NEXCOM International Co., Ltd.

Mobile Computing Solutions

Vehicle Telematics & Railway Computer
VTC 1031 and nROK 1031 Series

User Manual

NEXCOM International Co., Ltd.
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Contents

Chapter 3: Jumpers and Connectors

Chapter 4: System Setup

Appendix A: Software Demo Utility for I/O Ports of Function Control

Appendix B: GNSS Feature

Appendix C: GPS with Dead Reckoning Feature

Appendix D: Signal Connection of DI/DO

Appendix E: Pin Definition for the Multiport Cable

Appendix F: Vehicle Power Management Setup

Appendix G: Power Consumption

PREFACE

Copyright

Disclaimer

The information in this document is subject to change without prior notice and does not represent commitment from NEXCOM International Co., Ltd. However, users may update their knowledge of any product in use by constantly checking its manual posted on our website: http://www.nexcom.com. NEXCOM shall not be liable for direct, indirect, special, incidental, or consequential damages arising out of the use of any product, nor for any infringements upon the rights of third parties, which may result from such use. Any implied warranties of merchantability or fitness for any particular purpose is also disclaimed.

Acknowledgements

VTC 1031 and nROK 1031 series are trademarks of NEXCOM International Co., Ltd. All other product names mentioned herein are registered trademarks of their respective owners.

Regulatory Compliance Statements

This section provides the FCC compliance statement for Class A devices and describes how to keep the system CE compliant.

Declaration of Conformity

FCC

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

CE

The product(s) described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

RoHS Compliance

NEXCOM RoHS Environmental Policy and Status Update

NEXCOM is a global citizen for building the digital infrastructure. We are committed to providing green products and services, which are compliant with European Union RoHS (Restriction on Use of Hazardous Substance in Electronic Equipment) directive 2011/65/EU, to be your trusted green partner and to protect our environment.

RoHS restricts the use of Lead (Pb) < 0.1% or 1,000ppm, Mercury (Hg) < 0.1% or 1,000ppm, Cadmium (Cd) < 0.01% or 100ppm, Hexavalent Chromium (Cr6+) < 0.1% or 1,000ppm, Polybrominated biphenyls (PBB) < 0.1% or 1,000ppm, and Polybrominated diphenyl Ethers (PBDE) < 0.1% or 1,000ppm.

In order to meet the RoHS compliant directives, NEXCOM has established an engineering and manufacturing task force to implement the introduction of green products. The task force will ensure that we follow the standard NEXCOM development procedure and that all the new RoHS components and new manufacturing processes maintain the highest industry quality levels for which NEXCOM are renowned.

The model selection criteria will be based on market demand. Vendors and suppliers will ensure that all designed components will be RoHS compliant.

How to recognize NEXCOM RoHS Products?

For existing products where there are non-RoHS and RoHS versions, the suffix "(LF)" will be added to the compliant product name.

All new product models launched after January 2013 will be RoHS compliant. They will use the usual NEXCOM naming convention.

Warranty and RMA

NEXCOM Warranty Period

NEXCOM manufactures products that are new or equivalent to new in accordance with industry standard. NEXCOM warrants that products will be free from defect in material and workmanship for 2 years, beginning on the date of invoice by NEXCOM.

NEXCOM Return Merchandise Authorization (RMA)

- Customers shall enclose the "NEXCOM RMA Service Form" with the returned packages.
- Customers must collect all the information about the problems encountered and note anything abnormal or, print out any on-screen messages, and describe the problems on the "NEXCOM RMA Service Form" for the RMA number apply process.
- Customers can send back the faulty products with or without accessories (manuals, cable, etc.) and any components from the card, such as CPU and RAM. If the components were suspected as part of the problems, please note clearly which components are included. Otherwise, NEXCOM is not responsible for the devices/parts.
- Customers are responsible for the safe packaging of defective products, making sure it is durable enough to be resistant against further damage and deterioration during transportation. In case of damages occurred during transportation, the repair is treated as "Out of Warranty."
- Any products returned by NEXCOM to other locations besides the customers' site will bear an extra charge and will be billed to the customer.

Repair Service Charges for Out-of-Warranty Products

NEXCOM will charge for out-of-warranty products in two categories, one is basic diagnostic fee and another is component (product) fee.

System Level

- Component fee: NEXCOM will only charge for main components such as SMD chip, BGA chip, etc. Passive components will be repaired for free, ex: resistor, capacitor.
- Items will be replaced with NEXCOM products if the original one cannot be repaired. Ex: motherboard, power supply, etc.
- Replace with 3rd party products if needed.
- If RMA goods can not be repaired, NEXCOM will return it to the customer without any charge.

Board Level

- Component fee: NEXCOM will only charge for main components, such as SMD chip, BGA chip, etc. Passive components will be repaired for free, ex: resistors, capacitors.
- If RMA goods can not be repaired, NEXCOM will return it to the customer without any charge.

Warnings

Read and adhere to all warnings, cautions, and notices in this guide and the documentation supplied with the chassis, power supply, and accessory modules. If the instructions for the chassis and power supply are inconsistent with these instructions or the instructions for accessory modules, contact the supplier to find out how you can ensure that your computer meets safety and regulatory requirements.

Cautions

Electrostatic discharge (ESD) can damage system components. Do the described procedures only at an ESD workstation. If no such station is available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the computer chassis.

Safety Information

Before installing and using the device, note the following precautions:

- Read all instructions carefully.
- Do not place the unit on an unstable surface, cart, or stand.
- Follow all warnings and cautions in this manual.
- When replacing parts, ensure that your service technician uses parts specified by the manufacturer.
- Avoid using the system near water, in direct sunlight, or near a heating device.
- The load of the system unit does not solely rely for support from the rackmounts located on the sides. Firm support from the bottom is highly necessary in order to provide balance stability.
- The computer is provided with a battery-powered real-time clock circuit. There is a danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Installation Recommendations

Ensure you have a stable, clean working environment. Dust and dirt can get into components and cause a malfunction. Use containers to keep small components separated.

Adequate lighting and proper tools can prevent you from accidentally damaging the internal components. Most of the procedures that follow require only a few simple tools, including the following:

- A Philips screwdriver
- A flat-tipped screwdriver
- A grounding strap
- An anti-static pad

Using your fingers can disconnect most of the connections. It is recommended that you do not use needle-nose pliers to disconnect connections as these can damage the soft metal or plastic parts of the connectors.

Safety Precautions

1. Read these safety instructions carefully.

2. Keep this User Manual for later reference.

3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.

4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.

5. Keep this equipment away from humidity.

6. Put this equipment on a stable surface during installation. Dropping it or letting it fall may cause damage.

7. The openings on the enclosure are for air convection to protect the equipment from overheating. DO NOT COVER THE OPENINGS.

8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.

9. Place the power cord in a way so that people will not step on it. Do not place anything on top of the power cord. Use a power cord that has been approved for use with the product and that it matches the voltage and current marked on the product's electrical range label. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.

10. All cautions and warnings on the equipment should be noted.

11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.

12. Never pour any liquid into an opening. This may cause fire or electrical shock.

13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.

14. If one of the following situations arises, get the equipment checked by service personnel:
    a. The power cord or plug is damaged.
    b. Liquid has penetrated into the equipment.
    c. The equipment has been exposed to moisture.
    d. The equipment does not work well, or you cannot get it to work according to the user's manual.
    e. The equipment has been dropped and damaged.
    f. The equipment has obvious signs of breakage.

15. Do not place heavy objects on the equipment.

16. The unit uses a three-wire ground cable which is equipped with a third pin to ground the unit and prevent electric shock. Do not defeat the purpose of this pin. If your outlet does not support this kind of plug, contact your electrician to replace your obsolete outlet.

17. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER. DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

Technical Support and Assistance

1. For the most updated information of NEXCOM products, visit NEXCOM's website at www.nexcom.com.

2. For technical issues that require contacting our technical support team or sales representative, please have the following information ready before calling:
   - Product name and serial number
   - Detailed information of the peripheral devices
   - Detailed information of the installed software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wordings of the error messages

Warning!

1. Handling the unit: carry the unit with both hands and handle it with care.

2. Maintenance: to keep the unit clean, use only approved cleaning products or clean with a dry cloth.

3. CFast: Turn off the unit's power before inserting or removing a CFast storage card.

Conventions Used in this Manual

Warning:
Information about certain situations, which if not observed, can cause personal injury. This will prevent injury to yourself when performing a task.

Caution:
Information to avoid damaging components or losing data.

Note:
Provides additional information to complete a task easily.

Global Service Contact Information

Headquarters

NEXCOM International Co., Ltd.

9F, No. 920, Zhongzheng Rd.,
Zhonghe District, New Taipei City, 23586,
Taiwan, R.O.C.
Tel: +886-2-8226-7786
Fax: +886-2-8226-7782
www.nexcom.com

Asia

Taiwan

NexAIoT Headquarters
Industry 4.0 and Cloud Services

13F, No.922, Zhongzheng Rd.,
Zhonghe District, New Taipei City,
23586, Taiwan, R.O.C.
Tel: +886-2-8226-7796
Fax: +886-2-8226-7926
Email: jacobhuang@nexaiot.com
www.nexaiot.com

NexAIoT Co., Ltd.
Taichung Office

16F, No.250, Sec.2, Chongde Rd.,
Beitun District,
Taichung City, 406, Taiwan, R.O.C.
Tel: +886-4-2249-1179
Fax: +886-4-2249-1172
Email: jacobhuang@nexaiot.com
www.nexaiot.com

NexCOBOT Taiwan Co., Ltd.

13F, No.916, Zhongzheng Rd.,
Zhonghe District,
New Taipei City, 23586, Taiwan, R.O.C.
Tel: +886-2-8226-7786
Fax: +886-2-8226-7926
Email: jennyshern@nexcobot.com
www.nexcobot.com

GreenBase Technology Corp.

13F, No.922, Zhongzheng Rd.,
Zhonghe District,
New Taipei City, 23586, Taiwan, R.O.C.
Tel: +886-2-8226-7786
Fax: +886-2-8226-7900
Email: vivianlin@nexcom.com.tw
www.nexcom.com.tw

DivioTec Inc.

19F-1A, No.97, Sec.4, ChongXin Rd.,
Sanchong District,
New Taipei City, 24161, Taiwan, R.O.C.
Tel: +886-2-8976-3077
Email: sales@diviotec.com
www.diviotec.com

AIoT Cloud Corp.

13F, No.922, Zhongzheng Rd.,
Zhonghe District,
New Taipei City, 23586, Taiwan, R.O.C.
Tel: +886-2-8226-7786
Fax: +886-2-8226-7782
Email: alantsai@aiotcloud.net
www.aiotcloud.dev

EMBUX TECHNOLOGY CO., LTD.

13F, No.916, Zhongzheng Rd.,
Zhonghe District,
New Taipei City, 23586, Taiwan, R.O.C.
Tel: +886-2-8226-7786
Fax: +886-2-8226-7782
Email: info@embux.com
www.embux.com

TMR TECHNOLOGIES CO., LTD.

13F, No.916, Zhongzheng Rd.,
Zhonghe District,
New Taipei City, 23586, Taiwan, R.O.C.
Tel: +886-2-8226-7786
Fax: +886-2-8226-7782
Email: services@tmrtek.com
www.tmrtek.com

China
NEXSEC Incorporated

201, Floor 2, Unit 2, Building 15, Yard 3,
Gaolizhang Road, Haidian District,
Beijing, 100094, China
Tel: +86-10-5704-2680
Fax: +86-10-5704-2681
Email: marketing@nexsec.cn
www.nexsec.cn

NEXCOM Shanghai

Room 406-407, Building C, No 154, Lane 953,
Jianchuan Road, Minhang District,
Shanghai, 201108, China
Tel: +86-21-5278-5868
Fax: +86-21-3251-6358
Email: sales@nexcom.cn
www.nexcom.cn

NEXCOM Surveillance Technology Corp.

Floor 8, Building B3, Xiufeng Industrial Zone,
GanKeng Community, Buji Street,
LongGang District,
ShenZhen, 518112, China
Tel: +86-755-8364-7768
Fax: +86-755-8364-7738
Email: steveyang@nexcom.com.tw
www.nexcom.cn

NEXGOL Chongqing

1st Building No.999,
Star Boulevard, Yongchuan Dist,
Chongqing City, 402160, China
Tel: +86-23-4960-9080
Fax: +86-23-4966-5855
Email: sales@nexgol.com.cn
www.nexcobot.cn

Beijing NexGemo Technology Co.,Ltd.

Room 205, No.1, Fazhan Road.,
Beijing International Information Industry Base,
Changping District,
Beijing, 102206, China
Tel: +86-10-8072-2025
Fax: +86-10-8072-2022
Email: sales@nexgemo.cn
www.nexgemo.com

Japan
NEXCOM Japan

9F, Tamachi Hara Bldg.,
4-11-5, Shiba Minato-ku,
Tokyo, 108-0014, Japan
Tel: +81-3-5419-7830
Fax: +81-3-5419-7832
Email: sales@nexcom-jp.com
www.nexcom-jp.com

America
USA
NEXCOM USA

46665 Fremont Blvd.,
Fremont CA 94538, USA
Tel: +1-510-656-2248
Fax: +1-510-656-2158
Email: sales@nexcom.com
www.nexcomusa.com

Europe
United Kingdom
NEXCOM EUROPE

10 Vincent Avenue,
Crownhill Business Centre,
Milton Keynes, Buckinghamshire
MK8 0AB, United Kingdom
Tel: +44-1908-267121
Fax: +44-1908-262042
Email: sales.uk@nexcom.eu
www.nexcom.com

Package Contents

Before continuing, verify that the VTC 1031 and nROK 1031 series package that you received is complete. Your package should have all the items listed in the following table.

VTC 1031 / VTC 1031-C2

Item	Part Number	Name	Description	Qty
1	4NCPM00302X00	(T)TERMINAL BLOCKS 3P PHOENIX CONTACT:1777992	5.08mm MALE DIP GREEN	1
2	50311F0270X00	(H)ROUND HEAD SCREW W/SPRING+FLAT WASHER LONG FEI: P3x7L	P3x7 iso/SW6x0.5 NI	6
3	50311F0358X00	FLAT HEAD SCREW LONG FEI: F3x6ISO+NYLOK NIGP	F3x6 NI NYLOK	4
4	5040420242X00	(N)SSD BRACKET FOR VTC1031 VER: A JENN YIE	88x7x6.3mm T=0.8mm SPCC+Zn	2
5	5060700035X00	HDMI WIRE MOUNT KANG YANG: SWCM-1VB	13.85x11x7.8mm NYLON 66 UL94V-0 BLACK	2
6	603ANT0115X00	GPS/GLONASS ANTENNA UNICTRON: SM-76G	SMA MALE L=5000mm	1
7	603GPI0033X00	(N)GPIO MULTI CABLE ST: MD-5111058	HD 26P/M TO DB9P/Mx4+HD15P+H.S CABLE L=300mm	1

Package Contents

nROK 1031 / nROK 1031-C2

Item	Part Number	Name	Description	Qty
1	50311F0123X00	(H)F HEAD SCREW LONG FEI: F3*6ISO	M3x6 mm BLACK NYLOK	4
2	50311F0270X00	(H)ROUND HEAD SCREW W/SPRING+FLAT WASHER LONG FEI: P3x7L	P3x7 iso/SW6x0.5 NI	6
3	5040420242X00	(N)SSD BRACKET FOR VTC1031 VER: A JENN YIE	88x7x6.3mm T=0.8mm SPCC+Zn	2
4	5060700035X00	HDMI WIRE MOUNT KANG YANG: SWCM-1VB	13.85x11x7.8mm NYLON 66 UL94V-0 BLACK	2
5	603ANT0115X00	GPS/GLONASS ANTENNA UNICTRON:SM-76G	SMA MALE L=5000mm	1
6	603GPI0033X00	(N)GPIO MULTI CABLE ST: MD-5111058	HD 26P/M TO DB9P/Mx4+HD15P+H.S CABLE L=300mm	1
7	603POW0378X00	POWER CABLE ST:MD-5108077	WATERPROOF M12 A CODED 5PIN(FEMALE) TO OPEN L=300mm	1
8	50333P0027X00	WASHER FOR SMA CONN KANGYANG: TW-181	13x1.8mm NYLON 66 NATURAL	5
9	50333P0028X00	WASHER FOR SMA CONN KANGYANG: WS6-0.8(B)	12.8x6.4x0.8mm PC BLACK	5

Ordering Information

The following information below provides ordering information for the VTC 1031 and nROK 1031 series.

VTC 1031 (P/N: 10V00103100X0)
Intel Atom® x6413E processor 1.5GHz with 4GB DDR4, U-blox NEOM9N GNSS module, 1 x CAN 2.0B, 1 x VGA output, 1 x HDMI output, 1 x internal SSD tray, 2 x LAN RJ45, 1 x mini-PCIe slot, 2 x M.2 slots, 2 x micro-SIMs, 1 x USB 3.2 Gen 2, 3 x USB 2.0, 1 x full RS232/422/485, 1 x RS232 Tx/Rx, 2 x RS485, 5 x DI & 4 x DO

VTC 1031-C2 (P/N: 10V00103100X0)
Intel Atom® x6413E processor 1.5GHz with 4GB DDR4, U-blox NEOM9N GNSS module, 1 x CAN 2.0B, 1 x VGA output, 1 x HDMI output, 1 x internal SSD tray, 2 x LAN RJ45, 1 x mini-PCIe slot, 2 x M.2 slots, 2 x micro-SIMs, 1 x USB 3.2 Gen 2, 3 x USB 2.0, 1 x full RS232/422/485, 1 x RS232 Tx/ Rx, 2 x RS485, 5 x DI & 4 x DO, 2 x PoE RJ45

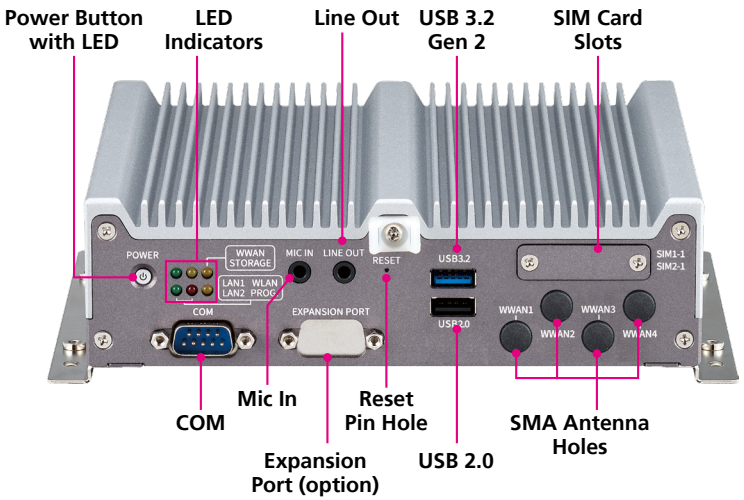
nROK 1031-A (P/N: 10A00103100X0)
Intel Atom® x6413E processor 1.5GHz with 4GB DDR4, U-blox NEOM9N GNSS module, 1 x CAN 2.0B, 1 x VGA output, 1 x HDMI output, 1 x internal SSD tray, 2 x LAN M12 X-coded, 1 x mini-PCIe slot, 2 x M.2 slots, 2 x micro-SIMs, 1 x USB 3.2 Gen 2, 3 x USB 2.0, 1 x full RS232/422/485, 1 x RS232 Tx/Rx, 2 x RS485, 5 x DI & 4 x DO

nROK 1031-AC2 (P/N: 10A00103100X0)
Intel Atom® x6413E processor 1.5GHz with 4GB DDR4, U-blox NEOM9N GNSS module, 1 x CAN 2.0B, 1 x VGA output, 1 x HDMI output, 1 x internal SSD tray, 2 x LAN M12 X-coded, 1 x mini-PCIe slot, 2 x M.2 slots, 2 x micro-SIMs, 1 x USB 3.2 Gen 2, 3 x USB 2.0, 1 x full RS232/422/485, 1 x RS232 Tx/Rx, 2 x RS485, 5 x DI & 4 x DO, 2 x PoE M12 X-coded

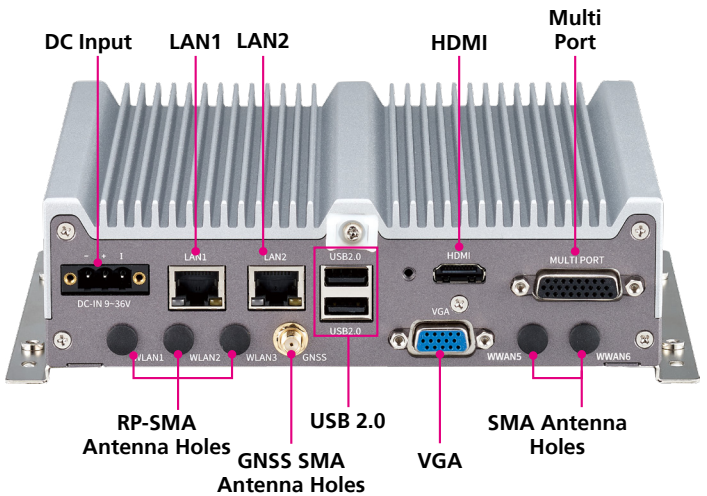
Chapter 1: Product Introduction

Physical Features

VTC 1031 Front View

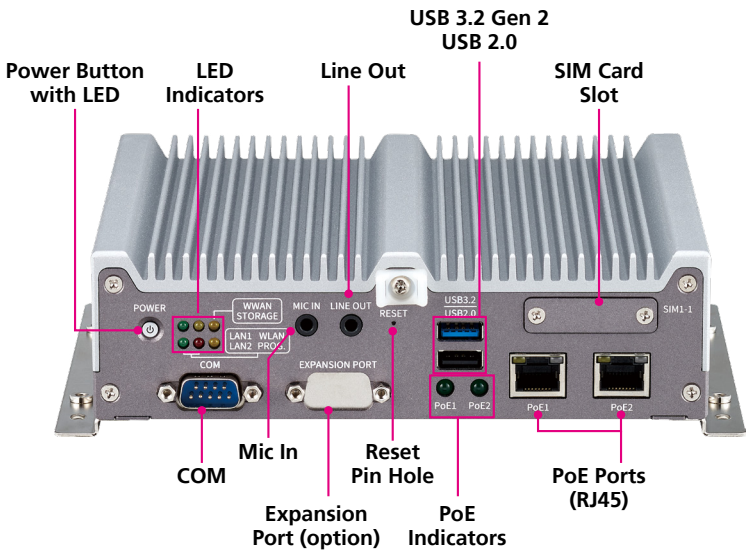


VTC 1031 Rear View

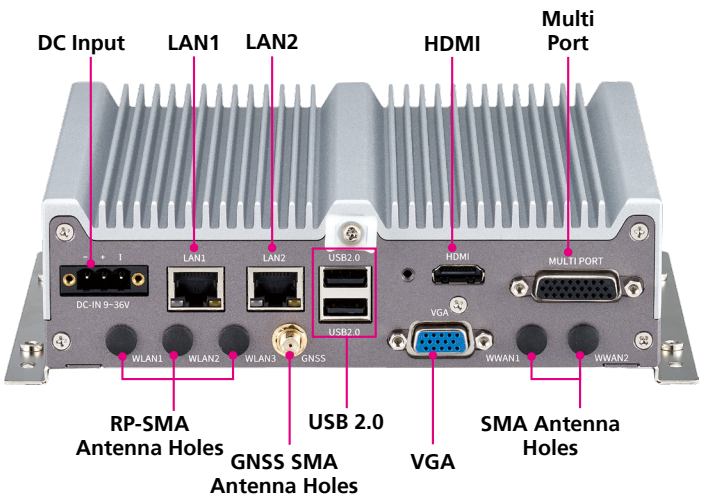


Physical Features

VTC 1031-C2 Front View

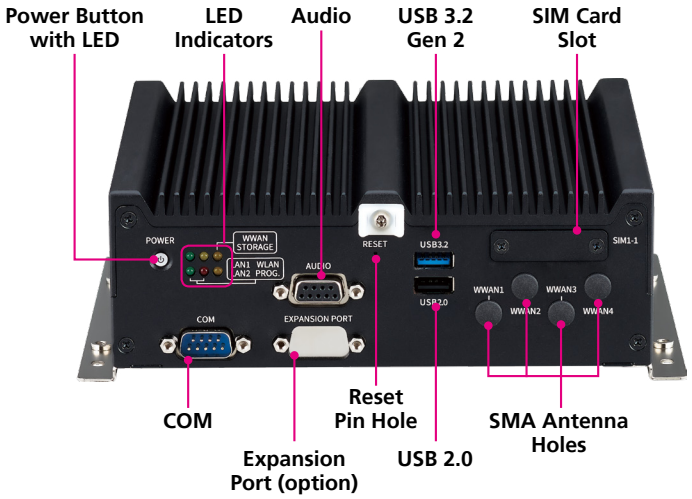


VTC 1031-C2 Rear View



Physical Features

nROK 1031 Front View



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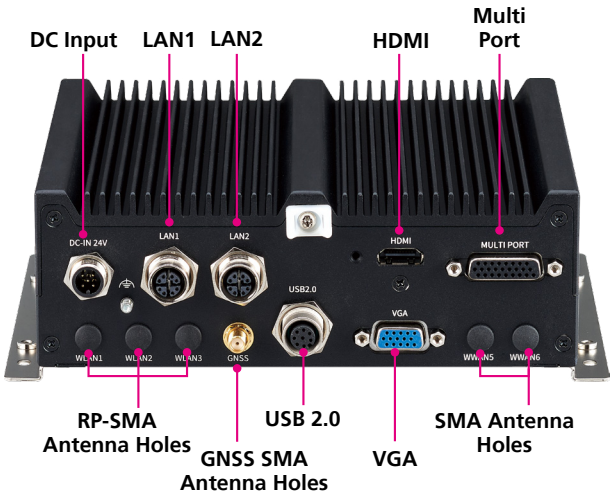
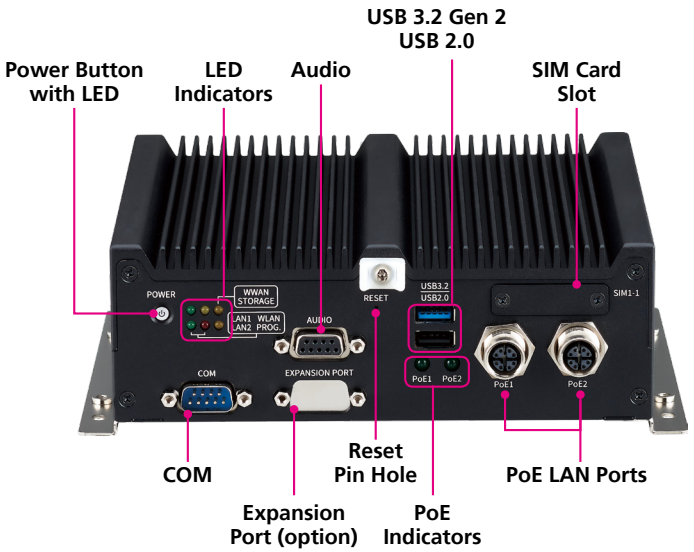
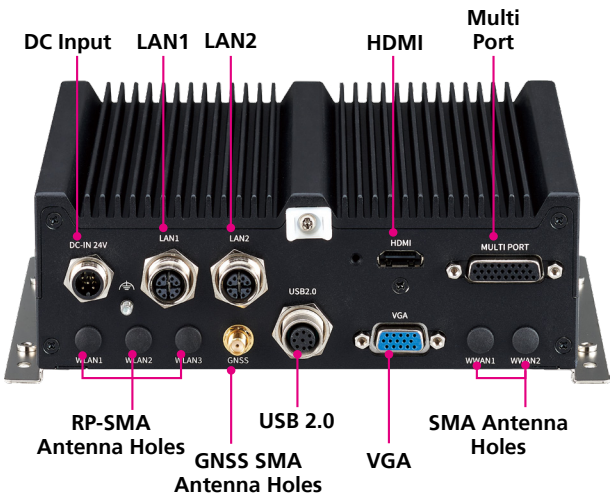


Physical Features

nROK 1031-C2 Front View



nROK 1031-C2 Rear View



VTC 1031 Series Overview

The VTC 1031 features next-generation Intel Atom® x6413E processor quad-core 1.5GHz, with powerful graphic and multimedia enhancement. It offers an onboard CAN 2.0B, an optional OBD interface (SAE J1939) for vehicle diagnostics & driver behavior management, an advanced GNSS receiver supporting GPS+QZSS/Glonass/Galileo/Beidou, and an optional dead reckoning. Moreover, for connectivity, it provides WLAN (Wi-Fi 5/6/6E) and WWAN (LTE/5G NR) wireless data. In consideration for convenience, there are dual micro-SIMs and one micro-SIM with an external access design, allowing users to easily access the micro-SIM cards. Equipped with an optional AI accelerator M.2/mPCIe module, the VTC 1031 also functions as a reliable AI edge computing platform, providing in-vehicle innovative AI solutions. With a rugged, fanless, and compact enclosure, this fanless computer can be easily installed.

The VTC1031-C2 provides dual IEEE802.3af/at PoE functions and is suited for most PoE devices. This includes connecting with wireless access points and IP cameras. Furthermore, an additional 12VDC output can be provided for external display via easy power wire arrangement. VTC 1031 is a flexible in-vehicle fanless computer that meets the various demands for telematics applications, such as wireless gateway, infotainment, fleet management, dispatching system, AI edge computing, and mobile video surveillance.

VTC 1031 Key Features

- Intel Atom® x6413E quad-core processor, 9W
- Compact and fanless design
- 5G NR and Wi-Fi 6/6E wireless communication options
- Built-in U-blox M9N GNSS, optional dead reckoning support
- Built-in 1 x CAN bus 2.0B (optional SAE J1939)
- Wide range DC input from 9~36V
- 2 x POE support, total 60W (VTC 1031-C2)
- 1 x mini-PCIe + 2 x M.2 socket expansions
- Optional AI accelerator M.2/mPCIe module
- Certified by CE/UKCA/FCC/E13 mark

nROK 1031 Series Overview

The nROK 1031 features next-generation Intel Atom® x6413E processor quad-core 1.5GHz, with powerful graphics and multimedia enhancements. It offers an onboard CAN 2.0B, an optional OBD interface (SAE J1939) for vehicle diagnostics, and an advanced GNSS receiver supporting GPS+QZSS/Glonass/Galileo/Beidou. Moreover, for connectivity, it provides optional WLAN (Wi-Fi 5/6/6E) and optional WWAN (LTE/5G NR) wireless data. In consideration for convenience, there are dual micro-SIMs and one micro-SIM with an external access design, allowing users to easily access the micro-SIM card. Equipped with an optional AI accelerator M.2/mPCIe module, the nROK 1031 also functions as a reliable AI edge computing platform, providing innovative AI solutions for the rolling stock. With a rugged, fanless, and compact enclosure, this fanless computer can easily be installed.

The nROK 1031-C2 provides dual IEEE 802.3af/at PoE functions and is suited for most PoE devices. This includes connecting with wireless access points and IP cameras. Furthermore, an additional 12VDC output can be provided for an external display via easy power wire arrangements. nROK 1031 is a flexible rolling stock computer that meets the various demands of train applications, such as wireless gateway, infotainment, dispatching system, AI edge computing, and mobile video surveillance.

nROK 1031 Key Features

- Intel Atom® x6413E quad-core processor, 9W
- Compact and fanless design
- 5G NR and Wi-Fi 6/6E wireless communication options
- Built-in U-blox M9N GNSS
- Built-in 1 x CAN bus 2.0B (optional SAE J1939)
- 1 x mini-PCIe + 2 x M.2 socket expansions
- 2 x POE support, total 60W (nROK 1031-C2)
- Dual display outputs
- Optional AI accelerator M.2/mPCIe module
- Certified by CE/UKCA/FCC/EN 50155

Hardware Specifications

VTC 1031/1031-C2

CPU

- Intel Atom® x6413E quad-core processor, 1.5GHz, TDP 9W

Memory

- 1 x 260-pin DDR4 SO-DIMM socket support 3200MHz up to 32GB. Default 2666MHz, 4GB
- With In-Band ECC (IBECC)

Video Output

- 1 x HDMI 1.4b up to 3840 x 2160@30Hz
- 1 x VGA port 1920 x 1200@60Hz

Storage

- 1 x 2.5" SATA 3.0 internal drive bay (9.5mm)
- 1 x M.2 Key M 2280 for SATA 3.0

Expansion

- 1 x Full size mini-PCIe socket (USB 2.0, PCIe 3.0), BOM optional M.2 3042 Key B socket (USB 2.0, USB 3.2 Gen 2) for LTE/5G NR module with 1 x internal micro-SIM and 1 x external micro-SIM
- 1 x M.2 2230 Key E socket (USB 2.0, PCIe 3.0 x2), BOM optional M.2 2230 Key E socket (USB 2.0, PCIe 3.0, PCIe 3.0)
- 1 x M.2 3042/3050/3052 Key B socket (USB 2.0, USB 3.2 Gen 2) for LTE/5G NR module with 1 x internal micro-SIM and 1 x external micro-SIM

GNSS and Onboard Sensor

- 1 x Default U-blox NEO-M9N GNSS module for GPS+QZSS /Glonass/ Galileo/Beidou
- Optional M8U/M8L modules with dead reckoning available
- 1 x 3D accelerometer and 3D gyroscope

LAN

- 1-Port LAN RJ45, 10/100/1000/2500 Mbps Ethernet, Intel® Ethernet Controller I225-IT (support WOL)
- 1-Port LAN RJ45, 10/100/1000 Mbps Ethernet, Marvell Ethernet PHY 88E1512
- 2-Port LAN RJ45, 10/100/1000 Mbps Ethernet, PoE 802.3af/at, max 60W (VTC 1031-C2)

Security

- TPM 2.0: Infineon SLB9670VQ2.0 FW7.62

I/O Interface-Front

- 6 x LED indicators (including 1 x programmable LED)
- 1 x USB 3.2 Gen 2 type A (5V/0.9A)
- 1 x USB 2.0 type A (5V/0.5A)
- 1 x Externally accessible micro-SIM card sockets with cover
- 1 x Reset button
- 1 x Power button
- 1 x DB9 (COM) for full RS232/422/485
- 1 x Mic-in, 1 x Line-out
- 1 x DB9 for Expansion Port (optional)
- 2 x RJ45 PoE, including 2 x PoE LED light (VTC 1031-C2)
- 4 x SMA connector holes for WWAN (VTC 1031)

I/O Interface-Rear

- 1 x HDMI
- 1 x VGA
- 1 x LAN (LAN1) RJ45, 10/100/1000/2500 Mbps

- 1 x LAN (LAN2) RJ45, 10/100/1000 Mbps
- 2 x USB 2.0 type A (5V/0.5A)
- 1 x DB26 (Multi Port)
- 1 x Isolated CANBus 2.0B
  - 1 x RS232 Tx/Rx
  - 1 x GNSS Speed/Direction
  - 5 x DI and 4 x DO
  - 2 x RS485
  - 12V/ 2A DC output
  - GND
- 1 x 3-pin terminal block for power/ignition input
- 1 x SMA connector for GNSS
- 2 x SMA connector holes for WWAN
- 3 x RP-SMA connector holes for WLAN

Power Management & Software Support

- Power input 9~36VDC
- Cranking voltage: 6V~9V (< 30 seconds)
- Reverse protection, OCP & UVP
- Selectable boot-up & shut-down voltage for low power protection by software
- Setting 8-level power on/off delay time by software
- 10~255 seconds WDT support, setup by software
- SDK (Windows/Linux) including utility and sample code

Operating System

- Windows 11/Windows 10/Linux

Dimensions

- 185mm (W) x 120mm (D) x 45mm (H)

Weight

- VTC 1031: 1.91kg
- VTC 1031-C2: 2.0kg

Environment

- Operating temperatures
  - 40°C to 70°C (w/ industrial SSD) with air flow
- Storage temperatures: -40°C to 85°C
- Relative humidity: 90% (non-condensing)
- Vibration (random)
  - 2g@5~500 Hz (in operation, SSD)
- Vibration (SSD)
  - Operating: MIL-STD-810H, Method 514.8C, Procedure 1, Category 4, common carrier US highway truck vibration exposure
  - Storage: MIL-STD-810H, Method 514.8E, Procedure 1, Category 24, minimum integrity test
- Shock (SSD)
  - Operating: MIL-STD-810H, Method 516.8, Procedure I, functional shock=40g
  - Non-operating: MIL-STD-810H, Method 516.8, Procedure V, crash hazard shock test=75g

Certifications

- CE
- FCC Class A
- E13 mark

nROK 1031/1031-C2

CPU

- Intel Atom® x6413E quad-core processor, 1.5GHz, TDP 9W

Memory

- 1 x 260-pin DDR4 SO-DIMM socket support 3200MHz up to 32GB. Default 2666MHz, 4GB
- With In-Band ECC (IBECC)

Video Output

- 1 x HDMI 1.4b up to 3840 x 2160@30Hz
- 1 x VGA port 1920 x 1200@60Hz

Storage

- 1 x 2.5" SATA 3.0 internal drive bay (9.5mm)
- 1 x M.2 2280 Key M for SATA 3.0

Expansion

- 1 x Full size mini-PCIe socket (USB 2.0, PCIe 3.0), BOM optional M.2 3042 Key B socket (USB 2.0, USB 3.2 Gen 2) for LTE/5G NR module with 1 x internal micro-SIM and 1 x external micro-SIM
- 1 x M.2 2230 Key E socket (USB 2.0, PCIe 3.0 x2), BOM optional M.2 2230 Key E socket (USB 2.0, PCIe 3.0, PCIe 3.0)
- 1 x M.2 3042/3050/3052 Key B socket (USB 2.0, USB 3.2 Gen 2) for LTE/5G NR module with 1 x internal micro-SIM and 1 x external micro-SIM

GNSS and Onboard Sensor

- 1 x Default U-blox NEO-M9N GNSS module for GPS+QZSS/Glonass/Galileo/Beidou
- 1 x 3D accelerometer and 3D gyroscope

LAN and Power over Ethernet

- 1-Port LAN M12 X-coded, 10/100/1000/2500 Mbps Ethernet, Intel® Ethernet Controller I225-IT (support WOL)
- 1-Port LAN M12 X-coded, 10/100/1000 Mbps Ethernet, Marvell Ethernet PHY 88E1512
- 2-Port LAN M12 X-coded, 10/100/1000/2500 Mbps Ethernet, PoE 802.3af/at, max 60W, isolation (nROK 1031-C2)

Security

- TPM 2.0: Infineon SLB9670VQ2.0 FW7.62

I/O Interface-Front

- 6 x LED indicators (including 1 x programmable LED)
- 1 x USB 3.2 Gen 2 type A (5V/0.9A)
- 1 x USB 2.0 type A (5V/0.5A)
- 1 x Externally accessible micro-SIM card sockets with cover
- 1 x Reset button
- 1 x Power button
- 1 x DB9 (COM) for full RS232/422/485
- 1 x DB9 (Audio) for 1 x Mic-in, 1 x Line-out
- 1 x DB9 for Expansion Port (optional)
- 2 x M12 X-coded PoE, including 2 x PoE LED light (nROK 1031-C2)
- 4 x SMA connector holes for WWAN (nROK 1031)

I/O Interface-Rear

- 1 x HDMI
- 1 x VGA
- 1 x LAN (LAN1) M12 X-coded, 10/100/1000/2500 Mbps
- 1 x LAN (LAN2) M12 X-coded, 10/100/1000 Mbps
- 1 x M12 A-coded 8-pin for 2 x USB 2.0 (5V/0.5A)
- 1 x DB26 (Multi Port)

  - 1 x Isolated CANBus 2.0B
  - 1 x RS232 Tx/ Rx
  - 1 x GNSS speed/direction
  - 5 x DI and 4 x DO
  - 2 x RS485
  - 12V/ 2A DC output
  - GND
- 1 x M12 A-coded 5-pin for power/ignition input
- 1 x SMA connector for GNSS
- 2 x SMA connector holes for WWAN
- 3 x RP-SMA connector holes for WLAN

Power Management & Software Support

- Power input 24VDC (9~36VDC) w/o isolation
- Cranking voltage: 6V~9V (< 30 seconds)
- Reverse protection, OCP & UVP
- Selectable boot-up & shut-down voltage for low power protection by software
- Setting 8-level power on/off delay time by software
- 10~255 seconds WDT support, setup by software
- SDK (Windows/Linux) including utility and sample code

Operating System

- Windows 11/Windows 10/Linux

Dimensions

- 180mm (W) x 180mm (D) x 60m (H)

Weight

- nROK 1031: 2.08kg
- nROK 1031-C2: 2.2kg

Environment

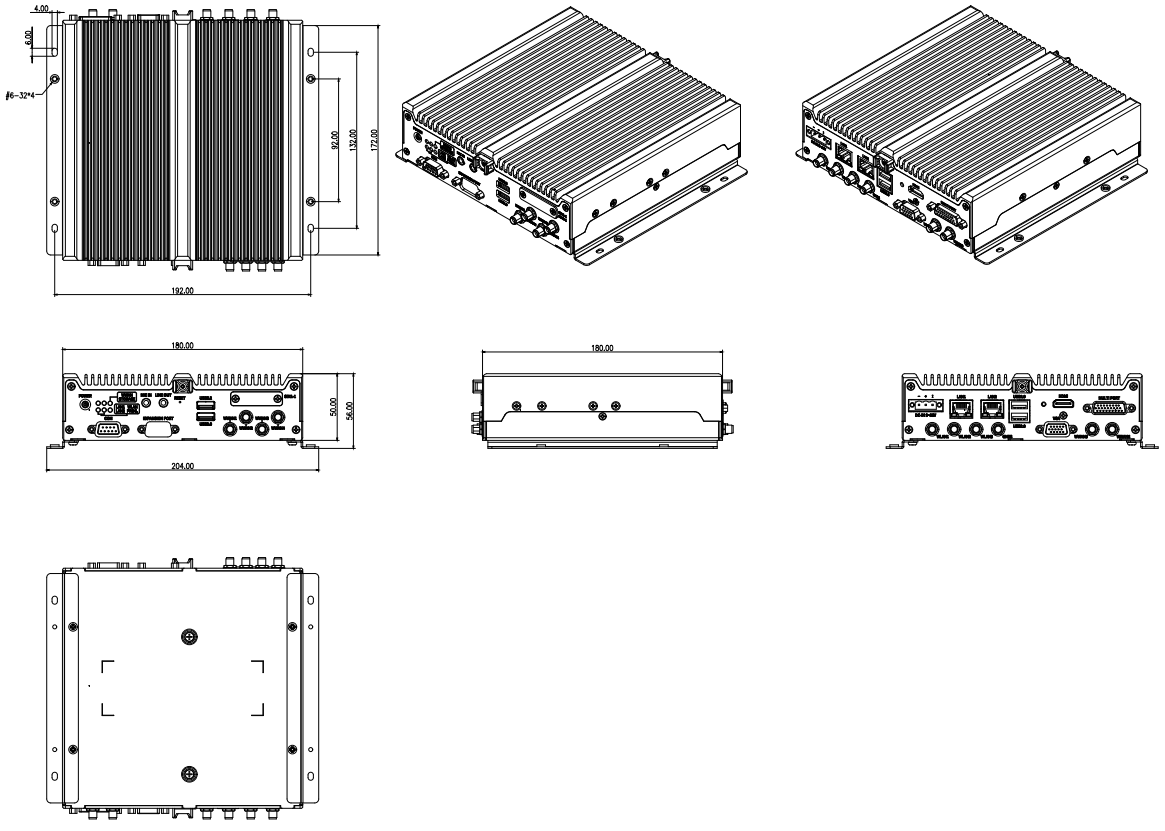
- Operating temperatures
  - EN 50155, class OT4 (-40°C ~70°C), 85°C for 10 minutes (w/industrial SSD) with air flow
- Storage temperatures: -40°C to 85°C
- Relative humidity: 90% (non-condensing)
- Vibration (random)
  - 2g@5~500 Hz (in operation, SSD)
- Vibration (SSD)
  - Operating: MIL-STD-810H, Method 514.8C, Procedure 1, Category 4, common carrier US highway truck vibration exposure
  - Storage: MIL-STD-810H, Method 514.8E, Procedure 1, Category 24, minimum integrity test
- Shock (SSD)
  - Operating: MIL-STD-810H, Method 516.8, Procedure I, functional shock=40g
  - Non-operating: MIL-STD-810H, Method 516.8, Procedure V, crash hazard shock test=75g

Certificate

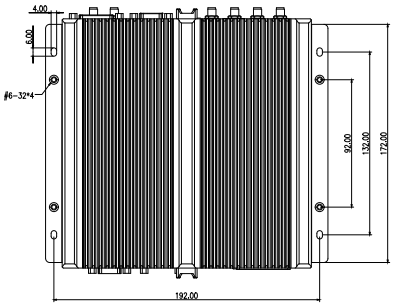
- CE
- UKCA
- FCC Class A
- EN 50155: 2017
  - Ambient temperature EN 50155, Class OT4 (-40°C ~70°C), 85°C for 10 minutes
  - Interruptions of voltage supply class S1
  - Supply change over class C1, C2
  - EMC EN 50121-1: 2017, EN 50121-3-2: 2016+A1: 2019
  - Environment EN 60068-2-1, EN 60068-2-2, EN 60068-2-30
  - Shock and vibration IEC 61373 Class B
  - Protective coating class PC1 (PC2, by request)
- EN 45545-2: 2020 (PCB)

Mechanical Dimensions

VTC 1031



VTC 1031-C2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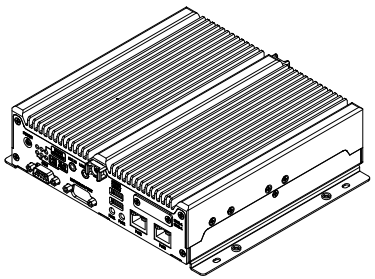
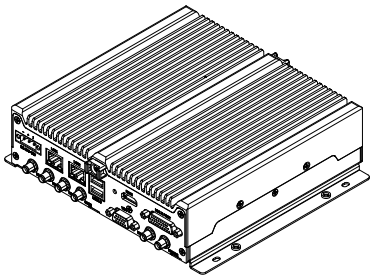
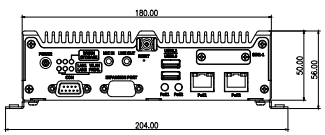
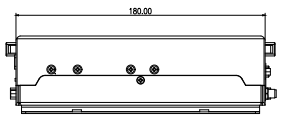
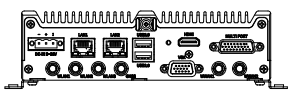
6.00
ϕ6~32*4
92.00
132.00
172.00
192.00

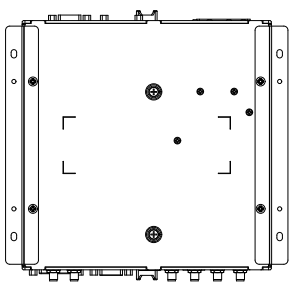




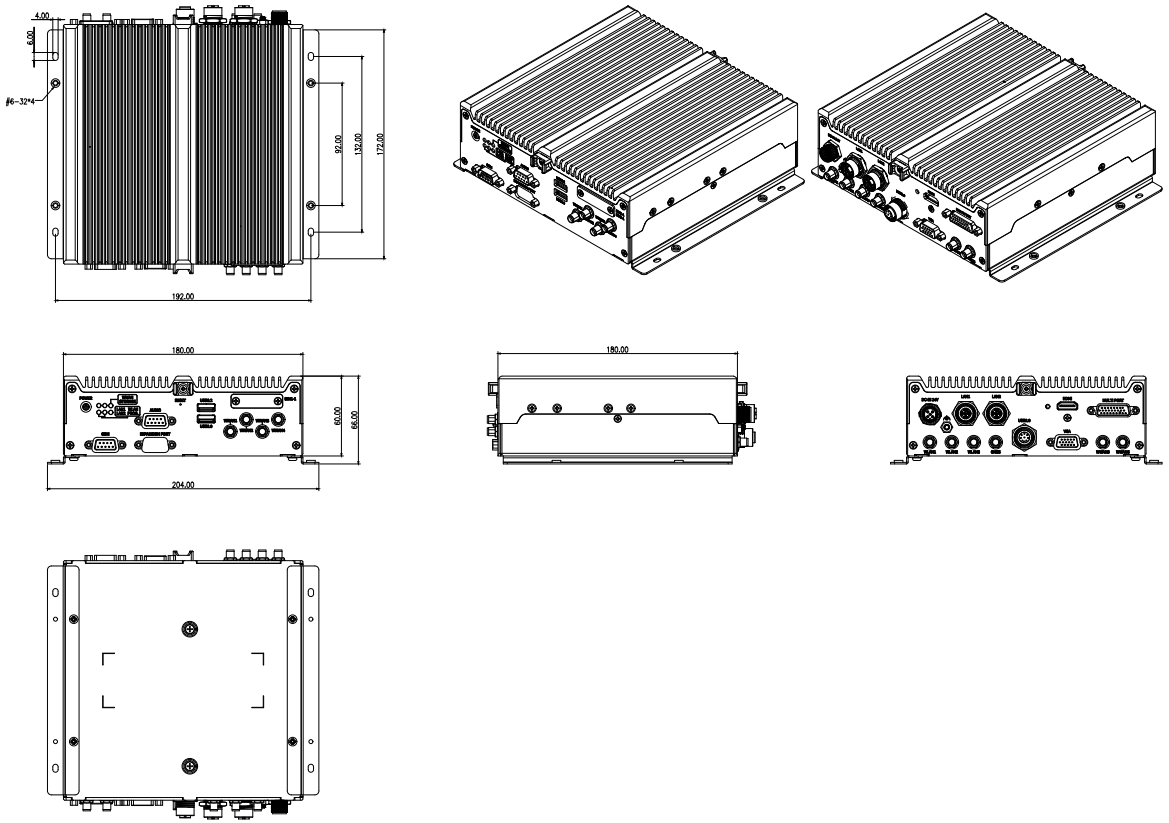

180.00
50.00
56.00
204.00


180.00

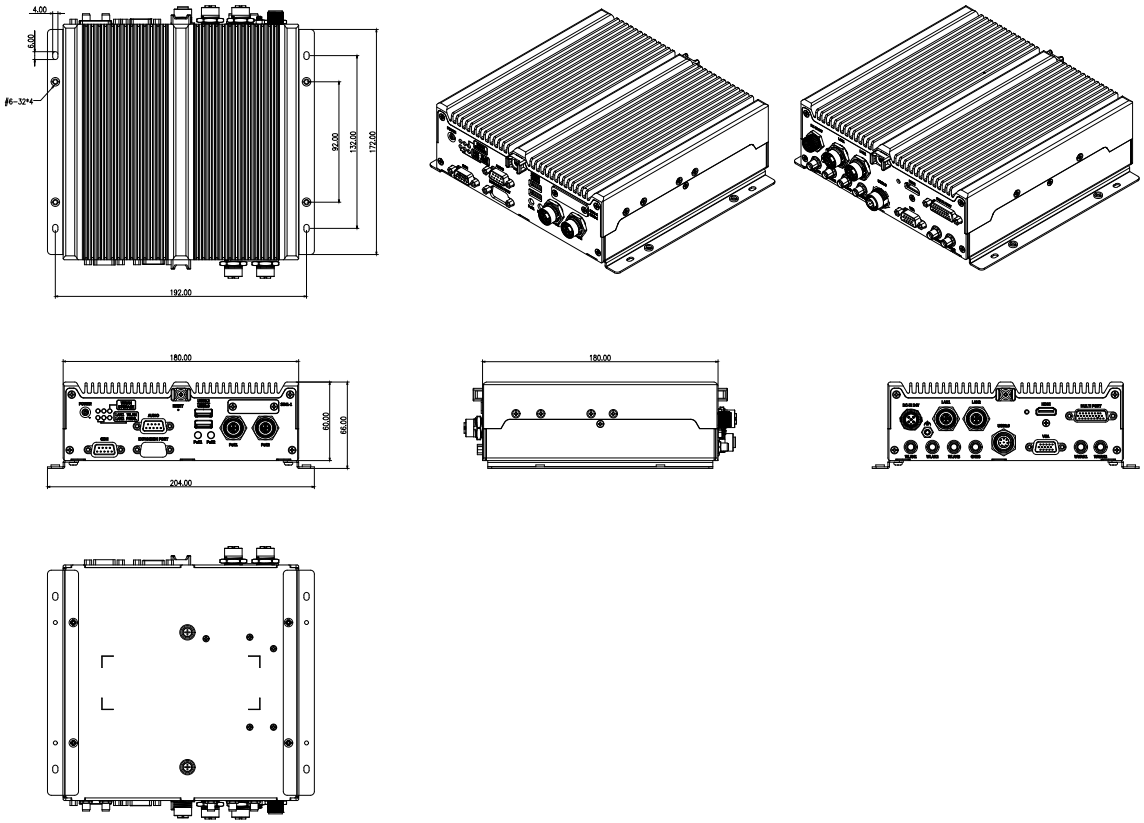




nROK 1031


4.00
6.00
#6-32*4
92.00
132.00
172.00
192.00
180.00
60.00
66.00
204.00
180.00

nROK 1031-C2

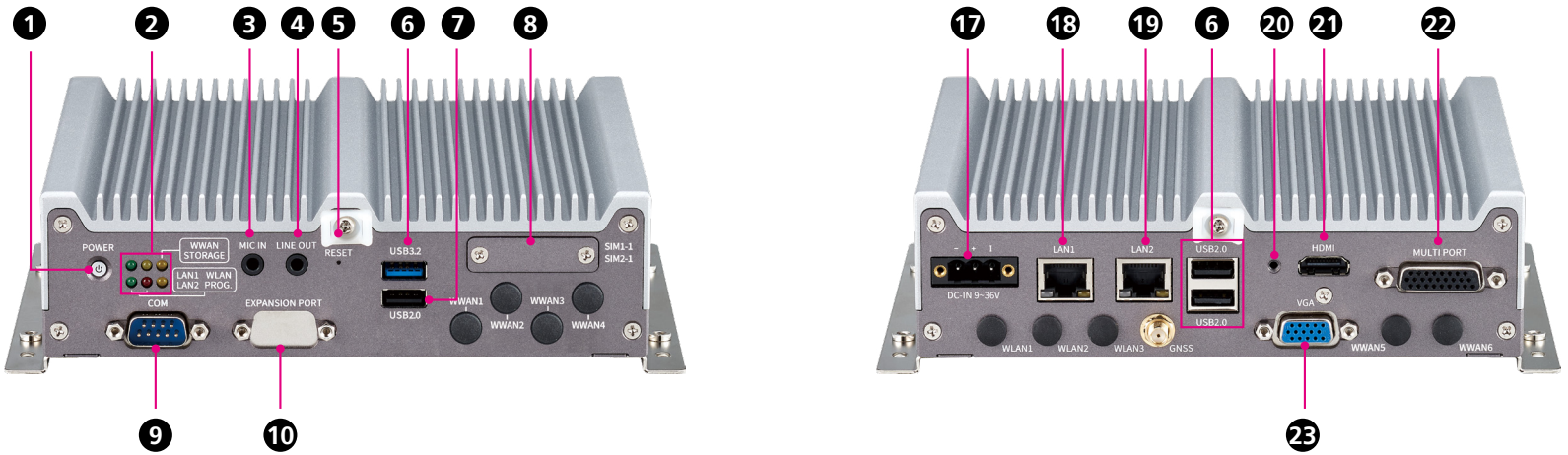


Chapter 2: External Connectors Pinout Description

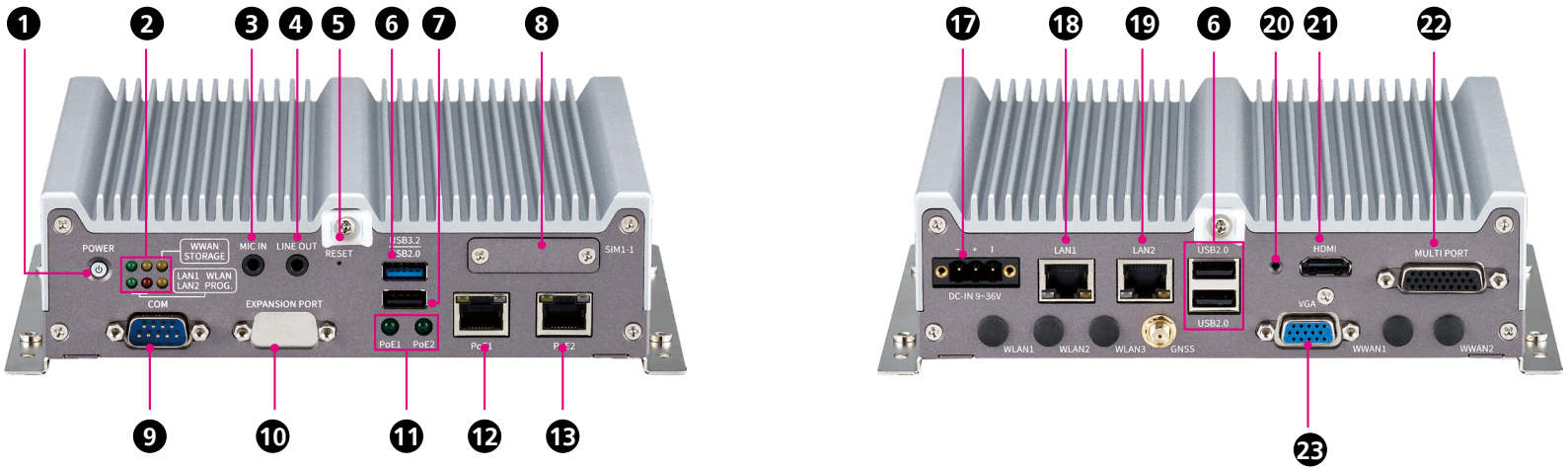
Connector Numbering

The following diagrams indicate the numbers of the connectors. Use these numbers to locate the connectors' respective pinout assignments.

VTC 1031

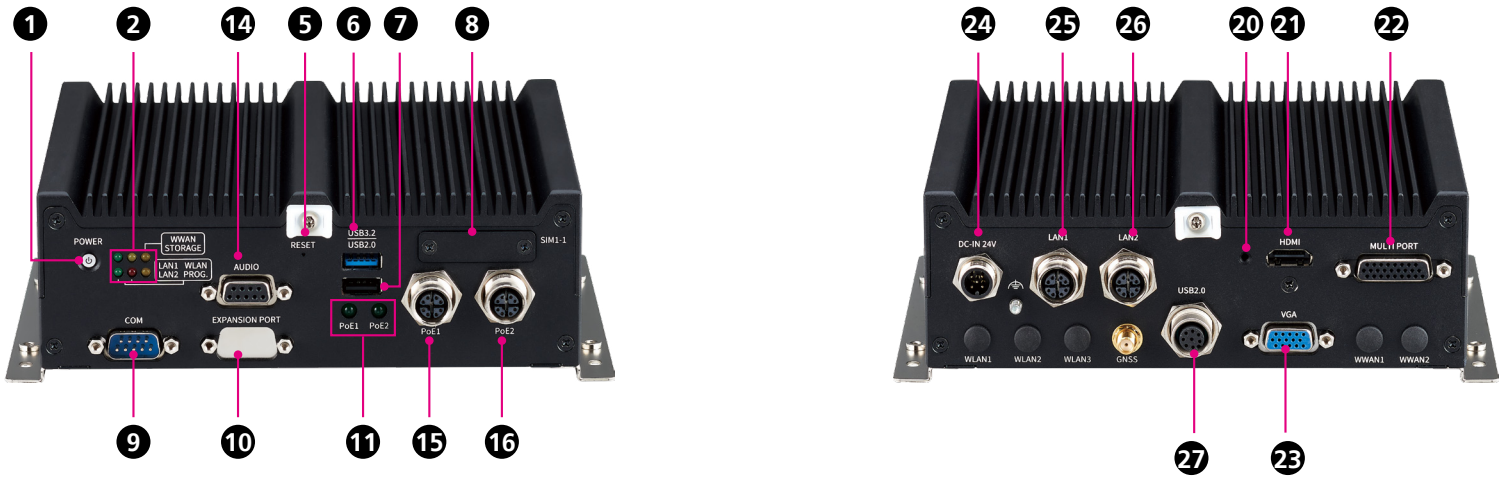


VTC 1031-C2


1
2
3
4
5
6
7
8
17
18
19
6
20
21
22
POWER
WWAN STORAGE
LAN1 WLAN
LAN2 PROG.
MIC IN
LINE OUT
RESET
USB3.2
USB2.0
SIM1-1
COM
EXPANSION PORT
PoE1
PoE2
DC-IN 9~36V
LAN1
LAN2
USB2.0
HDMI
MULTI PORT
VGA
WLAN1
WLAN2
WLAN3
GNSS
WWAN1
WWAN2
9
10
11
12
13
23

nROK 1031

nROK 1031-C2



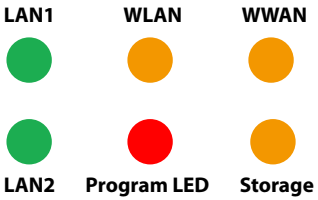
Power Button

Connector number: 1

- Before OS: Blue Blinking
- Enter OS: Blue Stay on
- Power Fail: Red Stay on
- Red color (Blinking) when input power is 6~9VDC

LED Indicators

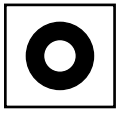
Connector number: 2



LED	Color	Status	Description
LAN1/LAN2	Green	Stay On	LAN active
		Blinking	LAN access
WLAN	Yellow	Stay On	WLAN active
Program LED	Red	Stay On	Programmable LED
WWAN	Yellow	Stay On	WWAN active
Storage	Yellow	Blinking	Storage access

Mic-In Connector

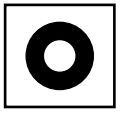
Connector number: 3



Pin	Definition	Pin	Definition
1	MIC1-CR	2	MIC1_JD
3	NC	4	MIC1-CL
5	AGND	6	AGND

Line-Out Connector

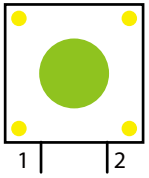
Connector number: 4



Pin	Definition	Pin	Definition
1	FRONT_RI	2	FRONT_JD
3	NC	4	FRONT_LI
5	AGND	6	AGND

Reset Switch

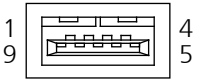
Connector Number: 5/SW1



Pin	Definition
Open	Normal (Default)
Short	Reset

USB 3.2 Gen 2

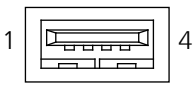
Connector number: 6



Pin	Definition
1	5V
2	USB_0N
3	USB_0P
4	GND
5	USB3_RX0N
6	USB3_RX0P
7	GND
8	USB3_TX0N
9	USB3_TX0P

USB 2.0

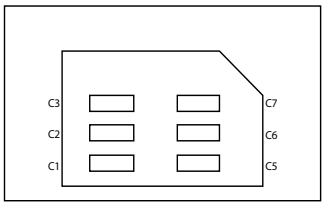
Connector number: 7



Pin	Definition
1	5V
2	USB_1N
3	USB_1P
4	GND

SIM1 Micro-SIM Socket

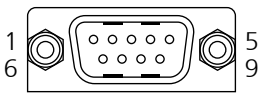
Connector number: 8



Pin	Definition	Pin	Definition
C1	UIM1_PWR_C	C2	UIM1_RST_C
C3	UIM1_CLK_C	C4	NC
C5	GND	C6	NC
C7	UIM1_DAT_C	C8	NC
C9	NC	C10	NC
CD11	UIM1_CD_C		

DB9 (COM) for full RS232/RS422/RS485

Connector number: 9



Pin	Definition	Pin	Definition
1	SP2_DCD#_TX-	6	SP2_DSR#
2	SP2_RX_TX+	7	SP2_RTS#
3	SP2_TX_RX+	8	SP2_CTS#
4	SP2_DTR#_RX-	9	SP2_RI#
5	COM2_GND		

DB9 Expansion Port (Optional)

Connector number: 10

This connector is an option and dedicated to the expansion.

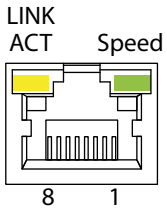
LED for PoE1/PoE2 (VTC 1031-C2 and nROK 1031-C2 only)

Connector number: 11

LED	Color	Description
PoE1/PoE2	Green	Lights up when the power is provided.

PoE LAN1 Port

Connector number: 12 (VTC 1031-C2)

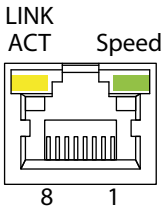


LED	Status	Description
Link/Act	Blinking Yellow	LAN access
Speed	Orange	1Gbps network link
	Green	100Mbps network link

Pin	Definition	Pin	Definition
1	LAN-1_MDI0P	5	LAN-1_MDI2N
2	LAN-1_MDI0N	6	LAN-1_MDI1N
3	LAN-1_MDI1P	7	LAN-1_MDI3P
4	LAN-1_MDI2P	8	LAN-1_MDI3N

PoE LAN2 Port

Connector number: 13 (VTC 1031-C2)

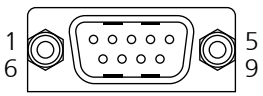


LED	Status	Description
Link/Act	Blinking Yellow	LAN access
Speed	Orange	1Gbps network link
	Green	100Mbps network link

Pin	Definition	Pin	Definition
1	LAN-2_MDI0P	5	LAN-2_MDI2N
2	LAN-2_MDI0N	6	LAN-2_MDI1N
3	LAN-2_MDI1P	7	LAN-2_MDI3P
4	LA-2N_MDI2P	8	LAN-2_MDI3N

Audio

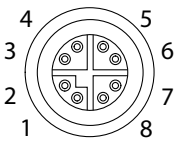
Connector number: 14



Pin	Definition	Pin	Definition
1	AGND	4	FRONT_JD
2	MIC_L	5	FRONT_L
3	MIC_JD	6	FRONT_R

PoE M12 X-Coded 8-Pin LAN1 Connector

Connector number: 15 (nROK 1031-C2)

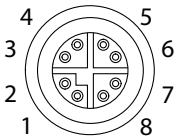


Pin	Definition	Pin	Definition
1	LAN-1_MDI0P	5	LAN-1_MDI3P
2	LAN-1_MDI0N	6	LAN-1_MDI3N
3	LAN-1_MDI1P	7	LAN-1_MDI2N
4	LAN-1_MDI1N	8	LAN-1_MDI2P

*Network speed is supported up to 2.5Gbps (10/100/1000/2500Mbps).

PoE M12 X-Coded 8-Pin LAN2 Connector

Connector number: 16 (nROK 1031-C2)

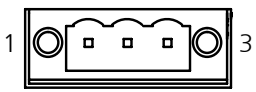


Pin	Definition	Pin	Definition
1	LAN-2_MDI0P	5	LAN-2_MDI3P
2	LAN-2_MDI0N	6	LAN-2_MDI3N
3	LAN-2_MDI1P	7	LAN-2_MDI2N
4	LAN-2_MDI1N	8	LAN-2_MDI2P

*Network speed is supported up to 2.5Gbps (10/100/1000/2500Mbps).

DC Input
(VTC 1031 and VTC 1031-C2 only)

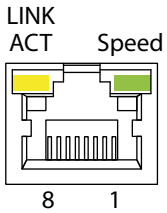
Connector number: 17



Pin	Definition
1	GND_IN
2	V_IN
3	IGNITION

RJ45 LAN1 Port

Connector number: 18 (VTC 1031 and VTC 1031-C2)



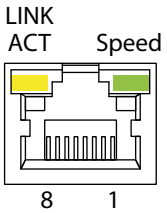
LED	Status	Description
Link/Act	Blinking Yellow	LAN access
Speed	Orange	1Gbps network link
	Green	2.5Gps network link

Pin	Definition	Pin	Definition
1	LAN-1_MDI0P	5	LAN-1_MDI2N
2	LAN-1_MDI0N	6	LAN-1_MDI1N
3	LAN-1_MDI1P	7	LAN-1_MDI3P
4	LAN-1_MDI2P	8	LAN-1_MDI3N

*Network speed is supported up to 2.5Gbps (10/100/1000/2500Mbps).

RJ45 LAN2 Port

Connector number: 19 (VTC 1031 and VTC 1031-C2)



LED	Status	Description
Link/Act	Blinking Yellow	LAN access
Speed	Orange	1Gbps network link
	Green	2.5Gps network link

Pin	Definition	Pin	Definition
1	LAN-2_MDI0P	5	LAN-2_MDI2N
2	LAN-2_MDI0N	6	LAN-2_MDI1N
3	LAN-2_MDI1P	7	LAN-2_MDI3P
4	LA-2N_MDI2P	8	LAN-2_MDI3N

*Network speed is supported up to 2.5Gbps (10/100/1000/2500Mbps).

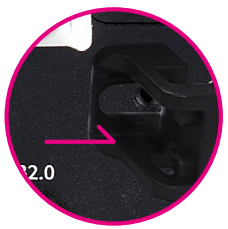
Screw Hole for HDMI Wire Mount

Connector number: 20

The screw hole is designed to lock the HDMI wire mount. See the steps on the right side to assemble the HDMI wire mount and HDMI connector.

1. Plug the HDMI cable into the HDMI connector (21) on the rear panel.

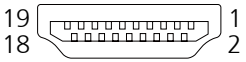
2. Place the HDMI wire mount against the HDMI connector then secure it using a screw.



3. Hold the HDMI connector firmly against the wire mount and tighten with a tie wrap.

HDMI

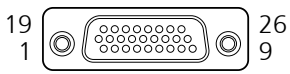
Connector number: 21



Pin	Definition	Pin	Definition
1	HDMI_TX2P	11	GND
2	GND	12	HDMI_CLK_N
3	HDMI_TX2N	13	NC
4	HDMI_TX1P	14	NC
5	GND	15	HDMIDDCSCL
6	HDMI_TX1N	16	HDMIDDCSDA
7	HDMI_TX0P	17	GND
8	GND	18	HDMI_P5V
9	HDMI_TX0N	19	HDMIHPD
10	HDMI_CLK_P		

Multi Port

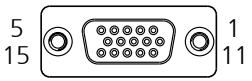
Connector number: 22



Pin	Definition	Pin	Definition
1	CAN1_H	2	CAN1_L
3	CANISO_GND	4	DB26G_GND
5	G_I_5	6	G_I_4
7	G_I_3	8	G_I_2
9	G_I_1	10	RS485-2_+
11	RS485-2_-	12	DB26G_GND
13	RS485-1_+	14	RS485-1_-
15	G_O_1	16	G_O_2
17	G_O_3	18	G_O_4
19	DB26G_GND	20	DB26G_GND
21	RS232_RXD	22	RS232_TXD
23	ODOMETER	24	DIRECTION
25	DB26G_GND	26	12VO

VGA

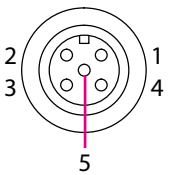
Connector number: 23



Pin	Definition	Pin	Definition
1	VGA_RED	9	VGA_5V
2	VGA_GREEN	10	GND
3	VGA_BLUE	11	NC
4	NC	12	VGA_DAT
5	GND	13	VGA_HSYNC
6	GND	14	VGA_VSYNC
7	GND	15	VGA_CLK
8	GND		

DC Input
(nROK 1031 and nROK 1031-C2 only)

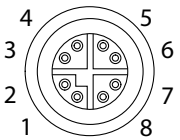
Connector location: 24



Pin	Definition	Pin	Definition
1	VIN	2	VIN
3	GND	4	GND
5	IGNITION		

M12 X-Coded 8-Pin LAN1 Connector

Connector number: 25 (nROK 1031 and nROK 1031-C2)

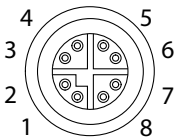


Pin	Definition	Pin	Definition
1	LAN-1_MDI0P	5	LAN-1_MDI3P
2	LAN-1_MDI0N	6	LAN-1_MDI3N
3	LAN-1_MDI1P	7	LAN-1_MDI2N
4	LAN-1_MDI1N	8	LAN-1_MDI2P

*Network speed is supported up to 2.5Gbps (10/100/1000/2500Mbps).

M12 X-Coded 8-Pin LAN2 Connector

Connector number: 26 (nROK 1031 and nROK 1031-C2)

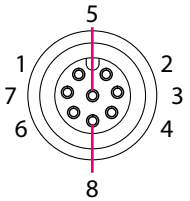


Pin	Definition	Pin	Definition
1	LAN-2_MDI0P	5	LAN-2_MDI3P
2	LAN-2_MDI0N	6	LAN-2_MDI3N
3	LAN-2_MDI1P	7	LAN-2_MDI2N
4	LAN-2_MDI1N	8	LAN-2_MDI2P

*Network speed is supported up to 1Gbps (10/100/1000Mbps).

M12 A-Coded 8-Pin USB 2.0 Connector (nROK 1031 and nROK 1031-C2 only)

Connector location: 27



Pin	Definition	Pin	Definition
1	USB1_N	2	USB1_P
3	USB1_VCC5	4	USB1_GND
5	USB2_N	6	USB2_P
7	USB2_VCC5	8	USB2_GND

Chapter 3: Jumpers and Connectors

This chapter describes how to set the jumpers and connectors on the VTC 1031 and nROK 1031 series motherboard.

Before You Begin

- Ensure you have a stable, clean working environment. Dust and dirt can get into components and cause a malfunction. Use containers to keep small components separated.
- Adequate lighting and proper tools can prevent you from accidentally damaging the internal components. Most of the procedures that follow require only a few simple tools, including the following:
  - A Philips screwdriver
  - A flat-tipped screwdriver
  - A set of jewelers screwdrivers
  - A grounding strap
  - An anti-static pad
- Using your fingers can disconnect most of the connections. It is recommended that you do not use needle-nosed pliers to disconnect connections as these can damage the soft metal or plastic parts of the connectors.
- Before working on internal components, make sure that the power is off. Ground yourself before touching any internal components, by touching a metal object. Static electricity can damage many of the electronic components. Humid environments tend to have less static electricity than dry environments. A grounding strap is warranted whenever danger of static electricity exists.

Precautions

Computer components and electronic circuit boards can be damaged by discharges of static electricity. Working on computers that are still connected to a power supply can be extremely dangerous.

Follow the guidelines below to avoid damage to your computer or yourself:

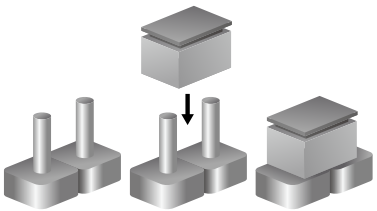
- Always disconnect the unit from the power outlet whenever you are working inside the case.
- If possible, wear a grounded wrist strap when you are working inside the computer case. Alternatively, discharge any static electricity by touching the bare metal chassis of the unit case, or the bare metal body of any other grounded appliance.
- Hold electronic circuit boards by the edges only. Do not touch the components on the board unless it is necessary to do so. Don't flex or stress the circuit board.
- Leave all components inside the static-proof packaging that they shipped with until they are ready for installation.
- Use correct screws and do not over tighten screws.

Jumper Settings

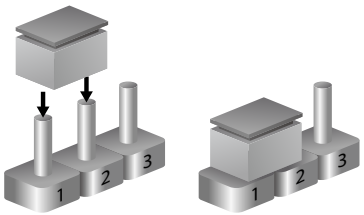
A jumper is the simplest kind of electric switch. It consists of two metal pins and a cap. When setting the jumpers, ensure that the jumper caps are placed on the correct pins. When the jumper cap is placed on both pins, the jumper is short. If you remove the jumper cap, or place the jumper cap on just one pin, the jumper is open.

Refer to the illustrations below for examples of what the 2-pin and 3-pin jumpers look like when they are short (on) and open (off).

Two-Pin Jumpers: Open (Left) and Short (Right)



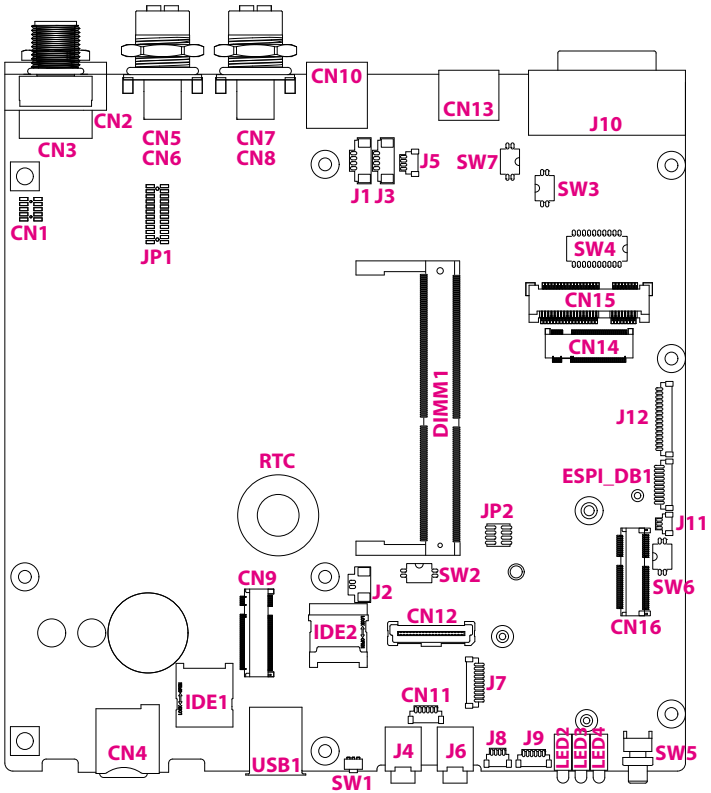
Three-Pin Jumpers: Pins 1 and 2 are Short



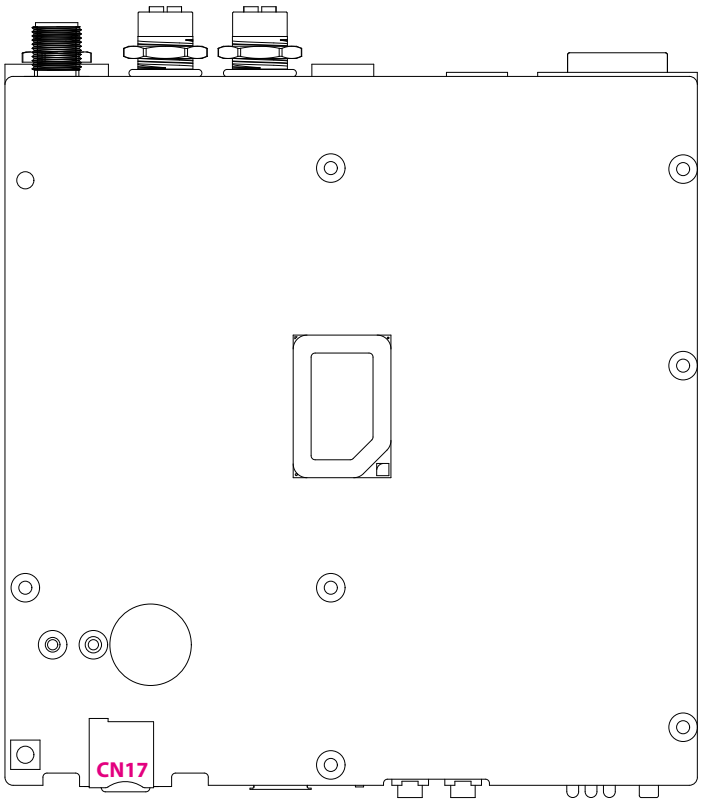
Locations of the Internal Jumpers and Connectors

This chapter lists the location and pinout assignment of the jumpers and connectors on the VTC 1031 and nROK 1031 series motherboards, as well as the storage expansion board.

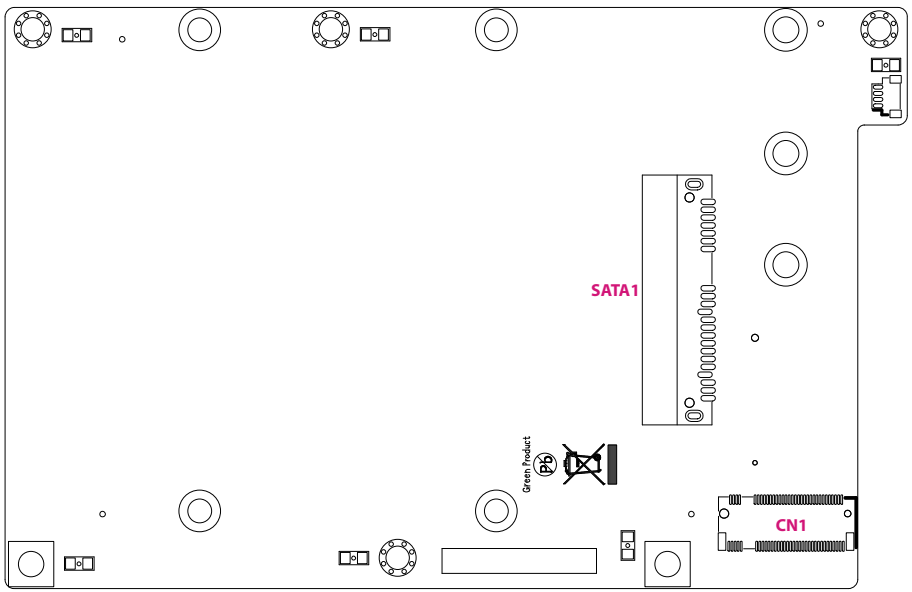
Top View



Bottom View



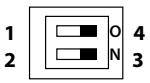
Storage Expansion Board



Jumpers

RTC Clear CMOS Selection Switch

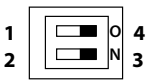
Connector size: 2 x 2 = 4-pin switch
Connector location: SW2



Pin	Definition
1 OFF 2 OFF	RTC Normal (Default) ME Normal (Default)
1 ON 2ON	RTC Clear CMOS ME Clear

RS485 Terminator Resistor Selection Switch

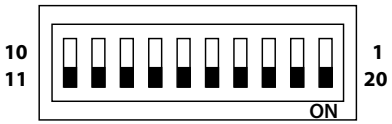
Connector size: 2 x 2 = 4-pin switch
Connector location: SW3



Pin	Definition
1 ON	RS485_1 Terminator Resistor (Default)
2 ON	RS485_2 Terminator Resistor (Default)
1 OFF 2 OFF	RS485_1/2 None Terminator Resistor

PIO PULL-HIGH Selection Switch

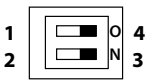
Connector size: 2 x 10 = 20-pin switch
Connector location: SW4



Pin	On	Off
1	GPI1 Internal Pull High (Default)	External Pull High
2	GPI2 Internal Pull High (Default)	External Pull High
3	GPI3 Internal Pull High (Default)	External Pull High
4	GPI4 Internal Pull High (Default)	External Pull High
5	GPI5 Internal Pull High (Default)	External Pull High
6	GPO1 Internal Pull High (Default)	External Pull High
7	GPO2 Internal Pull High (Default)	External Pull High
8	GPO3 Internal Pull High (Default)	External Pull High
9	GPO4 Internal Pull High (Default)	External Pull High
10	N/A	N/A

RTC Switch

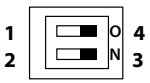
Connector size: 2 x 2 = 4-pin switch
Connector location: SW6



Pin	Definition
1 OFF 2 OFF	12V
1 OFF 2 ON	24V
1 ON 2 ON	9-36V (Default)

CAN Terminator Resistor Selection Switch

Connector size: 2 x 2 = 4-pin switch
Connector location: SW7

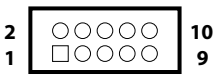


Pin	Definition
1 ON 2 ON	CAN Terminator Resistor (Default)
1 OFF 2 OFF	CAN None Terminator Resistor

Connector Pin Definitions

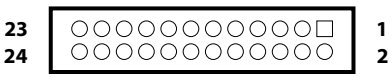
PoE Board to Board Connector

Power:
Connector size: 2 x 5 = 10-pin header (1.27mm)
Connector location: CN1



Pin	Definition	Pin	Definition
1	GND	2	12VSB
3	GND	4	12VSB
5	GND	6	12VSB
7	GND	8	12VSB
9	GND	10	12VSB

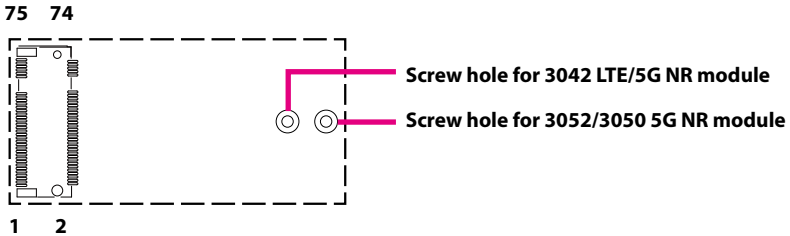
Signal:
Connector size: 2 x 12 = 24-pin header (1.27mm)
Connector location: JP1



Pin	Definition	Pin	Definition
1	CLKREQ4#_R	2	VCC5
3	USB_7N_T	4	VCC3
5	USB_7P_T	6	VCC3
7	LANRST#	8	CLKREQ1#_R
9	PCIE_TXP4	10	PCIE_TXP1
11	PCIE_TXN4	12	PCIE_TXN1
13	GND	14	GND
15	PCIE_RP4	16	PCIE_RP1
17	PCIE_RN4	18	PCIE_RN1
19	GND	20	GND
21	PCIE_CLK_P4_R	22	PCIE_CLK_P1_R
23	PCIE_CLK_N4_R	24	PCIE_CLK_N1_R

M.2 3042/3050/3052 Key B Socket (USB 2.0, USB 3.2 Gen2) for LTE/5G NR Module with 1 x External Micro-SIM, 1 x Internal Micro-SIM

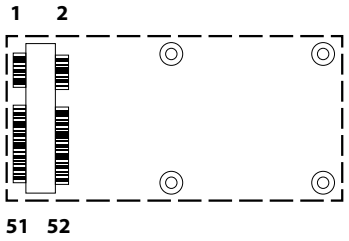
Connector location: CN9, WWAN1
SIM socket: CN17 (SIM1-1), IDE1 (SIM1-2)



Pin	Definition	Pin	Definition
1	CONFIG_3	2	V3.5G_P_A
3	GND	4	V3.5G_P_A
5	GND	6	POWER_OFF#
7	USB_0P	8	W_DISABLE1#
9	USB_0N	10	3.5G_LED#_A
11	GND	12	KEY(Notch location)
13	KEY(Notch location)	14	KEY(Notch location)
15	KEY(Notch location)	16	KEY(Notch location)
17	KEY(Notch location)	18	KEY(Notch location)
19	KEY(Notch location)	20	PCM_CLK
21	CONFIG_0	22	PCM_RX
23	WAKE#_3G	24	PCM_TX
25	NC	26	W_DISABLE2#
27	GND	28	PCM_SYNC
29	USB3_RX1N	30	UIM_RST_A
31	USB3_RX1P	32	UIM_CLK_A
33	GND	34	UIM_DAT_A
35	USB3_TX1N	36	UIM_PWR_A
37	USB3_TX1P	38	NC
39	GND	40	NC
41	3G A_PCIE_RXN1_C	42	UIM2_DAT_A
43	3G A_PCIE_RXP1_C	44	UIM2_CLK_A
45	GND	46	UIM2_RST_A
47	3G A_PCIE_TXN1_C	48	UIM2_PWR_A
49	3G A_PCIE_TXP1_C	50	NC
51	GND	52	NC
53	3G A_PCIE_CLKN_C	54	NC
55	3G A_PCIE_CLKP_C	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	W_RESET#	68	NC
69	CONFIG_1	70	V3.5G_P_A
71	GND	72	V3.5G_P_A
73	GND	74	V3.5G_P_A
75	CONFIG_2		

Full Size Mini-PCIe Socket (USB 2.0, PCIe 3.0)

Connector location: CN15, WLAN

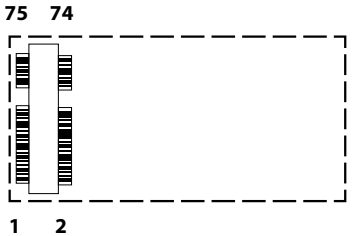


Pin	Definition	Pin	Definition
1	PCIE_WAKE#2	2	+V3.3_MINI_2
3	NC	4	GND
5	NC	6	+V1.5S_MINI_2
7	CLKREQ#1	8	NC
9	GND	10	NC
11	PCIE_CLKN2	12	NC
13	PCIE_CLKP2	14	NC
15	GND	16	NC
17	NC	18	GND
19	NC	20	PCIE_DIS#2
21	GND	22	PCIE_RST#2
23	PE_RX2N	24	+V3.3_MINI_2
25	PE_RX2P	26	GND

Pin	Definition	Pin	Definition
27	GND	28	+V1.5S_MINI_2
29	GND	30	NC
31	PE_TX2N	32	NC
33	PE_TX2P	34	GND
35	GND	36	USB_1N
37	GND	38	USB_1P
39	+V3.3_MINI_2	40	GND
41	+V3.3_MINI_2	42	NC
43	GND	44	PCIE_WLAN_LED#B
45	NC	46	NC
47	NC	48	+V1.5S_MINI_2
49	NC	50	GND
51	MBT_DIS#_R2	52	+V3.3_MINI_2

M.2 3042 Key B Socket (USB 2.0, USB 3.2 Gen 2) for LTE/5G NR Module with 1 x External Micro-SIM, 1 x Internal Micro-SIM (BOM Optional)

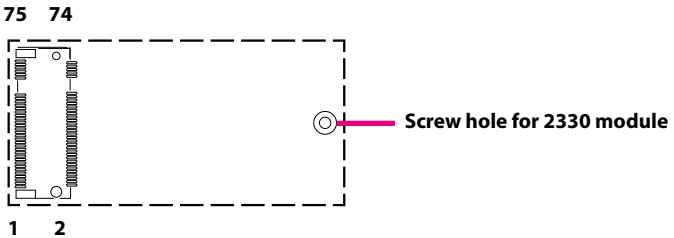
Connector location: CN14, WWAN2
SIM socket: CN4 (SIM2-1) , IDE2 (SIM2-2) (BOM optional)



Pin	Definition	Pin	Definition
1	CONFIG_3_B	2	V3.5G_P_B
3	GND	4	V3.5G_P_B
5	GND	6	PWR_OFF#_B
7	USB_1P_M	8	W_DISABLE1#_B
9	USB_1N_M	10	3.5G_LED#_B
11	GND	12	KEY(Notch location)
13	KEY(Notch location)	14	KEY(Notch location)
15	KEY(Notch location)	16	KEY(Notch location)
17	KEY(Notch location)	18	KEY(Notch location)
19	KEY(Notch location)	20	NC
21	CONFIG_0_B	22	NC
23	NC	24	NC
25	NC	26	W_DISABLE2#_B
27	GND	28	NC
29	USB3_RX2N	30	UIM_RST_B
31	USB3_RX2P	32	UIM_CLK_B
33	GND	34	UIM_DAT_B
35	USB3_TX2N	36	UIM_PWR_B
37	USB3_TX2P	38	NC
39	GND	40	NC
41	NC	42	UIM2_DAT_B
43	NC	44	UIM2_CLK_B
45	GND	46	UIM2_RST_B
47	NC	48	UIM2_PWR_B
49	NC	50	NC
51	GND	52	NC
53	NC	54	NC
55	NC	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	W_RESET#_R_B	68	NC
69	CONFIG_1_B	70	V3.5G_P_B
71	GND	72	V3.5G_P_B
73	GND	74	V3.5G_P_B
75	CONFIG_2_B		

M.2 2230 Key E Socket (USB 2.0, PCIe 3.0x2)

Connector location: CN16, WLAN



Pin	Definition	Pin	Definition
1	GND	2	VCC3
3	USB_P	4	VCC3
5	USB_N	6	WLAN1_LED#
7	GND	8	NC
9	NC	10	NC
11	NC	12	NC
13	NC	14	NC
15	NC	16	WLAN2_LED#
17	NC	18	GND
19	NC	20	NC
21	NC	22	NC
23	NC	24	NC
33	GND	34	NC
35	PCIE_TXP2	36	NC
37	PCIE_TXN2	38	NC
39	GND	40	NC

Pin	Definition	Pin	Definition
41	PCIE_RXP0	42	NC
43	PCIE_RXN0	44	NC
45	GND	46	NC
47	PCIE_CLKP0	48	NC
49	PCIE_CLKN0	50	SUSCLK
51	GND	52	RST0#
53	CLKREQ0#	54	BT_DIS#
55	PEWAKE#	56	WIFI_DIS#
57	GND	58	SM1_D
59	PCIE_TXP3	60	SM1_C
61	PCIE_TXN3	62	I2C_ALERT#
63	GND	64	NC
65	PCIE_RXP1	66	RST1#
67	PCIE_RXN1	68	CLKREQ1#
69	GND	70	NC
71	PCIE_CLKP1	72	VCC3
73	PCIE_CLKN1	74	VCC3
75	GND		

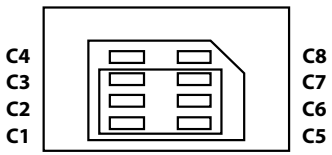
Audio Connector

Connector size: 1 x 6 = 6-pin header (1.0mm)
Connector location: CN11

Pin	Definition	Pin	Definition
1	SURR_OUT_L_CA	2	SURR_JD
3	SURR_OUT_R_CA	4	MIC1_OUT-R
5	MIC_JD	6	AGND

Micro-SIM1/Micro-SIM2 SIM Slot

SIM socket: IDE1 (SIM1-2), IDE2 (SIM2-2)



IDE1 Connector Pin Definition

Pin	Definition	Pin	Definition
C1	UIM2_PWR_C	C2	UIM2_RST_C
C3	UIM2_CLK_C	C4	NC
C5	GND	C6	NC
C7	UIM2_DAT_C	C8	NC
C9	NC	C10	NC
CD11	UIM2_CD_C		

IDE2 Connector Pin Definition

Pin	Definition	Pin	Definition
1	GND	2	NC
3	UIM2_DAT_A	4	NC
5	NC	6	UIM2_CLK_A
7	UIM2_RST_A	8	UIM2_PWR_A
		CD	CD

SATA Board to Board Connector

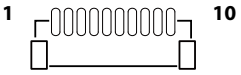
Connector size: 2 x 20 = 40-pin header (0.8mm)
Connector location: CN12

Pin	Definition	Pin	Definition
1	SATA_TXP0	2	VCC5
3	SATA_TXN0	4	VCC5
5	SATA_RXN0	6	VCC5
7	SATA_RXP0	8	VCC5
9	GND	10	GND
11	SATA_TXP1	12	GND
13	SATA_TXN1	14	GND
15	SATA_RXN1	16	GND
17	SATA_RXP1	18	USB2_P8
19	GND	20	USB2_N8

Pin	Definition	Pin	Definition
21	NC	22	M.2_SSD_LED#
23	GND	24	NC
25	NC	26	VCC3
27	NC	28	VCC3
29	GND	30	VCC3
31	NC	32	VCC3
33	NC	34	GND
35	GND	36	GND
37	NC	38	GND
39	GND	40	GND

ESPI Debug Port Connector

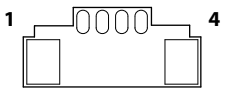
Connector size: 1 x 10 = 10-pin header (1.00mm)
Connector location: ESPI_DB1



Pin	Definition	Pin	Definition
1	GND	2	PLTRST#
3	ESPI_CLK_HDR	4	ESPI_CS0_HDR#
5	ESPI_IO3_HDR	6	ESPI_IO2_HDR
7	ESPI_IO1_HDR	8	ESPI_IO0_HDR
9	ESPI_RST_HDR#	10	3VSB

USB2.0 Connector (nROK 1031 and nROK 1031-C2)

Connector size: 1 x 4 = 4-pin header (1.25mm)
Connector location: J1, J3



J1 Connector Pin Definition

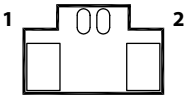
Pin	Definition	Pin	Definition
1	USB2_POWER	2	USB2_N6
3	USB2_P6	4	GND

J3 Connector Pin Definition

Pin	Definition	Pin	Definition
1	USB2_POWER	2	USB2_N5
3	USB2_P5	4	GND

RTC Battery Connector

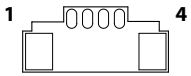
Connector size: 1x2= 2-pin header (1.25mm)
Connector location: J2



Pin	Definition
1	GND
2	VBAT

USB2.0 Connector

Connector size: 1 x 4 = 4-pin header (1.00mm)
Connector location: J5

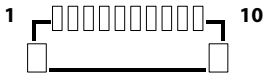


J5 Connector Pin Definition

Pin	Definition	Pin	Definition
1	GND	2	USB_9P
3	USB_9N	4	USB_POWER

COM Connector (RS232/422/485)

Connector size: 1 x 10 = 10-pin header (1.00mm)
Connector location: J7

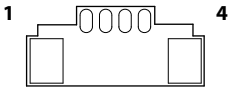


J7 Connector Pin Definition

Pin	Definition	Pin	Definition
1	COM1_GND	2	COM1_GND
3	SP1_CTS#	4	SP1_DSR#
5	SP1_DTR#_RX-	6	SP1_RX_TX+
7	SP1_RI#	8	SP1_RTS#
9	SP1_TX_RX+	10	SP1_DCD#_TX-

DR Connector

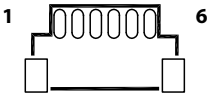
Connector size: 1 x 4 = 4-pin header (1.00mm)
Connector location: J8



Pin	Definition	Pin	Definition
1	GND	2	NC
3	ODOMETER	4	DIRECTION

GNSS Connector

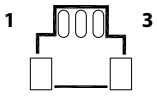
Connector size: 1 x 6 = 6-pin header (1.00mm)
Connector location: J9



Pin	Definition	Pin	Definition
1	GPS_BAT	2	NC
3	GPS_TXD	4	GPS_RXD
5	GND	6	GPS_3V3

MCU Debug Port Connector

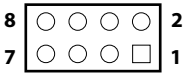
Connector size: 1 x 3 = 3-pin header (1.0mm)
Connector location: J11



Pin	Definition
1	MCU_TX6
2	MCU_RX6
3	GND

MCU Download Pin Header

Connector size: 2 x 4 = 8-pin header (1.27mm)
Connector location: JP2

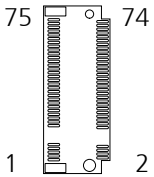


Pin	Definition	Pin	Definition
1	+V3.3ALW	2	MCU_RST
3	MCU_TRST	4	MCU_TDI
5	MCU_TCK	6	MCU_TMS
7	MCU_TDO	8	GND

Storage Board Connector

M.2 Key M 2280 Connector

Connector location: CN1

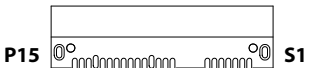


Pin	Definition	Pin	Definition
1	CONFIG_3_B	2	V3.5G_P_B
3	GND	4	V3.5G_P_B
5	GND	6	PWR_OFF#_B
7	USB_1P_M	8	W_DISABLE1#_B
9	USB_1N_M	10	3.5G_LED#_B
11	GND	12	KEY(Notch location)
13	KEY(Notch location)	14	KEY(Notch location)
15	KEY(Notch location)	16	KEY(Notch location)
17	KEY(Notch location)	18	KEY(Notch location)
19	KEY(Notch location)	20	NC
21	CONFIG_0_B	22	NC
23	NC	24	NC
25	NC	26	W_DISABLE2#_B
27	GND	28	NC
29	USB3_RX2N	30	UIM_RST_B
31	USB3_RX2P	32	UIM_CLK_B
33	GND	34	UIM_DAT_B
35	USB3_TX2N	36	UIM_PWR_B
37	USB3_TX2P	38	NC

Pin	Definition	Pin	Definition
39	GND	40	NC
41	NC	42	UIM2_DAT_B
43	NC	44	UIM2_CLK_B
45	GND	46	UIM2_RST_B
47	NC	48	UIM2_PWR_B
49	NC	50	NC
51	GND	52	NC
53	NC	54	NC
55	NC	56	NC
57	GND	58	NC
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	W_RESET#_R_B	68	NC
69	CONFIG_1_B	70	V3.5G_P_B
71	GND	72	V3.5G_P_B
73	GND	74	V3.5G_P_B
75	CONFIG_2_B		

SATA Connector

Connector location: SATA1



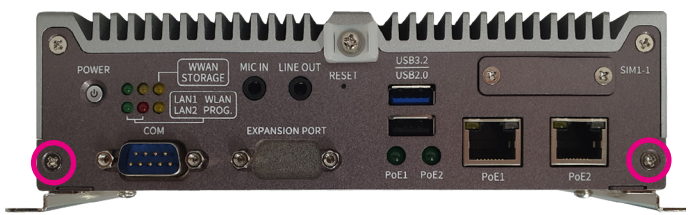
Pin	Definition	Pin	Definition
P1	NC	P2	NC
P3	NC	P4	GND
P5	GND	P6	GND
P7	SATA_PWR0	P8	SATA_PWR0
P9	SATA_PWR0	P10	GND
P11	NC	P12	SATA_PCIE_DETP0
P13	NC	P14	NC
P15	NC		
S1	GND	S2	SATA_TXP0
S3	SATA_TXN0	S4	GND
S5	SATA_RXN0	S6	SATA_RXP0
S7	GND		

Chapter 4: System Setup

Removing the Chassis for Storage Devices Installation

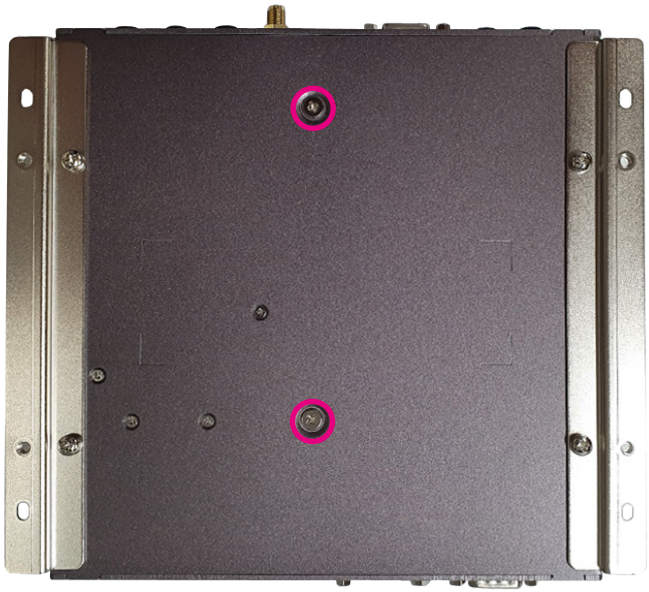
Prior to removing the chassis cover, make sure the unit's power is off and disconnected from the power sources to prevent electric shock or system damage.

1. Remove the screws on the front panel.



2. Remove the screw on the rear panel.

3. Remove the screws on the bottom cover



4. Remove the screws on the both sides.

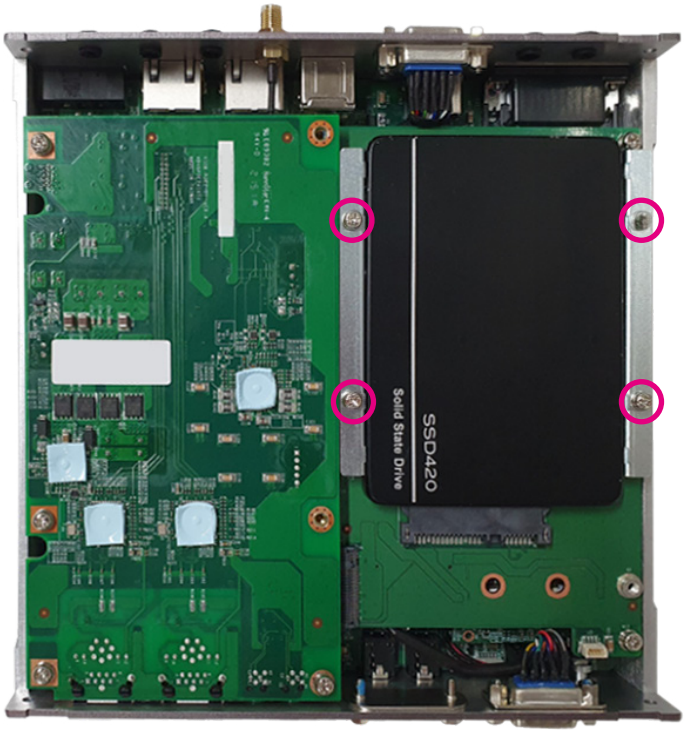
5. After removing the screws described in the previous steps, open the bottom cover.

Installing a SATA Hard Drive

1. Align the hard drive's mounting holes with the mounting holes on the hard drive bracket, and use the provided screws to secure the both sides of hard drive in place.

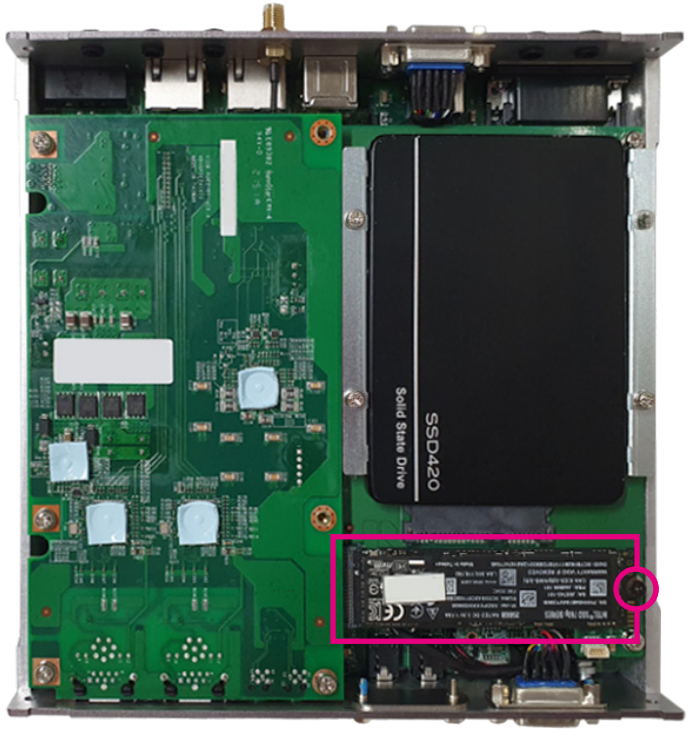
2. Slide the hard drive into the connector. Be sure to connect it with the appropriate orientation because of the foolproof design of the connector.

3. Tighten the screws to secure it in place.

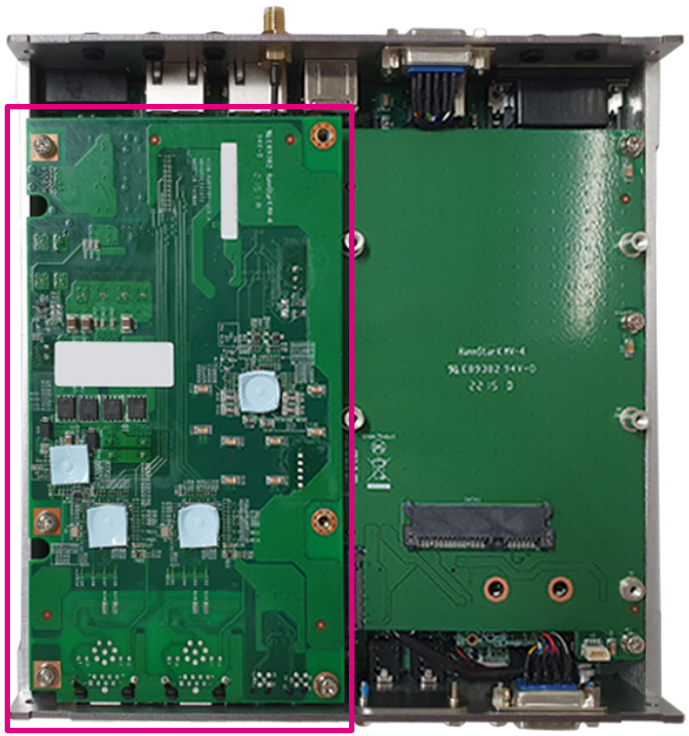


Installing an M.2 Storage Device

Insert an M.2 storage device into the M.2 slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten a screw into the mounting hole to secure the storage device.

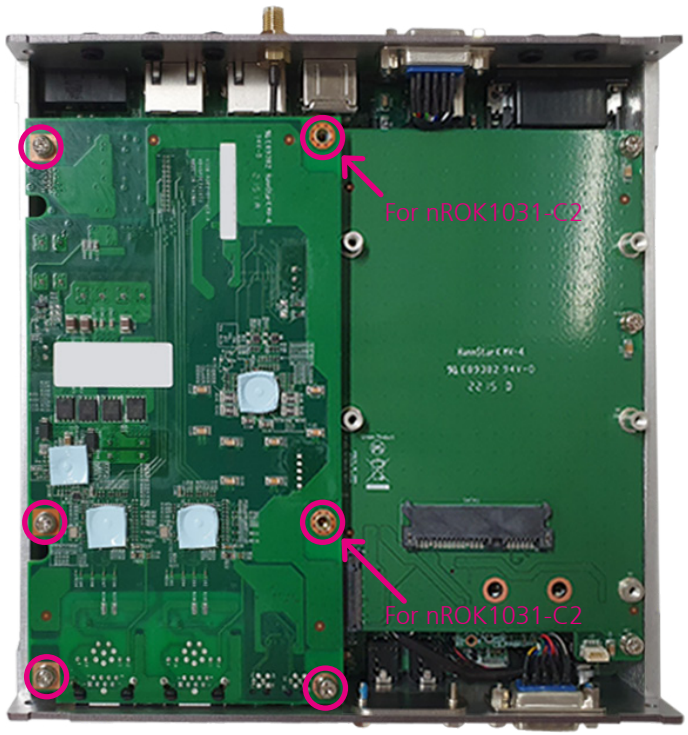


Removing the PoE Board for WWAN/WLAN/mSATA Module, Internal SIM Card, and Memory Installation on VTC 1031-C2 and nROK1031-C2



PoE Board

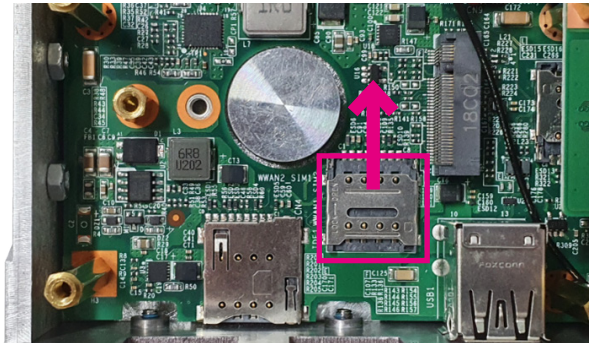
1. Remove the screws on the PoE board.



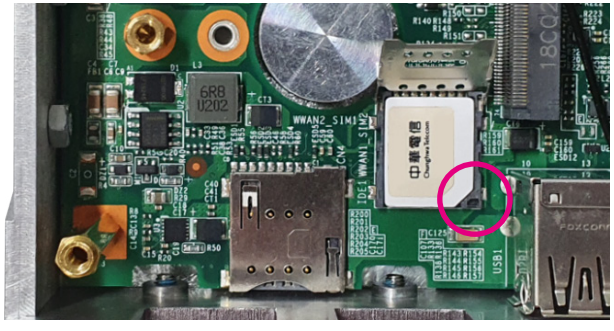
2. Remove the PoE board.

Installing an Internal SIM Card

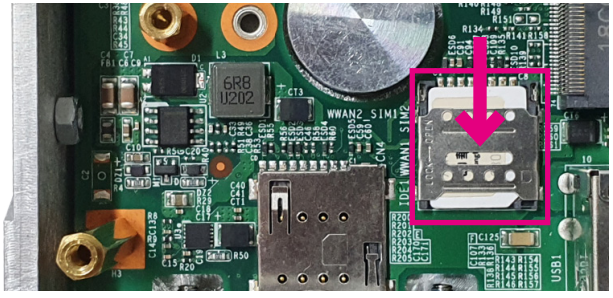
1. Push the sim slot cover with the direction as shown in the following picture, then open the cover.



2. Place the sim card with the direction as shown in the following picture, then close the cover.



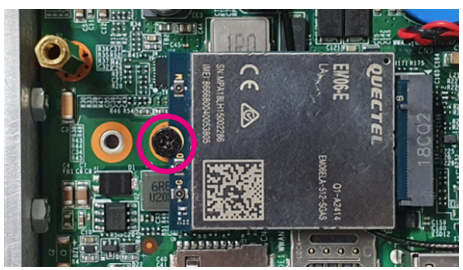
3. Push the sim slot cover with the direction as shown in the following picture to secure the sim card.



Installing a WWAN Module (M.2)

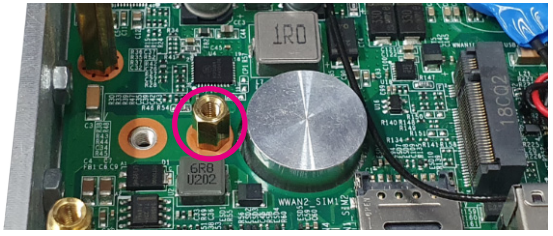
For M.2 3042:

Locate the WWAN M.2 slot (CN9). Insert the module into the M.2 slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten a screw in package into the mounting hole to secure the module.



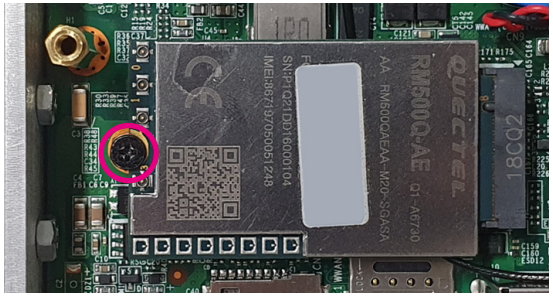
For M.2 3050/3052:

1. Locate the WWAN M.2 slot (CN9). Remove the copper standoff from the 3042 location using the appropriate tool.



2. With the copper standoff removed, tighten it to the 3052 location.

3. Insert the module into the M.2 slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten a screw into the mounting hole to secure the module.



Removing the Storage Board for WLAN/mSATA Module and Memory Installation

Note:
The PoE board should be removed before removing storage board on VTC 1031-C2 and nROK1031-C2

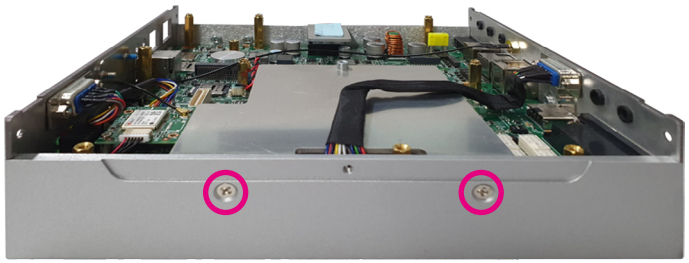
Storage Board

1. Remove the screws on the storage board.

2. Remove the storage board.

Installing a SO-DIMM Memory Module

1. Remove the screws on the sides, then remove the heatsink.



2. Push the ejector tabs which are at the ends of the socket outward. Then insert the memory module into the socket at an approximately 30 degrees angle. Apply firm even pressure to each end of the module until it slips down into the socket. The contact fingers on the edge of the module will almost completely disappear inside the socket.

Note:
The memory module has a foolproof design, be aware of the orientation when installing.

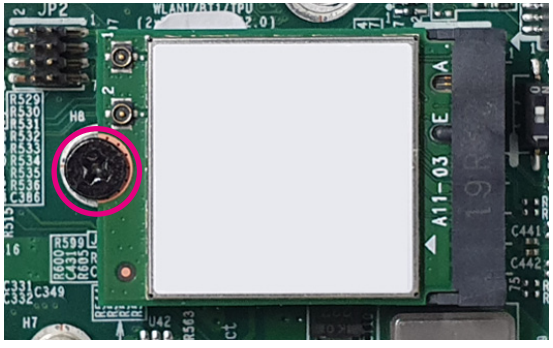
Installing a WLAN Module

Mini PCIe Slot

Locate the WLAN Mini PCI Express slot (CN15). Insert the module into the Mini PCI Express slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten screws into the mounting holes to secure the module.

M.2 Slot

Locate the WLAN M.2 slot (CN16). Insert the module into the M.2 slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten screws into the mounting holes to secure the module.



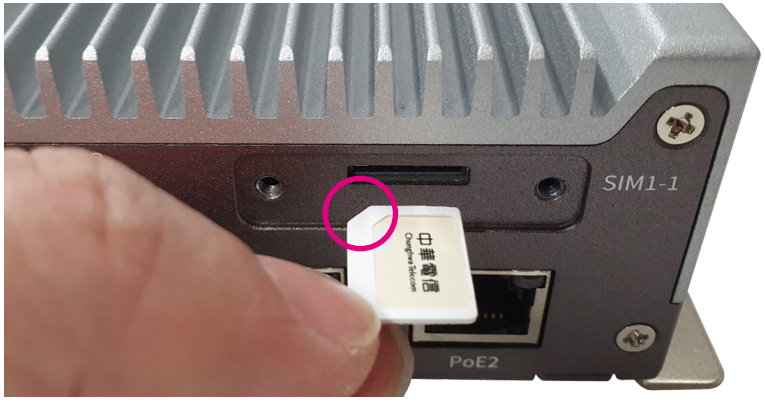
Installing a mSATA Module

Mini PCIe Slot

Locate the Mini PCI Express slot (CN15). Insert the module into the Mini PCI Express slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten screws into the mounting holes to secure the module.

Installing a SIM Card

Remove the SIM card cover on the front panel and insert the SIM cards. Please take note of the SIM card installation direction as shown in the following pictures.

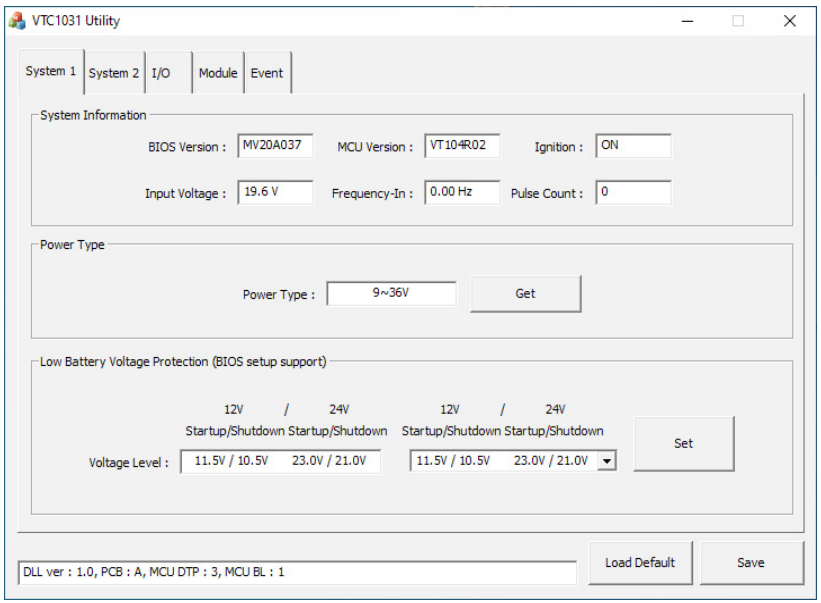


Appendix A:
Software Demo Utility for I/O Ports of Function Control

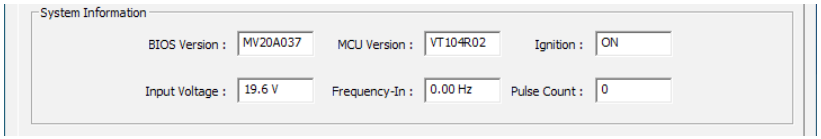
NEXCOM developed a software demo utility to let users test and control different I/O port functions on VTC 1031/VTC 1031-C2/nROK 1031/nROK 1031-C2. This document shows how to use the utility.
There are also the source code files of utility in official website. Users can refer to the source codes to develop their applications.

Menu Screen

1. System 1

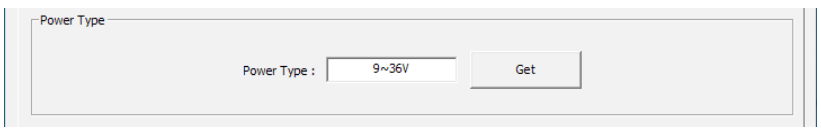


1.1 System Info



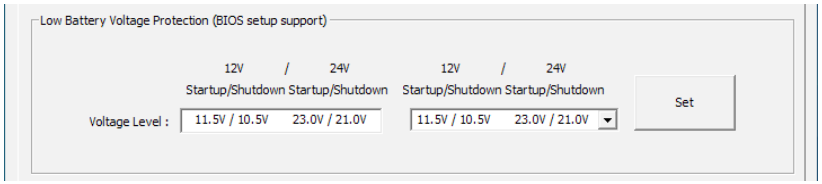
- BIOS Version: Shows the BIOS Version.
- MCU Version: Shows the MCU Version.
- Ignition: Shows the signal of ignition.
  - ON: Signal of ignition is high.
  - OFF: Signal of ignition is low.
- Input Voltage: Shows the voltage level of power-in.
- Frequency-In: Shows the voltage frequency.
- Pulse Count: Shows the Frequency-In of Pulse Count.

1.2 Power Type



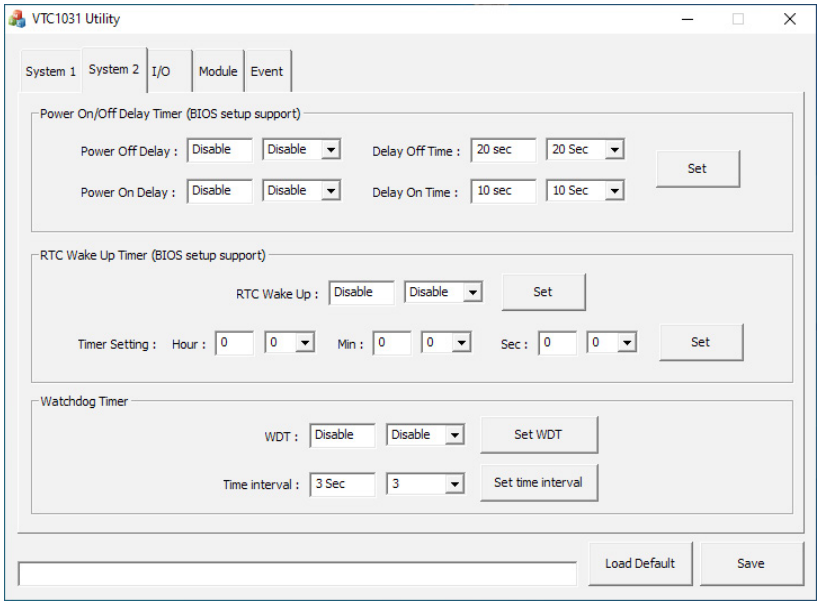
Shows the setting of input voltage in DIP switch.
- If the setting is 12V: 12V is shown.
- If the setting is 24V: 24V is shown.
- If the setting is 9V~36V: 9V~36V is shown.

1.3 Low Battery Voltage Protection

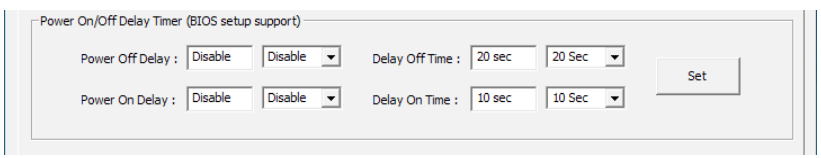


Sets the Low Battery Voltage Protection Startup/Shutdown voltage level during 12V/24V.

2. System 2



2.1 Power ON/OFF Delay Timer

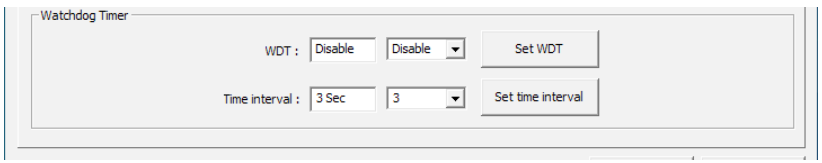


Enables or disables the delay time function. There are several options of delay time for configuration.

2.2 RTC Wake Up Timer

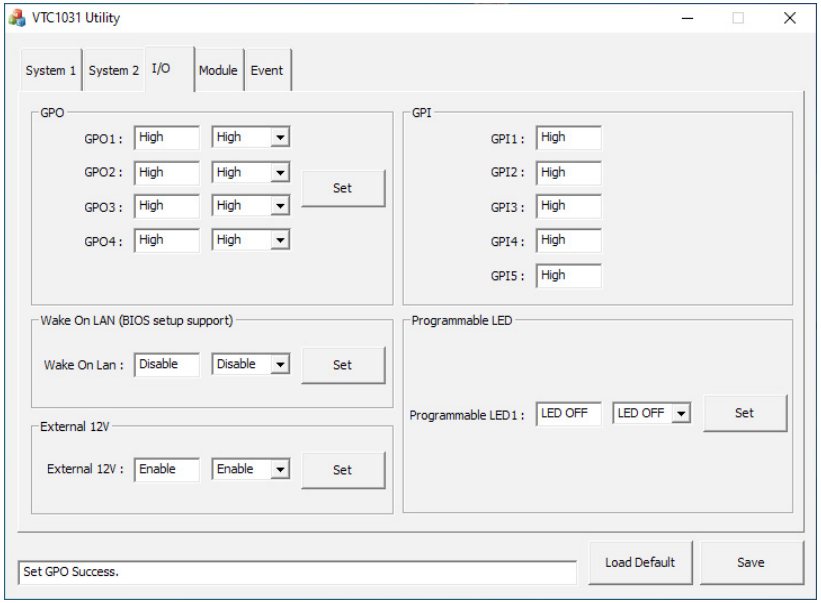
Enables or disables the RTC (real-time clock) wake up timer. The timer is available for configuration in the item of timer setting.

2.3 Watchdog Timer

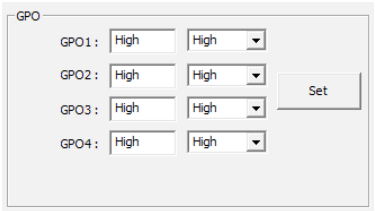


Enables or disables the WDT (watchdog timer) function. A watchdog timer can be configured with a time interval. Meanwhile, the WDT settings can be erased by clicking the Set WDT button.

3. I/O

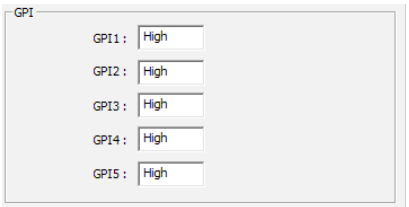


3.1 GPO



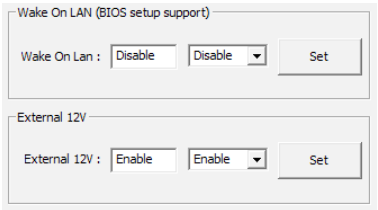
Defines the GPO port as high or low.

3.2 GPI



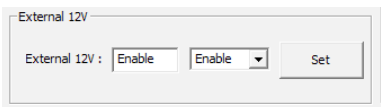
Get the GPI port as high or low.

3.3 Wake On LAN



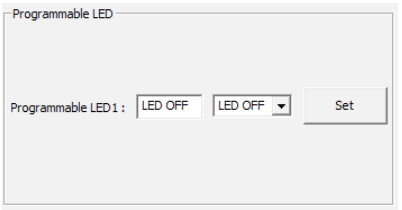
Enables or disables the Wake On LAN function.

3.4 External 12V



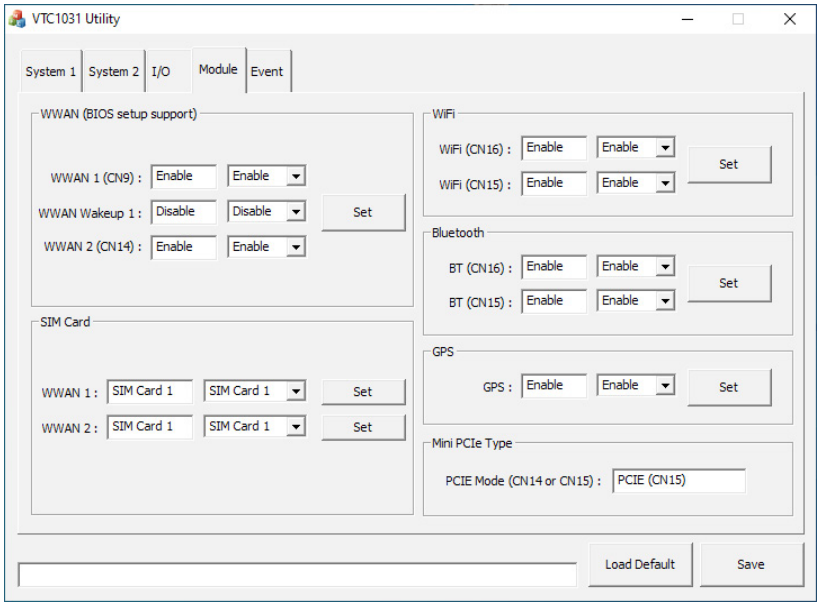
Enables or disables the external power output.

3.5 Programmable LED

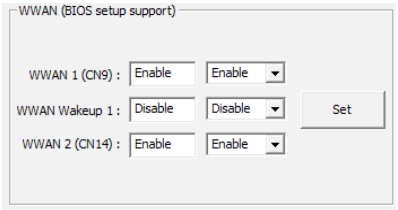


Defines the Program LED as on or off.

4. Module

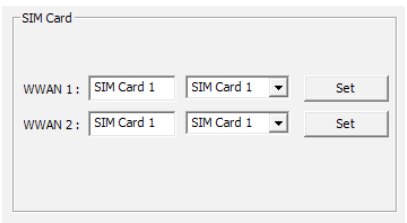


4.1 WWAN



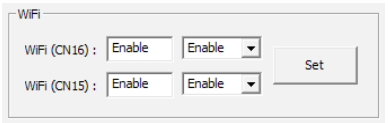
Enables or disables the WWAN function on CN9 (BOM optional for WWAN2 (CN14)).
Enables or disables the WWAN wakeup function. The settings can also be erased by clicking Set button.

4.2 SIM Card



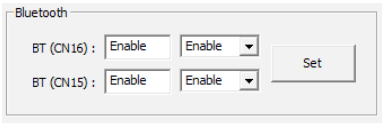
Selects your SIM card setting on WWAN is from SIM Card1 or SIM Card2 (BOM optional for WWAN 2).

4.3 WiFi



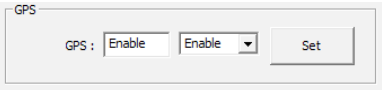
Enables or disables the Wi-Fi module function on CN16 M.2 socket.
Enables or disables the Wi-Fi module function on CN15 Mini-PCIe socket.

4.4 Bluetooth



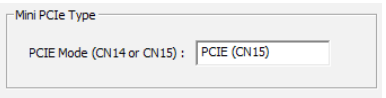
Enables or disables the Bluetooth function on CN16 or CN15.

4.5 GPS



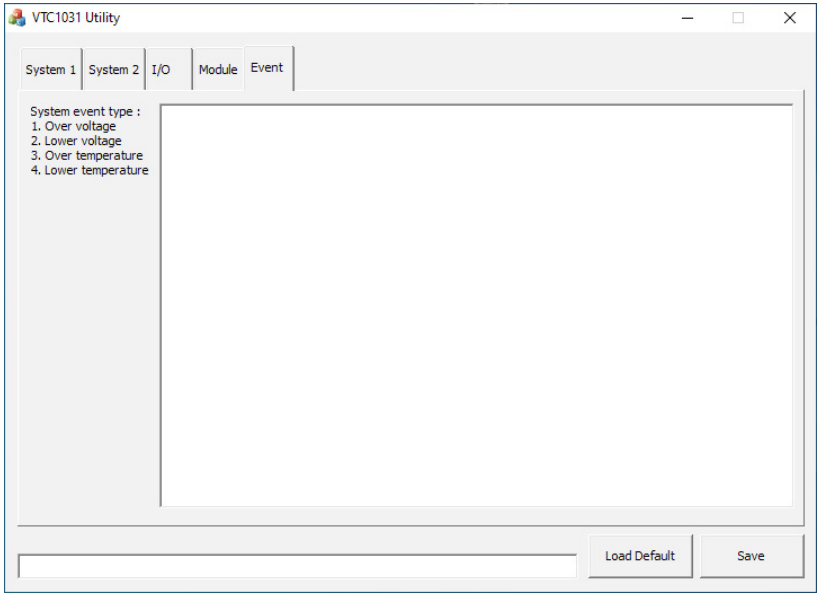
Enables or disables the GPS function.

4.6 MiniPCIe Type



Shows “PCIE (CN15)” for Mini-PCIe socket or “USB (CN14)” for BOM optional M.2 socket.

5. Event



Shows the event of VTC 1031 / VTC 1031–C2 / nROK 1031 / nROK 1031-C2.

(Information)
Date: YYMMDD
Time: HHMMSS
GPS Status: 0: Searching 1: Fixed
GPS Latitude
GPS Longitude
G Sensor X value: 0 ~ 65535
G Sensor Y value: 0 ~ 65535
G Sensor Z value: 0 ~ 65535

Activation Time: Defines when tracker function starts after ignition signal becomes low.

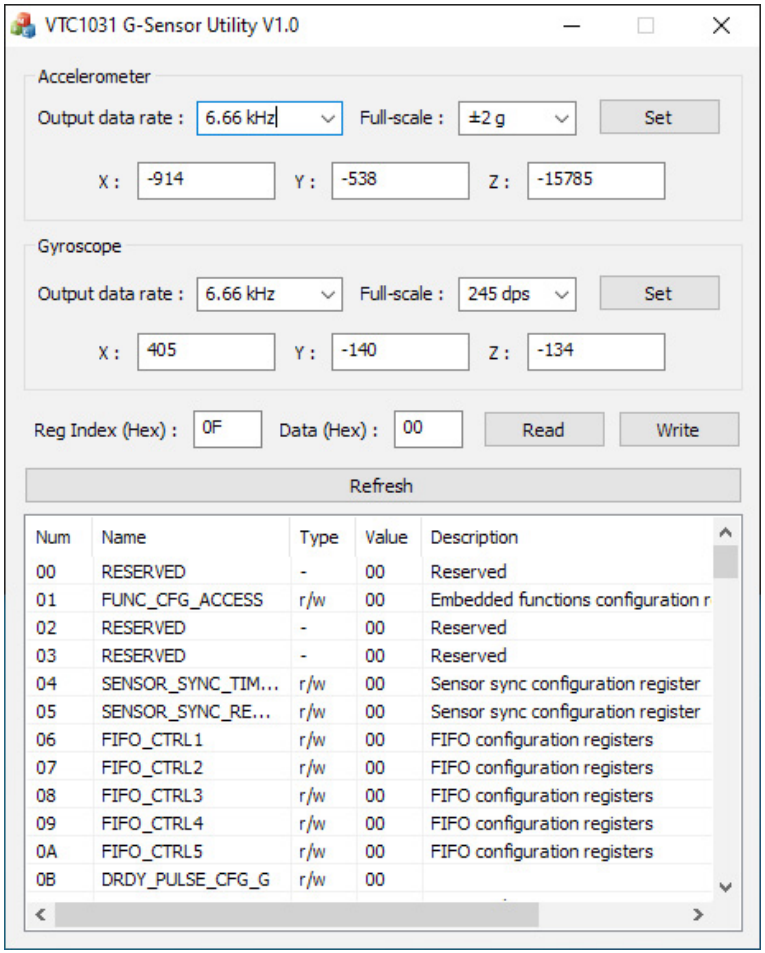
Send Period: Defines the interval time to send the information to server, when Tracker Mode is "Continue".

Acceleration Force: Defines the value of G-sensor that triggers the event.

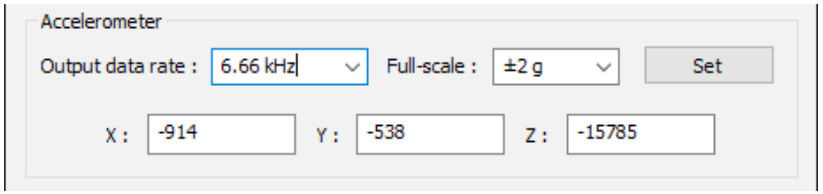
Tilt Angle: Defines the value of tilt angle that triggers the event.

IMEI: IMEI of WWAN module will be shown.

6. G-Sensor

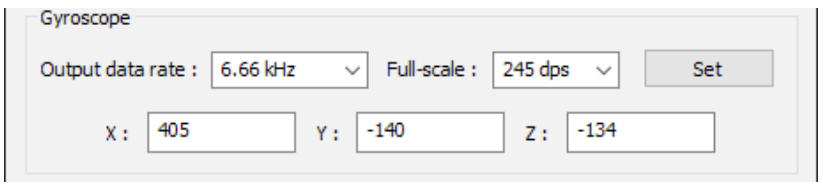


6.1 Accelerometer



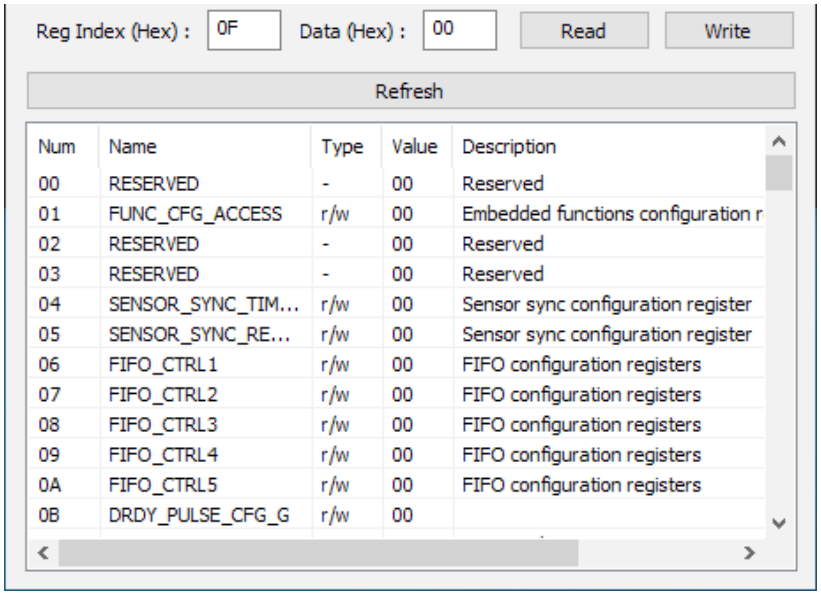
Set Output data rate and Full-scale for accelerometer.
Read the data from accelerometer.

6.2 Gyroscope



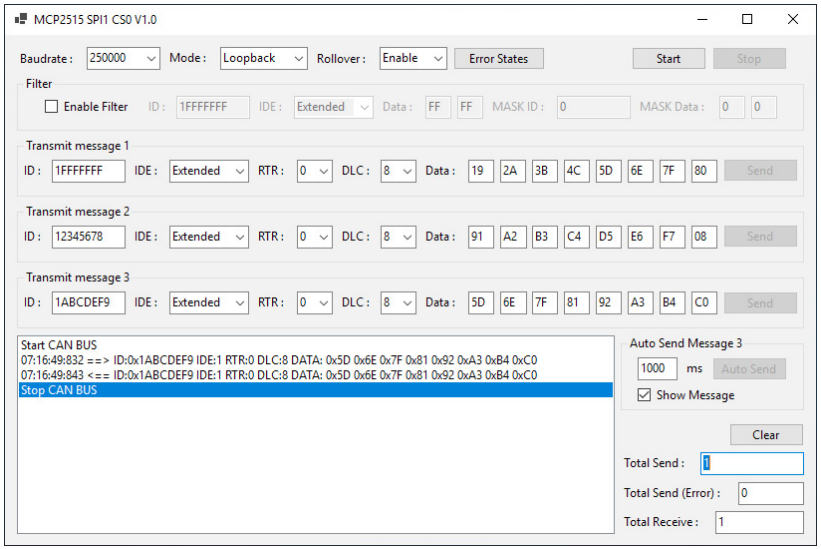
Set Output data rate and Full-scale for gyroscope.
Read the data from gyroscope.

6.3 Register Table



Shows the value of all registers in accelerometer and gyroscope, once the Refresh button is pressed.

7. CAN Bus



Defines Baudrate.

Defines Mode as the following options:

- **Normal:** Send data
- **Sleep:** Power saving mode (wake up automatically when data is received)
- **Loopback:** Self-test mode
- **Listen-Only:** Only receive data, including receiving wrong data

Defines Rollover as the following options:

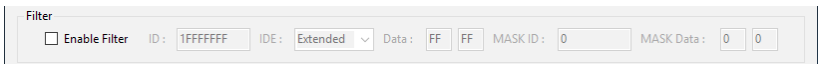
- **Enable:** Receive buffer 1 and buffer 2 data
- **Disable:** Only receive buffer data

Error States for showing error states.

Start button: After the setting is completed, press the Start button to start sending data.

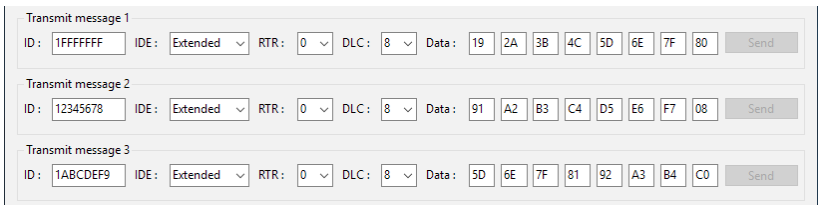
Stop button: Stop sending data.

Filter:



Check Enable Filter to enable the filter.

Transmit message: 3 groups of transmit buffers.



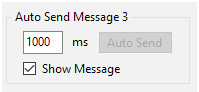
Defines IDE as the following options.

- **Standard** (11Bit ID, with Data1 and Data2).
- **Extended** (29Bit ID).

Data display area

"==>": Sending data.

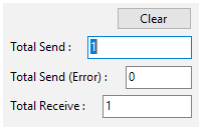
"<==": Receiving data.



The setting of period (ms) for automatic data sending. Press the Auto Send button to send the data automatically (Transmit message 3 data).

Check Show Message to display the sent information. If not check, it will not display.

Count area for sending data.



Press the Clear button to reset the count to 0.

Appendix B: GNSS Feature

u-Blox NEO-M9N Overview

The NEO-M9N module is built on the robust u-blox M9 GNSS chip, which provides exceptional sensitivity and acquisition times for all L1 GNSS systems. The u-blox M9 standard precision GNSS platform, which delivers meter-level accuracy, succeeds the well-known u-blox M8 product range.

NEO-M9N supports concurrent reception of four GNSS. The high number of visible satellites enables the receiver to select the best signals. This maximizes the position accuracy, in particular under challenging conditions such as in deep urban canyons.

NEO-M9N detects jamming and spoofing events and reports them to the host, so that the system can react to such events. Advanced filtering algorithms mitigate the impact of RF interference and jamming, thus enabling the product to operate as intended.

A SAW filter combined with an LNA in the RF path is integrat- ed in the NEO-M9N module. This setup allows normal operation even under strong RF interferences, for example when a cellular modem is colocated with NEO-M9N.

NEO-M9N offers backwards pin-to-pin compatibility with previous u-blox generations, which saves designers time and cost when upgrading their design. Software migration requires little effort thanks to the continuous support of UBX messages across product generations.

Technical Specifications

Product performance

Receiver type	92-channel u-blox M9 engine GPS L1 C/A, QZSS L1 C/A/S, GLONASS L10F BeiDou B1I, Galileo E1B/C SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN	
Nav. update rate	Up to 25 Hz (4 concurrent GNSS)	
Horizontal position accuracy	1.5 m CEP (with SBAS) 2.0 m CEP (without SBAS)	
Acquisition[1]	Cold start:	24 s
	Aided start:	2 s
	Hot start:	2 s
Sensitivity[1]	Tracking & Nav.	-167 dBm
	Reacquition	-160 dBm
	Cold start	-148 dBm
	Hot start	-159 dBm

Tracking features

Power save modes	On/off, cyclic
Data batching	Autonomous tracking up to 5 minutes
Data-logger	Position, velocity, time, and odometer data
Geofencing	Up to 4 circular areas; Software message or GPIO for waking up the host CPU

Security features

Signal integrity	RF interference & jamming detection and reporting Active GNSS in-band filtering Spoofing detection and reporting
Device integrity	Secure boot of firmware downloaded from host or flash Receiver configuration lock by command
Secure interface	Signed UBX messages (SHA-256) JTAG port locked

Electrical data

Power supply	2.7 V to 3.6 V
Power Consumption[1]	36 mA at 3.0 V (4 GNSS continous) 32 mA at 3.0 V (2 GNSS continous) 28 mA at 3.0 V (1 GNSS continous)
Backup Supply	1.65 V to 3.6 V

Interfaces

Serial interfaces	1 UART 1 USB (NEO-M9N) 1 SPI (optional) 1 DDC (I2C compliant)
Digital I/O	Configurable timepulse 1 EXTINT input for Wakeup
Raw Data output	Code phase data
Timepulse	Configurable: 0.25 Hz to 10 MHz
Supported antennas	Active and passive
Protocols	NMEA 4.10, UBX binary, RTCM 3.3

VIOB-GPS-06 Module and Computer Connector Pin Definitions

J2 (GNSS Side)

J9 (GNSS Side)

J2 Pin Definition

Pin	Definition	Pin	Definition
1	GPS_3V3	2	GND
3	GPS_TXD_M	4	GPS_RXD_M
5	NC	6	+V3.3ALW

J9 Pin Definition

Pin	Definition	Pin	Definition
1	3.3V_BAT	2	NC
3	TX	4	RX
5	GND	6	3.3V

COM Port for GNSS: COM 4
Baud Rate: 38400

Appendix C: GPS with Dead Reckoning Feature

(VTC 1031 and VTC1031-C2 Only)

u-Blox NEO-M9L Overview

The NEO-M8L standalone concurrent GNSS module with 3D dead-reckoning (DR) is built on the exceptional performance of the u-blox M8 concurrent GNSS (GPS, GLONASS, Galileo-ready[1], BeiDou, QZSS and SBAS) engine in the compact and industry proven NEO form factor.

The NEO-M8L delivers a complete, self-contained solution for roadvehicle Automotive Dead Reckoning (ADR) applications in an exceptionally compact 16 x 12 mm form-factor. The module combines information from GNSS, on-board 3-Dimensional inertial sensors, and speed data from the vehicle to deliver continuous navigation in road-vehicle applications. Its size and features make it suitable for aftermarket and first-fit navigation and Telematics applications. Position measurement rates of up to 2 Hz are available with optional extrapolation (based on vehicle dynamics) extending reporting rates to 20 Hz. Inertial sensor measurements are available to external applications at rates up to 10 Hz.

For ease of application, both hardware and message interfaces are supported for vehicle speed. u-blox' ADR and GNSS technologies deliver continuous and accurate positioning throughout the journey. u-blox' tightly-coupled navigation solution delivers significant improvements in navigation accuracy, especially in difficult urban environments. Dead reckoning sensors in conjunction with speed information from the vehicle also provide navigation before GNSS signals are acquired and during periods of complete signal loss. The introduction of three dimensional sensing and signal processing (for both acceleration and direction) extend accurate navigation to urban multilevel highways and car-parks as well as extending dead-reckoned range in tunnels and urban canyons. 3D sensing also enables flexibility in orientation of the receiver with respect to the vehicle frame.

The NEO form factor allows easy migration from previous NEO generations. Sophisticated RF architecture and interference suppression ensure maximum performance even in GNSS-hostile environments. The NEO-M8L module includes an internal Flash that allows simple firmware upgrades. These features make the NEO-M8L perfectly suited to industrial and automotive applications. UART, SPI and DDC (I^2C compatible) interfaces provide connectivity and enable synergies with most u-blox cellular modules.

u-blox M8 modules use GNSS chips qualified according to AEC-Q100, and are manufactured in ISO/TS 16949 certified sites. Qualification tests are performed as stipulated in the ISO16750 standard: "Road vehicles - Environmental conditions and testing for electrical and electronic equipment".

u-blox' AssistNow Assistance services supply aiding information, such as ephemeris, almanac and time, reducing the time to first fix significantly and improving acquisition sensitivity. The u-blox M8 generation extends validities of AssistNow Offline data (up to 35 days) and AssistNow Autonomous data (up to 6 days), providing the benefits of faster acquisition for longer durations since last use.

[1] With future flash firmware update.

Technical Specifications

Parameter	Specification
Receiver type	72-channel u-blox M8 engine GPS L1C/A, SBAS L1C/A, QZSS L1C/A GLONASS L1OF, BeiDou B1, Galileo E1B/C[2]

GNSS		GPS & GLONASS	GPS & BeiDou	GPS
Time-To-First-Fix[3]	Cold start	27 s	28 s	30 s
	Hot start	1.5 s	1.5 s	1.5 s
	Aided starts[4]	4 s	6 s[5]	3 s
Sensitivity[6]	Tracking & Navigation[7]	-160 dBm	-160 dBm	-160 dBm
	Reacquisition	-159 dBm	-159 dBm	-159 dBm
	Cold start	-147 dBm	-147 dBm	-147 dBm
	Hot start	-156 dBm	-156 dBm	-156 dBm

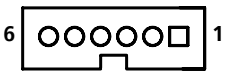
Navigation		GPS & GLONASS	GPS & BeiDou	GPS
Horizontal Position accuracy[8]	Autonomous	2.5 m	2.5 m	2.5 m
	SBAS	2.0 m	2.0 m	2.0 m
Velocity accuracy[9]		0.05 m/s	0.05 m/s	0.05 m/s
Heading accuracy[9]		0.3 degree	0.3 degree	0.3 degree
ADR position error[10]	Gyro + speed pulse + accelerometer		typ. 3 % of distance travelled without GNSS	
Frequency of time pulse signal			0.25 Hz ... 10 MHz	
Maximum navigation rate (High Rate output)[11]			20 Hz	

Navigation		GPS & GLONASS	GPS & BeiDou	GPS
Maximum navigation rate (Measurement rate)			2 Hz	
Navigation latency[12]			300 ms nominal	
Maximum sensor measurement message output rate			10 Hz	
Sensor measurement message output bandwidth[13]			nominal 50% of output rate	
Accuracy of time pulse signal	RMS 99% RMS 99%	30 ns 60 ns	30 ns 60 ns	30 ns 60 ns
Operational limits	Dynamics Altitude Velocity		≤ 4G 50,000m 500 m/s	

[2] Ready to support Galileo E1B/C when available with a flash firmware update
[3] All signals at - 130 dBm
[4] Dependent on aiding data connection speed and latency
[5] BeiDou assisted acquisition is not available
[6] Demonstrated with a good external LNA
[7] Optimized for best navigation performance with dead-reckoning
[8] GNSS fix available, CEP, 50%, 24 hours static, -130dBm, > 6 SVs
[9] GNSS fix available, 50% @ 30 m/s
[10] Typical road and vehicle conditions
[11] For update rates > 2 Hz, extrapolation techniques are applied.
[12] Dependent on signal conditions but measurements are delivered with time-stamp corresponding to measurement time
[13] Higher bandwidths are used for navigation
[14] Assuming Airborne < 4 g platform

VIOB-GPS-DR02/VTK-GPS-DR02
Module Connector Pin Definitions

J2 (GPS Side)



J9 (PC Side)

J3 (GPS Side)

J8 (GPS Side)

J2 Pin Definition

Pin	Definition	Pin	Definition
1	GPS_3V3	2	GND
3	GPS_TXD_M	4	GPS_RXD_M
5	NC	6	+V3.3ALW

J9 Pin Definition

Pin	Definition	Pin	Definition
1	GPS_BAT	2	NC
3	GPS_TXD	4	GPS_RXD
5	GND	6	VCC3_GPS

J3 Pin Definition

Pin	Definition	Pin	Definition
1	DR_DIRECTIO_M_R	2	DR_ODOMETER_M_R
3	1PPS_R	4	GND

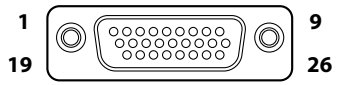
J8 Pin Definition

Pin	Definition	Pin	Definition
1	GND	2	NC
3	ODOMETER	4	DIRECTION

COM Port for GPS: COM 4
Baud Rate: 9600

Appendix D: Signal Connection of DI/DO

Multi Port Pinout Description



Pin	Definition	Pin	Definition
1		2	
3		4	
5	G_I_5	6	G_I_4
7	G_I_3	8	G_I_2
9	G_I_1	10	
11		12	
13		14	
15	G_O_1	16	G_O_2
17	G_O_3	18	G_O_4
19		20	
21		22	
23		24	
25	DB26G_GND	26	

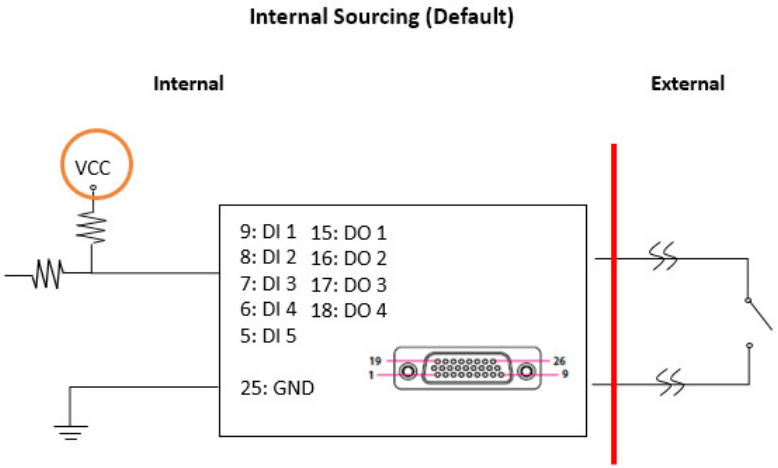
Digital Input

The GPIO connector (DIO, connector number: 22 for GPI signal (digital signal input)). The GPIO connector has 5 digital input channels by default.

Wet Contact (default)

The SW4 switch needs to switch to "ON" state. The GPI signals have a pull up resistor to Vin Voltage internally.

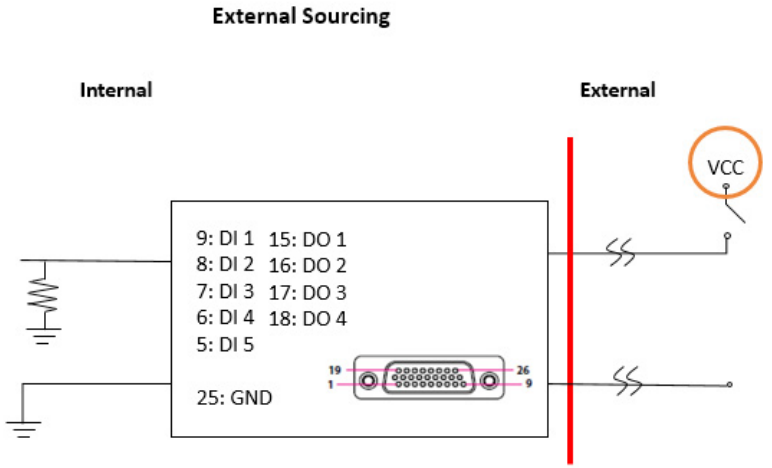
The figure below shows how to connect an external source to one of the input channels.



Dry Contact:

The SW4 switch needs to switch to "OFF" state. The GPI signal will not have a pull up resistor internally.

The figure below shows how to connect an external source to one of the input channels.

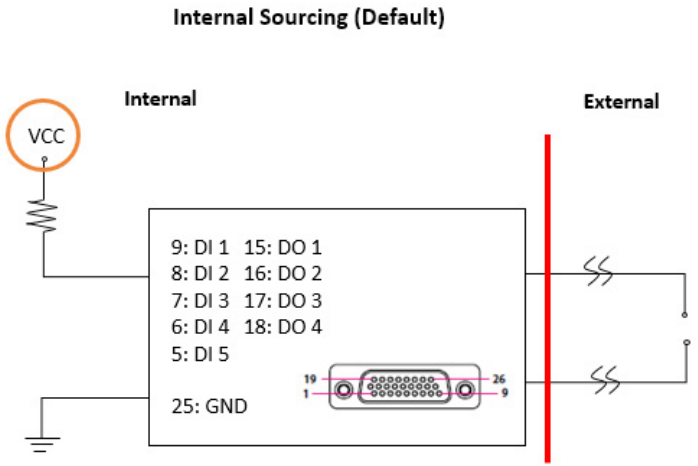


Digital Output

The GPIO connector (DIO, connector number: 22 for GPO signal (digital signal output). The GPIO connector has 4 digital output channels by default.
The signal connection of GPIO supports two connected methods for output signal type. One is Low level (driven to 0V from GPO signal) other is High level (high voltage is provided from external device).

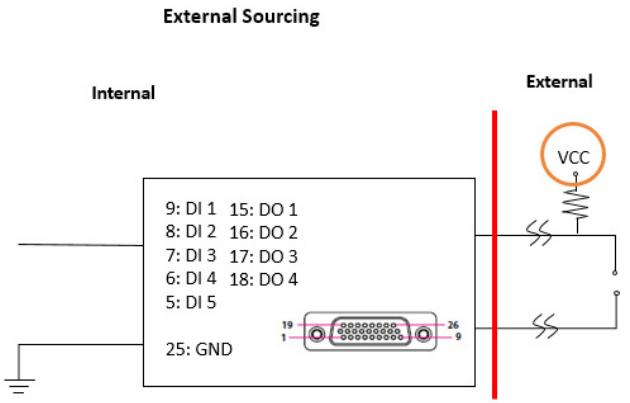
Wet Contact (default)

The SW4 switch needs to switch to "ON" state. The GPO signal will have a pull up resistor to Vin Voltage internally.
The figure below shows how to connect an external source to one of the output channels.



Dry Contact

The SW4 switch needs to switch to "OFF" state. The GPO signal will not have a pull up resistor internally.
The figure below shows how to connect an external source to one of the output channels.

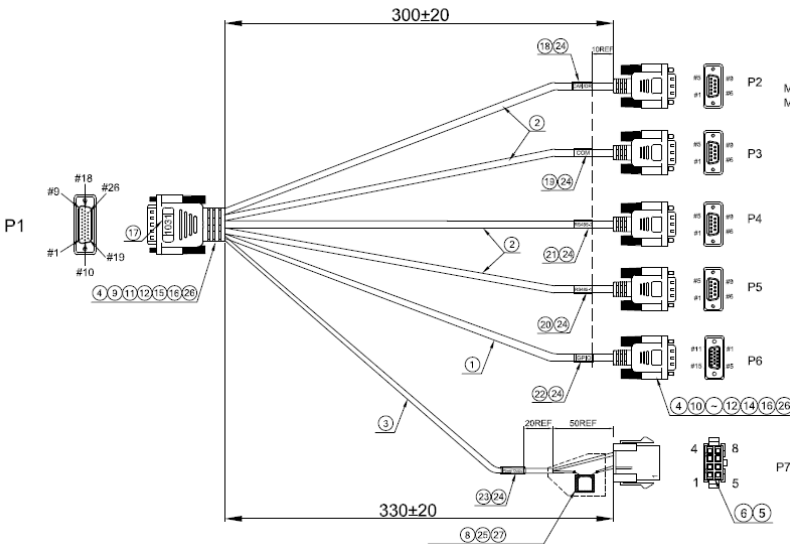


Appendix E: Pin Definition for the Multiport Cable

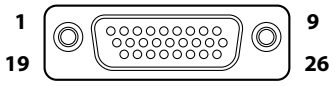
Multiport: The multiport consists of 26-pin male DB26 connector and multiple output connector. The tables in this appendix list the pin signals of the A connector and its corresponding pin signals to the output connector.

VTC 1031 / VTC 1031-C2

nROK 1031 / nROK 1031-C2



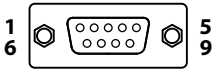
P1 Connector Pinout



Pin	Definition	Pin	Definition
1	CAN1_H	2	CAN1_L
3	CANISO_GND	4	DB26G_GND
5	G_I_5	6	G_I_4
7	G_I_3	8	G_I_2
9	G_I_1	10	RS485-2_+
11	RS485-2_-	12	DB26G_GND
13	RS485-1_+	14	RS485-1_-
15	G_O_1	16	G_O_2
17	G_O_3	18	G_O_4
19	DB26G_GND	20	DB26G_GND
21	RS232_RXD	22	RS232_TXD
23	ODOMETER	24	DIRECTION
25	DB26G_GND	26	12VO

P2 Connector Pinouts

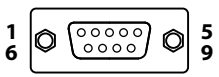
CAN/DR connector: P2



P1 Pin	P2 Pin	Definition
1	3	CAN-H
2	5	CAN-L
3	2	GND
23	7	ODOMETER
24	6	DIRECTION

P3 Connector Pinouts

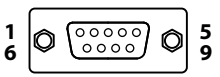
COM connector: P3



P1 Pin	P3 Pin	Definition
20	5	GND
21	2	RX
22	3	TX

P4 Connector Pinouts

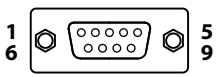
RS485-2 connector: P4



P1 Pin	P4 Pin	Definition
10	2	RS485-2+
11	1	RS485-2-
12	5	GND

P5 Connector Pinouts

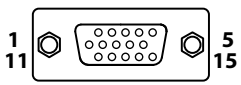
RS485-1 connector: P5



P1 Pin	P5 Pin	Definition
12	5	GND
13	2	RS485-1+
14	1	RS485-1-

P6 Connector Pinouts

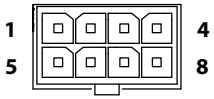
GPIO connector: P6



P1 Pin	P6 Pin	Definition
5	1	GPI-5
6	2	GPI-4
7	3	GPI-3
8	4	GPI-2
9	5	GPI-1
15	6	GPO-1
16	7	GPO-2
17	8	GPO-3
18	9	GPO-4
19	5	GND

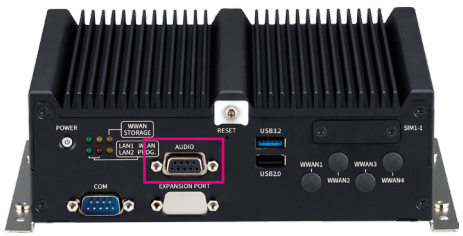
P7 Connector Pinouts

Power Output connector: P7



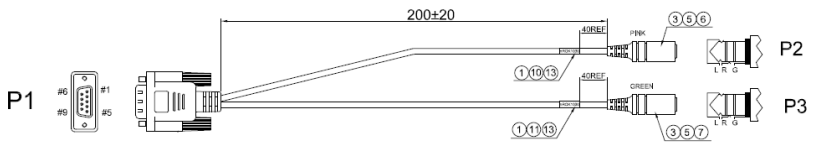
P1 Pin	P7 Pin	Definition
25	4	VCC 12V-
26	2	VCC 12V+

Audio: The multiport consists of a 9-pin male connector and multiple output connectors. The tables in this appendix list the pin signals of the P1 connector and its corresponding pin signals to the output connectors.

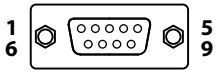


nROK 1031

nROK 1031-C2



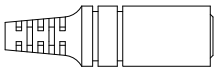
P1 Connector Pinout



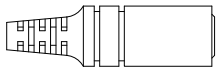
Pin	Definition	Pin	Definition
1	AGND	4	FRONT_JD
2	MIC_L	5	FRONT_L
3	MIC_JD	6	FRONT_R

P2 and P3 Connector Pinouts

Phone Connector: P2, P3



P2: Pink



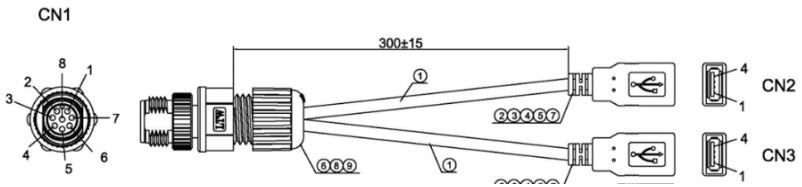
P3: Green

P1 Pin	P2 Pin	Definition
1	G	AGND
2	L	MIC_L
3	G	MIC_JD

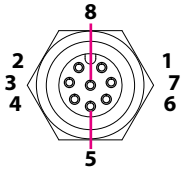
P1 Pin	P3 Pin	Definition
4	G	FRONT_JD
5	L	FRONT_L
6	R	FRONT_R

USB 2.0: The multiport consists of a 8-pin male M12 connector and multiple output connectors. The tables in this appendix list the pin signals of the CN1 connector and its corresponding pin signals to the output connectors

nROK 1031 / nROK 1031-C2



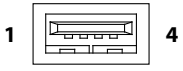
CN1 Connector Pinout

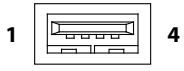


Pin	Definition	Pin	Definition
1	D-	2	D+
3	VCC	4	GND
5	D1	6	D+
7	VCC	8	GND

CN2 and CN3 Connector Pinouts

USB connector: CN2, CN3





CN2

CN1 Pin	CN2 Pin	Definition
1	2	D-
2	3	D+
3	1	VCC
4	4	GND

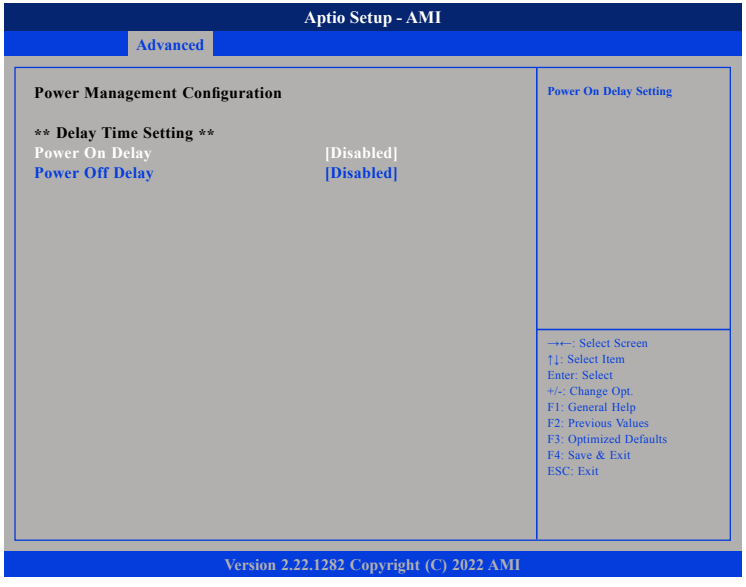
CN3

CN1 Pin	CN3 Pin	Definition
5	2	D-
6	3	D+
7	1	VCC
8	4	GND

Appendix F: Vehicle Power Management Setup

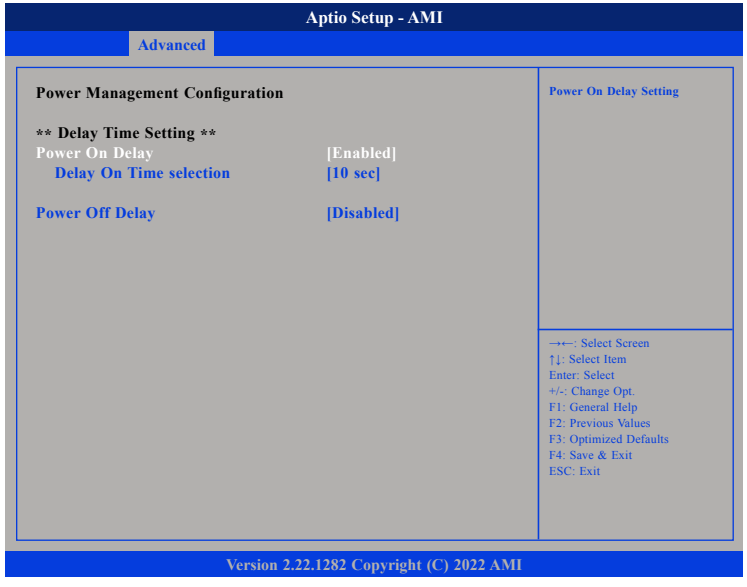
Power-on Delay Setting

Disable Power-on Delay



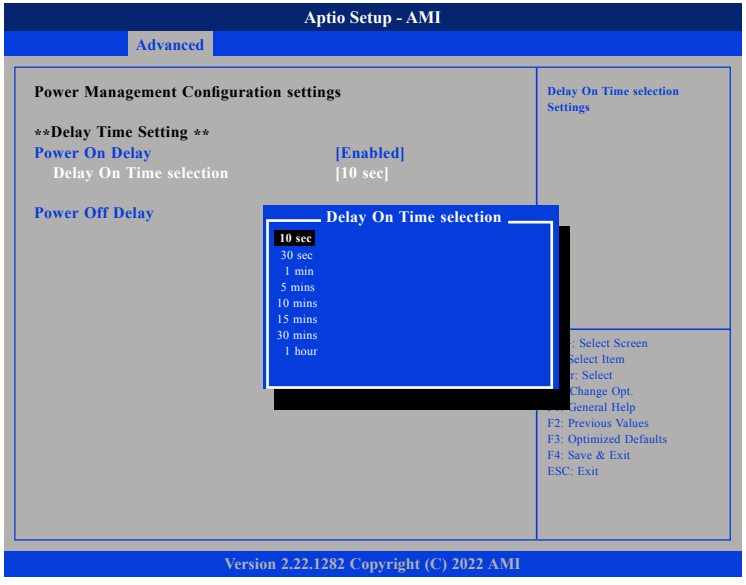
Enable Power-on Delay

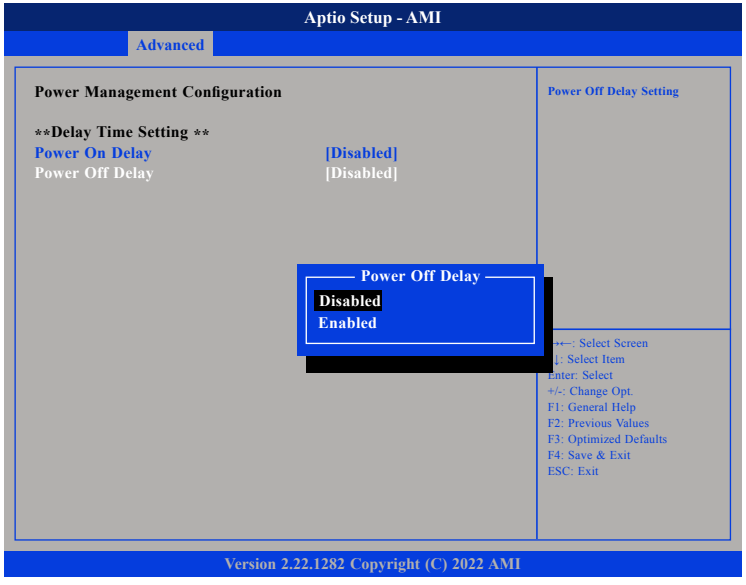
Delay time can be set at 10sec/30sec/1min./5min./10min./15min./30min./1hour.



Power-off Delay Setting

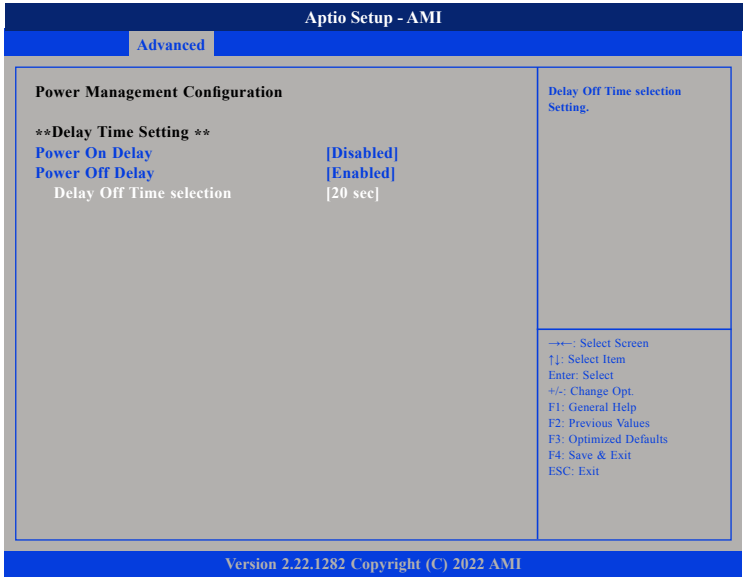
Disable Power-Off Delay

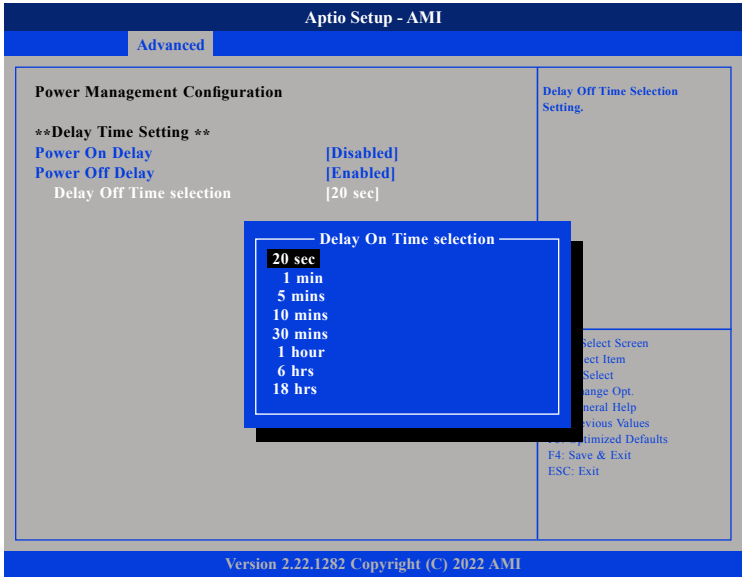




Enable Power-Off Delay

Delay time can be set at 20sec/1min./5min./10min./30min./1hour/6hour/ 18hour.





Appendix G: Power Consumption

Note: The external power supply power consumption is suggested 2 times of system power consumption. Please refer to the following table for system power consumption in different situations.

Idle	Full	Full+Load
Into OS HDMI x1 + D-Sub x1 (100%) USB3.2 x1 (USB Flash) USB2.0 x4 (Keyboard + Mouse + USB Flash x2) USB2.0 x1 (USB Flash x1, from storage board) Audio (Line Out x1 + Mic-In x1) GPS Module (Ublox M9N) All Storage (M.2 SATA SSD + 2.5” SATA SSD) Module (Mini PCIE WLAN + M.2 WWAN + M.2 Hailo)	Idle State GNSS Module link Play Video COM (COM1, COM2) Mini-PCIE Dummy Load (5.45w) Burn In 100% (CPU + 2D + 3D + Disk + Sound + RAM + Video Playback + GPU) M.2 Hailo	Full State (VTC 1031 / nROK 1031) USB dummy Load 3.0 (5V/1A x1) USB dummy Load 2.0 (5V/0.5A x5) Full State (VTC 1031-C2 / nROK 1031-C2) USB dummy Load 3.0 (5V/1A x1) USB dummy Load 2.0 (5V/0.5A x5) PoE board (30W + 30W)

Item	Device	Test Case		Average		Maximus	
				Current(A)	Watt(W)	Current(A)	Watt(W)
1	S0 state	Idle state	12V	1.59	19.08	2.07	24.84
			24V	0.79	18.96	1.06	25.44
			36V	0.59	21.24	0.73	26.28
		Full state (Burn-In)	12V	2.82	33.84	3.01	36.12
			24V	1.51	36.24	1.62	38.88
			36V	1.09	39.24	1.22	43.92
		Full state + load	12V	3.97	47.64	4.24	50.88
			24V	2.04	48.96	2.19	52.56
			36V	1.52	54.72	1.63	58.68
		Full state + loading + PoE (VTC 1031-C2 / nROK 1031-C2)	12V	8.86	106.32	9.14	109.68
			24V	4.32	103.68	4.53	108.72
			36V	3.03	109.08	3.14	113.04
2	S3 state	Full state Sleep mode	12V	0.4	4.8	N/A	N/A
			12V wake up WWAN	0.42	5.04	N/A	N/A
			24V	0.21	5.04	N/A	N/A
			24V wake up WWAN	0.23	5.52	N/A	N/A
			36V	0.2	7.2	N/A	N/A
			36V wake up WWAN	0.22	7.92	N/A	N/A
3	IGN OFF (S5)	Full state IGNITION OFF	12V	0.009	0.108	N/A	N/A
			12V wake up WWAN	0.05	0.6	N/A	N/A
			24V	0.008	0.192	N/A	N/A
			24V wake up WWAN	0.04	0.96	N/A	N/A
			36V	0.01	0.36	N/A	N/A
			36V wake up WWAN	0.03	1.08	N/A	N/A

*WWAN: Enable wakeup function of WWAN module