KBox A-103

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▶   KBOX A-103 - USER GUIDE

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Kontron S&T AG

Lise-Meitner-Str. 3-5
86156 Augsburg
Germany
www.kontron.com

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Revision History

Revision	Brief Description of Changes	Date of Issue	Author/ Editor
1.0	Initial Issue	2016-Jan-27	MK
2.0	New Corporate Design; legal and safety information updated, BIOS chapter reworked, Linux note added, pin-out of GPIO header added, COM port configuration information added, errors corrected	2017-Aug-03	MK
3.0	CE Directives and Standards updated	2018-Sep-27	MK

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If you have any difficulties using this user guide, discover an error, or just want to provide some feedback, contact Kontron support. Detail any errors you find. We will correct the errors or problems as soon as possible and post the revised user guide on our website.

Symbols

The following symbols may be used in this user guide

⚠DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
NOTICE	NOTICE indicates a property damage message.
⚠CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
	Electric Shock! This symbol and title warn of hazards due to electrical shocks (> 60 V) when touching products or parts of products. Failure to observe the precautions indicated and/or prescribed by the law may endanger your life/health and/or result in damage to your material.
	ESD Sensitive Device! This symbol and title inform that the electronic boards and their components are sensitive to static electricity. Care must therefore be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.
	HOT Surface! Do NOT touch! Allow to cool before servicing.
	Laser! This symbol inform of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall review before servicing.
	This symbol indicates general information about the product and the user guide. This symbol also indicates detail information about the specific product configuration.
	This symbol precedes helpful hints and tips for daily use.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

As a precaution and in case of danger, the power connector must be easily accessible. The power connector is the product's main disconnect device.

⚠ **CAUTION**	**Warning**
	All operations on this product must be carried out by sufficiently skilled personnel only.

⚠ **CAUTION**	**Electric Shock!**
	Before installing a non hot-swappable Kontron product into a system always ensure that your mains power is switched off. This also applies to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair, and maintenance operations on this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing any work on this product.
	Earth ground connection to vehicle's chassis or a central grounding point shall remain connected. The earth ground cable shall be the last cable to be disconnected or the first cable to be connected when performing installation or removal procedures on this product.

Special Handling and Unpacking Instruction

NOTICE	**ESD Sensitive Device!**
	Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the product is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the product.

Lithium Battery Precautions

If your product is equipped with a lithium battery, take the following precautions when replacing the battery.

⚠ CAUTION	Danger of explosion if the battery is replaced incorrectly.
	▶ Replace only with same or equivalent battery type recommended by the manufacturer.
	▶ Dispose of used batteries according to the manufacturer's instructions.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the product, that are not explicitly approved by Kontron and described in this user guide or received from Kontron Support as a special handling instruction, will void your warranty.

This product should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This also applies to the operational temperature range of the specific board version that must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, only follow the instructions supplied by the present user guide.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the product then re-pack it in the same manner as it was delivered.

Special care is necessary when handling or unpacking the product. See Special Handling and Unpacking Instruction.

Quality and Environmental Management

Kontron aims to deliver reliable high-end products designed and built for quality, and aims to complying with environmental laws, regulations, and other environmentally oriented requirements. For more information regarding Kontron's quality and environmental responsibilities, visit http://www.kontron.com/about-kontron/corporate-responsibility/quality-management.

Disposal and Recycling

Kontron's products are manufactured to satisfy environmental protection requirements where possible. Many of the components used are capable of being recycled. Final disposal of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

WEEE Compliance

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

▶ Reduce waste arising from electrical and electronic equipment (EEE)

▶ Make producers of EEE responsible for the environmental impact of their products, especially when the product become waste

▶ Encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE

▶ Improve the environmental performance of all those involved during the lifecycle of EEE

	Environmental protection is a high priority with Kontron.
	Kontron follows the WEEE directive
	You are encouraged to return our products for proper disposal.

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1/ General Safety Instructions for IT Equipment

⚠WARNING

Please read this chapter carefully and take careful note of the instructions, which have been compiled for your safety and to ensure to apply in accordance with intended regulations. If the following general safety instructions are not observed, it could lead to injuries to the operator and/or damage of the product; in cases of nonobservance of the instructions Kontron is exempt from accident liability, this also applies during the warranty period.

The product has been built and tested according to the basic safety requirements for low voltage (LVD) applications and has left the manufacturer in safety-related, flawless condition. To maintain this condition and also to ensure safe operation, the operator must not only observe the correct operating conditions for the product but also the following general safety instructions:

▶ The product must be used as specified in the product documentation, in which the instructions for safety for the product and for the operator are described. These contain guidelines for setting up, installation and assembly, maintenance, transport or storage.

▶ The on-site electrical installation must meet the requirements of the country's specific local regulations.

▶ If a power cable comes with the product, only this cable should be used. Do not use an extension cable to connect the product.

▶ To guarantee that sufficient air circulation is available to cool the product, please ensure that the ventilation openings are not covered or blocked. If an air filter is provided, this should be cleaned regularly. Do not place the system close to heat sources or damp places. Make sure the system is well ventilated.

▶ Only devices or parts which fulfill the requirements of SELV circuits (Safety Extra Low Voltage) as stipulated by IEC 60950-1 may be connected to the available interfaces.

▶ Before opening the device, make sure that the device is disconnected from the mains.

▶ Switching off the device by its power button does not disconnect it from the mains. Complete disconnection is only possible if the power cable is removed from the wall plug or from the device. Ensure that there is free and easy access to enable disconnection.

▶ The device may only be opened for the insertion or removal of add-on cards (depending on the configuration of the system). This may only be carried out by qualified operators.

▶ If extensions are being carried out, the following must be observed:

  ▶ All effective legal regulations and all technical data are adhered to.
  ▶ The power consumption of any add-on card does not exceed the specified limitations.
  ▶ The current consumption of the system does not exceed the value stated on the product label.

▶ Only original accessories that have been approved by Kontron can be used.

▶ Please note: safe operation is no longer possible when any of the following applies:

  ▶ The device has visible damages.
  ▶ The device is no longer functioning.

  In this case the device must be switched off and it must be ensured that the device can no longer be operated.

Additional safety instructions for DC power supply circuits

▶ To guarantee safe operation of devices with DC power supply voltages larger than 60 volts DC or a power consumption larger than 240 VA, please observe that:

  ▶ the device is set up, installed and operated in a room or enclosure marked with "RESTRICTED ACCESS", if there are no safety messages on product as safety signs and labels on the device itself.

  ▶ no cables or parts without insulation in electrical circuits with dangerous voltage or power should be touched directly or indirectly

  ▶ a reliable protective earthing connection is provided

  ▶ a suitable, easily accessible disconnecting device is used in the application (e.g. overcurrent protective device), if the device itself is not disconnectable

  ▶ a disconnect device, if provided in or as part of the equipment, shall disconnect both poles simultaneously

  ▶ interconnecting power circuits of different devices cause no electrical hazards

▶ A sufficient dimensioning of the power cable wires must be selected – according to the maximum electrical specifications on the product label – as stipulated by EN60950-1 or VDE0100 or EN60204 or UL508 regulations.

▶ The devices do not generally fulfill the requirements for "centralized DC power systems" (UL 60950-1, Annex NAB; D2) and therefore may not be connected to such devices!

1.1. Electrostatic Discharge (ESD)

A sudden discharge of electrostatic electricity can destroy static-sensitive devices or micro-circuitry.

Therefore proper packaging and grounding techniques are necessary precautions to prevent damage. Always take the following precautions:

1. Transport boards in ESD-safe containers such as boxes or bags.

2. Keep electrostatic sensitive parts in their containers until they arrive at the ESD-safe workplace.

3. Always be properly grounded when touching a sensitive board, component, or assembly.

4. Store electrostatic-sensitive boards in protective packaging or on antistatic mats.

1.1.1. Grounding Methods

By adhering to the guidelines below, electrostatic damage to the device can be avoided:

1. Cover workstations with approved antistatic material. Always wear a wrist strap connected to workplace. Always use properly grounded tools and equipment.

2. Use antistatic mats, heel straps, or air ionizers for more protection.

3. Always handle electrostatically sensitive components by their edge or by their casing.

4. Avoid contact with pins, leads, or circuitry.

5. Turn off power and input signals before inserting and removing connectors or connecting test equipment.

6. Keep work area free of non-conductive materials such as ordinary plastic assembly aids and Styrofoam.

7. Use only field service tools which are conductive, such as cutters, screwdrivers, and vacuum cleaners.

8. Always place drives and boards PCB-assembly-side down on the foam.

1.2. Instructions for the optional Lithium Battery

If ordered, your KBox A-103 is equipped with an optional lithium battery. For the replacement of this battery please observe the instructions described in section 5.1.9 "Replacing the optional Lithium Battery".

⚠WARNING Danger of explosion when replacing with wrong type of battery. Replace only with the same or equivalent type recommended by the manufacturer. The lithium battery type must be UL recognized.

Do not dispose of lithium batteries in general trash collection. Dispose of the battery according to the local regulations dealing with the disposal of these special materials, (e.g. to the collecting points for dispose of batteries).

2/ Electromagnetic Compatibility

For detailed information refer to section 10.3 "CE Directives and Standards".

2.1. Electromagnetic Compatibility (EU)

This product is intended only for use in industrial areas. The most recent version of the EMC guidelines (EMC Directive 2014/30/EU) and/or the German EMC laws apply. If the user modifies and/or adds to the equipment (e.g. installation of add-on cards) the prerequisites for the CE conformity declaration (safety requirements) may no longer apply.

Warning!

This is a class A product. In domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

⚠WARNING	This is a class A product. In domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

2.2. FCC Statement (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2.3. 5.3. EMC Compliance (Canada)

The method of compliance is self-declaration to Canadian standard ICES-003:

(English): This Class A digital apparatus complies with the Canadian ICES-003.

(French): Cet appareil numérique de la class A est conforme à la norme NMB-003 du Canada.

3/ Shipment and Unpacking

Please check that your package is complete, and contains the items below (according to the ordered unit configuration). If you discover damaged or missing items, please contact your dealer.

3.1. Unpacking

Proceed as follows to unpack the unit:
1. Remove packaging.

2. Do not discard the original packaging. Keep it for future relocation.

3. Check the delivery for completeness by comparing it with your order.

4. Please keep the associated paperwork. It contains important information for handling the unit.

5. Check the contents for visible shipping damage.

6. If you notice any shipping damage or inconsistencies between the contents and your order, please contact Kontron for help and information.

3.2. Scope of Delivery

3.2.1. Standard

▶ KBox A-103 (corresponding to the ordered system configuration)
▶ POWER-SUBCON PSC 1,5/ 3-F, 3-pin plug
▶ General Safety Instructions for IT Equipment

3.2.2. Optional Parts

▶ internal 2.5" SATA SSD
▶ mSATA (MO-300) card
▶ Mini PCIe cards
▶ Two brackets for wall/table mounting
▶ Vertical mounting plate for control cabinet mounting
▶ DIN rail mounting clip
▶ Rubber feet (self-adhesive)

3.2.3. Optional System Extension

▶ COM 2: configured as RS232 or RS422/RS485 via adapter module
▶ COM 3: configured as RS422/RS485
▶ Fieldbus: PROFIBUS via mPCIe module
▶ WiFi: via mPCIe module
▶ GPIO: via adapter cable

3.3. Type Label and Product Identification

The type label (product name, serial number) of your KBox A-103 system are located on the access cover of the device (refer to Figure 1 and Figure 14 pos. 1).

Figure 1: Type Label

4/ System Overview

The KBox A-103 expands the Kontron line of computers - KBox Series. It is a highly scalable and flexible industrial computer. The scalability performance is achieved through the use of the Computer-on-Module SMARC-sXBTi. This is based on Intel's Bay Trail platform and is available in different variants.

> **i▶** Refer to the information and technical data in the user manual of the installed SMARC-sXBTi Module.
>
> The user's manual of the installed SMARC-sXBTi Module can be downloaded from our web page http://www.kontron.com . Search for the name of the installed module.

The KBox A-103 hardware system configuration and the robust construction with excellent mechanical stability offer the superior qualities of a computer designed for operation in harsh industrial environment. It is a fanless system with a compact U-shaped aluminum chassis with cooling fins. The systems hardware configuration depends also on installation position of the KBox A-103 (refer to subsection 4.7.1 and 4.7.2).

The rated voltage of the mains (+24VDC) can be found on the type label. The type label is located at the bottom side of the device. The KBox A-103 may be optionally factory-equipped with an mPCIe WLAN card for three antennas or a mPCIe card for FIELDBUS communication. As storage media for your KBox A-103 system, you may choose the implementation of a 2.5" SSD (Solid State Drive) or/and of an mSATA SSD card. Further information about the configuration of the KBox A-103 can be found on our web site www.kontron.com by selecting the product.

The KBox A-103 offers maintenance-free operation. That means it operates without battery, fans and rotating storage device (HDD's). The system flexibility is a result of the basic design concept of the KBox A-103:

▶ by use of a prime carrier board which provides the SMARC-sXBTi (SXVV) module and a set of standard IO interfacing

▶ a comprehensive set of optionally available IOs and devices.

The following interfaces are available with the KBox A-103:

Standard front panel:

▶ 24VDC input power (X101)

▶ 2x Gigabit Ethernet (X102, X103)

▶ 1x USB 3.0 (X105)

▶ 2x USB 2.0 (X107, X108)

▶ DisplayPort (X109)

▶ COM 1 (X110)

▶ COM 2 (X204), optional

▶ COM 3 (X206), optional

▶ Fieldbus (X205), optional

▶ VGA (X207)

▶ Power button PWR and power LED

▶ SSD or/and mSATA drive status LED

Standard baseboard and system expansion capabilities:

▶ 1x SATA connector (J16) and SATA power connector (J12)

▶ 1x mSATA (J17)

▶ 2x mPCIe (one for FIELDBUS expansion (J27 slot) and the second one for WLAN expansion (J37 slot)

▶ 1x SIM card socket (J40) only with the corresponding mPCIe card installed in the onboard J37 slot.

▶ 1x GPIO connector on the rear side of the system

The device is designed to be operated in:

▶ Vertical position: (KBox A-103 configuration with vertical mounting plate) mounted inside a control cabinet or

▶ Vertical/horizontal: wall mounted (KBox A-103 configuration with wall mounting brackets) or

▶ Horizontal position: KBox A-103 as desktop unit (equipped with the supplied rubber feet) or

▶ Vertical/horizontal: KBox A-103 DIN Rail mounting (with DIN Rail mounting clip)

NOTICE	When powering on the KBox A-103, make sure that the cooling fins of the chassis (Figure 15, Figure 16 and Figure 17, pos. 6) are not obstructed (covered) by any objects.
	To provide sufficient heat dissipation by the cooling of the device, do not cover the cooling fins of the
	KBox A-103. Do not place any objects on the device. When installing the system, please note the clearance recommendation in the section 7.1 "System Mounting".

i	Please observe that the expansion of your system with an mPCIe WLAN card (and the corresponding antennas) and/or GPIO port, allows you to use the KBox A-103 only as desktop unit or equipped with brackets for vertical/horizontal wall/table mounting.
	The KBox A-103 equipped with an mPCIe WLAN card with the corresponding antennas and/or GPIO port is not possible to operate vertical mounting in a control cabinet.

4.1. RTC
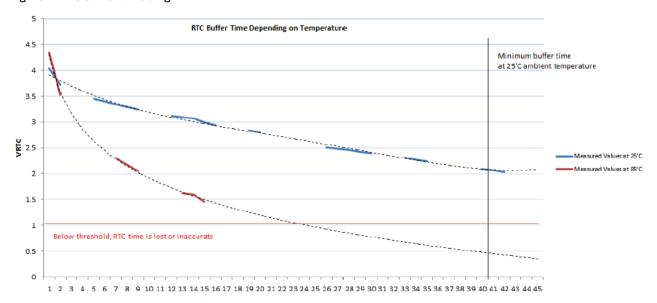
The KBox A-103 comprises a chipset external RTC. This RTC is connected to the SMBus of the processor module. A RTC of type RV-8564 or compatible is used. To provide a valid date and time when no power is connected to the KBox A-103, the RTC is equipped with a goldcap buffer.

4.1.1. RTC Buffer Time

The RTC buffer time is depending of the ambient temperature.

If the time is not valid this is indicated by a status bit in the RTC registers. For details see the RV-8564 application manual.

Figure 2: RTC buffer time diagram

> To get the maximum buffer time it is necessary to have the system a certain time powered on. This ensures that the buffer capacitors are fully loaded.
>
> The buffer time depends on the ambient temperature and on how long the box is connected to its power supply.

4.1.2. Setting the RTC

During startup, the uEFI performs a comparison of chipset clock and external RTC and sets the chipset clock accordingly if the RTC time is valid. Further it is possible to set the time manually by accessing the RTC over the SMBus.

4.2. 7.2. System Expansion Capabilities

4.2.1. System Expansion via SATA Interface

The baseboard comes with an onboard SATA interface connector and corresponding power connector (Figure 23, pos. 19 and pos. 20). You can expand your KBox A-103 with a 2.5" SATA SSD drive.

4.2.2. System Expansion via mSATA Interface

The baseboard comes with an onboard mSATA interface connector (Figure 23, pos. 17). You can expand your KBox A-103 with an mSATA SSD drive.

4.2.3. System Expansion via Mini PCI Express® (mPCIe) Card Interfaces (with SIM card socket)

There are two mPCIe interfaces (J27 and J37) on the baseboard of the KBox A-103 (Figure 23, pos. 11 and pos. 16). These interface connectors are intended to be used for the system expansion as follows:

▶ J27: to install an mPCIe PROFIBUS card (Figure 23, pos. 11)

▶ J37: to install an mPCIe WLAN card or an mPCIe modem adapter card (Figure 23, pos. 16) for the onboard SIM card reader socket (Figure 23, pos. 6).

> **i** If a customer requires one of these system expansions or both, it must be so stipulated when ordering, as the device must be installed at the factory.

> **i** If an mPCIe WLAN card is installed into your KBox A-103, the SIM card slot is not functional.

4.2.3.1. System Expansion via SIM Socket

The baseboard comes with an onboard socket for a SIM card (Figure 23, pos. 6).

In order to use the SIM card reader functionality, a corresponding mPCIe modem card must be installed to the mPCIe slot (Figure 23, pos. 16) of your KBox A-103.

> **i** If an mPCIe modem adapter card (and SIM card) is installed into your KBox A-103, the WLAN function is no longer usable.

Figure 3: Bottom side view

Figure 4: Right side view

Figure 5: Front side view config. with vertical mounting plate

Figure 6: Left side view

Figure 7: Top side view

Figure 8: Rear side view
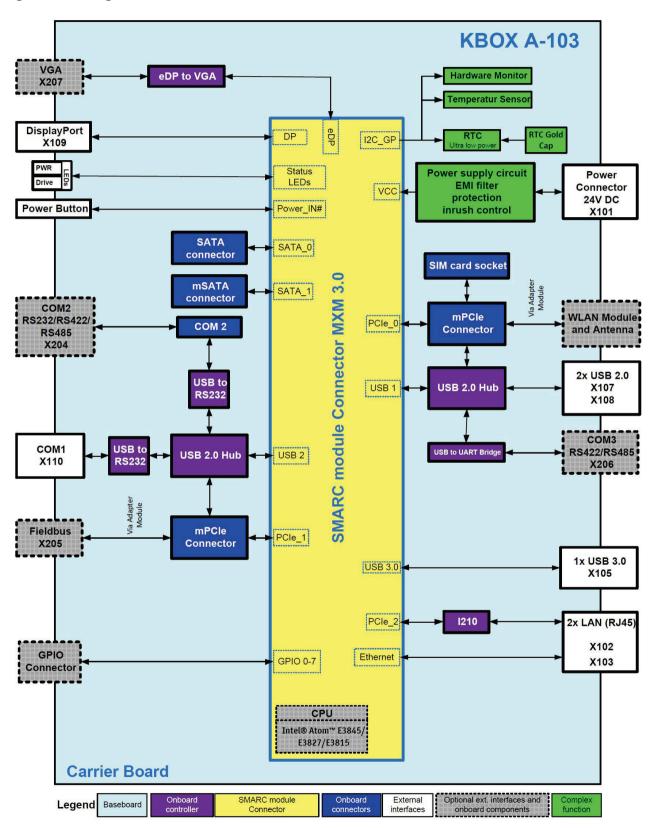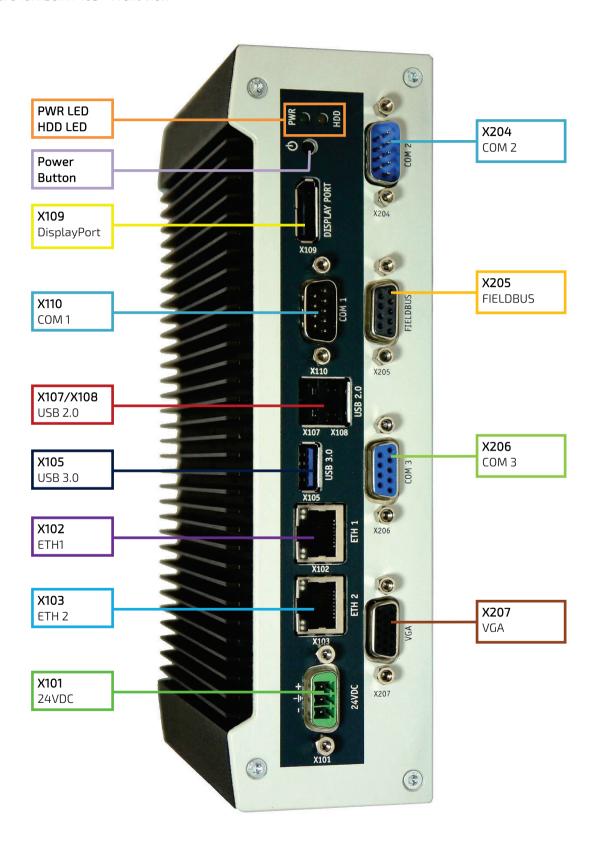
4.3. Block Diagram of the KBox A-103

Figure 9: Block Diagram of the KBox A-103

4.4. Front Side

Figure 10: KBox A-103 – Front View
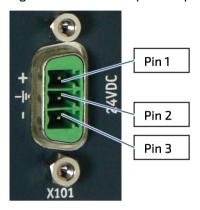
4.4.1. X101 - Power Input Connector

The 3-pin connector (X101, Figure 10) provides the power connection of the KBox A-103 to the appropriate DC main power supply. For pin assignments refer to the subsection 11.1.1.

The external cable connector is a Phoenix PSC 1,5/ 3-M, 3-pin plug with an SCT-D-SUB 9-KG housing. This power plug is delivered along with the KBox A-103. Please observe the section 8.1 "Connecting to DC Main Power Supply". The mating connector is a Phoenix PSC 1,5/ 3-F connector.

Figure 11: X101 - 24VDC power input connector

Pin	Signal Name
1	+24 VDC (input)
2	Functional Earth
3	0V (input)

4.4.2. 7.4.2. Controls and LED Indicators

Figure 12: Detail - Power button and PWR LED and HDD LED

1 Power button

2 Power LED (PWR), green

3 HDD LED, yellow

Power Button	Press this button (Figure 10) to turn the system on or off. Please observe the setting options for the power button in the BIOS-Setup.
Power LED (green)	The power LED (marked PWR, Figure 10 and Figure 12, pos. 2) lights up green if the system powered on. **Prerequisite:** The system must be attached by means of the power cord to an appropriate mains (DC).
HDD Activity LED (yellow)	The HDD LED (marked HDD, Figure 10 and Figure 12, pos. 3) indicates hard disk (SSD/mSATA) activity.

⚠ WARNING Even when the system is turned off via the power button there is still a standby voltage on the baseboard. The unit is only completely disconnected from the DC mains, when the power is removed.

4.4.3. X102/X103 - Ethernet Connectors (ETH)

These connectors (X102 as ETH 1 and X103 as ETH 2, Figure 10) are Gigabit Ethernet 10/100/1000 Mbit/s, IEEE 1588 capable interfaces. The connectors are standard 8-pin RJ45 type connectors with status LEDs:

▶ Activity/link: green = link up; green blinking = activity.

▶ Speed: off, green, yellow (10/100/1000 MBit/s).

For pin assignment refer to subsection 11.1.2.

4.4.4. X105 - USB 3.0

The KBox A-103 provides one USB 3.0/2.0 interface. This connector (X105, Figure 10) allows connection of USB 3.0 or USB 2.0 compatible device to the system. For pin assignment refer to subsection 11.1.3.

4.4.5. X107/X108 - USB 2.0

The KBox A-103 provides two USB 2.0/1.1 interfaces. These connectors (X107/X108, Figure 10) allow connection of USB-compatible devices to the system. For pin assignment refer to subsection 11.1.4.

4.4.6. X109 - DisplayPort

This is a DisplayPort compliant interface realized using a standard DisplayPort connector. An external (digital) display can be connected to the DisplayPort connector (X109, Figure 10). For pin assignment refer to subsection 11.1.5.

> **i** As the SMARC module does not support DP++ (dual-mode DisplayPort) only active converter cables can be used together with the KBox A-103. Active adapters use additional chips to make the conversion inside the adapter, regardless of whether the source supports DP++.

4.4.7. X110 – Serial Port COM 1

This interface (X110, Figure 10) is provided as a 9-pin D-SUB connector; it is RS232 configured and allows the connection of a serial peripheral. For pin assignment refer to subsection 11.1.6.

4.4.8. X204 - Serial Port COM 2 (Option)

This interface (X204, Figure 10) is provided as a 9-pin D-SUB and allows the connection of a serial peripheral. It is designed to support RS232 serial communication or can be factory configured for RS422/RS485 serial communication via an adapter module. The RS422/RS485 modes can be configured via an on-board DIP switch (SW1) on the RS422/485 adapter.

For configuration of COM 2 refer to 5.1.2 "Serial Port COM2 (X204) Configuration for RS422 or RS485 via DIP Switches".

For pin assignment of COM 2 refer to the chapters 11.1.7 to 11.1.10.

> **i** In RS-422/485 mode, the termination of this port is configurable via DIP switch (see chapter 5.1.2, "Serial Port COM2 (X204) Configuration for RS422 or RS485 via DIP Switches").

4.4.9. X206 - Serial Port COM 3 (Option)

This interface (X206, Figure 10) is provided as a 9-pin D-SUB (female) and allows the connection of a serial peripheral. It is designed to support RS422/RS485 serial communication and can be configured via onboard jumper J46 (Figure 23, pos. 3). The serial onboard header for COM 3 is J44 (Figure 23, pos. 5).

For configuration of COM 3 refer to 5.1.3 "Serial Port COM 3 (X206) Configuration of the Serial Port COM 3".

For pin assignment of COM3 refer to the chapters 11.1.11 to 11.1.3.

> This port has no internal termination. If necessary, it has to be terminated externally.

4.4.10. X205 - FIELDBUS Interface (Option)

Figure 13: X205 - Optional FIELDBUS interface

The optional interface (FIELDBUS) on the front side of the KBox A-103 (X205, Figure 10) must be ordered separately.

To expand KBox A-103 with an interface for FIELDBUS communication, the FIELDBUS additional card will be installed always into the second mPCIe slot on the bottom of the baseboard. This connection can be implemented at factory only.

4.4.11. X207 - VGA Interface Connector

An external (analog) monitor can be plugged into this interface (X207, Figure 10). The VGA port is provided as a 15-pin D-SUB socket.

For pin assignment of the VGA interface refer to the chapter 11.1.14.
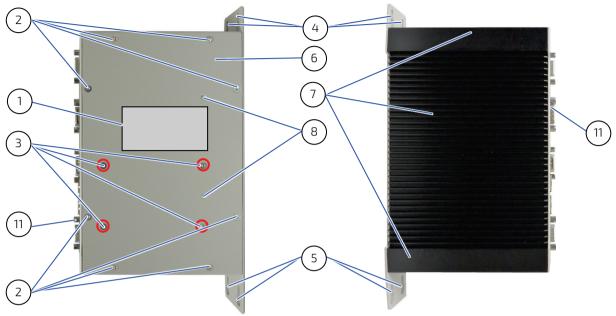
> VGA Hot Plug works on Windows and Linux installation which have an appropriate driver installed. However, VGA Hot Plug does not work on the EFI shell, DOS or BIOS Setup.
>
> Hot Removal and Re-Connect of a VGA display always works on BIOS Setup, EFI shell, DOS regardless
> of the OS Version, provided the VGA display is connected during power up of the KBox.

4.5. Left and Right Side View

Figure 14: Right side of the KBox A-103 system   Figure 15: Left side of the KBox A-103 system

1	Type label	6	Access cover
2	8x torx screws (3x8) that secure the access cover	7	Cooling fins on the left side of the U-shaped chassis
3	Screws that secure the internal 2.5" SSD	8	Threaded holes for mounting the DIN rail mounting clip
4	Upper side of the mounting plate with key holes	9	Cooling fins on the top side of the U-shaped chassis
5	Lower side of the mounting plate with M4 functional earth stud and key holes	10	Cooling fins on the bottom side of the U-shaped chassis
		11	Interface side
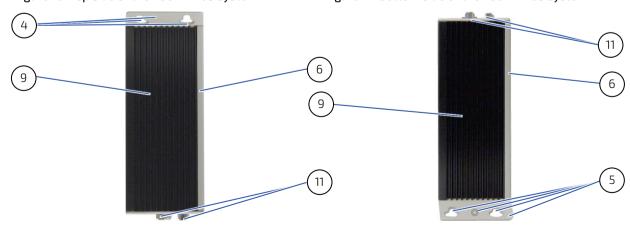
NOTICE   Please don't loosen or remove the screws (Figure 14, pos. 3) that secure the internal SSD drive.

4.6. Top and Bottom Side View

Figure 16: Top side of the KBox A-103 system   Figure 17: Bottom side of the KBox A-103 system

NOTICE   To provide sufficient heat dissipation for the cooling of the KBox A-103 platform, never cover the cooling fins of the chassis. Do not place any objects onto the device.
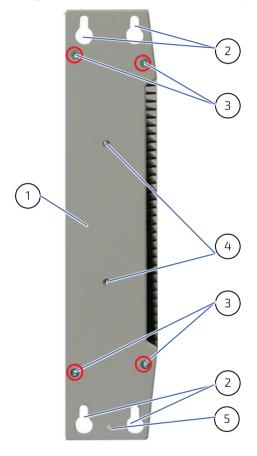
4.7. Rear Side View

4.7.1. Rear Side View of the KBox A-103 with Vertical Mounting Bracket

The KBox A-103 is designed for wall mounting, in vertical position inside of a control cabinet.

Please observe the mounting instructions included in the section 7/ "Installation Instructions", and the outline dimensions in the subsection 10.1.2 "Mechanical Specifications of the KBox A-103 with Vertical Mounting Plate".

Figure 18: Rear side of the KBox A-103 system with vertical mounting plate

1   Vertical mounting plate
2   Key holes on the mounting plate
3   Screws that secure the mounting plate to the chassis of the KBox A-103
4   Tapped holes for assembling the optional DIN Rail mounting clip
5   Functional earth stud (it is only available in the KBox A-103 with vertical mounting plate)

4.7.1.1. Functional Earth Stud

There is an M4 functional earth terminal on the lower side of the vertical mounting plate of the KBox A-103 (Figure 18, pos. 5). This terminal must be connected as required.

NOTICE	The KBox A-103 with the earth stud that is marked with a "Functional Earth" symbol (Figure 18) has to be grounded to an appropriate "common earth" connection point.
i	The earth stud (Figure 18, pos. 5) is available only on the vertical mounting plate of the KBox A-103.
i	The KBox A-103 with vertical mounting plate (Figure 18) can't be extended with the WLAN option and/or the GPIO option (refer to subsection 4.7.4 and 4.7.5).

4.7.2. Rear Side View of the KBox A-103 as Desktop Unit or with Wallmount Bracket

Depending on the ordered system configuration, the KBox A-103 (desktop unit or with horizontal/vertical wallmount brackets) can be equipped with the WLAN option with 3 antennas and/or with the GPIO option (Figure 20). If no options were ordered the location for the WLAN antennas and for the GPIO-port are corresponding covered as shown in Figure 19, pos. 1 and pos. 4.

Figure 19: Rear side of the KBox A-103 without optional WLAN and GPIO (shown as desktop unit)
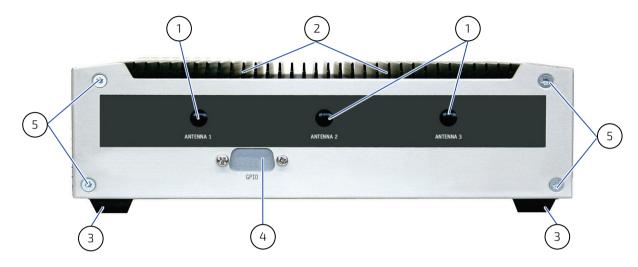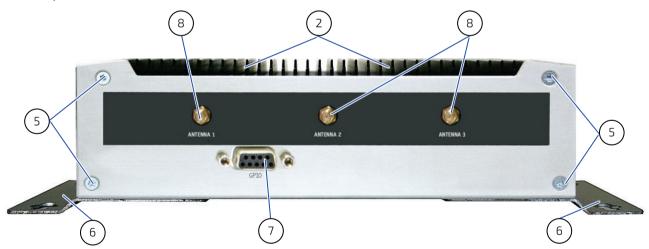
Figure 20: Rear side of the KBox A-103 with optional WLAN and GPIO (shown with vertical/horizontal mounting brackets)

1	Covered cutout for the Reverse (RP) SMA connector of the WLAN antennas (mPCIe WLAN card with 3 antennas is an option)
2	Cooling fins on the top side of the chassis
3	Rubber feet
4	Not installed GPIO interface (option)

5	Countersunk screws M3x8 ISO14581 torx
6	Wall/table mount brackets with key holes (left and right) for horizontal or vertical (with interface sides downwards or upwards) mounting position
7	Installed GPIO option
8	Reverse (RP) SMA connectors for the WLAN antennas

4.7.3. DIN Rail Clip (Option)

For DIN Rail mounting of the KBox A-103, may be ordered a DIN Rail clip (refer to subsection 3.2.2 "Optional Parts").
If ordered, you can adopt your system for mounting to a DIN Rail. On the vertical mounting plate (Figure 18, pos. 4) and on the access cover (Figure 14, pos. 8) are provided tapped holes for mounting the optional DIN Rail clip (Figure 21).

Figure 21: DIN rail clip

4.7.4. WiFi/WLAN (Option)

> **i** Please observe that the KBox A-103 with vertical mounting plate (Figure 18) can't be extended with the WLAN option.

Depending on the ordered system configuration, the KBox A-103 system (only KBox A-103 used as desktop or KBox A-103 with vertical/horizontal wallmount brackets or with DIN Rail clip) can be equipped with WiFi hardware. If you have ordered a system configuration including WLAN, at the rear side, two Reverse (RP) SMA-connectors (Figure 20, pos.8) for screwing on the provided WLAN antenna are installed.

4.7.4.1. WLAN/WiFi Antenna

During the installation of the KBox A-103 the provided system antennas (Figure 22) will be screwed onto the RP SMA connectors (Figure 20, pos.8) of the system. The antennas may be tilted and rotated in the appropriate positions to get the optimal transmission and reception quality.

Figure 22: WLAN (WiFi) antenna

| 1 | Reverse (RP) SMA antenna connector |
| 2 | Hinge for positioning the antenna |

4.7.5. GPIO Interface (Option)
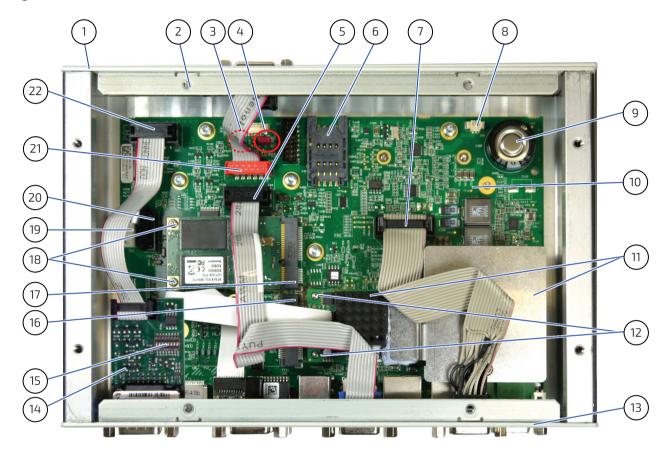
> **i** The KBox A-103 with vertical mounting plate (Figure 18) can't be extended with the GPIO option.

Optionally, the KBox A-103 may be equipped with via an internal factory mounted GPIO adapter (**G**eneral **P**urpose **I**nput/**O**utput) interface. Peripheral devices can be controlled freely programmable via this interface, which consists of a 9-pin D-SUB connector interface (Figure 20, pos. 7). The GPIOs can be controlled via the KEAPI (Kontron Embedded API), which is part of the official Board Support Package.

4.8. Internal View

Figure 23: KBox A-103 - internal view (without cover)

1 Rear Panel	12 Screws that secure the mPCIe card for PROFIBUS
2 Tapped holes for cover mounting (8x)	13 Interface side
3 Jumper J46 to configure COM 3	14 RS422/RS485 adapter module (COM 2)
4 BIOS recovery jumper J49 (default setting is OFF)	15 DIP switch of the RS422/RS485 (COM 2) adapter module
5 Onboard header (J44) for COM 3 (X206) serial port (configurable as RS422/RS485 by jumper J46)	16 mPCIe slot (J37 onboard)
6 SIM card socket	17 mSATA slot (J17 onboard)
7 Onboard VGA header (J52)	18 Screws that secure the mSATA SSD
8 Onboard header for optional lithium battery	19 Connector for power cable of the 2.5" SSD/HDD
9 Gold cap (for RTC)	20 Connector for data cable of the 2.5" SSD/HDD
10 Baseboard of the KBox A-103	21 Onboard header (J34) for GPIO port
11 mPCIe card with heat sink of the PROFIBUS card (always only factory installed into J27 onboard mPCIe slot)	22 Onboard header (J42) for COM 2 serial port (configurable as RS232 by cable or RS422/RS485 via adapter card; in Figure 23 shown with connection to the installed adapter card)

> **i** The KBox A-103 provides two internal mPCIe slots (J27 and J37). The onboard slot J27 is used for installation of the the mPCIe card for PROFIBUS (Figure 23, pos. 11). This PCIe slot J27 of the baseboard can be fitted only at the factory with a PROFIBUS expansion card.

4.8.1. Integrated SMARC-sXBTi Module

Your KBox A-103 accommodates a baseboard with an SMARC-sXBTi module. It is located on the bottom side of the baseboard and is not accessible for the user.

> **i** Refer to the information and technical data in the user manual of the installed SMARC-sXBTi module.
>
> The user's manual of the installed SMARC-sXBTi can be downloaded from our web page www.kontron.com . Search for the name of the installed board.

4.8.2. SATA Interface

Depending on the system configuration ordered your KBox A-103 can be extended with a 2.5" SATA SSD. It is located on the inside of the access cover (refer Figure 25 pos. 4).

4.8.3. mSATA Socket

Depending on the system configuration ordered your KBox A-103 can be extended with an mSATA SSD.

For installation/removing of the mSATA SSD, refer to the subsection 5.1.6, "Installing an mSATA SSD".

4.8.4. Expansion Slots for mPCIe Cards

Depending on the system configuration ordered your KBox A-103 can be extended with up to two mPCIe cards.

> **i** The KBox A-103 provides two internal mPCIe slots (J27 and J37). The J27 slot is used for installation of the the mPCIe card for PROFIBUS (Figure 23, pos. 8) and can be only at the factory fitted with aPROFIBUS expansion card.
>
> The J37 slot (Figure 23, pos. 16) can be used for the installation of a mPCIe WLAN card or an mPCIe modem adapter card (which uses the onboard SIM card reader socket).

For installation of an mPCIe card into an mPCIe slot please refer to the subsection 5.1.5 "Installing an mPCIe Mini Card".

> **i** If an mPCIe WLAN card is installed into your KBox A-103, the SIM card slot is not functional.

4.8.4.1. SIM Card

The baseboard of the KBox A-103 is equipped with a SIM card socket (Figure 23, pos. 6).

> **i** To avoid damage to the SIM card, insert the SIM card before you turn the power on and remove the SIM card after you turn the power off.

5/ Accessing internal Components

This section contains important information that you must read before accessing the internal components. You must follow these procedures properly when installing, removing or handling any board.

It is recommended to expand your system with additional mPCIe Mini cards before it is installed into an industrial control cabinet. Please consider following instruction when you install (or remove) expansion cards.

Before installing/removing an add-on card, please pay attention to the following information:

⚠ CAUTION	Please observe the "General Safety Instructions for IT-Equipment" provided with the system (refer to the chapter 1/) and the installation instructions in this manual.
	Only personnel with appropriate qualifications, trainings and authorization are permitted to install and work with the KBox A-103.
	The installation/removal of SSD and/or expansion cards may only be performed by a qualified person, according to the description in this manual.
	Before removing the cover of the device, make sure that the device is turned off and disconnected from the power supply.
	Before you upgrade the KBox A-103 with add-on cards, pay attention to the power specifications in chapter 10/ "Technical Specifications" and make sure that the power consumption of the add-on cards does not exceed 5 W per card.

Please follow the safety instructions for components that are sensitive to electrostatic discharge (ESD). Failure to observe this warning notice may result in damage to the device or the latter's components.

Please pay attention to the manufacturer's instructions before installing/removing an add-on card.

5.1. Opening and Closing the KBox A-103
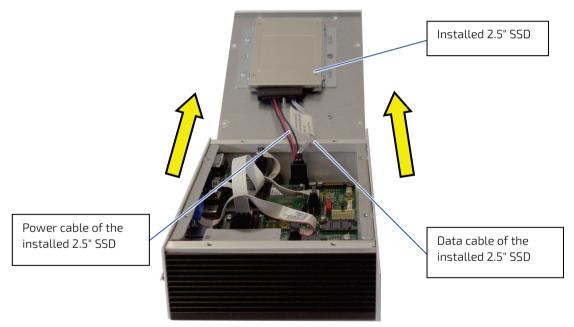
> **⚠ CAUTION**
>
> Before opening the KBox A-103, the system must be switched off and disconnected from the main power supply. Also, disconnect all peripheral devices from the KBox A-103. Before you begin, ensure that you have a clean, flat and ESD-safe surface to work on.

For opening and closing the KBox A-103, please perform the following steps:

1. Close all applications. Shut down the system properly and disconnect the connection to the main power source. Disconnect all peripherals.

2. The KBox A-103 should lay on a flat, clean surface with the access cover (Figure 14, pos. 6) facing upwards.

3. Loosen and remove the eight torx screws (Figure 14, pos. 2), that secure the access cover to the chassis. Retain the screws for later use.

4. Lift the access cover up as shown in the picture below (Figure 24). In order to remove the access cover you have to disconnect the cables of the SSD drive and of the optional lithium battery, if available (refer to Figure 25, pos. 2, pos. 10 and pos. 11).

Figure 24: Opening the access cover of the KBox A-103

5. Now you have access to the internal SIM, mPCIe and mSATA slots or cards, respectively SSD in order to remove or install hardware components. Also you can configure according to your requirements the serial ports COM 2 (X204) and COM 3 (X206).

6. For closing replace carefully power and data cables of the SSD (if installed) and the access cover to the system and screw it on with the retained screws.

7. Tighten the retained screws when the cover is firmly in place.

> **NOTICE**
>
> When used as intended, the KBox A-103 is to operate only in closed condition.
>
> Only when the access cover (Figure 25) is properly fixed with the screws (Figure 14, pos. 2) and the rear side with GPIO-port and/or WLAN antennas (available on KBox A-103 as desktop unit or equipped with horizontal/vertical wallmount brackets, refer to Figure 19 and Figure 20) are properly installed and secured with the screws (Figure 19 and Figure 20, pos. 5), it is ensured that the user does not have access to the internal parts of the KBox A-103.

5.1.1. Access Cover

The cover (Figure 14, Fig. 6) of the KBox A-103 is the access side of the internal components.

Figure 25: Inside of the access cover

1. Inside of the top cover

2. Power connector for 2.5" SSD drive

3. Holes for assembling the cover to the chassis (8x)

4. 2.5" SSD drive

5. Screws that secure the 2.5" SSD to the drive mounting brackets

6. Mounting brackets for fixing the 2.5" SSD drive to the internal side of the KBox A-103 cover

7. Countersunk screws M3x8 ISO14581 torx for assembling the drive mounting brackets to the cover

8. Threaded holes for mounting the DIN rail mounting clip

9. Optional lithium battery

10. Connector of the optional lithium battery

11. Connector of the data cable of the 2.5" SSD drive

5.1.2. Serial Port COM2 (X204) Configuration for RS422 or RS485 via DIP Switches

The serial port COM 2 is connected to J42 on the motherboard. It can be configured for RS232 (without any configuration) or for RS422 or RS485 serial communication (with an external module at the rear side of the COM connector) via an on-board DIP switch (SW1). For pin assignment refer to subsection 11.1.7 to 11.1.10.

In order to change the factory configuration of the RS422/RS485 port [factory settings: refer to the grey highlighted settings of the SW1 (DIP1-DIP8) (Figure 27, Table 1, Table 2 and Table 3)] proceed as follows:

> **NOTICE** The new port configuration has to be set before the system is installed onto a table, wall or into an industrial cabinet. The system must be disconnected from the power source. Disconnect all peripherals. Before you begin, ensure that you have a clean, flat and ESD-safe surface to work on.

1. Open the KBox A-103 as described in the section 5.1 "Opening and Closing the KBox A-103", steps 1 to 4.

2. Locate the DIP switches in the unit (refer to Figure 23, pos. 15 and Figure 26).

3. By use of an insulated thin tool (e. g. screwdriver or a stylus) set the DIP switches to the up (for ON) or down (for OFF) position corresponding the needed port configuration; refer to (Figure 27, Table 1, Table 2 and Table 3).

Figure 26: DIP1-DIP8 switches (shown with factory settings)

DIP Switches (DIP1–DIP3) in OFF position (factory settings)
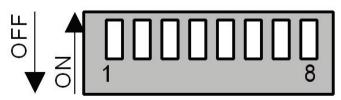
DIP Switches (DIP4-DIP8) in ON position (factory settings)

The optional settings (SW1) for RS485 mode communication allow the system's operation either in full duplex mode or in half duplex mode (see tables on the next page). While running in RS485 half-duplex mode the system stays permanently in a receiver mode. The switch to transmission mode will be done automatically. The user can determine if the automatic mode switch to transmission mode should be triggered by the RTS-line or should be triggered by the last sent message using the TxD line.

If triggered by RTS has been selected, then the RTS-signal must be activated by the application software before transmission of the data packets starts; and RTS signal has to be disabled again after termination of data transmission.

If TxD line will be used for the mode transceiver switch process, the receiver device has to follow a timeout before starting to send any data.

Figure 27: DIP-Switch (SW1) with DP1 to DP8 for RS422/RS485 serial communication settings (for COM 2)

In order to configure this external interface for serial communication (as RS422 or RS485) corresponding to your requirements, set the switches of the DIP switch (SW1) to "ON" or "OFF" (factory settings are in bold letters). For accessing the DIP switch refer to the procedure described in the chapter 5.1 "Opening and Closing the KBox A-103".

Table 1: DIP1, DIP2 and DIP3 settings for serial communication type

X204: Serial Communication Type	Transmitting<->receiving	SW1 Settings		
		DIP1	DIP2	DIP3
RS422 4-Channel Mode	-	**OFF**	**OFF**	**OFF**
RS485 4-Wire Mode (Bus-Master)	-	ON	OFF	ON
RS485 2-Wire Mode	RTS	ON	ON	ON
RS485 2-Wire Mode	Timeout	ON	ON	OFF

Table 2: DIP4 setting in order to activate or deactivate the termination resistor

Termination Resistor for RS422 and RS485	SW1 Settings
	DIP4
Deactivated	OFF
Activated	**ON**

Table 3: DIP5, DIP6, DIP7 and DIP8 settings in order to set the needed Timeout and min. baud rate

Timeout	Min. Baud Rate	SW1 Settings			
		DIP5	DIP6	DIP7	DIP8
10.2ms	1200	OFF	OFF	OFF	OFF
9.6ms		OFF	OFF	OFF	ON
9.0ms		OFF	OFF	ON	OFF
8.4ms		OFF	OFF	ON	ON
7.8ms		OFF	ON	OFF	OFF
7.2ms		OFF	ON	OFF	ON
6.5ms		OFF	ON	ON	OFF
5.9ms		OFF	ON	ON	ON
4.8ms	2400	ON	OFF	OFF	OFF
4.3ms		ON	OFF	OFF	ON
3.7ms		ON	OFF	ON	OFF
3.1ms		ON	OFF	ON	ON
2.5ms	4800	ON	ON	OFF	OFF
1.9ms		ON	ON	OFF	ON
1.2ms	9600	ON	ON	ON	OFF
0.6ms	**19200**	**ON**	**ON**	**ON**	**ON**

4. Replace carefully power and data cables of the SSD (if installed) and the access cover to the system and screw it on with the retained screws.

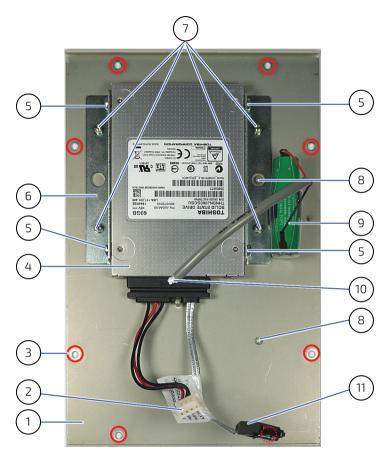5. Tighten the retained screws when the cover is firmly in place.

5.1.3. Serial Port COM 3 (X206) Configuration of the Serial Port COM 3

In order to configure the serial port COM3 as RS422 or RS485, there are following options to set the jumper J46 (Figure 23, pos. 3):

OPEN: RS485 half duplex (2 wires)

CLOSE: RS485 full duplex (4 wires) or

CLOSE: RS422 full duplex (8 wires) depends on user cabling connection to X206

Table 4: J46 settings forCOM 3 RS485 and RS422 modes (factory settings are in bold letters)

Communication Mode COM 3 (X206)	Jumper J46	J44, onboard Header or COM 3	X206: DSUB (9-pin female)
RS485 half duplex	OPEN	Pin 1: TxD-/RxD- Pin 5: TxD+/RxD+	Refer to pin assignment: 11.1.12
RS485 full duplex	**CLOSE**	**Pin 1: TxD-** **Pin 3: RxD+** **Pin 5: TxD+** **Pin 7: RxD-**	**Refer to pin assignment: 11.1.11**
RS422 full duplex	**CLOSE**	**Pin 1: TxD-** **Pin 2: RTS-** **Pin 3: RxD+** **Pin 4: RTS+** **Pin 5: TxD+** **Pin 6: CTS+** **Pin 7: RxD-** **Pin 8: CTS-**	**Refer to pin assignment: 11.1.13**

In the "Advanced → Kontron Board → RS422/485 DUPLEX Mode" menu of the BIOS setup, "Half Duplex" or "Full Duplex" must be selected according to the selected communication mode.

5.1.4. Optional GPIO Port

The optional GPIO port (Figure 20, pos. 7) on the rear side of the KBox A-103 is connected to J34 on the motherboard (Figure 23, pos. 21):

Table 5: Pin assignments of internal and external GPIO connector

J34, onboard GPIO Header			GPIO Port: DSUB Connector (9-pin female)	
	Pin 1:	V_3V3_GPIO_OUT	--	
	Pin 2:	GND	Pin 1	
	Pin 3:	GPIO_0_3V3	Pin 6	
	Pin 4:	GPIO_1_3V3	Pin 2	
	Pin 5:	GPIO_2_3V3	Pin 7	
	Pin 6:	GPIO_3_3V3	Pin 3	
	Pin 7:	GPIO_4_3V3	Pin 8	
	Pin 8:	GPIO_5_3V3	Pin 4	
	Pin 9:	GPIO_6_3V3	Pin 9	
	Pin 10:	GPIO_7_3V3	Pin 5	
	Pin 11:	GND	--	
	Pin 12:	V_5V0_GPIO_OUT	--	

5.1.5. Installing an mPCIe Mini Card

To have access to the mPCIe slot (Figure 23, pos. 16) please proceed according to the steps described:

1. Open the device as described in the subsection 5.1 "Opening and Closing the KBox A-103" (step 1-4).

2. Locate the mPCIe card slot and the corresponding fixing bolts (Figure 23, pos. 16).

3. Align the notches on the mPCIe card with the notches in the mPCIe socket (J27 or J37). Insert the mPCIe card into the slot (Figure 23, pos. 16) and rotate it down with the fixing holes of the card over the fixing bolts.

4. Press the mPCIe card down on the side with the fixing holes and secure it with the available fastening screws.

5. In order to close the KBox A-103, proceed in reverse order.

> **i** To install an mPCIe card into the mPCIe slot (Figure 23, pos. 16), if your KBox A-103 is equipped with an RS422/RS485 adapter module, you have to remove the RS422/RS485 adapter module (Figure 23, pos. 14), by unscrewing the two fastening screws of the DSUB connector COM 2 (X204, Figure 10) on the front side of the system. Retain the screws for later use.
>
> Replace the RS422/RS 485 adapter module, after the installation of the mPCIe card, by screwing on the DSUB connector COM 2 to the front side with the retained screws.

5.1.6. Installing an mSATA SSD

To have access to the mSATA slots please proceed according to the steps described:

1. Open the device as described in the subsection 5.1 "Opening and Closing the KBox A-103" (step 1-4).

2. Locate the mSATA slot (J17) (Figure 23, pos. 17) and the corresponding fixing bolts. (Figure 23, pos. 18).

3. Align the notches on the mSATA SSD with the notches in the mSATA slot (J17). Insert the mSATA SSD into the corresponding slot (Figure 23, pos. 17) and rotate it down with the fixing holes of the card over the fixing bolts.

4. Press the mSATA SSD down on the side with the fixing holes and secure it with the available fastening screws (Figure 23, pos. 18).

5. In order to close the KBox A-103, proceed in reverse order.

5.1.7. Installing the SIM Card

1. Open the device as described in the subsection 5.1 "Opening and Closing the KBox A-103" (step 1-4).

2. Locate SIM card socket (Figure 23, pos. 6).

3. To unlock the SIM card socket slide the cover of the SIM socket towards inside of the device (see arrows in Figure 28).

4. Lift gently the slot cover and open the slot cover as shown in Figure 29.

5. Slide the SIM card (Figure 30) into the left and right card guides of the socket cover and push down the cover in order to close the cover (refer to Figure 31).

6. After closing the cover, lock the cover by sliding the closed cover in the direction shown in Figure 32.

Figure 28: Locked SIM card socket (without SIM card)

Figure 29: Unlocked and opened SIM card socket

Figure 30: Mini SIM card

Figure 31: Inserted SIM card into the card holder of the SIM socket
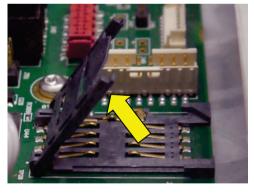
Figure 32: Closed and locked SIM card socket with inserted SIM card
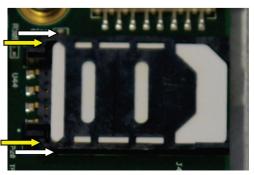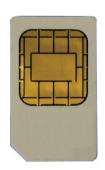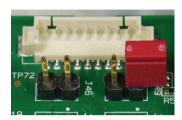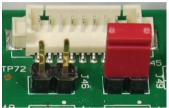
5.1.8. BIOS Recovery Jumper

The BIOS recovery jumper is located on the motherboard (Figure 23, pos. 4). If the BIOS is corrupt and the KBox A-103 cannot be booted (e.g. by a power failure while saving the BIOS settings), the system can be booted via a recovery BIOS. The default setting of J49 is OPEN (Figure 33, left image). After J49 has been set to CLOSED (Figure 33, right image), the system can be booted from the recovery BIOS. For further information, contact Kontron support.

Figure 33: J49 in open (default) and closed position

5.1.9. Replacing the optional Lithium Battery

To replace the optional lithium battery (Figure 25, pos. 9) please proceed according to the steps described:

1. Open the KBox A-103 as described in the section 5.1 "Opening and Closing the KBox A-103", steps 1 to 4.

2. Remove the old lithium battery from the battery clip.

3. Attach new lithium battery to the battery clip.

4. In order to close the KBox A-103, proceed in reverse order.

6/ Thermal Considerations

6.1. Available Processors

Please refer to the chapter 10/ "Technical Specifications".

> **i** The list of processors is not complete and may be extended over the product lifetime.

6.2. Convection Cooling

The applied cooling method provides adequate cooling of the device during operation and performs a one-way thermal transfer to the chassis. Three sides of the KBox A-103 consist of a compact aluminum U-shaped chassis are with cooling fins. The cooling fins provide heat dissipation during operation.

> **i** To provide sufficient heat dissipation for the cooling of the KBox A-103, never cover the cooling fins of the chassis. Do not place any objects on the device.

6.3. Minimum System Clearance

To provide a maximum of airflow through and around the box, minimum distances to surrounding parts must be observed (please refer to the chapter 7.1 "System Mounting" and Figure 34).

6.4. Maximum Temperatures

> **i** The maximum system ambient temperature depends mostly on the power consumption of the processor and the chipset.

For the temperature evaluation a specialised tool from Intel® was used to set the processor to a defined workload. Depending on the power consumption one or more cores were set to 75% workload. This includes the graphics core. The tool also handles the usage of the "Turbo Mode" of certain processor types.

> **i** The processor utilisation depends highly on the software used. Software using multicore feature will run on several cores whereas standard software will only utilise one core. In this case the processor will use the "Turbo Mode" to increase the clock for the core with the highest workload, as long as the temperature is within limits.

6.5. Third Party Components

When the KBox A-103 is extended and configured with third party components like mPCIe extension cards and hard drives (HDD or SSD), it has to be taken into account that the air temperature inside the system is higher than the ambient temperature. An approximately internal temperature rise is given for assistance.

7/ Installation Instructions

The KBox A-103 system is designed for operating:

    ▶   within control cabinets by use of the vertical mounting plate and/or DIN Rail mounting clip
    ▶   installed onto a wall or table by use of the corresponding vertical/horizontal wallmount brackets
    ▶   as desktop unit (horizontal position), by attaching the supplied self-adhesive feet.

> Expansion card installation should be performed before installing the KBox A-103 into the control cabinet, onto a table or wall.

NOTICE   Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of the system chassis.

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Prior any installation work, ensure that there are no live wires on the installation site.

Do not handle the device if there is any damage visible.

Do not operate the KBox A-103 with foreign objects inside the chassis.

Further do not insert any retrieval device into the device while it is connected to power.

Kontron rejects all liability for any and all damages resulting from operation of the unit with foreign objects inside the chassis.

The KBox A-103 has to be installed and operated only by trained and qualified personnel.

Only personnel with appropriate qualifications, trainings and authorization are permitted to install and work with the Kontron KBox A-103.

This device shall only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements.

The unit must be placed such that there is sufficient space in front of it for connecting the cables to the
I/O interface connectors and for operating the power button.

Leave sufficient free space around the unit to prevent the device from possibly overheating!

To ensure proper operation, we recommended free space as specified in Figure 34 and Figure 35.
Refer also to section 10.1.2 "Mechanical Specifications".

The KBox A-103 must be firmly attached to a clean flat and solid mounting surface. Use proper fastening materials suitable for the mounting surface. Ensure that the mounting surface type and the used mounting solution safely support the load of the KBox A-103 and the attached components.

Please follow the local/national regulations for grounding.

The voltage feeds must not be overloaded. Adjust the cabling and the overcurrent protection to correspond with the electrical figures indicated on the type label.

The type label is located on the access cover of the system.

It is recommended that the last cable attached to the system should be the power cable!
Refer to the section 7.2 "DC Power Connection" and chapter 8/ "Starting Up".

7.1. System Mounting

In order to adapt the KBox A-103 for mounting Kontron offers different mounting solution such as:

▶ KBox A-103 configuration with vertical mounting plate for installation into a control cabinet or

▶ KBox A-103 configuration with wall/table mounting brackets for vertical or horizontal mounting position

▶ KBox A-103 as desktop unit (equipped with the supplied rubber feet)

▶ KBox A-103 for DIN Rail mounting

Depending on the ordered KBox A-103 configuration, your system is supplied with the corresponding mounting plate, mounting brackets and/or DIN Rail clip.

The key holes of the vertical mounting plate (Figure 18, pos. 2) allow you to mount the KBox A-103 inside the control cabinet in vertical position.

The key holes of the mounting brackets (Figure 20, pos. 6) allow you to mount the KBox A-103 to a wall or table in vertical as well as in horizontal position.

Prepare the mounting surface with four screws and if necessary anchors corresponding to the mounting surface type (fire-resistant material). Please refer to the information for mounting in the section 10.1.2, "Mechanical Specifications of the KBox A-103 with Vertical Mounting Plate", 10.1.3 "Mechanical Specifications of the KBox A-103 Wall/Table Mounting Brackets", 10.1.1 "Mechanical Specifications of the KBox A-103 as Desktop" or refer to the drawings for KBox A-103 on our web site. The drawings can be downloaded from our web site www.kontron.com by selecting the product name.

> **i** For a sufficient air circulation around the device, we recommend not mount or operate any other devices within the "Restricted Area" around the KBox A-103; refer to the red marked area in Figure 34, Figure 35.

Figure 34: Restricted area for mounting around KBox A-103 (desktop side view with antenna)
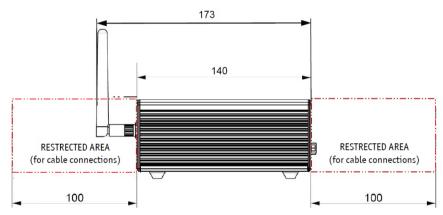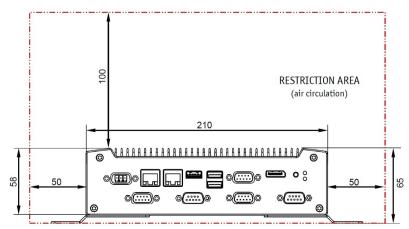
Figure 35: Restricted area for mounting around KBox A-103 (front view with vert./horiz. mounting brakets)
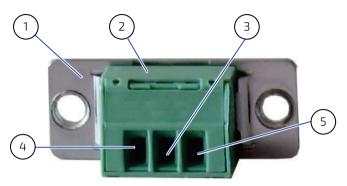
7.2. DC Power Connection

The KBox A-103 is connected by a Phoenix connector to a DC power source via a DC power supply wiring (only the Phoenix power plug terminal is included).

The KBox A-103 is delivered with a DC power plug terminal (3-pin Phoenix connector). For DC connection, prepare the connecting wires using the supplied Phoenix plug terminal: PSC 1,5/ 3-F.

Figure 36: Phoenix power plug terminal

1	3-pin Phoenix plug terminal	4	Location for inserting the "0V" wire
2	Cover over the slotted pan head screws	5	Location for inserting the "24V" wire
3	Location for inserting the functional earth wire		

7.2.1. Cabling

For the pin assignment Phoenix power plug terminal refer to the subsection 4.4.1 "X101 - Power Input Connector".

1. Cut the required length three isolated wires (1 mm2) AWG18 and strip each end 5 –7 mm.

2. Twist the striped wire-ends and provide them with ferrules.

3. Open the cover (Figure 36, pos. 2) to have access to the slotted pan head screws.

4. Loosen the three slotted pan head screws of the DC plug terminal far enough so that you can insert the end of the prepared wires.

5. Insert the wires into the corresponding clamp of the Phoenix plug terminal. Make sure that you have the right polarity of the connection [refer to Figure 36, Figure 11 or subsection 11.1.1, "(X101) Power Input Connector"].

6. Fasten the screws to secure the wires into the clamps of the plug terminal.

7. Close the cover (Figure 36, pos. 2).

8/ Starting Up

> **i** The KBox A-103 must be only operated with the nominal voltage of 24V DC of type SELV. For details refer to the chapter 10/ "Technical Specifications".

8.1. Connecting to DC Main Power Supply

The DC input connector (Figure 10 and Figure 11 marked X101) is located on the front side of the KBox A-103. The KBox A-103 will be connected to a DC main power supply via the supplied Phoenix power plug terminal (see Figure 36) and corresponding power wires (not included).

> **i** Before using your system, become familiar with the system components and check that everything is connected properly. Following a proper cabling procedure will prevent a false power-on condition, which could result in unit operational failure.
>
> When you install/disconnect the unit, the functional earth connection must always be made first and disconnected last.
>
> Also, it is recommended that the last connections attached to the system should be the power wires!

> **NOTICE** The KBox A-103 must be connected DC mains power supply complying with the SELV (Safety Extra Low Voltage) requirements of EN 60950-1 standard.
>
> It must be observed that wiring and short-circuit/overcurrent protection is performed according to the applicable standards, regulations and respect to the electrical specification of the KBox A-103.
>
> Even when the system is turned off via the power button (Figure 10 and Figure 12, marked PWR) parts of the system are still energized.
>
> The disconnecting device (fuse/circuit backer) rating must be in accordance with the wire cross-section and the rated current of the KBox A-103.

> **i** The wires used for power connections must be clearly marked (+/-/functional earth) to ensure that they will be proper connected to the DC IN connector of the KBox A-103 and to the main power source, corresponding to signals marked. Refer to Figure 11 and Figure 36.
>
> In addition, the cables must have some form of support so as to minimize the strain on the unit's connectors.

To connect the KBox A-103 to a corresponding DC main power supply, please perform the following steps:

1. Ensure that the DC power source is switched off via a disconnecting device (circuit breaker), in order to ensure that no power is flowing from the external DC power source during the connection procedure.

2. Connect at first the wire for "Functional Earth stud" (Figure 18, pos. 5) to an appropriate "common earth" connection point.

3. Connect the Phoenix power terminal prepared as described in the subsection 7.2.1 "Cabling" to the DC input connector (Figure 10 and Figure 11 marked X101) of the KBox A-103. The DC input connector is located on the front side and is marked "24VDC".

4. Connect the other ends of the DC power wires to the connections of the DC main power supply. Pay attention to the polarity of the connections.

5. Switch on the disconnecting device (circuit breaker) in order to apply voltage to the terminals of the power wires.

8.2. Operating System and Hardware Component Drivers

Your system can be supplied optionally with a pre-installed operating system.

If you have ordered your KBox A-103 with a pre-installed operating system, all drivers are installed in accordance with the system configuration ordered (optional hardware components). Your system is fully operational when you switch it on for the first time. Please pay attention to the following note.

> Important information on the use of the pre-installed "WINDOWS 7 ULTIMATE FOR EMBEDDED SYSTEMS" or "WINDOWS 7 PROFESSIONAL FOR EMBEDDED SYSTEMS" operating systems:
>
> The terms and conditions for the use of the pre-installed operating systems are specified in the document "MICROSOFT SOFTWARE LICENSE TERMS".
>
> You can download this document from our web site www.kontron.com by selecting Product/ Downloads tab/Windows.

If you have ordered The KBox A-103 without a pre-installed operating system, you will need to install the operating system and the appropriate drivers for the system configuration you have ordered (optional hardware components) yourself.

> You can download the relevant drivers for the installed hardware from our web site at www.kontron.com by selecting the product.
>
> Pay attention to the manufacturer specifications of the operating system and the integrated hardware components.

> Latest Linux Distribution and Kernel shall be used in order to properly support the Baytrail graphics engine.
> E.g. for Ubuntu: Ubuntu 16.04.2 Release (Linux Kernel 4.8.xx) works with display connected to DP.

9/ Maintenance and Cleaning

Equipment from Kontron requires only minimum servicing and maintenance for proper operation.

▶ For light soiling, clean the KBox A-103 with a dry cloth.
Carefully remove dust from the surface of the cooling fins of the chassis using a clean, soft brush.

▶ Stubborn dirt should be removed using a mild detergent and a soft cloth.

Do not use steel wool, metallic threads or solvents like abrasives, alcohol, acetone or benzene for cleaning the KBox A-103.

10/ Technical Specifications

Table 6: Technical Specifications

KBox A-103	
Installed Module and Baseboard	Baseboard with SMARC-sXBTi module
SMARC Module	Intel® Atom™ E3845, 4x 1.91 GHz, 4GB DDR3L with ECC, 16GB eMMC Intel® Atom™ E3827 2x 1.75GHz, 2GB DDR3L Intel® Atom™ E3815 1x 1.46GHz, 1GB DDR3L
RAM	up to 8 GB DDR3L, with ECC soldered on SMARC module
BIOS	Phoenix® BIOS
Interfaces **(front side accessible)**	2x Ethernet (10/100/1000 Mbit/s) with IEEE1588 support 1x USB 3.0 2x USB 2.0 1x DisplayPort 1x COM 1 (RS232) 1x VGA Optional: 1x FIELDBUS (PROFIBUS; the expansion has to be installed at the factory only) 1x COM 2 (configurable as RS232 or RS422/RS485 via adapter module) 1x COM 3 (configurable as RS422/RS485 via onboard jumper)
Internal Drive Bay **(not accessible from the outside)**	1x internal drive bay to install 1x 2.5" SATA SSD (SATA 3Gb/s)
Option for Storage Media	1x mSATA socket
Free Expansions Slots **(internal)**	2x mPCIe sockets for full-size mPCIe modules, one with SIM card socket
Controls **(at the front side)**	Power button (PWR)
Indicators **(at the front side)**	PWR (Power LED) HDD (SSD status LED)
DC IN Connector (at the front side)	3-pin DC input connector
Protection Class	IP20
Rated Voltage (tolerance)	24 VDC (+20%/-15%)

10.1. Mechanical Specifications

Table 7: Mechanical Specifications

Dimensions	KBox A-103 with vertical mounting plate	KBox A-103 with vert./horiz. mounting brackets	KBox A-103 as desktop
Height	266 mm (10.47")	135.5 mm (5.33")	65.6 mm (2.58")
Width	58 mm (2.28")	270 mm (10.63")	210 mm (8.27")
Depth	138 mm (5.43")	65 mm (2.56")	140 mm (5.51")
Weight (without packaging, without expansions)	Approx. 1.85 kg (4.08 lbs.)	Approx. 2 kg (4.41 lbs.)	Approx. 1.8 kg (3.97 lbs.)
Chassis	Cooling fins, black Chassis: steel sheet, light grey (RAL 7035) Side with External Interfaces : trim strips, traffic grey (RAL 7043)		

10.1.1. Mechanical Specifications of the KBox A-103 as Desktop

Figure 37: Dimensions: Front as desktop
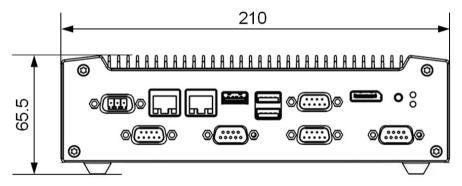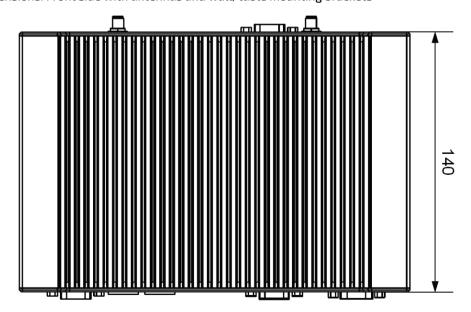
Figure 38: Dimensions: Front side with antennas and wall/table mounting brackets

10.1.2. Mechanical Specifications of the KBox A-103 with Vertical Mounting Plate

Figure 39: Dimensions: Left side
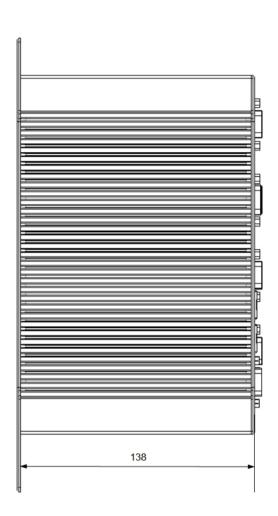
Figure 40: Dimensions: Rear side with vertical mounting plate
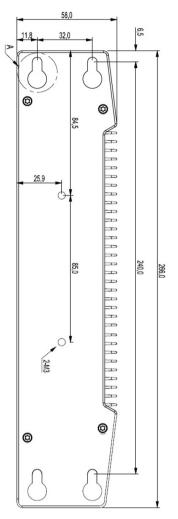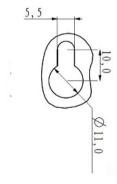
Figure 41: Dimensions: Detail key hole

10.1.3. Mechanical Specifications of the KBox A-103 Wall/Table Mounting Brackets

Figure 42: Dimensions: Top side (with wall/table mounting brackets)
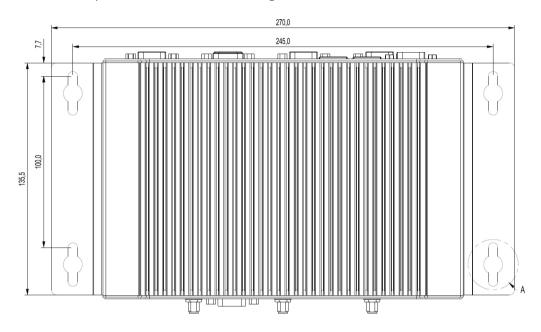
Figure 43: Dimensions: front side (with wall/table mounting brackets)
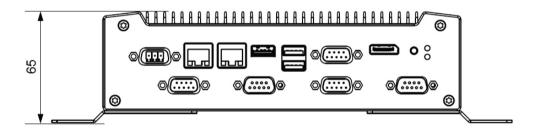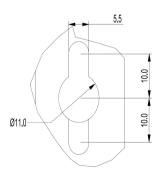
Figure 44: Detail mounting slide hole (wall/table mounting brackets)

10.2. Environmental Specifications

Table 8: Environmental Specifications

	KBox A-103 (Standard Version)
Thermal Management	Fanless cooling
Operating Temperature	–20°C … +60°C (–4 … 140°F)
Storage / Transit Temperature	–40°C … +85°C (–40°F … +185°F)
Relative Humidity (Operating/Transit)	95 % @ 40 °C (non-condensing) acc. to IEC 60068-2-78
Max. Operation Altitude	2,000 m (6,560 ft)
Max. Storage / Transit Altitude	10,000 m (32,810 ft)
Operating Shock	15 G, 11 ms, half sine, acc. to IEC 60068-2-27
Non-operating/Transit Shock	50 G, 11 ms, half sine (IEC 60068-2-27) no HDD and add on cards
Operating Vibration	10 - 150 Hz, 1 G (IEC 60068-2-6)
Non-operating/Transit Vibration	10 - 150 Hz, 2 G (IEC 60068-2-6)

10.3. CE Directives and Standards

Table 9: CE Directive

CE Directive	
Electrical Safety	General Product Safety Directive (GPSD) 2001/95/EC Low Voltage Directive (LVD) 2014/35/EU
Electromagnetic Compatibility (EMC)	EMC Directive 2014/30/EU
CE Marking	CE Directive 93/68/EEC
RoHS II Directives	2011/65/EU

Table 10: Electrical Safety

Electrical Safety	Harmonized Standards
EUROPE	Information technology equipment - Safety - Part 1: General requirements EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013
U.S.A. / CANADA	Conform UL 60950-1 Conform UL 61010-1 & 61010-2-201 Certified to CAN/CSA C22.2 No. 60950-1
CB Report	IEC 60950-1(ed.2);am1, am2

Table 11: EMC

EMC	Harmonized Standards
EU	Generic standards - Emission standard for industrial environments (Emission): EN 55032, Class A EN 61000-6-4
	Generic standards - Immunity for industrial environments (Immunity): EN 55024, EN 61000-6-2

11/Standard Interfaces – Pin Assignments

Low-active signals are indicated by a minus sign.

11.1.1. (X101) Power Input Connector

Table 12: (X101) Power Input Connector

Pin	Signal Name	3-pin POWER SUBCON (male)
1	0V (input	
2	Ground	
3	+24 VDC (input)	

11.1.2. (X102 as ETH 1 and X103 as ETH 2) Ethernet Connectors

Table 13: (X102, X103) Ethernet Connectors

Pin	Signal Name	X2, X3, X10LAN1, LAN2,LAN3 (RJ45)
1	MDI0+	
2	MDI0-	
3	MDI1+	
4	MDI2+	
5	MDI2-	
6	MDI1-	
7	MDI3+	
8	MDI3-	

Speed (Mbps)		LINK/ACT	
		LINK	ACTIVE
10	off	on	orange on (blinking)
100	green	on	orange on (blinking)
1000	orange	on	orange on (blinking)

11.1.3. (X105) USB 3.0 Port

Table 14: (X105) USB 3.0 Port

Pin	Signal Name	Pin	Signal Name	9-pin USB Connector Type A Version 3.0/2.0
USB 2.0 contact pins		USB 3.0 contact pins		
1	VCC, fused (900 mA max.)	5	StdA_SSRX-	
2	Data-	6	StdA_SSRX+	
3	Data+	7	GND_DRAIN	
4	GND	8	StdA_SSTX-	
		9	StdA_SSTX+	

11.1.4. (X107, X108) USB 2.0 Port

Table 15: (X107, X108) USB 2.0 Port

Pin	Signal Name	4-pin USB Connector Typ A Version 2.0
1	VCC	
2	Data-	
3	Data+	
4	GND	

11.1.5. (X109) DisplayPort

Table 16: (X109) DisplayPort

Pin	Signal Name	DisplayPort	Signal Name	Pin
1	ML Lane 0 (p)		GND (ML Lane 0)	2
3	ML Lane 0 (n)		Lane 1 (p)	4
5	GND (ML Lane 1)		Lane 1 (n)	6
7	Lane 2 (p)		GND (ML Lane 2)	8
9	Lane 2 (n)		Lane 3 (p)	10
11	GND (ML Lane 3)		Lane 3 (n)	12
13	AUX SEL#		Pull-down to GND	14
15	AUX CH (p)		GND (AUX CH)	16
17	AUX CH (n)		Hot Plug	18
19	GND (GND_DDC)		3.3V (DDC EEPROM power 500 mA fused	20

11.1.6. (X110) Serial Interface COM 1 (RS232)

Table 17: (X110) Serial Interface COM 1 (RS232)

Pin	Signal Name		9-pin D-SUB Connector (male)
1	DCD	(Data Carrier Detect)	
2	RXD	(Receive Data)	
3	TXD	(Transmit Data)	
4	DTR	(Data Terminal Ready)	
5	GND	(Signal Ground)	
6	DSR	(Data Set Ready)	
7	RTS	(Request to Send)	
8	CTS	(Clear to Send)	
9	RI	(Ring Indicator)	

11.1.7. (X204) Serial Interface COM 2 (RS232)

Table 18: (X204) Serial Interface COM 2 (RS232)

Pin	Signal Name		9-pin D-SUB Connector (male)
1	DCD	(Data Carrier Detect)	
2	RXD	(Receive Data)	
3	TXD	(Transmit Data)	
4	DTR	(Data Terminal Ready)	
5	GND	(Signal Ground)	
6	DSR	(Data Set Ready)	
7	RTS	(Request to Send)	
8	CTS	(Clear to Send)	
9	RI	Ring Indicator	

11.1.8. (X204) Serial Port COM 2 (RS422/RS485) configured as RS485 (2-Wire Mode) S, half duplex

Refer to the subsections 4.4.8 "X204 - Serial Port COM 2 (Option)" and to 5.1.2 "Serial Port COM2 (X204) Configuration for RS422 or RS485 via DIP Switches", Table 1, Table 2 and Table 3.

Table 19: (X204) Serial Port COM 2 (RS422/RS485) configured as RS485 (2-Wire Mode) S, half duplex

Pin	Signal Name	9-pin D-SUB Connector (female)
1	Data-	
2	NC	
3	Data+	
4	NC	
5	GND	
6	NC	
7	NC	
8	NC	
9	NC	

11.1.9. (X204) Serial Port COM 2 (RS422/RS485) configured as RS485 (4-Wire Mode), full duplex, (Bus-Master)

Refer to the subsections 4.4.8 "X204 - Serial Port COM 2" and to 5.1.2 "Serial Port COM2 (X204) Configuration for RS422 or RS485 via DIP Switches", Table 1, Table 2 and Table 3.

Table 20: (X204) Serial Port COM 2 (RS422/RS485) configured as RS485 (4-Wire Mode), full duplex, Bus-Master

Pin	Signal Name		9-pin D-SUB Connector (female)
1	TxD-	(Transmit Data-)	
2	RxD+	(Receive Data+)	
3	TxD+	(Transmit Data+)	
4	RxD-	(Receive Data-)	
5	GND	(Signal Ground)	
6	NC		
7	NC		
8	NC		
9	NC		

11.1.10. (X204) Serial Port COM 2 (RS422/RS485) configured as RS422 (4-Channel Mode)

Refer to the subsections 4.4.8 "X204 - Serial Port COM 2" and to 5.1.2 "Serial Port COM2 (X204) Configuration for RS422 or RS485 via DIP Switches", Table 1, Table 2 and Table 3.

Table 21: (X204) Serial Port COM 2 (RS422/RS485) configured as RS422 (4-Channel Mode)

Pin	Signal Name		9-pin D-SUB Connector (female)
1	TxD-	(Transmit Data-)	
2	RxD+	(Receive Data+)	
3	TxD+	(Transmit Data+)	
4	RxD-	(Receive Data-)	
5	GND	(Signal Ground)	
6	RTS-	(Request to Send-)	
7	RTS+	(Request to Send+)	
8	CTS+	(Clear to Send+)	
9	CTS-	(Clear to Send-)	

11.1.11. (X206) Serial Port COM 3 (RS422/RS485) configured as RS485 (4-Wire Mode), full duplex, (Bus-Master)

Refer to the subsections 4.4.9 "X206 - Serial Port COM 3, and 5.1.3 "Serial Port COM 3 (X206) Configuration of the Serial Port COM 3".

Table 22: (X204) Serial Port COM 2 (RS422/RS485) configured as RS485 (4-Wire Mode), full duplex, Bus-Master

Pin	Signal Name		9-pin D-SUB Connector (female)
1	TxD–	(Transmit Data–)	
2	RxD+	(Receive Data+)	
3	TxD+	(Transmit Data+)	
4	RxD–	(Receive Data–)	
5	GND	(Signal Ground)	
6	NC		
7	NC		
8	NC		
9	NC		

11.1.12. (X206) Serial Port COM 3 (RS422/RS485) configured as RS485 (2-Wire Mode), half duplex

Refer to the subsections 4.4.9 "X206 - Serial Port COM 3, and 5.1.3 "Serial Port COM 3 (X206) Configuration of the Serial Port COM 3".

Table 23: (X206) Serial Port COM 3 (RS422/RS485) configured as RS485 (2-Wire Mode), half duplex

Pin	Signal Name		9-pin D-SUB Connector (female)
1	TxD–/RxD–		
2	NC		
3	TxD+/RxD+		
4	NC		
5	GND	(Signal Ground)	
6	NC		
7	NC		
8	NC		
9	NC		

11.1.13. (X206) Serial Port COM 3 (RS422/RS485) configured as RS422 (8-Channel Mode) full duplex

Refer to the subsections 4.4.9 "X206 - Serial Port COM 3, and 5.1.3 "Serial Port COM 3 (X206) Configuration of the Serial Port COM 3".

Table 24: (X206) Serial Port COM 3 (RS422/RS485) configured as RS422 (8-Channel Mode) full duplex

Pin	Signal Name		9-pin D-SUB Connector (female)
1	TxD–	(Transmit Data–)	
2	RxD+	(Receive Data+)	
3	TxD+	(Transmit Data+)	
4	RxD–	(Receive Data–)	
5	GND	(Signal Ground)	
6	RTS–	(Request to Send–)	
7	RTS+	(Request to Send+)	
8	CTS+	(Clear to Send+)	
9	CTS–	(Clear to Send–)	

11.1.14. (X207) VGA Port

Table 25: (X207) VGA Port

Pin	Signal name	15 pin D-SUB Connector (female)
1	Analog red output	
2	Analog green output	
3	Analog blue output	
4	NC	
5-8	GND	
9	+5 V (DDC)	
10	GND	
11	NC	
12	SDA (DDC)	
13	TTL HSync	
14	TTL VSync	
15	SCL (DDC)	

12/ uEFI BIOS

12.1. Starting the uEFI BIOS

The KBOX-A103 is provided with a Kontron-customized, pre-installed and configured version of Phoenix SecureCore Tiano (SCT). It is based on the Unified Extensible Firmware Interface (uEFI) specification and the Intel® Platform Innovation Framework for EFI. This uEFI BIOS provides a variety of new and enhanced functions specifically tailored to the hardware features of the KBOX-A103.

> **i** The BIOS version covered in this document might not be the latest version. The latest version might have certain differences to the BIOS options and features described in this chapter.

The uEFI BIOS comes with a Setup program which provides quick and easy access to the individual function settings for control or modification of the uEFI BIOS configuration. The Setup program allows the accessing of various menus which provide functions or access to sub-menus with more specific functions of their own.

To start the uEFI BIOS Setup program, follow the steps below:

1. Power on the board.

2. Wait until the first characters appear on the screen (POST messages or splash screen).

3. Press the <F2> key.

4. If the uEFI BIOS is password-protected, a request for password will appear. Enter either the User Password or the Supervisor Password (see Security menu), press <RETURN>, and proceed with step 5.

5. A Setup menu will appear.

The KBOX-A103 uEFI BIOS Setup program uses a hot key-based navigation system. A hot key legend bar is located on the bottom of the Setup screens.

The following table provides information concerning the usage of these hot keys.

Table 26: Navigation Hot Keys Available in the Legend Bar

Hotkeys	Description
<F1>	The <F1> key is used to invoke the General Help window.
<->	The<Minus> key is used to select the next lower value within a field.
<+>	The <Plus> key is used to select the next higher value within a field.
<F10>	The <F10> key is used to Exit saving Changes.
<F9>	The <F9> key is used to Load Setups Defaults.
<→> or <←>	The <Left/Right> arrows are used to select major Setup menus on the menu bar. For example: Main screen, Advanced screen, Security screen, etc.
<↑> or <↓>	The <Up/Down> arrows are used to select fields in the current menu. For example a Setup function or a sub-screen.
<ESC>	The <ESC> key is used to exit a major Setup menu and enter the Exit Setup menu. Pressing the <ESC> key in a sub-menu causes the next higher menu level to be displayed.
<RETURN>	The <RETURN> key is used to execute a command or select a submenu.

12.2. Setup Menus

The Setup utility features a selection bar at the top of the screen that lists the available menus:

▶ Main

▶ Advanced

▶ Security

▶ Boot

▶ Exit
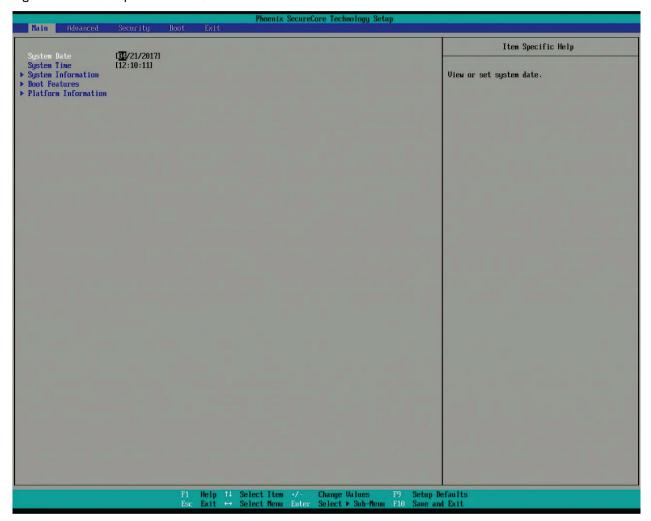
The currently active menu and the currently active uEFI BIOS Setup item are highlighted in white. Use the left and right arrow keys to select the Setup menus.

Each Setup menu provides two main frames. The left frame displays all available functions. Configurable functions are displayed in blue. Functions displayed in grey provide information about the status or the operational configuration. The right frame displays a Help window providing an explanation of the respective function.

12.2.1. Main Setup Menu

On entering the uEFI BIOS, the Setup program displays the Main Setup menu. This screen lists basic system information.

Figure 45: Main Setup Menu Initial Screen

The following table shows Main sub-screens and functions, and describes the content. Default settings are in **bold**.

Table 27: Main Setup Menu Sub-screens

Sub-Screen	Function	Second level Sub-Screen / Description
System Date>	Set the system date [mm/dd/yyyy]	
System Time>	Sets the system time [hh:mm:ss]	
System Information>	Read only field *Displays System Information* BIOS Version, Build Time, Processor Type, Processor Speed, System Memory Speed, L2 Cache RAM Total Memory (DIMM 1, DIMM2)	
Boot Features>	NumLock>	Selects Power-on state for NumLock. [On/**Off**]
	Timeout>	Number of seconds that P.O.S.T will wait for the user input before booting (0 - 99) [**1**]
	CSM Support>	Compatibility Support Module that provide backward compatibility services for legacy BIOS services, like int10/int13, dependent OS. [No, **Yes**]
	Quick Boot>	Enable/Disable Quick Boot. [**Disabled**, Enabled]
	Dark Boot>	Enable/Disable Dark Boot. [**Disabled**, Enabled]
	Diagnostic Splash Screen>	If you select 'Enabled' the diagnostic splash screen always displays during boot. If you select 'Disabled' the diagnostic splash screen does not display unless you press HOTKEY during boot. [**Disabled**, Enabled]
	Diagnostic Summary Screen>	Display the Diagnostic summary screen during boot. [**Disabled**, Enabled]
	BIOS Level USB>	Enable/Disable all BIOS support for USB in order to reduce boot time. Note that this will prevent using a USB keyboard in setup or a USB biometric scanner such as a finger print reader to control access to setup, but does not prevent the operating system from supporting such hardware. [Disabled, **Enabled**]
	Allow Hotkey in S4 resume>	Enable hotkey detection when system resuming from Hibernate state [Disabled, **Enabled**]
	UEFI Boot>	Enable the UEFI boot. [Disabled, **Enabled**]
	Legacy Boot>	Enable the Legacy Boot. [Disabled, **Enabled**]

Sub-Screen	Function	Second level Sub-Screen / Description
Boot Features> (continued)	Boot in Legacy Video Mode>	Enable to force the display adapter to switch the video mode to Text Mode 3 at the end of BIOS POST for non-UEFI boot mode (Legacy Boot). Some legacy software, such as DUET, requires that the BIOS explicitly enter text video mode prior to boot. [**Disabled**, Enabled]
	Load OPROM>	Load all OPROMs or on demand according to the boot device. [All, **On Demand**]
Platform Information>	Read only field *Displays Module Information* Product Name, Revision, Serial # , Module MAC Address, CPLD Revision, Boot Counter *Displays Carrier Board Information* Product Name, Revision, Serial # , Carrier MAC Address	
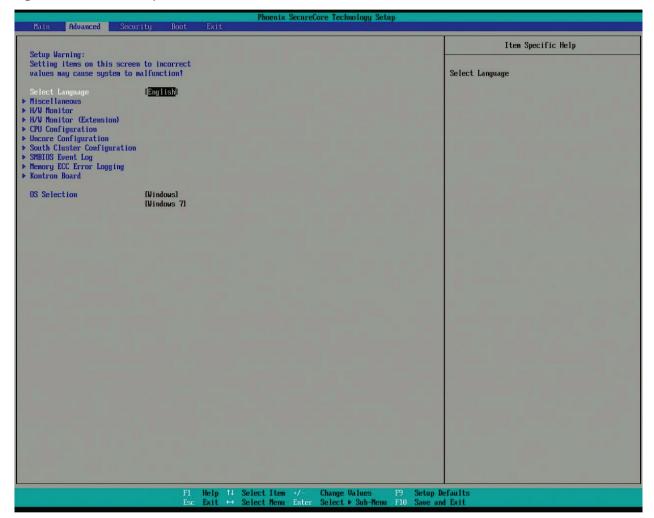
12.2.2. Advanced Setup Menu

The Advanced Setup menu provides sub-screens and second level sub-screens with functions, for advanced configuration and Kontron specific configurations.

| **NOTICE** | Setting items, on this screen, to incorrect values may cause system malfunctions. |

Figure 46: Advanced Setup Menu Initial Screen

The following table shows the Advanced sub-screens and functions and described the content. Default settings are in **bold** and some functions include additional information.

Table 28: Advanced Setup menu Sub-screens and Functions

Sub-Screen	Function	Second level Sub-Screen / Description	
Select Language>		Default is [**English**]	
Miscellaneous>	Watchdog>	Auto-reload>	Enable automatic reload of watchdog timers on timeout. [**Disabled**, Enabled]
		Global Lock>	If set to enabled, all Watchdog registers (except WD-KICK) become read only until the board is reset. [**Disabled**, Enabled]
		API Event>	Select Action for Watchdog if enabled by API. [**NMI**, SCI]
		Stage 1 Mode>	Select Action for this Watchdog stage. [**Disabled**, Reset, NMI, SCI, Delay]
	Smart Battery Configuration>	Configuration of M.A.R.S. Smart Battery System [Disabled, **Auto**, Charger, Manager]	
	Reset Button Behaviour>	Select Reset Button Behaviour: Chipset Reset, Power Cycle [**Chipset Reset**, Power Cycle]	
H/W Monitor>	PCB Temperature>	Read only field Displays PCB temperature in °C	
	NCT7802Y Temperate>	Read only field Displays NCT7802Y temperature in °C	
	CPU Fan – Fan Pulse>	Number of pulses the fan produces during one revolution. (Range: 1-4) [**2**]	
	CPU Fan – Fan Control>	Sets Fan Control mode for CPU fan (optional) Disable - stops fan Manual – manually sets the fan speed in % Auto – Hardware Monitor controls cooling (temperature sensor) [Disable, Manual, **Auto**]	
	CPU Fan – Fan Trip Point>	Temperature at which the fan accelerates. (Range: 20°C – 80°) [**45**]	
	CPU Fan – Trip Point Speed>	Fan speed at trip point in %. Minimum value is 30 %. Fan always runs at 100 % at TJmax (-10°C). [**50**]	
	CPU Fan – Reference Temperature>	Determines temperature source used for automatic fan control [NCT7802Y Temperature, **PCB Temperature**]	
	External Fan– Fan Pulse>	Number of pulses the fan produces during one revolution (Range: 1-4) [**2**]	

Sub-Screen	Function	Second level Sub-Screen / Description
H/W Monitor (continued)	External Fan- Fan Control>	Sets Fan Control mode for CPU fan (optional) Disable - stops fan Manual – manually sets the fan speed in % Auto – Hardware Monitor controls cooling (temperature sensor) [Disable, Manual, **Auto**]
	External Fan- Fan Trip point>	Temperature at which the fan accelerates. (Range: 20°C – 80°) [**45**]
	External Fan- Trip Point Speed>	Fan speed at trip point in %. Minimum value is 30 %. Fan always runs at 100 % at TJmax (-10°C). [**50**]
	External Fan Reference Temperature>	Determines temperature source used for automatic fan control [NCT7802Y Temperature, **PCB Temperature**]
	Voltage Measurement - DDR voltage>	Read only field Displays DDR voltage
	Voltage Measurement - Input voltage>	Read only field Displays input voltage
	Voltage Measurement - RTC Battery>	Read only field Displays RTC battery voltage
H/W Monitor (Extension)	LM75A>	Read only field Displays Board Temperature
	ADC128>	Read only field Displays Board IN0, IN1, IN2, IN3 and IN4 Voltage
	MSR>	Read only field Displays Internal CPU Temperature (DTS)
CPU Configuration>	Execute Disable Bit>	Execute Disable Bit prevent certain classes of malicious buffer overflow attacks when combined with a supporting OS [**Enable**, Disable]
	Limit CPUID Maximum>	Disabled for Windows XP [Enable, **Disable**]
	Bi-directional PROCHOT#>	When a processor thermal sensor trips (either core), the PROCHOT# will be driven. If bi-direction is enabled, external agents can drive PROCHOT# to throttle the processor. [Disable, **Enable**]
	VTX-2>	To enable or disable the VTX-2 Mode support [Disable, **Enable**]
	TM1>	Enable/Disable TM1 [Disable, **Enable**]
	DTS>	Enable/Disable Digital Thermal Sensor [Disable, **Enable**]
	Intel® Hyper- Threading Technology>	Read only field [**Not Supported**]

Sub-Screen	Function	Second level Sub-Screen / Description	
CPU Configuration> (continued)	CPU Power Management>	Intel® SpeedStep™>	Enable processor performance states (P-States). [Disable, **Enable**]
		Boot Performance Mode>	Select the performance state that the BIOS will set before OS handoff. [**Max Performance**, Max Battery]
		C-States>	Enable/Disable C States [Disable, **Enable**]
		Enhanced C-States>	Enable/Disable C1E, C2E and C4E. When enabled, CPU will switch to minimum speed when all cores enter C-State. [Disable, **Enable**]
		Max C State>	This option controls the Max C State that the processor will support. [**C6**, C1]
Uncore Configuration>	Integrated Graphics Device>		Enable : Enable Integrated Graphics Device (IGD) when selected as the Primary Video Adaptor. Disable: Always disable IGD [Disable, **Enable**]
	Primary Display>		Select which of IGD/PCI Graphics device should be Primary Display Or select SG for Switchable/Hybrid Gfx. [**Auto**, IGD, PCIe, SG]
	RC6 (Render Standby)>		Check to enable render standby support [**Enable**, Disable]
	GTT Size>		Select the GTT Size [1MB, **2MB**]
	Aperture Size>		Select the Aperture Size [128MB, **256MB**, 512MB]
	DVMT Pre-Allocated>		Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device [**64M**, 96M, 128M, 160M, 192M, 224M, 256M, 288M, 320M, 352M, 384M, 416M, 448M, 480M, 512M]
	DVMT Total Gfx Mem>		Select DVMT5.0 Total Graphic Memory size used by the Internal Graphics Device [128M, **256M**, MAX]
	IGD Turbo>		Select the IGD Turbo feature, Auto selected, IGD Turbo will only be enabled when SOC stepping is B0 or above. [**Auto**, Enable, Disable]
	Spread Spectrum Clock>		Enable clock chip Spread Spectrum feature. [**Disable**, Enable]
	ISP Enable/Disable>		Enable/Disable ISP PCI Deuice Selection. [Enable, **Disable**]
	ISP PCI Device Selection>		Select ISP default PCI device for Windows (B0D2F0) or Linux (B0D3F0) [**Disabled,** ISP PCI Device as B0D2F0, ISP PCI Device as B0D3F0]
	IGD – LCD Control>	IGD - Boot Type>	Select the Video Device activated during POST. This has no effect if external graphics are present. [Auto, **EFP**, EFP2]
		IGD – Secondary Boot Type>	Select Secondary Display Device. [Disabled, EFP, **EFP2**]

Sub-Screen	Function	Second level Sub-Screen / Description	
Uncore Configuration> (continued)	IGD – LCD Control> (continued)	Mode Persistence	Enables/Disables Mode Persistence [**Disabled**, Enabled]
		Center Mode	Select the Display Device that should be centered. [**Disabled**, CRT, EFP, EFP2]
	GMCH BLC Control>	Back Light Control Setting [**PWM-Inverted**, GMBus-Inverted, PWM-Normal, GMBus-Normal]	
South Cluster Configuration>	PCI Express Configuration>	PCIe 0 Speed>	Configure PCIe Speed [**Auto**, Gen1, Gen2]
		PCIe 1 Speed>	Configure PCIe Speed [**Auto**, Gen1, Gen2]
		PCIe 2 Speed>	Configure PCIe Speed [**Auto**, Gen1, Gen2]
		PCIe 3 Speed>	Configure PCIe Speed [**Auto**, Gen1, Gen2]
		PCI Express Root port 0>	Control the PCI Express Root Port [**Enable**, Disable]
		PCI Express Root port 1>	Control the PCI Express Root Port [**Enable**, Disable]
		PCI Express Root port 2>	Control the PCI Express Root Port [**Enable**, Disable]
		PCI Express Root port 3>	Control the PCI Express Root Port [**Enable**, Disable]
	USB Configuration>	xHCI Mode>	Mode of operation of xHCI controller. Thiswill also influence EHCI controller settings since certain combinations of those modes are not allowed. 'Smart Auto' mode is supposed to solve USB issues under Windows 7. [**Smart Auto**, Enable, Disable] Default depends on OS selection.
		EHCI Controller>	Read only field [**Enable**] Default depends on OS selection.
		USB Per-Port Control>	Control each of the USB ports (0~3) disabling [Disable, **Enable**]
		USB Port #0>	Disable USB Port [Disable, **Enable**]
		USB Port #1>	Disable USB Port [Disable, **Enable**]
		USB Port #2>	Disable USB Port [Disable, **Enable**]
		USB Port #3 >	Disable USB Port [Disable, **Enable**]
		XHCI Link Power Management>	Enable/Disable XHCI Link Power Management [**Disable**, Enable]
		USB0 Power Enable>	USB0 Power Enable or Disable [Disabled, **Enabled**]

Sub-Screen	Function	Second level Sub-Screen / Description	
South Cluster Configuration> (continued)	USB Configuration> (continued)	USB1 Power Enable>	USB1 Power Enable or Disable [Disabled, **Enabled**]
		USB2 Power Enable>	USB2 Power Enable or Disable [Disabled, **Enabled**]
		USB3 Power Enable>	USB3 Power Enable or Disable [Disabled, **Enabled**]
		USB0 Wake Enable>	USB0 Wake Enable or Disable [Disabled, **Enabled**]
		USB1 Wake Enable>	USB1 Wake Enable or Disable [Disabled, **Enabled**]
		USB2 Wake Enable>	USB2 Wake Enable or Disable [Disabled, **Enabled**]
		USB3 Wake Enable>	USB3 Wake Enable or Disable [Disabled, **Enabled**]
		USB 0 Host/Client Mode>	Select USB0 Host or Client mode [**Host Mode**, Client Mode]
	Audio Configuration>	Audio Controller>	Control Detection of the HDAudio device. Disabled = Azalia will be unconditionally disabled Enabled = Azalia will be unconditionally enabled [Disable, **Enable**]
		HDAudio VCi Enable>	Enable/Disable Virtual Channel 1 of Audio Controller [Disable, **Enable**]
		HDAudio Docking Support Enable>	Enable/Disable HDAudio Docking Support of Audio Controller [**Disabled**, Enabled]
		HDAudio PME Enable>	Enable/Disable Power Management capability of Audio Controller [Disable, **Enable**]
		HDAudio HDMI Codec>	Enable/Disable internal HDMI codec for HDAudio [Disable, **Enable**]
	SATA Drives>	Chipset-SATA>	Enables or Disables the Chipset SATA Controller. The Chipset SATA controller supports the 2 black internal SATA ports (up to 3Gb/s supported per port). [**Enable**, Disable]
		SATA Test Mode>	Test Mode Enable/Disable [Enable, **Disable**]
		Chipset SATA Mode>	IDE: Compatibility mode disables AHCI support. AHCI: Supports advanced SATA features such as Native Command Queuing. Warning: OS may not boot if this setting is changed after OS install. [IDE, **AHCI**]
		SATA Port 0 Hot Plug Capability>	If enabled. SATA port will be reported as Hot Plug capable. [Enable, **Disable**]

Sub-Screen	Function	Second level Sub-Screen / Description	
South Cluster Configuration> (continued)	SATA Drives> (continued)	SATA Port 1 Hot Plug Capability>	If enabled. SATA port will be reported as Hot Plug capable. [Enable, **Disable**]
	LPSS & SCC Configuration>	LPSS &SCC Devices Mode>	LPSS & SCC Devices Mode Settings. [ACPI Mode, **PCI Mode**]
		SCC eMMC Boot Controller>	Disable/Select eMMC Boot mode; Auto Detect mode can switch the eMMC controller against the stepping [Disable, **Auto Detect**, eMMC 4.41, eMMC 4.5]
		eMMC 4.5 Support>	Enable - eMMC 4.5 Disable - eMMC 4.41 [Disable, **Enable**]
		eMMC DDR50 Support>	SCC eMMC 4.5 DDR50 Support Enable\Disable [**Disable**, Enable]
		eMMC HS200 Support>	SCC eMMC 4.5 HS200 Support Enable/Disable [Disable, **Enable**]
		eMMC retune timer value>	Select the retune timer value in HS200 mode (range 0 - 15) [**8**]
		SCC SD card Support>	SDIO Support Enable/Disable [Disable, **Enable**]
		SD SDR 25 Support>	Enables a bus speed of 25MB/s for the SDcard (High speed). If disabled then bus speed will be 12.5MB/s (Normal speed). [Disable, **Enable**]
		SD SDR 50 Support>	Enables a bus speed of 50MB/s for the SDcard (UltraHighSpeed-I). If disabled, then bus speed will depend on the 'SDR 25' entry. [**Disable**, Enable]
		SCC SDIO Support>	SCC SDIO Support Enable\Disable [**Disable**, Enable]
		MIPI HSI Support>	MIPI HSI Support Enable/Disable [**Disable**, Enable]
		LPSS DMA #1 Support>	LPSS DMA #1 Support Enable/Disable [Disable, **Enable**]
		LPSS DMA #2 Support>	LPSS DMA #2 Support Enable/Disable [Disable, **Enable**]
		LPSS I2C #1 Support>	LPSS I2C #1 Support Enable/Disable [Disable, **Enable**]
		LPSS I2C #2 Support>	LPSS I2C #2 Support Enable/Disable [Disable, **Enable**]
		LPSS I2C #3 Support>	LPSS I2C #3 Support Enable/Disable [Disable, **Enable**]
		LPSS I2C #4 Support>	LPSS I2C #4 Support Enable/Disable [Disable, **Enable**]
		LPSS I2C #5 Support>	Read only field [**Enable**]

| Sub-Screen	Function	Second level Sub-Screen / Description	
South Cluster Configuration> (continued)	LPSS & SCC Configuration> (continued)	LPSS I2C #6 Support>	Read only field [**Disable**]
		LPSS I2C #7 Support>	Read only field [**Disable**]
		LPSS HSUART #1 Support>	LPSS HSUART #1 Support Enable\Disable. Must be disabled to support Console Redirection over the PCU UART. When Console Redirection is enabled, the PCU AHRT will be enabled and HSUART #1 will also be disabled. [**Disable**, Enable]
		LPSS HSUART #2 Support>	LPSS HSUART #1 Support Enable\Disable. [**Disable**, Enable]
		LPSS SPI Support>	LPSS SPI Support Enable/Disable [**Disable**, Enable]
	Miscellaneous Configuration>	High Precision Timer>	Enable or Disable the High Precision Event Timer [Disable, **Enable**]
		Boot Time with HPET Timer>	Boot time calculation with High Precision Event Timer enabled [**Disable**, Enable]
		Clock Spread Spectrum>	Enable Clock Chip's Spread Spectrum feature [**Disable**, Enable]
		PCU UART COM 1>	Enable/Disable Onboard PCU UART COM 1. Must be Enabled to support Console Redirection. When Console Redirection is Enabled, the PCU UART will be Enabled and HSUART #1 will also be Disabled. [Disable, **Enable**]
		SMM Lock>	Enable/Disable SMM Lock feature. It will lock the SMRAM and unable load SMM driver any more. [Disable, **Enable**]
		PCI MMIO Size>	PCI MMIO Size [2GB, 1.5GB, 1.25GB, **1GB**]
		PXE ROM>	Enable/Disable PXE Option ROM execution for onboard LAN [**Disable**, Enable]
		Remap Memory Above 4GB>	Enable/Disable Remap Memory Above 4GB. [Disable, **Enable**]
SMBIOS Event Log>	Event Log Validity>		Read only field Shows if Event Log is valid or invalid
	Event Log Capacity>		Read only field Shows if space for Event Log is available
	Event Log>		Enable/Disable Event Log. [**Disabled**, Enabled]
	Mark SMBIOS events as read>		Press Enter to mark SMBIOS events as read. [**Yes**, No]
	Clears SMBIOS events>		Press Enter to clearSMBIOS event log. [**Yes**, No]
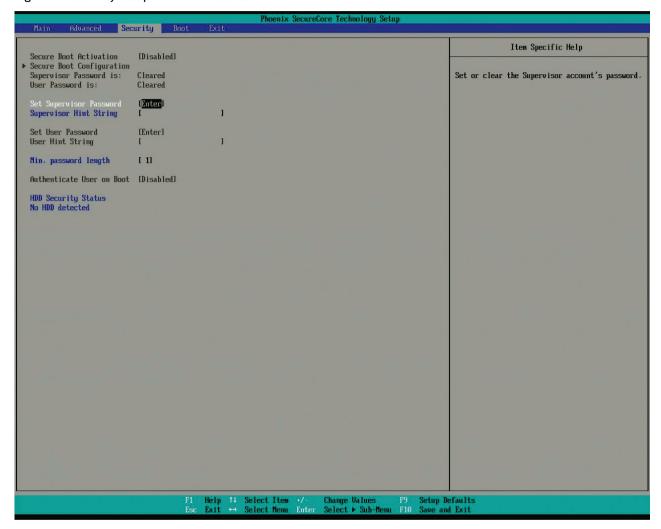
Sub-Screen	Function	Second level Sub-Screen / Description
Memory ECC Error Logging>	Error Logging>	Enable Memory ECC Error Logging to SMBIOS Event Log. Please note that enabling ECC error logging is only useful on systems equipped with ECC memory. Changing the settings on a non-ECC system will have no effEct. [**Disabled**, Enabled]
Kontron Board>	Wake on Lan>	Wake on LAN Enable or Disable. [**Disabled**, Enabled]
	S5 Eco>	Reduces supply current in Soft Off (S5). If enabled, power button is the only wakeup source in S5! See manual for restrictions in S5 Eco. [**Disabled**, Enabled]
	SMBus S0-S5>	SMBus S0-S5 Enable or Disable. [**Disabled**, Enabled]
	SMBus-I2CPM>	SMBus I2CPM Enable or Disable. [Disabled, **Enabled**]
	I2CPM-I2CPMEXT>	I2CPM-I2CPMEXT Enable or Disable. [Disabled, **Enabled**]
	GPIO MUX0 Select>	GPIO0+GPIO2 or Serial Camera 0 Control function select. [**GPIO0+GPIO2 Enabled**, Serial Camera 0 Control Enabled]
	GPIO MUX1 Select>	GPIO1+GPIO3 or Serial Camera 1 Control function select. [**GPIO1+GPIO3 Enabled**, Serial Camera 1 Control Enabled]
	GPIO MUX2 Select>	GPIO4 or HDA Audio function select. [**GPIO4 Enabled**, HDA Audio Enabled]
	GPIO MUX3 Select>	GPIO5+GPIO6 or FAN Control function select. [**GPIO5+GPIO6 Enabled**, FAN Control Enabled]
	RS422/485 DUPLEX Mode>	RS422/485 DUPLEX Mode selection [**Full Duplex**, Half Duplex]
	SMARC GPIO00 Mode>	Select Input or Output mode for this SMARC GPIO. [Input, **Output**]
	Output value>	Select initial value High or Low for this SMARC GPIO set as Output. [Low, **High**]
	SMARC GPIO01 Mode>	Select Input or Output mode for this SMARC GPIO. [Input, **Output**]
	Output value>	Select initial value High or Low for this SMARC GPIO set as Output. [Low, **High**]
	SMARC GPIO02 Mode>	Select Input or Output mode for this SMARC GPIO. [Input, **Output**]
	Output value>	Select initial value High or Low for this SMARC GPIO set as Output. [Low, **High**]
	SMARC GPIO03 Mode>	Select Input or Output mode for this SMARC GPIO. [Input, **Output**]
	Output value>	Select initial value High or Low for this SMARC GPIO set as Output. [Low, **High**]
	SMARC GPIO04 Mode>	Select Input or Output mode for this SMARC GPIO. [Input, **Output**]
	Output value>	Select initial value High or Low for this SMARC GPIO set as Output. [Low, **High**]

Sub-Screen	Function	Second level Sub-Screen / Description	
Kontron Board> (continued)	SMARC GPIO05 Mode>	Select Input or Output mode for this SMARC GPIO. [Input, **Output**]	
	Output value>	Select initial value High or Low for this SMARC GPIO set as Output. [Low, **High**]	
	SMARC GPIO06 Mode>	Select Input or Output mode for this SMARC GPIO. [**Input**, Output]	
	SMARC GPIO07 Mode>	Select Input or Output mode for this SMARC GPIO. [**Input**, Output]	
	SMARC GPIO08 Mode>	Select Input or Output mode for this SMARC GPIO. [**Input**, Output]	
	SMARC GPIO09 Mode>	Select Input or Output mode for this SMARC GPIO. [**Input**, Output]	
	SMARC GPIO10 Mode>	Select Input or Output mode for this SMARC GPIO. [**Input**, Output]	
	SMARC GPIO11 Mode>	Select Input or Output mode for this SMARC GPIO. [**Input**, Output]	
OS Selection>	OS Selection [**Windows**, Linux, Android]	Windows Selection *(if Windows was selected as OS:)* [**Windows 7**, Windows 8, Windows 10]	

12.2.3. Security Setup Menu

The Security Setup menu provides information about the passwords and functions for specifying the security settings. The passwords are case-sensitive.

Figure 47: Security Setup Menu Initial Screen

The following table shows Security sub-screens and functions.

Table 29: Security Setup Menu Functions

Function	Description
Secure Boot Activation>	Not supported yet [**Disabled**]
Secure Boot Configuration>	Not supported yet
Supervisor Password is:>	Read only field. Shows if Supervisor Password is set or cleared.
User Password is:>	Read only field. Shows if User Password is set or cleared.
Set Supervisor Password>	Set or clear the Supervisor account's password. [Enter]

Function	Description
Supervisor Hint String>	Here you can enter a hint for remembering the Supervisor Password. [Enter]
Set User Password>	Set or clear the User account's password. [Enter]
User Hint String>	Here you can enter a hint for remembering the User Password. [Enter]
Min. Password Length>	Set the minimum number of characters for password (1-20) [**1**]
Authenticate User on Boot>	Enable/Disable User Authentication prompt on boot [**Disabled**, Enabled]
HDD Security Status>	Options available if HDD/SSD connected
HDD Password Select>	User only or both user and master password (only active if HDD is detected) [**User+Master**, User only]
Set HDD02 User Password>	Set user password for HDD02 (only active if HDD is detected) [Enter]
Set HDD02 Master Password>	Set master password for HDD02 (only active if HDD is detected and HDD Password Select is User+Master) [Enter]

> **i**
>
> **If only the administrator's password is set, then only access to the setup is limited and is requested when entering the setup.**
>
> **If the user's password is set, then the password is a power on password and must be entered to boot or enter setup. In the setup the user has restricted rights.**

12.2.3.1. Remember the Password

It is highly recommended to keep a record of all passwords in a safe place. Forgotten passwords results in the user being locked out of the system.
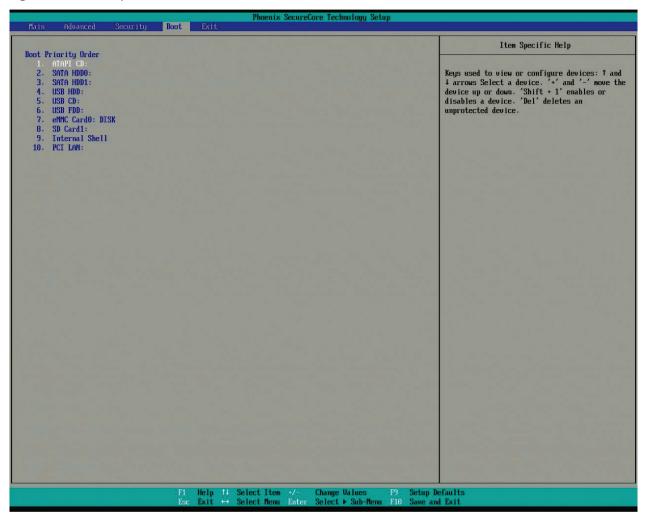
If the system cannot be booted because the User Password or the Supervisor Password are not known, boot from the recovery BIOS (J49), or contact Kontron Support for further assistance.

12.2.4. Boot Setup Menu

The Boot Setup menu lists dynamically generated boot device priority order.

Figure 48: Boot Setup Menu Initial Screen

The following table shows Boot sub-screens and functions, and describes the content. Default settings are in **bold**.
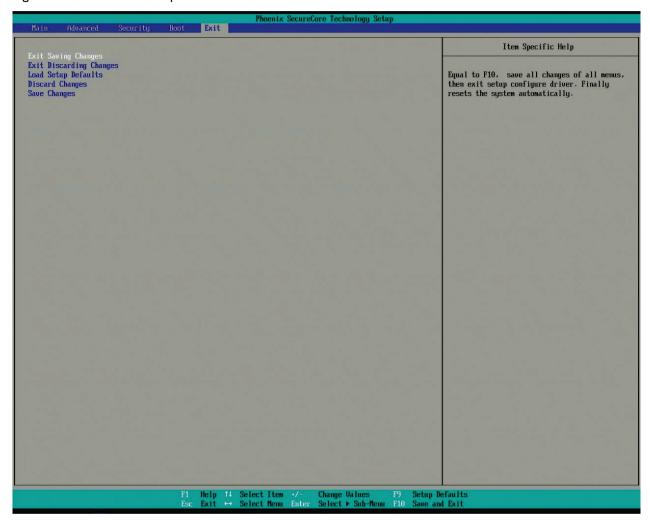
Table 30: Boot Setup Menu Functions

Function	Description
Boot Priority Order> 1. ATAPI CD: 2. SATA HDD0: 3. SATA HDD1: 4. USB HDD: 5. USB CD: 6. USB FDD: 7. eMMC Card0: Disk 8. SD Card1: 9. Internal Shell 10. PCI LAN:	Keys used to view or configure devices: ↑ and ↓ arrows Select a device. '+' and '-' move the device up or down. 'Shift + 1' enables or disables a device. 'Del' deletes an unprotected device.

12.2.5. Exit Setup Menu

The Save and Exit Setup menu provides functions for handling changes made to the uEFI BIOS settings and exiting the Setup program.

Figure 49: Save and Exit Setup Menu Initial Screen

The following table shows the Exit menu sub-screens and functions, and describes the content.

Table 31: Save and Exit Setup Menu Functions

Function	Description
Exit Saving Changes>	Equal to F10, save all changes of all menus, then exit setup configure driver. Finally resets the system automatically.
Exit Discarding Changes>	Never save changes, then exit setup configure driver
Load Setup Defaults>	Equal to F9. Load standard default values.
Discard Changes>	Load the original value of this boot time. Not the default setup value.
Save Changes>	Save all changes of all menus, but do not reset system.

12.3. The uEFI Shell

The Kontron uEFI BIOS features a built-in and enhanced version of the uEFI Shell. For a detailed description of the available standard shell scripting, refer to the EFI Shell User Guide. For a detailed description of the available standard shell commands, refer to the EFI Shell Command Manual. Both documents can be downloaded from the EFI and Framework Open Source Community homepage (http://sourceforge.net/projects/efi-shell/files/documents/).

> **i** Kontron uEFI BIOS does not provide all shell commands described in the EFI Shell Command Manual.

12.3.1. Basic Operation of the uEFI Shell

12.3.1.1. Entering the uEFI Shell

To enter the uEFI Shell, follow the steps below:

1. Power on the board.

2. Press the <F5> key (instead of <F2>) to display a choice of boot devices.

3. Choose 'Internal Shell'.

```
EFI Shell 2.31 [4660.22136]
Current running mode 1.1.2
Device mapping table
Fs0     :HardDisk - Alias hd33b0b0b fs0
   Acpi(PNP0A03,0)/Pci(1D|7)/Usb(1, 0)/Usb(1, 0)/HD(Part1,Sig17731773)
```

Press the ESC key within 5 seconds to skip startup.nsh, and any other key to continue.

4. The output produced by the device-mapping table can vary depending on the board's configuration.

5. If the ESC key is pressed before the 5 second timeout elapses, the shell prompt is shown:

```
Shell>
```

12.3.1.2. Exiting the uEFI Shell

To exit the uEFI Shell, follow one of the steps below:

1. Use the **exit** uEFI Shell command to select the boot device, in the Boot menu, that the OS will boot from.

2. Reset the board using the **reset** uEFI Shell command.

12.4. uEFI Shell Scripting

12.4.1. Startup Scripting

If the ESC key is not pressed and the timeout has run out then the uEFI Shell tries to execute some startup scripts automatically. It searches for scripts and executes them in the following order:

1. Initially searches for Kontron flash-stored startup script.

2. If there is no Kontron flash-stored startup script present then the uEFI-specified **startup.nsh** script is used. This script must be located on the root of any of the attached FAT formatted disk drive.

3. If none of the startup scripts are present or the startup script terminates then the default boot order is continued.

12.4.2. Create a Startup Script

Startup scripts can be created using the uEFI Shell built-in editor edit or under any OS with a plain text editor of your choice. To create a startup shell script, simply save the script on the root of any FAT-formatted drive attached to the system.

12.4.3. Examples of Startup Scripts

12.4.3.1. Execute Shell Script on other Harddrive

This example (**startup.nsh**) executes the shell script named **bootme.nsh** located in the root of the first detected disc drive (**fs0**).

```
fs0:
bootme.nsh
```

12.5. Firmware Update

Firmware updates are typically delivered as a ZIP archive containing only the firmware images. The content of the archive with the directory structure must be copied onto a data storage device with FAT partition.

12.5.1. Updating Procedure

BIOS can be updated with the Intel tool fpt64.efi using the procedure below:

1. Copy these files to an USB stick.

   ▶ flash.nsh (if available)

   ▶ fpt64.efi

   ▶ fparts.txt

   ▶ SMVVR<xxx>......bin (where xxx stands for the version #)

2. Start the system into the uEFI shell (see chapter 12.3.1.1 "Entering the uEFI Shell").

3. Change to the drive representing the USB stick.

```
fsx:   (x = 0,1,2,etc. represents the USB stick)
```

   Change to the directory where you copied the flash tool.

```
cd <your_directory>
```

4. Start flash.nsh (if available)

   OR type

```
fpt64 -F SMVVR<xxx>......bin
```

5. Wait until flashing is successful and then power cycle the board.

> **Do not switch off the power during the flash process!**

Appendix A: List of Acronyms

Table 32: List of Acronyms (Example)

API	Application Programming Interface			
BMC	Base Management Controller			
CLI	Command-Line Interface			
COM	Computer-on-Module			
ECC	Error Checking and Correction			
FRU	Field Replaceable Unit			
GPU	Graphics Processing Unit			
HD/HDD	Hard Disk /Drive			
HPM	PICMG Hardware Platform Management specification family			
IOL	IPMI-Over-LAN			
IOT	Internet of Things			
IPMI	Intelligent Platform Management Interface			
KCS	Keyboard Controller Style			
KVM	Keyboard Video Mouse			
MEI	Management Engine Interface			
NCSI	Network Communications Services Interface			
PCIe	PCI-Express			
PECI	Platform Environment Control Interface			
PICMG®	PCI Industrial Computer Manufacturers Group			
RTC	Real Time Clock			
SEL	System Event Log			
ShMC	Shelf Management Controller			
SMBus	System Management Bus			
SMWI	System Monitor Web Interface			
SOL	Serial Over LAN			
SSH	Secure Shell			
TPM	Trusted Platform Module			
UEFI	Unified Extensible Firmware Interface			
VLP	Very Low Profile			

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About Kontron

Kontron is a global leader in embedded computing technology (ECT). As a part of technology group S&T, Kontron offers a combined portfolio of secure hardware, middleware and services for Internet of Things (IoT) and Industry 4.0 applications. With its standard products and tailor-made solutions based on highly reliable state-of-the-art embedded technologies, Kontron provides secure and innovative applications for a variety of industries. As a result, customers benefit from accelerated time-to-market, reduced total cost of ownership, product longevity and the best fully integrated applications overall. For more information, please visit: **www.kontron.com**

Global Headquarters

Kontron S&T AG

Lise-Meitner-Str. 3-5
86156 Augsburg
Germany
Tel.: + 49 821 4086-0
Fax: + 49 821 4086-111
info@kontron.com