



KBox A-151-AML/ADN

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KBox A-151-AML/ADN – User Guide

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NOTICE

You find the most recent version of the “General Safety Instructions” online in the download area of this product.

NOTICE

This product is not intended for use or suited for storage or operation in corrosive environments, in particular under exposure to sulfur and chlorine and their compounds. For information on how to harden electronics and mechanics against these stress conditions, contact Kontron Support.

Revision History

Revision	Brief Description of Changes	Date of Issue	Author
0.1	Initial preliminary Issue	2025-May-12	CW
0.2	Hardware update and new photos	2025-May-30	CW
0.3	LAN to Ethernet and split to AML/ADN and RPL	2025-Jun-03	CW
0.4	New block diagram	2025-Jun-13	CW
0.5	New Customized front panel and added processor info, DIN rail figure, power spec., LTE bands and new photos.	2025-Jun-30	CW
0.6	New power Spec, new type label with warning and power spec.	2025-Jul-08	CW

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Customer Comments

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 indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



NOTICE indicates a property damage message.



CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury

ATTENTION indique une situation dangereuse qui, si elle n'est pas évitée, peut entraîner des blessures mineures ou modérées.



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.



Caution: HOT Surface!

Do NOT touch! Allow to cool before servicing.

Attention : Surface CHAUDE !

Ne pas toucher ! Laissez refroidir avant de procéder à l'entretien.



Caution: Laser!

This symbol informs of the risk of exposure to laser beam and light emitting devices (LEDs) from an electrical device. Eye protection per manufacturer notice shall be reviewed before servicing.



High sound pressure!

High sound pressure possible with headphones. There is a risk of hearing damage. Do not listen at high volume levels for long periods of time.

**Security**

This symbol indicates general information and guidelines regarding the product's cyber security to ensure secure installation, operation, maintenance and disposal of the product within the user's end environment.



This symbol indicates general information about the product and the user guide.



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.

⚠ CAUTION

Handling and operation of the product is permitted only for skilled personnel within a workplace that is access controlled. Follow the "General Safety Instructions" supplied with the product.

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 lithium battery.

⚠ CAUTION

Risk of Explosion if the lithium Battery is replaced by an incorrect Type. Dispose of used lithium batteries According to the instructions.

Risque d'explosion si la pile au lithium est remplacée par une pile de type incorrect.

Éliminez les piles au lithium usagées conformément aux 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 www.kontron.com/about-kontron/corporate-responsibility/quality-management.

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1/Introduction

This user guide describes the KBox A-151-AML/ADN designed for DIN Rail applications and also known as product within this user guide. This user guide focuses on describing the product's special features and how to assemble, install, operate, maintain and dispose of the product properly. New users are recommended to study the instructions within this user guide before switching on the product.

The KBox A-151-AML/ADN is a flexible fanless industrial grade DIN Rail box PC designed for use in performance demanding applications requiring flexible DIN Rail mounting in limited space, 24/7 continuous operation and longtime industrial employment. Based on Kontron's 3.5" Single Board Computer (SBC) with the Atom Alder-Lake-N (AML/ADN) series of processors, the KBox A-151-AML/ADN features a variety of external interfaces to enable extensive connectivity and allows for additional storage and wireless features such as Wi-Fi and/or cellular LTE. System expansion increases via the use of a system expansion I/O door on the front panel supporting a wide variety of interface options. All components are selected to ensure a long lifetime and the fanless design ensures a significantly prolonged lifespan and high system availability.

Figure 1: KBox A-151-AML/ADN



The main features are:

Processor

- Atom Alder-Lake-N (AML/ADN) series

System memory

- Up to 16 GByte with DDR5 SODIMM

Storage

- Up to 2 TByte with M.2 NVMe SSD

Front connectors

- 2x DP++
- 2x USB 3.2 Gen 2
- 1x USB-C 3.2 Gen 2
- 1x USB 2.0
- 2x 2.5 GbE
- 2x Serial Ports RS232

Wireless connectivity options:

- Wi-Fi
- LTE

System expansion options on the front panel:

- › System expansion I/O door options:
 - › Dual CAN
 - › Dual GbE
 - › Dual Serial Ports RS232 or RS232/422/485
 - › EtherCAT
 - › 8-Channel GPIO/Digital IO
- › Customized front panel options:
 - › Dual Ethernet + Dual DP with custom front panel
 - › Quad Ethernet with custom front panel

Chassis

- › Metal chassis with heatsink
- › Fanless passive cooling

Power

- › Power IN 24 VDC (10 VDC to 34 VDC [abs. max. 36 VDC])
- › 80 W



To ensure you have the latest version of this user guide, visit [Kontron's Embedded Box PC, KBox A-151-AML/ADN website.](#)



Preliminary Version of the User Guide!

This preliminary version of the user guide may contain information requiring rework. Yellow highlighted item may be subject to change, information may be TBD and figures may not represent the final product.

2/General Safety Instructions

Please read this passage 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 non-observance of the instructions Kontron Europe 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 to also 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 a filter mat is provided, this should be cleaned regularly. Do not place the product close to heat sources or damp places. Make sure the product is well ventilated.
- Only connect the product to an external power supply providing the voltage type (AC or DC) and the input power (max. current) specified on the Kontron Product Label and meeting the requirements of the Limited Power Source (LPS) and Power Source (PS2) of UL/IEC 62368-1 .
- Only products or parts that meet the requirements for Power Source (PS1) of UL/IEC 62368-1 may be connected to the product's available interfaces (I/O).
- Before opening the product, make sure that the product is disconnected from the mains.
- Switching off the product 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 product. Ensure that there is free and easy access to enable disconnection.
- The product may only be opened for the insertion or removal of add-on cards (depending on the configuration of the product). 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 product does not exceed the value stated on the product label
- Only original accessories that have been approved by Kontron Europe can be used.
- Please note: safe operation is no longer possible when any of the following applies:
 - the product has visible damages or
 - the product is no longer functioning
 In this case the product must be switched off and it must be ensured that the product can no longer be operated.
- Handling and operation of the product is permitted only for trained personnel within a work place that is access controlled.
- CAUTION: Risk of explosion if the lithium battery is replaced incorrectly (short-circuited, reverse-poled, wrong lithium battery type). Dispose of used lithium batteries according to the manufacturer's instructions.
- This product is not suitable for use in locations where children are likely to be present

2.1. Additional Safety Instructions for DC Power Supply Circuits

- To guarantee safe operation, please observe that:
 - the external DC power supply must meet the criteria for LPS and PS2 (UL/IEC 62368-1)
 - no cables or parts without insulation in electrical circuits with dangerous voltage or power should be touched directly or indirectly
 - a reliable functional earth connection is provided
 - a suitable, easily accessible disconnecting device is used in the application (e.g. overcurrent protective device), if the product itself is not disconnect able
 - a disconnect device, if provided in or as part of the product, shall disconnect both poles simultaneously
 - interconnecting power circuits of different products 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 EN62368-1 or VDE0100 or EN60204 or UL61010-1 regulations.

For the General Safety Instruction in German or French, visit Kontron's product web page> Downloads> Manuals> General Safety Instructions.

2.2. Instructions générales de sécurité

Veuillez lire attentivement ce passage et prendre bonne note des instructions, qui ont été compilées pour votre sécurité et pour assurer une application conforme aux réglementations prévues. Le non-respect des consignes de sécurité générales suivantes peut entraîner des blessures pour l'utilisateur et/ou des dommages pour le produit. En cas de non-respect des consignes, Kontron Europe est exonéré de la responsabilité en cas d'accident, ceci s'applique également pendant la période de garantie.

Le produit a été construit et testé conformément aux exigences de sécurité de base pour les applications basse tension (DBT) et a quitté le fabricant dans un état impeccable en matière de sécurité. Pour maintenir cet état et pour garantir également un fonctionnement sûr, l'opérateur doit non seulement respecter les conditions d'utilisation correctes du produit, mais aussi les consignes de sécurité générales suivantes :

- Le produit doit être utilisé conformément à la documentation du produit, dans laquelle sont décrites les instructions de sécurité pour le produit et pour l'opérateur. Celles-ci contiennent des directives pour la mise en place, l'installation et le montage, la maintenance, le transport ou le stockage.
- L'installation électrique sur place doit répondre aux exigences des réglementations locales spécifiques du pays.
- Si un câble d'alimentation est fourni avec le produit, seul ce câble doit être utilisé. N'utilisez pas de rallonge pour connecter le produit.
- Afin de garantir une circulation d'air suffisante pour refroidir le produit, veuillez vous assurer que les ouvertures de ventilation ne sont pas couvertes ou obstruées. Si un élément filtrant est fourni, celui-ci doit être nettoyé régulièrement. Ne placez pas le produit à proximité de sources de chaleur ou d'endroits humides. Veillez à ce que le produit soit bien ventilé.
- Ne connectez le produit qu'à une alimentation externe fournissant le type de tension (AC ou DC) et la puissance d'entrée (courant max.) spécifiés sur le Label Produit Kontron et répondant aux exigences de la source d'alimentation limitée (LPS) et de la source d'alimentation (PS2) de la norme UL/IEC 62368-1 .
- Seuls les produits ou les pièces qui répondent aux exigences de la source d'alimentation (PS1) de la norme UL/IEC 62368-1 peuvent être connectés aux interfaces (E/S) disponibles du produit.
- Avant d'ouvrir le produit, assurez-vous qu'il est bien débranché du secteur.
- Le fait d'éteindre le produit par son bouton de mise en marche ne le déconnecte pas du secteur. Une déconnexion complète n'est possible que si le câble d'alimentation est retiré de la prise murale ou du produit. Veillez à ce que l'accès soit libre et facile pour permettre la déconnexion.
- Le produit ne peut être ouvert que pour l'insertion ou le retrait de cartes supplémentaires (selon la configuration du produit). Cette opération ne peut être effectuée que par des opérateurs qualifiés.

- › Si des extensions sont effectuées, les points suivants doivent être respectés :
 - › toutes les réglementations légales en vigueur et toutes les données techniques sont respectées
 - › la consommation électrique d'une carte supplémentaire ne dépasse pas les limites spécifiées
 - › la consommation actuelle du produit ne dépasse pas la valeur indiquée sur l'étiquette du produit.
- › Seuls les accessoires d'origine approuvés par Kontron Europe peuvent être utilisés.
- › Veuillez noter que la sécurité des opérations n'est plus possible lorsque l'une des conditions suivantes s'applique.
 - › le produit présente des dommages visibles ou
 - › le produit ne fonctionne plus. Dans ce cas, le produit doit être éteint et il faut s'assurer que le produit ne puisse plus être utilisé.
- › La manipulation et le fonctionnement du produit ne sont autorisés que pour le personnel formé dans un lieu de travail dont l'accès est contrôlé.
- › ATTENTION: Risque d'explosion en cas de remplacement incorrect de la pile au lithium (court-circuit, inversion de polarité, mauvais type de pile au lithium). Éliminez les piles au lithium usagées conformément aux instructions du fabricant.
- › Ce produit n'est pas adapté à une utilisation dans des endroits où des enfants sont susceptibles d'être présents
- › Instructions de sécurité supplémentaires pour les circuits d'alimentation en courant continu
- › Pour garantir un fonctionnement sûr, veuillez observer ce qui suit:
 - › l'alimentation électrique externe en courant continu doit répondre aux critères des LPS et PS2 (UL/IEC 62368-1)
 - › aucun câble ou pièce non isolée dans les circuits électriques ayant une tension ou une puissance dangereuse ne doit être touché directement ou indirectement
 - › une connexion à la terre fonctionnelle fiable est fournie
 - › un dispositif de déconnexion approprié et facilement accessible est utilisé dans l'application (par exemple, un dispositif de protection contre les surintensités), si le produit lui-même n'est pas en mesure d'être déconnecté.
 - › un dispositif de déconnexion, s'il est prévu dans le produit ou s'il en fait partie, doit déconnecter les deux pôles simultanément
 - › l'interconnexion des circuits électriques de différents produits ne présente aucun risque électrique
- › Un dimensionnement suffisant des fils du câble d'alimentation doit être choisi - en fonction des spécifications électriques maximales figurant sur l'étiquette du produit - comme stipulé par les réglementations EN62368-1 ou VDE0100 ou EN60204 ou UL61010-1.

2.3. Electrostatic Discharge (ESD)



ESD Sensitive Device!

Keep electrostatic sensitive parts in their containers until they arrive at the ESD-safe workplace. Always be properly grounded when touching a sensitive board, component, or assembly.

A sudden discharge of electrostatic electricity can destroy static-sensitive devices or micro-circuitry. Proper packaging and grounding techniques are necessary 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.

2.4. Grounding Methods

The following measures help to avoid electrostatic damage to the product:

1. Cover workstations with approved antistatic material. Always wear a wrist strap connected to the workplace, as well as 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. Switch off power and input signals before inserting and removing connectors or connecting test equipment.
6. Keep the work area free of non-conductive materials such as ordinary plastic assembly aids and styrofoam.
7. Use field service tools such as cutters, screwdrivers, and vacuum cleaners that are conductive.
8. Always place drives and boards with the PCB-assembly-side down on the foam.

2.5. Instructions for Lithium Battery

The product is equipped with a Kontron specific lithium battery BR2032 with cable and is not designed to operate without a lithium battery. If the lithium battery is empty or disconnected, the BIOS settings will be set to the factory defaults. There is a risk of explosion if the lithium battery is replaced incorrectly (short-circuited, reverse-poled, wrong lithium battery type).

Replace the Kontron specific lithium battery assembly only with the same type of lithium battery (BR2032 with cable) or with a Kontron recommended lithium battery type, see Table 2: Accessories.

To replace the lithium battery, observe the instructions see Chapter 14.2: Replacing the RTC Lithium Battery.

After removing the lithium battery, dispose of the lithium battery according to the regulations within your region.

⚠ CAUTION

Danger of Explosion if the lithium battery is incorrectly placed!

- Replace only with the same or equivalent type recommended by the manufacturer
- Dispose of used batteries according to the manufacture's instructions

ATTENTION- Risque d'explosion avec l'échange inadéquat de la batterie!

- Remplacement seulement par le même ou un type équivalent recommandé par le producteur
- L'évacuation des batteries usagées conformément à des indications du fabricant

VORSICHT- Explosionsgefahr bei unsachgemäßem Austausch der Batterie!

- Ersatz nur durch denselben oder einen vom Hersteller empfohlenen gleichwertigen Typ
- Entsorgung gebrauchter Batterien nach Angaben des Herstellers



The product is not designed to operate without a lithium battery. If the lithium battery is empty or disconnected, the BIOS settings will be set to the factory defaults.



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

2.6. Thermal Conditions

The product is passively cooled using a heatsink. There is a risk of burns or injury when touching the heatsink.

Hot Surface

The heatsink can get very hot. To avoid burns and personal injury when handling the heatsink:

- › Do not touch while in operation
- › Allow to cool before handling
- › Wear protective gloves

Surface chaude

Le dissipateur thermique peut devenir très chaud. Pour éviter les brûlures et les blessures lors de la manipulation du dissipateur thermique :

- › Ne pas toucher pendant le fonctionnement
- › Laisser refroidir avant la manipulation
- › Portez des gants de protection

Heiße Oberfläche

Der Kühlkörper kann sehr heiß werden. Um Verbrennungen und Verletzungen beim Umgang mit dem Kühlkörper zu vermeiden:

- › Während des Betriebs nicht berühren
- › Vor der Handhabung abkühlen lassen
- › Schutzhandschuhe tragen



3/ Shipment and Unpacking

3.1. Packaging

The KBox A-151-AML/ADN is packaged together with all parts, in a product specific cardboard package designed to provide adequate protection and absorb shock.

3.2. Unpacking

To unpack the product, perform the following:

1. Remove packaging.
2. Do not discard the original packaging. Keep the original packaging for future transportation or storage.
3. Check the delivery for completeness by comparing the delivery with the original order.
4. Keep the associated paperwork. It contains important information for handling the product.
5. Check the product for visible shipping damage.

If you notice shipping damage or inconsistencies between the contents and the original order, contact your dealer.

3.3. Scope of Delivery

The scope of delivery describes the parts included in your delivery. Check that the delivery is complete, and contains the items listed. If damaged or missing items are discovered, contact your dealer.

Table 1: Scope of Delivery

Product	Description
KBox A-151-AML/ADN	KBox A-151-AML/ADN with customer defined configuration of processor and system expansion
Phoenix Power connector	3-pin Phoenix power connector (PSC 1.5/ 3-F)
DIN Rail clamp	DIN Rail clamp 50 mm x 50 mm (mounted on rear side)
Antenna	Wi-Fi and LTE antenna (only include in the delivery if configured with Wi-Fi and/or cellular LTE)
General Safety Instructions	General safety instructions when operating or handling IT equipment.

3.4. Accessories

Table 2: Accessories

Part Number	Part	Description
EE04-100001-01	3-pin Phoenix power connector	3-pin Phoenix power connector (PSC 1.5/3-F) incl. housing
ER40-100012-01	24 VDC AC/DC Power supply	24 VDC External AC/DC Power supply (80 W), cable 1.4 m and 3-pin Phoenix power connector (PSC 1.5/ 3-F)
840-0059	Power cable EU	Power cable AC mains (2 m) to external Europe plug
840-0115	Power cable UK	Power cable AC mains (1.8 m) to external UK plug
0-0064-4317	Power cable US	Power cable AC mains (2 m) to external USA plug

Part Number	Part	Description
1068-4995	BR2032 3V Lithium battery	BR2032 3V Lithium battery with cable
9-5000-1151	KIT Bookmount	Book mount adapter plate incl. Screws
9-5000-1154	KIT Rugged DIN-RAIL	Rugged DIN-RAIL adapter incl. screws
9-5000-1155	KIT DIN-RAIL	DIN-RAIL adapter incl. Screws
Manufacturer: SparkLan Article Number: R3410A10050 Product Name: AD-501AX	Wi-Fi Antenna 	Connector: RP-SMA (male) Type: Wi-Fi 6E Dipole Antenna Frequency: 2.4/5/6 GHz Peak gain: 3.7 dBi/5 dBi/5 dBi L x W x T: 162 x 22 x 6.8 mm Articulated hinge: 0° to 90° Impedance: 50 ohms
Manufacturer: 2J Antennas Article Number: 2JW0924-C952B	LTE Antenna 	Connector: SMA (male) Type: 4G LTE Pattern: Omni - directional Frequency: 698-960/1710-2170/2500-2700 MHz Peak Gain: 0.6 / 2.6 / 2.3 dBi (approx.) L x W x T: 170 x 18 x 10 mm Articulated hinge: 0° to 90° Impedance: 50 ohms

3.5. Product Identification Type Label

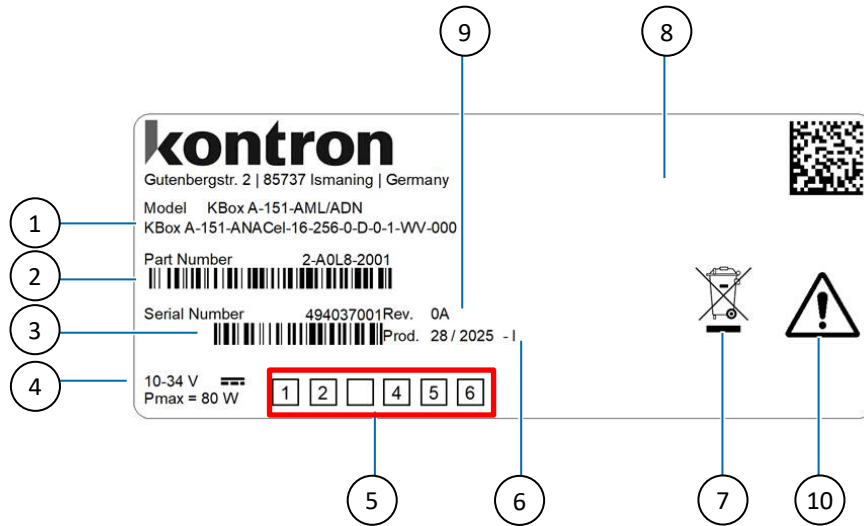
The KBox A-151-AML/ADN is part of Kontron's DIN Rail embedded Box PC. Kontron's A-Series is intended for control cabinet applications.

Table 3: Product Identification

System Type	Product Designation	Model	Description
KBox A	KBox A-151	KBox A-151-AML/ADN	Corresponds to system configurations based on 3.5"-SBC-AML/ADN with 13th Gen Intel® Core™ U series of processors.

The type label includes important product specific Information such as the electrical specification and the compliance of the ordered product variant.

Figure 2: Type Label Example



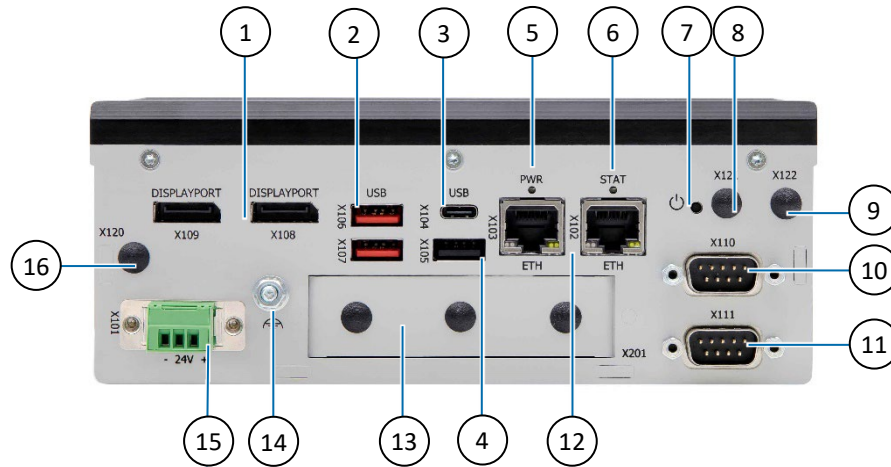
- | | |
|------------------------------|------------------------|
| 1 Model/Product family | 6 Production date |
| 2 Part Number with bar code | 7 Dispose of correctly |
| 3 Serial Number and bar code | 8 Compliance (TBD) |
| 4 Electrical specification | 9 Revision |
| 5 For Internal use | 10 Observe warnings |

4/Product Features

4.1. Front Panel

The front panel features all the I/O interfaces, status LEDs and the power connection.

Figure 3: Front Panel



- | | | | |
|---|------------------------------|----|-------------------------------------|
| 1 | 2x Display port (X109, X108) | 9 | 1x Antenna (X122) |
| 2 | 2x USB 3.2 Gen 2 (X107-X106) | 10 | 1x Serial port (X110) (option) |
| 3 | 1x USB-C 3.2 Gen 2 (X104) | 11 | 1x Serial port (X111) (option) |
| 4 | 1x USB 2.0 (X105) | 12 | 2x 2.5 GbE Ethernet (X103, X102) |
| 5 | 1x Power LED | 13 | 1x System expansion I/O door (X201) |
| 6 | 1x State LED | 14 | 1x Functional earth bolt |
| 7 | 1x Power button | 15 | 1x Power IN connector (X101) |
| 8 | 1x Antenna (X121) | 16 | 1x Antenna (X120) |

4.1.1. Power IN Connector (X101)

The 3-pin Power IN connector (PSC 1.5/ 3-M) connects to an appropriate DC power supply using the mating power connector (PSC 1.5/ 3-F) included in the delivery. To wire the mating power connector, see Chapter 9.1.1: Wiring the Power IN Connector.

For the pin assignment of the Power IN connector, see Chapter 13.1.1: Power IN Connector (X101).

4.1.2. Power Button

The power button switches on or switches off the product. Pressing the power button for more than four seconds switches the product from the 'on' to 'off' state.

4.1.3. Functional Earth Bolt

The functional earth bolt connects to the chassis ground.

4.1.4. Power LED and State LED

The Power LED and State LED indicate the product's power and state condition.

Table 4: Power LED and State LED Description

STAT LED (green)	PWR LED (yellow)	Description
On	On	Power on (Fully operational)
Flashing	On	Sleeping
Off	On	Sleeping
Off	Off	Power off

4.1.5. Ethernet Ports (X102, X103)

The Ethernet LAN ports (X102, X103) each support one channel of 10/100/1000/2500 Mbit Ethernet.



To achieve the specified Ethernet port performance, Category 5 twisted pair cables must be used with 10/100 Mbit and Category 5E, 6 or 6E with 1 GbE/2.5 GbE Ethernet networks.



The product is to be connected only to internal Ethernet networks without exiting a facility and being subjected to TNVs.

For the pin assignment of the Ethernet LAN ports and information regarding the Ethernet status LEDs, see Chapter 13.1.2: Ethernet 2.5 GbE Connectors (X102, X103).

4.1.6. USB-C 3.2 Gen 2 Port (X104)

The USB-C port (X104) supports USB 3.2 Gen 2 and DP Alternate Mode to carry video in, audio, data & power (PD 5V/3A) over a single port, to enable the direct connection of a monitor.



Product variants with the:

- Intel® Atom® x7000RE Series Processors support USB-C 3.2 Gen 1
- Intel® Core™ i3 N-Series & Intel® N-Series Processors support USB-C 3.2 Gen 2



The USB-C /DP Alt-Mode Port can power a device with 5 V and 3 A or connect a display as an additional DP port

For the pin assignment of the USB-C Port, see Chapter 13.1.3: USB-C 3.2 Gen 2 Port (X104).

4.1.7. USB 2.0 (X105)

The USB 2.0 port (X105) supports USB 2.0 connections only.

For the pin assignment of the USB-C Port, see Chapter 13.1.4: USB 2.0 Port (X105)

4.1.8. USB 3.2 Gen 2 Ports (X106, X107)

The four USB ports (X106, X107) support USB 3.2 Gen 2 compatible devices using a USB Type A connector.



The USB 3.2 Gen 2 ports are backwards compatible with USB 3.2 Gen 1 (or later thereof) and USB 2.0 ports.



To achieve the specified performance for USB 3.2 Gen 2 performance use cables that complies with the USB 3.2 standard.

For the pin assignment of the USB 3.2 Gen 2 ports, see Chapter 13.1.5: USB 3.2 Gen 2 Port (X106, X107).

4.1.9. Display Ports (X108, X109)

The two Display Ports (DP) (X108, X109) are standard DP++ ports with a maximum resolution of 7680 x 4230 @ 60 Hz. The product supports up to four displays. To implement an additional display, use a suitable system expansion I/O module.

For the pin assignment of the DP connector, see Chapter 13.1.6: Display Port Connectors (X108, X109).

4.1.10. Serial Port (X110, X111) (option)

The breakouts (X110, X111) support up to two serial RS232 connections.

For the pin assignment of the serial ports, see Chapter 13.1.7: Serial Ports (RS232) (X110, X111).

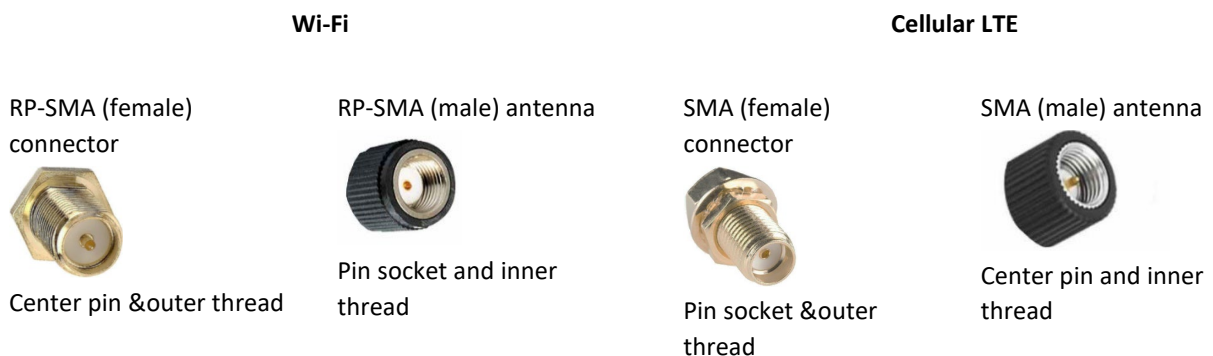
4.1.11. Antenna (X120, X121, X122) (option)

The three antennas (X120, X121, X122) support Wi-Fi and/or LTE depending on the internal configuration. If Wi-Fi and/or cellular LTE are not implemented the openings for (X120, X121, X122) are covered.

Wi-Fi and cellular LTE use different antenna types that are not electrically compatible and not interchangeable. Before connecting to an antenna connector, refer to Figure 4. Users are responsible for connecting the correct antenna type to the product's antenna connectors.

The position of the antenna may affect performance. Do not place the antenna close to a noise source that may cause interference.

Figure 4: Wi-Fi and Cellular LTE Connectors and Antenna Type



Antenna RF exposure

To avoid RF antenna exposure:

⚠ CAUTION

- Avoid placing the antenna near people, minimum distance 20 cm.
 - Avoid pointing the antenna at people.
 - Keep a safe distance from the antenna especially when transmitting.
-

SMA and RP-SMA not Interchangeable!**NOTICE**

SMA and RP-SMA connectors and antenna are not electrically compatible and not interchangeable. Ensure use of the correct antenna type. If RP-SMA and SMA connectors and antennas are mixed they may destroy the center pin or mate without the center pin contacts touching (minimal signal gets through).



Kontron recommends the use of Kontron's reference antenna included in the delivery and chosen to meet RF performance requirements, and to support a nominal impedance of 50 ohms, see Table 2: Accessories.

For more information regarding the delivered antenna and the antenna requirements, see Chapter 13.1.8: Antenna (X120, X121, X122) and Table 2: Accessories.

4.1.12. System Expansion I/O Door (X201)

The system expansion I/O door (X201) supports one factory installed I/O expansion option or a SIM Card slot for cellular LTE.

For information on the system expansion I/O door options, see Chapter 5.4: System Expansion I/O Door Options.

4.1.13. Customized Front Panel (option)

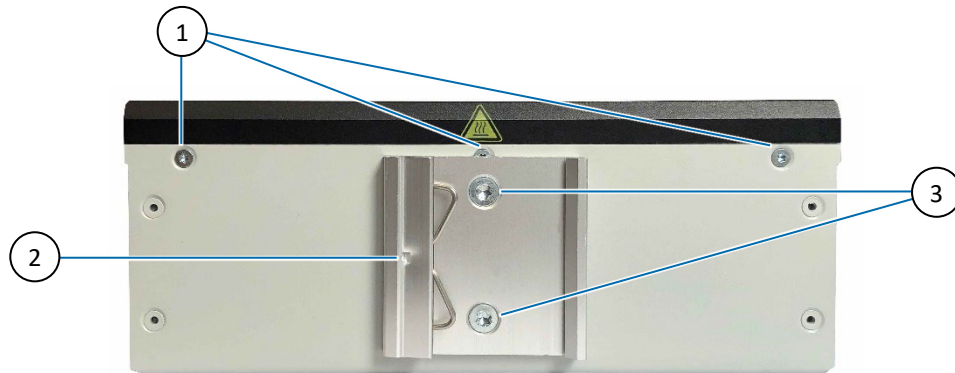
A customized front panel is available using Kontron's 3.5" extended I/O boards. These options deviate from the default product by supporting only one serial port and two antenna connectors on the front panel. The system expansion I/O door options are not available.

For information on the customized front panel options, see Chapter 5.5: Customized Front Panel.

4.2. Rear Side

The rear side features two-threaded openings used for the factory installed DIN Rail clamp (50 mm x 50 mm) or book mount bracket.

Figure 5: Rear Side



- | | | | |
|---|--|---|---|
| 1 | Three screws securing the heatsink-front-panel assembly. | 2 | DIN Rail clamp (50 mm x 50 mm) |
| | | 3 | 2x threaded screw openings for DIN Rail clamp or book mount bracket |



The rear and bottom side DIN Rail clamps are not interchangeable due to a difference in size.

4.3. Right and Left Sides

The right and left sides feature no operational parts.

Figure 6: Right and Left Side



- | | | | |
|---|--|---|------------------------|
| 1 | Screw securing the heatsink-front-panel assembly | 2 | Type label (left side) |
|---|--|---|------------------------|

4.4. Top Side

The top side features a heatsink.

Figure 7: Top Side



Hot Surface

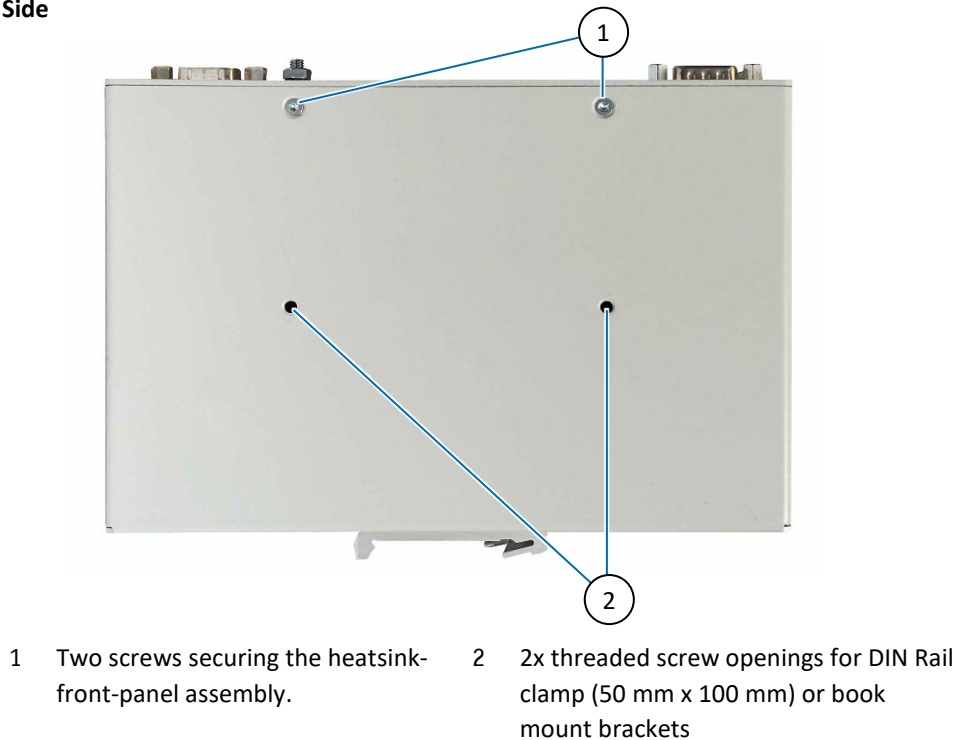
The heatsink can get very hot. To avoid burns and personal injury when handling the heatsink:

- › Do not touch while in operation
 - › Allow to cool before handling
 - › Wear protective gloves
-

4.5. Bottom Side

The bottom side features two-threaded openings used to mount a DIN Rail clamp (50 mm x 100 mm) or book mount bracket.

Figure 8: Bottom Side



The rear and bottom side DIN Rail clamps are not interchangeable due to a difference in size.

4.6. Internal Features

Opening the product may damage internal components and invalidate the warranty. To replace or install internal components, return the product to Kontron. For more information, refer to Chapter 15.1: Returning Defective Merchandise.

The internal Real Time Clock (RTC) lithium battery may over time need to be replaced. To open the product to change the RTC Lithium battery, see Chapter 14.2: Replacing the RTC Lithium Battery.

Protection Label

NOTICE

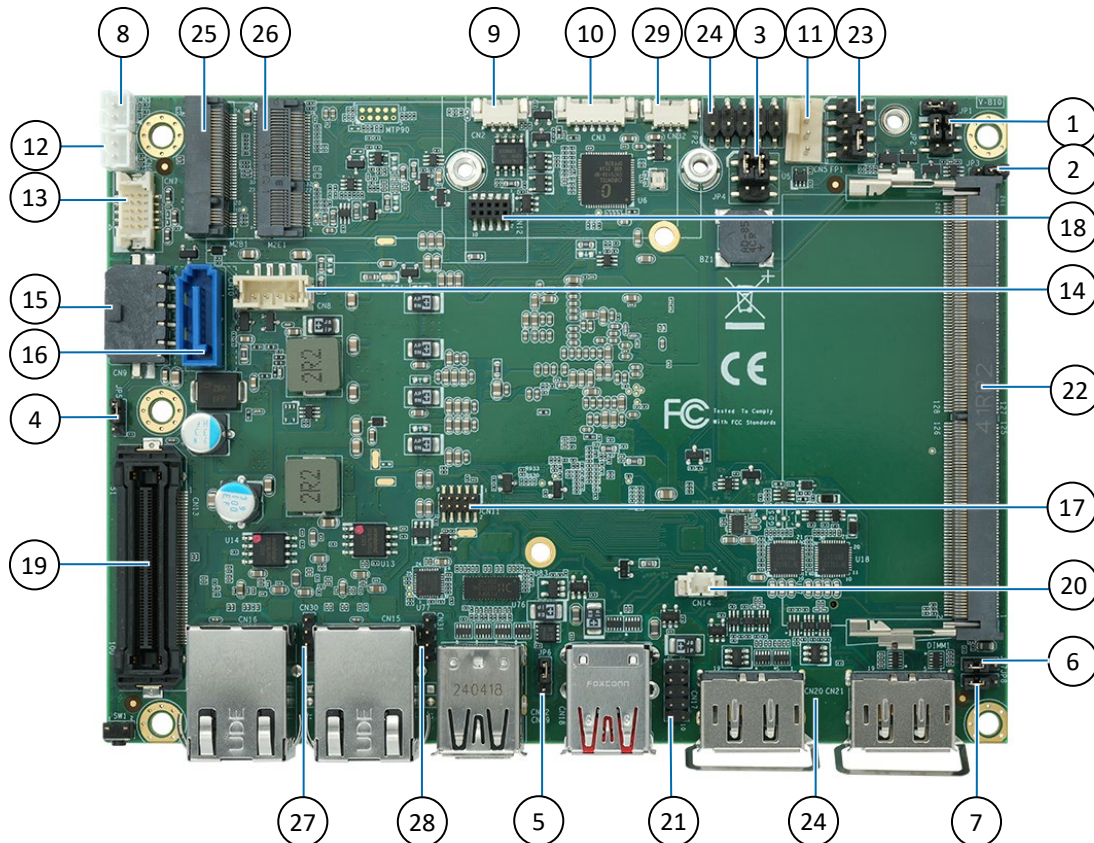
The product is factory configured to meet customer requirements and then sealed with a protection label. Opening the product invalidates the warranty and may cause damage to internal components.

4.6.1. 3.5"-SBC-AML/ADN Onboard Components

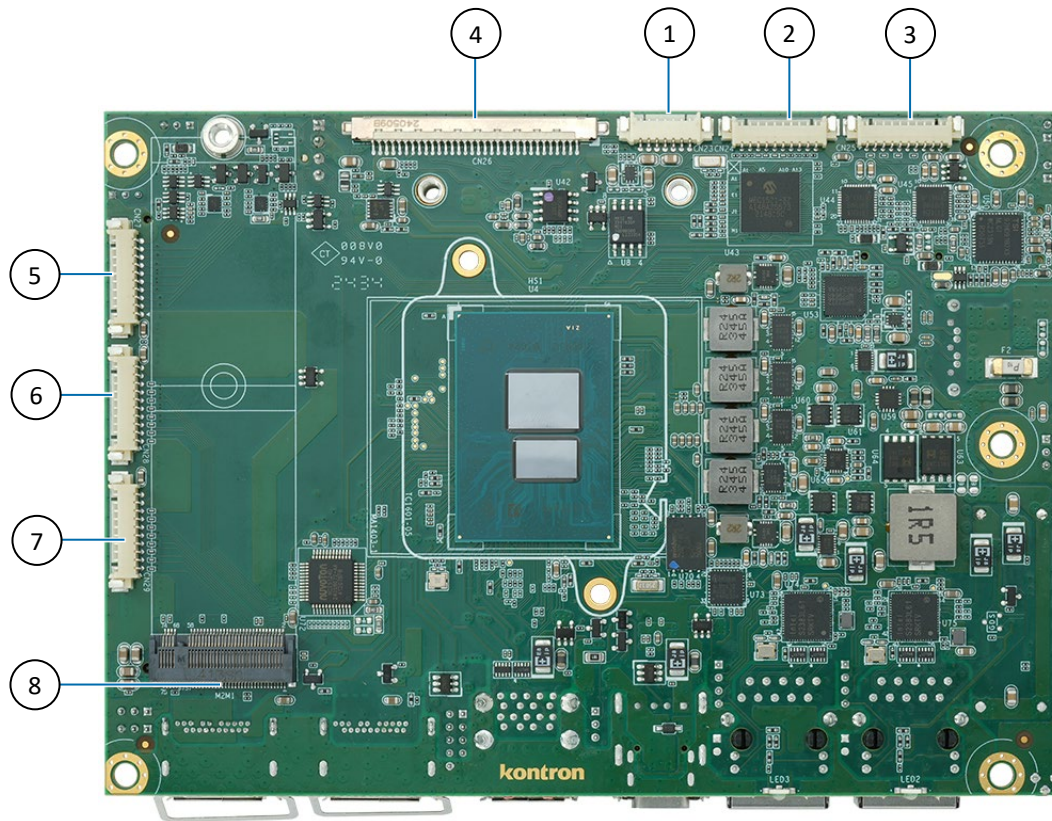
The following chapter provides 3.5"SBC-AML/ADN board layout and connector, header and jumper information.



For 3.5"-SBC-AML/ADN on-board connector, header and jumper information, visit the [3.5"-SBC-AML/ADN Website](#).

Figure 9: 3.5" SBC AML/ADN Onboard Components- Top Side

- | | |
|---|--|
| 1. LVDS / eDP Backlight Enable Selection jumper | 14. SATA Power Output Wafer |
| 2. AT / ATX Power Mode Selection Jumper | 15. DC Power Input Wafer |
| 3. LVDS/ eDP Backlight Power & Panel Power Selection Jumper | 16. SATA Connector |
| 4. On-board DC-DC 12 V Selection Jumper | 17. SPI 10-Pins Header |
| 5. USB Power Selection jumper | 18. P80 Holder |
| 6. Flash Descriptor Security Override Selection jumper | 19. Board-to-board Connector SATA Connector |
| 7. Clear CMOS Selection jumper | 20. RTC Power Input Wafer |
| 8. Left Channel Audio AMP Output Wafer | 21. USB 2.0 Port 3 & 4 Header |
| 9. S/PDIF Output Wafer | 22. DDR5 Channel 1 SO-DIMM Slot |
| 10. SIM Card Wafer for M.2 Key B | 23. Front Panel Header 1 |
| 11. FAN Wafer | 24. Front Panel Header 2 |
| 12. Right Channel Audio AMP Output Wafer | 25. M.2 Key B 2242 / 3042 / 3052 / 2280 Slot |
| 13. Audio Input / Output Header | 26. M.2 Key E 2230 Slot |
| | 27. 2.5 GbE LAN1 LED Header |
| | 28. 2.5 GbE LAN2 LED Header |
| | 29. LVDS / eDP Backlight Brightness Wafer Front Panel Header 2 |

Figure 10: 3.5" SBC AML/ADN Onboard Components- Bottom Side

- | | |
|-------------------------------------|--|
| 1. LVDS / eDP Backlight Power Wafer | 5. DIO Wafer |
| 2. RS232 COM2 Wafer | 6. RS232 COM3 Wafer |
| 3. RS232 COM1 Wafer | 7. RS232 COM4 Wafer |
| 4. LVDS / eDP Combo Connector | 8. M.2 Key M 2280 Slot S/PDIF Output Wafer |

5/System Expansion

Kontron supports the use of Kontron reference M.2 modules for Wi-Fi (see Table 5: Wi-Fi Module Option) and Cellular LTE (see Table 6: Cellular LTE Module Option) and Storage (see Table 7: Storage Reference Options) and additionally one of the system expansion I/O door options in Chapter 5.4 System Expansion I/O Door Options or a customized front panel with defined system expansion options in Chapter 5.5: Customized Front Panel.

5.1. Before Expanding

The expansion options are factory configured and are not accessible. Return the product to Kontron to replace or install internal components, see Chapter 15.1: Returning Defective Merchandise.

Protection label

NOTICE

The product is factory configured to meet customer requirements and then sealed with a protection label. Opening the product invalidates the warranty and may cause damage to internal components.

5.2. Wireless Expansion Options

5.2.1. Wi-Fi

The M.2 Wi-Fi module is factory installed and not accessible in the field. Return the product to Kontron, for replacement of the module, see Chapter 15.1: Returning Defective Merchandise.

Table 5: Wi-Fi Module Option

Function	Reference Modules
Wi-Fi	Wi-Fi Wi-Fi 6E AX210 Channel: 2x2 160 MHz Bandwidth: 2.4 Gbps Socket: M.2 Key E 2230 IEEE Standards: Wi-Fi: 802.11a/b/g/n/ac R2/ax R2(Pre-Standard) Bluetooth standard: V5.3 Interface: PCIe x1 (Wi-Fi) and USB 2.0 (Bluetooth®) MIMO Support: 2x2 MIMO Security levels: WPA, WPA2, WPA3
Connector	RP-SMA (female) Antenna connector with center pin and outer thread.

SMA and RP-SMA not Interchangeable!

NOTICE

SMA and RP-SMA connectors and antenna are not electrically compatible and not interchangeable. Ensure use of the correct antenna type. If RP-SMA and SMA connectors and antennas are mixed they may destroy the center pin or mate without the center pin contacts touching (minimal signal gets through).



Kontron recommends the use of Kontron's reference antenna included in the delivery and chosen to meet RF performance requirements, and to support a nominal impedance of 50 ohms, see Table 2: Accessories.

5.2.2. Cellular LTE

The cellular network's M.2 LTE module is factory installed and not accessible in the field. Return the product to Kontron, for replacement of the module, see Chapter 15.1: Returning Defective Merchandise.

The M.2 LTE module populates the M.2 key B socket and as a result this socket is no longer available for the system expansion options Dual CAN and Dual GbE Ethernet and EtherCat). Cellular LTE requires a SIM card that must be provided by the user for the required cellular network. The SIM slot for the Cellular LTE SIM card can be found on the front panel in X210 system expansion I/O door.

Table 6: Cellular LTE Module Option

Function	Description
Cellular LTE Module	Module: Quectel EM05-G Series LTE: LTE Cat. 4 Data Rate: 150 Mbps download; 50 Mbps upload Socket Type: M.2 Key B 3042 Freq. Bands: B1/2/3/4/5/7/8/12/13/14/18/19/20/25/26/28/66/71/38/39/40/41 Interface: USB 2.0 MIMO Support: Yes
Connector	SMA (female) antenna connector with pin socket and inner thread.

SMA and RP-SMA not Interchangeable!

NOTICE

SMA and RP-SMA connectors and antenna are not electrically compatible and not interchangeable. Ensure use of the correct antenna type. If RP-SMA and SMA connectors and antennas are mixed they may destroy the center pin or mate without the center pin contacts touching (minimal signal gets through).



Prerequisite for Cellular LTE: Motherboards M.2 key B socket is free.



Kontron recommends the use of Kontron's reference antenna included in the delivery and chosen to meet RF performance requirements, and to support a nominal impedance of 50 ohms, see Table 2: Accessories.

5.3. Storage Expansion (Internal)

The M.2 NVMe SSD module is factory installed and not accessible. Return the product to Kontron, for replacement or installation of the M.2 SSD module, see Chapter 15.1: Returning Defective Merchandise.

Table 7: Storage Reference Options

Function	Reference Modules
Storage	Module: NVMe SSD Socket type: M.2 Key M 2280 Density: 256 GB, 512 GB, 1 TB and 2 TB Interface: PCIe x4 Type: 3D NAND TLC Features: Power Loss protection, min. 3000 P/E cycles

5.4. System Expansion I/O Door Options

The system expansion I/O door (X201) supports one factory installed I/O expansion option. The system expansion options Dual GbE Ethernet, DUAL CAN or EtherCAT are only available if the motherboard's M.2 Key B socket is not populated with an M.2 Key B module.



The system expansion I/O door options must be factory installed.
Only one of the system expansion I/O door option can be ordered and installed.



The KBox A-151 can be equipped with one of the following (CAN Bus Port, GbE port or EtherCAT port) if the M.2 2280 B socket is not populated with a Cellular LTE module.

5.4.1. Dual CAN Bus

The dual CAN bus option supports two CAN bus 2.0B ports that are both backwards compatible with CAN bus 2.0A and meeting the requirements of ISO 11898-1.

Further CAN bus features are:

- › Support for baud rates of 10/20/50/100/250/500/800/1000K
- › Support for CAN message acceptance filter and J1939/CAN open high layer protocol

For the pin assignment of the Dual CAN Bus ports, see Chapter 13.2.1: CAN Bus .



Prerequisite: Motherboards M.2 Key B socket is not populated.

5.4.2. Dual GbE Ethernet

The dual GbE Ethernet option supports two 1 GbE isolated Ethernet ports with RJ45 connectors supporting speed and activity LEDs.

For the pin assignment of the Dual Ethernet ports, see Chapter 13.2.2: GbE .



To achieve the specified Ethernet port performance, Category 5 twisted pair cables must be used with 10/100 Mbit and Category 5E, 6 or 6E with 1 GbE Ethernet networks.



Prerequisite: Motherboards M.2 Key B socket is not populated.

5.4.3. Dual Serial Ports (RS232)

The dual serial port option supports two RS232 serial outputs.

Further serial port (COM) features are:

- › Full RS232 functions with DB9 connector
- › Support for baud rates of 4800 bps to 921.6 Kbps
- › Compatible with 16C550/16C650/16C750/16C850 & 16C950, 128-byte FIFOs

For the pin assignment of the dual RS232 ports, see Chapter 13.2.3: Serial Ports (RS232) .

5.4.4. Dual Serial Ports (RS232/422/485)

The dual serial port option supports two RS232/422/485 configurable serial outputs.

Further serial port (COM) features are:

- › RS232 is the factory setting (default) and RS422/RS485 are configurable
- › 9-pin D-Sub connectors (non-isolated)
- › Support for baud rates of 4800 bps to 921.6 Kbps
- › Compatible with 16C550/16C650/16C750/16C850 & 16C950, 128-byte FIFOs

For the pin assignment of the dual RS232 ports, see Chapter 13.2.4: Serial Ports (RS232/422/485) .

5.4.5. EtherCAT

The EtherCAT option supports dual RJ45 EtherCat ports with Auto Crossover and switching between RX and TX. The green EtherCat LEDs indicates the link status and the yellow EtherCat LEDs indicates the network activity. Check the status of the LEDs to confirm the connection. For the EtherCat interface use twisted pair cable of category 5 (CAT5) or higher, consisting of four twisted cores and with a maximum transfer rate of 100 MBit/s (CAT5).

NOTICE

EtherCAT Ethernet Only

The EtherCAT RJ45 connectors may only be used for Ethernet. Use for telecommunications is not possible.



Prerequisite: Motherboards M.2 Key B socket is not populated.

For the pin assignment of the EtherCAT ports, see Chapter 13.2.5: EtherCat .

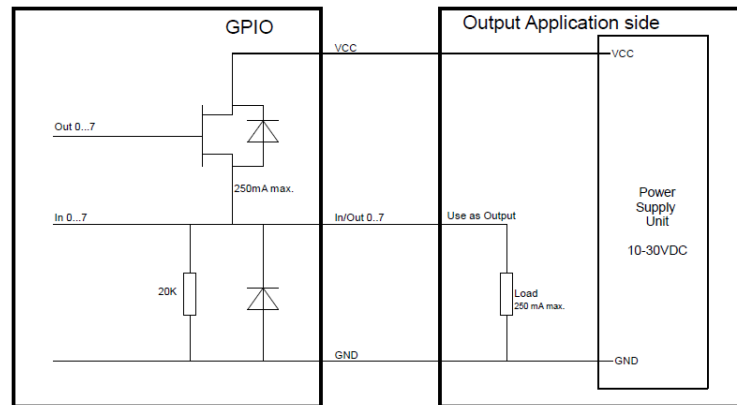
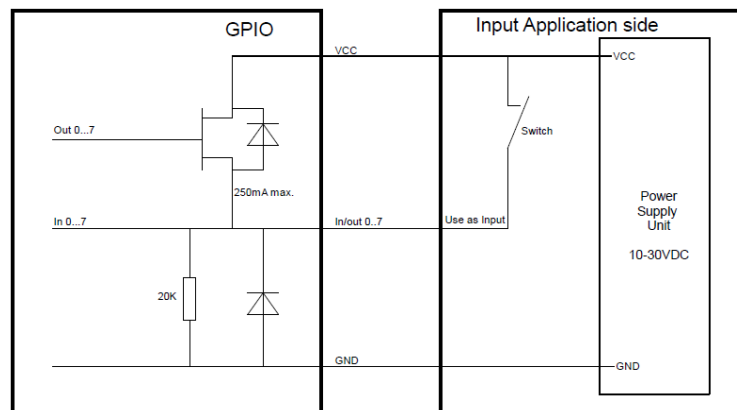
5.4.6. 8-Channel GPIO/DIO

The expansion slot option supports eight GPIO bi-directional digital IO signals, where each GPIO can be selected as an output or an input channel. The GPIO input and output specification supports the following:

Table 8: GPIO Input and Output Channels

GP Input Channel	Description	GP Output Channel	Description
Input Type	Input with integrated Pulldown	Output Type	High side switch
Input Voltage	10 VDC to 30 VDC ^[1]	Output Voltage	10 VDC to 30 VDC
Input Pulldown Resistor	20 k ohm approx.	Output Current	250 mA (500 mA max.)
Input High level	>8.8 V	Inductive load switch-off energy dissipation	40 mJ
Input Low Level	<4.2 V	Output Protection	Short to GND protection by current limit Thermal shutdown with output auto-retry Inductive Load negative Voltage Clamp
Input Hysteresis	>2.5 V		

^[1] Maximum allowed input voltage depends on external connected voltage at PWR_IN (GPIOx ≤ PWR_IN).

Figure 11: Output Application Connected to GPIO**Figure 12: Input Application Connected to GPIO**

For the GPIO/DIO connector pin assignment, see Chapter 13.2.6: 8-Channel GPIO/DIO Connector.

5.4.7. Cellular LTE SIM Slot

The SIM card slot is built into the system expansion I/O door, for configurations with cellular LTE. The SIM card slot option is only for use in combination with the cellular LTE network module and is not available for storage. Before inserting or extracting a SIM card, see Chapter 10/: Mobile Network.

NOTICE

Only insert or extract a SIM card if the product is switched off properly.



A SIM card is not part of the delivery and must be provided by the user, to support the required cellular network.

For the pin assignment of the SIM slot, see Chapter 13.2.7: SIM Slot.

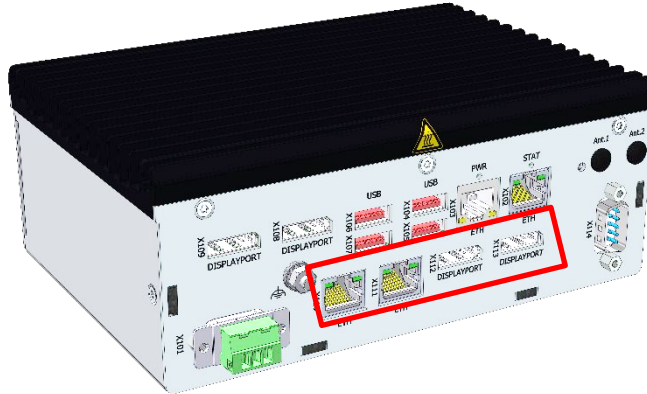
5.5. Customized Front Panel

The system expansion options with a customized front panel use Kontron's 3.5" extended I/O boards.

5.5.1. Dual Ethernet and Dual DP

The dual Ethernet and dual DP expansion option provides two additional 2.5 GbE RJ45 Ethernet ports with speed and activity indication LEDs and two additional DP++ ports. This option deviates from the default product by supporting only one serial port and two antenna connectors on the front panel.

Figure 13: Customized Front Panel with Dual Ethernet and Dual DP Expansion



For the pin assignment of the Ethernet and DP ports, refer to Chapter 13.1.2: Ethernet 2.5 GbE Connectors (X102, X103) and Chapter 13.1.6: Display Port Connectors (X108, X109).

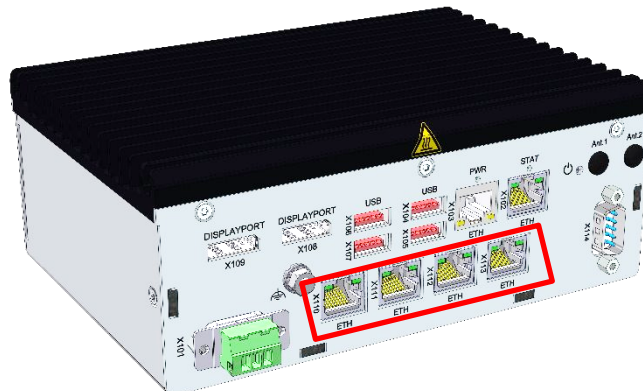


For more information, visit the [3.5" Extended I/O Board](#) website.

5.5.1.1. Quad Ethernet

The quad Ethernet expansion option provides four 2.5 GbE RJ45 Ethernet ports with speed and activity indication LEDs. This option deviates from the default product by supporting only one serial port and two antenna connectors on the front panel.

Figure 14: Customized Front Panel with Quad Ethernet Expansion



For the pin assignment of the 2.5 GbE Ethernet ports, refer to Chapter 13.1.2: Ethernet 2.5 GbE Connectors (X102, X103)



For more information, visit the [3.5" Extended I/O Board](#) website.

6/Thermal Management

6.1. Passive Cooling

The KBox A-151-AML/ADN is passively cooled and fanless, using a heatsink. The critical internal components are directly connected to the outer chassis to optimize heat transfer. The heatsink on the top side can get very hot and precautions must be taken before handling or touching.

Do not obstruct the airflow around the heatsink as this may cause a build-up of heat. Observe a minimum clearance around the product.

6.2. Heatsink

The heatsink is located on the top side.



Hot Surface

The heatsink can get very hot. To avoid burns and personal injury when handling the heatsink:

- › Do not touch while in operation
- › Allow to cool before handling
- › Wear protective gloves

6.3. Mount Orientation

When mounting the product unto the control cabinet take care not to obstruct the airflow over the heatsink, as this can stop sufficient heat dissipating into the ambient environment and cause a build-up of heat. Kontron provides a DIN Rail clamp or a book mount bracket to mount the product. For more information, see Chapter 8/ Installation.

6.4. Minimum Clearance

To provide maximum airflow away from the heatsink a minimum clearance distance (keep out area) of 12 mm (0.47 inch) to the surrounding environment must be observed, also known as keep out area in this user guide. The specified keep out areas for the product when mounted horizontally and vertically differ. For more information, see Chapter 8.6: Clearance.

⚠ CAUTION

Clearance

Leave sufficient clearance to prevent the product from overheating! To ensure proper operation observe the heatsink's specified minimum clearance of 12 mm (0.47 inch).

6.5. Maximum Processor Temperatures

As the Intel® processors provide only certain settings for maximal power consumption some typical processor Tjunction values are given below, as a guideline.

To change the processor's maximum Thermal Design Power (TDP) to reduce performance and temperature, access the BIOS and change the configured TDP Mode to the required option.

Table 9: Maximum Processor Temperatures

Atom® Alder Lake N Series Processors	TDP	TJ (max.)
Intel® N97, 4 Cores, 6 MB Smart Cache and up to 3.6 GHz	12 W	105°C (221°F)
Intel® Core™ i3-N305, 8 Cores, 6 MB Smart Cache and up to 3.8 GHz	15 W	105°C (221°F)
Intel Atom® x7211RE, 2 Cores, 6 MB Smart Cache and up to 3.2 GHz	6 W	105°C (221°F)
Intel Atom® x7433RE, 4 Cores, 6 MB Smart Cache and up to 3.4 GHz	9 W	105°C (221°F)
Intel Atom® x7835RE, 8 Cores, 6 MB Smart Cache and up to 3.6 Hz	12 W	105°C (221°F)



The Processors (i3-N305, N97): with Tjunction limits the max. temperature range during operation is +/-70°C starting from boot time temperature.

The Processor (RE) Type: within Tjunction limits the max. temperature range during operation is +/-110°C starting from boot time temperature.

The behavior is known by Intel as Dynamic Temperature Range (DTR). For more information or a higher DTR-value, contact Kontron Support.

6.6. Operating Temperature KBox A-151-AML/ADN

The product's operating range is 0°C to 60°C (32°F to 140°F). However, when operated at temperatures above 40°C (104°F) to protect the processor, the performance of the processor reduces.

For full performance over the operating temperature range of 0°C to 60°C (32°F to 140°F) users must observe that airflow is not obstructed to enable sufficient heat to be dissipated into the environment.

Figure 15: Performance Profiles vs Temperatures

TBD

6.7. Third Party Components

When extended and configured with additional third-party components, users must consider that an approximate internal temperature rise occurs. To avoid overheating users must include an adequate cooling solution for the additional third-party components to absorb and transfer the excess heat produced.



The maximum system ambient temperature depends mostly on the power consumption of the processor, chipset and third-party components.

7/Assembly

7.1. Before Assembling

The KBox A-151-AML/ADN is factory configured as ordered and then sealed with a protection label. No further customer assembly is required before operation. Return the product to Kontron to replace or install internal expansion options. To return the product to Kontron, see Chapter 15.1: Returning Defective Merchandise.

NOTICE**Protection label**

The product is factory configured to meet customer requirements and then sealed with a protection label. Opening the product invalidates the warranty and may cause damage to internal components.

8/Installation

8.1. Before Installing

Before installing the KBox A-151-AML/ADN in the operating environment, ensure that the operating environment meets the specification stated within this user guide, and that there is sufficient access to the Power IN connector and the front panel I/O connectors.

Kontron recommends expanding the product before installing the product in the end environment.

⚠ CAUTION

Ensure Sufficient Airflow

Operate only in a well-ventilated environment that does not obstruct the airflow over the heatsink or obstruct the product from dissipating heat.

⚠ CAUTION

Installation Environment

Do not install the product close to heat sources or damp places.

NOTICE

Support Cables

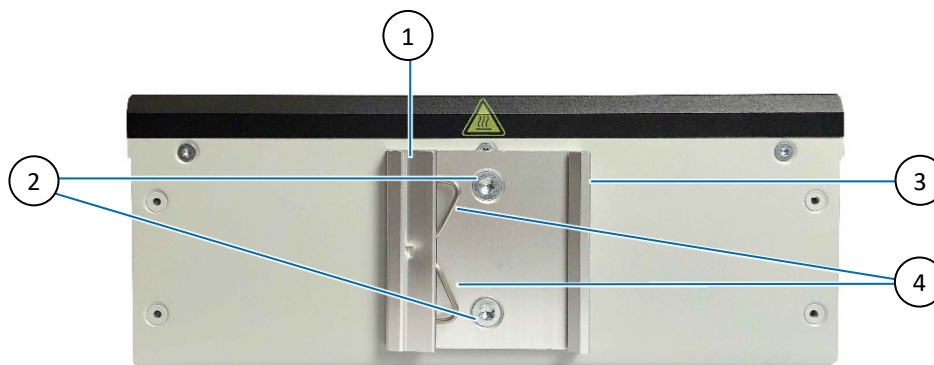
Support the power and I/O cables to minimize the strain on the product's connectors.

To install the product in an industrial control cabinet, install a DIN Rail clamp on the rear side or bottom side of the product. For more information, see Table 2: Accessories. The rear side and bottom side DIN Rail clamps are not interchangeable due to a difference in size.

8.2. DIN Rail Clamp (rear side)

The product is delivered with the rear side DIN Rail clamp installed for direct installation. The rear side DIN rail supports vertical airflow over the heatsink, and front access to all connectors and antennas. The DIN Rail clamp is reversible to enable the heatsink to be position of the left or right side when vertically mounted.

Figure 16: DIN Rail Clamp (50 mm x 50 mm)



1 DIN Rail clamp top bracket

2 Two screws

3 DIN Rail clamp bottom bracket

4 Spring

NOTICE

Mounting Requirement

Always mounting using the two M4x6 screws included with the DIN Rail Clamp.



The rear and bottom side DIN Rail clamps are not interchangeable due to a difference in size.

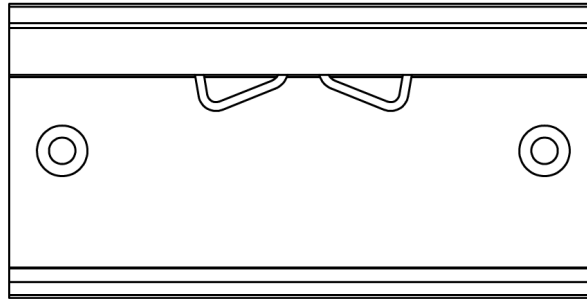
To attach the DIN Rail clamp, perform the following:

1. Fasten the DIN Rail clamp firmly to the rear side of the product using the two M4x6 screws supplied and a thread locking compound to secure the two screws.
2. Clip the top bracket of the DIN Rail clamp with the two springs onto the top of the DIN Rail and push the DIN Rail clamp firmly downwards until the DIN Rail clamp's bottom bracket attaches to the bottom of the DIN Rail.

8.3. DIN Rail Clamp (bottom side)

The bottom side DIN Rail clamp supports horizontal airflow over the heatsink. The DIN Rail clamp is reversible to enable top or bottom side access to all connectors and antennas.

Figure 17: DIN Rail Clamp 50 mm x 100 mm



- 1 DIN Rail clamp top bracket with two screws 2 DIN Rail clamp bottom bracket

NOTICE

Mounting Requirement

Always mounting using the two M4x6 screws supplied with the DIN Rail Clamp.



The rear and bottom side DIN Rail clamps are not interchangeable due to a difference in size.

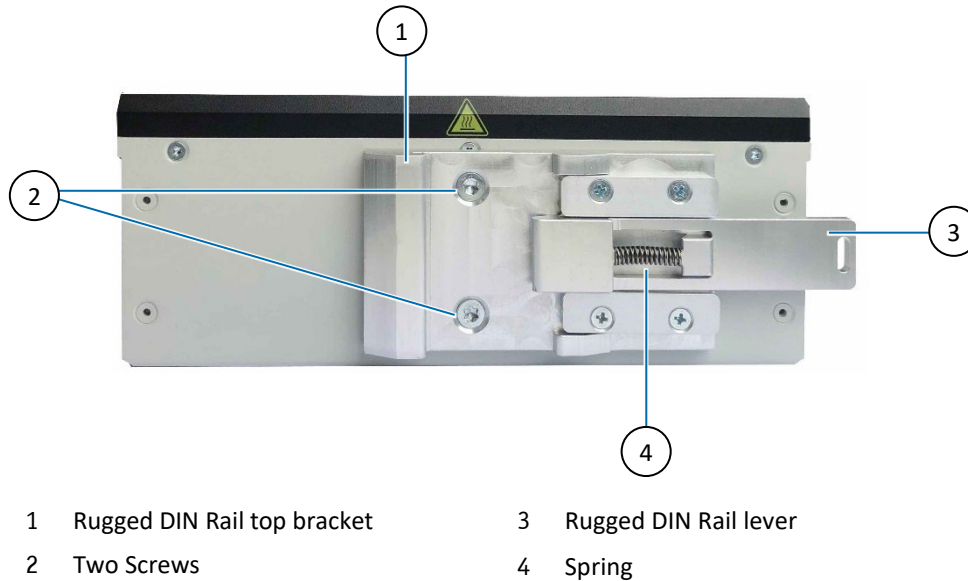
To attach the DIN Rail clamp, perform the following:

1. Fasten the DIN Rail clamp firmly to the bottom side of the product using the two M4x6 screws supplied and a thread locking compound to secure the two screws.
2. Clip the top bracket of the DIN Rail clamp with the two springs onto the top of the DIN Rail and push the DIN Rail clamp firmly downwards until the DIN Rail clamp's bottom bracket attaches to the bottom of the DIN Rail.

8.4. Rugged DIN Rail Clamp (rear side)

The rear side Rugged DIN Rail clamp supports vertical airflow over the heatsink and front access to all connectors and antennas. The Rugged DIN Rail clamp is reversible to enable the heatsink to be position of the left or right side when vertically mounted.

Figure 18: Rugged DIN Rail Clamp



To attach the Rugged DIN Rail clamp, perform the following:

1. Fasten the rugged DIN Rail clamp firmly to the rear side of the product using the two M4x6 screws supplied and a thread locking compound to secure the two screws.
2. Clip the top bracket of the Rugged DIN Rail clamp onto the top of the DIN Rail and pull the lever with the spring firmly downwards until the Rugged DIN Rail clamp's bottom bracket attaches to the bottom of the DIN Rail.

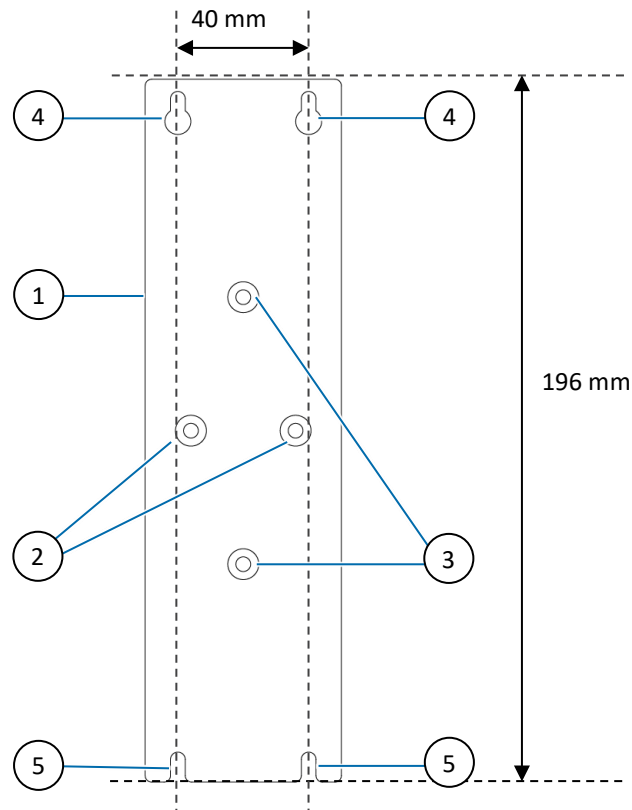
8.5. Book Mount Bracket

To install the product on a flat mounting surface, fix the book mount bracket to the product's rear side or bottom side. For more information, see Table 2: Accessories.

Mounting the Book Mount Bracket on the Mount Surface

⚠ CAUTION

- Always use four screws (M4x8, steel 4.8, DIN 7985/ISO 7045 or similar).
- Screw length depends on the thickness of the mounting surface.
- Mount on a surface with a minimum thickness of 3 mm and made of aluminum or better.

Figure 19: Book Mount Bracket

- | | | | |
|---|------------------------------|---|--------------------------------|
| 1 | Book mount bracket | 3 | 2x M4x6 screws for bottom side |
| 2 | 2x M4x6 screws for rear side | 4 | 2x Key screw openings |
| | | 5 | 2x Slot screw openings |

To attach the book mount bracket on a flat surface, perform the following:

1. Fasten the book mount bracket (Figure 19, pos. 1) firmly to the rear side or bottom side (Figure 19, pos. 2 or pos. 3) of the product using the two M4x6 screws supplied and a thread locking compound to secure the two screws.
2. Attach the book mount bracket to a flat surface with a minimum thickness of 3 mm and made of aluminum or better using four (M4x8, steel 4.8, DIN 7985/ISO 7045 or similar) screws. Always use all four designated openings (Figure 19, pos. 4 and pos. 5) and a thread locking compound to secure the four screws. The four screws are supplied by the user, as the user environment dictates the required screw length.

8.6. Clearance

For sufficient air circulation around the product, Kontron recommends users not to mount or operate any other devices within the specified keep out areas around the product. The specified keep out areas for the product are displayed in Figure 20: Keep Out Areas- Horizontal and Figure 21: Keep Out Areas- Vertical.

⚠ CAUTION

Leave sufficient clearance (keep out area) to prevent the product from overheating!
Ensure proper operation by observing the heatsink's min. clearance of 12 mm (0.47 inch).

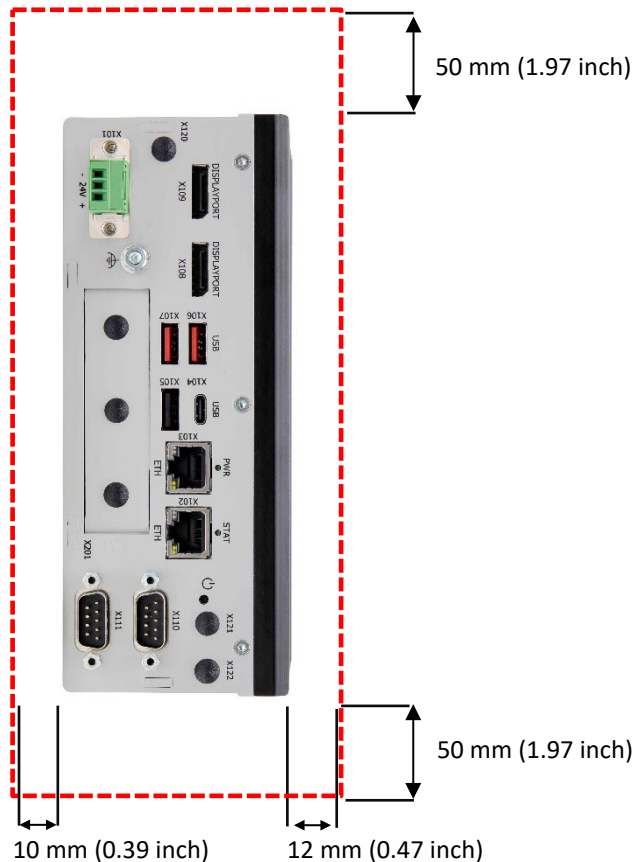
The connector keep out area on the front panel increases with the addition of antennas and depends on the type of Wi-Fi antenna used.

Cable clearance depends on the installed connector types and antennas and is therefore user dependent.

Figure 20: Keep Out Areas- Horizontal



Figure 21: Keep Out Areas- Vertical



9/Starting UP

9.1. Before Starting

Before connecting the KBox A-151-AML/ADN to power, read the instructions in this user guide and observe the safety instructions in Chapter 2/: General Safety Instructions. The product comes hardware configured and on request with a pre-installed Operating System (OS) and all the necessary drivers. Enabling full operation when connected to power and switched on for the first time.

⚠ WARNING

Operated in closed condition only

It is only ensured that users do not have access to internal components during operation if the product is closed and secured.

⚠ CAUTION

External Power Source

Only connect the product to an external power supply providing the voltage type (AC or DC) and the input power (max. current) specified on the Kontron Product Label and meeting the requirements of the Limited Power Source (LPS) and Power Source (PS2) of UL/IEC 62368-1.

⚠ CAUTION

Switch off Properly!

Even when switched off using the power button, parts of the product are still energized. The product is only completely switched off when the power has been switched off using the power button and the power cable is disconnected from the Power IN connector.

⚠ CAUTION

Protection

Observe that wiring and short-circuit/overcurrent protection is performed according to the applicable standards, regulations and in respect to the product's electrical specification.

⚠ CAUTION

Disconnection Device

If there is limited access to the power cable use a disconnecting device, (fuse/circuit breaker) rated in accordance with the product wire cross-section.

⚠ CAUTION

Cable Damage

Ensure that the power cable has no visible damage.

NOTICE

Proper Cabling Procedure

To prevent a false power-on condition, that could result in operational failure. When installing or disconnecting cables ensure that:

- The functional earth connection is made first and disconnected last.
- The last connection made is to the Power IN Connector.

NOTICE

Forced Shutdown

Disconnecting the power while the product is operating, performs a forced shut down and can lead to loss of data or other undesirable effects! To shutdown properly without data loss, switch off using the power button.

9.2. Connecting to a DC Power Supply

External Power Supply

⚠ CAUTION

Only connect the product to an external power supply providing the voltage type (AC or DC) and the input power (max. current) specified on the Kontron Product Label and meeting the requirements of the Limited Power Source (LPS) and Power Source (PS2) of UL/IEC 62368-1.

To connect to the external DC power supply, perform the following:

1. Wire the supplied mating power connector/terminal (PSC 1.5/3-F) as described, see Chapter 9.2.1: Wiring the Power IN Connector
2. Switch off the external DC power supply via a disconnecting device (fuse/circuit breaker), to ensure that no power flows during the connection procedure.
3. Connect the functional earth bolt to an appropriate common earth connection.
4. Connect the wired mating power connector (PSC 1.5/3-F) to the Power IN connector. Pay attention to the polarity of the connections.
5. Connect the other end of the wired mating power connector to the external DC power supply.

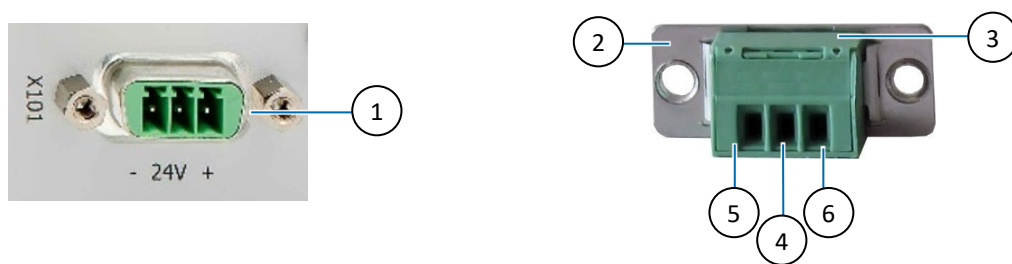
9.2.1. Wiring the Power IN Connector

The Power IN connector connects to an external DC power supply using the mating power connector (PSC 1.5/ 3-F) included in the delivery. Only connect to a power supply unit within the specified voltage range that meets the product's electrical specification as stated in this user guide and on the product's type label and provides the required safety and protection features.

The wiring is not part of the delivery and must be provided by the user.

- marked clearly with (+/-) to ensure a safe connection
- Use copper conductors only if the field wiring terminal is only for connection to copper wire.
- The minimum temperature rating of the field wiring terminals is 75° C.

Figure 22: Power IN Connector and Mating Power Connector



- | | |
|---|--------------------------|
| 1 3-pin Power IN connector (PSC 1.5/ 3-M) | 4 Clamp for earth wire |
| 2 3-pin mating power connector (PSC 1.5/ 3-F) | 5 Clamp for 0 VDC wire |
| 3 Cover over the slotted pan head screws | 6 Clamp for +24 VDC wire |

To wire the supplied mating power connector (PSC 1.5/ 3-F), perform the following:

1. Cut three (1 mm²) AWG18 isolated wires to the required length and strip each end 5 mm to 7 mm.
2. Twist the striped wire-ends and provide them with ferrules.

3. Access the slotted pan head screws by opening the mating power connector's cover.
4. Loosen the slotted pan head screws far enough so that you can insert the end of the prepared wires.
5. Insert the wires into the corresponding clamp of the mating power connector. Make sure that you have the right polarity of the connection.
6. Fasten the screws to secure the wires into the mating power connector's clamps.
7. Close the mating power connector's cover.

NOTICE**Mark the Power Supply Wires**

Mark the supply wires (+/-) clearly to ensure a safe connection from the Power IN connector to the DC power supply.

9.3. Connecting to the AC/DC Power Supply

To connect the product to the delivered AC/DC power supply with power connector, perform the following:

1. Connect the ground to the functional earth bolt if not already connected.
2. Connect the power supply to the Power IN connector using the Phoenix connector. Pay attention to the polarity of the connections
3. Connect the power cord for your region to the AC/DC power supply and then to the mains power source.
4. When connected to power the PWR LED illuminates yellow.

9.4. Switching On/Off

Once connected to an external DC power supply switched on and switched off the product using the power button. Press the power button to switch on and when powered on, press the power button again to perform an orderly shutdown.

Switch off Properly!**CAUTION**

Even when switched off using the power button, parts of the product are still energized. The product is only completely switched off when the power has been switched off using the power button and the power cable is disconnected from the Power IN connector.

Forced Shutdown**NOTICE**

Disconnecting the power while the product is operating, performs a forced shut down and can lead to loss of data or other undesirable effects! To shutdown properly without data loss, switch off using the power button.

9.5. Operating System (OS) and Drivers

If ordered with a pre-installed operating system, all drivers are installed in accordance with the ordered configuration and the product is operational when switched on for the first time. If ordered without a pre-installed operating system, users will need to install the operating system and the appropriate drivers for the configuration ordered.



To download relevant drivers for the factory installed internal hardware components, visit Kontron's [Customer Section](#).



Pay attention to the manufacturer's OS specifications relating to the integrated hardware components.

10/ Mobile Network

10.1. Before Setting Up

All software installed by the user is at the user's own risk. Kontron is not responsible for any malfunction, data loss, outage of services and other problems caused by software installed by the user. Kontron is not responsible for the loss of stored, transmitted, received and used data. It is the user's responsibility to consider access control, and the protection measures required to prevent unwanted access.

10.2. Setting up the Mobile Network

Kontron provides a Board Support Package (BSP) with an installer that includes the required drivers for the supported Wi-Fi and/or Cellular (LTE).

Kontron is not responsible for setup of the cellular network software and users must consider that setting up the product incorrectly can lead to the product becoming inaccessible. Kontron recommends testing the mobile network software in a safe test environment before installation in the end environment.



For the BSP and required drivers, visit the KBox A-151-AML/ADN product information within Kontron's [Customer Section](#).

10.3. SIM Card Inserting

The SIM card's push push insertion and extraction enables quick and easy insertion or extraction. The SIM card slot is only for use in combination with the cellular LTE system expansion module and is not available for storage.

NOTICE

Switch off to Insert/Extract SIM

Only insert or extract the SIM cards if the product is switched off properly.



A SIM card is not part of the delivery and must be provided by the user, to support the required network.

To insert a SIM card into the SIM slot on the front panel, perform the following:

1. Insert the SIM card with the terminal contacts facing forwards and on the underside.
2. Push the SIM card carefully into the SIM slot until the card clicks acoustically.

To extract a SIM, perform the following:

1. Push the inserted SIM card slightly to release the card from the SIM slot.
2. Pull the SIM card carefully out of the slot.

11/ BIOS

The KBox A-151-AML/ADN uses the AMI Aptio V uEFI BIOS based on the Unified Extensible Firmware Interface (uEFI) specification and the Intel® Platform Innovation Framework for EFI. The uEFI BIOS preferences are preset and do not require further adjustment for operation.

The UEFI BIOS setup menus may vary. For information on the BIOS for your product, contact [Kontron Support](#).



UEFI only! No legacy support and no Master Boot Record (MBR) installation.



The uEFI BIOS features and special settings are open to change. For the latest uEFI BIOS Information, visit the [Customer Section](#) to download the BIOS.

11.1. Starting the uEFI BIOS

The uEFI BIOS's Setup program provides quick and easy access to the individual function settings for control or modification of the uEFI BIOS configuration. The Setup program allows for access to various functions that include sub-menus with further functions and sub-menus.

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

1. Switch on the product.
2. Wait until the first characters appear on the screen (POST messages or splash screen).
3. Press the key.
4. If the uEFI BIOS is password-protected, a request for password will appear. Enter either the User Password or the Supervisor Password, press <RETURN>, and proceed with step 5.
5. The BIOS setup utility appears in the Main menu.

Using the hot key navigation system, users can navigate through the BIOS. The hot key legend bar is located at the bottom of the Setup screens. For a list of navigation hot keys available in the legend bar, see Table 10: Navigation Hot Keys.

Table 10: Navigation Hot Keys

Sub-screen	Description
<F1>	<F1> key invokes the General Help window
<->	<Minus> key selects the next lower value within a field
<+>	<Plus> key selects the next higher value within a field
<F2>	<F2> key loads previous values
<F3>	<F3> key loads optimized defaults
<F4>	<F4> key Saves and Exits
<→> or <←>	<Left/Right> arrows select major Setup menus on menu bar, for example, Main or Advanced
<↑> or <↓>	<Up/Down> arrows select fields in the current menu, for example, Setup function or sub-screen
<ESC>	<ESC> key exits a major Setup menu and enters the Exit Setup menu Pressing the <ESC> key in a sub-menu displays the next higher menu level
<RETURN>	<RETURN> key executes a command or selects a submenu

11.2. Setup Menus

The Setup menus listed in the selection bar at the top of the screen are:

- › Main
- › Advanced
- › Chipset
- › Security
- › Boot
- › Save & Exit

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

Each Setup menu is made up of 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 an explanation of the respective function in a help window.

Advanced Setup Menu – Caution when Changing

NOTICE

Making changes within the Advanced Setup menu without understanding the full implications may cause system malfunction.

Kontron recommends users to make changes only when the user is sure of the impact.

11.3. Common BIOS Setting Changes

11.3.1. Power Management

The power management settings within the BIOS setup determine how the product uses and conserves power to run more efficiently. Before changing the Power Management within BIOS setting, see Chapter 6.6: Operating Temperature KBox A-151-AML/ADN.

To disable the power limits (PL1, PL2, PL4) or enable a Power Limits (PL1, PL2, PL4) with a set value for a defined time windows over which the processor base time TDP value should be maintained, refer to the BIOS setup and select Advanced / Power & Performance, CPU- Power Management Control.

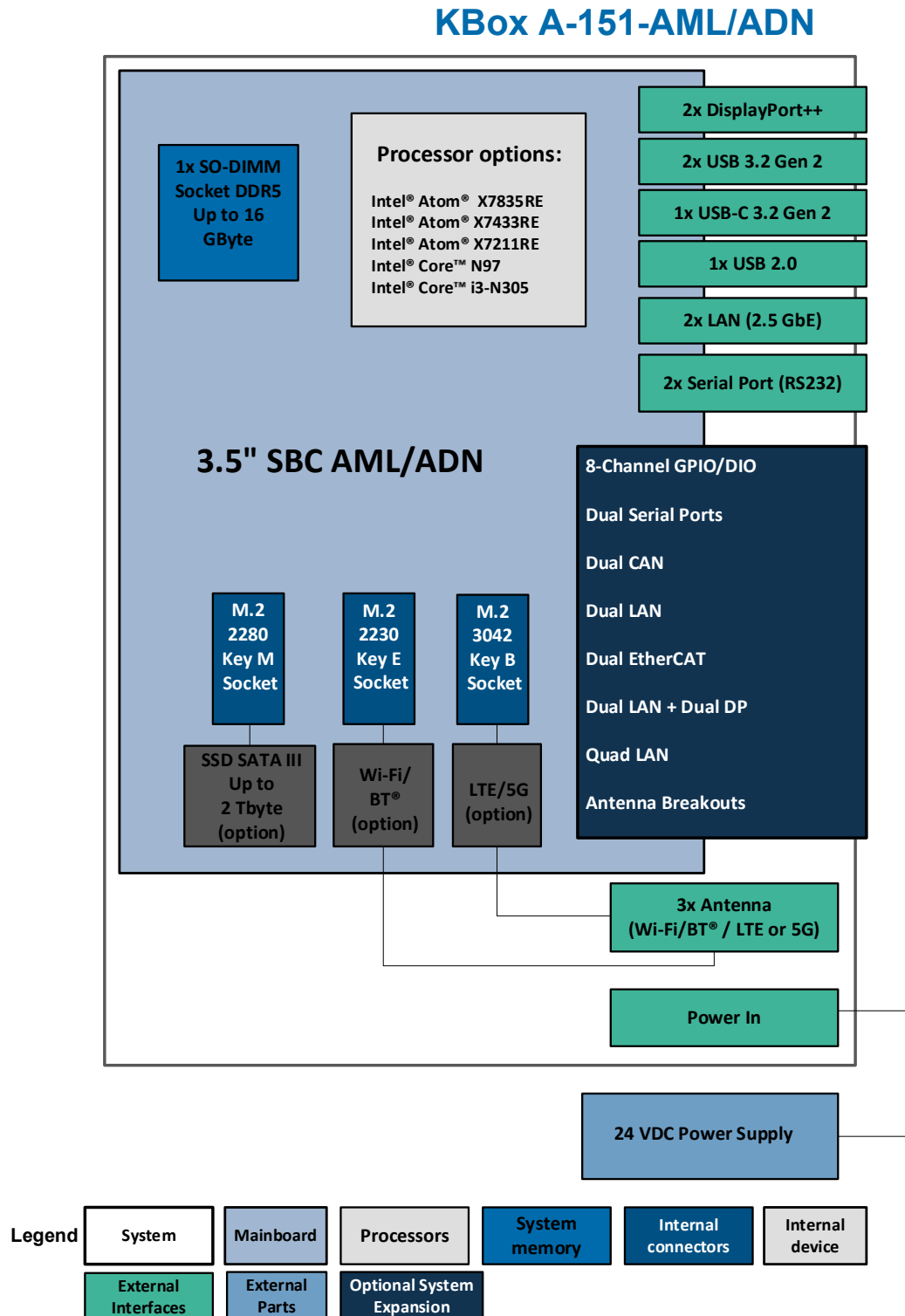


For the product's full BIOS Setup Information, visit Kontron's [Customer Section](#).

12/ Product Specification

12.1. Block Diagram

Figure 23: Block Diagram KBox A-151-AML/ADN



12.2. Hardware Specification

Table 11: Hardware Specification

Hardware	Description				
Processor Board	3.5” SBC AML/ADN				
Processors	Type	Cores	Speed	TDP	CPU TJ
	Intel® N97	4	Up to 3.6 GHz	12 W	105°C
	Intel® Core™ i3-N305	8	Up to 3.8 GHz	15 W	105°C
	Intel Atom® x7211RE	2	Up to 3.2 GHz	6 W	105°C
	Intel Atom® x7433RE	4	Up to 3.4 GHz	9 W	105°C
	Intel Atom® x7835RE	8	Up to 3.6 GHz	12 W	105°C
System Memory	Up to 16 GByte max. (with 8 GByte, 16 GByte, 32 GByte) SODIMM DDR5 262-pin 2x SODIMM per channel				
Graphics	Intel® Iris Xe Graphics or Intel® UHD Graphics Max. DP Resolution: 7680 x 4320 at 60 Hz				
Front I/O	2x DP++ 2x USB 3.2 Gen 2 1x USB-C 3.2 Gen 2 1x USB 2.0 2x 2.5 GbE 2x Serial (RS232) Ports				
Internal M.2 Sockets	Storage	M.2 Key M 2280 (PCIe x4) SSD (3D NAND TLC) module 128 Gbyte, 256 GByte, 512 GByte, 1 TByte and 2 TByte			
	Wireless Expansion Options	Wi-Fi: M.2 Key E 2230 (interface: Wi-Fi-PCIe 2.1 / BT® -USB 2.0) module Wi-Fi 6E 2x2 160 MHz channel bandwidth 2.4 GHz /Bluetooth V5.3			
		Cellular LTE:[3] M.2 Key B 3042 (Interface: USB 2.0) module LTE Cat. 4 (150 Mbit/s Download; 50 Mbit/s Upload) LTE SIM card slot in the System Expansion I/O door. Note: The M.2 Key B socket can also be used for the system expansion I/O door options: Dual CAN Bus, Dual GbE and EtherCat[2]			
System Expansion - I/O Door Options	Dual CAN Bus [2]				
	Dual GbE[2]				
	Dual Serial Ports RS232				
	Dual Serial ports RS232/422/85				
	EtherCAT[2]				
	8-Channel GPIO/DIO				
	LTE SIM slot[3]				

Hardware	Description
System Expansion - Customized Front Panel	Dual Ethernet + Dual DP
	Quad Ethernet
RTC Battery	3V RTC lithium battery Type: BR2032 with cable
Power	24 VDC (Range: 10 VDC to 34 VDC [abs. max. 36 VDC]) 80 W max.

^[1] RE Communications/Embedded Broad Market/Industrial Extended Temp (-40°C to 60°C).

^[2] The M.2 key B socket can be used to install one of the following cellular LTE module, Dual CAN Bus module, Dual GbE module and EtherCat module.

^[3] If the cellular LTE module is installed, the SIM slot is location in the system expansion I/O door and all other system expansion I/O door options are not available.

12.3. Software Specification

Table 12: Software Specification

Software	Description
Operating System (OS)	Windows 11 IoT Enterprise 2024 Windows 10 IoT Enterprise 2021 Linux Debian
BIOS	AMI Aptio V



To access the KBox A 151-AML/ADN Board Support Package (BSP) and BIOS Updates, visit Kontron's [Customer Section](#).

12.4. Power Specification

Before connecting the product to an external 24 VDC power supply, ensure that the power supply meets the electrical specification for the product as specified in this user guide and documented on the product's Type Label, and that protection and supply limitation have been taken into consideration. The power supply used must automatically recover from AC power loss and start up under peak loading. Connect the product only to a power supply designed to achieve NEC Class-2 and Limited Power Source (LPS) and used according to the manufacturer's instructions.

External Power Supply

⚠ CAUTION

Only connect the product to an external power supply providing the voltage type (AC or DC) and the input power (max. current) specified on the Kontron Product Label and meeting the requirements of the Limited Power Source (LPS) and Power Source (PS2) of UL/IEC 62368-1.

Disconnection Device

⚠ CAUTION

Observe that wiring and short-circuit/overcurrent protection is performed according to the applicable standards, regulations and in respect to the product's electrical specification. The disconnecting device (fuse/circuit breaker) rating must be in accordance with the product's wire cross-section.

Minimum Immunity**NOTICE**

Ensure the external DC power supply has been fully tested to meet the minimum immunity of AC inputs requirements, as stipulated in IEC 55024. Including power supplies marketed with a separate AC/DC power converter.

Avoid Forced Shutdown**NOTICE**

Do not disconnect the power while the product is operating!
Performing a forced shut down can lead to loss of data or other undesirable effects!

Power Cables**NOTICE**

To protect the product and any connected peripherals, make sure that the power cables have the right diameter to withstand the maximum available current.

Table 13: Electrical Specification 24 VDC

Electrical Specification	Description
Input Voltage (nominal)	24 VDC
Input Voltage (range)	10 VDC to 30 VDC
Input Power (max.)	80 W

12.4.1. Power Supply Protection Requirements

The external DC power supply is required to incorporate protection and supply features such as over current protection, inrush current protection, over voltage protection and under voltage (brownout) protection, to protect the product against fluctuations and interruptions in the delivered DC power supply.

Brownout**NOTICE**

If an under voltage (brownout) condition occurs the used power supply must remain in the “off state” long enough to allow internal voltages to discharge sufficiently. Failure to observe this “off state” may mean that parts of the product or peripherals work incorrectly or suffer a reduction of MTBF. The minimum “off state”, to allow internal voltages to discharge sufficiently, is dependent on the power supply and additional electrical factors. To determine the required “off state”, each case must be considered individually. For more information, contact Kontron Support.

12.4.2. Power Consumption

The external power supply used must be capable of delivering the product with the required power when configured with all components. The total power consumption depends on factors such as the SBC board with components, processor, Ethernet and M.2 sockets. Additionally, external devices connected using USB must be considered, to establish the total power available for possible expansion.

The total power requirement for the 24 Volt power supply depends on the product’s application. For typical values, see Table 14: Power Consumption. Be aware that the DC power supply must be able to handle peak currents for several seconds.



The external DC power supply must supply the power required by all configured components.



The maximum ambient temperature depends mostly on the power consumption of the processor, chipset and third-party components. For information regarding the maximum ambient temperature, see Chapter 6.5: Maximum Processor Temperatures.

Table 14: Power Consumption

Power Consumption	Thermal Design Power (TDP)		Turbo Power (Power Limit 2)		Short Power Peaks (Power Limit 4)	
	Per Unit/Port	Total	Per Unit/Port	Total	Per Unit/Port	Total
SBC Board		4 W		4 W		4 W
Processor		15 W		35 W		55 W
2x 2.5 GBE Ethernet (/port)	(1.5 W)	3 W	(1.5 W)	3 W	(1.5 W)	3 W
2x USB 3.2 Gen 2	(4.5 W)	9 W	(4.5 W)	9 W	(4.5 W)	9 W
1x USB 2.0	(2.5W)	2.5 W	(2.5W)	2.5 W	(2.5W)	2.5 W
1x USB-C	(15 W)	15 W	(15 W)	15 W	(15 W)	15 W
M.2 Key M socket		4 W		4 W		4 W
M.2 Key B socket		5 W		5 W		5 W
M.2 Key E socket		2.5 W		2.5 W		2.5 W
DC/DC Input losses		2.7 W		3.8 W		3.8 W
Total Power Consumption		62.7.2 W		83.8 W		103.8 W

12.4.3. Functional Earth

The functional earth bolt connects to the internal chassis ground. To avoid damage to the product, observe proper grounding methods:

1. Connect the product to ground before switching on the product.
2. Only connect the product to an applied ground that meets all applicable local, national and international grounding requirements.
3. When assembling, the first cable to be connected is the ground and when disassembling, the last cable to be removed is the ground cable.

⚠ CAUTION

Ground Properly

The installation sites applied ground must meet your local, national and international region grounding requirements.

12.5. Environmental Specification

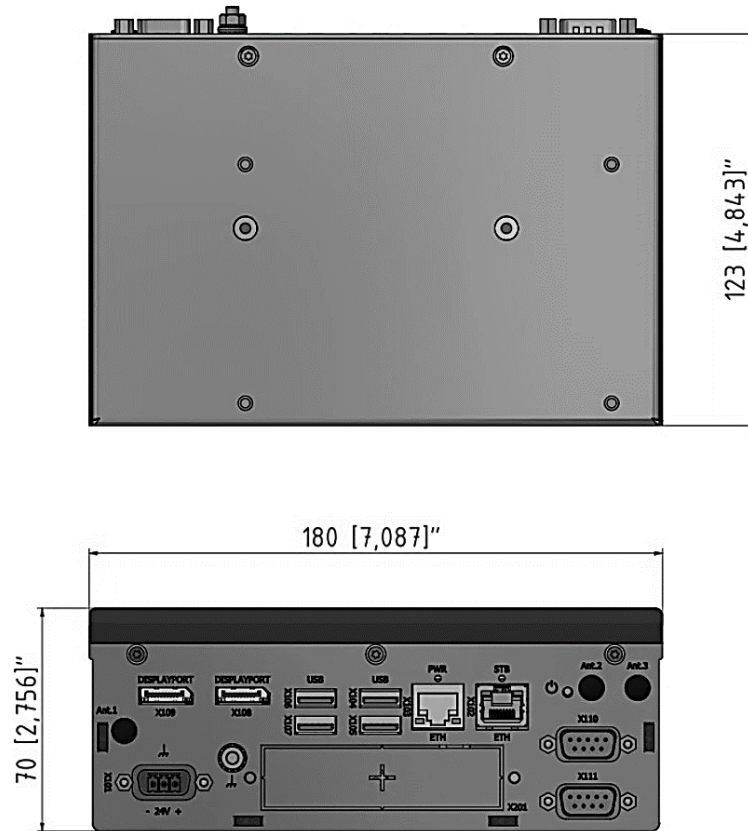
Table 15: Environmental Specification

Environmental Specification	Description
Temperature (Operating)	Standard: 0°C to 60°C (32°F to 140°F) Extended: -40°C to 60° (-40°F to 140°F)
Temperature (Non-Operating)	-40°C to +60°C (-4°F to 140°F)
Humidity	According to IEC 60068-2-78 93% RH at 40°C, non-condensing
Shock (Operating)	According to IEC 60068-2-27 Peak Accel.: 15 g, Shock Dur.: 11 ms half sine, Shock Count: 3/direction, total 18
Shock (Non-Operating)	According to IEC 60068-2-27 Peak Accel. 30 g, Shock Dur. 11 ms half sine, Shock Count: 3/direction, total 18
Vibration (Operating)	According to IEC 60068-2-6 Frequency: 10 Hz - 150 Hz, Acceleration: 1 g
Vibration (Non-Operating)	According to IEC 60068-2-6 Frequency: 10 Hz - 150 Hz, Acceleration: 2 g
Altitude (Operating)	3,000 m max. (9,800 ft. max.)
Altitude (Non-Operating)	10,000 m max. (32,800 ft. max.)
Cooling Solution	Passive cooling solution via heatsink
MTBF	120,000 hours @ 30°C Ground Benign (GB)

12.6. Mechanical Specification

Table 16: Mechanical Specification

Mechanical Specification	Description
Material	Chassis: Steel Heatsink: Aluminium
Dimension (W x H x D)	180 mm x 70 mm x 123 mm (7.09" x 2.76" x 4.84")
Color	RAL7035 (front panel and main chassis) Black (heatsink)
Mounting	DIN Rail clamp (rear or bottom sides) Book mount bracket (rear or bottom sides)
Weight	2 kg approx. (4.4 lbs. approx.)
IP Protection Class	IP20

Figure 24: Mechanical Dimensions (mm)

To access the KBox A 151-AML/ADN STEP files, visit Kontron's [Customer Section](#).

12.7. Compliance

The KBox A-151-AML/ADN **plans to comply** with the relevant requirements and the approximation of the laws relating to 'CE' (no Wi-Fi/LTE variant) and 'RED' (Wi-Fi/LTE variant), and the standards that are constitutional parts of the declaration, or later thereof.

Table 17: Compliance CE Mark

Europe – CE Mark & UK CA	
Directives	2014/30/EU Electromagnetic compatibility 2014/35/EU Low Voltage 2011/65/EU RoHS II Restriction of the use of Hazardous Substances in electrical and electronic equipment
EMC	EN 55032 Electromagnetic compatibility of multimedia equipment for non-residential environment. Class b radiated and conducted emissions EN 55035 Electromagnetic compatibility of multimedia equipment - Immunity requirements

Europe – CE Mark & UK CA	
	EN 61000-6-2 Electromagnetic compatibility (EMC), part 6-2: Generic standards- Immunity for industrial environment
Safety	EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements EN 61010-2-201 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-201: Particular requirements for control equipment

Table 18: Compliance RED mark

Europe – CE RED Mark & UK CA	
Directives	2014/53/EU Radio Equipment Directive (RED) 2011/65/EU RoHS II
EMC	EN 55032 Electromagnetic compatibility of multimedia equipment- Emission Requirements EN 55035 Electromagnetic compatibility of multimedia equipment - Immunity requirements EN 61000-6-2 Electromagnetic compatibility (EMC), Part 6-2: Generic standards- Immunity for industrial environment EN 301 489-1 V2.2.3 Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements harmonized standard for Electro Magnetic Compatibility EN 301 489-17 V3.2.4 Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems EN 300 328 V2.2.2 Wideband transmission systems - Data transmission equipment operating in the 2,4 GHz band EN 301 893-2 V2.1.1 5 GHz RLAN
Safety	EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements EN 61010-2-201 Safety requirements for electrical equipment for measurement, control and laboratory use – Part 2-201: Particular requirements for control equipment
Health and Safety	EN 62311 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

The KBox-A-151-AML/ADN plans to comply with the following country specific certifications, or later thereof:

Table 19: International Compliance

USA/CANADA Certifications	
EMC	FCC 47 CFR Part 15 (Class B) and ICES-003 Complies with part 15 FCC rules and regulations of title 47 of the CFR rules for class B products; under which an unintentional radiator may be operated, administrated and other conditions relating to the marketing of part 15 devices.
Safety	UL 61010-1 and CSA-C22.2 No. 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements UL 61010-2-201 and CSA-C22.2 NO. 61010-2-201 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-201: Particular requirements for control equipment

International Certifications	
EMC	IEC 61000-6-2 Electromagnetic compatibility (EMC), Part 6-2: Generic standards- Immunity for industrial environment
Safety	IEC 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements



For the product Declaration of Conformity (DOC), visit Kontron's [Customer Section](#).



If the product is modified, the prerequisites for specific approvals may no longer apply.



Kontron is not responsible for any radio television interference caused by unauthorized modifications of the delivered product or the substitution or attachment of connecting cables and equipment other than those specified by Kontron. The correction of interference caused by unauthorized modification, substitution or attachment is the user's responsibility.

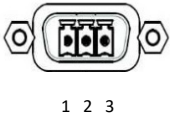
13/ Connectors Pin Assignments

This chapter describes the KBox A-151-AML/ADN's external connectors, connector LEDs, and relevant internal headers. For further motherboard information, visit Kontron's [3.5"-SBC-AML/ADN](https://www.kontron.com) website.

13.1. Front Panel Connector Pin Assignments

13.1.1. Power IN Connector (X101)

Table 20: Power IN Connector Pin Assignment (X101)

3-Pin Phoenix PSC 1.5/3-M	Pin	Signal Name	Description
	1	GND (-)	There is no isolation between Power IN GND (-) and the system chassis (include functional earth).
	2		Connected to system chassis (electrical connected to functional earth bolt)
	3	VIN (+)	+24 VDC
Mating Power Connector	PSC 1.5/ 3-F		

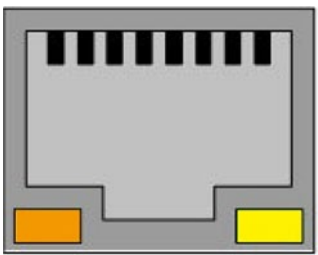
Include a Functional Earth

⚠ CAUTION

There is no isolation between Power IN GND and the system chassis (include functional earth).

13.1.2. Ethernet 2.5 GbE Connectors (X102, X103)

Table 21: Ethernet 2.5 GbE (10/100/1000/2500 Mbit) Connector Pin Assignment (X102, X103)

RJ45 (female)	Pin	Signal Name
	1	TX1+
	2	TX1-
	3	TX2+
	4	TX3+
	5	TX3-
	6	TX2-
	7	TX4+
	8	TX4-

LED: Speed		LED: Link Activity	
Off	10 Mbps	Off	Link down
Orange	1000 Mbps	Yellow Flashing	Link up and active
Green	2500 Mbps	Yellow	Link up and no activity

Signal	Description
TX1+ / TX1-	In MDI mode, this is the first pair in 2.5GBase-T and 1000Base-T, i.e. the BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX.
TX2+ / TX2-	In MDI mode, this is the second pair in 2.5GBase-T and 1000Base-T, i.e. the BI_DB+/- pair, and is the receive pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DA+/- pair, and is the transmit pair in 10Base-T and 100Base-TX.
TX3+ / TX3-	In MDI mode, this is the third pair in 2.5GBase-T and 1000Base-T, i.e. the BI_DC+/- pair. In MDI crossover mode, this pair acts as the BI_DD+/- pair.
TX4+ / TX4-	In MDI mode, this is the fourth pair in 2.5GBase-T and 1000Base-T, i.e. the BI_DD+/- pair. In MDI crossover mode, this pair acts as the BI_DC+/- pair.



To achieve the specified performance Category 5 twisted pair cables must be used with 10/100 MByte and Category 5E, 6 or 6E with 1 Gbit/2.5Gbit Ethernet networks.

13.1.3. USB-C 3.2 Gen 2 Port (X104)

Table 22: USB-C USB 3.2 Gen 2 Port Pin Assignment (X104)

USB Type C	Pin	Signal Name	Pin
	A1	GND	Ground
	A2	CON_TX1P_C	USB 3.2 Tx differential pair (+) /DP Lane 2 Tx differential pair (+)
	A3	CON_TX1N_C	USB 3.2 Tx differential pair (-) /DP Lane 2 Tx differential pair (-)
	A4	+5V_VBus	+5 V bus power
	A5	CC1	Configuration channel signal 1
	A6	USB2_P	USB 2.0 differential pair (+), position 1
	A7	USB2_N	B6 USB 2.0 differential pair (-), position 1
	A8	SBU1	Sideband use signal 1: DP Auxiliary channel differential pair (+)
	A9	+5V_VBus	+5 V bus power
	A10	CON_RX2N_C	DP Lane 0 Tx differential pair (-)
	A11	CON_RX2P_C	DP Lane 0 Tx differential pair (+)
	A12	GND	Ground
	B1	GND	Ground
	B2	CON_TX2P_C	DP Lane 1 Tx differential pair (+)
	B3	CON_TX2N_C	DP Lane 1 Tx differential pair (-)
	B4	+5V_VBUS	+5 V bus power
	B5	CC2	Configuration channel signal 2
	B6	USB2_P	USB 2.0 differential pair (+), position 2
	B7	USB2_N	USB 2.0 differential pair (-), position 2
	B8	SUB2	Sideband use signal 2: DP Auxiliary channel differential pair (-)
	B9	+5V_VBUS	+5 V bus power
	B10	CON_RX1N_C	USB 3.2 Rx differential pair (-) /DP Lane 3 Tx differential pair (-)
	B11	CON_RX1P_C	USB 3.2 Rx differential pair (+) /DP Lane 3 Tx differential pair (+)
	B12	GND	Ground


Product variants with the:

- ▶ Intel® Atom® x7000RE series processors support USB-C 3.2 Gen 1
- ▶ Intel® Core™ i3 N-series & Intel® N-series processors support USB-C 3.2 Gen 2

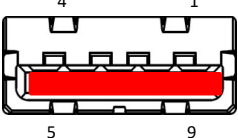
13.1.4. USB 2.0 Port (X105)

Table 23: USB 2.0 Port Pin Assignment (X104)

USB Type A	Pin	Signal Name	Description
	1	USB_VCC	+5 V power supply for USB device
	2	USB_D-	USB 2.0 differential pair (-)
	3	USB_D+	USB 2.0 differential pair (+)
	4	GND	Ground

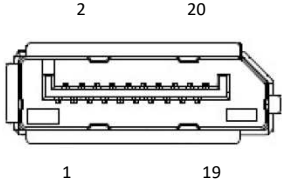
13.1.5. USB 3.2 Gen 2 Port (X106, X107)

Table 24: USB Type A Pin Assignment (X106, X107)

USB Type A	Pin	Signal Name	Description
	1	+USB_VCC	+5 V power supply for USB device
	2	USB_D-	USB 2.0 differential pair (-)
	3	USB_D+	USB 2.0 differential pair (+)
	4	GND	Ground
	5	USB_RX-	USB 3.2 receiver differential pair (-)
	6	USB_RX+	USB 3.2 receiver differential pair (+)
	7	GND	Ground
	8	USB_TX-	USB 3.2 transmitter differential pair (-)
	9	USB_TX+	USB 3.2 transmitter differential pair (+)

13.1.6. Display Port Connectors (X108, X109)

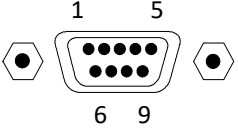
Table 25: Display Port Connector Pin Assignment (X108, X109)

20-pin Standard DP Connector (female)	Pin	Signal Name	Pin	Signal Name
	1	ML_Lane0+	11	GND
	2	GND	12	ML_Lane3-
	3	ML_Lane0-	13	Config1
	4	ML_Lane1+	14	Config2
	5	GND	15	AUX_CH+
	6	ML_Lane1-	16	GND
	7	ML_Lane2+	17	AUX_CH-
	8	GND	18	Hot_Plug
	9	ML_Lane2-	19	GND
	10	ML_Lane3+	20	DP_PWR

Signal Name	Description
ML_Lane# +/-	DisplayPort Lane # transmitter differential pair (+/-)
Aux_CH +/-	DisplayPort Auxiliary channel differential pair (+)
Hot_Plug	Display Port hot plug detect
Config#	Connect to Ground directly or via a pulldown device
GND	Ground signal
DP_PWR	Power supply signal for connector

13.1.7. Serial Ports (RS232) (X110, X111)

Table 26: Serial Ports (RS232) Pin Assignment (X110, X111)

9-pin D-SUB (male)	Pin	Signal Name	Description	Pin	Signal Name	Description
	1	NC		6	NC	
	2	RxD	Receive data	7	NC	
	3	TxD	Transmit data	8	NC	
	4	NC		9	NC	
	5	GND	Ground signal			

13.1.8. Antenna (X120, X121, X122)

The three antenna connectors (X120, X121, X122) support Wi-Fi and/or cellular LTE antenna depending on the internal configuration. The Wi-Fi and cellular LTE antenna connectors are not electrically compatible and not interchangeable. Users are responsible for connecting the correct antenna type to the product's antenna connectors.

Additional antennas may be implemented on the system expansion I/O door if the I/O door is not implemented with another feature.

Table 27: Antenna Type

Antenna Type	Description
Wi-Fi Antenna 	RP-SMA (male) antenna With pin socket and inner thread.
LTE Antenna 	SMA (male) Antenna With center pin and inner thread.

Antenna RF exposure

Avoid RF antenna exposure by:

⚠ CAUTION

- Avoid placing the antenna near people, minimum distance 20 cm.
- Avoid pointing the antenna at people.
- Keep a safe distance from the antenna especially when transmitting.

SMA and RP-SMA not Interchangeable!

NOTICE

SMA and RP-SMA connectors and antenna are not electrically compatible and not interchangeable. Ensure use of the correct antenna type. If RP-SMA and SMA connectors and antennas are mixed they may destroy the center pin or mate without the center pin contacts touching (minimal signal gets through).



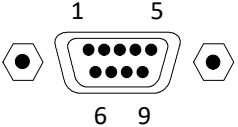
Kontron recommends the use of Kontron's reference antenna chosen to meet performance requirements. The reference antennas are included in the delivery and available as an accessory see Table 2: Accessories.

13.2. System Expansion I/O Door Pin Assignments Options (X201)

The system expansion I/O door options must be factory installed. Only one of the system expansion I/O door option can be ordered and installed. The product can only be equipped with one of the following (Dual CAN Bus, Dual GbE or EtherCAT) if the M.2 2280 B socket is not populated with a Cellular LTE module.

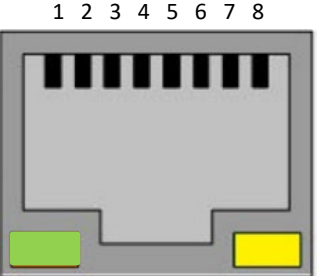
13.2.1. CAN Bus Port

Table 28: CAN Ports Pin Assignment

9-pin D89 port	Pin	Signal Name	Description	Pin	Signal Name	Description
	1	NC		6	NC	
	2	CAN-L	Dominant low line	7	CAN-H	Dominant high line
	3	GND	CAN Ground signal	8	NC	
	4	NC		9	NC	
	5	NC				

13.2.2. GbE Port

Table 29: Dual (GbE) Ethernet Ports Pin Assignment

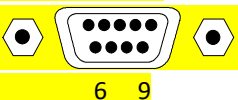
RJ45 (female)	Pin	Signal Name
	1	TX1+
	2	TX1-
	3	TX2+
	4	TX3+
	5	TX3-
	6	TX2-
	7	TX4+
	8	TX4-

LED: Link Activity		Right LED: Speed	
Off	Link down	Off	10/100 Mbit/s
Green Flashing	Link up and active	Orange	1000 Mbit/s
Green	Link up and no activity		

Signal	MDI Mode Description
TX1+ / TX1-	First pair in 1000Base-T, i.e. the BI_DA+/- pair, and transmit pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as the BI_DB+/- pair and is the receive pair in 10Base-T & 100Base-TX.
TX2+ / TX2-	Second pair in 1000Base-T, i.e. the BI_DB+/- pair, and receive pair in 10Base-T and 100Base-TX. In MDI crossover mode, this pair acts as BI_DA+/- pair and is the transmit pair in 10Base-T & 100Base-TX.
TX3+ / TX3-	Third pair in 1000Base-T, i.e. the BI_DC+/- pair. In MDI crossover mode, this pair acts as the BI_DD+/- pair.
TX4+ / TX4-	Fourth pair in 1000Base-T, i.e. the BI_DD+/- pair. In MDI crossover mode, this pair acts as the BI_DC+/- pair.

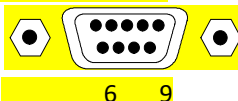
13.2.3. Serial Ports (RS232)

Table 30: Serial Ports (RS232) Pin Assignment

9-pin D-SUB (male)	Pin	Signal Name	Description	Pin	Signal Name	Description
	1	NC		6	NC	
	2	RxD	Receive data	7	NC	
	3	TxD	Transmit data	8	NC	
	4	NC		9	NC	
	5	GND	Ground signal			

13.2.4. Serial Ports (RS232/422/485)

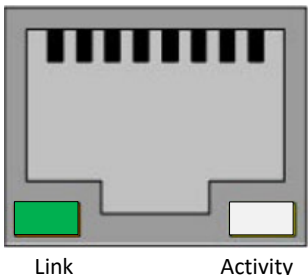
Table 31: Serial Ports (RS232/422/485) Pin Assignment

9-pin D-SUB (male)	Pin	RS232	RS422	RS485 (Full Duplex)
	1	DCD	TxD-	TxD/RxD-
	2	RxD	TxD+	TxD/RxD+
	3	TxD	RxD+	
	4	DTR	RxD-	
	5	GND	GND	GND
	6	DSR		
	7	RTS		
	8	CTS		
	9	RI		

Signal Name	Description
DCD	Data Carrier Detect
RxD+/-	Receive Data receives data from the communications link
TxD+/-	Transmitted Data sends data to the communications link.
DTR	Data Terminal Ready indicates that the on-board UART is ready to establish communication link
DSR	Data Set Ready, indicates that the modem etc. is ready to establish a communications link
RTS	Request To Send, indicates to the modem etc. that the on-board UART is ready to
CTS	Clear to send
RI	Ring Indicator, indicates that the modem has received a ringing signal from the telephone line
GND	GND signal

13.2.5. EtherCat Port

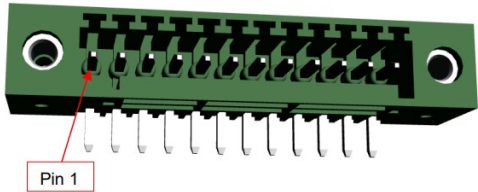
Table 32: EtherCAT Port Pin Assignment

RJ45 Port (female)	Pin	Signal Name	Description
	1	TX+	Transmit data + channel
	2	TX-	Transmit data - channel
	3	RX +	Receive data + channel
	4	Term 1	Bridged and terminated to PE via RC link
	5	Term 1	
	6	RX -	Receive data - channel
	7	Term_2	Bridged and terminated to PE via RC link*
	8	Term_2	

LED: Link Green		LED Activity Yellow	
Off	No link to the Ethernet	Off	LED is not used
Green	Linked to the Ethernet but does not send or receive frames		
Green Flashing	Linked to the Ethernet and sends/receives Ethernet frames		

13.2.6. 8-Channel GPIO/DIO Connector

Table 33: GPIO/DIO Connector Pin Assignment

12-pin GPIO Connector	Pin	Signal Name	Direction	Description
	1	PWR_IN	Power	Power Input for the GPIOs 10 V to 30 V (fused with 3A)
	2	PWR_IN	Power	
	3	NC		
	4	GPIO1	In/Out	GP Input /Output Channel
	5	GPIO2	In/Out	
	6	GPIO3	In/Out	
	7	GPIO4	In/Out	
	8	GPIO5	In/Out	
	9	GPIO6	In/Out	
	10	GPIO7	In/Out	
	11	GPIO8	In/Out	
	12	GND	Ground	Ground directly connected to system chassis (shield)

Mating Connector Information:



- 691381030012 WR-TBL Serie 381 or equivalent from Würth Elektronik
- 12-pin 2.50 mm vertical CAB entry plug screw less with Flanges
- Stranded Wire: 24-16 AWG / 0.205-1.31 MM²

13.2.7. SIM Slot

The SIM slot card holder supports one SIM card supplied by the user to support the user's cellular network

NOTICE

Switch off to Insert/Extract SIM

Only insert or extract the SIM cards if the product is switched off properly.



A SIM card is not part of the delivery and must be provided by the user, to support the required network.

13.3. On-board Header Pin Assignments

This chapter provides the pin assignment of relevant on-board headers.

13.3.1. RTC Lithium Battery Power Input Header

The motherboard RTC Lithium battery header connects to the lithium battery. The lithium battery provides power to the system clock to retain the time when the power is switched off.

Table 34: RTC Lithium Battery Connector Pin Assignment

2-pin, 1.25 mm Pitch	Pin	Signal Name	Description
	1	+VRTC	Real-time clock backup lithium battery input
	2	GND	Ground

14/ Maintenance

Maintenance or repair on the KBox A-151-AML/ADN may only be carried out by skilled personnel authorized by Kontron. Kontron products require only minimum servicing and maintenance for problem-free operation.

⚠ CAUTION

Handling and Operation

Handling and operation of the product is permitted only for skilled personnel aware of the associated dangers within an access-controlled workplace that fulfills all necessary technical and environmental requirements.

NOTICE

Protection Label

The product is factory configured to meet customer requirements and then sealed with a protection label. Opening the product invalidates the warranty and may cause damage to internal components.

NOTICE

Internal Components not Accessible

Internal Components are not accessible. For replacement or installation, the product must be returned to Kontron, see Chapter 15.1: Returning Defective Merchandise.

14.1. Cleaning

The heatsink on the top side can get very hot and precautions must be taken before handling or touching the heatsink to clean the product.



Hot Surface

The heatsink can get very hot. To avoid burns and personal injury when handling the heatsink:

- Do not touch while in operation
- Allow to cool before handling
- Wear protective gloves

To clean the surface of the product, perform the following:

1. Close all applications. Shut down properly using the power button and disconnect the power cable from the Power IN connector or the DC power supply. Disconnect all peripherals.
2. Allow the product to cool before handling and do not touch the heatsink when the product is in operation.
3. Carefully remove dust using a clean, soft brush and if light soiling, clean the product with a dry cloth.
4. Remove stubborn dirt using mild detergent and a soft cloth.
5. Clean the heatsink to help improve the heat dissipation from internal critical components and optimize heat transfer from internal critical components to the ambient environment.

14.2. Replacing the RTC Lithium Battery

The product is not designed to operate without a lithium battery. If the lithium battery is empty or disconnected, the BIOS settings will be set to the factory defaults. The internal lithium battery BR2032 with cable must be replaced with an identical three Volt lithium battery or a Kontron recommended lithium battery, see Table 2: Accessories.

For replacement or installation, Kontron recommends returning the product to Kontron, see Chapter 15.1: Returning Defective Merchandise.

⚠ WARNING

Disconnect Properly

Before opening the product, the product must be switched off using the power button, and all peripheral devices disconnected. Disconnect the product by removing the power cable from the Power IN connector or the DC power supply.

⚠ CAUTION

Handling and Operation

Handling and operation of the product is permitted only for skilled personnel aware of the associated dangers, within an access-controlled workplace that fulfills all necessary technical and environmental requirements.

⚠ CAUTION

Danger of Explosion if the lithium battery is incorrectly placed!

- Replace only with the same or equivalent type recommended by the manufacturer
- Dispose of used batteries according to the manufacturer's instructions



Hot Surface

The heatsink can get very hot. To avoid burns and personal injury when handling the heatsink:

- Do not touch while in operation
- Allow to cool before handling
- Wear protective gloves

NOTICE

Protection Label

The product is factory configured to meet customer requirements and then sealed with a protection label. Opening the product invalidates the warranty and may cause damage to internal components. For replacement or installation, the product must be returned to Kontron, see Chapter 15.1: Returning Defective Merchandise.



ESD Sensitive Device!

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 product or/and internal components.

NOTICE

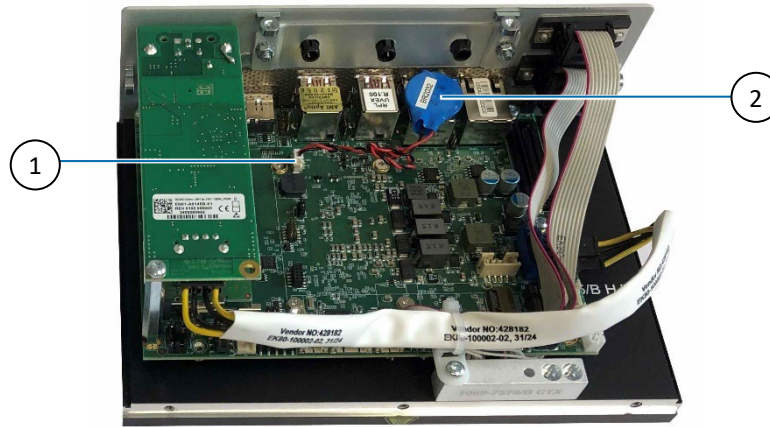
Handle with Care

The internal 3.5" SBC contains components on both sides that damage easily if handled without reasonable care, resulting in malfunction or no function at all.



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

Figure 25: RTC Lithium Battery



1 3.5" SBC battery header

2 Lithium battery BR2032 with cable (fixed)

For replacement or installation, the product must be returned to Kontron, see Chapter 15.1: Returning Defective Merchandise. If required to open the product observe the safety instructions in Chapter 2/General Safety Instructions and the instructions within this chapter. To open the product, perform the following:

1. Close all applications. Shut down properly using the power button and disconnect the power cable from the Power IN connector or the DC power supply. Disconnect all peripherals.
2. Allow the product to cool before handling and do not touch the heatsink until the heatsink has cooled.
3. Place on a flat, clean and ESD-safe surface with the heatsink facing downwards.
4. Remove the two screws on the bottom side of the product.



5. Removed the screw on the right and left sides of the product.



- If attached, remove the DIN Rail clamp and then remove the three screws on the rear side of the product.



- Lift the cover vertically upwards off the heatsink-front-panel-assembly, while taking care not to damage internal components or disconnect any internal cables. Place the cover on a soft surface to avoid scratching.



- Locate and disconnect the lithium battery cable from the RTC power input header (Figure 25, pos. 1) and pull to remove the lithium battery (Figure 25, pos. 2) from the top of the connector housing, by loosening the adhesive pad.
- Replace a new lithium battery of the same type by inserting the new lithium battery's cable connector into the RTC power input header (Figure 25, pos. 1) and attaching the lithium battery (Figure 25, pos. 2) with a new adhesive pad to the top of the connector housing.
- Close the product by proceeding in the reverse order (steps 7 to 4).

14.3. Changing the SIM CARD

NOTICE

Switch off to Insert/Extract SIM

Only insert or extract the SIM cards if the product is switched off properly.



A SIM card is not part of the delivery and must be provided by the user, to support the required network.

To extract a SIM and insert a new SIM card in the SIM card slot on the front panel, perform the following:

- Close all applications. Shut down properly using the power button and disconnect the power cable from the Power IN connector or the DC power supply.
- Allow the product to cool before handling or do not touch the heatsink.
- Push the inserted SIM card lightly to release the SIM from the SIM slot.
- Pull the SIM card carefully out of the SIM slot.
- Position the new SIM card with the terminal contacts facing forwards and on the underside.
- Push the SIM card carefully into the SIM slot until the SIM card clicks acoustically.

15/ Technical Support

Should a problem occur, contact Kontron's Support Department:

- › Email: support@kontron.com
- › Phone: +49-821-4086-888

Make sure you have the following information available when you call:

- › Product ID Number (PN)
- › Serial Number (SN)



The serial number can be found on the product's type label.

Be ready to explain the nature of your problem to the service technician.

15.1. Returning Defective Merchandise

All equipment returned to Kontron must have a Return of Material Authorization (RMA) number assigned exclusively by Kontron. Kontron cannot be held responsible for any loss or damage caused to the equipment received without an RMA number. The buyer accepts responsibility for all freight charges for the return of goods to Kontron's designated facility. Kontron will pay the return freight charges back to the buyer's location in the event that the equipment is repaired or replaced within the stipulated warranty period.

Follow these steps before returning any product to Kontron.

Follow these steps before returning any product to Kontron.

1. Visit the RMA Information website: <http://www.kontron.com/support-and-services/support/rma-information>.
2. Download the RMA Request sheet for Kontron Europe GmbH and fill out the form. Take care to include a short detailed description of the observed problem or failure and to include the product identification Information (Name of product, Product number and Serial number). If a delivery includes more than one product, fill out the above information in the RMA Request form for each product.
3. Send the completed RMA-Request form to the fax or email address given below at Kontron Europe GmbH. Kontron will provide an RMA-Number.
4. Kontron Europe GmbH
RMA Support
Phone: +49 (0) 821 4086-0
Fax: +49 (0) 821 4086 111
Email: service@kontron.com
5. The goods for repair must be packed properly for shipping, considering shock and ESD protection.



Goods returned to Kontron Europe GmbH in non-proper packaging will be considered as customer caused faults and cannot be accepted as warranty repairs.

6. Include the RMA-Number with the shipping paperwork and send the product to the delivery address provided in the RMA form or received from Kontron RMA Support.

16/ Storage and Transportation

16.1. Storage

If the product is not in use for an extended period of time, disconnect the product from the main power supply. If it is necessary to store the product, then repack the product as originally delivered to avoid damage. The storage facility must meet the product's environmental storage requirements as stated within this user guide. Kontron recommends keeping the original packaging material for future storage or warranty shipments.

16.2. Transportation

To ship the product, use the original packaging, designed to withstand impact and adequately protect the product. When packing or unpacking the product always take shock and ESD protection into consideration and use an EOS/ESD safe working area.

17/ Warranty

Kontron defines product warranty in accordance with regional warranty definitions. Claims are at Kontron's discretion and limited to the defect being of a material nature. To find out more about the warranty conditions and the defined warranty period for your region, follow the steps below:

1. Visit Kontron's Term and Conditions webpage.
<http://www.kontron.com/terms-and-conditions>
2. Click on your region's General Terms and Conditions of Sale.

17.1. Limitation/Exemption from Warranty Obligation

In general, Kontron shall not be required to honor the warranty, even during the warranty period, and shall be exempted from the statutory accident liability obligations in the event of damage caused to the product due to failure to observe the following:

- General safety instructions for IT equipment within this user guide.
- Warning labels on the product and warning symbols within this user guide.
- Information and hints within this user guide.

Additionally, alterations or modifications to the product that are not explicitly approved by Kontron, described in this user guide, or received from Kontron Support as a special handling instruction will void your warranty.

Due to their limited service life, parts that by their nature are subject to a particularly high degree of wear (wearing parts) are excluded from the warranty beyond that provided by law.

18/ Disposal

18.1. Disposal

Dispose of the product in accordance with country, state, or local regulations and requirements as part of your disposal and decommissioning policies or recycle the product or parts of the product for re-use after performing data sanitization to erase sensitive data stored on the product's memory devices.

When disposing of the product

- › Remove any product labels from the product that could indicate ownership and provide a clue to the type of data stored on the memory device.
- › Comply with your company's environmental requirements and the requirements of Waste Electrical and Electronic Equipment (WEEE) directive.
- › Use data sanitization guidelines to ensure that data sensitive to your business and/or confidential or proprietary data and software is removed from the product using a data sanitization method that stops the data from being retrieved or reconstructed.

18.2. 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 becomes 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.

18.3. Data Sanitization

Data sanitization is the process of permanently erasing or destroying sensitive data on the product's memory devices to prevent unauthorized access to data sensitive to your business and/or confidential/proprietary data stored on the memory devices.

When designing a system, the user must plan for data sanitization and design in memory devices that are easier to sanitize, memory devices from manufacturers that provide an effective data erasure tool or a return to factory default command.

When performing data sanitization, the user must consider if the product's memory devices contain sensitive data and develop a data sanitization plan to erase all sensitive data in accordance with country, state, or local data sanitization regulations and requirements or as part of your disposal and decommissioning policies.



Data Sanitization

Users are responsible for erasing sensitive data on memory devices in accordance with country, state, or local data sanitization regulations and requirements, or as part of your disposal and decommissioning policies.

Kontron recommends performing data sanitization when reusing the product in a different user environment, sending the product in for repair, disposing of the product or decommissioning the product.

General guidelines when performing data sanitization on memory devices containing data sensitive to your business and/or confidential/proprietary data:

- › Before powering down, consider if power is required to perform data sanitization on the product's memory devices.
- › When disconnected from the power source, dismantle all removable memory devices from the product and erase sensitive data.
- › Volatile memory devices only store data temporarily. Data on volatile memory can be erased easily by disconnecting the power/removing the battery for approximately 24 hours.
- › Non-volatile memory devices store data permanently and retain information when disconnected from power. Data on non-volatile memory must be actively erased using one of the following methods:
 - › Use an accredited third-party software tool that provides an audit trail, capable of performing a complete data clean including areas such as hidden data and bad blocks not accessed by general service-based utilities.
 - › Use the physical destruction methods on memory devices that cannot be securely software erased. The aim of the destruction is to break the silicon die within the chips package into two or more parts to prevent reading data from the die. Fragments should be no longer than 6 mm. If this service is performed by a third party obtain destruction certificates for confirmation.
 - › Use the manufacture's data erasure tool for sanitization or return to factory default command (if provided by the manufacturer). The manufacturer's tools and commands have been designed to fulfil the data sanitization requirement of the manufacture's specific memory device(s).
- › Always verify that all sensitive data has been effectively sanitized.



Dismantle Removable Memory

Dismantle all removable memory devices and erase sensitive data for reuse by using:

- › An accredited third-party software tool.
- › Manufacture's data erasure tool' or 'return to factory default command'. (if provided)
- › If the removable memory is not for reuse, physically destruct the memory according to data sanitization guidelines.



Erase Data

To ensure that forensic tools cannot be used to recover sensitive data:

- › Use an accredited third-party software tool, with an audit trail, capable of performing a complete data clean, including areas such as hidden data and bad blocks not accessed by general service-based utilities.
- › Use the manufacture's data erasure tool or return to factory default command designed to fulfil the data sanitization requirement of the manufacture's specific memory device(s).



Physical Destruction

When physically destructing the memory:

- › Follow proper safety protocols.
- › Break the chip packaged silicon die into two or more parts, fragments ≤ 6 mm.
- › Check both sides as memory devices may be positioned on the rear side.
- › Use a third-party destruction company providing certificates for confirmation.

18.4. Statement of Memory Volatility

The product's statement of memory volatility provides the user with a detailed list of the product's memory devices and their volatility, to enable the user to develop a suitable data sanitization plan.



In some cases, special tools and/or software are necessary to access the memory

19/ Cyber Security

Cyber security is an important aspect to consider when installing, operating, maintaining and disposing of the product. This chapter provides cyber security guidelines for the user.



Security White Paper

For cyber security guidelines to protect your Kontron product from potential cyber security threats, refer to Kontron's [Security White paper](#).



Security Measures

Kontron is not aware of the final target end user environment in which the product operates. It is not possible for Kontron to provide precise instructions for your cyber security measures. Kontron strives to provide hints for considerations for your threat analysis and to point out particular security mechanisms implemented in Kontron products.

19.1. Security Defense Strategy

When developing your security defense strategy consider implementing the following guidelines to help you effectively secure the product:

- › Policies and procedures developed in association with the product's/end environment's security.
- › Instructions and recommendations for periodic security maintenance activities and reporting product security incidents.
- › Security network controls/setting such as firewall rules.
- › Third party software tools that further protect the product.
- › Authentication to access the product, limit user privileges and managing user accounts.
- › Data encryption.
- › Reduced number of potential security entry points.
- › BIOS/OS and security updates when available that do not compromise the product's operation or defense in depth strategy.
- › User accounts with length and complexity requirements.
- › Supplied default passwords are changed.
- › Limited network access (IP address range).
- › Installation of anti-virus and malware software.
- › Network access requirements such as VPN.

Appendix: List of Acronyms

AC	Alternating Current
BIOS	Basic Input Output System
CAN	Controller Area Network
CE	Conformité Européenne
COM	Communication port
DC	Direct Current
DOC	Declaration of Conformity
DP	Display Port
EMC	ElectroMagnetic compatibility
ESD	ElectroStatic Discharge
FCC	Federal Communications Commission
GbE	Giga Bit Ethernet
GPIO	General Purpose Input Output
HD	High Definition
HDMI	High Definition Multimedia Interface
IEC	International Electrotechnical Commission
IOT	Internet of Things
IP	International Protection
LAN	Local Area Network
LED	Light Emitting Diode
LPS	Limited Power Source
LTE	Long-Term Evolution
MBR	Master Boot Record
MDI	Media Dependent Interface
MTBF	Mean Time Before Failure
PS	Power Source
PSU	Power Supply Unit
RED	Radio Equipment Directive
RMA	Return of Material Authorization
RoHS	Restriction of Hazardous Substances
RP_SMA	Reverse Polarity Sub Miniture version A
RTC	Real Time Clock
RX	Receive
SD card	Secure Digital Card
SIM	Subscriber Identity Module
SMA	Sub Miniture version A
TDP	Thermal Design Power
TPM	Trusted Platform Module

TX	Transmit
UEFI	Unified Extensible Firmware Interface
UL	Underwriters Laboratories
USB	Universal Serial Bus



About Kontron

Kontron is a global leader in IoT/Embedded Computing Technology (ECT) and offers individual solutions in the areas of Internet of Things (IoT) and Industry 4.0 through a combined portfolio of hardware, software and services. With its standard and customized products based on highly reliable state-of-the-art technologies, Kontron provides secure and innovative applications for a wide variety of industries. As a result, customers benefit from accelerated time-to-market, lower total cost of ownership, extended product lifecycles and the best fully integrated applications.

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