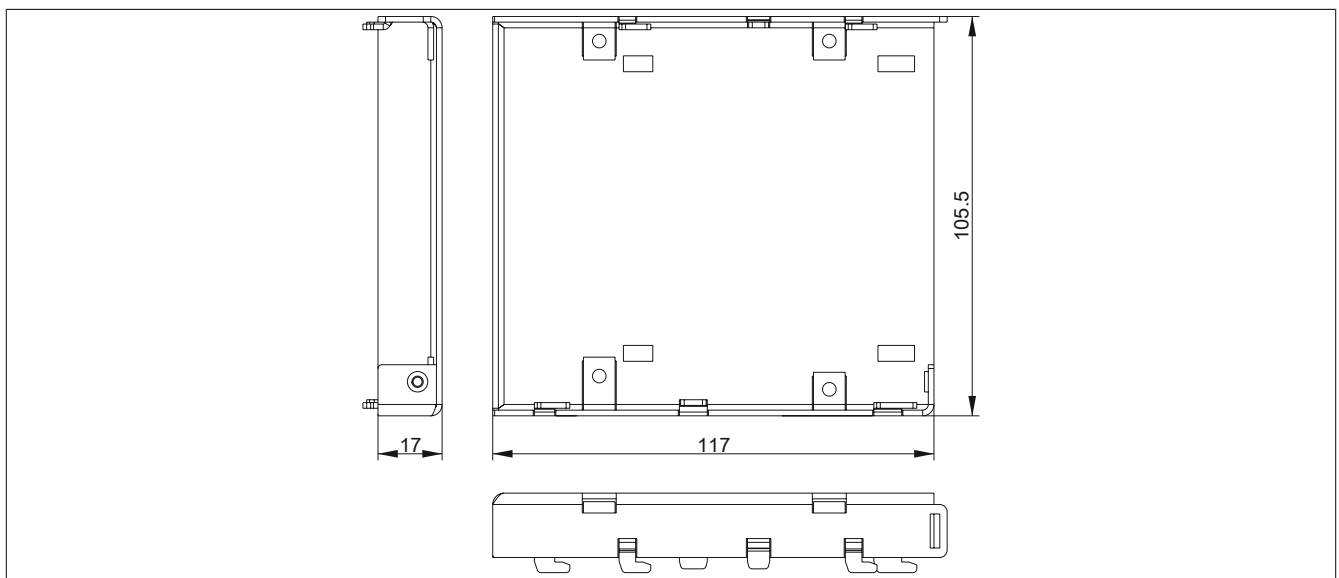


Figure 242: 5AC901.FRAM-00 - Dimensions

9 Cables

9.1 DVI cables

9.1.1 5CADVI.0xxx-00

9.1.1.1 General information

5CADVI.0xxx-00 DVI cables are designed for use in fixed installations.

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

9.1.1.2 Order data


Model number	Short description	Figure
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 382: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data

9.1.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CADVI.0018-00	5CADVI.0050-00	5CADVI.0100-00
General information			
Certifications			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾		
GOST-R	Yes		
Cable construction			
Wire cross section	28 AWG		
Shield	Individual cable pairs, entire cable		
Complete shielding	Tinned copper braiding, optical coverage >86%		
Outer jacket			
Material	PVC		
Color	Beige		
Labeling	AWM STYLE 20276 80°C 30 V 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		
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		
Mechanical properties			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter	Max. 8.5 mm		
Bend radius	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)		
Weight	Approx. 260 g	Approx. 460 g	Approx. 790 g

Table 383: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

9.1.1.4 Bend radius specifications

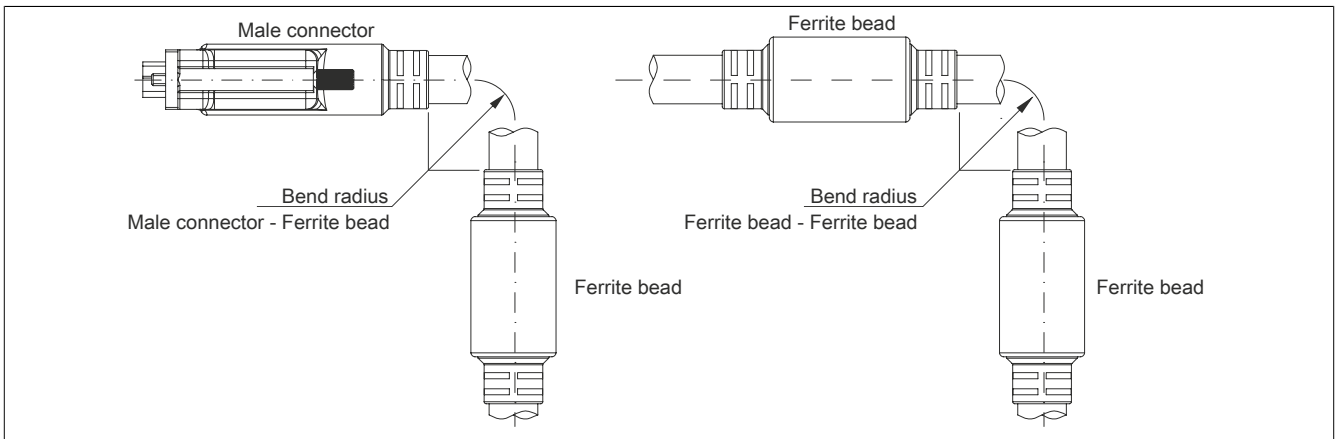


Figure 243: Bend radius specifications

9.1.1.5 Dimensions

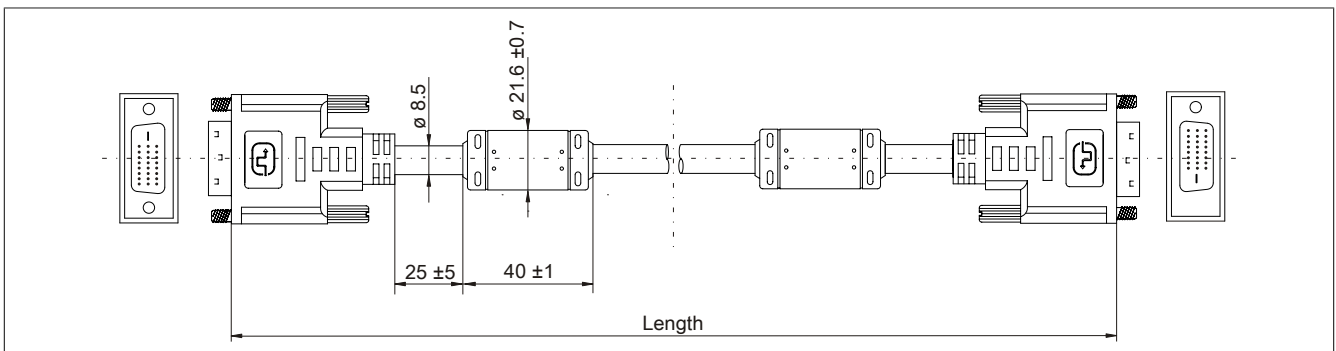


Figure 244: 5CADVI.0xxx-00 - Dimensions

9.1.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

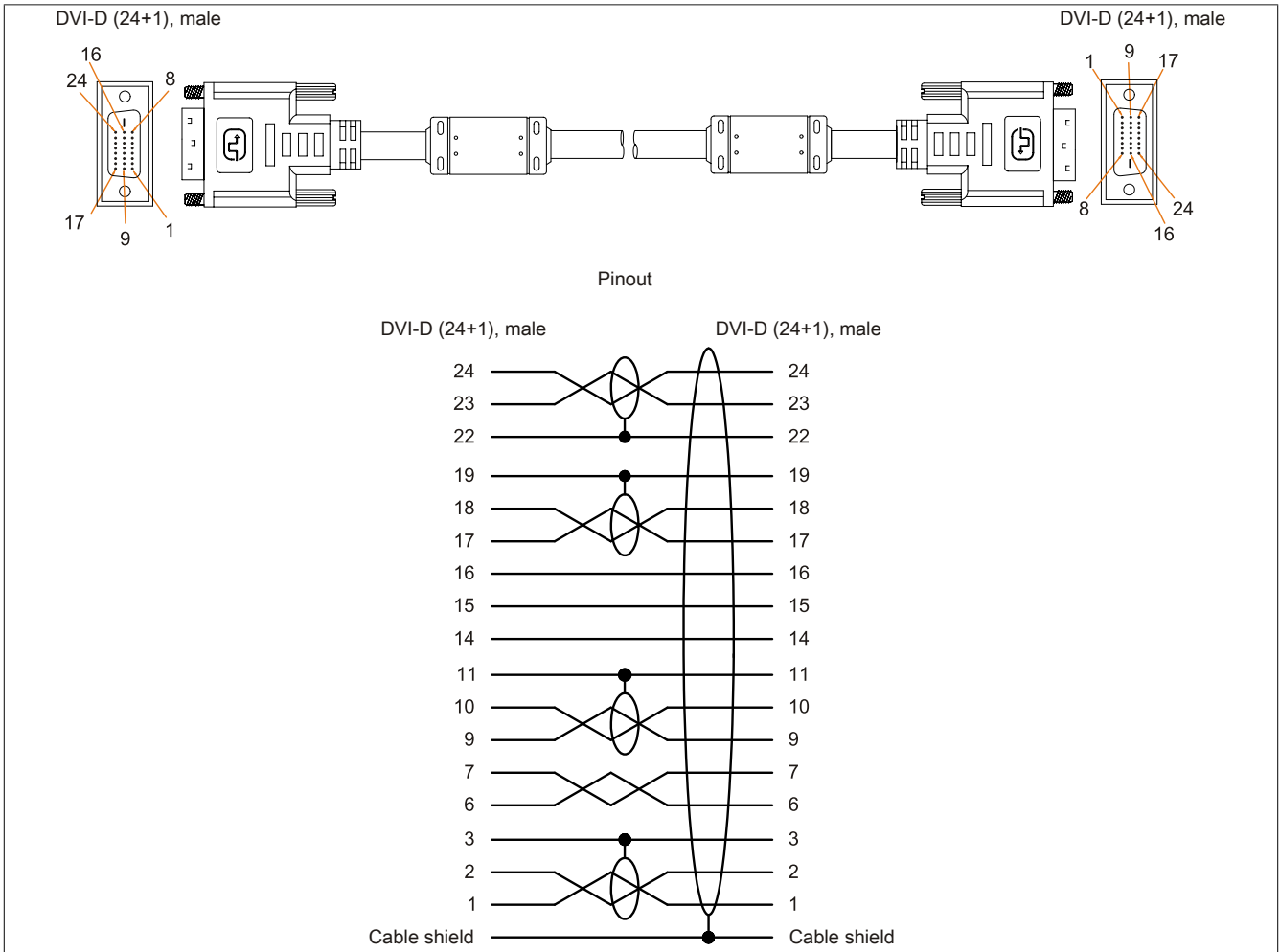


Figure 245: 5CADVI.0xxx-00 - Pinout

9.2 SDL cables

9.2.1 5CASDL.0xxx-00

9.2.1.1 General information

5CASDL.0xxx-00 SDL cables are designed for use in fixed installations. 5CASDL.0xxx-03 SDL flex cables are required for flexible installations (e.g. swing arm systems).

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

9.2.1.2 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 384: 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

9.2.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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								
Certifications								
CE	Yes							
UL	cULus E115267 Industrial control equipment							
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 ¹⁾							
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾							
GOST-R	-	Yes						
Cable construction								
Wire cross section	28 AWG			24 AWG				
Shield	Individual cable pairs, entire cable							
Complete shielding	Tinned copper braiding, optical coverage >85%							
Outer jacket								
Material	PVC							
Color	Black							
Labeling	E74020-C (UL) AWM STYLE 20176 80°C 30 V 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 strain relief							
Locating screw tightening torque	Max. 0.5 Nm							
Electrical characteristics								
Conductor resistance								
24 AWG	-			≤93 Ω/km				
28 AWG	≤237 Ω/km			-				

Table 385: 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

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
Insulation resistance	Min. 10 MΩ/km							
Operating conditions								
Pollution degree per EN 61131-2	Pollution degree 2							
Mechanical properties								
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				
Bend 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 385: 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 in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

9.2.1.4 Bend radius specifications

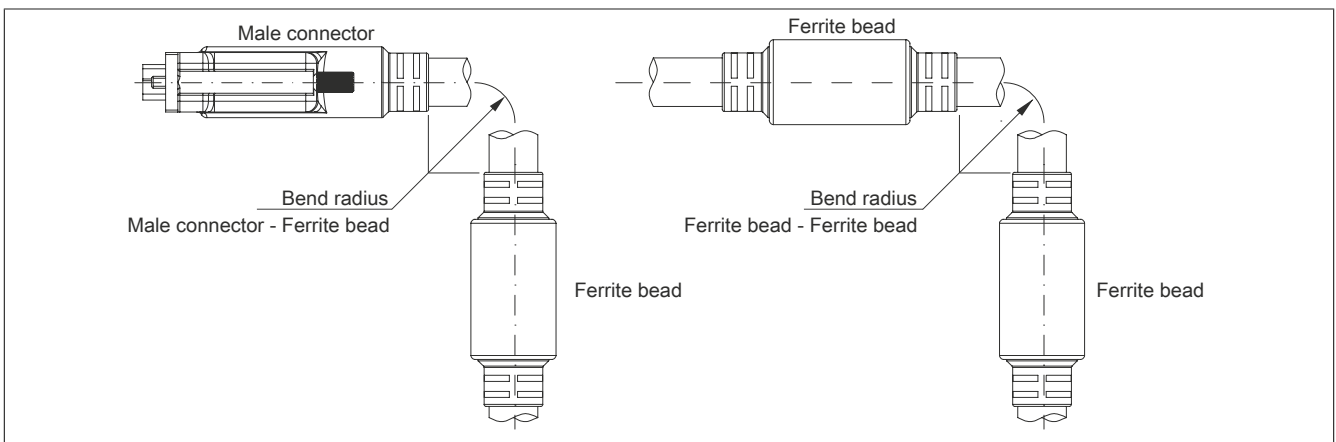


Figure 246: Bend radius specifications

9.2.1.5 Dimensions

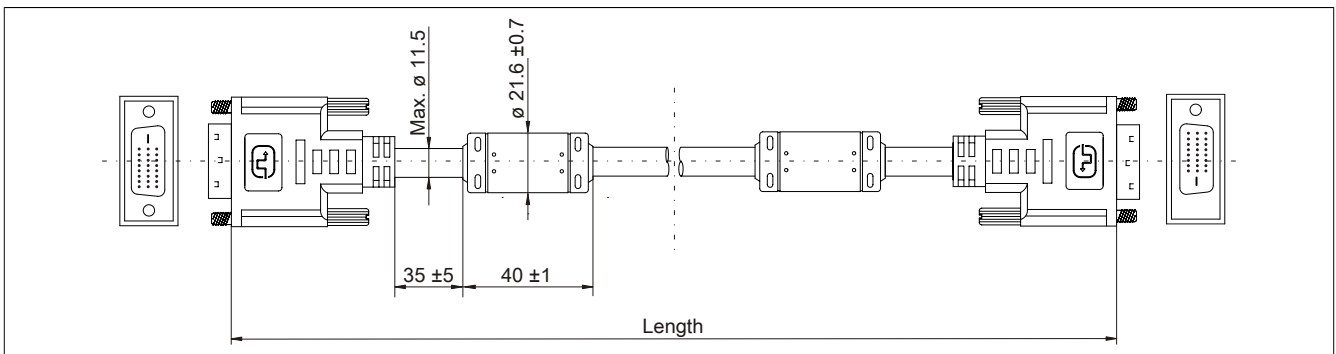


Figure 247: 5CASDL.0xxx-00 - Dimensions

9.2.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

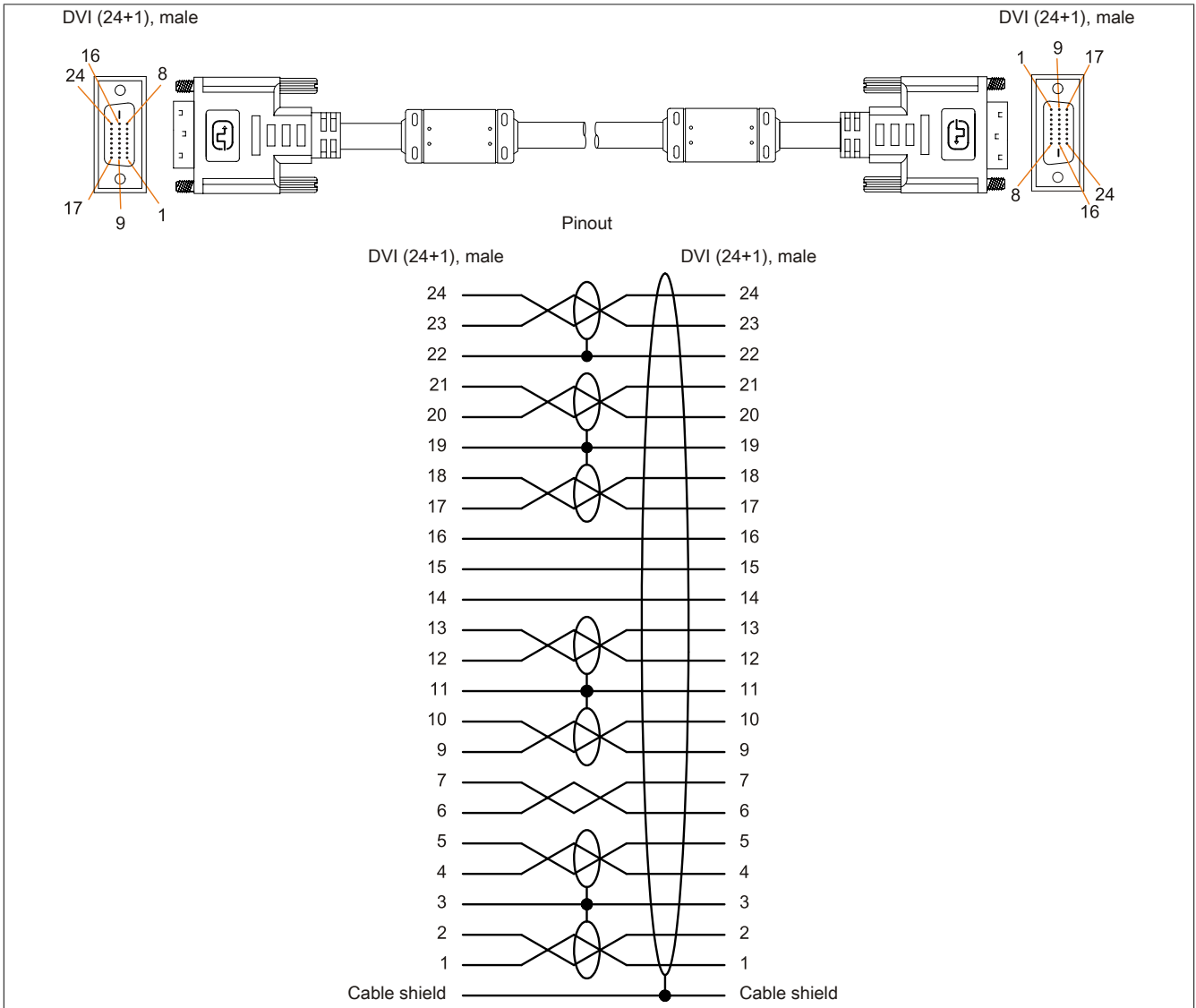


Figure 248: 5CASDL.0xxx-00 - Pinout

9.3 SDL cables with 45° male connector

9.3.1 5CASDL.0xxx-01

9.3.1.1 General information

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

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

9.3.1.2 Order data


Model number	Short description	Figure
	SDL cables 45° connection	
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 386: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Order data

9.3.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CASDL.0018-01	5CASDL.0050-01	5CASDL.0100-01	5CASDL.0150-01
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 ¹⁾			
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾			
GOST-R	Yes			
Cable construction				
Wire cross section	28 AWG		24 AWG	
Shield	Individual cable pairs, entire cable			
Complete shielding	Tinned copper braiding, optical coverage >85%			
Outer jacket				
Material	PVC			
Color	Black			
Connector				
Type	2x DVI-D (24+1), male			
Connection cycles	100			
Contacts	Gold-plated			
Mechanical protection	Metal cover with crimped strain relief			
Locating screw tightening torque	Max. 0.5 Nm			
Electrical characteristics				
Conductor resistance				
24 AWG	-		≤93 Ω/km	
28 AWG	≤237 Ω/km		-	
Insulation resistance	Min. 10 MΩ/km			
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			
Mechanical properties				
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	

Table 387: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

Model number	5CASDL.0018-01	5CASDL.0050-01	5CASDL.0100-01	5CASDL.0150-01
Bend radius	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)			
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 387: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

9.3.1.4 Bend radius specifications

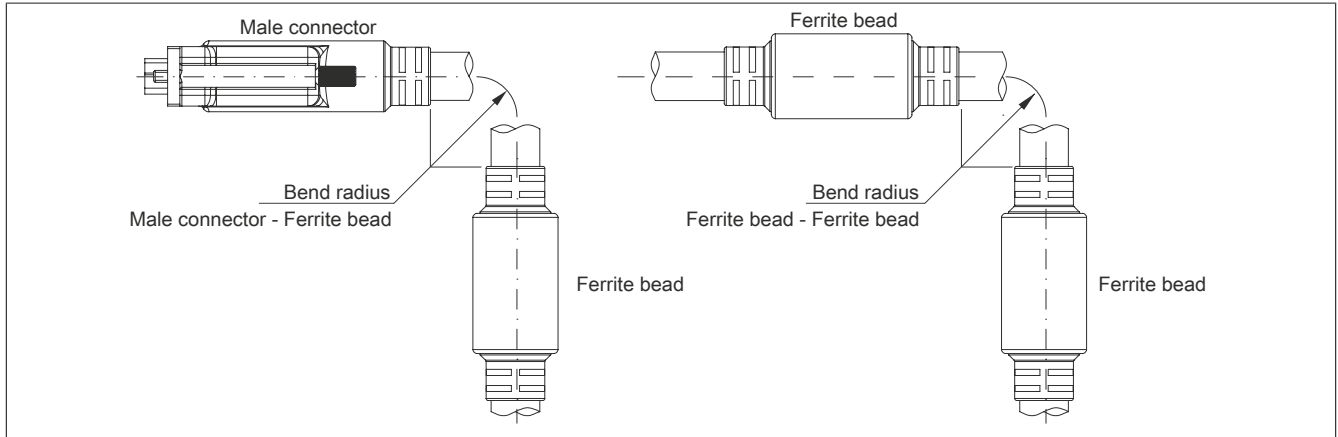


Figure 249: Bend radius specifications

9.3.1.5 Dimensions

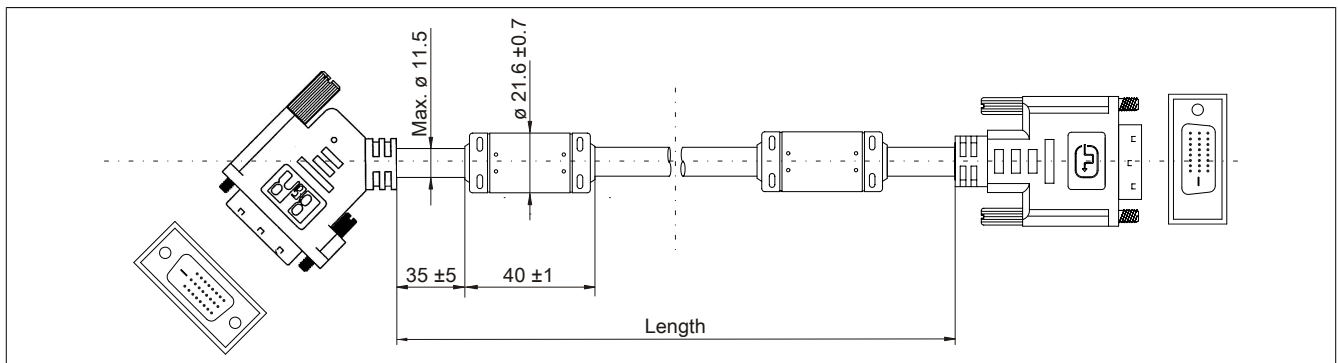


Figure 250: 5CASDL.0xxx-01 - Dimensions

9.3.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

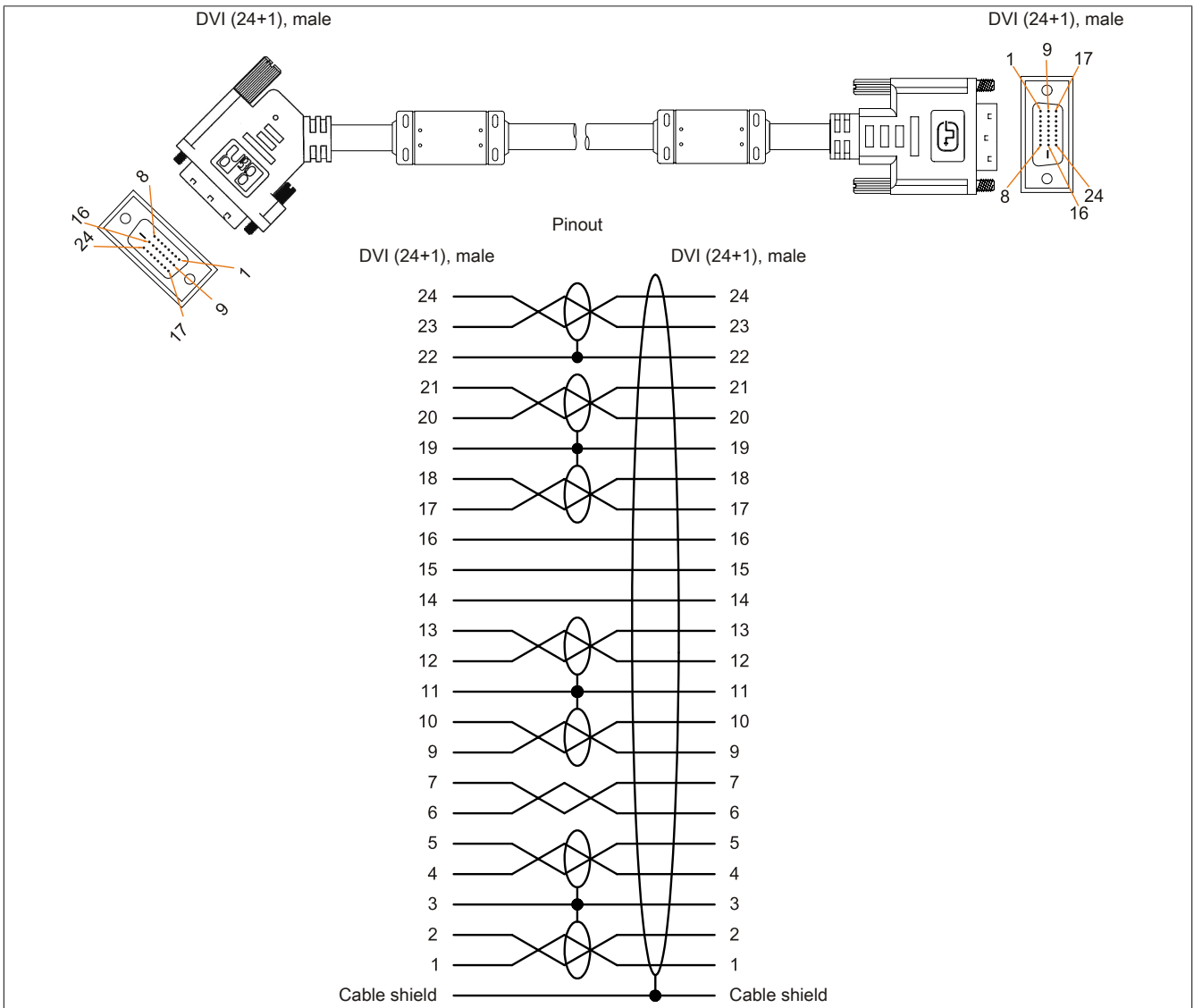


Figure 251: 5CASDL.0xxx-01 - Pinout

9.4 SDL flex cables

9.4.1 5CASDL.0xxx-03

9.4.1.1 General information

5CASDL.0xxx-03 SDL flex cables are designed for use in both fixed and flexible installations (e.g. swing arm systems).

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

9.4.1.2 Order data


Model number	Short description	Figure
	SDL cables flex	
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 388: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Order data

9.4.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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							
Certifications							
CE	Yes						
UL	cULus E115267 Industrial control equipment						
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations						
DNV GL	Class I, Division 2, Groups ABCD, T4 ¹⁾ Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾						
GOST-R	Yes						
Cable construction							
Wire cross section	24 AWG (control wires) 26 AWG (DVI, USB, data)						
Properties	Silicone- and halogen-free						
Shield	Individual cable pairs, entire cable						
Complete shielding	Aluminum-clad foil and tinned copper braiding						
Outer jacket							
Material	Special semi-matte TMPU						
Color	Black						
Labeling	(B&R) SDL cable (UL) AWM 20236 80°C 30 V E 63216						
Connector							
Type	2x DVI-D (24+1), male						
Connection cycles	Min. 200						
Contacts	Gold-plated						
Mechanical protection	Metal cover with crimped strain relief						
Locating screw tightening torque	Max. 0.5 Nm						
Electrical characteristics							
Operating voltage	≤30 V						

Table 389: 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
Test voltage							
Wire/Wire	1 kV						
Wire/Shield	0.5 kV						
Wave impedance	100 ±10 Ω						
Conductor resistance							
24 AWG	≤95 Ω/km						
26 AWG	≤145 Ω/km						
Insulation resistance	>200 MΩ/km						
Operating conditions							
Pollution degree per EN 61131-2	Pollution degree 2						
Approbation	UL AWM 20236 80°C 30 V						
Flame-retardant	Per UL 758 (cable vertical flame test)						
Oil and hydrolysis resistance	Per VDE 0282-10						
Environmental conditions							
Temperature							
Storage	-20 to 80°C						
Fixed installation	-20 to 80°C						
Flexible installation	-5 to 60°C						
Mechanical properties							
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						
Bend radius							
Fixed installation	≥3.5x cable diameter						
Flexible installation	≥15x cable diameter (ferrite bead - ferrite bead)						
Flexibility	Flexible, applies to ferrite bead - ferrite bead (tested 300000 cycles with 15x cable diameter, 4800 cycles/hour)						
Drag chain data							
Flex cycles	300,000						
Speed	4800 cycles/hour						
Bend 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 389: 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 in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

9.4.1.4 Bend radius specifications

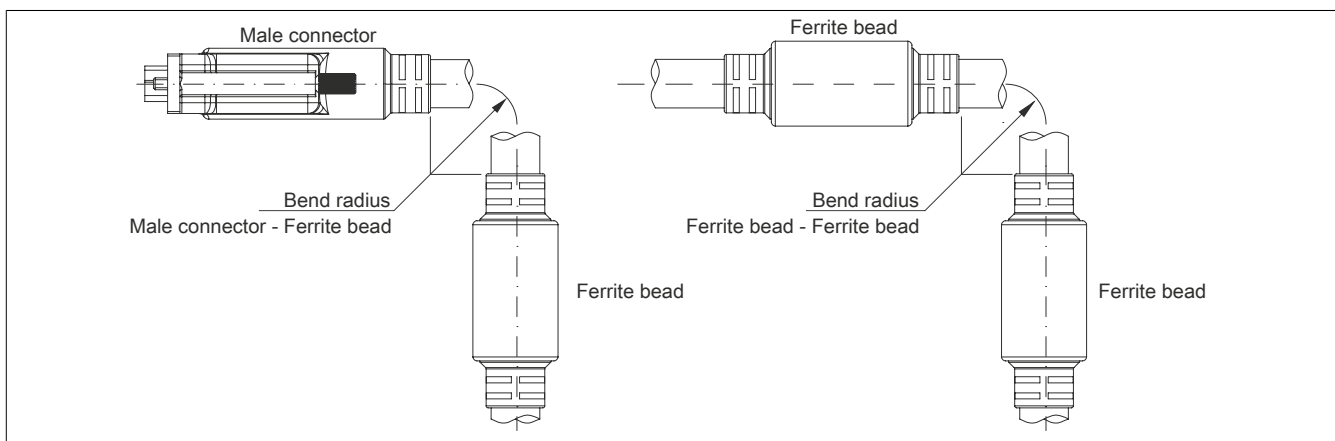


Figure 252: Bend radius specifications

9.4.1.5 Dimensions

All dimensions are specified in mm.

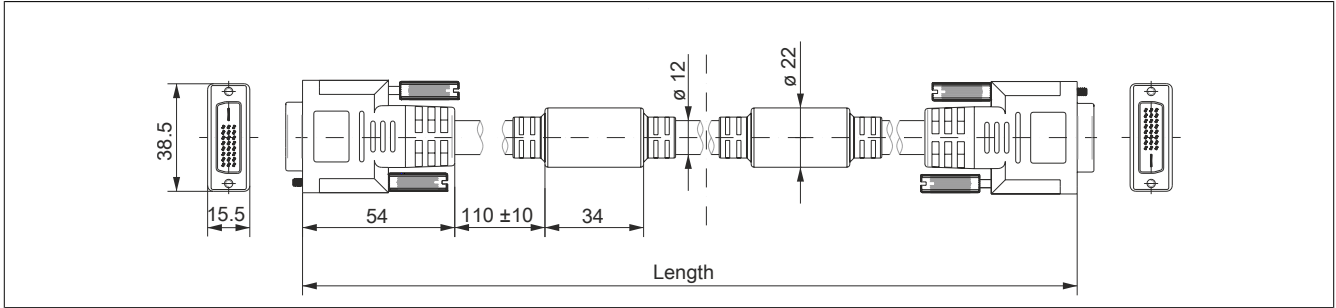


Figure 253: 5CASDL.0xxx-03 ≥Rev. E0 - Dimensions

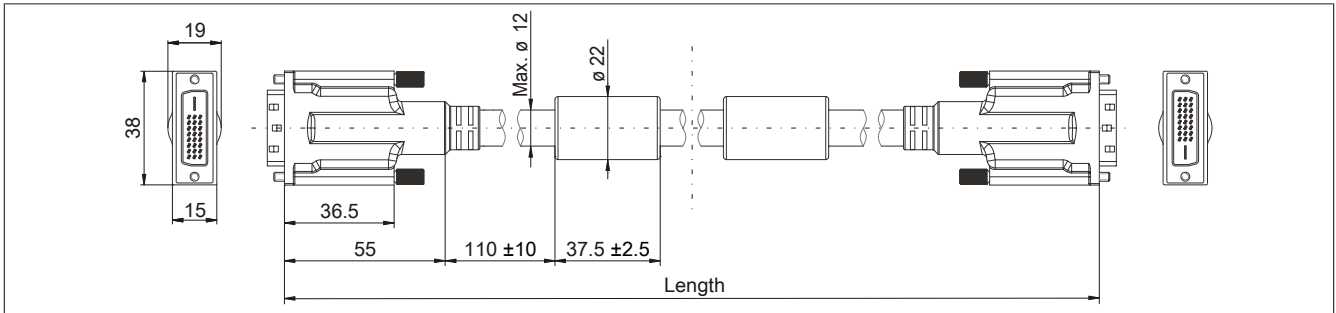


Figure 254: 5CASDL.0xxx-03 ≤Rev. D0 - Dimensions

9.4.1.6 Construction

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 390: 5CASDL.0xxx-03 SDL flex cables - Construction

9.4.1.7 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

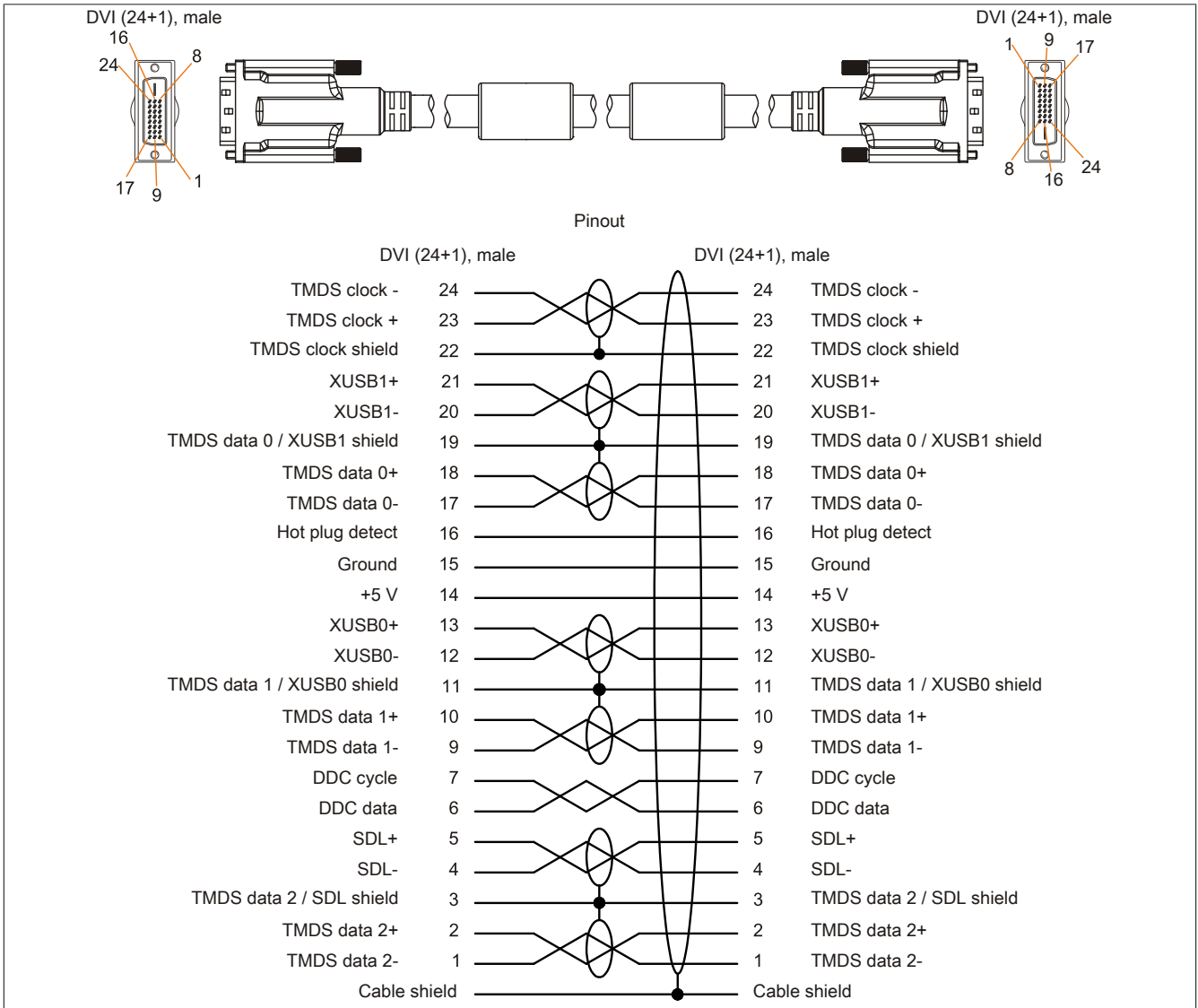


Figure 255: 5CASDL.0xxx-03 - Pinout

9.5 SDL flex cables with extender

9.5.1 5CASDL.0xx0-13

9.5.1.1 General information

5CASDL.0xx0-13 SDL flex cables with extender are designed for use in both fixed and flexible installations (e.g. swing arm systems).

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

9.5.1.2 Order data


Model number	Short description	Figure
	SDL cables flex	
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 391: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Order data

9.5.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
General information			
Certifications			
CE		Yes	
UL		cULus E115267 Industrial control equipment	
HazLoc		cULus HazLoc E180196 Industrial control equipment for hazardous locations	
DNV GL		Class I, Division 2, Groups ABCD, T4 ¹⁾ Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾	
GOST-R		Yes	
Cable construction			
Wire cross section		24 AWG (control wires) 26 AWG (DVI, USB, data)	
Properties		Silicone- and halogen-free	
Shield		Individual cable pairs, entire cable	
Complete shielding		Aluminum-clad foil and tinned copper braiding	
Outer jacket			
Material		Special semi-matte TMPU	
Color		Black	
Labeling		(B&R) SDL cable (UL) AWM 20236 80°C 30 V E63216	
Connector			
Type		2x DVI-D (24+1), male	
Connection cycles		Min. 200	
Contacts		Gold-plated	
Mechanical protection		Metal cover with crimped strain 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			
24 AWG		≤95 Ω/km	
26 AWG		≤145 Ω/km	
Insulation resistance		>200 MΩ/km	

Table 392: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

Model number	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
Operating conditions			
Pollution degree per EN 61131-2		Pollution degree 2	
Approbation		UL AWM 20236 80°C 30 V	
Flame-retardant		Per UL 758 (cable vertical flame test)	
Oil and hydrolysis resistance		Per VDE 0282-10	
Environmental conditions			
Temperature			
Storage		-20 to 60°C	
Fixed installation		-20 to 60°C	
Flexible installation		-5 to 60°C	
Mechanical properties			
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	
Bend radius			
Fixed installation		≥6x cable diameter (male connector - ferrite bead) ≥10x cable diameter (ferrite bead - ferrite bead)	
Flexible installation		≥15x cable diameter (ferrite bead - ferrite bead)	
Flexibility		Flexible, applies to ferrite bead - ferrite bead (tested 300000 cycles with 15x cable diameter, 4800 cycles/hour)	
Drag chain data			
Flex cycles		300,000	
Speed		4800 cycles/hour	
Bend 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 392: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

- 1) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

9.5.1.4 Bend radius specifications

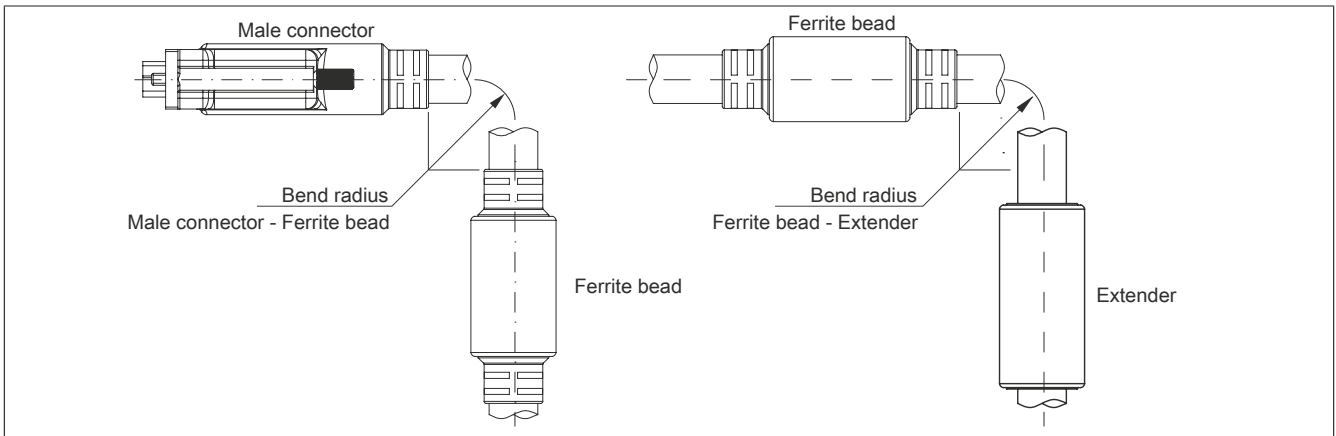


Figure 256: Bend radius specification with extender

9.5.1.5 Dimensions

All dimensions are specified in mm.

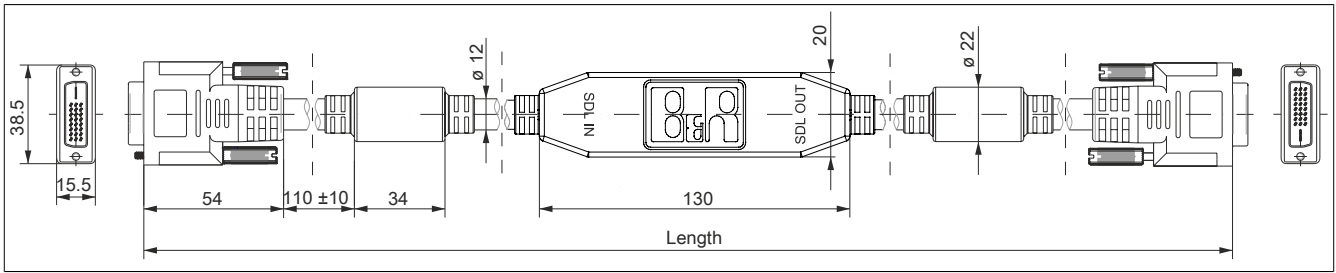


Figure 257: 5CASDL.xxxx-13 ≥Rev. E0 - Dimensions

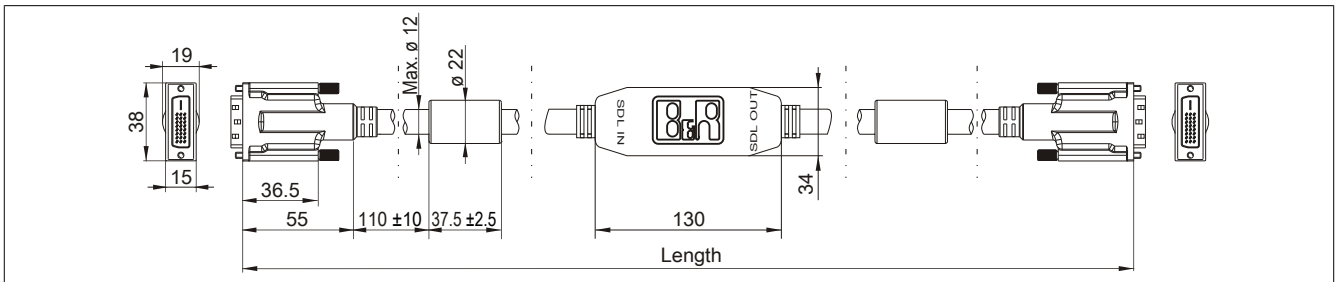


Figure 258: 5CASDL.0xx0-13 ≤Rev. D0 - Dimensions

9.5.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

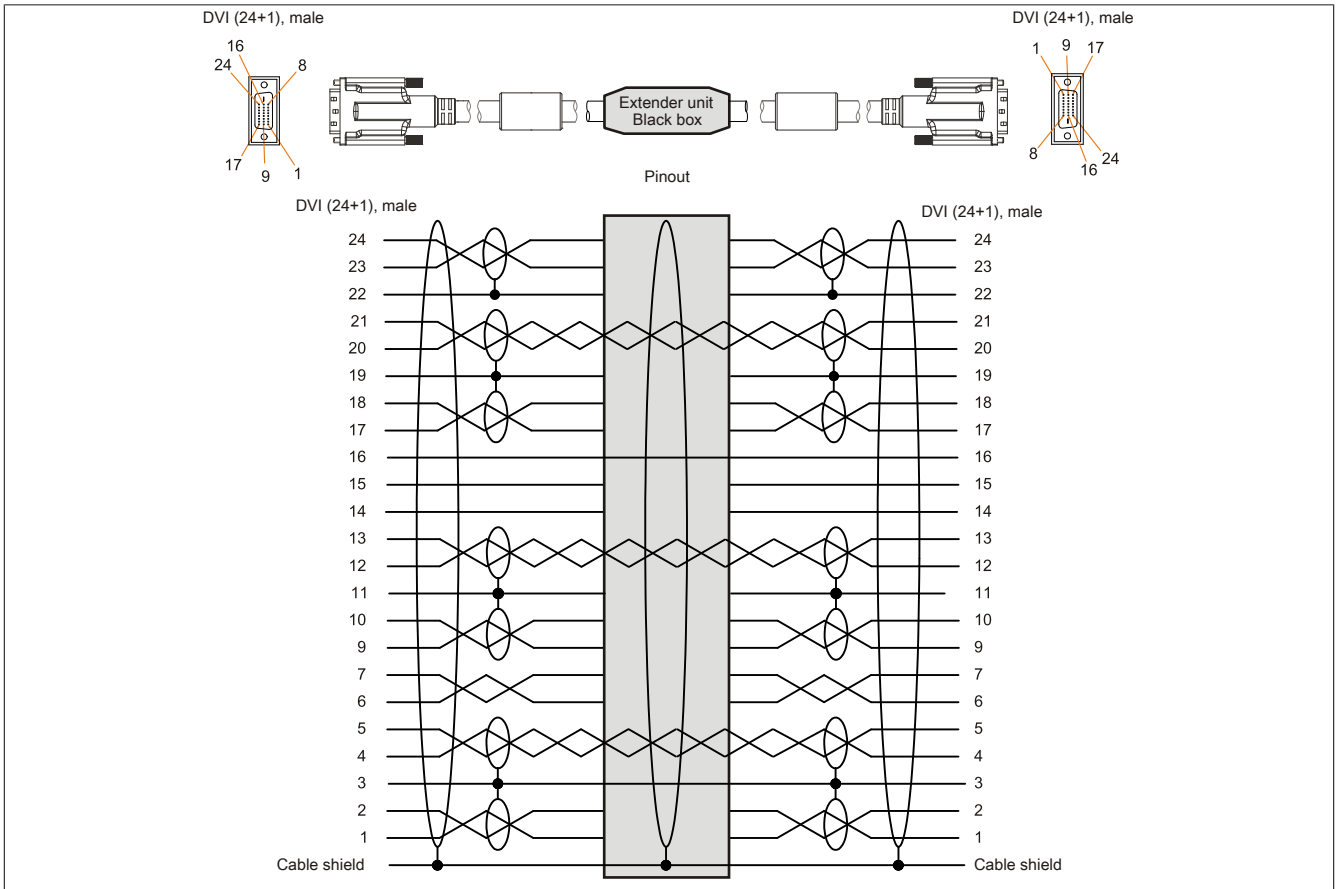


Figure 259: 5CASDL.0xx0-13 - Pinout

9.5.1.7 Cable connection

SDL flex cables with extender must be connected between the B&R industrial PC and Automation Panel in the correct direction. The correct signal direction is indicated on the extender.

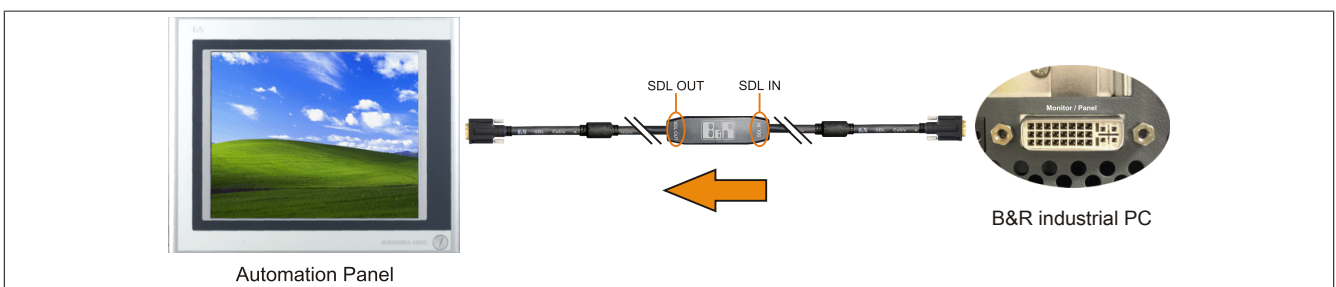


Figure 260: Signal direction for SDL flex cable with extender - Example

9.6 SDL3/SDL4 cables

9.6.1 5CASD3.xxxx-00

9.6.1.1 General information

5CASD3.xxxx-00 SDL3/SDL4 cables are designed to transfer SDL3/SDL4 data and simplify cable installation. The RJ45 connector allows these cables to be connected in very narrow spaces, for example in swing arm shafts.

Caution!

The cable is only permitted to be connected or disconnected when the power is switched off.

9.6.1.2 Order data


Model number	Short description	Figure
	SDL3/SDL4 cables	
5CASD3.0030-00	SDL3/SDL4 cable - 3 m	
5CASD3.0050-00	SDL3/SDL4 cable - 5 m	
5CASD3.0100-00	SDL3/SDL4 cable - 10 m	
5CASD3.0150-00	SDL3/SDL4 cable - 15 m	
5CASD3.0200-00	SDL3/SDL4 cable - 20 m	
5CASD3.0300-00	SDL3/SDL4 cable - 30 m	
5CASD3.0500-00	SDL3/SDL4 cable - 50 m	
5CASD3.1000-00	SDL3/SDL4 cable - 100 m	

Table 393: 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

9.6.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

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								
Certifications								
CE	Yes							
UL	cULus E115267 Industrial control equipment							
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 ¹⁾							
Cable construction								
Wire cross section	4x 2x 26/7 AWG				4x 2x 23/1 AWG			
Properties	Flame-retardant, halogen-free, lead-free							
Outer jacket								
Material	Polyurethane (PUR)							
Color	Yellow, RAL 1021							
Labeling	HARTING INDUSTRIAL CABLE S/FTP CAT 6A PUR 4x2xAWG26/7				HARTING INDUSTRIAL INSTALLATION CABLE S/FTP CAT 7 PUR 4x2xAWG23/1			
Lines								
Wire insulation	Polyethylene (PE)							
Wire colors	Green/White-green, orange/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 ²⁾								
Operating voltage	≤100 V				≤125 V			
Conductor resistance	≤290 Ω/km				≤75 Ω/km			
Wave impedance	100 ±5 Ω (at 100 MHz)							

Table 394: 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
Transfer properties	Category 6A / Class EA up to 500 MHz per ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)					Category 7 / Class F up to 600 MHz per ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)		
Insulation resistance	≥500 MΩ/km					≥5 GΩ/km		
Operating conditions								
Pollution degree per EN 61131-2	Pollution degree 2							
Flame-retardant	IEC 60332-1-2							
Oil and hydrolysis resistance	EN 60811-2-1 (90°C / 7x24 h)							
Degree of protection per EN 60529	IP20							
Cables	IP20							
RJ45 connector	IP20, only when properly connected							
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 properties								
Dimensions								
Length	3 m	5 m	10 m	15 m	20 m	30 m	50 m	100 m
Diameter	6.7 mm					8.3 mm		
Bend 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 394: 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) Yes, although applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
- 2) At an ambient temperature of 20°C.

9.6.1.4 Bend radius specifications

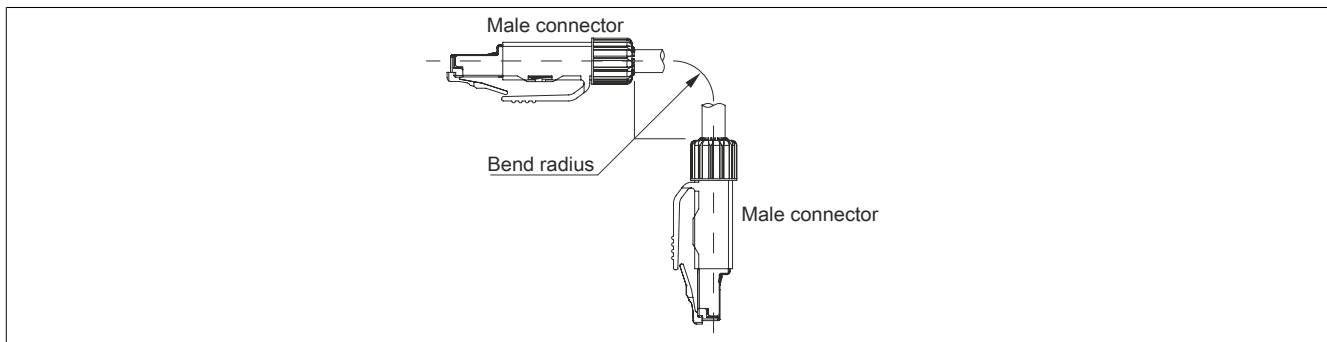


Figure 261: SDL3/SDL4 bending radius specification

9.6.1.5 Dimensions

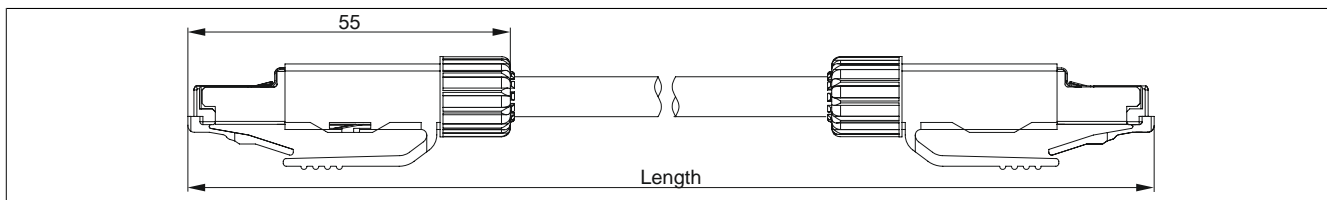


Figure 262: 5CASD3.xxxx-00 - Dimensions

9.6.1.6 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

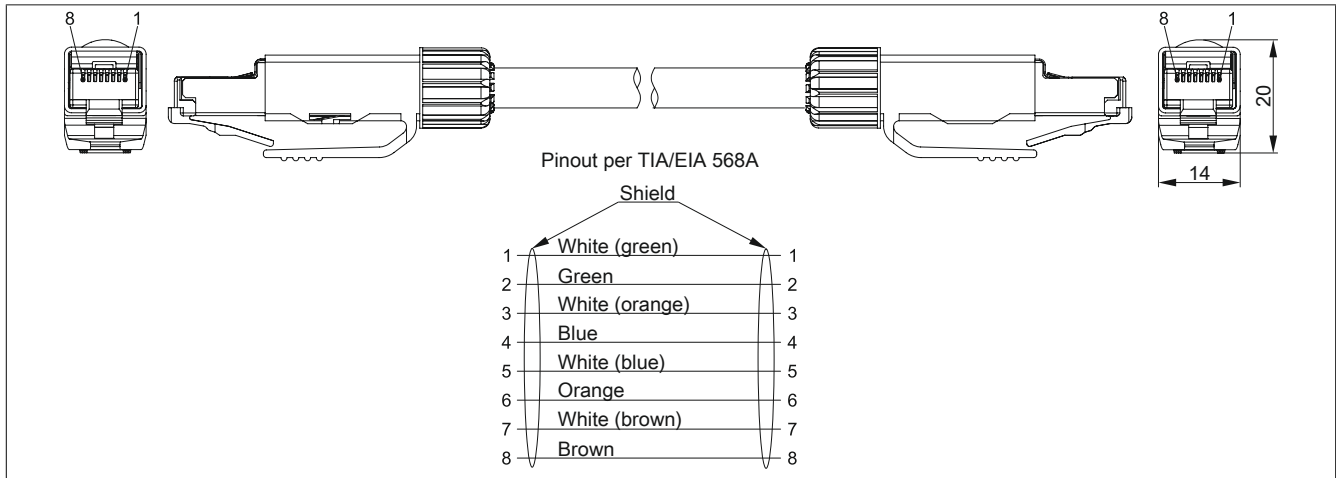


Figure 263: 5CASD3.xxxx-00 - Pinout

9.6.1.7 Wiring

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).

Wiring must meet category 6a (Cat 6a) or category 7 (Cat 7) requirements. Exceeding the maximum total length of 100 m is not permitted.

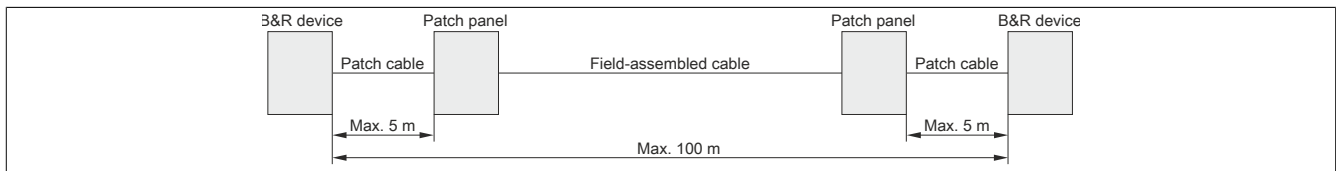


Figure 264: Wiring with a field-assembled cable

9.7 USB cables

9.7.1 5CAUSB.00xx-00

9.7.1.1 General information

USB cables are designed for a USB 2.0 transfer rate.

9.7.1.2 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 395: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data

9.7.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5CAUSB.0018-00	5CAUSB.0050-00
General information		
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ¹⁾	
GOST-R	Yes	
Cable construction		
Wire cross section	24, 28 AWG	
Shield	Entire cable	
Outer jacket		
Color	Beige	
Connector		
Type	USB type A male and USB type B male	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Mechanical properties		
Dimensions		
Length	1.8 m ±30 mm	5 m ±50 mm
Diameter	Max. 5 mm	
Bend radius	Min. 100 mm	

Table 396: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data

1) Yes, although applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

9.7.1.4 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

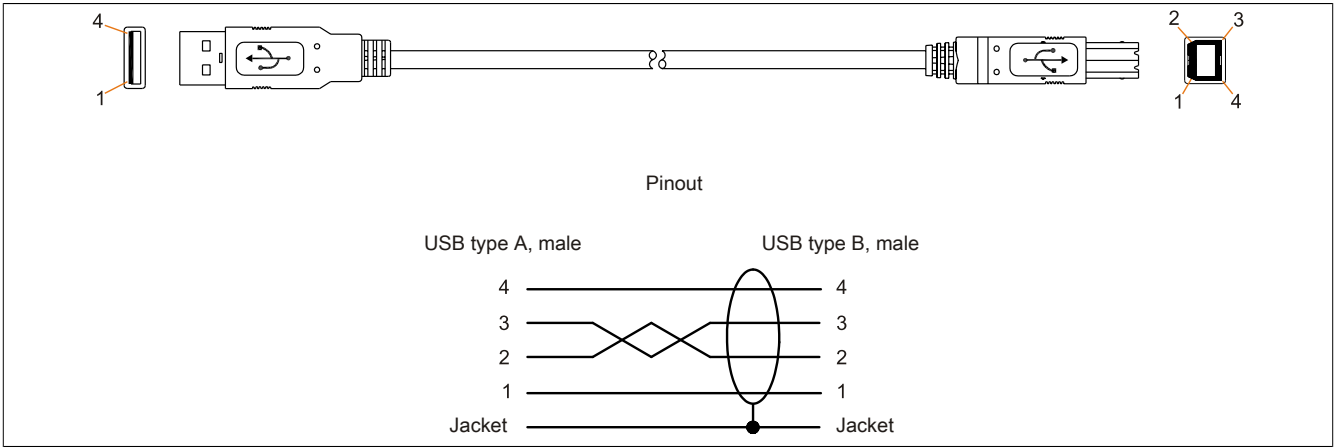


Figure 265: 5CAUSB.00xx-00 USB cables - Pinout

9.8 RS232 cables

9.8.1 9A0014.xx

9.8.1.1 General information

RS232 cables are used as extension cables between two RS232 interfaces.

9.8.1.2 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 397: 9A0014.02, 9A0014.05, 9A0014.10 - Order data

9.8.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	9A0014.02	9A0014.05	9A0014.10
General information			
Certifications			
CE		Yes	
GOST-R	-		Yes
Cable construction			
Wire cross section	26 AWG		AWG 26
Shield	Entire cable		
Outer jacket			
Color	Beige		
Connector			
Type	9-pin male/female DSUB connector		
Locating screw tightening torque	Max. 0.5 Nm		
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		
Mechanical properties			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter	Max. 5 mm		
Bend radius	Min. 70 mm		

Table 398: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data

9.8.1.4 Cable pinout

Warning!

If a field-assembled cable is desired, it must be wired according to this pinout.

If a field-assembled cable is used, B&R cannot make any guarantee as to its functionality. Functionality is only ensured with cables provided by B&R.

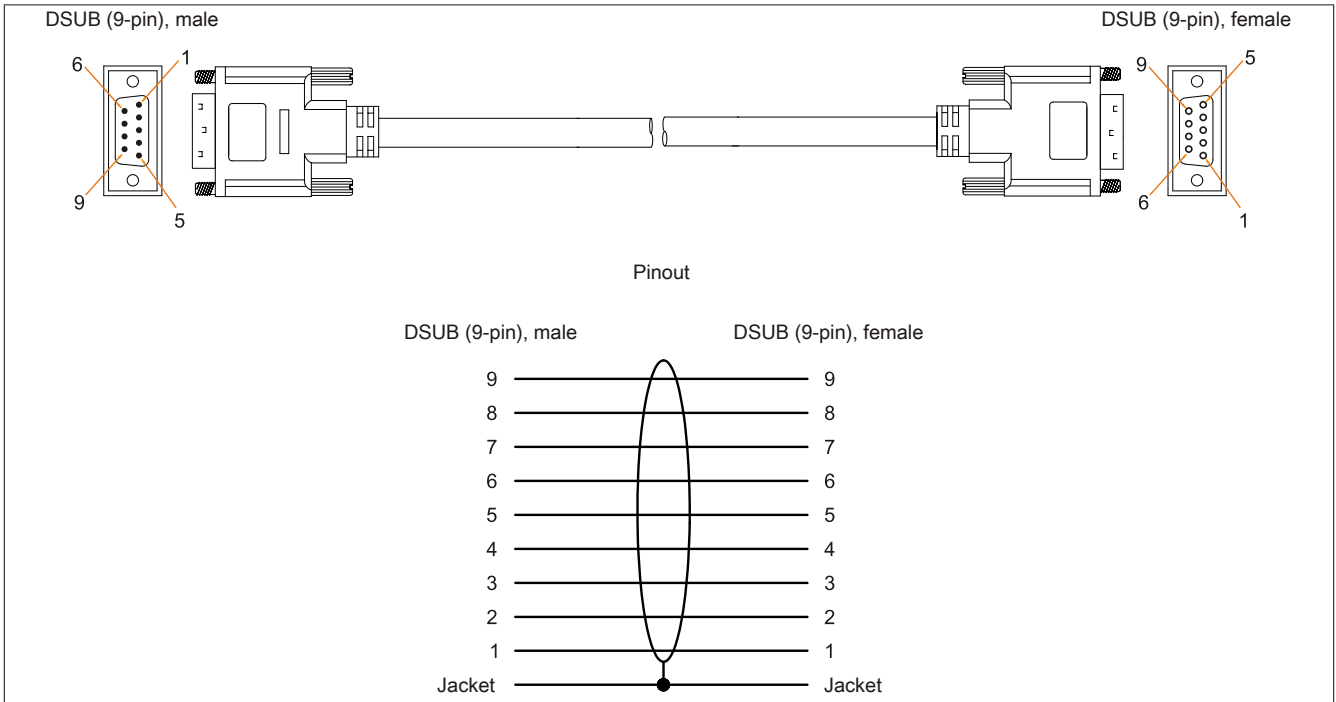


Figure 266: 9A0014.xx RS232 cables - Pinout

9.9 Internal supply cable

9.9.1 5CAMSC.0001-00

9.9.1.1 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.

9.9.1.2 Order data


Model number	Short description	Figure
	Accessories	
5CAMSC.0001-00	Internal supply cable	

Table 399: 5CAMSC.0001-00 - Order data

9.9.1.3 Technical data

Model number	5CAMSC.0001-00
General information	
Certifications	
CE	Yes
GOST-R	Yes
Cable construction	
Wire cross section	22 AWG
Connector	
Type	1x 4-pin male disk drive power connector, 1x 4-pin female connector housing
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Mechanical properties	
Dimensions	
Length	100 mm ±5 mm
Flexibility	Flexible

Table 400: 5CAMSC.0001-00 - Technical data

10 Replacement fan

10.1 5AC901.FI0x-00

10.1.1 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.

10.1.2 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 401: 5AC901.FI01-00, 5AC901.FI02-00, 5AC901.FI05-00 - Order data

11 Line filter

11.1 5AC804.MFLT-00

11.1.1 General information

Line filter 5AC804.MFLT-00 may be necessary to satisfy requirements regarding conducted disturbances in supply lines in accordance with the 2003 edition of GL EMC1 (Germanischer Lloyd) or DNVGL-CG-0339 from November 2015.

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.

11.1.2 Order data


Model number	Short description	Figure
5AC804.MFLT-00	Line filter	

Table 402: 5AC804.MFLT-00 - Order data

11.1.3 Technical data

Information:

The following specifications, properties and limit values apply only to this accessory and may deviate from those that apply to the complete system. For the complete system in which this accessory is installed, for example, the data specified for that complete system applies.

Model number	5AC804.MFLT-00
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T4 ¹⁾
DNV GL	Temperature: B (0 - 55°C) Humidity: B (up to 100%) Vibration: A (0.7 g) EMC: B (Bridge and open deck) ²⁾
GOST-R	Yes
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 per EN 61131-2	II
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
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

Table 403: 5AC804.MFLT-00 - Technical data

Model number	5AC804.MFLT-00
Dimensions	
Width	54 mm
Length	94 mm
Depth	32.15 mm
Weight	205 g

Table 403: 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 in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
- 3) EN 60950 requirements must be observed; see section "+24 VDC power supply" in the user's manual.

11.1.4 Dimensions

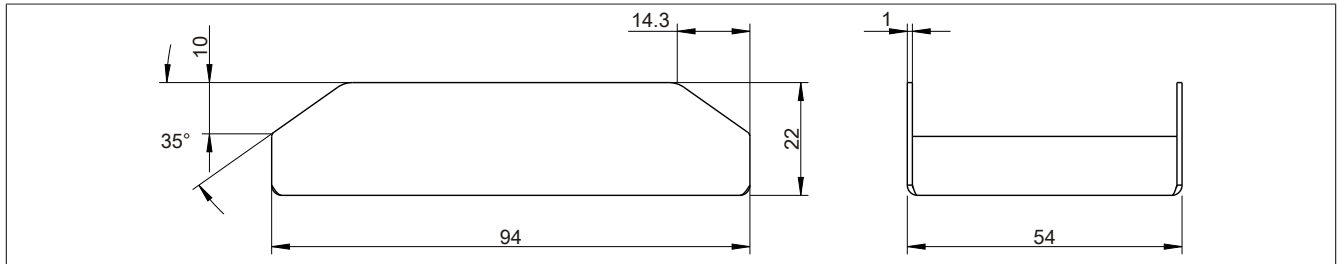


Figure 267: 5AC804.MFLT-00 - Dimensions

11.1.5 Drilling template

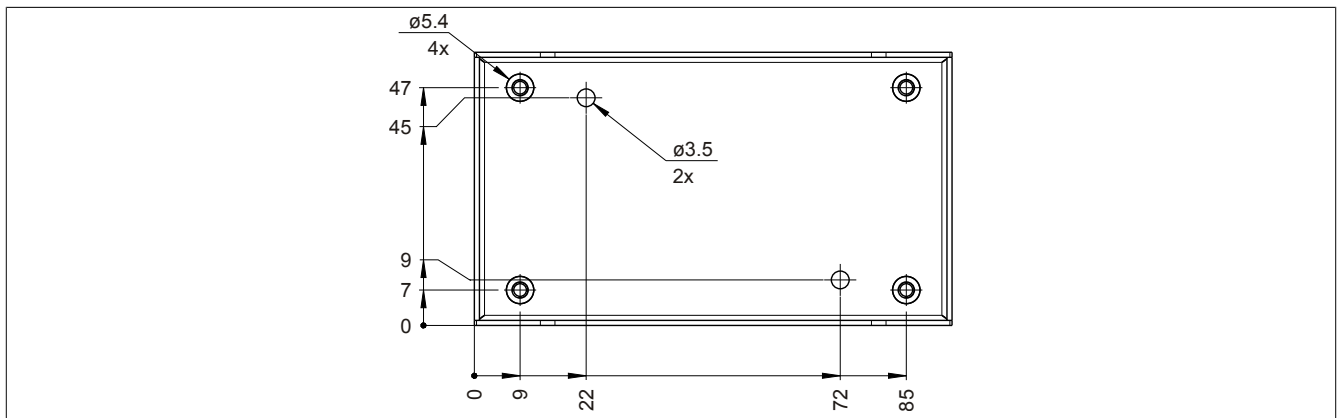


Figure 268: 5AC804.MFLT-00 - Drilling template

11.1.6 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.

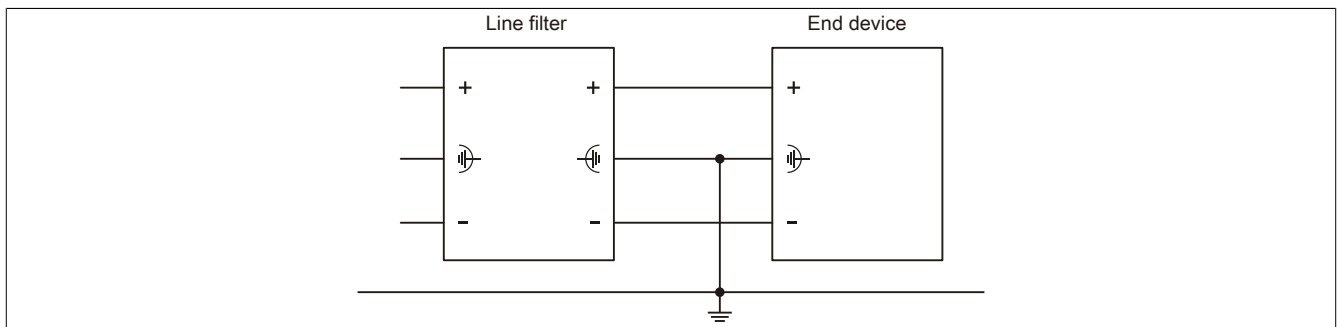


Figure 269: Connection example

Chapter 7 • Servicing and maintenance

This chapter describes the servicing/maintenance work that is possible to be carried out by a trained and qualified end user.

Information:

Only components approved by B&R are permitted to be used for maintenance and repair work.

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 fire or explosion hazard.

The battery can explode if handled improperly. Do not recharge, disassemble or dispose of the battery 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 404: 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.

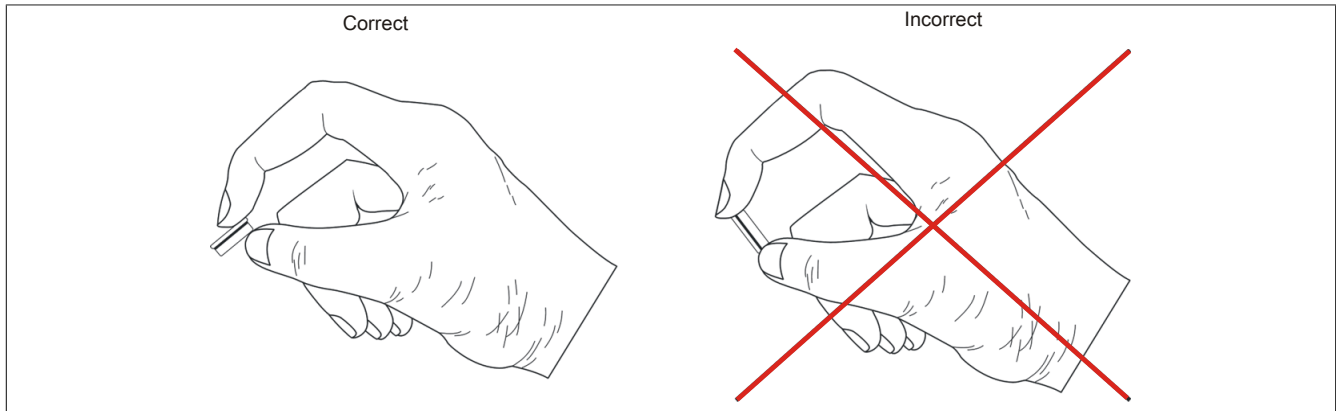


Figure 270: Battery handling

- Insert the new battery with the correct polarity.

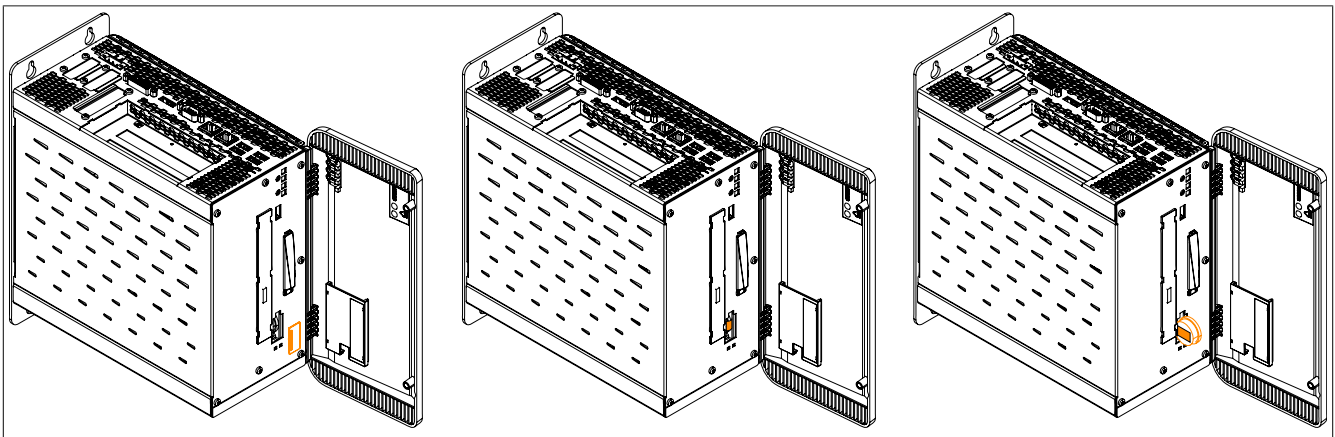


Figure 271: Replacing the battery

- 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.

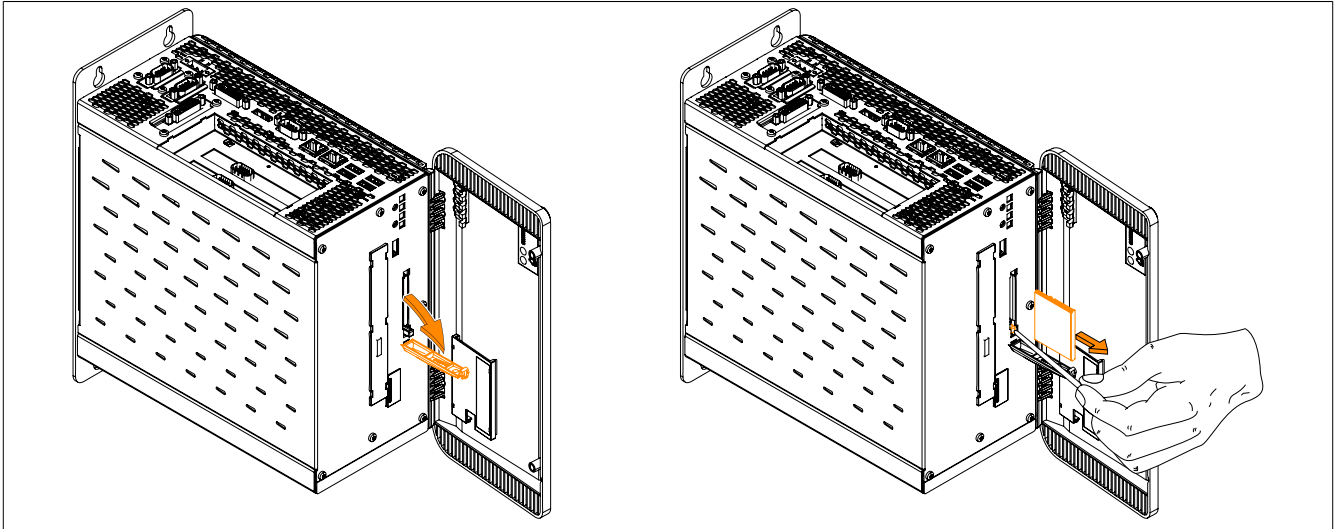


Figure 272: Exchanging a CFast card

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 72 and "IF option 2 slot" on page 72.

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 306).

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.

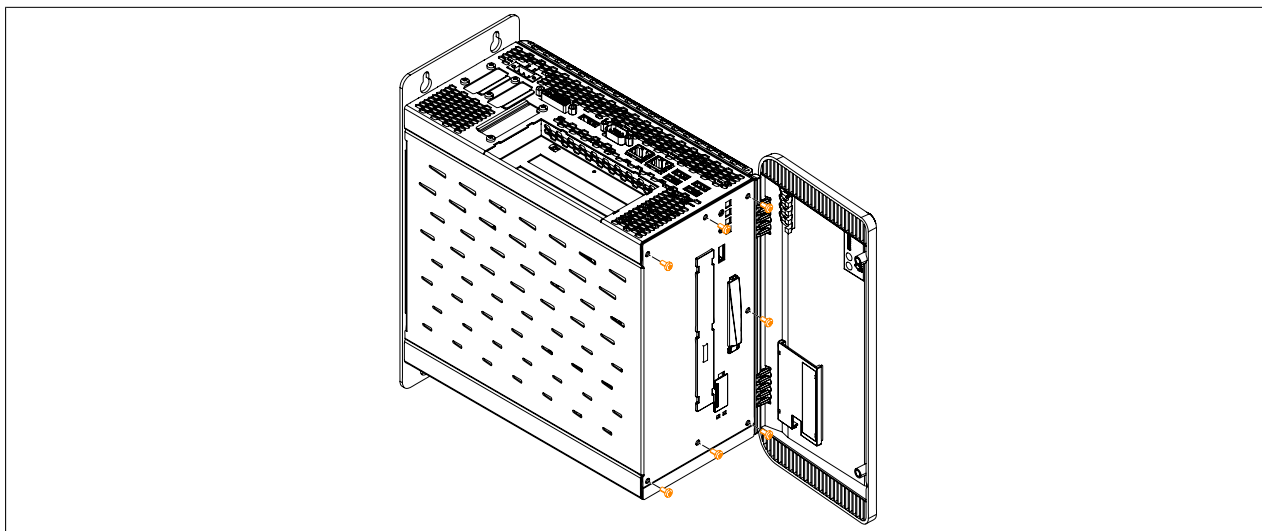


Figure 273: Removing the Torx screws for the side cover

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.

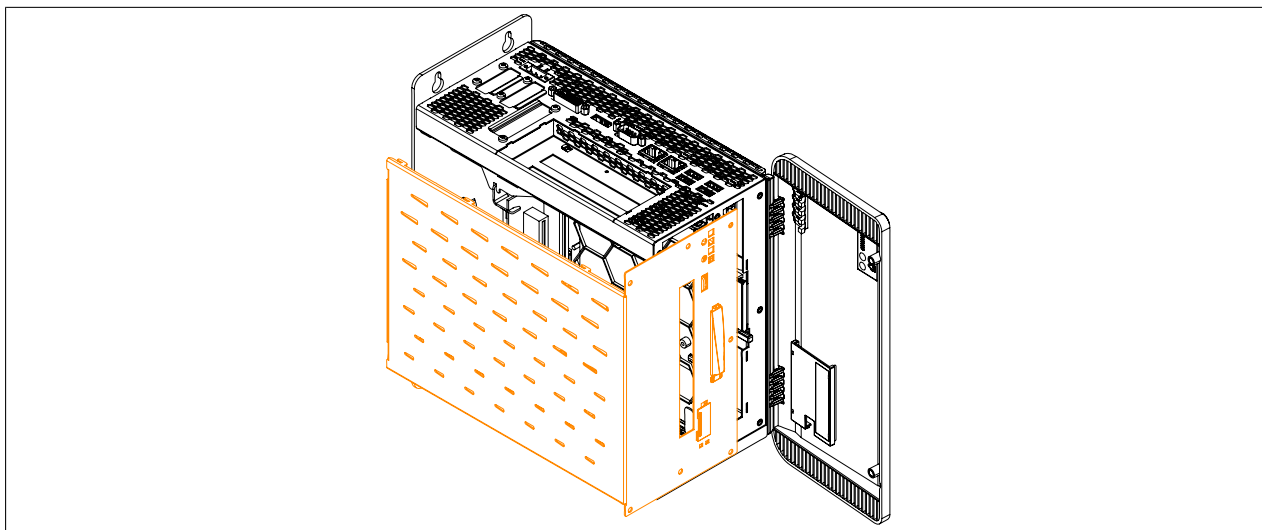


Figure 274: Removing the side cover

5. Remove the plastic slot cover and the marked Torx screws (T10) as well as the metal slot cover.

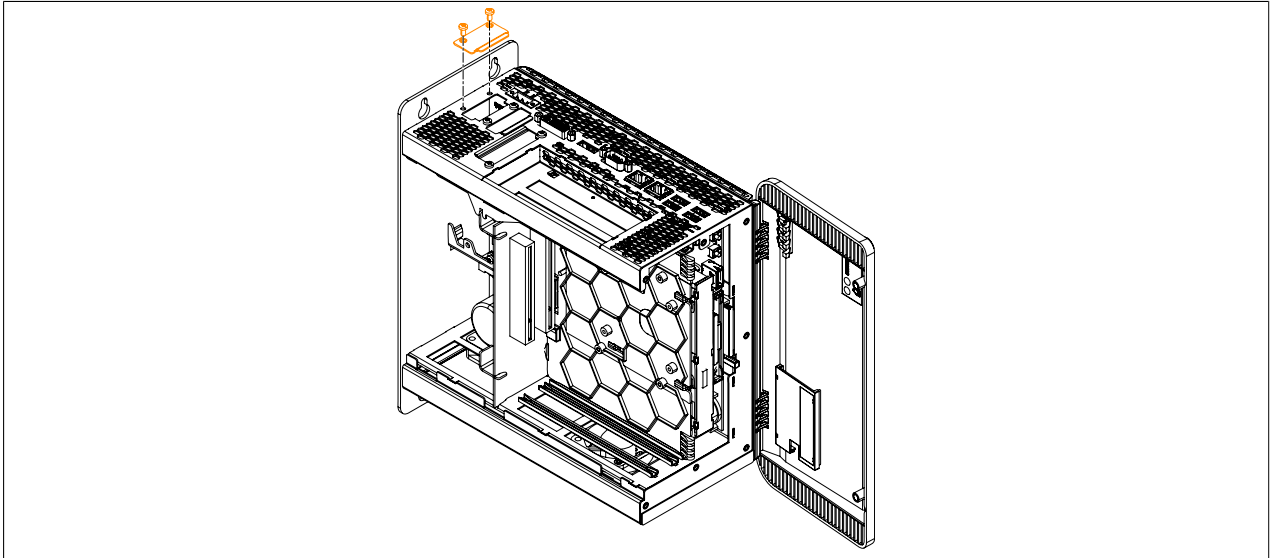


Figure 275: Removing the Torx screws and slot cover

6. Insert the interface option into the slot.

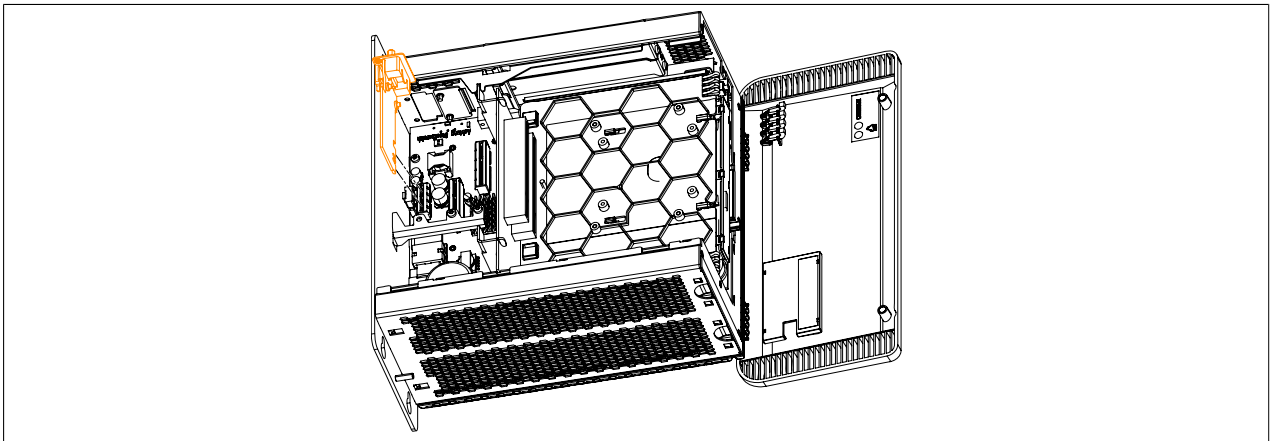


Figure 276: Installing the interface option

7. Secure the interface option to the B&R Industrial PC using the Torx screws (T10).

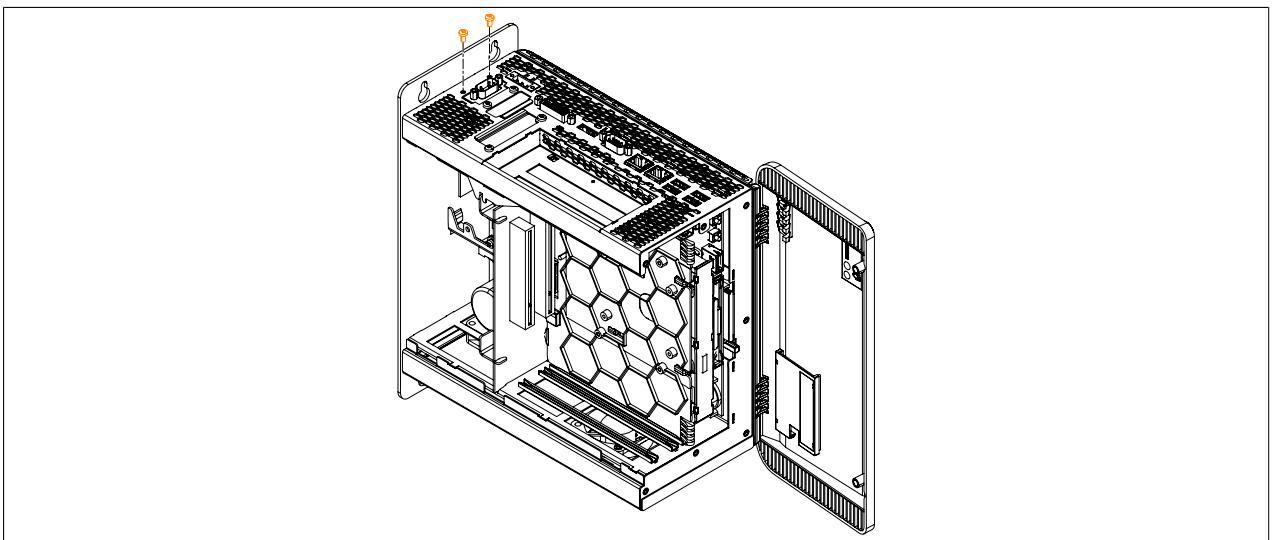


Figure 277: Securing the interface option

8. Attach the side cover.

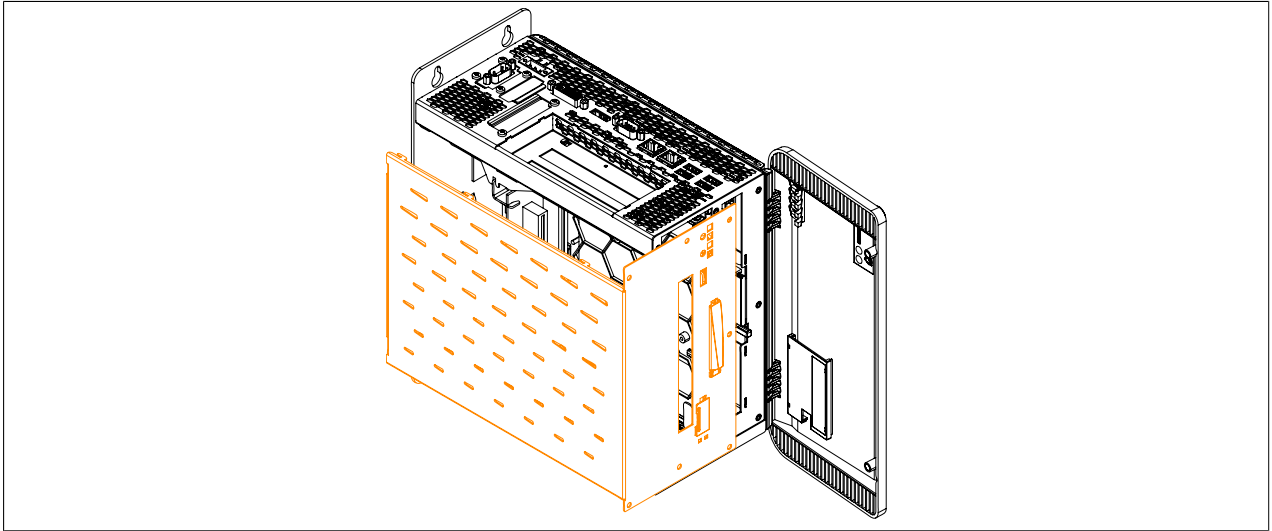


Figure 278: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

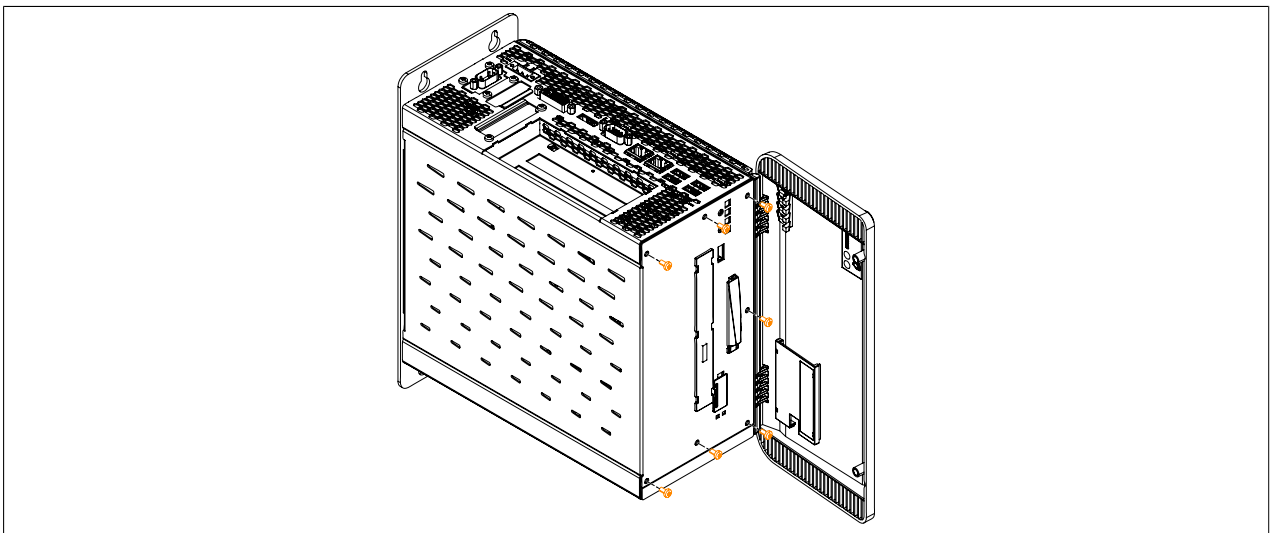


Figure 279: Securing the side cover

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 306.

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 306).

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.

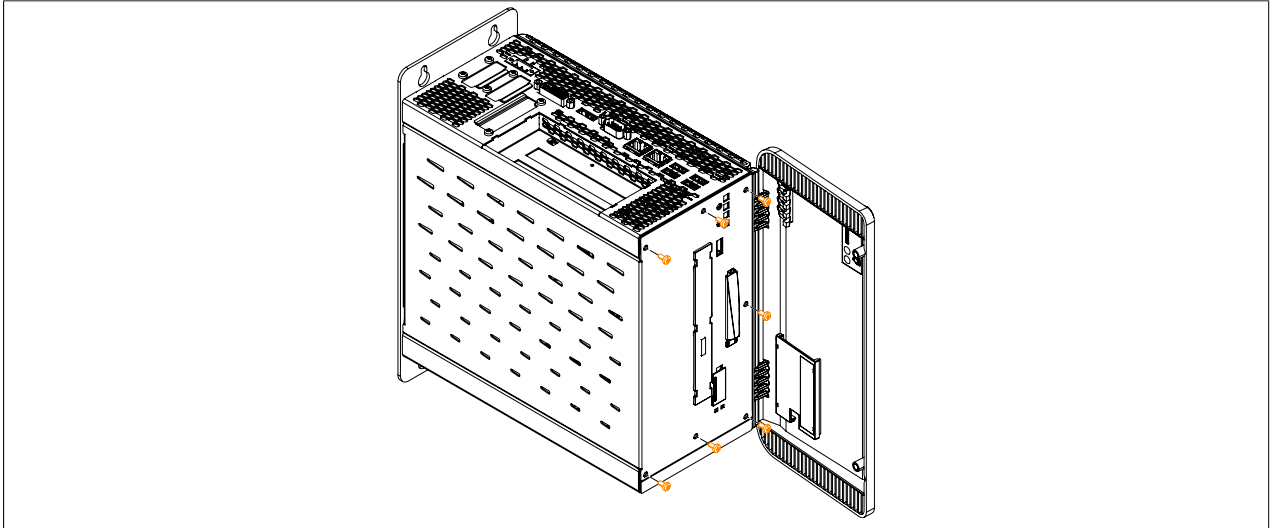


Figure 280: Removing the Torx screws for the side cover

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.

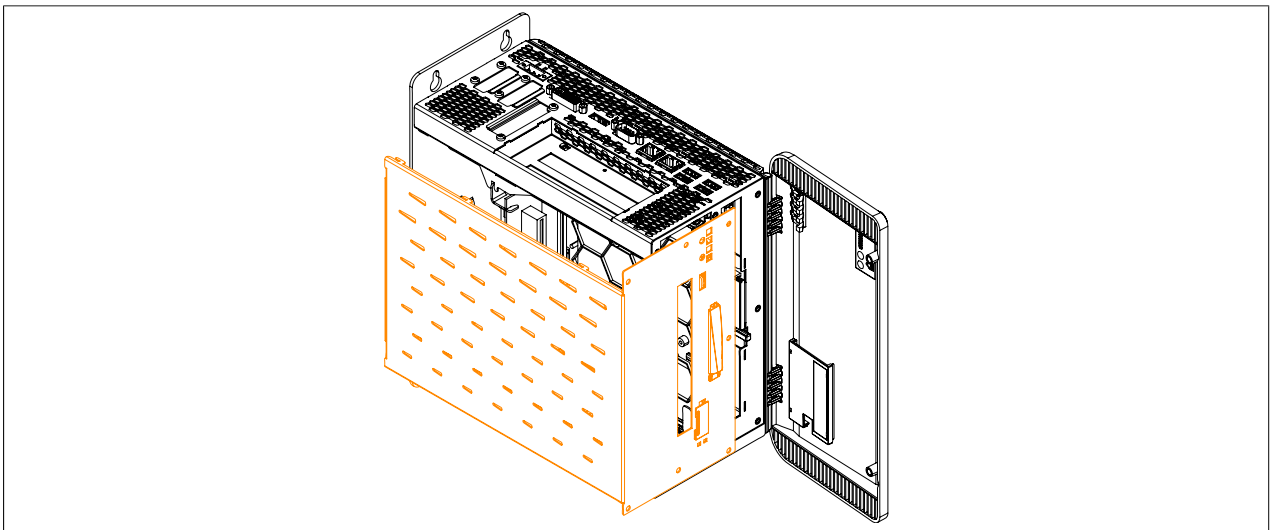


Figure 281: Removing the side cover

- Remove the plastic slot cover and the marked Torx screws (T10) as well as the metal slot cover.

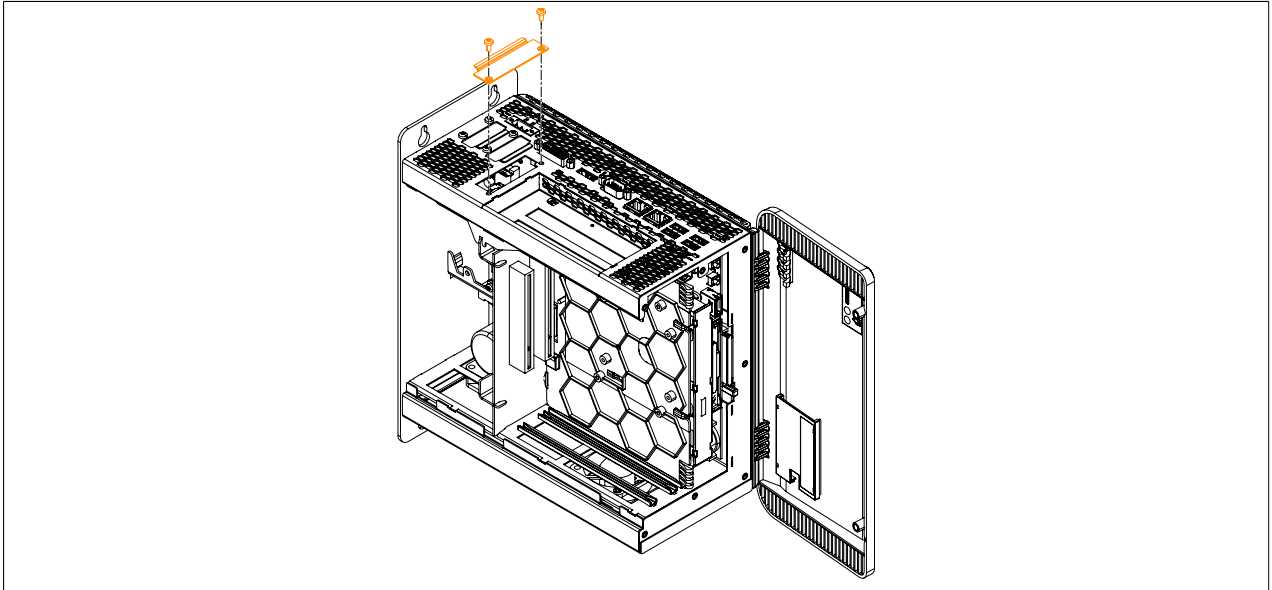


Figure 282: Removing the Torx screws and slot cover

- Insert the monitor/panel option into the slot.

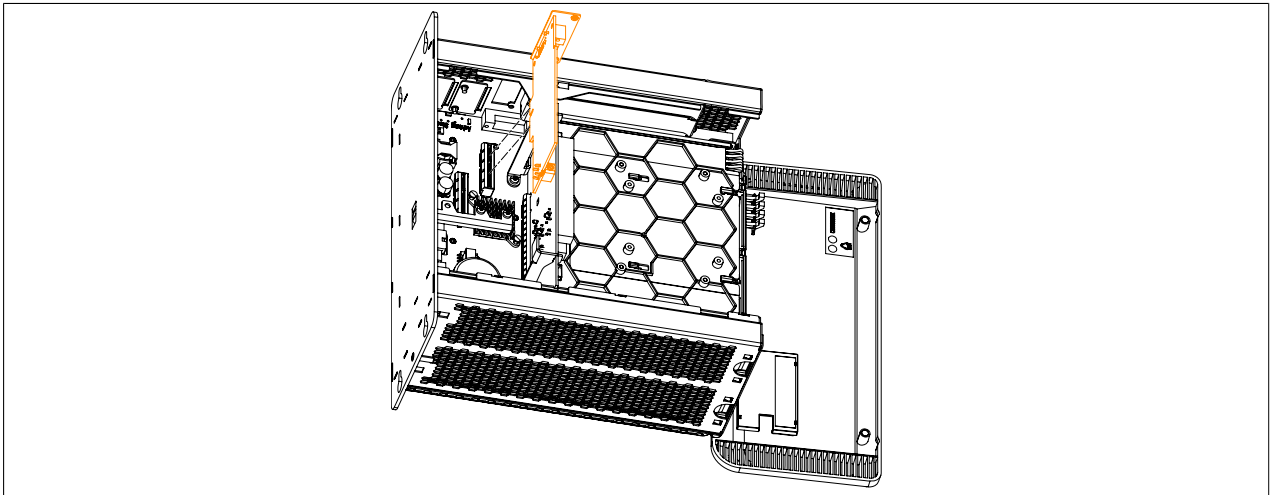


Figure 283: Inserting the monitor/panel option into the APC910

- Secure the monitor/panel option to the B&R Industrial PC using the Torx screws (T10).

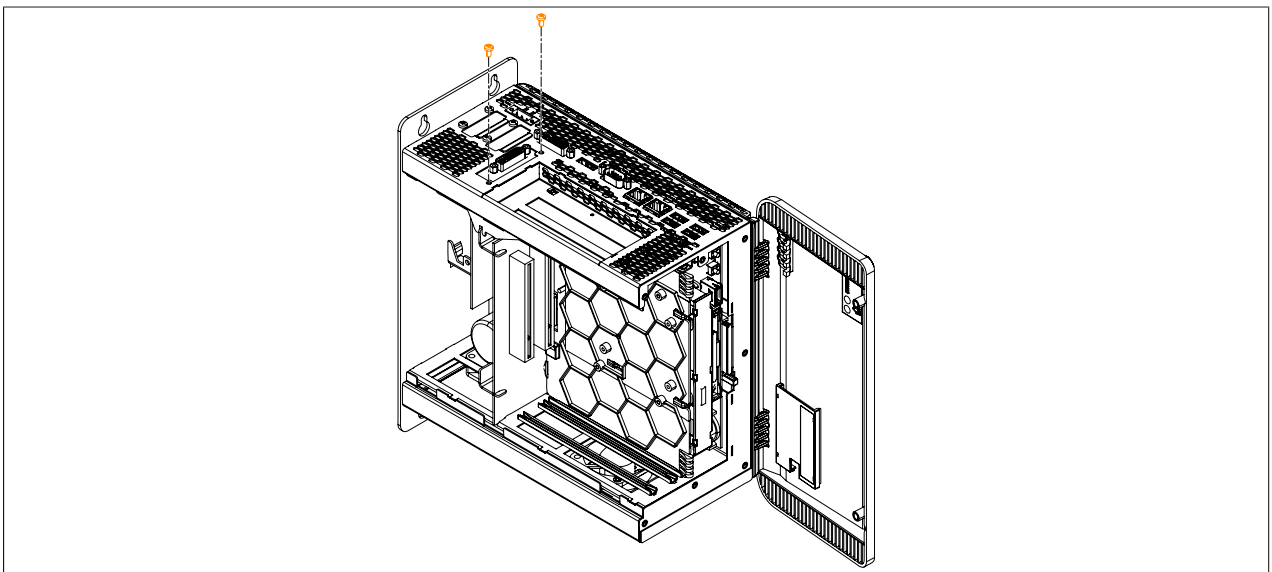


Figure 284: Securing the monitor/panel option using the Torx screws

8. Attach the side cover.

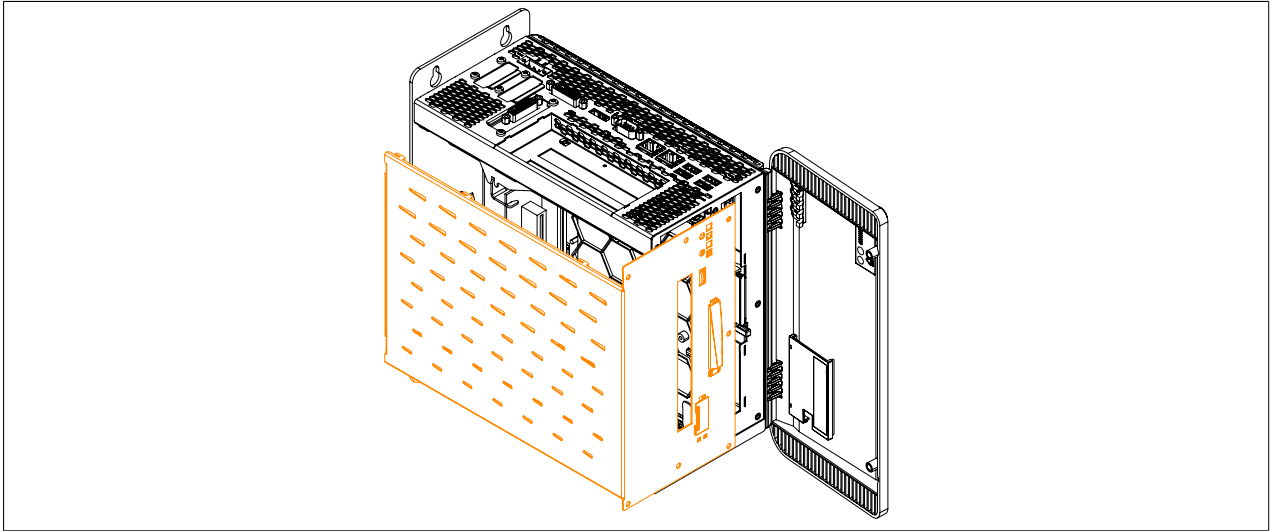


Figure 285: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

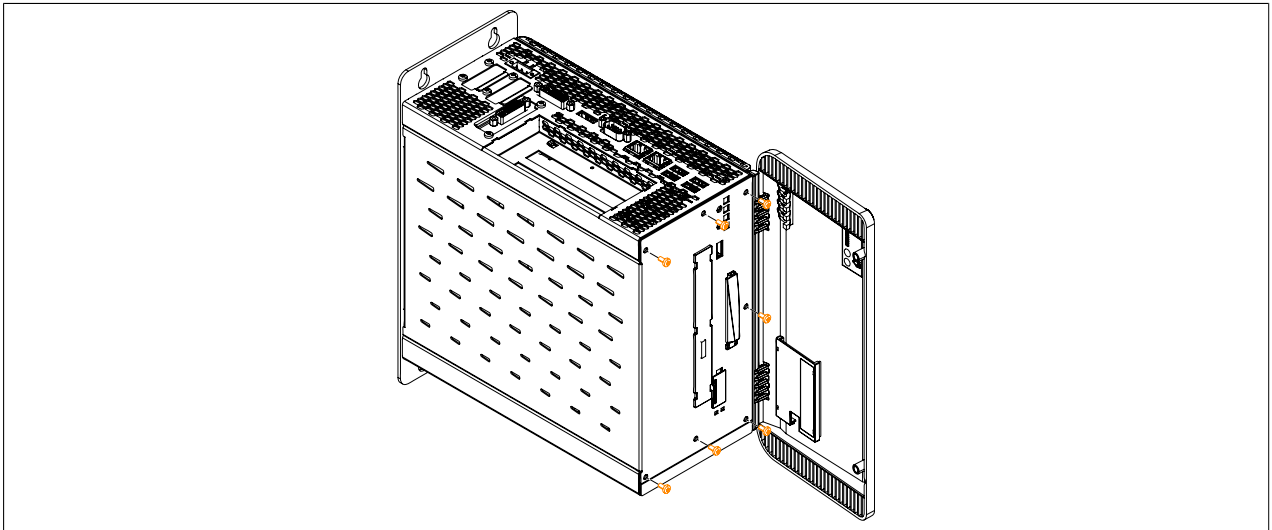


Figure 286: Securing the side cover

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 306.

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.

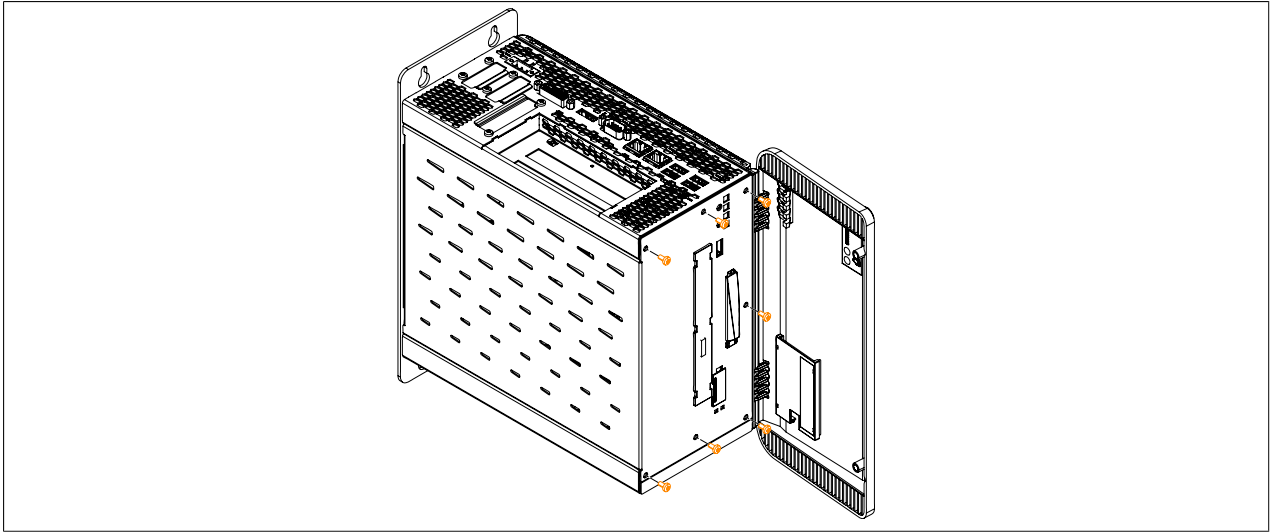


Figure 287: Removing the Torx screws for the side cover

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.

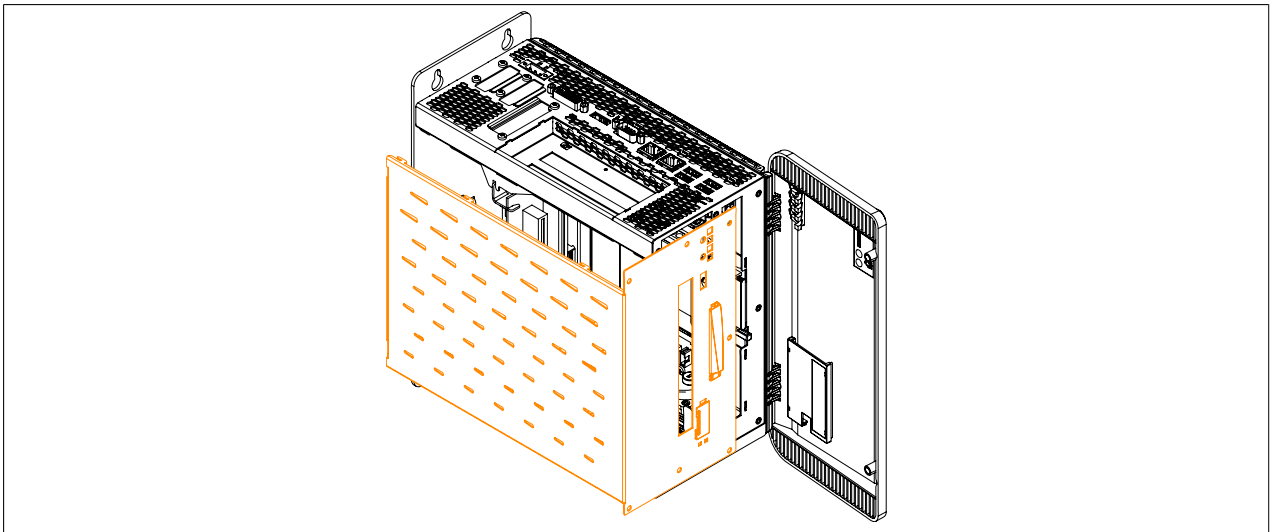


Figure 288: Removing the side cover

- 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).

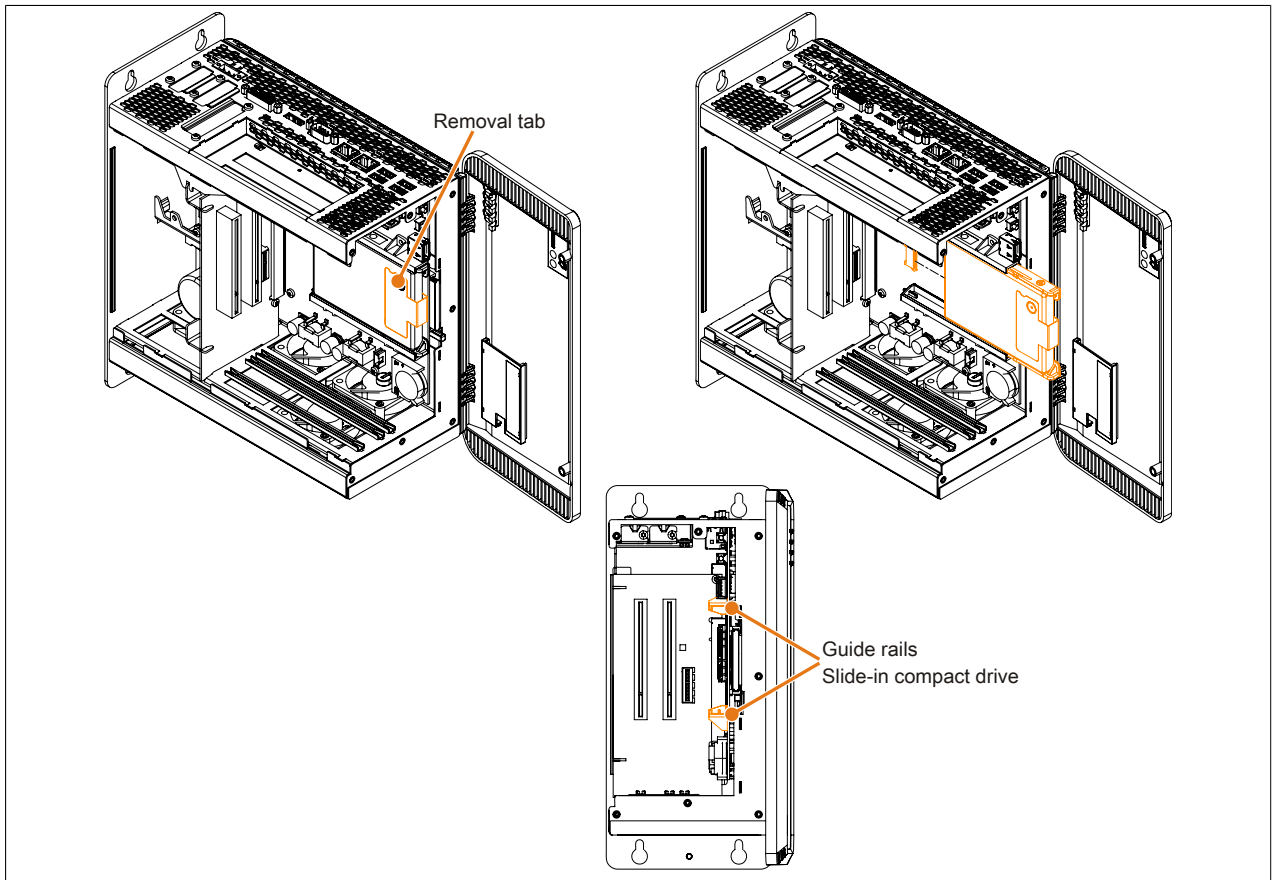


Figure 289: Installing/Exchanging the slide-in compact drive

- Attach the side cover.

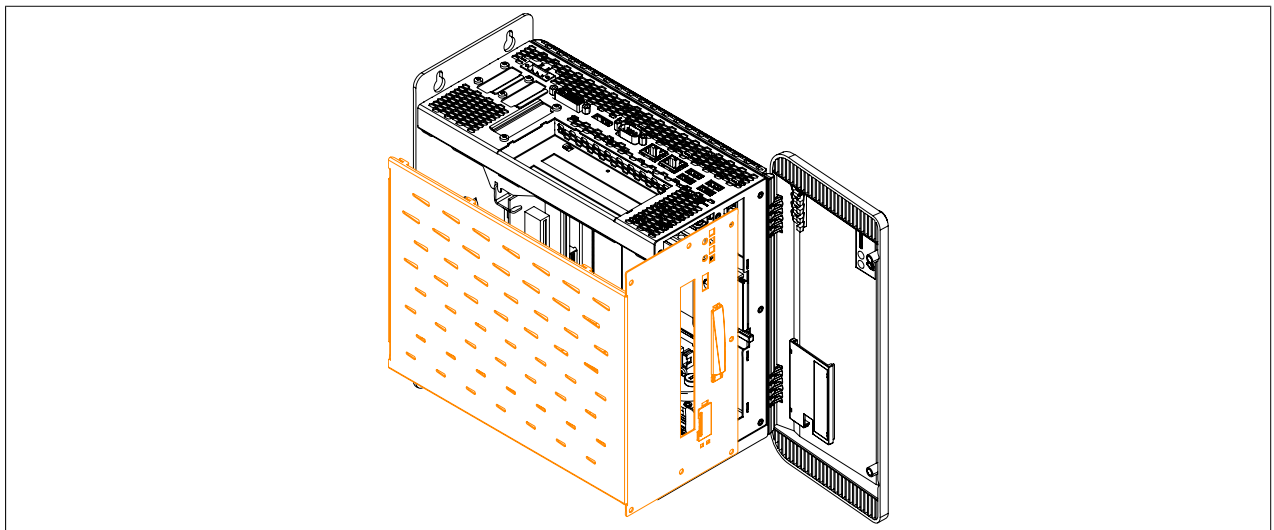


Figure 290: Replacing the side cover

- Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

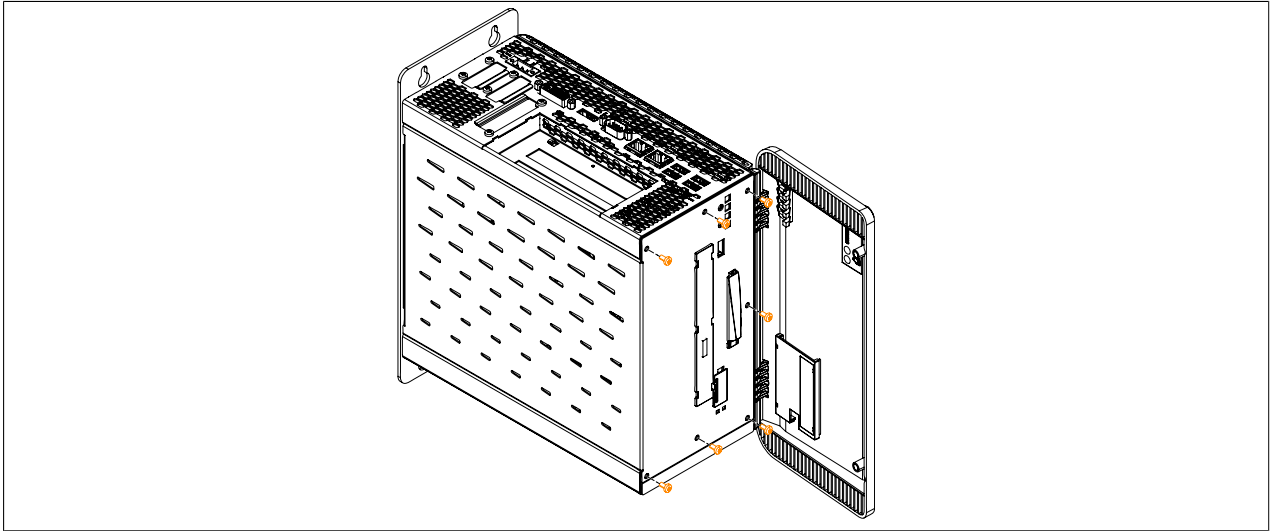


Figure 291: Securing the side cover

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.

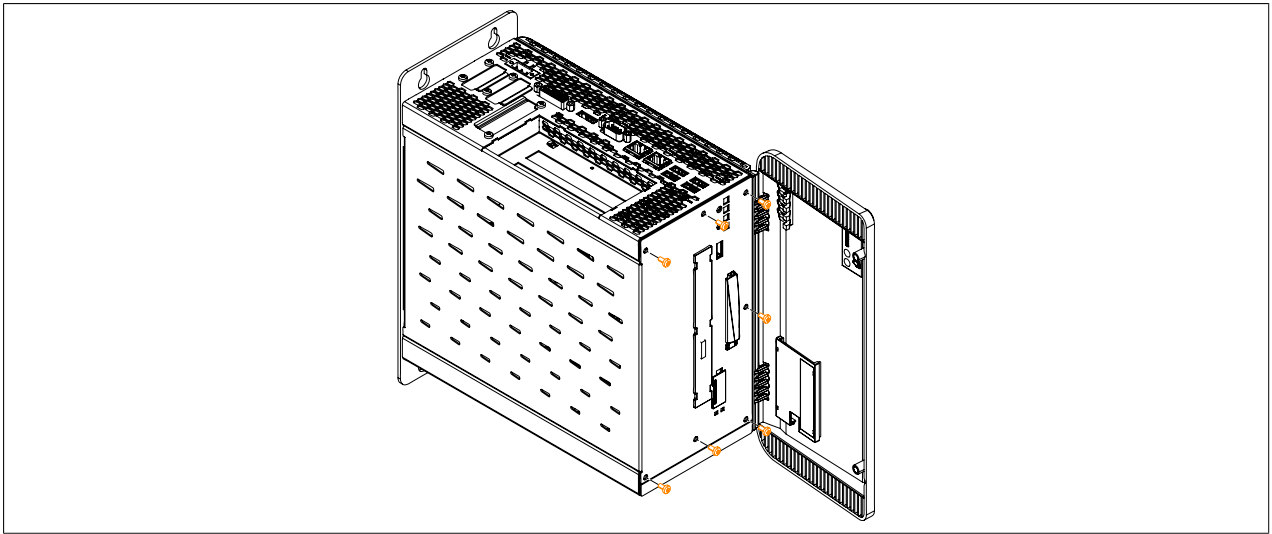


Figure 292: Removing the Torx screws for the side cover

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.

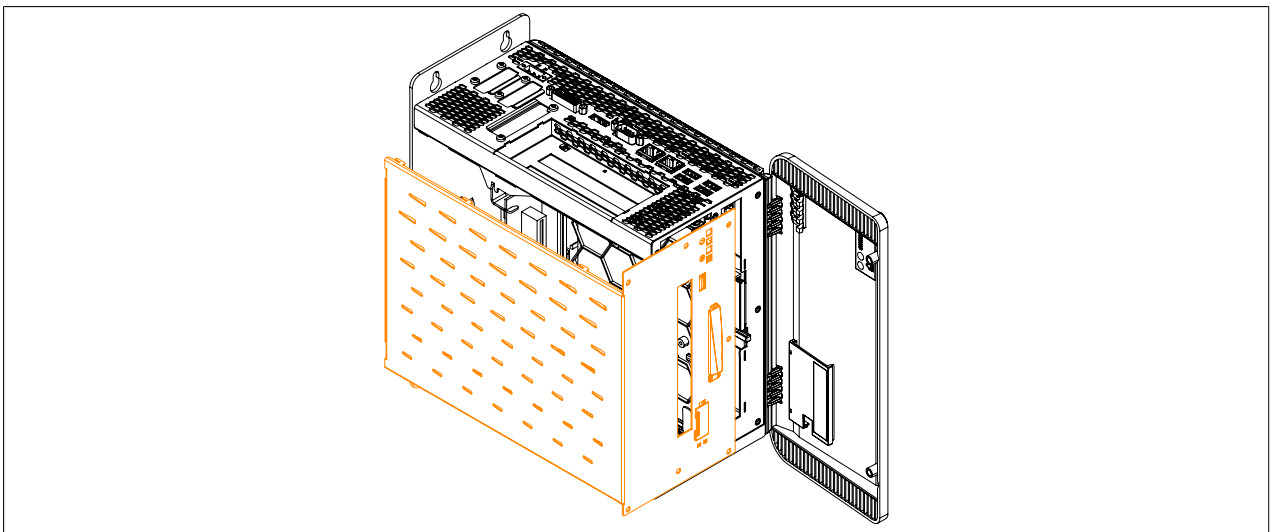


Figure 293: Removing the side cover

5. Install/Exchange the slide-in compact drive. The slide-in compact drive must slide into the guide rails and snap into the connector.

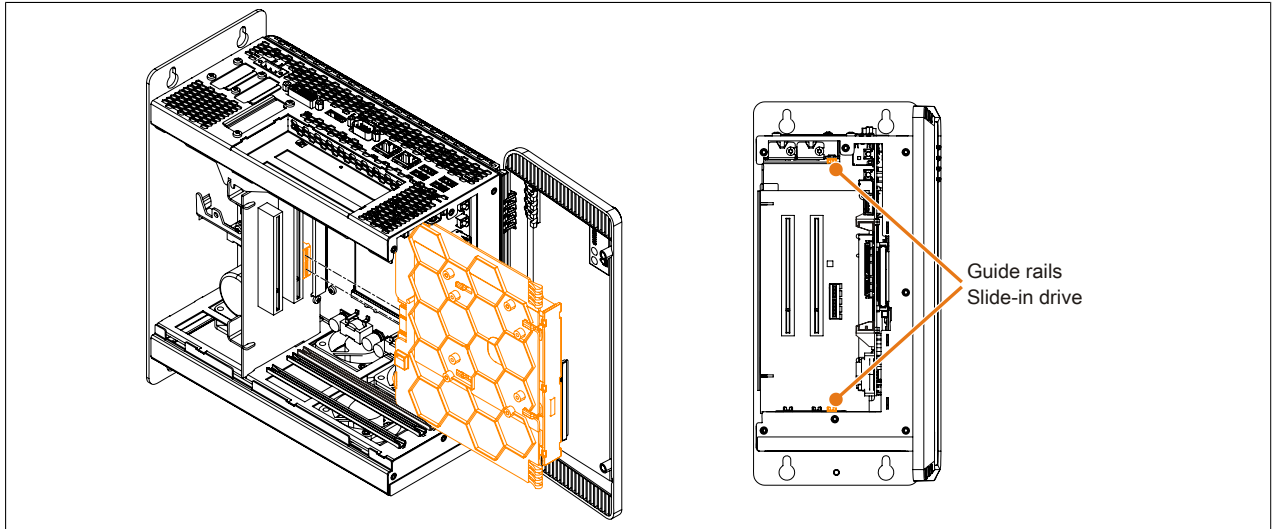


Figure 294: Installing/Exchanging the slide-in drive

6. Attach the side cover.

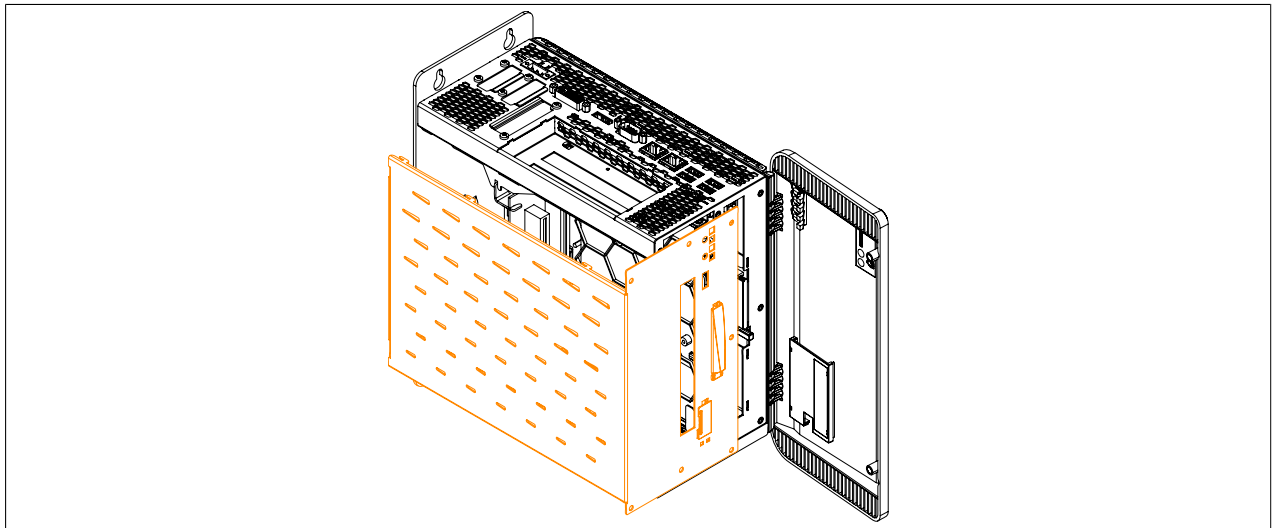


Figure 295: Replacing the side cover

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.

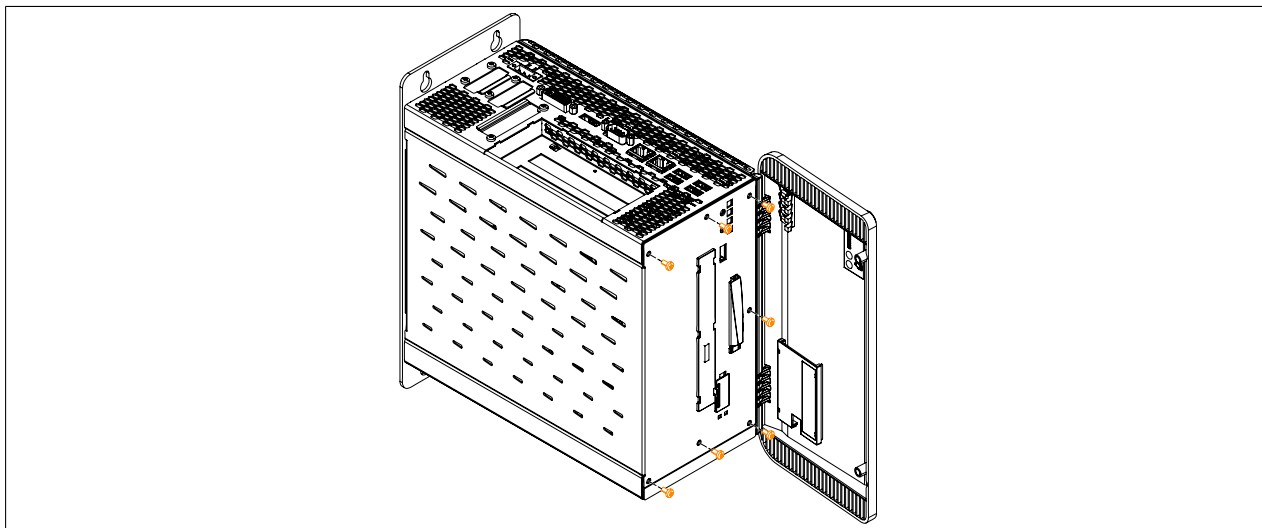


Figure 296: Securing the side cover

7 Installing PCI/PCIe 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.

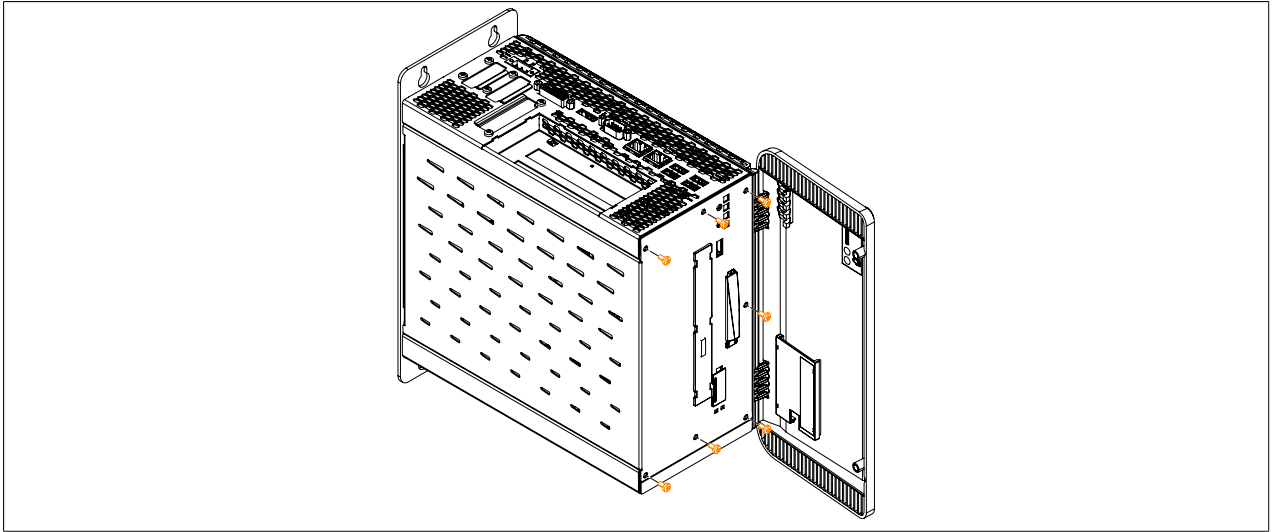


Figure 297: Removing the Torx screws for the side cover

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.

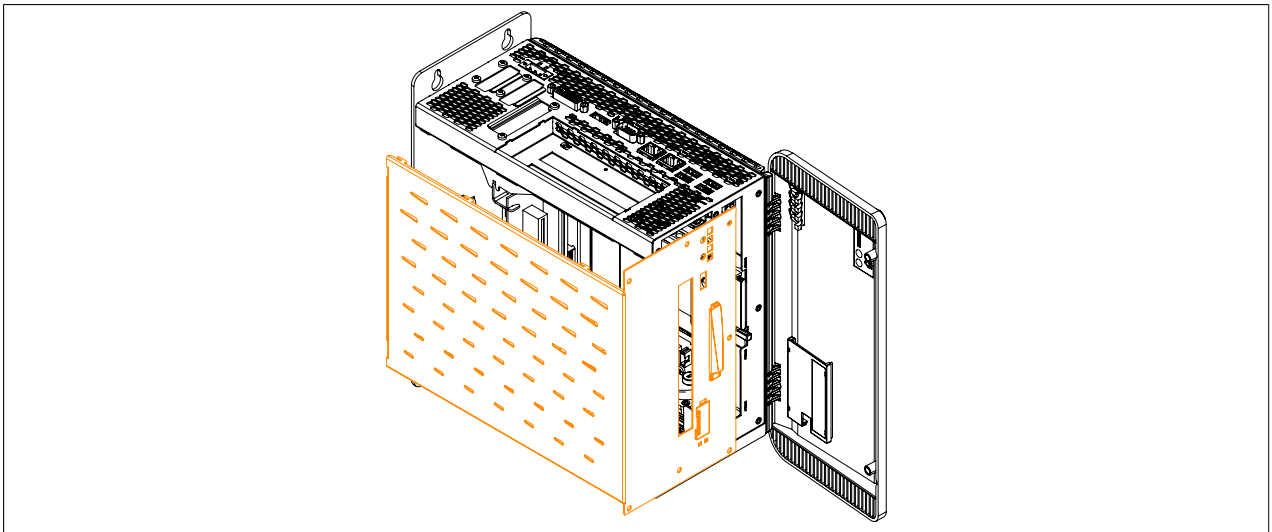


Figure 298: Removing the side cover

5. Remove the PCI slot cover. This is done by first removing the indicated Torx screws (T10) and then removing the cover.

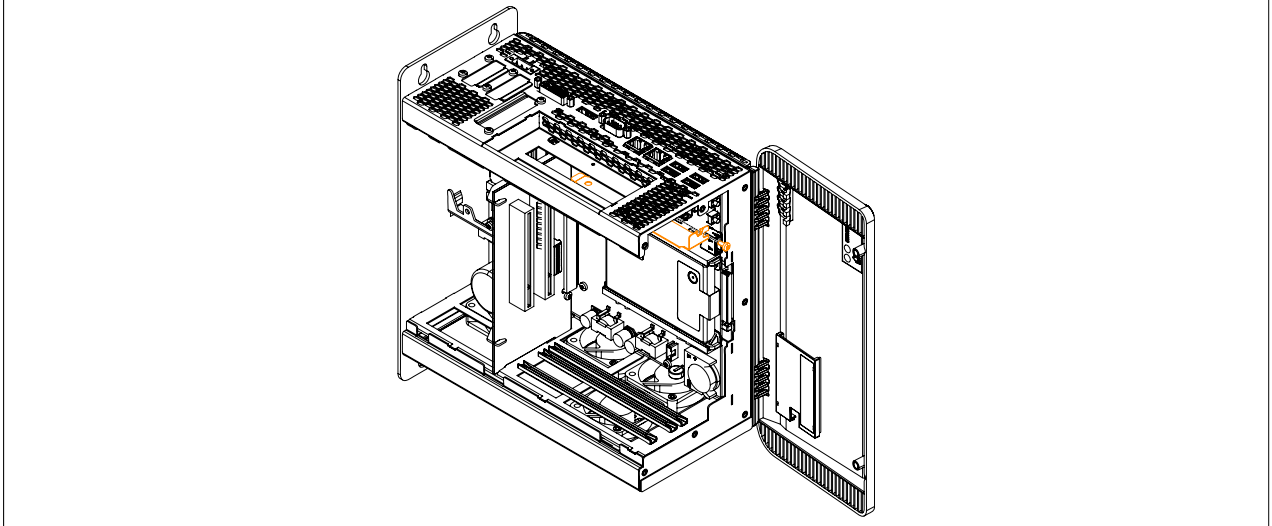


Figure 299: Removing the PCI/PCIe slot cover

6. Install or replace the PCI/PCIe card. Be sure to insert the PCI/PCIe card in the lower black guide rail. Fasten the PCI or PCIe card using the indicated (previously removed) Torx screws (T10).

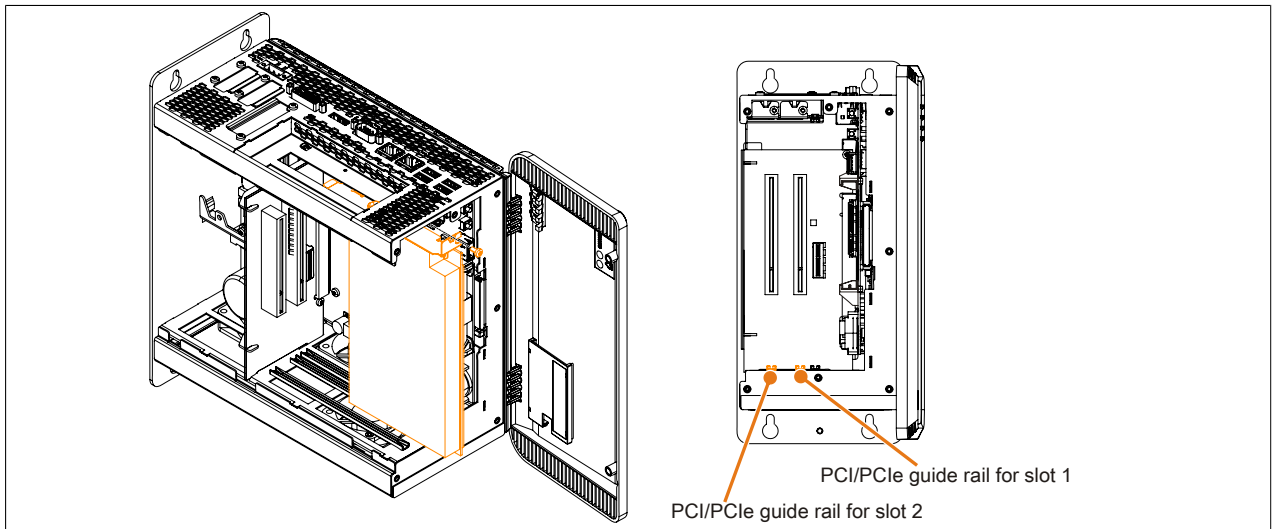


Figure 300: Installing/Replacing the PCI/PCIe card

7. Attach the side cover.

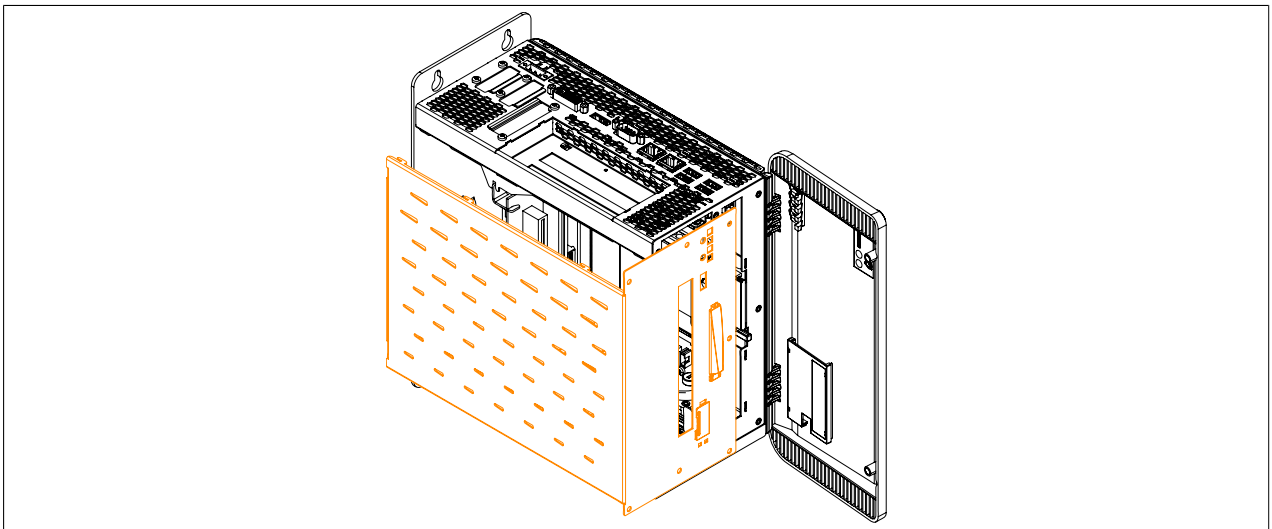


Figure 301: Replacing the side cover

- Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

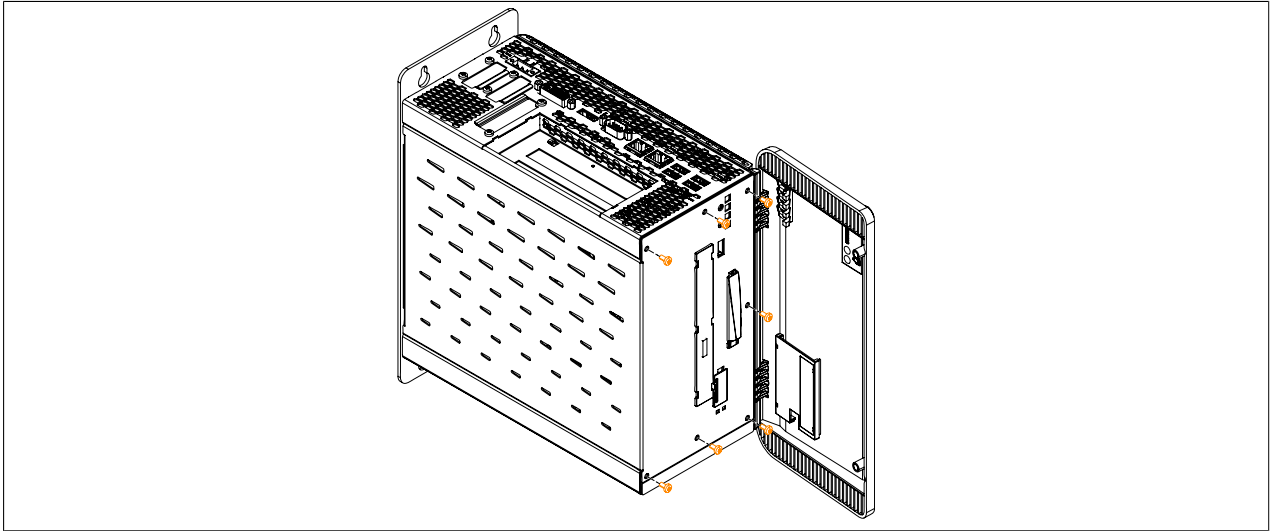


Figure 302: Securing the side cover

8 Installing and connecting the UPS battery unit

Information:

For information about installing the UPS IF option, see section "Installing interface options" on page 501.

Warning!

Opening the UPS battery unit is not permitted!

1. Disconnect the power supply cable to the B&R industrial PC.
2. Install the battery unit. For the drilling template, see the technical data for 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).
4 M5 screws, 4 flat washers and 1 screw locking washer are needed for installation (min. tightening torque 1.3 Nm, screw-in depth per applicable DIN regulations and the application). These are not included in delivery.
3. Connect the UPS cable to the battery. To do so, connect the red and black wires to the power supply (orange screw clamp terminal). Be sure to use the correct terminals (red wire to +, black wire to -)!
Connect the white and brown wires to the temperature sensor (green screw clamp terminal) (brown wire to 1, white wire to 2).

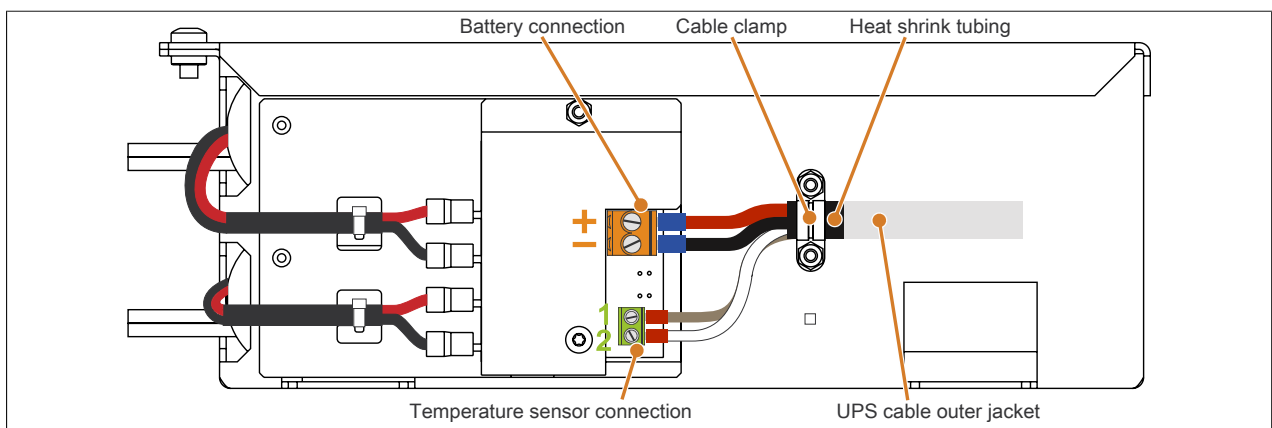


Figure 303: Connecting the UPS cable to the battery

4. Tighten the connected wires to the screw clamp terminals with a screwdriver (max. tightening torque 0.4 Nm).
5. Remove both nuts (M3) on the cable clamp and feed the UPS cable through.
6. Fasten the UPS cable using the cable clamp. Alternately tighten the previously removed nuts onto the cable clamp (max. tightening torque 0.35 Nm).
7. Connect the 4-pin screw clamp terminal block to the UPS IF option and tighten the two screws with a screwdriver (max. tightening torque 0.4 Nm).

8.1 Permissible mounting orientations

The UPS battery unit is only permitted to be mounted as illustrated below.

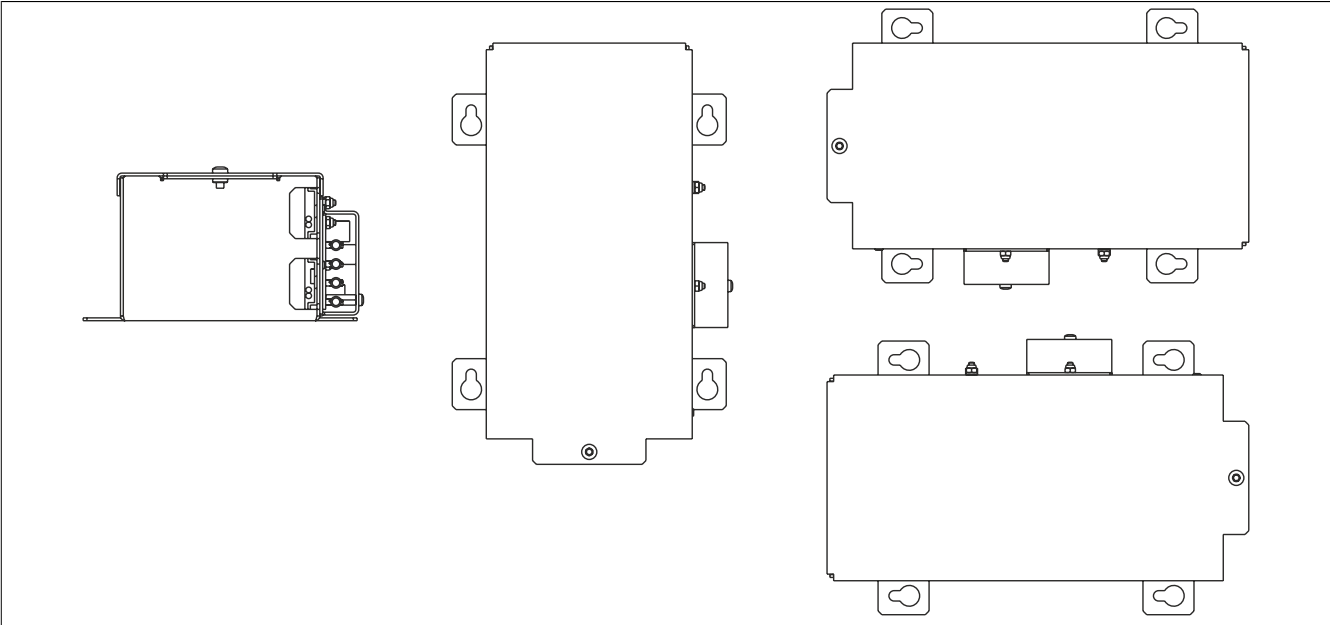


Figure 304: 5AC901.BUPS-0x - Mounting orientation

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.

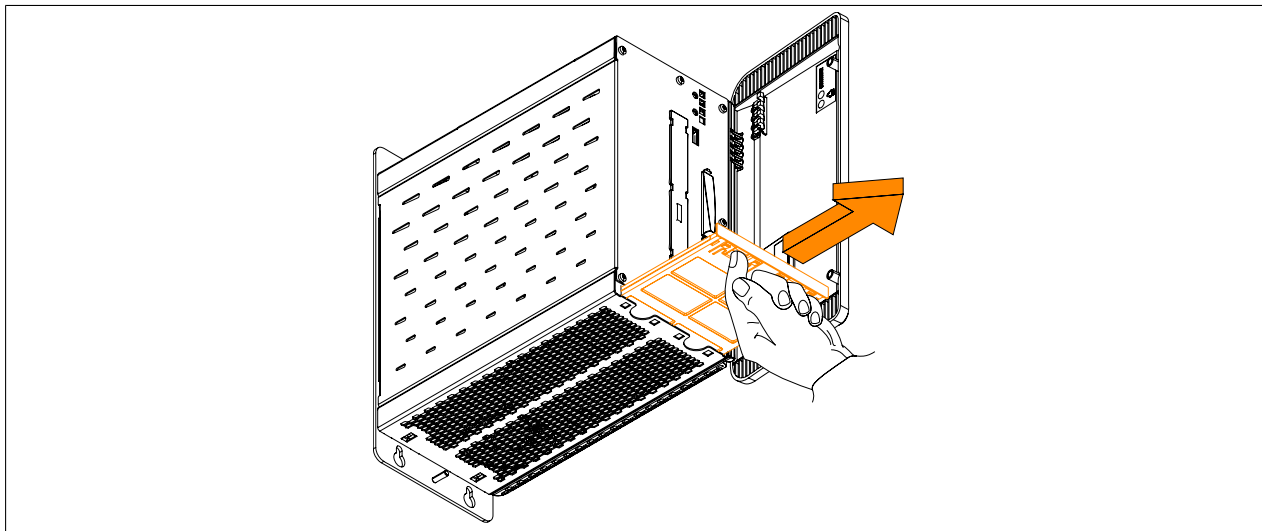


Figure 305: Removing the fan filter from the APC910

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.

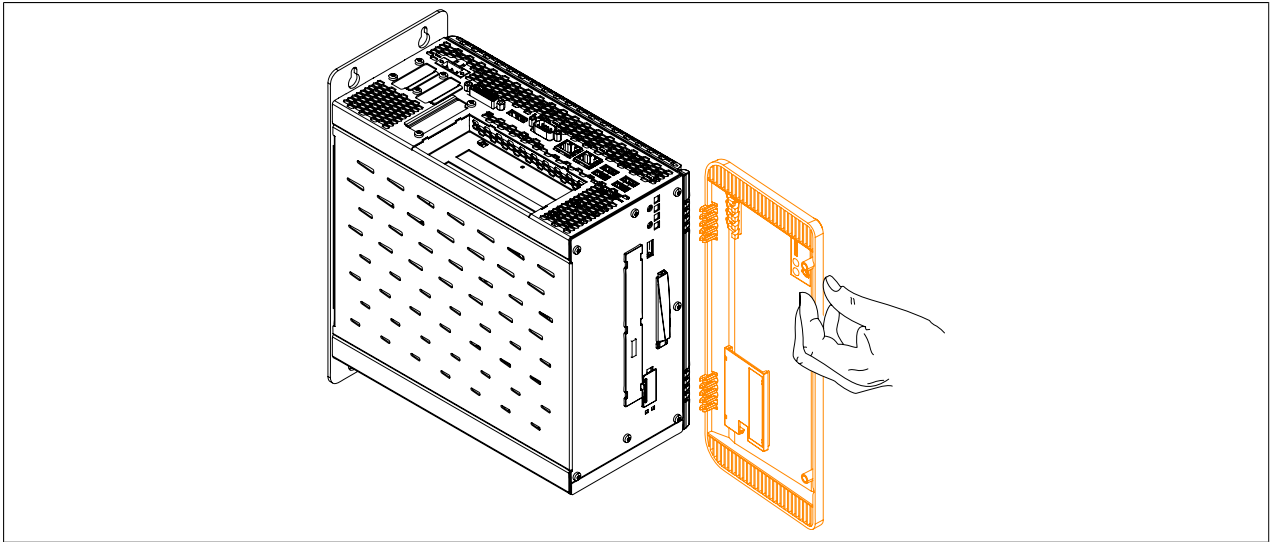


Figure 306: Removing the front cover

4. Remove the heat sink cover. The Torx screws (T15) that are marked in the image must be removed.

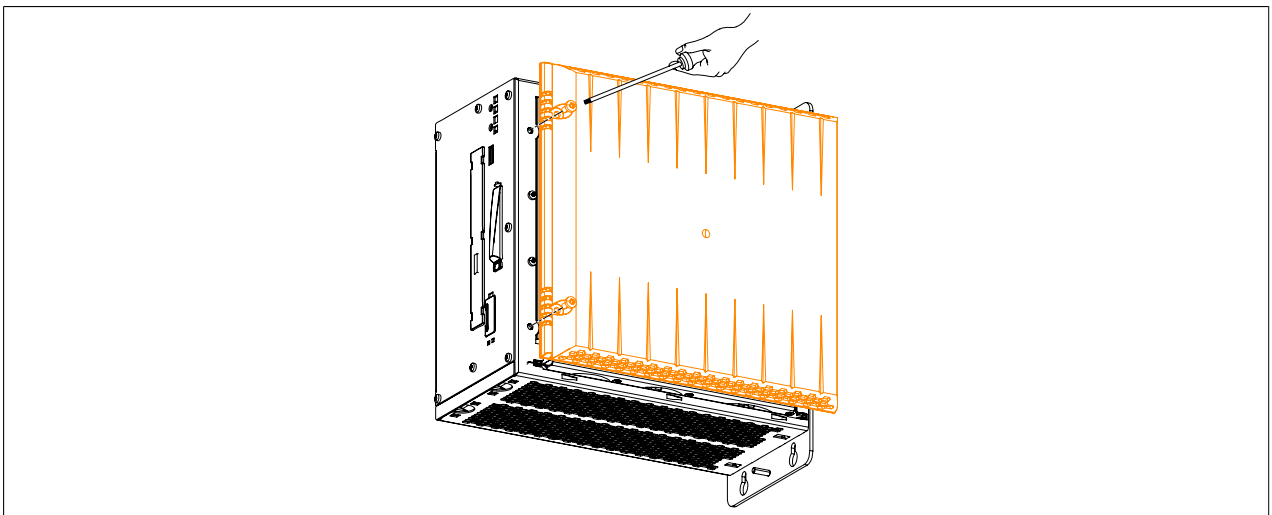


Figure 307: Removing the heat sink cover

- 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.

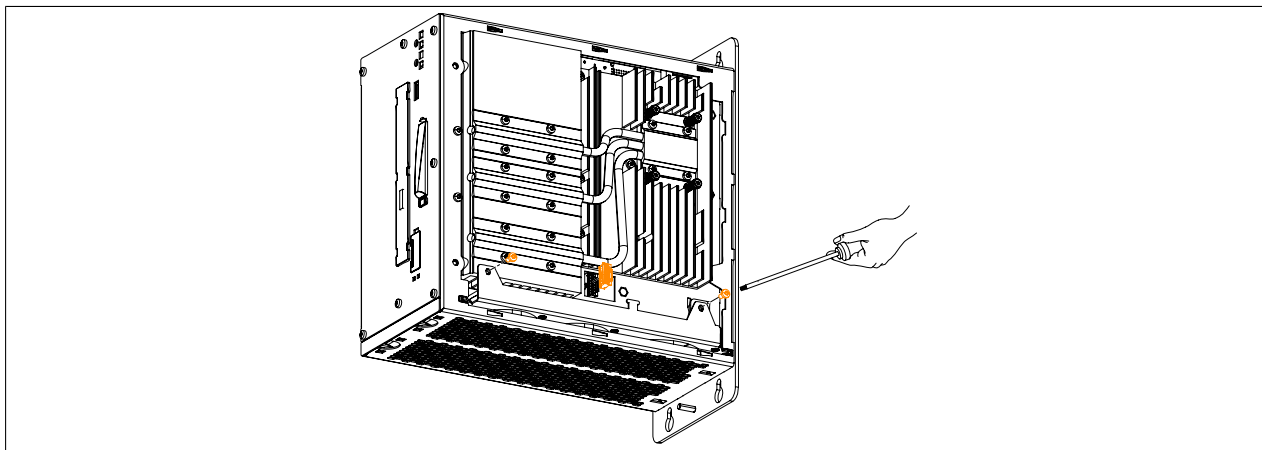


Figure 308: Removing the Torx screws and fan cable

- The fan kit can now be removed from the Automation PC 910.

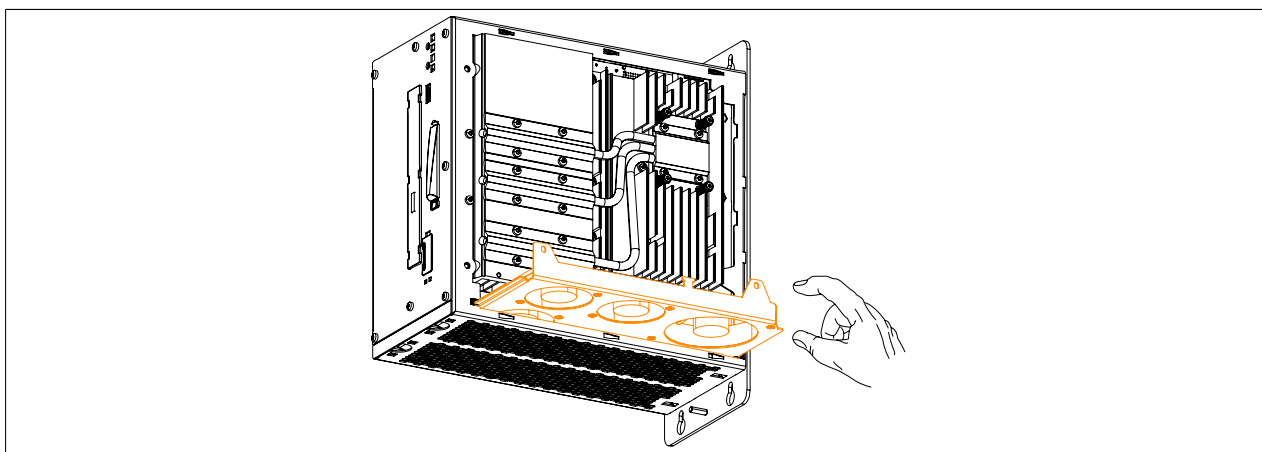


Figure 309: Removing the fan kit from the APC910

- 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 306.

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. The file needed to program the fan kit (called "fn" in the example below) is available from the B&R headquarters upon request.

1. Boot the B&R Industrial PC and type the following on the command line:
`mtcxsvc i fanfset` - Checks whether the fan kit has already been programmed
2. If the fan kit has not yet been programmed, this **can** be done by typing in the following:
`mtcxsvc 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:
`mtcxsvc 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:
`mtcxsvc 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 494. The multi-pin connector is located near the battery and slide-in compact drive.


Multi-pin connector for external devices			4-pin connector, male 
Pin	Assignment	Power	
1	+12 VDC	Max. 10 watts	
2	GND		
3	GND	Max. 5 watts	
4	+5 VDC		

Table 405: 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.

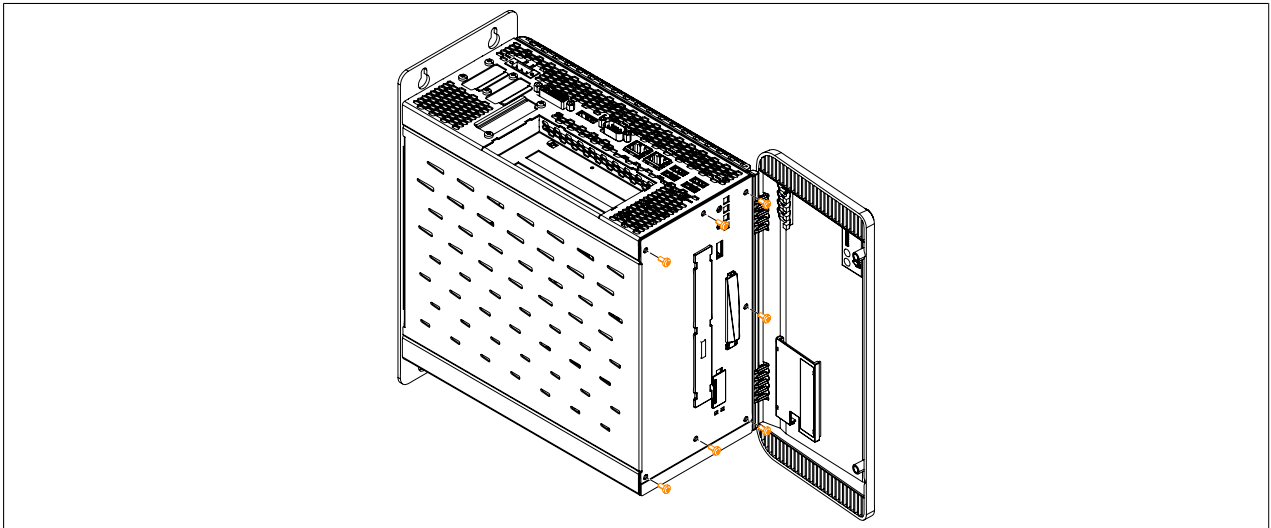


Figure 310: Removing the Torx screws for the side cover

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.

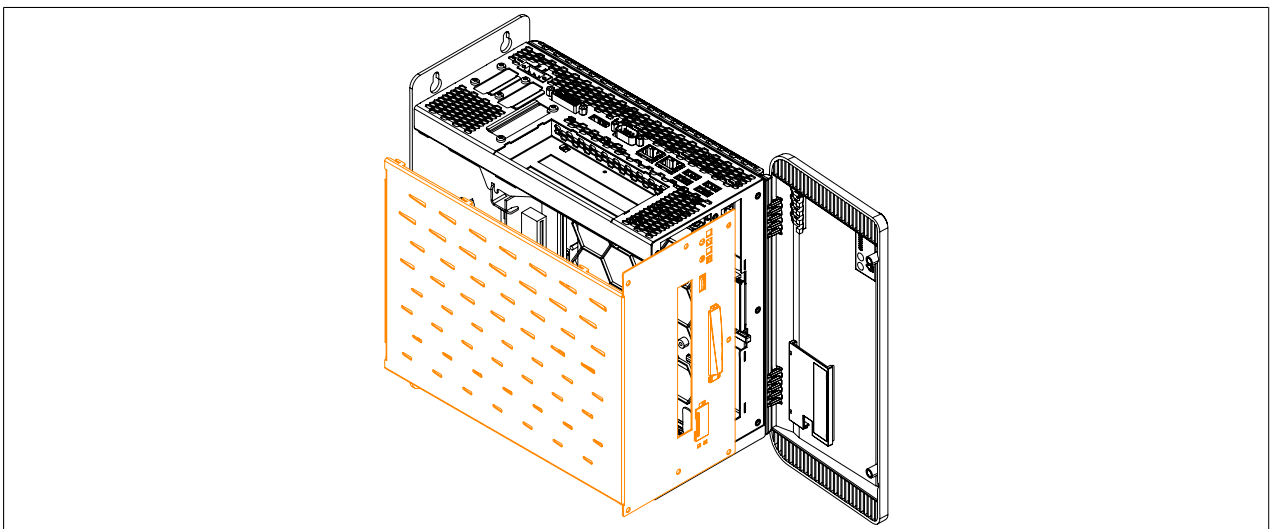


Figure 311: Removing the side cover

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.

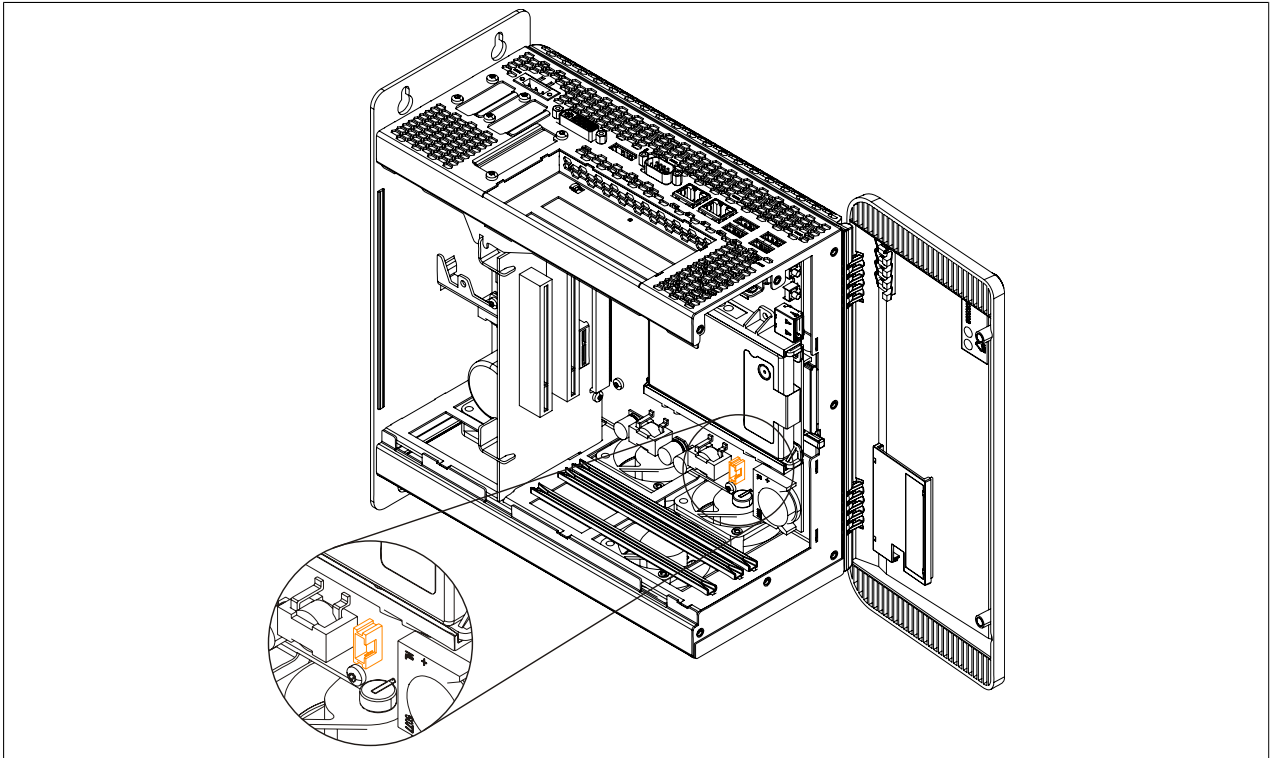


Figure 312: Connector location for external devices

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.

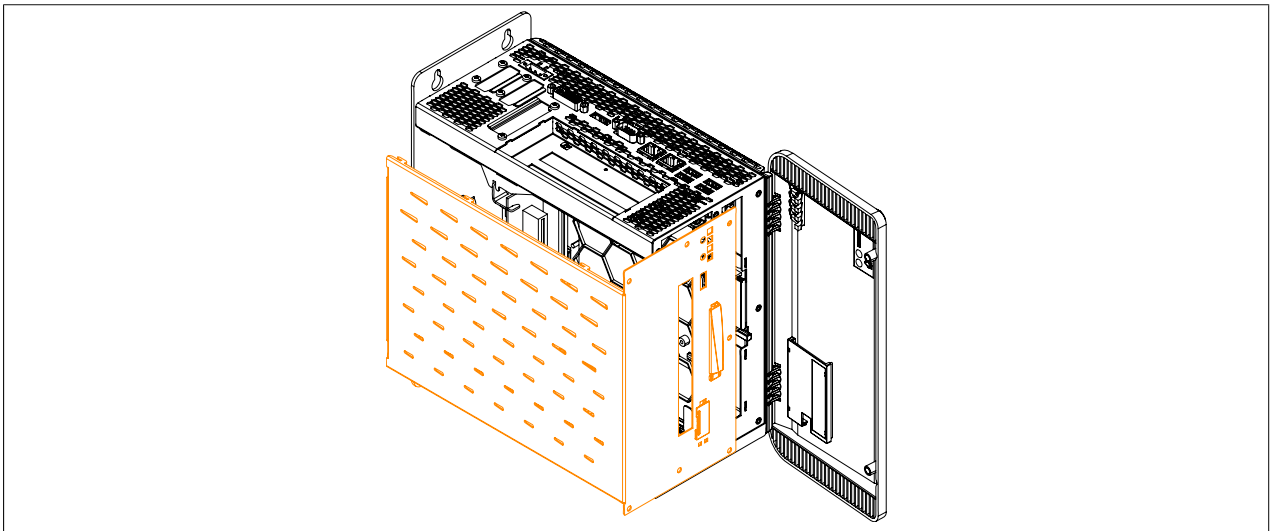


Figure 313: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same Torx screws (T10) as before.

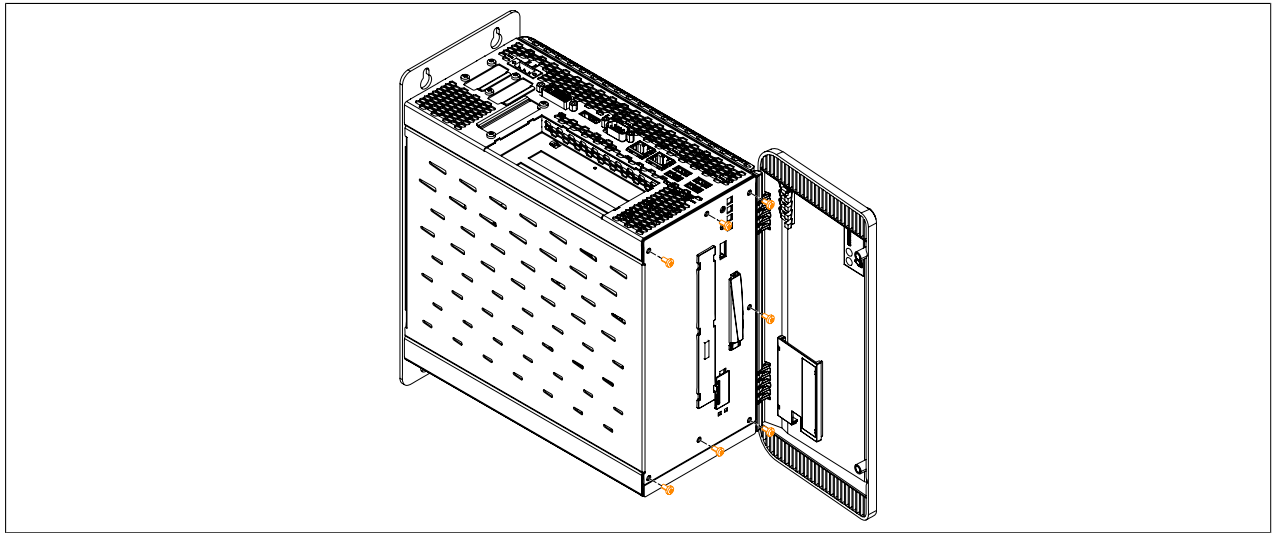


Figure 314: Securing the side cover

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 406: 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).

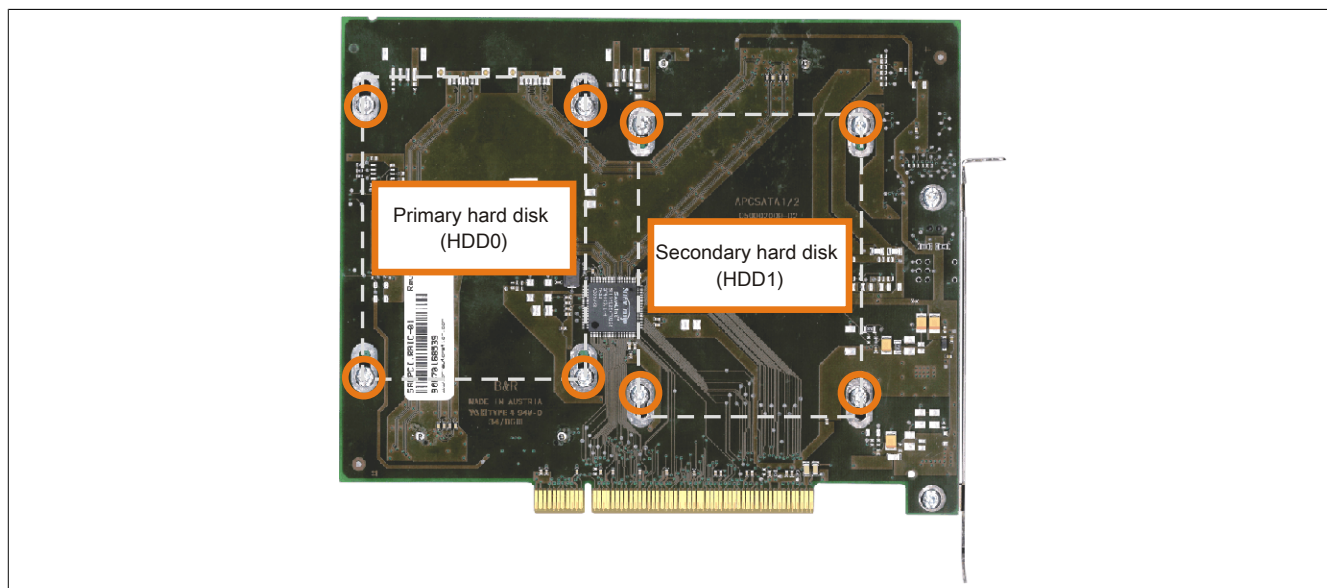


Figure 315: Screw layout on the back of the 5ACPCI.RAIC-03 SATA RAID controller

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.

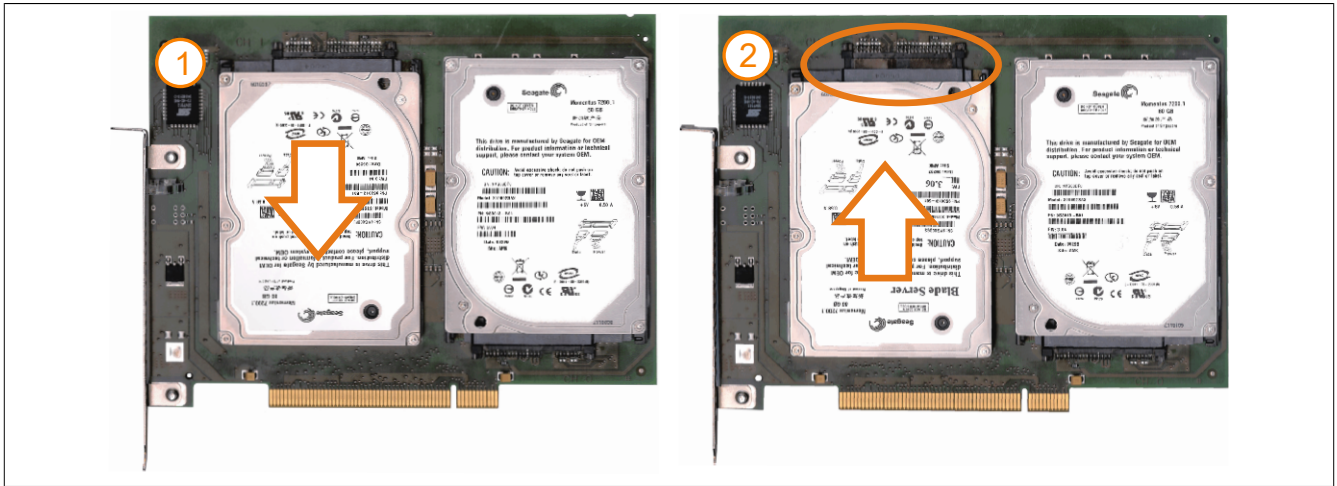


Figure 316: Exchanging the hard disk

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 238.

13 Repairs, complaints and replacement parts

Danger!

The unauthorized opening or repair of the **device can** result in injury and/or extensive damage to property. Therefore, do not attempt to perform repairs yourself. Repairs are only permitted to be performed by authorized qualified personnel at the place of manufacture.

To **process** a repair/complaint, please create a repair order or complaint using the B&R Material Return Portal on the B&R website at www.br-automation.com.

Appendix A

1 Maintenance Controller Extended (MTCX)

The **MTCX controller** (FPGA processor) is located on the mainboard (component of every system unit) of the APC910 device.

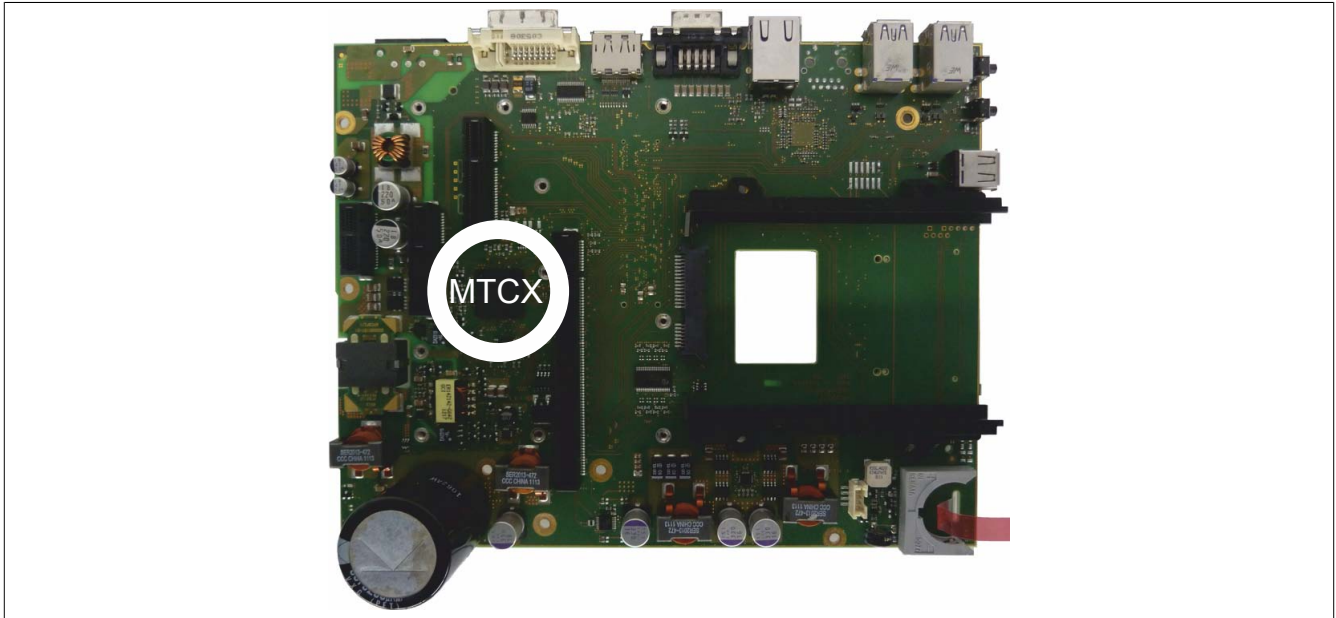


Figure 317: MTCX controller - Position

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** redirection)
- Daisy chain display operation (**touch screen**, **USB** redirection)
- Panel locking mechanism (configurable 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 at 15-minute intervals)
- SDL data transfer (display, matrix keyboard, **touch screen**, service data, **USB**)
- **LED** status indicators (Power, **HDD**, Link, Run)
- Optimal default **BIOS** settings are reported to **BIOS** by the **MTCX** based on the actual hardware.

Extended **MTCX** functions are available by upgrading its **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	Normally closed relay contact.
	Not connected	Used in pinout descriptions if a terminal or pin is not connected on the module side.
ND	Not defined	In technical data tables, this stands for a value that is not defined. This may be because a cable manufacturer does not provide a value for certain technical data, for example.
NO	Normally open	Normally open relay contact.
TBD	To be defined	Used in technical data tables when there is currently no value for specific technical data. The value will be provided at a later point in time.
B ₁₀₀	-	Number of cycles before 10% of the components have experienced hazardous failure (per channel).
MTTF _D	Mean time to dangerous failure	Average time before hazardous failure occurs (per channel).
DC	Diagnostic coverage	Diagnostic coverage
PL	Performance level	Discrete level that specifies the ability of safety-related devices to perform a safety function under foreseeable conditions.
PFH	Probability of failure per hour	Probability of failure per hour.
SIL	Safety integrity level	Safety integrity level

Table 407: Abbreviations used in this user's manual

3 Glossary

NC	<i>Numerical Control</i> > Numerical Control
Nominal current	The nominal current is the RMS value for the phase current (current in the motor supply line) when generating the nominal torque at the nominal speed. This is possible for any length of time if the environmental conditions are correct.
BIOS	<i>Basic Input/Output System</i> is abbreviated as BIOS. Core software for computer systems with essential routines for controlling input and output processes on hardware components, for performing tests after system start and for loading the operating system. Although BIOS is used to configure a system's performance, the user does not usually come into contact with it.
Baud rate	Measurement unit for data transfer speed. It indicates the number of states for a transferred signal per second and is measured using the baud unit of measurement. 1 baud = 1 bit/s or 1 bps
Bit	A <i>binary digit</i> is the smallest discrete information unit. A bit can have the value 0 or 1.
Bit rate	The number of bits that can be transferred within a specified time unit. 1 bit/sec = 1 baud.
Browser	A software tool for searching and reading websites. The most famous browsers are Microsoft Internet Explorer and Netscape Navigator.
Byte	Data format [1 byte = 8 bits] and a unit for characterizing information amounts and memory capacity. The following units are the commonly used: KB, MB, GB.
B&R Automation Runtime	Windows-based program for creating installation disks to install B&R Automation Runtime™ on the target system.
CPU	A <i>Central Processing Unit</i> is the processing and control unit of a computer; the unit which interprets and executes commands. Also known as the central processor or microprocessor. A CPU has the capability to load commands, to decode and to execute, as well as to transfer information to and from other resources.
CRT	<i>Cathode Ray Tube</i> is abbreviated as CRT. The main component of a television set or a standard computer screen. A cathode ray tube consists of a vacuum tube that contains one or more electron guns. Each electron gun creates a horizontal electron beam that appears on the front of the tube (the screen). The inner surface of the screen is coated with phosphor, which is lit when hit by the electrons. Each of the electron beams move in a line from top to bottom. In order to prevent flickering, the screen content is updated at least 25 times per second. The sharpness of the picture is determined by the number of pixels on the screen.
CTS	<i>Clear To Send</i> is abbreviated as CTS. A signal used when transferring serial data from modem to computer, indicating its readiness to send the data. CTS is a hardware signal which is transferred via line number 5 in compliance with the RS-232-C standard.
Cache	<i>Background memory</i> , also known as non-addressable memory or fast buffer memory, is used to relieve the fast main memory of a computer. For example, data that should be output to slower components by the working memory (e.g. disk storage, printers) is stored temporarily in cache memory and output from there at an appropriate speed for the target devices.
CAN	<i>Controller Area Network</i> is a serial bus system. Structure according to ISO 11898; Bus medium: twisted pair. Good transfer properties in short distances less than 40 m with a 1 Mbit/sec data transfer rate. Maximum number of stations: Theoretically unlimited, but practically limited up to 64. Real-time capable (i.e. defined maximum latency times for messages with high priority). High reliability using error detection, error handling, troubleshooting. Hamming distance.
CE mark	It consists of the letters "CE" and indicates conformity to all EU guidelines for the labeled product. It indicates that the individual or corporate body who has performed or attached the label assures that the product conforms to all EU guidelines for complete harmonization. It also indicates that all mandatory conformity evaluation procedures have taken place.
CMOS	<i>Battery-powered memory area</i> where fundamental parameters of an IBM (or compatible) personal computer are stored. Information such as the type of hard drive, size of the working memory and the current date and time are required when booting the computer. As the name suggests, the memory is based on CMOS technology standards.
COM	A device name used to access serial ports in MS-DOS. The first serial port can be accessed under COM1, the second under COM2, etc. A modem, mouse, or serial printer is typically connected to a serial port.
COM1	Device name for the first serial port in a PC system. The input/output area for COM1 is usually found at address 03F8H. Generally, the COM1 port is assigned to IRQ 4. In many systems, an RS232 serial mouse is connected to COM1.
Controller	A device component which allows access to other devices on a computer subsystem. A disk controller, for example, allows access to hard disks and disk drives and is responsible both for physical and logic drive access.
DCD	<i>Data Carrier Detected</i> is a signal used in serial communication that is sent by the modem to the computer it is connected to, indicating that it is ready for transfer.

DIMM	<i>Double In-line Memory Module</i> consists of one or more RAM chips on a small circuit board that is connected with the motherboard of a computer.
DMA	<i>Direct Memory Access</i> is accelerated direct access to a computer's RAM by bypassing the CPU.
DRAM	<i>Dynamic Random Access Memory</i> is a form of dynamic RAM consisting of an integrated semiconductor circuit that stores information based on the capacitor principle. Capacitors lose their charge in a relatively short time. Therefore, dynamic RAM circuit boards must contain a logic that allows continual recharging of RAM chips. Since the processor cannot access dynamic RAM while it is being recharged, one or more waiting states can occur when reading or writing data. Although it is slower, dynamic RAM is used more often than static RAM since the simple design of the circuits means that it can store four times more data than static RAM.
DSR	<i>Data Set Ready</i> is a signal used in serial data transfer, which is sent by the modem to the computer it is connected to, indicating its readiness for processing. DSR is a hardware signal which is sent via line number 6 in compliance with the RS-232-C standard.
DTR	<i>Data Terminal Ready</i> is a signal used in serial data transfer that is sent by the computer to the modem it is connected to, indicating the computer's readiness to accept incoming signals.
DVI-D	Digital only
DVI-I	Integrated, i.e. analog and digital
DVI	<i>Digital Visual Interface</i> is an interface for the digital transfer of video data.
EMC	<i>Electromagnetic Compatibility</i> represents the ability of a device or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment [IEV 161-01-07].
EN	<i>European Norm</i> see CENELEC
ESD	<i>Electrostatic discharge</i> > Discharge of static electricity. ESD is a process for charge equalization between solid, liquid or gaseous media, which are electrically charged in a different way. It is usually accompanied by a surface, brush, spark discharge or also flashing discharge phenomenon. However, it can also take place via a contact point (excluding line-conducted), and only when the potential difference before the contact does not exceed 330 volts. Sparking can cause flammable gases and vapors or explosive compounds to ignite and through the discharge of currents and fields can damage or destroy electronic components or interfere with the functions of their electronic operating equipment. The first-named effect falls into the jurisdiction of Fire and Explosions Protection and Technical Safety. The second-named area is the responsibility of the protection of Electrostatic Discharge Sensitive components (ESDS) and Electromagnetic Compatibility (EMC). Possible human body discharge from handling switching circuits, circuit boards, control elements, and container surfaces in transport, installation, testing, operating, repairs and service are particularly important issues for people dealing with electronic device technology. The following electrical values should be calculated: Energy content 10 to 30 mJ, electrostatic voltage 0.1 to 20 kV, strength of discharge current up to 30 A (pulse amplitude, current change speed up to 100 A/ns, electrical field strength 1 to 4 kV/m, magnetic field strength up to 15 A/m within centimeters of the discharge).
Electromagnetic compatibility	<i>Electromagnetic compatibility</i> > In accordance with EMVG: The ability of a device or a system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment [IEV 161-01-07])
Ground	In the context of electro-technical theory, the term 'ground' is more or less understood as good conductive ground, which does not have any potential differences outside the area of influence or any other electrical phenomena.
Ethernet	<i>Baseband bus system</i> from RANK XEROX. Originally developed for linking minicomputers in the early 1970s. Ethernet is based on the CSMA/CD access procedure. Coaxial cables and/or twisted pair cables [twisted copper wire pairs] serve as transfer medium. Transfer speeds: 10 Mbps [Ethernet], 100 Mbps [Fast Ethernet] as well as 1 Gbps and 10 Gbps [Gigabit Ethernet], widely growing technology used for networking computers in a LAN, standardized since 1985 [IEEE 802.3 and ISO 8802-3]. Ethernet technology has established itself in office usage. After the enabling the possibility of extremely tough real-time demands and the adaptation of the device technology [bus cable, path fields, connection boxes] to the operating conditions of the industrial world, which are considerably tougher than those in the area of office use, Ethernet is further advancing into the area of automation technology.
EDID data	<i>Extended Display Identification Data</i> > EDID data contains the characteristics of monitors / TFT displays transferred as 128 kB data blocks to the graphics card via the Display Data Channel (DDC). This EDID data can be used to set the graphics card to the monitor properties.
FDD	<i>Floppy Disk Drive</i> > Reading device for removable magnetic memory from the early days of PC technology. Due to their sensitivity and moving components, FDDs have been almost completely replaced by CompactFlash memory in modern automation solutions.
FTP	<i>File Transfer Protocol</i> > Rules for transferring data over a network from one computer to another computer. This protocol is based on TCP/IP, which has established itself as quasi standard for the transfer of data via Ethernet networks. FTP is one of the most used protocols on the Internet. It is defined in RFC 959 in the official regulations for Internet communication.
Errors	<i>Fault</i> > in accordance with IEC 61508: Abnormal operation, which can reduce or prevent the capability of a functional unit to perform a required function.
Fieldbus	Bus system in the area close to the process, for directly connecting sensors and actuators with own intelligence. On a fieldbus, small amounts of data are transferred between sensors, actuators and control devices in digital form. Transfer must occur as fast as possible (i.e. near real-time). Furthermore, a fixed minimum and maximum response time must be guaranteed. Serial fieldbuses are replacing conventional wiring more and more in modern automation systems. Serial networking of the components saves time during planning and installation. Additionally, the size of control cabinets is reduced and failure and maintenance times are shortened, thereby achieving better system availability. System expansions, changes and updates are easy to implement.
ROM	<i>Read-only memory</i> > is memory that retains the information written by the user or manufacturer, even when the power supply is shut off (i.e. nonvolatile memory). Common types of such memory include ROM, PROM, EPROM, EEPROM, EAROM.
Filter	In terms of suppression, filters are components used for damping conducted disturbance. Proper application of filters requires that the spectral part of the reference and disturbance variables are different enough from one another. This allows selective damping of disturbance variables without noticeable interference of the reference variables when the filter parameters have been laid out sufficiently. Therefore, the actual damping effect is achieved mostly through voltage division and the resulting filter effect is described using insertion loss. Filters can be used on a source of disturbance to prevent the emission of conducted disturbance and on a noise reduction system to increase the immunity to conducted disturbance. In addition to the most commonly used passive filters, which are made up of passive components, there are also active filters, which contain components that require a power supply. Active filters are widely used as signal filters. They are only used in power supply networks in special cases.
Firewall	<i>Literal meaning: Wall that provides fire protection</i> > A term used for an electronic, hardware and/or software-based security system between two networks, (i.e. Intranet and Internet), which protects the computer or internal company network from unauthorized access from the Internet. Only data for specific, authorized services are allowed to pass through the security barrier at a strictly defined point.

Firmware	Firmware is software used to operate computer-controlled devices that generally stays in the device throughout its lifespan or over a long period of time. Such software includes operating systems for CPUs and application programs for industrial PCs as well as programmable logic controllers (e.g. the software in a washing machine controller). This software is written in read-only memory (ROM, PROM, EPROM) and cannot be easily replaced.
FIFO	<i>First In First Out</i> > A queuing organization method whereby elements are removed in the same order as they were inserted. The first element inserted is also the first one removed. Such an organization method is typical for a list of documents that are waiting to be printed.
Floppy	<i>Diskette</i> > A round plastic disk with an iron oxide coating that can store a magnetic field. When the floppy disk is inserted in a disk drive, it rotates so that the different areas (or sectors) of the disk's surface are moved under the read/write head. This allows the magnetic orientation of the particle to be modified and recorded. Orientation in one direction represents binary 1, while the reverse orientation represents binary 0.
GB	<i>Gigabyte</i> > 1 GB = 1024 MB or 1,073,741,824 bytes
Device	In common usage, the word "device" is a synonym for an apparatus, instrument, piece of equipment, appliance, tool or utensil. This mostly refers to fixed or mobile equipment with relatively small spatial dimensions, with a specific function or special area of use that is generally designated using a preceding word such as in the phrases sporting device, medical device, kitchen device, hearing device, measuring device, control device, automation device, peripheral device etc. Furthermore, there are fixed and mobile large devices, such as those used in the military (tanks, aircraft, ships), medical (MRI scanners), geological (earth drilling equipment, and conveyor bridges) as well as those used in research (e.g. particle accelerator). From a technical standpoint (DIN 40150), devices are made up of components, units and modules. According to regulations regarding electromagnetic compatibility of devices, a device is considered any electrical or electronic apparatus, system, construction or network, which contains electrical or electronic parts. This device definition contradicts guidelines that are well-established and also documented in DIN standards [see above] and widely accepted by engineers, and therefore causes many misunderstandings when using the regulations regarding electromagnetic compatibility of devices.
HDD	<i>Hard Disk Drive</i> > Fixed magnetic mass memory with high capacities, e.g. 120 GB.
HTTP	<i>Hyper Text Transfer Protocol</i> > Data transfer protocol for HTML pages and all types of files coupled to them. It is the protocol that the entire WWW is based on. That means, it controls the interaction between web browser and web server. It becomes active with each mouse-click on a hyperlink and ensures that the browser is provided the respective information. www.w3c.org/Protocols
Host	<i>Host</i> > On computer systems with multiple CPUs and bus masters, this refers to the device with the arbitration unit and host CPU or the device that has control of the complete system. With regard to the Internet, a constantly available network server is called a host. <i>Hot Swap</i> > Changing computer components during operation. There are three different level: basic hot swap, full hot swap and the high availability model. Basic hot swap is the simplest form in which the module to be exchanged is deactivated or the computer configuration is changed using the computer keyboard. Computer specialists are normally needed. With full hot swap, software installed on the components being exchanged handles activation and deactivation. An integrated switch on the front of the component signals the computer that removing the component will start or that inserting the new component is complete. An LED on the front side shows that the component can be removed or that the new component has been inserted. The high availability model is used in computer systems with high availability requirements. Here, the hot swap software does not control each component individually, instead it uses a separate hot swap controller [HSC]. This allows faulty boards to be automatically deactivated and prevents crashes.
Hub	In this context, a hub is a central connection point in a network with star formed topology, which distributes incoming data packets to all connected end devices [similar to the way a multiple power socket distributes power].
IDE	<i>Integrated Device Electronics</i> > Interface for mass memory, such as HDDs, in which the controller electronics are found in the drive itself.
IEC	<i>International Electrotechnical Commission</i> > International standards organization that includes all national electro-technical committees. It specifies electro-technical standards worldwide; location: Geneva. www.iec.ch
IP	<i>Internet Protocol</i> > Protocol [method, procedure] used to transfer data from one computer to another in a network, for example on the Internet or Intranet. Each computer in the network is clearly identified by its IP address. If data is sent from one computer to another, it is broken into small information packets containing the address of the sender and receiver. These packets can reach their destination over the network using different paths and in an order other than the send sequence. Once there, they are put back in the correct order by another protocol, the Transmission Control Protocol [TCP].
ISO	<i>International Organization for Standardization</i> > Worldwide federation of national standardization institutions from over 130 countries. ISO is not an acronym for the name of the organization; it is derived from the Greek word isos, meaning "equal". www.iso.ch
Internet	<i>International Network</i> > Worldwide collection of computers and computer networks of various sizes and architectures that work with various operating systems. Information is stored remote computers [servers] that can be accessed by anyone at any time from their computers [clients]. It has developed in steps in recent decades and now is the basis for the worldwide exchange of data, for example via e-mail. It is currently the most popular network in the world with approximately 500 million users. www.isoc.org
Jitter	Jitter is a term that describes time deviations of cyclic events. If, for example, an event should take place every 200 μ s and it actually occurs every 198 to 203 μ s, then the jitter is 5 μ s. Jitter has many causes. It originates in the components and transfer media of networks because of noise, crosstalk, electromagnetic interference and many other random occurrences. In automation technology, jitter is a measure of the quality of synchronization and timing.
LED	<i>Light Emitting Diode</i> > Illuminated diodes
Latency time	Synonym for delay time, response time and runtime. For technical purposes, the time a device requires to provide an output reaction after an input arrives or, for example, the time a data packet requires to pass from the sender to the receiver on a network or remains in a network device before being forwarded.
Circuit breaker	Circuit breaker - Mechanical switching device that can switch on, allow timed operation and switch off currents under certain specified operating conditions; they can also switch on allow timed operation and switch off currents under defined exception conditions e.g. short circuit current. They are available in open and compact designs with manual, magnet, motor or pressurized air drives; in one, two, three or four pole designs; for AC, DC and three-phase current; for low voltage and high voltage applications.
Nodes	Branching point in a network.

MB	<i>Megabyte</i> > 1 MB = 220 or 1,048,576 bytes
MTBF	<i>Mean Time Between Failures</i> > The mean time between two failures for repairable objects and reliability parameters.
Machine	According to machine regulations, a machine is understood to be an entire collection of interconnected components, with at least one being movable. Along with the mechanical components, the actuator, controller and energy components are also part of a machine. See also Automation Object.
Microprocessor	Highly integrated circuit with the functionality of a CPU, normally housed on a single chip. It comprises a control unit, arithmetic and logic unit, several registers and a link system for connecting memory and peripheral components. The main performance features are the internal and external data bus and address bus widths, the command set and the clock frequency. Additionally, a choice can be made between CISC and RISC processors. The first commercially available worldwide microprocessor was the Intel 4004. It came on the market in 1971.
Modem	<i>Modulator/demodulator</i> > Modulation/demodulation device, add-on card, or external device that allows information to be exchanged between computers over the telephone network using digital/analog or analog/digital signal conversion.
Motherboard	<i>Motherboard</i> > A circuit board that houses the main components of a computer such as the CPU switching circuit, co-processors, RAM, ROM for firmware, interface circuits, and expansion slots for hardware expansions.
MTCX	<i>Maintenance Controller Extended</i> > The MTCX is an independent processor system that provides additional functions for a B&R Industrial PC that are not available with a normal PC. The MTC communicates with the B&R Industrial PC via the ISA bus (using a couple register).
OEM	<i>Original Equipment Manufacturer</i> > A company that integrates third-party and in-house manufactured components into their own product range and then distributes these products under its own name.
OPC	<i>OLE for Process Control</i> > OLE for Process Control A communication standard for components in the area of automation. The goal of OPC development is to provide an open interface that builds on Windows-based technologies such as OLE, COM and DCOM. It allows problem-free standardized data transfer between controllers, operating and monitoring systems, field devices and office applications from different manufacturers. This development is promoted by the OPC Foundation, which is made up of over 200 companies from around the world, including Microsoft and other leading companies. Nowadays, OPC is also interpreted as a synonym for Openness, Productivity and Connectivity, symbolizing the new possibilities that this standard opens up.
Object	A material thing that can be seen and touched. A person or thing to which a specified action or feeling is directed. In the context of software, it is a self-contained unit that contains specific data [attributes] and functions [operations].
Protocol	Colloquially: 1. Synonym for record or meeting minutes. 2. The original draft of a diplomatic document. In the area of Information technology (IT): Specifications regarding data formats and control procedures for communication between two devices or processes. The protocol can be implemented as hardware or software and mainly includes the following aspects: the type of error detection used, the data compression method (if used) and the way the sender indicates the end of the information sent and the receiver indicates that the information has been received.
PCI bus	<i>Peripheral Component Interconnect Bus</i> > Developed by Intel as an intermediary/local bus for the latest PC generations. It is basically a synchronous bus. The main clock of the CPU is used for synchronization. The PCI bus is microprocessor independent, compatible with 32-bit and 64-bit and supports both 3.3 V and 5 V cards and devices. See also PCI SIG.
Power Panel	Devices from this B&R product family combine visualization, control and I/O components in one compact device.
POWERLINK	see Ethernet POWERLINK www.ethernet-powerlink.org
Process	Action, event or procedure in which continuous or discontinuous, quantitative or qualitative changes to parameters or states of a real or virtual object or media being observed take place. Every process has a defined start and a defined end. Depending on what happens during a process or which objects undergo the process, it is possible to differentiate between many types of economic and industrial processes such as value-added processes [production and manufacturing processes], service processes [logistics, maintenance and repair processes], management processes [planning and maneuvering processes], etc. For technological processes, a differentiation is often made between continuous processes, discontinuous processes and charge processes depending on the continuity of the main process activity.
POH	<i>Power On Hours</i> > see MTBF.
POST	<i>Power-On Self Test</i> A set of routines that are stored in ROM on the computer and that test different system components, e.g. RAM, disk drive and the keyboard in order to determine that the connection is operating correctly and ready for operation. POST routines notify the user of problems that occur. This is done using several signal tones or by displaying a message that frequently accompanies a diagnosis value on the standard output or standard error devices (generally the monitor). If the POST runs successfully, control is transferred over to the system's bootstrap loader.
RAM	<i>Random Access Memory</i> > Memory with random access. Semiconductor memory which can be read or written to by the microprocessor or other hardware components. Memory locations can be accessed in any order. The various ROM memory types do allow random access, but they cannot be written to. The term RAM refers to a more temporary memory that can be written to as well as read.
ROM	<i>Read Only Memory</i> > Nonvolatile memory. Contents of the memory are stored by the chip manufacturer in final mask step [also called mask-programmed ROM]. It can only be read and constantly remains in the same form.
RS232	<i>Recommended Standard Number 232</i> > Oldest and most widespread interface standard, also called a V.24 interface. All signals are referenced to ground making this an imbalanced interface. High level: -3 to -30 V, low level: +3 to +30 V; Cable lengths up to 15 m, transfer rates up to 20 kbit/s. For point-to-point connections between 2 participants.
RS422	<i>Recommended Standard Number 422</i> > Interface standard, balanced operation, increased immunity to disturbances. High level: 2 to -6 V, low level: +2 to +6 V; 4-wire connections [inverted/not inverted], cable lengths up to 1200 m, transfer rates up to 10 Mbit/s, 1 sender can carry out simplex communication with up to 10 receivers.
RS485	<i>Recommended Standard Number 485</i> > Interface standard upgraded from RS422. High level: 1.5 to -6 V, low level: +1.5 to +6 V; two-wire connection [half-duplex mode] or four-wire connection [full-duplex mode]; permissible cable length up to 1200 m, transfer rates up to 10 Mbit/s. Up to 32 stations (sender/receiver) can be connected to an RS485 bus.
Control	Defined according to DIN 19226 as a procedure in which the value of a variable [controlled variable] is continually recorded, compared with another variable [reference variable] and changed according to the result of the comparison with the reference variable as compensation. This takes place in a closed control loop.
Terminals	Terminals are used to connect or attach electrical conductors. Terminals can be arranged in a row and usually have two separate poles (connection points). Single or multi-pole terminals (terminal blocks) can be grouped as terminal strips.
Robustness	<i>Robustness</i> > Ability of an object to continue functioning, even if specified conditions are not met. Qualitative term because exact assessment criteria do not exist.

RTS	<i>Request To Send</i> > A signal used in serial data transfer for requesting send permission. For example, it is sent from a computer to the modem connected to it. The RTS signal is assigned to pin 4 according to the hardware specifications of the RS-232-C standard.
RXD	<i>Receive (RX) Data</i> > A line for transferring serial data received from one device to another, e.g. from a modem to a computer. For connections complying with the RS-232-C standard, the RXD is connected to pin 3 of the plug.
SDRAM	<i>Synchronous Dynamic Random Access Memory</i> > A form of dynamic RAM semiconductor modules that can be operated at high clock rates.
PLC	<i>Programmable Logic Controller</i> > Computer-based control device that functions using an application program. The application program is relatively easy to create using standardized programming languages [IL, FBD, LAD, AS, ST]. Because of its serial functionality, response times are slower compared to connection-oriented control. Today, PLCs are available in device families with matched modular components for all levels of an automation hierarchy.
SRAM	<i>Static Random Access Memory</i> > A high-speed RAM semiconductor type that is mostly used in computers for cache memory. Using a backup battery, the contents of this memory can also be retained during a power failure.
SVGA	<i>Super Video Graphics Array</i> > Graphics standard with a resolution of at least 800×600 pixels and at least 256 colors.
Interface	From the hardware point of view, an interface is the connection point between two modules/devices/systems. The units on both sides of the interface are connected by the interface lines so that data, addresses, and control signals can be exchanged. The term interface includes all functional, electrical and constructive conditions [coding, signal level, pinout], which characterize the connection point between the modules, devices or systems. Depending on the type of data transfer, a differentiation is made between parallel [e.g. Centronics, IEEE 488] and serial interfaces [e.g. V.24, TTY, RS232, RS422, RS485], which are set up for different transfer speeds and transfer distances. From the point of view of software, the term interface describes the transfer point between program modules using specified rules for transferring the program data.
Sensor	Equipment that converts a physical value based on a physical effect into an electrical, pneumatic or hydraulic signal for further processing. Modern sensors have integrated signal preprocessing to prevent disturbances or nonlinearity. In automation technology, sensors are used to get the information required to control a process. For example, determining aggregate and machine states or to collect process data such as temperature, pressure, speed, fill level, flow, distances, angles, etc.
Safety	Brockhaus: The absence of danger or the knowledge that an individual or group is protected from potential dangers. When referring to technology, safety is the characteristic of an object [component, device, machine, system] to not present unacceptable dangers to people, equipment or the environment when operated according to specifications. Handling security issues takes place in two ways: Firstly, under the premise that the object will function as it should; secondly, under the premise that the object will not function correctly (complete failure). The first aspect mainly concerns issues of health, working conditions and fire and is regulated by many laws and guidelines. The second aspect is part of technical safety measures that are set up to minimize dangerous situations and risks associated with system failures (at least below an acceptable limiting risk level) based on the probability of a failure and the possible extent of damages. These issues are included in the topic of functional safety. For automation technology, the corresponding standards are IEC 61508 and EN 954-1. As a footnote, there is no such thing as absolute safety without any risks, neither in technology or nature.
Signal	Physical value that changes over time, e.g. a voltage or current with a parameter [amplitude, frequency, phase position] that provides concrete information about changes to another physical value. The respective parameter is called an information parameter. For example, an electric tachometer measures the rotational speed of a mechanical shaft, i.e. it is indicated by the amplitude of the tachometer output voltage. In this case, the amplitude of the output voltage is the information parameter providing information about the rotational speed of the machine shaft over time according to the signal definition. It is possible to differentiate between different basic signal types depending on the number of values, availability over time and the number of information parameters. Analog, binary and digital signals are most important for automation technology.
Slot PLC	PC insert card that has full PLC functionality. On the PC, it is coupled via a DPR with the Process using a fieldbus connection. It is programmed externally or using the host PC.
Software	SoftPLC; All programs including the respective documentation available for the operation of data processing systems, computer systems and computer-based devices of all types. Software is implemented on hardware as the non-physical functional elements of a computer system. Using the term software when referring to computer programs was initiated in 1958 by mathematician John Tukey, Princeton University. Software can be grouped as system software and application software.
Control	Targeted interaction with values in a system that can be influenced. The system being influenced is known as the controlled system and in this case is a device, machine or system in which material and/or energy are subject to one or more possible handling forms, such as extracting, transferring, converting, saving or using as desired.
Switch	Device, similar to a hub, that takes data packets received in a network and, unlike a hub, does not pass them on to all network nodes, instead only to the respective addressee. Unlike a hub, a switch provides targeted communication within a network that only takes place between sender and receiver. Other network nodes are not involved.
SXGA	<i>Super Extended Graphics Array</i> > Graphics standard with a screen resolution of 1280 × 1024 pixels (aspect ratio 5:4).
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.
Algorithm	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>Discrete</i> > An algorithm is made up of a finite series of steps. <i>Deterministic</i> > Under the same start conditions, an algorithm always creates the same end result. <i>Unambiguous</i> > The order of steps in an algorithm is clearly defined. <i>Finite</i> > An algorithm 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	The <i>American National Standards Institute</i> promotes and manages American industrial standards.
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.
APC	<i>Automation PC</i>
ASCII	<i>American Standard Code for Information Interchange</i> is a standard code is 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
Failure	<i>Failure in accordance with IEC 61508</i> indicates that a functional 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.
Automation Runtime	A uniform runtime system for all B&R automation components.
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.
ACPI	<i>Advanced Configuration and Power Interface</i> is a configuration interface that enables the operating system to control the power supply for each device connected to the PC. With ACPI, the computer's BIOS is only responsible for the details of communication with the hardware.
Symbol	From the point of view of linguistics, a symbol is a "thing" [mark, indicator, etc.] that represents "something else" [in the real or virtual world]. A "symbol" has a defined relationship with the object being referenced, an "icon" has a visual similarity with the object being referenced and an "index" is a reference to a fact or conclusion. For technical terminology [i.e. DIN 44300], characters are symbols that represent certain information [letters, numbers, special characters, etc.].
Reliability	In a technical context, reliability represents the ability to correctly operate at a continual performance level within defined probability limits and time spans. Characteristic reliability parameters are: A for availability, MTBF of repairable devices, MTTF for non-repairable systems and failure rate for modules or components, which can be used to establish the failure rate.
Task	Program unit that is assigned a specific priority by the real-time operating system. It contains a complete process can consist of several modules.
Topology	<i>Network architecture</i> > Type of connection between the network components [stations, nodes]. Standard basic structures are star structure. [All stations are connected to a central node. All communication runs through this node. Direct communication between stations is not possible] Line structure [All stations are in a single common transfer path. Only one message can be transferred from one station to another at one time] Ring structure [All stations are connected in the form of a ring. There is no central node. All stations have the same rights] Mixed structure [Each station is connected to several others. Several independent transfer paths can exist between two stations. This redundancy can be used to guarantee data transport if a transfer path is broken] Tree structure [Branched topologies are created by combining the structures mentioned]. Depending on the existing conditions, most real applications have mixed structures. For industrial automation, for example, the structure of the communication network used is heavily influenced by the special properties of the automation object [machine/system]. Applications for star network structures are mostly limited to small areas with many devices, such as individual production machines. Tree configurations, which group several star structures, are found in complex systems with many autonomous subsystems. Line structures are especially well suited for longer objects such as conveyor systems and ring structures are especially well suited for systems with stricter requirements on reliability.
Touch screen	Screen with touch sensors for selecting options in a displayed menu using the tip of the finger.
TXD	<i>Transmit (TX) Data</i> > A line for the transfer of serial data sent from one device to another, e.g. from a computer to a modem. For connections complying with the RS-232-C standard, the TXD is connected to pin 2 of the plug.
UART	<i>Universal Asynchronous Receiver/Transmitter</i> > Universal Asynchronous Receiver/Transmitter
UDMA	<i>Ultra Direct Memory Access</i> > A special IDE data transfer mode that allows high data transfer rates for drives. There have been many variations in recent times. UDMA33 mode transfers 33 megabytes per second. UDMA66 mode transfers 66 megabytes per second. UDMA100 mode transfers 100 megabytes per second.
USB	<i>Universal Serial Bus</i> > Cost-effective serial interface for PCs; IBM standard supported by Intel, Compaq and Microsoft and other well-known companies; up to 127 peripheral devices [mouse, keyboard, printer, scanner, digital cameras, modems, CDROM drives, telephones, etc.] can be connected to a single USB interface. The connected devices are also supplied with power via the 4-wire bus cable. The version on the market since 2001 (Version USB 2.0) allows data transfer rates up to 480 Mbps and is therefore also useful for transferring video data and for high-speed disk drives. www.usb.org
UPS	<i>Uninterruptible Power Supply</i> > see UPS
UXGA	<i>Ultra Extended Graphics Array</i> > Generally a screen resolution of 1600×1200 pixels (aspect ratio 4:3, 12:9).
VDE	<i>The Association for Electrical, Electronic & Information Technologies (Verband der Elektrotechnik Elektronik Informationstechnik e.V.)</i> www.vde.de
VGA	<i>Video Graphics Adapter</i>
Availability	[A] The probability that a system will be functioning at a certain point in time. Reliability parameter for repairable systems. The stationary availability is defined using the following formula: $A = 1/[1 + MDT/MTBF]$. To achieve the highest possible availability values, it is necessary to perfect all quality assurance measures regarding reliability. However, this procedure has its technical and economical limits for given production conditions. When the automation plan is not sufficient to achieve the required reliability parameters, the principle of error tolerance, which is based on the shortest error detection and reconfiguration times, can allow the availability value to be increased.

Windows CE	Compact 32-bit operating system with multitasking and multithreading that Microsoft developed especially for the OEM market. It can be ported for various processor types and has a high degree of real-time capability. The development environment uses proven, well-established development tools. It is an open and scalable Windows operating system platform for many different devices. Examples of such devices are handheld PCs, digital wireless receivers, intelligent mobile phones, multimedia consoles, etc. In embedded systems, Windows CE is also an excellent choice for automation technology.
WUXGA	<i>Wide UXGA</i> > Generally 1920 × 1200 pixels (16:10)
XGA	<i>eXtended Graphics Array</i> > An expanded standard for graphics controllers and monitors that was introduced by IBM in 1990. This standard supports 640x480 resolution with 65,536 colors or 1024x768 resolution with 256 colors. This standard is generally used in workstation systems.
XML	<i>eXtensible Markup Language</i> > Extensible markup language . This new language was officially recommended in 1998 by the World Wide Web Consortium W3C as standard for web publishing and document management in client-server environments. Further development of the SGML standard. Unlike SGML documents, XML documents do not require a schema description in the form of a DTD file. XML is already supported completely in the newer versions of many ERP and MES systems. XML is accepted as an industrial standard thanks to its simple notation. Information is represented using the ASCII character set. This makes XML easy to read and transparent, and for the most part, portability of the text form is superior to binary structures. www.xml.com

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