Automation PC 910

User's Manual

Version: **1.22 (August 2014)**
Model no.: **MAAPC900-ENG**

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Chapter 1: General information

Chapter 2: Technical data

Chapter 3: Commissioning

Chapter 4: Software

Chapter 5: Standards and certifications

Chapter 6: Accessories

Chapter 7: Maintenance and service

Appendix A

Chapter 1 General information 10

1 Manual history 10
2 Safety notices 12
2.1 Intended use 12
2.2 Protection against electrostatic discharge 12
2.2.1 Packaging 12
2.2.2 Guidelines for proper ESD handling 12
2.3 Policies and procedures 12
2.4 Transport and storage 13
2.5 Installation 13
2.6 Operation 13
2.6.1 Protection against touching electrical parts 13
2.6.2 Environmental conditions - Dust, humidity, aggressive gases 13
2.6.3 Viruses and dangerous programs 13
2.7 Environmentally friendly disposal 14
2.7.1 Separation of materials 14
3 Organization of safety notices 15
4 Guidelines 15
5 Overview 16

Chapter 2 Technical data 19

1 Introduction 19
1.1 Intel® Core™ i-series processors for the most demanding tasks 19
1.2 Maximum performance 19
1.3 Availability and reliability for many productive years 19
1.4 Features 20
1.5 System components / configuration 21
1.5.1 Configuration - Base system 21
1.5.2 Accessory and software configuration 23
2 Complete system 24
2.1 Temperature specifications 24
2.1.1 Maximum ambient temperature 25
2.1.2 Minimum ambient temperature 27
2.1.3 Temperature monitoring 27
2.1.4 Temperature sensor positions 27
2.1.5 Fan control 28
2.2 Humidity specifications 29
2.3 Power management 30
2.3.1 Supply voltage block diagram 30
2.3.2 Power calculation with 5PC910.SX01-00 31
2.3.3 Power calculation with 5PC910.SX02-00 33
2.3.4 Power calculation with 5PC910.SX05-00 35
2.4 Serial number sticker 37
2.5 Block diagrams 38
2.5.1 System unit 5PC910.SX01-00 and bus unit 5AC901.BX01-00 38
2.5.2 System unit 5PC910.SX01-00 and bus unit 5AC901.BX01-01 39
2.5.3 System unit 5PC910.SX02-00 and bus unit 5AC901.BX02-00 40
2.5.4 System unit 5PC910.SX02-00 and bus unit 5AC901.BX02-01 41
2.5.5 5PC910.SX02-00 system unit + 5AC901.BX02-02 bus unit 42
2.5.6 System unit 5PC910.SX05-00 and bus unit 5AC901.BX05-00 43
2.5.7 System unit 5PC910.SX05-00 and bus unit 5AC901.BX05-01 44
2.5.8 System unit 5PC910.SX05-00 and bus unit 5AC901.BX05-02 45
2.5.9 System unit 5PC910.SX05-00 and bus unit 5AC901.BX05-03 46
2.5.10 Monitor/Panel options 47
2.6 Device interfaces and slots 48
2.6.1 Overview of device interfaces 48
2.6.2 Supply voltage +24 VDC 50

2.6.3 COM1 serial interface....51
2.6.4 Monitor/Panel connection....52
2.6.5 DisplayPort....54
2.6.6 Ethernet 1 (ETH1)....55
2.6.7 Ethernet 2 (ETH2)....55
2.6.8 USB interfaces....56
2.6.9 IF option 1 slot....57
2.6.10 IF option 2 slot....57
2.6.11 Monitor/Panel option....58
2.6.12 Card slot (PCI / PCIe)....58
2.6.13 Status LEDs....59
2.6.14 Power button....60
2.6.15 Reset button....60
2.6.16 Battery....61
2.6.17 CFast slot....61
2.6.18 Slide-in compact slot....62
2.6.19 Slide-in slot 1....62
2.6.20 Slide-in slot 2....63
3 Individual components....64
3.1 System units....64
3.1.1 5PC910.SX01-00....64
3.1.2 5PC910.SX02-00....70
3.1.3 5PC910.SX05-00....75
3.2 QM77 CPU boards....81
3.2.1 5PC900.TS77-0x....81
3.3 HM76 CPU boards....83
3.3.1 5PC900.TS77-0x....83
3.4 Main memory....85
3.4.1 5MMDDR.xxxx-03....85
3.5 Bus units....86
3.5.1 5AC901.BX0x-0x....86
3.6 Heat sink....89
3.6.1 5AC901.HS0x-00....89
3.7 Fan kit....90
3.7.1 5AC901.FA01-00....90
3.7.2 5AC901.FA02-00....91
3.7.3 5AC901.FA05-00....92
3.8 Drives....93
3.8.1 5AC901.CHDD-00....93
3.8.2 5AC901.CHDD-01....95
3.8.3 5MMHDD.0500-00....97
3.8.4 5AC901.CSSD-00....99
3.8.5 5AC901.CSSD-01....101
3.8.6 5AC901.CSSD-02....103
3.8.7 5AC901.CSSD-03....105
3.8.8 5AC901.CSSD-04....108
3.8.9 5AC901.CSSD-05....111
3.8.10 5MMSSD.0060-00....113
3.8.11 5MMSSD.0060-01....115
3.8.12 5MMSSD.0128-01....118
3.8.13 5MMSSD.0180-00....121
3.8.14 5MMSSD.0256-00....123
3.8.15 5AC901.CCFA-00....125
3.8.16 5AC901.CHDD-99....126
3.8.17 5AC901.SDVW-00....127
3.8.18 5AC901.SSCA-00....129
3.8.19 5ACPCI.RAIC-06....130

3.9 Interface options....133
3.9.1 5AC901.I485-00....133
3.9.2 5AC901.ICAN-00....137
3.9.3 5AC901.IHDA-00....139
3.9.4 5AC901.ISRM-00....141
3.9.5 5AC901.IRDY-00....142
3.10 Monitor/Panel options....143
3.10.1 5AC901.LDPO-00....143
3.10.2 5AC901.LSDL-00....145
3.10.3 5AC901.LSD3-00....148
3.11 Uninterruptible power supply (UPS)....150
3.11.1 Requirements....150
3.11.2 5AC901.IUPS-00....151
3.11.3 5AC901.IUPS-01....153
3.11.4 5AC901.BUPS-00....155
3.11.5 5AC901.BUPS-01....159
3.11.6 5CAUPS.xxxx-01....163
3.12 Front covers....165
3.12.1 5AC901.FF0x-00....165

Chapter 3 Commissioning....166
1 Installation....166
1.1 Important installation information....166
1.2 Procedure....166
1.3 Mounting orientation....167
1.3.1 Vertical mounting orientation....167
1.3.2 Horizontal mounting orientation....167
1.4 Spacing for air circulation....168
2 Cable connections....169
3 Grounding concept....170
4 Configuring a SATA RAID set....171
4.1 Create RAID set....172
4.2 Create RAID set - Striped....172
4.3 Create RAID set - Mirrored....173
4.4 Delete RAID set....173
4.5 Rebuild mirrored set....174
4.6 Resolve conflicts....174
4.7 Low level format....175
5 Configuring a SATA RAID set using the internal RAID controller....176
5.1 Create RAID volume....177
5.2 Delete RAID volume....178
5.3 Reset disks to non-RAID....179
5.4 Recovery volume options....180

Chapter 4 Software....181
1 BIOS options....181
1.1 General information....181
1.2 BIOS Setup and boot procedure....181
1.2.1 BIOS Setup keys....182
1.3 Main....183
1.3.1 Platform information....184
1.4 Advanced....185
1.4.1 Graphics configuration....186
1.4.2 Hardware health monitoring....188
1.4.3 OEM features....189
1.4.4 PCI configuration....209
1.4.5 PCI Express configuration....211

1.4.6 ACPI settings ... 217
1.4.7 RTC wake settings ... 218
1.4.8 CPU configuration ... 219
1.4.9 Chipset configuration ... 222
1.4.10 SATA configuration ... 223
1.4.11 Memory configuration ... 226
1.4.12 USB configuration ... 229
1.4.13 Serial port console redirection ... 233
1.5 Boot ... 235
1.5.1 Boot device priority ... 235
1.5.2 Boot configuration ... 236
1.6 Security ... 237
1.6.1 HDD user password ... 238
1.7 Save & Exit ... 238
1.8 BIOS default settings ... 240
1.8.1 Advanced ... 240
1.8.2 Boot ... 244
1.9 Allocation of resources ... 246
1.9.1 RAM address assignment ... 246
1.9.2 I/O address assignment ... 246
1.9.3 Interrupt assignments in PIC mode ... 246
1.9.4 Interrupt assignments in APIC mode ... 247
2 Upgrade information ... 249
2.1 BIOS upgrade ... 249
2.1.1 Important information ... 249
2.1.2 Procedure with MS-DOS ... 250
2.2 Firmware upgrade ... 251
2.2.1 Procedure ... 251
2.3 Creating an MS-DOS boot diskette in Windows XP ... 252
2.4 Creating a bootable USB flash drive for B&R upgrade files ... 254
2.4.1 Requirements ... 254
2.4.2 Procedure ... 254
2.4.3 How to access MS-DOS ... 254
2.5 Creating a bootable mass storage device for B&R upgrade files ... 255
2.5.1 Requirements ... 255
2.5.2 Procedure ... 255
2.5.3 How to access MS-DOS ... 255
3 Windows 7 ... 256
3.1 General information ... 256
3.2 Order data ... 256
3.3 Overview ... 256
3.4 Installation ... 257
3.4.1 Installation on PCI SATA RAID controller - 5ACPCI.RAIC-06 ... 257
3.4.2 Installing to the internal RAID controller (QM77) ... 257
3.5 Drivers ... 257
3.6 Special considerations, limitations ... 257
4 Windows Embedded Standard 7 ... 258
4.1 General information ... 258
4.2 Order data ... 258
4.3 Overview ... 258
4.4 Features with WES7 (Windows Embedded Standard 7) ... 259
4.5 Installation ... 259
4.6 Drivers ... 259
4.6.1 Touch screen driver ... 260
5 Windows XP Professional ... 261
5.1 General information ... 261
5.2 Order data ... 261

5.3 Overview....261
5.4 Installation....261
5.4.1 Installation on PCI SATA RAID controller - 5ACPCI.RAIC-06....262
5.4.2 Installing to the internal RAID controller (QM77) or in AHCI mode....262
5.5 Drivers....262
6 Windows Embedded Standard 2009....263
6.1 General information....263
6.2 Order data....263
6.3 Overview....263
6.4 Features with WES2009 (Windows Embedded Standard 2009)....263
6.5 Installation....264
6.6 Drivers....264
7 Automation Runtime....265
7.1 General information....265
7.2 Order data....265
7.3 Automation Runtime Windows (ARwin)....265
7.4 Automation Runtime Embedded (ARemb)....266
8 B&R Automation Device Interface (ADI) - Control Center....267
8.1 Functions....267
8.2 Installation....268
9 B&R Automation Device Interface (ADI) Development Kit....269
10 B&R Automation Device Interface (ADI) .NET SDK....271

Chapter 5 Standards and certifications....273
1 Standards and guidelines....273
1.1 CE mark....273
1.2 EMC directive....273
1.3 Low voltage directive....273
2 Certifications....274
2.1 UL certification....274
2.2 GOST-R....274
2.3 GL certification (Germanischer Lloyd)....274

Chapter 6 Accessories....278
1 Power connectors....278
1.1 0TB103.9x....278
1.1.1 General information....278
1.1.2 Order data....278
1.1.3 Technical data....278
2 Replacement CMOS batteries....280
2.1 0AC201.91 / 4A0006.00-000....280
2.1.1 General information....280
2.1.2 Order data....280
2.1.3 Technical data....280
3 CFast cards....281
3.1 5CFAST.xxxx-00....281
3.1.1 General information....281
3.1.2 Order data....281
3.1.3 Technical data....281
3.1.4 Dimensions....284
3.1.5 Temperature humidity diagram....284
4 USB flash drives....286
4.1 5MMUSB.xxxx-01....286
4.1.1 General information....286
4.1.2 Order data....286
4.1.3 Technical data....286
4.1.4 Temperature/Humidity diagram....287

5 USB media drive....288
5.1 5MD900.USB2-02....288
5.1.1 General information....288
5.1.2 Order data....288
5.1.3 Interfaces....288
5.1.4 Technical data....288
5.1.5 Dimensions....290
5.1.6 Dimensions with front cover....290
5.1.7 Cutout installation....291
5.1.8 Contents of delivery....291
5.1.9 Installation....291
5.2 5A5003.03....292
5.2.1 General information....292
5.2.2 Order data....292
5.2.3 Technical data....292
5.2.4 Dimensions....292
5.2.5 Contents of delivery....292
5.2.6 Installation....293
6 Replacement disk tray....294
6.1 5AC901.FRAM-00....294
6.1.1 General information....294
6.1.2 Order data....294
6.1.3 Technical data....294
6.1.4 Dimensions....294
7 Cables....295
7.1 DVI cable....295
7.1.1 5CADVI.0xxx-00....295
7.2 SDL cable....298
7.2.1 5CASDL.0xxx-00....298
7.3 SDL cable with 45° male connector....301
7.3.1 5CASDL.0xxx-01....301
7.4 SDL flex cables....304
7.4.1 5CASDL.0xxx-03....304
7.5 SDL flex cable with extender....307
7.5.1 5CASDL.0xx0-13....307
7.6 SDL3 cables....311
7.6.1 5CASD3.xxxx-00....311
7.7 USB cables....314
7.7.1 5CAUSB.00xx-00....314
7.8 RS232 cables....315
7.8.1 9A0014.xx....315
7.9 Internal supply cable....317
7.9.1 5CAMSC.0001-00....317
8 Replacement fan....318
8.1 5AC901.FI0x-00....318
8.1.1 General information....318
8.1.2 Order data....318
9 Line filter....319
9.1 5AC804.MFLT-00....319
9.1.1 General information....319
9.1.2 Order data....319
9.1.3 Technical data....319
9.1.4 Dimensions....320
9.1.5 Drilling template....320
9.1.6 Connecting to the end device....320

Chapter 7 Maintenance and service....321
1 Changing the battery....321
1.1 Evaluating the battery status....321
1.2 Procedure....322
2 Replacing a CFast card....323
3 Installing interface options....324
4 Installation monitor/panel options....327
5 Installing and replacing slide-in compact drives....330
6 Installing and replacing slide-in drives....333
7 Installing PCI / PCIe cards....336
8 Installing and connecting the UPS battery unit....339
9 Replacing fan filters....340
10 Replacing fan kits....341
11 Connecting an external device to the mainboard....344
12 Replacing a PCI SATA RAID hard disk in a RAID 1 set....347
12.1 Procedure....347

Appendix A 349
1 Abbreviations....349
2 Glossary....350

Chapter 1 • General information

1 Manual history

Version	Date	Change
0.10 Preliminary	12-Jun-12	• First version
1.00	26-Nov-12	• Updated 4 "Software" on page 181. • Updated 7 "Maintenance and service" on page 321. • "Appendix A" on page 349 updated • Modified "Organization of safety notices" on page 15, updated descriptions for cautions and warnings. • Revised terminology in German edition. • Updated the following sections in the chapter "Technical data": "Temperature specifications" on page 24, "Block diagrams" on page 38 and "Humidity specifications" on page 29. • Updated the following sections in the chapter "Commissioning": "Mounting orientation" on page 167, "Spacing for air circulation" on page 168 and "Grounding concept" on page 170. • Updated CPU boards 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-05, 5PC900.TS77-06, 5PC900.TS77-07 and 5PC900.TS77-08 in section "QM77 CPU boards " on page 81 and "HM76 CPU boards " on page 83. • Updated the following drives: "5AC901.CSSD-00" on page 99, "5AC901.CSSD-01" on page 101, "5AC901.CSSD-02" on page 103, "5AC901.CCFA-00" on page 125 • Updated the following interface options: "5AC901.ICAN-00" on page 137, "5AC901.IHDA-00" on page 139, "5AC901.ISRM-00" on page 141 • Updated section "Monitor/Panel options" on page 143. • Updated the 5AC901.HS01-00 heat sink, see "5AC901.HS0x-00" on page 89. • Modified section "System components / configuration" on page 21. • Updated bus units 5AC901.BX01-01 and 5AC901.BX02-01, see "Bus units" on page 86. • "CFast cards" on page 281 updated • Updated USB media drive, see "5MD900.USB2-02" on page 288.
1.05	19-Mar-13	• Updated the following sections in the chapter 2 "Technical data": "Monitor/Panel option" on page 58, "Slide-in slot 1" on page 62 and "Uninterruptible power supply (UPS)" on page 150. • Updated the following drives: "5AC901.CHDD-01" on page 95, "5MMHDD.0500-00" on page 97, "5AC901.CHDD-99" on page 126. • Updated the service life of the battery, see "Battery" on page 61. • Updated sections "BIOS options" on page 181 and "Upgrade information" on page 249 in chapter 4 "Software". • Updated sections "Changing the battery" on page 321, "Installing PCI / PCIe cards" on page 336 and "Connecting an external device to the mainboard" on page 344 in 7 "Maintenance and service". • Modified "Max Umgebungstemperatur" on page and "Max Umgebungstemperatur" on page . • Updated "Internal supply cable" on page 317.
1.10	12-Jun-13	• Updated system unit "5PC910.SX05-00" on page 75. • Updated fan kit "5AC901.FA05-00" on page 92. • Updated front covers 5AC901.FF01-01, 5AC901.FF02-01, 5AC901.FF05-00 and 5AC901.FF05-01 on page 165. • Updated slide-in compact drive "5AC901.CSSD-03" on page 105. • Updated replacement SSDs "5MMSSD.0060-00" on page 113, "5MMSSD.0060-01" on page 115 and "5MMSSD.0180-00" on page 121. • Updated the slide-in drives "5AC901.SDVW-00" on page 127, and "5AC901.SSCA-00" on page 129. • Updated bus units 5AC901.BX05-00, 5AC901.BX05-01und and 5AC901.BX05-02 on page 86. • Updated the PCI RAID system "5ACPCI.RAIC-06" on page 130. • Updated the replacement fan kits on page 318. • Updated section "Slide-in slot 2" on page 63. • Updated 5 "Standards and certifications" on page 273. • Updated section "Configuring a SATA RAID set using the internal RAID controller" on page 176. • Updated sections "Slide-in 1 features" on page 204 and "Slide-in 2 features" on page 206 in BIOS. • Revised section "Installing and connecting the UPS battery unit" on page 339. • Revised section "Power management" on page 30. • Figure 144 "PCI and PCIe routing with the QM77/HM76 APIC CPU board" on page 248 revised. • Updated the BIOS version to V1.13, see "BIOS options" on page 181.

Table 1: Manual history

Version	Date	Change
1.15	30-Jul-13	• Updated section "Fan control" on page 28. • Updated UPS cable, see "5CAUPS.xxxx-01" on page 163. • Updated B&R USB flash drive 5MMUSB.4096-01, see "USB flash drives" on page 286. • Updated slide-in compact drive "5AC901.CSSD-04" on page 108. • Updated replacement SSD "5MMSSD.0128-01" on page 118. • Updated UPS IF option "5AC901.IUPS-01" on page 153 and UPS battery unit "5AC901.BUPS-01" on page 159. • Updated replacement disk tray "5AC901.FRAM-00" on page 294. • Updated tightening torque of locating screws in section "Cables" on page 295. • Updated 5AC901.BX02-02 and 5AC901.BX05-03 in section "Bus units" on page 86. • Updated sections "B&R Automation Device Interface (ADI) Development Kit" on page 269 and "B&R Automation Device Interface (ADI) .NET SDK" on page 271. • Updated HM76 CPU boards 5PC900.TS77-09 and 5PC900.TS77-10 in section "5PC900.TS77-0x" on page 83.
1.20	2014-04-14	• Revised sections "IF option 1 slot" on page 57 and "IF option 2 slot" on page 57. • Updated following section in "Windows 7": "Installing to the internal RAID controller (QM77)" on page 257. • Updated following section in "Windows XP Professional": "Installing to the internal RAID controller (QM77) or in AHCI mode" on page 262. • Updated information about the discontinuation of support for the "Windows XP Professional" on page 261 operating system. • Revised section "Automation Runtime" on page 265. • 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 274 and "GL certification (Germanischer Lloyd)" on page 274 in chapter 5 "Standards and certifications". • Updated the BIOS version to V1.15, see "BIOS options" on page 181. • Updated front covers 5AC901.FF01-02, 5AC901.FF02-02 and 5AC901.FF05-02 on page 165. • Updated monitor/panel option "5AC901.LSD3-00" on page 148. • Updated ready relay IF option "5AC901.IRDY-00" on page 142. • Updated slide-in compact drive "5AC901.CSSD-05" on page 111. • Updated replacement SSD "5MMSSD.0256-00" on page 123. • Corrected the technical data for ambient temperature and humidity for the following drives: "5AC901.CSSD-03" on page 105, "5AC901.CSSD-04" on page 108, "5MMSSD.0060-01" on page 115, "5MMSSD.0128-01", "5MMSSD.0256-00" on page 123. • Updated "Line filter" on page 319. • Updated SDL3 cables "5CASD3.xxxx-00" on page 311. • Updated service life diagram for the "5AC901.BUPS-00"and "5AC901.BUPS-01" battery units.
1.21	2014-05-27	• Corrected technical data for bus units with PCI Express slots, corrected PCIe standard and bus speed, see "Technical data" on page 88. • Figure 144 "PCI and PCIe routing with the QM77/HM76 APIC CPU board" on page 248 was corrected. • Documented new revision of CFast cards, see "CFast cards" on page 281.
1.22	2014-08-25	• Table 10 "1-slot APC variant - Power calculation table" on page 31, Table 12 "2-slot APC variant - Power calculation table" on page 33 and Table 14 "5-slot APC variant - Power calculation table" on page 35 corrected. • Figure 5 "Supply voltage for system units" on page 30 was corrected.

Table 1: Manual history

2 Safety notices

2.1 Intended use

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

2.2 Protection against electrostatic discharge

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

2.2.1 Packaging

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

2.2.2 Guidelines for proper ESD handling

Electrical components with a housing

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

Electrical components without a housing

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

- Any persons handling electrical components or devices with installed electrical components must be grounded.
- Components may only be touched on their narrow sides or front plate.
- Components should always be stored in a suitable medium (ESD packaging, conductive foam, etc.). Metallic surfaces are not suitable storage surfaces!
- Components should not be subjected to electrostatic discharge (e.g. through the use of charged plastics).
- Ensure a minimum distance of 10 cm from monitors and TV sets.
- Measurement devices and equipment must be grounded.
- Measurement probes on potential-free measurement devices must be discharged on sufficiently grounded surfaces before taking measurements.

Individual components

- ESD protective measures for individual components are thoroughly integrated at B&R (conductive floors, footwear, arm bands, etc.).
- These increased ESD protective measures for individual components are not necessary for customers handling B&R products.

2.3 Policies and procedures

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

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

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

2.4 Transport and storage

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

2.5 Installation

- Installation must be performed according to this documentation using suitable equipment and tools.
- Devices may only be installed by qualified personnel without voltage applied. Before installation, voltage to the control cabinet must be switched off and prevented from being switched on again.
- General safety guidelines and national accident prevention regulations must be observed.
- Electrical installation must be carried out according to applicable guidelines (e.g. line cross sections, fuses, protective ground connections).

2.6 Operation

2.6.1 Protection against touching electrical parts

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

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

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

2.6.2 Environmental conditions - Dust, humidity, aggressive gases

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

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

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

2.6.3 Viruses and dangerous programs

This system is subject to potential risk each time data is exchanged or software is installed from a data medium (e.g. diskette, CD-ROM, USB flash drive, etc.), a network connection or the Internet. The user is responsible for assessing these dangers, implementing preventive measures such as virus protection programs, firewalls, etc. and making sure that software is only obtained from trusted sources.

2.7 Environmentally friendly disposal

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

2.7.1 Separation of materials

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

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

Table 2: Environmentally friendly separation of materials

Disposal must comply with applicable legal regulations.

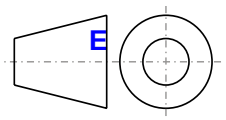
3 Organization of safety notices

Safety notices in this manual are organized as follows:

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

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

4 Guidelines



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

All dimensions are specified in mm.

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

Table 4: Range of nominal sizes

5 Overview

Product ID	Short description	on page
	Accessories	
5AC804.MFLT-00	Line filter	319
5AC901.FI01-00	APC910 replacement fan filter for 5AC901.FA01-00; 5 pcs.	318
5AC901.FI02-00	APC910 replacement fan filter for 5AC901.FA02-00; 5 pcs.	318
5AC901.FI05-00	APC910 replacement fan filter for 5AC901.FA05-00; 5 pcs.	318
5AC901.FRAM-00	APC910 slide-in compact tray	294
5CAMSC.0001-00	Internal supply cable	317
	Automation Runtime	
1A4600.10-5	B&R Automation Runtime ARwin, including license sticker	265
1A4601.06-5	B&R Automation Runtime ARemb, including license sticker	265
	Batteries	
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect the cells against short circuit. For emergency information, call RENATA SA at +41 61 319 28 27.	280
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell	280
	Bus units	
5AC901.BX01-00	APC910 bus, 1 PCI	87
5AC901.BX01-01	APC910 bus, 1 PCI Express (x8)	87
5AC901.BX02-00	APC910 bus, 2 PCI	87
5AC901.BX02-01	APC910 bus, 1 PCI, 1 PCI Express (x8)	87
5AC901.BX02-02	APC910 bus, 2 PCI Express (x4)	87
5AC901.BX05-00	APC910 bus, 5 PCI	87
5AC901.BX05-01	APC910 bus, 4 PCI, 1 PCI Express (x8)	87
5AC901.BX05-02	APC910 bus, 2 PCI, 1 PCI Express (x8), 2 PCI Express (x1)	87
5AC901.BX05-03	APC910 Bus, 2 PCI Express (x4), 3 PCI Express (x1)	87
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB	281
5CFAST.032G-00	CFast card, 32 GB	281
5CFAST.2048-00	CFast card, 2 GB	281
5CFAST.4096-00	CFast card, 4 GB	281
5CFAST.8192-00	CFast card, 8 GB	281
	CPU boards	
5PC900.TS77-00	APC910 Core i7 3615QE CPU board, 2.3 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	81
5PC900.TS77-01	APC910 Core i7 3612QE CPU board, 2.1 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	81
5PC900.TS77-02	APC910 Core i7 3555LE CPU board, 2.5 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	81
5PC900.TS77-03	APC910 Core i7 3517UE CPU board, 1.7 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	81
5PC900.TS77-04	APC910 Core i5 3610ME CPU board, 2.7 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	81
5PC900.TS77-05	APC910 Core i3 3120ME CPU board, 2.4 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	81
5PC900.TS77-06	APC910 Core i3 3217UE CPU board, 1.6 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	81
5PC900.TS77-07	APC910 Celeron 847E CPU board, 1.1 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	83
5PC900.TS77-08	APC910 Celeron 827E CPU board, 1.4 GHz, single core, 1.5 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	83
5PC900.TS77-09	APC910 Celeron 1020E CPU board, 2.2 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	83
5PC900.TS77-10	APC910 Celeron 1047UE CPU board, 1.4 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	83
	DVI cables	
5CADVI.0018-00	DVI-D cable, 1.8 m	295
5CADVI.0050-00	DVI-D cable, 5 m	295
5CADVI.0100-00	DVI-D cable, 10 m	295
	Drives	
5AC901.CCFA-00	CFast adapter for operating a CFast card in a slide-in compact slot	125
5AC901.CHDD-00	250 GB SATA hard disk, slide-in compact, 24/7 operation note: please see the manual for information about using this hard disk	93
5AC901.CHDD-01	500 GB SATA hard disk, slide-in compact, 24/7 operation Note: please see the manual for information about using this hard disk	95
5AC901.CHDD-99	Slide-in compact kit	126
5AC901.CSSD-00	32 GB SATA SSD (SLC), slide-in compact	99
5AC901.CSSD-01	60 GB SATA SSD (MLC), slide-in compact	101
5AC901.CSSD-02	180 GB SATA SSD (MLC), slide-in compact	103
5AC901.CSSD-03	60 GB SATA slide-in compact SSD (MLC)	105
5AC901.CSSD-04	128 GB SATA SSD (MLC), slide-in compact	108
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	111
5AC901.SDVW-00	DVD-R/RW DVD+R/RW SATA slide-in drive	127
5AC901.SSCA-00	Slide-in compact adapter for operating a slide-in compact drive in a slide-in slot.	129
5ACPCI.RAIC-06	PCI RAID system SATA 2x 500 GB; note: please see the manual for information about using this hard disk	130

Product ID	Short description	on page
5MMHDD.0500-00	500 GB SATA hard disk; replacement for 5AC801.HDDI-04, 5AC901.CHDD-01 and 5ACPCI.RAIC-06; note: please see the manual for information about using this hard disk	97
5MMSSD.0060-00	60 GB SATA SSD (MLC); replacement for 5AC801.SSDI-01 and 5AC901.CSSD-01; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	113
5MMSSD.0060-01	60 GB SATA SSD (MLC); replacement for 5AC801.SSDI-03 and 5AC901.CSSD-03; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	115
5MMSSD.0128-01	128 GB SATA SSD (MLC); replacement for 5AC801.SSDI-04 and 5AC901.CSSD-04; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	118
5MMSSD.0180-00	180 GB SATA SSD (MLC); replacement part for 5AC801.SSDI-02 and 5AC901.CSSD-02; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	121
5MMSSD.0256-00	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	123
	Fan kit	
5AC901.FA01-00	APC910 fan kit for 5PC910.SX01-00 system unit	90
5AC901.FA02-00	APC910 fan kit for 5PC910.SX02-00 system unit	91
5AC901.FA05-00	APC910 fan kit for 5PC910.SX05-00 system unit	92
	Front cover	
5AC901.FF01-00	Front cover for 1-slot APC910, orange	165
5AC901.FF01-01	Front cover for 1-slot APC910, dark gray	165
5AC901.FF01-02	Front cover for 1-slot APC910 - Dark gray - Without logo	165
5AC901.FF02-00	Front cover for 2-slot APC910, orange	165
5AC901.FF02-01	Front cover for 2-slot APC910, dark gray	165
5AC901.FF02-02	Front cover for 2-slot APC910 - Dark gray - Without logo	165
5AC901.FF05-00	Front cover for 5-slot APC910, orange	165
5AC901.FF05-01	Front cover for 5-slot APC910, dark gray	165
5AC901.FF05-02	Front cover for 5-slot APC910 - Dark gray - Without logo	165
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	89
5AC901.HS01-00	APC910 heat sink, passive	89
	Interface options	
5AC901.I485-00	RS232/422/485 interface option; for installation in an APC910 or PPC900	133
5AC901.ICAN-00	CAN interface option; for installation in an APC910 or PPC900	137
5AC901.IHDA-00	Audio interface option; connection for 1x MIC, 1x Line IN, 1x Line OUT; for installation in an APC910	139
5AC901.IRDY-00	Ready relay interface option; for APC910	142
5AC901.ISRM-00	SRAM interface option, 2 MB; for installation in an APC910 or PPC900	141
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	85
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	85
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	85
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	85
	Monitor / Panel options	
5AC901.LDPO-00	DisplayPort transmitter	143
5AC901.LSD3-00	SDL3 transmitter	148
5AC901.LSDL-00	Smart Display Link / DVI transmitter	145
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of a display unit with touch screen, 1.8 m	315
9A0014.05	RS232 extension cable for remote operation of a display unit with touch screen, 5 m	315
9A0014.10	RS232 extension cable for remote operation of a display unit with touch screen, 10 m	315
	SDL cables	
5CASDL.0018-00	SDL cable, 1.8 m	298
5CASDL.0050-00	SDL cable, 5 m	298
5CASDL.0100-00	SDL cable, 10 m	298
5CASDL.0150-00	SDL cable, 15 m	298
5CASDL.0200-00	SDL cable, 20 m	298
5CASDL.0250-00	SDL cable, 25 m	298
5CASDL.0300-00	SDL cable, 30 m	298
	SDL cables with 45° connectors	
5CASDL.0018-01	SDL cable with 45° male connector, 1.8 m	301
5CASDL.0050-01	SDL cable with 45° male connector, 5 m	301
5CASDL.0100-01	SDL cable with 45° male connector, 10 m	301
5CASDL.0150-01	SDL cable with 45° male connector, 15 m	301
	SDL flex cables	
5CASDL.0018-03	SDL flex cable, 1.8 m	304
5CASDL.0050-03	SDL flex cable, 5 m	304
5CASDL.0100-03	SDL flex cable, 10 m	304
5CASDL.0150-03	SDL flex cable, 15 m	304
5CASDL.0200-03	SDL flex cable, 20 m	304
5CASDL.0250-03	SDL flex cable, 25 m	304
5CASDL.0300-03	SDL flex cable, 30 m	304
5CASDL.0300-13	SDL flex cable with extender, 30 m	307
5CASDL.0400-13	SDL flex cable with extender, 40 m	307
5CASDL.0430-13	SDL flex cable with extender, 43 m	307
	SDL3 -Kabel	
5CASD3.0100-00	SDL3 cable, 10 m	311
5CASD3.0150-00	SDL3 cable, 15 m	311
5CASD3.0200-00	SDL3 cable, 20 m	311

Product ID	Short description	on page
5CASD3.0300-00	SDL3 cable, 30 m	311
5CASD3.0500-00	SDL3 cable, 50 m	311
5CASD3.1000-00	SDL3 cable, 100 m	311
	System units	
5PC910.SX01-00	APC910 system unit,1 slot (PCI Express, PCI, depending on the bus), 1 slide-in compact slot, Smart Display Link/DVI/Monitor, DisplayPort, 1x RS232, 5x USB, 2x ETH 10/100/1000, 1 CFast slot, 24 VDC	64
5PC910.SX02-00	APC910 system unit, 2 slots (PCI Express, PCI, depending on the bus), 1 slot for monitor/panel option, 1 slide-in compact slot and 1 slide-in slot; Smart Display Link/DVI/Monitor, DisplayPort, 1x RS232, 5x USB, 2x ETH 10/100/1000, 1 CFast slot, 24 VDC	70
5PC910.SX05-00	APC910 system unit, 5 slots (PCI Express, PCI, depending on the bus), 1 slot for monitor/panel option, 1 slide-in compact slot and 2 slide-in slots; Smart Display Link/DVI/Monitor, DisplayPort, 1x RS232, 5x USB, 2x ETH 10/100/1000, 1 CFast slot, 24 VDC	75
	Terminal blocks	
0TB103.9	Connector, 24 VDC, 3-pin female, 3.31 mm² screw clamps, protected against vibration by the screw flange	278
0TB103.91	Connector, 24 VDC, 3-pin female, 3.31 mm² cage clamps, protected against vibration by the screw flange	278
	USB accessories	
5A5003.03	Front cover, for remote CD-ROM drive 5A5003.02 and USB 2.0 drive combination 5MD900.USB2-00, 5MD900.USB2-01 and 5MD900.USB2-02	292
5MD900.USB2-02	USB 2.0 drive combination, consists of DVD-R/RW DVD+R/RW, CompactFlash slot (Type II), USB connection (Type A on the front, Type B on the back); 24V DC (order screw clamp terminal 0TB103.9 or cage clamp terminal 0TB103.91 separately)	288
5MMUSB.2048-01	USB 2.0 flash drive, 2048 MB, B&R	286
5MMUSB.4096-01	USB 2.0 flash drive, 4096 MB, B&R	286
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable type A - type B, 1.8 m	314
5CAUSB.0050-00	USB 2.0 connection cable type A - type B, 5 m	314
	Uninterruptible power supplies	
5AC901.BUPS-00	Battery unit 4.5 Ah; for UPS 5AC901.IUPS-00	155
5AC901.BUPS-01	Battery unit 2.2 Ah; for UPS 5AC901.IUPS-01	159
5AC901.IUPS-00	UPS interface option; for installation in an APC910 or PPC900; for 4.5 Ah battery	151
5AC901.IUPS-01	UPS interface option; for installation in an APC910 or PPC900; for 2.2 Ah battery	153
5CAUPS.0005-01	UPS cable 0.5 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	163
5CAUPS.0010-01	UPS cable 1 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	163
5CAUPS.0030-01	UPS cable 3 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	163
	Windows 7 Professional/Ultimate	
5SWWI7.1100-ENG	Microsoft OEM Windows 7 Professional 32-bit, Service Pack 1, DVD, English. Only available with a new device.	256
5SWWI7.1100-GER	Microsoft OEM Windows 7 Professional 32-bit, Service Pack 1, DVD, German. Only available with a new device.	256
5SWWI7.1200-ENG	Microsoft OEM Windows 7 Professional 64-bit, Service Pack 1, DVD, English. Only available with a new device.	256
5SWWI7.1200-GER	Microsoft OEM Windows 7 Professional 64-bit, Service Pack 1, DVD, German. Only available with a new device.	256
5SWWI7.1300-MUL	Microsoft OEM Windows 7 Ultimate 32-bit, Service Pack 1, DVD, multilingual. Only available with a new device.	256
5SWWI7.1400-MUL	Microsoft OEM Windows 7 Ultimate 64-bit, Service Pack 1, DVD, multilingual. Only available with a new device.	256
	Windows Embedded Standard 2009	
5SWWXP.0740-ENG	Microsoft OEM Windows Embedded Standard 2009, English; for APC910 with QM77/HM76 chipset; order CFast separately (at least 2 GB).	263
	Windows Embedded Standard 7	
5SWWI7.1540-ENG	Microsoft OEM Windows Embedded Standard 7 32-bit, Service Pack 1, English; for APC910 with QM77/HM76 chipset; order CFast separately (at least 16 GB).	258
5SWWI7.1640-ENG	Microsoft OEM Windows Embedded Standard 7 64-bit, Service Pack 1, English; for APC910 with QM77/HM76 chipset; order CFast separately (at least 16 GB).	258
5SWWI7.1740-MUL	Microsoft OEM Windows Embedded Standard 7 Premium 32-bit, Service Pack 1, multilingual; for APC910 with QM77/HM76 chipset; order CFast separately (at least 16 GB without language packs).	258
5SWWI7.1840-MUL	Microsoft OEM Windows Embedded Standard 7 Premium 64-bit, Service Pack 1, multilingual; for APC910 with QM77/HM76 chipset; order CFast separately (at least 16 GB).	258
	Windows XP Professional	
5SWWXP.0600-ENG	Microsoft OEM Windows XP Professional Service Pack 3, CD, English. Only available with a new device.	261
5SWWXP.0600-GER	Microsoft OEM Windows XP Professional Service Pack 3, CD, German. Only available with a new device.	261
5SWWXP.0600-MUL	Microsoft OEM Windows XP Professional Service Pack 3, CD, multilingual. Only available with a new device.	261

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 ports 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 paint 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 have guaranteed long-term availability. In addition, Automation PC generations are produced in excess of 10 years – quite the exception in the otherwise fast-paced PC sector and a significant advantage for

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

1.4 Features

- Latest processor technology - Intel® Core™ i-series (Generation 3 - Ivy Bridge)
- Up to 16 GB main memory (dual-channel memory support)
- 1 CFast slot[1)]
- 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
- Fan-free operation[2)]
- BIOS (AMI)
- Real-time clock (RTC, battery-backed)
- Wide range of interface options
- Wide range of monitor/panel options

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

2) Depends on the device configuration and ambient temperature.

1.5 System components / configuration

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

- System unit
- Bus unit
- CPU board
- Heat sink
- Fan kit[3)]
- Main memory
- Drive (mass storage device such as CFast card or hard disk) for the operating system
- Software

1.5.1 Configuration - Base system

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

Using a fan kit allows for operation at higher ambient temperatures. More information can be found under "Maximum ambient temperature" on page 25.

Configuration with a fan kit

Base system configuration 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
Heat sink	Select 1		
	5AC901.HS00-00		
Fan kit	Select 1		
	5AC901.FA01-00	5AC901.FA02-00	5AC901.FA05-00
Main memory	Select one or two		
	5MMDDR.1024-03 5MMDDR.2048-03	5MMDDR.4096-03 5MMDDR.8192-03	

Figure 1: Base system configuration with a fan kit

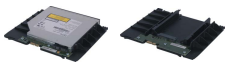
[3)] A fan kit is only mandatory when using the 5AC901.HS00-00 heat sink. If a fan kit is not used, it is important to consider the more limited ambient temperature specifications (see "Maximum ambient temperature" on page 25).

Configuration without a fan kit

Base system configuration without a fan kit (passive)			
System unit	Select 1		
A system unit consists of a housing and mainboard.	5PC910.SX01-00	5PC910.SX02-00	5PC910.SX05-00
Bus unit	Select 1		
	5AC901.BX01-00 5AC901.BX01-01	5AC901.BX02-00 5AC901.BX02-01 5AC901.BX02-02	5AC901.BX05-00 5AC901.BX05-01 5AC901.BX05-02 5AC901.BX05-03
CPU board / Heat sink / Main memory			
CPU board	Select 1		
	QM77 CPU boards 5PC900.TS77-01 5PC900.TS77-02 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
Heat sinks	Select 1		
	5AC901.HS01-00		
Main memory	Select one or two		
	5MMDDR.1024-03 5MMDDR.2048-03	5MMDDR.4096-03 5MMDDR.8192-03	

Figure 2: Base system configuration without a fan kit

1.5.2 Accessory and software configuration

Accessory and software configuration			
System unit	Select 1		
A system unit consists of a housing and mainboard.	5PC910.SX01-00	5PC910.SX02-00	5PC910.SX05-00
Front cover	Select 1 [1]		
	5AC901.FF01-00 5AC901.FF01-01 5AC901.FF01-02	5AC901.FF02-00 5AC901.FF02-01 5AC901.FF02-02	5AC901.FF05-00 5AC901.FF05-01 5AC901.FF05-02
Slide-in compact drives	Select 1		
	5AC901.CHDD-01 5AC901.CSSD-03 5AC901.CSSD-04	5AC901.CSSD-05 5AC901.CCFA-00	
Slide-in drives		Select max. 1	Select max. 2
		5AC901.SDVW-00 5AC901.SSCA-00	
RAID system	Select 1		
	5ACPCI.RAIC-06 (uses 1 PCI slot) 5MMHDD.0500-00		
IF options	Select max. 2 [2]		
	5AC901.I485-00 5AC901.ICAN-00	5AC901.IHDA-00 5AC901.ISRM-00	5AC901.IRDY-00
Monitor/Panel options		Select 1	
		5AC901.LDPO-00 5AC901.LSDL-00 5AC901.LSD3-00	
UPS	Select 1 each		
	UPS module [3] + **Battery unit** + **UPS cable** 5AC901.IUPS-00 + 5AC901.BUPS-00 5CAUPS.0005-01 5AC901.IUPS-01 + 5AC901.BUPS-01 5CAUPS.0010-01 5CAUPS.0030-01		
CFast cards	Select 1		
	5CFAST.2048-00 5CFAST.4096-00 5CFAST.8192-00	5CFAST.016G-00 5CFAST.032G-00	
USB accessories	Select 1		
	5MMUSB.2048-01 5MMUSB.4096-01		
Terminal blocks	Select 1		
	Power connectors 0TB103.9 0TB103.91		
Operating systems	Select 1		
Windows 7 Windows Embedded Standard 2009 Windows Embedded Standard 7 Automation Runtime	**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 **Windows Embedded Standard 2009** 5SWWXP.0740-ENG	**Automation Runtime** 1A4600.10-5 1A4601.06-5 **Windows XP** 5SWWXP.0600-ENG 5SWWXP.0600-GER 5SWWXP.0600-MUL

The front cover is not included in the delivery of the system unit and must be ordered separately.

2) Certain limitations must be taken into account when using IF options. For more information, please refer to the section "Device interfaces" in Chapter 2 "Technical data".

3) The UPS module can only be operated in the IF option 1 slot.

Figure 3: Accessory and software configuration

2 Complete system

2.1 Temperature specifications

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

Information:

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

Information regarding worst-case conditions

- Thermal Analysis Tool (TAT V4.3) from Intel for simulating a 100% processor load
- BurnInTest tool (BurnInTest V4.0 Pro from Passmark Software) for simulating a 100% load on the interface via loop back adapters (serial interfaces, slide-in drives, USB ports, audio outputs)
- Maximum system expansion and power consumption

2.1.1 Maximum ambient temperature

Operation with a fan kit

Information:

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

	All temperature values in degrees Celsius (°C) at 500 m above sea level. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).	Operation with a fan kit and 5AC901.HS00-00 heat sink											Temperature limits	Location of sensor(s)
		i7 3615QE 5PC900.TS77-00	i7 3612QE 5PC900.TS77-01	i7 3555LE 5PC900.TS77-02	i7 3517UE 5PC900.TS77-03	i5 3610ME 5PC900.TS77-04	i3 3120ME 5PC900.TS77-05	i3 3217UE 5PC900.TS77-06	CM 847E 5PC900.TS77-07	CM 827E 5PC900.TS77-08	CM 1020E 5PC900.TS77-09	CM 1047UE 5PC900.TS77-10		
	Maximum ambient temperature	**50**	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**55**		
	What else can also be operated at the max. ambient temperature, or are there any limits?													
System units	5PC910.SX01-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	Power supply
	5PC910.SX02-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5PC910.SX05-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Main memory	5MMDDR.1024-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
	5MMDDR.2048-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5MMDDR.4096-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5MMDDR.8192-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Slide-in compact Drives	5AC901.CHDD-00	✓	50	50	50	50	50	50	50	50	50	50	-	Slide-in compact drive
	5AC901.CHDD-01	✓	50	50	50	50	50	50	50	50	50	50	-	
	5AC901.CSSD-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-04	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-05	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.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.IHDA-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.ISRM-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.IRDY-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.IUPS-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.IUPS-01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Monitor/Panel Options	5AC901.LDPO-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	Monitor/Panel option
	5AC901.LSDL-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.LSD3-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
CFast cards	5CFAST.2048-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
	5CFAST.4096-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5CFAST.8192-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5CFAST.016G-00	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5CFAST.032G-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

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 temperature values in degrees Celsius (°C) at 500 m above sea level. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).	Operation without a fan kit and with 5AC901.HS01-00 heat sink											Temperature limits	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		
		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		
	Maximum ambient temperature	**-**	**35**	**40**	**50**	**35**	**35**	**50**	**50**	**50**	**35**	**50**		
	What else can also be operated at the max. ambient temperature, or are there any limits?													
System units	5PC910.SX01-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	Power supply
	5PC910.SX02-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5PC910.SX05-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Main memory	5MMDDR.1024-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
	5MMDDR.2048-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5MMDDR.4096-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5MMDDR.8192-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Slide-in compact Drives	5AC901.CHDD-00	-	✓	✓	45	✓	✓	45	45	45	✓	45	-	Slide-in compact drive
	5AC901.CHDD-01	-	✓	✓	45	✓	✓	45	45	45	✓	45	-	
	5AC901.CSSD-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-01	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-02	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-03	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-04	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CSSD-05	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.CCFA-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Slide-in drives	5AC901.SDVW-00	-	25	25	25	25	25	25	25	25	25	25	-	Slide-in drive
	5AC901.SSCA-00[1]	-	-	-	-	-	-	-	-	-	-	-	-	
RAID system	5ACPCI.RAIC-06	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
Interface options	5AC901.I485-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	Interface option
	5AC901.ICAN-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.IHDA-00	-	✓	✓	40	✓	✓	40	40	40	✓	40	-	
	5AC901.ISRM-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.IRDY-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.IUPS-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.IUPS-01	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
Monitor/Panel Options	5AC901.LDPO-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	Monitor/Panel option
	5AC901.LSDL-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5AC901.LSD3-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
CFast cards	5CFAST.2048-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
	5CFAST.4096-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5CFAST.8192-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5CFAST.016G-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	
	5CFAST.032G-00	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	

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

Table 6: Ambient temperature without a fan kit

2.1.1.1 How is the maximum ambient temperature determined?

1. The CPU board is selected (i.e. 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, for example "45", next to the component, then the ambient temperature of the complete APC910 system cannot exceed this temperature.

2.1.2 Minimum ambient temperature

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

If none of these components are used, then the minimum ambient temperature is 0°C.

2.1.3 Temperature monitoring

Sensors monitor temperature values at many different locations in the APC910. The location of these temperature sensors can be seen in Figure 4 " Temperature sensor locations" on page 27. The values listed in Table 7 "Temperature sensor locations" on page 27 represent the defined maximum temperature for this measurement point. An alarm is not triggered if this temperature is exceeded. These temperatures can be read in BIOS or approved Microsoft Windows operating systems via the B&R Control Center.

In addition, the hard disks for APC910 systems available from B&R are equipped with S.M.A.R.T, or Self-Monitoring, Analysis, and Reporting Technology. This makes it possible to read various parameters, e.g. temperature, using software (such as HDD Thermometer, a freeware program) on approved Microsoft operating systems.

2.1.4 Temperature sensor positions

Sensors indicate temperature values at many different locations in the APC910. The temperatures[4] can be read in BIOS (Advanced - OEM features - System board features / CPU board features - Temperature values) or in Microsoft Windows operating systems via the B&R Control Center[5].

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

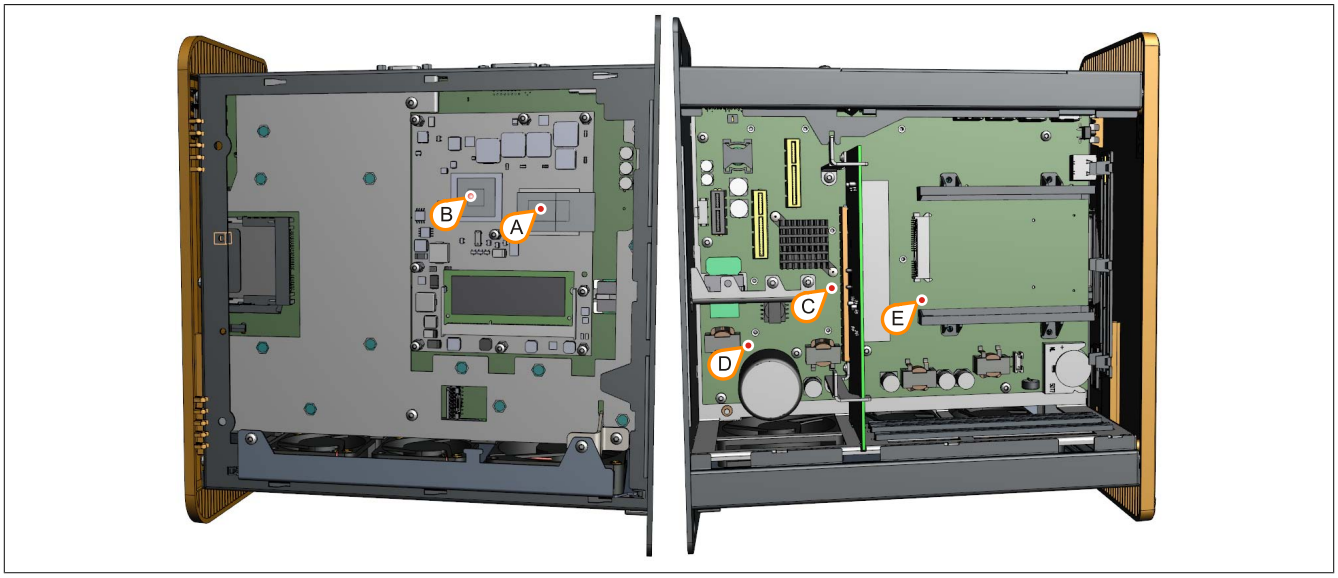


Figure 4: Temperature sensor locations

Position	Measurement point for	Measurement	Max. specified
A	CPU	Ambient temperature of the processor (sensor integrated in the processor)	95°C
B	Board controller	Board controller temperature (sensor integrated on the CPU board)	95°C
C	Main memory	Main memory proximity temperature (sensor integrated on the mainboard)	75°C
D	Board power supply	Board power supply temperature (sensor on the mainboard)	90°C
E	Slide-in compact	Slide-in compact drive proximity temperature (sensor on the mainboard).	Drive-dependent
F	Slide-in drive 1	Slide-in drive 1 temperature (sensor integrated in the slide-in slot)	Depends on the drive
G	Slide-in drive 2	Slide-in drive 2 temperature (sensor integrated in the slide-in slot)	Depends on the drive

Table 7: Temperature sensor locations

[4] The temperature measured approximates the immediate ambient temperature but can be influenced by neighboring components.
[5] The ADI driver that includes the B&R Control Center is available in the Downloads section of the B&R website (www.br-automation.com).

Position	Measurement point for	Measurement	Max. specified
H	Interface option[1)]	Interface option temperature (sensor integrated on the interface option)	Depends on the interface option
I	Monitor/Panel option	Monitor/Panel option temperature (sensor integrated on the monitor/panel option)	Depends on the monitor/panel option

Table 7: Temperature sensor locations

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

2.1.5 Fan control

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

Position	Measurement point for	Start-up temperature	Max. fan speed at:
A	CPU	65°C	81°C
B	Board controller	65°C	81°C
C	Main memory	60°C	76°C
D	Board power supply	70°C	86°C
E	Slide-in compact	60°C	76°C
F	Slide-in drive 1	5AC901.SDVW-00: 44°C, 5AC901.SSCA-00: 55°C	5AC901.SDVW-00: 60°C, 5AC901.SSCA-00: 71°C
G	Slide-in drive 2	5AC901.SDVW-00: 44°C, 5AC901.SSCA-00: 55°C	5AC901.SDVW-00: 60°C, 5AC901.SSCA-00: 71°C
H	Interface option[1)]	-	-
I	Monitor/Panel option	5AC901.LDPO-00: 60°C, 5AC901.LSDL-00: 60°C, 5AC901.LSD3-00: 60°C	5AC901.LDPO-00: 76°C, 5AC901.LSDL-00: 76°C, 5AC901.LSD3-00: 76°C

Table 8: Temperature sensor locations

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

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

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

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

2.2 Humidity specifications

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

Component		Operation	Storage / Transport
System units (all models)		5 to 90%	5 to 95%
QM77 / HM76 CPU boards		10 to 90%	5 to 95%
Main memory for CPU boards		10 to 90%	5 to 95%
Slide-in compact drives	5AC901.CHDD-00	5 to 95%	5 to 95%
	5AC901.CHDD-01	5 to 95%	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 95%	8 to 95%
	5AC901.CSSD-03 ≥ Rev. D0	5 to 90%	5 to 95%
	5AC901.CSSD-04 ≤ Rev. C0	8 to 95%	8 to 95%
	5AC901.CSSD-04 ≥ Rev. D0	5 to 90%	5 to 95%
	5AC901.CSSD-05	5 to 90%	5 to 95%
	5AC901.CCFA-00	5 to 90%	5 to 95%
Slide-in drives	5AC901.SDVW-00	8 to 80%	5 to 95%
RAID system	5ACPCI.RAIC-06	5 to 95%	5 to 95%
Interface options	5AC901.I485-00	5 to 90%	5 to 95%
	5AC901.ICAN-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.IRDY-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%
Accessories	USB Flash Drive 5MMUSB.2048-01	10 to 90%	5 to 90%
	USB Flash Drive 5MMUSB.4096-01	10 to 90%	5 to 90%
	5CFAST.xxxx-00 CFast cards	Max. 85%	Max. 85%
	5MD900.USB2-02 USB media drive	20 to 80%	5 to 90% / 5 to 95%

Table 9: Overview of humidity specifications for individual components

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

2.3 Power management

2.3.1 Supply voltage block diagram

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

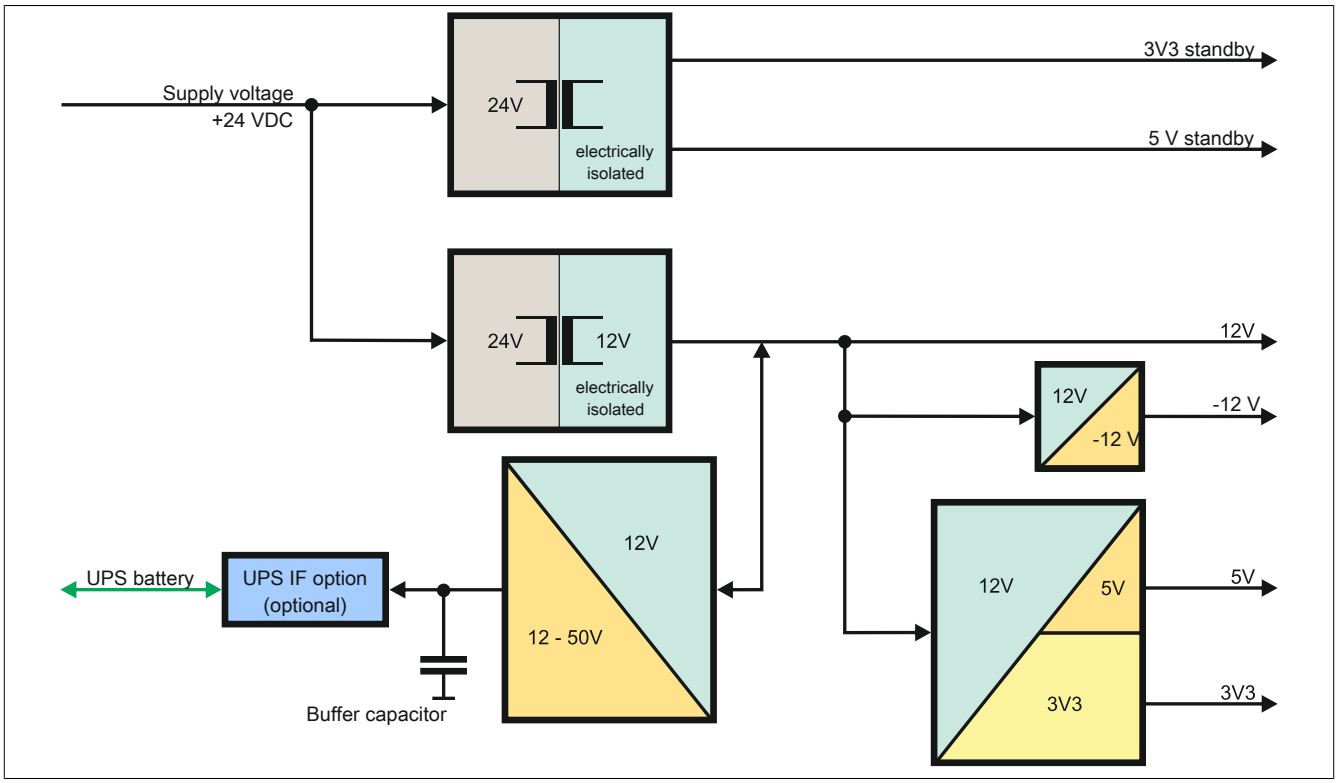


Figure 5: Supply voltage for system units

2.3.2 Power calculation with 5PC910.SX01-00

Information:

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

Information: All values in **watts** The values for the **suppliers** are maximum values. The values for the **consumers** are average maximum values, but not peak values.			**CPU board**									**Current system**
			5PC900.TS77-00	5PC900.TS77-01	5PC900.TS77-02	5PC900.TS77-03	5PC900.TS77-04	5PC900.TS77-05	5PC900.TS77-06	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10	Enter values in this column
													Total power supply power (maximum)	**130**
													Maximum possible	**130**
Total power supply +12 V		CPU board, permanent consumer	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	3	3	3	3	3	3	3	3	3	3	3	
		UPS IF option 5AC901.IUPS-00 during operation, optional	30	30	30	30	30	30	30	30	30	30	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 limit, optional (max. 3 W without fan kit, max. 6 W with fan kit)[1]												
		PCIe x8 card limit, optional (max. 3 W without fan kit, max. 20 W with fan kit)[1]												
													Maximum possible at -12V	**1.2**
	-12 V	PCI card limit, optional (max. 1.2 W with or without fan kit)[1]												
													Consumers -12 V ∑	
													Consumers ∑	
													Maximum possible at +5V	**45**
	+5 V	Slide-in compact (HDD / SSD)	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												
		External consumers, optional	5	5	5	5	5	5	5	5	5	5	5	
		PCI card limit, 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	5	5	5	5	
		CFast card	1	1	1	1	1	1	1	1	1	1	1	
		Interface option, optional[2]												
		PCI card limit, optional (max. 3 W without fan kit, max. 15 W with fan kit)[1]												
		PCIe x8 card limit, optional (max. 3 W without fan kit, max. 10 W with fan kit)[1]												
													Consumers 3V3 ∑	
													Total power supply, consumers ∑	

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

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

Table 10: 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**
Interface option				
RS232/422/485 IF option	5AC901.I485-00	1 W	-	-
CAN IF option	5AC901.ICAN-00	1 W	-	-
Audio IF option	5AC901.IHDA-00	0.2 W	0.2 W	-
SRAM IF option	5AC901.ISRM-00	-	2 W	-
Ready relay IF option	5AC901.IRDY-00	0.2 W		
UPS IF option	5AC901.IUPS-00 in standby	-	-	0.1 W
UPS IF option	5AC901.IUPS-01 in standby	-	-	0.1 W

Table 11: Power rating table for interface and monitor/panel options

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

Table 11: Power rating table for interface and monitor/panel options

2.3.3 Power calculation with 5PC910.SX02-00

Information:

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

Information: All values in **watts** The values for the **suppliers** are maximum values. The values for the **consumers** are average maximum values, but not peak values.			**CPU board**									**Current system**
			5PC900.TS77-00	5PC900.TS77-01	5PC900.TS77-02	5PC900.TS77-03	5PC900.TS77-04	5PC900.TS77-05	5PC900.TS77-06	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10	Enter values in this column
		Total power supply power (maximum)												**130**
		Maximum possible												**130**
	CPU board, permanent consumer		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		3	3	3	3	3	3	3	3	3	3	3	
	UPS IF option 5AC901.IUPS-00 during operation, optional		30	30	30	30	30	30	30	30	30	30	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 limit, optional (max. 3 W without fan kit, max. 6 W with fan kit)[1]													
	PCIe x8 card limit, optional (max. 3 W without fan kit, max. 20 W with fan kit)[1]													
		Maximum possible at -12V												**1.2**
-12 V	PCI card limit, optional (max. 1.2 W with or without fan kit)[1]													
		Consumers -12 V ∑												
		Consumers ∑												
		Maximum possible at +5V												**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 limit, optional (max. 3 W without fan kit, max. 20 W with fan kit)[1]													
		Consumers +5 V ∑												
		Maximum possible at 3V3												**30**
	System unit, permanent consumers		5	5	5	5	5	5	5	5	5	5	5	
	CFast card		1	1	1	1	1	1	1	1	1	1	1	
	Interface option, optional[2]													
	Monitor/Panel option, optional[2]													
	PCI card limit, optional (max. 3 W without fan kit, max. 15 W with fan kit)[1]													
	PCIe x8 card limit, optional (max. 3 W without fan kit, max. 10 W with fan kit)[1]													
		Consumers 3V3 ∑												
		Total power supply, consumers ∑												

Total power supply +12 V

+5 V

3V3

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 are listed in the table below.

Table 12: 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**
Interface option				
RS232/422/485 IF option	5AC901.I485-00	1 W	-	-
CAN IF option	5AC901.ICAN-00	1 W	-	-
Audio IF option	5AC901.IHDA-00	0.2 W	0.2 W	-
SRAM IF option	5AC901.ISRM-00	-	2 W	-
Ready relay IF option	5AC901.IRDY-00	0.2 W		

Table 13: Power rating table for interface and monitor/panel options

Component	Model number	+5 V	3V3	12 V
UPS IF option	5AC901.IUPS-00 in standby	-	-	0.1 W
UPS IF option	5AC901.IUPS-01 in standby	-	-	0.1 W
Monitor/Panel option				
DisplayPort transmitter	5AC901.LDPO-00	-	0.2 W	-
SDL / DVI transmitter	5AC901.LSDL-00	-	1 W	-
SDL3 transmitter	5AC901.LSD3-00	2.2 W	1.8 W	-

Table 13: Power rating table for interface and monitor/panel options

2.3.4 Power calculation with 5PC910.SX05-00

Information:

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

Information: All values in **watts** The values for the **suppliers** are maximum values. The values for the **consumers** are average maximum values, but not peak values.			**CPU board**									**Current system**
			5PC900.TS77-00	5PC900.TS77-01	5PC900.TS77-02	5PC900.TS77-03	5PC900.TS77-04	5PC900.TS77-05	5PC900.TS77-06	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10	Enter values in this column
		Total power supply power (maximum)												**130**
		Maximum possible												**130**
	CPU board, permanent consumer		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 limit, optional (max. 3 W without fan kit, max. 6 W with fan kit)[1]													
	PCIe x8 card limit, optional (max. 3 W without fan kit, max. 20 W with fan kit)[1]													
		Maximum possible at -12V												**1.2**
-12 V	PCI card limit, optional (max. 1.2 W with or without fan kit)[1]													
		Consumers -12 V ∑												
		Consumers ∑												
		Maximum possible at +5V												**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 limit, optional (max. 3 W without fan kit, max. 20 W with fan kit)[1]													
		Consumers +5 V ∑												
		Maximum possible at 3V3												**30**
	System unit, permanent consumers		5	5	5	5	5	5	5	5	5	5	5	
	CFast card		1	1	1	1	1	1	1	1	1	1	1	
	Interface option, optional[2]													
	Monitor/Panel option, optional[2]													
	PCI card limit, optional (max. 3 W without fan kit, max. 15 W with fan kit)[1]													
	PCIe x8 card limit, optional (max. 3 W without fan kit, max. 10 W with fan kit)[1]													
		Consumers 3V3 ∑												
		Total power supply, consumers ∑												

Total power supply +12 V

+5 V

3V3

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 are listed in the table below.

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

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

Component	**Model number**	**+5 V**	**3V3**	**12 V**
Interface option				
RS232/422/485 IF option	5AC901.I485-00	1 W	-	-
CAN IF option	5AC901.ICAN-00	1 W	-	-
Audio IF option	5AC901.IHDA-00	0.2 W	0.2 W	-
SRAM IF option	5AC901.ISRM-00	-	2 W	-
Ready relay IF option	5AC901.IRDY-00	0.2 W		

Table 15: Power rating table for interface and monitor/panel options

Component	Model number	+5 V	3V3	12 V
UPS IF option	5AC901.IUPS-00 in standby	-	-	0.1 W
UPS IF option	5AC901.IUPS-01 in standby	-	-	0.1 W
Monitor/Panel option				
DisplayPort transmitter	5AC901.LDPO-00	-	0.2 W	-
SDL / DVI transmitter	5AC901.LSDL-00	-	1 W	-
SDL3 transmitter	5AC901.LSD3-00	2.2 W	1.8 W	-

Table 15: Power rating table for interface and monitor/panel options

2.4 Serial number sticker

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

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

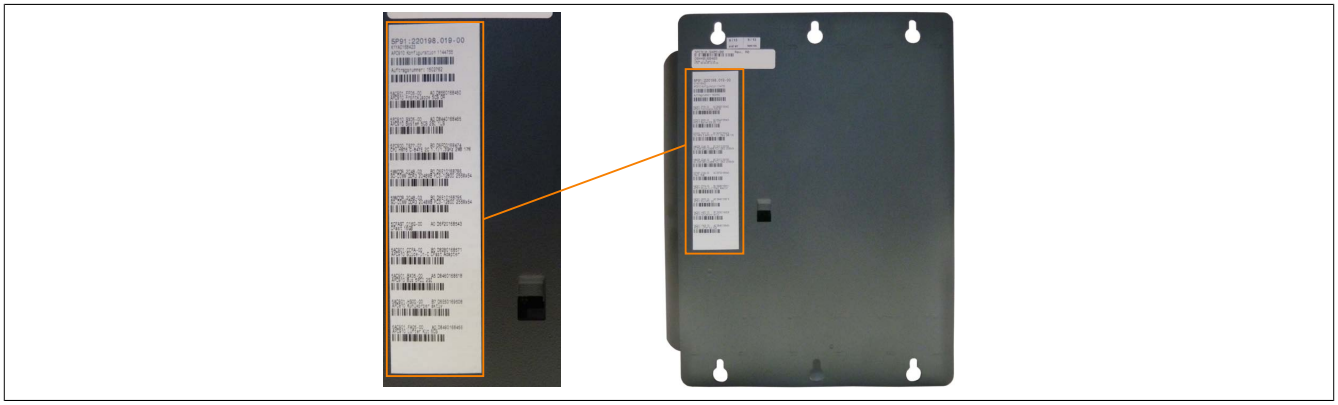


Figure 6: Serial number sticker (back)

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

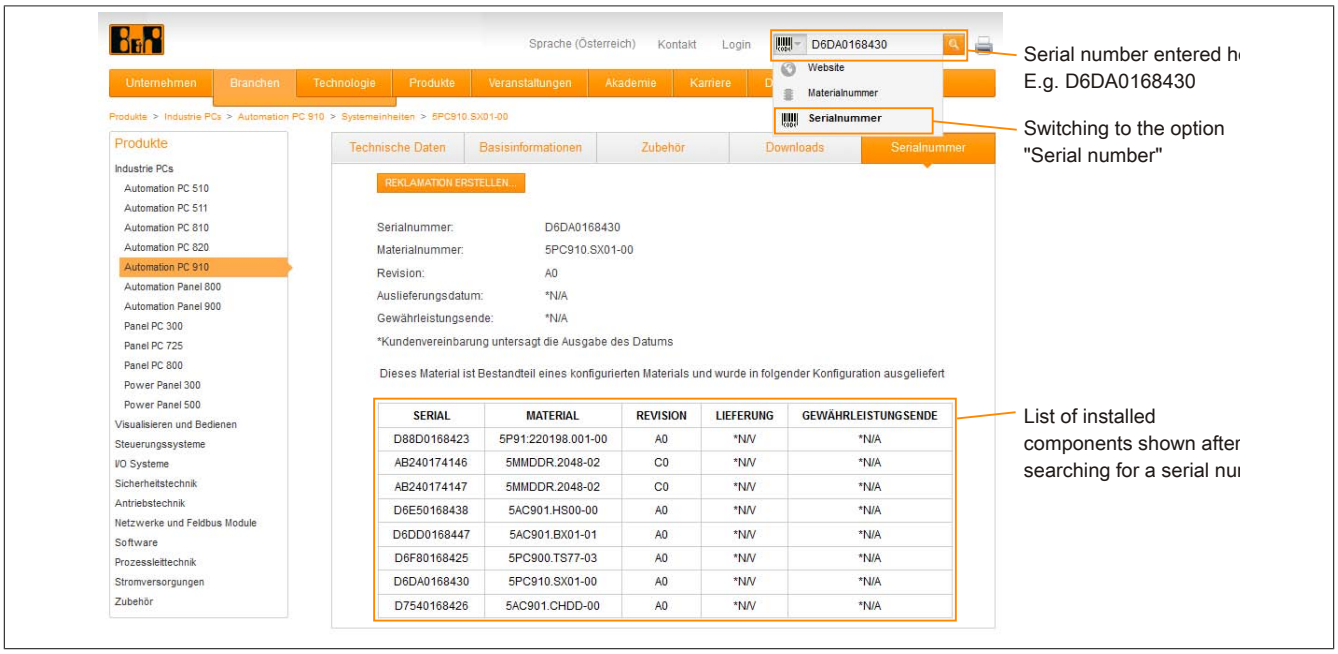


Figure 7: Searching for a serial number on the B&R website

2.5 Block diagrams

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

2.5.1 System unit 5PC910.SX01-00 and bus unit 5AC901.BX01-00

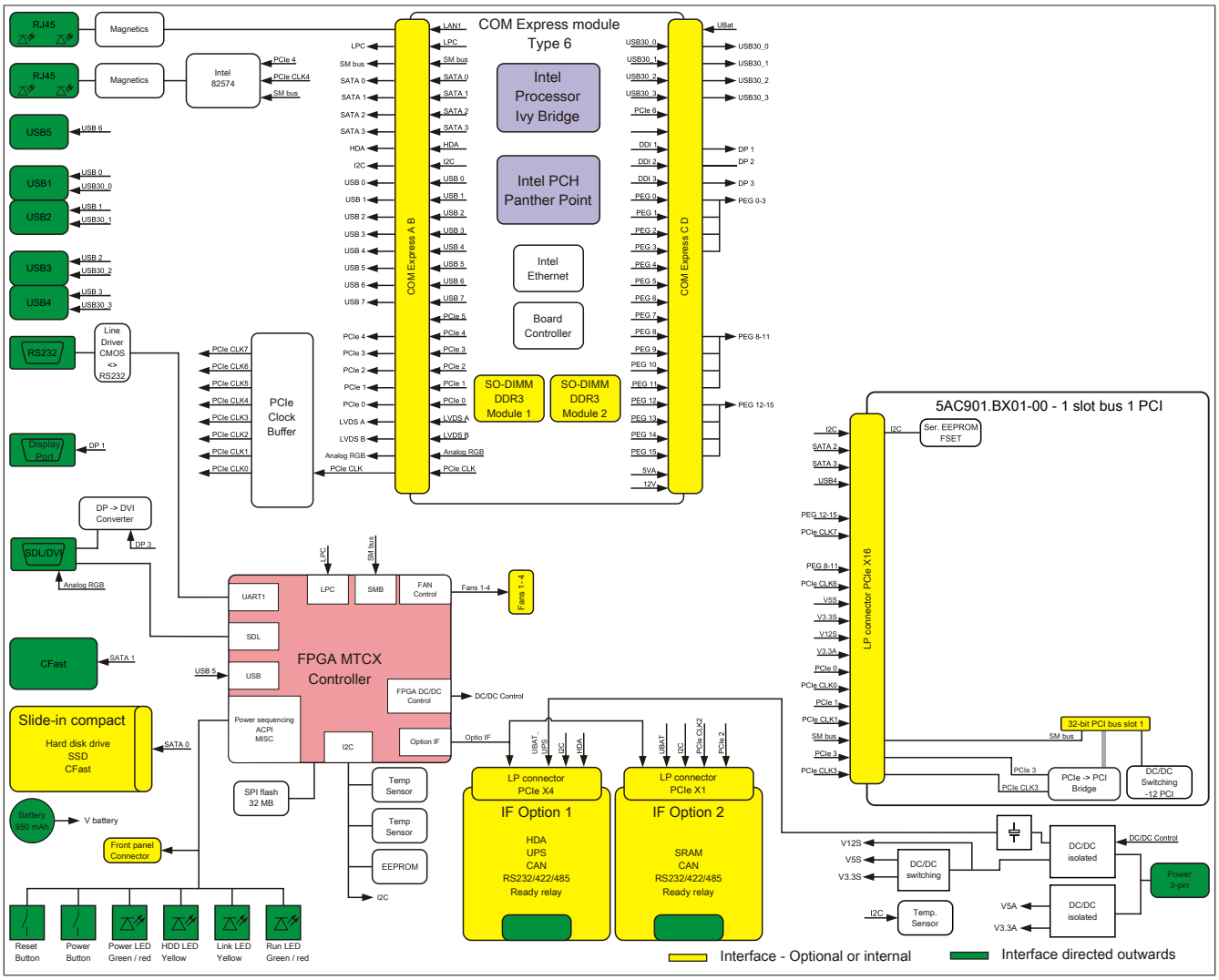


Figure 8: Block diagram of system unit 5PC910.SX01-00 and bus unit 5AC901.BX01-00

2.5.2 System unit 5PC910.SX01-00 and bus unit 5AC901.BX01-01

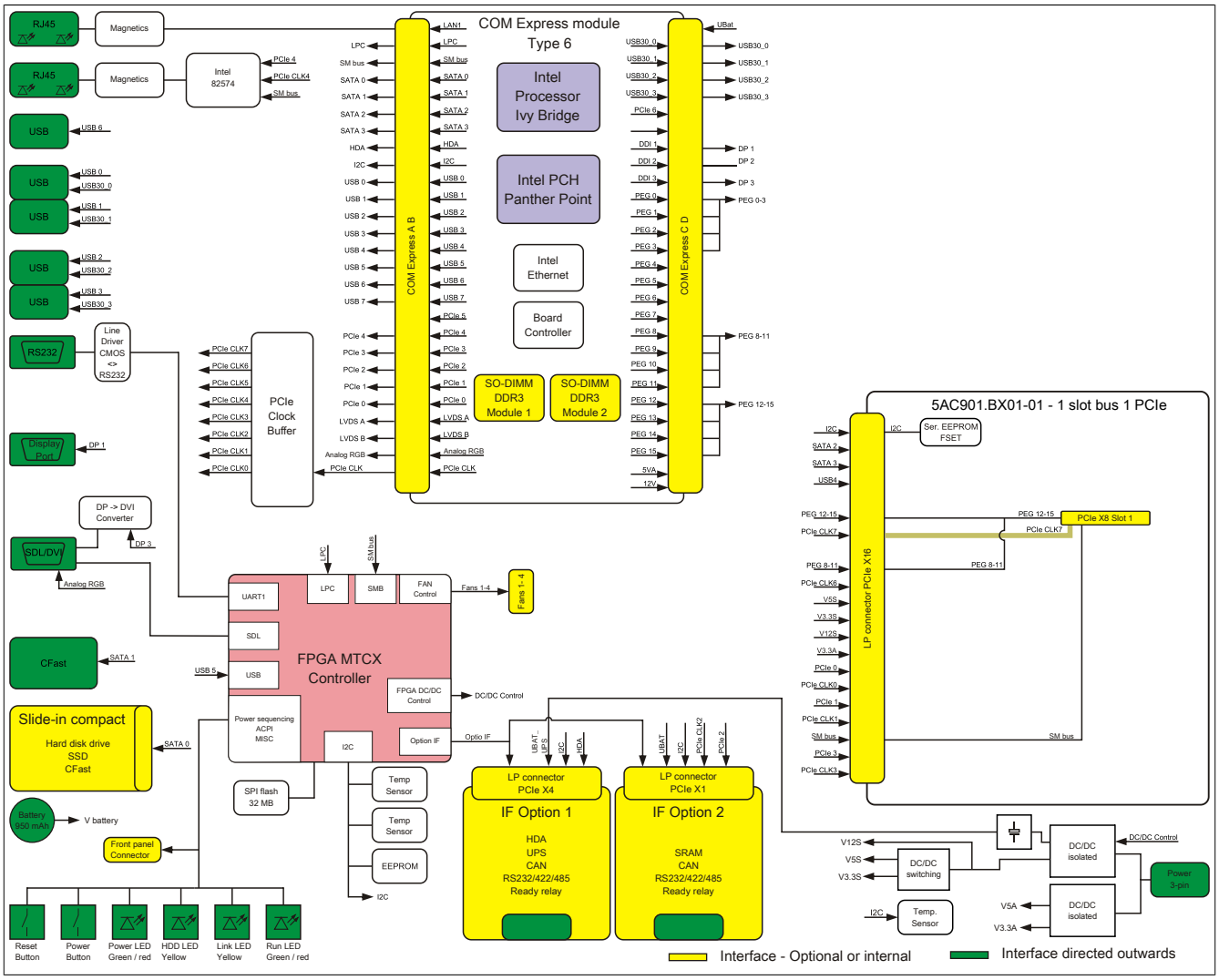


Figure 9: Block diagram of system unit 5PC910.SX01-00 and bus unit 5AC901.BX01-01

2.5.3 System unit 5PC910.SX02-00 and bus unit 5AC901.BX02-00

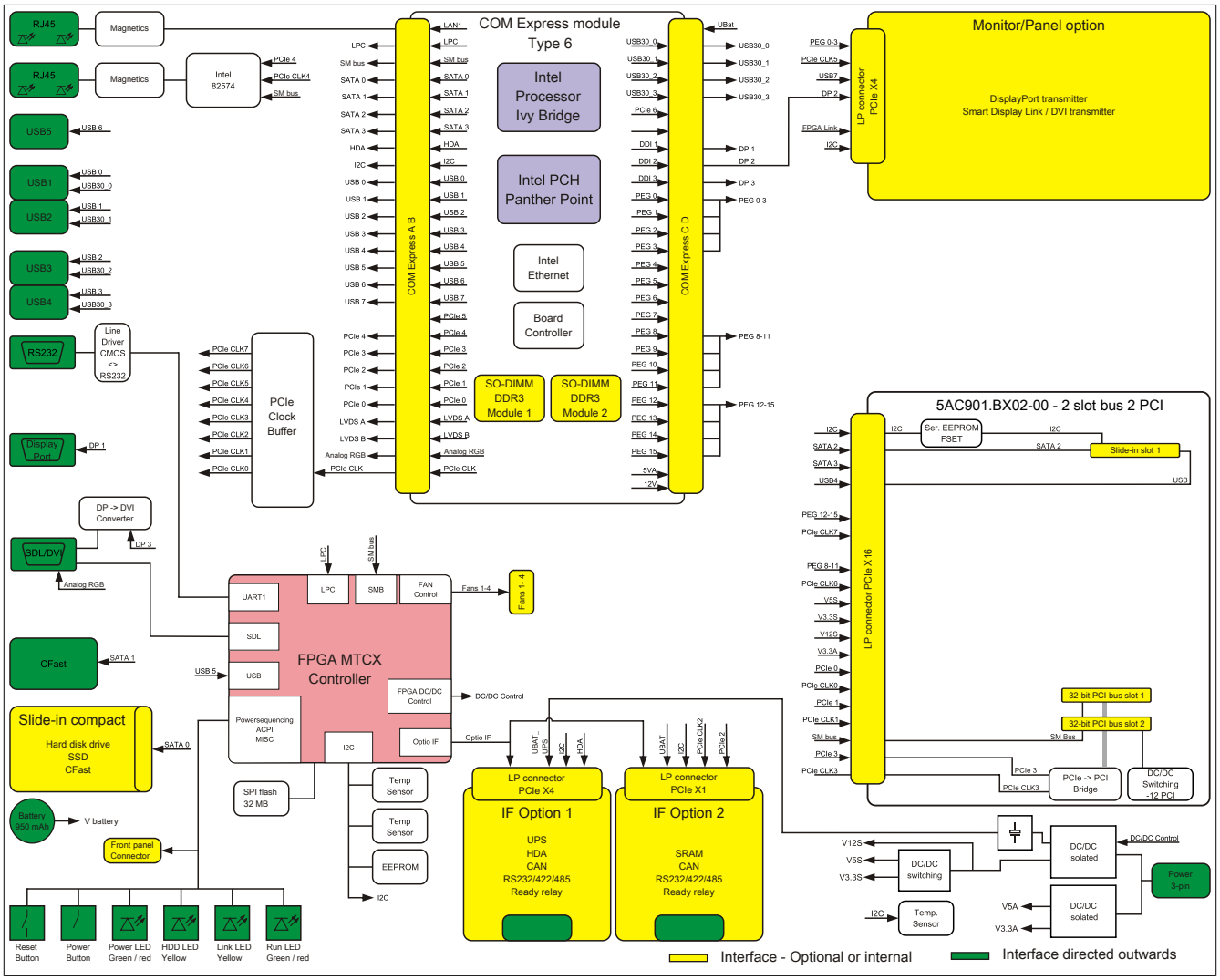


Figure 10: Block diagram of system unit 5PC910.SX02-00 and bus unit 5AC901.BX02-00

2.5.4 System unit 5PC910.SX02-00 and bus unit 5AC901.BX02-01

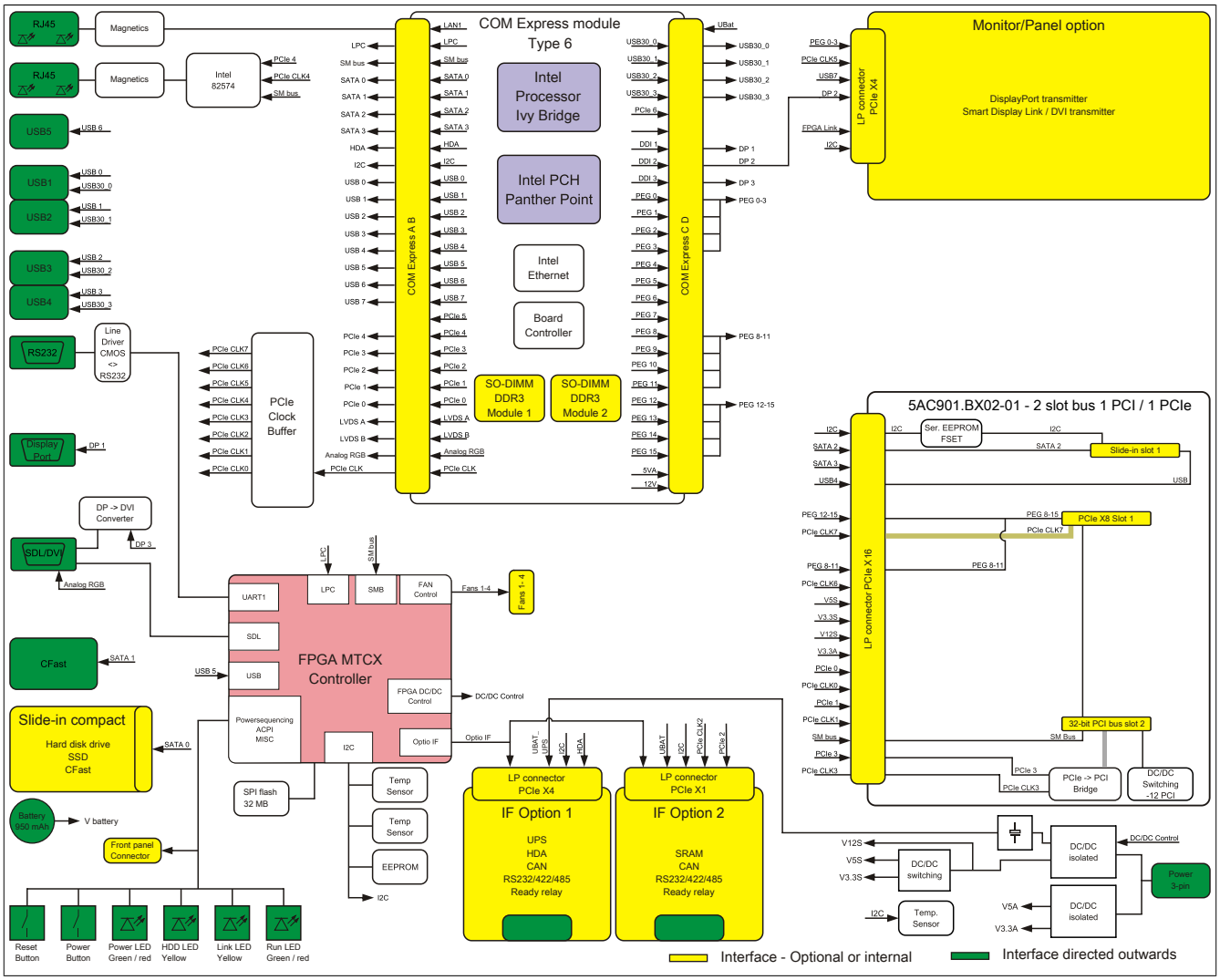


Figure 11: Block diagram of system unit 5PC910.SX02-00 and bus unit 5AC901.BX02-01

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

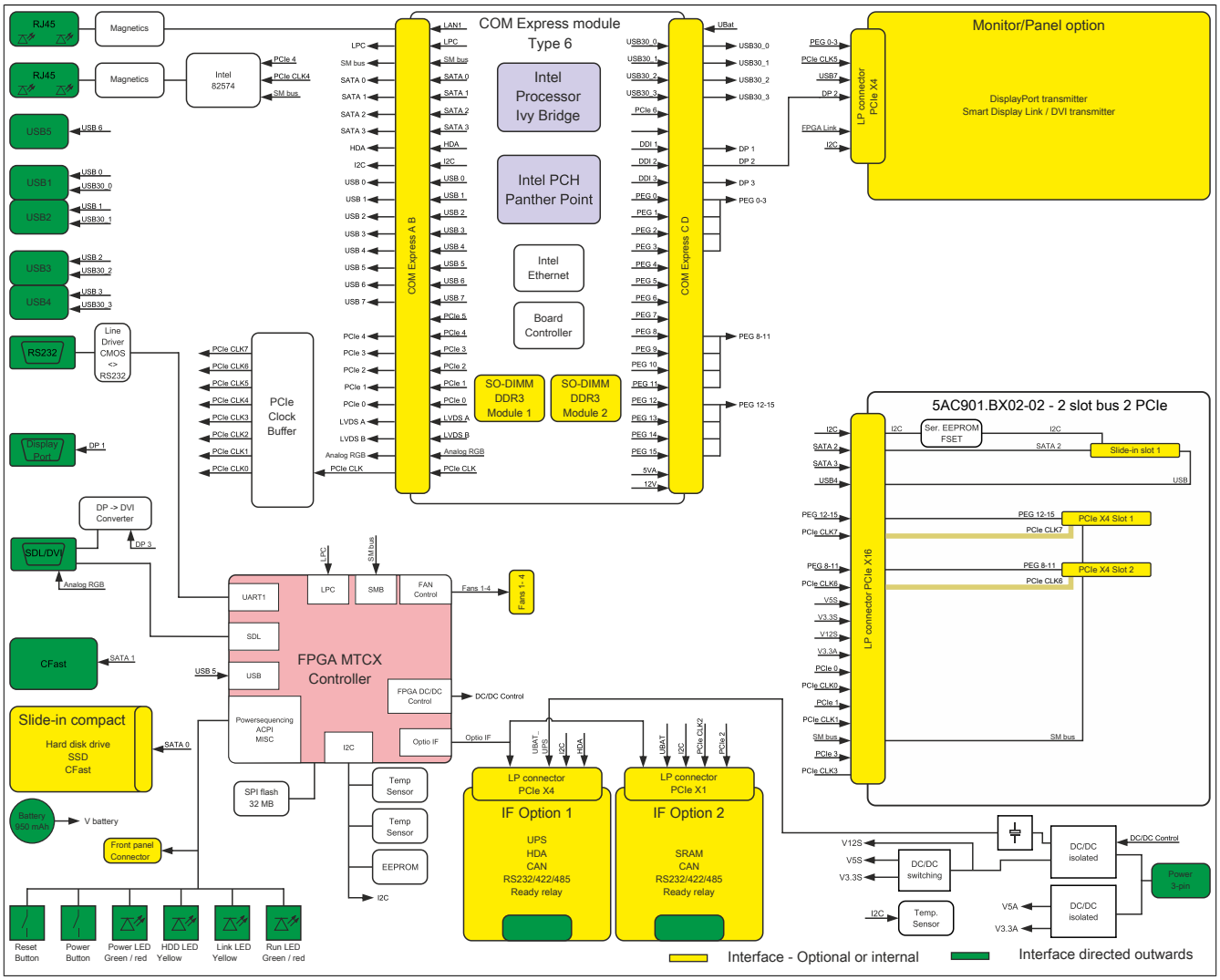


Figure 12: Block diagram of system unit 5PC910.SX02-00 and bus unit 5AC901.BX02-02

2.5.6 System unit 5PC910.SX05-00 and bus unit 5AC901.BX05-00

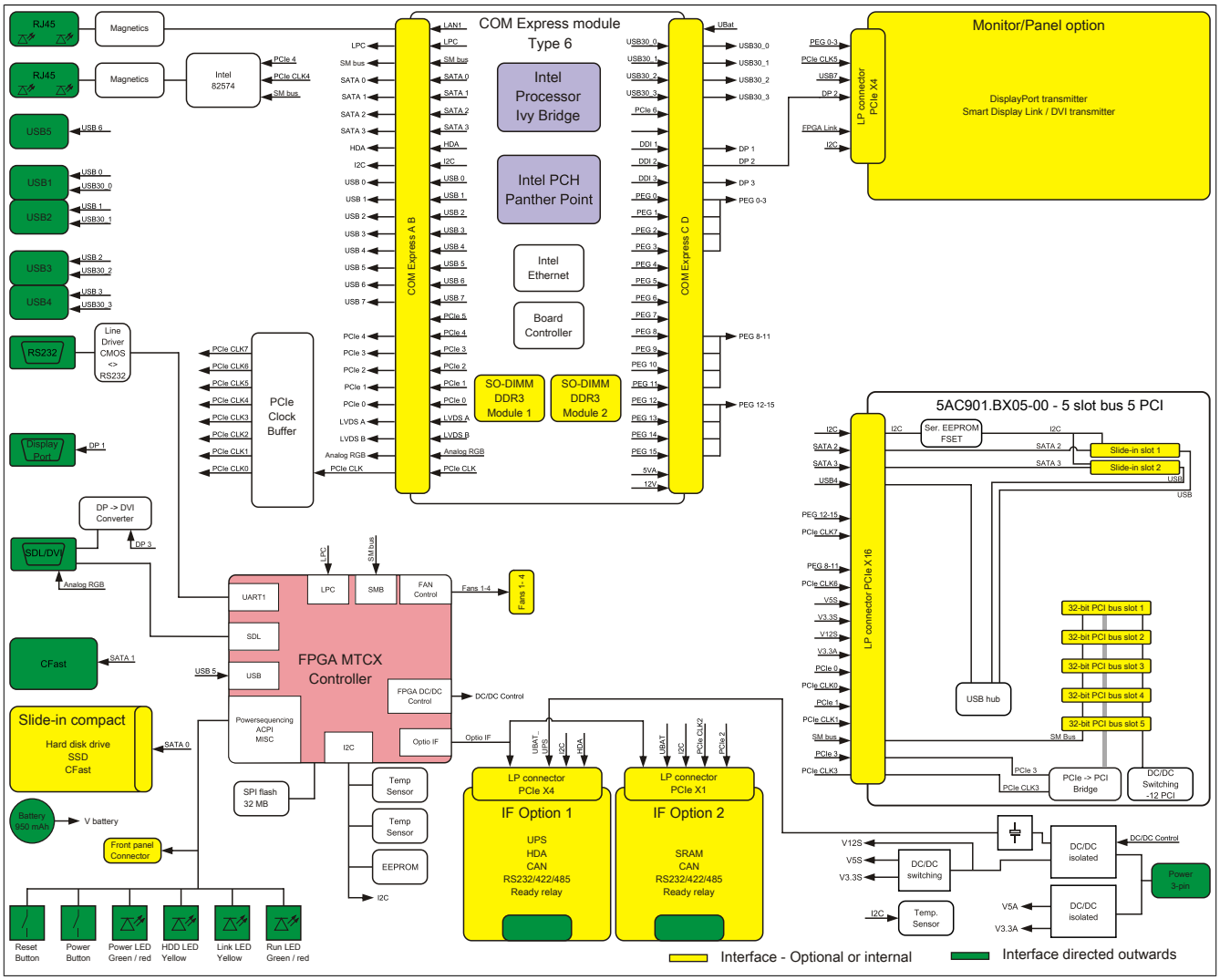


Figure 13: Block diagram of system unit 5PC910.SX05-00 and bus unit 5AC901.BX05-00

2.5.7 System unit 5PC910.SX05-00 and bus unit 5AC901.BX05-01

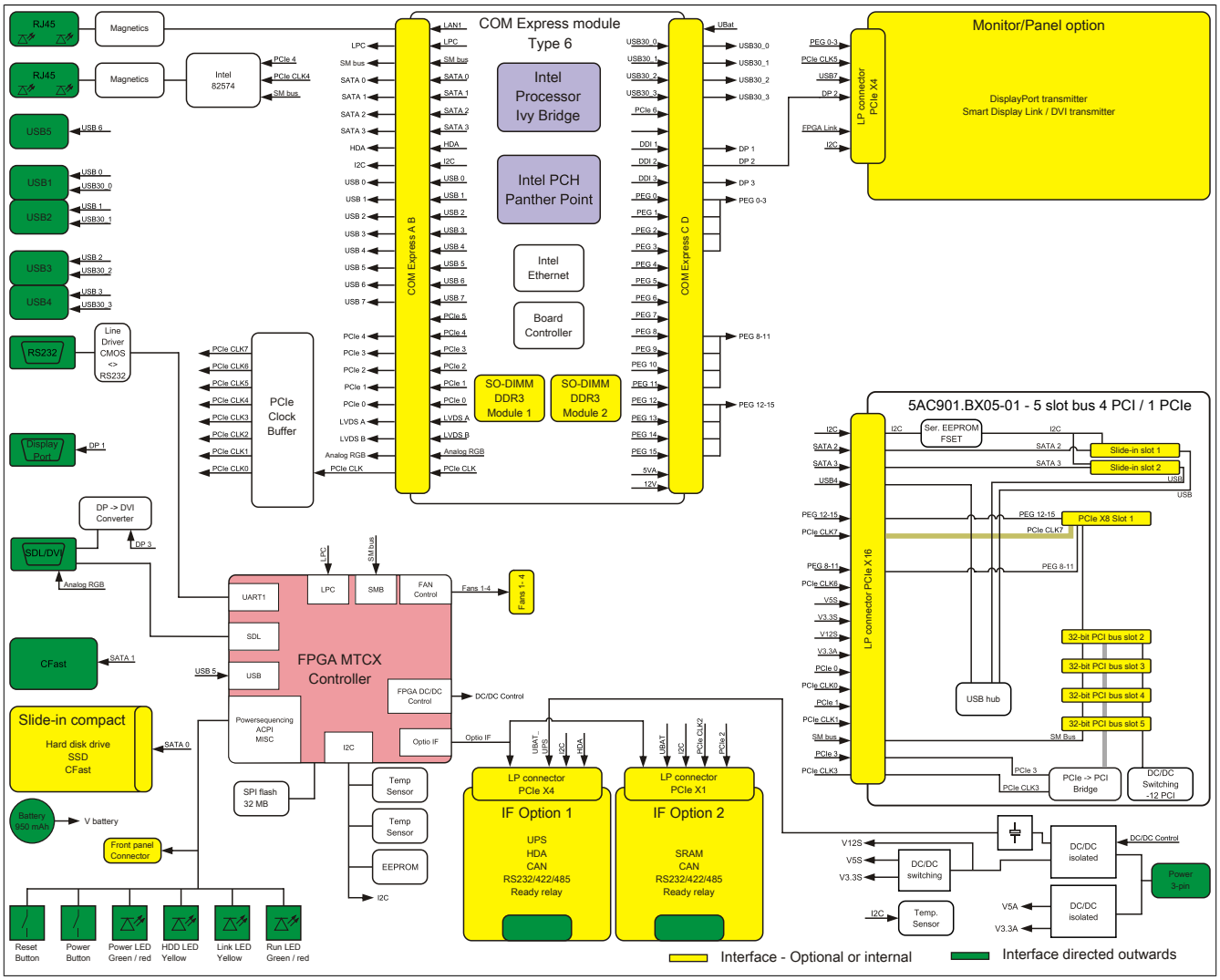


Figure 14: Block diagram of system unit 5PC910.SX05-00 and bus unit 5AC901.BX05-01

2.5.8 System unit 5PC910.SX05-00 and bus unit 5AC901.BX05-02

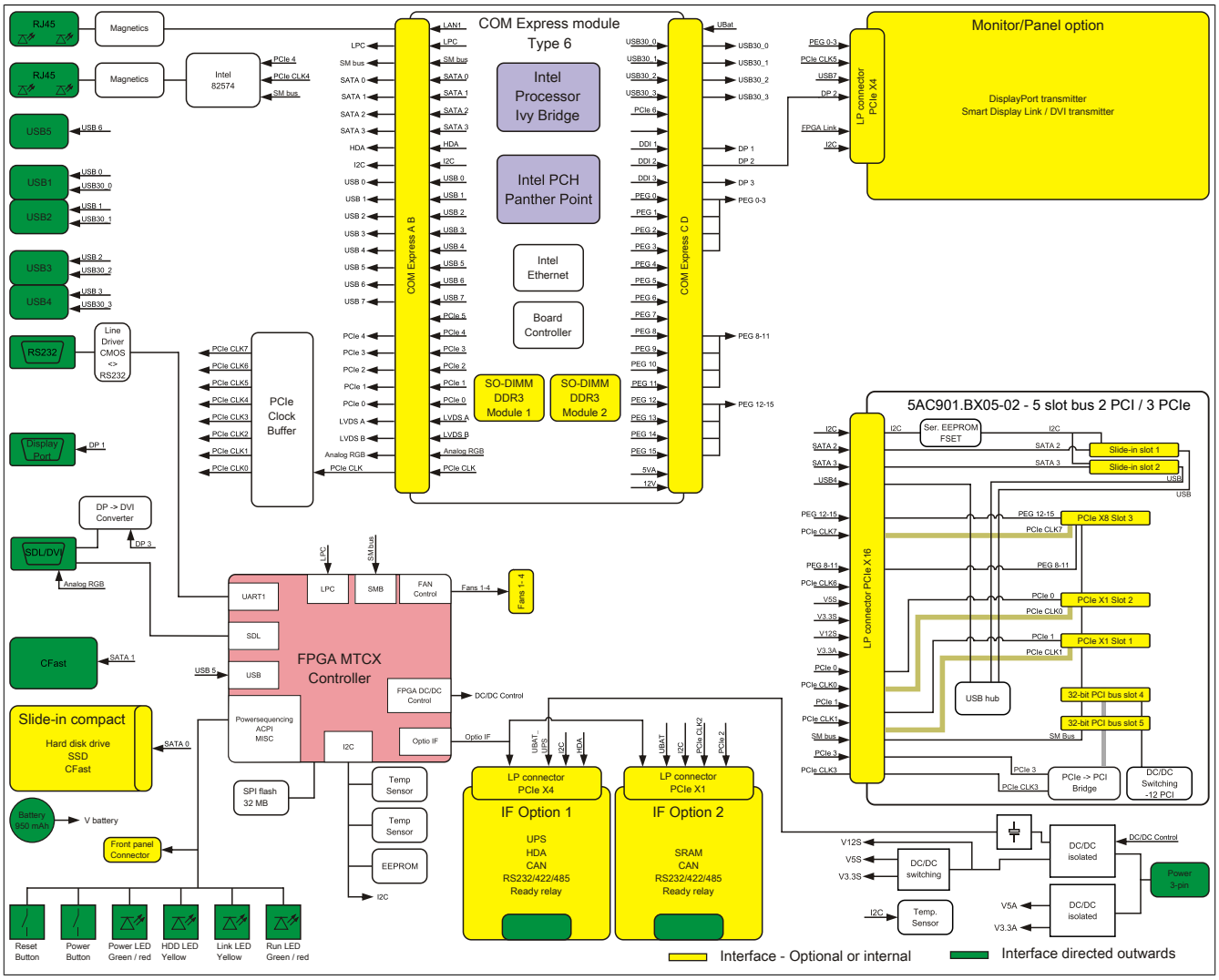


Figure 15: Block diagram of system unit 5PC910.SX05-00 and bus unit 5AC901.BX05-02

2.5.9 System unit 5PC910.SX05-00 and bus unit 5AC901.BX05-03

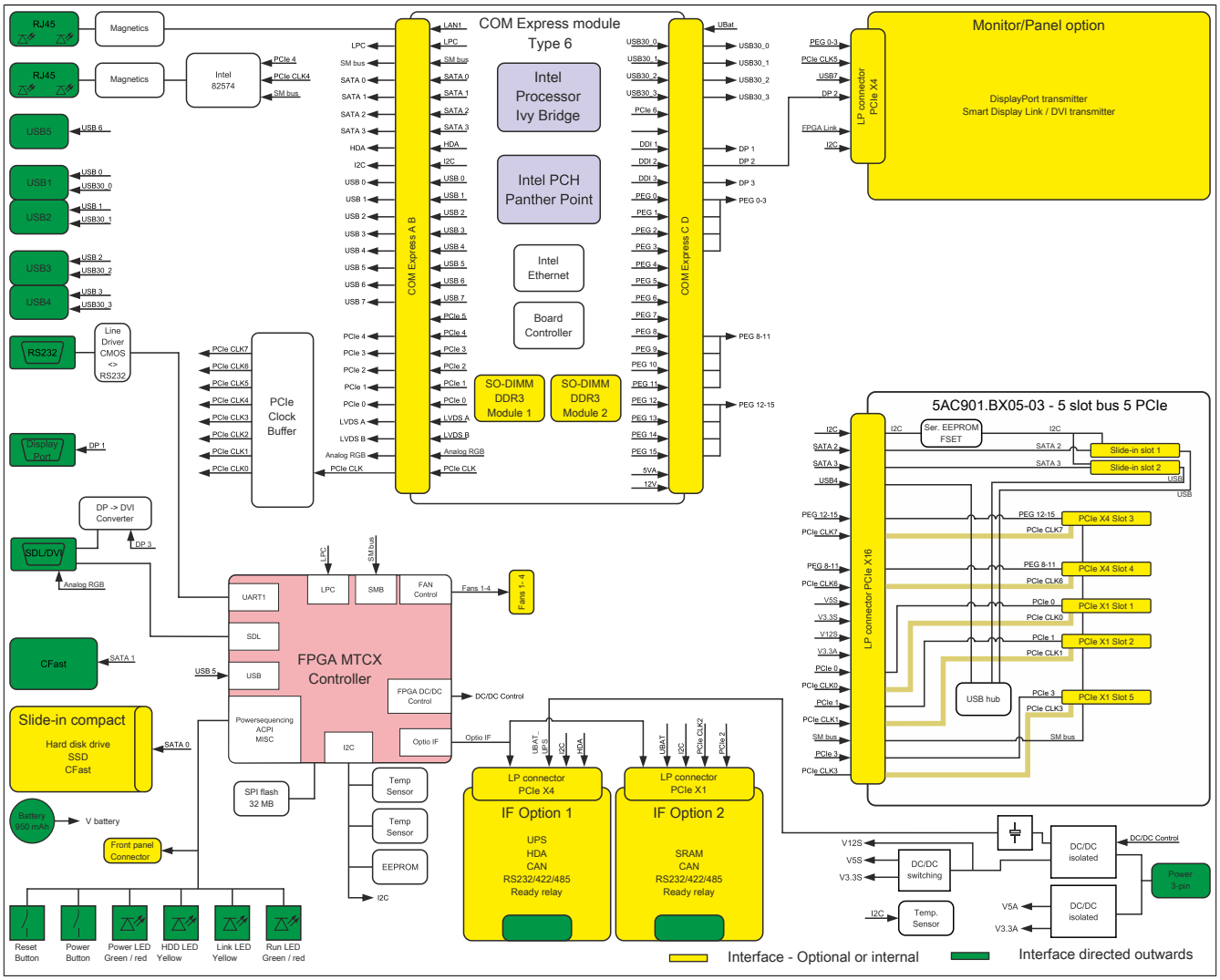


Figure 16: Block diagram of system unit 5PC910.SX05-00 and bus unit 5AC901.BX05-03

2.5.10 Monitor/Panel options

DisplayPort transmitter

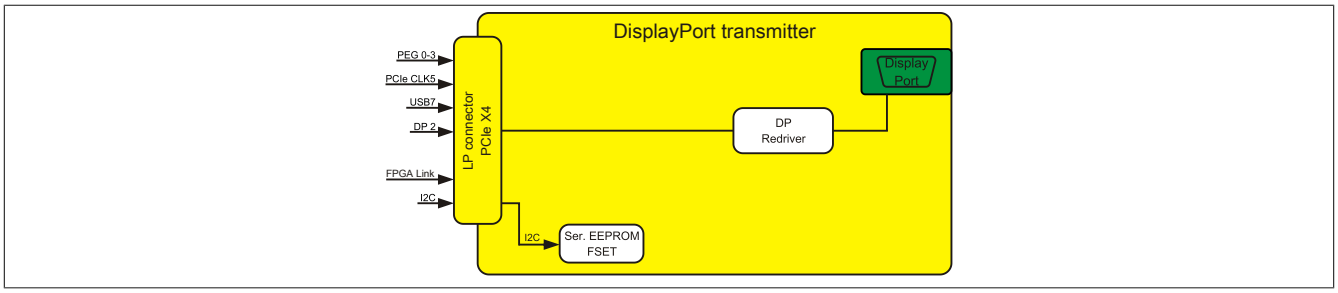


Figure 17: Block diagram of DisplayPort transmitter 5AC901.LDPO-00

SDL/DVI transmitter

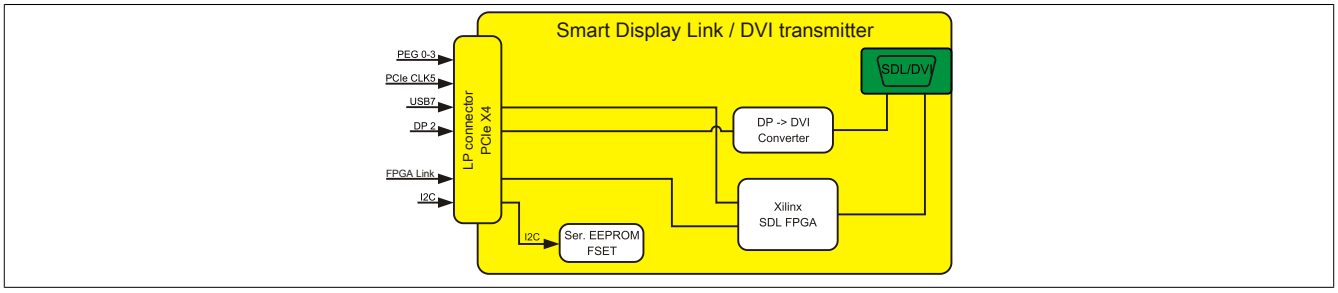


Figure 18: Block diagram of Smart Display Link / DVI transmitter 5AC901.LSDL-00

SDL3 transmitter

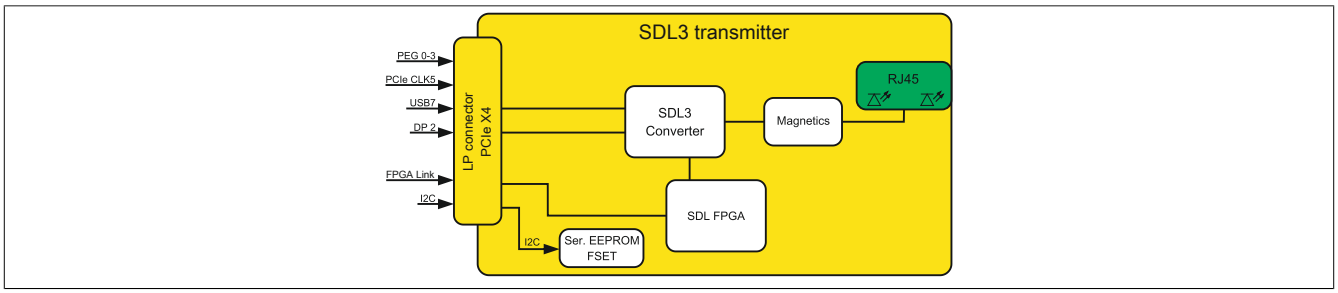


Figure 19: Block diagram of Smart Display Link / DVI transmitter 5AC901.LSD3-00

2.6 Device interfaces and slots

2.6.1 Overview of device interfaces

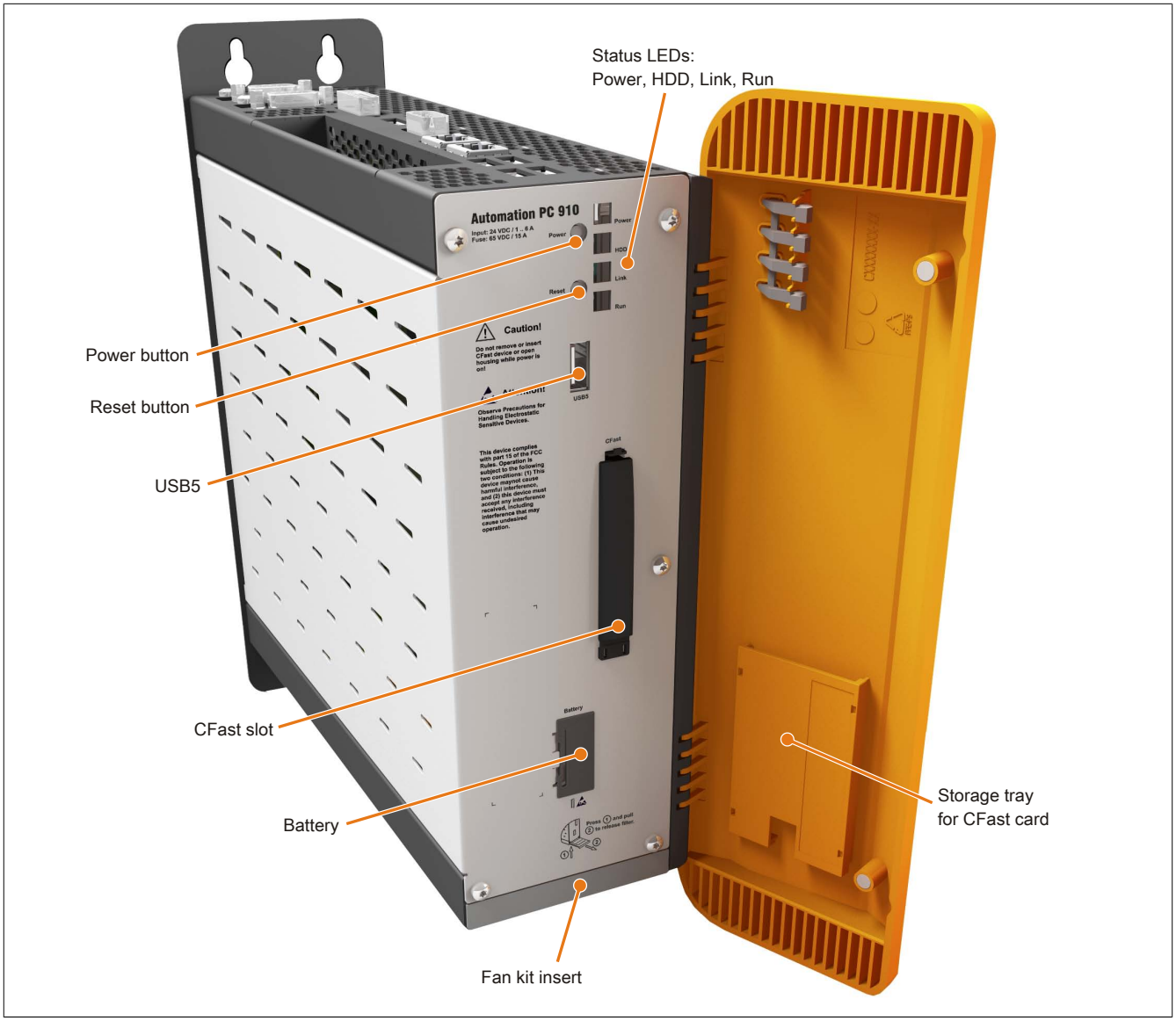


Figure 20: Device interfaces - Overview (front)

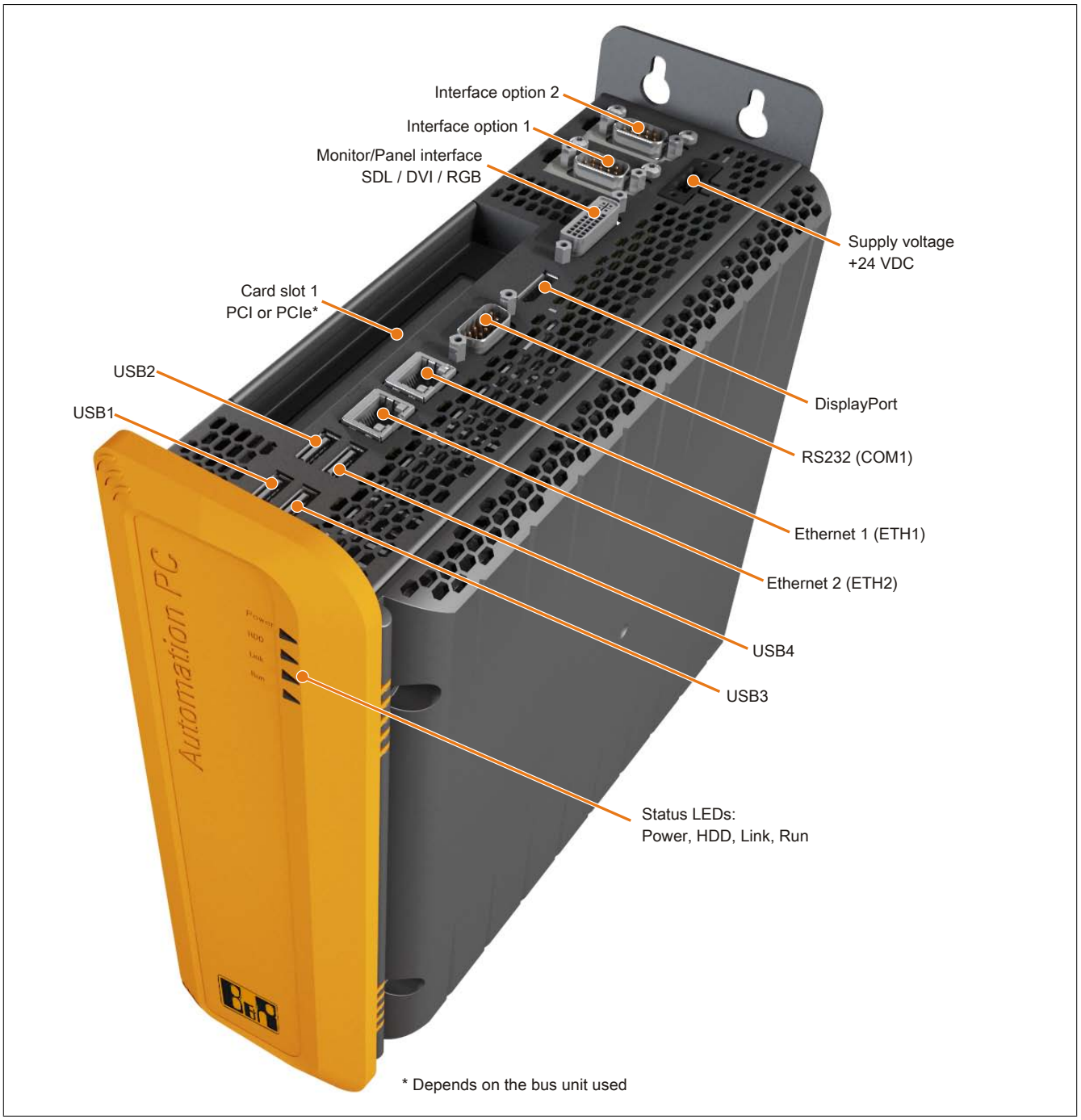


Figure 21: Device interfaces - Overview (top)

2.6.2 Supply voltage +24 VDC

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

The pinout can be found either in the following table or 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.

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

Table 16: Supply voltage connection 24 VDC

2.6.2.1 Grounding

Caution!

The functional ground (pin 2) must be connected to ground (e.g. control cabinet) using the shortest possible path. Using the largest possible conductor cross section on the supply connector is recommended.

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

Figure 22: Ground connection

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

2.6.3 COM1 serial interface

COM1 serial 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

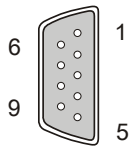


Table 17: COM1 - Pinout

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

2.6.4 Monitor/Panel connection

Monitor/Panel connection - RGB / SDL (Smart Display Link) / DVI	
The following is an overview of 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 for all system unit types**
5PC900.TS77-00	RGB, DVI, SDL
5PC900.TS77-01	RGB, DVI, SDL
5PC900.TS77-02	RGB, DVI, SDL
5PC900.TS77-03	RGB, DVI, SDL
5PC900.TS77-04	RGB, DVI, SDL
5PC900.TS77-05	RGB, DVI, SDL
5PC900.TS77-06	RGB, DVI, SDL
5PC900.TS77-07	RGB, DVI, SDL
5PC900.TS77-08	RGB, DVI, SDL
5PC900.TS77-09	RGB, DVI, SDL
5PC900.TS77-10	RGB, DVI, SDL

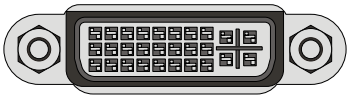


Table 18: Monitor/Panel connection - RGB, DVI, SDL

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 male monitor/panel connector is specified for 100 connection cycles.

Information:

If a display device with a 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.

Information:

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

2.6.4.1 USB transfer rates in SDL and DVI modes

Information:

In SDL mode, the USB transfer rate is limited to USB 1.1.

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

2.6.4.2 Pinout

Pin	Assignment	Description	Pin	Assignment	Description
1	TMDS data 2-	DVI lane 2 (negative)	16	HPD	Hot plug detect
2	TMDS data 2+	DVI lane 2 (positive)	17	TMDS data 0-	DVI lane 0 (negative)
3	TMDS data 2/4 SHIELD	Shield for data pair 2 and 4	18	TMDS data 0+	DVI lane 0 (positive)
4	SDL-	SDL lane (negative)	19	TMDS Data 0/ XUSB1 SHIELD	Shield for data pair 0 and USB1
5	SDL+	SDL lane (positive)	20	XUSB1-	USB lane 1 (negative)
6	DDC clock	DDC-based control signal (clock)	21	XUSB1+	USB lane 1 (positive)
7	DDC data	DDC-based control signal (data)	22	TMDS clock shield	Shield for clock pair
8	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	ANALOG RED	Analog red
11	TMDS DATA 1/ XUSB0 SHIELD	Shield for data pair 1 and USB0	C2	ANALOG GREEN	Analog green
12	XUSB0-	USB lane 0 (negative)	C3	ANALOG BLUE	Analog blue
13	XUSB0+	USB lane 0 (positive)	C4	ANALOG HORZ SYNC	Analog horizontal synchronization

24-pin female DVI connector

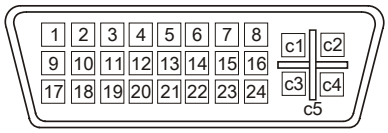


Table 19: DVI interface - Pinout

Pin	Assignment	Description	Pin	Assignment	Description	
14	+5 V power[1)]	+5 V power supply	C5	ANALOG GND	Analog ground (return for R, G and B signals)	
15	Ground (return for +5 V, HSync and VSync)	Ground				

Table 19: DVI interface - Pinout

1) Protected internally by a multifuse.

2.6.4.3 Cable lengths and resolutions for SDL transmission

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

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

Table 20: Cable lengths and resolutions for SDL transmission

2.6.4.4 Cable lengths and resolutions for DVI transmission

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

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

Table 21: Cable lengths and resolutions for DVI transmission

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

2.6.5 DisplayPort

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

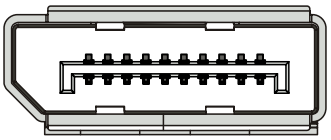


Table 22: DisplayPort 1.1

Information:

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

2.6.5.1 DisplayPort - Pinout

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

DisplayPort (20-pin, female)

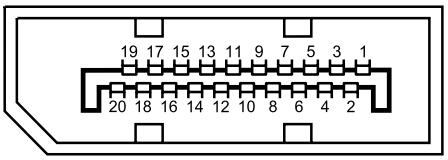


Table 23: DisplayPort - Pinout

2.6.6 Ethernet 1 (ETH1)

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

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

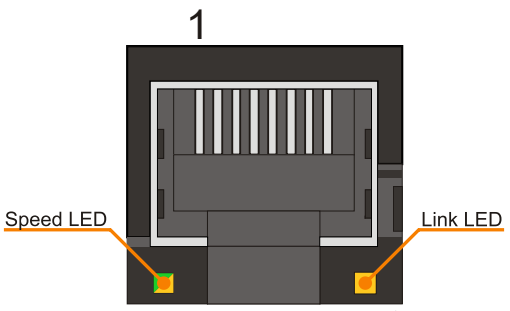


Table 24: Ethernet interface (ETH1)

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

Driver support

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

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

2.6.7 Ethernet 2 (ETH2)

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

Ethernet 2 connection (ETH2[1])			
Controller	Intel® 82574L		Female RJ45 connector
Cabling	S/STP (Cat 5e)		
Transfer rate	10/100/1000 Mbit/s[2]		
Cable length	Max. 100 m (min. Cat 5e)		
Speed LED	**On**	**Off**	
Green	100 Mbit/s	10 Mbit/s[3]	
Orange	1000 Mbit/s	-	
Link LED	**On**	**Off**	
Orange	Link (Ethernet network connection available)	Activity (blinking - data transfer in progress)	

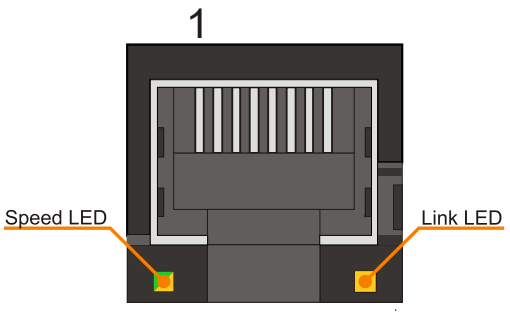


Table 25: Ethernet interface (ETH2)

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

Driver support

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

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

2.6.8 USB interfaces

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

Warning!

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

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 ports are provided on the top of the APC910.

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

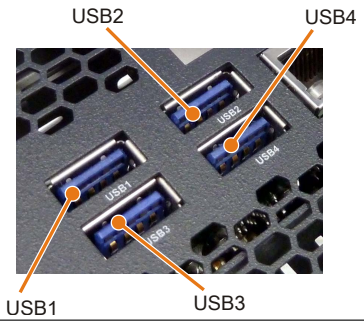


Table 26: USB1, USB2, USB3 and USB4 interfaces

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

USB5

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

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

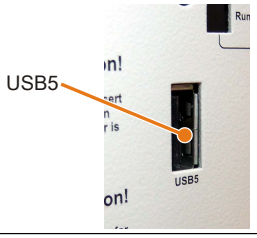


Table 27: USB5 interface

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

2.6.9 IF option 1 slot

Automation PC 910 system units include 2 slots for interface options.

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

IF option 1 slot	
Model number	**Short description**
	Interface option
5AC901.I485-00[1)]	RS232/422/485 interface option; for installation in an APC910 or PPC900
5AC901.ICAN-00[1)2)]	CAN interface option; for installation in an APC910 or PPC900
5AC901.IHDA-00	Audio interface option, connection for 1x MIC, 1x Line IN, 1x Line OUT, for installation in an APC910
5AC901.IRDY-00	Ready relay interface option; for installation in an APC910 or PPC900
5AC901.IUPS-00[2)]	UPS interface option; for installation in an APC910 or PPC900; for 4.5 Ah battery
5AC901.IUPS-01[3)]	UPS interface option; for installation in an APC910 or PPC900; for 2.2 Ah battery

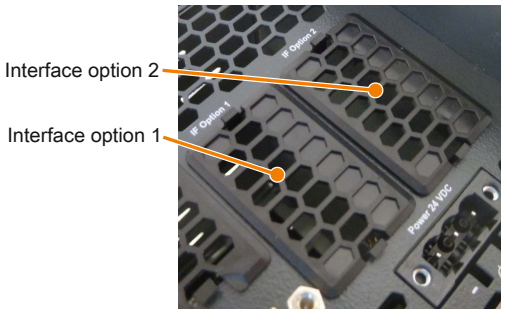


Table 28: IF option 1 slot

1) If IF options 5AC901.I458-00 and 5AC901.ICAN-00 are used simultaneously, 5AC901.ICAN-00 should be installed in the IF option 1 slot and 5AC901.I485-00 should be installed in the IF option 2 slot.
2) It is not possible to operate two 5AC901.ICAN interface options (in the IF option 1 and IF option 2 slots) at the same time.
3) The 5AC901.IUPS-00 UPS IF option is only permitted to be operated with the 5AC901.BUPS-00 battery unit!
4) The 5AC901.IUPS-01 UPS IF option is only permitted to be operated with the 5AC901.BUPS-01 battery unit!

Information:

For information about installing or replacing an interface option, please refer to the section "Installing interface options" on page 324.

2.6.10 IF option 2 slot

Automation PC 910 system units include 2 slots for interface options.

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

IF option 2 slot	
Model number	**Short description**
	Interface option
5AC901.I485-00[1)]	RS232/422/485 interface option; for installation in an APC910 or PPC900
5AC901.ICAN-00[1)2)]	CAN interface option; for installation in an APC910 or PPC900
5AC901.ISRM-00	SRAM interface option, 2 MB; for installation in an APC910 or PPC900
5AC901.IRDY-00	Ready relay interface option; for installation in an APC910 or PPC900

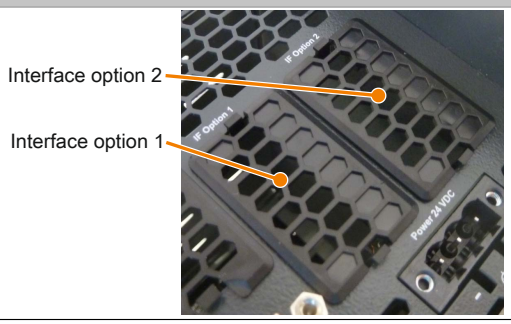


Table 29: IF option 2 slot

1) If IF options 5AC901.I458-00 and 5AC901.ICAN-00 are used simultaneously, 5AC901.ICAN-00 should be installed in the IF option 1 slot and 5AC901.I485-00 should be installed in the IF option 2 slot.
2) It is not possible to operate two 5AC901.ICAN interface options (in the IF option 1 and IF option 2 slots) at the same time.

Information:

For information about installing or replacing an interface option, please refer to the section "Installing interface options" on page 324.

2.6.11 Monitor/Panel option

2-slot APC910 (5PC910.SX02-00) and 5-slot APC910 (5PC910.SX05-00) 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

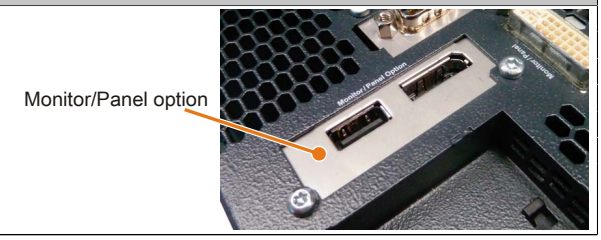


Table 30: Monitor/Panel option

Information:

For information about installing or replacing a monitor/panel option, please refer to the section "Installation monitor/panel options" on page 327.

2.6.12 Card slot (PCI / PCIe)

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

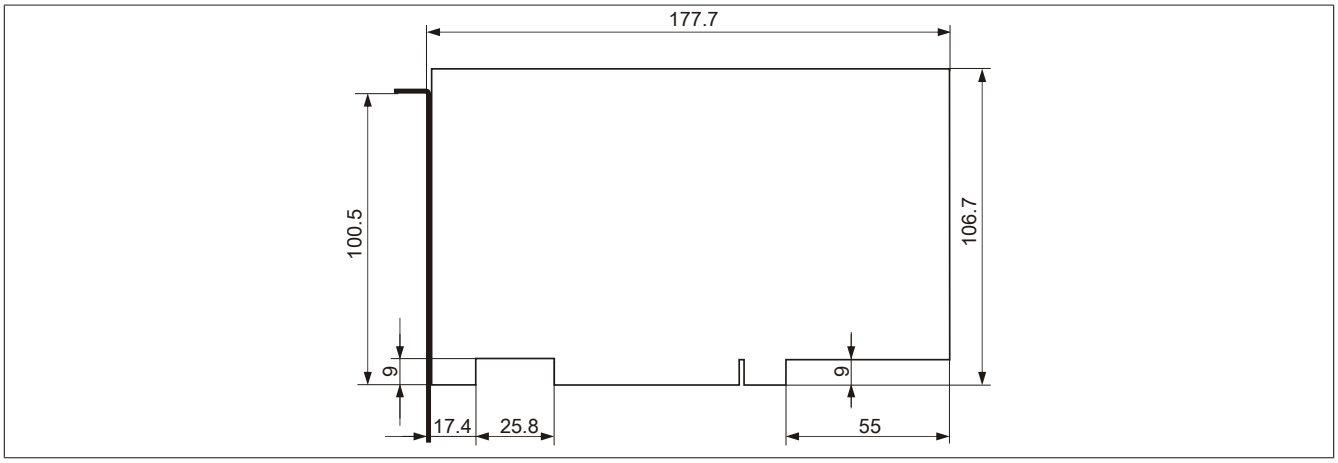


Figure 23: Standard half-size 32-bit PCI card - Dimensions

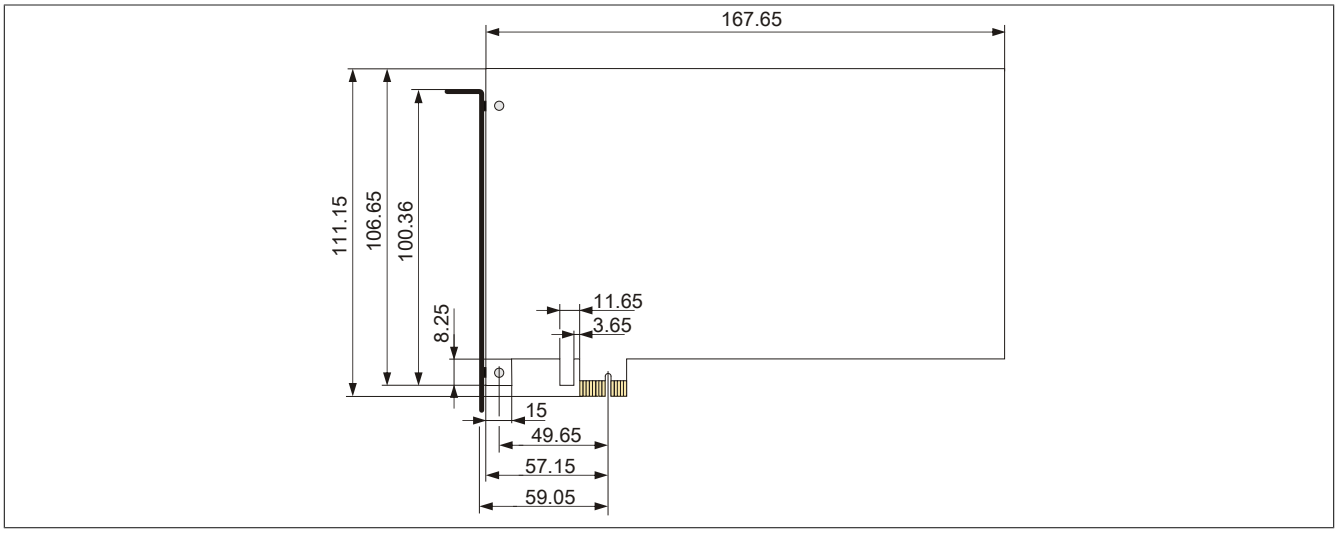


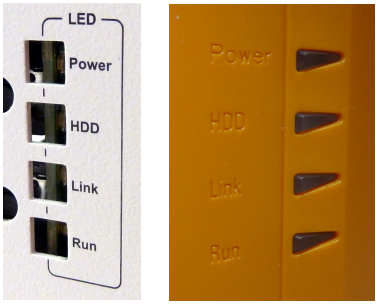
Figure 24: Standard half-size PCIe card - Dimensions

Information:

For information about installing or replacing a PCI / PCIe card, please refer to the section "Installing PCI / PCIe cards" on page 336.

2.6.13 Status LEDs

Status LEDs are located on the front of the system unit.



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

LED	Color	Status	Description	LED indicator
Power	Green	On	Supply voltage OK	
		Blinking	Device booted, battery status "BAD"	
			Information: **For more information, see "Battery" on page 61.**	
	Red	On	System in standby mode (S5: Soft-off mode or S4: Hibernation mode - suspend-to-disk)	
		Blinking	MTCX running, battery status "BAD". System in standby mode (S5: Soft-off mode or S4: Hibernation mode - suspend-to-disk).	
	Red / green	Blinking	Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status OK, supply voltage OK	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status OK, standby mode (S5: Soft-off mode or S4: Hibernation mode - suspend-to-disk)	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status BAD, supply voltage OK	
			Faulty or incomplete BIOS, MTCX or I/O FPGA update, battery status BAD, standby mode (S5: Soft-off mode or S4: Hibernation mode - suspend-to-disk)	
			Information: **An update must be performed again.**	
HDD	Yellow	On	Indicates drive access (HDD, CFast)	
Link	Yellow	On	Indicates an active SDL connection on the male panel connector	
		Blinking	Indicates that an active SDL connection has been interrupted by a loss of power to the display unit	
			Information: **Check the supply voltage / power connector of the connected display unit.**	
Run	Green	Blinking	Automation Runtime booting Controlled by Automation Runtime (ARemb and ARwin)	
	Green	On	Application running Controlled by Automation Runtime (ARemb and ARwin)	
	Red	On	Application in service mode Controlled by Automation Runtime (ARemb and ARwin)	

Table 31: Status LEDs - Data

2.6.14 Power button

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

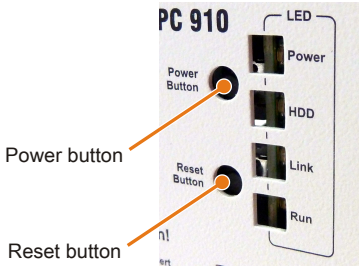
Power button	
The power button can be pressed with a pointed object (e.g. paper clip or tip of a pen). The power switch acts like the on/off switch on a normal desktop PC with an ATX power supply: **Press and release** ... Switches on the APC910 or shuts down the operating system and switches off the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

Table 32: Power button

2.6.15 Reset button

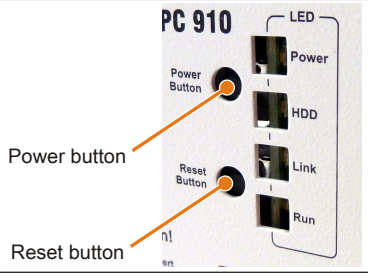
Reset button	
The reset button can be pressed with a pointed object (e.g. paper clip or tip of a pen). Pushing the reset button triggers a hardware and PCI reset. The APC910 is restarted (cold restart). Pressing the reset button does not reset the MTCX processor.	

Table 33: Reset button

Warning!

A system reset can result in lost data!

2.6.16 Battery

The lithium battery (3 V, 950 mAh) buffers the internal real-time clock (RTC). It is located behind the black cover on the front of the device. The battery's buffer lifespan is at least 4 years (at 50°C, 8.5 µA for the components being supplied and a self-discharge of 40%). If an SRAM interface option has been installed, this lifespan is reduced to 2½ years. The battery has a limited service life and should be replaced regularly (after the specified service life at the latest).

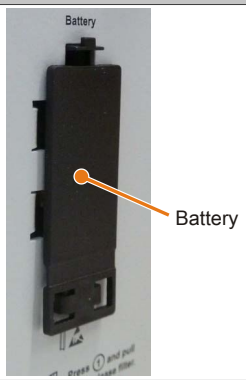
Battery		
Battery Type Removable Service life	 Renata 950 mAh Yes, accessible from the outside 4 years[1)]	
Model number	**Short description**	
	Batteries	
0AC201.91	Lithium batteries, 4 pcs., 3 V / 950 mAh, button cell	
4A0006.00-000	Lithium battery, 1 pc., 3 V / 950 mAh, button cell	

Table 34: Battery

1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an SRAM interface option has been installed, the service life is 2½ years.

The status of the battery is determined immediately after the device is started and subsequently checked by the system every 24 hours. During this measurement, the battery is subjected to a brief load (approximately 1 second) and then evaluated. Once determined, the battery status is displayed in BIOS (under 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	Description
N/A	The hardware or firmware being used is too old and does not support reading the battery status.
GOOD	Data buffering is intact.
BAD	From the point when battery capacity is recognized as insufficient (BAD), data buffering is intact for approximately another 500 hours

Table 35: Battery status

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

2.6.17 CFast slot

The APC910 offers an easy-to-reach 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).

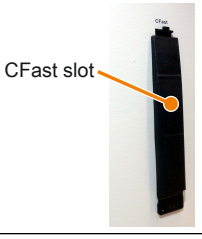
CFast slot		
Connection	SATA 1	
Model number	**Short description**	
	CFast cards	
5CFAST.2048-00	CFast card, 2 GB	
5CFAST.4096-00	CFast card, 4 GB	
5CFAST.8192-00	CFast card, 8 GB	
5CFAST.016G-00	CFast card, 16 GB	
5CFAST.032G-00	CFast card, 32 GB	

Table 36: CFast slot

Warning!

Power must be turned off before inserting and removing the CFast card.

2.6.18 Slide-in compact slot

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

Slide-in compact slot	
Connection	SATA 0
Model number	**Short description**
	Drives
5AC901.CHDD-00	250 GB SATA slide-in compact hard disk, 24/7 operation with extended temperature range. Please see the manual for information about using this hard disk.
5AC901.CHDD-01	500 GB SATA slide-in compact hard disk, 24/7 operation with extended temperature range. Note: Please see the manual for information about using this hard disk.
5AC901.CSSD-00	32 GB SATA SSD (SLC), slide-in compact drive
5AC901.CSSD-01	60 GB SATA SSD (MLC), slide-in compact
5AC901.CSSD-02	180 GB SATA SSD (MLC), slide-in compact
5AC901.CSSD-03	60 GB SATA SSD (MLC), slide-in compact
5AC901.CSSD-04	128 GB SATA SSD (MLC), slide-in compact
5AC901.CSSD-05	256 GB SATA SSD (MLC), slide-in compact
5AC901.CCFA-00	CFast adapter for operating a CFast card in a slide-in compact slot

Table 37: Slide-in compact slot

Information:

The slide-in compact slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in compact drive, please refer to the section "Installing and replacing slide-in compact drives" on page 330.

2.6.19 Slide-in slot 1

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

Slide-in slot 1	
Connection	SATA 2 and USB
Model number	**Short description**
	Drives
5AC901.SDVW-00	DVD-R/RW DVD+R/RW SATA slide-in drive
5AC901.SSCA-00	Slide-in compact adapter for operating a slide-in compact drive in a slide-in slot

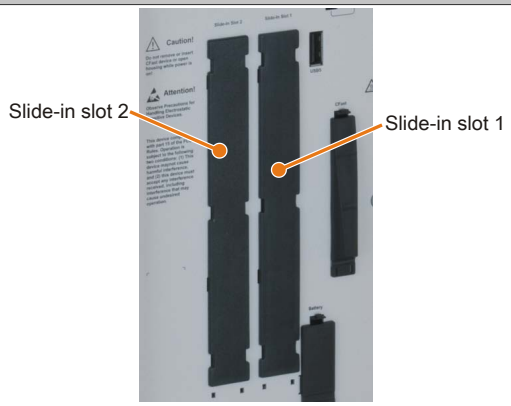


Table 38: Slide-in slot 1

Information:

The slide-in slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in drive, please refer to the section "Installing and replacing slide-in drives" on page 333.

2.6.20 Slide-in slot 2

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

Slide-in slot 2	
Connection	SATA 3 and USB
Model number	**Short description**
	Drives
5AC901.SDVW-00	DVD-R/RW DVD+R/RW SATA slide-in drive
5AC901.SSCA-00	Slide-in compact adapter for operating a slide-in compact drive in a slide-in slot

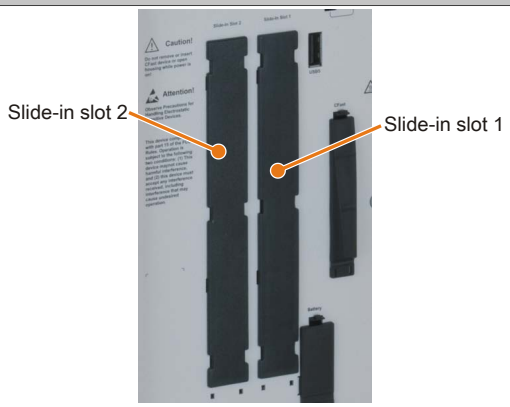


Table 39: Slide-in slot 2

Information:

The slide-in slot cannot be accessed from the outside. The side panel must be removed in order to replace a drive. For information about installing or replacing a slide-in drive, please refer to the section "Installing and replacing slide-in drives" on page 333.

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 in the delivery of the system unit and must be ordered separately, see "Front covers" on page 165.

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	APC910 system unit,1 slot (PCI Express, PCI, depending on the bus), 1 slide-in compact slot, Smart Display Link/DVI/Monitor, DisplayPort, 1x RS232, 5x USB, 2x ETH 10/100/1000, 1 CFast slot, 24 VDC	
	Required accessories	
	Bus units	
5AC901.BX01-00	APC910 bus, 1 PCI	
5AC901.BX01-01	APC910 bus, 1 PCI Express (x8)	
	CPU boards	
5PC900.TS77-00	APC910 Core i7 3615QE CPU board, 2.3 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-01	APC910 Core i7 3612QE CPU board, 2.1 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-02	APC910 Core i7 3555LE CPU board, 2.5 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-03	APC910 Core i7 3517UE CPU board, 1.7 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-04	APC910 Core i5 3610ME CPU board, 2.7 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-05	APC910 Core i3 3120ME CPU board, 2.4 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-06	APC910 Core i3 3217UE CPU board, 1.6 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-07	APC910 Celeron 847E CPU board, 1.1 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-08	APC910 Celeron 827E CPU board, 1.4 GHz, single core, 1.5 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-09	APC910 Celeron 1020E CPU board, 2.2 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-10	APC910 Celeron 1047UE CPU board, 1.4 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
	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	

Table 40: 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.8192-03	SO-DIMM DDR3, 8192 MB	
	Terminal blocks	
0TB103.9	Connector, 24 VDC, 3-pin female, 3.31 mm² screw clamps, protected against vibration by the screw flange	
0TB103.91	Connector, 24 VDC, 3-pin female, 3.31 mm² cage clamps, protected against vibration by the screw flange	
	Optional accessories	
	Drives	
5AC901.CCFA-00	CFast adapter for operating a CFast card in a slide-in compact slot	
5AC901.CHDD-01	500 GB SATA hard disk, slide-in compact, 24/7 operation Note: please see the manual for information about using this hard disk	
5AC901.CSSD-04	128 GB SATA SSD (MLC), slide-in compact	
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	
	Fan kit	
5AC901.FA01-00	APC910 fan kit for 5PC910.SX01-00 system unit	
	Front cover	
5AC901.FF01-00	Front cover for 1-slot APC910, orange	
5AC901.FF01-01	Front cover for 1-slot APC910, dark gray	
5AC901.FF01-02	Front cover for 1-slot APC910 - Dark gray - Without logo	
	Interface options	
5AC901.I485-00	RS232/422/485 interface option; for installation in an APC910 or PPC900	
5AC901.ICAN-00	CAN interface option; for installation in an APC910 or PPC900	
5AC901.IHDA-00	Audio interface option; connection for 1x MIC, 1x Line IN, 1x Line OUT; for installation in an APC910	
5AC901.IRDY-00	Ready relay interface option; for APC910	
5AC901.ISRM-00	SRAM interface option, 2 MB; for installation in an APC910 or PPC900	
	Uninterruptible power supplies	
5AC901.IUPS-00	UPS interface option; for installation in an APC910 or PPC900; for 4.5 Ah battery	
5AC901.IUPS-01	UPS interface option; for installation in an APC910 or PPC900; for 2.2 Ah battery	

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

3.1.1.3 Technical data

Product ID	5PC910.SX01-00
General information	
Cooling	Passive via heat sink and optionally supported with an active fan kit
LEDs	Power, HDD, Link, Run
B&R ID code	0xD6DA
Battery	
Type	Renata 950 mAh
Service life	4 years [1]
Removable	Yes, accessible behind the front cover
Design	Lithium ion
Power button	Yes
Reset button	Yes
Buzzer	Yes
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
GL	Yes [2]
Controller	
Boot loader	BIOS
Real-time clock	
Battery backed	Yes
Power failure logic	
Controller	MTCX [3]
Buffer time	10 ms
Graphics	
Controller	Depends on the CPU board being used
Memory	
Type	SO-DIMM DDR3 SDRAM
Memory size	Max. 16 GB

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

Product ID	5PC910.SX01-00
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 6.0 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), super speed (5 Gbit/s) [4]
Current load	Max. 1 A per connection
Ethernet	
Quantity	2
Design	Shielded RJ45 port
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	1.1
Monitor/Panel interface	
Design	Female DVI-I connector
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 6.0 Gbit/s)
Interface option	2
Monitor/Panel option	No
Add-on UPS slot	Yes [6]
Insert for fan kit	Yes
Electrical characteristics	
Nominal voltage	24 VDC ±25%
Nominal current	Max. 5.5 A [7]
Starting current	Max. 60 A for <300 µs
Electrical isolation	Yes
Operating conditions	
EN 60529 protection	IP20 [8]
Environmental conditions	
Temperature	
Operation	Depends on the component [9]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	Depends on the component
Storage	Depends on the component
Transport	Depends on the component
Vibration [10]	
Operation (continuous)	2 to 8 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g
Operation (occasional)	2 to 8 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, 15 ms
Transport	30 g, 15 ms
Altitude	
Operation	-300 to 3000 m above sea level [11]
Mechanical characteristics	
Housing [12]	
Material	Galvanized plate, plastic
Paint	Anthracite gray

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

Product ID	5PC910.SX01-00
Dimensions	
Width	91 mm
Height	270 mm
Depth	254.75 mm
Weight	2050 g

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

1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an SRAM interface option has been installed, the service life is 2½ years.
2) Yes, although applies only if all components installed within the complete system have this certification
3) Maintenance Controller Extended.
4) The super speed 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 or 5AC901.BX01-01 bus unit being used.
6) This UPS module can only be operated in the IF option 1 slot.
7) Maximum current consumption (24 V / 130 W). This can vary depending on the configuration (see "Power calculation" section). The starting current must also be taken into consideration when selecting the power supply.
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.
11) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
12) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.1.1.4 Dimensions

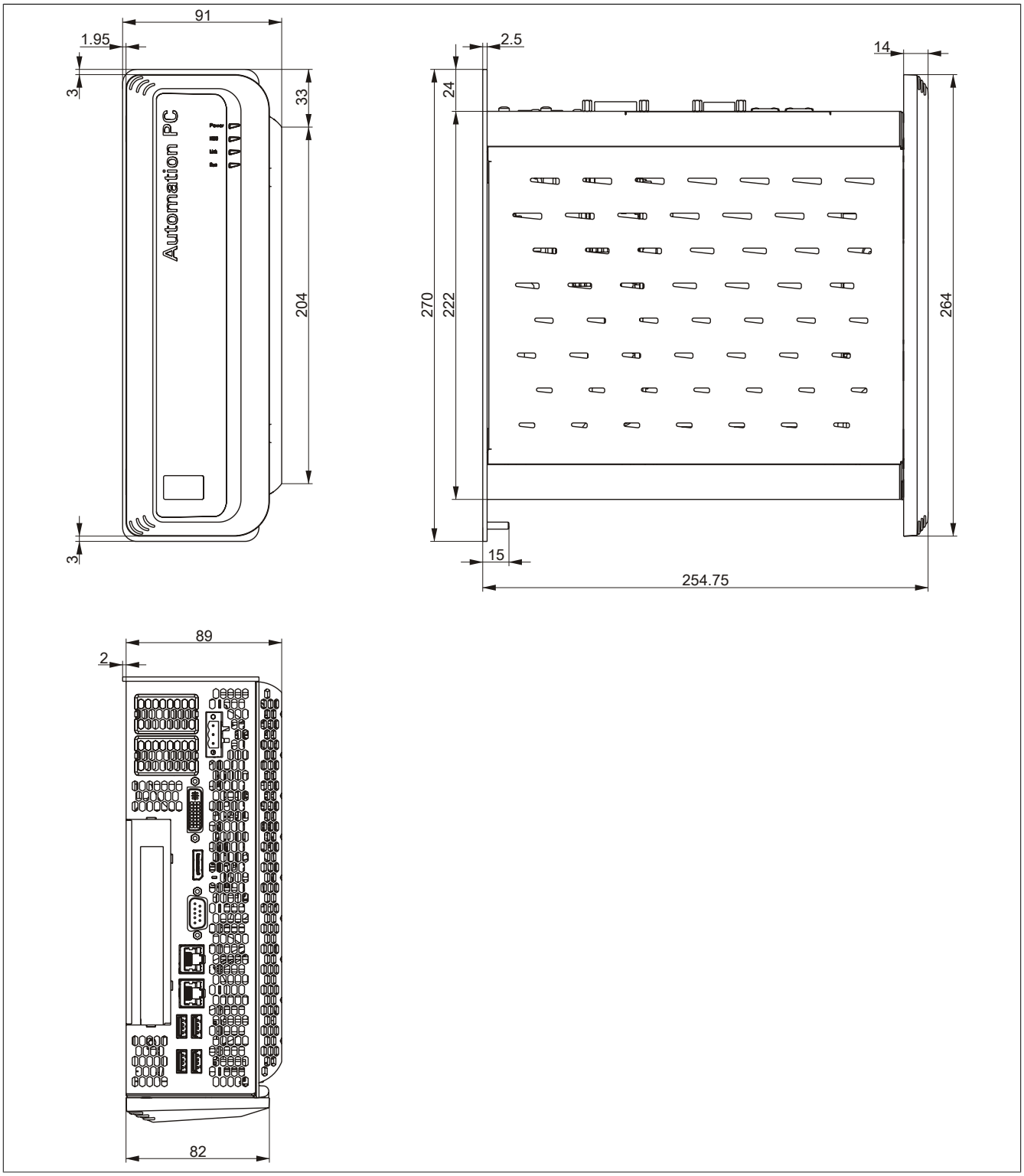


Figure 25: 5PC910.SX01-00 - Dimensions

3.1.1.5 Drilling template

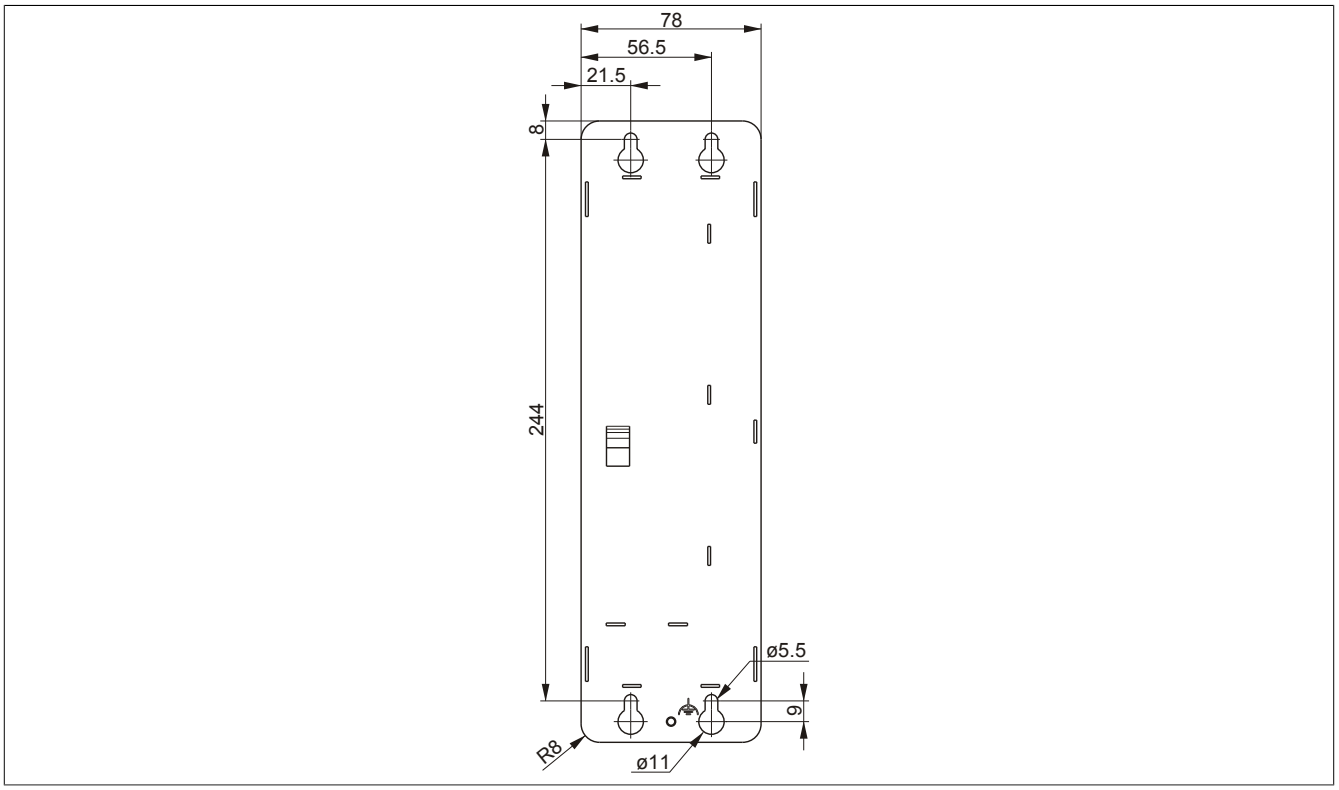


Figure 26: 5PC910.SX01-00 - Drilling template

3.1.2 5PC910.SX02-00

3.1.2.1 General information

- Slot for a bus unit with 2 PCI slots or 1 PCI and 1 PCIe slots
- Insert for 1 slide-in compact 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	APC910 system unit, 2 slots (PCI Express, PCI, depending on the bus), 1 slot for monitor/panel option, 1 slide-in compact slot and 1 slide-in slot; Smart Display Link/DVI/Monitor, DisplayPort, 1x RS232, 5x USB, 2x ETH 10/100/1000, 1 CFast slot, 24 VDC	
	Required accessories	
	Bus units	
5AC901.BX02-00	APC910 bus, 2 PCI	
5AC901.BX02-01	APC910 bus, 1 PCI, 1 PCI Express (x8)	
5AC901.BX02-02	APC910 bus, 2 PCI Express (x4)	
	CPU boards	
5PC900.TS77-00	APC910 Core i7 3615QE CPU board, 2.3 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-01	APC910 Core i7 3612QE CPU board, 2.1 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-02	APC910 Core i7 3555LE CPU board, 2.5 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-03	APC910 Core i7 3517UE CPU board, 1.7 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-04	APC910 Core i5 3610ME CPU board, 2.7 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-05	APC910 Core i3 3120ME CPU board, 2.4 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-06	APC910 Core i3 3217UE CPU board, 1.6 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-07	APC910 Celeron 847E CPU board, 1.1 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-08	APC910 Celeron 827E CPU board, 1.4 GHz, single core, 1.5 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-09	APC910 Celeron 1020E CPU board, 2.2 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-10	APC910 Celeron 1047UE CPU board, 1.4 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
	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	
	Terminal blocks	
0TB103.9	Connector, 24 VDC, 3-pin female, 3.31 mm² screw clamps, protected against vibration by the screw flange	
0TB103.91	Connector, 24 VDC, 3-pin female, 3.31 mm² cage clamps, protected against vibration by the screw flange	
	Optional accessories	
	Drives	

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

Model number	Short description	Figure
5AC901.CCFA-00	CFast adapter for operating a CFast card in a slide-in compact slot	
5AC901.CHDD-01	500 GB SATA hard disk, slide-in compact, 24/7 operation Note: please see the manual for information about using this hard disk	
5AC901.CSSD-04	128 GB SATA SSD (MLC), slide-in compact	
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	
5AC901.SDVW-00	DVD-R/RW DVD+R/RW SATA slide-in drive	
5AC901.SSCA-00	Slide-in compact adapter for operating a slide-in compact drive in a slide-in slot.	
	Fan kit	
5AC901.FA02-00	APC910 fan kit for 5PC910.SX02-00 system unit	
	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	
	Interface options	
5AC901.I485-00	RS232/422/485 interface option; for installation in an APC910 or PPC900	
5AC901.ICAN-00	CAN interface option; for installation in an APC910 or PPC900	
5AC901.IHDA-00	Audio interface option; connection for 1x MIC, 1x Line IN, 1x Line OUT; for installation in an APC910	
5AC901.IRDY-00	Ready relay interface option; for APC910	
5AC901.ISRM-00	SRAM interface option, 2 MB; for installation in an APC910 or PPC900	
	Monitor / Panel options	
5AC901.LDPO-00	DisplayPort transmitter	
5AC901.LSD3-00	SDL3 transmitter	
5AC901.LSDL-00	Smart Display Link / DVI transmitter	
	Uninterruptible power supplies	
5AC901.IUPS-00	UPS interface option; for installation in an APC910 or PPC900; for 4.5 Ah battery	
5AC901.IUPS-01	UPS interface option; for installation in an APC910 or PPC900; for 2.2 Ah battery	

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

3.1.2.3 Technical data

Product ID	5PC910.SX02-00
General information	
Cooling	Passive via heat sink and optionally supported with an active fan kit
LEDs	Power, HDD, Link, Run
B&R ID code	0xD6DB
Battery	
Type	Renata 950 mAh
Service life	4 years [1]
Removable	Yes, accessible behind the front cover
Design	Lithium Ion
Power button	Yes
Reset button	Yes
Buzzer	Yes
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Controller	
Boot loader	BIOS
Real-time clock	
Battery backed	Yes
Power failure logic	
Controller	MTCX [2]
Buffer time	10 ms
Graphics	
Controller	Depends on the CPU board being used
Memory	
Type	SO-DIMM DDR3 SDRAM
Memory size	Max. 16 GB
Interfaces	
COM1	
Type	RS232, modem-capable, not electrically isolated
Design	9-pin male DSUB connector
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s

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

Product ID	5PC910.SX02-00
CFast slot	
Quantity	1
Type	SATA III (SATA 6.0 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 peed (12 Mbit/s), high speed (480 Mbit/s), super speed (5 Gbit/s) [3]
Current load	Max. 1 A per connection
Ethernet	
Quantity	2
Design	Shielded RJ45 port
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	1.1
Monitor/Panel interface	
Design	DVI-I connector
Type	SDL / DVI / Monitor
Inserts	
PCI / PCIe slots	
Quantity	2 PCI slots or 1 PCI slots and 1 PCIe slot or 2 PCIe slots [4]
Slide-in drives	
Quantity	1
Type	SATA II (SATA 3.0 Gbit/s)
Slide-in compact drives	
Quantity	1
Type	SATA III (SATA 6.0 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%
Nominal current	Max. 5.5 A [6]
Starting current	Max. 60 A for <300 µs
Electrical isolation	Yes
Operating conditions	
EN 60529 protection	IP20 [7]
Environmental conditions	
Temperature	
Operation	Component-dependent [8]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	Component-dependent
Storage	Component-dependent
Transport	Component-dependent
Vibration [9]	
Operation (continuous)	2 to 8 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g
Operation (occasional)	2 to 8 Hz: 3.5 mm amplitude / 9 to 200 Hz: 1 g
Storage	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Transport	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Shock [9]	
Operation	15 g, 11 ms
Storage	30 g, 15 ms
Transport	30 g, 15 ms
Altitude	
Operation	-300 to 3000 m above sea level [10]
Mechanical characteristics	
Housing [11]	
Material	Galvanized plate, plastic
Paint	Anthracite gray
Dimensions	
Width	130 mm
Height	270 mm
Depth	254.75 mm
Weight	2550 g

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

1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an SRAM interface option has been installed, the service life is 2½ years.
2) Maintenance Controller Extended.
3) The super speed 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.BX02-00, 5AC901.BX02-01 and 5AC901.BX02-02).
5) This UPS module can only be operated in the IF option 1 slot.
6) Maximum current consumption (24 V / 130 W). This can vary depending on the configuration (see "Power calculation" section). The starting current must also be taken into consideration when selecting the power supply.
7) Only when all interface covers and the front cover are closed.
8) Detailed information can be found in the temperature tables in the user's manual.
9) Maximum values unless specified otherwise by another individual component.
10) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
11) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.1.2.4 Dimensions

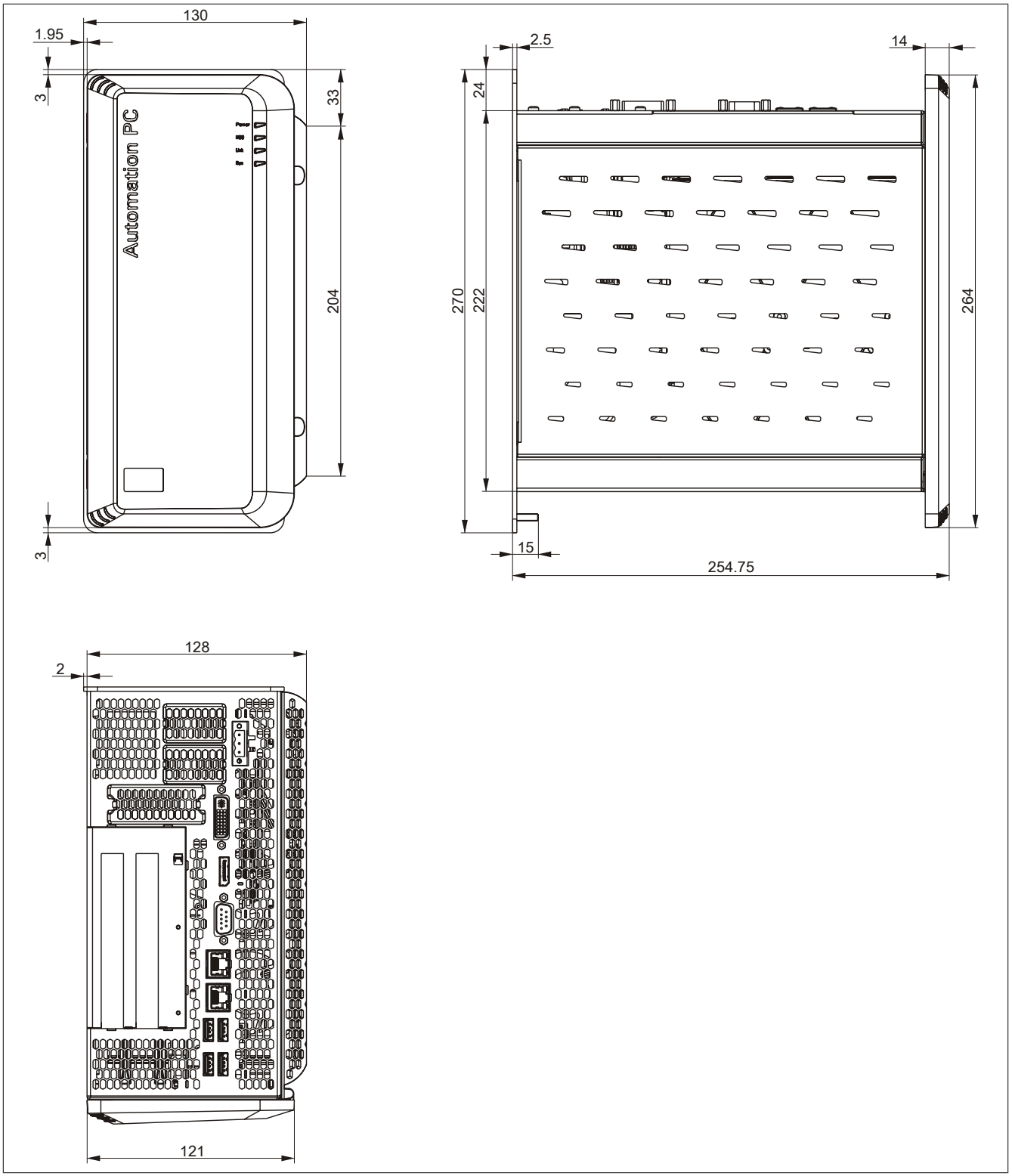


Figure 27: 5PC910.SX02-00 - Dimensions

3.1.2.5 Drilling template

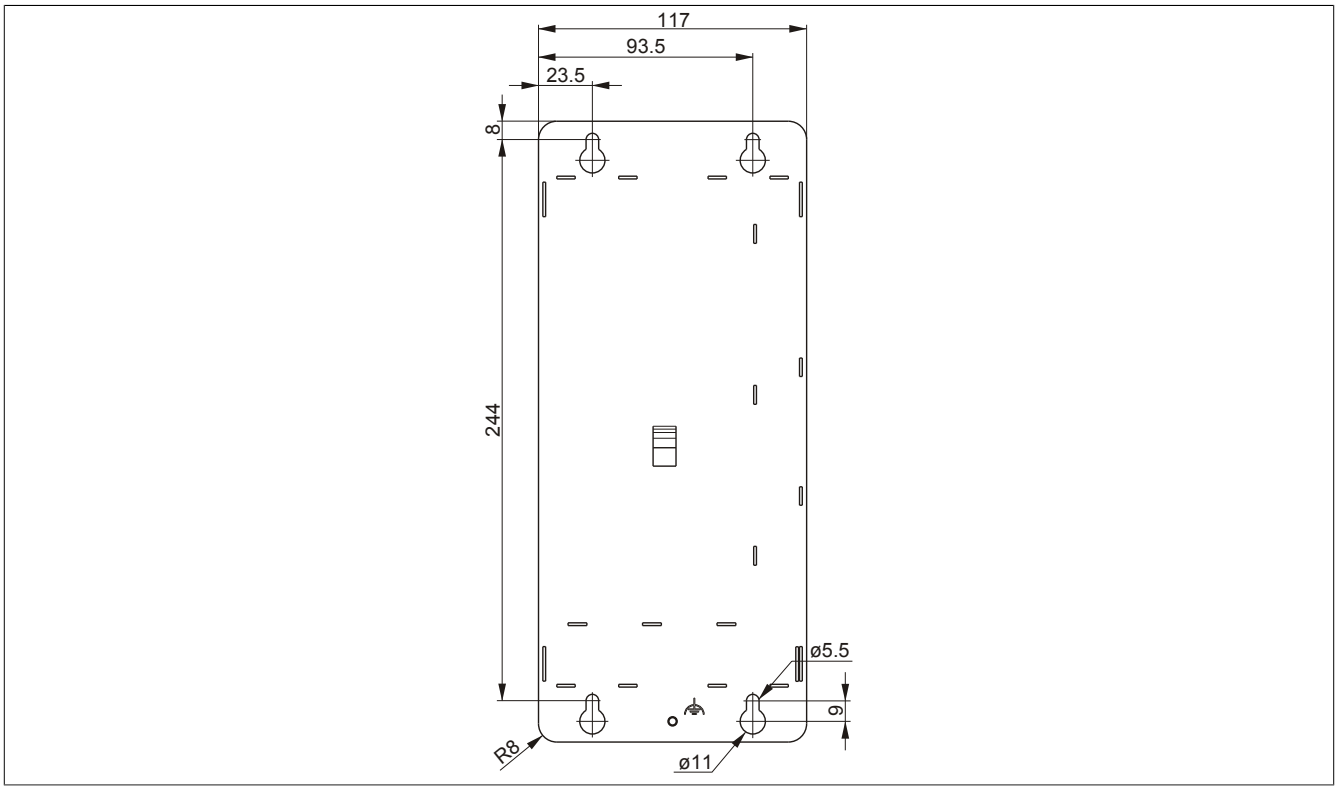


Figure 28: 5PC910.SX02-00 - Drilling template

3.1.3 5PC910.SX05-00

3.1.3.1 General information

- Slot for a bus unit with 5 PCI / PCIe slots
- Insert for 1 slide-in compact 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	APC910 system unit, 5 slots (PCI Express, PCI, depending on the bus), 1 slot for monitor/panel option, 1 slide-in compact slot and 2 slide-in slots; Smart Display Link/DVI/Monitor, DisplayPort, 1x RS232, 5x USB, 2x ETH 10/100/1000, 1 CFast slot, 24 VDC	
	Required accessories	
	Bus units	
5AC901.BX05-00	APC910 bus, 5 PCI	
5AC901.BX05-01	APC910 bus, 4 PCI, 1 PCI Express (x8)	
5AC901.BX05-02	APC910 bus, 2 PCI, 1 PCI Express (x8), 2 PCI Express (x1)	
5AC901.BX05-03	APC910 Bus, 2 PCI Express (x4), 3 PCI Express (x1)	
	CPU boards	
5PC900.TS77-00	APC910 Core i7 3615QE CPU board, 2.3 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-01	APC910 Core i7 3612QE CPU board, 2.1 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-02	APC910 Core i7 3555LE CPU board, 2.5 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-03	APC910 Core i7 3517UE CPU board, 1.7 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-04	APC910 Core i5 3610ME CPU board, 2.7 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-05	APC910 Core i3 3120ME CPU board, 2.4 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-06	APC910 Core i3 3217UE CPU board, 1.6 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-07	APC910 Celeron 847E CPU board, 1.1 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-08	APC910 Celeron 827E CPU board, 1.4 GHz, single core, 1.5 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-09	APC910 Celeron 1020E CPU board, 2.2 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-10	APC910 Celeron 1047UE CPU board, 1.4 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
	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	
	Terminal blocks	
0TB103.9	Connector, 24 VDC, 3-pin female, 3.31 mm² screw clamps, protected against vibration by the screw flange	
0TB103.91	Connector, 24 VDC, 3-pin female, 3.31 mm² cage clamps, protected against vibration by the screw flange	

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

Model number	Short description	Figure
	Optional accessories	
	Drives	
5AC901.CCFA-00	CFast adapter for operating a CFast card in a slide-in compact slot	
5AC901.CHDD-01	500 GB SATA hard disk, slide-in compact, 24/7 operation Note: please see the manual for information about using this hard disk	
5AC901.CSSD-04	128 GB SATA SSD (MLC), slide-in compact	
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	
5AC901.SDVW-00	DVD-R/RW DVD+R/RW SATA slide-in drive	
5AC901.SSCA-00	Slide-in compact adapter for operating a slide-in compact drive in a slide-in slot.	
	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	
	Interface options	
5AC901.I485-00	RS232/422/485 interface option; for installation in an APC910 or PPC900	
5AC901.ICAN-00	CAN interface option; for installation in an APC910 or PPC900	
5AC901.IHDA-00	Audio interface option; connection for 1x MIC, 1x Line IN, 1x Line OUT; for installation in an APC910	
5AC901.IRDY-00	Ready relay interface option; for APC910	
5AC901.ISRM-00	SRAM interface option, 2 MB; for installation in an APC910 or PPC900	
	Monitor / Panel options	
5AC901.LDPO-00	DisplayPort transmitter	
5AC901.LSD3-00	SDL3 transmitter	
5AC901.LSDL-00	Smart Display Link / DVI transmitter	
	Uninterruptible power supplies	
5AC901.IUPS-00	UPS interface option; for installation in an APC910 or PPC900; for 4.5 Ah battery	
5AC901.IUPS-01	UPS interface option; for installation in an APC910 or PPC900; for 2.2 Ah battery	

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

3.1.3.3 Technical data

Product ID	5PC910.SX05-00
General information	
Cooling	Passive via heat sink and optionally supported with an active fan kit
LEDs	Power, HDD, Link, Run
B&R ID code	0xD844
Battery	
Type	Renata 950 mAh
Service life	4 years [1]
Removable	Yes, accessible behind the front cover
Design	Lithium Ion
Power button	Yes
Reset button	Yes
Buzzer	Yes
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Controller	
Boot loader	BIOS
Real-time clock	
Battery backed	Yes
Power failure logic	
Controller	MTCX [2]
Buffer time	10 ms
Graphics	
Controller	Depends on the CPU board being used
Memory	
Type	SO-DIMM DDR3 SDRAM
Memory size	Max. 16 GB

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

Product ID	5PC910.SX05-00
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 6.0 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 peed (12 Mbit/s), high speed (480 Mbit/s), super speed (5 Gbit/s) [3]
Current load	Max. 1 A per connection
Ethernet	
Quantity	2
Design	Shielded RJ45 port
Transfer rate	10/100/1000 Mbit/s
Max. baud rate	1 Gbit/s
DisplayPort	
Quantity	1
Version	1.1
Monitor/Panel interface	
Design	Female DVI-I connector
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 4 PCIe slots or 5 PCIe slots [4]
Slide-in drives	
Quantity	2
Type	SATA II (SATA 3.0 Gbit/s)
Slide-in compact drives	
Quantity	1
Type	SATA III (SATA 6.0 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%
Nominal current	Max. 5.5 A [6]
Starting current	Max. 60 A for <300 µs
Electrical isolation	Yes
Operating conditions	
EN 60529 protection	IP20 [7]
Environmental conditions	
Temperature	
Operation	Component-dependent [8]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	Component-dependent
Storage	Component-dependent
Transport	Component-dependent
Vibration [9]	
Operation (continuous)	2 to 8 Hz: 1.75 mm amplitude / 9 to 200 Hz: 0.5 g
Operation (occasional)	2 to 8 Hz: 3.5 mm amplitude / 9 to 200 Hz: 1 g
Storage	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Transport	2 to 8 Hz: 7.5 mm amplitude / 8 to 200 Hz: 2 g / 200 to 500 Hz: 4 g
Shock [9]	
Operation	15 g, 11 ms
Storage	30 g, 15 ms
Transport	30 g, 15 ms
Altitude	
Operation	-300 to 3000 m above sea level [10]
Mechanical characteristics	
Housing [11]	
Material	Galvanized plate, plastic
Paint	Anthracite gray

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

Product ID	5PC910.SX05-00
Dimensions	
Width	211 mm
Height	270 mm
Depth	254.75 mm
Weight	2850 g

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

1) At 50°C, 8.5 µA of the supplied components and a self-discharge of 40%. If an SRAM interface option has been installed, the service life is 2½ years.
2) Maintenance Controller Extended.
3) The super speed transfer rate (5 Gbit/s) is only possible with USB 3.0.
4) The PCI and PCIe slots available depend on the 5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02 and 5AC901.BX05-03 bus unit being used.
5) This UPS module can only be operated in the IF option 1 slot.
6) Maximum current consumption (24 V / 130 W). This can vary depending on the configuration (see "Power calculation" section). The starting current must also be taken into consideration when selecting the power supply.
7) Only when all interface covers and the front cover are closed.
8) Detailed information can be found in the temperature tables in the user's manual.
9) Maximum values unless specified otherwise by another individual component.
10) The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).
11) There may be visible deviations in the color and surface appearance depending on the process or batch.

3.1.3.4 Dimensions

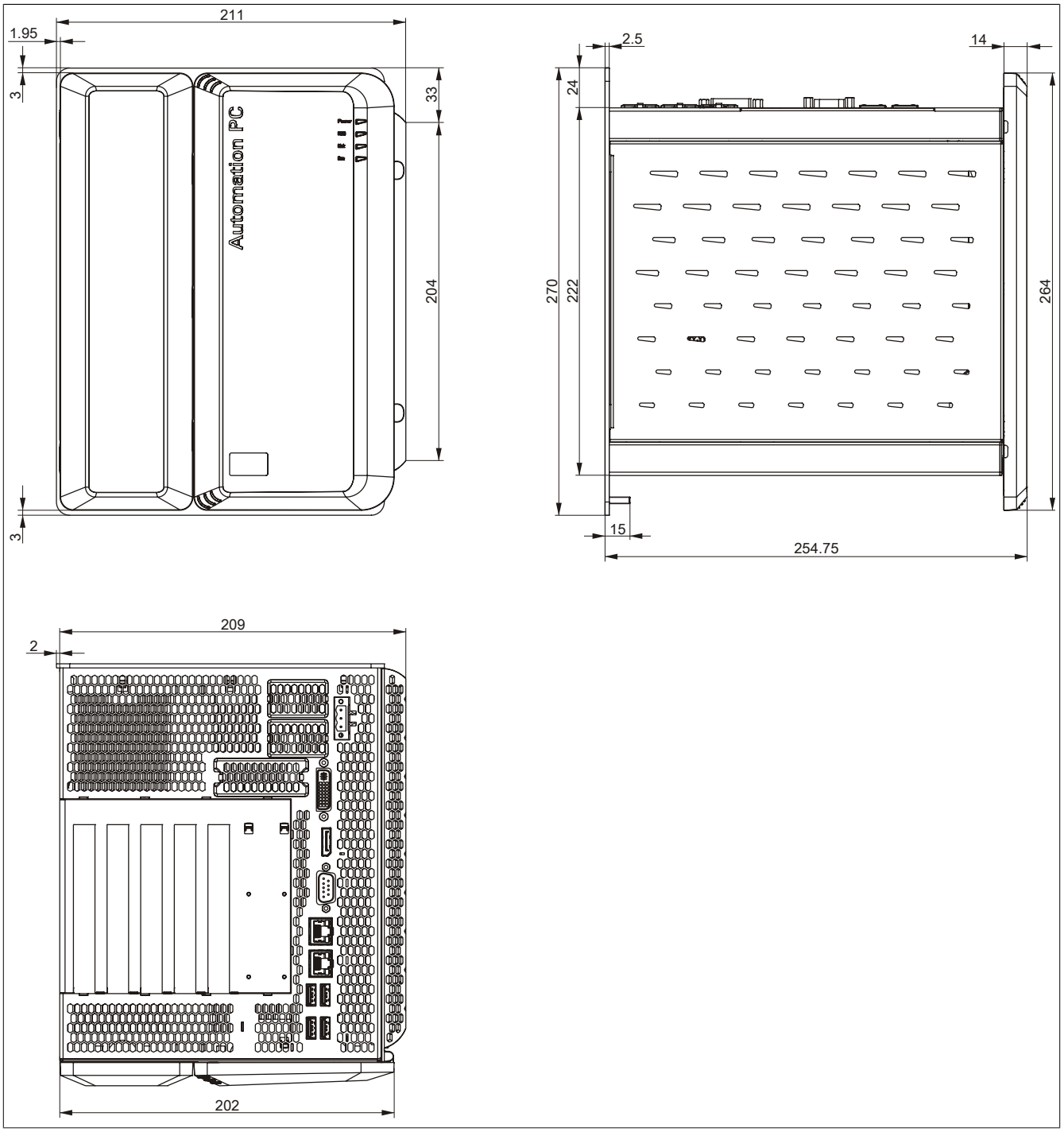


Figure 29: 5PC910.SX05-00 - Dimensions

3.1.3.5 Drilling template

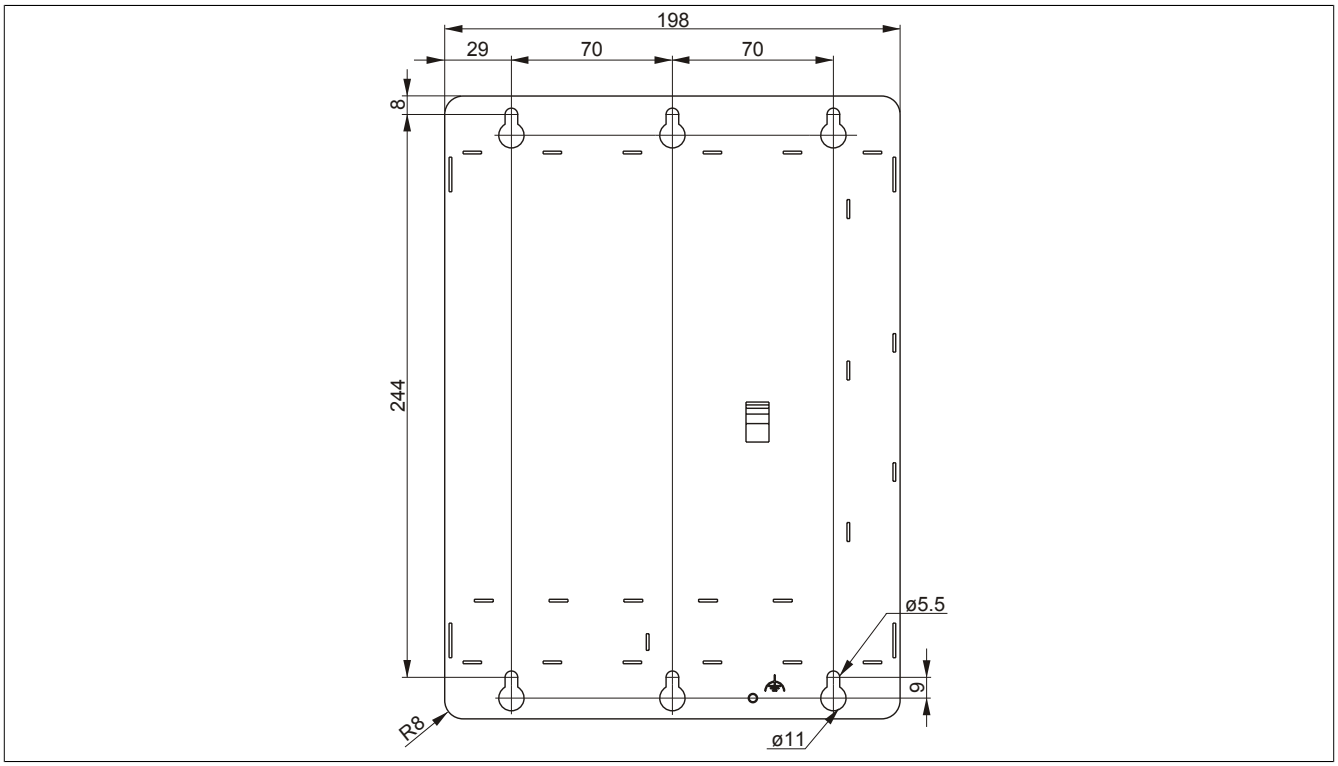


Figure 30: 5PC910.SX05-00 - Drilling template

3.2 QM77 CPU boards

3.2.1 5PC900.TS77-0x

3.2.1.1 General information

- Intel® Core™ i-series processors
- Intel® QM77 chipset
- 2x DDR3 memory socket
- 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	APC910 Core i7 3615QE CPU board, 2.3 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-01	APC910 Core i7 3612QE CPU board, 2.1 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-02	APC910 Core i7 3555LE CPU board, 2.5 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-03	APC910 Core i7 3517UE CPU board, 1.7 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-04	APC910 Core i5 3610ME CPU board, 2.7 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-05	APC910 Core i3 3120ME CPU board, 2.4 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-06	APC910 Core i3 3217UE CPU board, 1.6 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
	Required accessories	
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	

Table 46: 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-02, 5PC900.TS77-03, 5PC900.TS77-04, 5PC900.TS77-05, 5PC900.TS77-06 - Order data

3.2.1.3 Technical data

Product ID	5PC900.TS77-00	5PC900.TS77-01	5PC900.TS77-02	5PC900.TS77-03	5PC900.TS77-04	5PC900.TS77-05	5PC900.TS77-06
General information							
Certification							
CE				Yes			
cULus				Yes			
GOST-R				Yes			
Controller							
Boot loader				Embedded AMI BIOS			
Processor							
Type	Intel® Core™ i7 3615QE	Intel® Core™ i7 3612QE	Intel® Core™ i7 3555LE	Intel® Core™ i7 3555LE	Intel® Core™ i5 3610ME	Intel® Core™ i3 3120ME	Intel® Core™ i3 3217UE
Clock frequency	2300 MHz	2100 MHz	2500 MHz	1700 MHz	2700 MHz	2400 MHz	1600 MHz
Number of cores	4	4	2	2	2	2	2
Architectures				22 nm			
Intel® Smart Cache	6 MB	6 MB	4 MB	4 MB	3 MB	3 MB	3 MB
External bus				DMI, 5 GT/s			
Intel® 64 Architecture				Yes			
Intel® Turbo Boost Technology	2.0	2.0	2.0	2.0	2.0	No	No
Intel® Hyper-Threading Technology				Yes			
Intel® Virtualization Technology (VT-x)				Yes			
Enhanced Intel SpeedStep® Technology				Yes			
Chipset				Intel® QM77			
Real-time clock							
Precision				At 25°C: typ. 12 ppm (1 seconds) per day [1]			
Battery backed				Yes			
Memory socket							
Number of memory channels				2			
Type				DDR3			
Size				Max. 16 GB			
Max. memory bandwidth				25.6 GB/s			
Graphics							
Controller				Intel® HD Graphics 4000			
Max. dynamic graphics frequency	1 GHz	1 GHz	1 GHz	1 GHz	950 MHz	900 MHz	900 MHz
Color depth				Max. 32-bit			
Resolution							
DVI				Resolution up to 1920 x 1200 (WUXGA)			
RGB				350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)			
DisplayPort				Version 1.1			
Mass memory management				4x SATA			
Power management				ACPI 4.0 with battery support			

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

1) At max. specified ambient temperature: typically 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 slot
- Intel® HD graphics 2000 / 2500
- AMI BIOS (UEFI)

3.3.1.2 Order data

Model number	Short description	Figure
	CPU boards	
5PC900.TS77-07	APC910 Celeron 847E CPU board, 1.1 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-08	APC910 Celeron 827E CPU board, 1.4 GHz, single core, 1.5 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-09	APC910 Celeron 1020E CPU board, 2.2 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-10	APC910 Celeron 1047UE CPU board, 1.4 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
	Required accessories	
	Heat sink	
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
	Main memory	
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	
5MMDDR.4096-03	SO-DIMM DDR3, 4096 MB	
5MMDDR.8192-03	SO-DIMM DDR3, 8192 MB	

Table 48: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Order data

3.3.1.3 Technical data

Product ID	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10
General information				
Certification				
CE	Yes			
cULus	Yes			
GOST-R	Yes			
GL	-	-	-	Yes [3]
Controller				
Boot loader	Embedded AMI BIOS			
Processor				
Type	Intel® Celeron® 847E	Intel® Celeron® 827E	Intel® Celeron® 1020E	Intel® Celeron® 1047UE
Clock frequency	1100 MHz	1400 MHz	2200 MHz	1400 MHz
Number of cores	2	1	2	2
Architectures	32 nm	32 nm	22 nm	22 nm
Intel® Smart Cache	2 MB	1.5 MB	2 MB	2 MB
External bus	DMI, 5 GT/s			
Intel® 64 Architecture	Yes			
Intel® Turbo Boost Technology	No			
Intel® Hyper-Threading Technology	No			
Intel® Virtualization Technology (VT-x)	Yes			
Enhanced Intel SpeedStep® Technology	Yes			
Chipset	Intel® HM76			
Real-time clock				
Precision	At 25°C: typ. 12 ppm (1 seconds) per day [1]	At 25°C: typ. 12 ppm (1 seconds) per day [2]	At 25°C: typ. 12 ppm (1 seconds) per day [1]	At 25°C: typ. 12 ppm (1 seconds) per day [1]
Battery backed	Yes			

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

Product ID	5PC900.TS77-07	5PC900.TS77-08	5PC900.TS77-09	5PC900.TS77-10
Memory socket				
Number of memory channels	2			
Type	DDR3			
Size	Max. 16 GB			
Max. memory bandwidth	21.3 GB/s	21.3 GB/s	25.6 GB/s	25.6 GB/s
Graphics				
Controller	Intel® HD Graphics 2000	Intel® HD Graphics 2000	Intel® HD Graphics 2500	Intel® HD Graphics 2500
Max. dynamic graphics frequency	800 MHz	800 MHz	1 GHz	900 MHz
Color depth	Max. 32-bit			
Resolution				
DVI	Resolution up to 1920 x 1200 (WUXGA)			
RGB	350 MHz RAMDAC, resolution up to 2048 x 1536 @ 75 Hz (QXGA)			
DisplayPort	Version 1.1			
Mass memory management	4x SATA			
Power management	ACPI 4.0 with battery support			

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

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

3.4 Main memory

3.4.1 5MMDDR.xxxx-03

3.4.1.1 General information

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

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

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

3.4.1.2 Order data

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

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

3.4.1.3 Technical data

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

Table 51: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Technical data

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

Information:

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

3.5 Bus units

3.5.1 5AC901.BX0x-0x

3.5.1.1 General information

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

1-slot bus units

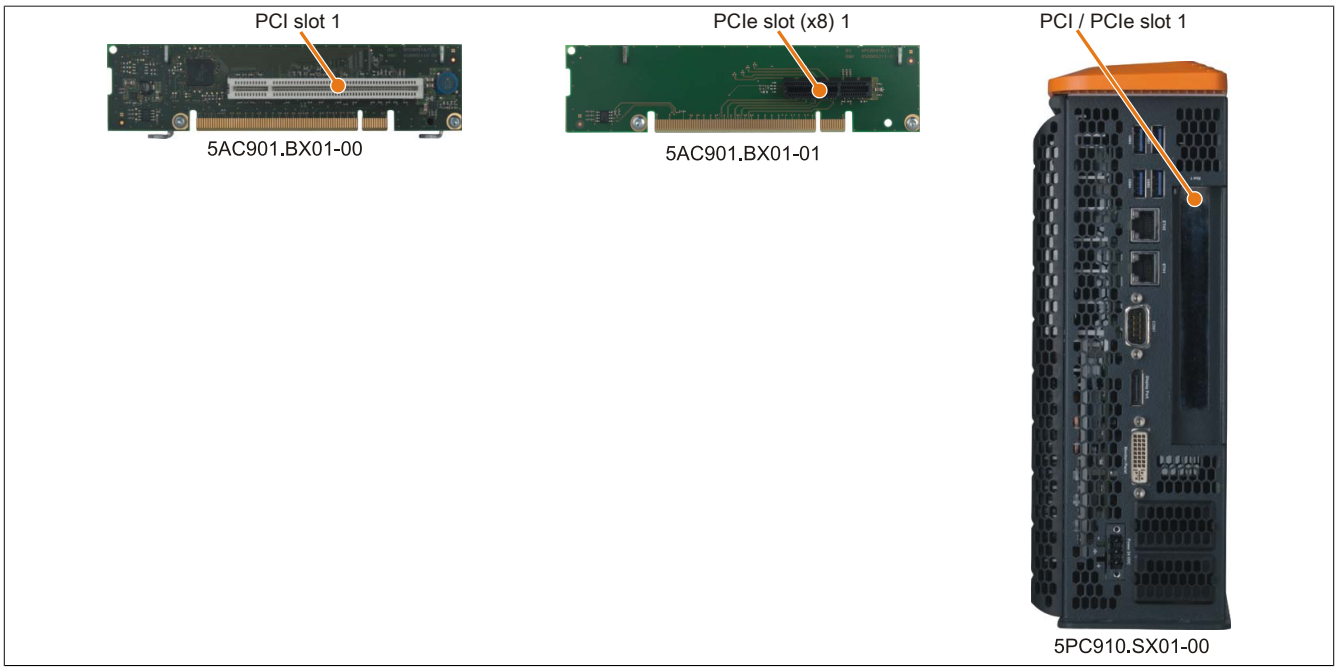


Figure 31: 1-slot bus units

2-slot bus units

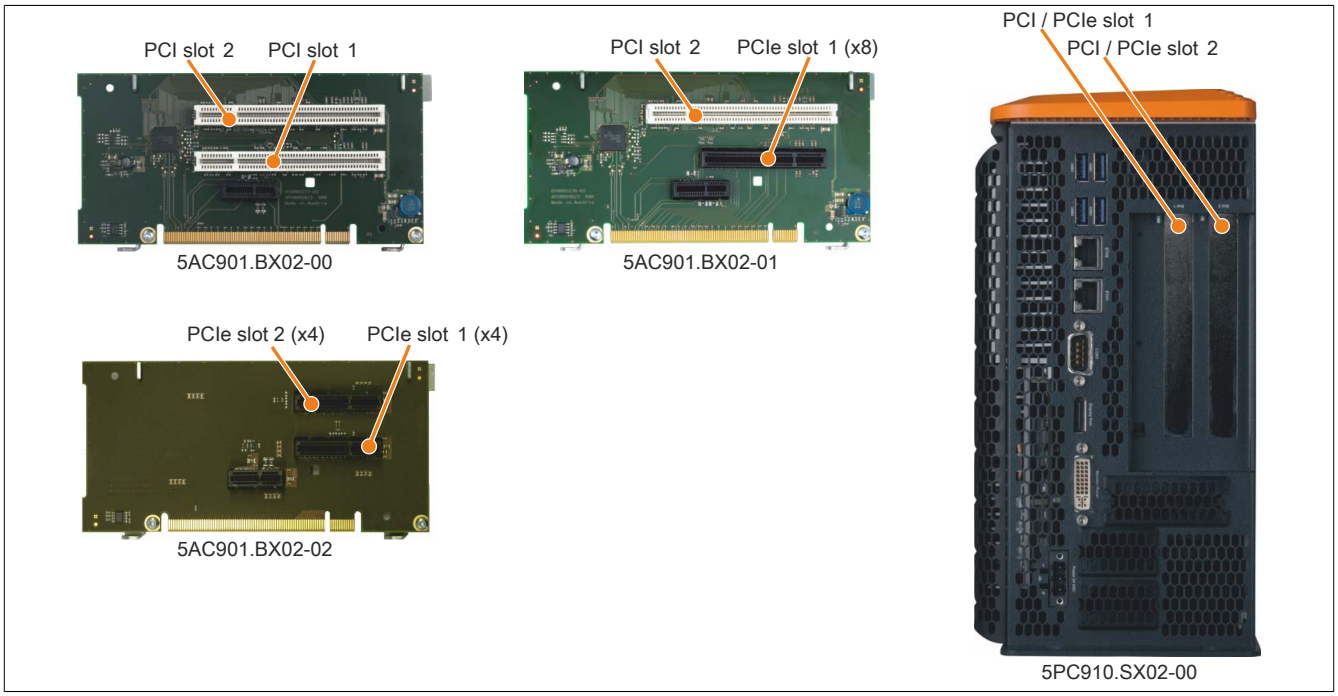


Figure 32: 2-slot bus units

5-slot bus units

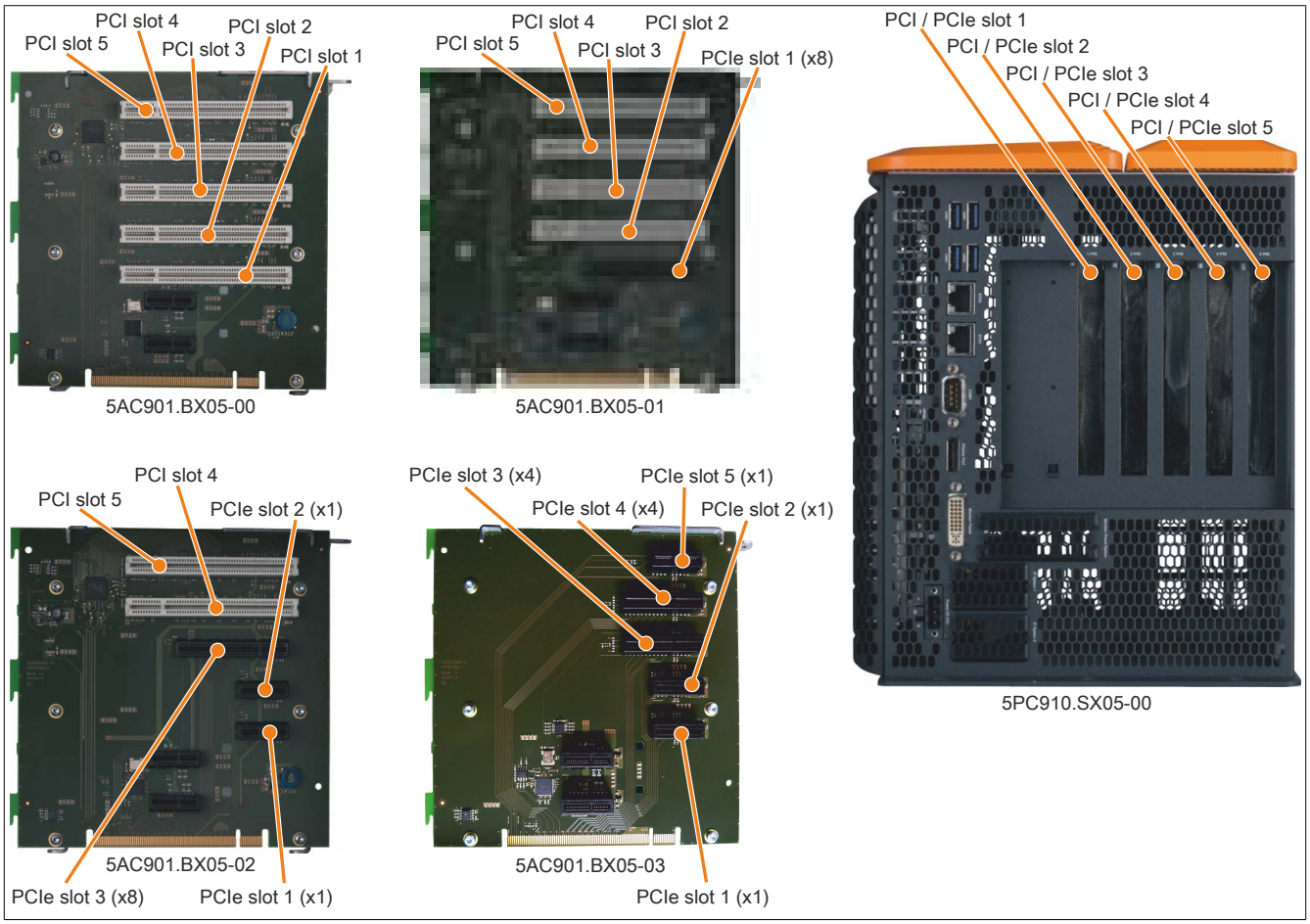


Figure 33: 5-slot bus units

3.5.1.2 Order data

Model number	Short description	Figure
	Bus units	
5AC901.BX01-00	APC910 bus, 1 PCI	
5AC901.BX01-01	APC910 bus, 1 PCI Express (x8)	
5AC901.BX02-00	APC910 bus, 2 PCI	
5AC901.BX02-01	APC910 bus, 1 PCI, 1 PCI Express (x8)	
5AC901.BX02-02	APC910 bus, 2 PCI Express (x4)	
5AC901.BX05-00	APC910 bus, 5 PCI	
5AC901.BX05-01	APC910 bus, 4 PCI, 1 PCI Express (x8)	
5AC901.BX05-02	APC910 bus, 2 PCI, 1 PCI Express (x8), 2 PCI Express (x1)	
5AC901.BX05-03	APC910 Bus, 2 PCI Express (x4), 3 PCI Express (x1)	

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

3.5.1.3 Technical data

Information:

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

Product ID	5AC901.BX01-00	5AC901.BX01-01	5AC901.BX02-00	5AC901.BX02-01	5AC901.BX02-02
General information					
Certification					
CE			Yes		
cULus			Yes		
GOST-R			Yes		
GL	Yes [1]	-	-	-	-
Inserts					
PCI slots					
Quantity	1	-	2	1	-
Type	32-bit	-	32-bit	32-bit	-
Design	PCI half-size	-	PCI half-size	PCI half-size	-
Standard	2.2	-	2.2	2.2	-
Bus speed	33 MHz	-	33 MHz	33 MHz	-
PCIe to PCI bridge	Yes	-	Yes	Yes	-
PCIe slots					
Quantity	-	1	-	1	2
Design	-	PCIe half-size	-	PCIe half-size	PCIe half-size
Standard	-	2.0	-	2.0	2.0
Bus speed	-	x8 (4 GB/s)	-	x8 (4 GB/s)	x4 (2 GB/s) (2x)

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

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

Product ID	5AC901.BX05-00	5AC901.BX05-01	5AC901.BX05-02	5AC901.BX05-03
General information				
Certification				
CE			Yes	
cULus			Yes	
GOST-R			Yes	
Inserts				
PCI slots				
Quantity	5	4	2	-
Type	32-bit	32-bit	32-bit	-
Design	PCI half-size	PCI half-size	PCI half-size	-
Standard	2.2	2.2	2.2	-
Bus speed	33 MHz	33 MHz	33 MHz	-
PCIe to PCI bridge	Yes	Yes	Yes	-
PCIe slots				
Quantity	-	1	3	5
Design	-	PCIe half-size	PCIe half-size	PCIe half-size
Standard	-	2.0	2.0	2.0
Bus speed	-	x8 (4 GB/s)	x8 (4 GB/s) (1x); x1 (500 MB/s) (2x)	x4 (2 GB/s) (2x); x1 (500 MB/s) (3x)

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

Information:

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

3.6 Heat sink

3.6.1 5AC901.HS0x-00

3.6.1.1 General information

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

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

3.6.1.2 Order data

Model number	Short description	Figure
	Heat sink	Image not found for 5AC901.HS00-00!
5AC901.HS00-00	APC910 heat sink, active	
5AC901.HS01-00	APC910 heat sink, passive	
	Required accessories	
	CPU boards	
5PC900.TS77-00	APC910 Core i7 3615QE CPU board, 2.3 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-01	APC910 Core i7 3612QE CPU board, 2.1 GHz, quad core, 6 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total memory 16 GB)	
5PC900.TS77-02	APC910 Core i7 3555LE CPU board, 2.5 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-03	APC910 Core i7 3517UE CPU board, 1.7 GHz, dual core, 4 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-04	APC910 Core i5 3610ME CPU board, 2.7 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-05	APC910 Core i3 3120ME CPU board, 2.4 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-06	APC910 Core i3 3217UE CPU board, 1.6 GHz, dual core, 3 MB L2 cache; QM77 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-07	APC910 Celeron 847E CPU board, 1.1 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-08	APC910 Celeron 827E CPU board, 1.4 GHz, single core, 1.5 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-09	APC910 Celeron 1020E CPU board, 2.2 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	
5PC900.TS77-10	APC910 Celeron 1047UE CPU board, 1.4 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	

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

3.7 Fan kit

Information:

Fan kits are subject to wear and must be checked with appropriate frequency and cleaned or replaced when not functioning properly (e.g. due to dirt and grime). For information about replacing fan filters, please refer to the section "Replacing fan filters" on page 340.

Information:

For information about installing or replacing a fan kit, please refer to the section "Replacing fan kits" on page 341.

3.7.1 5AC901.FA01-00

3.7.1.1 General information

This fan kit includes 3 fans that are installed in order to improve heat dissipation on APC910 1-slot system units.

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

3.7.1.2 Order data

Model number	Short description	Figure
	Fan kit	
5AC901.FA01-00	APC910 fan kit for 5PC910.SX01-00 system unit	
	Optional accessories	
	Accessories	
5AC901.FI01-00	APC910 replacement fan filter for 5AC901.FA01-00; 5 pcs.	

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

3.7.1.3 Technical data

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

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

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

3.7.2 5AC901.FA02-00

3.7.2.1 General information

This fan kit includes 4 fans that are installed in order to improve heat dissipation on APC910 2-slot system units.

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

3.7.2.2 Order data

Model number	Short description	Figure
	Fan kit	
5AC901.FA02-00	APC910 fan kit for 5PC910.SX02-00 system unit	
	Optional accessories	
	Accessories	
5AC901.FI02-00	APC910 replacement fan filter for 5AC901.FA02-00; 5 pcs.	

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

3.7.2.3 Technical data

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

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

3.7.3 5AC901.FA05-00

3.7.3.1 General information

This fan kit includes 4 fans that are installed in order to improve heat dissipation on APC910 5-slot system units.

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

3.7.3.2 Order data

Model number	Short description	Figure
	Fan kit	
5AC901.FA05-00	APC910 fan kit for 5PC910.SX05-00 system unit	
	Optional accessories	
	Accessories	
5AC901.FI05-00	APC910 replacement fan filter for 5AC901.FA05-00; 5 pcs.	

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

3.7.3.3 Technical data

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

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

3.8 Drives

3.8.1 5AC901.CHDD-00

3.8.1.1 General information

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

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

3.8.1.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CHDD-00	250 GB SATA hard disk, slide-in compact, 24/7 operation note: please see the manual for information about using this hard disk	

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

3.8.1.3 Technical data

Information:

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

Product ID	5AC901.CHDD-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Hard disk drive	
Capacity	250 GB
Number of heads	2
Number of sectors	488,397,168
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 POH [2]
S.M.A.R.T. support	Yes
Interface	SATA
Access time	5.6 ms
Supported transfer modes	SATA 1.0, Serial ATA Revision 2.6 PIO mode 0-4, multiword DMA mode 0-2, UDMA mode 0-6
Data transfer rate	
Internal	Max. 1175 Mbit/s
To/From host	Max. 150 MB/s (SATA I), max. 300 MB/s (SATA II)
Positioning time	
Minimum (track to track)	1 ms
Nominal (read only)	14 ms
Maximum (read only)	30 ms
Environmental conditions	
Temperature [3]	
Operation [4]	0 to 60°C
24-hour operation [5]	0 to 60°C
Storage	-40 to 70°C
Transport	-40 to 70°C

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

Product ID	5AC901.CHDD-00
Relative humidity [6]	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation (continuous)	5 to 500 Hz: 0.25 g; no unrecoverable errors
Operation (occasional)	5 to 500 Hz: 0.5 g; no unrecoverable errors
Storage	10 to 500 Hz: 5 g; no unrecoverable errors
Transport	10 to 500 Hz: 5 g; no unrecoverable errors
Shock	
Operation	350 g and 2 ms duration; no unrecoverable errors
Storage	800 g and 2 ms duration; no unrecoverable errors 800 g and 1 ms duration; no unrecoverable errors 600 g and 0.5 ms duration; no unrecoverable errors
Transport	800 g and 2 ms duration; no unrecoverable errors 800 g and 1 ms duration; no unrecoverable errors 600 g and 0.5 ms duration; no unrecoverable errors
Altitude	
Operation	-300 to 3048 m
Storage	-300 to 12192 m
Mechanical characteristics	
Installation	Fixed [7]
Dimensions	
Width	13 mm
Height	75 mm
Depth	105 mm
Weight	134 g
Manufacturer information	
Manufacturer	Seagate
Manufacturer's product ID	ST9250311CS

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

1) Yes, although applies only if all components installed within the complete system have this certification
2) With 8760 POH (power on hours) per year and 25°C surface temperature.
3) Temperature values at an altitude of 305 meters. The temperature specification must be reduced linearly by 1°C every 305 meters. The temperature increase and decrease can be a maximum of 20°C per hour.
4) Standard operation means 333 POH (power-on hours) per month.
5) 24-hour operation means 732 POH (power-on hours) per month.
6) Humidity gradient: Maximum 30% per hour.
7) Slide-in compact installation.

3.8.1.4 Temperature humidity diagram

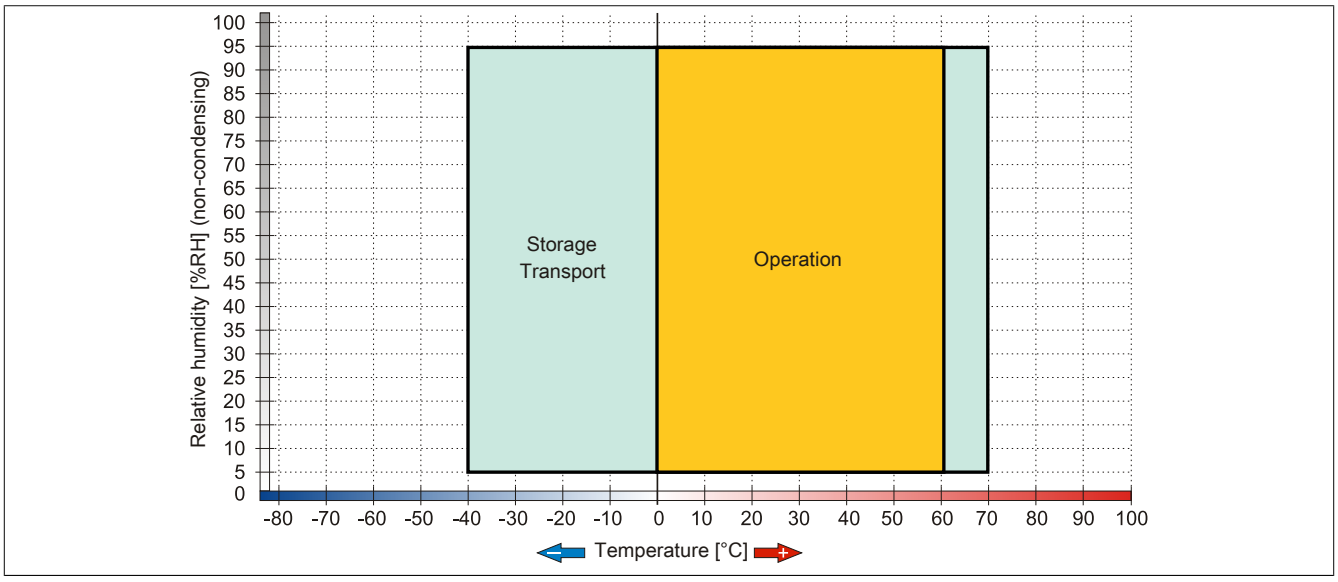


Figure 34: 5AC901.CHDD-00 - Temperature humidity diagram

3.8.2 5AC901.CHDD-01

3.8.2.1 General information

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

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

3.8.2.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CHDD-01	500 GB SATA hard disk, slide-in compact, 24/7 operation Note: please see the manual for information about using this hard disk	
	Optional accessories	
	Drives	
5MMHDD.0500-00	500 GB SATA hard disk; replacement for 5AC801.HDDI-04, 5AC901.CHDD-01 and 5ACPCI.RAIC-06; note: please see the manual for information about using this hard disk	

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

3.8.2.3 Technical data

Information:

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

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

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

Product ID	5AC901.CHDD-01
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	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
Altitude	
Operation	-305 to 3048 m
Storage	-305 to 12192 m
Mechanical characteristics	
Installation	Fixed [7]
Dimensions	
Width	10 mm
Height	75 mm
Depth	105 mm
Weight	134 g
Manufacturer information	
Manufacturer	Western Digital
Manufacturer's product ID	WD5000LUCT

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

1) Yes, although applies only if all components installed within the complete system have this certification
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 increase and decrease can be a maximum of 20°C per hour.
4) Standard operation refers to 333 POH (power-on hours) per month.
5) 24-hour operation refers to 732 POH (power-on hours) per month.
6) Humidity gradient: Maximum 20% per hour.
7) Slide-in compact installation.

3.8.2.4 Temperature humidity diagram

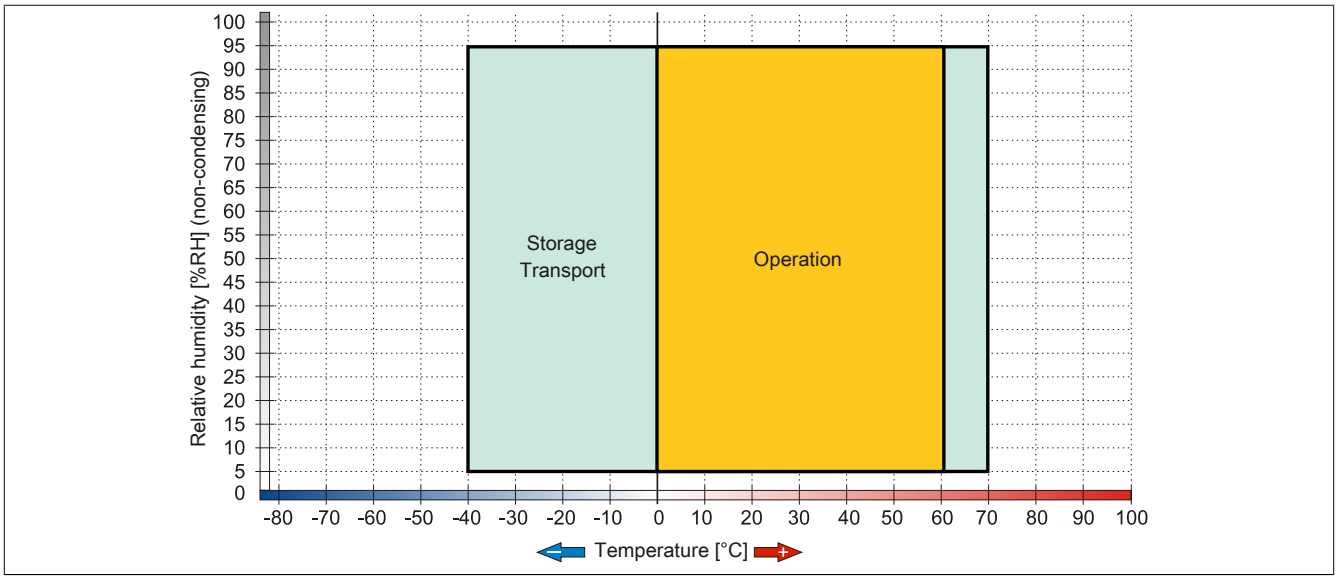


Figure 35: 5AC901.CHDD-01 - Temperature humidity diagram

3.8.3 5MMHDD.0500-00

3.8.3.1 General information

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

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

3.8.3.2 Order data

Model number	Short description	Figure
	Drives	
5MMHDD.0500-00	500 GB SATA hard disk; replacement for 5AC801.HDDI-04, 5AC901.CHDD-01 and 5ACPCI.RAIC-06; note: please see the manual for information about using this hard disk	

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

3.8.3.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

Product ID	5MMHDD.0500-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1)]
GOST-R	Yes
Hard disk drive	
Capacity	500 GB
Number of heads	2
Number of sectors	976,773,168
Bytes per sector	512 (logical) / 4096 (physical)
Cache	16 MB
Speed	5400 rpm ±0.2%
Startup time	Typ. 3.5 s (from 0 rpm to read access)
Service life	5 years
MTBF	1,000,000 POH [2)]
S.M.A.R.T. support	Yes
Interface	SATA
Access time	5.5 ms

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

Product ID	5MMHDD.0500-00
Supported transfer modes	SATA II
Data transfer rate	
Internal	Max. 147 MB/s
To/From host	Max. 150 MB/s (SATA I), max. 300 MB/s (SATA II)
Positioning time	
Nominal (read only)	11 ms
Maximum (read only)	21 ms
Environmental conditions	
Temperature [3]	
Operation [4]	0 to 60°C
24-hour operation [5]	0 to 60°C
Storage	-40 to 70°C
Transport	-40 to 70°C
Relative humidity [6]	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
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
Altitude	
Operation	-305 to 3048 m
Storage	-305 to 12192 m
Mechanical characteristics	
Dimensions	
Width	7 mm
Height	69 mm
Depth	100 mm
Weight	100 g
Manufacturer information	
Manufacturer	Western Digital
Manufacturer's product ID	WD5000LUCT

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

1) Yes, although applies only if all components installed within the complete system have this certification
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 increase and decrease can be a maximum of 20°C per hour.
4) Standard operation refers to 333 POH (power-on hours) per month.
5) 24-hour operation refers to 732 POH (power-on hours) per month.
6) Humidity gradient: Maximum 20% per hour.

3.8.3.4 Temperature humidity diagram

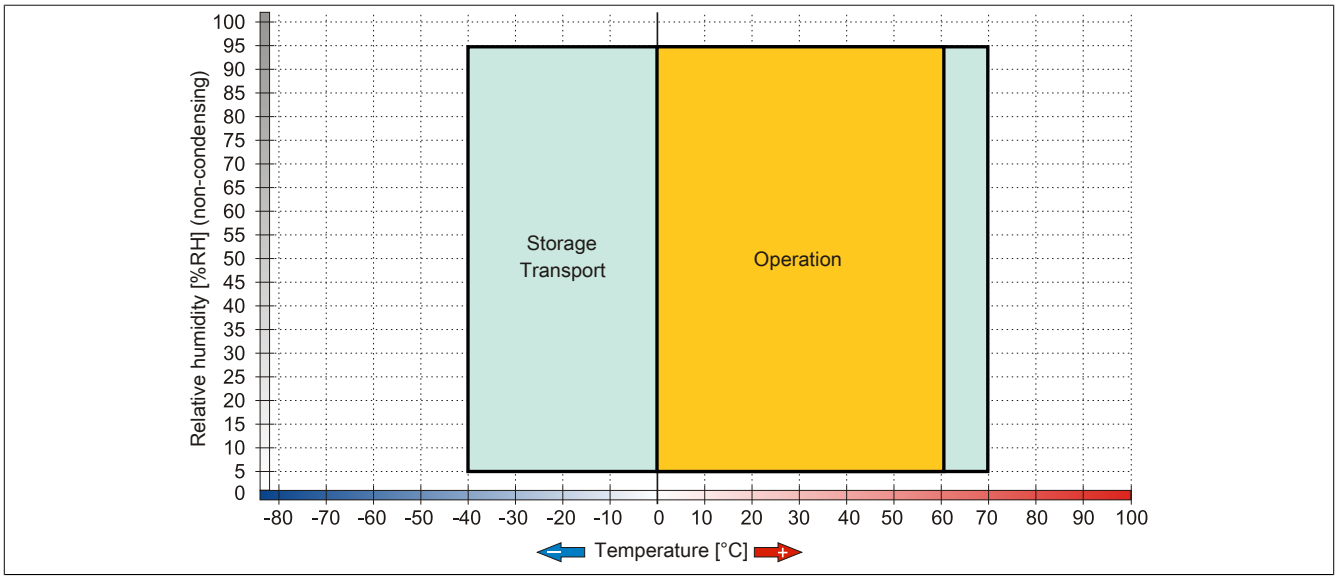


Figure 36: 5MMHDD.0500-00 - Temperature humidity diagram

3.8.4 5AC901.CSSD-00

3.8.4.1 General information

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

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

3.8.4.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-00	32 GB SATA SSD (SLC), slide-in compact	

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

3.8.4.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

Product ID	5AC901.CSSD-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Solid state drive	
Capacity	32 GB
Data reliability	<1 unrecoverable error in 10^{16} bit read accesses
MTBF	2,000,000 hours
Power on/off cycles	50,000
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	45,000
4k write	5,500
Endurance	
SLC flash	Yes
Guaranteed data volume	
Guaranteed	700 TB
Results for 5 years	350 GB/day
Wear leveling	Static
Error correction coding (ECC)	Yes

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

Product ID	5AC901.CSSD-00
Compatibility	SATA revision 2.6 compatible, compatible with SATA 1.5 Gbit/s and 3 Gbit/s interface rates ATA/ATAPI-7 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Environmental conditions	
Temperature	
Operation	0 to 70°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 700 Hz: 2.17 g
Storage	5 to 800 Hz: 3.13 g
Transport	5 to 800 Hz: 3.13 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Altitude	
Operation	-300 to 12192 m
Storage	-300 to 12192 m
Transport	-300 to 12192 m
Mechanical characteristics	
Installation	Fixed [3]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Intel
Manufacturer's product ID	SSDSA2SH032G201

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

1) Yes, although applies only if all components installed within the complete system have this certification
2) IOPS: Random read and write input/output operations per second.
3) Slide-in compact mounting.

3.8.4.4 Temperature humidity diagram

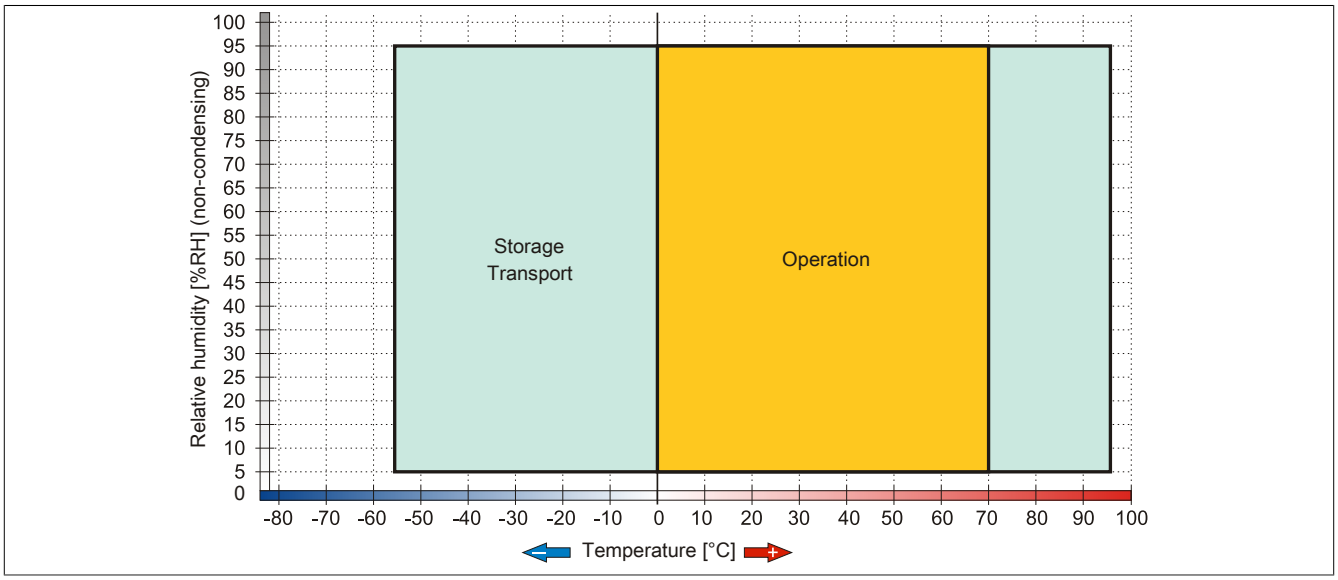


Figure 37: 5AC901.CSSD-00 - Temperature humidity diagram

3.8.5 5AC901.CSSD-01

3.8.5.1 General information

This 60 GB slide-in compact SSD (solid-state drive) is based on MLC (multi-level cell) technology, SATA 3.0 compatible and 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
- SATA 3.0 compatible

3.8.5.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-01	60 GB SATA SSD (MLC), slide-in compact	
	Optional accessories	
	Drives	
5MMSSD.0060-00	60 GB SATA SSD (MLC); replacement for 5AC801.SSDI-01 and 5AC901.CSSD-01; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	

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

3.8.5.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

Product ID	5AC901.CSSD-01
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Solid state drive	
Capacity	60 GB
Data reliability	<1 unrecoverable error in 10^{16} bit read accesses
MTBF	1,200,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 550 MB/s with SATA 6 Gbit/s Max. 280 MB/s with SATA 3 Gbit/s
Sequential write	Max. 475 MB/s with SATA 6 Gbit/s Max. 245 MB/s with SATA 3 Gbit/s
IOPS [2]	
4k read	15,000
4k write	
Typical	23,000
Maximum	80,000
Endurance	
MLC flash	Yes
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)

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

Product ID	5AC901.CSSD-01
Environmental conditions	
Temperature	
Operation	0 to 70°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	5 to 700 Hz: 2.17 g
Storage	5 to 800 Hz: 3.13 g
Transport	5 to 800 Hz: 3.13 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Altitude	
Operation	-300 to 12192 m
Storage	-300 to 12192 m
Transport	-300 to 12192 m
Mechanical characteristics	
Installation	Fixed [3]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Intel
Manufacturer's product ID	SSDSC2CW060A3

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

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

3.8.5.4 Temperature humidity diagram

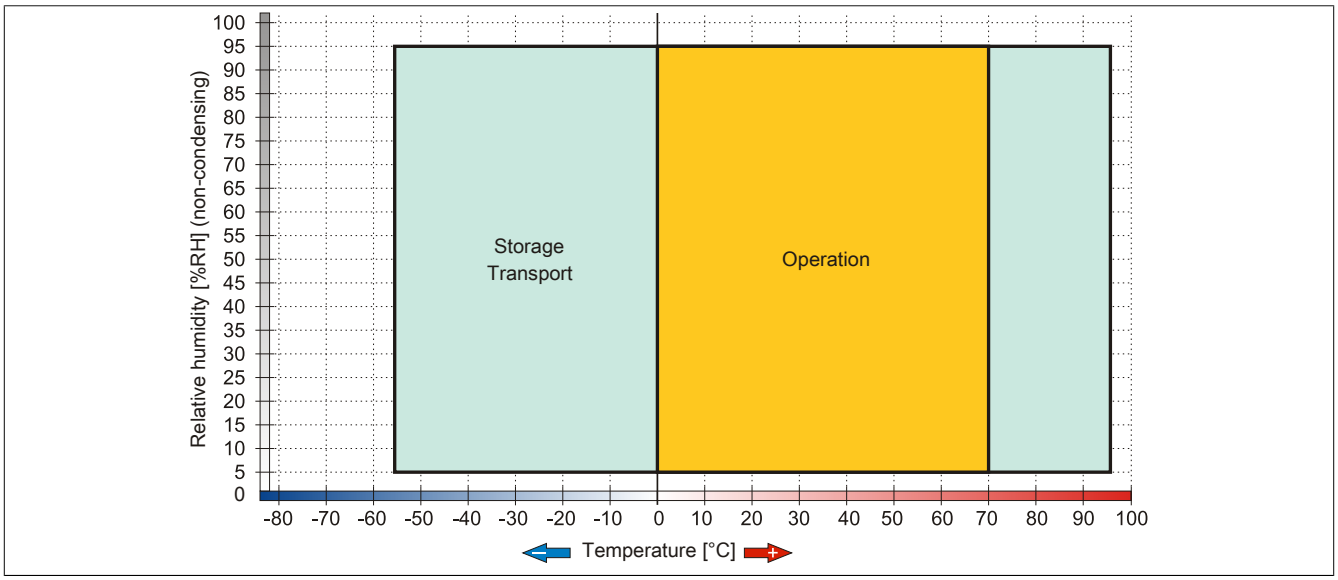


Figure 38: 5AC901.CSSD-01 - Temperature humidity diagram

3.8.6 5AC901.CSSD-02

3.8.6.1 General information

This 180 GB slide-in compact SSD (solid-state drive) is based on MLC (multi-level cell) technology, SATA 3.0 compatible and 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
- SATA 3.0 compatible

3.8.6.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-02	180 GB SATA SSD (MLC), slide-in compact	
	Optional accessories	
	Drives	
5MMSSD.0180-00	180 GB SATA SSD (MLC); replacement part for 5AC801.SSDI-02 and 5AC901.CSSD-02; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	

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

3.8.6.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

Product ID	5AC901.CSSD-02
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Solid state drive	
Capacity	180 GB
Data reliability	<1 unrecoverable error in 10^{16} bit read accesses
MTBF	1,200,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 550 MB/s with SATA 6 Gbit/s Max. 280 MB/s with SATA 3 Gbit/s
Sequential write	Max. 520 MB/s with SATA 6 Gbit/s Max. 260 MB/s with SATA 3 Gbit/s
IOPS [2]	
4k read	50,000
4k write	
Typical	60,000
Maximum	80,000
Endurance	
MLC flash	Yes

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

Product ID	5AC901.CSSD-02
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Environmental conditions	
Temperature	
Operation	0 to 70°C
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
Altitude	
Operation	-300 to 12192 m
Storage	-300 to 12192 m
Transport	-300 to 12192 m
Mechanical characteristics	
Installation	Fixed [3]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Intel
Manufacturer's product ID	SSDSC2CW180A3

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

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

3.8.6.4 Temperature humidity diagram

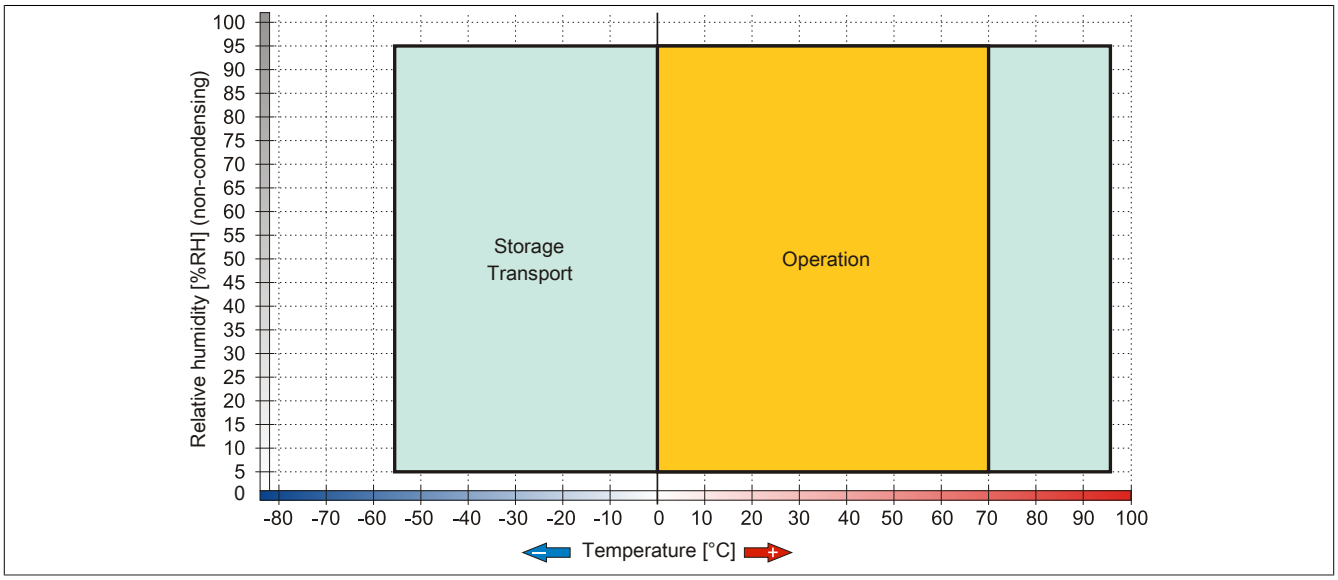


Figure 39: 5AC901.CSSD-02 - Temperature humidity diagram

3.8.7 5AC901.CSSD-03

3.8.7.1 General information

This 60 GB slide-in compact SSD (solid-state drive) is based on MLC (multi-level cell) technology, SATA 3.0 compatible and 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
- SATA 3.0 compatible

3.8.7.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-03	60 GB SATA slide-in compact SSD (MLC)	
	Optional accessories	
	Drives	
5MMSSD.0060-01	60 GB SATA SSD (MLC); replacement for 5AC801.SSDI-03 and 5AC901.CSSD-03; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	

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

3.8.7.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

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

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

Product ID	5AC901.CSSD-03	
Environmental conditions		
Temperature		
Operation	0 to 70°C	-30 to 85°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing
Vibration		
Operation	10 to 2000 Hz: 20 g	
Storage	10 to 2000 Hz: 20 g	
Transport	10 to 2000 Hz: 20 g	
Shock		
Operation	1500 g, 0.5 ms	
Storage	1500 g, 0.5 ms	
Transport	1500 g, 0.5 ms	
Altitude		
Operation	-300 to 12192 m	
Storage	-300 to 12192 m	
Transport	-300 to 12192 m	
Mechanical characteristics		
Installation	Fixed [4]	
Dimensions		
Width	13 mm	
Height	98 mm	
Depth	105 mm	
Weight	118 g	
Manufacturer information		
Manufacturer	Toshiba	
Manufacturer's product ID	THNSNH060GBST	THNSNJ060WCST

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

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

3.8.7.4 Temperature humidity diagram

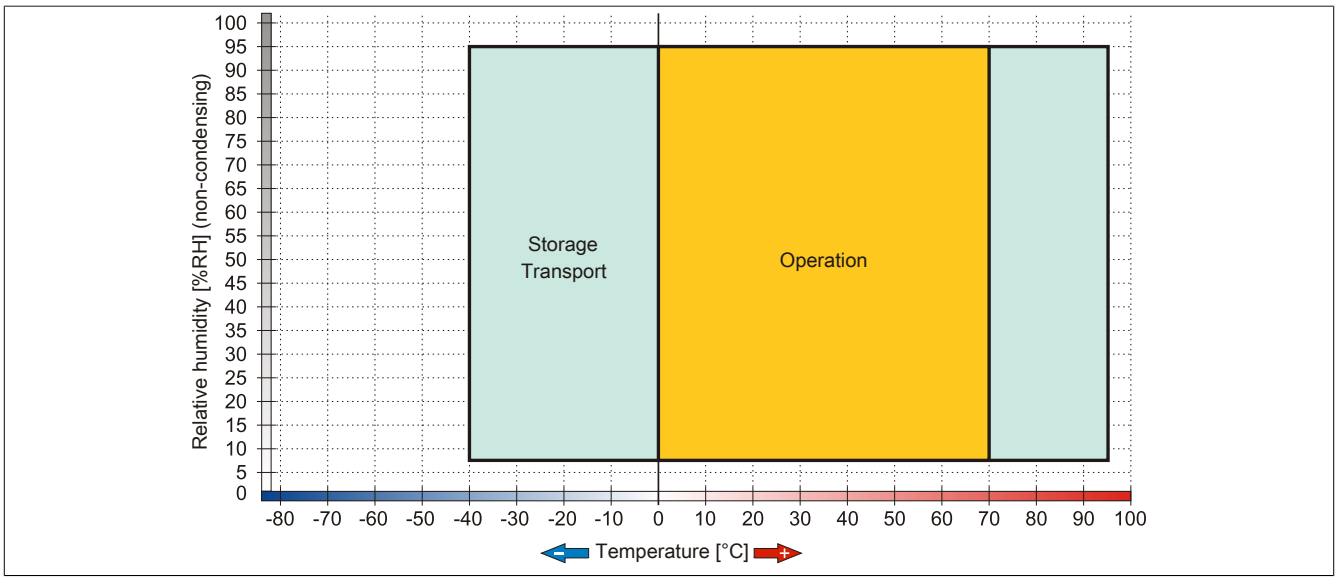


Figure 40: 5AC901.CSSD-03 ≤ Rev. C0 - Temperature/Humidity diagram

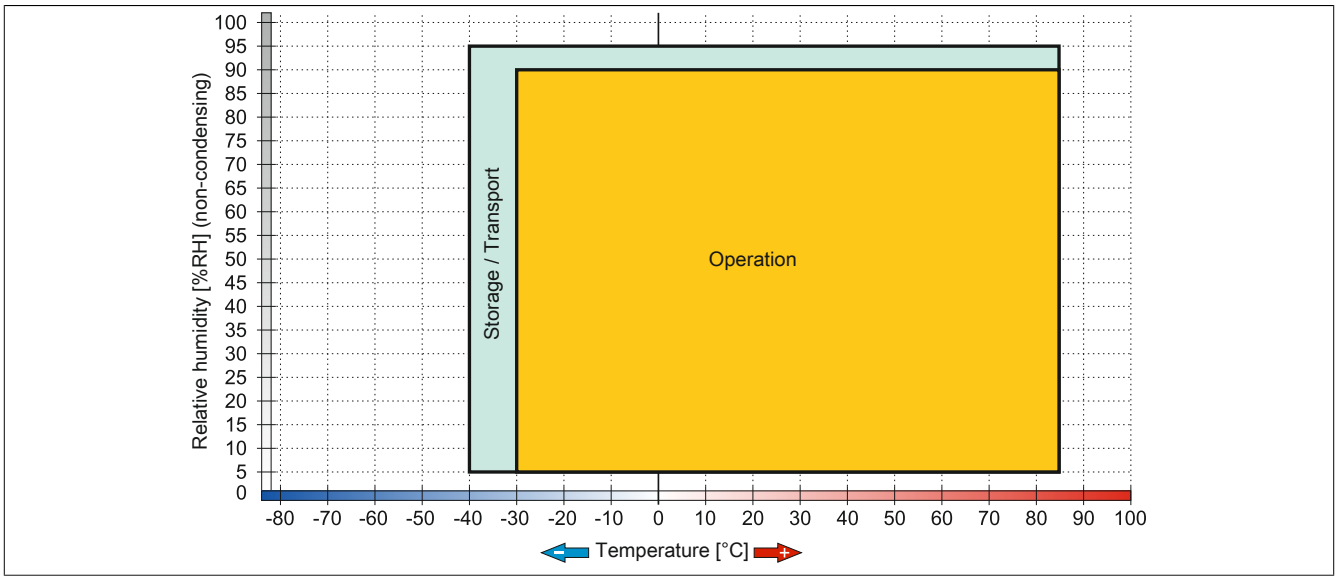


Figure 41: 5AC901.CSSD-03 ≥ Rev. D0 - Temperature/Humidity diagram

3.8.8 5AC901.CSSD-04

3.8.8.1 General information

This 128 GB slide-in compact SSD (solid-state drive) is based on MLC (multi-level cell) technology, SATA 3.0 compatible and 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
- SATA 3.0 compatible

3.8.8.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CSSD-04	128 GB SATA SSD (MLC), slide-in compact	
	Optional accessories	
	Drives	
5MMSSD.0128-01	128 GB SATA SSD (MLC); replacement for 5AC801.SSDI-04 and 5AC901.CSSD-04; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	

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

3.8.8.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

Product ID	5AC901.CSSD-04		
Revision	C0	D0	E0
General information			
Certification			
CE		Yes	
cULus		Yes	
cULus HazLoc Class 1 Division 2		Yes [1]	
GOST-R		Yes	
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. 80,000 (random)	Max. 85,000 (random)	
4k write		Max. 35,000 (random)	
Endurance			
MLC flash		Yes	
Guaranteed data volume			
Guaranteed		74 TBW [3]	

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

Product ID	5AC901.CSSD-04		
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)		
Environmental conditions			
Temperature			
Operation	0 to 70°C	-30 to 85°C	
Storage	-40 to 85°C		
Transport	-40 to 85°C		
Relative humidity			
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing	
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing	
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing	
Vibration			
Operation	10 to 2000 Hz: 20 g		
Storage	10 to 2000 Hz: 20 g		
Transport	10 to 2000 Hz: 20 g		
Shock			
Operation	1500 g, 0.5 ms		
Storage	1500 g, 0.5 ms		
Transport	1500 g, 0.5 ms		
Altitude			
Operation	-300 to 12192 m		
Storage	-300 to 12192 m		
Transport	-300 to 12192 m		
Mechanical characteristics			
Installation	Fixed [4]		
Dimensions			
Width	13 mm		
Height	98 mm		
Depth	105 mm		
Weight	118 g		
Manufacturer information			
Manufacturer	Toshiba		
Manufacturer's product ID	THNSNH128GBST	THNSNJ128WBST	THNSNJ128WCST

Table 77: 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
2) IOPS: Random read and write input/output operations per second.
3) TBW: Terabyte written
4) Slide-in compact installation.

3.8.8.4 Temperature humidity diagram

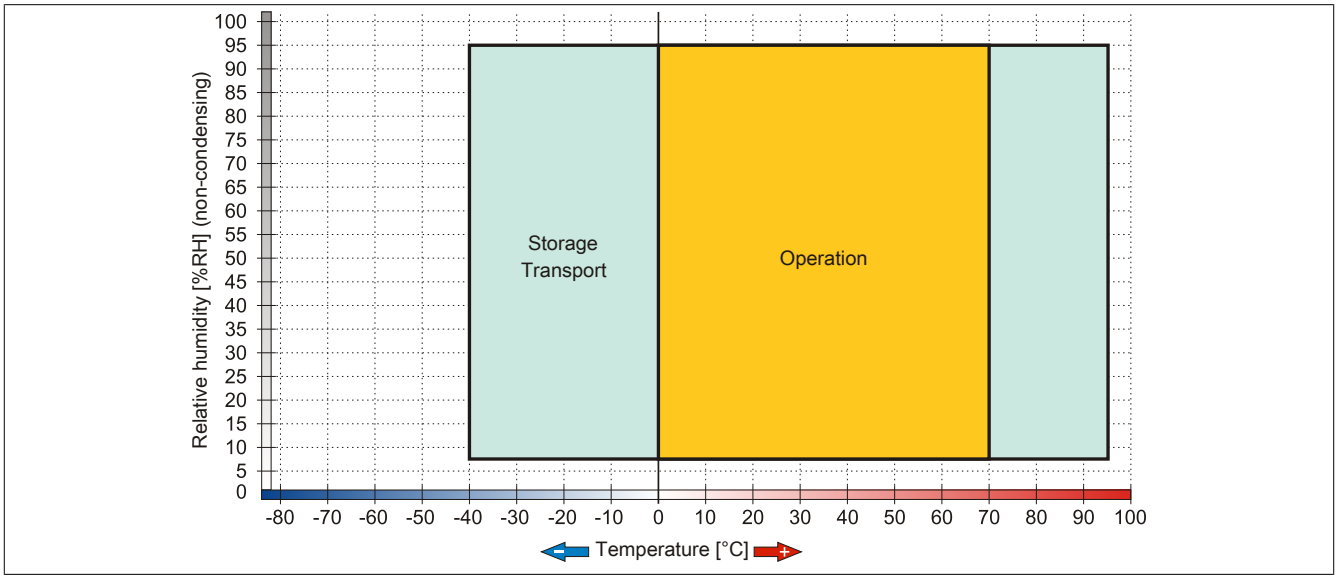


Figure 42: 5AC901.CSSD-04 ≤ Rev. C0 - Temperature/Humidity diagram

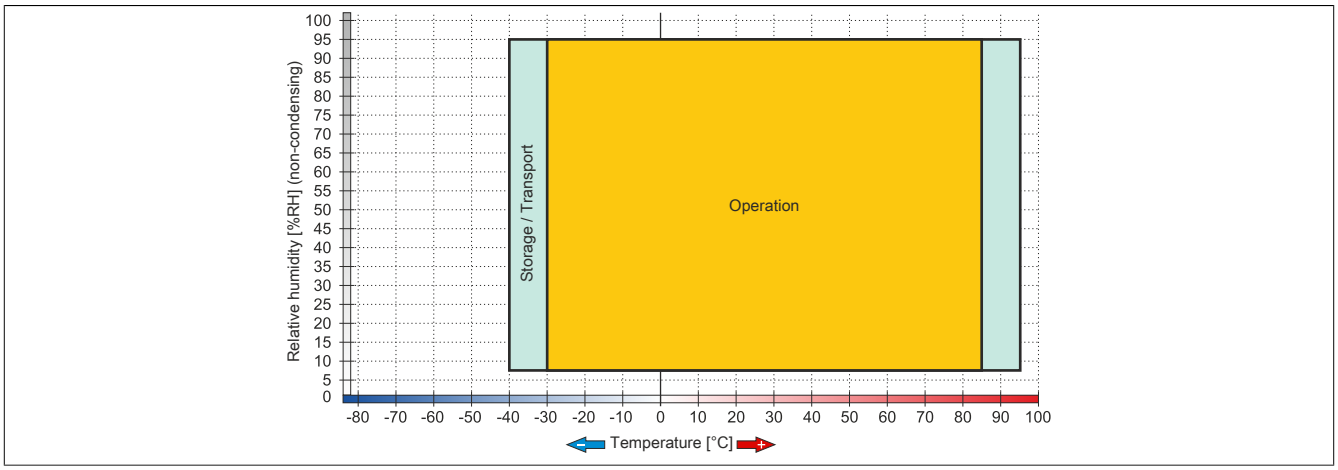


Figure 43: 5AC901.CSSD-04 ≥ Rev. D0 - Temperature/Humidity diagram

3.8.9 5AC901.CSSD-05

3.8.9.1 General information

This 256 GB slide-in compact SSD (solid-state drive) is based on MLC (multi-level cell) 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
- SATA 3.0 compatible

3.8.9.2 Order data

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

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

3.8.9.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

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

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

Product ID	5AC901.CSSD-05
Environmental conditions	
Temperature	
Operation	-30 to 85°C
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Altitude	
Operation	-300 to 12192 m
Storage	-300 to 12192 m
Transport	-300 to 12192 m
Mechanical characteristics	
Installation	Fixed [4]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Manufacturer information	
Manufacturer	Toshiba
Manufacturer's product ID	THNSNJ256WCST

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

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

3.8.9.4 Temperature humidity diagram

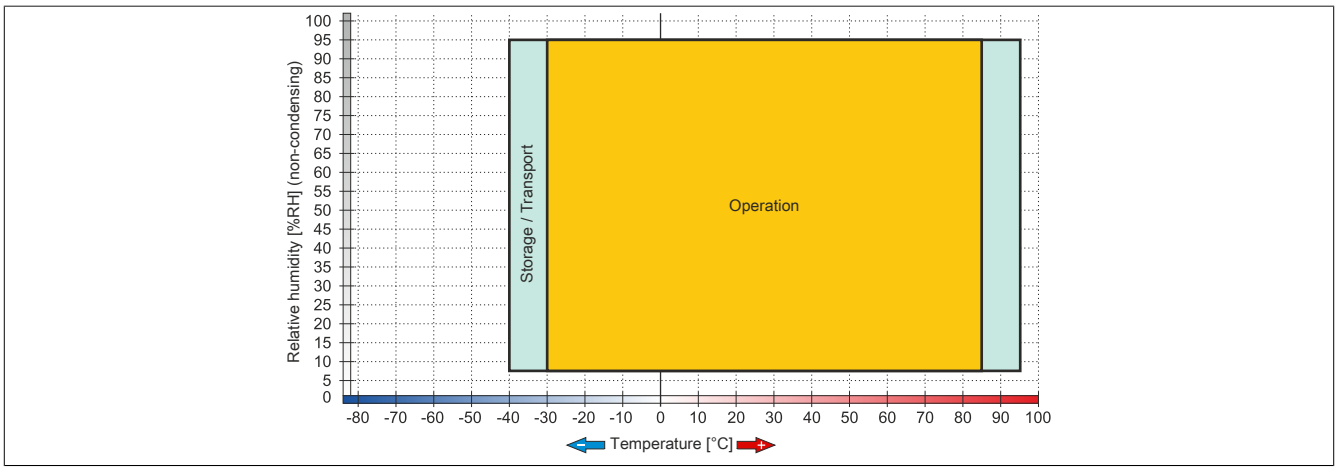


Figure 44: 5AC901.CSSD-05 - Temperature humidity diagram

3.8.10 5MMSSD.0060-00

3.8.10.1 General information

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

- Replacement for 5AC801.SSDI-01 or 5AC901.CSSD-01 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

3.8.10.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0060-00	60 GB SATA SSD (MLC); replacement for 5AC801.SSDI-01 and 5AC901.CSSD-01; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	

Table 80: 5MMSSD.0060-00 - Order data

3.8.10.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

Product ID	5MMSSD.0060-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Solid state drive	
Capacity	60 GB
Data reliability	<1 unrecoverable error in 10^{16} bit read accesses
MTBF	1,200,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 550 MB/s with SATA 6 Gbit/s Max. 280 MB/s with SATA 3 Gbit/s
Sequential write	Max. 475 MB/s with SATA 6 Gbit/s Max. 245 MB/s with SATA 3 Gbit/s
IOPS [2]	
4k read	15,000
4k write	
Typical	23,000
Maximum	80,000
Endurance	
MLC flash	Yes

Table 81: 5MMSSD.0060-00 - Technical data

Product ID	5MMSSD.0060-00
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Environmental conditions	
Temperature	
Operation	0 to 70°C
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
Altitude	
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 81: 5MMSSD.0060-00 - Technical data

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

3.8.10.4 Temperature humidity diagram

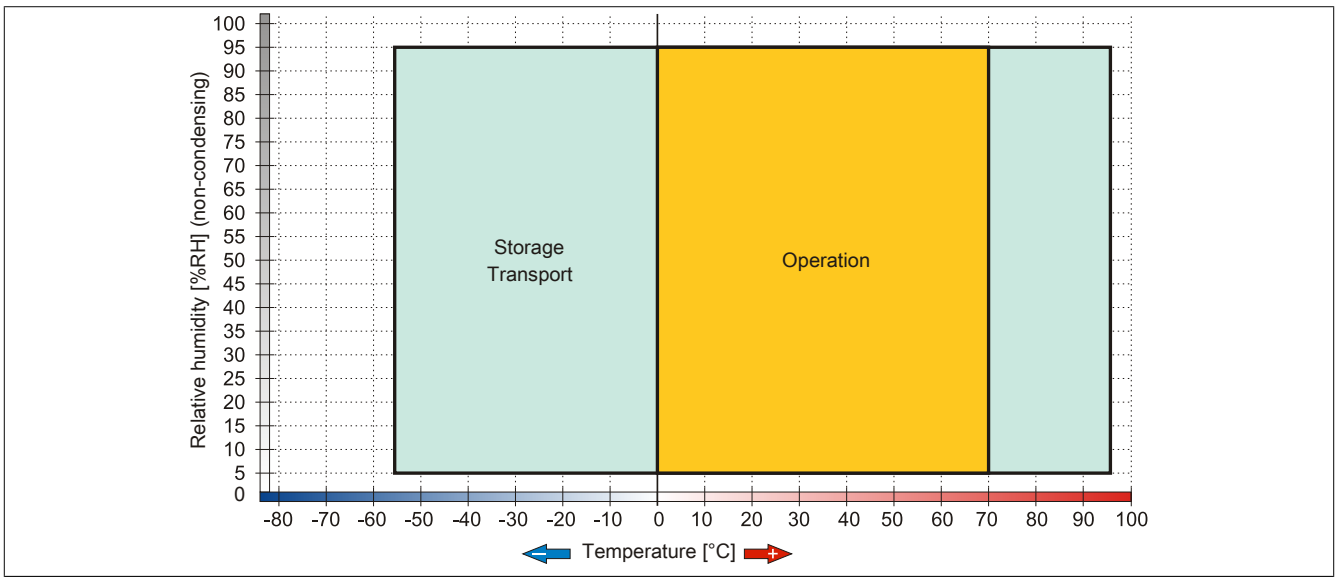


Figure 45: 5MMSSD.0060-00 - Temperature humidity diagram

3.8.11 5MMSSD.0060-01

3.8.11.1 General information

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

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

3.8.11.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0060-01	60 GB SATA SSD (MLC); replacement for 5AC801.SSDI-03 and 5AC901.CSSD-03; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	

Table 82: 5MMSSD.0060-01 - Order data

3.8.11.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

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

Table 83: 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data

Product ID	5MMSSD.0060-01	
Environmental conditions		
Temperature		
Operation	0 to 70°C	-30 to 85°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing
Vibration		
Operation	10 to 2000 Hz: 20 g	
Storage	10 to 2000 Hz: 20 g	
Transport	10 to 2000 Hz: 20 g	
Shock		
Operation	1500 g, 0.5 ms	
Storage	1500 g, 0.5 ms	
Transport	1500 g, 0.5 ms	
Altitude		
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	Toshiba	
Manufacturer's product ID	THNSNH060GBST	THNSNJ060WCST

Table 83: 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data

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

3.8.11.4 Temperature humidity diagram

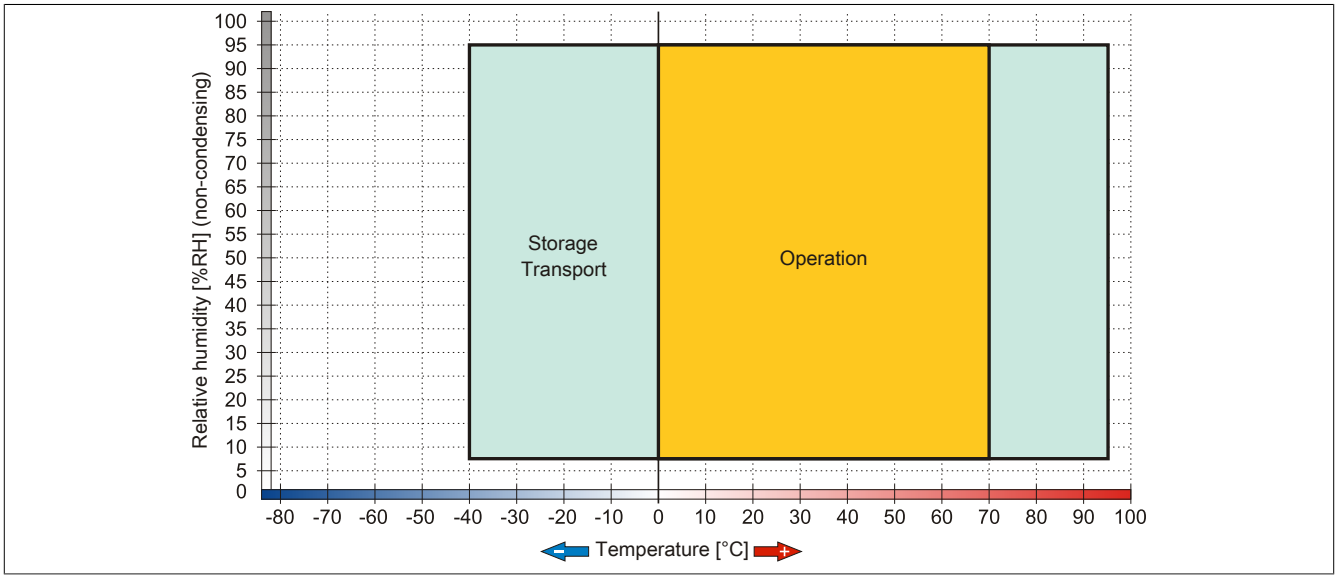


Figure 46: 5MMSSD.0060-01 ≤ Rev. C0 - Temperature/Humidity diagram

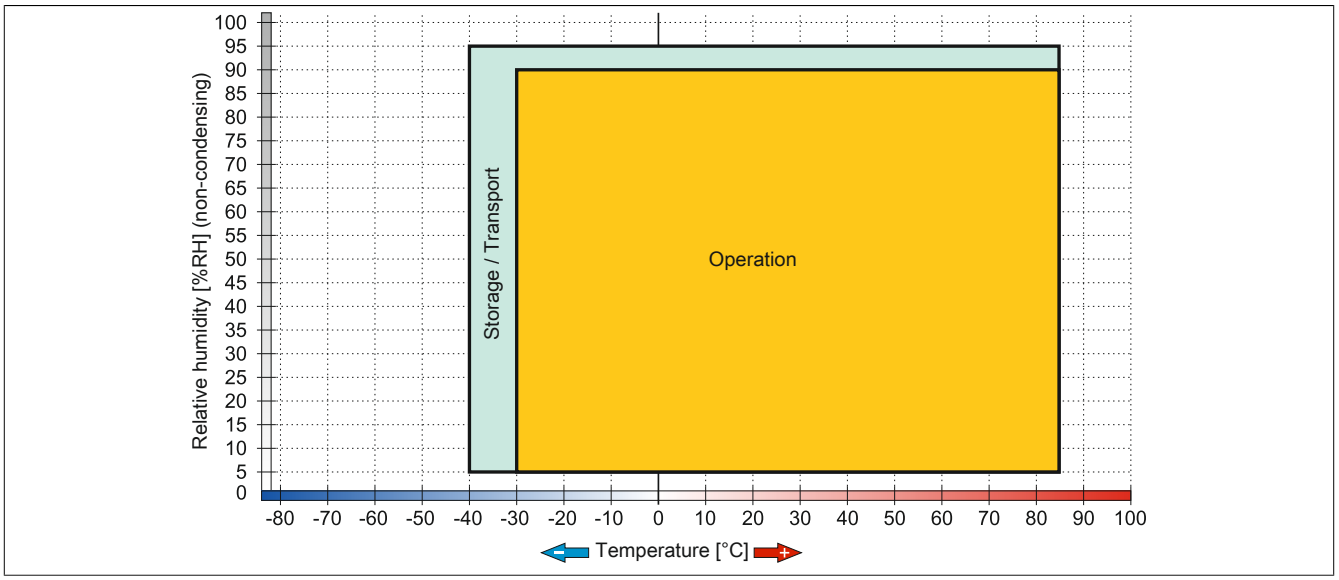


Figure 47: 5MMSSD.0060-01 ≥ Rev. D0 - Temperature/Humidity diagram

3.8.12 5MMSSD.0128-01

3.8.12.1 General information

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

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

3.8.12.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0128-01	128 GB SATA SSD (MLC); replacement for 5AC801.SSDI-04 and 5AC901.CSSD-04; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	

Table 84: 5MMSSD.0128-01 - Order data

3.8.12.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

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

Table 85: 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data

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

Table 85: 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data

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

3.8.12.4 Temperature humidity diagram

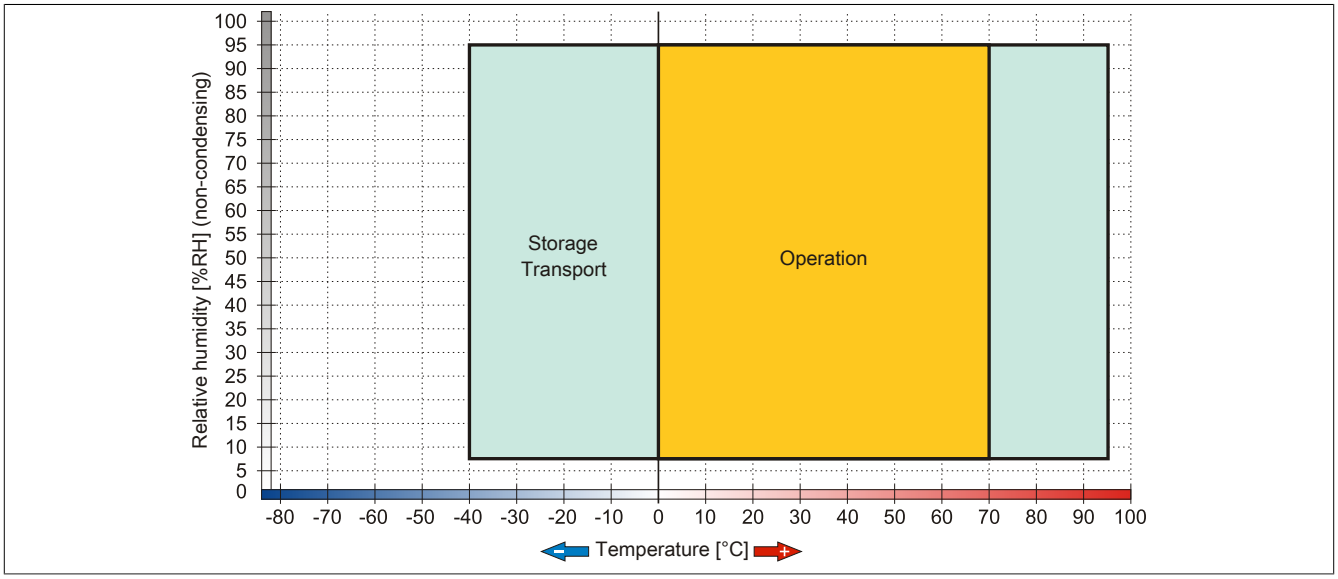


Figure 48: 5MMSSD.0128-01 ≤ Rev. C0 - Temperature/Humidity diagram

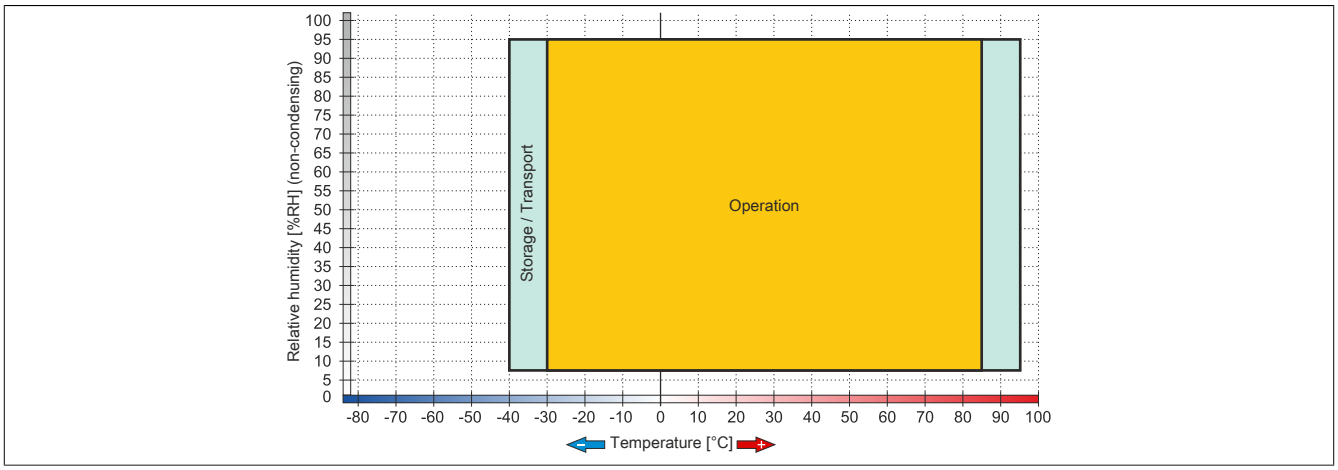


Figure 49: 5MMSSD.0128-01 ≥ Rev. D0 - Temperature/Humidity diagram

3.8.13 5MMSSD.0180-00

3.8.13.1 General information

This 180 GB slide-in compact SSD (solid-state drive) is based on multi-level cell (MLC) technology and can be used as a replacement or accessory part.

- Replacement for 5AC801.SSDI-02 or 5AC901.CSSD-02 SSD drives
- Accessory for the APC510 (optional SSD for I/O board)

3.8.13.2 Order data

Model number	Short description	Figure
	Drives	
5MMSSD.0180-00	180 GB SATA SSD (MLC); replacement part for 5AC801.SSDI-02 and 5AC901.CSSD-02; SSD for 5PP5IO.GMAC-00; note: please see the manual for information about using this SSD	

Table 86: 5MMSSD.0180-00 - Order data

3.8.13.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

Product ID	5MMSSD.0180-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Solid state drive	
Capacity	180 GB
Data reliability	<1 unrecoverable error in 10^{16} bit read accesses
MTBF	1,200,000 hours
S.M.A.R.T. support	Yes
Interface	SATA
Maintenance	None
Sequential read	Max. 550 MB/s with SATA 6 Gbit/s Max. 280 MB/s with SATA 3 Gbit/s
Sequential write	Max. 520 MB/s with SATA 6 Gbit/s Max. 260 MB/s with SATA 3 Gbit/s
IOPS [2]	
4k read	50,000
4k write	
Typical	60,000
Maximum	80,000
Endurance	
MLC flash	Yes

Table 87: 5MMSSD.0180-00 - Technical data

Product ID	5MMSSD.0180-00
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Environmental conditions	
Temperature	
Operation	0 to 70°C
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
Altitude	
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 87: 5MMSSD.0180-00 - Technical data

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

3.8.13.4 Temperature humidity diagram

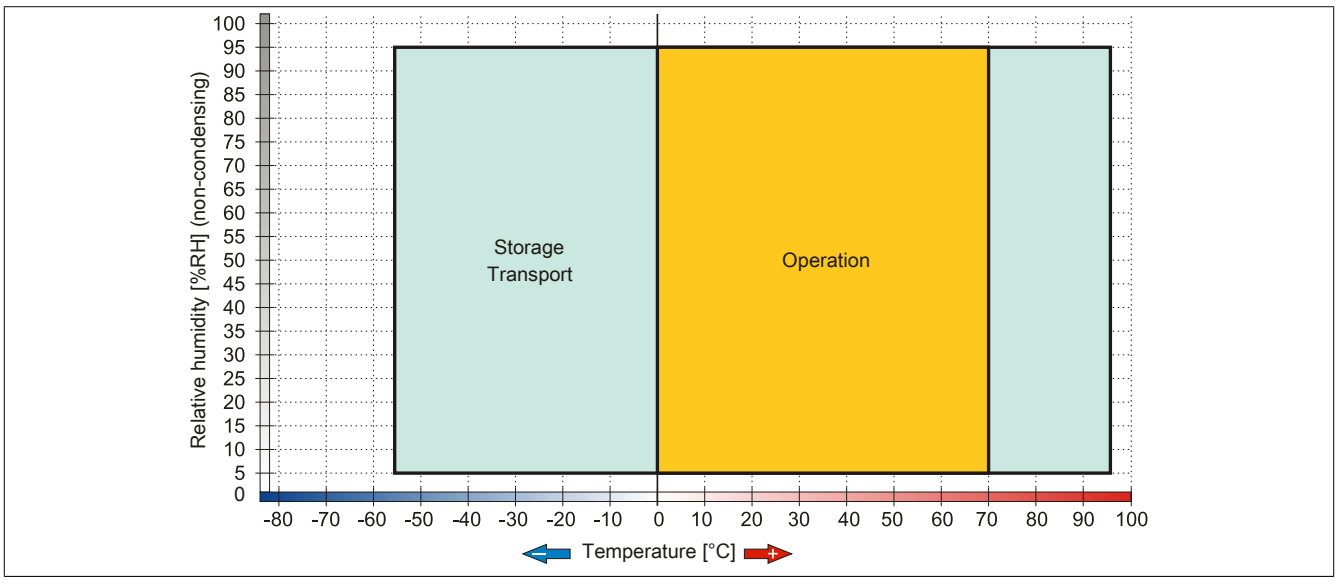


Figure 50: 5MMSSD.0180-00 - Temperature humidity diagram

3.8.14 5MMSSD.0256-00

3.8.14.1 General information

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

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

3.8.14.2 Order data

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

Table 88: 5MMSSD.0256-00 - Order data

3.8.14.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

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

Table 89: 5MMSSD.0256-00 - Technical data

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

Table 89: 5MMSSD.0256-00 - Technical data

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

3.8.14.4 Temperature humidity diagram

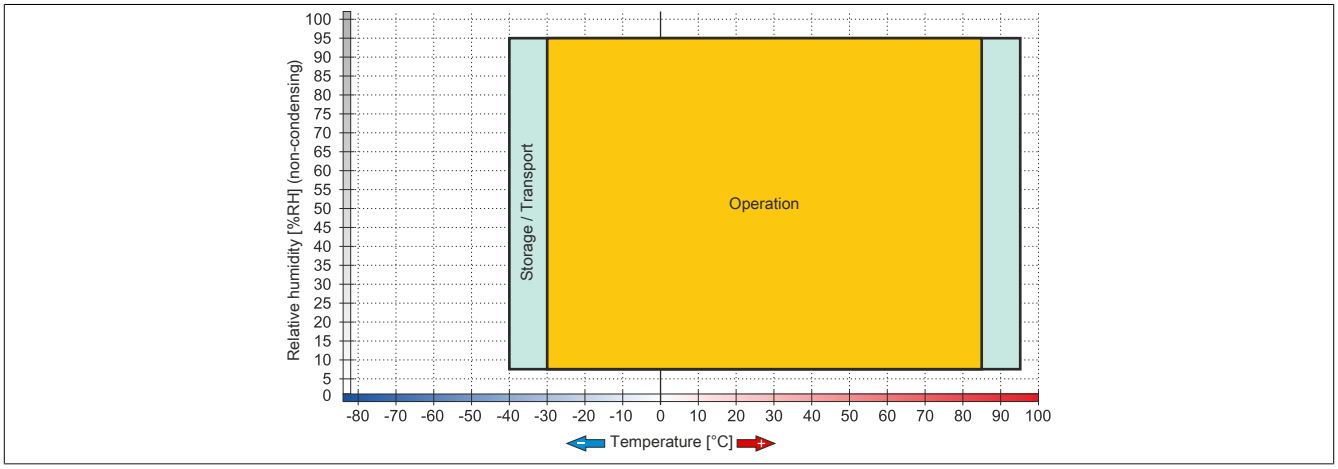


Figure 51: 5MMSSD.0256-00 - Temperature humidity diagram

3.8.15 5AC901.CCFA-00

3.8.15.1 General information

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

- CFast slot
- Slide-in compact

3.8.15.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.CCFA-00	CFast adapter for operating a CFast card in a slide-in compact slot	
	Optional accessories	
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB	
5CFAST.032G-00	CFast card, 32 GB	
5CFAST.2048-00	CFast card, 2 GB	
5CFAST.4096-00	CFast card, 4 GB	
5CFAST.8192-00	CFast card, 8 GB	

Table 90: 5AC901.CCFA-00 - Order data

3.8.15.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

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

Table 91: 5AC901.CCFA-00 - Technical data

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

3.8.16 5AC901.CHDD-99

3.8.16.1 General information

This slide-in compact kit consists of a removal strip and plastic guide rails for installing any 2.5" HDD or SSD drive in a slide-in compact slot for operation on an Automation PC 910 or Panel PC 900.

3.8.16.2 Order data

Model number	Short description	Figure
	Drives	Image not found for 5AC901.CHDD-99!
5AC901.CHDD-99	Slide-in compact kit	

Table 92: 5AC901.CHDD-99 - Order data

3.8.17 5AC901.SDVW-00

3.8.17.1 General information

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

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

3.8.17.2 Order data

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

Table 93: 5AC901.SDVW-00 - Order data

3.8.17.3 Technical data

Information:

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

Product ID	5AC901.SDVW-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1)]
GOST-R	Yes
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 in 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 access)
DVD	Max. 15 seconds (from 0 rpm to read access)
Access time	
CD	On average 140 ms (24x)
DVD	On average 150 ms (8x)
Readable media	
CD	CD/CD-ROM (12 cm, 8 cm), CD-R, CD-RW
DVD	DVD-ROM, DVD-R, DVD-R (dual layer), DVD-RW. DVD-RAM, DVD+R, DVD+R (dual layer), DVD+RW, DVD-RAM
Writable media	
CD	CD-R, CD-RW
DVD	DVD-R/RW, DVD-R (dual layer), DVD-RAM (4.7 GB), DVD+R/RW, DVD+R (dual layer)
Read speed	
CD	24x
DVD	8x

Table 94: 5AC901.SDVW-00 - Technical data

Product ID	5AC901.SDVW-00
Write speed	
CD-R	24x, 16x, 10x and 4x
CD-RW	24x, 16x, 10x and 4x
DVD+R	8x, 4x and 2.4x
DVD+R (dual layer)	6x, 4x and 2.4x
DVD+RW	4x and 2x
DVD-R	8x, 4x and 2x
DVD-R (dual layer)	6x, 4x and 2x
DVD-RAM 2)	5x, 3x and 2x
DVD-RW	6x, 4x and 2x
Write methods	
CD	Disk at once, session at once, packet write, track at once
DVD	Disk at once, incremental, overwrite, sequential, multi-session
Environmental conditions	
Temperature 3)	
Operation	5 to 55°C 4)
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 94: 5AC901.SDVW-00 - Technical data

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

3.8.17.4 Temperature humidity diagram

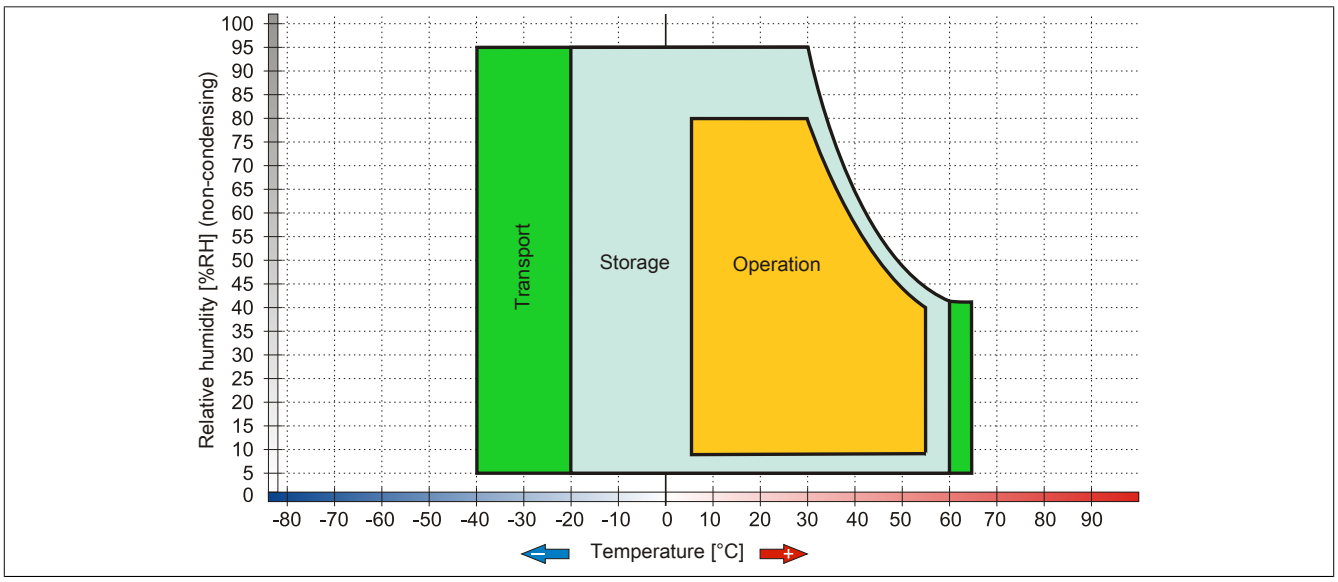


Figure 52: 5AC901.SDVW-00 - Temperature humidity diagram

3.8.18 5AC901.SSCA-00

3.8.18.1 General information

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

- Slide-in compact slot
- Slide-in

3.8.18.2 Order data

Model number	Short description	Figure
	Drives	
5AC901.SSCA-00	Slide-in compact adapter for operating a slide-in compact drive in a slide-in slot.	
	Optional accessories	
	Drives	
5AC901.CCFA-00	CFast adapter for operating a CFast card in a slide-in compact slot	
5AC901.CHDD-01	500 GB SATA hard disk, slide-in compact, 24/7 operation Note: please see the manual for information about using this hard disk	
5AC901.CSSD-00	32 GB SATA SSD (SLC), slide-in compact	
5AC901.CSSD-03	60 GB SATA slide-in compact SSD (MLC)	
5AC901.CSSD-04	128 GB SATA SSD (MLC), slide-in compact	
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Toshiba - SATA	

Table 95: 5AC901.SSCA-00 - Order data

3.8.18.3 Technical data

Caution!

A sudden loss of power 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 device is recommended.

Information:

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

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

Table 96: 5AC901.SSCA-00 - Technical data

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

3.8.19 5ACPCI.RAIC-06

3.8.19.1 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

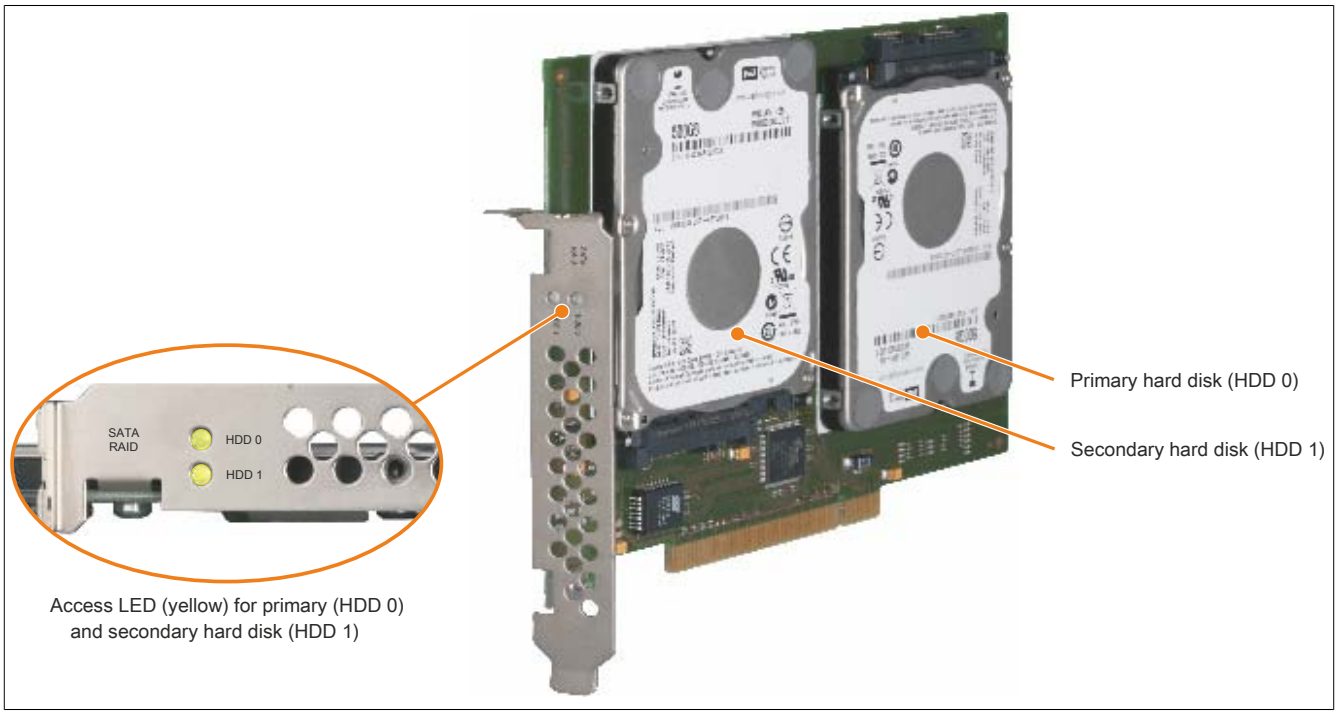


Figure 53: PCI SATA RAID controller

Information:

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

3.8.19.2 Order data

Model number	Short description	Figure
	Drives	
5ACPCI.RAIC-06	PCI RAID system SATA 2x 500 GB; note: please see the manual for information about using this hard disk	
	Optional accessories	
	Drives	
5MMHDD.0500-00	500 GB SATA hard disk; replacement for 5AC801.HDDI-04, 5AC901.CHDD-01 and 5ACPCI.RAIC-06; note: please see the manual for information about using this hard disk	

Table 97: 5ACPCI.RAIC-06 - Order data

3.8.19.3 Technical data

Information:

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

Product ID	5ACPCI.RAIC-06
General information	
Capacity	2x 500 GB
Number of hard disks	2
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Controller	
Type	SiI 3512 SATA link
Specification	Serial ATA 1.0
Data transfer rate	Max. 1.5 Gbit/s (150 MB/s)
RAID level	Supports RAID 0, 1
BIOS extension ROM requirements	Approx. 32 kB
Hard disk drive [2]	
Capacity	500 GB
Number of heads	2
Number of sectors	976,773,168
Bytes per sector	512 (logical) / 4096 (physical)
Cache	16 MB
Speed	5400 rpm ±0.2%
Startup time	Typ. 3.5 s (from 0 rpm to read access)
Service life	5 years
MTBF	1,000,000 POH [3]
S.M.A.R.T. support	Yes
Interface	SATA
Access time	5.5 ms
Supported transfer modes	SATA II
Data transfer rate	
Internal	Max. 147 MB/s
To/From host	Max. 150 MB/s (SATA I), max. 300 MB/s (SATA II)
Positioning time	
Nominal (read only)	11 ms
Maximum (read only)	21 ms
Environmental conditions	
Temperature [4]	
Operation [5]	0 to 60°C
24-hour operation [6]	0 to 60°C
Storage	-40 to 70°C
Transport	-40 to 70°C
Relative humidity [7]	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration [8]	
Operation (continuous)	5 to 500 Hz: 0.125 g; no unrecoverable errors
Operation (occasional)	5 to 500 Hz: 0.25 g; no unrecoverable errors
Storage	10 to 500 Hz: 5 g; no unrecoverable errors
Transport	10 to 500 Hz: 5 g; no unrecoverable errors
Shock	
Operation	200 g and 2 ms duration; no unrecoverable errors
Storage	1000 g and 2 ms duration; no unrecoverable errors
Transport	1000 g and 2 ms duration; no unrecoverable errors
Altitude	
Operation	-305 to 3048 m
Storage	-305 to 12192 m
Mechanical characteristics	
Installation	Fixed [9]

Table 98: 5ACPCI.RAIC-06 - Technical data

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

Table 98: 5ACPCI.RAIC-06 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification
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 increase and decrease can be 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) Installed in PCI slot.

3.8.19.4 Temperature humidity diagram

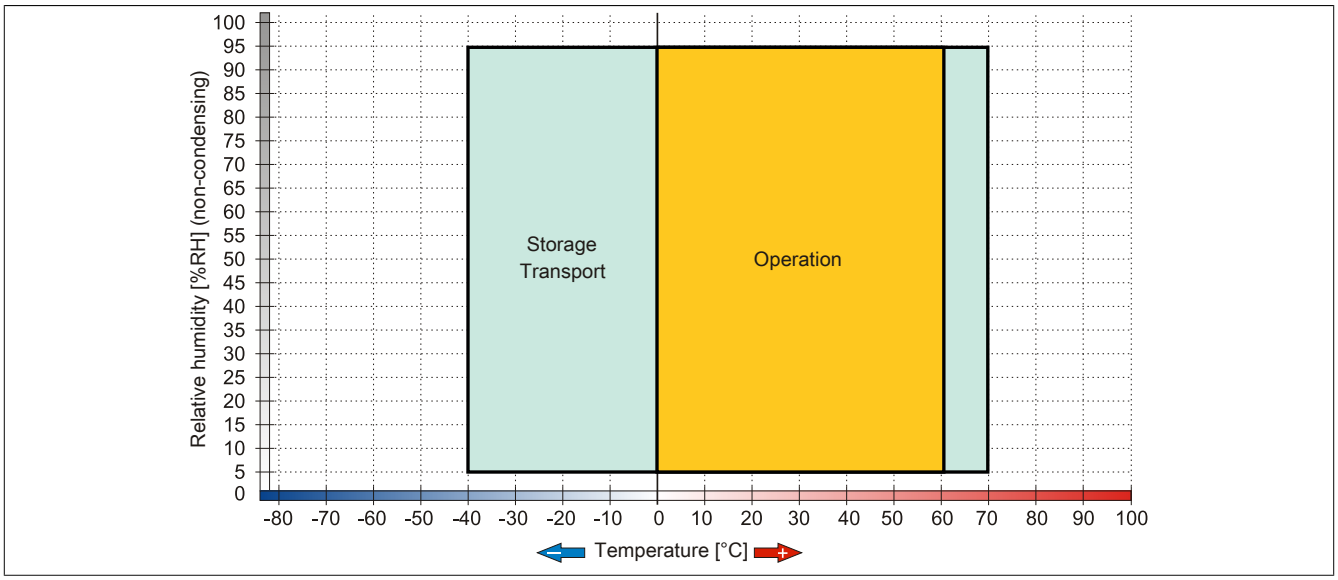


Figure 54: 5ACPCI.RAIC-06 - Temperature humidity diagram

3.8.19.5 Driver support

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

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

Information:

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

3.8.19.6 Configuration

For information about configuring a SATA RAID set, see 3 "Commissioning", section 4 "Configuring a SATA RAID set" on page 171.

3.8.19.7 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 performing a replacement, see "Replacing a PCI SATA RAID hard disk in a RAID 1 set" on page 347.

3.9 Interface options

Information:

Please note that not every interface option can be installed in interface slots 1 and 2. For more information, see "IF option 1 slot" on page 57 and "IF option 2 slot" on page 57.

Information:

For information about installing or replacing an interface option, please refer to the section "Installing interface options" on page 324.

Depending on the IF option version, it may be necessary to load the setup defaults in BIOS after replacement or installation (see "Save & Exit" on page 238).

3.9.1 5AC901.I485-00

3.9.1.1 General information

The 5AC901.I485-00 interface option 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
- Can be installed in APC910 and PPC900 systems

3.9.1.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.I485-00	RS232/422/485 interface option; for installation in an APC910 or PPC900	

Table 99: 5AC901.I485-00 - Order data

3.9.1.3 Technical data

Information:

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

Product ID	5AC901.I485-00
General information	
B&R ID code	0xD84A
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1)]
GOST-R	Yes
GL	Yes [1)]
Interfaces	
COM	
Type	RS232/422/485, electrically isolated
Design	9-pin male DSUB connector
UART	16550-compatible, 16-byte FIFO
Max. baud rate	115 kbit/s
Terminating resistor	Yes
Electrical characteristics	
Power consumption	1 W

Table 100: 5AC901.I485-00 - Technical data

Product ID	5AC901.I485-00
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. 34 g

Table 100: 5AC901.I485-00 - Technical data

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

3.9.1.3.1 Pinout

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

9-pin male DSUB connector

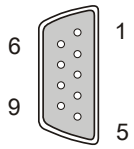


Table 101: COM - Pinout

3.9.1.3.2 RS232 - Bus length and cable type

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

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

Table 102: RS232 - Bus length and transfer rate

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

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

Table 103: RS232 - Cable requirements

3.9.1.3.3 RS422 - Bus length and cable type

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

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

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 104: RS422 - Bus length and transfer rate

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

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

Table 105: RS422 - Cable requirements

3.9.1.3.4 When operated as an RS485 interface

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

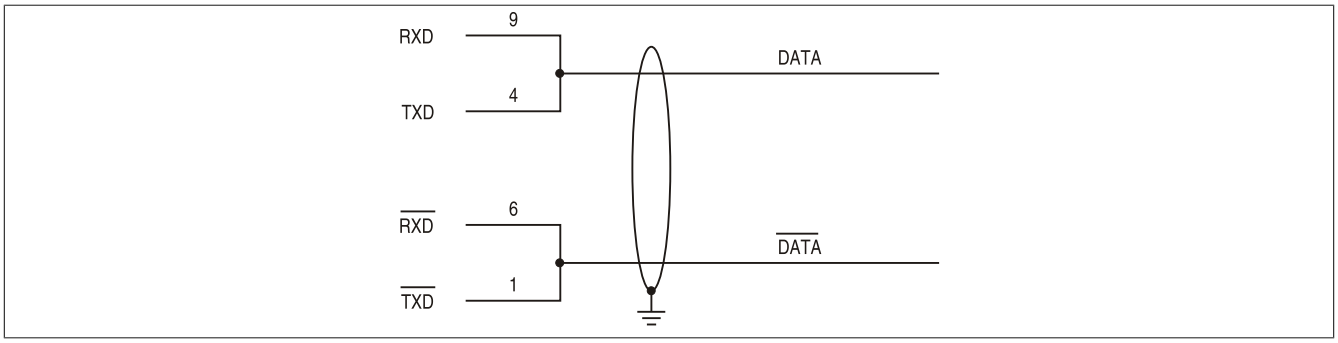


Figure 55: RS232/422/485 interface - Operation in RS485 mode

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

3.9.1.3.5 RS485 - Bus length and cable type

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

Extension	Transfer rate
1200 m	Typ. 115 kbit/s

Table 106: RS485 - Bus length and transfer rate

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

RS485 cables	Property
Signal lines	
Cable cross section	4x 0.25 mm² (24AWG/19), tinned Cu stranded wire
Wire insulation	PE
Conductor resistance	≤82 Ω/km
Stranding	Wires stranded in pairs
shield	Paired shield with aluminum foil

Table 107: RS485 - Cable requirements

RS485 cables	Property
Grounding line	
Cable cross section	1x 0.34 mm² (22AWG/19), tinned Cu stranded wire
Wire insulation	PE
Conductor cross section	≤59 Ω/km
Outer sheathing	
Materials	PUR mixture
Features	Halogen-free
Cable shielding	From tinned copper wires

Table 107: RS485 - Cable requirements

3.9.1.3.6 Terminating resistor

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

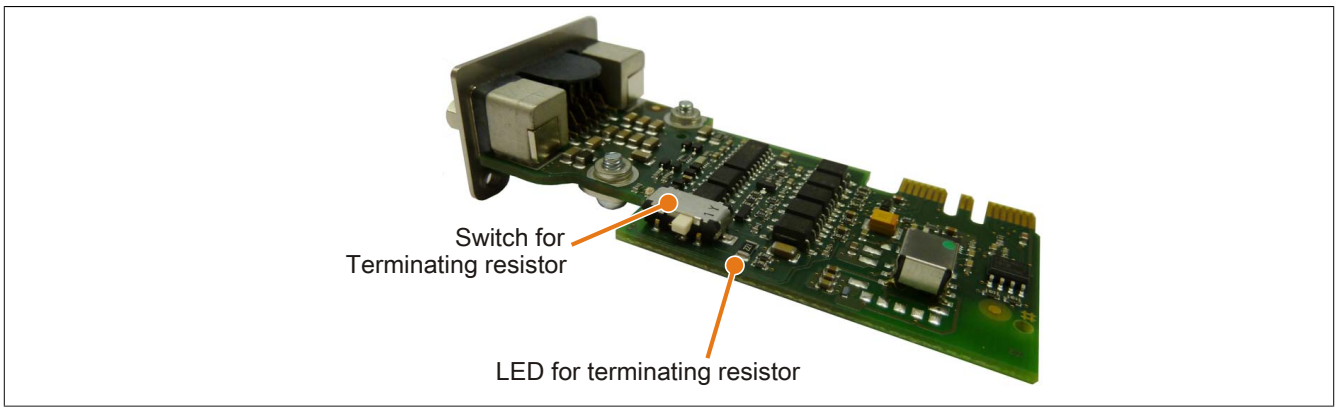


Figure 56: 5AC901.I485-00 - Terminating resistor

3.9.2 5AC901.ICAN-00

3.9.2.1 General information

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

- 1x CAN bus master interface
- Can be installed in APC910 and PPC900 systems

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

3.9.2.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.ICAN-00	CAN interface option; for installation in an APC910 or PPC900	

Table 108: 5AC901.ICAN-00 - Order data

3.9.2.3 Technical data

Information:

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

Product ID	5AC901.ICAN-00
General information	
B&R ID code	0xD84B
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Interfaces	
CAN	
Quantity	1
Controller	Bosch CC770 (compatible with Intel 82527 CAN controller)
Design	9-pin male DSUB connector
Transfer rate	Max. 500 kbit/s
Terminating resistor	Yes
Electrical characteristics	
Power consumption	1 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [2]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 33 g

Table 109: 5AC901.ICAN-00 - Technical data

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

3.9.2.3.1 Pinout

CAN bus		
Type	Electrically isolated	
Transfer rate	Max. 500 kbit/s	
Bus length	Max. 1000 meters	
Pin	**Assignment**	9-pin male DSUB connector
1	NC	
2	CAN low	
3	GND	
4	NC	
5	NC	
6	Reserved	
7	CAN high	
8	NC	
9	NC	

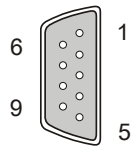


Table 110: 5AC901.ICAN-00 - Pinout

3.9.2.3.2 Terminating resistor

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

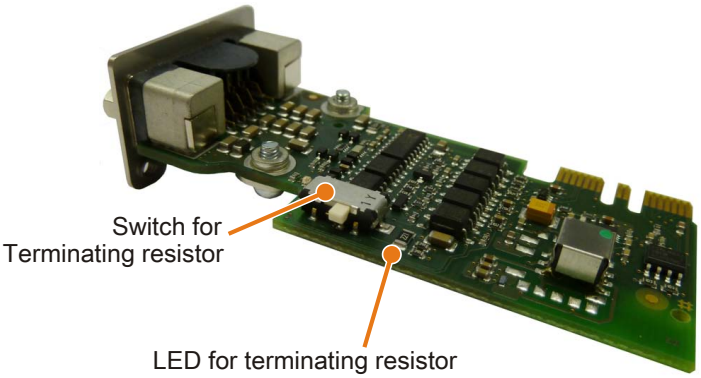


Figure 57: 5AC901.ICAN-00 - Terminating resistor

3.9.2.3.3 Drivers

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

3.9.3 5AC901.IHDA-00

3.9.3.1 General information

The 5AC901.IHDA-00 interface option has an HDA sound chip with externally accessible MIC, Line IN and Line OUT channels.

- 1x MIC
- 1x Line IN
- 1x Line OUT
- Can be installed in APC910 and PPC900 systems

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

3.9.3.2 Order data

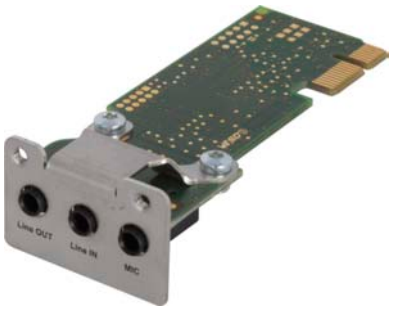
Model number	Short description	Figure
	Interface options	
5AC901.IHDA-00	Audio interface option; connection for 1x MIC, 1x Line IN, 1x Line OUT; for installation in an APC910	

Table 111: 5AC901.IHDA-00 - Order data

3.9.3.3 Technical data

Information:

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

Product ID	5AC901.IHDA-00
General information	
B&R ID code	0xD84E
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [1]
Interfaces	
Audio	
Type	HDA sound
Controller	Realtek ALC 662
Inputs	Microphone, Line IN
Outputs	Line OUT
Electrical characteristics	
Power consumption	0.4 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [2]
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 112: 5AC901.IHDA-00 - Technical data

Product ID	5AC901.IHDA-00
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 21 g

Table 112: 5AC901.IHDA-00 - Technical data

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

3.9.3.3.1 Pinout

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

Table 113: 5AC901.IHDA-00 - Pinout

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

Information:

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

3.9.4 5AC901.ISRM-00

3.9.4.1 General information

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

- 2 MB SRAM
- Can be installed in APC910 and PPC900 systems

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

Information:

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

3.9.4.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.ISRM-00	SRAM interface option, 2 MB; for installation in an APC910 or PPC900	

Table 114: 5AC901.ISRM-00 - Order data

3.9.4.3 Technical data

Information:

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

Product ID	5AC901.ISRM-00
General information	
B&R ID code	0xD850
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Controller	
SRAM	
Size	2 MB
Battery-buffered	Yes
Remanent variables in power failure mode	512 kB (e.g. for Automation Runtime, see the AS help documentation)
Electrical characteristics	
Power consumption	2 W
Environmental conditions	
Temperature	
Operation	0 to 55°C [2]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 20 g

Table 115: 5AC901.ISRM-00 - Technical data

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

3.9.5 5AC901.IRDY-00

3.9.5.1 General information

Since the 5AC901.IRDY-00 ready relay switches the relay contacts as soon as the B&R industrial PC has booted and is supplied internally with all voltages, it is possible to connect additional devices to the relay that will also be switched on.

- 1 N.C. contact, 1 N.O. contact
- Compatible with the APC910 and PPC900

3.9.5.2 Order data

Model number	Short description	Figure
	Interface options	
5AC901.IRDY-00	Ready relay interface option; for APC910	

Table 116: 5AC901.IRDY-00 - Order data

3.9.5.3 Technical data

Information:

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

Product ID	5AC901.IRDY-00
General information	
B&R ID code	0xD84F
Ready relay	N.O. and N.C. contact, max. 30 VDC, max. 2 A
Certification	
CE	Yes
cULus	Yes
Electrical characteristics	
Power consumption	0.2 W
Environmental conditions	
Temperature	
Operation	0 to 55°C
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%
Storage	5 to 95%
Transport	5 to 95%
Mechanical characteristics	
Weight	Approx. 30 g

Table 117: 5AC901.IRDY-00 - Technical data

3.9.5.3.1 Pinout

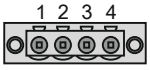
Ready relay			
Pin	**Assignment**	**Description**	4-pin male connector 1 2 3 4 
1	NO	Normally open contact	
2	COM	Changeover contact	
3	NC	Normally closed contact	
4	-	Not connected	

Table 118: 5AC901.IRDY-00 - Pinout

3.10 Monitor/Panel options

Information:

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

Information:

For information about installing or replacing a monitor/panel option, please refer to the section "Installation monitor/panel options" on page 327.

After replacement or installation, it may be necessary to load the setup defaults in BIOS (see "Save & Exit" on page 238).

3.10.1 5AC901.LDPO-00

3.10.1.1 General information

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

- DisplayPort interface
- USB 2.0 port

3.10.1.2 Order data

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

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

3.10.1.3 Technical data

Information:

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

Product ID	5AC901.LDPO-00
General information	
B&R ID code	0xD852
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes
Interfaces	
USB	
Quantity	1
Type	USB 2.0
Design	Type A
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 1 A
DisplayPort	
Quantity	1
Version	1.1
Electrical characteristics	
Power consumption	0.2 W

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

Product ID	5AC901.LDPO-00
Environmental conditions	
Temperature	
Operation	0 to 55°C [1]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 26 g

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

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

3.10.1.3.1 DisplayPort

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

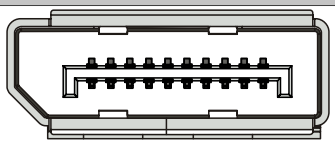


Table 121: DisplayPort 1.1

Information:

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

3.10.1.3.2 DisplayPort - Pinout

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

DisplayPort (20-pin, female)

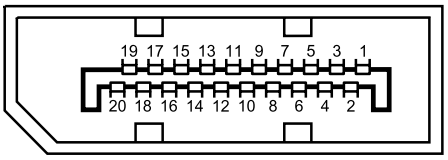


Table 122: DisplayPort - Pinout

3.10.2 5AC901.LSDL-00

3.10.2.1 General information

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

- DVI/SDL interface

3.10.2.2 Order data

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

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

3.10.2.3 Technical data

Information:

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

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

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

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

3.10.2.3.1 Monitor/Panel interface

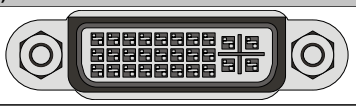
Monitor/Panel interf©€ - SDL (Smart Display Link) / DVI		
The following is an overview of the video signals available on the monitor/panel output.		
Monitor/Panel option	**Video signals**	
5AC901.LSDL-00	DVI, SDL	

Table 125: Monitor/Panel interface - DVI, SDL

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 male monitor/panel connector is specified for 100 connection cycles.

Information:

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

3.10.2.3.2 USB transfer rates in SDL and DVI modes

Information:

In SDL mode, the USB transfer rate is limited to USB 1.1.

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

3.10.2.3.3 Pinout

Pin	Assignment	Description	Pin	Assignment	Description
1	TMDS data 2-	DVI lane 2 (negative)	16	HPD	Hot plug detect
2	TMDS data 2+	DVI lane 2 (positive)	17	TMDS data 0-	DVI lane 0 (negative)
3	TMDS data 2/4 SHIELD	Shield for data pair 2 and 4	18	TMDS data 0+	DVI lane 0 (positive)
4	SDL-	SDL lane (negative)	19	TMDS Data 0/ XUSB1 SHIELD	Shield for data pair 0 and USB1
5	SDL+	SDL lane (positive)	20	XUSB1-	USB lane 1 (negative)
6	DDC clock	DDC-based control signal (clock)	21	XUSB1+	USB lane 1 (positive)
7	DDC data	DDC-based control signal (data)	22	TMDS clock shield	Shield for clock pair
8	N.C.	Not connected	23	TMDS clock+	DVI clock (positive)
9	TMDS data 1-	DVI lane 1 (negative)	24	TMDS clock -	DVI clock (negative)
10	TMDS DATA 1+	DVI lane 1 (negative) HDMI clock (positive)	C1	N.C.	Not connected
11	TMDS DATA 1/ XUSB0 SHIELD	Shield for data pair 1 and USB0	C2	N.C.	Not connected
12	XUSB0-	USB lane 0 (negative)	C3	N.C.	Not connected
13	XUSB0+	USB lane 0 (positive)	C4	N.C.	Not connected
14	+5 V power[1)]	+5 V power supply	C5	N.C.	Not connected
15	Ground (return for +5 V, HSync and VSync)	Ground			

24-pin female DVI connector

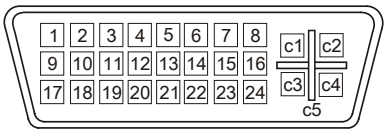


Table 126: DVI interface - Pinout

1) Protected internally by a multifuse.

3.10.2.3.4 Cable lengths and resolutions for SDL transmission

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

SDL cables	Resolution						
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	HD 1366 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200	FHD 1920 x 1080
1.8	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

Table 127: Cable lengths and resolutions for SDL transmission

SDL cables 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
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 127: Cable lengths and resolutions for SDL transmission

3.10.2.3.5 Cable lengths and resolutions for DVI transmission

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

DVI cables 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 128: Cable lengths and resolutions for DVI transmission

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

3.10.3 5AC901.LSD3-00

3.10.3.1 General information

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

- SDL3 interface

3.10.3.1.1 SDL3 operation

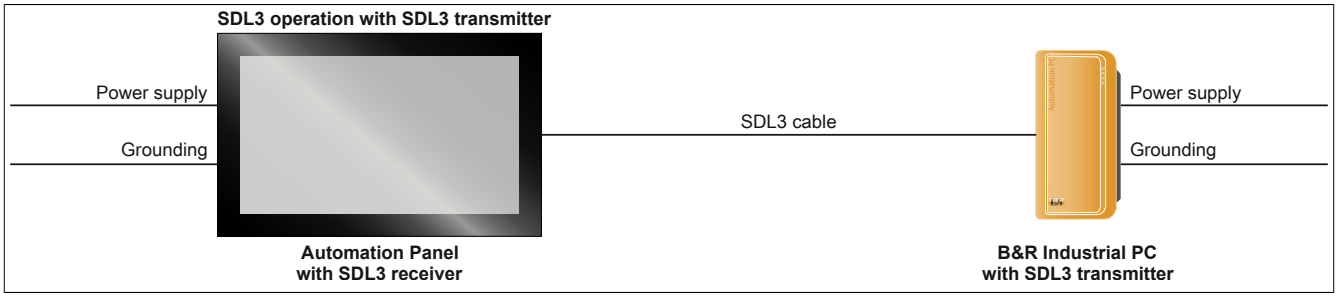
Smart Display Link 3 (SDL3) technology is used to transfer data from all communication channels between a B&R Industrial PC and a panel over a standard Ethernet cable up to 100 m. A male RJ45 connector designed for tight spaces and swing arm systems used to connect to the device.

SDL3 operationwith SDL3 transmitter

Operating SDL3 with an SDL3 transmitter in the B&R Industrial PC allows all communication between the Automation Panel and the PC to be transferred using a single SDL3 cable.

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

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



Availability of interfaces on the Automation Panel 9x3 / 9xD:

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

SDL3 maximum cable length: 100 m

3.10.3.2 Order data

Model number	Short description	Figure
	Monitor / Panel options	Image not found for 5AC901.LSD3-00!
5AC901.LSD3-00	SDL3 transmitter	

Table 129: 5AC901.LSD3-00 - Order data

3.10.3.3 Technical data

Information:

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

Product ID	5AC901.LSD3-00
General information	
LEDs	TBD
B&R ID code	0xE400
Interfaces	
SDL3 out Design Type	 Shielded female RJ45 connector SDL3
Electrical characteristics	
Power consumption	5 W

Table 130: 5AC901.LSD3-00 - Technical data

Product ID	5AC901.LSD3-00
Environmental conditions	
Temperature	
Operation	0 to 55°C [1]
Storage	-20 to 60°C
Transport	-20 to 60°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 47 g

Table 130: 5AC901.LSD3-00 - Technical data

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

3.10.3.3.1 SDL3 interface

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

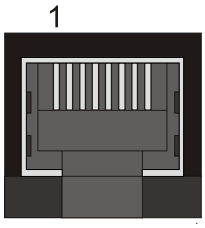
SDL3 interface	
The following overview lists the video signals available on the SDL3 output.	Female RJ45 connector
Link module / **Video signals**	
5AC901.LSD3-00 / SDL3	

Table 131: SDL3 interface

Information:

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

Information:

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

3.10.3.3.2 Cable lengths and resolutions for SDL3 transmission

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

SDL3 cable	Resolution						
Segment length [m]	VGA 640 x 480	SVGA 800 x 600	XGA 1024 x 768	HD 1366 x 768	SXGA 1280 x 1024	UXGA 1600 x 1200	FHD 1920 x 1080
10	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00	5CASD3.0100-00
15	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00	5CASD3.0150-00
20	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00	5CASD3.0200-00
30	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00	5CASD3.0300-00
50	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00	5CASD3.0500-00
100	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00	5CASD3.1000-00

Table 132: Cable lengths and resolutions for SDL3 transmission

3.11 Uninterruptible power supply (UPS)

With an optionally integrated UPS, the B&R Industrial PC makes sure that the PC system completes write operations even when a power failure occurs. When the UPS detects a power failure, it switches to battery operation immediately without interruption. Any running programs will be properly terminated by the UPS. This eliminates the chance of inconsistent data (only works if the UPS has already been configured and the drive is enabled).

Information:

- **The monitor/panel is not buffered by the UPS and will shut off when the power fails.**
- **More detailed information about uninterruptible power supplies can be found in the user's manual for the external UPS. This can be downloaded from the B&R website.**

Because the charging circuit is integrated in the housing of the B&R Industrial PC, installation has been simplified to merely attaching the connection cable to the battery unit mounted next to the PC.

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

3.11.1 Requirements

- A suitable system unit
- 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)
- Configuration of the B&R UPS in the ADI Control Center

Warning!

The 5AC901.BUPS-00 battery unit must only be operated with the 5AC901.IUPS-00 UPS IF option!

The 5AC901.BUPS-01 battery unit must only be operated with the 5AC901.IUPS-01 UPS IF option!

Information:

For information about installation and connecting to the UPS IF option, see "Installing and connecting the UPS battery unit" on page 339.

3.11.2 5AC901.IUPS-00

3.11.2.1 General information

The 5AC901.IUPS-00 UPS IF option, together with the 5AC901.BUPS-00 battery unit, allows the B&R Industrial PC to be shut down without any loss of data during a power failure.

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

Warning!

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

Information:

If the system is in standby mode (S5: Soft-off mode or S4: Hibernation mode - suspend-to-disk), then the internal UPS interface option charges the connected battery unit. The system's internal power supplies are active during this procedure. This allows various actions to be completed (e.g. opening the tray of the slide-in DVD drive).

3.11.2.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5AC901.IUPS-00	UPS interface option; for installation in an APC910 or PPC900; 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-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0010-01	UPS cable 1 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0030-01	UPS cable 3 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	

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

3.11.2.3 Technical data

Information:

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

Product ID	5AC901.IUPS-00
General information	
B&R ID code	0xD851
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Electrical characteristics	
Power consumption	Max. 30 W at 1 A
Deep discharge protection	Yes
Short circuit protection	Yes [2]
Battery charging data	
Charging current	Typ. 1 A
Environmental conditions	
Temperature	
Operation	0 to 55°C [3]
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 134: 5AC901.IUPS-00 - Technical data

Product ID	5AC901.IUPS-00
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 28 g

Table 134: 5AC901.IUPS-00 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification
2) The interface option provides protection against short circuits. This does not apply to the connected battery unit.
3) Detailed information can be found in the temperature tables in the user's manual.

3.11.2.3.1 Pinout

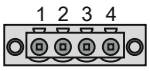
UPS interface		
Pin	**Assignment**	4-pin male connector 
1	Temperature sensor	
2	Temperature sensor	
3	-	
4	+	

Table 135: 5AC901.IUPS-00 / -01 - Pinout

3.11.2.4 Installation

This module is installed using the materials included in delivery. For more information regarding installation, see "Installing interface options" on page 324.

3.11.3 5AC901.IUPS-01

3.11.3.1 General information

The 5AC901.IUPS-01 UPS IF option, together with the 5AC901.BUPS-01 battery unit, allows the B&R Industrial PC to be shut down without any loss of data during a power failure.

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

Warning!

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

Information:

If the system is in standby mode (S5: Soft-off mode or S4: Hibernation mode - suspend-to-disk), then the internal UPS interface option charges the connected battery unit. The system's internal power supplies are active during this procedure. This allows various actions to be completed (e.g. opening the tray of the slide-in DVD drive).

3.11.3.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5AC901.IUPS-01	UPS interface option; for installation in an APC910 or PPC900; 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-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0010-01	UPS cable 1 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0030-01	UPS cable 3 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	

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

3.11.3.3 Technical data

Information:

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

Product ID	5AC901.IUPS-01
General information	
B&R ID code	0xDF84
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
Electrical characteristics	
Power consumption	Max. 25 W at 0.9 A
Deep discharge protection	Yes
Short circuit protection	Yes [2]
Battery charging data	
Charging current	Typ. 0.88 A
Environmental conditions	
Temperature	
Operation	0 to 55°C [3]
Storage	-20 to 60°C
Transport	-20 to 60°C

Table 137: 5AC901.IUPS-01 - Technical data

Product ID	5AC901.IUPS-01
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Mechanical characteristics	
Weight	Approx. 28 g

Table 137: 5AC901.IUPS-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification
2) The interface option provides protection against short circuits. This does not apply to the connected battery unit.
3) Detailed information can be found in the temperature tables in the user's manual.

3.11.3.3.1 Pinout

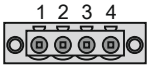
UPS interface		
Pin	**Assignment**	4-pin male connector 
1	Temperature sensor	
2	Temperature sensor	
3	-	
4	+	

Table 138: 5AC901.IUPS-00 / -01 - Pinout

3.11.3.4 Installation

This module is installed using the materials included in delivery. For more information regarding installation, see "Installing interface options" on page 324.

3.11.4 5AC901.BUPS-00

3.11.4.1 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 has a limited service life and should be replaced regularly (after the specified service life at the latest).

Warning!

The battery unit 5AC901.BUPS-00 must only be operated with the UPS IF option 5AC901.IUPS-00!

3.11.4.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5AC901.BUPS-00	Battery unit 4.5 Ah; for UPS 5AC901.IUPS-00	
	Required accessories	
	Uninterruptible power supplies	
5CAUPS.0005-01	UPS cable 0.5 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0010-01	UPS cable 1 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0030-01	UPS cable 3 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	

Table 139: 5AC901.BUPS-00 - Order data

3.11.4.3 Technical data

Product ID	5AC901.BUPS-00
General information	
Battery	
Type	Hawker Cyclon 12V 4.5 Ah; two rechargeable batteries connected in series
Service life	Up to 15 years at 20°C / 10 years at 25°C. [1]
Design	Single cell
Temperature sensor	NTC resistance
Maintenance interval during storage	6 month interval between charges
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [2]
GOST-R	Yes
Charge duration when battery low	Typ. 7 hours
Electrical characteristics	
Nominal voltage	24 V
Capacity	4.5 Ah
Fuse	Yes
Battery charging data	
Charging current [3]	Typ. 1 A
Environmental conditions	
Temperature	
Operation	-30 to 60°C [4]
Storage	-65 to 80°C
Transport	-65 to 80°C
Relative humidity	
Operation	5 to 95%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Altitude	
Operation	Max. 3000 m

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

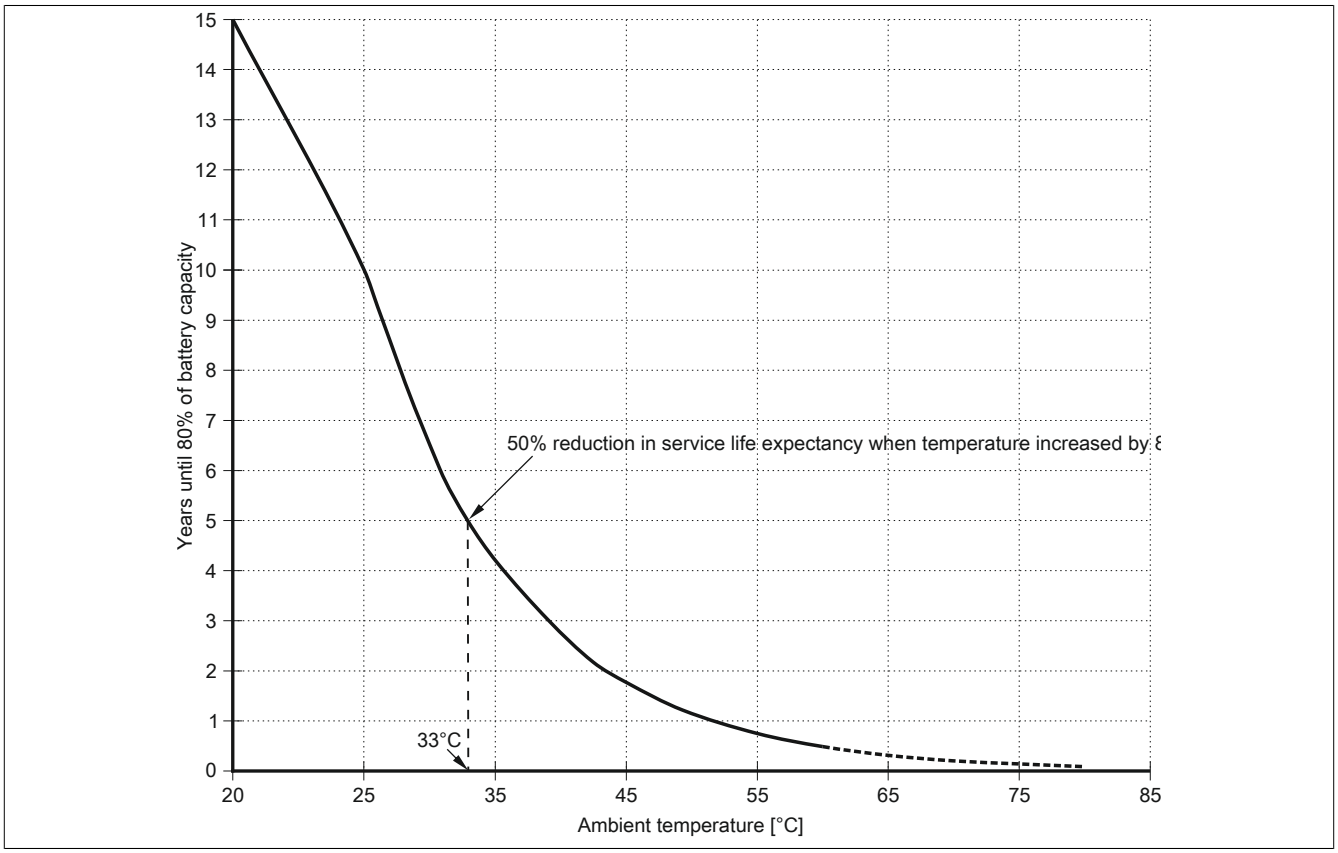
Product ID	5AC901.BUPS-00
Mechanical characteristics	
Dimensions	
Width	223.2 mm
Height	78.2 mm
Depth	145 mm
Weight	Approx. 4600 g

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

1) Depending 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
3) Maximum charging current.
4) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

3.11.4.4 Service life

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



3.11.4.5 Dimensions

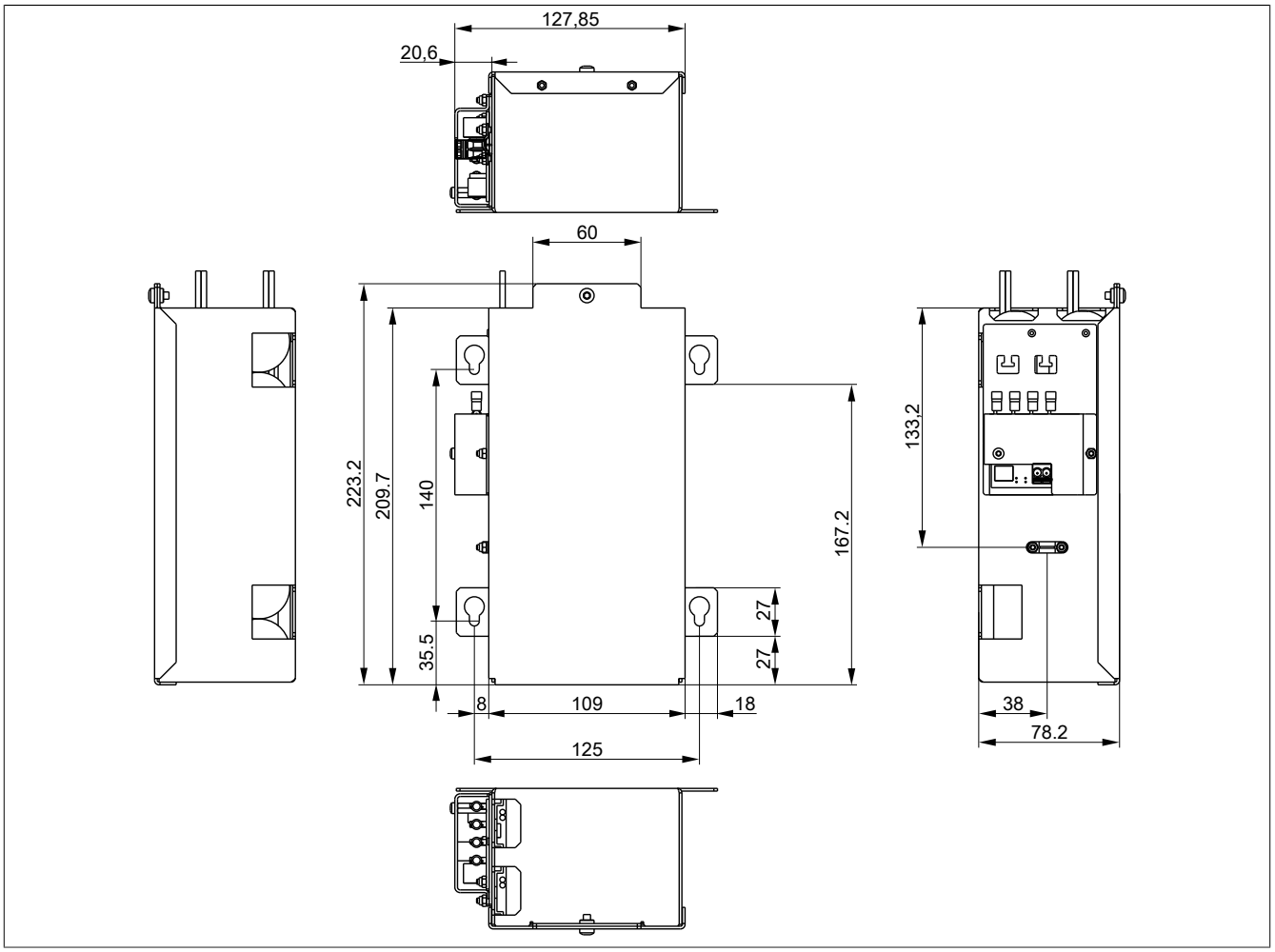


Figure 58: 5AC901.BUPS-00 - Dimensions

3.11.4.6 Drilling template

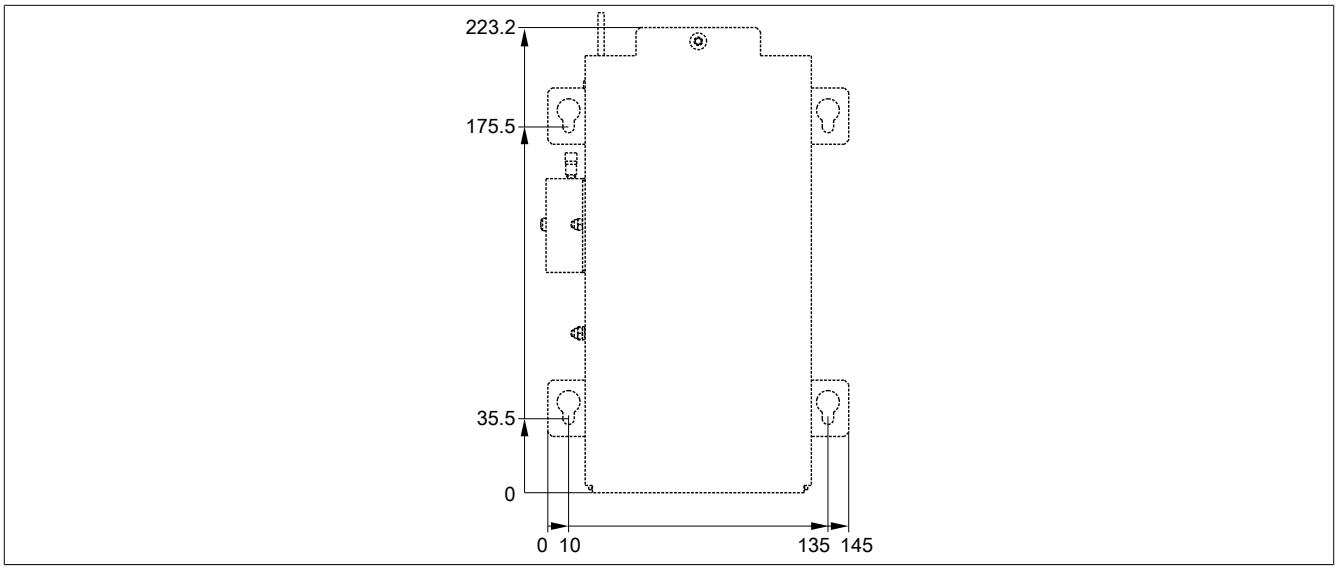


Figure 59: 5AC901.BUPS-00 - Drilling template

3.11.4.7 Installation

For information about installation and connecting to the UPS IF option, see "Installing and connecting the UPS battery unit" on page 339.

3.11.4.8 Precautions for handling and use

Spills and leaks:

Any further spillage or leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is prohibited. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

Waste disposal:

Used batteries must be disposed of in an environmentally friendly recycling process.

Neutralized mud must be stored in closed containers and stored/disposed of in accordance with applicable regulations. After neutralization and testing, larger spills diluted with water must be disposed of in accordance with applicable regulations.

Handling and storage:

- Batteries must be kept in cool, dry and well ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Batteries must be protected from adverse weather conditions and separated from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Damage to containers where batteries are stored and transported must be prevented.
- Keep away from fire, sparks and excessive heat.

3.11.5 5AC901.BUPS-01

3.11.5.1 General information

- Battery unit for 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 has a limited service life and should be replaced regularly (after the specified service life at the latest).

Warning!

The battery unit 5AC901.BUPS-01 must only be operated with the UPS IF option 5AC901.IUPS-01!

3.11.5.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5AC901.BUPS-01	Battery unit 2.2 Ah; for UPS 5AC901.IUPS-01	
	Required accessories	
	Uninterruptible power supplies	
5CAUPS.0005-01	UPS cable 0.5 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0010-01	UPS cable 1 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0030-01	UPS cable 3 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	

Table 141: 5AC901.BUPS-01 - Order data

3.11.5.3 Technical data

Product ID	5AC901.BUPS-01
General information	
Battery	
Type	Panasonic 12V 2.2 Ah; two rechargeable batteries connected in series
Service life	Up to 5 years at 20°C [1]
Design	Maintenance-free lead acid battery
Temperature sensor	NTC resistance
Maintenance interval during storage	6 month interval between charges
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [2]
GOST-R	Yes
Charge duration when battery low	Typ. 5 hours
Electrical characteristics	
Nominal voltage	24 V
Capacity	2.2 Ah
Fuse	Yes
Battery charging data	
Charging current [3]	Typ. 0.88 A
Environmental conditions	
Temperature	
Operation	0 to 40°C [4]
Storage	-15 to 40°C
Transport	-15 to 40°C
Relative humidity	
Operation	25 to 85%, non-condensing
Storage	25 to 85%, non-condensing
Transport	25 to 85%, non-condensing
Altitude	
Operation	Max. 3000 m

Table 142: 5AC901.BUPS-01 - Technical data

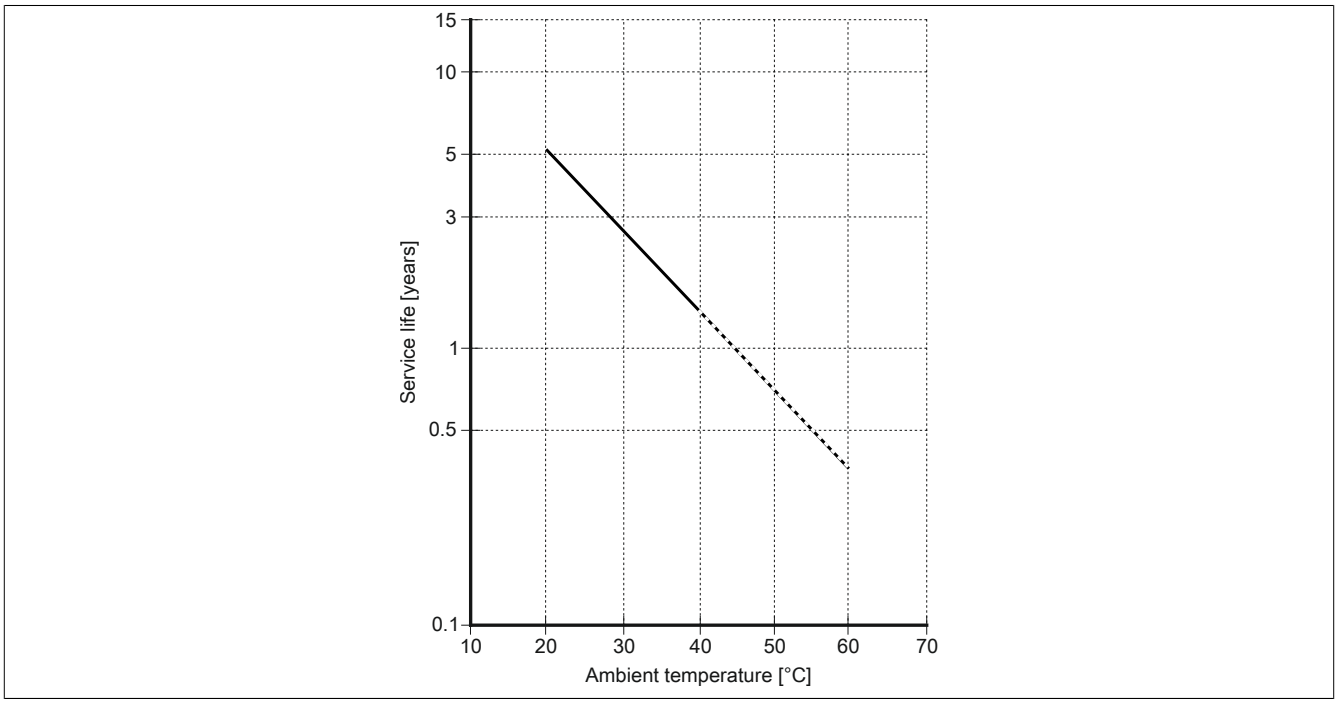
Product ID	5AC901.BUPS-01
Mechanical characteristics	
Dimensions	
Width	188 mm
Height	78 mm
Depth	115 mm
Weight	Approx. 2550 g

Table 142: 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
3) Maximum charging current.
4) Battery backing is no longer provided if the temperature falls below the minimum temperature or rises above the maximum temperature. Charging also no longer takes place since this could lead to battery damage.

3.11.5.4 Service life

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



3.11.5.5 Dimensions

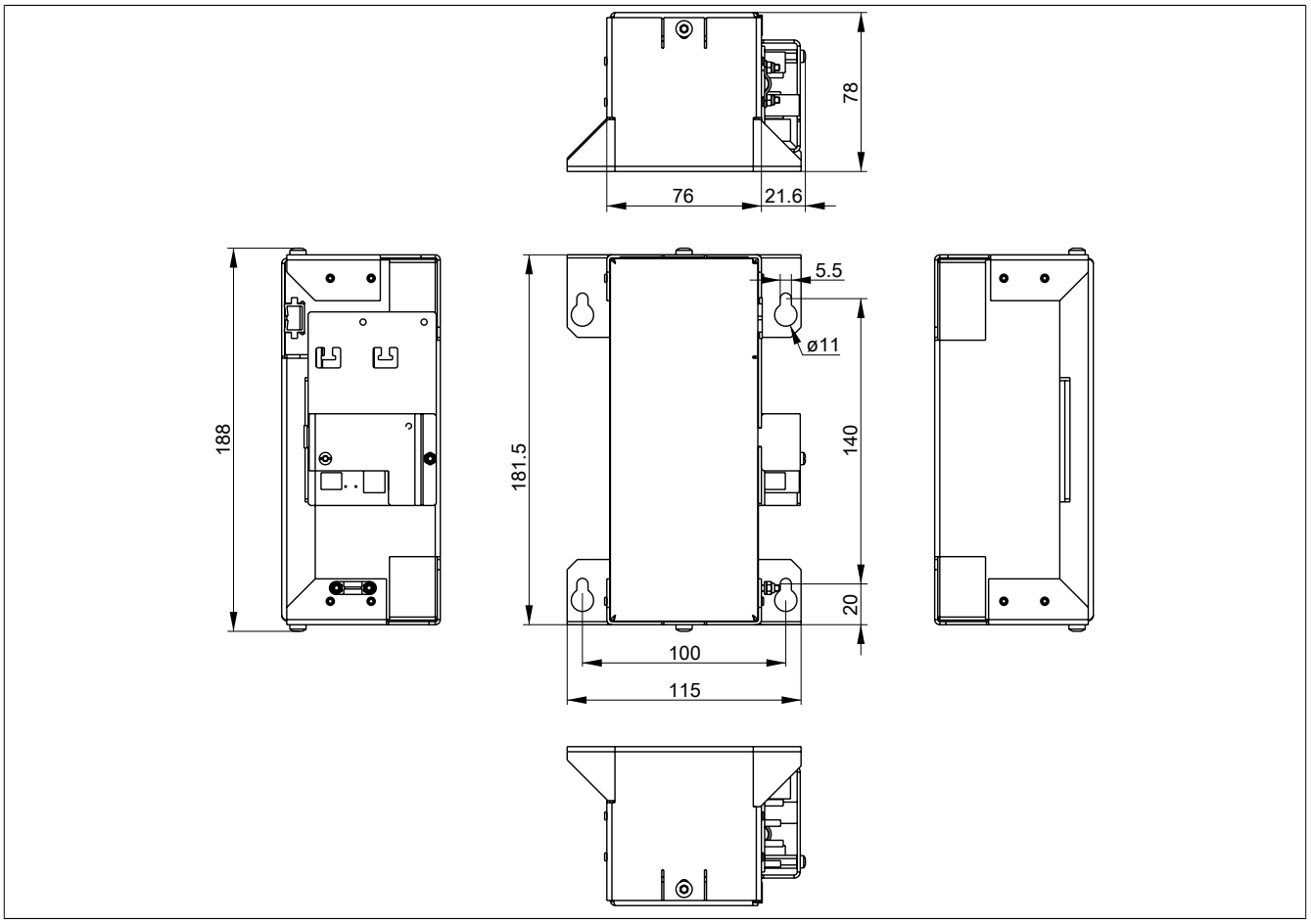


Figure 60: 5AC901.BUPS-01 - Dimensions

3.11.5.6 Drilling template

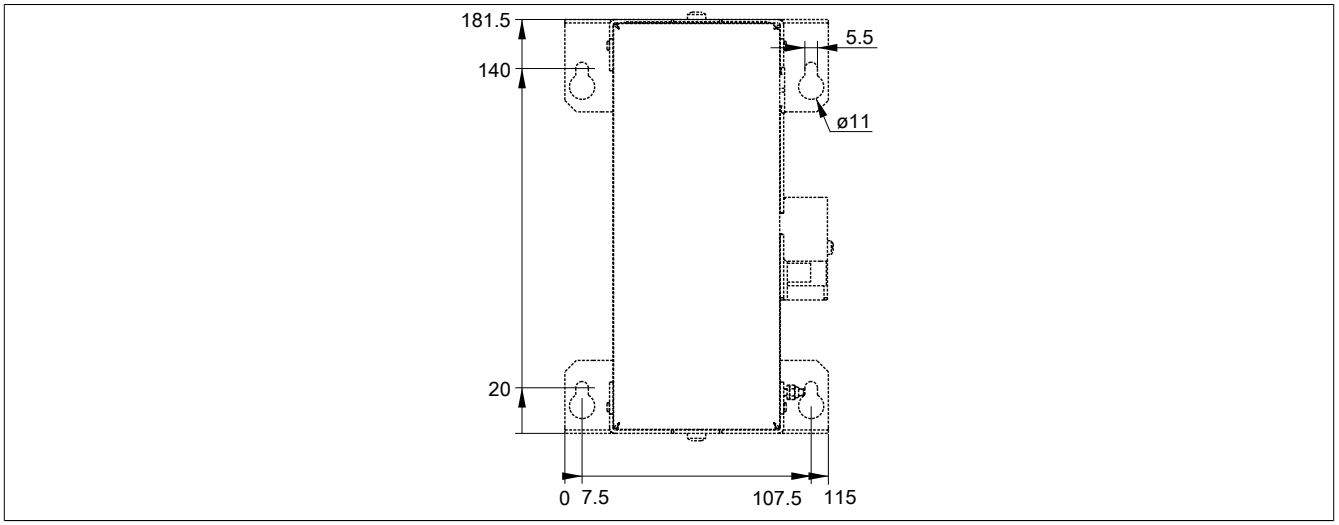


Figure 61: 5AC901.BUPS-01 - Drilling template

3.11.5.7 Installation

For information about installation and connecting to the UPS IF option, see "Installing and connecting the UPS battery unit" on page 339.

3.11.5.8 Precautions for handling and use

Spills and leaks:

Any further spillage or leakage must be prevented. Smaller spills must be bonded with dry sand, dirt and vermiculite. The use of flammable materials is prohibited. If possible, neutralize acids with sodium bicarbonate, chalk, etc. Acid-resistant clothing, shoes, gloves and face protection must be worn. The disposal of unneutralized acid in the sewage system is prohibited!

Waste disposal:

Used batteries must be disposed of in an environmentally friendly recycling process.

Neutralized mud must be stored in closed containers and stored/disposed of in accordance with applicable regulations. After neutralization and testing, larger spills diluted with water must be disposed of in accordance with applicable regulations.

Handling and storage:

- Batteries must be kept in cool, dry and well ventilated rooms with impermeable surfaces and appropriate containment conditions in case of leakage.
- Batteries must be protected from adverse weather conditions and separated from incompatible materials during storage and transport.
- A sufficient supply of water must be located nearby.
- Damage to containers where batteries are stored and transported must be prevented.
- Keep away from fire, sparks and excessive heat.

3.11.6 5CAUPS.xxxx-01

3.11.6.1 General information

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

3.11.6.2 Order data

Model number	Short description	Figure
	Uninterruptible power supplies	
5CAUPS.0005-01	UPS cable 0.5 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0010-01	UPS cable 1 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	
5CAUPS.0030-01	UPS cable 3 m; for 5AC901.IUPS-00 and 5AC901.IUPS-01 UPS	

Table 143: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - Order data

3.11.6.3 Technical data

Product ID	5CAUPS.0005-01	5CAUPS.0010-01	5CAUPS.0030-01
General information			
Certification			
CE		Yes	
cULus		Yes	
cULus HazLoc Class 1 Division 2		Yes [1]	
GOST-R		Yes	
Cable structure			
Wire cross section		2x 0.5 mm² (AWG 20) 2x 2.5 mm² (AWG 13)	
Conductor resistance		At 0.5 mm² max. 39 Ω/km At 2.5 mm² max. 7.98 Ω/km [2]	
Outer sheathing			
Material		Thermoplastic PVC-based material	
Color		Window gray (similar to RAL 7040)	
Connector			
Type		Screw clamp, 4-pin [3]	
Electrical characteristics			
Operating voltage		Max. 30 VDC	
Peak operating voltage		Typ. 30 VDC	
Test voltage			
Wire/Wire		1500 V	
Current load		10 A at 20°C	
Environmental conditions			
Temperature			
Moving		-5 to 70°C	
Static		-30 to 70°C	
Mechanical characteristics			
Dimensions			
Length	0.5 m	1 m	3 m
Diameter		7 mm	
Flex radius			
Moving		10x wire cross section	
Fixed installation		5x wire cross section	
Weight	Approx. 55 g	Approx. 100 g	Approx. 250 g

Table 144: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification
2) At an ambient temperature of 20°C.
3) Tightening torque: min. 0.4 Nm; max. 0.5 Nm

Information:

The maximum length of the UPS connection cable depends on:

- **Power**
- **Voltage drop**
- **Wire cross section**
- **Sensor lines**

3.11.6.4 Installation

For information about connecting the cable to the battery unit, please see the section "Installing and connecting the UPS battery unit" on page 339.

3.12 Front covers

3.12.1 5AC901.FF0x-00

3.12.1.1 General information

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

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

> **Information:**
>
> **The front cover is not included in the delivery of the system unit and must be ordered separately.**

3.12.1.2 Order data

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

Table 145: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02 - Order data

3.12.1.3 Technical data

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

Table 146: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02 - Technical data

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

Chapter 3 • Commissioning

1 Installation

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

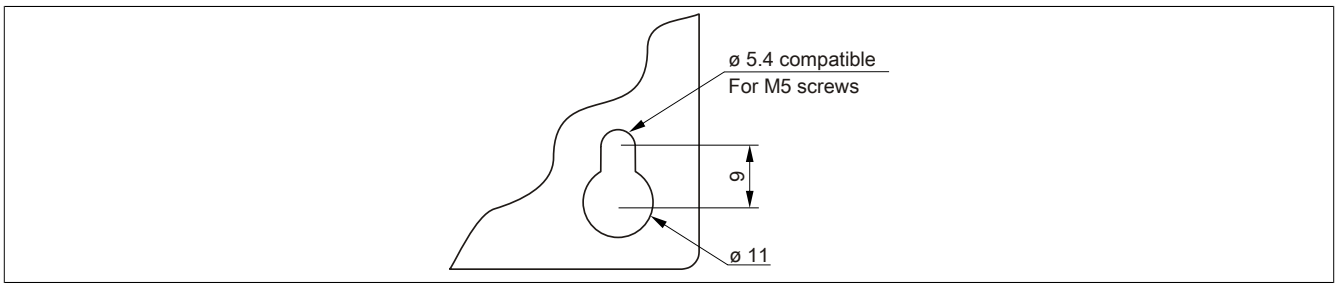


Figure 62: Mounting plates

The exact position of the mounting holes is illustrated in the drilling templates in 2 "Technical data", section "Individual components" on page 64.

1.1 Important installation information

- Environmental conditions must be taken into consideration.
- When installed in an enclosed housing, enough space must be available for air to circulate sufficiently.
- This device must be mounted to a flat surface.
- This device is only certified for operation in closed rooms.
- This device must not be subjected to direct sunlight.
- Ventilation holes must not be covered.
- This device must be mounted in one of the approved orientations.
- The wall or control cabinet must be able to withstand four times the total weight of the device.
- The flex radius of connected cables (DVI, SDL, USB, etc.) must not be exceeded.

1.2 Procedure

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

1.3 Mounting orientation

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.

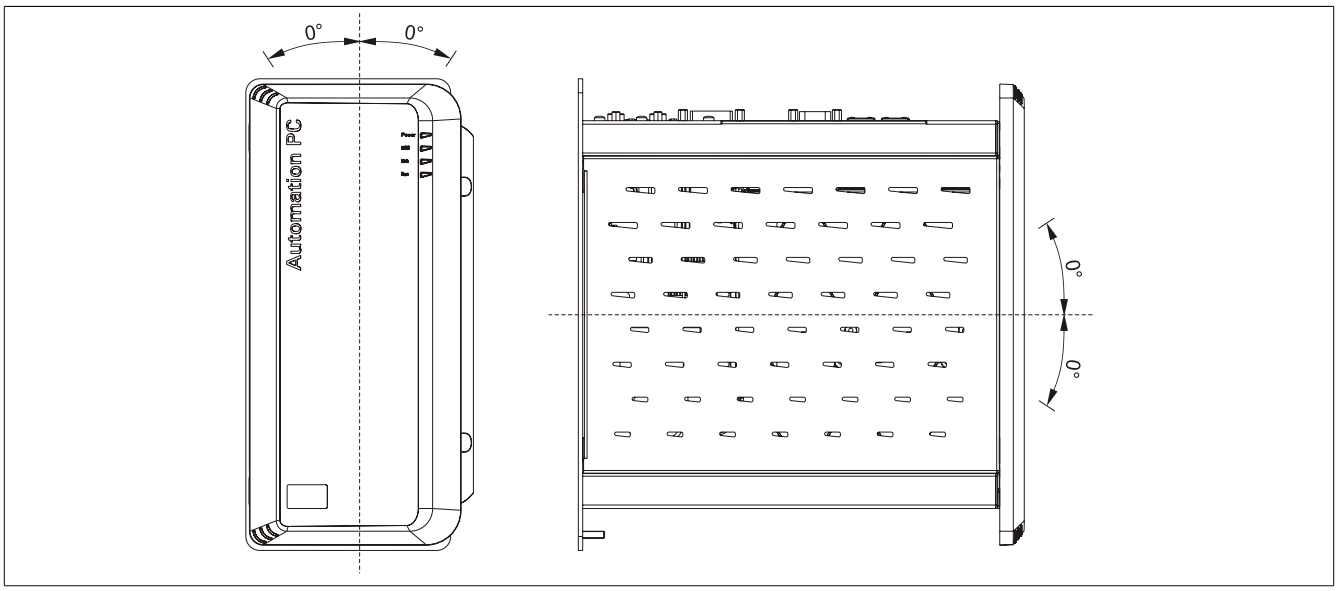


Figure 63: Vertical mounting orientation

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 168.

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.

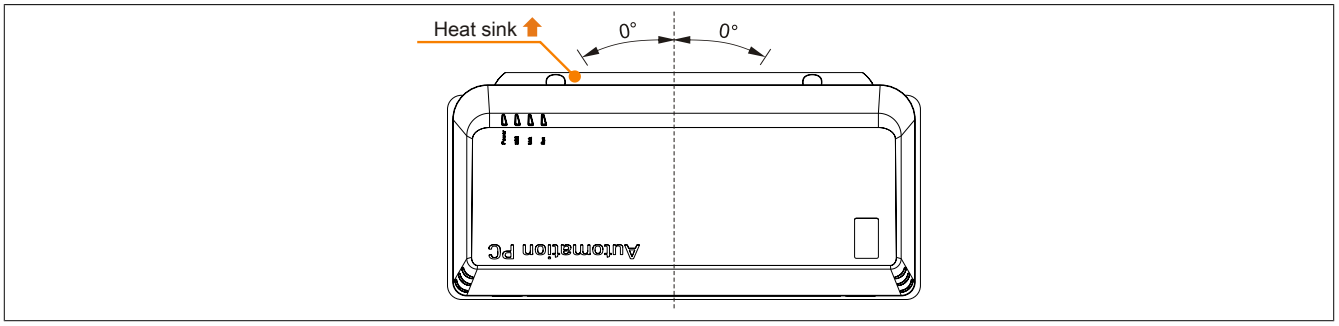


Figure 64: Horizontal mounting orientation

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 168.

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

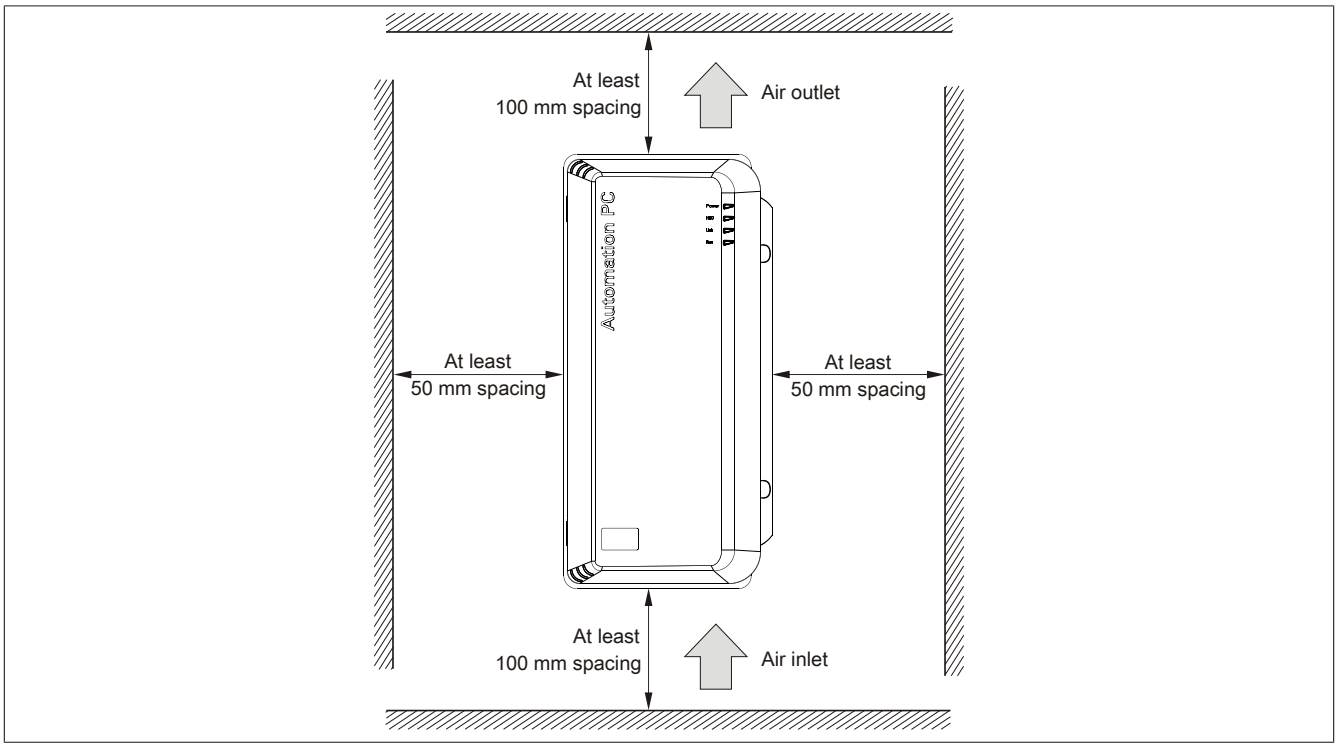


Figure 65: Standard mounting - Spacing

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

Information:

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

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

2 Cable connections

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

Information:

The maximum torque for the locating screws is 0.5 Nm.

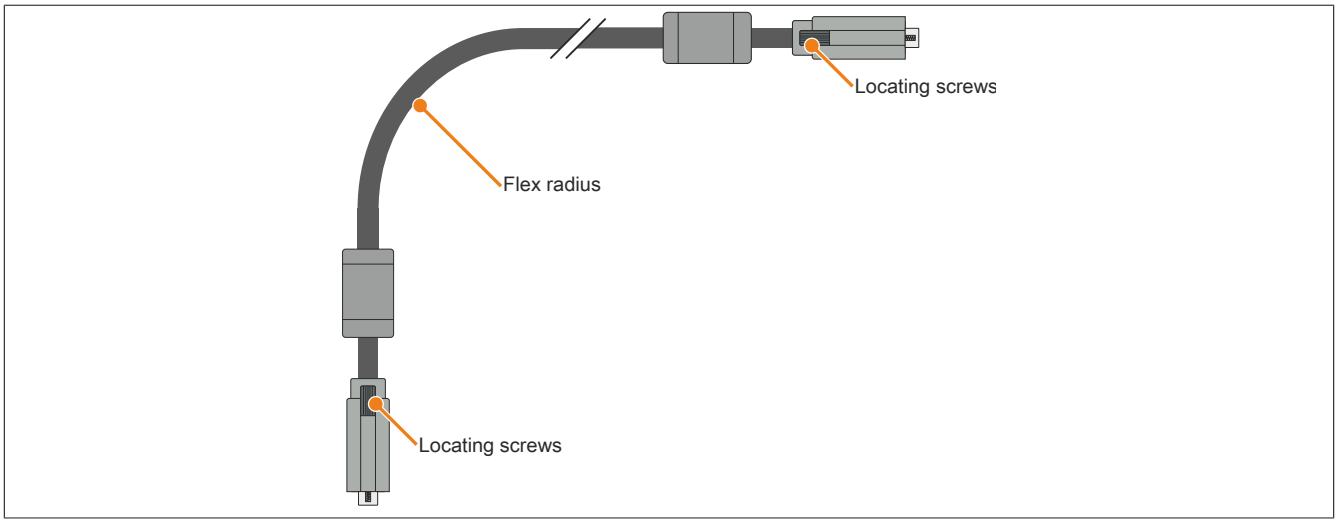


Figure 66: Flex radius - Cable connection

Information:

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

3 Grounding concept

Functional ground is a current path of low impedance between electrical circuits and ground. It is used, for example, to improve immunity to disturbances and not necessarily as a protective measure. It therefore serves only to deflect disturbances, not to provide any kind of protection against electric shock.

The functional ground on the device has 2 connections:

- Supply voltage
- Ground connection

To guarantee safe conductance of electric disturbances, the following points should be observed:

- The device should be connected to the central grounding point in the control cabinet using the shortest route possible.
- A cable with a minimum cross section of 2.5 mm² per connection should be used. If a cable with wire end sleeves is connected to the 0TB103.9 or 0TB103.91 terminal block, then a cable with maximum 1.5 mm² per connection is possible.
- Note the line shielding concept; all connected data cables are used as shielded lines.

Functional ground is indicated on the B&R device with the following symbol: ⏚

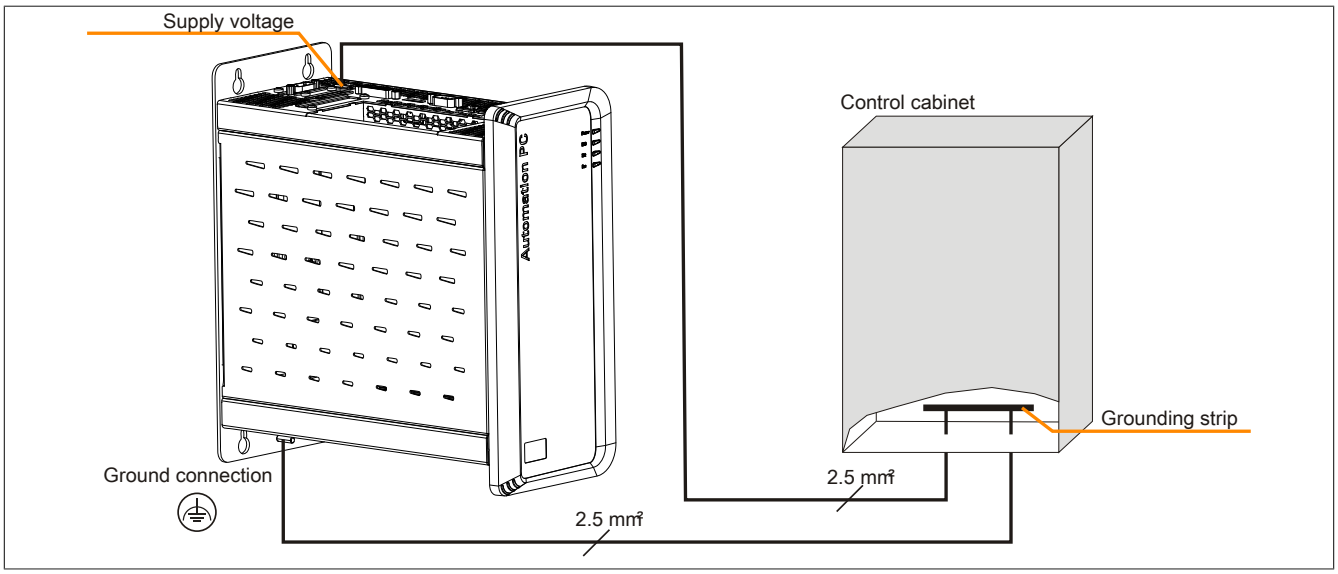


Figure 67: Grounding concept

4 Configuring a SATA RAID set

Information:

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

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.

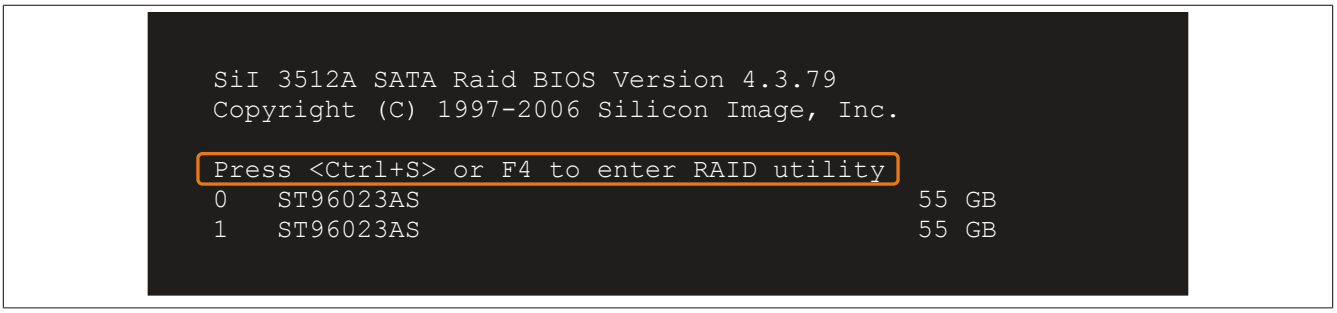


Figure 68: Open the RAID Configuration Utility

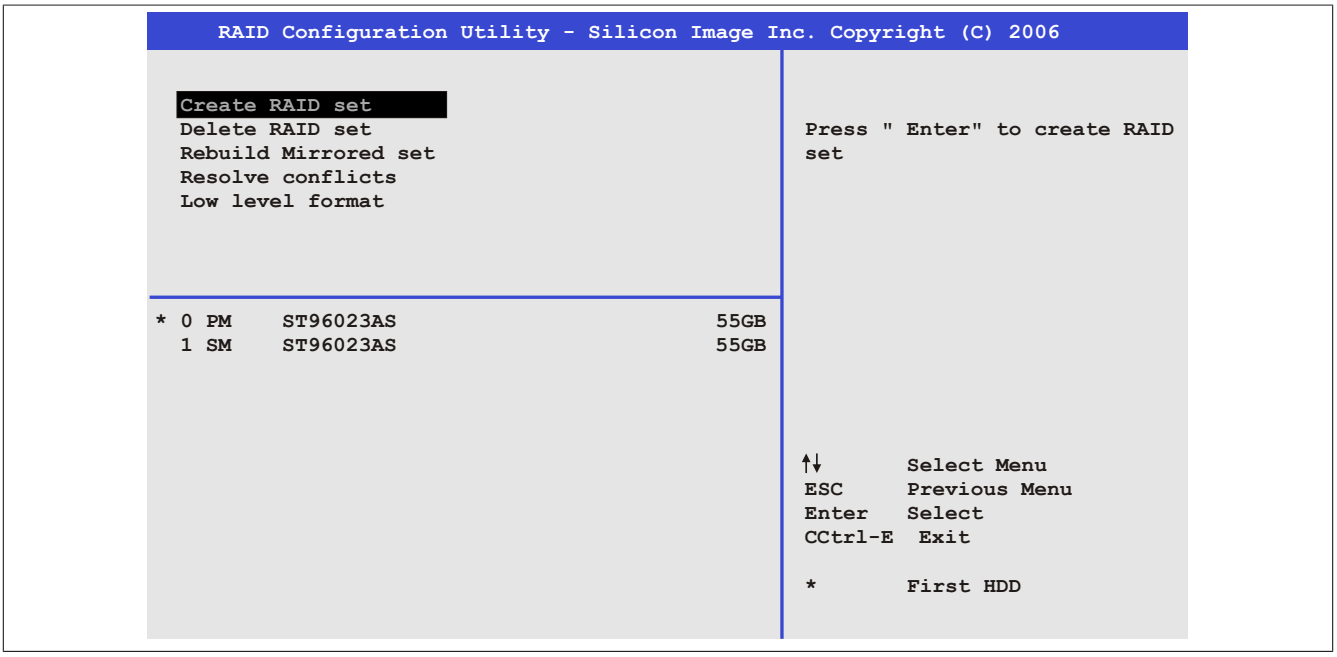


Figure 69: RAID Configuration Utility - Menu

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 147: BIOS-relevant keys in the RAID Configuration Utility

4.1 Create RAID set

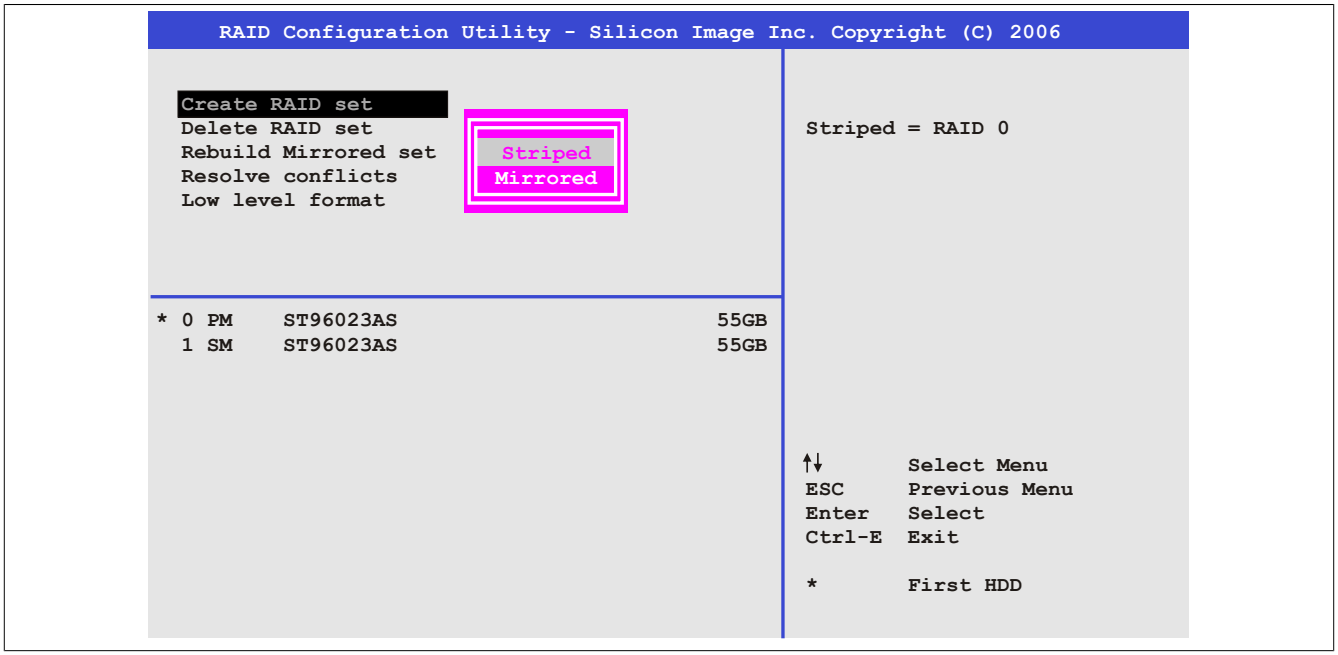


Figure 70: RAID Configuration Utility - Menu

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

4.2 Create RAID set - Striped

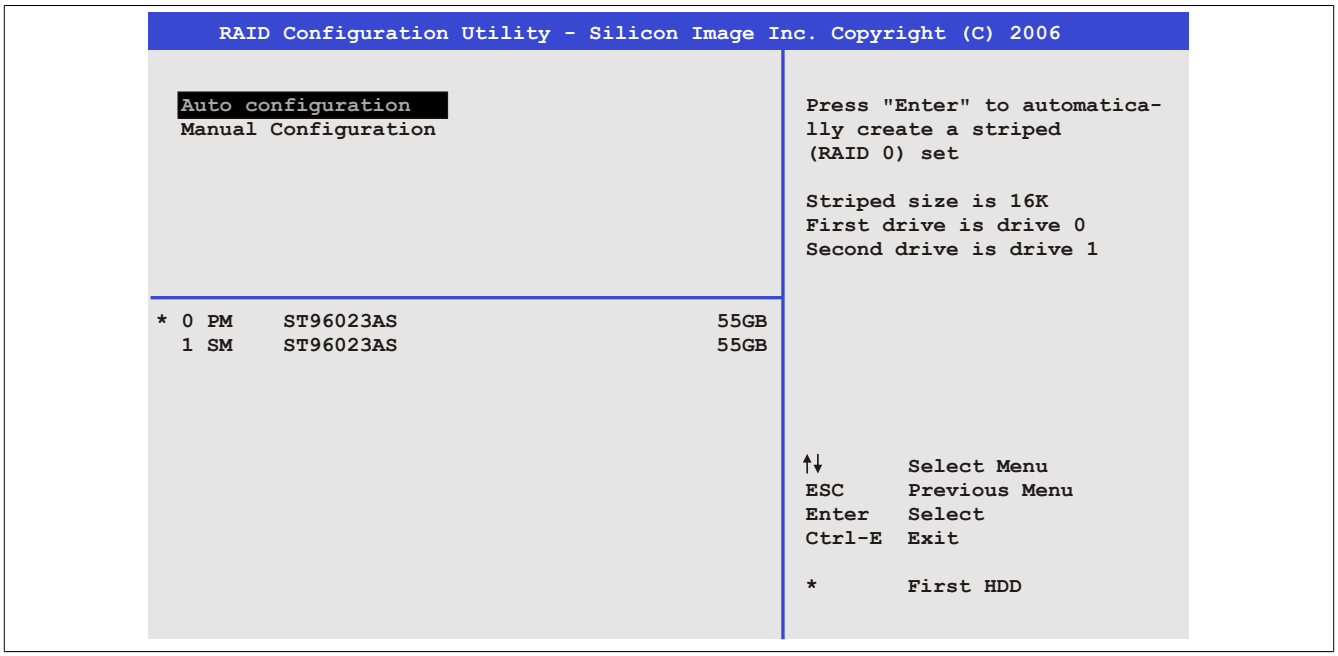


Figure 71: RAID Configuration Utility - Create RAID set - Striped

"Auto configuration"
Auto configuration optimizes all settings.

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

4.3 Create RAID set - Mirrored

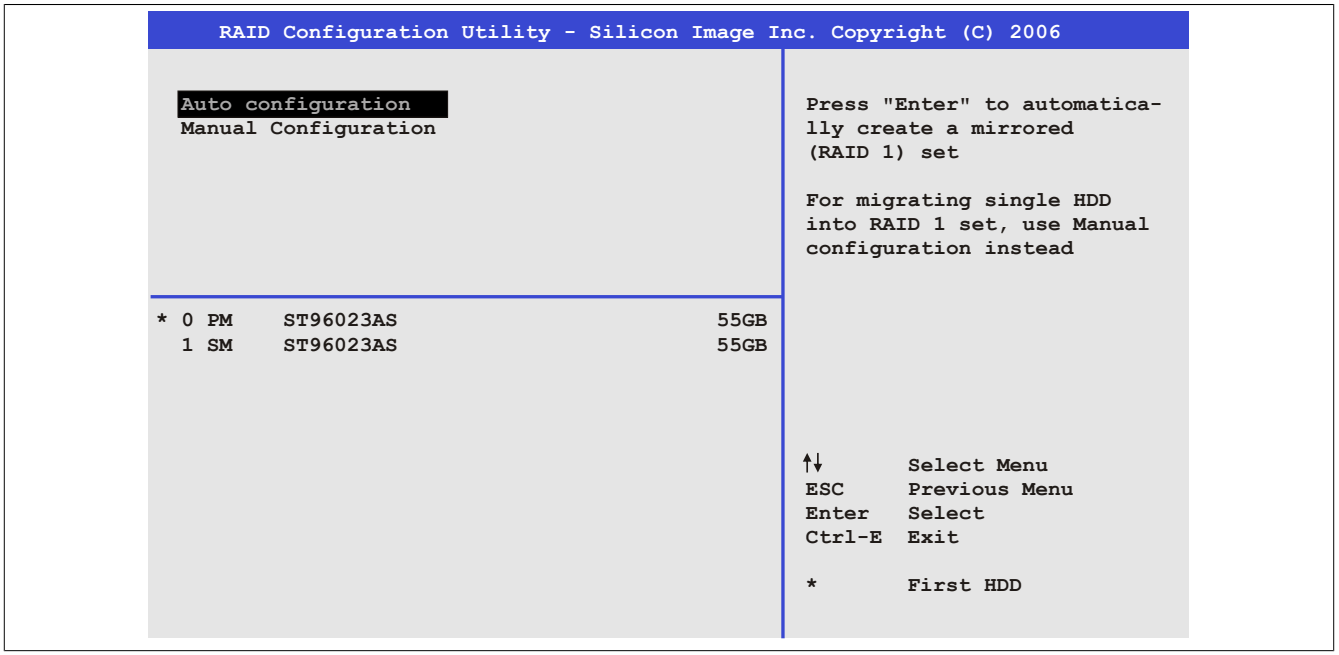


Figure 72: RAID Configuration Utility - Create RAID set - Mirrored

"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).

4.4 Delete RAID set

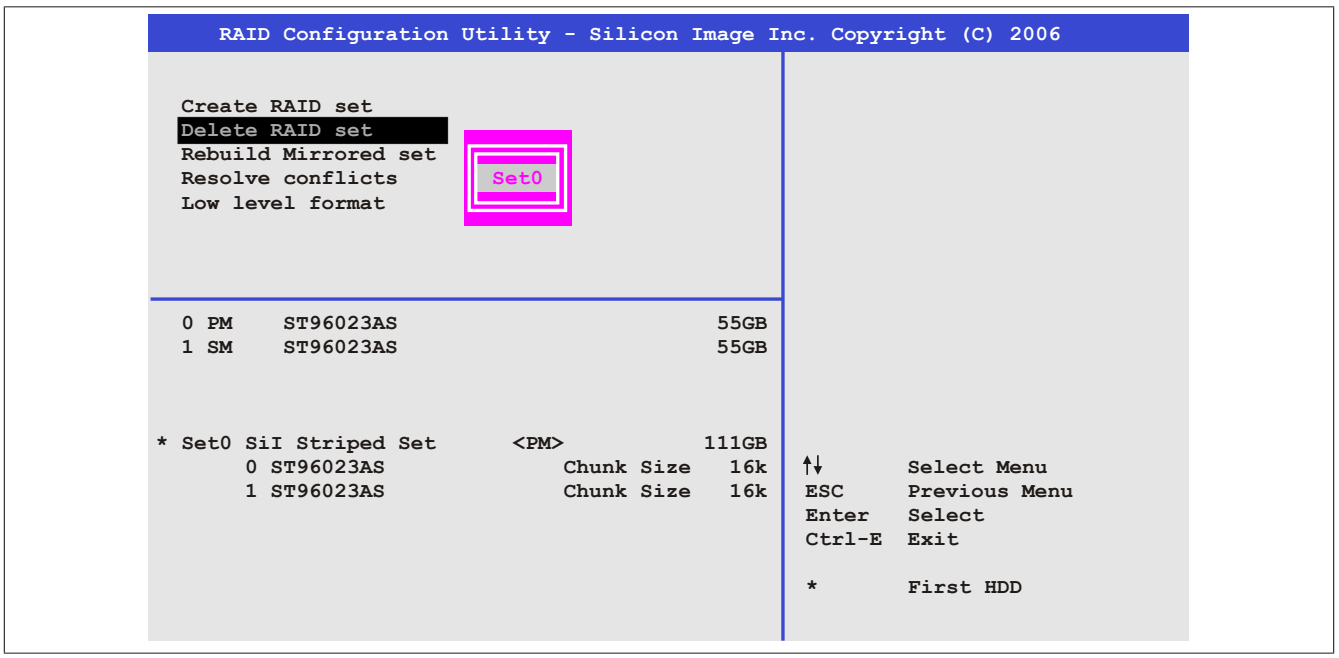


Figure 73: RAID Configuration Utility - Delete RAID set

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

4.5 Rebuild mirrored set

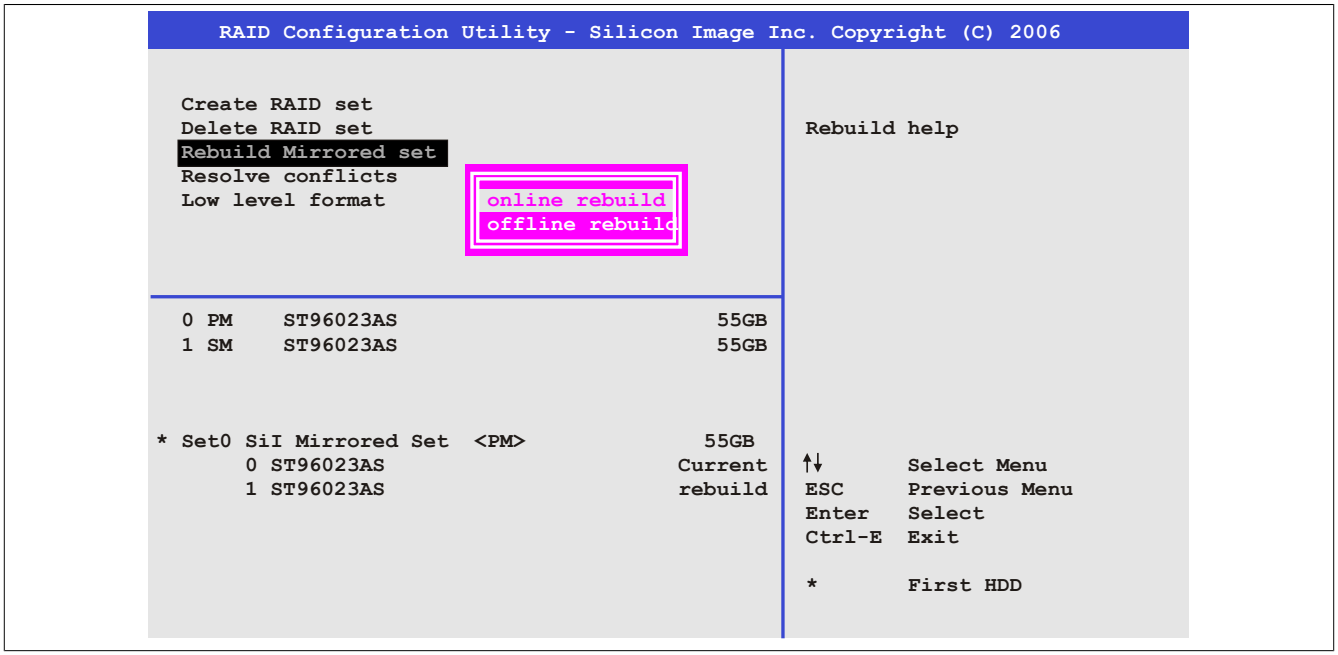


Figure 74: RAID Configuration Utility - Rebuild mirrored set

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).

4.6 Resolve conflicts

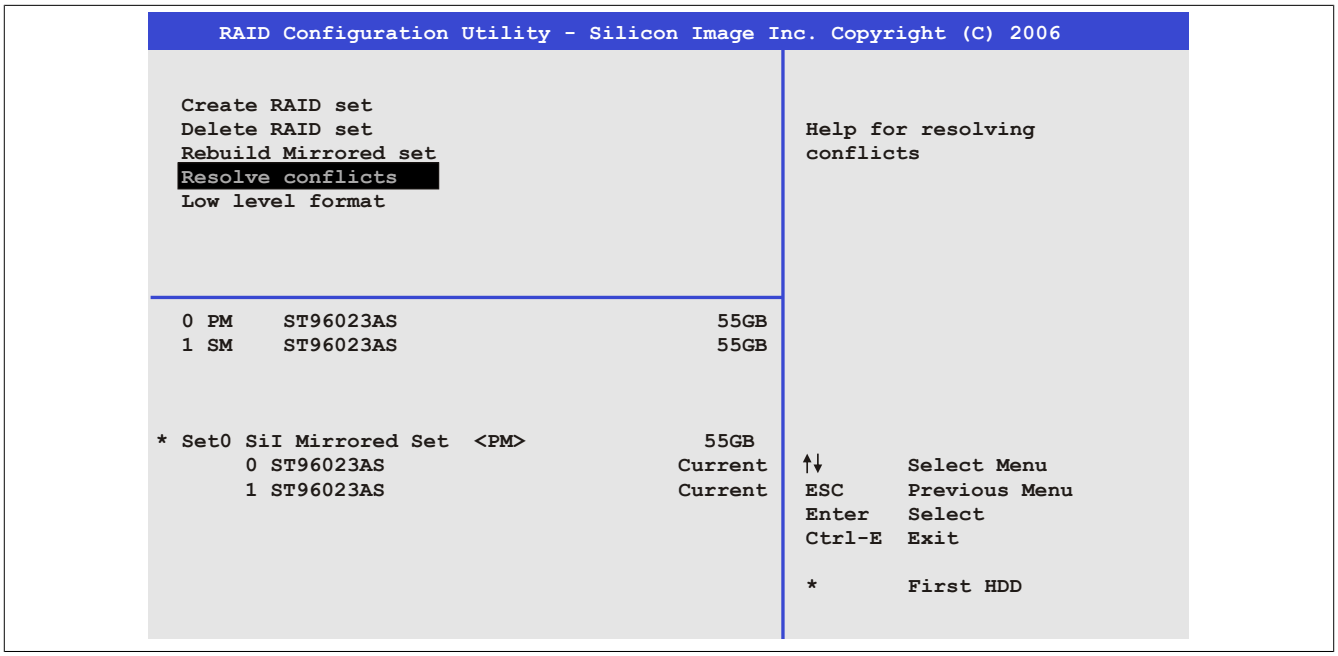


Figure 75: RAID Configuration Utility - Resolve conflicts

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".

4.7 Low level format

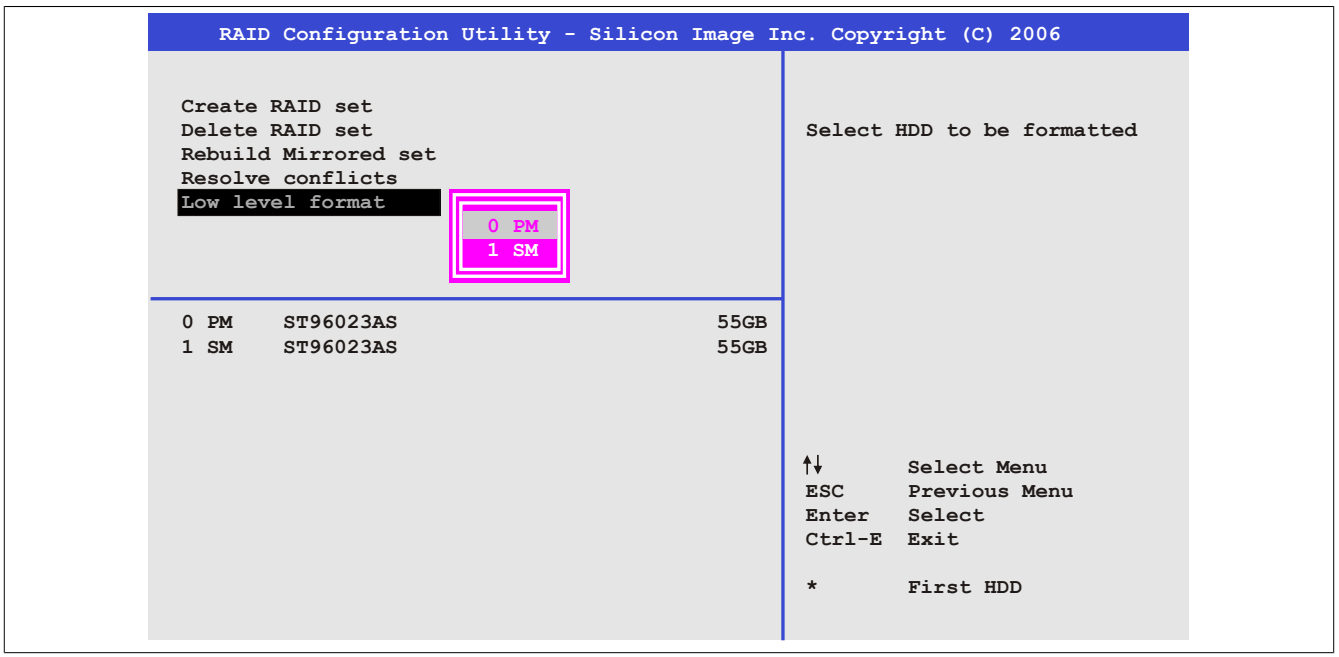


Figure 76: RAID Configuration Utility - Low level format

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 disk takes approx. 40 minutes.

5 Configuring a SATA RAID set using the internal RAID controller

The following software description applies to the internal RAID controller with QM77 chipset. The HM76 chipset does not provide RAID support.

Information:

B&R recommends using only drives of the same type in a SATA RAID set (hard disk with hard disk in a set, SSD with SSD in a set; CFast with CFast in a set).

Caution!

The maximum number of possible write cycles must be taken into consideration when setting up a RAID set with SSDs (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 77: Configuration Utility - Boot

```
              Intel(R) Rapid Storage Technology - Option ROM - 11.6.0.1624
              Copyright(C) 2003-12 Intel Corporation. All Rights Reserved.
                                   [ MAIN MENU ]
           1.  Create RAID Volume            4.  Recovery Volume Options
           2.  Delete RAID Volume            5.  Acceleration Options
           3.  Reset Disks to Non-RAID       6.  Exit
                                [ DISK/VOLUME INFORMATION ]
RAID Volumes:
ID  Name     Level                Strip             Size  Status          Bootable
0   Mirror   RAID1(Mirror)        N/A             465.8GB  Normal             Yes

Pyhsical Devices:
ID  Device   Model         Serial #                  Size  Type/Status(Vol ID)
0   WDC      WD500LUCT-6   WD-WX21AB2X6150        465.7GB  Member Disk(0)
2   WDC      WD500LUCT-6   WD-WX21AB2P6063        465.7GB  Member Disk(0)

        [↑↓]-Select              [ESC]-Exit              [ENTER]-Select Menu
```

Figure 78: Configuration Utility - Overview

The following keys can be used once inside BIOS Setup:

Key	Function
Cursor ↑	Moves to the previous item
Cursor ↓	Moves to the next item
Enter	Selects an item or opens a submenu
ESC	Returns to the previous menu
Ctrl+E	Saves any changed settings and exits setup

Table 148: BIOS-relevant keys in the RAID Configuration Utility

5.1 Create RAID volume

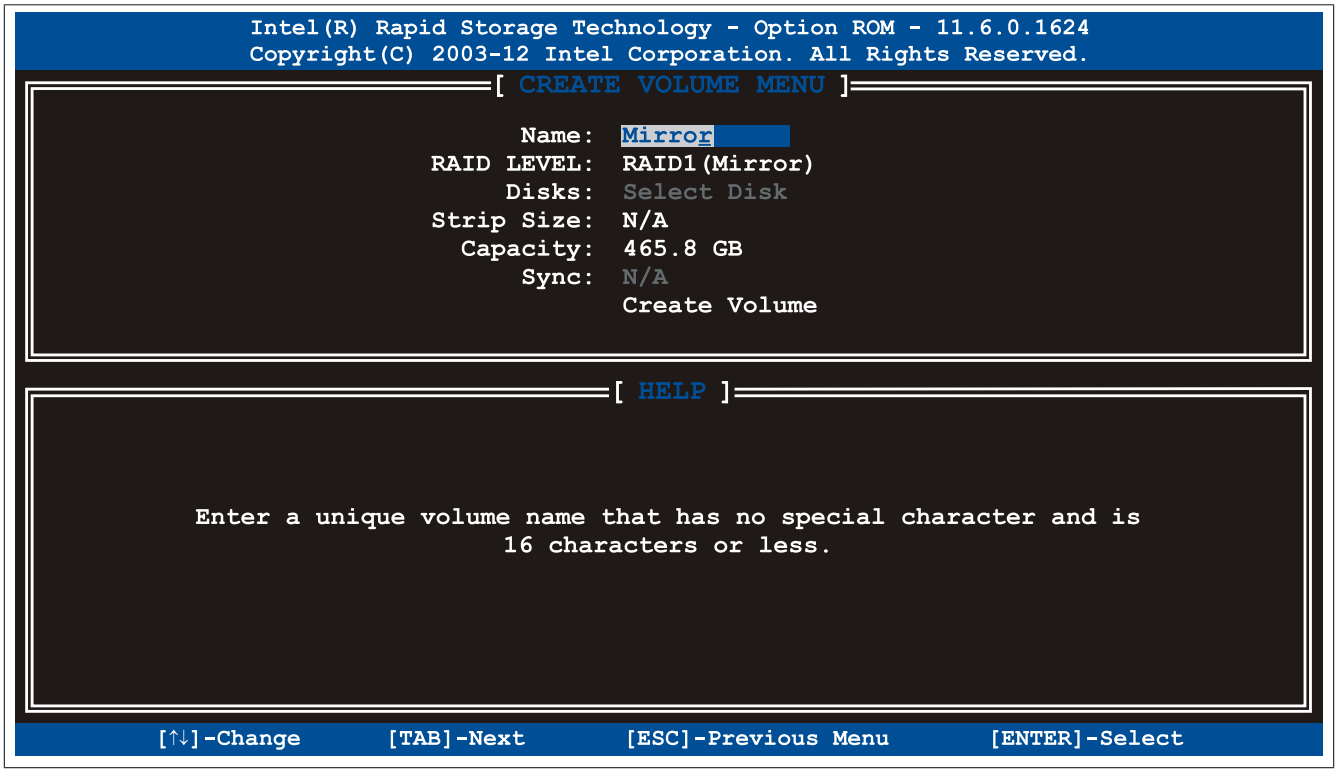


Figure 79: Configuration Utility - Create RAID volume

Parameter	Function	Configuration options	Effect
Name	Option for entering the RAID name	Name with up to 16 characters	Assigns a name to the RAID volume
RAID level	Option for setting the RAID level	RAID0 (Stripes)	Creates RAID0
		RAID1 (Mirror)	Creates RAID1
		Recovery	Creates recovery RAID
Disks[1)]	Specifies the installed hard disks as either Master or Recovery	Master, Recovery	Defines the hard disks as Master or Recovery
Strip size[2)]	Option for configuring the size of data blocks	4 KB, 8 KB, 16 KB, 32 KB, 64 KB, 128 KB	Configures the size of the data block
Capacity	Option for configuring the RAID capacity		Configures the memory size of the RAID
Sync[3)]	Option for configuring RAID synchronization	N/A	-
		Continuous	Automatically synchronizes the RAID
		On request	Manually synchronizes the RAID
Create volume	Creates the RAID volume	-	Creates the RAID volume

Table 149: 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*.

5.2 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 must be selected and then deleted by pressing <DEL>.

Information:

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

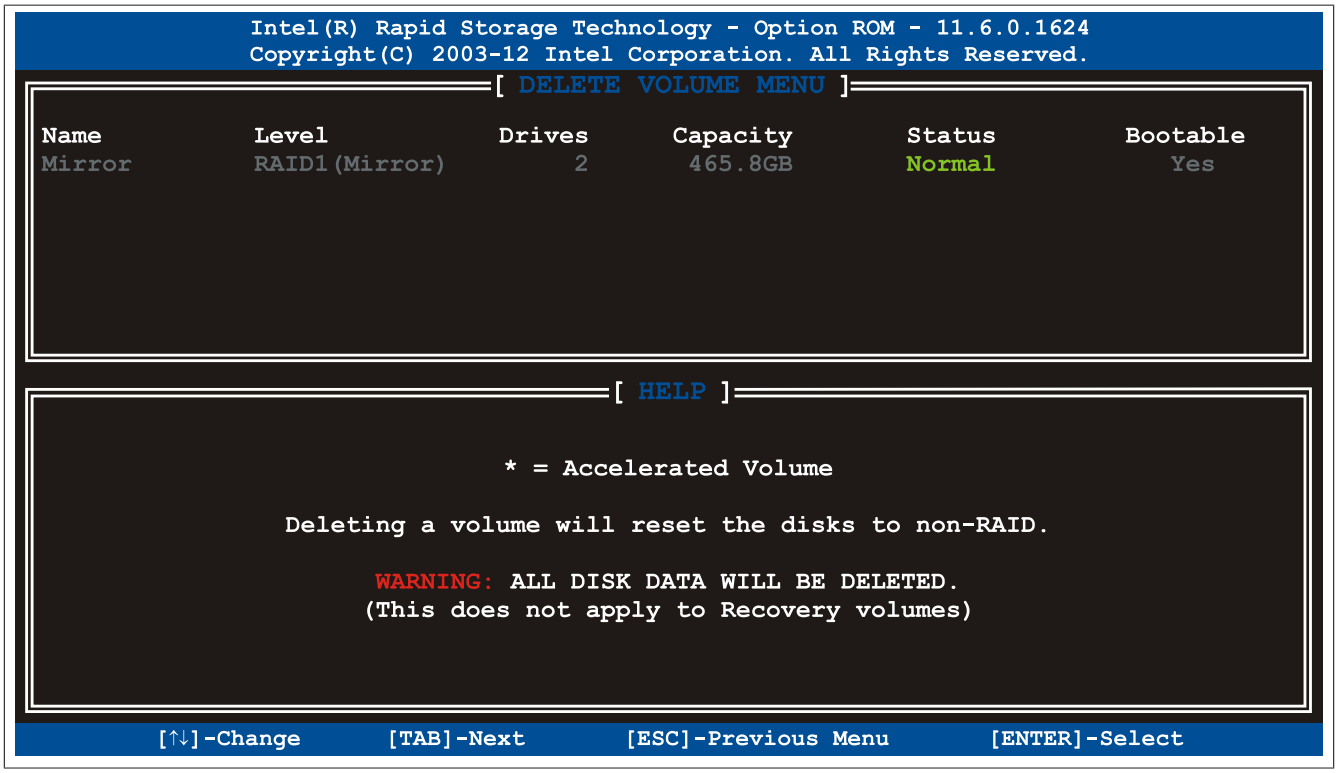


Figure 80: Configuration Utility - Delete RAID volume

5.3 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 must be selected and then deleted by pressing <SPACE> (<ENTER> to confirm).

Information:

Deleting a RAID set also deletes all of the data on the drive.

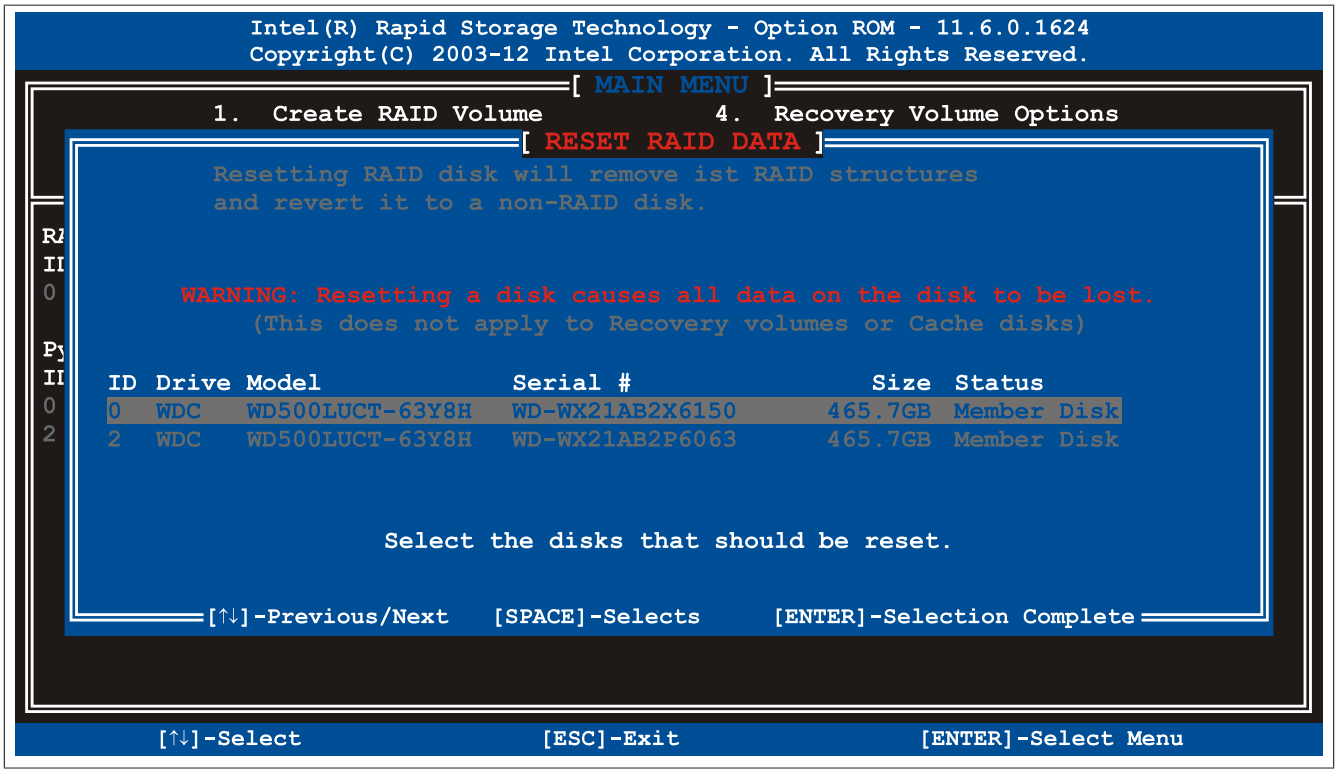


Figure 81: Configuration Utility - Reset disks to non-RAID

5.4 Recovery volume options

The "Recovery volume options" menu option can be used to enable/disable Recovery Disk and Master Disk.

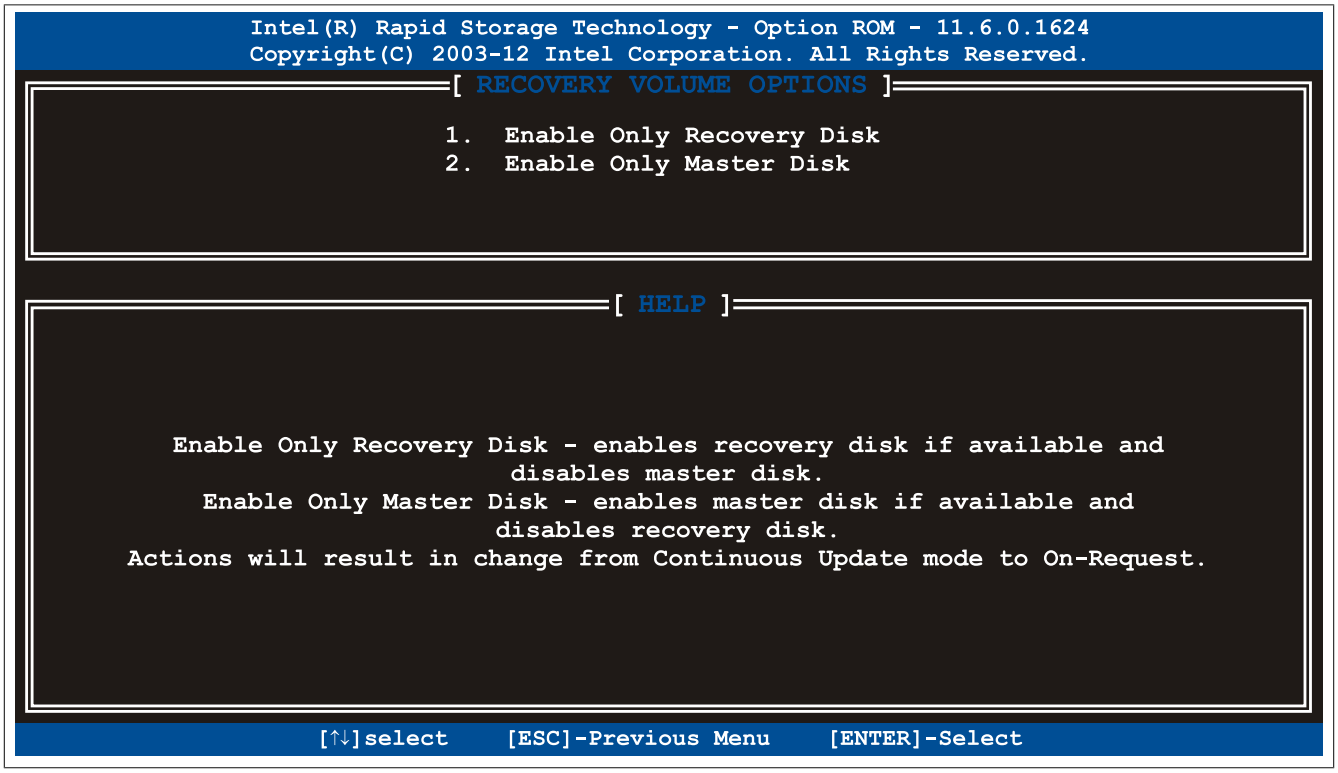


Figure 82: Configuration Utility - Recovery volume options

Chapter 4 • Software

1 BIOS options

Information:

The following diagrams and BIOS menu items including descriptions refer to BIOS version 1.15. It is therefore possible that these diagrams and BIOS descriptions will not correspond with the BIOS version actually installed. In addition, the BIOS menu items provided depend on the system configuration.

1.1 General information

BIOS is an acronym for "Basic Input/Output System". It is the most basic standardized interface between the user and the system (hardware). The BIOS system used in this B&R Industrial PC was developed by American Megatrends Inc.

The BIOS Setup utility can be used to modify basic system configuration settings. These settings are stored in CMOS and EEPROM memory (as a backup).

CMOS data is buffered by a battery (if present) and continues to remain stored on the B&R Industrial PC even when the power is turned off (no 24 VDC supply).

1.2 BIOS Setup and boot procedure

BIOS is immediately activated 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 at each restart, the BIOS Setup utility can be opened by pressing <Del>. The settings can then be re-saved.

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, the <Del> key must be pressed 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 83: 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.

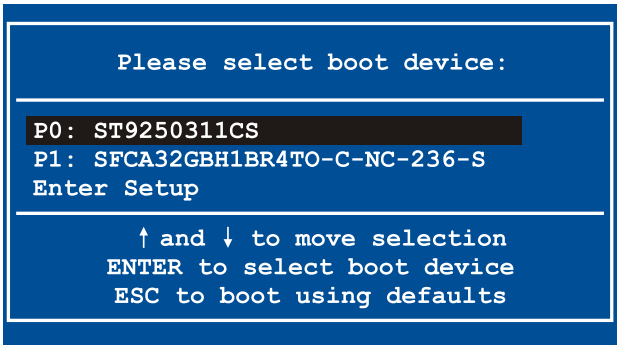
Keys	Function
Del, F2	Opens the main BIOS Setup screen
F12	Network boot
F11	Opens the boot menu. This lists all bootable devices that are connected to the system. Selecting a device with cursor ↑, cursor ↓ and the pressing <ENTER> will boot from that device. 
<Pause>	Pauses POST. Pressing any other key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

Table 150: 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
Pos 1	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 151: BIOS-relevant keys

1.3 Main

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

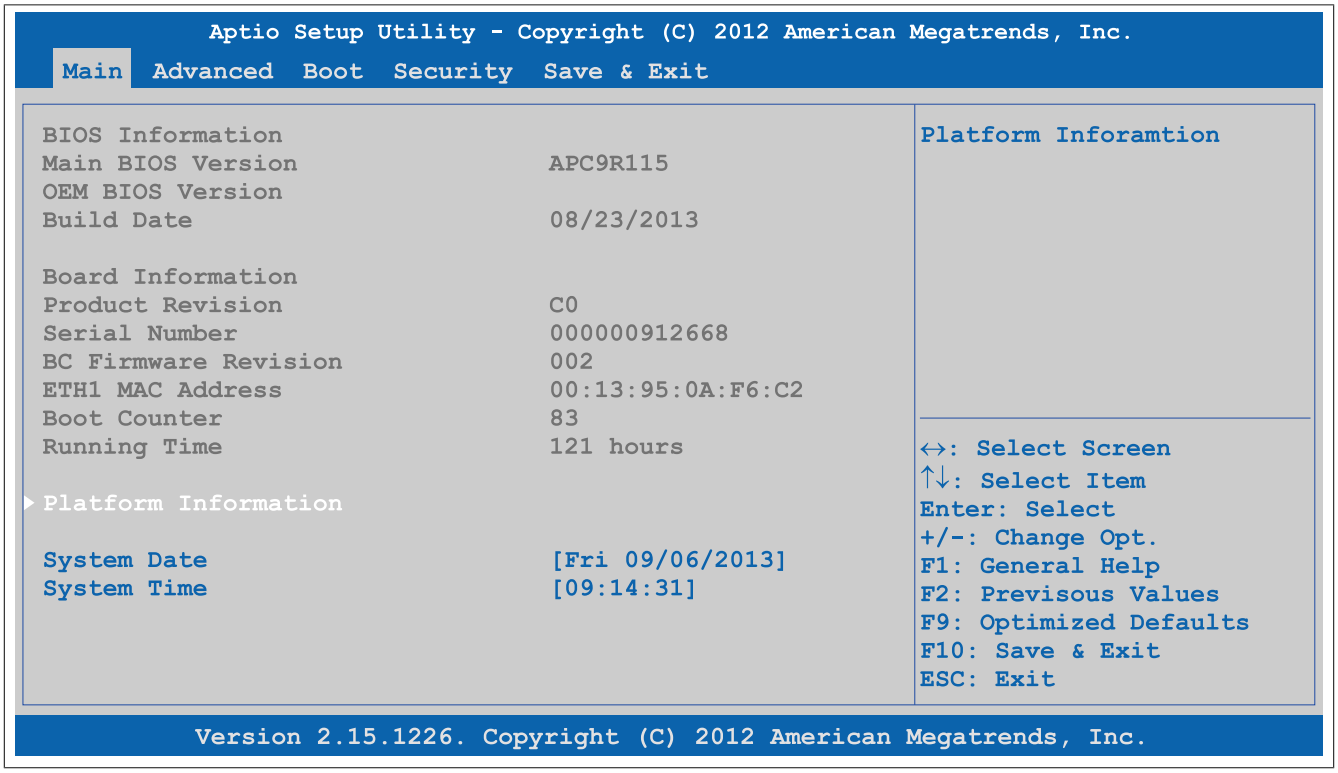


Figure 84: Main

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 Rev.	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 the submenu See "Platform information" on page 184
System date	The currently configured system date. This is buffered by the CMOS battery when the system is switched off.	Changes 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.	Changes the system time	Sets the system time in the format Hour:Minute:Second (hh:mm:ss)

Table 152: Main - Configuration options

1.3.1 Platform information

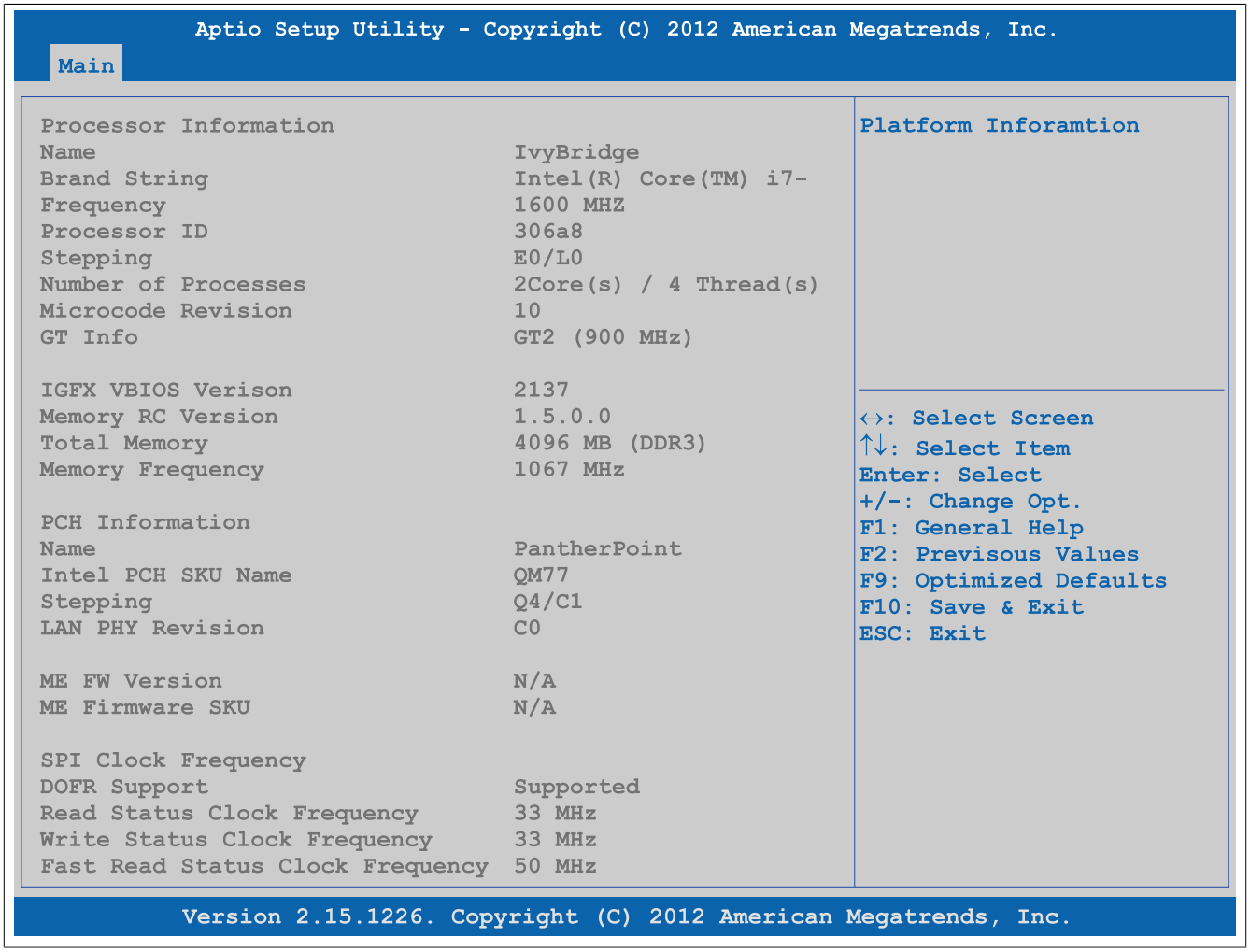


Figure 85: Main - Platform Information

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 read status clock frequency.	None	-
Write status clock frequency	Displays the write status clock frequency	None	-
Fast read status clock frequency	Displays the fast read status clock frequency	None	-

Table 153: Main - Platform information overview

1.4 Advanced

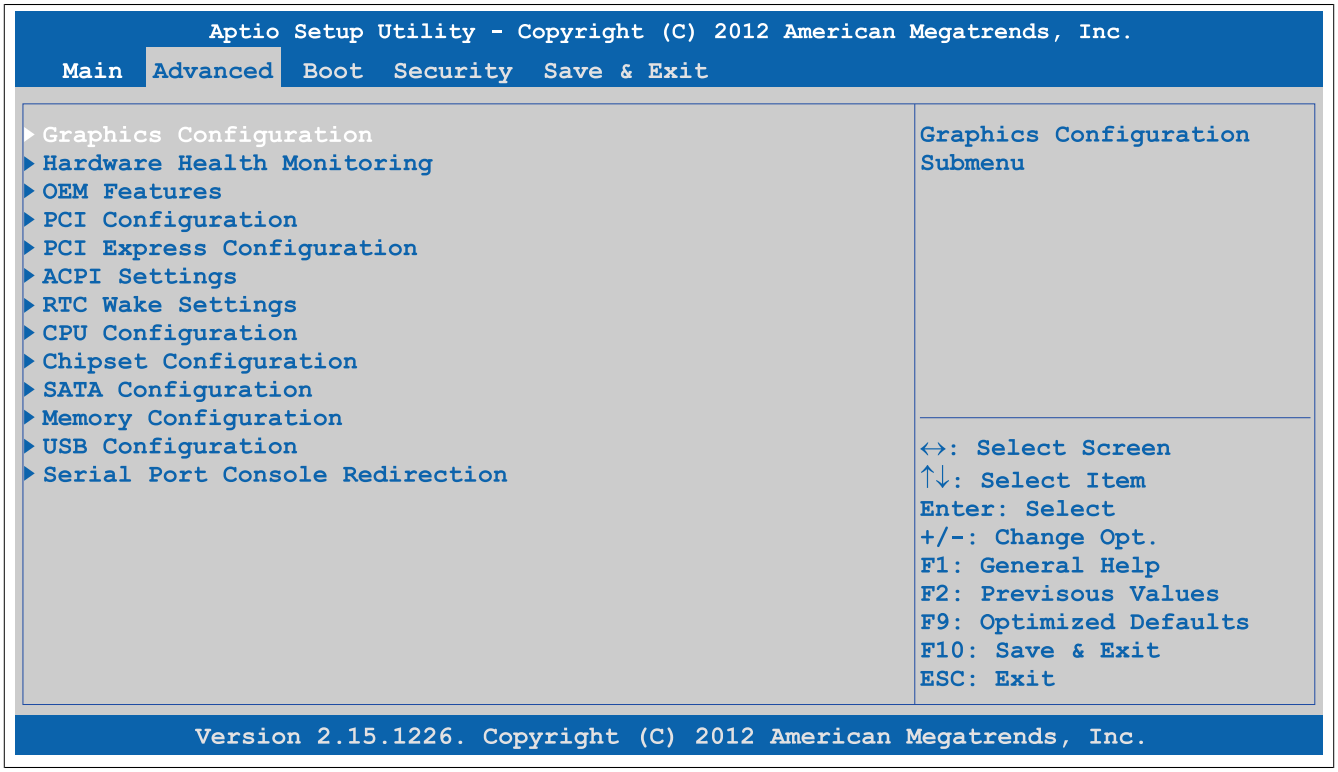


Figure 86: Advanced Übersicht

BIOS setting	Function	Configuration options	Effect
Graphics configuration	Configures graphics settings	Enter	Opens the submenu See "Graphics configuration" on page 186
Hardware health monitoring	Displays the current voltage levels as well as the CPU and baseboard temperatures	Enter	Opens the submenu See "Hardware health monitoring" on page 188
OEM features	Configures OEM features	Enter	Opens the submenu See "OEM features" on page 189
PCI configuration	Configures PCI devices	Enter	Opens the submenu See "PCI configuration" on page 209
PCI Express configuration	Configures PCI Express devices	Enter	Opens the submenu See "PCI Express configuration" on page 211
ACPI settings	Configures ACPI settings	Enter	Opens the submenu See "ACPI settings" on page 217
RTC wake settings	Configures the start time when switched off	Enter	Opens the submenu See "RTC wake settings" on page 218
CPU configuration	Configures CPU settings	Enter	Opens the submenu See "CPU configuration" on page 219
Chipset configuration	Configures chipset settings	Enter	Opens the submenu See "Chipset configuration" on page 222
SATA configuration	Configures SATA settings	Enter	Opens the submenu See "SATA configuration" on page 223
Memory configuration	Configures main memory settings	Enter	Opens the submenu See "Memory configuration" on page 226
USB configuration	Configures USB settings	Enter	Opens the submenu See "USB configuration" on page 229
Serial port console redirection	Configures the remote console	Enter	Opens the submenu See "Serial port console redirection" on page 233

Table 154: Advanced overview

1.4.1 Graphics configuration

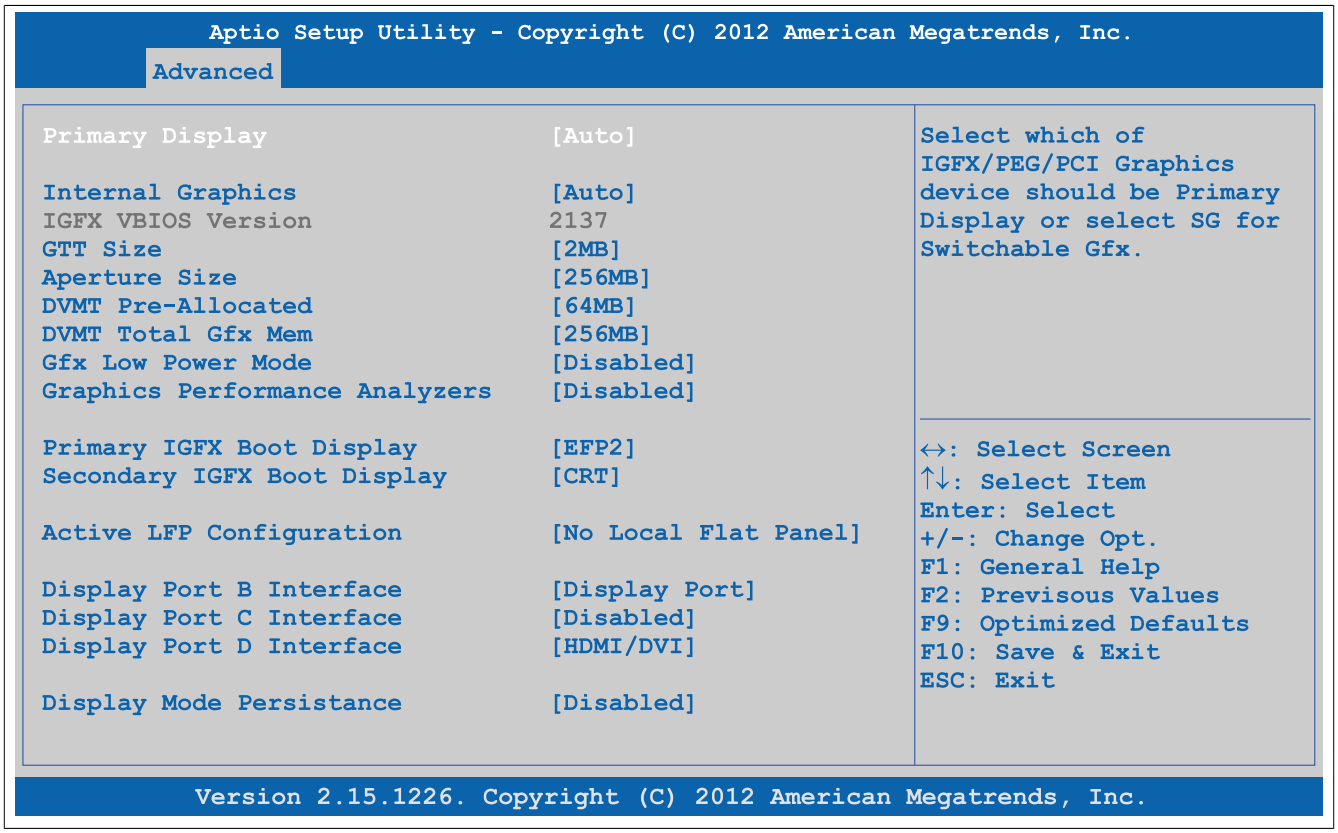


Figure 87: Advanced - Graphics Configuration

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	128 M	Reserves 128 MB
		256 M	Reserves 256 MB
		512 M	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.	128 M	Allocates 128 MB of main memory
		256 M	Allocates 256 MB of main memory
		MAX	Allocates the entire main memory
Gfx low power mode	Option for setting the power saving function for the graphics controller **Information:** **This option can only be used for SFF.**	Enabled	Enables low power mode. The graphics controller does not operate at full speed.
		Disabled	Disables low power mode
Graphics performance analyzers	Option for enabling/disabling the Intel graphics performance analyzers	Enabled	Enables this function
		Disabled	Disables this function
Primary IGFX boot display	Option for defining the primary enabled display device during booting.	VBIOS default	Uses the default setting from IGFX BIOS
		CRT	Uses the CRT (cathode ray tube) channel
		LFP	Uses the LFP (local flat panel) channel
		EFP	Uses the EFP (external flat panel) channel

Table 155: Advanced - Graphics configuration options

BIOS setting	Function	Configuration options	Effect
	Information: **The numbering of EFP occurs dynamically depending on the DisplayPort interface (B/C/D).**	EFP2	Uses the EFP2 (external flat panel 2) channel
		EFP3	Uses the EFP3 (external flat panel 3) channel
Secondary IGFX boot display	Option for defining the secondary enabled panel during POST **Information:** **The numbering of EFP occurs dynamically depending on the DisplayPort interface (B/C/D).** **Information:** **After the BIOS boot screen, nothing more is shown on this display until the graphics driver is reloaded from the operating system.**	Disabled	Disables this function Only shows POST on one display
		CRT	Uses the CRT (cathode ray tube) channel
		LFP	Uses the LFP (local flat panel) channel
		EFP	Uses the EFP (external flat panel) channel
		EFP2	Uses the EFP2 (external flat panel 2) channel
		EFP3	Uses the EFP3 (external flat panel 3) channel
Active LFP configuration	Option for selecting the active LFP (local flat panel) channel **Information:** **This option has no effect on the Automation PC 910.**	No local flat panel	Does not use the LVDS channel
		Integrated LVDS	Uses the integrated LVDS channel
Display port B interface	Option for selecting the display device that is connected to the DisplayPort interface	Disabled	Disables the DisplayPort interface
		Display port	Configures the DisplayPort interface as a DisplayPort interface
		HDMI/DVI	Configures the DisplayPort interface as an HDMI/DVI interface
Display Port C interface	Option for selecting the display device that is connected to the monitor/panel option	Disabled	Disables the monitor/panel option
		Display port	Configures the monitor/panel option as a DisplayPort interface
		HDMI/DVI	Configures the monitor/panel option as an HDMI/DVI interface
Display Port D interface	Option for selecting the display device that is connected to the monitor/panel interface	Disabled	Disables the monitor/panel interface
		Display port	Configures the monitor/panel interface as a DisplayPort interface **Information:** **The monitor/panel interface can no longer be used when this setting is selected. This setting is not permitted for the monitor/panel interface!**
		HDMI/DVI	Configures the monitor/panel interface as an HDMI/DVI interface
Display mode persistence	"Display mode persistence" means that the operating system can remember and restore past display configurations. For example, a dual DVI configuration is automatically restored when both DVI monitors are reconnected, even if only one of them was connected and enabled during a previous boot.	Disabled	Disables this function
		Enabled	Enables this function

Table 155: Advanced - Graphics configuration options

1.4.2 Hardware health monitoring

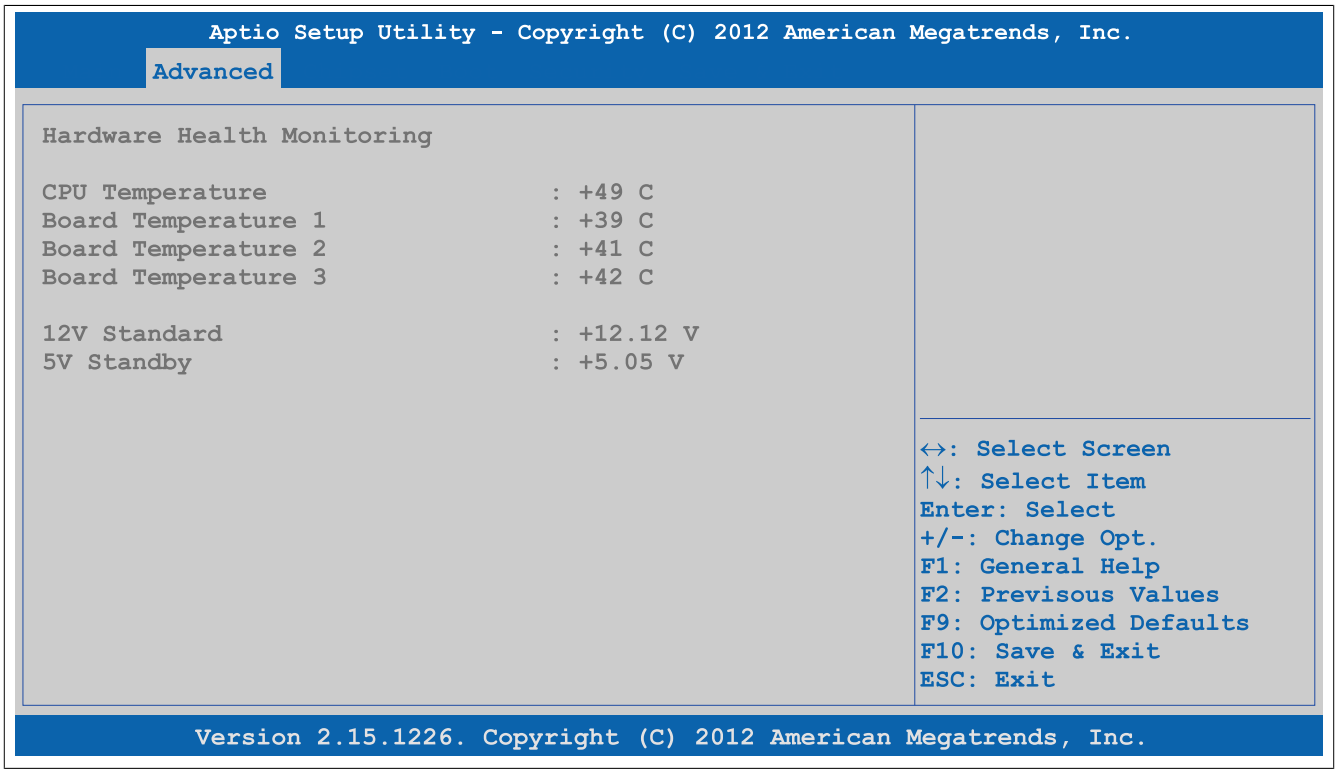


Figure 88: Advanced - Hardware Health Monitoring

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 156: Advanced - Hardware health monitoring

1.4.3 OEM features

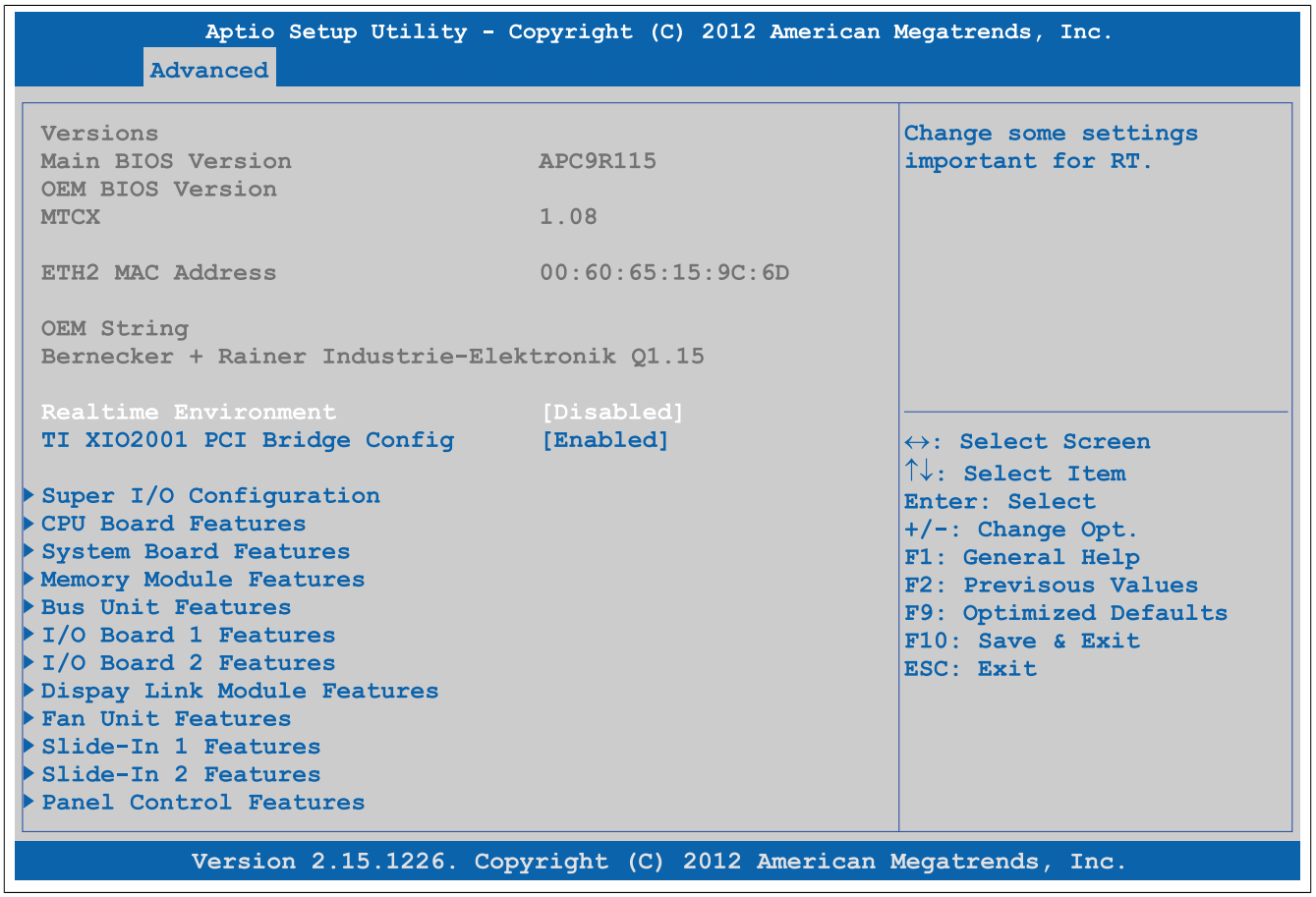


Figure 89: Advanced - OEM Features

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	-
Real-time environment	Configures settings for real-time operating systems such as ARwin	Disabled	Disables this function
		Enabled	Disables hyper-threading, turbo mode and EIST. Also disables ASPM and the IRQ of root ports 2 and 3.
TI XIO2001 PCI bridge config	Option for setting DMA access	Enabled	Optimizes DMA access
		Disabled	Disables this function
Super I/O configuration	Configures special interface settings	Enter	Opens the submenu See "Super I/O configuration" on page 190
CPU board features	Displays device-specific information for the CPU board	Enter	Opens the submenu See "CPU board features" on page 191
System board features	Displays device-specific information for the system unit	Enter	Opens the submenu See "System board features" on page 192
Memory module features	Displays device-specific information for the main memory	Enter	Opens the submenu See "Memory module features" on page 195
Bus unit features	Displays device-specific information for the bus unit	Enter	Opens the submenu See "Bus unit features" on page 196
I/O board 1 features[1)]	Displays device-specific information for interface option 1	Enter	Opens the submenu See "I/O board 1 features" on page 197
I/O board 2 features[1)]	Displays device-specific information for interface option 2	Enter	Opens the submenu See "I/O board 2 features" on page 199
Display link module features[1)]	Displays device-specific information for the monitor/panel option	Enter	Opens the submenu See "Display link module features" on page 200
Fan unit features[2)]	Displays device-specific information for the fan kit	Enter	Opens the submenu See "Fan unit features" on page 202
Slide-in features 1[3)]	Displays device-specific information for slide-in drive 1	Enter	Opens the submenu See "Slide-in 1 features" on page 204

Table 157: Advanced - OEM features screen

BIOS setting	Function	Configuration options	Effect
Slide-in features 2[3)]	Displays device-specific information for slide-in drive 2	Enter	Opens the submenu See "Slide-in 2 features" on page 206
Panel control features	Displays device-specific information for the connected panel	Enter	Opens the submenu See "Panel control features" on page 207

Table 157: Advanced - OEM features screen

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

1.4.3.1 Super I/O configuration

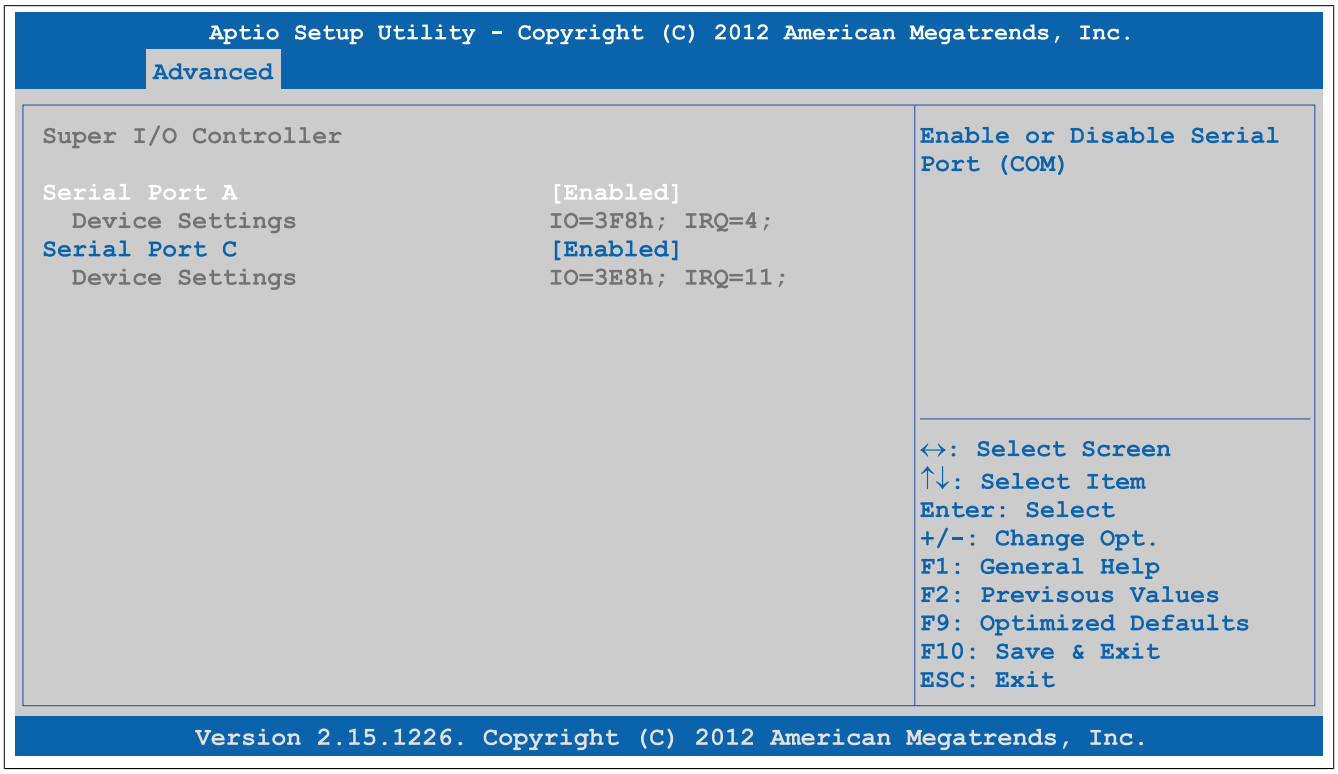


Figure 90: Advanced - OEM Features - Super I/O Configuration

BIOS setting	Function	Configuration options	Effect
Serial port A	Settings for the COM1 serial interface	Enabled	Enables the interface
		Disabled	Disables the 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 the interface
		Disabled	Disables the 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 the interface
		Disabled	Disables the 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 the interface
		Disabled	Disables the 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 the interface
		Disabled	Disables the interface
Device settings	Displays the I/O address and interrupt for the RS232 IF option in IF option slot 2	None	-
CAN controller[1)]	Setting for the CAN IF option	Enabled	Enables the interface
		Disabled	Disables the interface
Device settings	Displays the I/O address and interrupt for the CAN IF option	None	-

Table 158: Advanced - OEM features - Super I/O configuration - Setting options

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

1.4.3.2 CPU board features

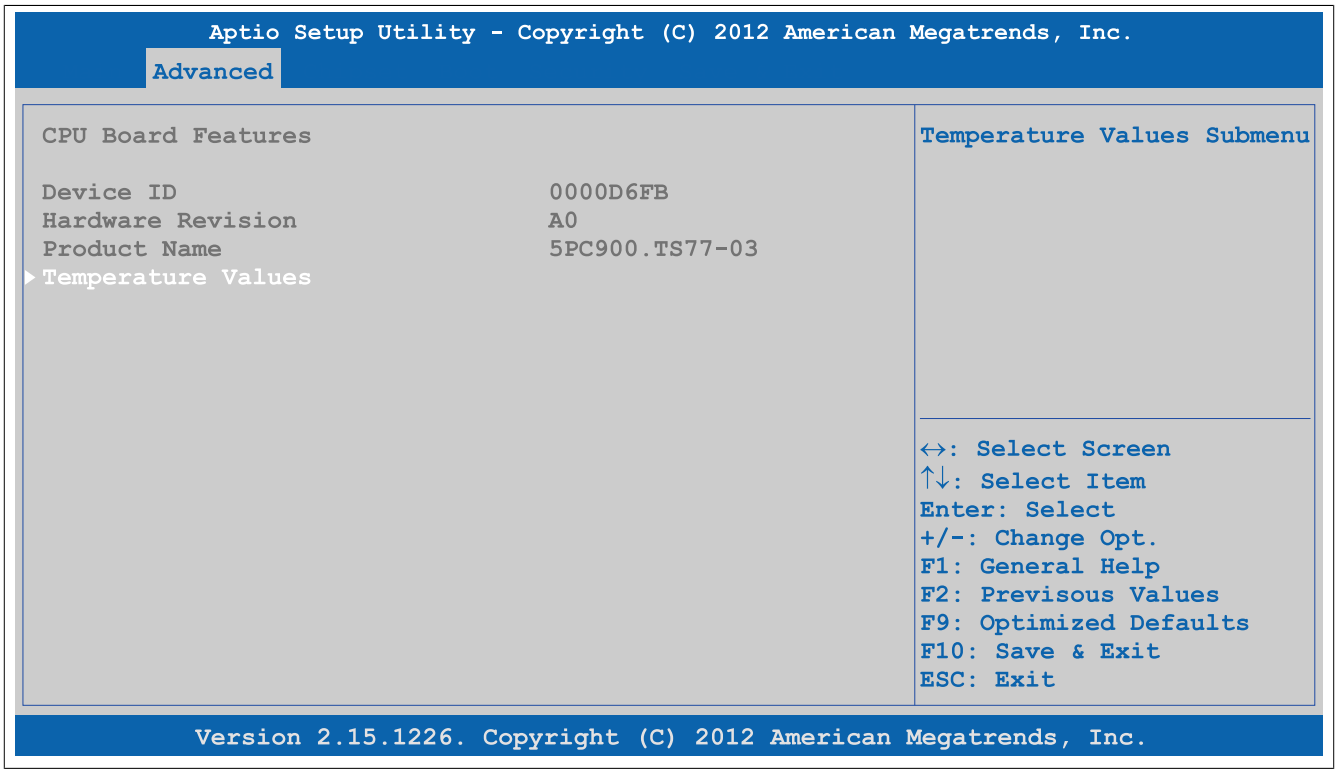


Figure 91: Advanced - OEM Features - CPU Board Features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the CPU board	None	-
Hardware revision	Displays the CPU board hardware revision	None	-
Product name	Displays the B&R model number	None	-
Temperature values	Displays current temperature values	Enter	Opens the submenu See "Temperature values" on page 191

Table 159: Advanced - OEM features - CPU board features

1.4.3.2.1 Temperature values

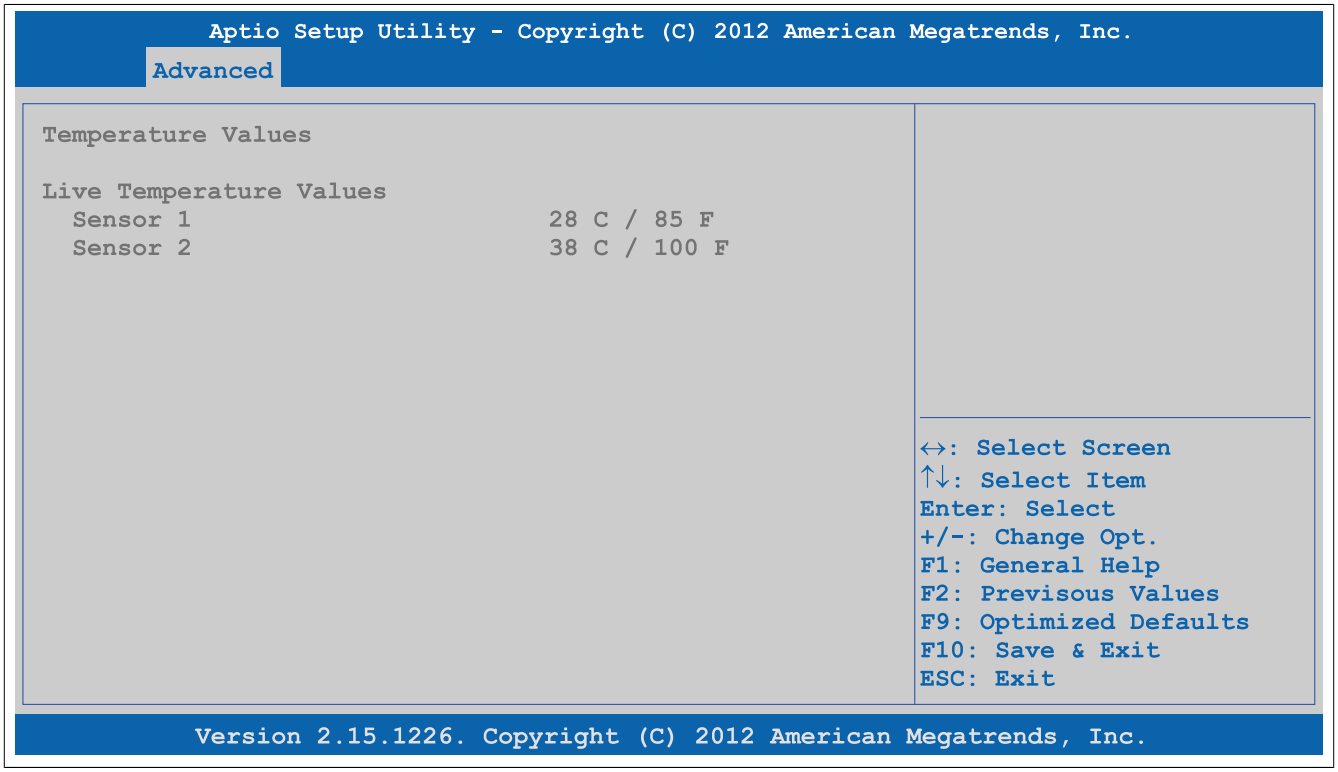


Figure 92: Advanced - OEM Features - CPU Board Features - Temperature Values

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

Table 160: Advanced - OEM features - CPU board features - Temperature values

1.4.3.3 System board features

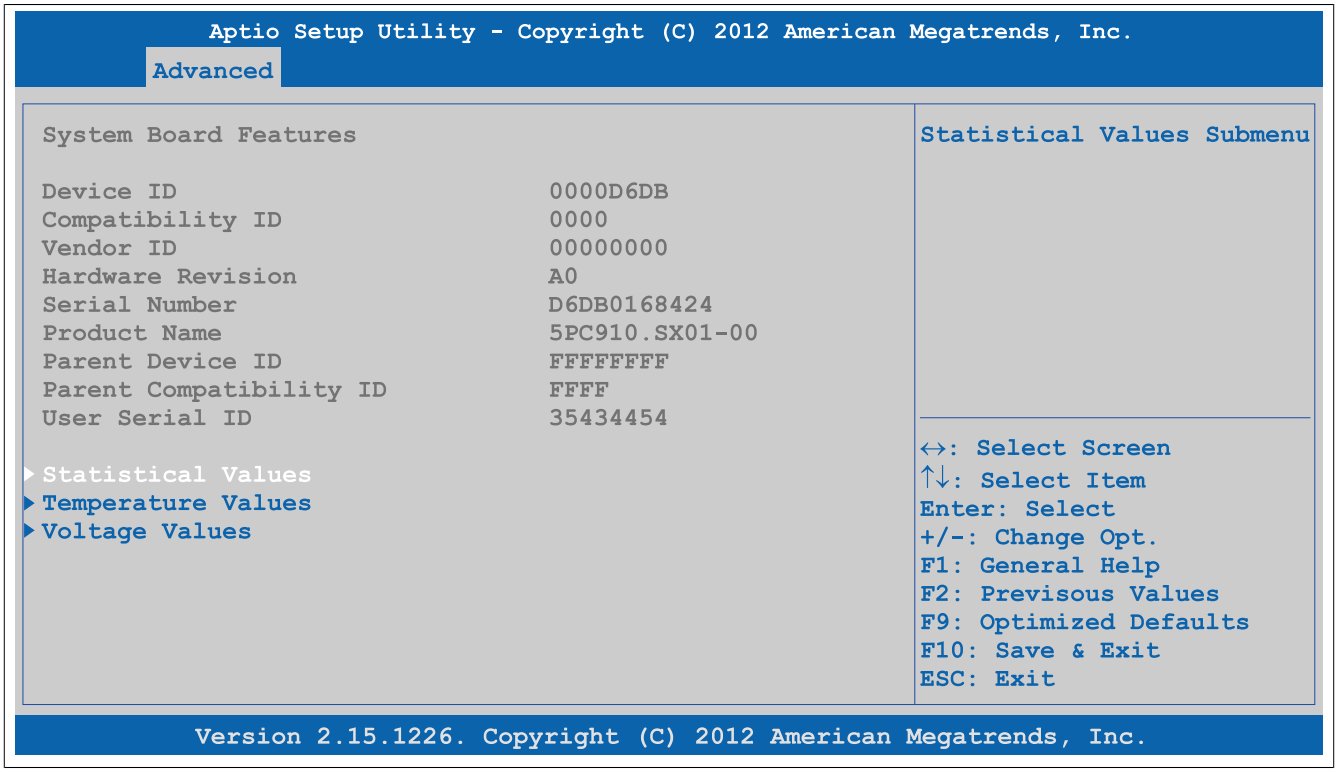


Figure 93: Advanced - OEM Features - System Board Features

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 system board hardware revision	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 the submenu See "Statistical values" on page 193
Temperature values	Displays current temperature values	Enter	Opens the submenu See "Temperature values" on page 193
Voltage control	Displays current battery properties	Enter	Opens the submenu See "Voltage values" on page 194

Table 161: Advanced - OEM features - System board features

1.4.3.3.1 Statistical values

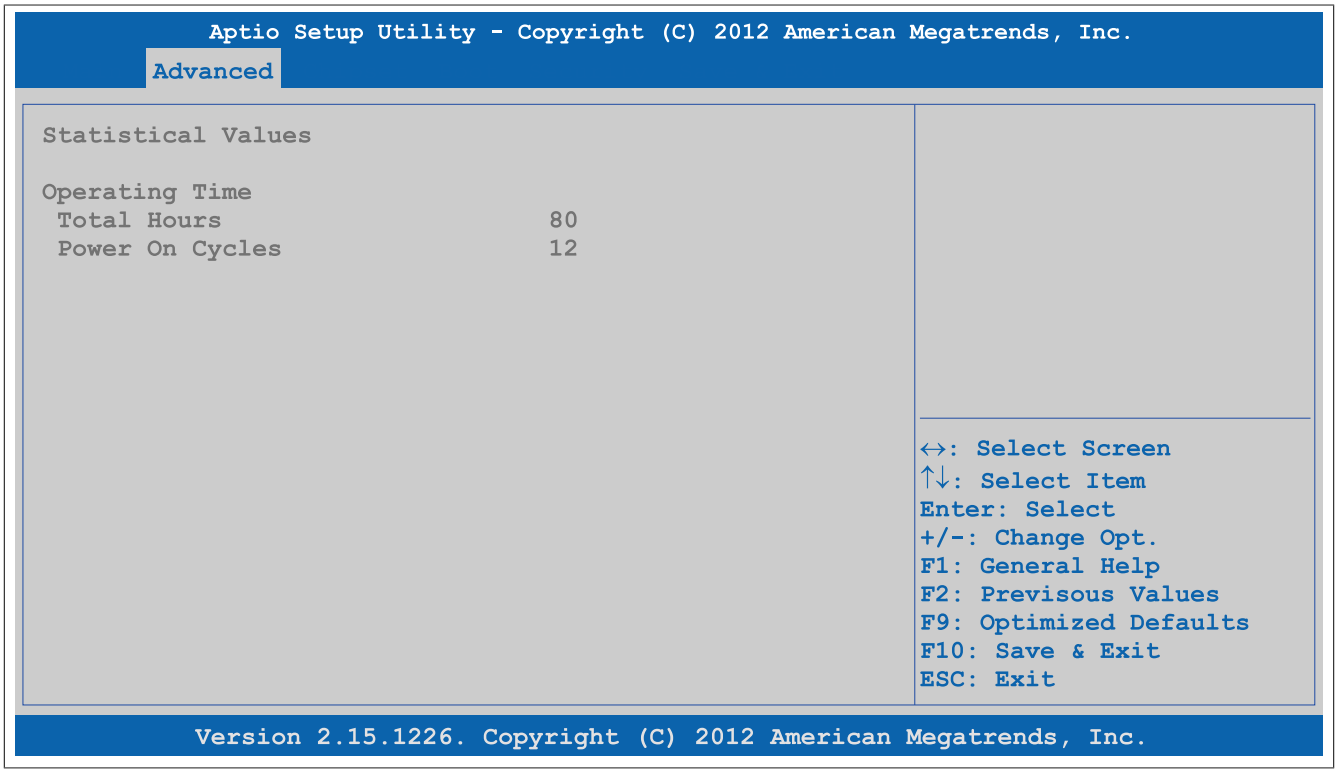


Figure 94: Advanced - OEM Features - System Board Features - Statistical Values

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

1.4.3.3.2 Temperature values

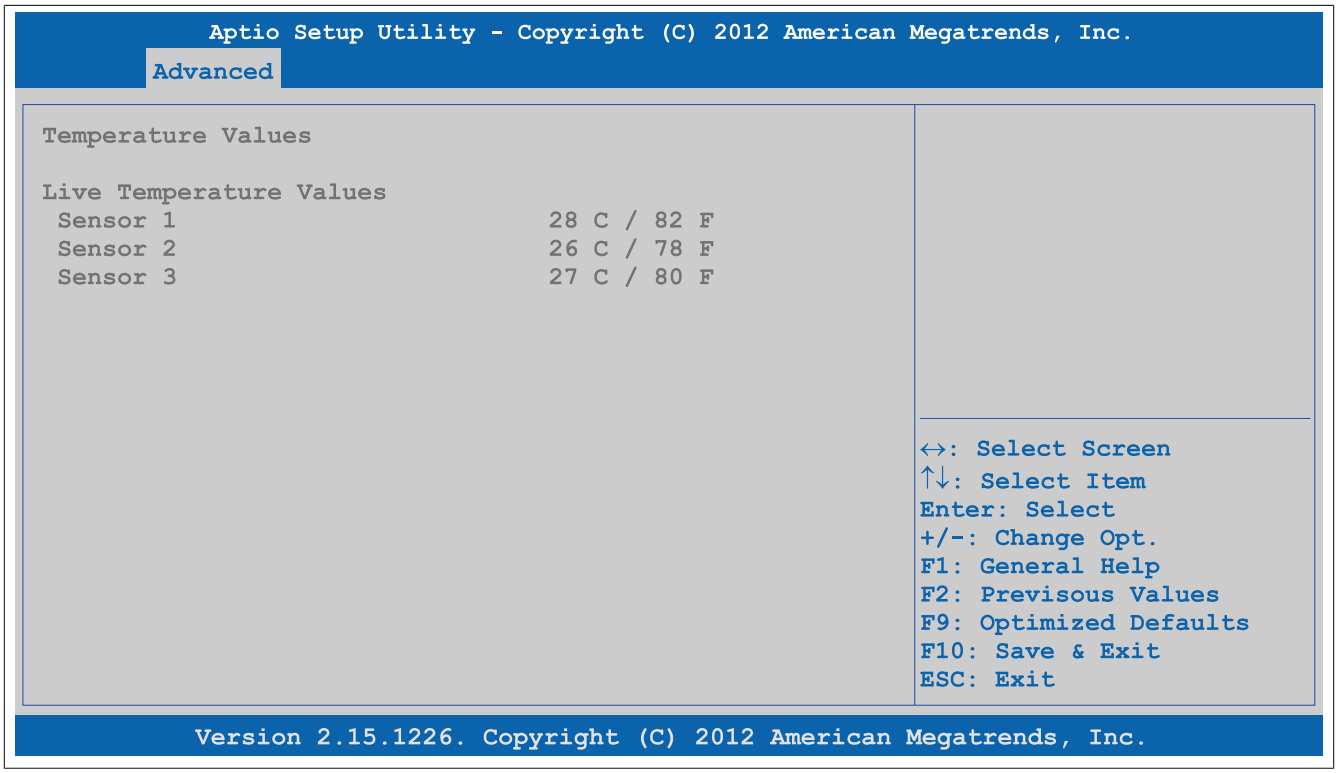


Figure 95: Advanced - OEM Features - System Board Features - Temperature Values

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 163: Advanced - OEM features - System board features - Temperature values

1.4.3.3.3 Voltage values

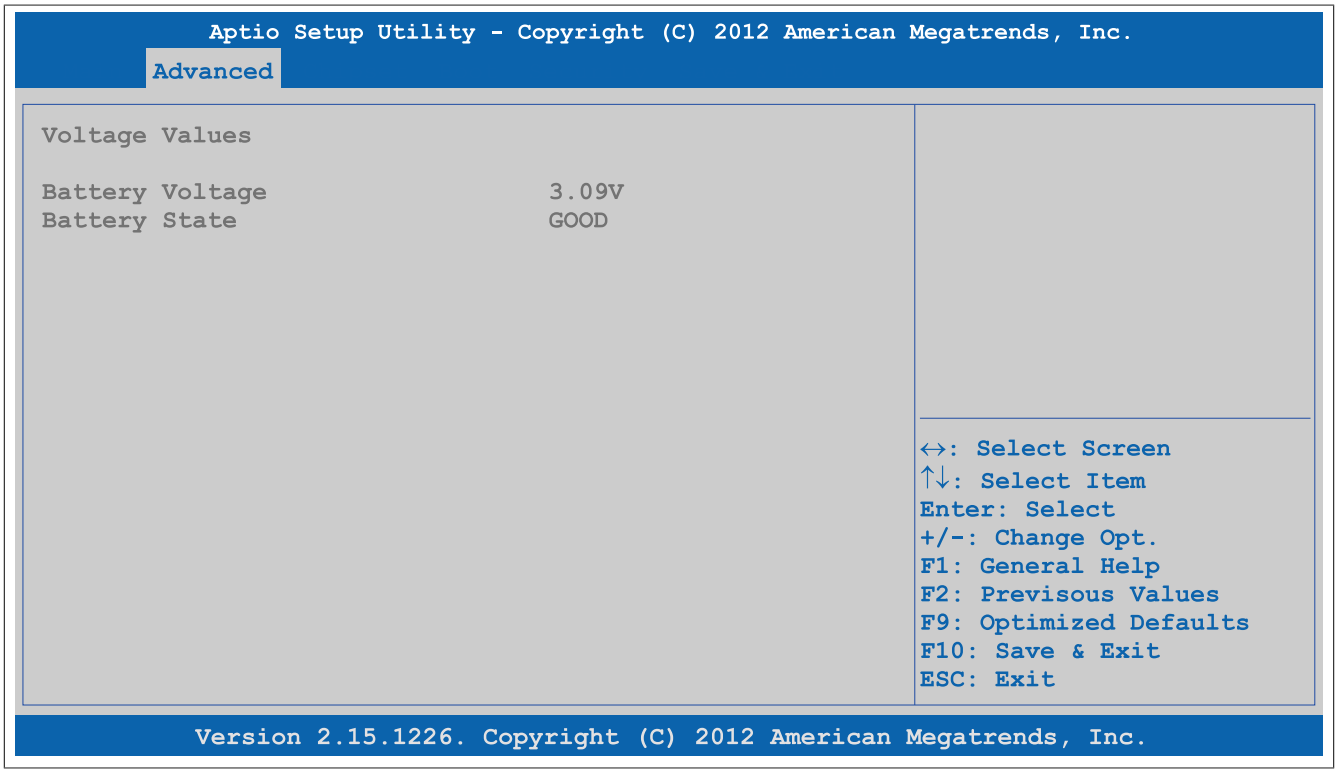


Figure 96: Advanced - OEM Features - System Board Features - Voltage Values

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

1.4.3.4 Memory module features

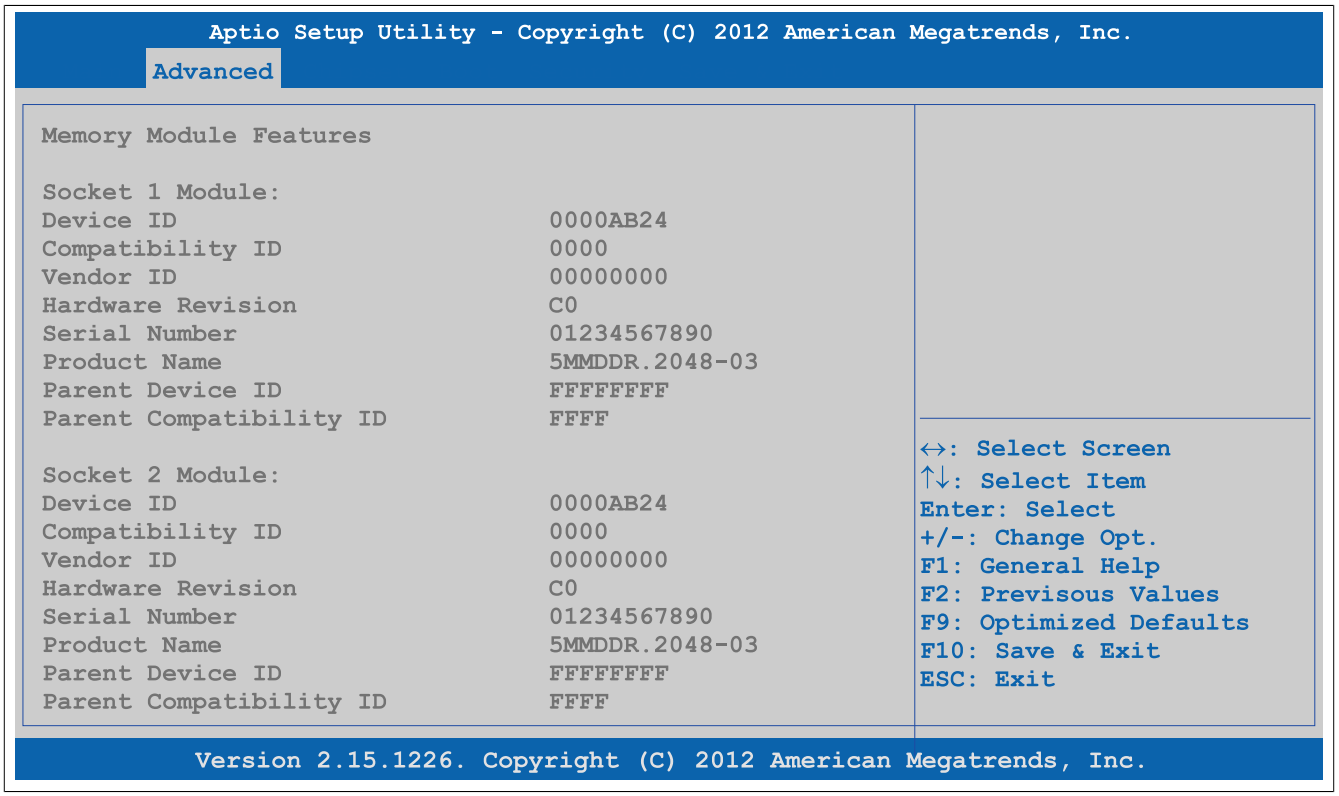


Figure 97: Advanced - OEM Features - Memory Module Features

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 165: Advanced - OEM features - Memory module features

1.4.3.5 Bus unit features

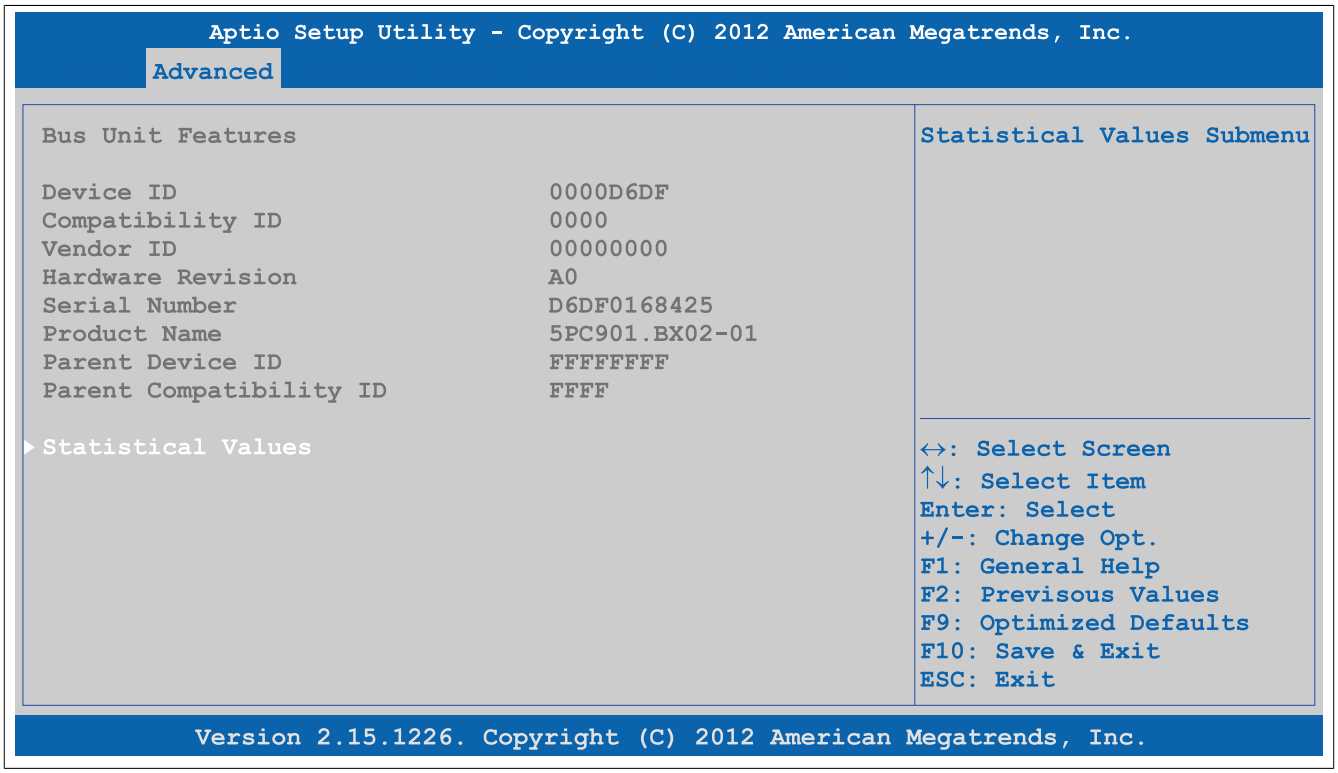


Figure 98: Advanced - OEM Features - Bus Unit Features

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 the submenu See "Statistical values" on page 197

Table 166: Advanced - OEM features - Bus unit features

1.4.3.5.1 Statistical values

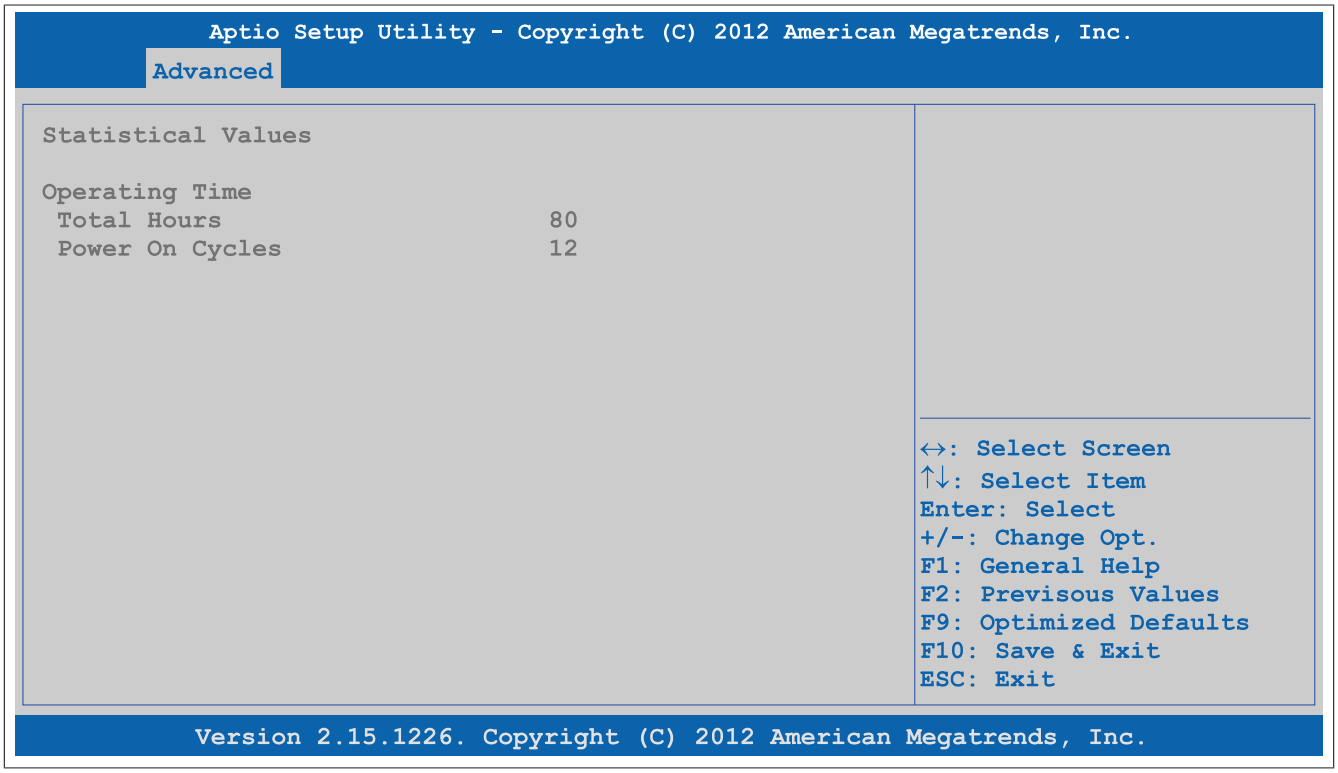


Figure 99: Advanced - OEM Features - Bus Unit Features - Statistical Values

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

1.4.3.6 I/O board 1 features

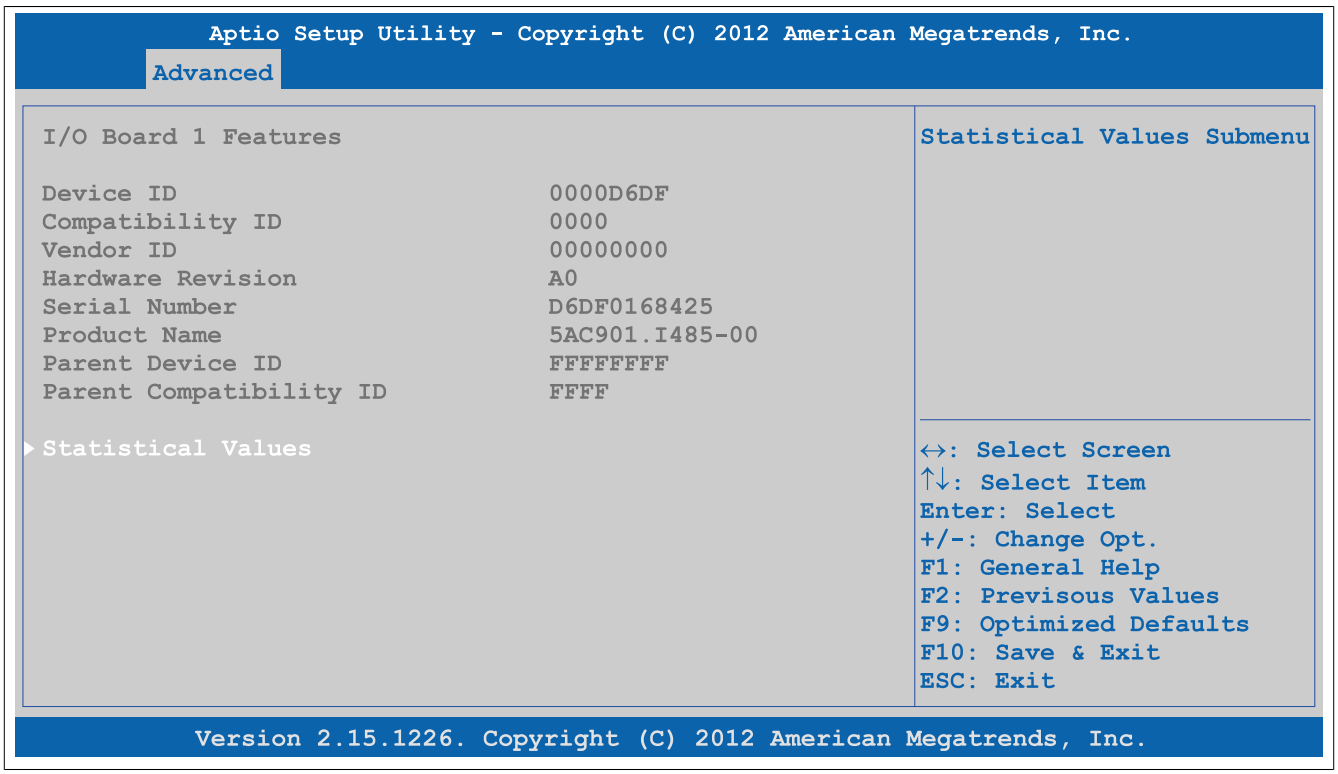


Figure 100: Advanced - OEM features - I/O board 1 features

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 the submenu See "Statistical values" on page 198

Table 168: Advanced - OEM features - I/O board 1 features

1.4.3.6.1 Statistical values

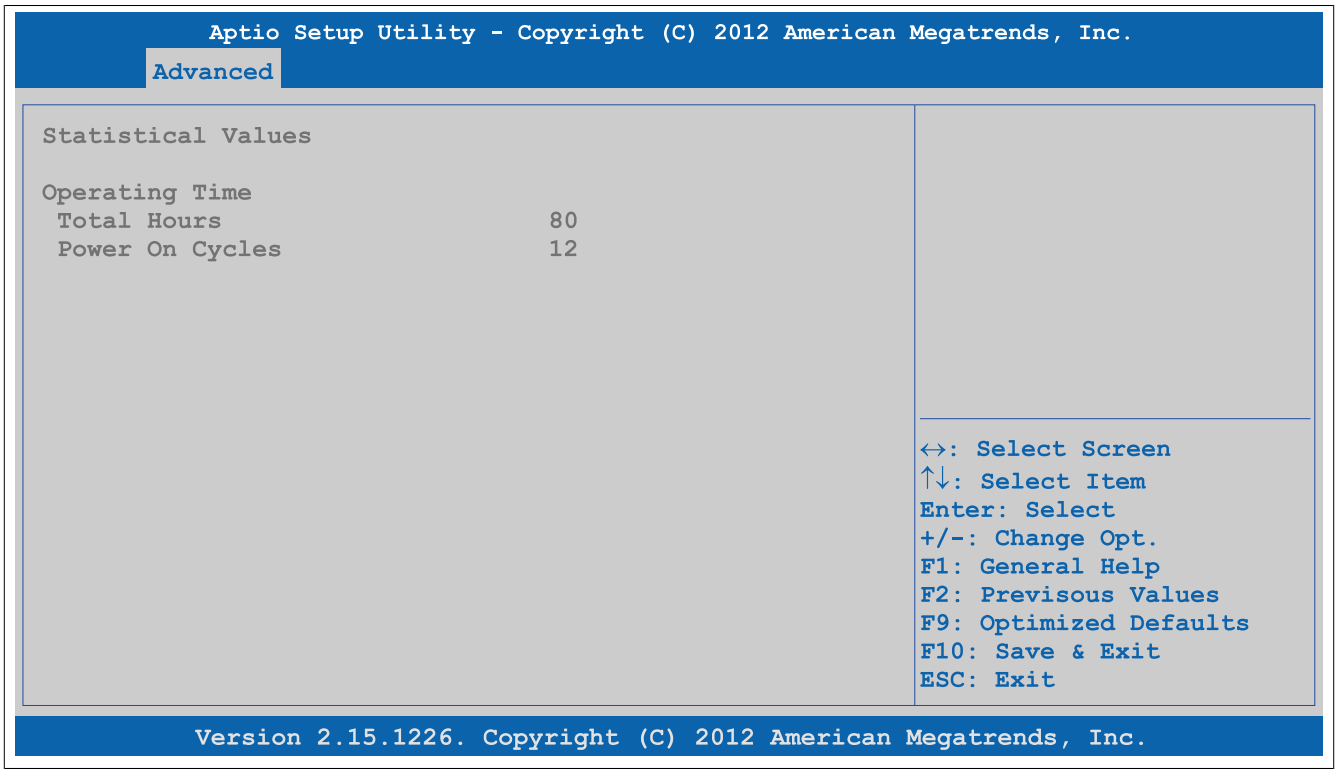


Figure 101: Advanced - OEM features - I/O board 1 features - Statistical values

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 169: Advanced - OEM features - I/O board 1 features - Statistical values

1.4.3.7 I/O board 2 features

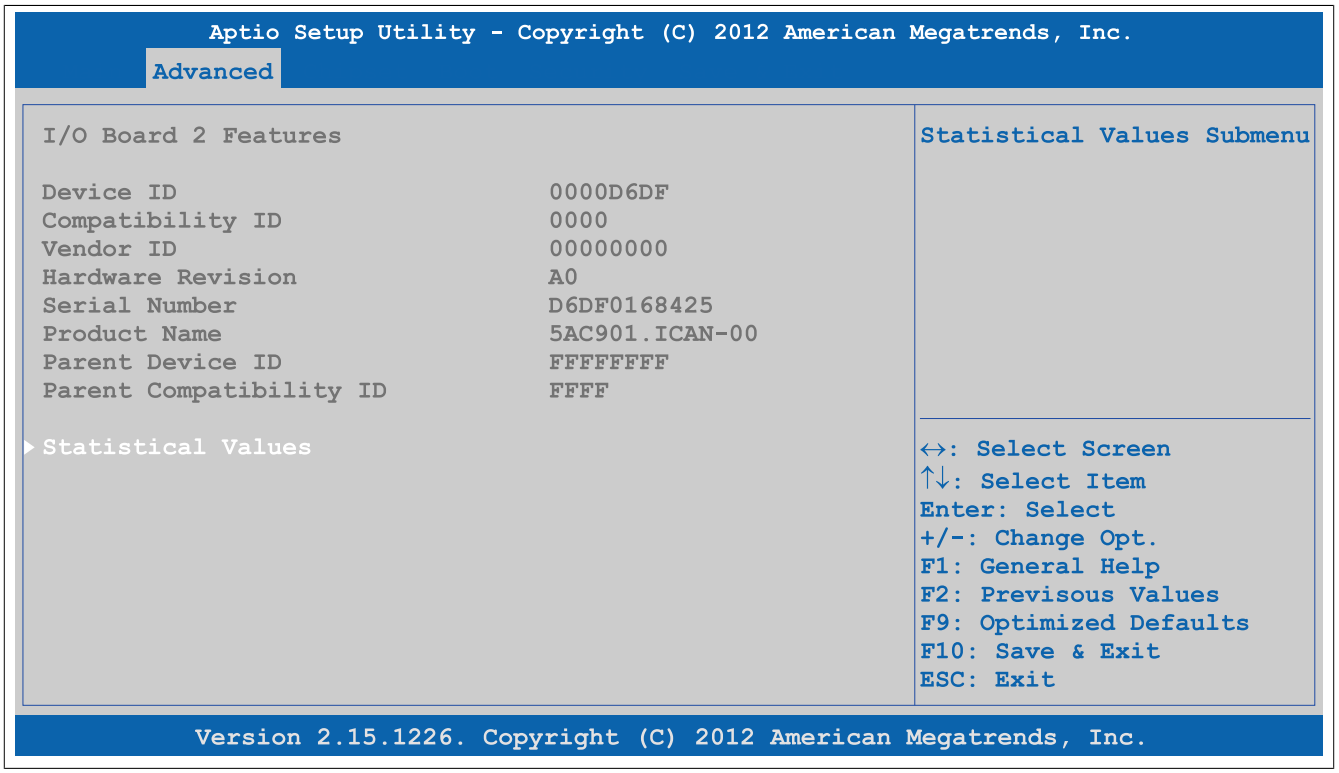


Figure 102: Advanced - OEM features - I/O board 2 features

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 the submenu See "Statistical values" on page 200

Table 170: Advanced - OEM features - I/O board 2 features

1.4.3.7.1 Statistical values

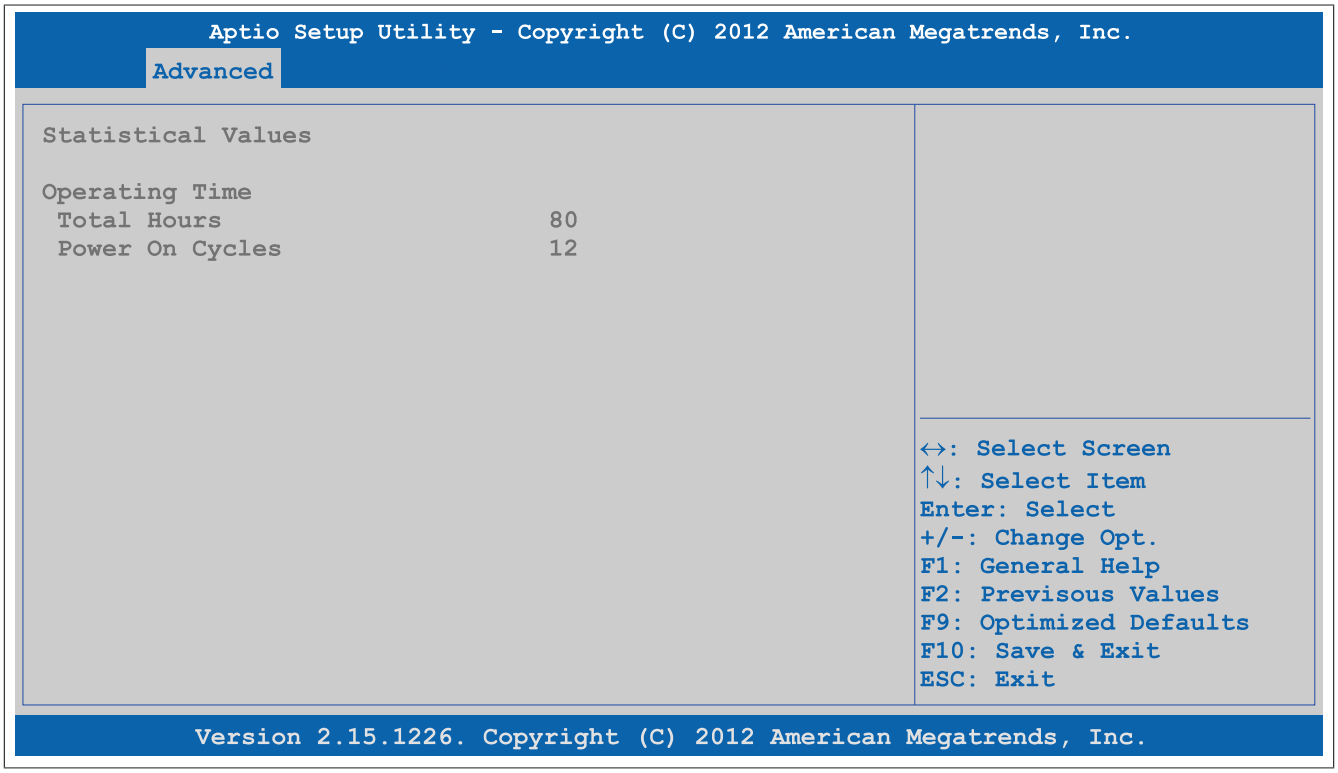


Figure 103: Advanced - OEM features - I/O board 2 features - Statistical values

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 171: Advanced - OEM features - I/O board 2 features - Statistical values

1.4.3.8 Display link module features

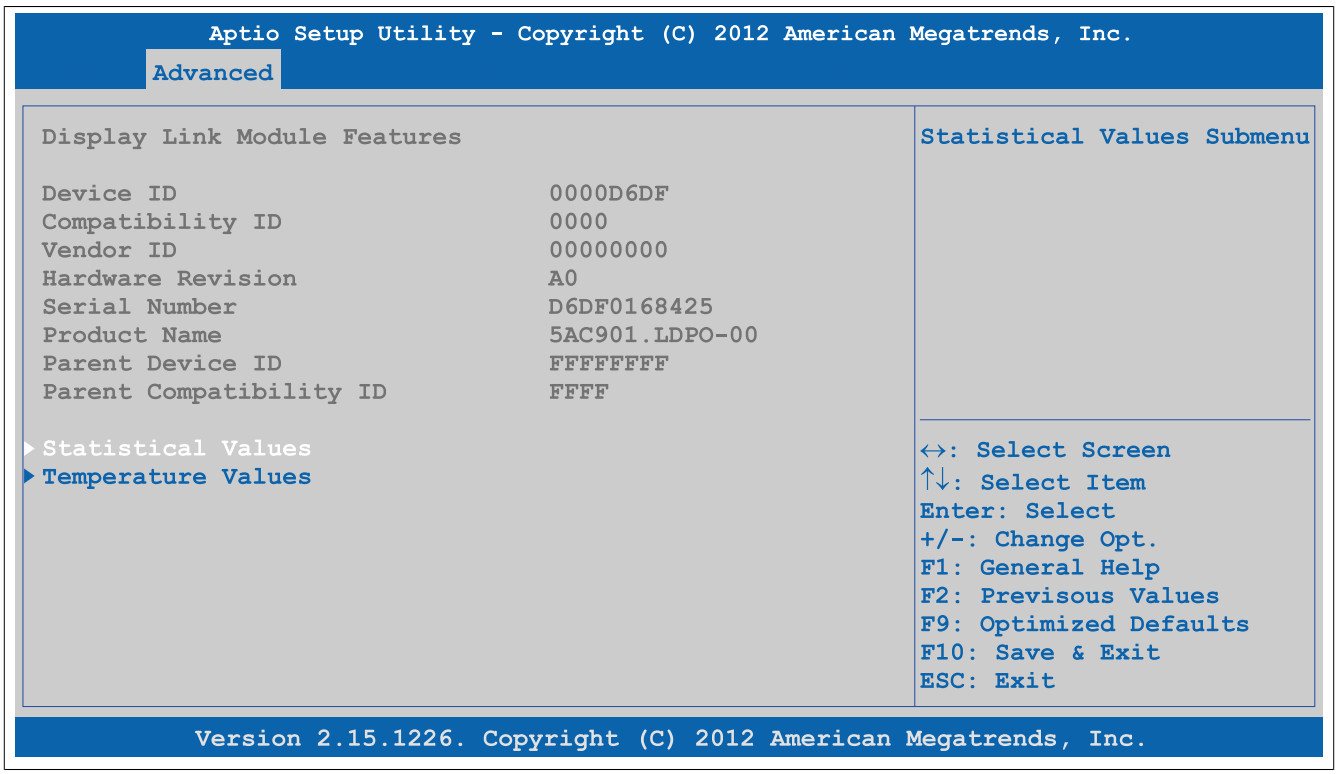


Figure 104: Advanced - OEM features - Display link module features

BIOS setting	Function	Configuration options	Effect
Device ID	Displays the device ID of the monitor/panel option	None	-
Compatibility ID	Displays the version of the device within the same B&R device ID. This ID is needed for Automation Runtime.	None	-
Vendor ID	Displays the vendor ID	None	-
Hardware revision	Displays the hardware revision of the monitor/panel option	None	-
Serial number	Displays the B&R serial number	None	-
Product name	Displays the B&R model number	None	-
Parent device ID	Displays the manufacturer number	None	-
Parent compatibility ID	Displays the manufacturer ID	None	-
Statistical values	Displays statistical values	Enter	Opens the submenu See "Statistical values" on page 201
Temperature values	Displays current temperature values	Enter	Opens the submenu See "Temperature values" on page 202

Table 172: Advanced - OEM features - Display link module features

1.4.3.8.1 Statistical values

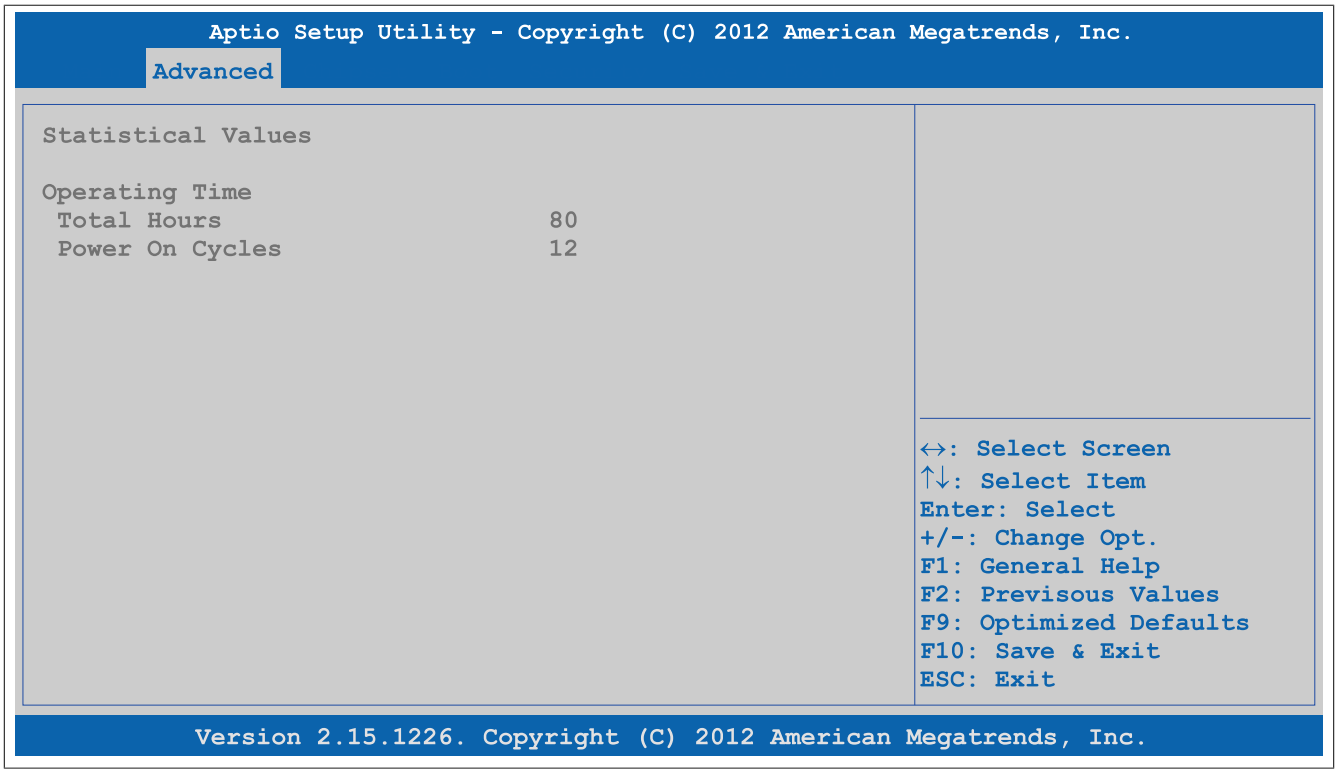


Figure 105: Advanced - OEM features - Display link module features - Statistical values

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

1.4.3.8.2 Temperature values

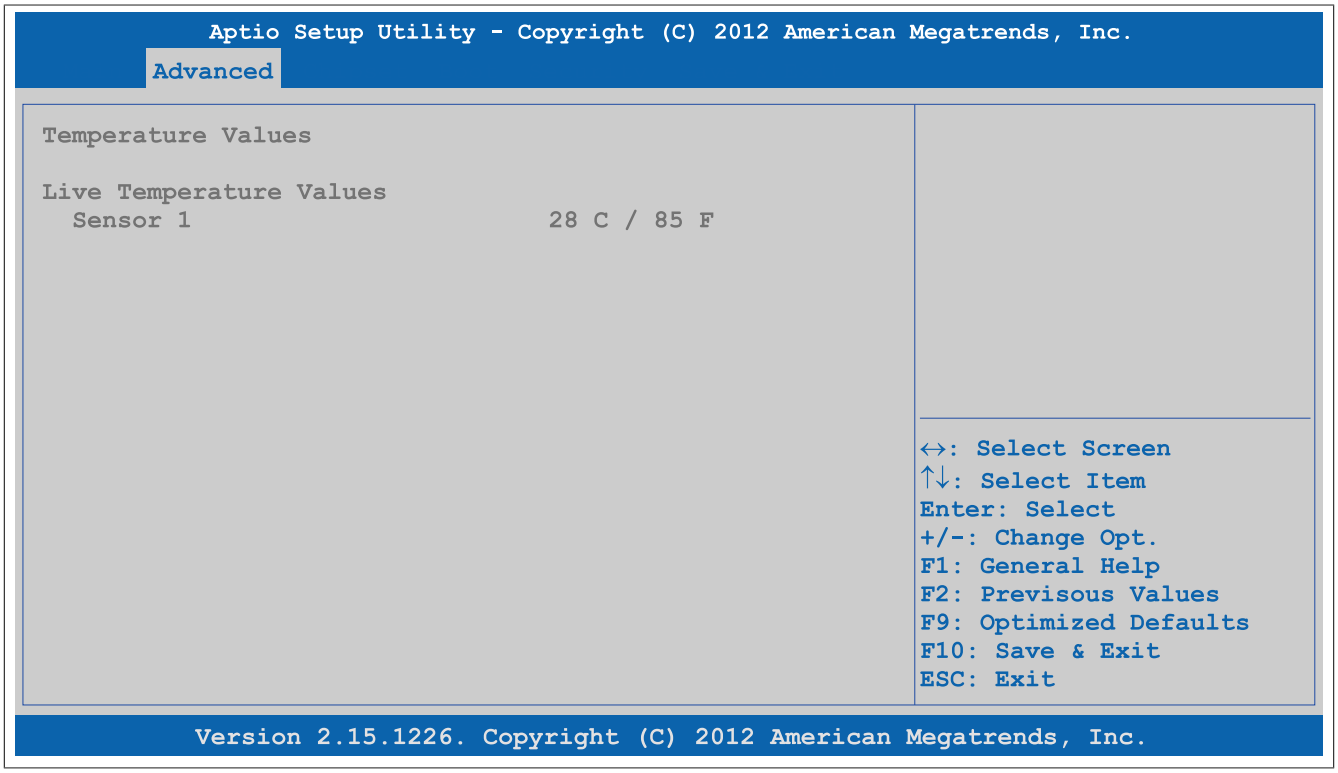


Figure 106: Advanced - OEM features - Display link module features - Temperature values

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

Table 174: Advanced - OEM features - Display link module features - Temperature values

1.4.3.9 Fan unit features

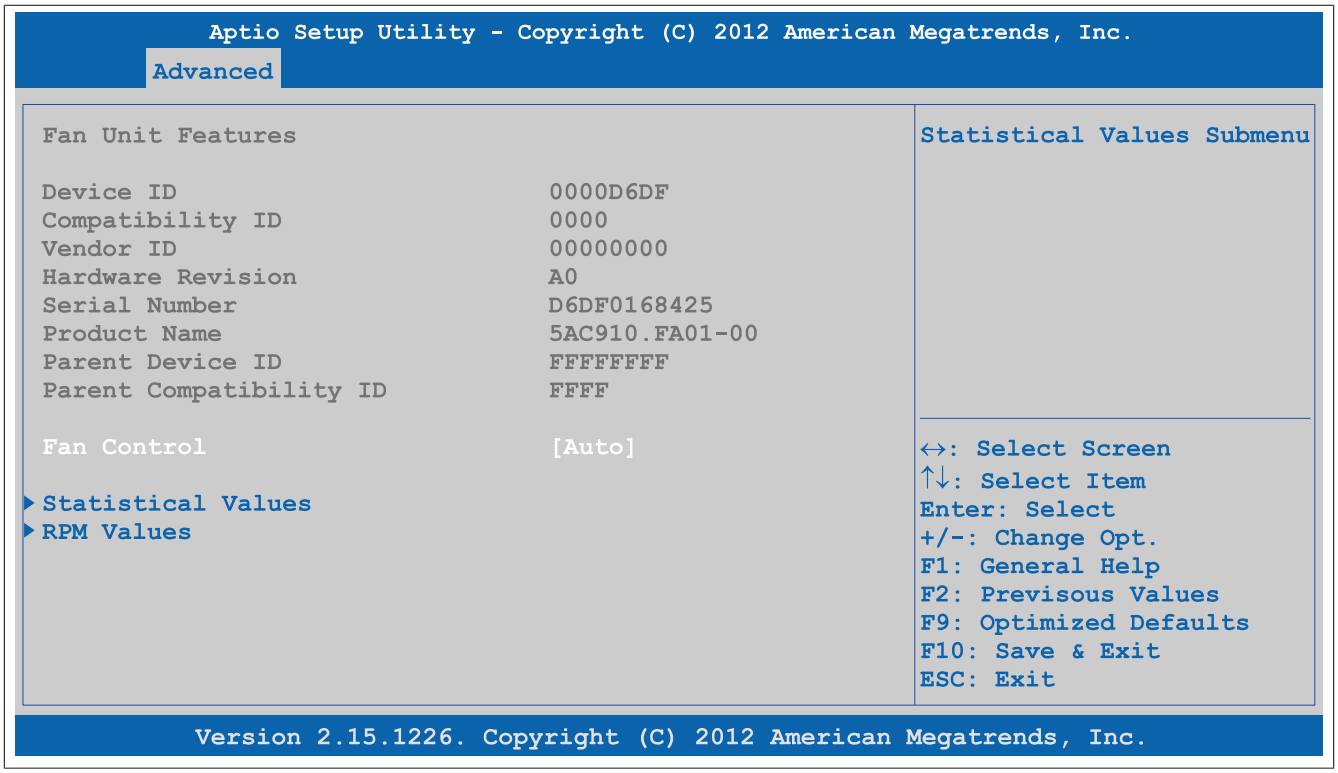


Figure 107: Advanced - OEM features - Fan unit features

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 the submenu See "Statistical values" on page 203
RPM values	Displays the speed (in RPM) of the individual fans in the fan kit	Enter	Opens the submenu See "RPM values" on page 204

Table 175: Advanced - OEM features - Fan unit features

1.4.3.9.1 Statistical values

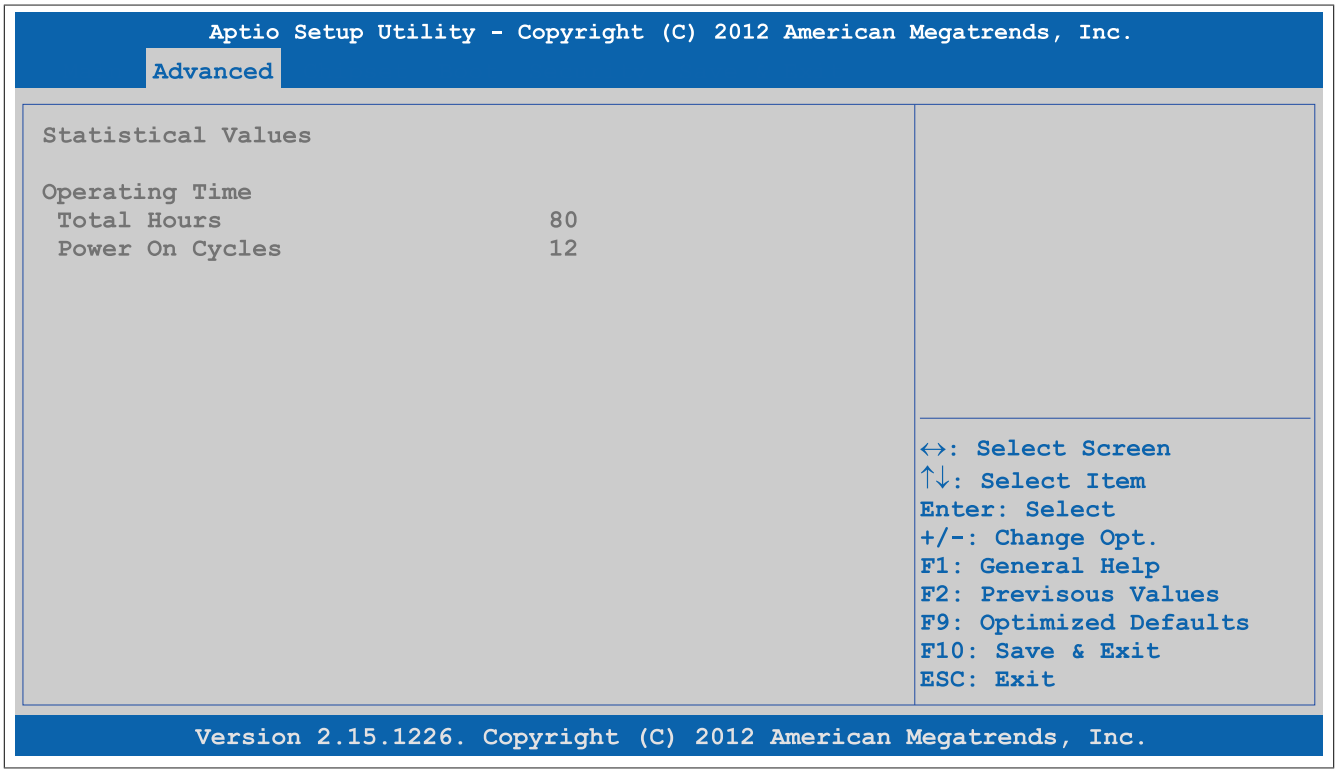


Figure 108: Advanced - OEM features - Fan unit features - Statistical values

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 176: Advanced - OEM features - Fan unit features - Statistical values

1.4.3.9.2 RPM values

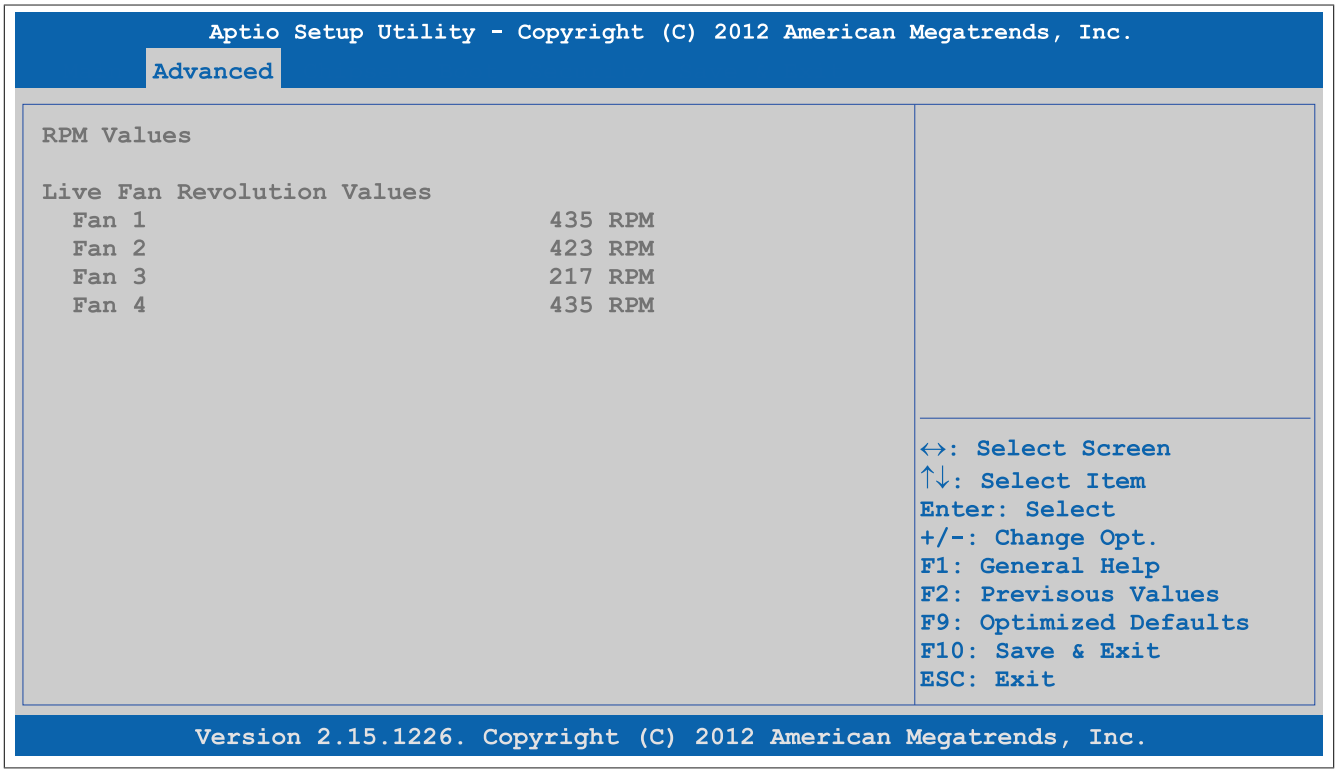


Figure 109: Advanced - OEM features - Fan unit features - RPM values

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

1.4.3.10 Slide-in 1 features

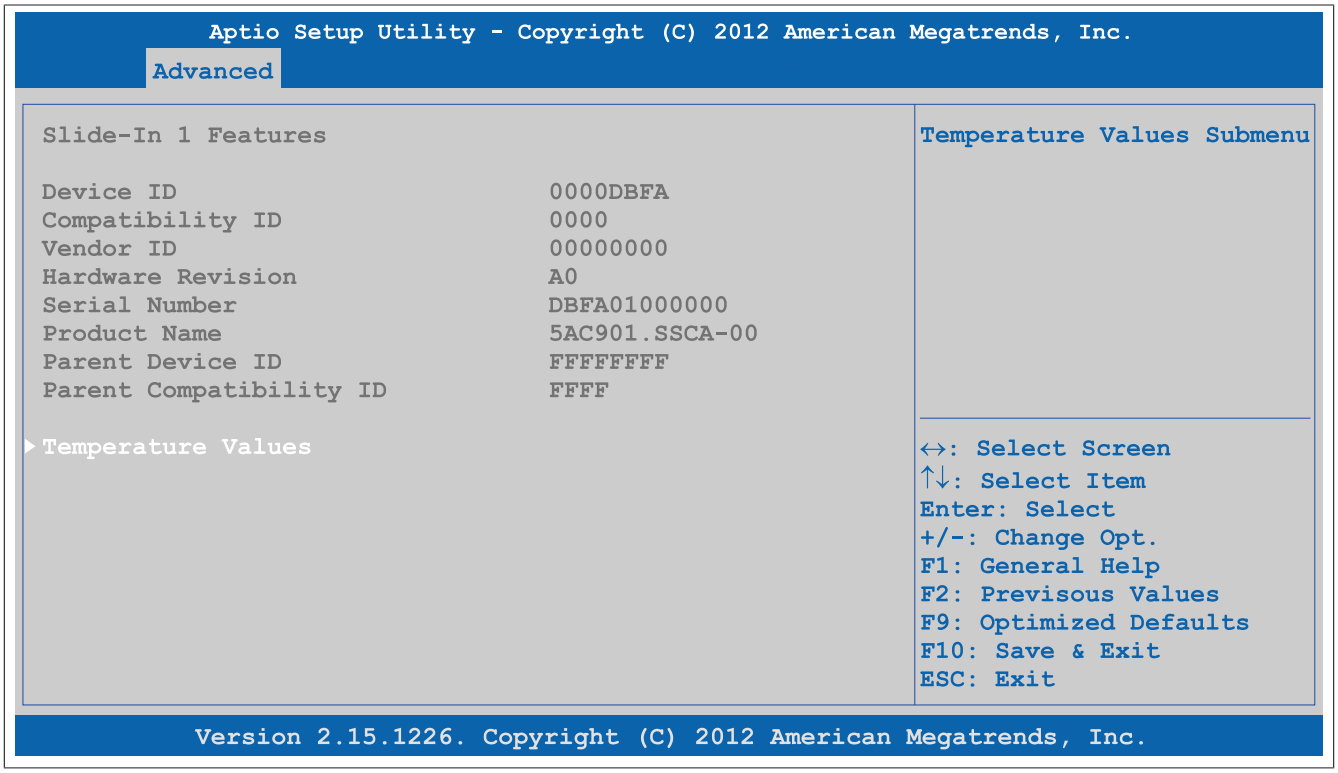


Figure 110: Advanced - OEM Features - Slide-in 1 features

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	-
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	-
Temperature values	Displays current temperature values	Enter	Opens the submenu See "Temperature values" on page 205

Table 178: Advanced - OEM Features - Slide-in 1 features

1.4.3.10.1 Temperature values

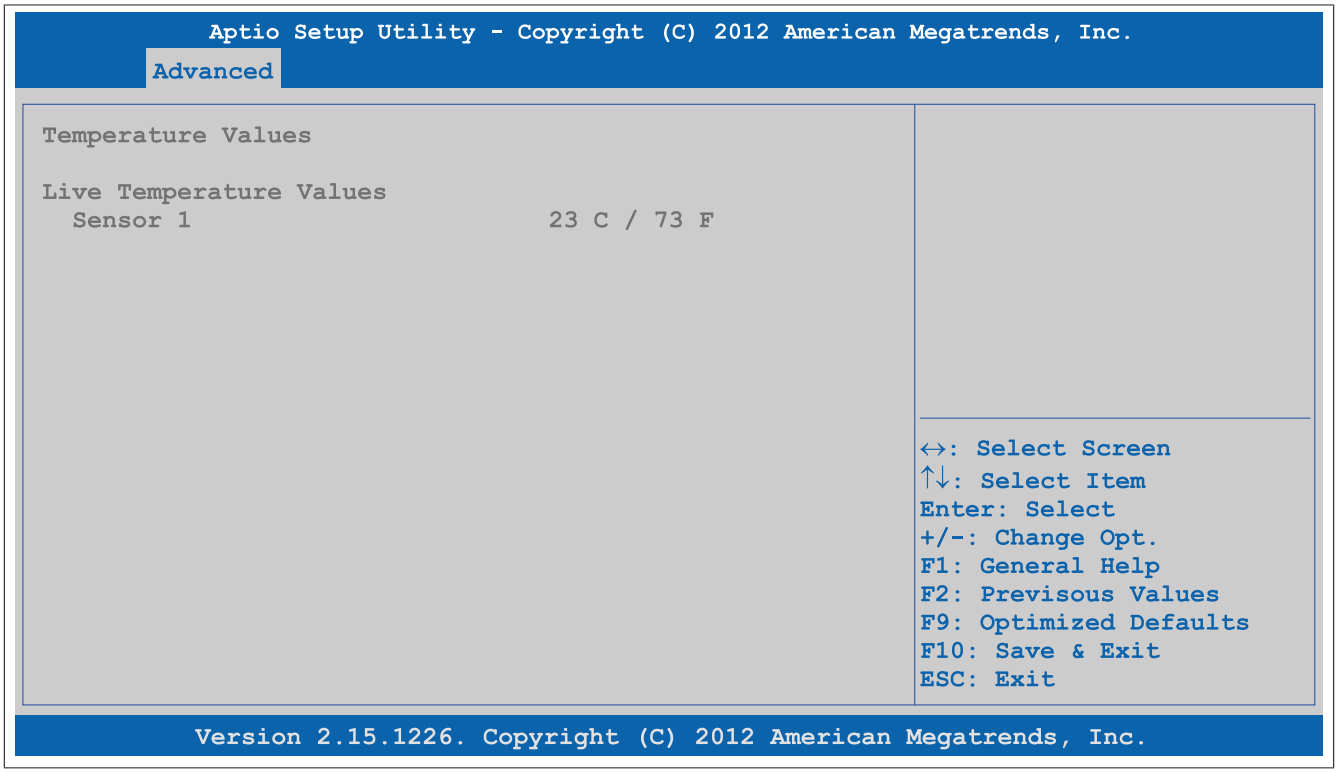


Figure 111: Advanced - OEM features - Slide-in 1 features - Temperature values

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

1.4.3.11 Slide-in 2 features

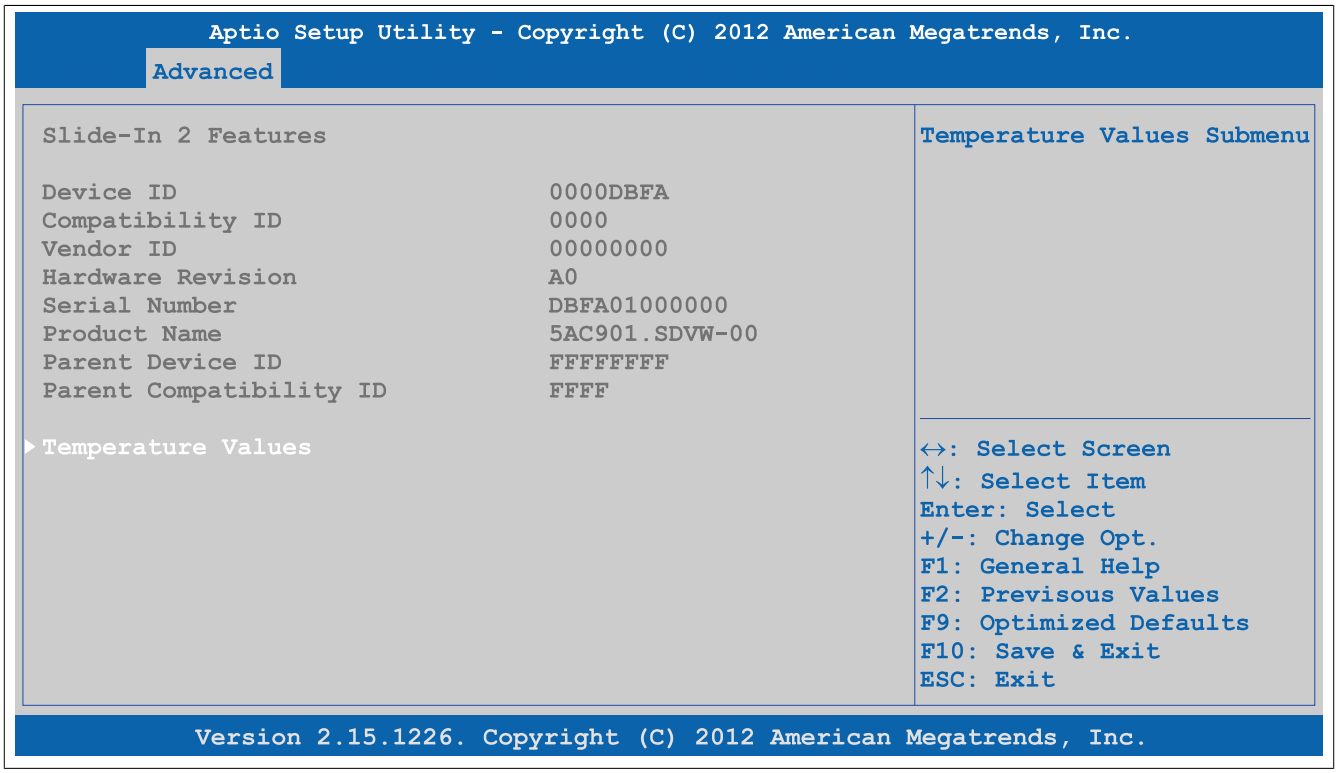


Figure 112: Advanced - OEM Features - Slide-in 2 features

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	-
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	-
Temperature values	Displays current temperature values	Enter	Opens the submenu See "Temperature values" on page 207

Table 180: Advanced - OEM Features - Slide-in 2 features

1.4.3.11.1 Temperature values

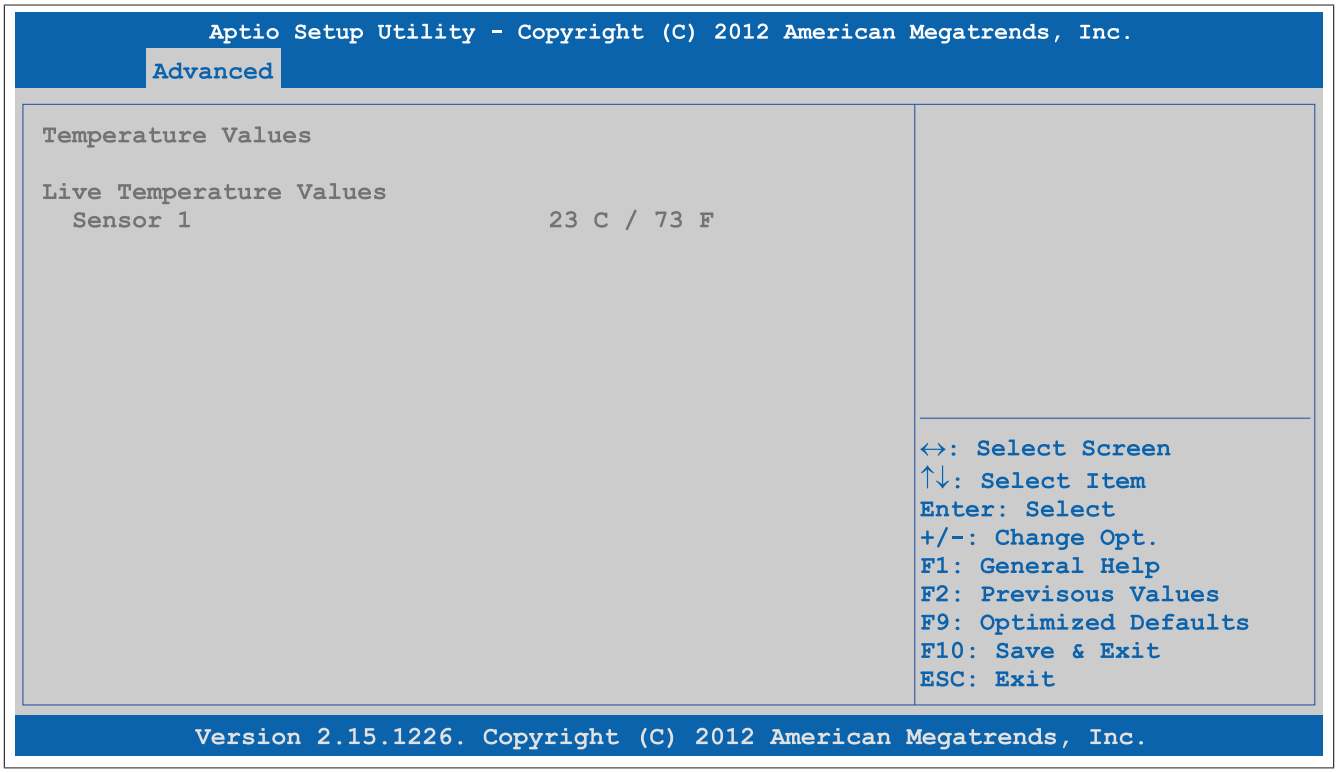


Figure 113: Advanced - OEM features - Slide-in 2 features - Temperature values

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 181: Advanced - OEM features - Slide-in 2 features - Temperature values

1.4.3.12 Panel control features

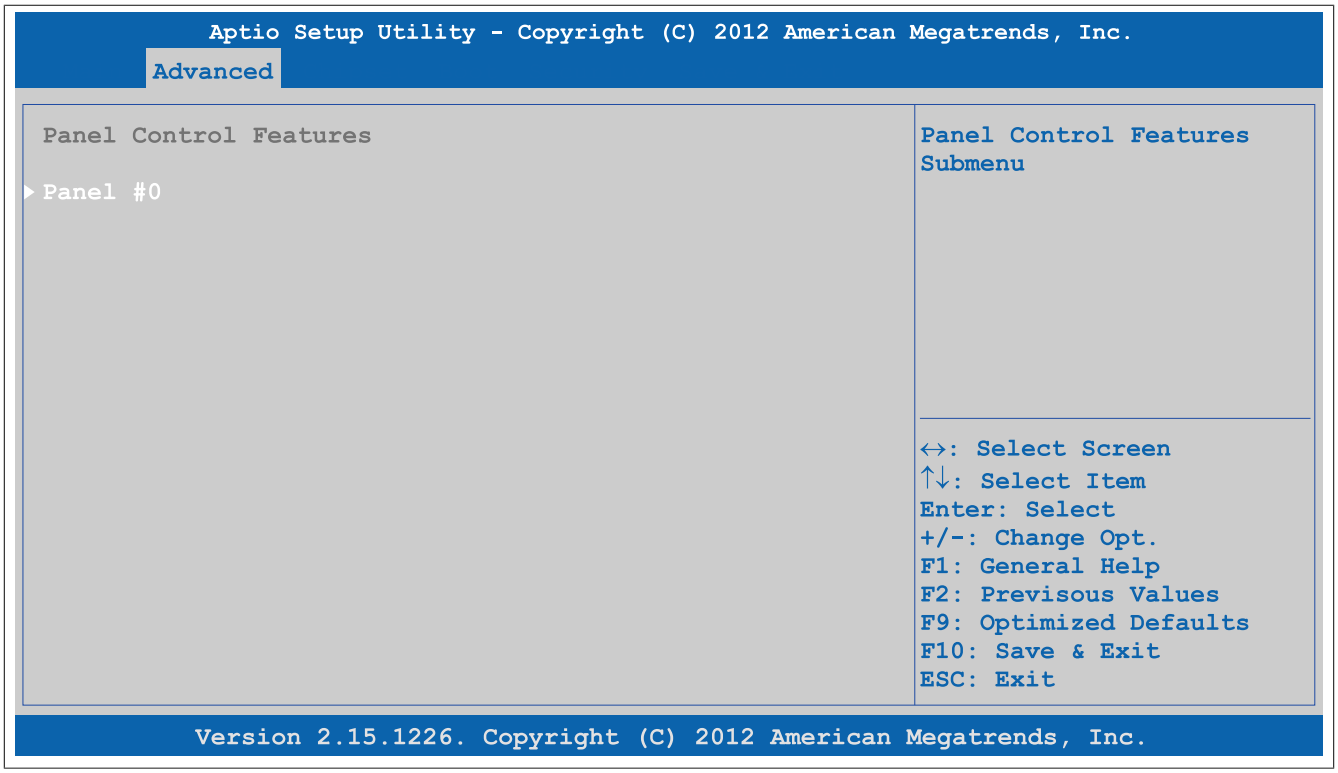


Figure 114: Advanced - OEM Features - Panel Control Features

BIOS setting	Function	Configuration options	Effect
Panel #X	Displays the panel properties of the connected panel	Enter	Opens the submenu See "Panel #X" on page 208

Table 182: Advanced - OEM features - Panel control features

1.4.3.12.1 Panel #X

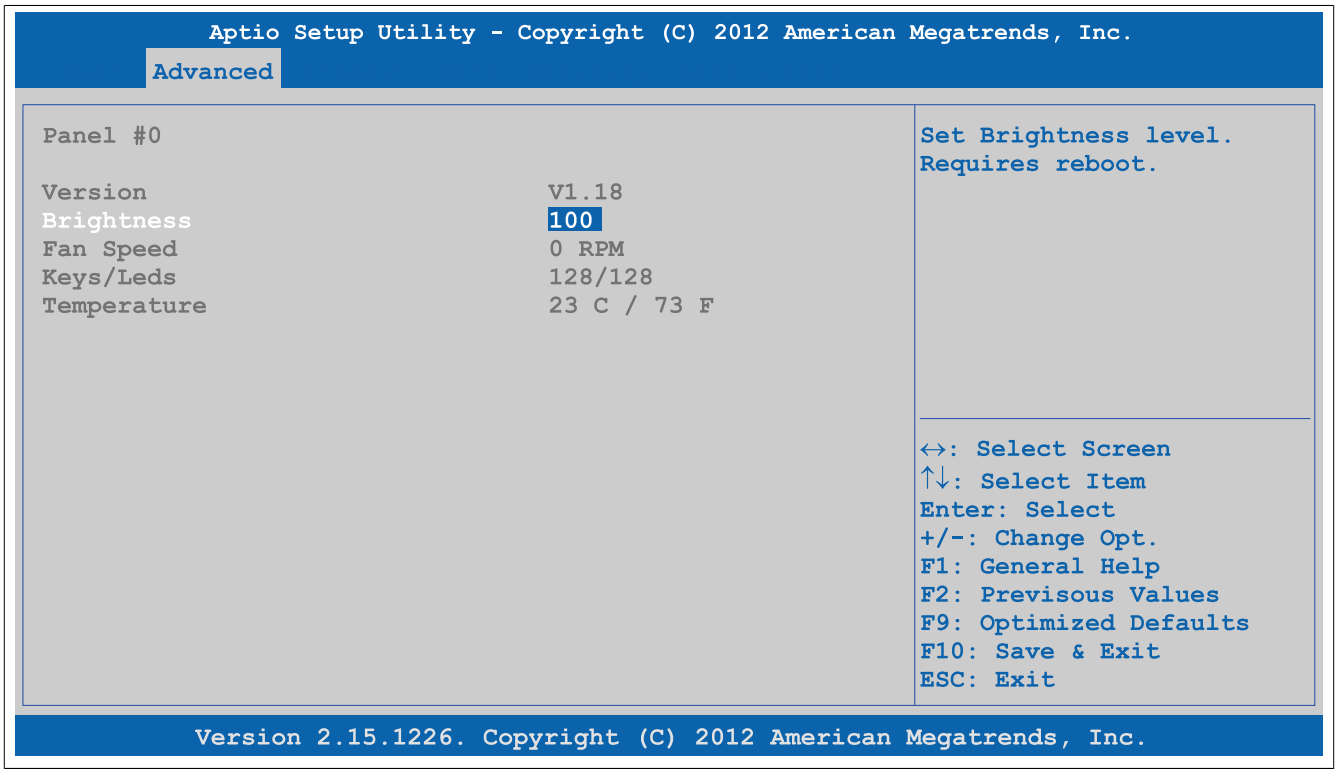


Figure 115: Advanced - OEM Features - Panel Control Features - Panel #x

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 183: Advanced - OEM features - Panel control features - Panel #X

1.4.4 PCI configuration

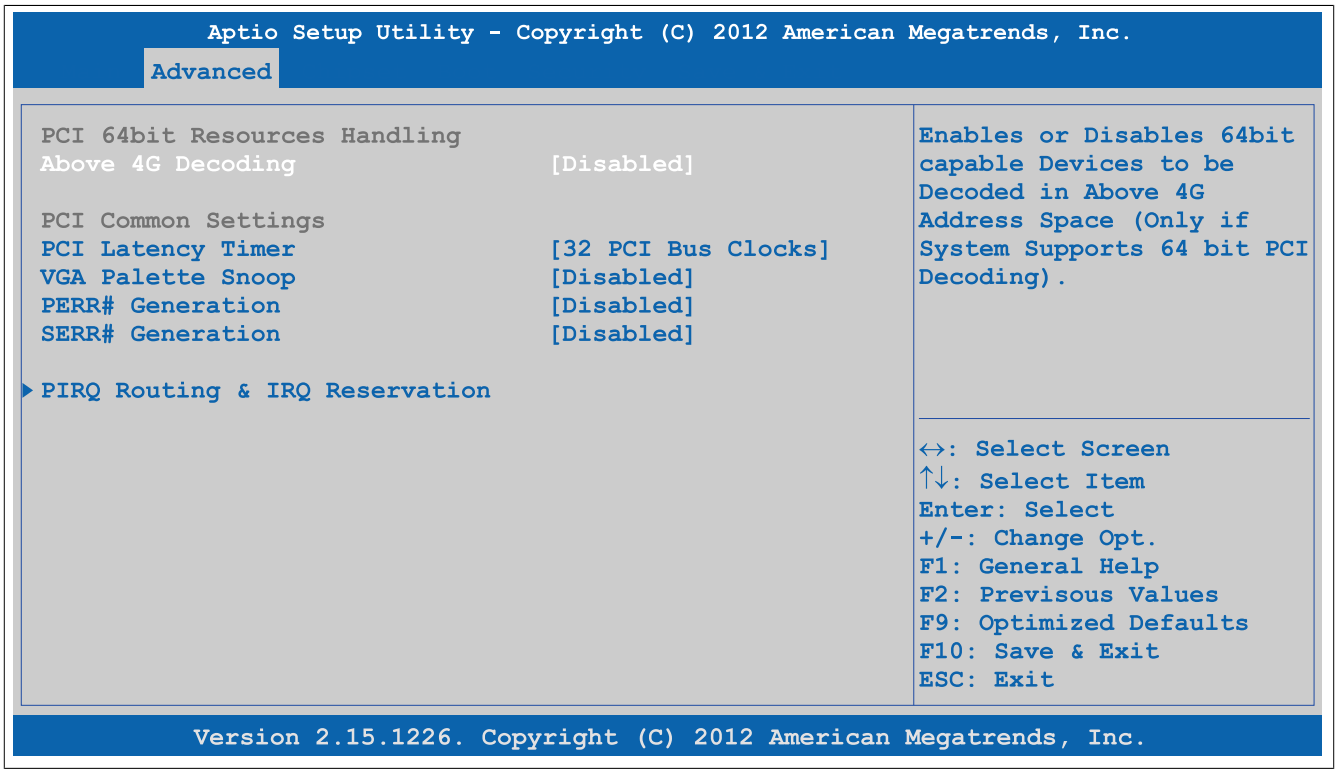


Figure 116: Advanced - PCI Configuration

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
PIRQ routing & IRQ reservation	Configures PIRQ routing	Enter	Opens the submenu See "PIRQ routing & IRQ reservation" on page 210

Table 184: Advanced - PCI configuration - Configuration options

1.4.4.1 PIRQ routing & IRQ reservation

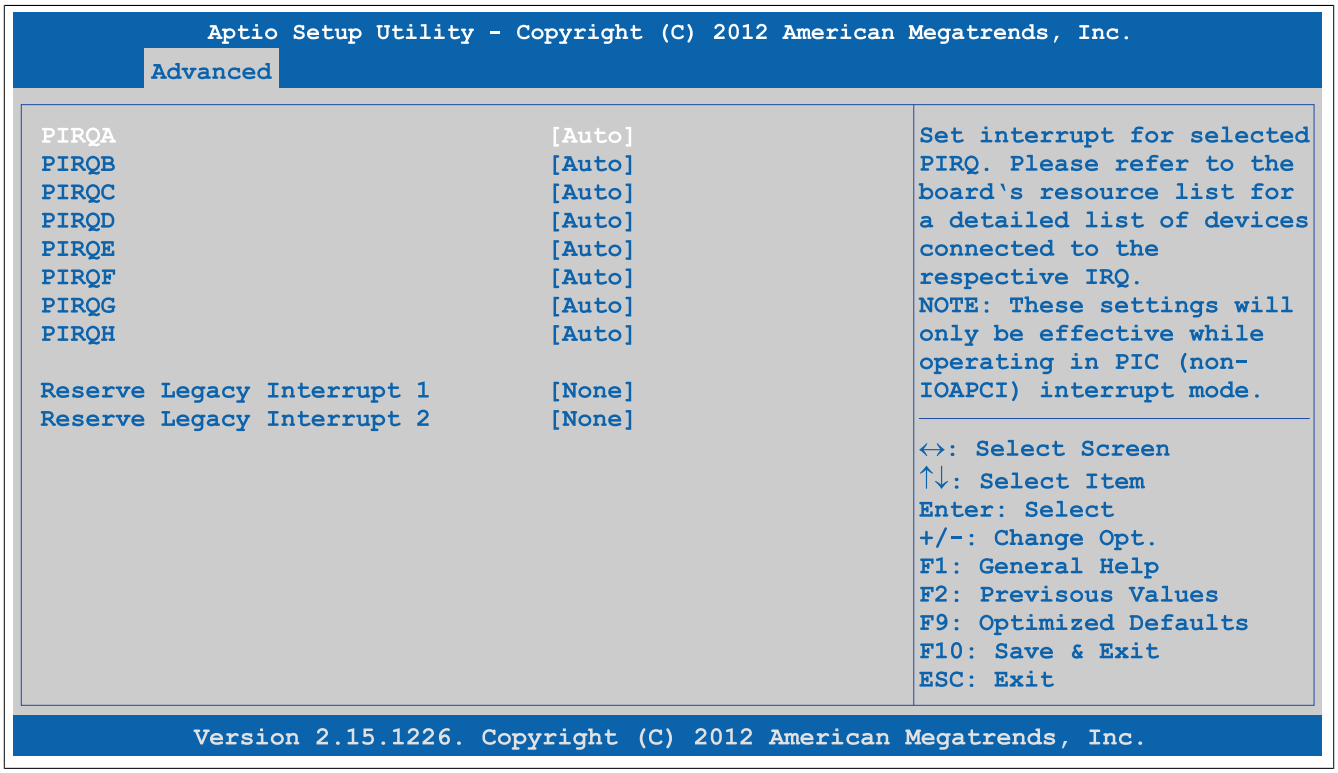


Figure 117: Advanced - PCI Configuration - PIRQ Routing & IRQ Reservation

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	The interrupt reserved here is not 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	The interrupt reserved here is not made available to a PCI or PCI Express device.	None	No interrupt assigned
		IRQ3, IRQ4, IRQ5, IRQ6, IRQ10, IRQ11, IRQ14, IRQ15	Reserves IRQx

Table 185: Advanced - PCI configuration - PIRQ routing & IRQ reservation - Configuration options

1.4.5 PCI Express configuration

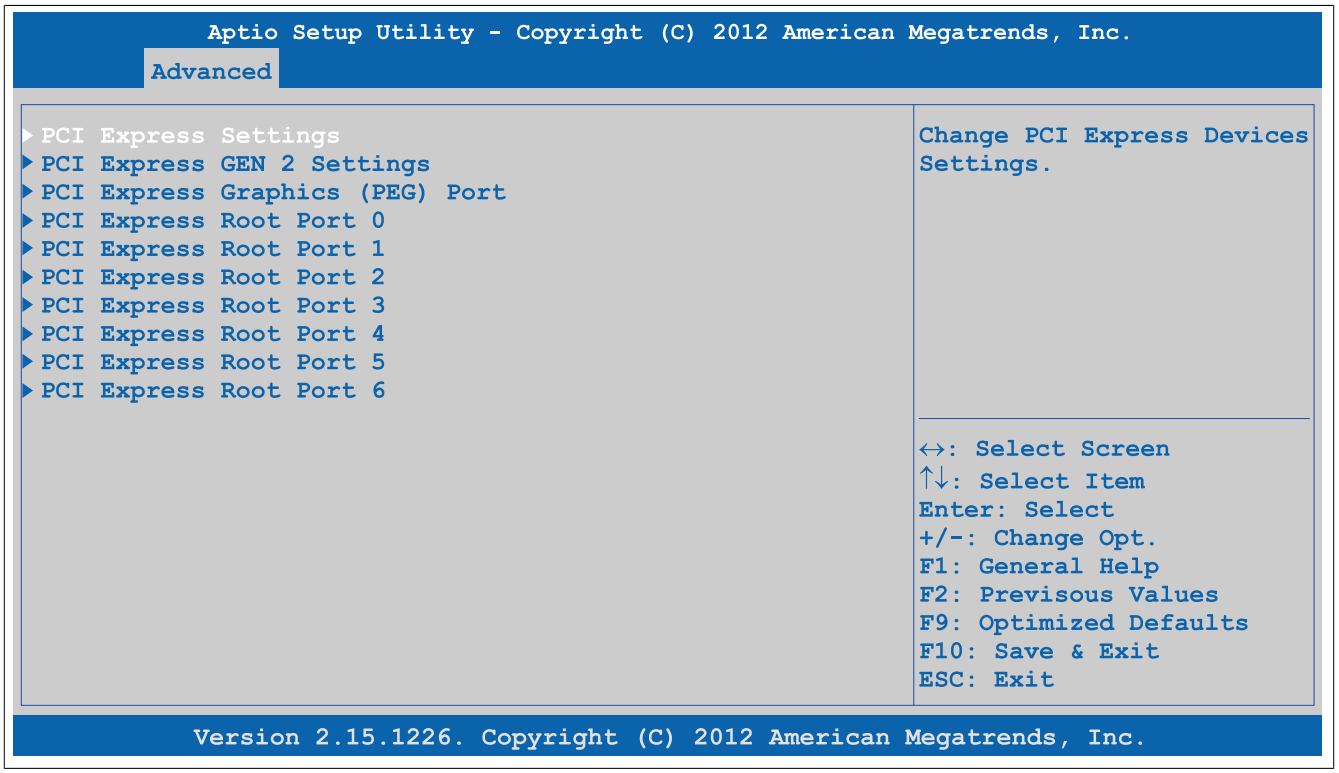


Figure 118: Advanced - PCI Express Configuration

BIOS setting	Function	Configuration options	Effect
PCI Express settings	Configures PCI Express settings	Enter	Opens the submenu See "PCI Express settings" on page 212
PCI Express GEN 2 settings	Configures PCI Express GEN2 settings	Enter	Opens the submenu See "PCI Express GEN 2 settings" on page 213
PCI Express graphics (PEG) port	Configures PCI Express graphics settings	Enter	Opens the submenu See "PCI Express graphics (PEG) port" on page 214
PCI Express root port 0	Configures PCI Express settings on port 0	Enter	Opens the submenu See "PCI Express root port" on page 216
PCI Express root port 1	Configures PCI Express settings on port 1	Enter	Opens the submenu See "PCI Express root port" on page 216
PCI Express root port 2	Configures PCI Express settings on port 2	Enter	Opens the submenu See "PCI Express root port" on page 216
PCI Express root port 3	Configures PCI Express settings on port 3	Enter	Opens the submenu See "PCI Express root port" on page 216
PCI Express root port 4	Configures PCI Express settings on port 4	Enter	Opens the submenu See "PCI Express root port" on page 216
PCI Express root port 5	Configures PCI Express settings on port 5	Enter	Opens the submenu See "PCI Express root port" on page 216
PCI Express root port 6	Configures PCI Express settings on port 6	Enter	Opens the submenu See "PCI Express root port" on page 216

Table 186: Advanced - PCI Express configuration - Menu

1.4.5.1 PCI Express settings

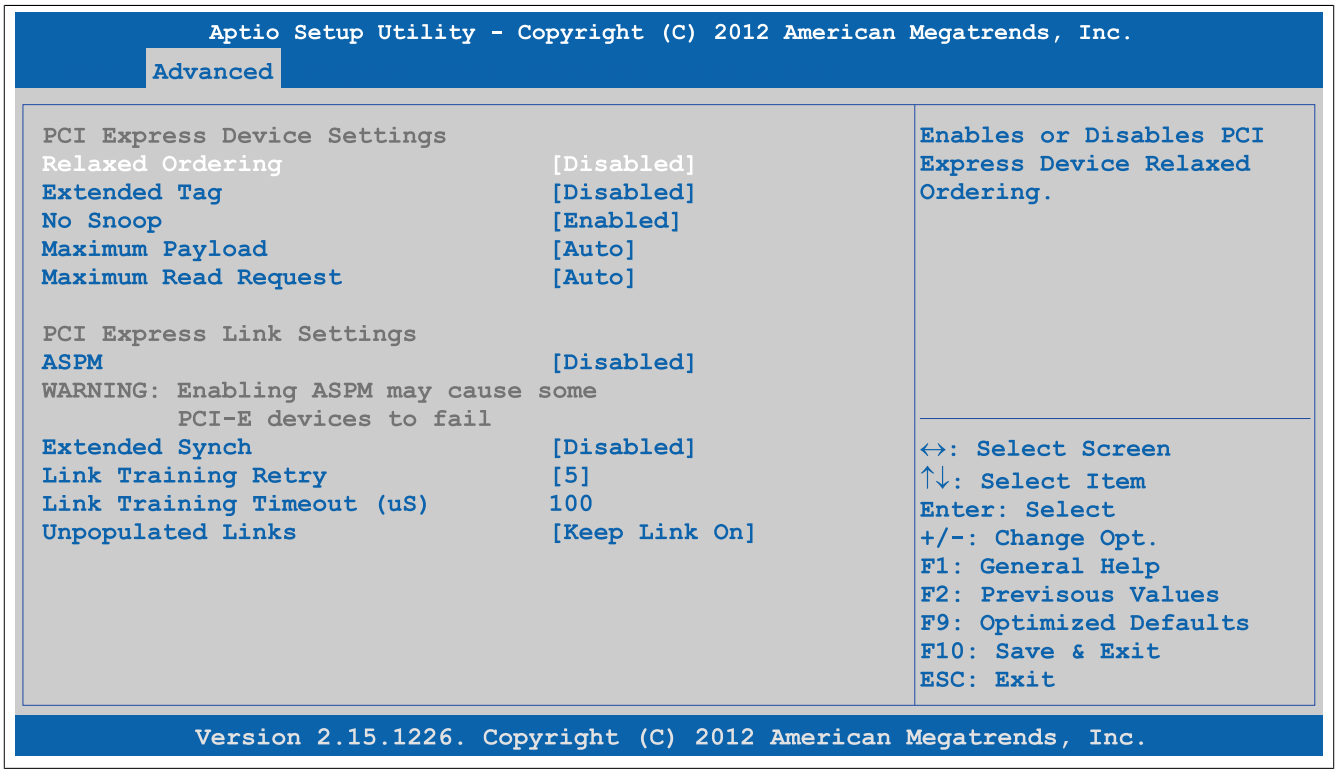


Figure 119: Advanced - PCI Express Configuration - PCI Express Settings

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	Manual maps the packet size
Maximum read request	Option for setting the maximum read request	Auto	Automatic assignment
		128 bytes to 4096 bytes	Manual assignment
ASPM[1)]	Option for configuring a power saving function (L0s/L1) for PCIe slots if they do not require full power	Disabled	Disables the energy saving function
		Auto	Maximum energy savings. The energy saving function is set to L0 or L1.
		Force L0s	Enables L0 mode
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

Table 187: Advanced - PCI Express configuration - PCI Express settings - Configuration options

1) ASPM = Active state power management.

1.4.5.2 PCI Express GEN 2 settings

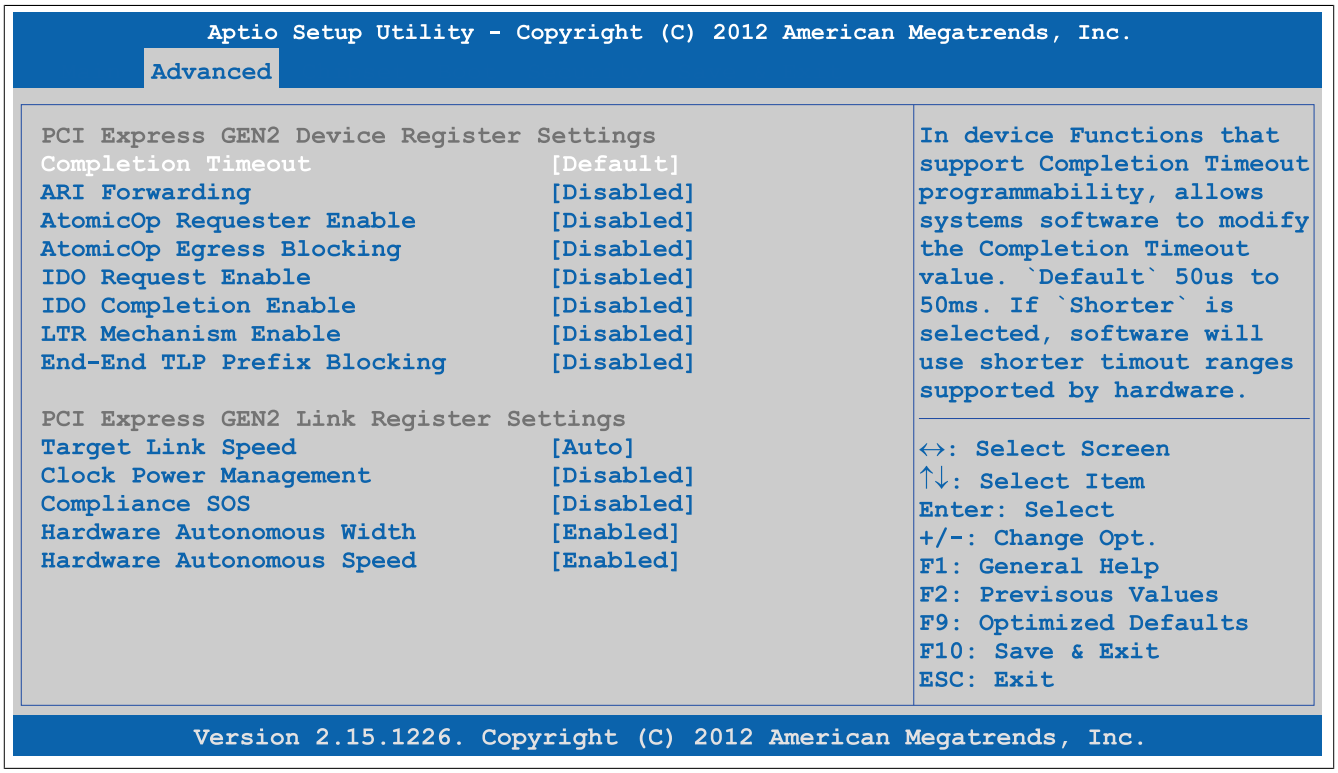


Figure 120: Advanced - PCI Express Configuration - PCI Express GEN 2 Settings

BIOS setting	Function	Configuration options	Effect
Completion timeout	Option for allowing software to modify the completion timeout value if supported by device functions	Default	Timeout range: 50 µs - 50 ms
		Shorter	The software uses shorter timeout ranges than are supported by the hardware.
		Longer	The software uses longer timeout ranges than are supported by the hardware.
		Disabled	Disables this function
ARI forwarding	If supported by 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 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 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 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 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 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
Target link speed	If supported by hardware and set to "Force to 2.5 GT/s" for downstream ports, this sets an upper limit on Link operational speed by redistricting the values advertised by the upstream component in its training sequences. When "Auto" is selected, hardware-initialized data will be used.	Auto	TBD
		Force to 2.5 GT/s	TBD
		Force to 5.0 GT/s	TBD

Table 188: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options

BIOS setting	Function	Configuration options	Effect
Clock power management	If supported by hardware and set to "Enabled", the device is permitted to use the CLKREQ# signal for power management of the Link clock in accordance with the protocol defined in the appropriate form factor specification.	Disabled	Disables this function
		Enabled	Enables this function
Compliance SOS	If supported by 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 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 hardware and set to "Disabled", this will disable the hardware's ability to change link speed except speed size reduction for the purpose of correcting unstable link operation.	Disabled	Disables this function The PCIe device can no longer change the link speed except to correct unstable operation.
		Enabled	Enables this function

Table 188: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options

1.4.5.3 PCI Express graphics (PEG) port

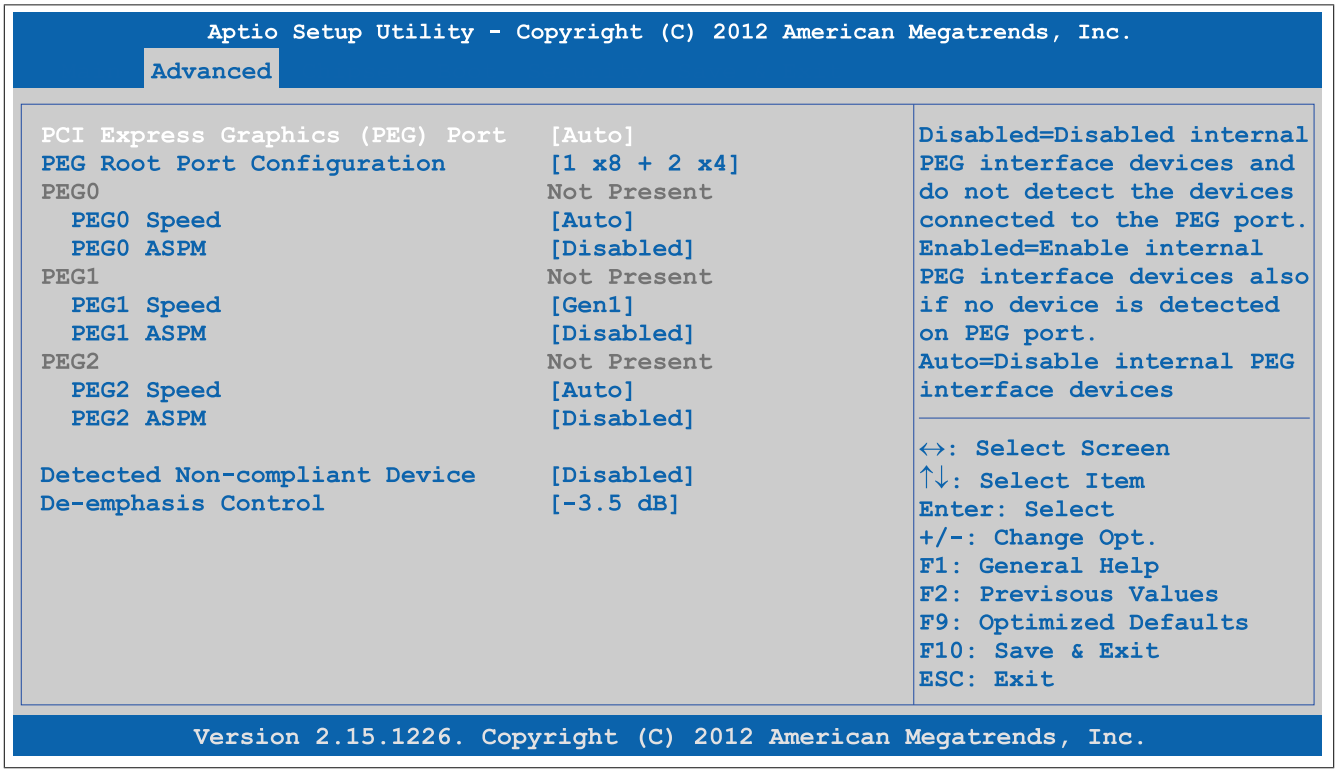


Figure 121: Advanced - PCI Express Configuration - PCI Express Graphics (PEG) Port

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	-
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

Table 189: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Configuration options

BIOS setting	Function	Configuration options	Effect
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		ASPM L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
ASPM L0s[2]	Option for configuring the L0 power saving function	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
PEG1	Displays the mode in which the device connected to the PEG1 port is being operated.	None	-
PEG1 speed	Option for setting the maximum transfer rate for the PEG1 port	Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
		Gen3	Maximum transfer rate = 8 GT/s
PEG1 ASPM[1]	Option for configuring a power saving function for the PEG1 port if it does not require full power	Disabled	Disables this function
		Auto	Automatic assignment by BIOS and the operating system
		ASPM L0s	Enables the L0 energy saving function
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		ASPM L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
ASPM L0s[3]	Option for configuring the L0 power saving function	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
PEG2	Displays the mode in which the device connected to the PEG2 port is operated.	None	-
PEG2 speed	Option for setting the maximum transfer rate for the PEG2 port	Auto	Selects the maximum transfer rate
		Gen1	Maximum transfer rate = 2.5 GT/s
		Gen2	Maximum transfer rate = 5 GT/s
		Gen3	Maximum transfer rate = 8 GT/s
PEG2 ASPM[1]	Option for configuring a power saving function for the PEG2 port if it does not require full power	Disabled	Disables this function
		Auto	Automatic assignment by BIOS and the operating system
		ASPM L0s	Enables the L0 energy saving function
		ASPM L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		ASPM L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
ASPM L0s[4]	Option for configuring the L0 power saving function	Disabled	Disables this function
		Root port only	Enables the power saving function for the root port
		Endpoint only	Enables the power saving function for the endpoint port
		Both root and endpoint ports	Enables the power saving function for the root and endpoint ports
Detect non-compliant device	Option for detecting incompatible PCI Express devices on the PEG port	Disabled	Disables this function
		Enabled	Enables this function Even incompatible PCI Express devices are detected on the PEG port.
De-emphasis control	Option for configuring de-emphasis on the PEG port	-6 dB	-6 dB de-emphasis
		-3.5 dB	-3.5 dB de-emphasis

Table 189: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Configuration options

1) ASPM = Active state power management.
2) This setting is only possible if *PEG0 ASPM* is set to *ASPM L0s* or *ASPM L0sL1*.
3) This setting is only possible if *PEG1 ASPM* is set to *ASPM L0s* or *ASPM L0sL1*.
4) This setting is only possible if *PEG2 ASPM* is set to *ASPM L0s* or *ASPM L0sL1*.

1.4.5.4 PCI Express root port

Warning!

Improper settings can cause instability or device problems. It is therefore strongly recommended that these settings only be changed by experienced users.

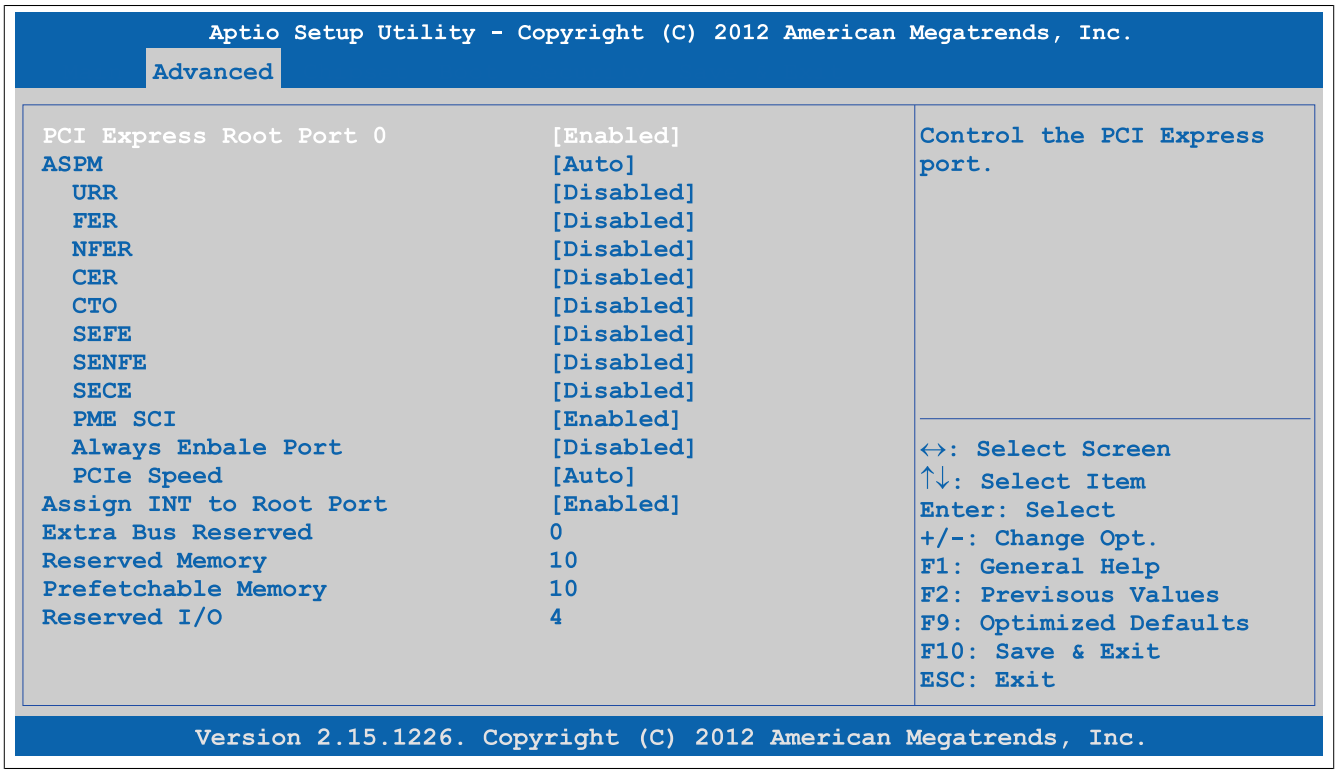


Figure 122: Advanced - PCI Express Configuration - PCI Express Root Port

BIOS setting	Function	Configuration options	Effect
PCI Express root port x	Option for enabling/disabling the PCI Express root port	Enabled	Enables PCI Express root port 1
		Disabled	Disables PCI Express root port 1 and 2
ASPM	*Active state power management* Option for configuring a power saving function (L0s/L1) for PCIe devices if they do not require full power	Disabled	Disables this function
		L0s	Enables the L0 energy saving function
		L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
		Auto	Automatic assignment by BIOS and the operating system
URR	*Unsupported Request (UR) reporting* Option for reporting unsupported requests. Logging of error messages received by the root port is controlled exclusively by the root control register.	Enabled	Enables this function
		Disabled	Disables this function
FER	*Fatal error reporting* Option for reporting fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Enabled	Enables this function
		Disabled	Disables this function
NFER	*Non-fatal error reporting* Option for reporting non-fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Enabled	Enables this function
		Disabled	Disables this function
CER	*Correctable error reporting* Option for reporting non-fatal errors. All of the functions of a multifunction device will be monitored. The report for the root port takes place internally inside the root complex.	Enabled	Enables this function
		Disabled	Disables this function
CT0	*PCI Express completion timer T0*	Enabled	Enables this function

Table 190: 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 registered by a device on the root port or by the root port itself	Enabled	Enables this function
		Disabled	Disables this function
SENFE	*System error on non-fatal error* Option for generating a system error if a non-fatal error is registered 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 registered 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 190: Advanced - PCI Express configuration - PCI Express root port - Configuration options

1.4.6 ACPI settings

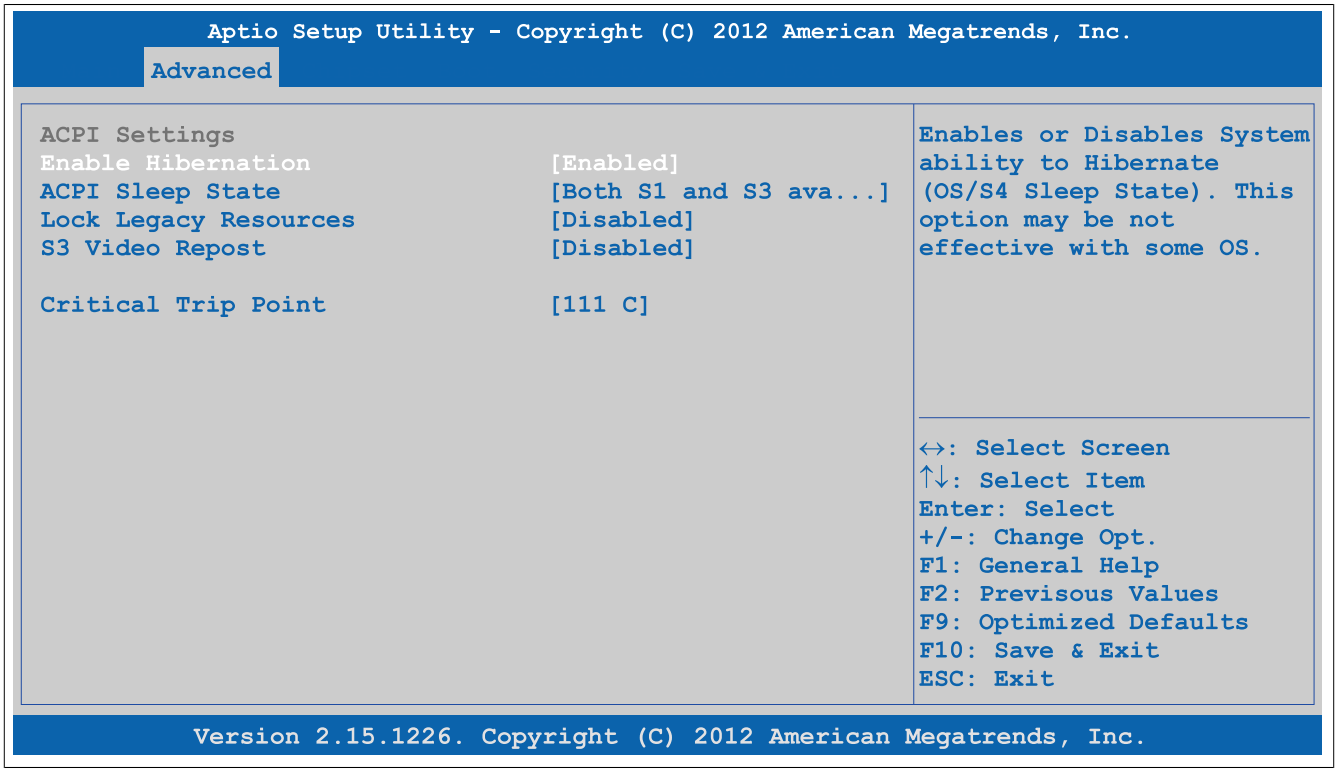


Figure 123: Advanced - ACPI Settings

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 throttles the system	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 5°C.

Table 191: Advanced - ACPI settings - Configuration options

1.4.7 RTC wake settings

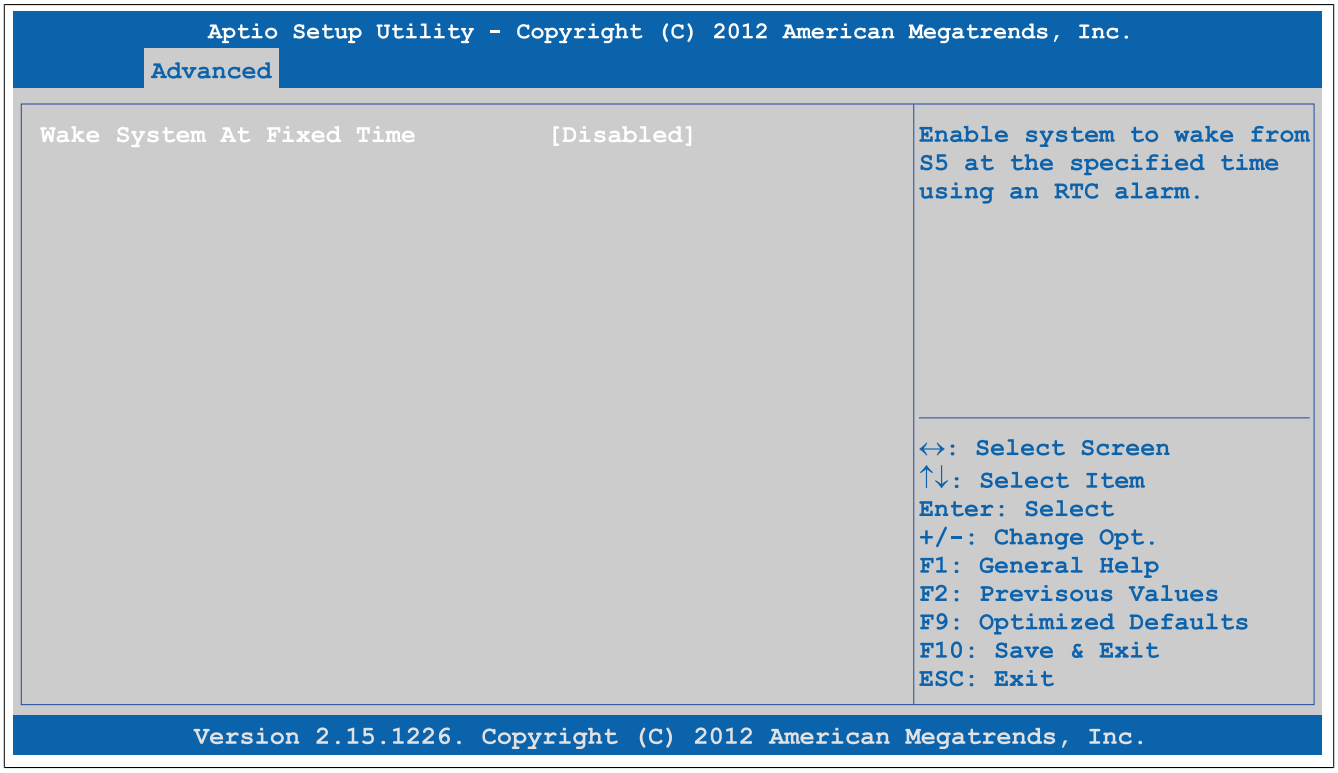


Figure 124: Advanced - RTC Wake Settings

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 192: Advanced - RTC wake settings - Configuration options

1.4.8 CPU configuration

Information:

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

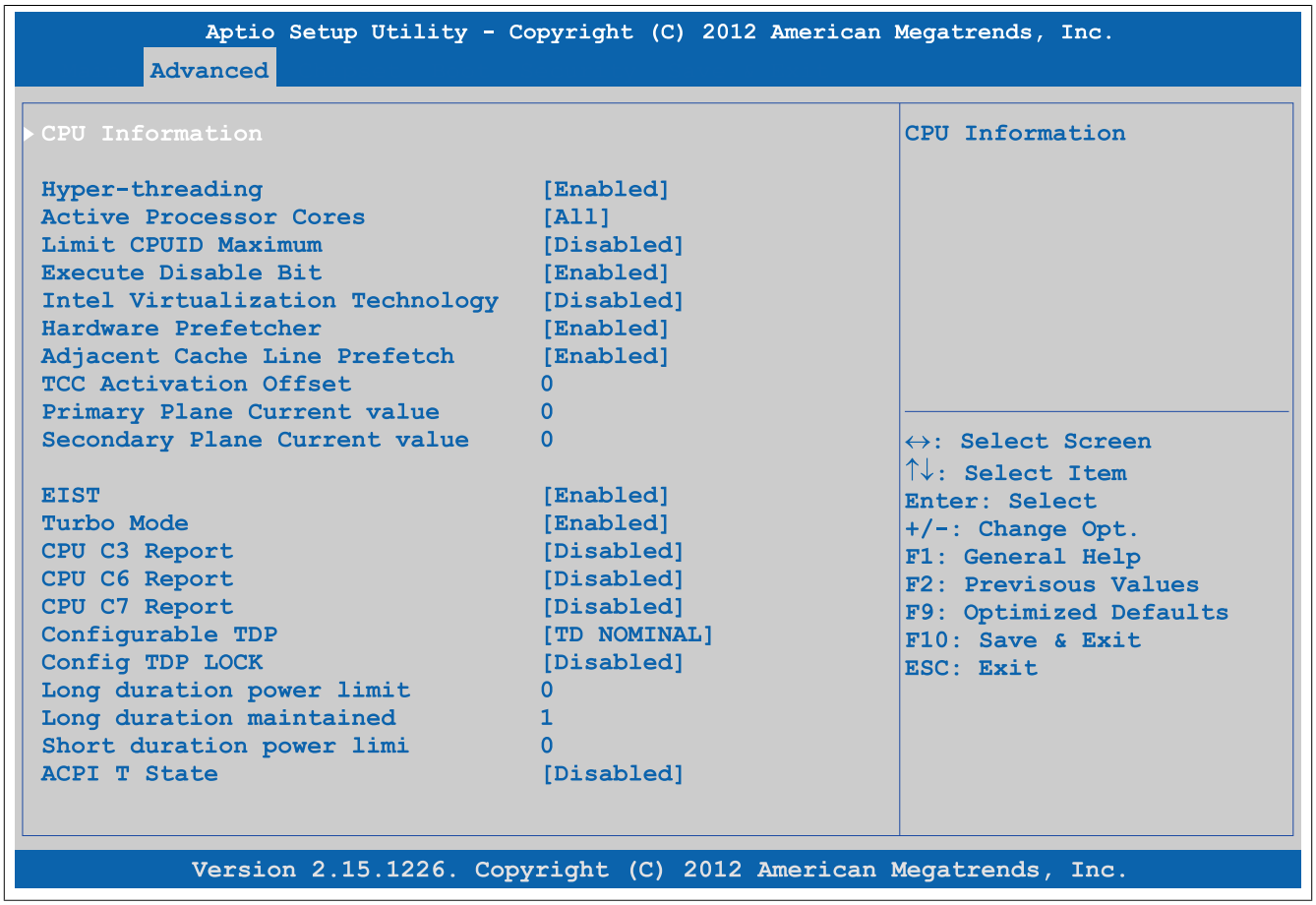


Figure 125: Advanced - CPU Configuration

BIOS setting	Function	Configuration options	Effect
CPU information	Displays CPU properties	Enter	Opens the submenu See "CPU information" on page 221
Hyper-threading	Option for enabling/disabling Intel hyper-threading technology	Disabled	Disables this function
		Enabled	Enables this function Each processor core can execute multiple tasks (threads) at the same time. Intel hyper-threading technology increases processor throughput and improves the overall performance of multi-thread software.
Active processor cores	Option for configuring which processor cores are to be used	All	Uses all processor cores
		1	Only uses one processor core
Limit CPUID maximum	Option for limiting the CPUID value. This may be necessary for older operating systems. **Information:** **This option must be set to *Disabled* when using Windows XP.**	Disabled	The processor returns the current maximum value when the CPUID value is requested.
		Enabled	The processor limits the maximum CPUID value to 03h if necessary if the processor supports a higher value.
Execute disable bit	Option for enabling/disabling hardware support for prevention of data execution	Disabled	Disables this function
		Enabled	Enables this function
Intel virtualization technology	Option for enabling/disabling a virtual machine **Information:** **A restart is required in order to apply changes made to this setting.**	Disabled	Disables this function
		Enabled	Allows a virtual machine to use the additional hardware capacity
Hardware prefetcher	Option for enabling/disabling the hardware prefetcher	Disabled	Disables this function
		Enabled	Enables this function. Data is temporarily stored in cache memory to increase performance.

Table 193: 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	Disabled	Disables Intel® SpeedStep™ technology
		Enabled	Enables Intel® SpeedStep™ technology
Turbo mode	Option for enabling/disabling Intel® Turbo Boost technology	Disabled	Disables Intel® Turbo Boost technology
		Enabled	Enables Intel® Turbo Boost technology
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		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 193: Advanced - CPU configuration - Configuration options

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

1.4.8.1 CPU information

Information:

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

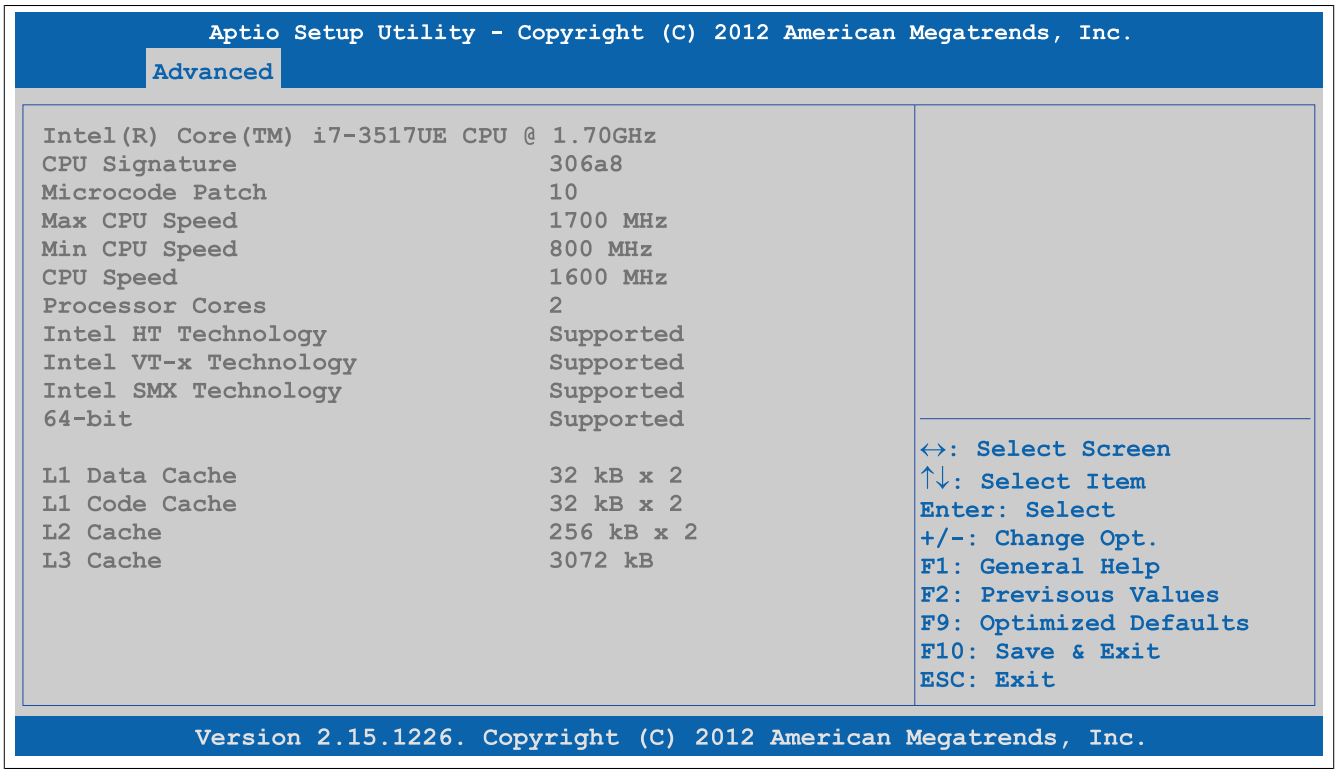


Figure 126: Advanced - CPU Configuration - CPU Information

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 cache	None	-
L3 cache	Displays the size of the L3 cache	None	-

Table 194: Advanced - CPU configuration - CPU information - Configuration options

1.4.9 Chipset configuration

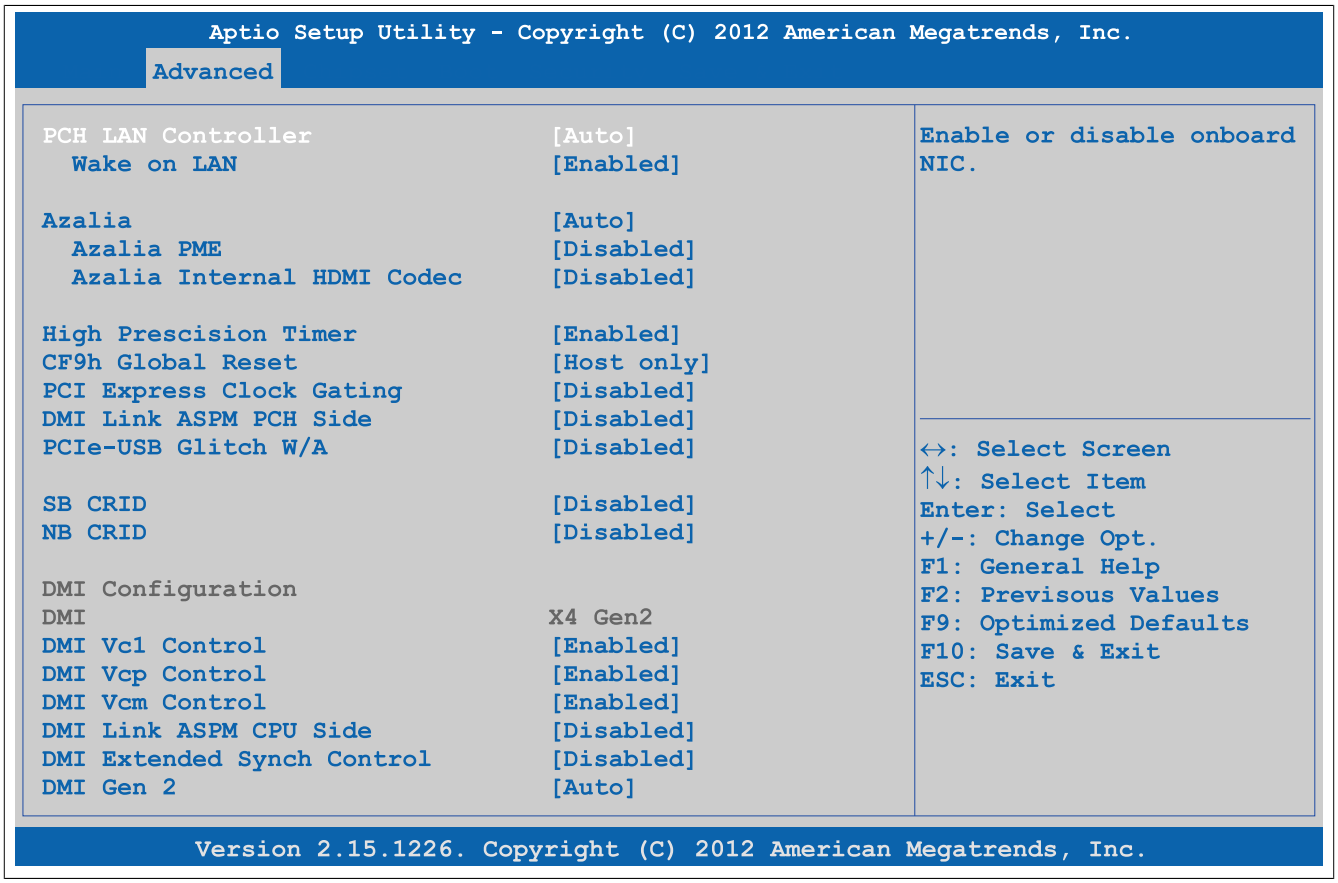


Figure 127: Advanced - Chipset Configuration

BIOS setting	Function	Configuration options	Effect
PCH LAN controller	Option for turning the onboard LAN controller (ETH1) on and off	Disabled	Disables the controller
		Enabled	Enables the controller
Wake on LAN	Option for switching on the system via the on-board LAN controller (ETH1)	Enabled	Enables this function. The LAN controller can switch on the system.
		Disabled	Disables this function. The LAN controller cannot switch on the system.
Azalia	Option for enabling/disabling the audio controller	Disabled	Disables the audio controller
		Enabled	Enables the audio controller
		Auto	Only enables the audio controller if a device is connected
Azalia PME	Option for enabling/disabling power management for the audio controller	Disabled	Disables this function
		Enabled	Enables this function
Azalia internal HDMI codec	Option for enabling/disabling the internal HDMI codec for Azalia	Disabled	Disables audio output
		Enabled	Enables audio output
High-precision timer	The HPET is a timer inside the PC. It is able to trigger an interrupt with a high degree of accuracy, which allows other programs to better synchronize a variety of applications.	Disabled	Disables this function
		Enabled	Enables this function. This function is recommended for multimedia applications.
CF9h global reset	Option for setting the restart on the CF9h reset register	Host only	Chipset only
		Host+ME	Chipset and management engine
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
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
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

Table 195: Advanced - Chipset configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
DMI Vcp control	Option for enabling/disabling DMI Vcp	Enabled	Enables this function
		Disabled	Disables this function
DMI Vcm control	Option for enabling/disabling DMI Vcm.	Enabled	Enables this function
		Disabled	Disables this function
DMI link ASPM CPU side	Option for enabling/disabling active state power management (ASPM) for the DMI link on the CPU side	Disabled	Disables this function
		L0s	Enables the L0 energy saving function
		L1	Enables the L1 energy saving function. Power consumption is lower than with L0, but the exit latency is higher.
		L0sL1	Automatic assignment of L0s or L1 power saving function by the PCIe device
DMI extended synch control	Option for enabling/disabling DMI extended synchronization	Enabled	Enables this function
		Disabled	Disables this function
DMI Gen 2	Option for enabling/disabling DMI Gen 2	Auto	Disabled for IVB A0 MB/DT and IVB B0 MB, enabled for other CPUs
		Enabled	Enables this function
		Disabled	Disables this function

Table 195: Advanced - Chipset configuration - Configuration options

1.4.10 SATA configuration

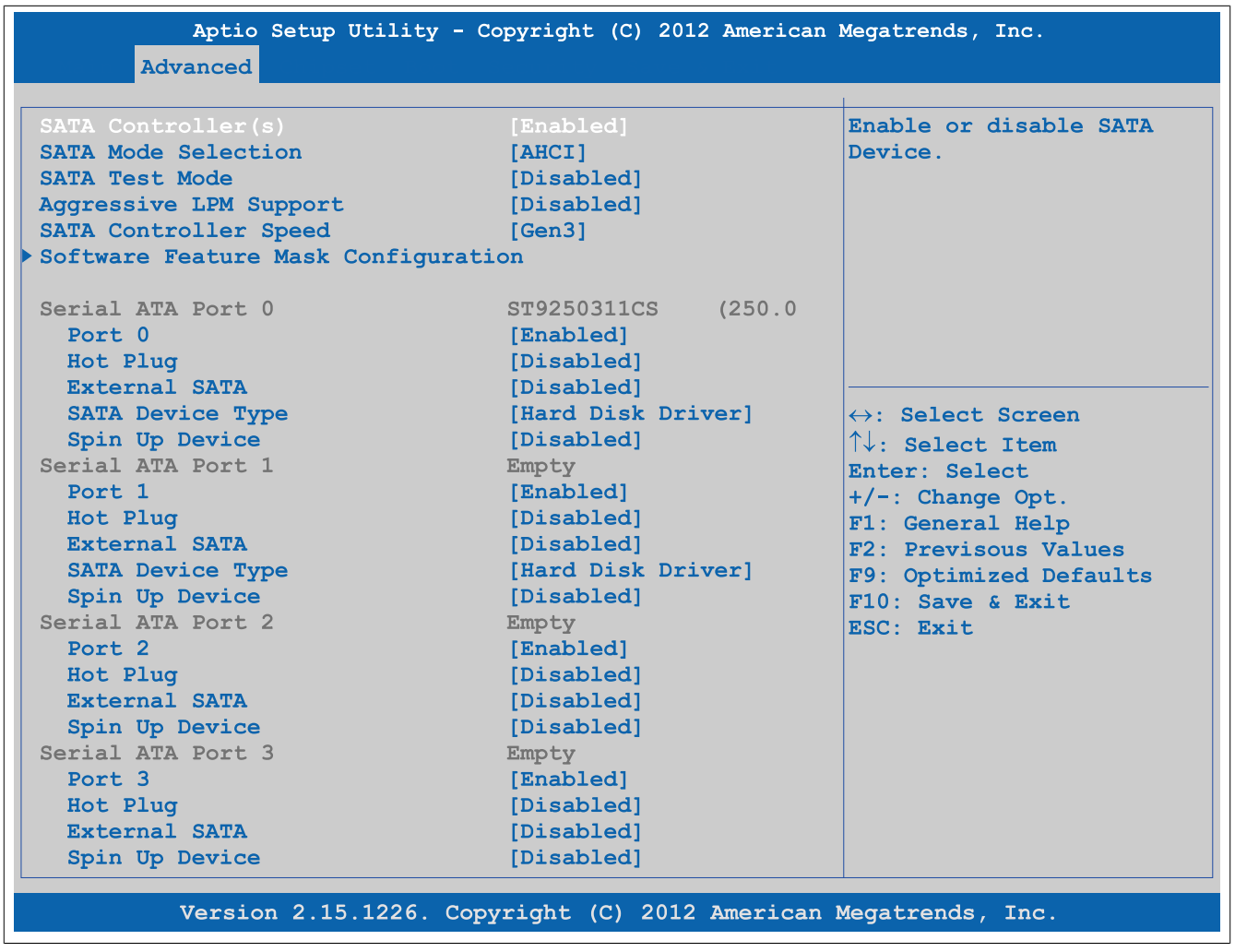


Figure 128: Advanced - SATA Configuration

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	The serial ATA hard drive is used 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.

Table 196: Advanced - SATA configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
		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
Software feature mask configuration	Configuration of various drive settings	Enter	Opens the submenu See "Software feature mask configuration" on page 225
Alternate ID[1)]	Option for enabling/disabling a report of the alternate device ID	Enabled	Enables this function
		Disabled	Disables this function
Serial ATA port 0	Displays the device connected to SATA port 0	None	-
Port 0	Option for enabling/disabling SATA port 0	Disabled	Disables SATA port 0
		Enabled	Enables SATA port 0
Hot plug	Option for configuring hot plugging for SATA port 0	Disabled	Hot plugging not enabled for SATA port 0
		Enabled	Hot plugging enabled for SATA port 0. Devices can be connected/disconnected during operation.
External SATA	Option for configuring the external SATA port	Disabled	Uses the port externally as eSATA
		Enabled	Uses the port internally as SATA
Mechanical presence switch[2)]	Option for enabling/disabling the report if this port has a mechanical presence switch	Disabled	Disables this function
		Enabled	Enables this function
SATA device type	Identifies whether a solid state or hard disk drive is connected to the SATA port	Hard disk drive	A hard disk is connected to the SATA port.
		Solid state drive	A solid state drive is connected to the SATA port.
Spin up device	Option for configuring an initialization sequence for the connected device during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 1	Displays the device connected to SATA port 1	None	-
Port 1	Option for enabling/disabling SATA port 1	Disabled	Disables SATA port 1
		Enabled	Enables SATA port 1
Hot plug	Option for configuring hot plugging for SATA port 1	Disabled	Hot plugging not enabled for SATA port 1
		Enabled	Hot plugging enabled for SATA port 1. Devices can be connected/disconnected during operation.
External SATA	Option for configuring the external SATA port	Disabled	Uses the port externally as eSATA
		Enabled	Uses the port internally as SATA
Mechanical presence switch[2)]	Option for enabling/disabling the report if this port has a mechanical presence switch	Disabled	Disables this function
		Enabled	Enables this function
SATA device type	Identifies whether a solid state or hard disk drive is connected to the SATA port	Hard disk drive	A hard disk is connected to the SATA port.
		Solid state drive	A solid state drive is connected to the SATA port.
Spin up device	Option for configuring an initialization sequence for the connected device during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 2	Displays the device connected to SATA port 2	None	-
Port 2	Option for enabling/disabling SATA port 2	Disabled	Disables SATA port 2
		Enabled	Enables SATA port 2
Hot plug	Option for configuring hot plugging for SATA port 2	Disabled	Hot plugging not enabled for SATA port 2
		Enabled	Hot plugging enabled for SATA port 2. Devices can be connected/disconnected during operation.
External SATA	Option for configuring the external SATA port	Disabled	Uses the port externally as eSATA
		Enabled	Uses the port internally as SATA
Mechanical presence switch[2)]	Option for enabling/disabling the report if this port has a mechanical presence switch	Disabled	Disables this function
		Enabled	Enables this function
SATA device type	Identifies whether a solid state or hard disk drive is connected to the SATA port	Hard disk drive	A hard disk is connected to the SATA port.
		Solid state drive	A solid state drive is connected to the SATA port.
Spin up device	Option for configuring an initialization sequence for the connected device during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function
Serial ATA port 3	Displays the device connected to SATA port 3	None	-
Port 3	Option for enabling/disabling SATA port 3	Disabled	Disables SATA port 3
		Enabled	Enables SATA port 3
Hot plug	Option for configuring hot plugging for SATA port 3	Disabled	Hot plugging not enabled for SATA port 3
		Enabled	Hot plugging enabled for SATA port 3. Devices can be connected/disconnected during operation.
External SATA	Option for configuring the external SATA port	Disabled	Uses the port externally as eSATA
		Enabled	Uses the port internally as SATA

Table 196: Advanced - SATA configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
Mechanical presence switch[2)]	Option for enabling/disabling the report if this port has a mechanical presence switch	Disabled	Disables this function
		Enabled	Enables this function
SATA device type	Identifies whether a solid state or hard disk drive is connected to the SATA port	Hard disk drive	A hard disk is connected to the SATA port.
		Solid state drive	A solid state drive is connected to the SATA port.
Spin up device	Option for configuring an initialization sequence for the connected device during startup for the SATA port	Disabled	Disables this function
		Enabled	Enables this function

Table 196: Advanced - SATA configuration - Configuration options

1) This setting is only possible if *SATA mode selection* is set to *RAID*.
2) This setting is only possible if *Hot plug* is set to *Enabled*.

1.4.10.1 Software feature mask configuration

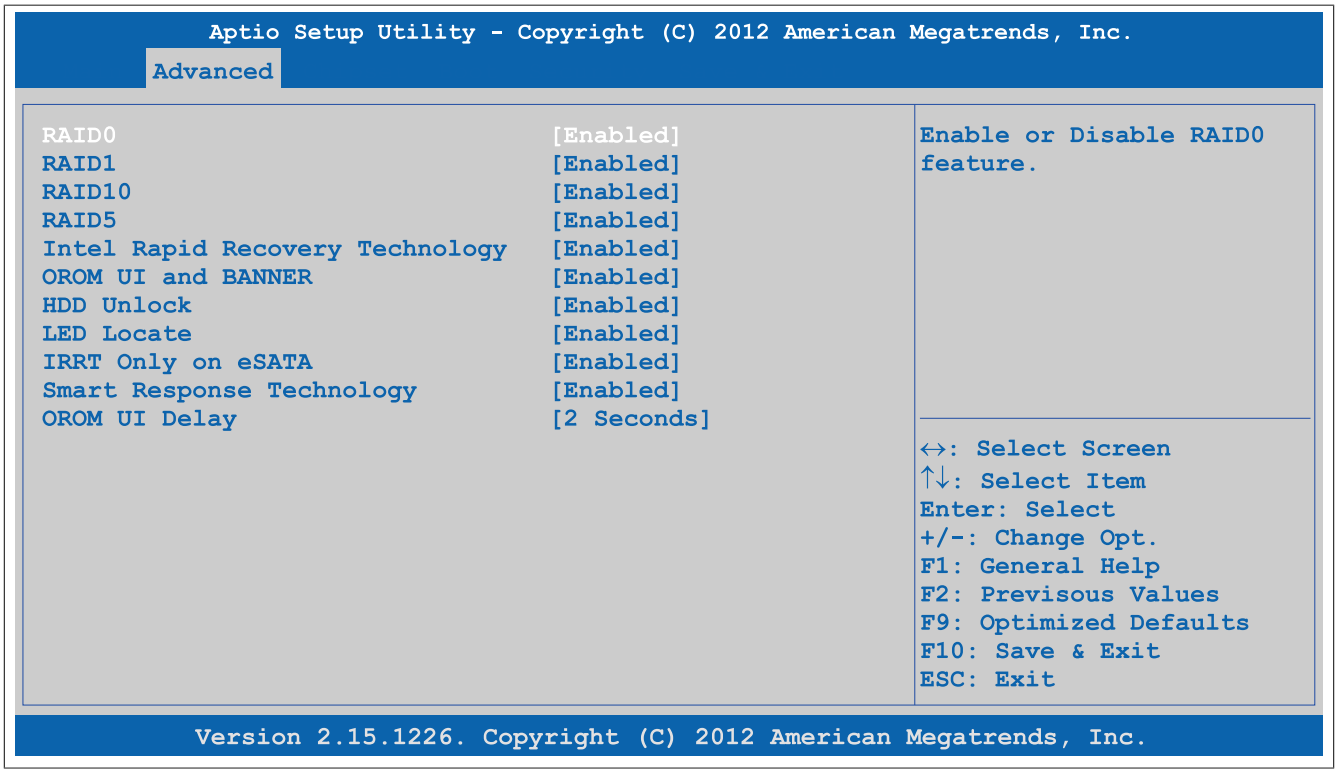


Figure 129: Advanced - SATA Configuration - Software Feature Mask Configuration

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.

Table 197: Advanced - SATA configuration - Software feature mask configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
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 197: Advanced - SATA configuration - Software feature mask configuration - Configuration options

1) IRRT = Intel Rapid Recovery technology

1.4.11 Memory configuration

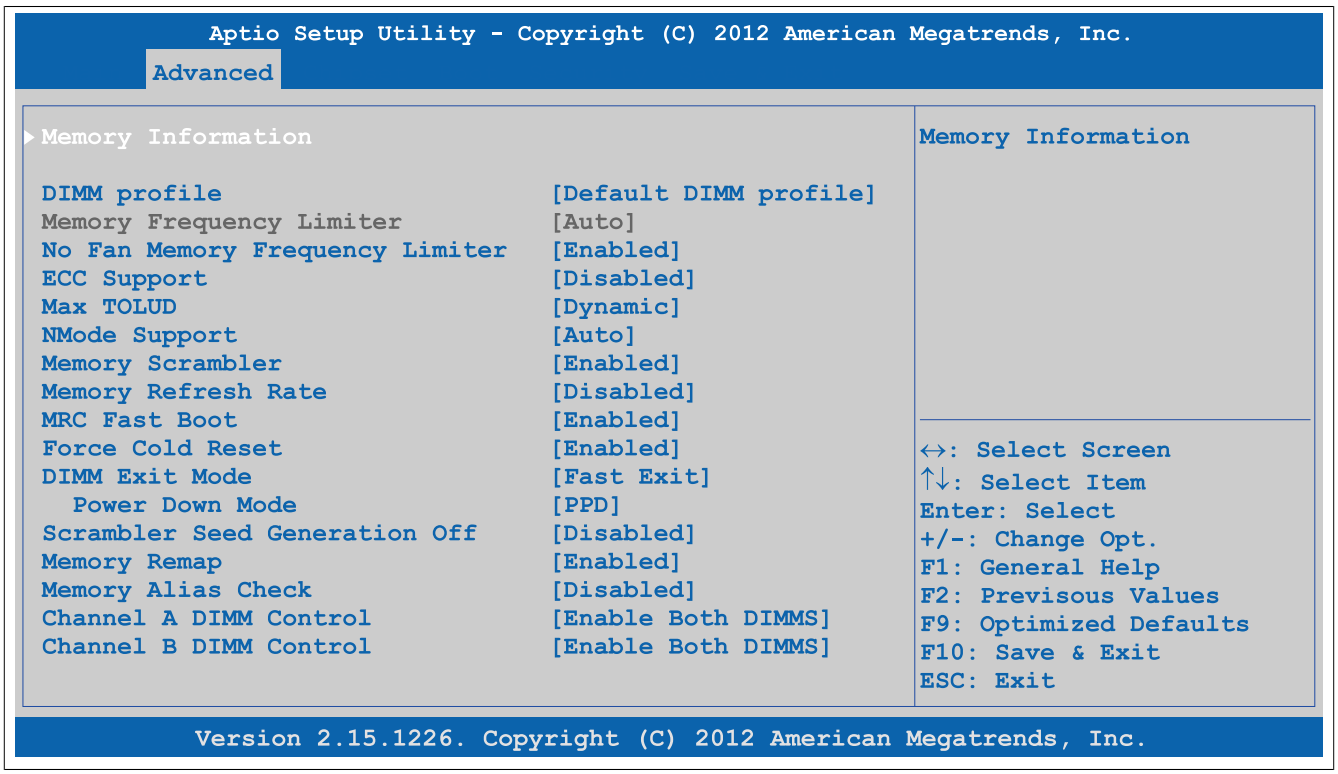


Figure 130: Advanced - Memory Configuration

BIOS setting	Function	Configuration options	Effect
Memory information	Displays main memory properties	Enter	Opens the submenu See "Memory information" on page 227
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 the submenu See "Custom profile control" on page 228
Memory frequency limiter[2)]	Option for setting the maximum possible main memory frequency **Information:** **If a fan kit is not installed in the device, then the main memory frequency is limited to 1067 MHz when set to "Auto".**	Auto	Automatic configuration
		1067, 1333, 1600, 1867, 2133, 2400, 2667	Manual configuration
No fan memory frequency limiter	Option for automatically throttling down the main memory frequency when the system unit has no fan	Disabled	Disables this function
		Enabled	Enables this function
ECC support	Option for enabling/disabling main memory ECC support	Disabled	Disables this function
		Enabled	Enables this function
Max TOLUD[3)]	Option for configuring the maximum "Top Of Low Usable DRAM"	Dynamic	Automatically adjusts the TOLUD based on the MMIO length of the graphics controller
		1 GB, 1.25 GB, 1.5 GB, 1.75 GB, 2 GB, 2.25 GB, 2.5 GB, 2.75 GB, 3 GB, 3.25 GB	Manual setting of the TOLUD
NMode support	Option for configuring NMode support	Auto	Sets automatically
		1N mode	Sets 1N mode
		2N mode	Sets 2N mode

Table 198: Advanced - Memory configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
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
		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	TBD
		APD	TBD
		PPD	TBD
		APD-PPD	TBD
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 198: Advanced - Memory configuration - Configuration options

1) This setting is only shown if *DIMM profile* is set to *Custom profile*.
2) This setting is only possible if *No fan memory frequency limiter* is set to *Disabled*.
3) TOLUD = Top of Low Usable DRAM

1.4.11.1 Memory information

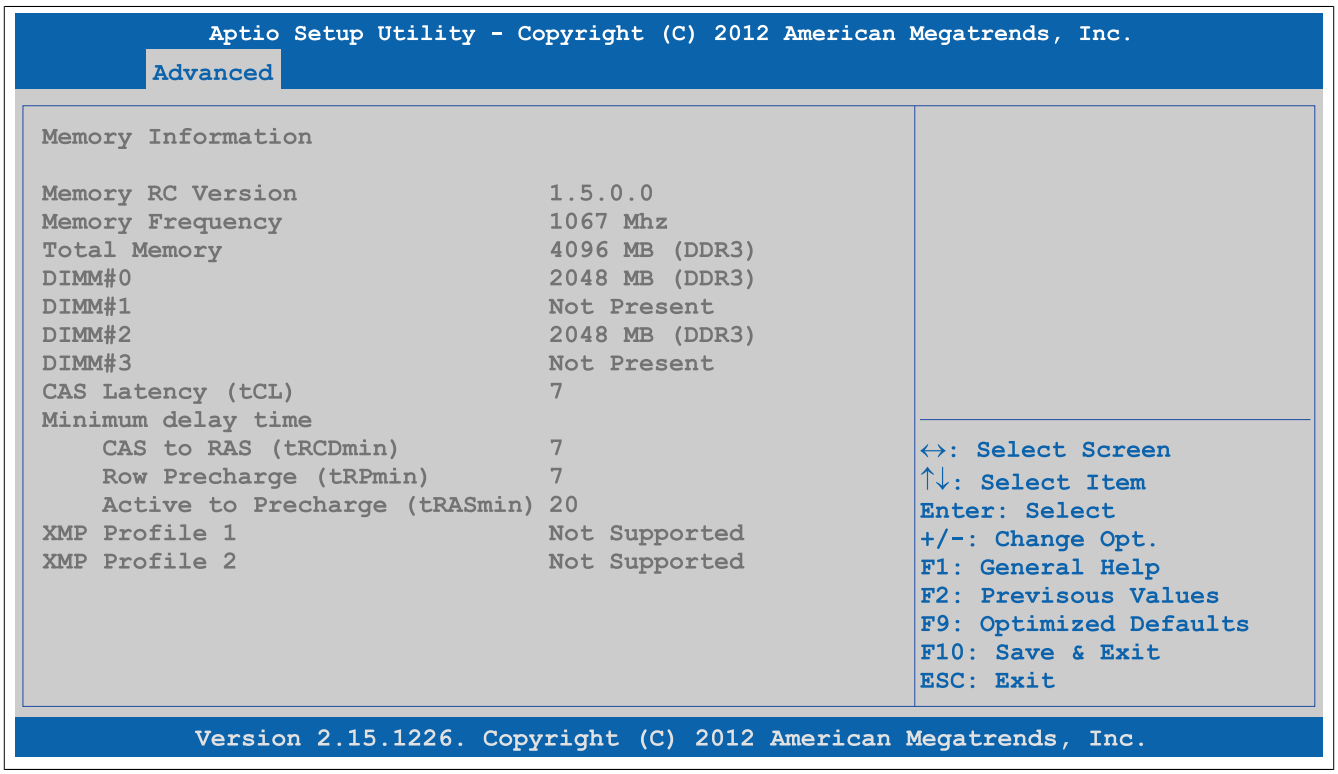


Figure 131: Advanced - Memory Configuration - Memory Information

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			
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 199: Advanced - Memory configuration - Memory information

1.4.11.2 Custom profile control

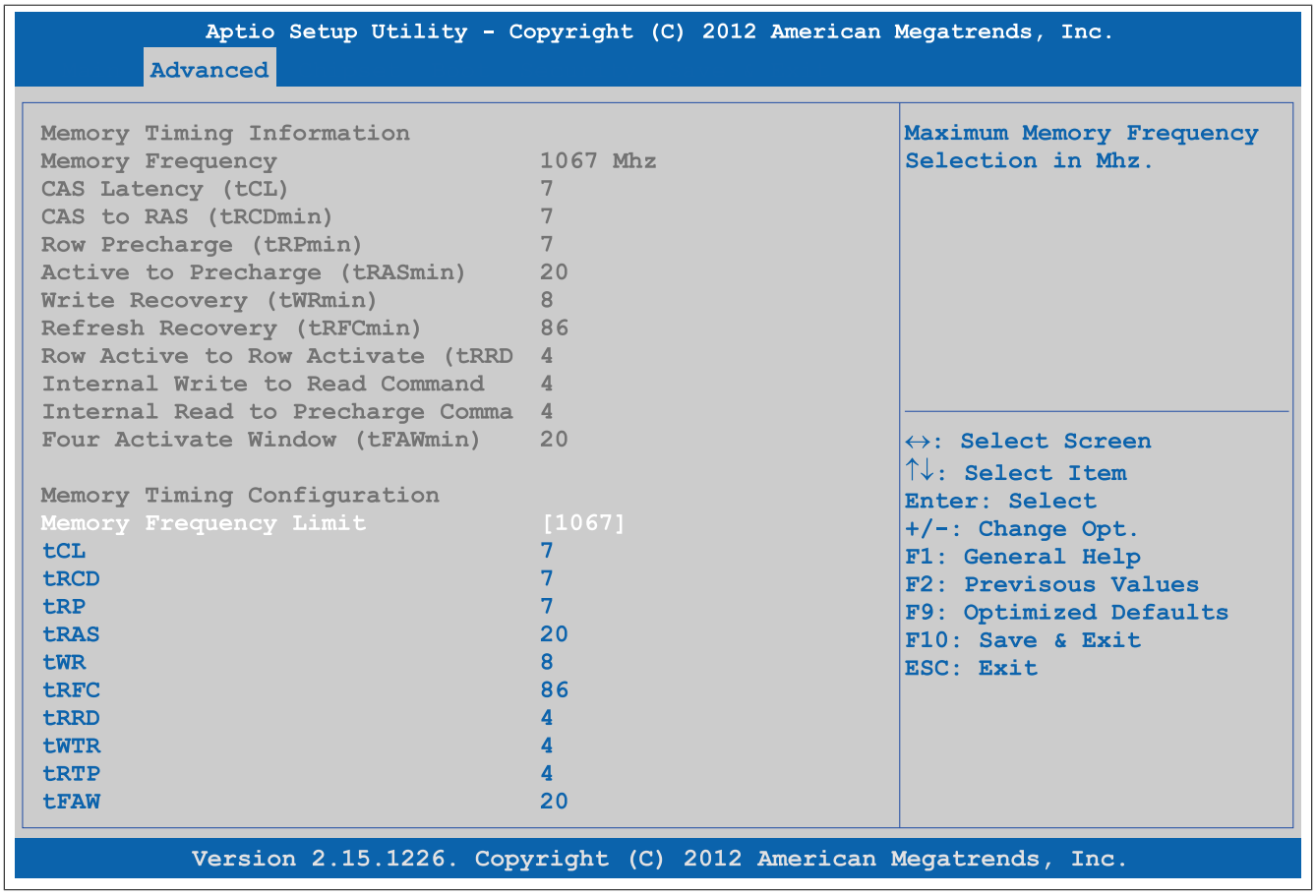


Figure 132: Advanced - Memory Configuration - Custom Profile Control

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	

Table 200: Advanced - Memory configuration - Custom profile control - Configuration options

BIOS setting	Function	Configuration options	Effect
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 200: Advanced - Memory configuration - Custom profile control - Configuration options

1.4.12 USB configuration

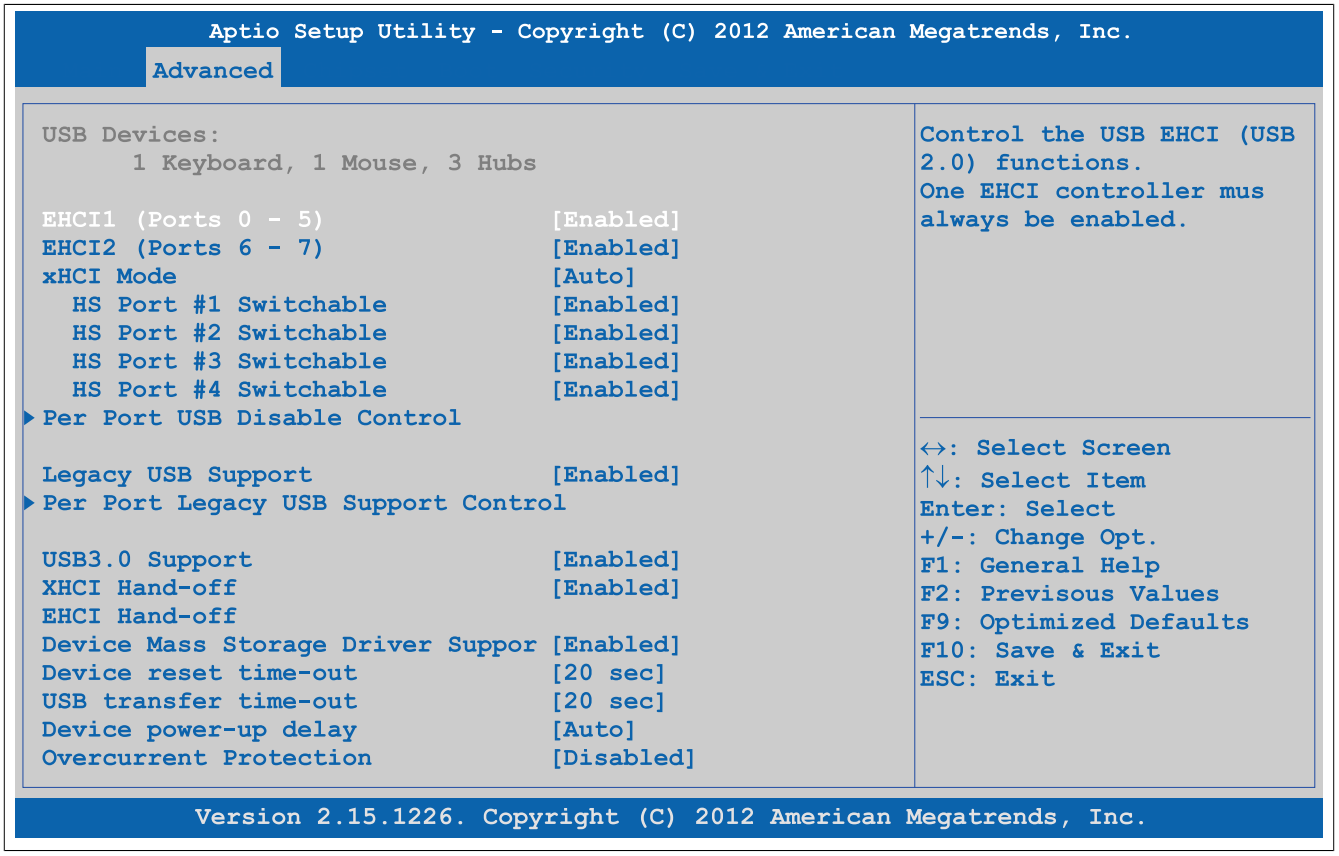


Figure 133: Advanced - USB Configuration

BIOS setting	Function	Configuration options	Effect
EHCI1 (ports 0-5)	Sets USB EHCI controller 1 for USB ports #0 through #5 (USB1 through USB4 on the system unit, USB on the monitor/panel interface and the bus unit)	Enabled	Enables EHCI controller 1
		Disabled	Disables EHCI controller 1
EHC2 (ports 6-7)	Sets USB EHCI controller 1 for USB ports #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	The USB 3.0 ports are not handled as USB 3.0 until after the operating system has started. Before that, they are handled as USB 2.0 ports. If the APC910 is rebooted, then the USB 3.0 ports are handled as USB 3.0 during booting.
		Auto	During the BIOS boot procedure, USB 3.0 ports are handled as USB 2.0 ports. They are not handled as USB 3.0 ports 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 ports are always identified as such
		Disabled	Disables the xHCI controller. All USB 3.0 ports become USB 2.0 ports.
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

Table 201: Advanced - USB configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
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 ports	Enter	Opens the submenu See "Per port USB disable control" on page 231
Legacy USB support	Option for configuring legacy USB support. USB ports 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 support for individual USB ports	Enter	Opens the submenu See "Per port legacy USB support control" on page 232
USB 3.0 support	Option for enabling or disabling USB 3.0 mode	Enabled	Uses USB 3.0 for all USB 3.0 ports
		Disabled	Uses USB 2.0 or 1.1 for all USB ports
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 With operating systems that do not have a fully automated XHCI function, USB devices are only operated with USB 2.0.
EHCI hand-off	Option for configuring support for operating systems without a fully automated EHCI function	Disabled	Disables this function With operating systems that do not have a fully automated EHCI function, USB devices are only operated with USB 1.1.
		Enabled	Enables USB 2.0 support
Device mass storage driver support	Option for enabling/disabling USB mass storage device support	Enabled	Enables this function
		Disabled	Disables this function
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
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 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 ports	Disabled	Disables this function
		Enabled	Enables this function

Table 201: Advanced - USB configuration - Configuration options

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

1.4.12.1 Per port USB disable control

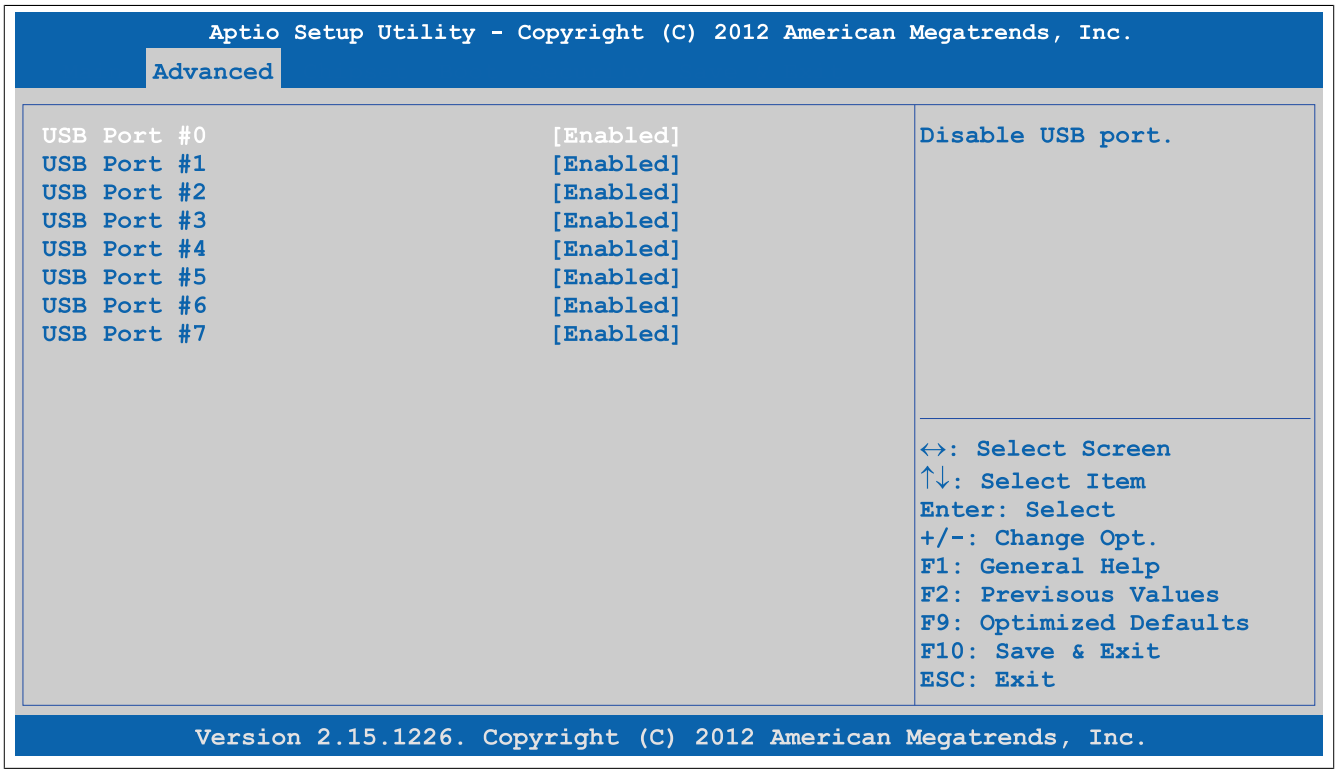


Figure 134: Advanced - USB Configuration - Per Port USB Disable Control

BIOS setting	Function	Configuration options	Effect
USB port #0	Option for enabling/disabling the USB4 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB port #1	Option for enabling/disabling the USB2 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB port #2	Option for enabling/disabling the USB3 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB port #3	Option for enabling/disabling the USB1 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB port #4	Option for enabling/disabling the USB port on the bus unit	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB port #5	Option for enabling/disabling the USB port on the monitor/panel interface	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB port #6	Option for enabling/disabling the USB5 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB port #7	Option for enabling/disabling the USB port on the monitor/panel option	Disabled	Disables the USB port
		Enabled	Enables the USB port

Table 202: Advanced - USB configuration - Per port USB disable control - Configuration options

1.4.12.2 Per port legacy USB support control

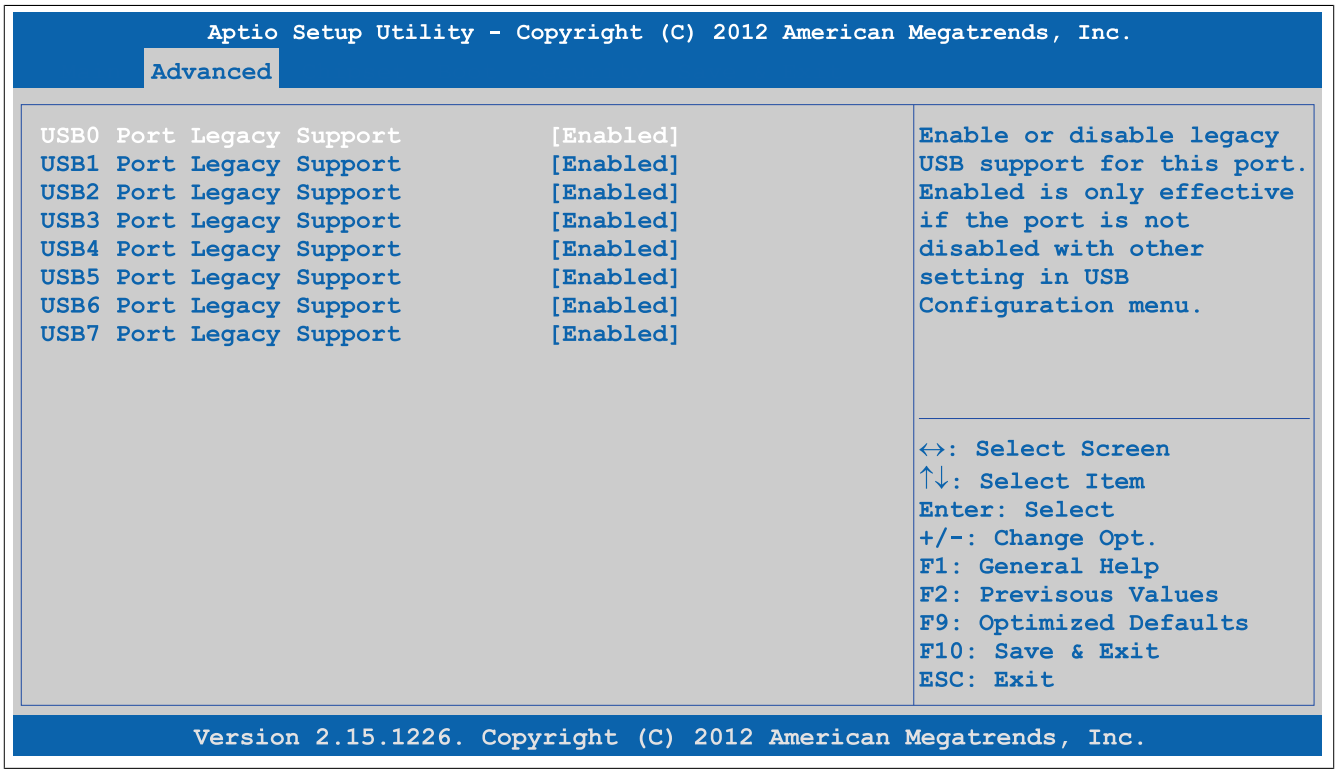


Figure 135: Advanced - USB Configuration - Per Port Legacy USB Support Control

BIOS setting	Function	Configuration options	Effect
USB0 port legacy support	Option for enabling/disabling legacy support for the USB4 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB1 port legacy support	Option for enabling/disabling legacy support for the USB2 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB2 port legacy support	Option for enabling/disabling legacy support for the USB3 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB3 port legacy support	Option for enabling/disabling legacy support for the USB1 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB4 port legacy support	Option for enabling/disabling legacy support for the USB port on the bus unit	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB5 port legacy support	Option for enabling/disabling legacy support for the USB port on the monitor/panel interface	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB6 port legacy support	Option for enabling/disabling legacy support for the USB5 port	Disabled	Disables the USB port
		Enabled	Enables the USB port
USB7 port legacy support	Option for enabling/disabling legacy support for the USB port on the monitor/panel option	Disabled	Disables the USB port
		Enabled	Enables the USB port

Table 203: Advanced - USB configuration - Per port legacy USB support control - Configuration options

1.4.13 Serial port console redirection

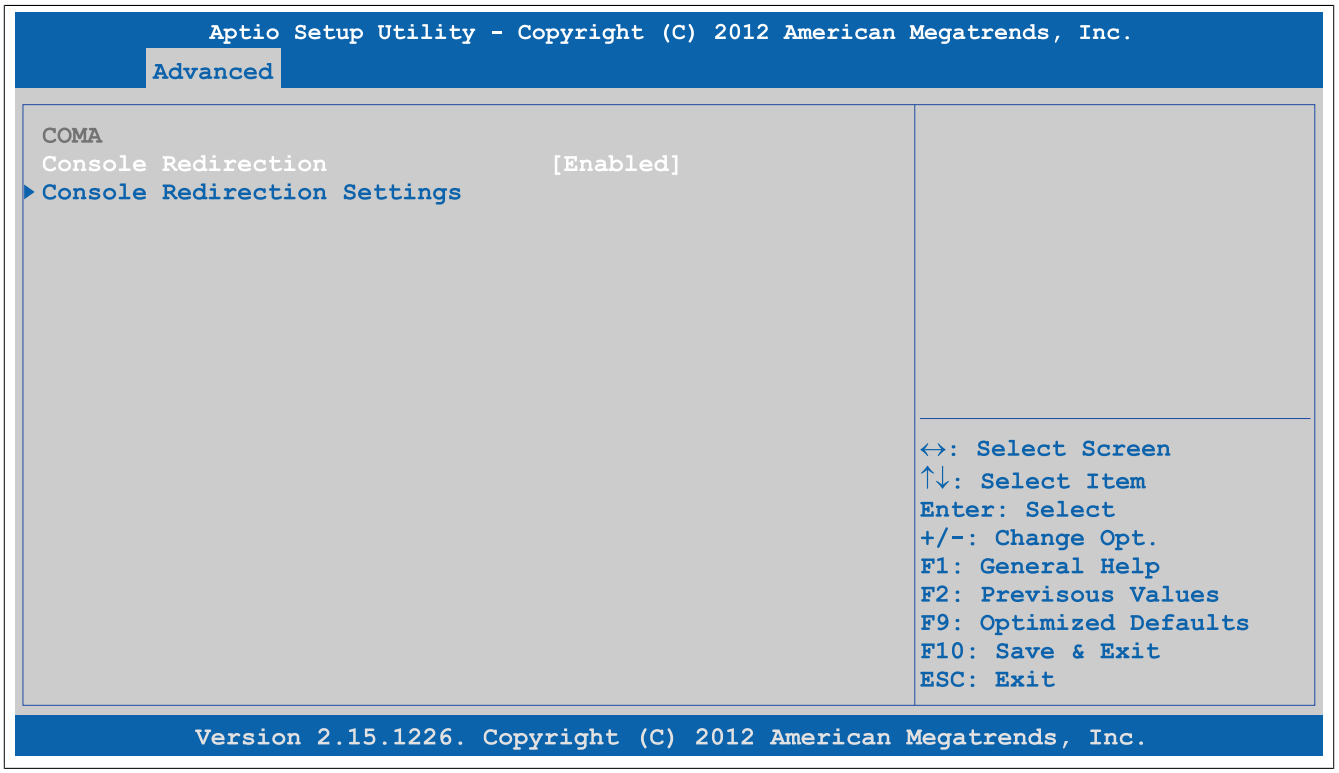


Figure 136: Advanced - Serial Port Console Redirection

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 the submenu See "Console redirection settings" on page 234

Table 204: Advanced - Serial port console redirection - Configuration options

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

1.4.13.1 Console redirection settings

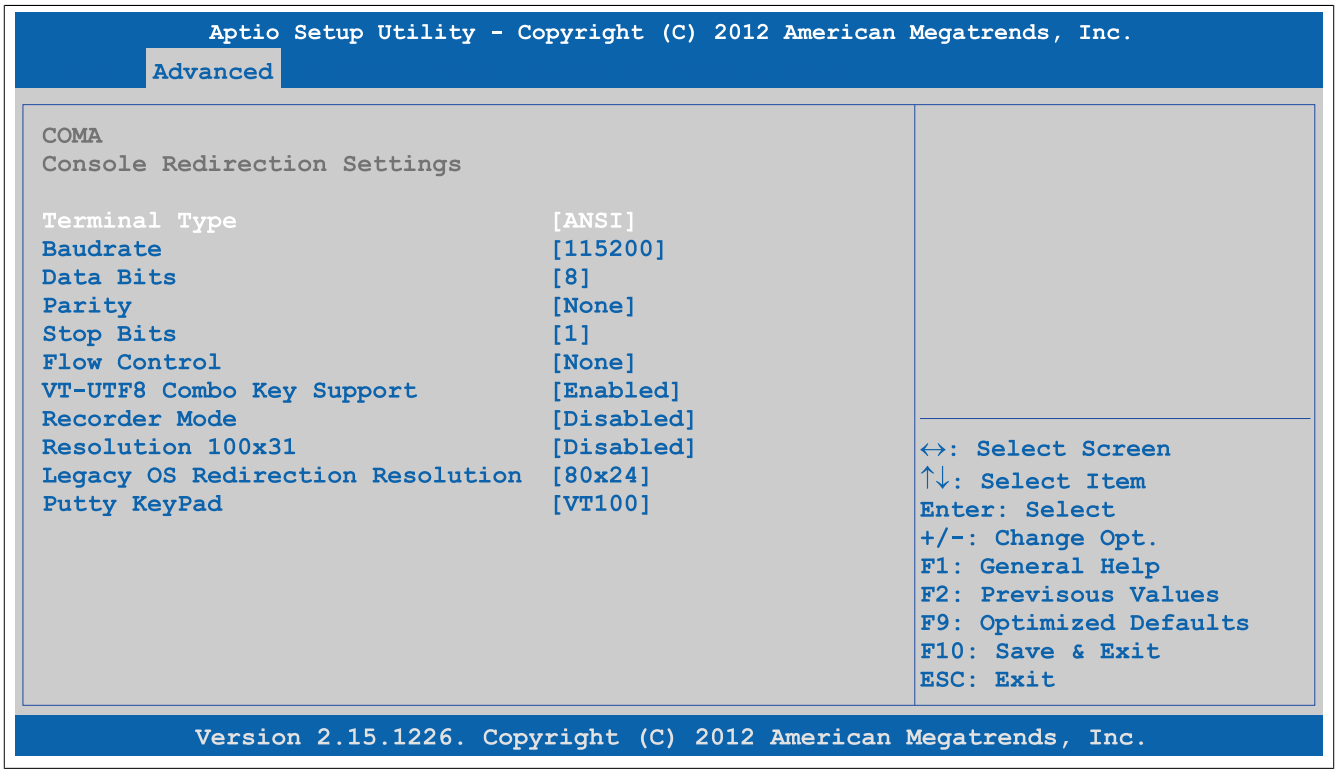


Figure 137: Advanced - Console Redirection - Console Redirection Settings

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 UTF8 encoding to assign Unicode characters to one or more bytes)
		ANSI	Enables the ANSI convention (extended ASCII character set)
Baud rate	Option for setting the transfer rate of the serial interface (bits per second)	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	Enables a transfer rate of x bits
Data bits	Option for configuring the character length (data bits) to use for serial communication	7	Character length with 7 bits
		8	Character length with 8 bits
Parity	Option for configuring the parity bit to use for serial communication	None	Parity bit not used
		Even	Uses an even number of parity bits
		Odd	Uses an odd number of parity bits
		Mark	Parity bit always 1
		Space	Parity bit always 0
Stop bits	Option for configuring the stop bits to use for serial communication	1	Uses 1 bit as the stop bit
		2	Uses 2 bits as the stop bit
Flow control	Option for configuring the data flow control	None	Disables data flow control
		Hardware RTS/CTS	Enables hardware handshake
VT-UTF8 combo key support	Option for enabling/disabling VT-UTF8 combo key support for ANSI and VT100 connections	Disabled	Disables this function
		Enabled	Enables this function
Recorder mode	Option for enabling/disabling recorder mode	Disabled	Disables this function
		Enabled	Enables this function When this setting is used, all control escape sequences are suppressed from the serial redirection output. This may lead to incorrectly formatted screen output but makes automatic storage of the serial console output easier.
Resolution 100x31	Option for enabling/disabling extended terminal resolution	Disabled	Disables this function
		Enabled	Enables this function
Legacy OS redirection resolution	Option for configuring the number of lines and columns for legacy OS redirection	80x24	Resolution of 80x24
		80x25	Resolution of 80x25
Putty keypad	TBD	VT100	TBD
		Linux	TBD
		XTERMR6	TBD
		SCO	TBD
		ESCN	TBD
		VT400	TBD

Table 205: Advanced - Console redirection - Console redirection settings - Configuration options

1.5 Boot

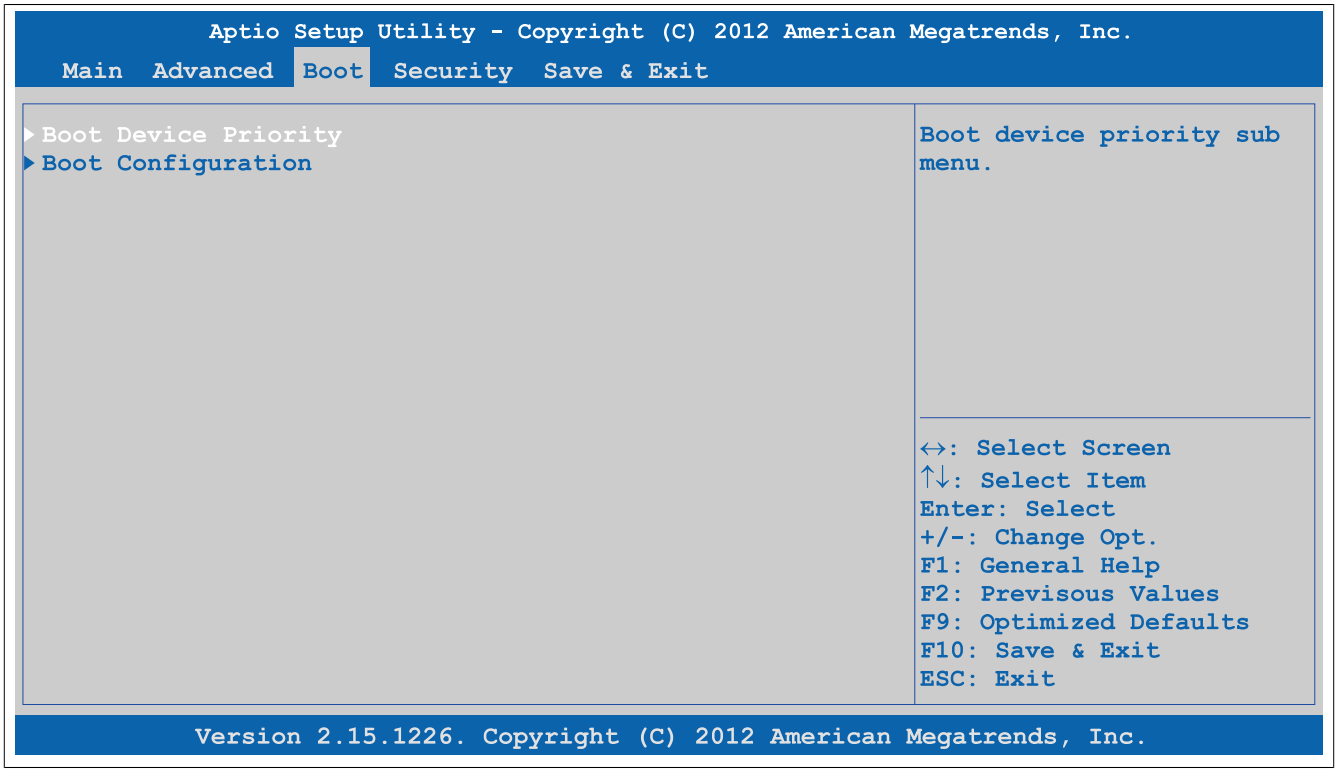


Figure 138: Boot

BIOS setting	Function	Configuration options	Effect
Boot device priority	Configures the boot order	Enter	Opens the submenu See "Boot device priority" on page 235
Boot configuration	Configures boot properties	Enter	Opens the submenu See "Boot configuration" on page 236

Table 206: Boot overview

1.5.1 Boot device priority

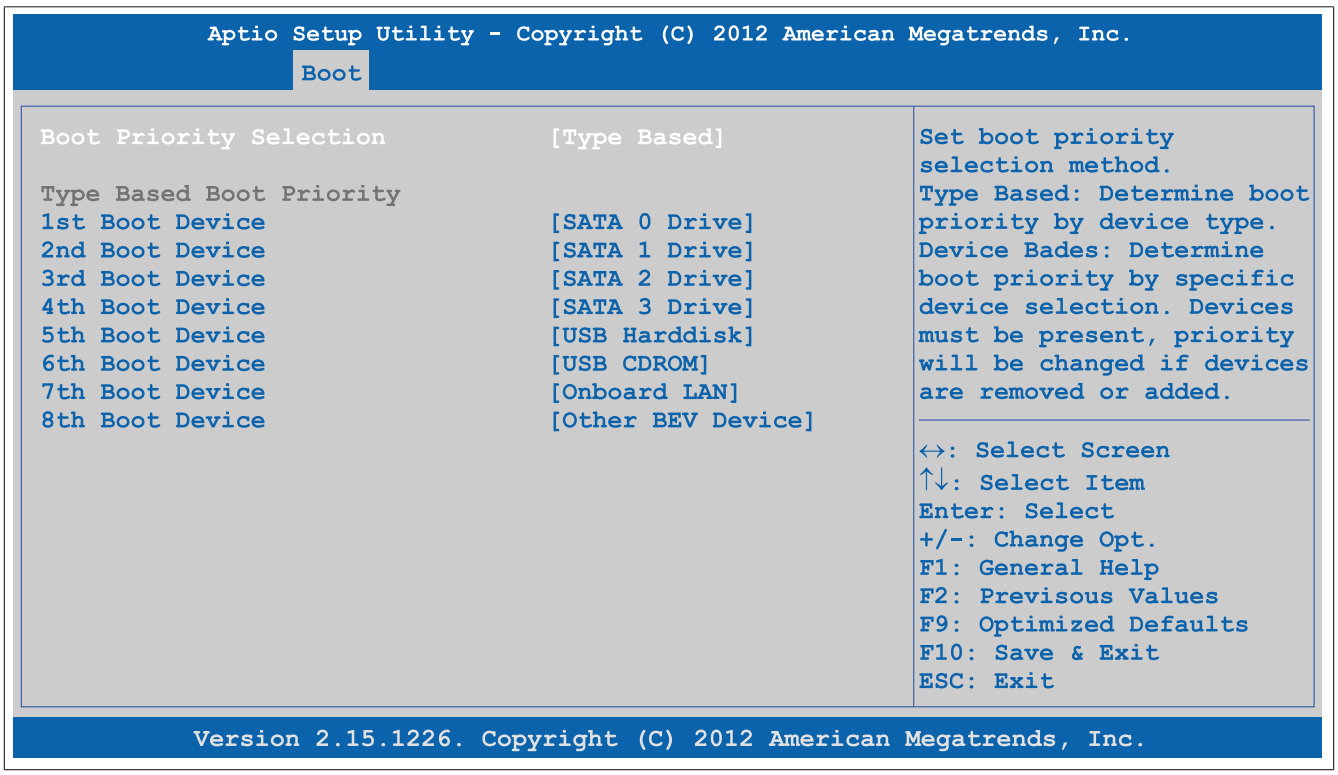


Figure 139: Boot - Boot Device Priority

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 207: Boot - Boot device priority - Configuration options

1.5.2 Boot configuration

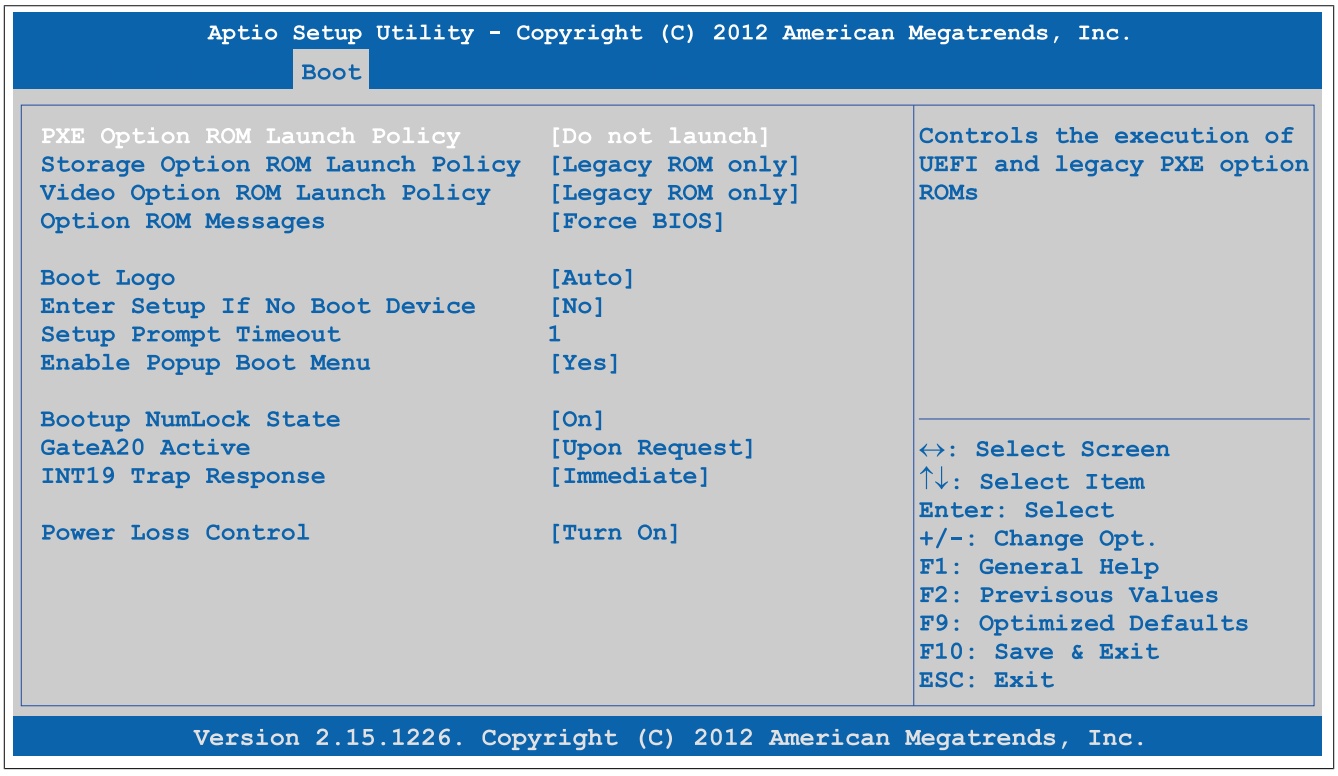


Figure 140: Boot - Boot Configuration

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

Table 208: Boot - Boot configuration - Configuration options

BIOS setting	Function	Configuration options	Effect
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.
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	GA20 can be disabled.
		Always	GA20 is not disabled.
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 APC910 turned off
		Turn on	Turns on the APC910
		Last state	Enables the previous state

Table 208: Boot - Boot configuration - Configuration options

1.6 Security

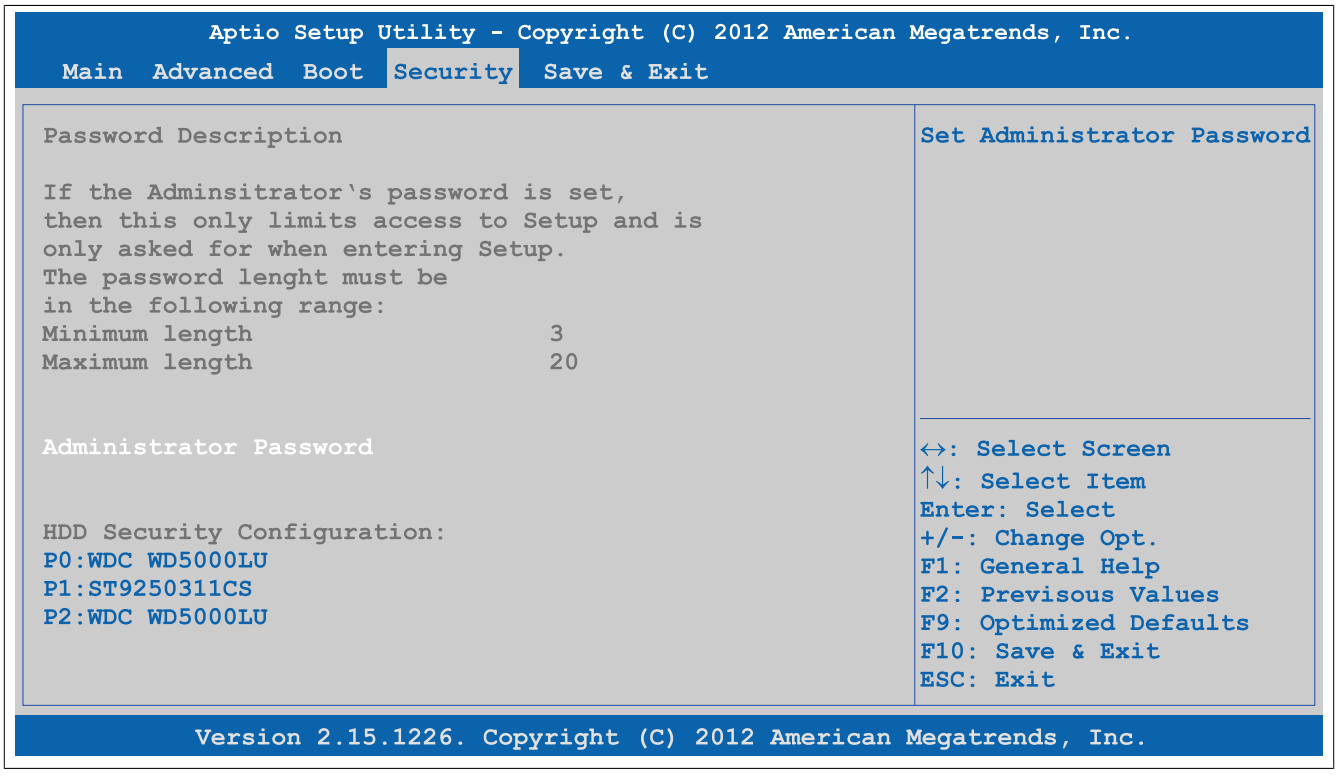


Figure 141: Security

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

Table 209: Security menu - Configuration options

1.6.1 HDD user password

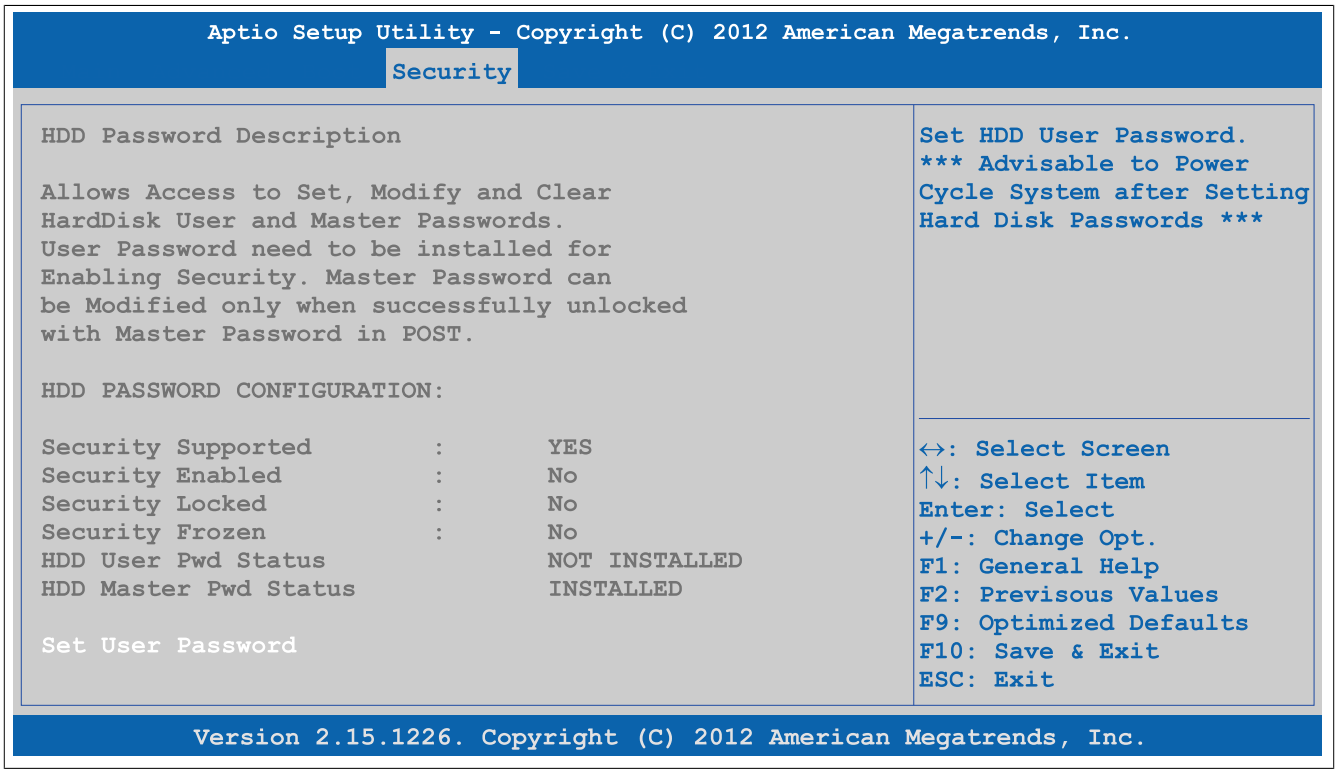


Figure 142: Security - HDD user password

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

Table 210: Security - HDD user password - Configuration options

1.7 Save & Exit

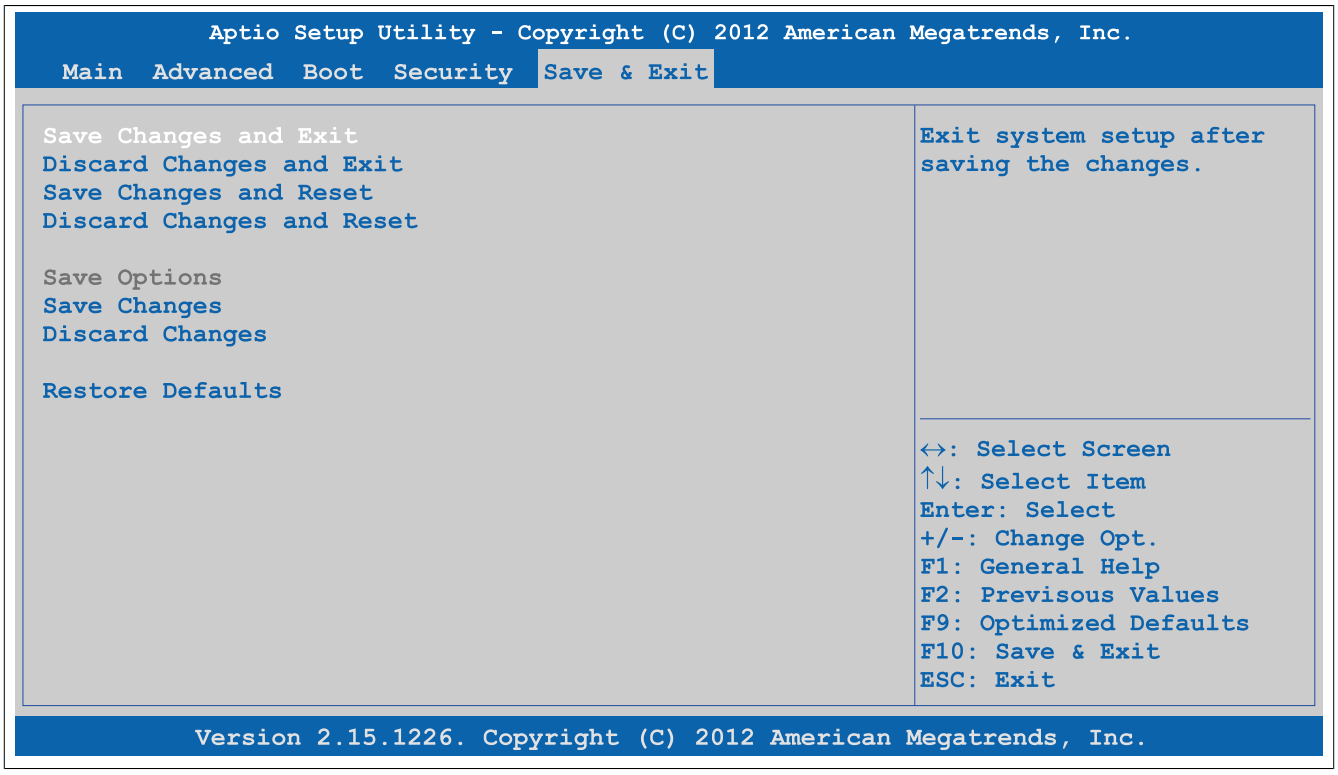


Figure 143: Save & Exit

BIOS setting	Function	Configuration options	Effect
Save changes and exit	Selecting this option closes BIOS Setup. Any changes made are saved 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. Any changes made are saved to CMOS after confirmation, and the system is rebooted.	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	Any changes made are saved to CMOS after confirmation.	Yes / No	
Discard changes	This option can be used to reset any settings that may have been made but have been forgotten in the meantime (provided they have not yet been saved).	Yes / No	
Restore defaults	This option restores BIOS default values.	Yes / No	

Table 211: Save & Exit menu - Configuration options

1.8 BIOS default settings

BIOS default settings may vary depending on how the complete system is configured.

If the function "Restore defaults" is selected in the main BIOS setup menu, or if "Save & Exit" is selected (or F9 is pressed) in the individual setup screens, the following BIOS settings are the optimized values that will be used.

1.8.1 Advanced

1.8.1.1 Graphics configuration

Setting / Option	Default profile	My setting
Primary display	Auto	
Internal graphics	Auto	
IGFX VBIOS version	-	
GTT size	2 MB	
Aperture size	256 M	
DVMT pre-allocated	64 M	
DVMT total gfx mem	256 M	
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	Display port	
Display Port C interface	Disabled	
Display Port D interface	HDMI/DVI	
Display mode persistence	Disabled	

Table 212: Advanced - Graphics configuration - Profile setting overview

1.8.1.2 OEM features

Setting/Option	Default profile	My setting
Main BIOS version	-	
OEM BIOS version	-	
MTCX	-	
ETH2 MAC address	-	
Real-time environment	Disabled	

Table 213: Advanced - OEM features - Overview of profile settings

1.8.1.2.1 Super I/O configuration

Setting / Option	Default profile	My setting
Serial port A	Enabled	
Device settings	-	
Serial port C	Enabled	
Device settings	-	

Table 214: Advanced - OEM features - Super I/O configuration - Profile settings overview

1.8.1.3 PCI configuration

Setting/Option	Default profile	My setting
Above 4G decoding	Disabled	
PCI latency timer	32 PCI bus clocks	
VGA palette snoop	Disabled	
PERR# generation	Disabled	
SERR# generation	Disabled	
PIRQ routing & IRQ reservation		
PIRQA	Auto	
PIRQB	Auto	
PIRQC	Auto	
PIRQD	Auto	
PIRQE	Auto	
PIRQF	Auto	
PIRQG	Auto	
PIRQH	Auto	
Reserve legacy interrupt 1	None	
Reserve legacy interrupt 2	None	

Table 215: Advanced - PCI configuration - Overview of profile settings

1.8.1.4 PCI Express configuration

1.8.1.4.1 PCI Express settings

Setting/Option	Default profile	My setting
Relaxed ordering	Disabled	
Extended tag	Disabled	
No snoop	Enabled	
Maximum payload	Auto	
Maximum read request	Auto	
ASPM	Disabled	
Extended synch	Disabled	
Link training retry	5	
Link training timeout (µS)	100	
Unpopulated links	Keep link on	

Table 216: Advanced - PCI Express configuration - PCI Express settings - Overview of profile settings

1.8.1.4.2 PCI Express GEN 2 settings

Setting/Option	Default profile	My setting
Completion timeout	Default	
ARI forwarding	Disabled	
AtomicOp requester enable	Disabled	
AtomicOp egress blocking	Disabled	
IDO request enable	Disabled	
IDO completion enable	Disabled	
LTR mechanism enable	Disabled	
End-End TLP prefix blocking	Disabled	
Target link speed	Auto	
Clock power management	Disabled	
Compliance SOS	Disabled	
Hardware autonomous width	Enabled	
Hardware autonomous speed	Enabled	

Table 217: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Overview of profile settings

1.8.1.4.3 PCI Express graphics (PEG) port

Setting / Option	Default profile	My setting
PCI Express graphics (PEG) port	Auto	
PEG root port configuration	1 x 8 + 2 x 4	
PEG0	-	
PEG0 speed	Auto	
PEG0 ASPM	Disabled	
PEG1	-	
PEG1 speed	Gen1	
PEG1 ASPM	Disabled	
PEG2	-	
PEG2 speed	Auto	
PEG2 ASPM	Disabled	
Detect non-compliant device	Disabled	
De-emphasis control	-3.5 dB	

Table 218: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Profile setting overview

1.8.1.4.4 PCI Express root port

Setting/Option	Default profile	My setting
PCI Express root port x	Enabled	
ASPM	Auto	
URR	Disabled	
FER	Disabled	
NFER	Disabled	
CER	Disabled	
CT0	Disabled	
SEFE	Disabled	
SENFE	Disabled	
SECE	Disabled	
PME SCI	Enabled	
Always enable port	Disabled	
PCIe speed	Auto	
Assign INT to root port	Enabled	

Table 219: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings

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

Table 219: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings

1.8.1.5 ACPI settings

Setting/Option	Default profile	My setting
Enable hibernation	Enabled	
ACPI sleep state	Both S1 and S3 available for OS to choose from	
Lock legacy resources	Disabled	
S3 video repost	Disabled	
Critical trip point	111 C	

Table 220: Advanced - ACPI settings - Overview of profile settings

1.8.1.6 RTC wake settings

Setting/Option	Default profile	My setting
Wake system at fixed time	Disabled	

Table 221: Advanced - RTC wake settings - Overview of profile settings

1.8.1.7 CPU configuration

Setting/Option	Default profile	My setting
Hyper-threading	Enabled	
Active processor cores	All	
Limit CPUID maximum	Disabled	
Execute disable bit	Enabled	
Intel virtualization technology	Disabled	
Hardware prefetcher	Enabled	
Adjacent cache line prefetch	Enabled	
TCC activation offset	0	
Primary plane current value	0	
Secondary plane current value	0	
EIST	Enabled	
Turbo mode	Enabled	
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 222: Advanced - CPU configuration - Overview of profile settings

1.8.1.8 Chipset configuration

Setting/Option	Default profile	My setting
PCH LAN controller	Enabled	
Wake on LAN	Enabled	
Azalia	Auto	
Azalia PME	Disabled	
Azalia internal HDMI codec	Disabled	
High-precision timer	Enabled	
CF9h global reset	Host only	
PCI Express clock gating	Disabled	
DMI link ASPM PCH side	Disabled	
PCIe USB glitch W/A	Disabled	
SB CRID	Disabled	
NB CRID	Disabled	
DMI	-	
DMI Vc1 control	Enabled	
DMI Vcp control	Enabled	

Table 223: Advanced - Chipset configuration - Overview of profile settings

Setting/Option	Default profile	My setting
DMI Vcm control	Enabled	
DMI link ASPM CPU side	Disabled	
DMI extended synch control	Disabled	
DMI Gen 2	Auto	

Table 223: Advanced - Chipset configuration - Overview of profile settings

1.8.1.9 SATA configuration

Setting / Option	Default profile	My setting
SATA controller(s)	Enabled	
SATA mode selection	AHCI	
SATA test mode	Disabled	
Aggressive LPM support	Disabled	
SATA controller speed	Gen3	
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 224: Advanced - SATA configuration - Profile setting overview

1.8.1.10 Memory configuration

Setting/Option	Default profile	My setting
DIMM profile	Default DIMM profile	
No fan memory frequency limiter	Enabled	
ECC support	Disabled	
Max TOLUD	Dynamic	
NMode support	Auto	
Memory scrambler	Enabled	
Memory refresh rate	Disabled	
MRC fast boot	Enabled	
Force cold reset	Enabled	
DIMM exit mode	Fast exit	
Power down mode	PPD	
Scrambler seed generation off	Disabled	

Table 225: Advanced - Memory configuration - Overview of profile settings

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

Table 225: Advanced - Memory configuration - Overview of profile settings

1.8.1.11 USB configuration

Setting/Option	Default profile	My setting
EHCI1 (ports 0-5)	Enabled	
EHC2 (ports 6-7)	Enabled	
xHCI mode	Auto	
HS port #1 switchable	Enabled	
HS port #2 switchable	Enabled	
HS port #3 switchable	Enabled	
HS port #4 switchable	Enabled	
Legacy USB support	Enabled	
USB 3.0 support	Enabled	
XHCI hand-off	Enabled	
EHCI hand-off	Disabled	
USB mass storage driver support	Enabled	
Device reset time-out	20 sec	
USB transfer 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 226: Advanced - USB configuration - Overview of profile settings

1.8.1.12 Serial port console redirection

Setting/Option	Default profile	My setting
Console redirection	Disabled	

Table 227: Advanced - Serial port console redirection - Overview of profile settings

1.8.2 Boot

1.8.2.1 Boot device priority

Setting/Option	Default profile	My setting
Boot priority selection	Type based	
1st boot device	SATA 0 drive	
2nd boot device	SATA 1 drive	
3rd boot device	SATA 2 drive	
4th boot device	SATA 3 drive	
5th boot device	USB hard disk	
6th boot device	USB CDROM	
7th boot device	Onboard LAN	
8th boot device	Other BEV device	

Table 228: Boot - Boot device priority - Overview of profile settings

1.8.2.2 Boot configuration

Setting/Option	Default profile	My setting
PXE Option ROM launch policy	Do not launch	
Storage Option ROM launch policy	Legacy ROM only	
Video Option ROM launch policy	Legacy ROM only	
Option ROM messages	Force BIOS	
Boot logo	Auto	
Enter setup if no boot device	No	
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	

Table 229: Boot - Boot configuration - Overview of profile settings

1.9 Allocation of resources

1.9.1 RAM address assignment

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
869kB – 1024 kB	0E0000h - 0FFFFFh	Runtime BIOS
768kB – 896 kB	0C0000h - 0DFFFFh	Expansion area
640kB – 768 kB	0A0000h - 0BFFFFh	Video memory and BIOS
639kB – 640 kB	09FC00h - 09FFFFh	Extended BIOS data
0 – 639 kB	000000h - 09FC00h	Conventional memory

Table 230: RAM address assignment

1) TOM = Top of memory: Max. installed DRAM.

1.9.2 I/O address assignment

I/O address	Resource
0000h - 00FFh	Motherboard resources
0170h - 0177h	Secondary IDE channel
01F0h - 01F7h	Primary IDE channel
0228h - 022Fh	COMF (I/O board 2)
02E8h - 02EFh	COME (I/O board 1)
02F8h - 02FFh	COMB (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	COMC (SDL onboard)
03F6h - 03F6h	Primary IDE channel command port
03F7h - 03F7h	Primary IDE channel status port
03F8h - 03FFh	COMA (COM1)
0400h - 047Fh	Motherboard resources
0500h - 057Fh	Motherboard resources
0CF8h - 0CFBh	PCI config address register
0CFCh - 0CFFh	PCI config data register
0D00h - FFFFh	PCI / PCI Express bus
4100h - 417Fh	MTCX
FF00h - FF07h	IDE bus master register

Table 231: I/O address assignment

1.9.3 Interrupt assignments in PIC mode

IRQ		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	NONE
System timer		●																
Keyboard			●															
IRQ cascade				●														
COMA (COM1)					○	●	○	○	○			○	○	○				
ACPI[1)]											●							
Real-time clock										●								
Coprocessor (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 232: IRQ interrupt assignments in PIC mode

1) **A**dvanced **C**onfiguration and **P**ower **I**nterface.

● ... Default setting
○ ... Optional setting

1.9.4 Interrupt assignments in APIC mode

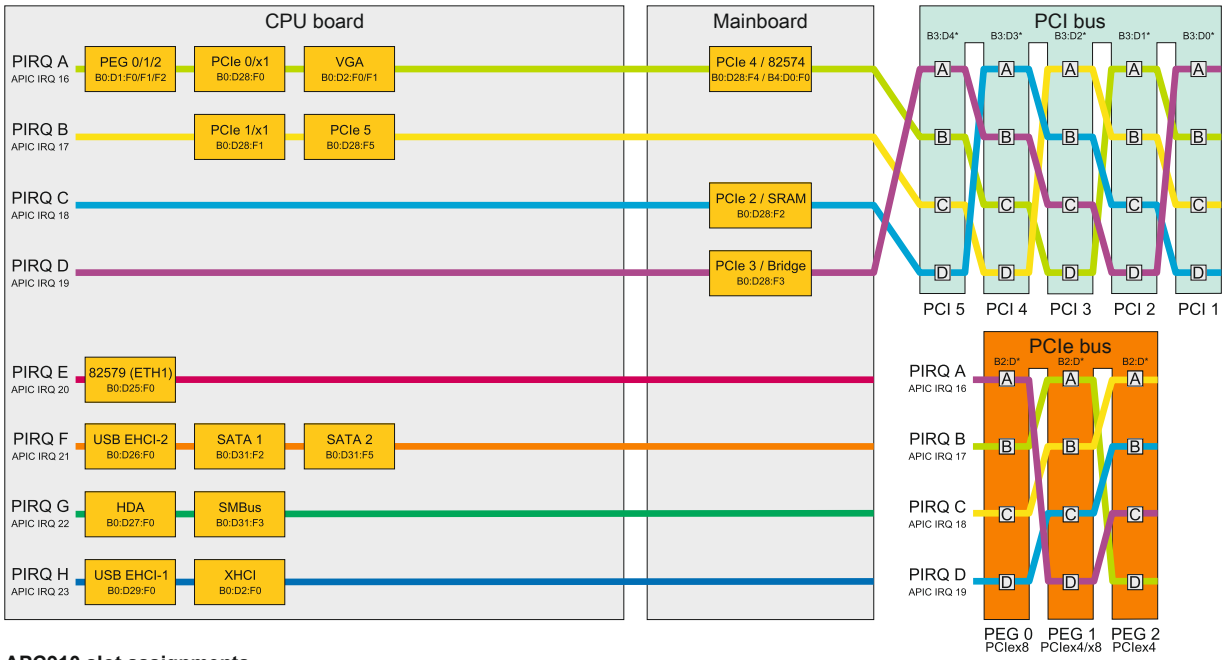
A total of 23 IRQs are available in APIC (**A**dvanced **P**rogrammable **I**nterrupt **C**ontroller) mode. Enabling this option is only effective if done before the Windows operating system is installed.

IRQ		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	NONE
System timer		●																								
Keyboard			●																							
IRQ cascade				●																						
COMA (COM1)					○	●	○	○	○			○	○	○												
ACPI[1]											●															
Real-time clock										●																
Coprocessor (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				○	○	○	○	○			●	○	○												
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 233: 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.
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



APC910 slot assignments

Slot 5	Slot 4	Slot 3	Slot 2	Slot 1	
				PCI 5	5AC901.BX01-00
				PEG 1	5AC901.BX01-01
			PCI 5	PCI 4	5AC901.BX02-00
			PCI 5	PEG 1	5AC901.BX02-01
			PEG 2	PEG 1	5AC901.BX02-02
PCI 5	PCI 4	PCI 3	PCI 2	PCI 1	5AC901.BX05-00
PCI 5	PCI 4	PCI 3	PCI 2	PEG 1	5AC901.BX05-01
PCI 5	PCI 4	PEG 1	PCIe 0	PCIe 1	5AC901.BX05-02
PCIe 3	PEG 2	PEG 1	PCIe 0	PCIe 1	5AC901.BX05-03

*The bus number can change depending on which bus unit is being used.

**By default, PCIe slots are limited to Gen1 in BIOS.
The PCIe Gen configuration can be changed in BIOS, however.

Figure 144: PCI and PCIe routing with the QM77/HM76 APIC CPU board

2 Upgrade information

Warning!

The BIOS and firmware on B&R devices must be kept current. New versions can be downloaded from the B&R website (www.br-automation.com).

2.1 BIOS upgrade

An upgrade may be necessary in order to accomplish the following:

- Updating implemented functions or adding newly implemented functions or components to BIOS Setup (information about changes can be found in the Readme file for the BIOS upgrade).

2.1.1 Important information

Information:

Customized BIOS settings are deleted when upgrading BIOS.

Before starting an upgrade, it helps to determine the various software versions.

2.1.1.1 Which BIOS version and firmware are already installed?

This information can be found on the following BIOS Setup screen:

- After switching on the APC910, BIOS Setup can be accessed by pressing <Del>.
- From the "Advanced" menu in BIOS, select "OEM features".

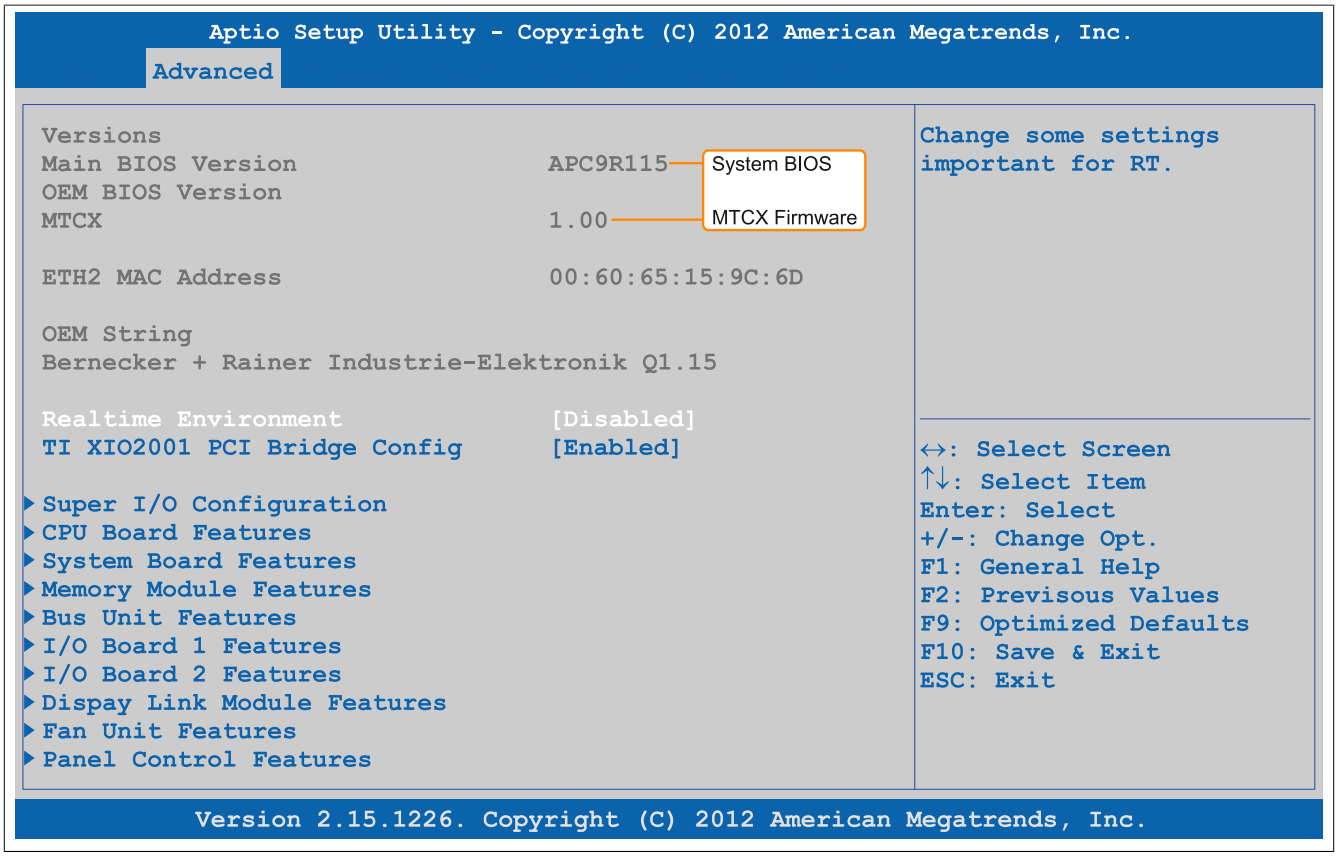


Figure 145: Software version

2.1.2 Procedure with MS-DOS

1. Download the .zip file from the B&R website (www.br-automation.com).
2. Create bootable media.

Information:

In MS-DOS, Win95 and Win98, a blank HD disk can be made bootable by typing "sys a:" or "format a: /s" on the command line.
Information about creating a bootable diskette in Windows XP can be found on page 252.

Information on creating a USB flash drive for a B&R upgrade can be found on page 254.

Information on creating a storage device for a B&R upgrade can be found on page 255.

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 or HM76)
2. Exit
```

Item 1:
BIOS is automatically upgraded (default after 5 seconds).

Item 2:
Returns to the shell (MS-DOS)

Information:

If a button is not pressed within 5 seconds, then item 1 is automatically carried out to update the industrial PC.

6. The system must be rebooted after a successful upgrade.
7. Reboot and press <Del> to enter BIOS Setup and load the setup defaults, then select "Save changes and exit".

2.2 Firmware upgrade

The "Firmware upgrade (MTCX, SDLR, AP830, AP9x3)" software makes it possible to update the firmware for multiple controllers (MTCX, SDLR, AP830, AP9x3) depending on the 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

1. Download the .zip file from the B&R website (www.br-automation.com).
2. Open the **Control Center** in the Control Panel.
3. Select the **Versions** tab.
4. Under System unit, click on **Update** for **MTCX**. This brings up the "Open" dialog box.
5. Enter the name of the firmware file or select the file under **Filename**.
6. Click on **Open**. This brings up the "Open" dialog box.

The transfer can be canceled by clicking on **Cancel**. **Cancel** is disabled when writing to flash memory.

> **Warning!**
>
> **Do not press any panel keys while the firmware is being transferred! This can disrupt the procedure.**

Deleting the data in flash memory can take several seconds depending on the memory block being used. The progress indicator is not updated during this time.

> **Information:**
>
> **Power to the PC must be shut off and turned back on for the new firmware to take effect and for the updated version to be displayed. The user is prompted to do this when closing the Control Center.**

> **Information:**
>
> **For more information about saving and updating firmware, please refer to the help documentation for the Control Center.**

2.3 Creating an MS-DOS boot diskette in Windows XP

1. Insert a blank 1.44 MB HD diskette into the disk drive.
2. Open Windows Explorer.
3. Right-click on the 3½ floppy diskette icon and select "Format".

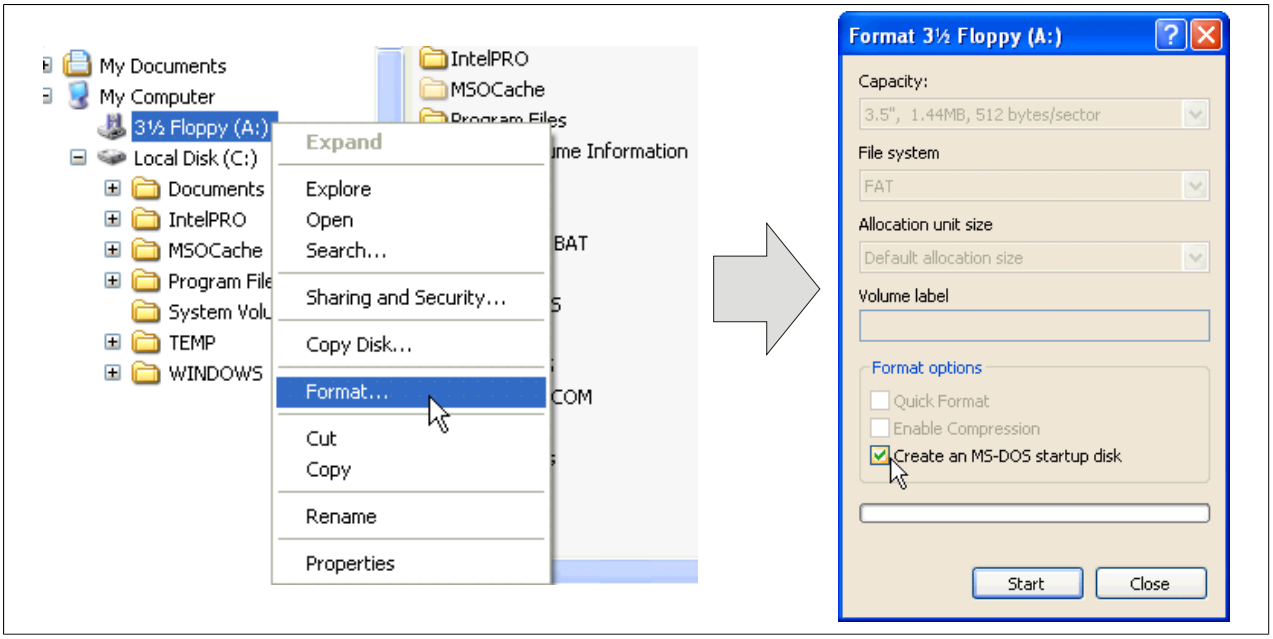


Figure 146: Creating a bootable diskette in Windows XP - Step 1

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

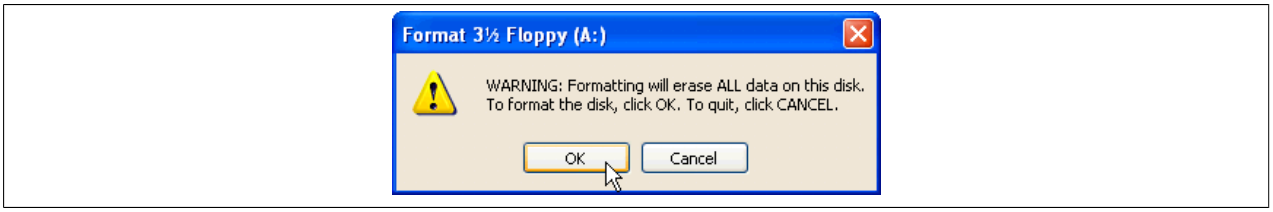


Figure 147: Creating a bootable diskette in Windows XP - Step 2

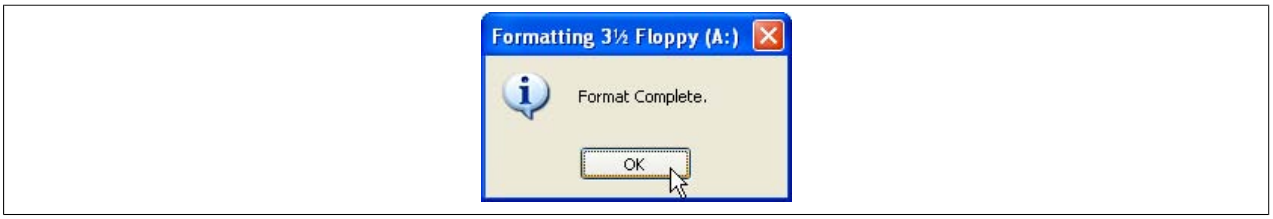


Figure 148: Creating a bootable diskette in Windows XP - Step 3

After creating the startup disk, some of the files must be deleted because of the size of the update.

To do this, all files (hidden system files, etc.) must be visible on the diskette.

In Windows Explorer, go to the "Tools" menu, select "Folder options" and open the "View" tab. Then deselect the option "Hide protected operating system files (Recommended)" (enabled by default) and enable the option "Show hidden files and folders".

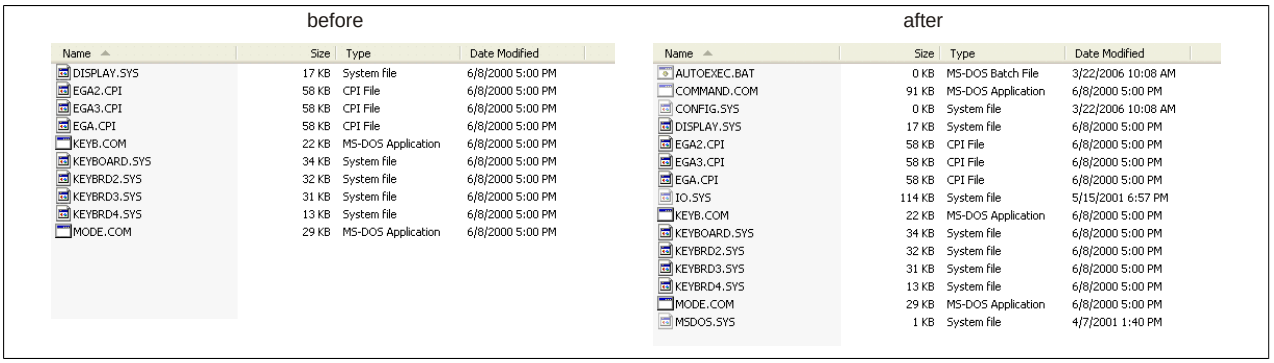


Figure 149: Creating a bootable diskette in Windows XP - Step 4

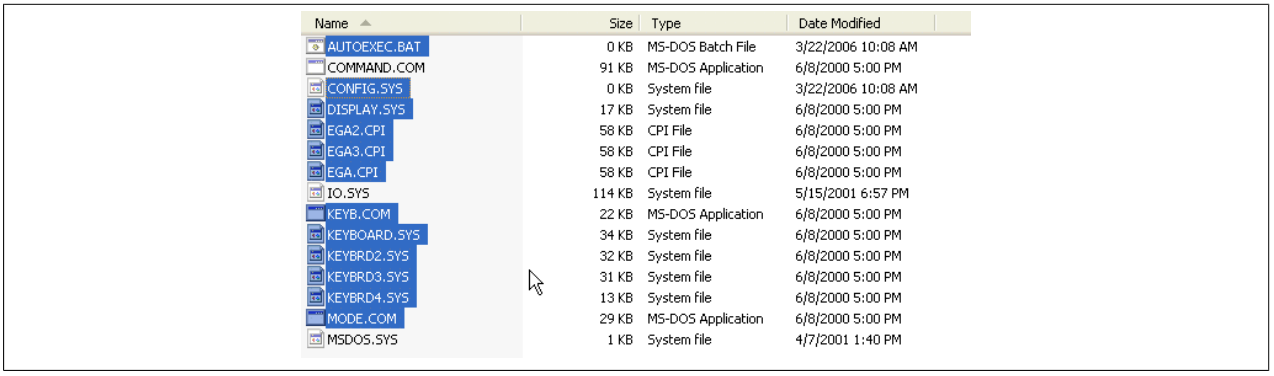


Figure 150: Creating a bootable diskette in Windows XP - Step 5

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. upgrade 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, the list can be updated using the command **Drives > Refresh**.
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.

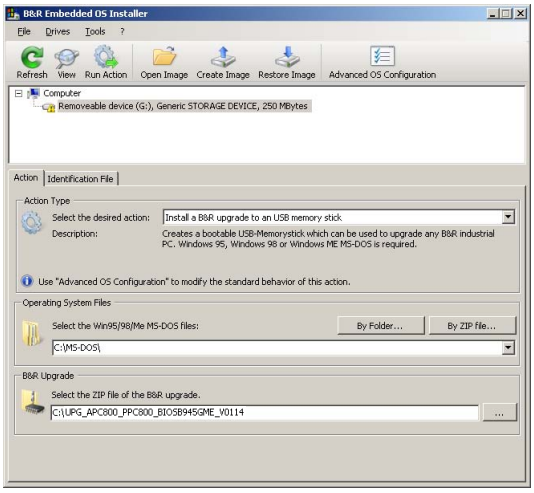


Figure 151: Creating a USB flash drive for B&R upgrade files

2.4.3 How to access MS-DOS

Information on creating an MS-DOS boot diskette can be found in section see "Creating an MS-DOS boot diskette in Windows XP" on page 252. 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. upgrade 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, the list can be updated using the command **Drives > Refresh**.
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.

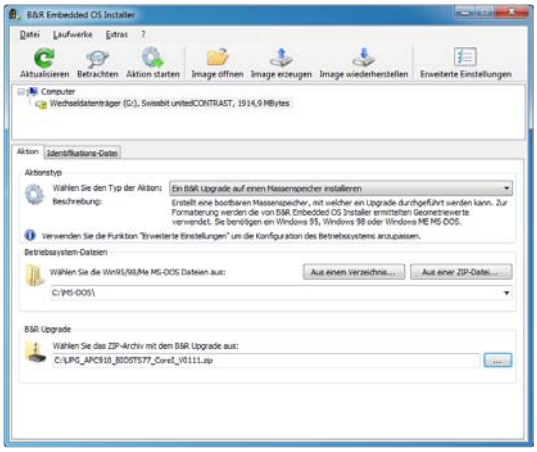


Figure 152: Creating a mass storage device for B&R upgrade files

2.5.3 How to access MS-DOS

Information on creating an MS-DOS boot diskette can be found in section "Creating an MS-DOS boot diskette in Windows XP" on page 252. The files from the diskette are then copied to the hard drive.

3 Windows 7

3.1 General information

Windows® 7 offers a wealth of innovative features and performance improvements. The 64-bit variants can also exploit the full power of current PC architectures. Faster switching to power saving mode, quicker restores, less memory usage and high-speed detection of USB devices are just a few of the advantages provided by Windows® 7. Both English and German are available in Windows® 7 Professional, while Windows® 7 Ultimate supports up to 35 different languages (up to 36 languages in Service Pack 1). Product activation is not necessary on B&R PCs, which is a huge advantage for simple logistical procedures relating to machine automation.

All of the Windows® operating systems offered by B&R are from the Microsoft Embedded division. This guarantees much longer availability, especially compared to products offered on the consumer market.

3.2 Order data

Model number	Short description	Figure
	Windows 7 Professional/Ultimate	
5SWWI7.1100-GER	Microsoft OEM Windows 7 Professional 32-bit, Service Pack 1, DVD, German. Only available with a new device.	
5SWWI7.1100-ENG	Microsoft OEM Windows 7 Professional 32-bit, Service Pack 1, DVD, English. Only available with a new device.	
5SWWI7.1200-GER	Microsoft OEM Windows 7 Professional 64-bit, Service Pack 1, DVD, German. Only available with a new device.	
5SWWI7.1200-ENG	Microsoft OEM Windows 7 Professional 64-bit, Service Pack 1, DVD, English. Only available with a new device.	
5SWWI7.1300-MUL	Microsoft OEM Windows 7 Ultimate 32-bit, Service Pack 1, DVD, multilingual. Only available with a new device.	
5SWWI7.1400-MUL	Microsoft OEM Windows 7 Ultimate 64-bit, Service Pack 1, DVD, multilingual. Only available with a new device.	

Table 234: 5SWWI7.1100-GER, 5SWWI7.1100-ENG, 5SWWI7.1200-GER, 5SWWI7.1200-ENG, 5SWWI7.1300-MUL, 5SWWI7.1400-MUL - Order data

3.3 Overview

Model number	Edition	Target system	Chipset	Service Pack	Architectures	Language	Preinstalled	Minimum hard disk space required	Minimum RAM required
5SWWI7.1100-GER	Professional	APC510 APC511 APC810 APC910 PPC800 PPC900 PP500	945GME GM45 QM77/HM76 NM10 US15W	SP1	32-bit	German	Optional	16 GB	1 GB
5SWWI7.1100-ENG	Professional	APC510 APC511 APC810 APC910 PPC800 PPC900 PP500	945GME GM45 QM77/HM76 NM10 US15W	SP1	32-bit	English	Optional	16 GB	1 GB
5SWWI7.1200-GER	Professional	APC810 APC910 PPC800 PPC900	945GME Intel® Core™2 Duo GM45 QM77/HM76	SP1	64-bit	German	Optional	20 GB	2 GB
5SWWI7.1200-ENG	Professional	APC810 APC910 PPC800 PPC900	945GME Intel® Core™2 Duo GM45 QM77/HM76	SP1	64-bit	English	Optional	20 GB	2 GB
5SWWI7.1300-MUL	Ultimate	APC510 APC511 APC810 APC910 PPC800 PPC900 PP500	945GME GM45 QM77/HM76 NM10 US15W	SP1	32-bit	Multilingual	Optional	16 GB [1)]	1 GB
5SWWI7.1400-MUL	Ultimate	APC810 APC910 PPC800 PPC900	945GME Intel® Core™2 Duo GM45 QM77/HM76	SP1	64-bit	Multilingual	Optional	20 GB [1)]	2 GB

Table 235: Windows 7 - Overview

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

3.4 Installation

Upon request, B&R can preinstall the required Windows 7 version on the desired mass storage device (e.g. CompactFlash card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

3.4.1 Installation on PCI SATA RAID controller - 5ACPCI.RAIC-06

The following steps are necessary to install Windows 7 on a 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 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. Plug the USB flash drive with the RAID drivers into an available USB port.
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.

3.4.2 Installing to the internal RAID controller (QM77)

The following steps are necessary for installing 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 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. Plug the USB flash drive with the RAID drivers into an available USB port.
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.

3.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website www.br-automation.com.

Information:

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

3.6 Special considerations, limitations

- Windows 7 does not contain a Beep.sys file, which means that an audible signal is no longer sounded (e.g. when pressing a key).
- There is currently no support for the Windows 7 system rating (although this does not apply to PP500, APC510, APC511, APC910 or PPC800 devices with an NM10 chipset).

4 Windows Embedded Standard 7

4.1 General information

The successor to Windows® XP Embedded is Windows® Embedded Standard 7. As with previous versions, this embedded operating system offers full system support for B&R Industrial PCs. In addition to brand new features that are also included in Windows® 7 Professional, Windows® Embedded Standard 7 includes embedded components such as Enhanced Write Filter, File-Based Write Filter, Registry Filter and USB Boot. Windows® Embedded Standard 7 is available in two different versions. The main difference between them has to do with multilingual support. Windows® Embedded Standard 7 is only available in a single language, whereas Windows® Embedded Standard 7 Premium supports the installation of several languages simultaneously.

With Windows® Embedded Standard 7, Microsoft has made substantial improvements in the area of security. The AppLocker program, available in the premium version, can prevent the execution of unknown or potentially undesired applications that are being installed over a network or from drives that are directly connected. A tiered approach allows the differentiation between scripts (.ps1, .bat, .cmd, .vbs and .js), installation files (.msi, .msp) and libraries (.dll, .ocx). AppLocker can also be configured to record undesired activity and display it in the Event Viewer. Windows® Embedded Standard 7 is available in both a 32-bit and 64-bit version.[6)], which ensures that even the most demanding applications have the level of support they need.

4.2 Order data

Model number	Short description	Figure
	Windows Embedded Standard 7	
5SWWI7.1540-ENG	Microsoft OEM Windows Embedded Standard 7 32-bit, Service Pack 1, English; for APC910 with QM77/HM76 chipset; order CFast separately (at least 16 GB).	
5SWWI7.1640-ENG	Microsoft OEM Windows Embedded Standard 7 64-bit, Service Pack 1, English; for APC910 with QM77/HM76 chipset; order CFast separately (at least 16 GB).	
5SWWI7.1740-MUL	Microsoft OEM Windows Embedded Standard 7 Premium 32-bit, Service Pack 1, multilingual; for APC910 with QM77/HM76 chipset; order CFast separately (at least 16 GB without language packs).	
5SWWI7.1840-MUL	Microsoft OEM Windows Embedded Standard 7 Premium 64-bit, Service Pack 1, multilingual; for APC910 with QM77/HM76 chipset; order CFast separately (at least 16 GB).	
	Required accessories	
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB	
5CFAST.032G-00	CFast card, 32 GB	
	Optional accessories	
	Windows Embedded Standard 7	
5SWWI7.1900-MUL	Microsoft OEM Windows Embedded Standard 7 32-bit, Service Pack 1, Language Pack DVD	
5SWWI7.2000-MUL	Microsoft OEM Windows Embedded Standard 7 64-bit, Service Pack 1, Language Pack DVD	

Table 236: 5SWWI7.1540-ENG, 5SWWI7.1640-ENG, 5SWWI7.1740-MUL, 5SWWI7.1840-MUL - Order data

4.3 Overview

Product ID	5SWWI7.1540-ENG
Operating system	
Target systems Industrial PC Chipset	 APC910 QM77 HM76
Edition	Embedded
Architectures	32-bit
Service Pack	SP1
Language	English
Preinstallation	Optional
Minimum RAM required	1 GB
Minimum disk size	16 GB

Table 237: 5SWWI7.1540-ENG - Technical data

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

4.4 Features with WES7 (Windows Embedded Standard 7)

The following list of features shows the most important device functions included in Windows Embedded Standard 7.

Function	Windows Embedded Standard 7	Windows Embedded Standard 7 Premium
Enhanced Write Filter (EWF)	✓	✓
File-Based Write Filter (FBWF)	✓	✓
Administrator accounts	✓	✓
User accounts	Configurable	Configurable
Windows Explorer shell	✓	✓
Registry filter	✓	✓
Internet Explorer 8.0	✓	✓
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	-	✓
Windows Touch	-	✓
Boot from USB flash drive	✓	✓
Accessories	✓	✓
Page file	Configurable	Configurable
Number of fonts	134	134

Table 238: Device functions in Windows Embedded Standard 7

4.5 Installation

Upon request, B&R can preinstall 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 the EWF should be used, all mass storage devices should be disconnected from the system during installation oder SYSPREP (except for the boot drive). It is also possible to disable additional mass storage devices in BIOS.

4.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of the driver is still being used, the 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.

4.6.1 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 the Enhanced Write Filter (EWF) and the File Based Write Filter (FBWF) are disabled for this.

Information:

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

5 Windows XP Professional

5.1 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.

5.2 Order data

Model number	Short description	Figure
	Windows XP Professional	
5SWWXP.0600-GER	Microsoft OEM Windows XP Professional Service Pack 3, CD, German. Only available with a new device.	
5SWWXP.0600-ENG	Microsoft OEM Windows XP Professional Service Pack 3, CD, English. Only available with a new device.	
5SWWXP.0600-MUL	Microsoft OEM Windows XP Professional Service Pack 3, CD, multilingual. Only available with a new device.	

Table 239: 5SWWXP.0600-GER, 5SWWXP.0600-ENG, 5SWWXP.0600-MUL - Order data

5.3 Overview

Model number	Edition	Target system	Chipset	Service Pack	Language	Preinstalled	Minimum hard disk space required	Minimum RAM required
5SWWXP.0600-GER	Professional	APC510 APC511 APC620 APC810 APC820 APC910 PPC700 PPC725 PPC800 PPC900 PP500	945GME GM45 QM77/HM76 NM10 US15W	SP3	German	Optional	≤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	Optional	≤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	Optional	≤2.1 GB	128 MB

5.4 Installation

Upon request, B&R can preinstall the required Windows XP Professional version on the desired mass storage device (e.g. CompactFlash card, etc.). All of the drivers required for operation (graphics, network, etc.) are also installed in this process.

5.4.1 Installation on 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 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 port.
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.**

5.4.2 Installing to the internal RAID controller (QM77) or in AHCI mode

The following steps are necessary for installing 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 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 port.
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.**

5.5 Drivers

Current drivers for all approved operating systems are available in the Downloads section of the B&R website www.br-automation.com.

Information:

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

6 Windows Embedded Standard 2009

6.1 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.

6.2 Order data

Model number	Short description	Figure
	Windows Embedded Standard 2009	
5SWWXP.0740-ENG	Microsoft OEM Windows Embedded Standard 2009, English; for APC910 with QM77/HM76 chipset; order CFast separately (at least 2 GB).	
	Required accessories	
	CFast cards	
5CFAST.016G-00	CFast card, 16 GB	
5CFAST.032G-00	CFast card, 32 GB	
5CFAST.2048-00	CFast card, 2 GB	
5CFAST.4096-00	CFast card, 4 GB	
5CFAST.8192-00	CFast card, 8 GB	

Table 240: 5SWWXP.0740-ENG - Order data

6.3 Overview

Product ID	5SWWXP.0740-ENG
Operating system	
Target systems Industrial PC [1] Chipset	 APC910 QM77 HM76
Language	English
Preinstallation	Yes
Minimum RAM required	256 MB
Minimum disk size [2]	2 GB

Table 241: 5SWWXP.0740-ENG - Technical data

1) Can only be ordered together with a suitable B&R device.
2) Data medium sold separately.

6.4 Features with WES2009 (Windows Embedded Standard 2009)

The following list of features shows the most important device functions included in Windows Embedded Standard 2009.

Function	Present
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	✓

Table 242: Device functions in Windows Embedded Standard 2009

Function	Present
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	✓
Media Player 6.4	✓
DirectX 9.0c	✓
Accessories	✓
Number of fonts	89

Table 242: Device functions in Windows Embedded Standard 2009

6.5 Installation

Upon request, B&R can preinstall Windows Embedded Standard 2009 on a suitable CFast card (at least 2 GB necessary). 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.

6.6 Drivers

All drivers required for operation are preinstalled along with the operating system. If an older version of the driver is still being used, the latest version can be downloaded and installed from the B&R website (www.br-automation.com). It is important that Enhanced Write Filter (EWF) is disabled for this.

7 Automation Runtime

7.1 General information

An integral component of Automation Studio is the real-time operating system, which makes up 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 runtime system
- Multitasking according to deterministic runtime rules
- Configuration of priorities, time classes and jitter tolerance
- Up to eight different time classes with any number of subroutines
- Guaranteed response to time and jitter tolerance violations
- Exception handling
- Configurable jitter tolerance in all task classes
- Support for all relevant programming languages, including IEC 61131-3 and ANSI C
- Extensive function library conforming to IEC 61131-3 as well as the expanded Automation library
- 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 fieldbus) and other devices (interfaces, networks, etc.).

7.2 Order data

Model number	Short description	Figure
	Automation Runtime	
1A4600.10-5	B&R Automation Runtime ARwin, including license sticker	
1A4601.06-5	B&R Automation Runtime ARemb, including license sticker	

Table 243: 1A4600.10-5, 1A4601.06-5 - Order data

7.3 Automation Runtime Windows (ARwin)

System support is provided by ARwin with an AS 3.0.90.23 or AS 4.0.14.0 / AR Q4.02 upgrade. An Automation Runtime dongle is not necessary; all that is needed is an AR license.

Information:

In order to use Automation Runtime Windows (ARwin), the BIOS setting *Advanced - OEM Features - Realtime Environment* must be set to *Enabled*.

Information:

Beginning with 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.

7.4 Automation Runtime Embedded (ARemb)

System support is provided by ARemb with an AS 3.0.90.23 or AS 4.0.14.0 / AR Q4.02 upgrade. An Automation Runtime dongle is not necessary; all that is needed is an AR license.

Information:

In order to use Automation Runtime Embedded (ARemb), the BIOS setting *Advanced - OEM features - Realtime environment* must be set to *Enabled*.

8 B&R Automation Device Interface (ADI) - Control Center

The ADI (Automation Device Interface) enables access to specific functions on B&R devices. Settings for devices can be read and configured using the B&R Control Center applet in the Control Panel.

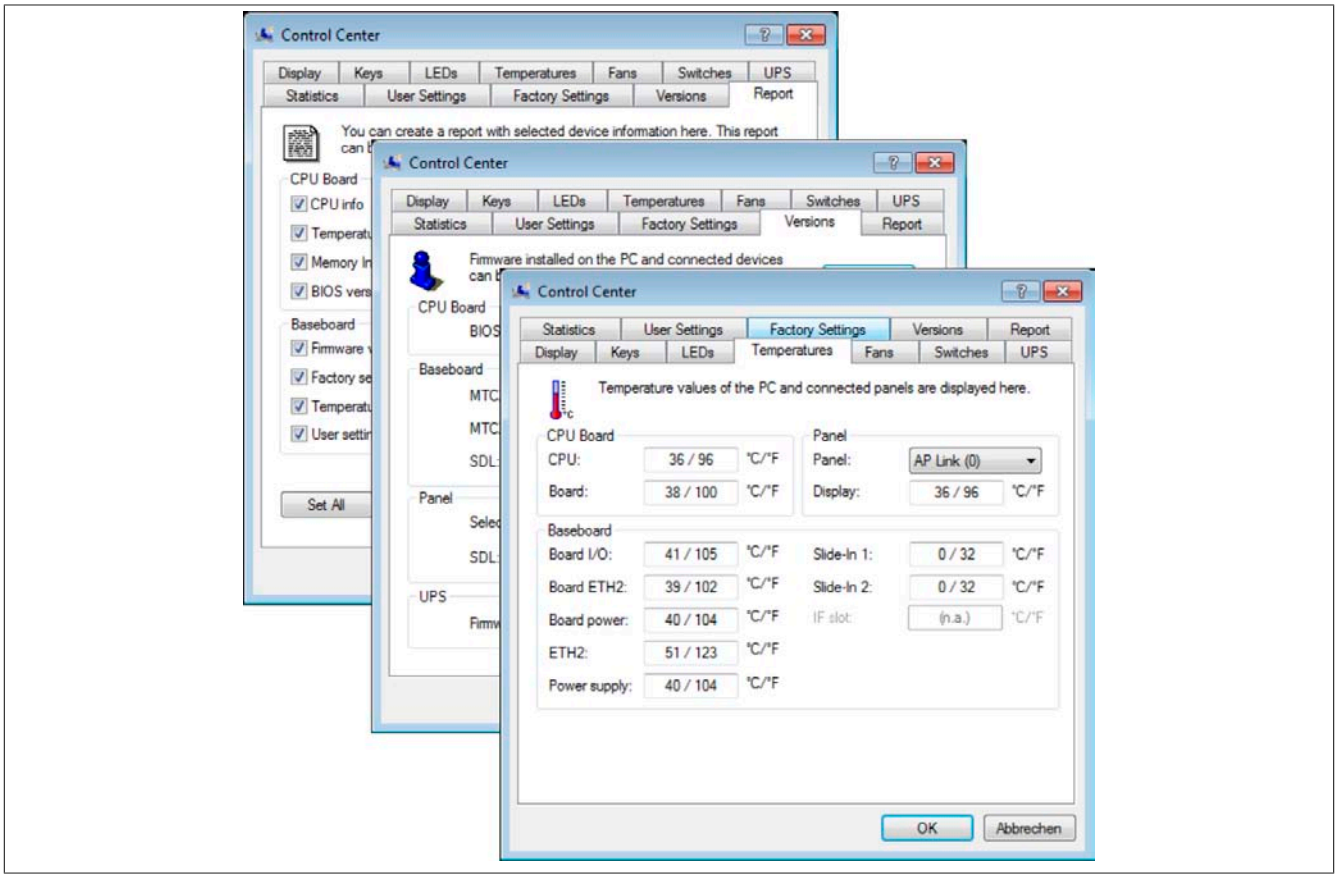


Figure 153: ADI Control Center screenshots - Examples

Information:

The temperature and voltage values (e.g. CPU temperature, core voltage, battery voltage) shown in the corresponding ADI window represent uncalibrated values for informational purposes. They cannot be used to draw any conclusions about hardware alarms or error conditions. The hardware components used have automatic diagnostic functions that can be applied in the event of error.

8.1 Functions

Information:

The functions provided by the Automation Device Interface (ADI) - Control Center vary according to the device series.

- Changing display-specific parameters
- Reading device-specific keys
- Updating the key configuration
- Enabling device-specific LEDs on a membrane keypad
- Reading and calibrating control devices (e.g. key switches, handwheels, joysticks, potentiometers)
- Reading temperatures, fan speeds, statistical data and switch settings
- Reading operating hours (power-on hours)
- Reading user and factory settings
- Reading software versions
- Updating and backing up BIOS and firmware
- Creating reports about the current system (support assistance)
- Setting the SDL equalizer value when adjusting SDL cables
- Changing the user serial ID

Supports the following systems:

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Panel PC 300
- Panel PC 700
- Panel PC 725
- Panel PC 800
- Panel PC 900
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200
- Connected Automation Panel 800
- Connected Automation Panel 900

8.2 Installation

A detailed description of the Control Center can be found in the integrated help system. The B&R Automation Device Interface (ADI) driver (also contains Control Center) is available in the Downloads section of the B&R website (www.br-automation.com).

1. Download and unzip the .zip archive.
2. Close all applications.
3. Run the Setup.exe file (e.g. double-click on it in Explorer).

Information:

The ADI driver is already included in B&R images of embedded operating systems.

If a more current ADI driver version exists (see the Downloads section of the B&R website), it can be installed later. It is important that Enhanced Write Filter (EWF) is disabled for this.

9 B&R Automation Device Interface (ADI) Development Kit

This software can be used to access B&R Automation Device Interface (ADI) functions directly from Windows applications created in one of the following development environments:

- Microsoft Visual C++ 6.0
- Microsoft Visual Basic 6.0
- Microsoft Embedded Visual C++ 4.0
- Microsoft Visual Studio 2008 (or newer)

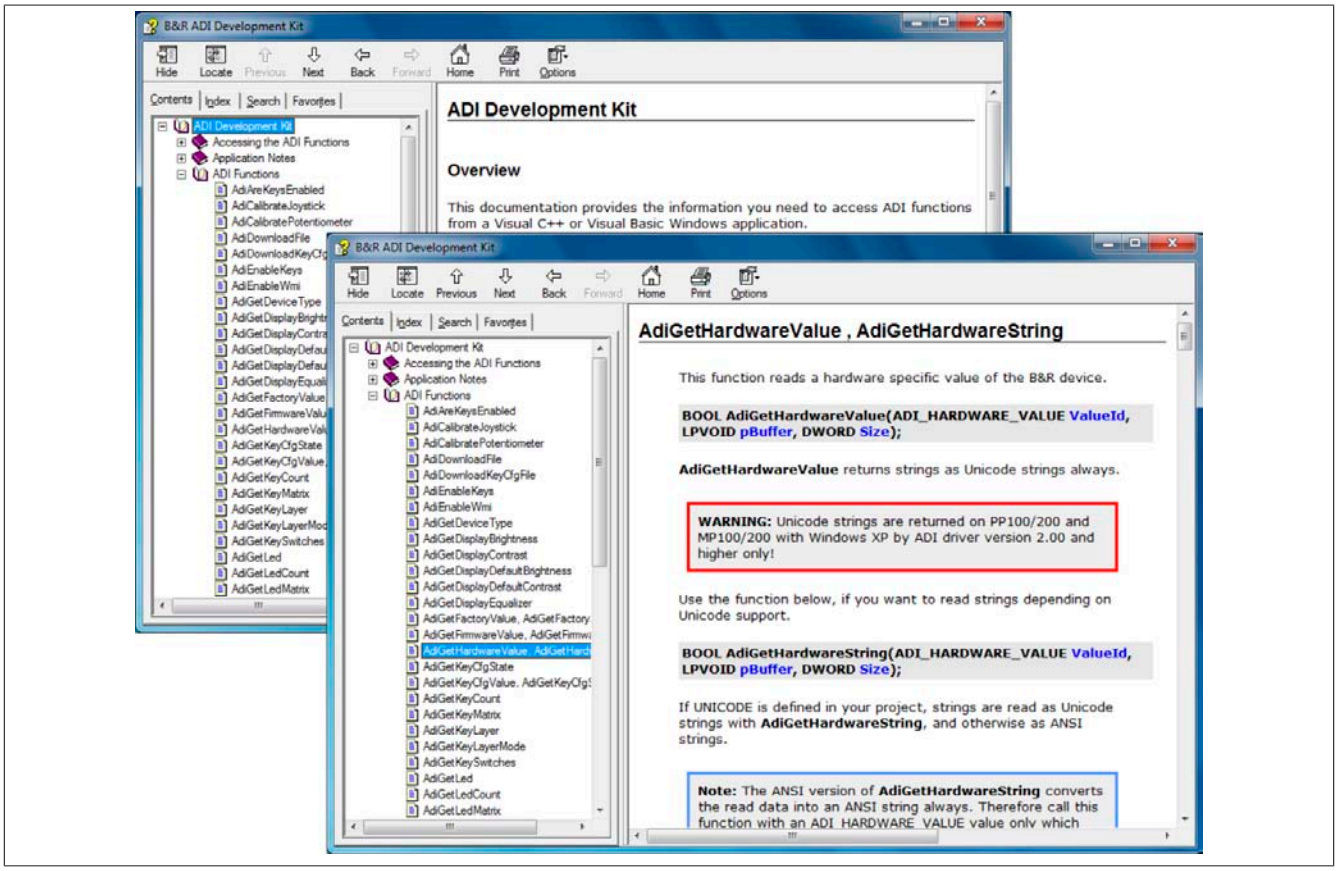


Figure 154: ADI Development Kit Screenshots (Version 3.60)

Features:

- One Microsoft Visual Basic module with ADI function declarations
- Header files and import libraries for Microsoft Visual C++
- Help files for Visual Basic and Visual C++
- Sample projects for Visual Basic and Visual C++
- ADI DLL (for application testing if no ADI driver is installed)

The following systems are supported (version 3.60 and higher):

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Power Panel 100/200
- Power Panel 300/400

- Power Panel 500
- Mobile Panel 40/50
- Mobile Panel 100/200

The ADI driver installed on the stated product series must be suitable for that device. The ADI driver is already included in B&R images of embedded operating systems.

A detailed description of how to use ADI functions can be found in the help system.

The B&R Automation Device Interface (ADI) development kit is available at no cost in the Downloads section of the B&R website (www.br-automation.com).

10 B&R Automation Device Interface (ADI) .NET SDK

This software can be used to access B&R Automation Device Interface (ADI) functions directly from .NET applications created using Microsoft Visual Studio 2005 or later.

Supported programming languages:

- Visual Basic
- Visual C++
- Visual C#

System requirements

- Development system: PC with Windows XP/7 and
  - Microsoft Visual Studio 2005 (or newer)
  - Microsoft .NET Framework 2.0 and/or Microsoft .NET Compact Framework 2.0 (or newer)

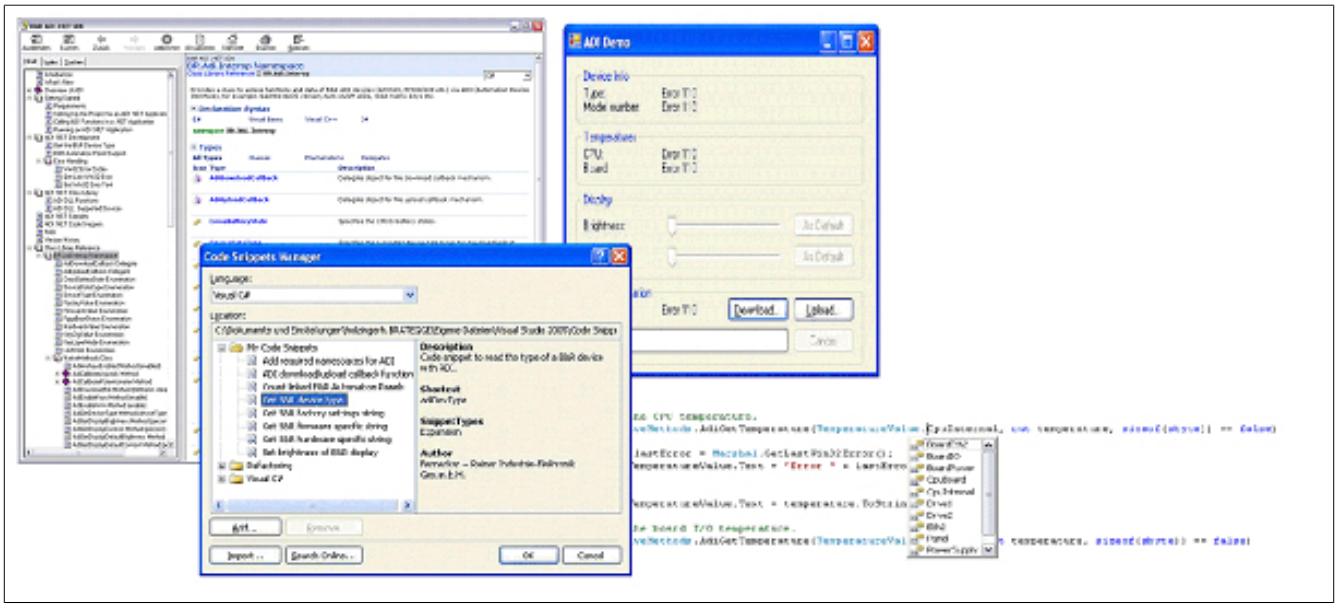


Figure 155: ADI .NET SDK screenshots (version 2.00)

Features (version 2.00 and higher)

- ADI .NET class library
- Help files in HTML Help 1.0 format (.chm), MS Help 2.0 format (.HxS) and MS Help Viewer format (.MSHC) (help documentation is in English only)
- Sample projects and code snippets for Visual Basic, Visual C++ and Visual C#
- ADI DLL (for application testing if no ADI driver is installed)

The following systems are supported (version 2.00 and higher):

- Automation PC 510
- Automation PC 511
- Automation PC 620
- Automation PC 810
- Automation PC 820
- Automation PC 910
- Panel PC 300
- Panel PC 700
- Panel PC 800
- Panel PC 900
- Power Panel 100/200
- Power Panel 300/400
- Power Panel 500
- Mobile Panel 40/50

- Mobile Panel 100/200

The ADI driver installed on the stated product series must be suitable for that device. The ADI driver is already included in B&R images of embedded operating systems.

A detailed description of how to use ADI functions can be found in the help system.

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

Chapter 5 • Standards and certifications

1 Standards and guidelines

1.1 CE mark

This mark certifies that all harmonized EN standards for the applicable directives have been met for B&R products.

1.2 EMC directive

These devices meet the requirements of EC directive "2004/108/EC Electromagnetic compatibility" and are designed for the following areas:

EN 61131-2:2007	Programmable logic controllers - Part 2: Equipment requirements and tests
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
EN 61000-6 -4:2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

1.3 Low voltage directive

These devices satisfy the requirements of EC directive "2006/95/EC Low voltage directive" and are designed for the following areas:

EN 61131-2:2007	Programmable logic controllers - Part 2: Equipment requirements and tests
EN 60204-1:2006 + A1:2009	Safety of machinery - Electrical equipment of machines - Part 1: General requirements

2 Certifications

Danger!

A complete system can only receive certification if ALL of the individual components it includes have the applicable certifications. If an individual component is being used that DOES NOT have an applicable certification, then the complete system will NOT RECEIVE certification.

B&R products and services comply with applicable standards. This includes international standards from organizations such as ISO, IEC and CENELEC, as well as national standards from organizations such as UL, CSA, FCC, VDE, ÖVE, etc. We are committed to ensuring the reliability of our products in an industrial environment.

Unless otherwise specified, the following certifications apply:

2.1 UL certification

Products with this label have been certified by Underwriters Laboratories and are listed as "Industrial Control Equipment". This mark is valid for the USA and Canada and simplifies the certification of your machines and systems in these areas.

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

2.2 GOST-R

Products with this mark have been certified by an accredited certification body and have been approved for import to the Russian Federation.

2.3 GL certification (Germanischer Lloyd)

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

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

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

Information:

Line filter 5AC804.MFLT-00 is absolutely mandatory in the supply line when used in a maritime environment. For more information, see "Connecting to the end device" on page 320.

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

Model number	Description	GL beginning with rev.
5PC910.SX01-00	APC910 system unit,1 slot (PCI Express, PCI, depending on the bus), 1 slide-in compact slot, Smart Display Link/DVI/Monitor, DisplayPort, 1x RS232, 5x USB, 2x ETH 10/100/1000, 1 CFast slot, 24 VDC	E0
5AC901.BX01-00	APC910 bus, 1 PCI	D0
5PC900.TS77-10	Intel Celeron 1047UE CPU board, 1.4 GHz, dual core, 2 MB L2 cache; HM76 chipset; 2 slots for SO-DIMM DDR3 modules (max. total of 16 GB)	D0
5MMDDR.1024-03	SO-DIMM DDR3, 1024 MB	D0
5MMDDR.2048-03	SO-DIMM DDR3, 2048 MB	D0

Table 244: Revision of individual components with GL certification

Model number	Description	GL beginning with rev.
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 system unit	D0
5AC901.I485-00	RS232/422/485 interface option; for installation in an APC910 or PPC900	D0
5AC901.IHDA-00	Audio interface option, connection for 1x MIC, 1x Line IN, 1x Line OUT, for installation in an APC910	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
0TB103.9	Connector, 24 VDC, 3-pin female, 3.31 mm² screw clamp, protected against vibration by the screw flange	D0
0TB103.91	Connector, 24 VDC, 3-pin female, 3.31 mm² cage clamp, protected against vibration by the screw flange	D0
5AC901.CCFA-00	CFast adapter for operating a CFast card in a slide-in compact slot	D0
5CFAST.2048-00	CFast card, 2 GB	D0
5CFAST.4096-00	CFast card, 4 GB	D0
5CFAST.8192-00	CFast card, 8 GB	D0
5CFAST.016G-00	CFast card, 16 GB	D0
5CFAST.032G-00	CFast card, 32 GB	D0
5AC901.FF01-00	Front cover for 1-slot APC910, orange	D0
5AC901.FF01-01	Front cover for 1-slot APC910, dark gray	D0
5AC900.1000-00	DVI (male connector) to CRT (female connector) adapter. For connecting a standard monitor to a DVI-I interface.	C0

Table 244: Revision of individual components with GL certification

Certificate no. 61 601 - 13 HH

Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No.	61 601 - 13 HH
Company	Bernecker + Rainer Industrie-Elektronik GmbH B&R Straße 1 5142 Eggelsberg, Austria
Product Description	Automation PC
Type	APC 910
Environmental Category	C, EMC1
Technical Data / Range of Application	System unit: 5PC910.SX01-(X)00 Bus module: 5AC901.BX01-(X)00 CPU board: 5PC900.TS77-(X)10 Heat sink: 5AC901.HS00-(X)00 Fan kit: 5AC901.FA01-(X)00 Main memory: 5MMDDR.XXXX-(X)03 options: Front flap: 5AC901.FF01-(X)XX Slide-In compact: 5AC901.CCFA-(X)00 Interface board: 5AC901.I485-(X)00; 5AC901.IHDA-(X)00 CFast: 5CFAST.XXXX-(X)XX PCI slot: 5ACPCI.ETH1-(X)01; 5ACPCI.ETH3-(X)01
Test Standard	Guidelines for the Performance of Type Approvals Chapter 2, Edition 2012 Guidelines for the Use of Computers and Computer Systems, Edition 1994
Documents	Test reports : B&R Prüfberichte 20131022-01 + 20130826-01; Mikes E37221-00-00MU + S37201-00-00MV Documents: GL Zertifizierung - APC910 Produkt- und Prüfübersicht V1.00; Automation PC 910 Anwenderhandbuch V1.15
Remarks	Filter 5AC804.MFLT-(X)00 to be used in DC power line

Valid until 2018-12-11
Page 1 of 1
File No. I.B.05

Hamburg, 2013-12-12

Type Approval Symbol GL

Germanischer Lloyd

i.A. Marco Rinkel

i.A.B. Burkhard Lilienthal

This certificate is issued on the basis of "Guidelines for the Performance of Type Approvals Part 1, Procedure".

Figure 156: GL certificate no. 61 601 - 13 HH

Chapter 6 • Accessories

The following accessories have successfully completed functional testing at B&R and are approved for use with this device. Nevertheless, it is important to observe any limitations that may apply to the complete system when operated with other individual components. When operating the complete system, the specifications for the individual components must be adhered to.

All components listed in this manual have been subjected to extensive system and compatibility testing and are approved for use. B&R can make no guarantee regarding the functionality of non-approved accessories.

1 Power connectors

1.1 0TB103.9x

1.1.1 General information

The single-row 3-pin terminal block 0TB103 is used to connect the supply voltage.

1.1.2 Order data

Model number	Short description	Figure
	Terminal blocks	
0TB103.9	Connector, 24 VDC, 3-pin female, 3.31 mm² screw clamps, protected against vibration by the screw flange	
0TB103.91	Connector, 24 VDC, 3-pin female, 3.31 mm² cage clamps, protected against vibration by the screw flange	

Table 245: 0TB103.9, 0TB103.91 - Order data

1.1.3 Technical data

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

Product ID	0TB103.9	0TB103.91
General information		
Certification		
CE	Yes	
cULus	Yes	
cULus HazLoc Class 1 Division 2	Yes [1]	
GL	Yes [1]	
Terminal block		
Note	Protected against vibration by the screw flange Nominal values according to UL	
Number of pins	3 (female)	
Type of terminal clamp	Screw clamps	Cage clamps [3]
Cable type	Only copper wires (no aluminum wires!)	
Distance between contacts	5.08 mm	
Connection cross section		
AWG wire	26 to 14 AWG	26 to 12 AWG
Wire end sleeves with plastic covering	0.20 to 1.50 mm²	
Solid wires	0.20 to 2.50 mm²	
Fine strand wires	0.20 to 1.50 mm²	0.20 to 2.50 mm²
With wire end sleeves	0.20 to 1.50 mm²	
Fastening torque	0.4 Nm	-

Table 246: 0TB103.9, 0TB103.91 - Technical data

Product ID	0TB103.9	0TB103.91
Electrical characteristics		
Nominal voltage	300 V	
Nominal current [2)]	10 A / contact	
Contact resistance	≤5 mΩ	

Table 246: 0TB103.9, 0TB103.91 - Technical data

1) Yes, although applies only if all components installed within the complete system have this certification
2) The limit data for each I/O module must be taken into consideration.
3) Cage clamp terminal blocks cannot be used side-by-side.

2 Replacement CMOS batteries

2.1 0AC201.91 / 4A0006.00-000

2.1.1 General information

This lithium battery is needed to back BIOS CMOS data and the real-time clock (RTC).

The battery is subject to wear and must be replaced when the battery power is insufficient ("Bad" status).

2.1.2 Order data

Model number	Short description	Figure
	Batteries	
0AC201.91	Lithium batteries 4 pcs., 3 V / 950 mAh button cell We hereby state that the lithium cells contained in this shipment qualify as "partly regulated". Handle with care. If the package is damaged, inspect the cells, repack intact cells and protect the cells against short circuit. For emergency information, call RENATA SA at +41 61 319 28 27.	
4A0006.00-000	Lithium battery, 3 V / 950 mAh, button cell	

Table 247: 0AC201.91, 4A0006.00-000 - Order data

2.1.3 Technical data

Warning!

The battery must be replaced by a Type CR2477N Renata battery only. The use of another battery may present a risk of fire or explosion.

The battery may explode if handled improperly. Do not recharge, disassemble or dispose of in fire.

Information:

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

Product ID	0AC201.91	4A0006.00-000
General information		
Storage time	Max. 3 years at 30°C	
Certification		
CE	Yes	
cULus	Yes	
Electrical characteristics		
Capacity	950 mAh	
Self-discharging	<1% per year (at 23°C)	
Voltage range	3 V	
Environmental conditions		
Temperature		
Storage	-20 to 60°C	
Relative humidity		
Operation	0 to 95%	
Storage	0 to 95%	
Transport	0 to 95%	

Table 248: 0AC201.91, 4A0006.00-000 - Technical data

3 CFast cards

3.1 5CFAST.xxxx-00

3.1.1 General information

CFast cards are based on SLC (single-level cell) technology and are SATA 2.6 compatible. Their dimensions are identical to CompactFlash cards.

3.1.2 Order data

Model number	Short description	Figure
	CFast cards	
5CFAST.2048-00	CFast card, 2 GB	
5CFAST.4096-00	CFast card, 4 GB	
5CFAST.8192-00	CFast card, 8 GB	
5CFAST.016G-00	CFast card, 16 GB	
5CFAST.032G-00	CFast card, 32 GB	

Table 249: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Order data

3.1.3 Technical data

Information:

Due to the changeover to the new controller, revision E0 may not be image-compatible to previous revisions when using older cloning tools. This is not the case when using current cloning tools.

Information:

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

Product ID	5CFAST.2048-00 ≥ Rev. E0	5CFAST.4096-00 ≥ Rev. E0	5CFAST.8192-00 ≥ Rev. E0	5CFAST.016G-00 ≥ Rev. E0	5CFAST.032G-00 ≥ Rev. E0
General information					
Capacity	2 GB	4 GB	8 GB	16 GB	32 GB
Data retention	10 years				
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses				
Lifetime monitoring	Yes				
MTBF	>2,500,000 hours (at 25°C)				
Maintenance	None				
Supported operating modes	SATA 2.6, max. PIO Mode 4, Multiword DMA Mode 2, Ultra DMA Mode 6				
Sequential read					
Typical					
With 128 kB block size	94 MB/s	108 MB/s	108 MB/s	108 MB/s	116 MB/s
With 4 kB block size	42 MB/s	46 MB/s	46 MB/s	46 MB/s	46 MB/s
Maximum					
With 128 kB block size	100 MB/s	115 MB/s	115 MB/s	115 MB/s	120 MB/s
With 4 kB block size	50 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 250: 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
Certification					
CE			Yes		
cULus			Yes		
cULus HazLoc Class 1 Division 2			Yes[1)]		
GOST-R			Yes		
GL			Yes[1)]		
Endurance					
SLC flash			Yes		
Wear leveling			Static		
S.M.A.R.T. support			Yes		
Support					
Hardware			APC910, PPC900		
Operating systems					
Windows 7 32-bit	No	No	No	Yes	Yes
Windows 7 64-bit	No	No	No	No	Yes
Windows Embedded Standard 7 32-bit	No	No	No	Yes	Yes
Windows Embedded Standard 7 64-bit	No	No	No	Yes	Yes
Windows XP Professional	No	Yes	Yes	Yes	Yes
Windows Embedded Standard 2009			Yes		
Software					
PVI Transfer			≥ V4.0.0.8 (part of PVI Development Setup ≥ V3.0.2.3014)		
B&R Embedded OS Installer	≥V3.10	≥V3.10	≥V3.10	≥V3.20	≥V3.21
Environmental conditions					
Temperature					
Operation			-40 to 85°C		
Storage			-50 to 100°C		
Transport			-50 to 100°C		
Relative humidity					
Operation			Max. 85% at 85°C		
Storage			Max. 85% at 85°C		
Transport			Max. 85% at 85°C		
Vibration					
Operation			20 g peak, 10 to 2000 Hz		
Storage			20 g peak, 10 to 2000 Hz		
Transport			20 g peak, 10 to 2000 Hz		
Shock					
Operation			1.5 kg peak, 0.5 ms		
Storage			1.5 kg peak, 0.5 ms		
Transport			1.5 kg peak, 0.5 ms		
Altitude					
Operation			TBD		
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 250: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

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

Product ID	5CFAST.2048-00 ≤ Rev. D0	5CFAST.4096-00 ≤ Rev. D0	5CFAST.8192-00 ≤ Rev. D0	5CFAST.016G-00 ≤ Rev. D0	5CFAST.032G-00 ≤ Rev. D0
General information					
Capacity	2 GB	4 GB	8 GB	16 GB	32 GB
Data retention	10 years				
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses				
Lifetime monitoring	Yes				
MTBF	>2,500,000 hours (at 25°C)				
Maintenance	None				
Supported operating modes	SATA 2.6, max. PIO Mode 4, Multiword DMA Mode 2, Ultra DMA Mode 6				
Sequential read					
Typical					
With 128 kB block size	56 MB/s	107 MB/s	116 MB/s	116 MB/s	116 MB/s
With 4 kB block size	23 MB/s	26 MB/s	29 MB/s	29 MB/s	29 MB/s
Maximum					
With 128 kB block size	60 MB/s	110 MB/s	120 MB/s	120 MB/s	120 MB/s
With 4 kB block size	25 MB/s	30 MB/s	35 MB/s	35 MB/s	35 MB/s
Sequential write					
Typical					
With 128 kB block size	24 MB/s	49 MB/s	93 MB/s	93 MB/s	93 MB/s
With 4 kB block size	17 MB/s	19 MB/s	21 MB/s	21 MB/s	21 MB/s
Maximum					
With 128 kB block size	30 MB/s	55 MB/s	100 MB/s	100 MB/s	100 MB/s
With 4 kB block size	20 MB/s	25 MB/s	25 MB/s	25 MB/s	25 MB/s
Certification					
CE	Yes				
cULus	Yes				
cULus HazLoc Class 1 Division 2	Yes[1)]				
GOST-R	Yes				
GL	Yes[1)]				
Endurance					
SLC flash	Yes				
Wear leveling	Static				
S.M.A.R.T. support	Yes				
Support					
Hardware	APC910, PPC900				
Operating systems					
Windows 7 32-bit	No	No	No	Yes	Yes
Windows 7 64-bit	No	No	No	No	Yes
Windows Embedded Standard 7 32-bit	No	No	No	Yes	Yes
Windows Embedded Standard 7 64-bit	No	No	No	Yes	Yes
Windows XP Professional	No	Yes	Yes	Yes	Yes
Windows Embedded Standard 2009	Yes				
Software					
PVI Transfer	≥ V4.0.0.8 (part of PVI Development Setup ≥ V3.0.2.3014)				
B&R Embedded OS Installer	≥V3.10	≥V3.10	≥V3.10	≥V3.20	≥V3.21
Environmental conditions					
Temperature					
Operation	0 to 70°C				
Storage	-50 to 100°C				
Transport	-50 to 100°C				
Relative humidity					
Operation	Max. 85% at 70°C				
Storage	Max. 85% at 70°C				
Transport	Max. 85% at 70°C				
Vibration					
Operation	20 g peak, 10 to 2000 Hz				
Storage	20 g peak, 10 to 2000 Hz				
Transport	20 g peak, 10 to 2000 Hz				
Shock					
Operation	1.5 kg peak, 0.5 ms				
Storage	1.5 kg peak, 0.5 ms				
Transport	1.5 kg peak, 0.5 ms				
Altitude					
Operation	TBD				
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 251: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data

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

3.1.4 Dimensions

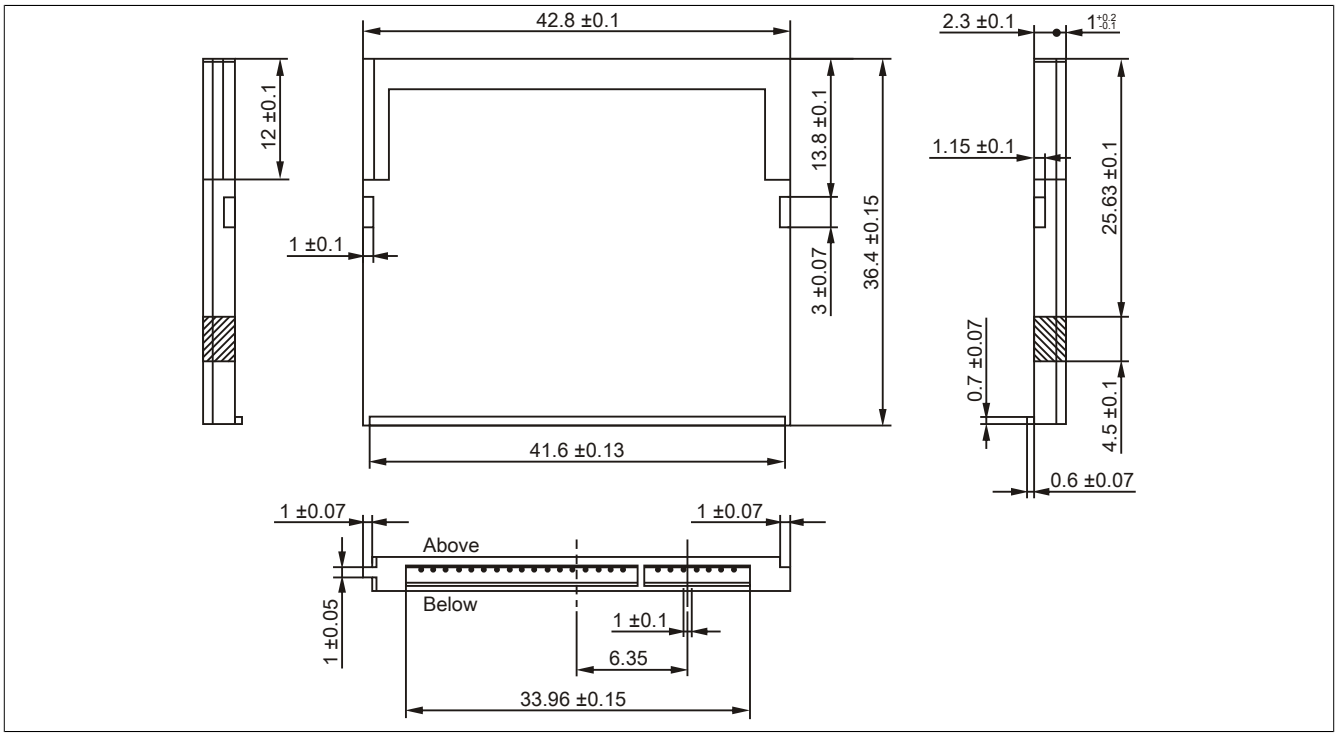


Figure 157: CFast card - Dimensions

3.1.5 Temperature humidity diagram

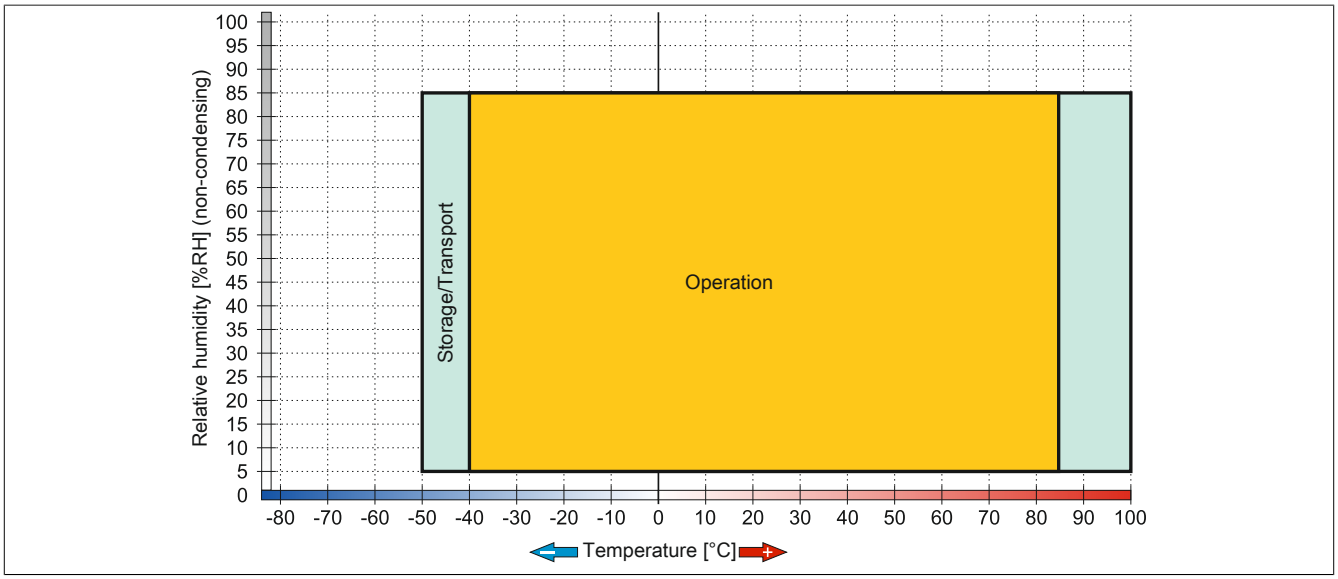


Figure 158: 5CFAST.xxxx-00 ≥ Rev. E0 - Temperature/Humidity diagram

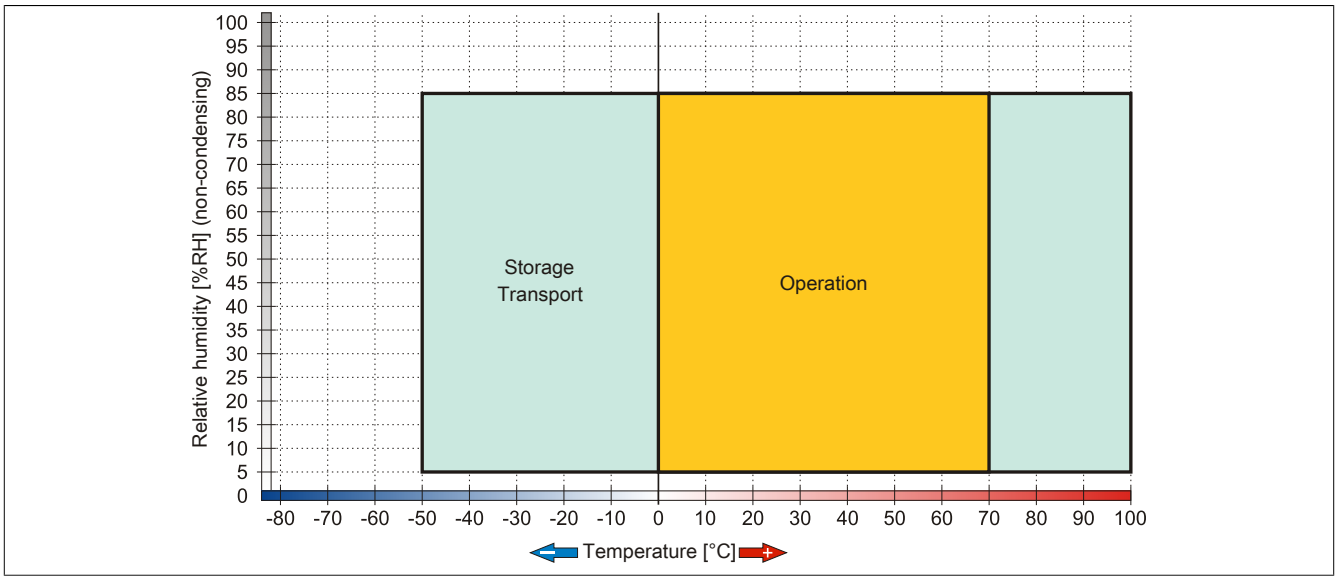


Figure 159: 5CFAST.xxxx-00 ≤ Rev. D0 - Temperature/Humidity diagram

4 USB flash drives

4.1 5MMUSB.xxxx-01

4.1.1 General information

USB flash drives are storage media that are easy to replace. Because of their fast data transfer (USB 2.0), USB flash drives are ideal for use as portable data storage. Without requiring additional drivers ("hot plugging", except in the case of Windows 98SE), the USB flash drive can immediately act as an additional drive where data can be read or written.

Information:

Due to the vast quantity of USB flash drives available on the market as well as their short product life cycle, we reserve the right to supply alternative products at any time. The following measures may therefore be necessary in order to boot from these flash drives as well:

- **The flash drive must be reformatted or in some cases even repartitioned (set active partition).**
- **The flash drive must be the first bootable device in the BIOS boot order; alternatively, the IDE controllers can be disabled in BIOS. This can be avoided in most cases if the "fdisk /mbr" command is additionally executed on the USB flash drive.**

4.1.2 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 252: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data

4.1.3 Technical data

Product ID	5MMUSB.2048-01	5MMUSB.4096-01
General information		
Capacity	2 GB	4 GB
LEDs	1 LED (green) [1)]	
MTBF	>3,000,000 hours	
Type	USB 1.1, USB 2.0	
Maintenance	None	
Default file system	FAT16	FAT32
Certification		
CE	Yes	
GOST-R	Yes	
Interfaces		
USB		
Type	USB 1.1, USB 2.0	
Connection	To any USB type A interface	
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)	
Sequential reading	Full speed max. 1 MB/s, High speed max. 32 MB/s	
Sequential writing	Full speed max. 0.9 MB/s, High speed max. 23 MB/s	
Endurance		
SLC flash	Yes	
Data retention	>10 years	
Data reliability	<1 unrecoverable error in 10^{14} bit read accesses	
Connection cycles	>1500	
Support		
Operating systems		
Windows 7	Yes	
Windows XP Professional	Yes	
Windows XP Embedded	Yes	
Windows ME	Yes	
Windows 2000	Yes	
Windows CE 5.0	Yes	
Windows CE 4.2	Yes	

Table 253: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

Product ID	5MMUSB.2048-01	5MMUSB.4096-01
Electrical characteristics		
Power consumption	Max. 500 µA sleep mode, max. 120 mA read/write	
Environmental conditions		
Temperature		
Operation	0 to 70°C	
Storage	-50 to 100°C	
Transport	-50 to 100°C	
Relative humidity		
Operation	85%, non-condensing	
Storage	85%, non-condensing	
Transport	85%, non-condensing	
Vibration		
Operation	20 to 2000 Hz: 20 g (peak)	
Storage	20 to 2000 Hz: 20 g (peak)	
Transport	20 to 2000 Hz: 20 g (peak)	
Shock		
Operation	Max. 1500 g (peak)	
Storage	Max. 1500 g (peak)	
Transport	Max. 1500 g (peak)	
Altitude		
Operation	Max. 3048 m	
Storage	Max. 12192 m	
Transport	Max. 12192 m	
Mechanical characteristics		
Dimensions		
Width	17.97 mm	
Length	67.85 mm	
Height	8.35 mm	

Table 253: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data

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

4.1.4 Temperature/Humidity diagram

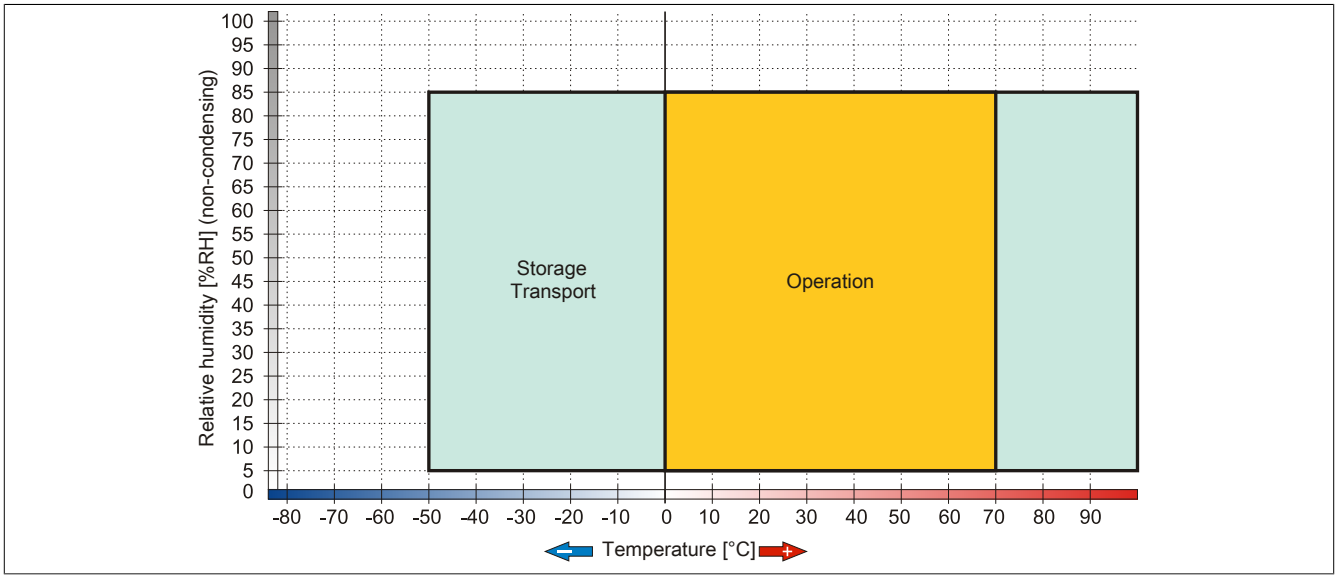


Figure 160: 5MMUSB.xxxx-01 - Temperature/Humidity diagram

5 USB media drive

5.1 5MD900.USB2-02

5.1.1 General information

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

- Desktop or rack-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

5.1.2 Order data

Model number	Short description	Figure
	USB accessories	
5MD900.USB2-02	USB 2.0 drive combination, consists of DVD-R/RW DVD+R/RW, CompactFlash slot (Type II), USB connection (Type A on the front, Type B on the back); 24V DC (order screw clamp terminal 0TB103.9 or cage clamp terminal 0TB103.91 separately)	
	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, 3.31 mm² screw clamps, protected against vibration by the screw flange	
0TB103.91	Connector, 24 VDC, 3-pin female, 3.31 mm² cage clamps, protected against vibration by the screw flange	
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable type A - type B, 1.8 m	
5CAUSB.0050-00	USB 2.0 connection cable type A - type B, 5 m	

Table 254: 5MD900.USB2-02 - Order data

5.1.3 Interfaces

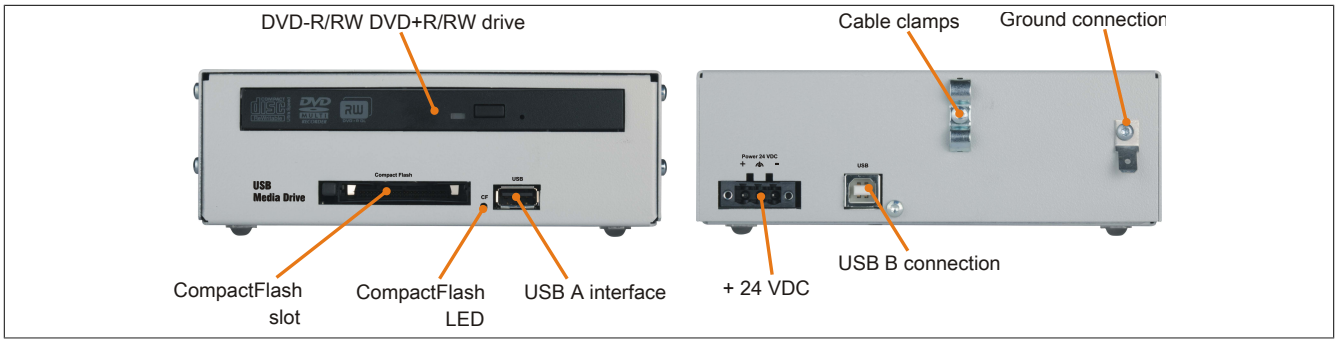


Figure 161: 5MD900.USB2-02 - Interfaces

5.1.4 Technical data

Product ID	5MD900.USB2-02
General information	
Max. cable length	5 m (not including hub)
Certification	
CE	Yes
cULus	Yes
GOST-R	Yes

Table 255: 5MD900.USB2-02 - Technical data

Product ID	5MD900.USB2-02
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	Type A front Type B back
Transfer rate	Low speed (1.5 Mbit/s), full speed (12 Mbit/s), high speed (480 Mbit/s)
Current load	Max. 500 mA
CD / DVD drive	
Data buffer capacity	2 MB
Data transfer rate	Max. 33.3 MB/s
Speed	Max. 5090 rpm ±1%
Noise level	Approx. 45 dBA in a distance of 50 cm (full read access)
Compatible formats	CD-DA, CD-ROM mode 1/mode 2 CD-ROM XA mode 2 (form 1, form 2) Photo CD (single-/multi-session), Enhanced CD, CD text DVD-ROM, DVD-R, DVD-RW, DVD-Video DVD-RAM (4.7GB, 2.6GB) DVD+R, DVD+R (dual layer), DVD+RW
Laser class	Class 1 laser
Service life	60000 POH (power-on hours)
Interface	IDE (ATAPI)
Startup time	
CD	Max. 14 seconds (from 0 rpm to read access)
DVD	Max. 15 seconds (from 0 rpm to read access)
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 ±25%
Operating conditions	
EN 60529 protection	Front: IP65 (only with optional front cover), back: IP20
Environmental conditions	
Temperature [1)]	
Operation	5 to 45°C
Storage	-20 to 60°C
Transport	-40 to 60°C
Relative humidity	
Operation	20 to 80%
Storage	5 to 90%
Transport	5 to 95%
Vibration	
Operation	5 to 500 Hz: 0.3 g (2.9 m/s² 0-peak)
Storage	10 to 100 Hz: 2 g (19.6 m/s² 0-peak)
Transport	10 to 100 Hz: 2 g (19.6 m/s² 0-peak)
Shock	
Operation	5 g, 11 ms
Storage	60 g, 11 ms
Transport	60 g, 11 ms

Table 255: 5MD900.USB2-02 - Technical data

Product ID	5MD900.USB2-02
Altitude	
Operation	Max. 3000 m
Mechanical characteristics	
Dimensions	
Width	156 mm
Height	52 mm
Depth	140 mm
Weight	Approx. 1100 g (without front cover)

Table 255: 5MD900.USB2-02 - Technical data

1) Temperature specifications refer to operation at 500 meters. The maximum ambient temperature is typically derated by 1°C per 1000 meters (starting at 500 meters above sea level).

5.1.5 Dimensions

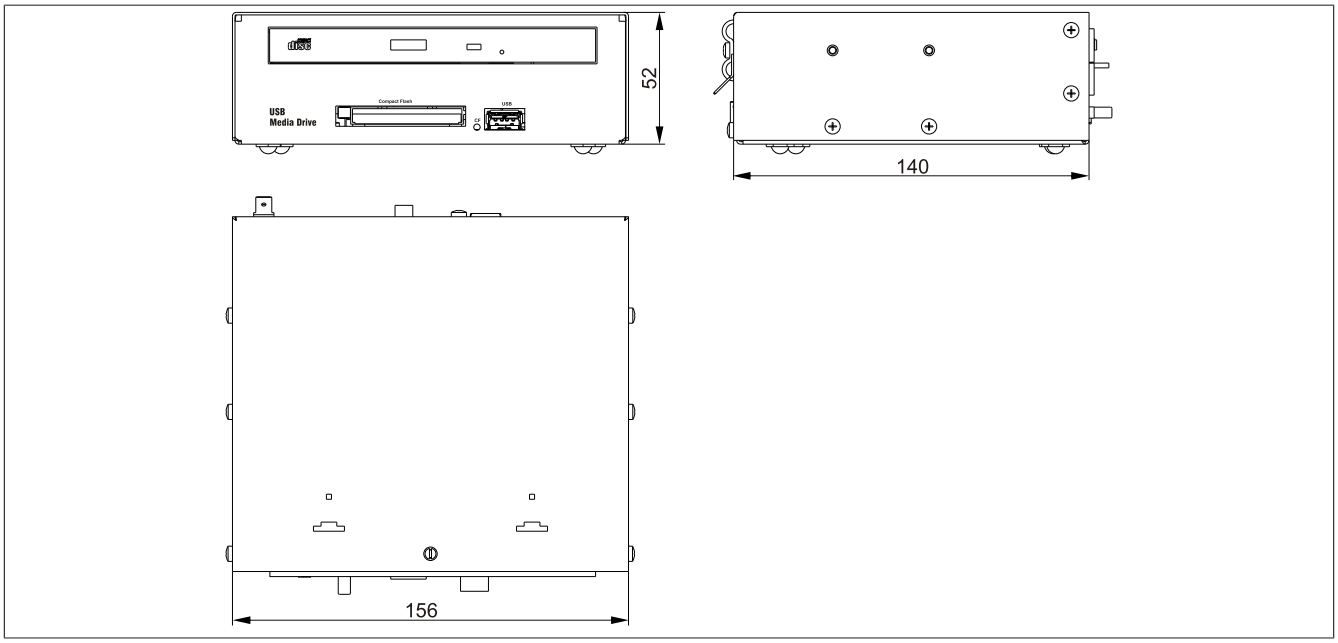


Figure 162: 5MD900.USB2-02 - Dimensions

5.1.6 Dimensions with front cover

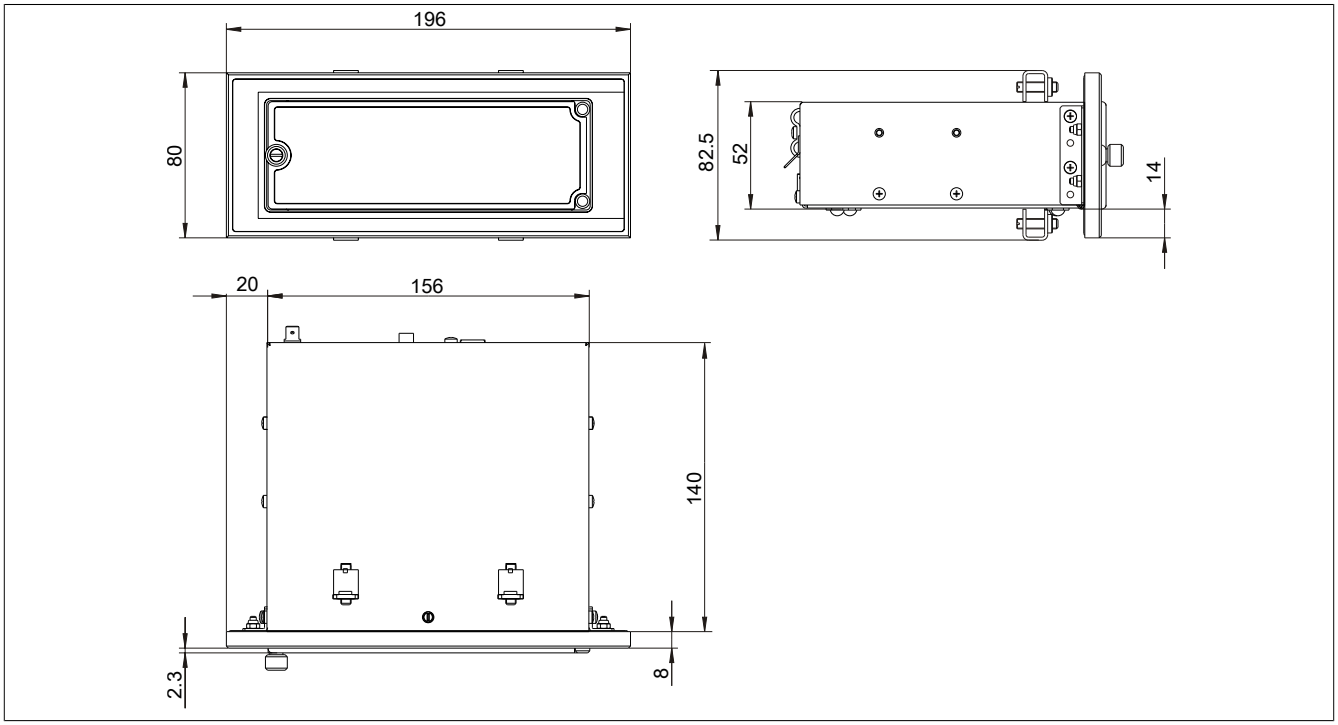


Figure 163: USB media drive with front cover - Dimensions

5.1.7 Cutout installation

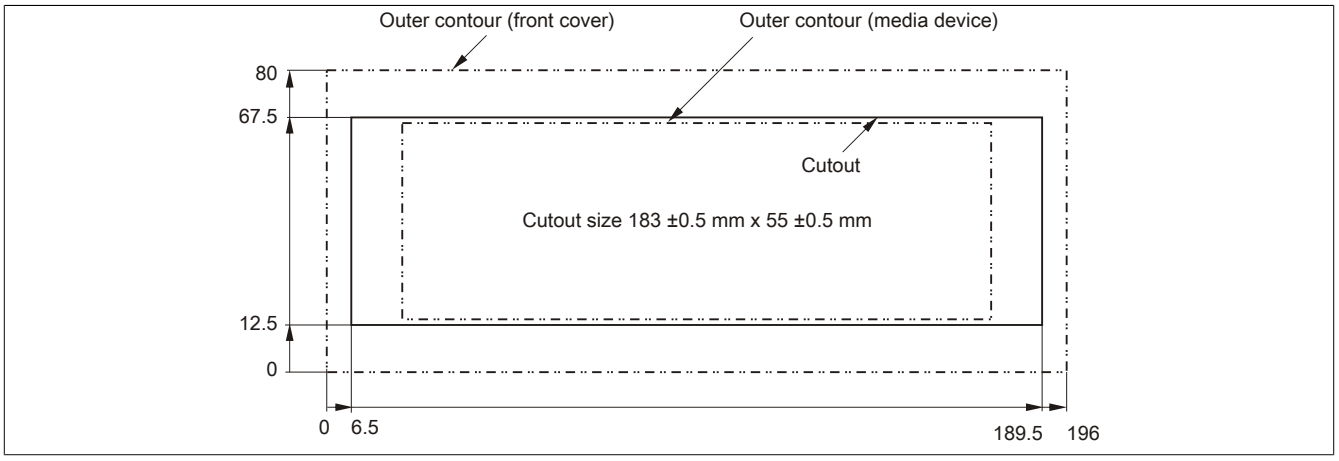


Figure 164: USB media drive with front cover - Installation cutout

5.1.8 Contents of delivery

Quantity	Component
1	USB media drive
2	Mounting rail brackets

Table 256: 5MD900.USB2-02 - Contents of delivery

5.1.9 Installation

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

5.1.9.1 Mounting orientation

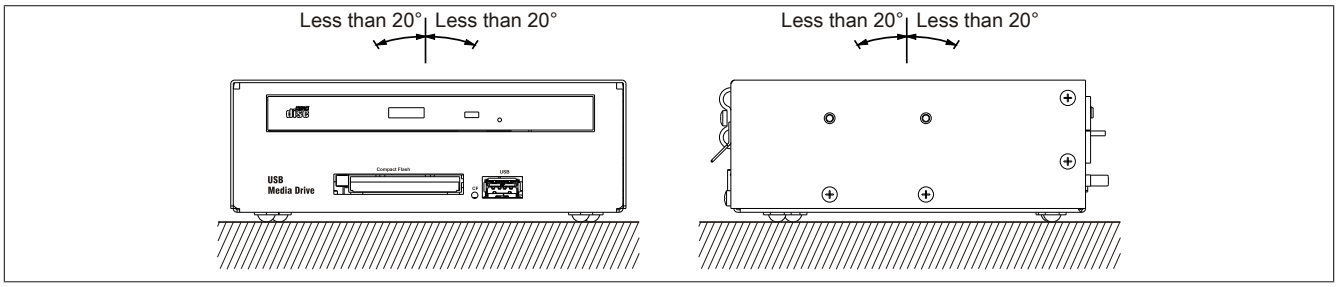


Figure 165: 5MD900.USB2-02 - Mounting orientation

5.2 5A5003.03

5.2.1 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.

5.2.2 Order data

Model number	Short description	Figure
	USB accessories	
5A5003.03	Front cover, for remote CD-ROM drive 5A5003.02 and USB 2.0 drive combination 5MD900.USB2-00, 5MD900.USB2-01 and 5MD900.USB2-02	

Table 257: 5A5003.03 - Order data

5.2.3 Technical data

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

Table 258: 5A5003.03 - Technical data

5.2.4 Dimensions

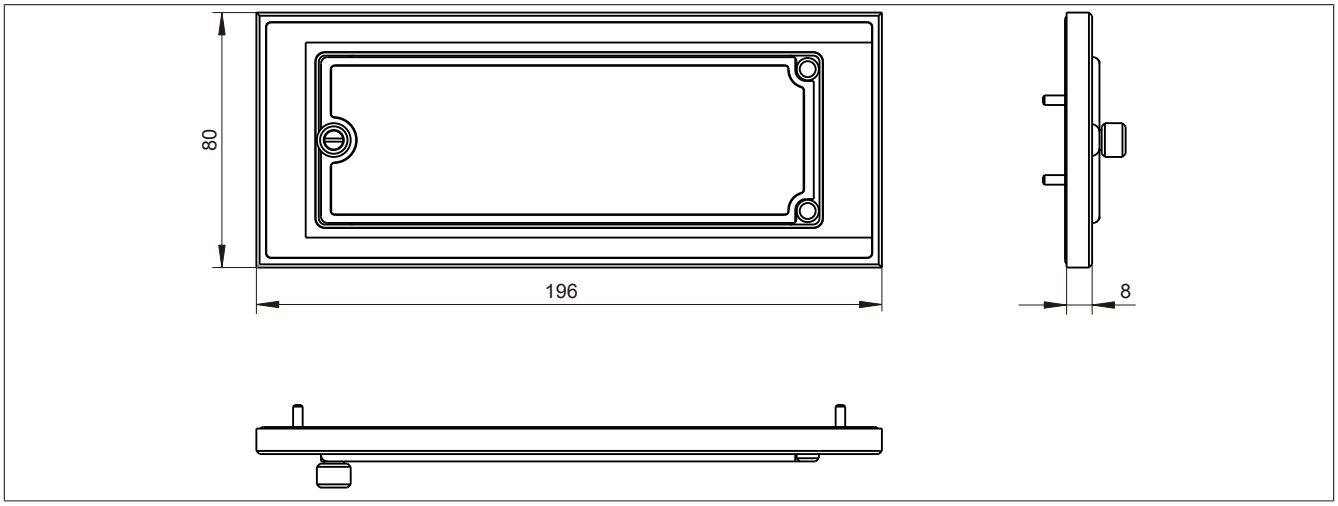


Figure 166: 5A5003.03 - Dimensions

5.2.5 Contents of delivery

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

Table 259: 5A5003.03 - Contents of delivery

5.2.6 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.

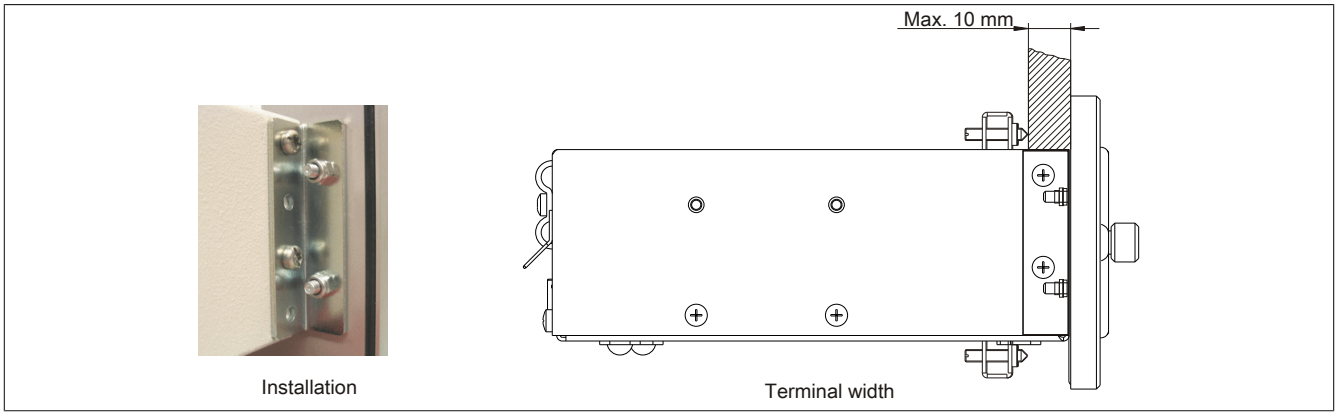


Figure 167: Front cover mounting and installation depth

5.2.6.1 Cutout installation

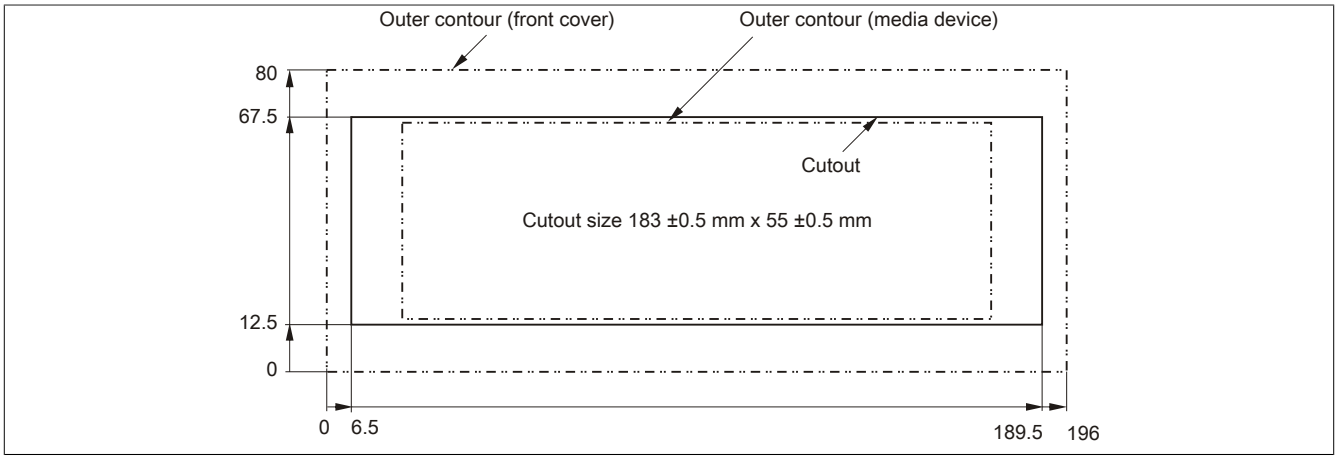


Figure 168: USB media drive with front cover - Installation cutout

6 Replacement disk tray

6.1 5AC901.FRAM-00

6.1.1 General information

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

6.1.2 Order data

Model number	Short description	Figure
	Accessories	Image not found for 5AC901.FRAM-00!
5AC901.FRAM-00	APC910 slide-in compact tray	

Table 260: 5AC901.FRAM-00 - Order data

6.1.3 Technical data

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

Table 261: 5AC901.FRAM-00 - Technical data

6.1.4 Dimensions

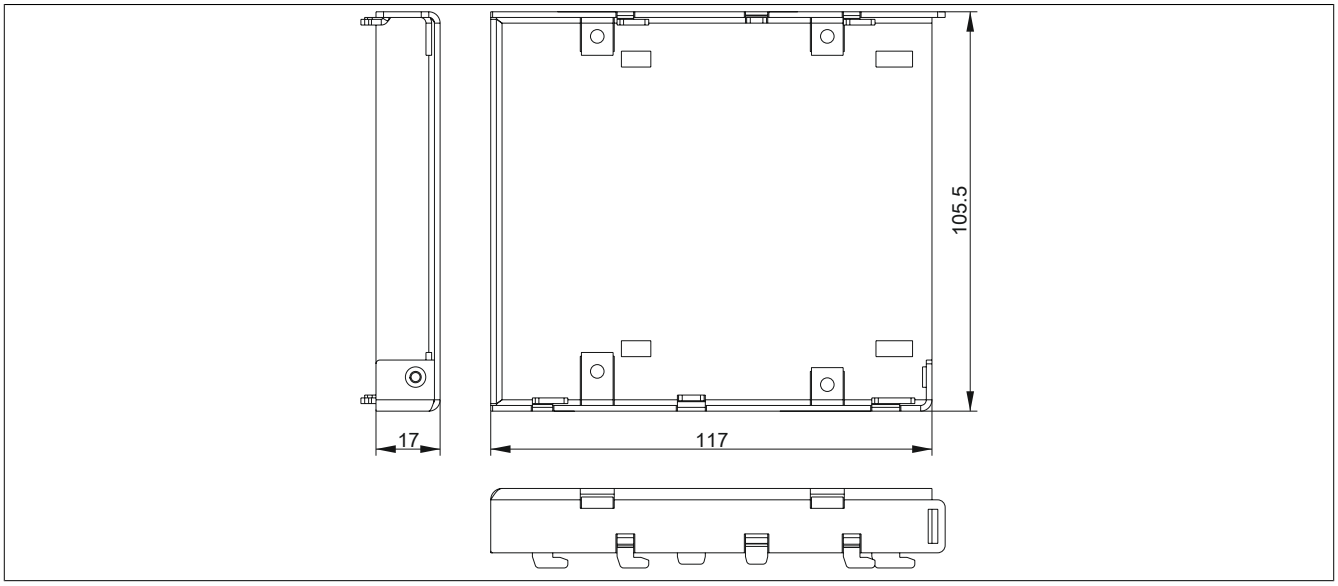


Figure 169: 5AC901.FRAM-00 - Dimensions

7 Cables

7.1 DVI cable

7.1.1 5CADVI.0xxx-00

7.1.1.1 General information

The DVI cable 5CADVI.0xxx-00 is designed for a fixed layout.

> **Caution!**
>
> **Power must be turned off before plugging in and unplugging cables.**

7.1.1.2 Order data

Model number	Short description	Figure
	DVI cables	
5CADVI.0018-00	DVI-D cable, 1.8 m	
5CADVI.0050-00	DVI-D cable, 5 m	
5CADVI.0100-00	DVI-D cable, 10 m	

Table 262: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data

7.1.1.3 Technical data

Product ID	5CADVI.0018-00	5CADVI.0050-00	5CADVI.0100-00
General information			
Certification			
CE	Yes		
cULus	Yes		
GOST-R	Yes		
GL	Yes [1]		
Cable structure			
Wire cross section	AWG 28		
Shield	Individual cable pairs and entire cable		
Complete shielding	Tinned copper braiding, optical coverage >86%		
Outer sheathing			
Material	PVC		
Color	Beige		
Labeling	AWM STYLE 20276 80°C 30V VW1 DVI DIGITAL SINGLE LINK DER AN		
Connector			
Type	2x DVI-D (18+1), male		
Connection cycles	100		
Locating screw tightening torque	Max. 0.5 Nm		
Electrical characteristics			
Conductor resistance	Max. 237 Ω/km		
Insulation resistance	Min. 100 MΩ/km		
Mechanical characteristics			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter	Max. 8.5 mm		
Flex radius	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)		
Weight	Approx. 260 g	Approx. 460 g	Approx. 790 g

Table 263: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Technical data

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

7.1.1.4 Flex radius specifications

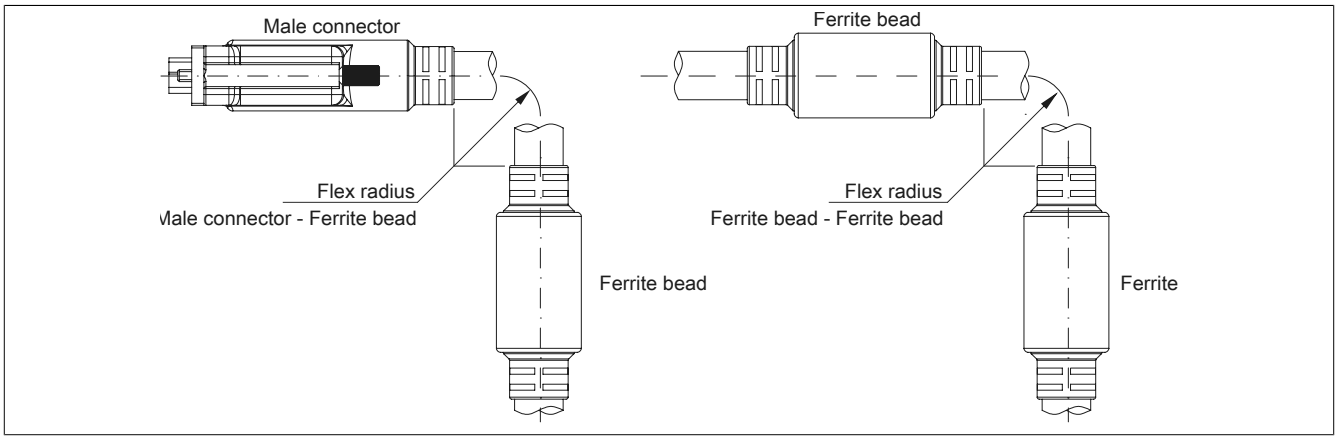


Figure 170: Flex radius specifications

7.1.1.5 Dimensions

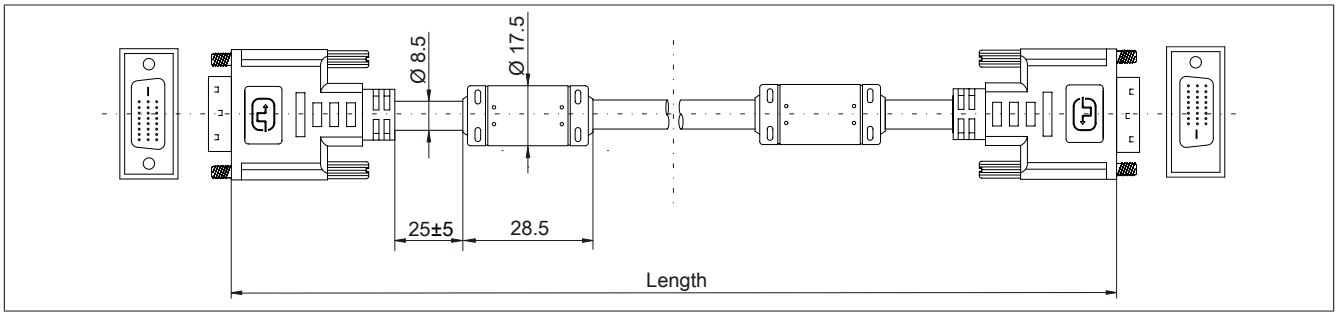


Figure 171: 5CADVI.0xxx-00 - Dimensions

7.1.1.6 Cable pinout

Warning!

If you choose to make a suitable cable yourself, it should be wired according to these specifications.

If a self-made cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

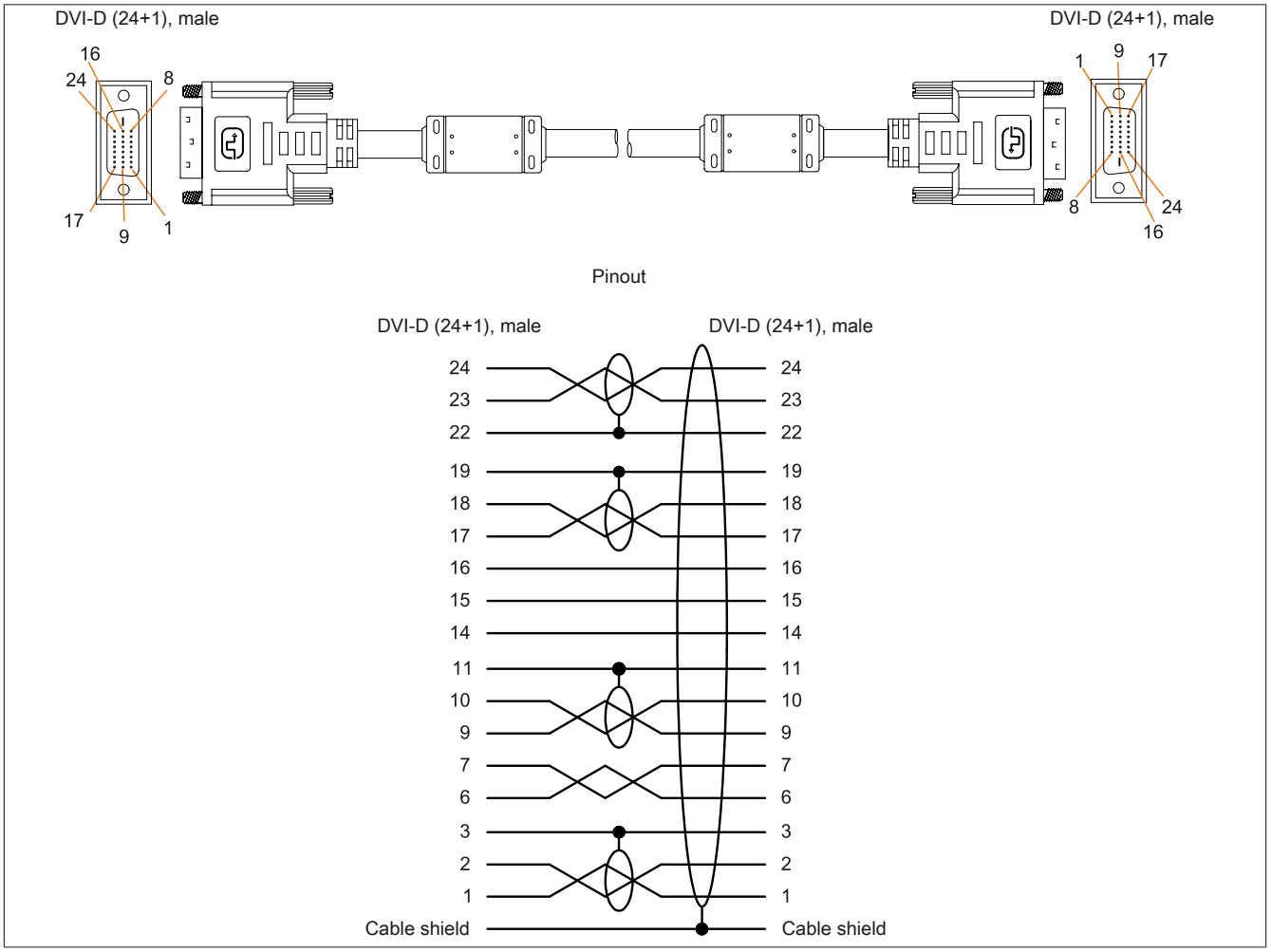


Figure 172: 5CADVI.0xxx-00 - Pinout

7.2 SDL cable

7.2.1 5CASDL.0xxx-00

7.2.1.1 General information

The SDI cable 5CASDL.0xxx-00 is designed for a fixed layout. SDL flex cables 5CASDL.0xxx-03 are required for flexible applications (e.g. swing arm systems).

Caution!

Power must be turned off before plugging in and unplugging cables.

7.2.1.2 Order data

Model number	Short description	Figure
	SDL cables	
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 264: 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Order data

7.2.1.3 Technical data

Product ID	5CASDL. 0018-00	5CASDL. 0050-00	5CASDL. 0100-00	5CASDL. 0150-00	5CASDL. 0200-00	5CASDL. 0250-00	5CASDL. 0300-00
General information							
Certification							
CE	Yes						
cULus	Yes						
GOST-R	Yes						
GL	Yes [1]						
Cable structure							
Wire cross section	AWG 28		AWG 24				
Shield	Individual cable pairs and entire cable						
Complete shielding	Tinned copper braiding, optical coverage >85%						
Outer sheathing							
Material	PVC						
Color	Black						
Labeling	E74020-C (UL) AWM STYLE 20176 80°C 30V VW-1 DVI DIGITAL LINK						
Connector							
Type	2x DVI-D (24+1), male						
Connection cycles	100						
Contacts	Gold-plated						
Mechanical protection	Metal cover with crimped stress relief						
Locating screw tightening torque	Max. 0.5 Nm						
Electrical characteristics							
Conductor resistance							
AWG 24	-		≤93 Ω/km				
AWG 28	≤237 Ω/km		-				
Insulation resistance	Min. 10 MΩ/km						
Mechanical characteristics							
Dimensions							
Length	1.8 m ±30 mm	5 m ±30 mm	10 m ±50 mm	15 m ±100 mm	20 m ±100 mm	25 m ±100 mm	30 m ±100 mm
Diameter	Typ. 8.6 ±0.2 mm Max. 9 mm		Typ. 11 ±0.2 mm Max. 11.5 mm				
Flex radius	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)						
Flexibility	Limited flexibility; valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles / minute)						
Weight	Approx. 300 g	Approx. 580 g	Approx. 1500 g	Approx. 2250 g	Approx. 2880 g	Approx. 4800 g	Approx. 5520 g

Table 265: 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Technical data

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

7.2.1.4 Flex radius specifications

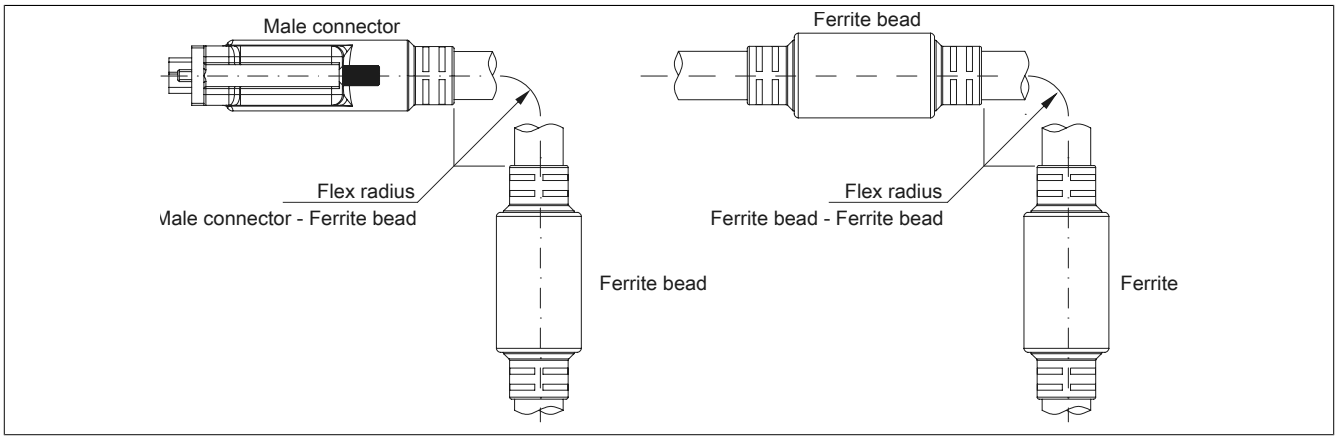


Figure 173: Flex radius specifications

7.2.1.5 Dimensions

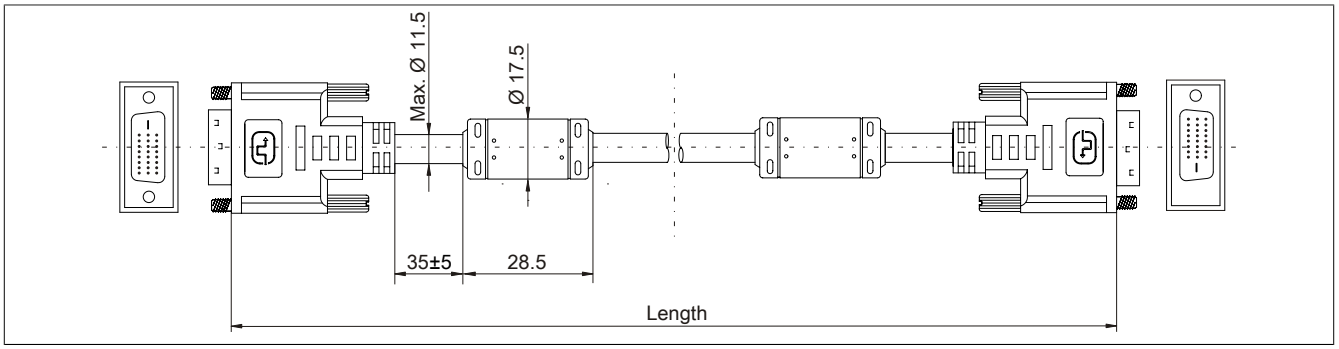


Figure 174: 5CASDL.0xxx-00 - Dimensions

7.2.1.6 Cable pinout

Warning!

If you choose to make a suitable cable yourself, it should be wired according to these specifications.

If a self-made cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

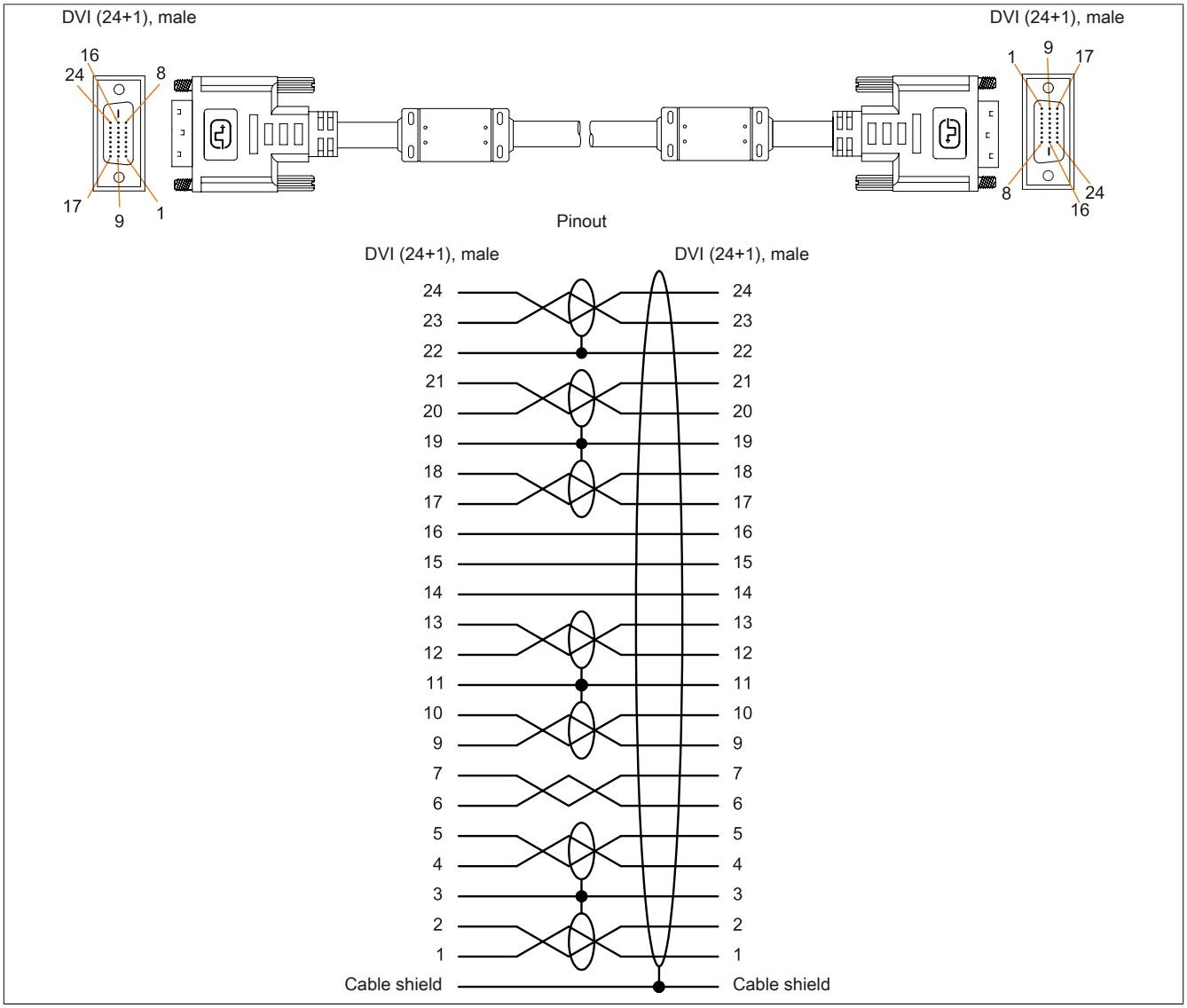


Figure 175: 5CASDL.0xxx-00 - Pinout

7.3 SDL cable with 45° male connector

7.3.1 5CASDL.0xxx-01

7.3.1.1 General information

The SDL cable with a 45° male connector 5CASDL.0xxx-01 is designed for a fixed layout.

Caution!

Power must be turned off before plugging in and unplugging cables.

7.3.1.2 Order data

Model number	Short description	Figure
	SDL cables with 45° connectors	
5CASDL.0018-01	SDL cable with 45° male connector, 1.8 m	
5CASDL.0050-01	SDL cable with 45° male connector, 5 m	
5CASDL.0100-01	SDL cable with 45° male connector, 10 m	
5CASDL.0150-01	SDL cable with 45° male connector, 15 m	

Table 266: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Order data

7.3.1.3 Technical data

Product ID	5CASDL.0018-01	5CASDL.0050-01	5CASDL.0100-01	5CASDL.0150-01
General information				
Certification				
CE	Yes			
cULus	Yes			
GOST-R	Yes			
GL	Yes [1]			
Cable structure				
Wire cross section	AWG 28		AWG 24	
Shield	Individual cable pairs and entire cable			
Complete shielding	Tinned copper braiding, optical coverage >85%			
Outer sheathing				
Material	PVC			
Color	Black			
Connector				
Type	2x DVI-D (24+1), male			
Connection cycles	100			
Contacts	Gold-plated			
Mechanical protection	Metal cover with crimped stress relief			
Locating screw tightening torque	Max. 0.5 Nm			
Electrical characteristics				
Conductor resistance				
AWG 24	-		≤93 Ω/km	
AWG 28	≤237 Ω/km		-	
Insulation resistance	Min. 10 MΩ/km			
Mechanical characteristics				
Dimensions				
Length	1.8 m ±30 mm	5 m ±50 mm	10 m ±100 mm	15 m ±100 mm
Diameter	Max. 9 mm		Max. 11.5 mm	
Flex radius				
Fixed installation	≥5x cable diameter (male connector - ferrite bead and ferrite bead - ferrite bead)			
Flexibility	Limited flexibility; valid for ferrite bead - ferrite bead (tested 100 cycles with 5x cable diameter, 20 cycles / minute)			
Weight	Approx. 300 g	Approx. 590 g	Approx. 2800 g	Approx. 2860 g

Table 267: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data

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

7.3.1.4 Flex radius specifications

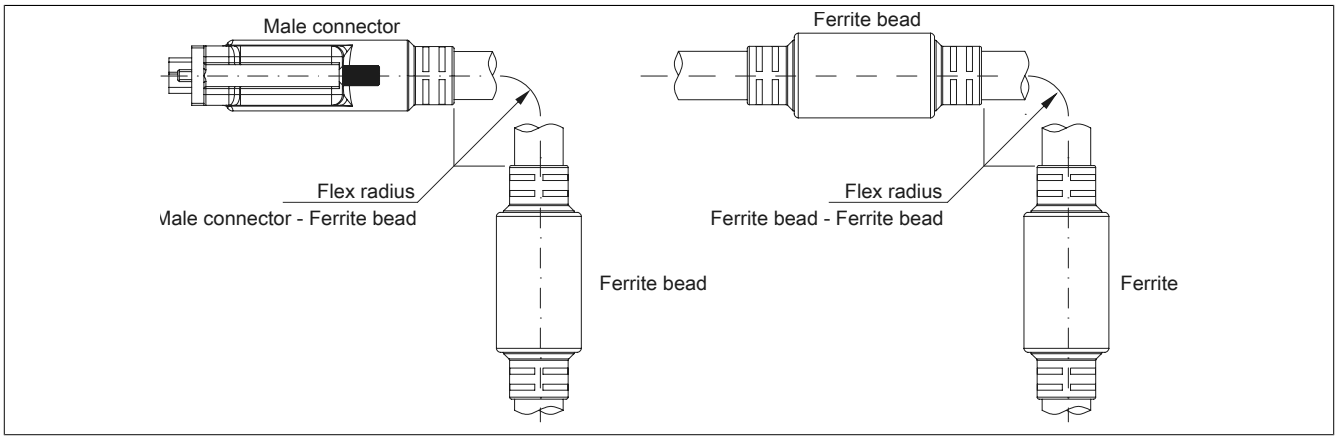


Figure 176: Flex radius specifications

7.3.1.5 Dimensions

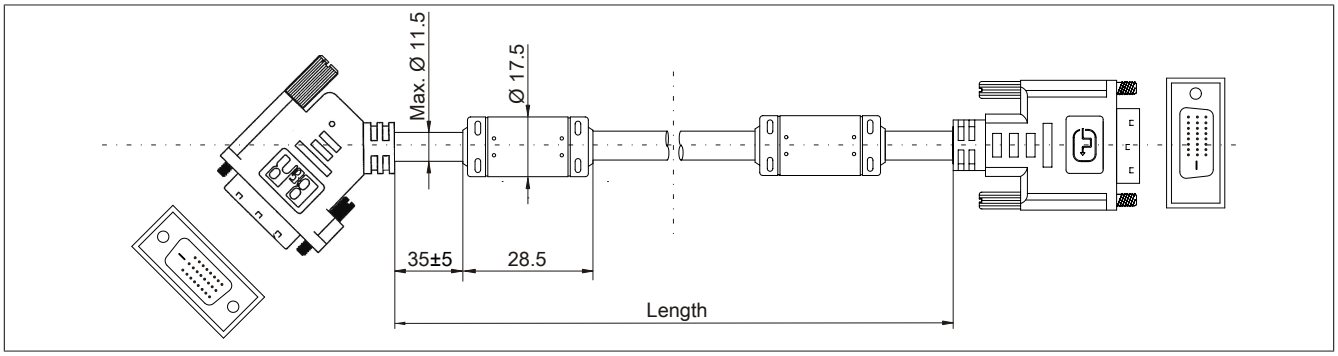


Figure 177: 5CASDL.0xxx-01 - Dimensions

7.3.1.6 Cable pinout

Warning!

If you choose to make a suitable cable yourself, it should be wired according to these specifications.

If a self-made cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

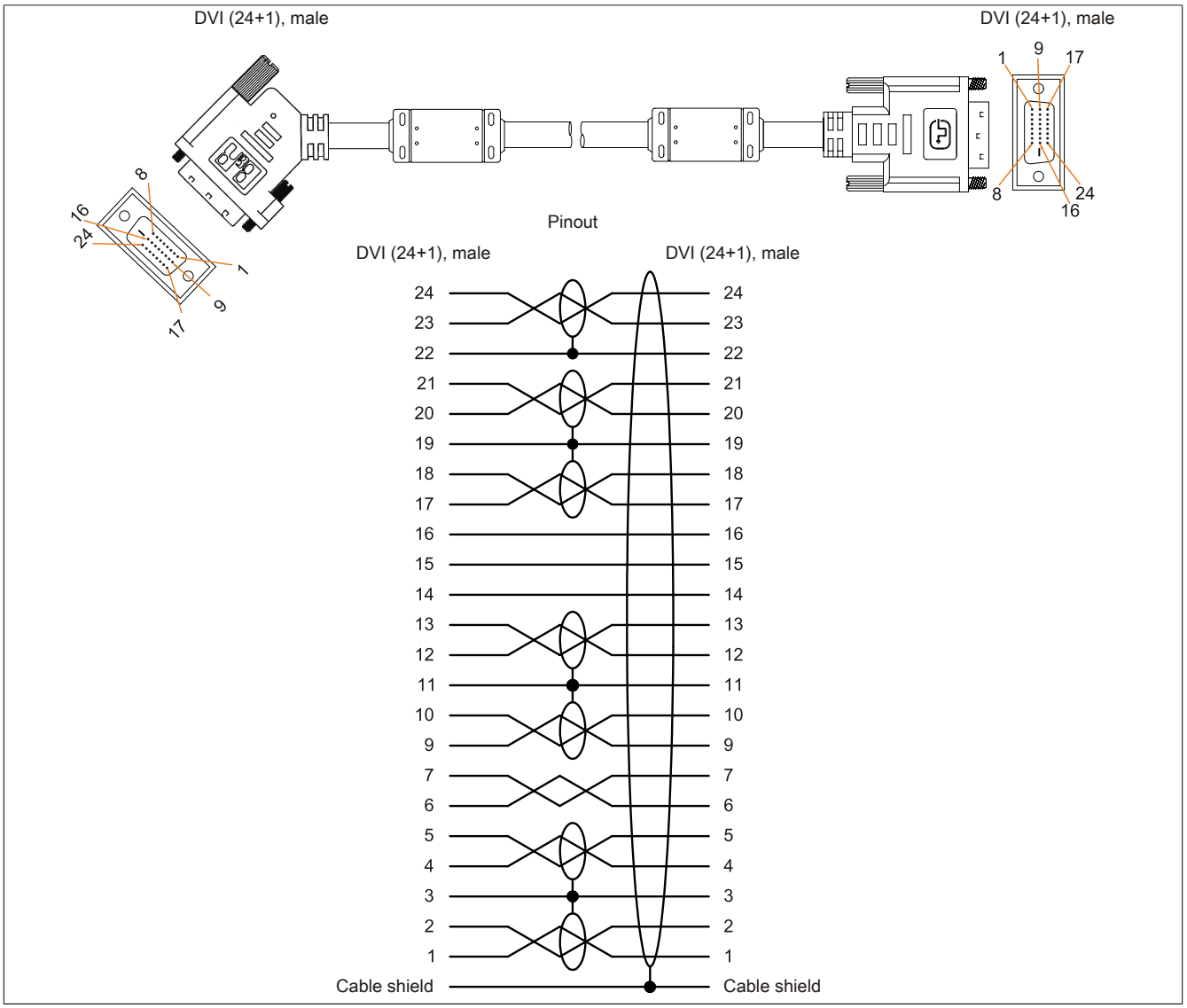


Figure 178: 5CASDL.0xxx-01 - Pinout

7.4 SDL flex cables

7.4.1 5CASDL.0xxx-03

7.4.1.1 General information

5CASDL.0xxx-03 SDL flex cables are designed for use in both inflexible and flexible applications (e.g. swing arm systems).

Caution!

Power must be turned off before plugging in and unplugging cables.

7.4.1.2 Order data

Model number	Short description	Figure
	SDL flex cables	
5CASDL.0018-03	SDL flex cable, 1.8 m	
5CASDL.0050-03	SDL flex cable, 5 m	
5CASDL.0100-03	SDL flex cable, 10 m	
5CASDL.0150-03	SDL flex cable, 15 m	
5CASDL.0200-03	SDL flex cable, 20 m	
5CASDL.0250-03	SDL flex cable, 25 m	
5CASDL.0300-03	SDL flex cable, 30 m	

Table 268: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Order data

7.4.1.3 Technical data

Product ID	5CASDL. 0018-03	5CASDL. 0050-03	5CASDL. 0100-03	5CASDL. 0150-03	5CASDL. 0200-03	5CASDL. 0250-03	5CASDL. 0300-03
General information							
Certification							
CE	Yes						
cULus	Yes						
GOST-R	Yes						
GL	Yes [1]						
Cable structure							
Wire cross section	AWG 24 (control wires) AWG 26 (DVI, USB, data)						
Properties	Silicone- and halogen-free						
Shield	Individual cable pairs and entire cable						
Complete shielding	Aluminum-clad foil + tinned copper braiding						
Outer sheathing							
Material	Special semi-glossy TMPU						
Color	Black						
Labeling	(B&R) SDL Cable (UL) AWM 20236 80°C 30V E 63216						
Connector							
Type	2x DVI-D (24+1), male						
Connection cycles	Min. 200						
Contacts	Gold-plated						
Mechanical protection	Metal cover with crimped stress relief						
Locating screw tightening torque	Max. 0.5 Nm						
Electrical characteristics							
Operating voltage	≤30 V						
Test voltage							
Wire/Wire	1 kV						
Wire/Shield	0.5 kV						
Wave impedance	100 ±10 Ω						
Conductor resistance							
AWG 24	≤95 Ω/km						
AWG 26	≤145 Ω/km						
Insulation resistance	>200 MΩ/km						
Operating conditions							
Approbation	UL AWM 20236 80°C 30 V						
Flame-resistant	In accordance with UL758 (cable vertical flame test)						
Oil and hydrolysis resistance	In accordance with VDE 0282-10						

Table 269: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data

Product ID	5CASDL. 0018-03	5CASDL. 0050-03	5CASDL. 0100-03	5CASDL. 0150-03	5CASDL. 0200-03	5CASDL. 0250-03	5CASDL. 0300-03
Environmental conditions							
Temperature							
Storage	-20 to 80°C						
Fixed installation	-20 to 80°C						
Flexible installation	-5 to 60°C						
Mechanical characteristics							
Dimensions							
Length	1.8 m ±20 mm	5 m ±45 mm	10 m ±90 mm	15 m ±135 mm	20 m ±180 mm	25 m ±225 mm	30 m ±270 mm
Diameter	Max. 12 mm						
Flex radius							
Fixed installation	≥6x cable diameter (from male connector - ferrite bead) ≥10x cable diameter (from ferrite bead - ferrite bead)						
Flexible installation	≥15x cable diameter (from ferrite bead - ferrite bead)						
Flexibility	Flexible; valid for ferrite bead - ferrite bead (tested 300,000 cycles with 15x cable diameter, 4800 cycles/hour)						
Drag chain data							
Flex cycles	300,000						
Velocity	4800 cycles/hour						
Flex radius	180 mm; 15x cable diameter						
Hub	460 mm						
Weight	Approx. 460 g	Approx. 1020 g	Approx. 1940 g	Approx. 2840 g	Approx. 3740 g	Approx. 4560 g	Approx. 5590 g
Tension							
During operation	≤50 N						
During installation	≤400 N						

Table 269: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data

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

7.4.1.4 Flex radius specifications

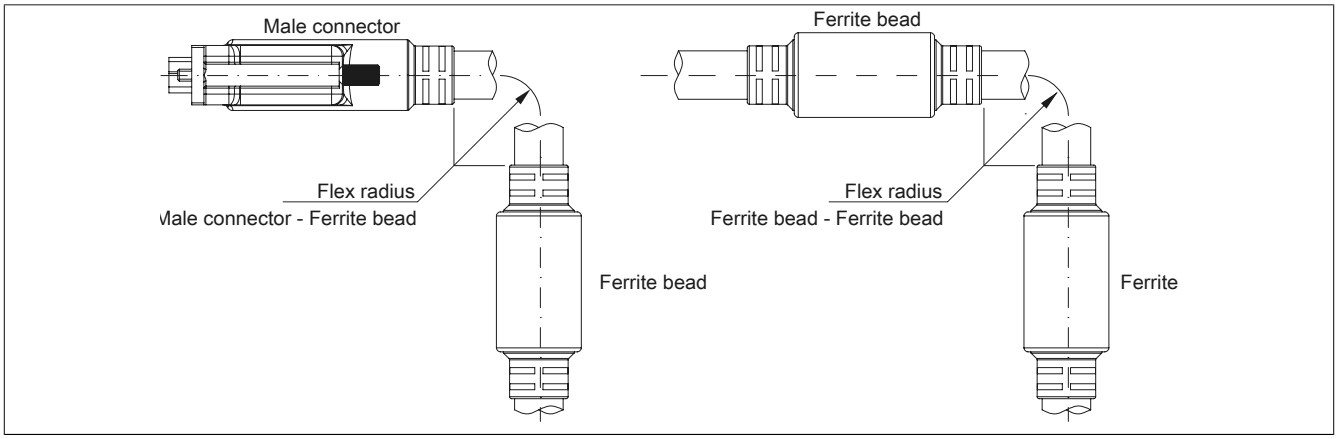


Figure 179: Flex radius specifications

7.4.1.5 Dimensions

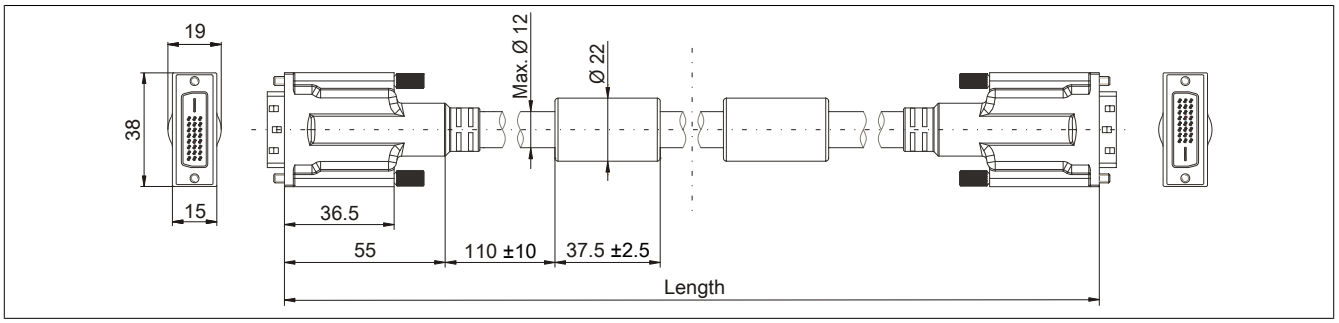


Figure 180: 5CASDL.0xxx-03 - Dimensions

7.4.1.6 Construction

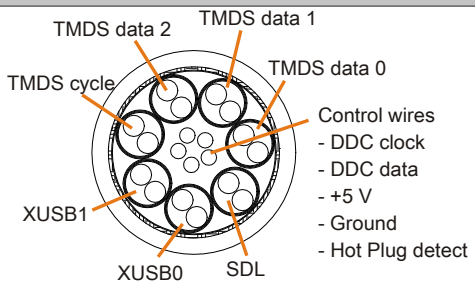
Element	Assignment	Cross section	
DVI	TMDS data 0	26 AWG	
	TMDS data 1	26 AWG	
	TMDS data 2	26 AWG	
	TMDS cycle	26 AWG	
USB	XUSB0	26 AWG	
	XUSB1	26 AWG	
Data	SDL	26 AWG	
Control wires	DDC cycle	24 AWG	
	DDC data	24 AWG	
	+5 V	24 AWG	
	Ground	24 AWG	
	Hot plug detect	24 AWG	

Table 270: 5CASDL.0xxx-03 SDL flex cables - Structure

7.4.1.7 Cable pinout

Warning!

If you choose to make a suitable cable yourself, it should be wired according to these specifications.

If a self-made cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

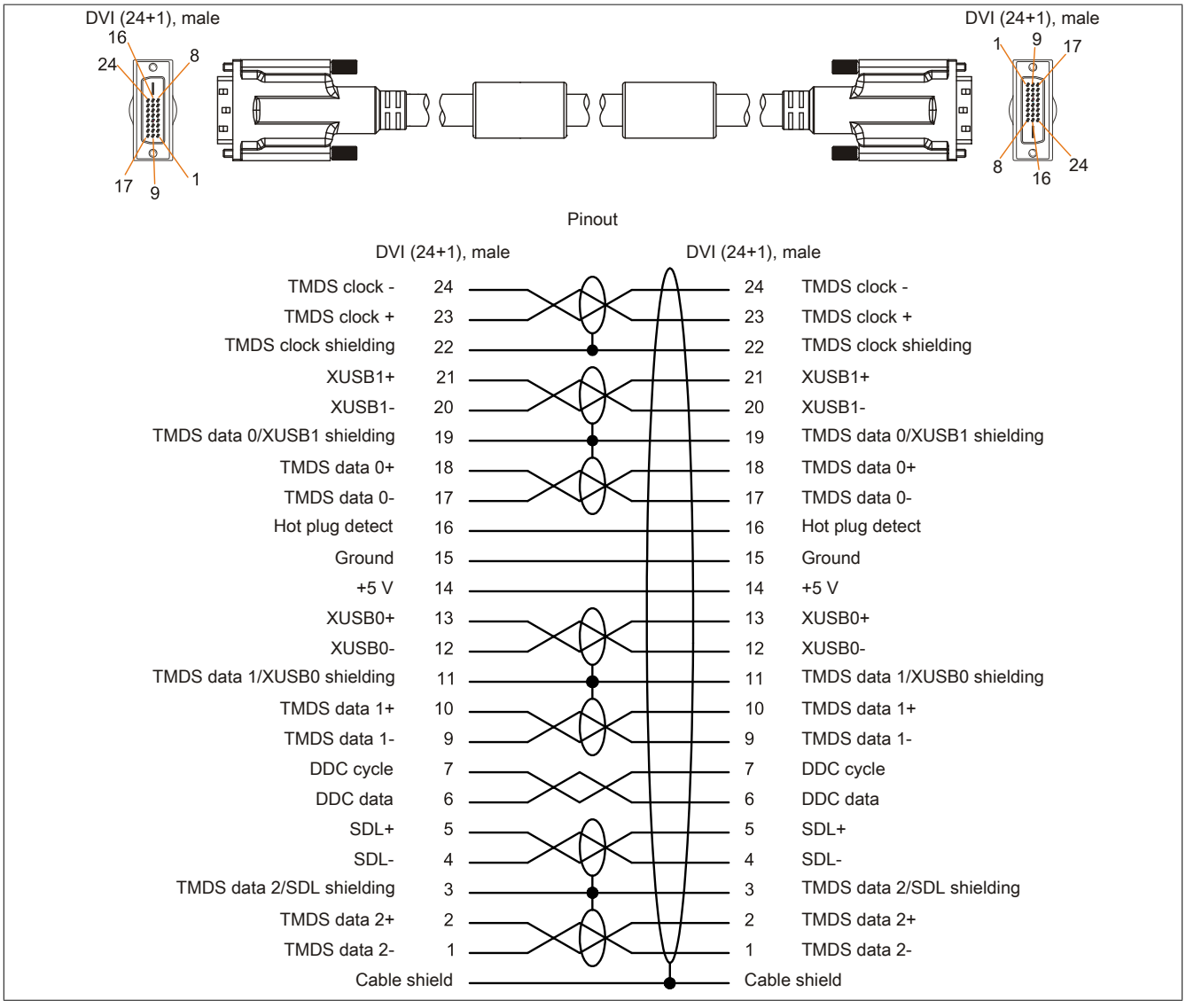


Figure 181: 5CASDL.0xxx-03 - Pinout

7.5 SDL flex cable with extender

7.5.1 5CASDL.0xx0-13

7.5.1.1 General information

5CASDL.0xx0-13 SDL flex cables with extender are designed for use in both inflexible and flexible applications (e.g. swing arm systems).

Caution!

Power must be turned off before plugging in and unplugging cables.

7.5.1.2 Order data

Model number	Short description	Figure
	SDL flex cables	
5CASDL.0300-13	SDL flex cable with extender, 30 m	
5CASDL.0400-13	SDL flex cable with extender, 40 m	
5CASDL.0430-13	SDL flex cable with extender, 43 m	

Table 271: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Order data

7.5.1.3 Technical data

Product ID	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
General information			
Certification			
CE	Yes		
cULus	Yes		
GOST-R	Yes		
GL	Yes [1)]		
Cable structure			
Wire cross section	AWG 24 (control wires) AWG 26 (DVI, USB, data)		
Properties	Silicone- and halogen-free		
Shield	Individual cable pairs and entire cable		
Complete shielding	Aluminum-clad foil + tinned copper braiding		
Outer sheathing			
Material	Special semi-glossy TMPU		
Color	Black		
Labeling	(B&R) SDL cable (UL) AWM 20236 80°C 30V E63216		
Connector			
Type	2x DVI-D (24+1), male		
Connection cycles	Min. 200		
Contacts	Gold-plated		
Mechanical protection	Metal cover with crimped stress relief		
Locating screw tightening torque	Max. 0.5 Nm		
Electrical characteristics			
Operating voltage	≤30 V		
Test voltage			
Wire/Wire	1 kV		
Wire/Shield	0.5 kV		
Wave impedance	100 ±10 Ω		
Conductor resistance			
AWG 24	≤95 Ω/km		
AWG 26	≤145 Ω/km		
Insulation resistance	>200 MΩ/km		
Operating conditions			
Approbation	UL AWM 20236 80°C 30 V		
Flame-resistant	In accordance with UL758 (cable vertical flame test)		
Oil and hydrolysis resistance	In accordance with VDE 0282-10		
Environmental conditions			
Temperature			
Storage	-20 to 60°C		
Fixed installation	-20 to 60°C		
Flexible installation	-5 to 60°C		

Table 272: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

Product ID	5CASDL.0300-13	5CASDL.0400-13	5CASDL.0430-13
Mechanical characteristics			
Dimensions			
Length	30 m ±280 mm	40 m ±380 mm	43 m ±410 mm
Diameter		Max. 12 mm	
Extender box			
Width		35 mm	
Length		125 mm	
Height		18.5 mm	
Flex radius			
Fixed installation		≥6x cable diameter (from male connector - ferrite bead) ≥10x cable diameter (from ferrite bead - ferrite bead)	
Flexible installation		≥15x cable diameter (from ferrite bead - ferrite bead)	
Flexibility		Flexible; valid for ferrite bead - ferrite bead (tested 300,000 cycles with 15x cable diameter, 4800 cycles/hour)	
Drag chain data			
Flex cycles		300,000	
Velocity		4800 cycles/hour	
Flex radius		180 mm; 15x cable diameter	
Hub		460 mm	
Weight	Approx. 5430 g	Approx. 7200 g	Approx. 7790 g
Tension			
During operation		≤50 N	
During installation		≤400 N	

Table 272: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data

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

7.5.1.4 Flex radius specifications

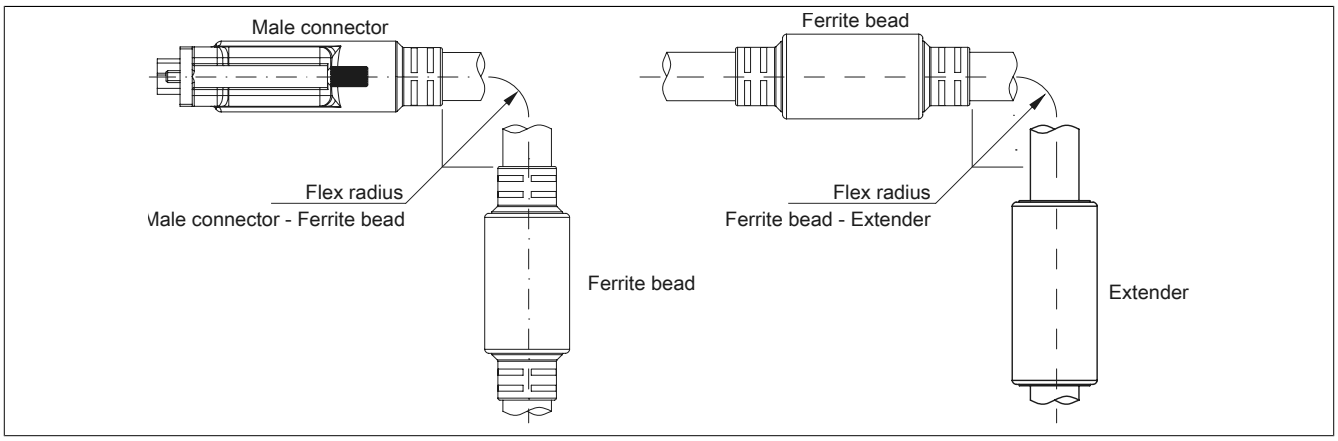


Figure 182: Flex radius specification with extender

7.5.1.5 Dimensions

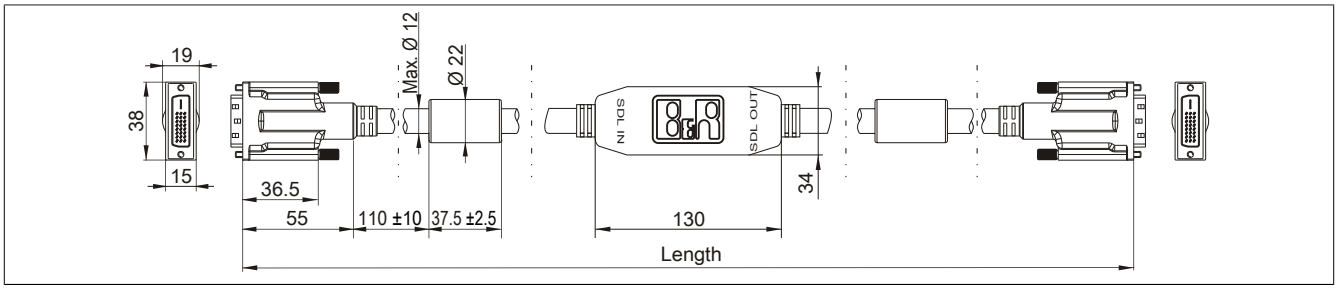


Figure 183: 5CASDL.0xx0-13 - Dimensions

7.5.1.6 Cable pinout

Warning!

If you choose to make a suitable cable yourself, it should be wired according to these specifications.

If a self-made cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

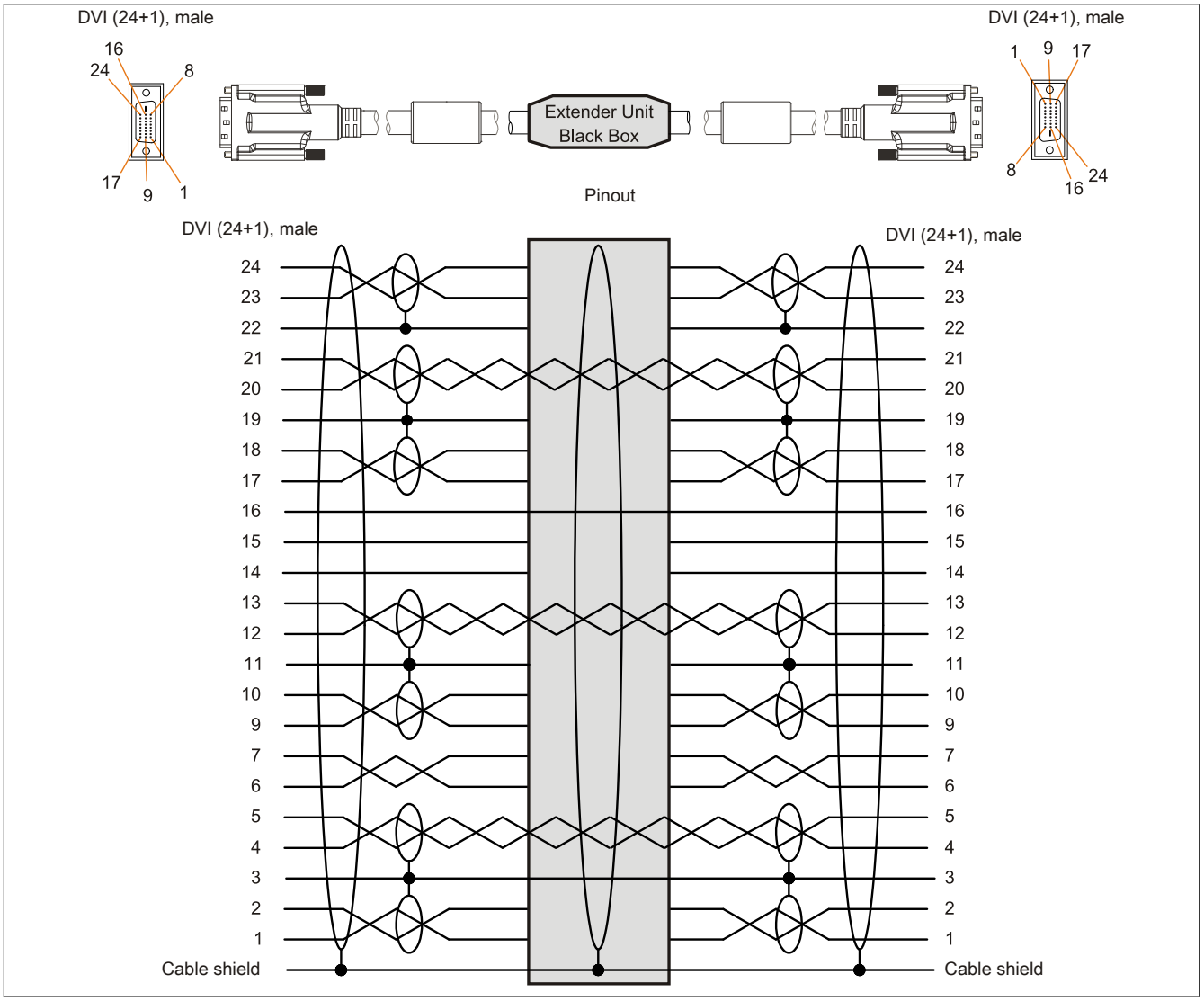


Figure 184: 5CASDL.0xx0-13 - Pinout

7.5.1.7 Cable connection

SDL flex cables with an extender must be connected between the B&R Industrial PC and the Automation Panel display unit in the correct direction. The proper signal direction is indicated on the extender.

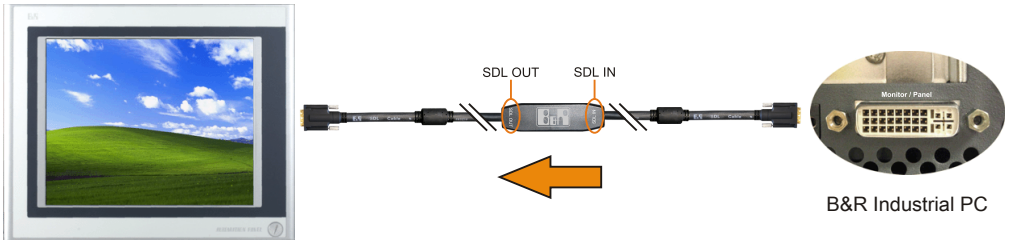


Figure 185: Example of the signal direction for an SDL flex cable with extender

7.6 SDL3 cables

7.6.1 5CASD3.xxxx-00

7.6.1.1 General information

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

Caution!

Power must be turned off before plugging in and unplugging cables.

7.6.1.2 Order data

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

Table 273: 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Order data

7.6.1.3 Technical data

Product ID	5CASD3.0100-00	5CASD3.0150-00	5CASD3.0200-00	5CASD3.0300-00	5CASD3.0500-00	5CASD3.1000-00
Cable structure						
Wire cross section	4x 2x 26/7 AWG			4x 2x 23/1 AWG		
Properties	Flame-resistant, halogen-free, lead-free					
Outer sheathing						
Material	Polyurethane (PUR)					
Color	Yellow, RAL 1021					
Labeling	HARTING INDUSTRIAL CABLE S/ FTP CAT 6A PUR 4x 2x 26/7 AWG			HARTING INDUSTRIAL INSTALLATION CABLE S/FTP CAT 7 PUR 4x 2x 23/1 AWG		
Lines						
Wire insulation	Polyethylene (PE)					
Wire colors	Green/white-green, orange/white-orange, blue/white-blue, brown/white-brown					
Shield	Aluminum foil and meshed wire shield made of tinned Cu wires					
Type	Unprotected copper wire, 4x 2x 26/7 AWG			Unprotected copper wire, 4x 2x 23/1 AWG		
Connector						
Type	2x RJ45, male					
Connection cycles	Min. 750					
Contacts	8					
Electrical characteristics [1]						
Operating voltage	≤100 V			≤125 V		
Conductor resistance	≤290 Ω/km			≤75 Ω/km		
Wave impedance	100 ±5 Ω (at 100 MHz)					
Transfer properties	Category 6A / Class EA up to 500 MHz in accordance with ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)			Category 7 / Class F up to 600 MHz in accordance with ISO/IEC 11801 (EN 50173-1), ISO/IEC 24702 (EN 50173-3)		
Insulation resistance	≥ 500 MΩ/km			≥5 GΩ/km		
Operating conditions						
Flame-resistant	IEC 60332-1-2					
Oil and hydrolysis resistance	EN 60811-2-1 (90°C / 7x24 h)					
EN 60529 protection						
Cables	IP20					
RJ45 plug	IP20, only when connected properly					
Environmental conditions						
Temperature						
Storage	-40 to 70°C					
Fixed installation	-40 to 70°C					
Flexible installation	-40 to 70°C			-10 to 50°C		
Mechanical characteristics						
Dimensions						
Length	10 m	15 m	20 m	30 m	50 m	100 m
Diameter	6.7 mm			8.3 mm		

Table 274: 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

Product ID	5CASD3.0100-00	5CASD3.0150-00	5CASD3.0200-00	5CASD3.0300-00	5CASD3.0500-00	5CASD3.1000-00
Flex radius						
Fixed installation	≥ 5x diameter			≥ 4x diameter		
Flexible installation	≥ 10x diameter			≥ 8x diameter		
Weight	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 274: 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data

1) At an ambient temperature of 20°C.

7.6.1.4 Flex radius specifications

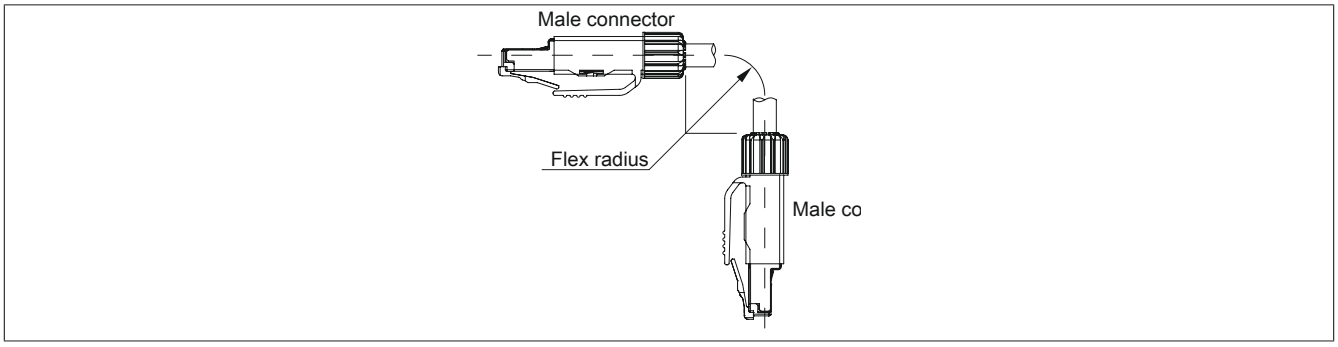


Figure 186: SDL3 - Flex radius specifications

7.6.1.5 Dimensions

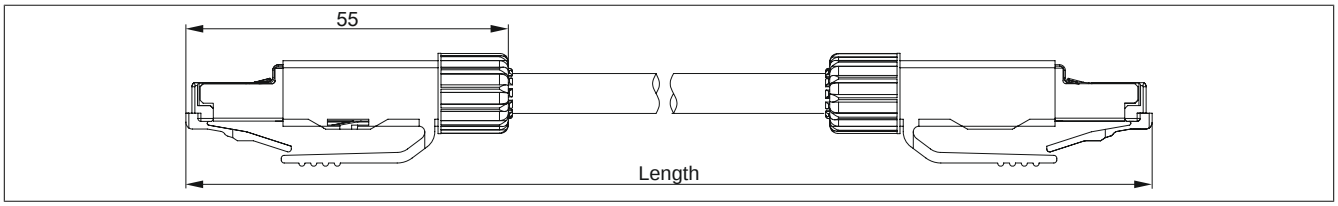


Figure 187: 5CASD3.xxxx-00 - Dimensions

7.6.1.6 Cable pinout

Warning!

If you choose to make a suitable cable yourself, it should be wired according to these specifications.

If a self-made cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

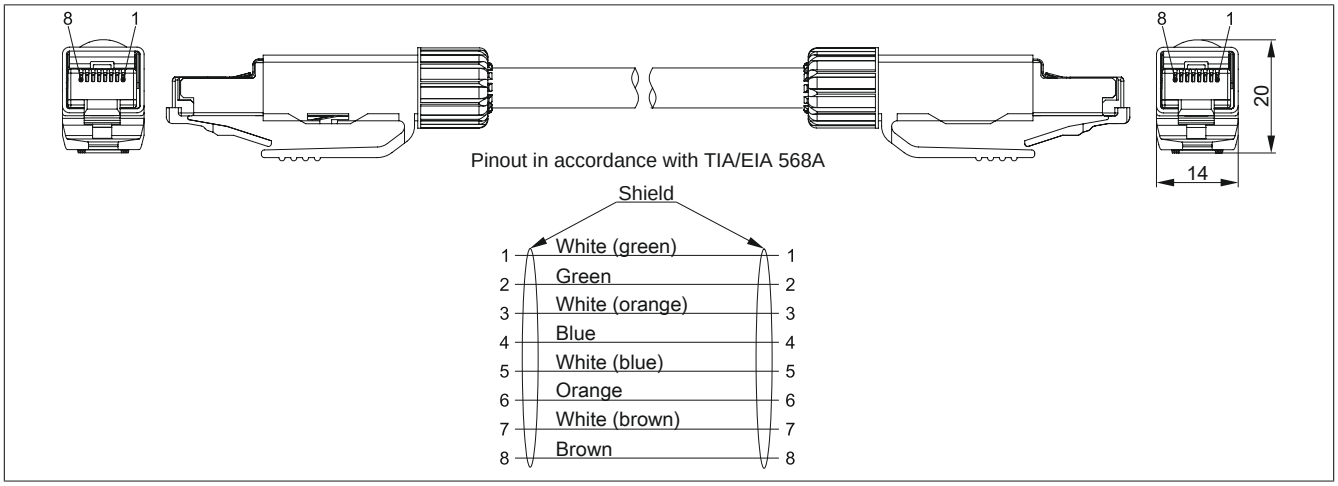


Figure 188: 5CASD3.xxxx-00 - Pinout

7.6.1.7 Cabling

The following information and figure apply when using a field-assembled cable that is not directly connected to a B&R device, but to an RJ45 network interface (e.g. patch panel).

Cabling must be done in accordance with category 6a (Cat6a) or 7 (Cat7) requirements. It is not permitted to exceed the total maximum length of 100 m.

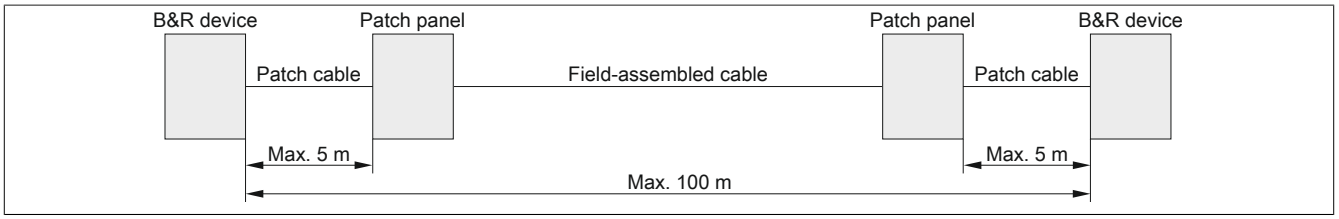


Figure 189: Cabling with a field-assembled cable

7.7 USB cables

7.7.1 5CAUSB.00xx-00

7.7.1.1 General information

USB cables are designed to achieve USB 2.0 transfer speeds.

7.7.1.2 Order data

Model number	Short description	Figure
	USB cables	
5CAUSB.0018-00	USB 2.0 connection cable type A - type B, 1.8 m	
5CAUSB.0050-00	USB 2.0 connection cable type A - type B, 5 m	

Table 275: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data

7.7.1.3 Technical data

Product ID	5CAUSB.0018-00	5CAUSB.0050-00
General information		
Certification		
CE	Yes	
cULus	Yes	
GOST-R	Yes	
Cable structure		
Wire cross section	AWG 24, 28	
Shield	Entire cable	
Outer sheathing		
Color	Beige	
Connector		
Type	USB type A male and USB type B male	
Mechanical characteristics		
Dimensions		
Length	1.8 m ±30 mm	5 m ±50 mm
Diameter	Max. 5 mm	
Flex radius	Min. 100 mm	

Table 276: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data

7.7.1.4 Cable pinout

Warning!

If you choose to make a suitable cable yourself, it should be wired according to these specifications.

If a self-made cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

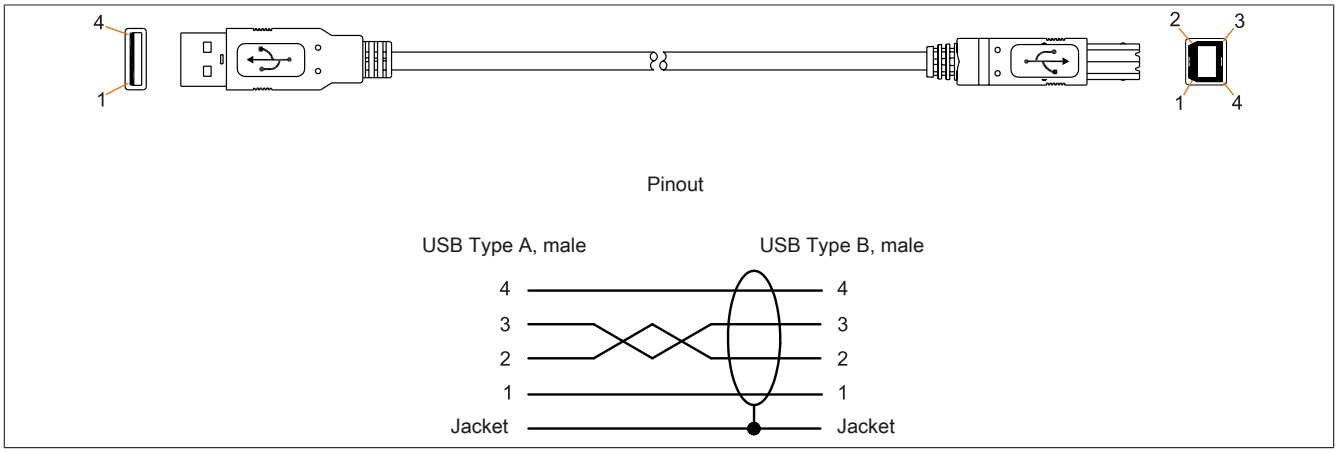


Figure 190: 5CAUSB.00xx-00 USB cables - Pinout

7.8 RS232 cables

7.8.1 9A0014.xx

7.8.1.1 General information

RS232 cables are used as extension cables between two RS232 interfaces.

7.8.1.2 Order data

Model number	Short description	Figure
	RS232 cables	
9A0014.02	RS232 extension cable for remote operation of a display unit with touch screen, 1.8 m	
9A0014.05	RS232 extension cable for remote operation of a display unit with touch screen, 5 m	
9A0014.10	RS232 extension cable for remote operation of a display unit with touch screen, 10 m	

Table 277: 9A0014.02, 9A0014.05, 9A0014.10 - Order data

7.8.1.3 Technical data

Product ID	9A0014.02	9A0014.05	9A0014.10
General information			
Certification			
CE		Yes	
GOST-R	-	Yes	
Cable structure			
Wire cross section		AWG 26	
Shield		Entire cable	
Outer sheathing			
Color		Beige	
Connector			
Type		9-pin male/female DSUB connector	
Locating screw tightening torque		Max. 0.5 Nm	
Mechanical characteristics			
Dimensions			
Length	1.8 m ±50 mm	5 m ±80 mm	10 m ±100 mm
Diameter		Max. 5 mm	
Flex radius		Min. 70 mm	

Table 278: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data

7.8.1.4 Cable pinout

Warning!

If you choose to make a suitable cable yourself, it should be wired according to these specifications.

If a self-made cable is used, B&R cannot guarantee that it will function properly. All cables provided by B&R are guaranteed to function properly, however.

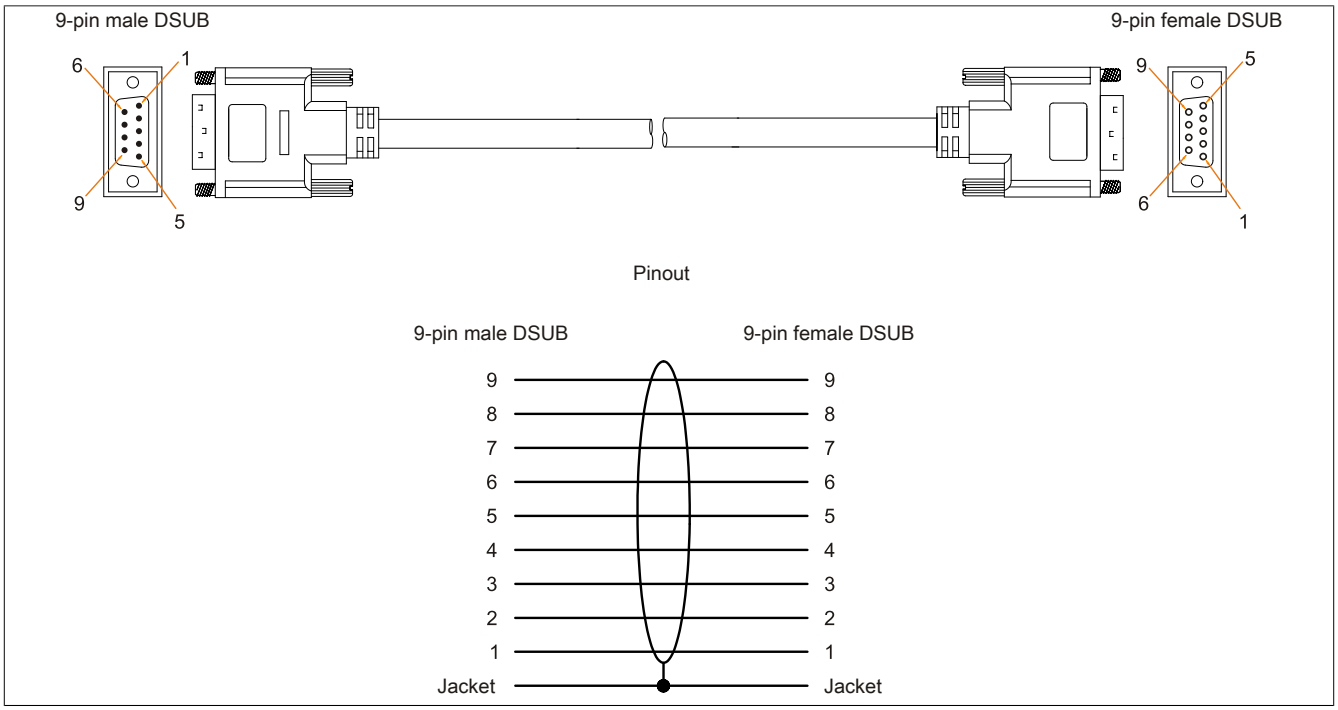


Figure 191: 9A0014.xx RS232 cables - Pinout

7.9 Internal supply cable

7.9.1 5CAMSC.0001-00

7.9.1.1 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 turned off before plugging in and unplugging cables.**

7.9.1.2 Order data

Model number	Short description	Figure
	Accessories	
5CAMSC.0001-00	Internal supply cable	

Table 279: 5CAMSC.0001-00 - Order data

7.9.1.3 Technical data

Product ID	5CAMSC.0001-00
General information	
Certification	
CE	Yes
GOST-R	Yes
Cable structure	
Wire cross section	AWG 22
Connector	
Type	1x 4-pin male disk drive power connector, 1x 4-pin female connector housing
Mechanical characteristics	
Dimensions	
Length	100 mm ±5 mm
Flexibility	Flexible

Table 280: 5CAMSC.0001-00 - Technical data

8 Replacement fan

8.1 5AC901.FI0x-00

8.1.1 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 of the filter kit is appropriate at that time.

8.1.2 Order data

Model number	Short description	Figure
	Accessories	Image not found for 5AC901.FI01-00!
5AC901.FI01-00	APC910 replacement fan filter for 5AC901.FA01-00; 5 pcs.	
5AC901.FI02-00	APC910 replacement fan filter for 5AC901.FA02-00; 5 pcs.	
5AC901.FI05-00	APC910 replacement fan filter for 5AC901.FA05-00; 5 pcs.	

Table 281: 5AC901.FI01-00, 5AC901.FI02-00, 5AC901.FI05-00 - Order data

9 Line filter

9.1 5AC804.MFLT-00

9.1.1 General information

The 5AC804.MFLT-00 line filter may be necessary to satisfy requirements regarding conducted disturbances in supply lines in accordance with the 2003 edition of GL EMC1 (Germanischer Lloyd).

The line filter should be installed as close to the end device as possible; the supply line from the end device to the line filter should be kept as short as possible.

9.1.2 Order data

Model number	Short description	Figure
	Accessories	
5AC804.MFLT-00	Line filter	

Table 282: 5AC804.MFLT-00 - Order data

9.1.3 Technical data

Information:

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

Product ID	5AC804.MFLT-00
General information	
Certification	
CE	Yes
cULus	Yes
cULus HazLoc Class 1 Division 2	Yes [1]
GOST-R	Yes
GL	Yes [1]
Terminal block	
Connection cross section	
With wire end sleeves	1.5 mm²
Flexible	0.2 to 1.5 mm²
Inflexible	0.2 to 2.5 mm²
Electrical characteristics	
Nominal voltage	24 VDC -25% / +30%
Nominal current	8 A
Environmental conditions	
Temperature	
Operation	-25 to 65°C
Storage	-25 to 65°C
Transport	-25 to 65°C
Mechanical characteristics	
Housing	
Material	Galvanized steel plate
Dimensions	
Width	54 mm
Length	94 mm
Depth	32.15 mm
Weight	205 g

Table 283: 5AC804.MFLT-00 - Technical data

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

9.1.4 Dimensions

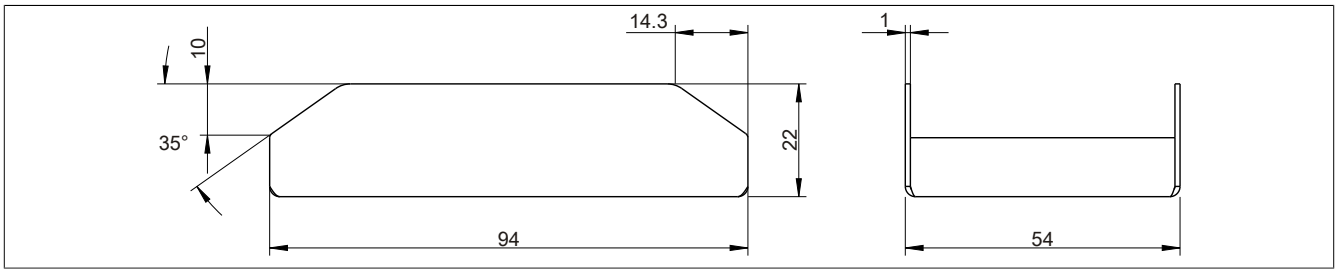


Figure 192: 5AC804.MFLT-00 - Dimensions

9.1.5 Drilling template

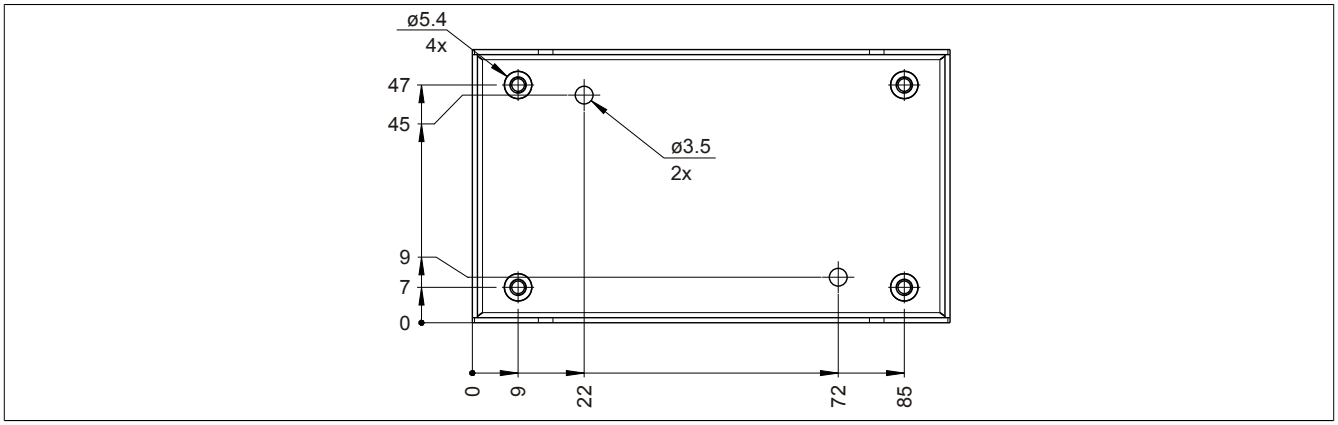


Figure 193: 5AC804.MFLT-00 - Drilling template

9.1.6 Connecting to the end device

The line filter must be connected between the supply voltage and the end device.

The following points must be observed:

- Use shielded, twisted wires.
- Keep the lines as short as possible (supply voltage - line filter - end device).
- The line filter must be installed on an unpainted, oil-free metallic surface.

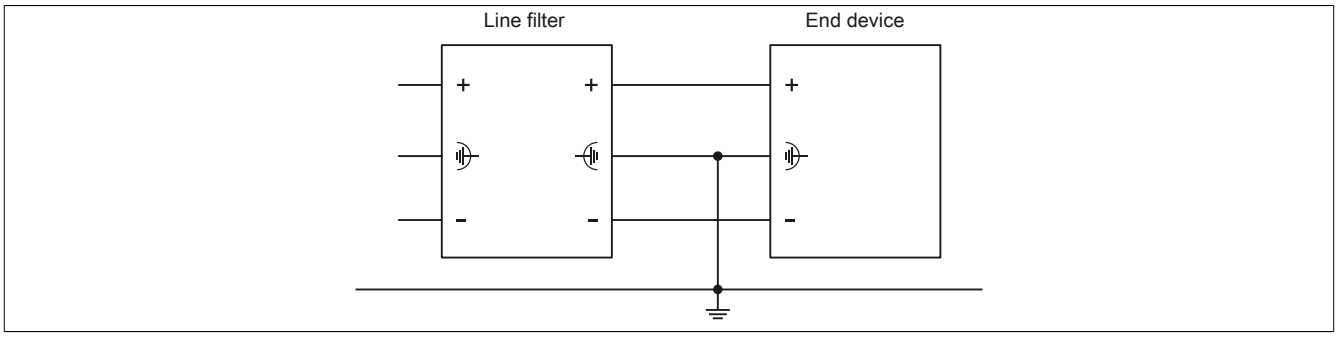


Figure 194: Connection example

Chapter 7 • Maintenance and service

This chapter describes service/maintenance work that can be carried out by a qualified end user.

1 Changing 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 non-volatile EEPROM). The date and time must be reset later since this data is lost when the battery is changed.**
- **The battery should only be changed by qualified personnel.**

Warning!

The battery must be replaced by a Type CR2477N Renata battery only. The use of another battery may present a risk of fire or explosion.

The battery may explode if handled improperly. Do not recharge, disassemble or dispose of in fire.

The following replacement lithium batteries are available: 4A0006.00-000 (1 pc.) and 0AC201.91 (4 pcs.).

1.1 Evaluating the battery status

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

Battery status	Significance
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 284: 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.

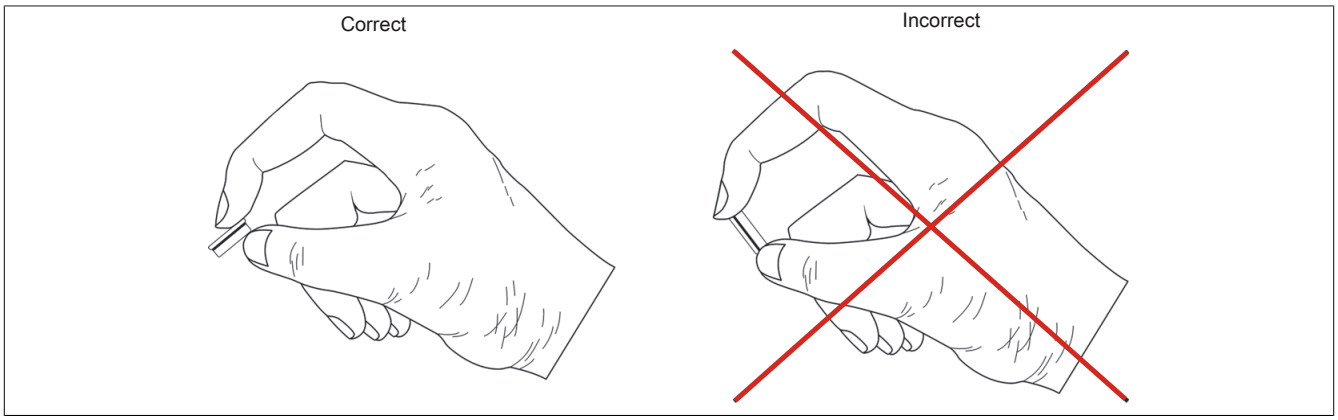


Figure 195: Battery handling

- Insert the new battery with the correct polarity.

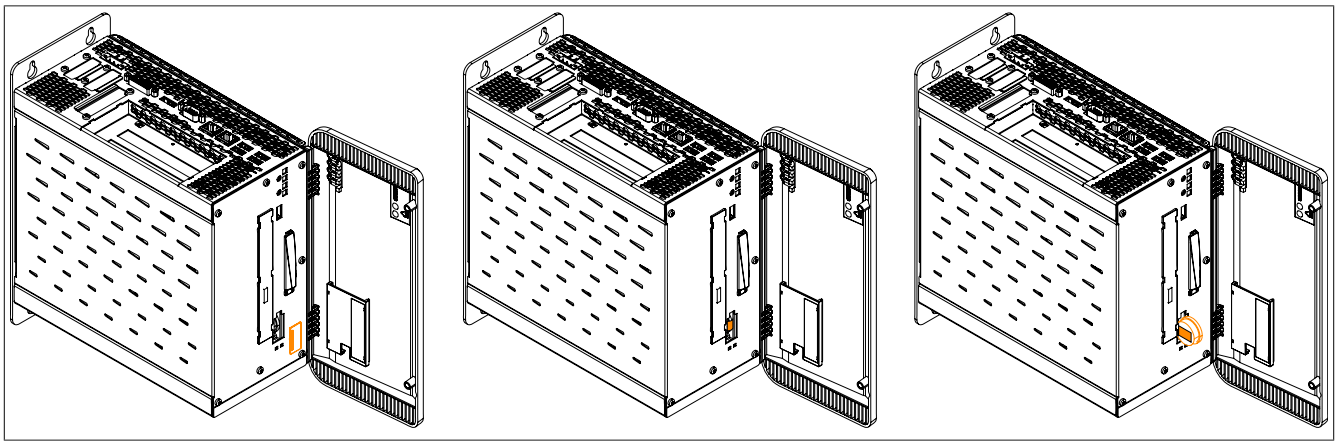


Figure 196: Changing the battery

- 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 Replacing a CFast card

Caution!

Power must be turned off before replacing CFast cards.

The CFast card can be replaced quickly and easily by pressing the ejector (see image) with a pointed object such as a pen.

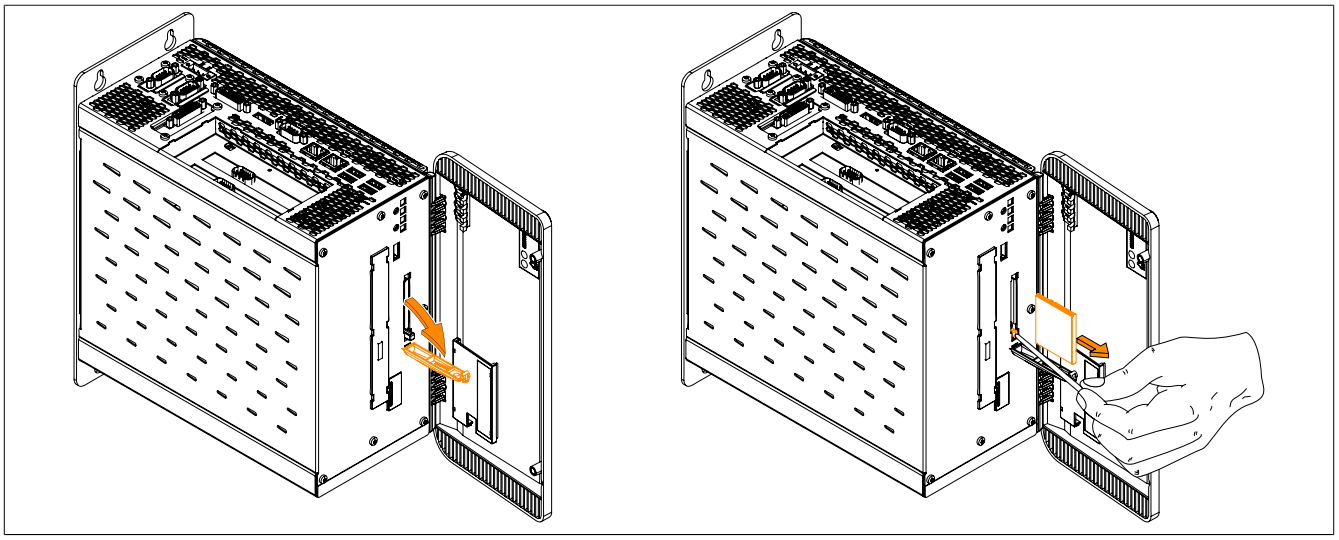


Figure 197: Replacing the CFast card

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 57 and "IF option 2 slot" on page 57.

Depending on the IF option version, it may be necessary to load the setup defaults in BIOS after replacement or installation (see "Save & Exit" on page 238).

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.

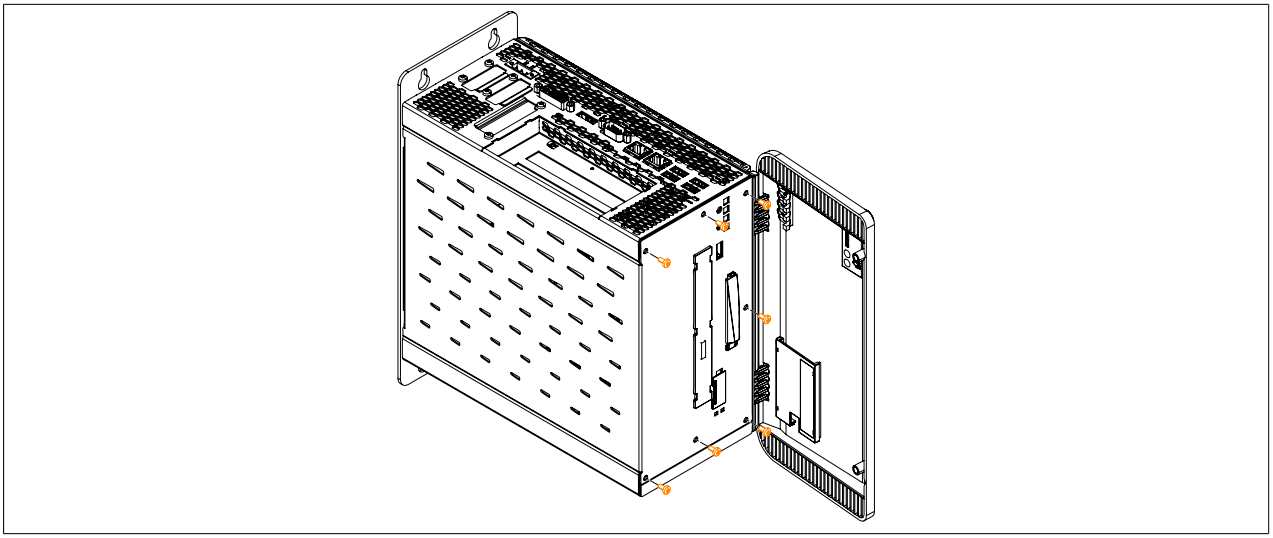


Figure 198: Removing the Torx screws for the side cover

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.

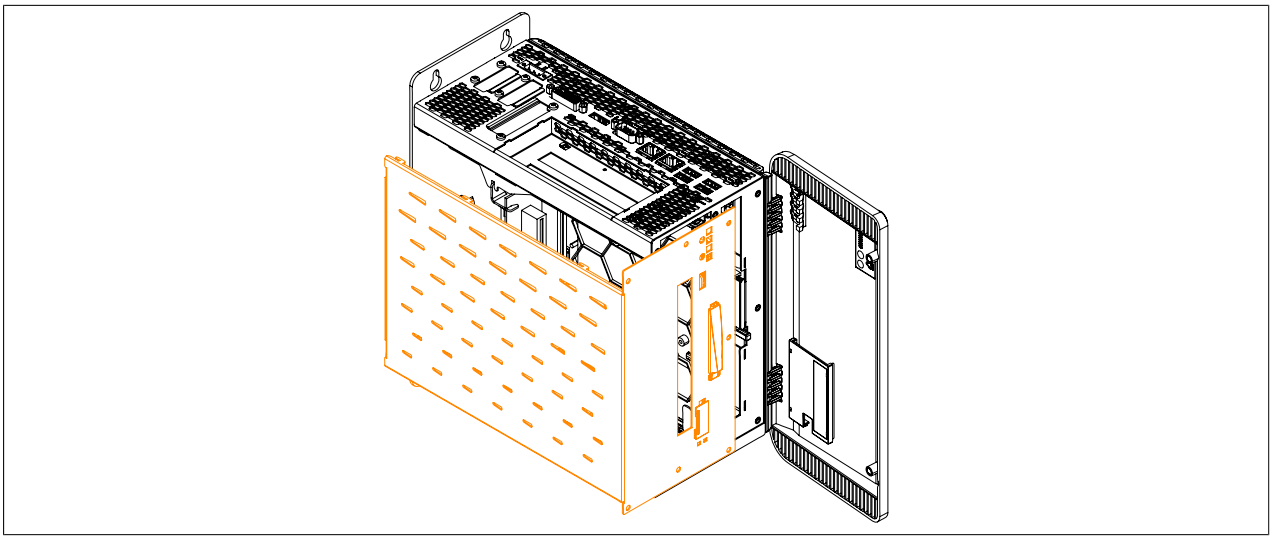


Figure 199: Removing the side cover

5. Remove plastic slot cover, the marked torx screws (T10) and the metal slot cover.

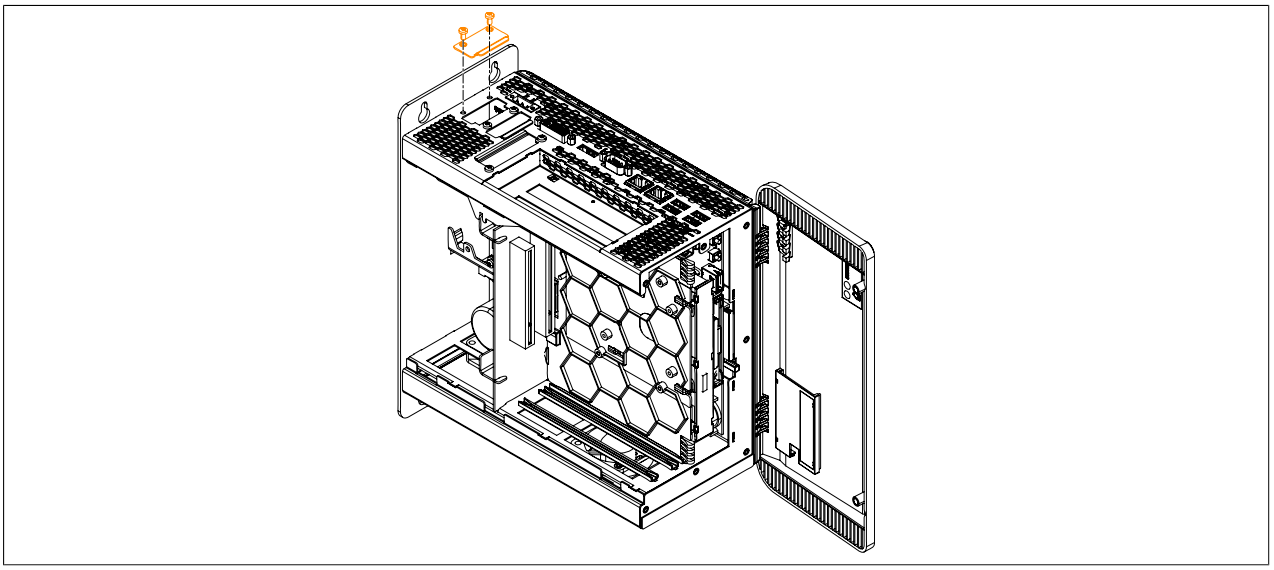


Figure 200: Removing the torx screws and slot cover

6. Insert the interface option into the slot.

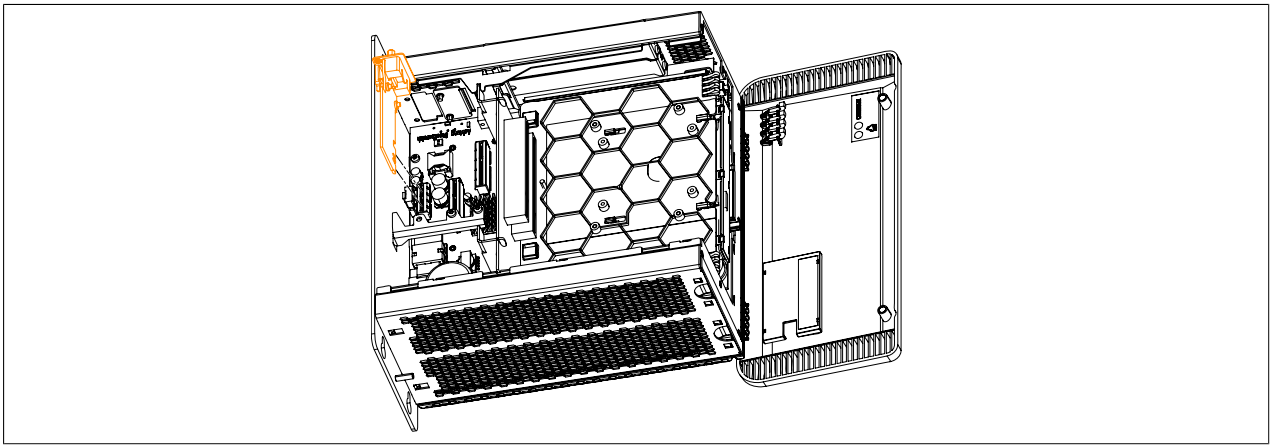


Figure 201: Installing the interface option

7. Secure the interface option to the B&R Industrial PC using the torx screws (T10).

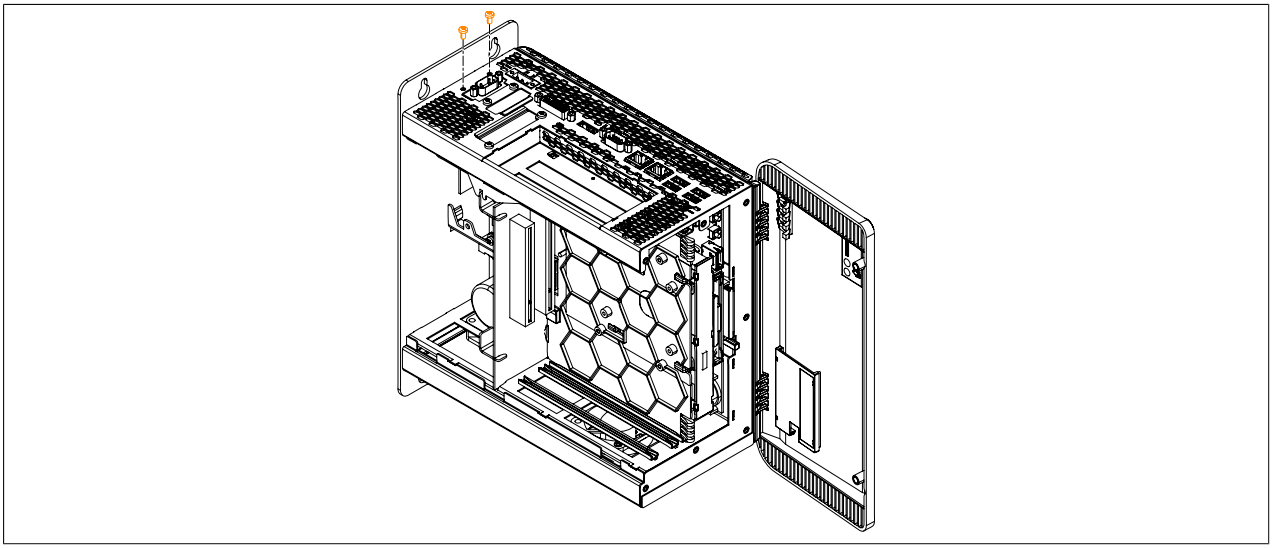


Figure 202: Securing the interface option

8. Attach the side cover.

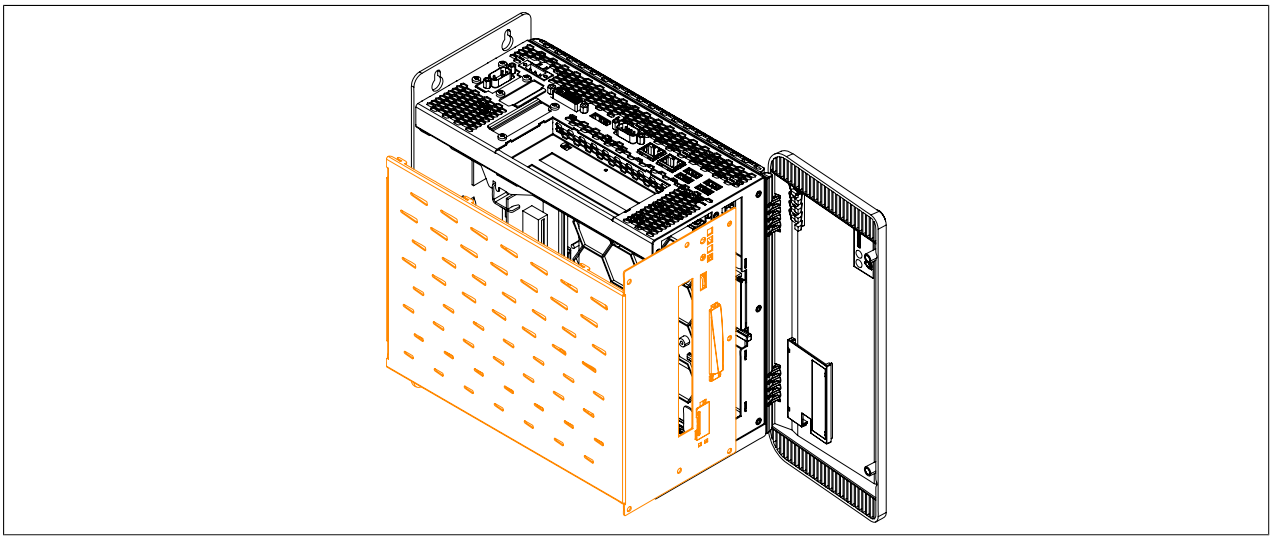


Figure 203: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same torx screws (T10) as before.

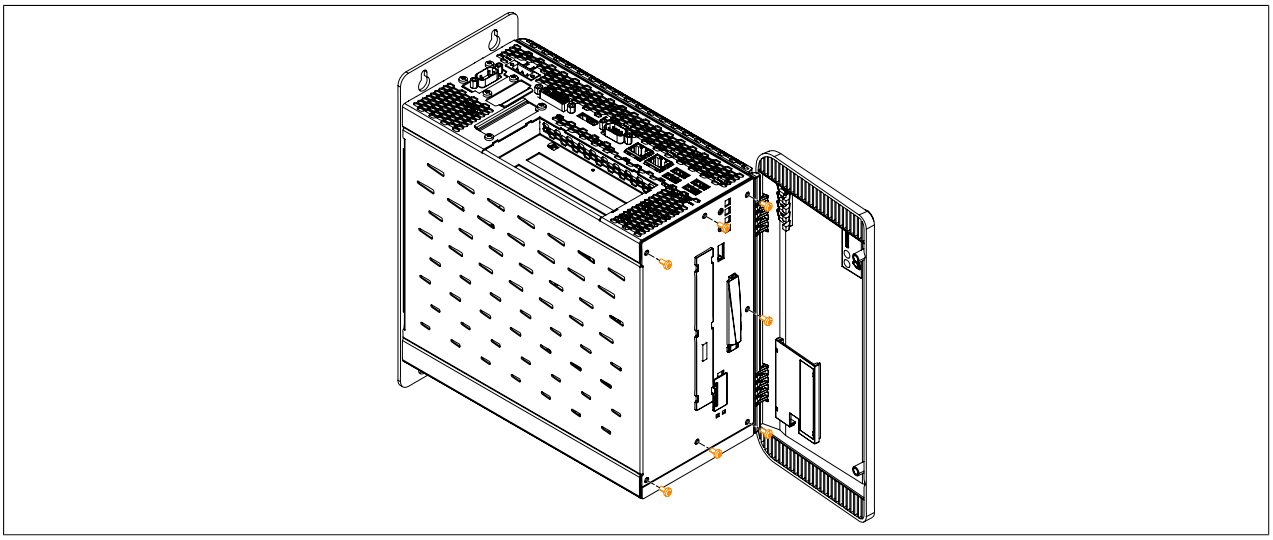


Figure 204: Securing the side cover

10. This option must be enabled in BIOS after the interface has been installed successfully. To do this, open BIOS when booting the system, load the default BIOS values and then save the settings. For additional information, see "Save & Exit" on page 238.

4 Installation monitor/panel options

Information:

After replacement or installation, it may be necessary to load the setup defaults in BIOS (see "Save & Exit" on page 238).

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.

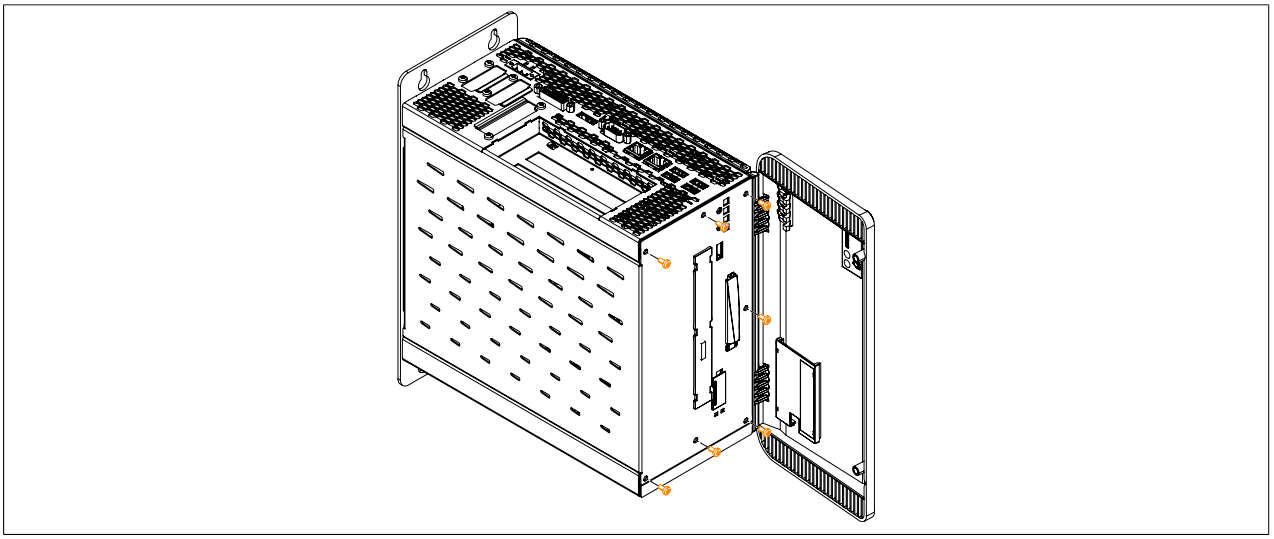


Figure 205: Removing the Torx screws for the side cover

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.

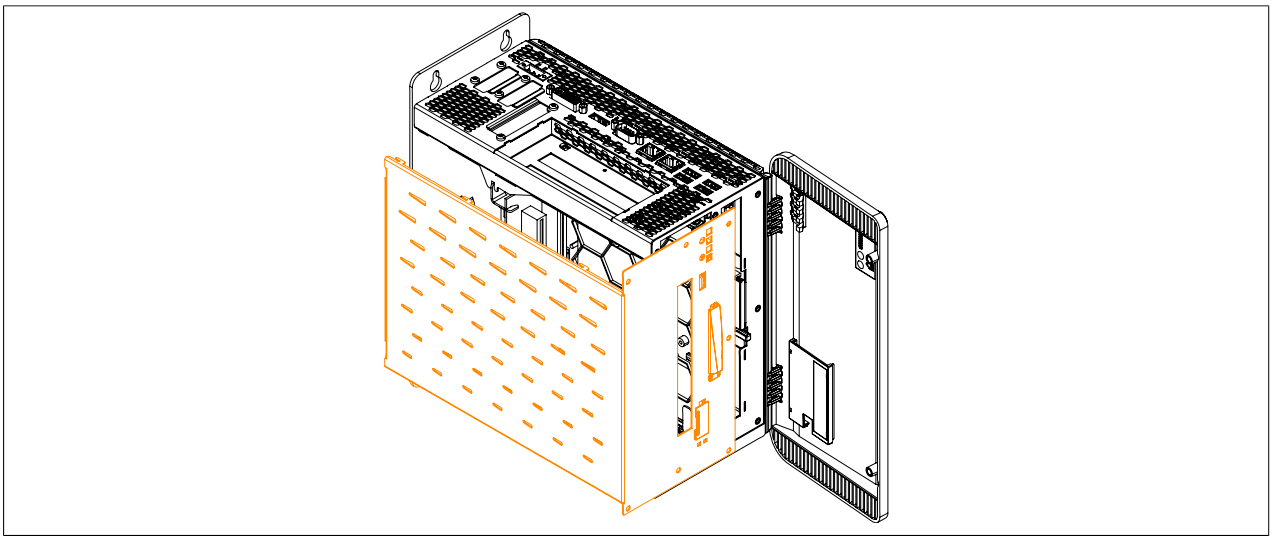


Figure 206: Removing the side cover

5. Remove the plastic slot cover and the marked torx screws (T10) as well as the metal slot cover.

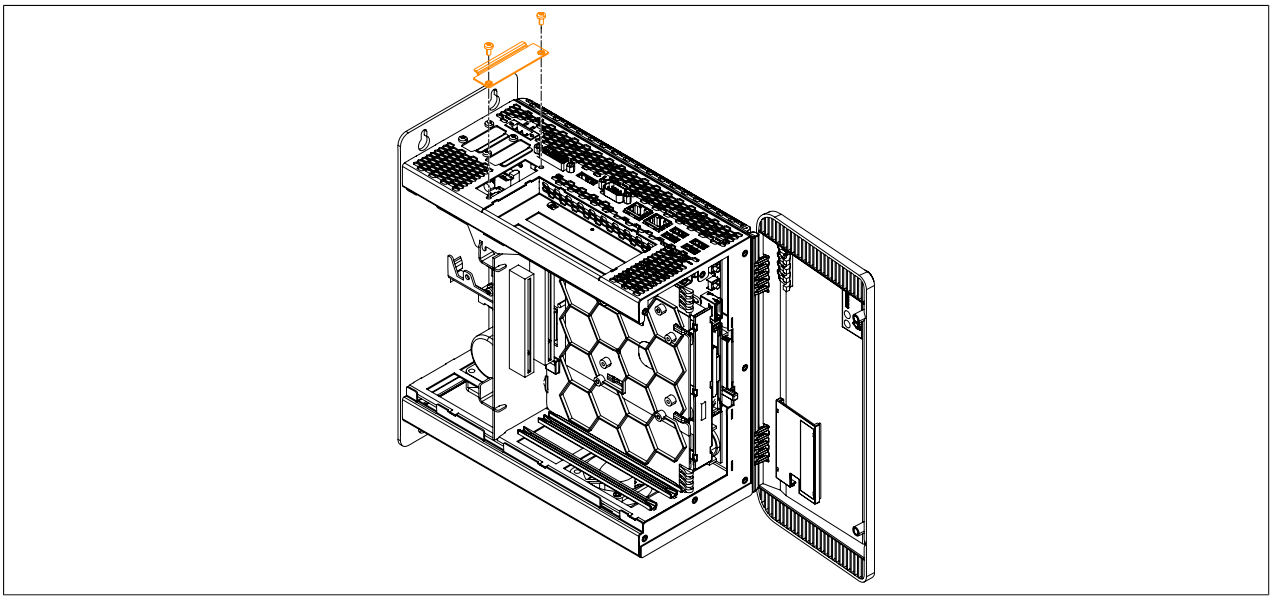


Figure 207: Removing the torx screws and slot cover

6. Insert the monitor/panel option into the slot.

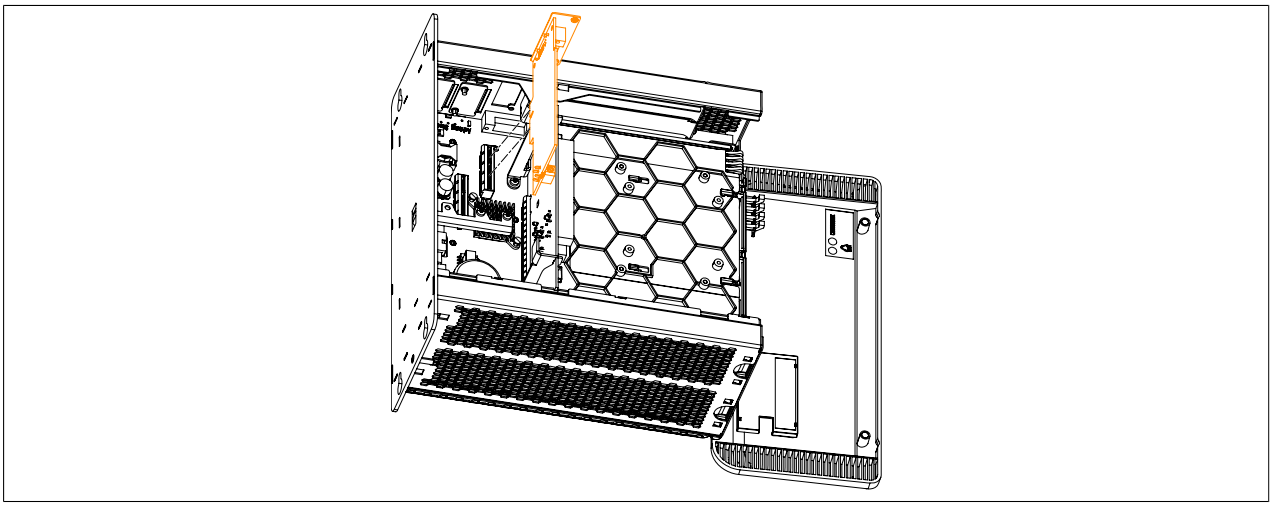


Figure 208: Inserting the monitor/panel option into the APC910

7. Secure the monitor/panel option to the B&R Industrial PC using the torx screws (T10).

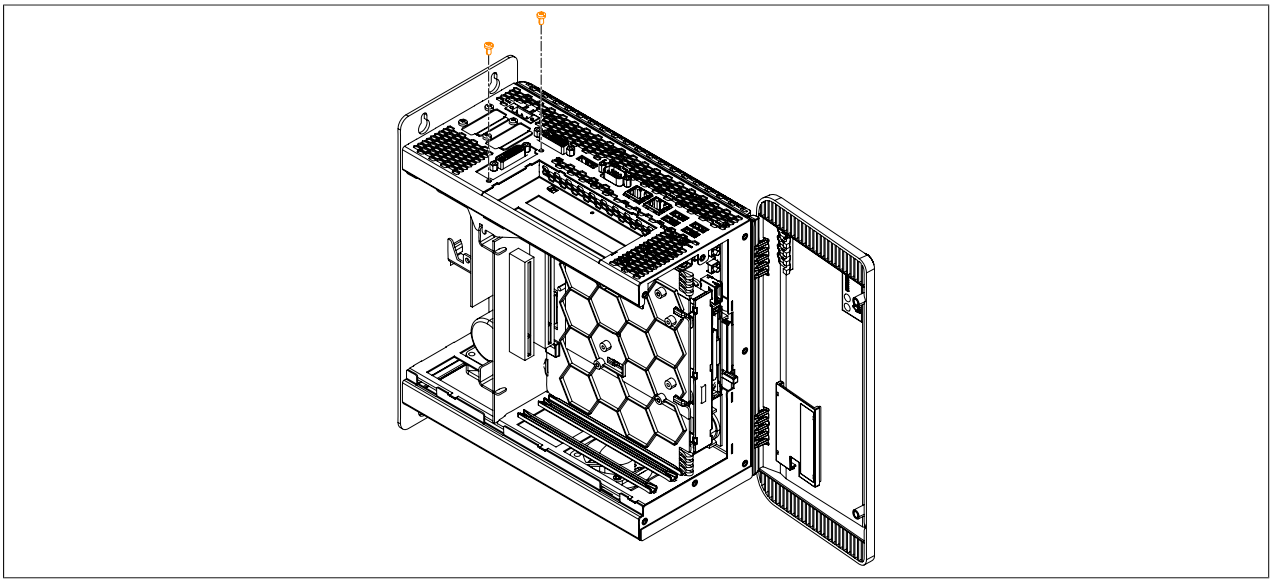


Figure 209: Securing the monitor/panel option using the torx screws

8. Attach the side cover.

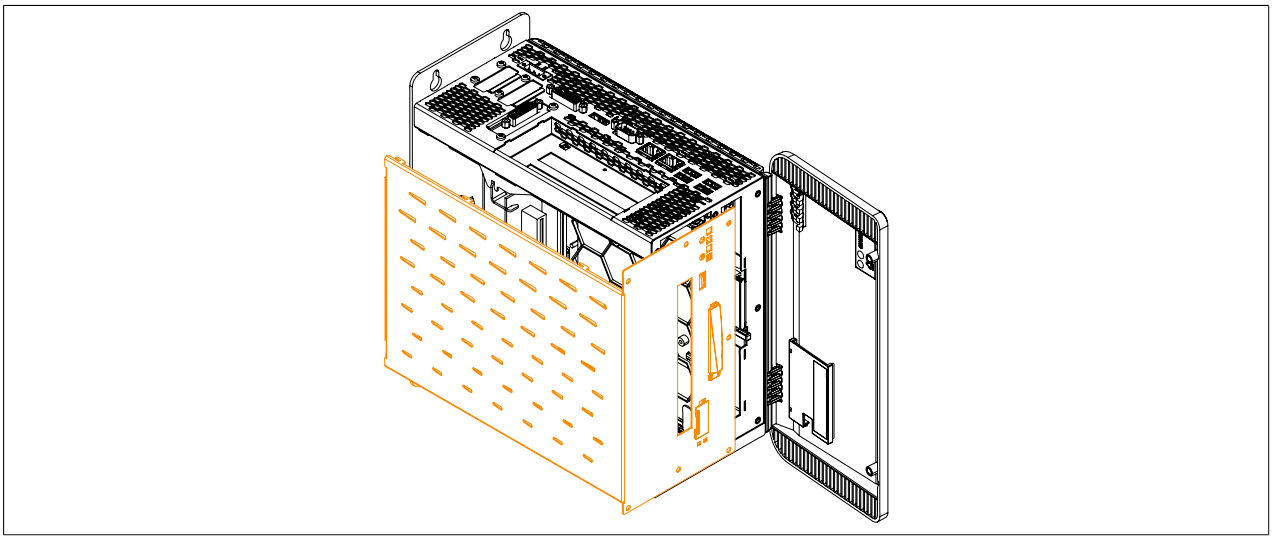


Figure 210: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same torx screws (T10) as before.

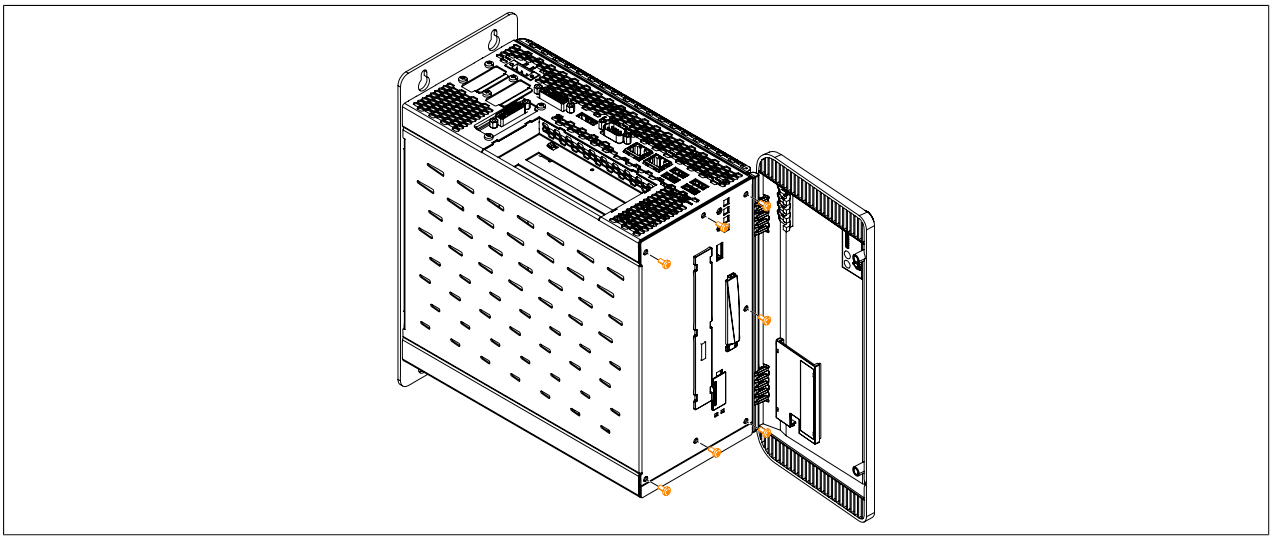


Figure 211: Securing the side cover

10. Once installed successfully, the monitor/panel option must be enabled in BIOS. To do this, open BIOS when booting the system, load the default BIOS values and then save the settings. For additional information, see "Save & Exit" on page 238.

5 Installing and replacing 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.

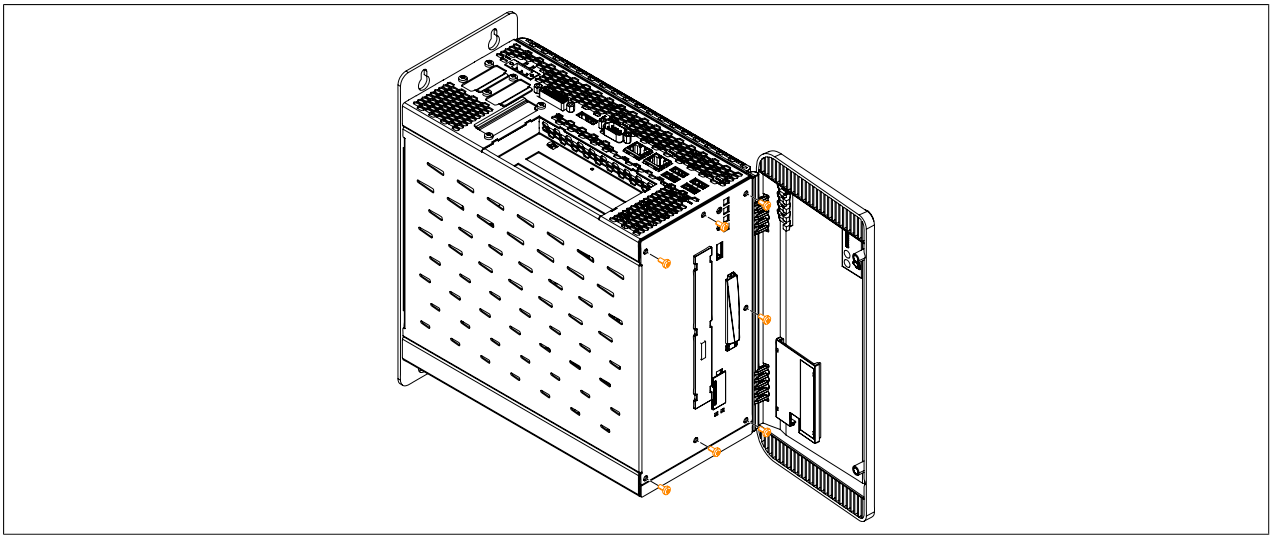


Figure 212: Removing the Torx screws for the side cover

4. After the screws have been removed, the side cover can be removed by sliding it first toward the front and then to the side.

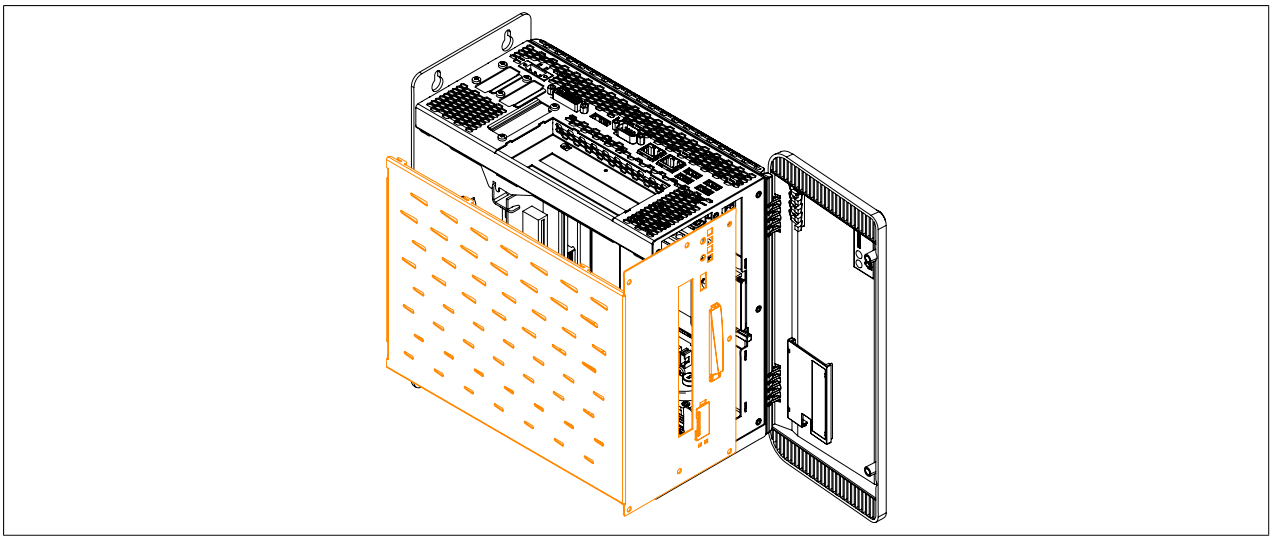


Figure 213: Removing the side cover

5. 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).

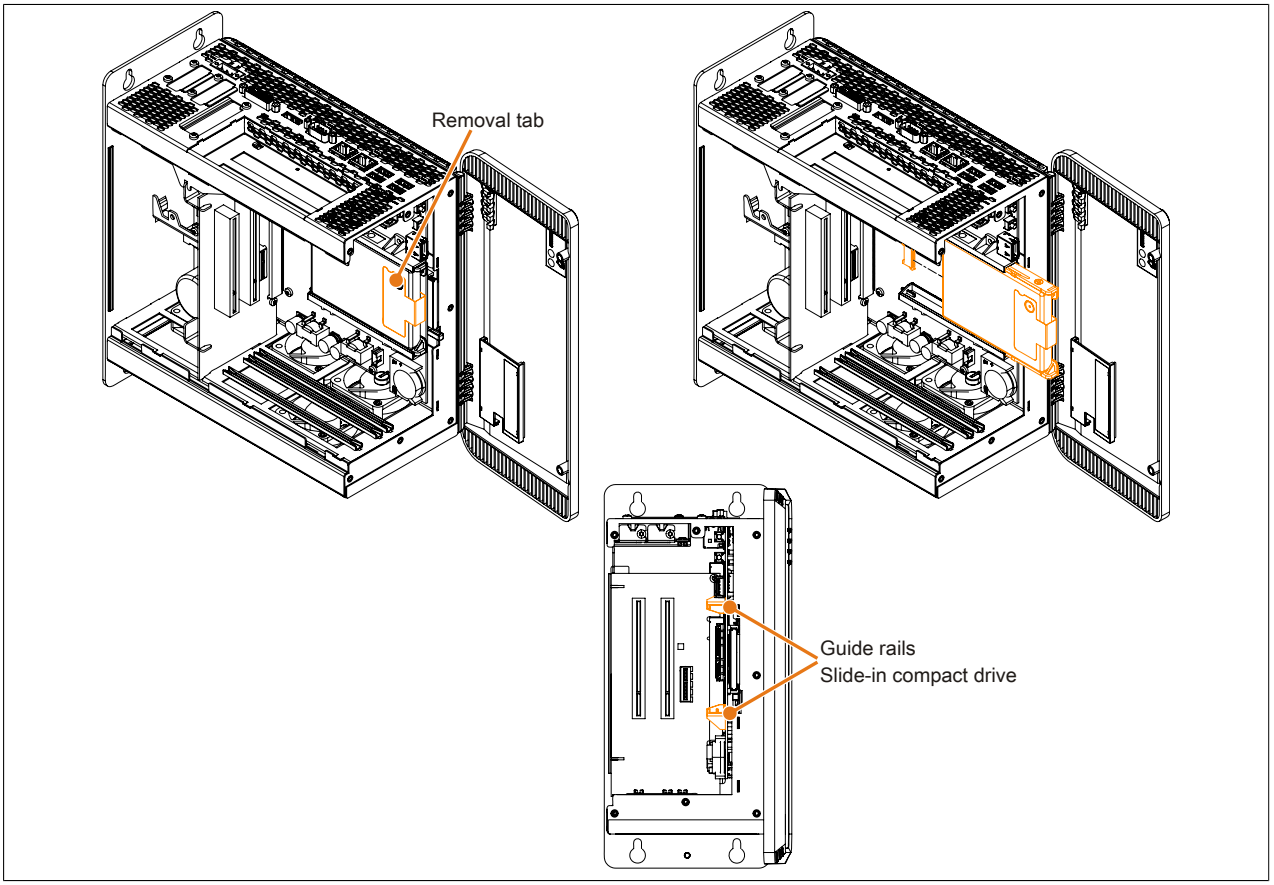


Figure 214: Installing/Replacing the slide-in compact drive

6. Attach the side cover.

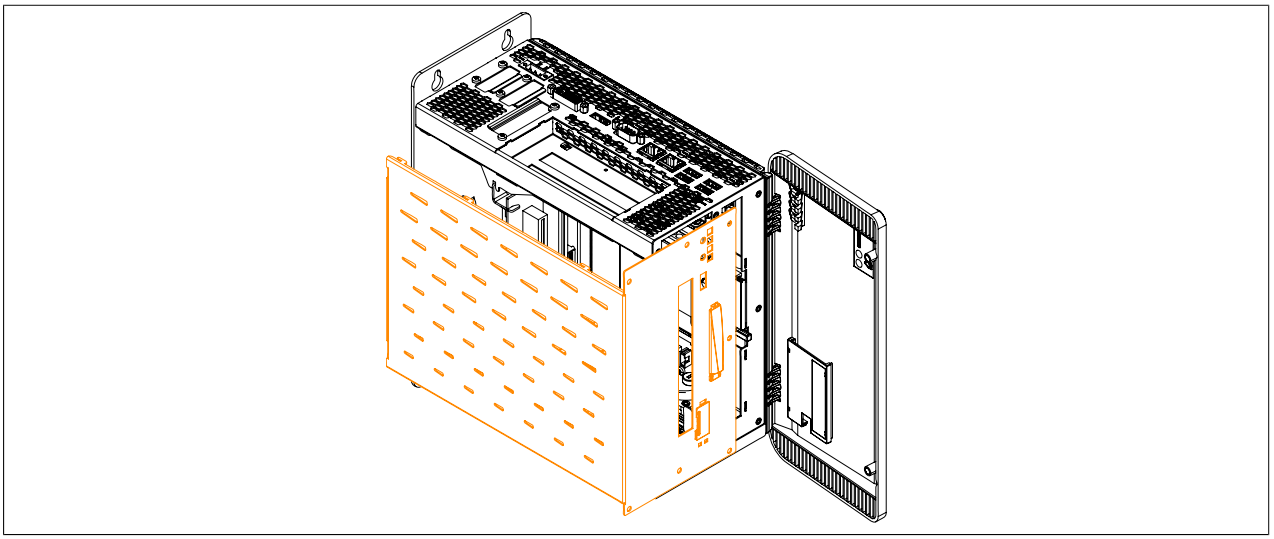


Figure 215: Replacing the side cover

7. Secure the side cover to the B&R Industrial PC using the same torx screws (T10) as before.

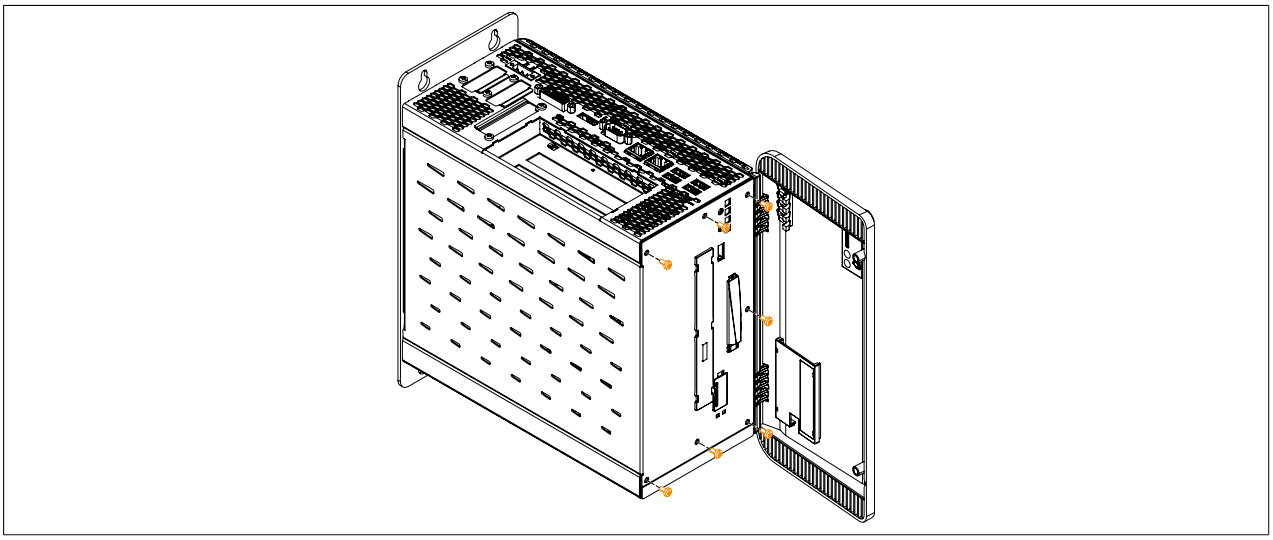


Figure 216: Securing the side cover

6 Installing and replacing 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.

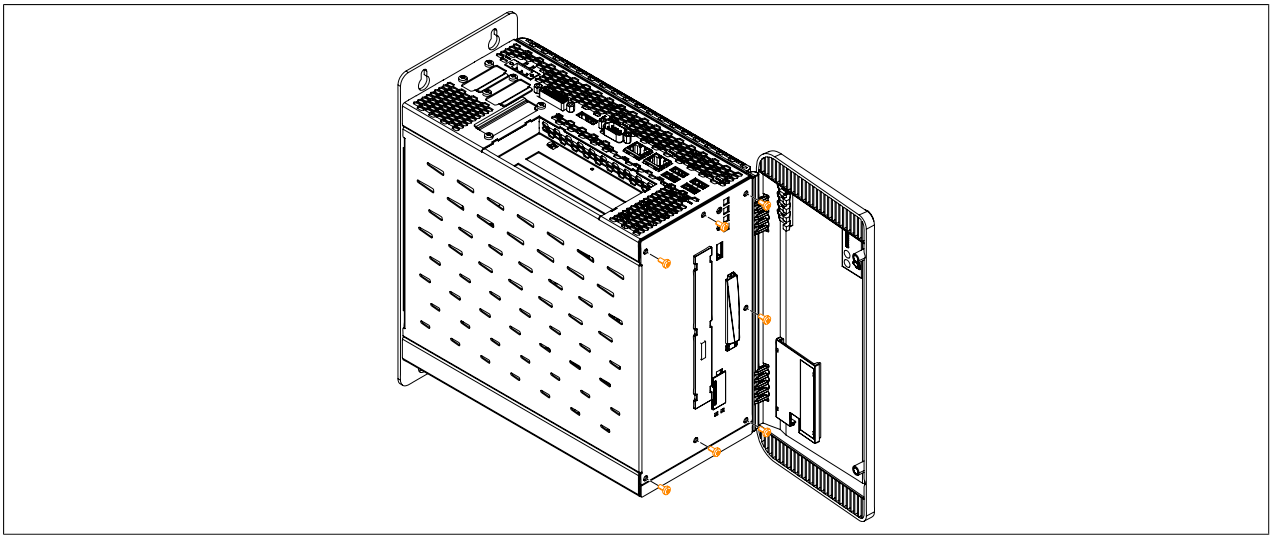


Figure 217: Removing the Torx screws for the side cover

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.

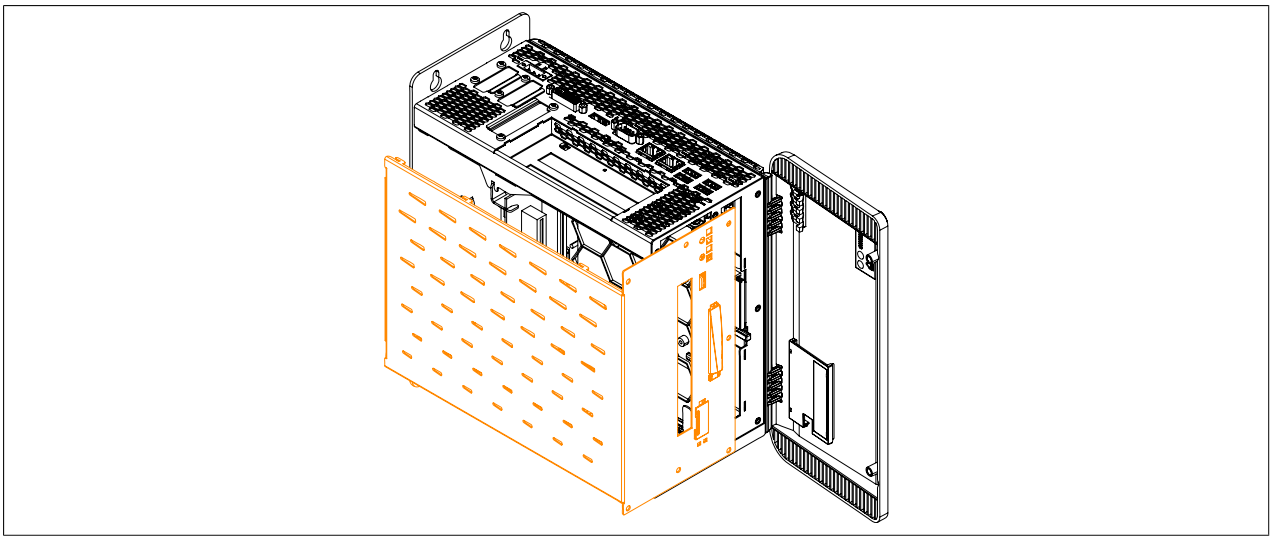


Figure 218: Removing the side cover

5. Install / replace the slide-in compact drive. The slide-in compact drive must slide into the guide rails and snap into the connector.

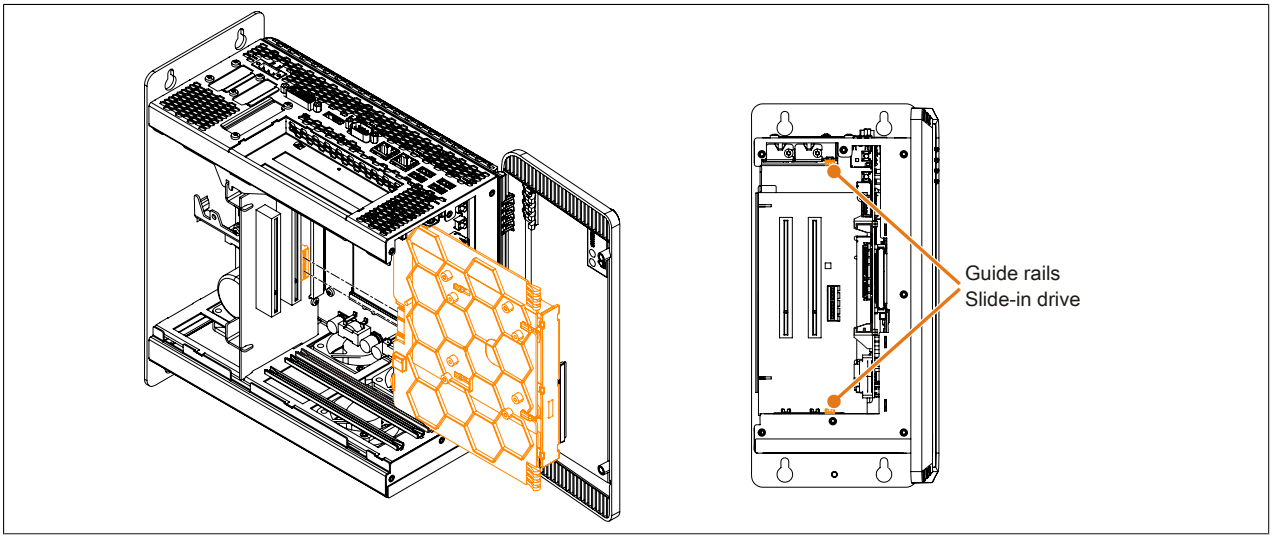


Figure 219: Installing / replacing the slide-in drive

6. Attach the side cover.

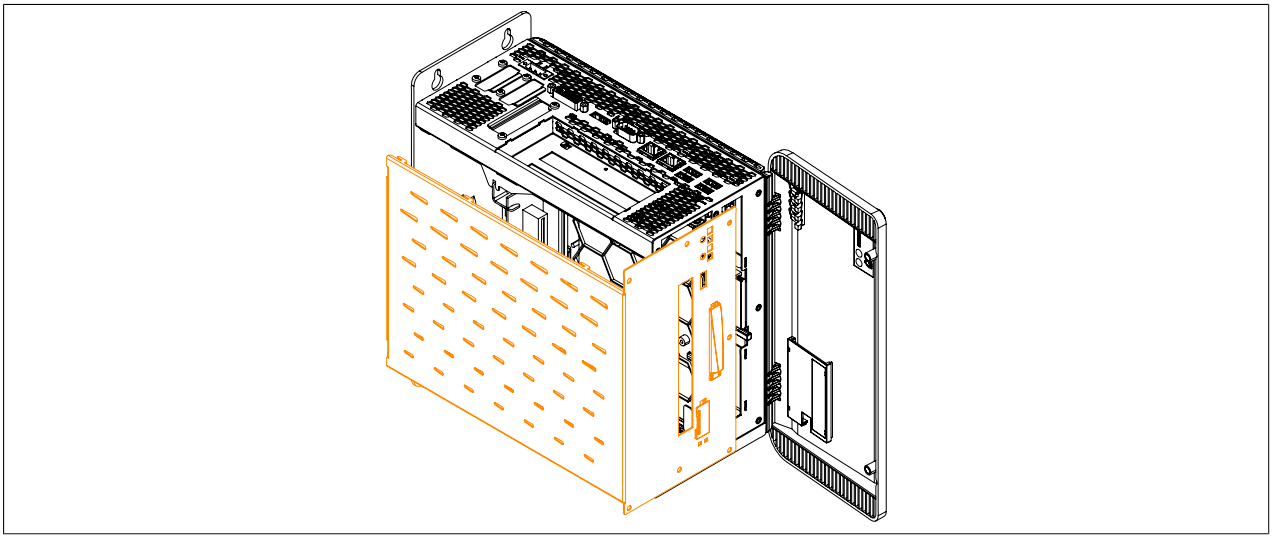


Figure 220: Replacing the side cover

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.

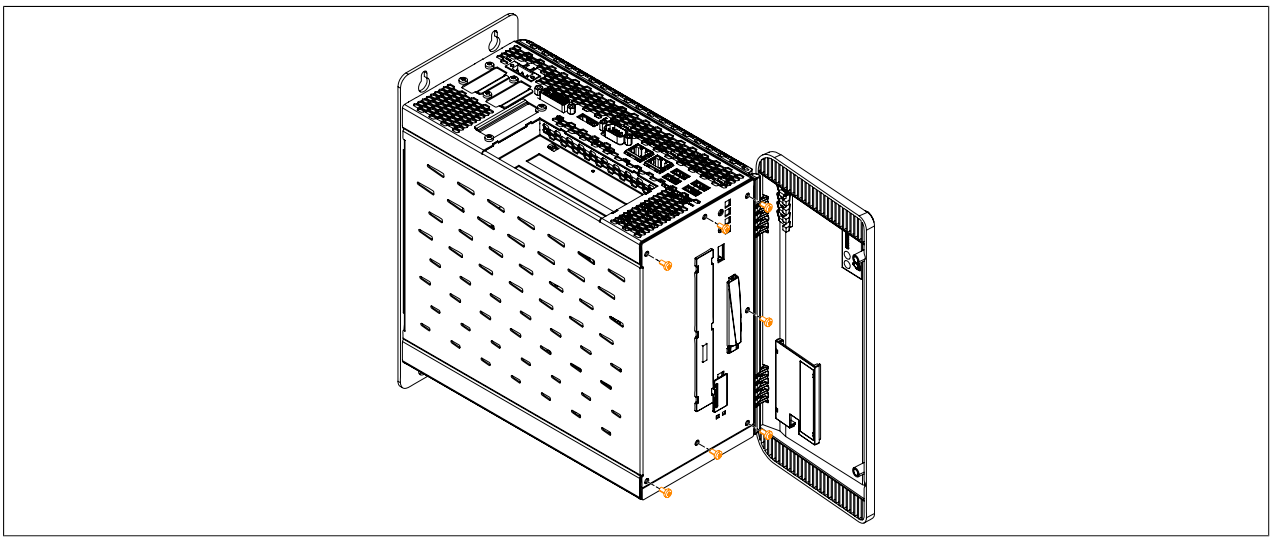


Figure 221: Securing the side cover

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.

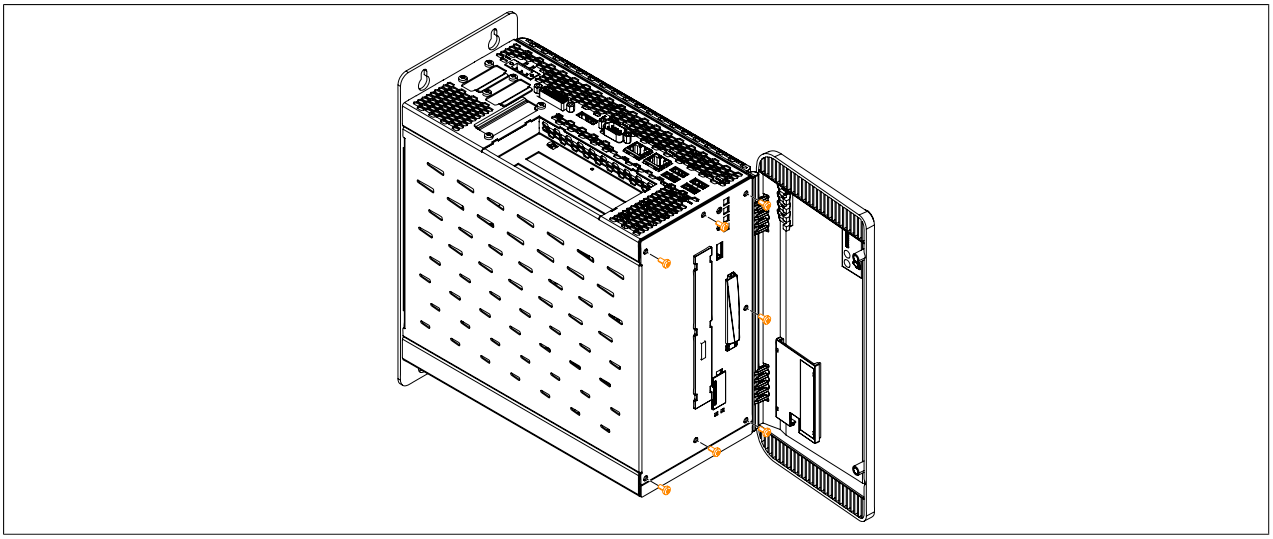


Figure 222: Removing the Torx screws for the side cover

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.

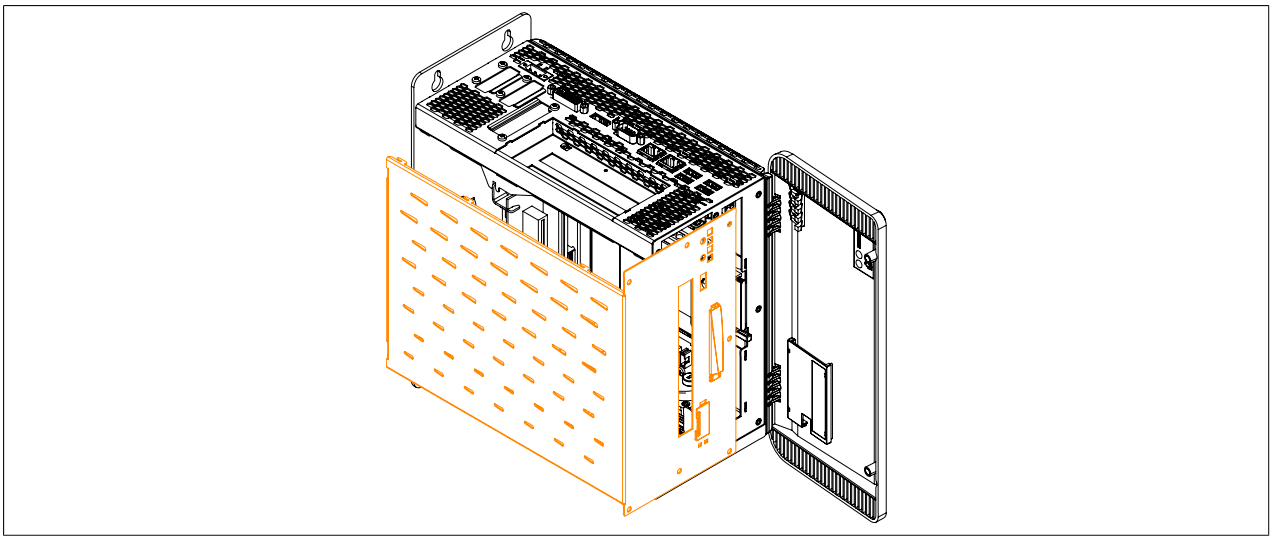


Figure 223: Removing the side cover

5. Remove the PCI slot cover. This is done by first removing the marked torx screws (T10) and then removing the cover.

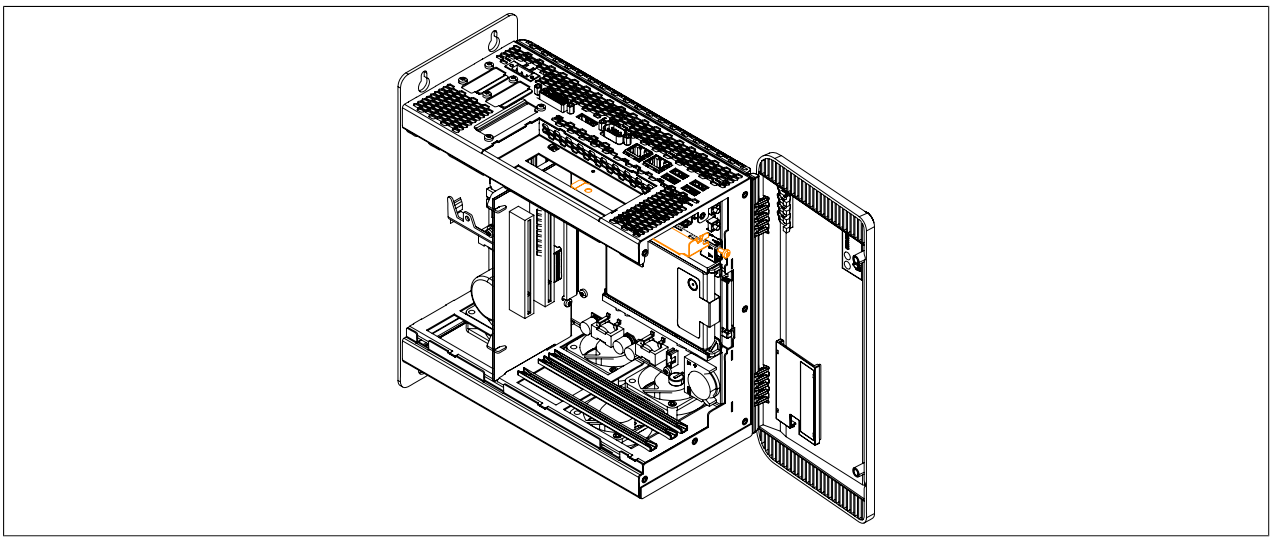


Figure 224: Removing the PCI / PCIe slot cover

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 marked (previously removed) torx screws (T10).

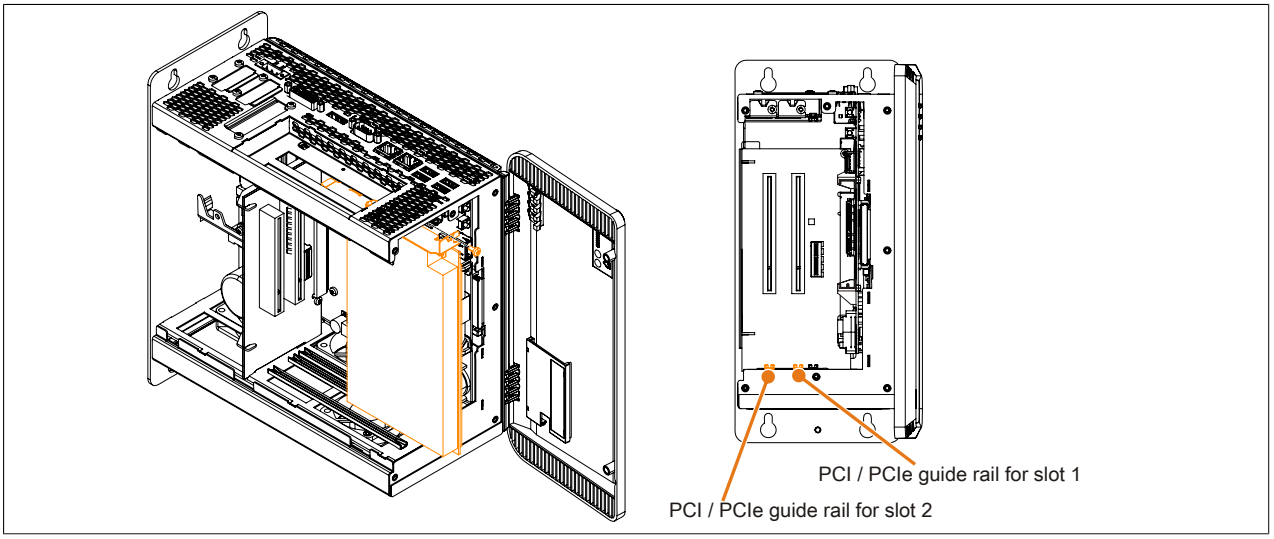


Figure 225: Installing / Replacing the PCI / PCIe card

7. Attach the side cover.

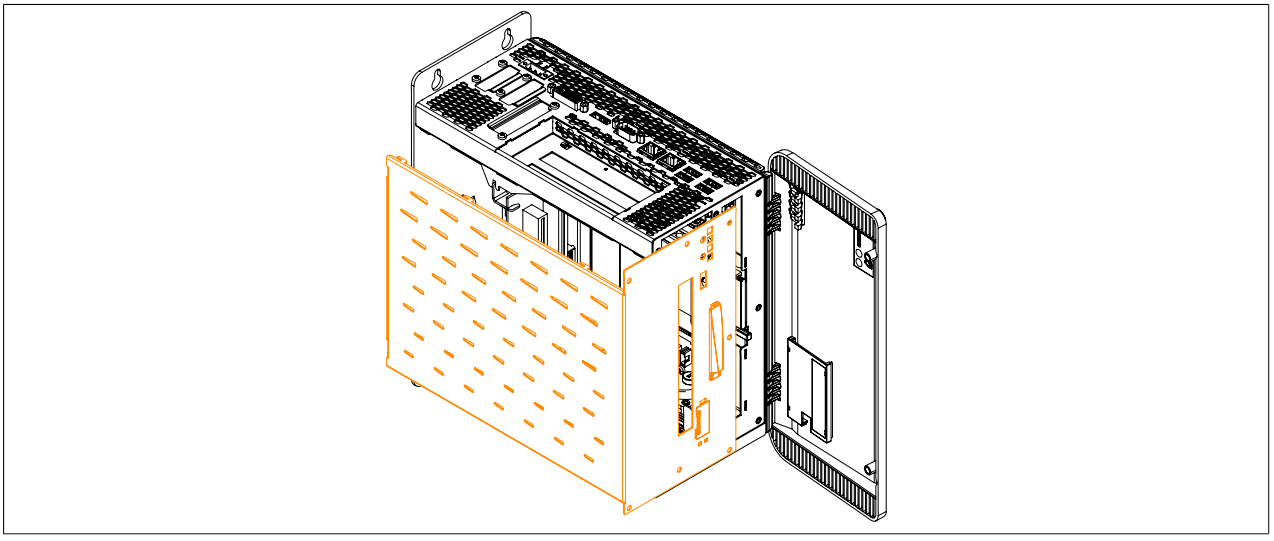


Figure 226: Replacing the side cover

8. Secure the side cover to the B&R Industrial PC using the same torx screws (T10) as before.

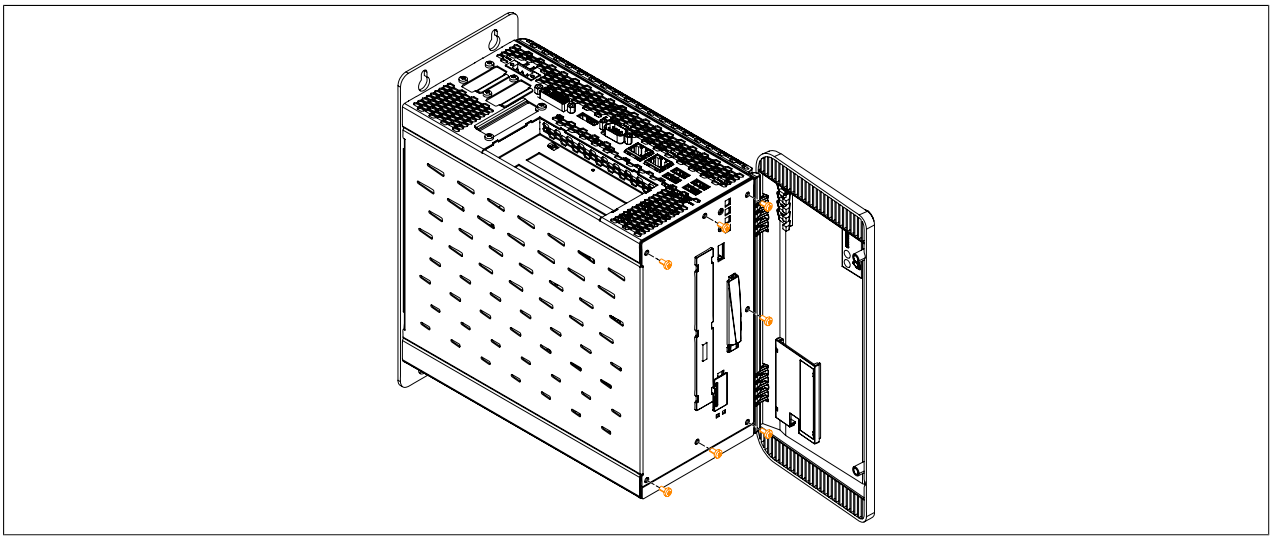


Figure 227: Securing the side cover

8 Installing and connecting the UPS battery unit

Information:

For information on installing the UPS IF option, see "Installing interface options" on page 324.

Warning!

Do not open the UPS battery unit!

1. Disconnect the power supply to the B&R Industrial PC.
2. Install the battery unit. Information about the drilling template can be found in the technical data of the respective UPS battery unit. Ensure that the distance between the battery unit and the B&R industrial PC allows them to be connected with the UPS cable (0.5 m, 1 m or 3 m).
   Installation requires 4 M5 screws, 4 washers and 1 screw lock (min. torque 1.3 Nm; screw depth as per applicable DIN regulations and specific application). These are not included in delivery.
3. Connect the UPS cable to the battery unit. When doing so, make sure to connect the red and black wires to the power supply (orange screw clamp). Be sure to use the right connection terminals (red wire for +; black wire for -)!
   Connect the white and brown wires to the temperature sensor (green screw clamp terminal block) (white wire for 1; brown wire for 2).

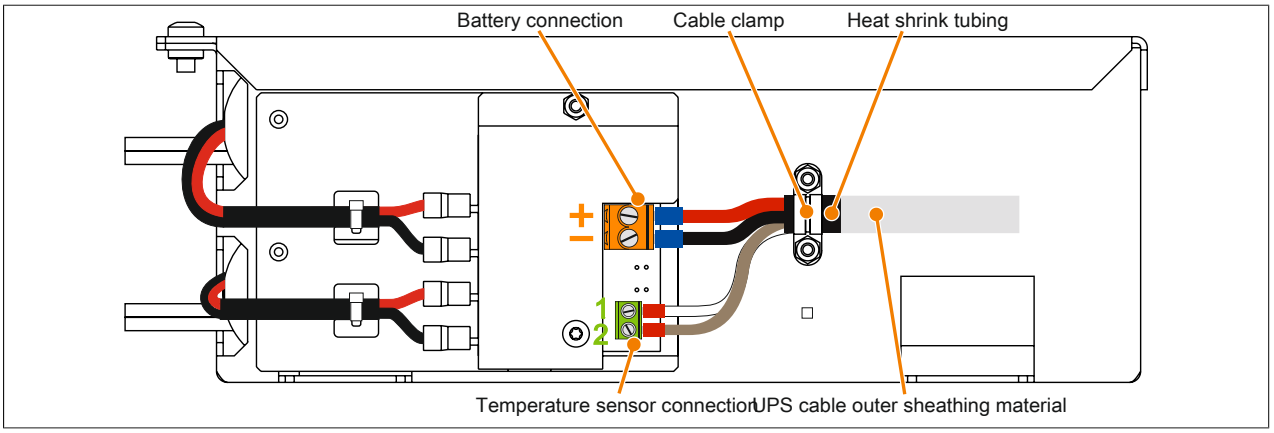


Figure 228: Connecting the UPS cable to the battery

4. Tighten the connected wires in the screw clamps with a screw driver (to a max. tightening torque of 0.4 Nm).
5. Loosen the two nuts (M3) on the cable clamp and feed the UPS cable through.
6. Fasten the UPS cable using the cable clamp. Tighten the previously removed nuts onto the cable clamp in alternating order (max. 0.35 Nm torque).
7. Connect the 4-pin screw clamp to the UPS IF option and tighten the two screws with a screwdriver (max. torque 0.4 Nm).

9 Replacing fan filters

1. Disconnect the power supply to the B&R Industrial PC.
2. Touch the housing or ground connection in order to discharge any electrostatic charge from your body.
3. Open the front cover.
4. To remove the fan filter from the B&R Industrial PC, push up on the locking mechanism while pulling the fan filter outward. The number of locking mechanisms may vary depending on the system unit.

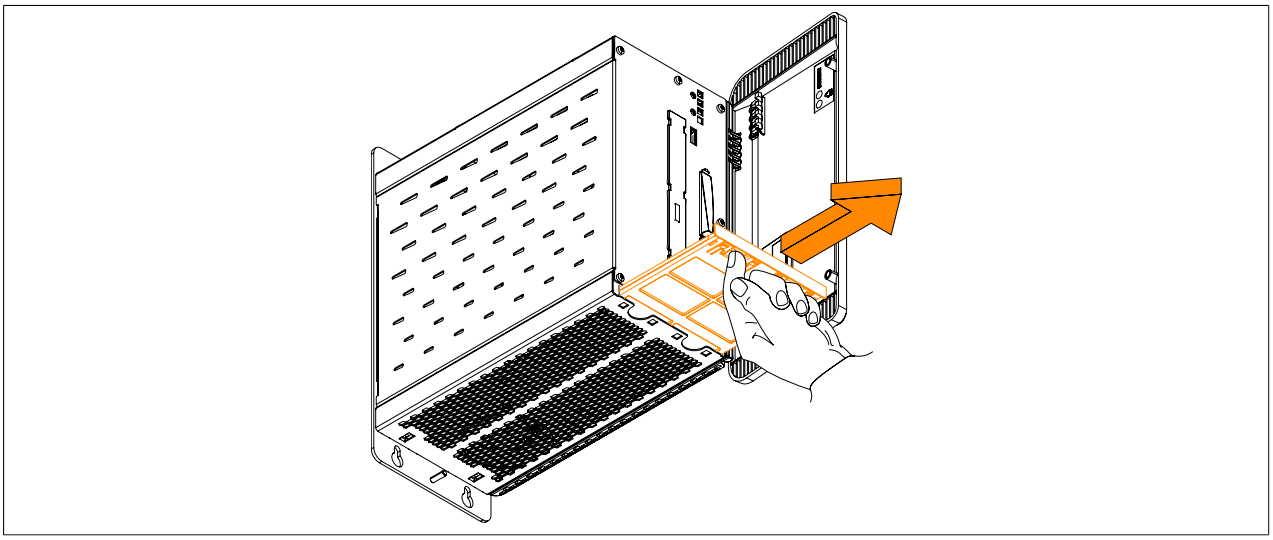


Figure 229: Removing the fan filter from the APC910

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.

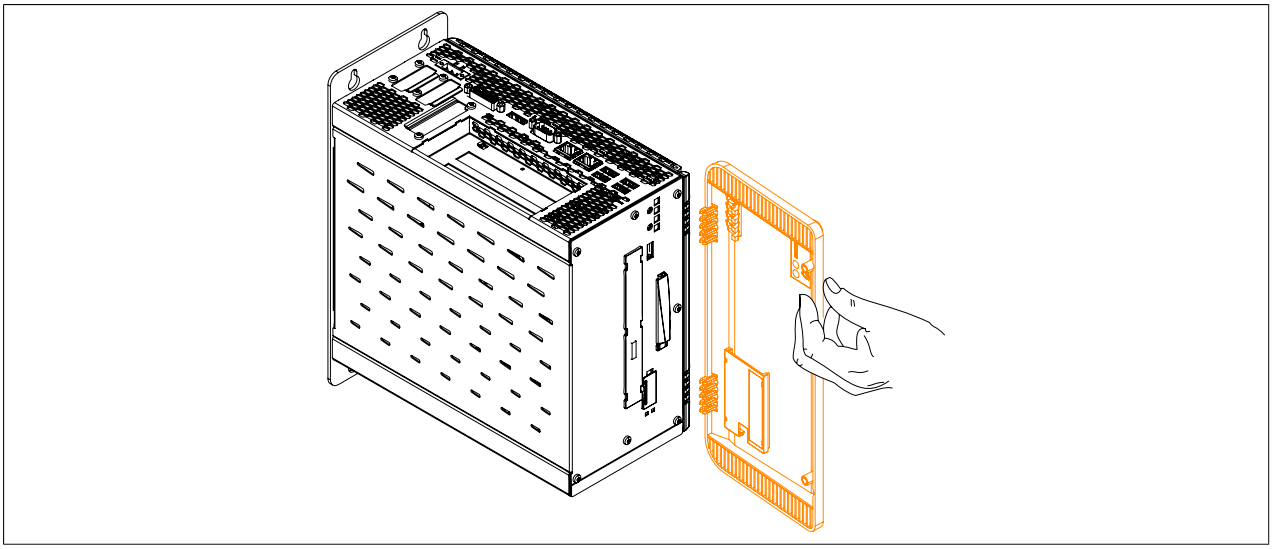


Figure 230: Removing the front cover

4. Remove the heat sink cover. The torx screws (T10) that are marked in the image must be removed.

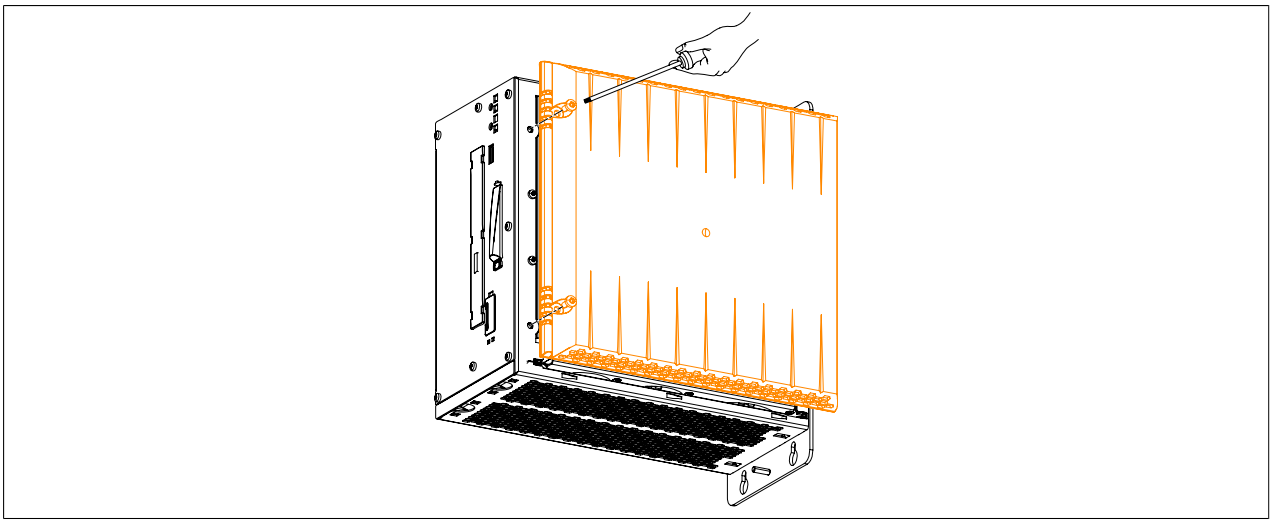


Figure 231: Removing the heat sink cover

5. 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.

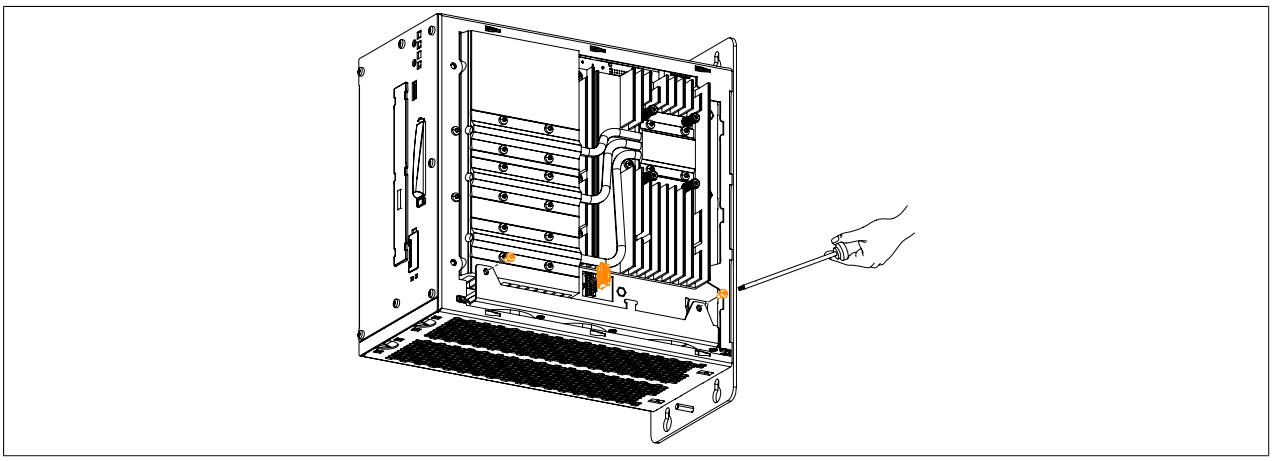


Figure 232: Removing the torx screws and fan cable

6. The fan kit can now be removed from the Automation PC 910.

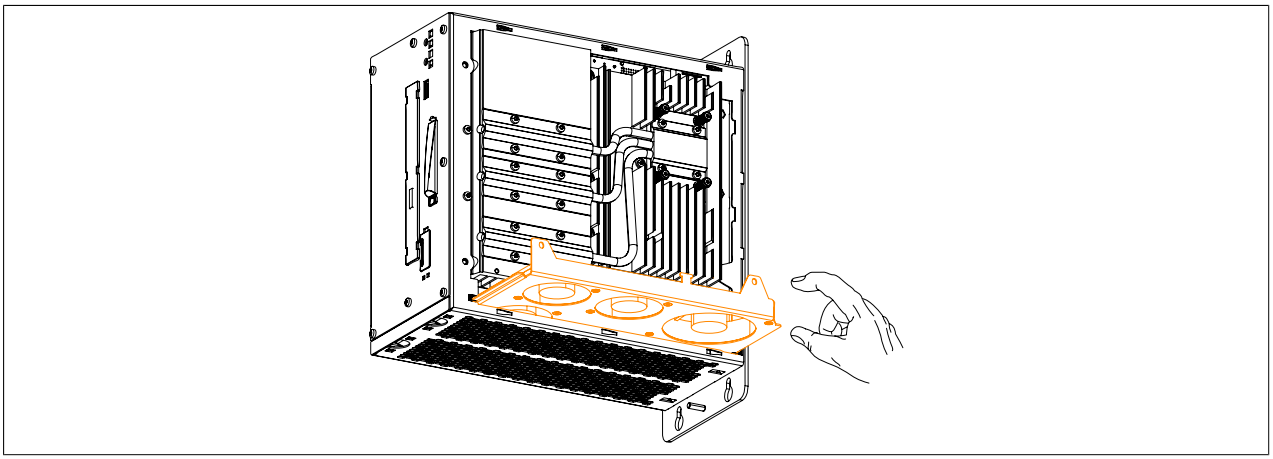


Figure 233: Removing the fan kit from the APC910

7. A new fan kit can now be installed.
8. The Automation PC 910 can now be re-assembled by carrying out these instructions in reverse.
9. If a fan kit is being installed for the first time (i.e. fan kit previously not used in device), then it must still 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.**

10. 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 238.

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 must still be programmed.**

1. Boot the B&R industrial PC and type the following on the command line:
   `mtxcsvc i fanfset` Checks whether the fan kit has already been programmed
2. If the fan kit has not yet been programmed, this can be done by typing in the following:
   `mtxcsvc u fanfset "fn"` The path of the file and filename must be specified in place of "fn".

Deleting fan kit data

Information:

If a fan kit has been removed from the device and is not being replaced, then its data must be deleted.

1. Boot the B&R industrial PC and type the following on the command line:
   `mtxcsvc i fanfset` Checks whether the fan kit has already been programmed
2. Since a fan kit was already installed, its data must be deleted. This is done by typing the following on the command line:
   `mtxcsvc d fanfset` Deletes the data of 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 branched off in order to supply special PCI cards, for example.

This voltage can be accessed using the "Internal supply cable" on page 317. The multi-pin connector is located near the battery and slide-in compact drive.

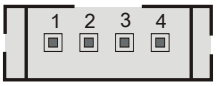
Multi-pin connector for external devices			
Pin	**Assignment**	**Power**	4-pin connector, male
1	+12 VDC	Max. 10 watts	
2	GND		
3	GND	Max. 5 watts	
4	+5 VDC		

Table 285: Multi-pin connector on the mainboard - Pinout

Connections are protected with a 1A 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.

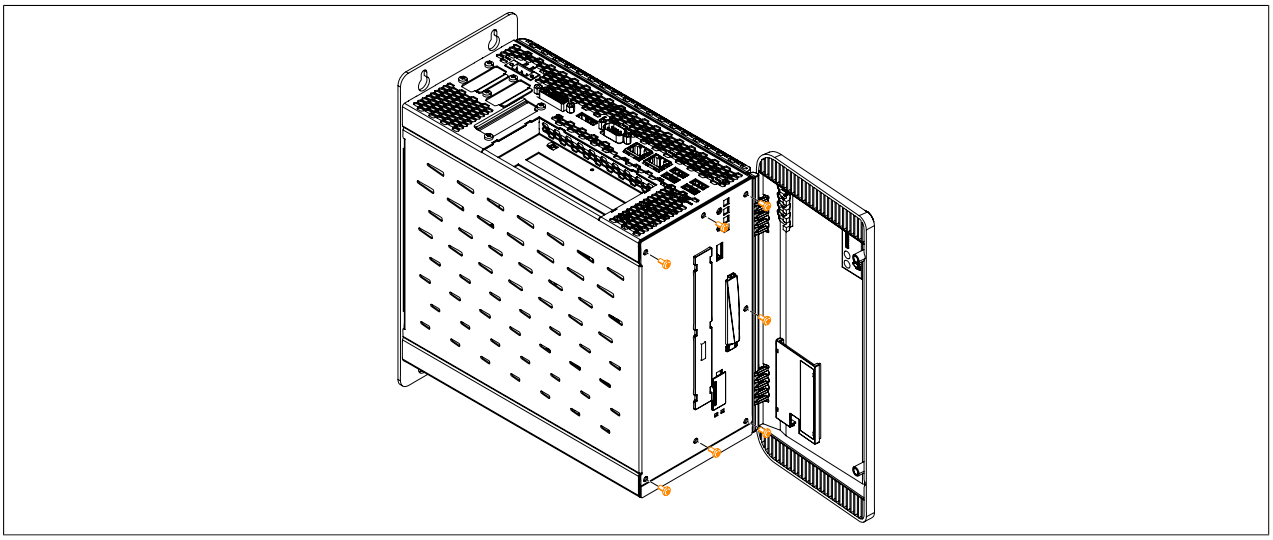


Figure 234: Removing the Torx screws for the side cover

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.

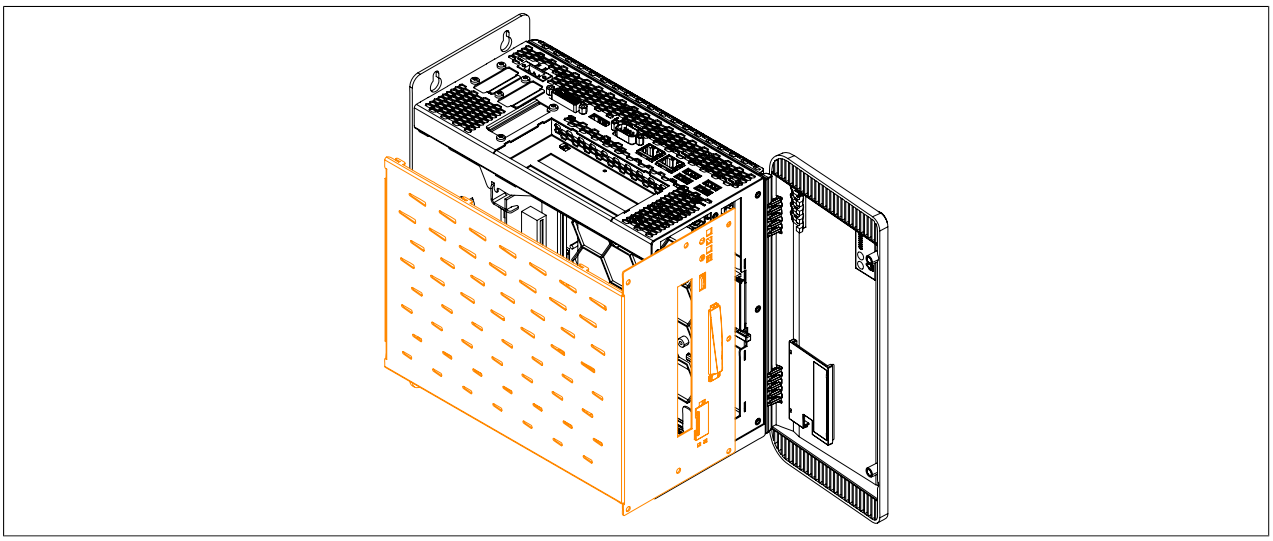


Figure 235: Removing the side cover

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.

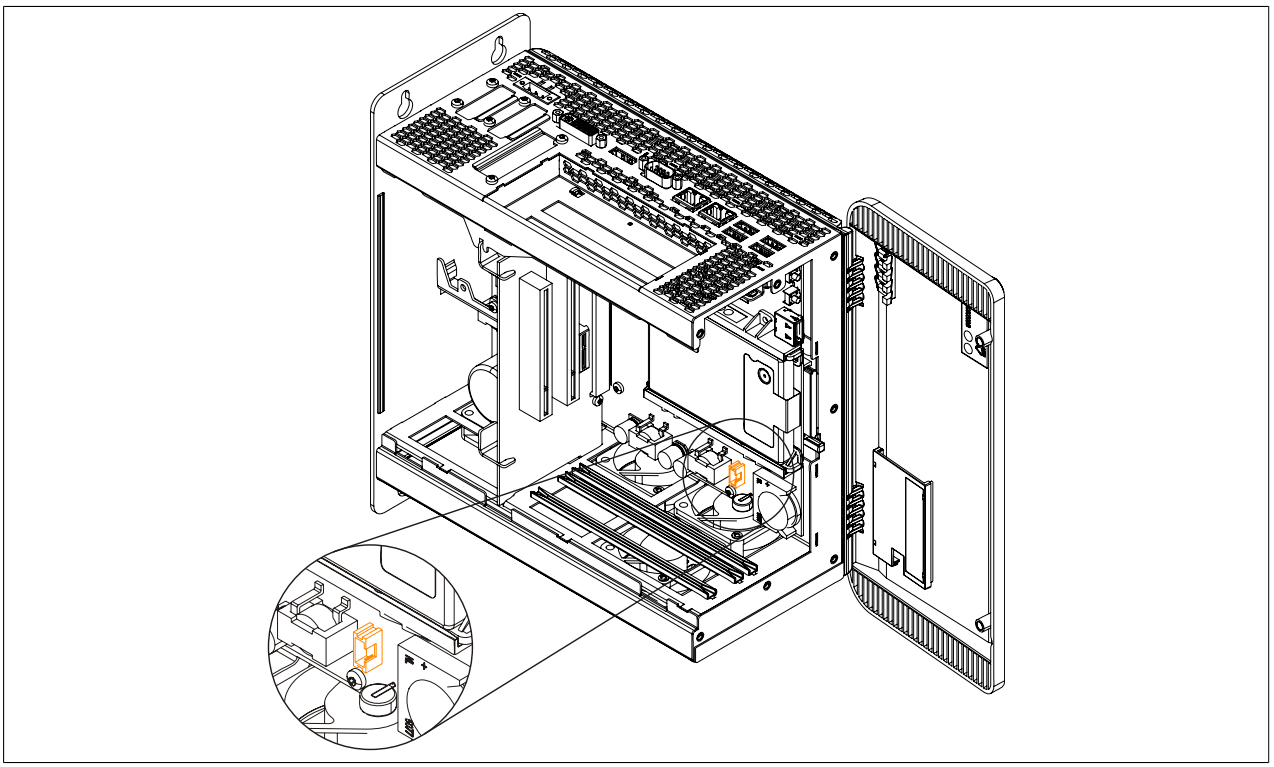


Figure 236: Connector location for external devices

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.

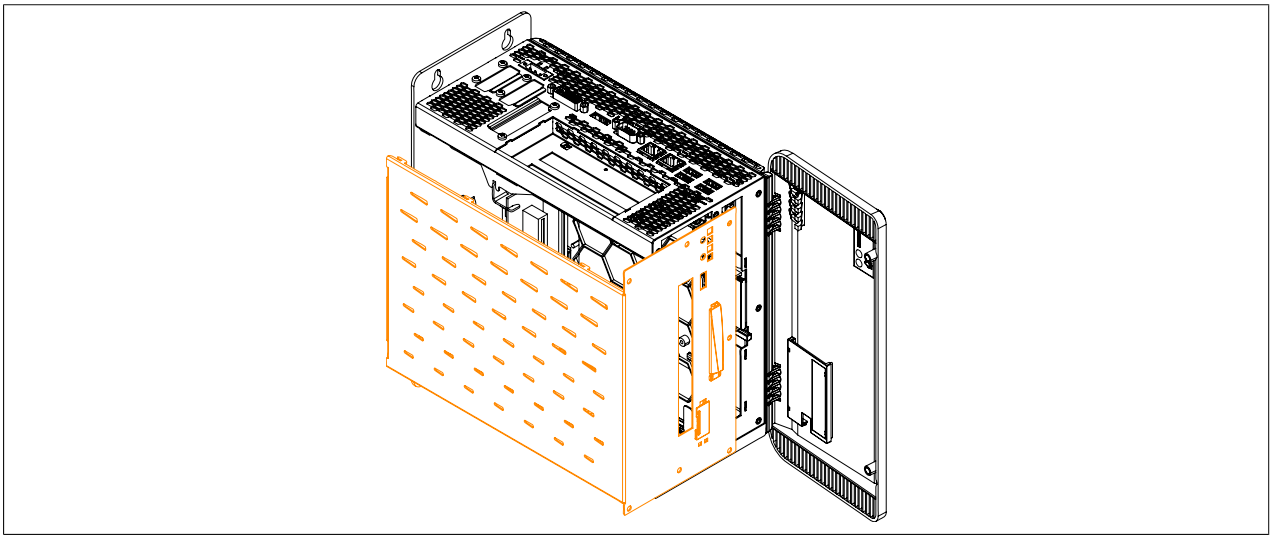


Figure 237: Replacing the side cover

9. Secure the side cover to the B&R Industrial PC using the same torx screws (T10) as before.

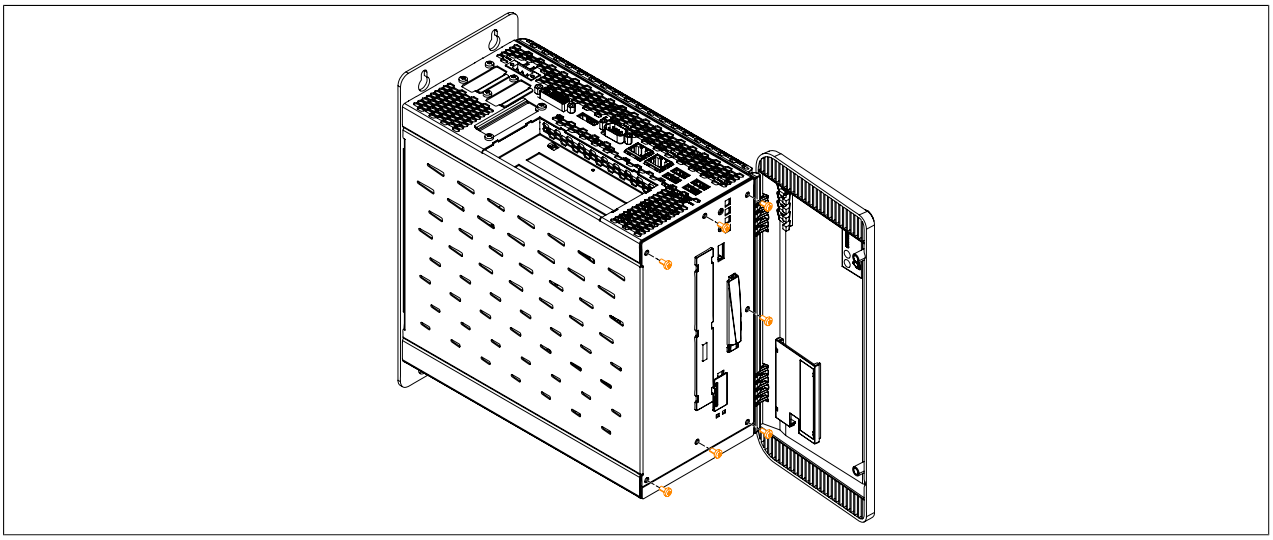


Figure 238: Securing the side cover

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 286: 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).

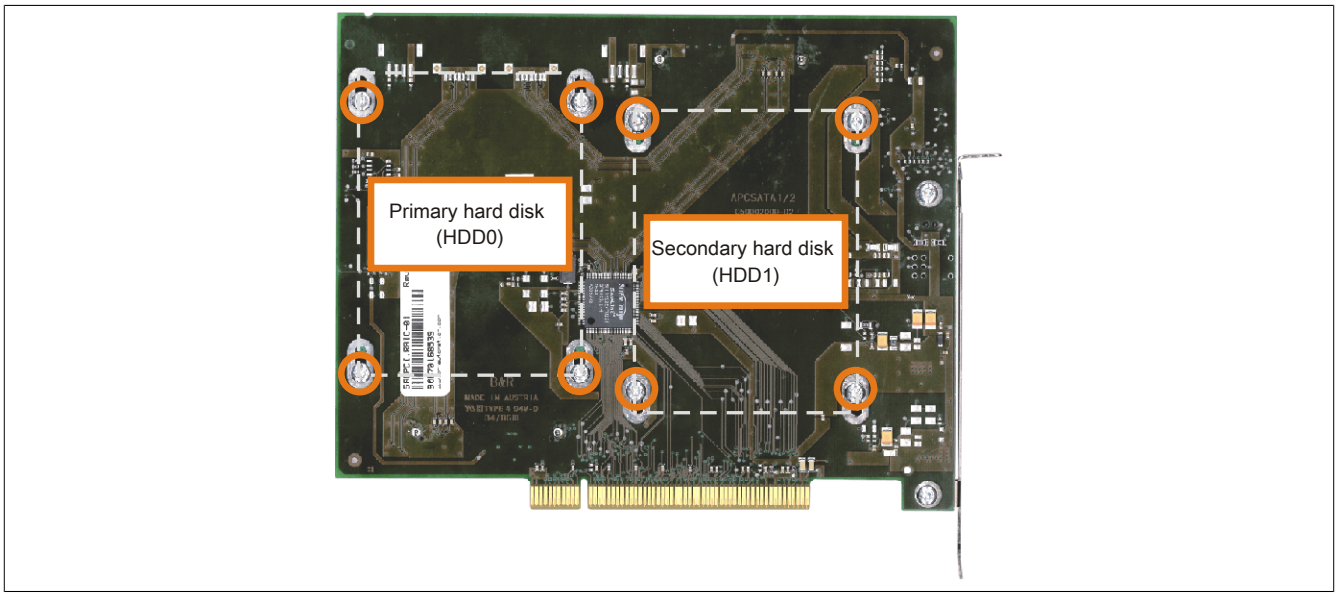


Figure 239: Screw layout on the back side of the 5ACPCI.RAIC-03 SATA RAID controller

6. On the front side, slide the hard disk down and away (Replacing the hard disk - left image).
7. Insert the new hard disk carefully into the connector (Replacing the hard disk - right image), being careful to only touch it on the front, not on the top.

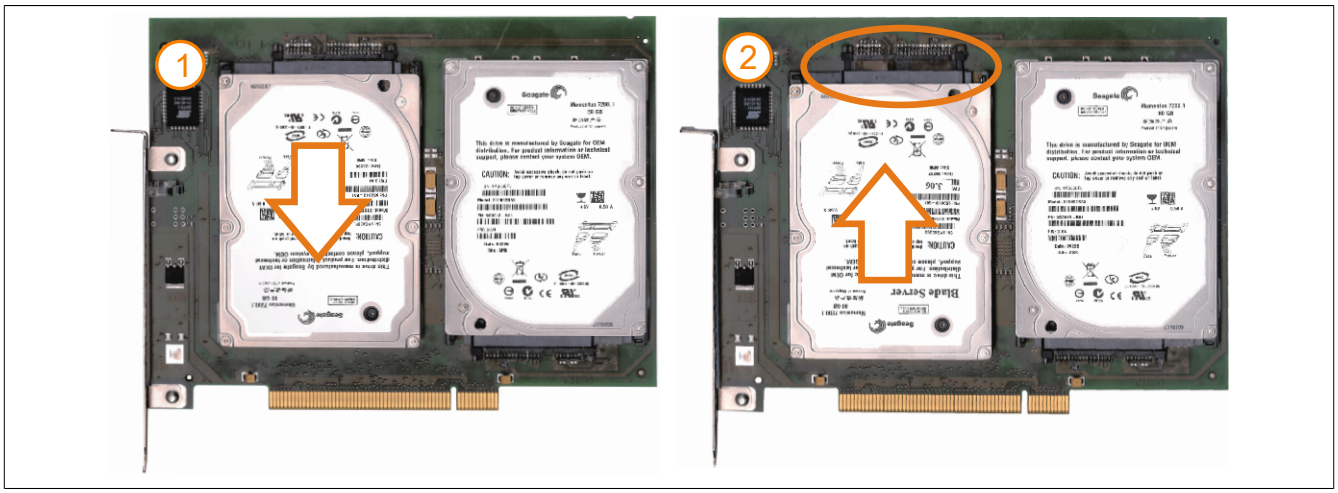


Figure 240: Replacing the hard disk

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 174.

Appendix A

1 Abbreviations

Abbreviation	Stands for	Description
NC	Normally closed	A normally closed relay contact
	Not connected	Used in pinout descriptions if a terminal or pin is not connected to a module
ND	Not defined	In data tables, this stands for a value that has not been defined. This may be because a cable manufacturer does not provide certain technical data, for example.
NO	Normally open	A normally open relay contact
TBD	To be defined	Used in technical data tables when certain information is not yet available. The value will be provided later.

Table 287: Abbreviations used in this user's manual

2 Glossary

Address	An address is a character string for identifying a memory location or a memory area, where data is stored and can be retrieved. It is also a symbol (e.g. with numerical controllers) for identifying a function unit for which subsequent geometrical or technological data are determined by the symbol.
Analog Signal	A signal, whose information parameters can accept any number of values, within specific technical limits. Theoretically, they can have an infinitely high resolution. However, in practice it is limited to a range of only 1 to 104. In addition, long-term storage and allocation causes many size problems. Therefore, digital signals are predominantly used in modern automation technology.
ANSI	American National Standards Institute > this organization promotes and manages American industrial standards.
APC	Abbreviation for »Automation PC«
ASCII	American Standard Code for Information Interchange, used worldwide; numbers, letters, special characters and device controller characters are represented as 7-bit binary combinations. Standard ASCII-characters cover 27 = 128 characters in total. An eighth bit is used as a so-called parity bit for error detection when transferring ASCII files. During even parity checking, this bit is set to 0, when the number of ‘1s’ in the remaining seven bits is an even number. Otherwise, it is set to 1. The expanded ASCII character set does not use parity checking. The highest value bit is used here to switch from the standard character set to the expansion. This allows space for special regional characters e.g. umlauts in the German language. www.asciitable.com
Automation	According to Brockhaus: The application of technical means, using specific programs that (either partially or totally) do not require human intervention to perform operations.
Automation Runtime	A uniform runtime system for all B&R automation components.
Failure	Failure according to IEC 61508: A function unit loses the ability to perform a required function. In regards to safety-oriented systems, a distinction is made between dangerous and safe failures. This depends on whether the status of the system failure is considered dangerous or safe. The cause of the failure may be load related or age-related, and therefore a random failure, or related to a flaw inherent in the system. In this case, it is known as a systematic failure.

Figure 1: Base system configuration with a fan kit....21
Figure 2: Base system configuration without a fan kit....22
Figure 3: Accessory and software configuration....23
Figure 4: Temperature sensor locations....27
Figure 5: Supply voltage for system units....30
Figure 6: Serial number sticker (back)....37
Figure 7: Searching for a serial number on the B&R website....37
Figure 8: Block diagram of system unit 5PC910.SX01-00 and bus unit 5AC901.BX01-00....38
Figure 9: Block diagram of system unit 5PC910.SX01-00 and bus unit 5AC901.BX01-01....39
Figure 10: Block diagram of system unit 5PC910.SX02-00 and bus unit 5AC901.BX02-00....40
Figure 11: Block diagram of system unit 5PC910.SX02-00 and bus unit 5AC901.BX02-01....41
Figure 12: Block diagram of system unit 5PC910.SX02-00 and bus unit 5AC901.BX02-02....42
Figure 13: Block diagram of system unit 5PC910.SX05-00 and bus unit 5AC901.BX05-00....43
Figure 14: Block diagram of system unit 5PC910.SX05-00 and bus unit 5AC901.BX05-01....44
Figure 15: Block diagram of system unit 5PC910.SX05-00 and bus unit 5AC901.BX05-02....45
Figure 16: Block diagram of system unit 5PC910.SX05-00 and bus unit 5AC901.BX05-03....46
Figure 17: Block diagram of DisplayPort transmitter 5AC901.LDPO-00....47
Figure 18: Block diagram of Smart Display Link / DVI transmitter 5AC901.LSDL-00....47
Figure 19: Block diagram of Smart Display Link / DVI transmitter 5AC901.LSD3-00....47
Figure 20: Device interfaces - Overview (front)....48
Figure 21: Device interfaces - Overview (top)....49
Figure 22: Ground connection....50
Figure 23: Standard half-size 32-bit PCI card - Dimensions....58
Figure 24: Standard half-size PCIe card - Dimensions....58
Figure 25: 5PC910.SX01-00 - Dimensions....68
Figure 26: 5PC910.SX01-00 - Drilling template....69
Figure 27: 5PC910.SX02-00 - Dimensions....73
Figure 28: 5PC910.SX02-00 - Drilling template....74
Figure 29: 5PC910.SX05-00 - Dimensions....79
Figure 30: 5PC910.SX05-00 - Drilling template....80
Figure 31: 1-slot bus units....86
Figure 32: 2-slot bus units....86
Figure 33: 5-slot bus units....87
Figure 34: 5AC901.CHDD-00 - Temperature humidity diagram....94
Figure 35: 5AC901.CHDD-01 - Temperature humidity diagram....96
Figure 36: 5MMHDD.0500-00 - Temperature humidity diagram....98
Figure 37: 5AC901.CSSD-00 - Temperature humidity diagram....100
Figure 38: 5AC901.CSSD-01 - Temperature humidity diagram....102
Figure 39: 5AC901.CSSD-02 - Temperature humidity diagram....104
Figure 40: 5AC901.CSSD-03 ≤ Rev. C0 - Temperature/Humidity diagram....106
Figure 41: 5AC901.CSSD-03 ≥ Rev. D0 - Temperature/Humidity diagram....107
Figure 42: 5AC901.CSSD-04 ≤ Rev. C0 - Temperature/Humidity diagram....109
Figure 43: 5AC901.CSSD-04 ≥ Rev. D0 - Temperature/Humidity diagram....110
Figure 44: 5AC901.CSSD-05 - Temperature humidity diagram....112
Figure 45: 5MMSSD.0060-00 - Temperature humidity diagram....114
Figure 46: 5MMSSD.0060-01 ≤ Rev. C0 - Temperature/Humidity diagram....116
Figure 47: 5MMSSD.0060-01 ≥ Rev. D0 - Temperature/Humidity diagram....117
Figure 48: 5MMSSD.0128-01 ≤ Rev. C0 - Temperature/Humidity diagram....119
Figure 49: 5MMSSD.0128-01 ≥ Rev. D0 - Temperature/Humidity diagram....120
Figure 50: 5MMSSD.0180-00 - Temperature humidity diagram....122
Figure 51: 5MMSSD.0256-00 - Temperature humidity diagram....124
Figure 52: 5AC901.SDVW-00 - Temperature humidity diagram....128
Figure 53: PCI SATA RAID controller....130
Figure 54: 5ACPCI.RAIC-06 - Temperature humidity diagram....132
Figure 55: RS232/422/485 interface - Operation in RS485 mode....135
Figure 56: 5AC901.I485-00 - Terminating resistor....136
Figure 57: 5AC901.ICAN-00 - Terminating resistor....138

Figure 58: 5AC901.BUPS-00 - Dimensions....157
Figure 59: 5AC901.BUPS-00 - Drilling template....157
Figure 60: 5AC901.BUPS-01 - Dimensions....161
Figure 61: 5AC901.BUPS-01 - Drilling template....161
Figure 62: Mounting plates....166
Figure 63: Vertical mounting orientation....167
Figure 64: Horizontal mounting orientation....167
Figure 65: Standard mounting - Spacing....168
Figure 66: Flex radius - Cable connection....169
Figure 67: Symbol for functional ground....170
Figure 68: Grounding concept....170
Figure 69: Open the RAID Configuration Utility....171
Figure 70: RAID Configuration Utility - Menu....171
Figure 71: RAID Configuration Utility - Menu....172
Figure 72: RAID Configuration Utility - Create RAID set - Striped....172
Figure 73: RAID Configuration Utility - Create RAID set - Mirrored....173
Figure 74: RAID Configuration Utility - Delete RAID set....173
Figure 75: RAID Configuration Utility - Rebuild mirrored set....174
Figure 76: RAID Configuration Utility - Resolve conflicts....174
Figure 77: RAID Configuration Utility - Low level format....175
Figure 78: Configuration Utility - Boot....176
Figure 79: Configuration Utility - Overview....176
Figure 80: Configuration Utility - Create RAID volume....177
Figure 81: Configuration Utility - Delete RAID volume....178
Figure 82: Configuration Utility - Reset disks to non-RAID....179
Figure 83: Configuration Utility - Recovery volume options....180
Figure 84: Bootscreen....181
Figure 85: Main....183
Figure 86: Main - Platform Information....184
Figure 87: Advanced Übersicht....185
Figure 88: Advanced - Graphics Configuration....186
Figure 89: Advanced - Hardware Health Monitoring....188
Figure 90: Advanced - OEM Features....189
Figure 91: Advanced - OEM Features - Super I/O Configuration....190
Figure 92: Advanced - OEM Features - CPU Board Features....191
Figure 93: Advanced - OEM Features - CPU Board Features - Temperature Values....191
Figure 94: Advanced - OEM Features - System Board Features....192
Figure 95: Advanced - OEM Features - System Board Features - Statistical Values....193
Figure 96: Advanced - OEM Features - System Board Features - Temperature Values....193
Figure 97: Advanced - OEM Features - System Board Features - Voltage Values....194
Figure 98: Advanced - OEM Features - Memory Module Features....195
Figure 99: Advanced - OEM Features - Bus Unit Features....196
Figure 100: Advanced - OEM Features - Bus Unit Features - Statistical Values....197
Figure 101: Advanced - OEM features - I/O board 1 features....197
Figure 102: Advanced - OEM features - I/O board 1 features - Statistical values....198
Figure 103: Advanced - OEM features - I/O board 2 features....199
Figure 104: Advanced - OEM features - I/O board 2 features - Statistical values....200
Figure 105: Advanced - OEM features - Display link module features....200
Figure 106: Advanced - OEM features - Display link module features - Statistical values....201
Figure 107: Advanced - OEM features - Display link module features - Temperature values....202
Figure 108: Advanced - OEM features - Fan unit features....202
Figure 109: Advanced - OEM features - Fan unit features - Statistical values....203
Figure 110: Advanced - OEM features - Fan unit features - RPM values....204
Figure 111: Advanced - OEM Features - Slide-in 1 features....204
Figure 112: Advanced - OEM features - Slide-in 1 features - Temperature values....205
Figure 113: Advanced - OEM Features - Slide-in 2 features....206
Figure 114: Advanced - OEM features - Slide-in 2 features - Temperature values....207

Figure 115: Advanced - OEM Features - Panel Control Features 207
Figure 116: Advanced - OEM Features - Panel Control Features - Panel #x 208
Figure 117: Advanced - PCI Configuration 209
Figure 118: Advanced - PCI Configuration - PIRQ Routing & IRQ Reservation 210
Figure 119: Advanced - PCI Express Configuration 211
Figure 120: Advanced - PCI Express Configuration - PCI Express Settings 212
Figure 121: Advanced - PCI Express Configuration - PCI Express GEN 2 Settings 213
Figure 122: Advanced - PCI Express Configuration - PCI Express Graphics (PEG) Port 214
Figure 123: Advanced - PCI Express Configuration - PCI Express Root Port 216
Figure 124: Advanced - ACPI Settings 217
Figure 125: Advanced - RTC Wake Settings 218
Figure 126: Advanced - CPU Configuration 219
Figure 127: Advanced - CPU Configuration - CPU Information 221
Figure 128: Advanced - Chipset Configuration 222
Figure 129: Advanced - SATA Configuration 223
Figure 130: Advanced - SATA Configuration - Software Feature Mask Configuration 225
Figure 131: Advanced - Memory Configuration 226
Figure 132: Advanced - Memory Configuration - Memory Information 227
Figure 133: Advanced - Memory Configuration - Custom Profile Control 228
Figure 134: Advanced - USB Configuration 229
Figure 135: Advanced - USB Configuration - Per Port USB Disable Control 231
Figure 136: Advanced - USB Configuration - Per Port Legacy USB Support Control 232
Figure 137: Advanced - Serial Port Console Redirection 233
Figure 138: Advanced - Console Redirection - Console Redirection Settings 234
Figure 139: Boot 235
Figure 140: Boot - Boot Device Priority 235
Figure 141: Boot - Boot Configuration 236
Figure 142: Security 237
Figure 143: Security - HDD user password 238
Figure 144: Save & Exit 238
Figure 145: PCI and PCIe routing with the QM77/HM76 APIC CPU board 248
Figure 146: Software version 249
Figure 147: Creating a bootable diskette in Windows XP - Step 1 252
Figure 148: Creating a bootable diskette in Windows XP - Step 2 252
Figure 149: Creating a bootable diskette in Windows XP - Step 3 252
Figure 150: Creating a bootable diskette in Windows XP - Step 4 253
Figure 151: Creating a bootable diskette in Windows XP - Step 5 253
Figure 152: Creating a USB flash drive for B&R upgrade files 254
Figure 153: Creating a mass storage device for B&R upgrade files 255
Figure 154: ADI Control Center screenshots - Examples 267
Figure 155: ADI Development Kit Screenshots (Version 3.60) 269
Figure 156: ADI .NET SDK screenshots (version 2.00) 271
Figure 157: GL certificate no. 61 601 - 13 HH 276
Figure 158: CFast card - Dimensions 284
Figure 159: 5CFAST.xxxx-00 ≥ Rev. E0 - Temperature/Humidity diagram 284
Figure 160: 5CFAST.xxxx-00 ≤ Rev. D0 - Temperature/Humidity diagram 285
Figure 161: 5MMUSB.xxxx-01 - Temperature/Humidity diagram 287
Figure 162: 5MD900.USB2-02 - Interfaces 288
Figure 163: 5MD900.USB2-02 - Dimensions 290
Figure 164: USB media drive with front cover - Dimensions 290
Figure 165: USB media drive with front cover - Installation cutout 291
Figure 166: 5MD900.USB2-02 - Mounting orientation 291
Figure 167: 5A5003.03 - Dimensions 292
Figure 168: Front cover mounting and installation depth 293
Figure 169: USB media drive with front cover - Installation cutout 293
Figure 170: 5AC901.FRAM-00 - Dimensions 294
Figure 171: Flex radius specifications 296

Figure 172: 5CADVI.0xxx-00 - Dimensions ... 296
Figure 173: 5CADVI.0xxx-00 - Pinout ... 297
Figure 174: Flex radius specifications ... 299
Figure 175: 5CASDL.0xxx-00 - Dimensions ... 299
Figure 176: 5CASDL.0xxx-00 - Pinout ... 300
Figure 177: Flex radius specifications ... 302
Figure 178: 5CASDL.0xxx-01 - Dimensions ... 302
Figure 179: 5CASDL.0xxx-01 - Pinout ... 303
Figure 180: Flex radius specifications ... 305
Figure 181: 5CASDL.0xxx-03 - Dimensions ... 305
Figure 182: 5CASDL.0xxx-03 - Pinout ... 306
Figure 183: Flex radius specification with extender ... 308
Figure 184: 5CASDL.0xx0-13 - Dimensions ... 308
Figure 185: 5CASDL.0xx0-13 - Pinout ... 309
Figure 186: Example of the signal direction for an SDL flex cable with extender ... 310
Figure 187: SDL3 - Flex radius specifications ... 312
Figure 188: 5CASD3.xxxx-00 - Dimensions ... 312
Figure 189: 5CASD3.xxxx-00 - Pinout ... 312
Figure 190: Cabling with a field-assembled cable ... 313
Figure 191: 5CAUSB.00xx-00 USB cables - Pinout ... 314
Figure 192: 9A0014.xx RS232 cables - Pinout ... 316
Figure 193: 5AC804.MFLT-00 - Dimensions ... 320
Figure 194: 5AC804.MFLT-00 - Drilling template ... 320
Figure 195: Connection example ... 320
Figure 196: Battery handling ... 322
Figure 197: Changing the battery ... 322
Figure 198: Replacing the CFast card ... 323
Figure 199: Removing the Torx screws for the side cover ... 324
Figure 200: Removing the side cover ... 324
Figure 201: Removing the torx screws and slot cover ... 325
Figure 202: Installing the interface option ... 325
Figure 203: Securing the interface option ... 325
Figure 204: Replacing the side cover ... 326
Figure 205: Securing the side cover ... 326
Figure 206: Removing the Torx screws for the side cover ... 327
Figure 207: Removing the side cover ... 327
Figure 208: Removing the torx screws and slot cover ... 328
Figure 209: Inserting the monitor/panel option into the APC910 ... 328
Figure 210: Securing the monitor/panel option using the torx screws ... 328
Figure 211: Replacing the side cover ... 329
Figure 212: Securing the side cover ... 329
Figure 213: Removing the Torx screws for the side cover ... 330
Figure 214: Removing the side cover ... 330
Figure 215: Installing/Replacing the slide-in compact drive ... 331
Figure 216: Replacing the side cover ... 331
Figure 217: Securing the side cover ... 332
Figure 218: Removing the Torx screws for the side cover ... 333
Figure 219: Removing the side cover ... 333
Figure 220: Installing / replacing the slide-in drive ... 334
Figure 221: Replacing the side cover ... 334
Figure 222: Securing the side cover ... 335
Figure 223: Removing the Torx screws for the side cover ... 336
Figure 224: Removing the side cover ... 336
Figure 225: Removing the PCI / PCIe slot cover ... 337
Figure 226: Installing / Replacing the PCI / PCIe card ... 337
Figure 227: Replacing the side cover ... 337
Figure 228: Securing the side cover ... 338

Figure 229: Connecting the UPS cable to the battery....339
Figure 230: Removing the fan filter from the APC910....340
Figure 231: Removing the front cover....341
Figure 232: Removing the heat sink cover....341
Figure 233: Removing the torx screws and fan cable....342
Figure 234: Removing the fan kit from the APC910....342
Figure 235: Removing the Torx screws for the side cover....344
Figure 236: Removing the side cover....344
Figure 237: Connector location for external devices....345
Figure 238: Replacing the side cover....345
Figure 239: Securing the side cover....346
Figure 240: Screw layout on the back side of the 5ACPCI.RAIC-03 SATA RAID controller....347
Figure 241: Replacing the hard disk....348

Table 1: Manual history ... 10
Table 2: Environmentally friendly separation of materials ... 14
Table 3: Description of the safety notices used in this documentation ... 15
Table 4: Range of nominal sizes ... 15
Table 5: Ambient temperature with a fan kit ... 25
Table 6: Ambient temperature without a fan kit ... 26
Table 7: Temperature sensor locations ... 27
Table 8: Temperature sensor locations ... 28
Table 9: Overview of humidity specifications for individual components ... 29
Table 10: 1-slot APC variant - Power calculation table ... 31
Table 11: Power rating table for interface and monitor/panel options ... 31
Table 12: 2-slot APC variant - Power calculation table ... 33
Table 13: Power rating table for interface and monitor/panel options ... 33
Table 14: 5-slot APC variant - Power calculation table ... 35
Table 15: Power rating table for interface and monitor/panel options ... 35
Table 16: Supply voltage connection 24 VDC ... 50
Table 17: COM1 - Pinout ... 51
Table 18: Monitor/Panel connection - RGB, DVI, SDL ... 52
Table 19: DVI interface - Pinout ... 52
Table 20: Cable lengths and resolutions for SDL transmission ... 53
Table 21: Cable lengths and resolutions for DVI transmission ... 53
Table 22: DisplayPort 1.1 ... 54
Table 23: DisplayPort - Pinout ... 54
Table 24: Ethernet interface (ETH1) ... 55
Table 25: Ethernet interface (ETH2) ... 55
Table 26: USB1, USB2, USB3 and USB4 interfaces ... 56
Table 27: USB5 interface ... 56
Table 28: IF option 1 slot ... 57
Table 29: IF option 2 slot ... 57
Table 30: Monitor/Panel option ... 58
Table 31: Status LEDs - Data ... 59
Table 32: Power button ... 60
Table 33: Reset button ... 60
Table 34: Battery ... 61
Table 35: Battery status ... 61
Table 36: CFast slot ... 61
Table 37: Slide-in compact slot ... 62
Table 38: Slide-in slot 1 ... 62
Table 39: Slide-in slot 2 ... 63
Table 40: 5PC910.SX01-00 - Order data ... 64
Table 41: 5PC910.SX01-00 - Technical data ... 65
Table 42: 5PC910.SX02-00 - Order data ... 70
Table 43: 5PC910.SX02-00 - Technical data ... 71
Table 44: 5PC910.SX05-00 - Order data ... 75
Table 45: 5PC910.SX05-00 - Technical data ... 76
Table 46: 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-02, 5PC900.TS77-03, 5PC900.TS77-04, 5PC900.TS77-05, 5PC900.TS77-06 - Order data ... 81
Table 47: 5PC900.TS77-00, 5PC900.TS77-01, 5PC900.TS77-02, 5PC900.TS77-03, 5PC900.TS77-04, 5PC900.TS77-05, 5PC900.TS77-06 - Technical data ... 82
Table 48: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Order data ... 83
Table 49: 5PC900.TS77-07, 5PC900.TS77-08, 5PC900.TS77-09, 5PC900.TS77-10 - Technical data ... 83
Table 50: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Order data ... 85
Table 51: 5MMDDR.1024-03, 5MMDDR.2048-03, 5MMDDR.4096-03, 5MMDDR.8192-03 - Technical data ... 85
Table 52: 5AC901.BX01-00, 5AC901.BX01-01, 5AC901.BX02-00, 5AC901.BX02-01, 5AC901.BX02-02, 5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02, 5AC901.BX05-03 - Order data ... 87
Table 53: 5AC901.BX01-00, 5AC901.BX01-01, 5AC901.BX02-00, 5AC901.BX02-01, 5AC901.BX02-02 - Technical data ... 88

Table 54: 5AC901.BX05-00, 5AC901.BX05-01, 5AC901.BX05-02, 5AC901.BX05-03 - Technical data.... 88
Table 55: 5AC901.HS00-00, 5AC901.HS01-00 - Order data.... 89
Table 56: 5AC901.FA01-00 - Order data.... 90
Table 57: 5AC901.FA01-00 - Technical data.... 90
Table 58: 5AC901.FA02-00 - Order data.... 91
Table 59: 5AC901.FA02-00 - Technical data.... 91
Table 60: 5AC901.FA05-00 - Order data.... 92
Table 61: 5AC901.FA05-00 - Technical data.... 92
Table 62: 5AC901.CHDD-00 - Order data.... 93
Table 63: 5AC901.CHDD-00 - Technical data.... 93
Table 64: 5AC901.CHDD-01 - Order data.... 95
Table 65: 5AC901.CHDD-01 - Technical data.... 95
Table 66: 5MMHDD.0500-00 - Order data.... 97
Table 67: 5MMHDD.0500-00 - Technical data.... 97
Table 68: 5AC901.CSSD-00 - Order data.... 99
Table 69: 5AC901.CSSD-00 - Technical data.... 99
Table 70: 5AC901.CSSD-01 - Order data.... 101
Table 71: 5AC901.CSSD-01 - Technical data.... 101
Table 72: 5AC901.CSSD-02 - Order data.... 103
Table 73: 5AC901.CSSD-02 - Technical data.... 103
Table 74: 5AC901.CSSD-03 - Order data.... 105
Table 75: 5AC901.CSSD-03, 5AC901.CSSD-03 - Technical data.... 105
Table 76: 5AC901.CSSD-04 - Order data.... 108
Table 77: 5AC901.CSSD-04, 5AC901.CSSD-04, 5AC901.CSSD-04 - Technical data.... 108
Table 78: 5AC901.CSSD-05 - Order data.... 111
Table 79: 5AC901.CSSD-05 - Technical data.... 111
Table 80: 5MMSSD.0060-00 - Order data.... 113
Table 81: 5MMSSD.0060-00 - Technical data.... 113
Table 82: 5MMSSD.0060-01 - Order data.... 115
Table 83: 5MMSSD.0060-01, 5MMSSD.0060-01 - Technical data.... 115
Table 84: 5MMSSD.0128-01 - Order data.... 118
Table 85: 5MMSSD.0128-01, 5MMSSD.0128-01 - Technical data.... 118
Table 86: 5MMSSD.0180-00 - Order data.... 121
Table 87: 5MMSSD.0180-00 - Technical data.... 121
Table 88: 5MMSSD.0256-00 - Order data.... 123
Table 89: 5MMSSD.0256-00 - Technical data.... 123
Table 90: 5AC901.CCFA-00 - Order data.... 125
Table 91: 5AC901.CCFA-00 - Technical data.... 125
Table 92: 5AC901.CHDD-99 - Order data.... 126
Table 93: 5AC901.SDVW-00 - Order data.... 127
Table 94: 5AC901.SDVW-00 - Technical data.... 127
Table 95: 5AC901.SSCA-00 - Order data.... 129
Table 96: 5AC901.SSCA-00 - Technical data.... 129
Table 97: 5ACPCI.RAIC-06 - Order data.... 130
Table 98: 5ACPCI.RAIC-06 - Technical data.... 131
Table 99: 5AC901.I485-00 - Order data.... 133
Table 100: 5AC901.I485-00 - Technical data.... 133
Table 101: COM - Pinout.... 134
Table 102: RS232 - Bus length and transfer rate.... 134
Table 103: RS232 - Cable requirements.... 134
Table 104: RS422 - Bus length and transfer rate.... 135
Table 105: RS422 - Cable requirements.... 135
Table 106: RS485 - Bus length and transfer rate.... 135
Table 107: RS485 - Cable requirements.... 135
Table 108: 5AC901.ICAN-00 - Order data.... 137
Table 109: 5AC901.ICAN-00 - Technical data.... 137
Table 110: 5AC901.ICAN-00 - Pinout.... 138

Table 111: 5AC901.IHDA-00 - Order data....139
Table 112: 5AC901.IHDA-00 - Technical data....139
Table 113: 5AC901.IHDA-00 - Pinout....140
Table 114: 5AC901.ISRM-00 - Order data....141
Table 115: 5AC901.ISRM-00 - Technical data....141
Table 116: 5AC901.IRDY-00 - Order data....142
Table 117: 5AC901.IRDY-00 - Technical data....142
Table 118: 5AC901.IRDY-00 - Pinout....142
Table 119: 5AC901.LDPO-00 - Order data....143
Table 120: 5AC901.LDPO-00 - Technical data....143
Table 121: DisplayPort 1.1....144
Table 122: DisplayPort - Pinout....144
Table 123: 5AC901.LSDL-00 - Order data....145
Table 124: 5AC901.LSDL-00 - Technical data....145
Table 125: Monitor/Panel interface - DVI, SDL....145
Table 126: DVI interface - Pinout....146
Table 127: Cable lengths and resolutions for SDL transmission....146
Table 128: Cable lengths and resolutions for DVI transmission....147
Table 129: 5AC901.LSD3-00 - Order data....148
Table 130: 5AC901.LSD3-00 - Technical data....148
Table 131: SDL3 interface....149
Table 132: Cable lengths and resolutions for SDL3 transmission....149
Table 133: 5AC901.IUPS-00 - Order data....151
Table 134: 5AC901.IUPS-00 - Technical data....151
Table 135: 5AC901.IUPS-00 / -01 - Pinout....152
Table 136: 5AC901.IUPS-01 - Order data....153
Table 137: 5AC901.IUPS-01 - Technical data....153
Table 138: 5AC901.IUPS-00 / -01 - Pinout....154
Table 139: 5AC901.BUPS-00 - Order data....155
Table 140: 5AC901.BUPS-00 - Technical data....155
Table 141: 5AC901.BUPS-01 - Order data....159
Table 142: 5AC901.BUPS-01 - Technical data....159
Table 143: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - Order data....163
Table 144: 5CAUPS.0005-01, 5CAUPS.0010-01, 5CAUPS.0030-01 - Technical data....163
Table 145: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02 - Order data....165
Table 146: 5AC901.FF01-00, 5AC901.FF01-01, 5AC901.FF01-02, 5AC901.FF02-00, 5AC901.FF02-01, 5AC901.FF02-02, 5AC901.FF05-00, 5AC901.FF05-01, 5AC901.FF05-02 - Technical data....165
Table 147: BIOS-relevant keys in the RAID Configuration Utility....171
Table 148: BIOS-relevant keys in the RAID Configuration Utility....177
Table 149: Configuration Utility - Create RAID volume....177
Table 150: BIOS-relevant keys for POST....182
Table 151: BIOS-relevant keys....182
Table 152: Main - Configuration options....183
Table 153: Main - Platform information overview....184
Table 154: Advanced overview....185
Table 155: Advanced - Graphics configuration options....186
Table 156: Advanced - Hardware health monitoring....188
Table 157: Advanced - OEM features screen....189
Table 158: Advanced - OEM features - Super I/O configuration - Setting options....190
Table 159: Advanced - OEM features - CPU board features....191
Table 160: Advanced - OEM features - CPU board features - Temperature values....192
Table 161: Advanced - OEM features - System board features....192
Table 162: Advanced - OEM features - System board features - Statistical values....193
Table 163: Advanced - OEM features - System board features - Temperature values....194
Table 164: Advanced - OEM features - System board features - Voltage values....194
Table 165: Advanced - OEM features - Memory module features....195

Table 166: Advanced - OEM features - Bus unit features....196
Table 167: Advanced - OEM features - Bus unit features - Statistical values....197
Table 168: Advanced - OEM features - I/O board 1 features....198
Table 169: Advanced - OEM features - I/O board 1 features - Statistical values....198
Table 170: Advanced - OEM features - I/O board 2 features....199
Table 171: Advanced - OEM features - I/O board 2 features - Statistical values....200
Table 172: Advanced - OEM features - Display link module features....201
Table 173: Advanced - OEM features - Display link module features - Statistical values....201
Table 174: Advanced - OEM features - Display link module features - Temperature values....202
Table 175: Advanced - OEM features - Fan unit features....203
Table 176: Advanced - OEM features - Fan unit features - Statistical values....203
Table 177: Advanced - OEM features - Fan unit features - RPM values....204
Table 178: Advanced - OEM Features - Slide-in 1 features....205
Table 179: Advanced - OEM features - Slide-in 1 features - Temperature values....205
Table 180: Advanced - OEM Features - Slide-in 2 features....206
Table 181: Advanced - OEM features - Slide-in 2 features - Temperature values....207
Table 182: Advanced - OEM features - Panel control features....208
Table 183: Advanced - OEM features - Panel control features - Panel #X....208
Table 184: Advanced - PCI configuration - Configuration options....209
Table 185: Advanced - PCI configuration - PIRQ routing & IRQ reservation - Configuration options....210
Table 186: Advanced - PCI Express configuration - Menu....211
Table 187: Advanced - PCI Express configuration - PCI Express settings - Configuration options....212
Table 188: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Configuration options....213
Table 189: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Configuration options....214
Table 190: Advanced - PCI Express configuration - PCI Express root port - Configuration options....216
Table 191: Advanced - ACPI settings - Configuration options....218
Table 192: Advanced - RTC wake settings - Configuration options....218
Table 193: Advanced - CPU configuration - Configuration options....219
Table 194: Advanced - CPU configuration - CPU information - Configuration options....221
Table 195: Advanced - Chipset configuration - Configuration options....222
Table 196: Advanced - SATA configuration - Configuration options....223
Table 197: Advanced - SATA configuration - Software feature mask configuration - Configuration options....225
Table 198: Advanced - Memory configuration - Configuration options....226
Table 199: Advanced - Memory configuration - Memory information....228
Table 200: Advanced - Memory configuration - Custom profile control - Configuration options....228
Table 201: Advanced - USB configuration - Configuration options....229
Table 202: Advanced - USB configuration - Per port USB disable control - Configuration options....231
Table 203: Advanced - USB configuration - Per port legacy USB support control - Configuration options....232
Table 204: Advanced - Serial port console redirection - Configuration options....233
Table 205: Advanced - Console redirection - Console redirection settings - Configuration options....234
Table 206: Boot overview....235
Table 207: Boot - Boot device priority - Configuration options....236
Table 208: Boot - Boot configuration - Configuration options....236
Table 209: Security menu - Configuration options....237
Table 210: Security - HDD user password - Configuration options....238
Table 211: Save & Exit menu - Configuration options....239
Table 212: Advanced - Graphics configuration - Profile setting overview....240
Table 213: Advanced - OEM features - Overview of profile settings....240
Table 214: Advanced - OEM features - Super I/O configuration - Profile settings overview....240
Table 215: Advanced - PCI configuration - Overview of profile settings....240
Table 216: Advanced - PCI Express configuration - PCI Express settings - Overview of profile settings....241
Table 217: Advanced - PCI Express configuration - PCI Express GEN 2 settings - Overview of profile settings....241
Table 218: Advanced - PCI Express configuration - PCI Express graphics (PEG) port - Profile setting overview....241
Table 219: Advanced - PCI Express configuration - PCI Express root port - Overview of profile settings....241
Table 220: Advanced - ACPI settings - Overview of profile settings....242

Table 221: Advanced - RTC wake settings - Overview of profile settings....242
Table 222: Advanced - CPU configuration - Overview of profile settings....242
Table 223: Advanced - Chipset configuration - Overview of profile settings....242
Table 224: Advanced - SATA configuration - Profile setting overview....243
Table 225: Advanced - Memory configuration - Overview of profile settings....243
Table 226: Advanced - USB configuration - Overview of profile settings....244
Table 227: Advanced - Serial port console redirection - Overview of profile settings....244
Table 228: Boot - Boot device priority - Overview of profile settings....244
Table 229: Boot - Boot configuration - Overview of profile settings....245
Table 230: RAM address assignment....246
Table 231: I/O address assignment....246
Table 232: IRQ interrupt assignments in PIC mode....246
Table 233: IRQ interrupt assignments in APIC mode....247
Table 234: 5SWWI7.1100-GER, 5SWWI7.1100-ENG, 5SWWI7.1200-GER, 5SWWI7.1200-ENG, 5SWWI7.1300-MUL, 5SWWI7.1400-MUL - Order data....256
Table 235: Windows 7 - Overview....256
Table 236: 5SWWI7.1540-ENG, 5SWWI7.1640-ENG, 5SWWI7.1740-MUL, 5SWWI7.1840-MUL - Order data....258
Table 237: 5SWWI7.1540-ENG - Technical data....258
Table 238: Device functions in Windows Embedded Standard 7....259
Table 239: 5SWWXP.0600-GER, 5SWWXP.0600-ENG, 5SWWXP.0600-MUL - Order data....261
Table 240: 5SWWXP.0740-ENG - Order data....263
Table 241: 5SWWXP.0740-ENG - Technical data....263
Table 242: Device functions in Windows Embedded Standard 2009....263
Table 243: 1A4600.10-5, 1A4601.06-5 - Order data....265
Table 244: Revision of individual components with GL certification....274
Table 245: 0TB103.9, 0TB103.91 - Order data....278
Table 246: 0TB103.9, 0TB103.91 - Technical data....278
Table 247: 0AC201.91, 4A0006.00-000 - Order data....280
Table 248: 0AC201.91, 4A0006.00-000 - Technical data....280
Table 249: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Order data....281
Table 250: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data....281
Table 251: 5CFAST.2048-00, 5CFAST.4096-00, 5CFAST.8192-00, 5CFAST.016G-00, 5CFAST.032G-00 - Technical data....283
Table 252: 5MMUSB.2048-01, 5MMUSB.4096-01 - Order data....286
Table 253: 5MMUSB.2048-01, 5MMUSB.4096-01 - Technical data....286
Table 254: 5MD900.USB2-02 - Order data....288
Table 255: 5MD900.USB2-02 - Technical data....288
Table 256: 5MD900.USB2-02 - Contents of delivery....291
Table 257: 5A5003.03 - Order data....292
Table 258: 5A5003.03 - Technical data....292
Table 259: 5A5003.03 - Contents of delivery....292
Table 260: 5AC901.FRAM-00 - Order data....294
Table 261: 5AC901.FRAM-00 - Technical data....294
Table 262: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Order data....295
Table 263: 5CADVI.0018-00, 5CADVI.0050-00, 5CADVI.0100-00 - Technical data....295
Table 264: 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Order data....298
Table 265: 5CASDL.0018-00, 5CASDL.0050-00, 5CASDL.0100-00, 5CASDL.0150-00, 5CASDL.0200-00, 5CASDL.0250-00, 5CASDL.0300-00 - Technical data....298
Table 266: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Order data....301
Table 267: 5CASDL.0018-01, 5CASDL.0050-01, 5CASDL.0100-01, 5CASDL.0150-01 - Technical data....301
Table 268: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Order data....304
Table 269: 5CASDL.0018-03, 5CASDL.0050-03, 5CASDL.0100-03, 5CASDL.0150-03, 5CASDL.0200-03, 5CASDL.0250-03, 5CASDL.0300-03 - Technical data....304

Table 270: 5CASDL.0xxx-03 SDL flex cables - Structure ... 306
Table 271: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Order data ... 307
Table 272: 5CASDL.0300-13, 5CASDL.0400-13, 5CASDL.0430-13 - Technical data ... 307
Table 273: 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Order data ... 311
Table 274: 5CASD3.0100-00, 5CASD3.0150-00, 5CASD3.0200-00, 5CASD3.0300-00, 5CASD3.0500-00, 5CASD3.1000-00 - Technical data ... 311
Table 275: 5CAUSB.0018-00, 5CAUSB.0050-00 - Order data ... 314
Table 276: 5CAUSB.0018-00, 5CAUSB.0050-00 - Technical data ... 314
Table 277: 9A0014.02, 9A0014.05, 9A0014.10 - Order data ... 315
Table 278: 9A0014.02, 9A0014.05, 9A0014.10 - Technical data ... 315
Table 279: 5CAMSC.0001-00 - Order data ... 317
Table 280: 5CAMSC.0001-00 - Technical data ... 317
Table 281: 5AC901.FI01-00, 5AC901.FI02-00, 5AC901.FI05-00 - Order data ... 318
Table 282: 5AC804.MFLT-00 - Order data ... 319
Table 283: 5AC804.MFLT-00 - Technical data ... 319
Table 284: Battery status ... 321
Table 285: Multi-pin connector on the mainboard - Pinout ... 344
Table 286: Overview of required replacement SATA HDD for PCI SATA HDD RAID controller ... 347
Table 287: Abbreviations used in this user's manual ... 349

0AC201.91....280
0TB103.9....278
0TB103.91....278
1A4600.10-5....265
1A4601.06-5....265
4A0006.00-000....280
5A5003.03....292
5AC804.MFLT-00....319
5AC901.BUPS-00....155
5AC901.BUPS-01....159
5AC901.BX01-00....87
5AC901.BX01-01....87
5AC901.BX02-00....87
5AC901.BX02-01....87
5AC901.BX02-02....87
5AC901.BX05-00....87
5AC901.BX05-01....87
5AC901.BX05-02....87
5AC901.BX05-03....87
5AC901.CCFA-00....125
5AC901.CHDD-00....93
5AC901.CHDD-01....95
5AC901.CHDD-99....126
5AC901.CSSD-00....99
5AC901.CSSD-01....101
5AC901.CSSD-02....103
5AC901.CSSD-03....105
5AC901.CSSD-04....108
5AC901.CSSD-05....111
5AC901.FA01-00....90
5AC901.FA02-00....91
5AC901.FA05-00....92
5AC901.FF01-00....165
5AC901.FF01-01....165
5AC901.FF01-02....165
5AC901.FF02-00....165
5AC901.FF02-01....165
5AC901.FF02-02....165
5AC901.FF05-00....165
5AC901.FF05-01....165
5AC901.FF05-02....165
5AC901.FI01-00....318
5AC901.FI02-00....318
5AC901.FI05-00....318
5AC901.FRAM-00....294
5AC901.HS00-00....89
5AC901.HS01-00....89
5AC901.I485-00....133
5AC901.ICAN-00....137
5AC901.IHDA-00....139
5AC901.IRDY-00....142
5AC901.ISRM-00....141
5AC901.IUPS-00....151
5AC901.IUPS-01....153
5AC901.LDPO-00....143
5AC901.LSD3-00....148
5AC901.LSDL-00....145
5AC901.SDVW-00....127
5AC901.SSCA-00....129
5ACPCI.RAIC-06....130
5CADVI.0018-00....295
5CADVI.0050-00....295

5CADVI.0100-00 ... 295
5CAMSC.0001-00 ... 317
5CASD3.0100-00 ... 311
5CASD3.0150-00 ... 311
5CASD3.0200-00 ... 311
5CASD3.0300-00 ... 311
5CASD3.0500-00 ... 311
5CASD3.1000-00 ... 311
5CASDL.0018-00 ... 298
5CASDL.0018-01 ... 301
5CASDL.0018-03 ... 304
5CASDL.0050-00 ... 298
5CASDL.0050-01 ... 301
5CASDL.0050-03 ... 304
5CASDL.0100-00 ... 298
5CASDL.0100-01 ... 301
5CASDL.0100-03 ... 304
5CASDL.0150-00 ... 298
5CASDL.0150-01 ... 301
5CASDL.0150-03 ... 304
5CASDL.0200-00 ... 298
5CASDL.0200-03 ... 304
5CASDL.0250-00 ... 298
5CASDL.0250-03 ... 304
5CASDL.0300-00 ... 298
5CASDL.0300-03 ... 304
5CASDL.0300-13 ... 307
5CASDL.0400-13 ... 307
5CASDL.0430-13 ... 307
5CAUPS.0005-01 ... 163
5CAUPS.0010-01 ... 163
5CAUPS.0030-01 ... 163
5CAUSB.0018-00 ... 314
5CAUSB.0050-00 ... 314
5CFAST.016G-00 ... 281
5CFAST.032G-00 ... 281
5CFAST.2048-00 ... 281
5CFAST.4096-00 ... 281
5CFAST.8192-00 ... 281
5MD900.USB2-02 ... 288
5MMDDR.1024-03 ... 85
5MMDDR.2048-03 ... 85
5MMDDR.4096-03 ... 85
5MMDDR.8192-03 ... 85
5MMHDD.0500-00 ... 97
5MMSSD.0060-00 ... 113
5MMSSD.0060-01 ... 115
5MMSSD.0128-01 ... 118
5MMSSD.0180-00 ... 121
5MMSSD.0256-00 ... 123
5MMUSB.2048-01 ... 286
5MMUSB.4096-01 ... 286
5PC900.TS77-00 ... 81
5PC900.TS77-01 ... 81
5PC900.TS77-02 ... 81
5PC900.TS77-03 ... 81
5PC900.TS77-04 ... 81
5PC900.TS77-05 ... 81
5PC900.TS77-06 ... 81
5PC900.TS77-07 ... 83
5PC900.TS77-08 ... 83
5PC900.TS77-09 ... 83

5PC900.TS77-10....83
5PC910.SX01-00....64
5PC910.SX02-00....70
5PC910.SX05-00....75
5SWWI7.1100-ENG....256
5SWWI7.1100-GER....256
5SWWI7.1200-ENG....256
5SWWI7.1200-GER....256
5SWWI7.1300-MUL....256
5SWWI7.1400-MUL....256
5SWWI7.1540-ENG....258
5SWWI7.1640-ENG....258
5SWWI7.1740-MUL....258
5SWWI7.1840-MUL....258
5SWWXP.0600-ENG....261
5SWWXP.0600-GER....261
5SWWXP.0600-MUL....261
5SWWXP.0740-ENG....263
9A0014.02....315
9A0014.05....315
9A0014.10....315

A

Accessories ... 278
ACPI ... 246, 247
ADI ... 267
  .NET SDK ... 271
  Development Kit ... 269
ADI Control Center ... 150
air circulation ... 168
Allocation of resources ... 246
ambient temperature ... 25, 27
ARemb ... 266
ARwin ... 265
Automation PC configuration ... 21, 21
Automation Runtime ... 265
Automation Runtime Embedded ... 266
Automation Runtime Windows ... 265

B

B&R Automation Device Interface ... 267
B&R Control Center ... 267
Battery ... 61
Battery unit ... 150, 155
BIOS
  Advanced ... 185
  Boot ... 235
  default settings ... 240
  Main ... 183
  Save & Exit ... 238
  Security ... 237
BIOS Setup keys ... 182
BIOS upgrade ... 249
Blink code ... 59
Block diagrams ... 38
buffer lifespan ... 61
Bus unit ... 86

C

Cable
  SDL cable with 45° male connector ... 301
Cable connections ... 169
Cables ... 295
  DVI ... 295
  DVI cables ... 295
  SDL ... 298
  SDL3 ... 311
  SDL cables ... 298
  SDL flex ... 304
  SDL flex cables ... 304
  SDL flex cable with extender ... 307, 307
  SDL with 45° male connector ... 301
  USB ... 314
  USB cables ... 314
CAN interface ... 138
CAN master interface ... 137
CE mark ... 273
Certifications ... 274
  Germanischer Lloyd ... 274
certifications
  GOST-R ... 274

Certifications
UL ... 274
CFast slot ... 61
Changing the battery ... 321
Chipset ... 81, 83
COM ... 134
COM1 ... 51, 51
Complete system ... 24
Connecting an external device ... 344
Connecting the battery unit ... 339
Control Center ... 267
CPU board ... 81, 83
Create RAID volume ... 177
Creating reports ... 267

D

deflect disturbances ... 170
Delete RAID volume ... 178
Device interfaces and slots ... 48
Dimensions
5A5003.03 ... 292
5AC901.BUPS-00 ... 157
5AC901.BUPS-01 ... 161
5MD900.USB2-02 ... 290
5PC910.SX01-00 ... 68
5PC910.SX02-00 ... 73
5PC910.SX05-00 ... 79
Dimension standards ... 15
DisplayPort ... 54, 144
Disposal ... 14, 14
Drilling template
5AC901.BUPS-00 ... 157
5AC901.BUPS-01 ... 161
5PC910.SX01-00 ... 69
5PC910.SX02-00 ... 74
5PC910.SX05-00 ... 80
Drive ... 62, 62, 63
Drives ... 93
dual-channel memory ... 85
DVI cable ... 295
DVI resolution ... 53, 147

E

Electromagnetic compatibility ... 273
EMC directive ... 273
ESD ... 12
Electrical components with a housing ... 12
Electrical components without a housing ... 12
Individual components ... 12
Packaging ... 12
ETH1 ... 55
ETH2 ... 55
Ethernet 1 ... 55
Ethernet 2 ... 55
Ethernet controller ... 55, 55
Evaluating the battery status ... 321
External device ... 344

F

Fan control... 28
Fan kit... 90
Fan kits... 90
fan speed... 28
Firmware upgrade... 251
Flex radius... 169
Flex radius specifications... 169
Front cover... 165
Functional ground... 170

G

General tolerance... 15
Germanischer Lloyd... 274
GL certification... 274
GOST-R... 274
Gosudarstwenny standard... 274
ground connection... 50, 170
Grounding... 50, 170
Guidelines... 15

H

HDA... 139
HDD LED... 59
Heat sink... 89
HM76 chipset... 83
Humidity specifications... 29

I

I/O address assignment... 246
IF option... 133
IF option 1 slot... 57
IF option 2 slot... 57
immunity to disturbances... 170
Installation... 166
  battery unit... 339
  Installing... 336
  Installing and replacing... 330, 333
  interface options... 324
  Replacing... 340, 341
  UPS... 324
Installing
  monitor/panel options... 327
Installing and replacing slide-in drives... 330, 333
Installing interface options... 324
Installing monitor/panel options... 327
Installing PCI / PCIe cards... 336
Installing the battery unit... 339
Interface option... 133
Interfaces... 48
  CFast slot... 61
  DisplayPort... 54, 144
  Ethernet 1... 55
  Ethernet 2... 55
  Grounding... 50
  Monitor/Panel connection... 52
  Monitor/Panel interface... 145

SDL3 ... 149
Supply voltage ... 50
USB ... 56
Internal RAID controller ... 176
Interrupt assignments ... 246, 247

L

LED ... 59
LED indicator ... 59
LEDs ... 59
Line filter ... 319
Link LED ... 59
Low voltage directive ... 273

M

Main memory ... 85
Maximum ambient temperature ... 25
MIC, Line IN, Line OUT ... 140
Minimum ambient temperature ... 27
Monitor/Panel connection ... 52
Monitor/Panel interface ... 145
Monitor/Panel option ... 58, 143
Mounting orientation ... 167
mounting plates ... 166

O

Operating system
Windows 7 ... 256
Windows Embedded Standard 2009 ... 263
Windows Embedded Standard 7 ... 258
Windows XP Professional ... 261
Operation with a fan kit ... 25
Operation without a fan kit ... 26

P

PCI Express slot ... 86
PCI slot ... 86
Power button ... 60
Power calculation ... 30
5PC910.SX01-00 ... 31
5PC910.SX02-00 ... 33
5PC910.SX05-00 ... 35
Power connectors ... 278
Power LED ... 59
Power management ... 30
Proper ESD
handling ... 12

Q

QM77 chipset ... 81

R

RAID set ... 176
RAM address assignment ... 246
real-time clock ... 61

Recovery volume options ... 180
Relative humidity ... 29
Replacing a CFast card ... 323
Replacing a PCI SATA RAID hard disk ... 347
Replacing fan filters ... 340
Replacing fan kits ... 341
Reset button ... 60
Reset disks to non-RAID ... 179
RS232
  Bus length ... 134
  Cable type ... 134
RS232/422/485 interface ... 133
RS232 cables ... 315
RS422
  Bus length ... 134
  Cable type ... 135
RS485
  Bus length ... 135
  Cable type ... 135
RS485 interface ... 135
Run LED ... 59

S

S.M.A.R.T ... 27
Safety guidelines
  Intended use ... 12
  Policies and procedures ... 12
Safety notices ... 12
  Environmental conditions ... 13
  Environmentally friendly disposal ... 14
  Installation ... 13
  Operation ... 13
  Protection against electrostatic discharge ... 12
  Separation of materials ... 14
  Transport and storage ... 13
SATA RAID set ... 176
SDL3 cables ... 311
SDL3 interface ... 149
SDL3 operation ... 148
  with SDL3 transmitter ... 148
SDL3 resolution ... 149
SDL cable ... 298
SDL cable with 45° male connector ... 301
SDL flex cables ... 304
SDL flex cable with extender ... 307
SDL resolution ... 53, 146
serial interface ... 134
serial number sticker ... 37
Slide-in compact drive ... 62
Slide-in compact slot ... 62
Slide-in drive ... 62, 63
Slide-in slot 1 ... 62
Slide-in slot 2 ... 63
Slots ... 48
software versions ... 267
spacing ... 168
Spacing for air circulation ... 168
Standards and guidelines ... 273
Start-up temperature of fans ... 28
Status LEDs ... 59
Supply voltage ... 30, 50, 170

T

Temperature monitoring..... 27
Temperature sensor positions..... 27
Temperature specifications..... 24

U

UL certification..... 274
Uninterruptible power supply..... 150
Upgrade
  BIOS..... 249
  Firmware..... 251
Upgrade information..... 249
UPS..... 150, 150
UPS connection cable..... 150, 163
UPS IF option..... 150
UPS installation..... 324
UPS interface..... 152, 154
USB 3.0..... 56
USB cables..... 314
USB flash drive..... 286
USB interfaces..... 56
USB media drive..... 288
user serial ID..... 267

V

Video signal..... 52, 54, 144, 145, 149

W

WES2009..... 263
WES7..... 259
Windows 7..... 256
Windows Embedded Standard 2009..... 263
Windows Embedded Standard 7..... 258
Windows XP Professional..... 261