



NEXCOM International Co., Ltd.

Mobile Computing Solutions

Railway Computer

nROK 7251 Series

User Manual

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PREFACE

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Disclaimer

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Acknowledgements

nROK 7251-WI-7C4IP, nROK 7251-7C4 and nROK 7251-7A 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 in 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.

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 needlenose pliers to disconnect connections as these can damage the soft metal or plastic parts of the connectors.

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. CompactFlash: Turn off the unit's power before inserting or removing a CompactFlash storage card.
4. SIM: Do not insert or remove the SIM card when the **system is powered** on. Always **power** off the **system** before inserting or removing the SIM card.

Safety Precautions

- Read these safety instructions carefully.
- Keep this User Manual for later reference.
- Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
- For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
- Keep this equipment away from humidity.
- Put this equipment on a stable surface during installation. Dropping it or letting it fall may cause damage.
- Do not leave this equipment in either an unconditioned environment or in a above 40°C storage temperature as this may damage the equipment.
- The openings on the enclosure are for air convection to protect the equipment from overheating. DO NOT COVER THE OPENINGS.
- Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
- 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.
- All cautions and warnings on the equipment should be noted.
- If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
- Never pour any liquid into an opening. This may cause fire or electrical shock.
- Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
- 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.
- Do not place heavy objects on the equipment.
- 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.
- 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.

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

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Package Contents

Before continuing, verify that the nROK 7251-7C4/nROK 7251-7A and nROK 7251-WI-7C4IP package that you received is complete. Your nROK 7251-7C4/nROK 7251-7A and nROK 7251-WI-7C4IP package should have all the items listed in their respective tables below.

nROK 7251-7C4/nROK 7251-7A

Item	P/N	Name	Specification	Qty
1	50311F0581X00	I Head Bolts Screw Long Fei:I3x15.8 ISO NIGP	I3x5.8 AXISx2.8mm SCREWx3mm	8
2	50333P0027X00	Washer for SMA CONN Kang Yang:TW-181	13x1.8mm Nylon 66 Natural	10
3	50333P0028X00	Washer for SMA CONN Kang Yang:WS6-0.8(B)	12.8x6.4x0.8mm PC Black	10
4	6012200052X00	PE Zipper Bag #8	170x240mm, w/China RoHS Symbol	1
5	6012200053X00	PE Zipper Bag #3	100x70mm, w/China RoHS Symbol	1
6	602DCD1662X00	nROK 7251 Series DVD Driver VER:1.0	JCL	1
7	603ANT0115X00	GPS/GLONASS Antenna SANAV:SM-76G	SMA Male L=5000mm	1
8	603POW0378X00	Power Cable ST:MD-5108077	Waterproof M12 A Coded 5-pin (Female) to Open L=300mm	1

nROK 7251-WI-7C4IP

Item	P/N	Name	Specification	Qty
1	50311F0581X00	I Head Bolts Screw Long Fei:13x15.8 ISO NIGP	I3x5.8 AXISx2.8mm SCREWx3mm	8
2	50333P0027X00	Washer for SMA CONN Kang Yang:TW-181	13x1.8mm Nylon 66 Natural	10
3	50333P0028X00	Washer for SMA CONN Kang Yang:WS6-0.8(B)	12.8x6.4x0.8mm PC Black	10
4	6012200052X00	PE Zipper Bag #8	170x240mm, w/China RoHS Symbol	1
5	6012200053X00	PE Zipper Bag #3	100x70mm, w/China RoHS Symbol	1
6	602DCD1662X00	nROK 7251 Series DVD Driver VER:1.0	JCL	1
7	603ANT0115X00	GPS/GLONASS Antenna SANAV:SM-76G	SMA Male L=5000mm	1
8	603POW0407X00	Power Cable ST:ST-2005011	Waterproof M23 5-pin (Female) to Open L=300mm	1

Ordering Information

The following provides ordering information for the nROK 7251 series.

- **nROK 7251-WI-7C4IP (P/N: 10A00725100X0)**

9th generation Intel® Core™ i7-9700TE, 2 x 4 GB industrial grade memory, DC input 24V~110V w/ isolation, 1 x VGA, 1 x LAN, 4 x PoE 802.3af/at (total 60W), IP65

- **nROK 7251-7C4 (P/N: 10A00725101X0)**

9th generation Intel® Core™ i7-9700TE, 2 x 4 GB industrial grade memory, DC input 24V w/o isolation, 1 x VGA, 1 x HDMI, 1 x LAN, 4 x PoE 802.3af/at (total 60W)

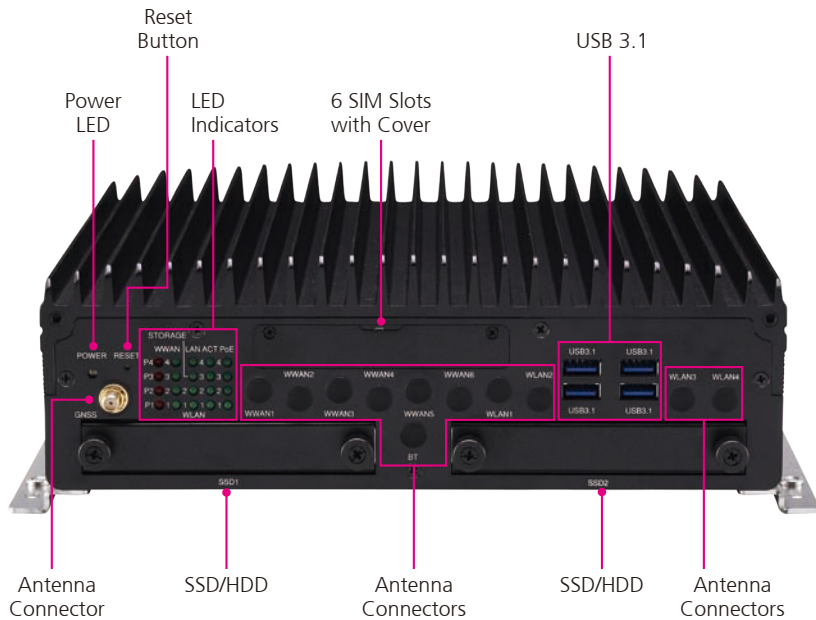
- **nROK 7251-7A (P/N: 10A00725103X0)**

9th generation Intel® Core™ i7-9700TE, 2 x 4 GB industrial grade memory, DC input 24V w/o isolation, 1 x VGA, 1 x HDMI, 2 x LAN

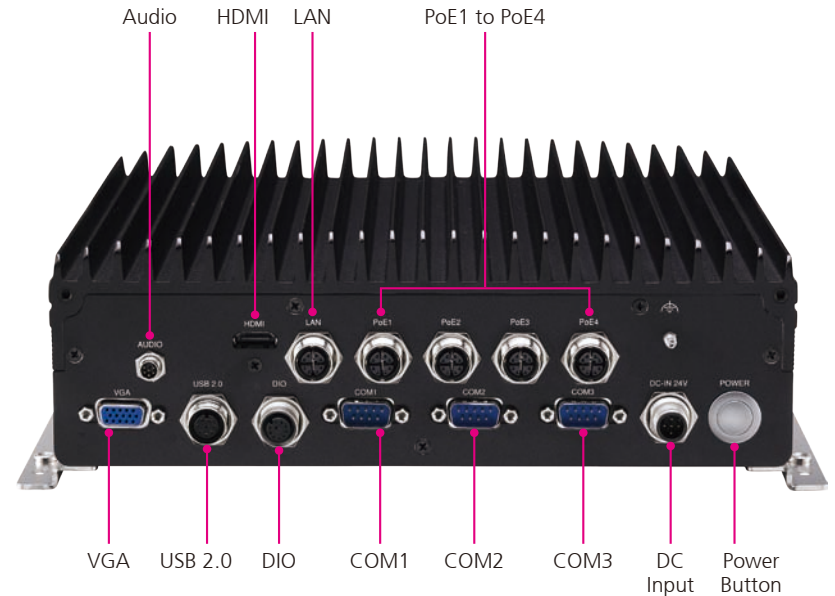
CHAPTER 1: PRODUCT INTRODUCTION

nROK 7251-7C4 Physical Features

Front View

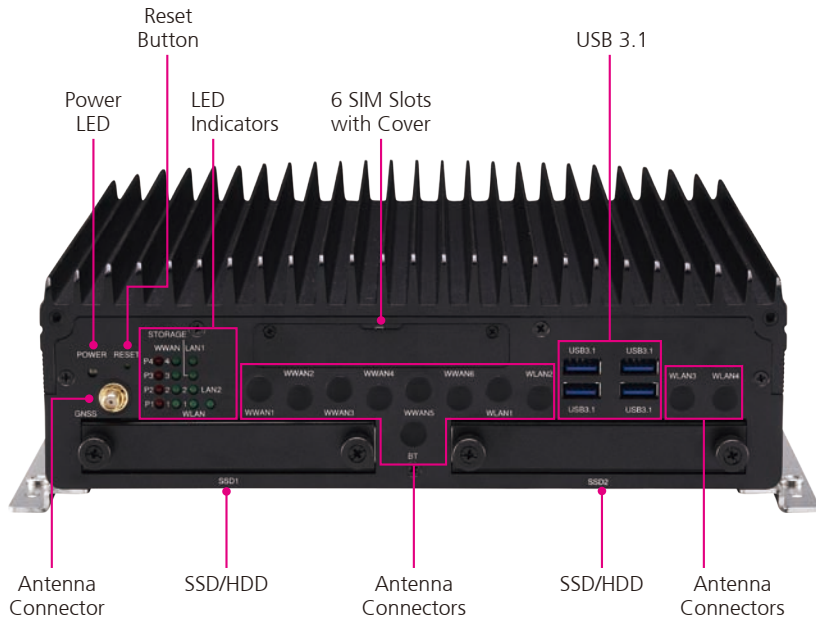


Rear View

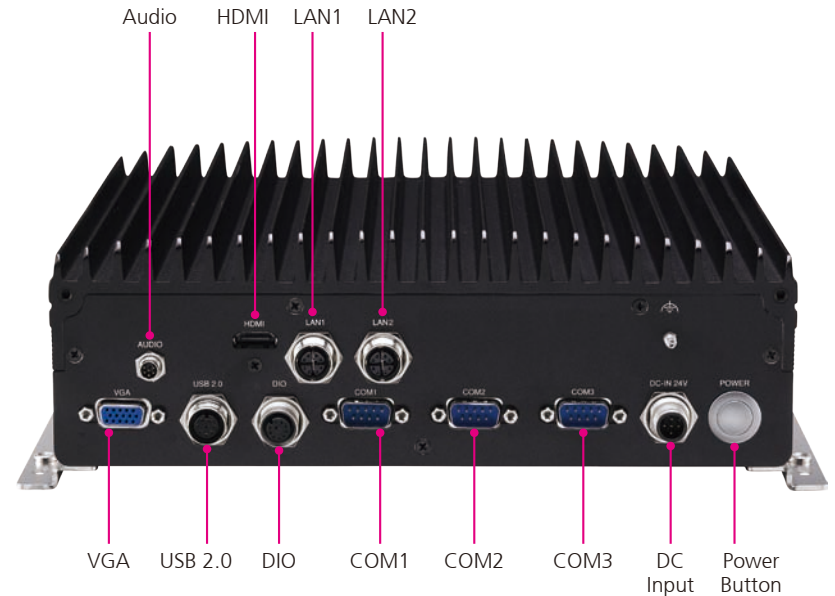


nROK 7251-7A Physical Features

Front View

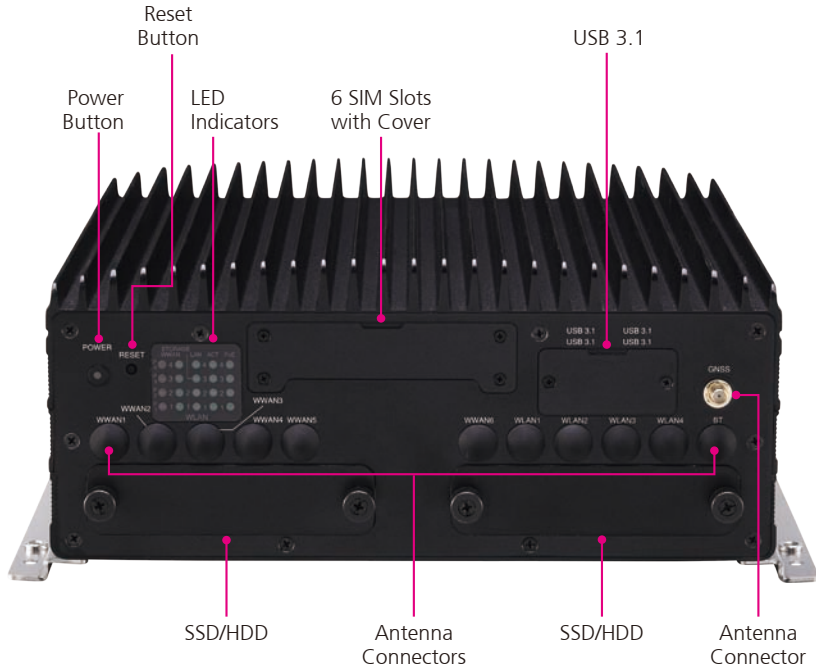


Rear View

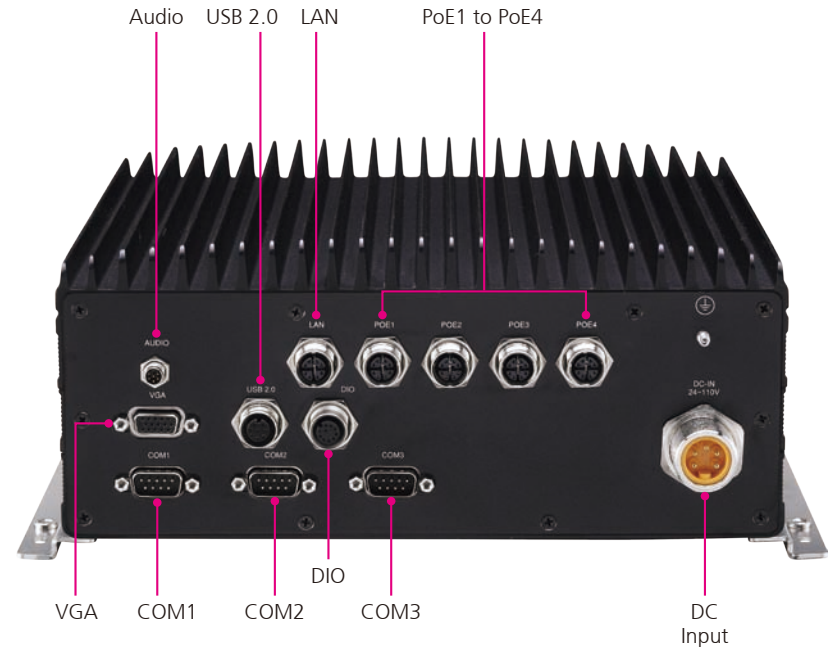


nROK 7251-WI-7C4IP Physical Features

Front View



Rear View



nROK 7251 Series Hardware Specifications

CPU

- Support 9th/8th generation Intel® Core™ i7/i5/i3 processor, LGA1151 socket
 - Intel® Core™ i7-9700TE, TDP 35W

Chipset

- Intel® Q370 platform controller hub

Memory

- 2-Channel 260-pin DDR4 SO-DIMM sockets up to 32GB/channel (64GB for two channels, non-ECC up to 2666 MHz), default 4GB + 4GB industrial grade memory

Video Output

- Chipset Intel® UHD Graphics 630
- 1 x Waterproof VGA up to 1920 x 1200 @ 60Hz
- 1 x HDMI 1.4b up to 4096 x 2160 @ 30Hz (nROK 7251-7C4, nROK 7251-7A)

Storage

- 2 x 2.5" SATA 3.0 external SSD/HDD (compatible with 15mm height), RAID 0/1 supported
- 2 x mSATA 3.0 (BIOS selection, occupied by mPCIe slot)

Expansion

- 1 x Full size mini-PCIe socket (USB 2.0, PCIe 3.0/SATA 3.0 [BIOS selection])
- 1 x Full size mini-PCIe socket (USB 2.0, PCIe 3.0/SATA 3.0 [BIOS selection]), BOM optional full size mini-PCIe socket (USB 2.0) for LTE module with 2 x external SIM
- 1 x Full size mini-PCIe socket (USB 2.0) for LTE module, BOM optional M.2 3042 Key B socket (USB 2.0, USB 3.1 Gen2) for LTE/5G NR module with 2 x external SIM

- 1 x M.2 3042/3050/3052 Key B socket (USB 2.0, USB 3.1 Gen2) for LTE/5G NR module with 2 x external SIM
- 1 x M.2 3042/3050/3052 Key B socket (USB 2.0, USB 3.1 Gen2, PCIe 3.0 [BOM optional]) for LTE/5G NR modem with 2 x external SIM

GNSS and Onboard Sensor

- 1 x Default U-blox NEO-M8N GNSS module for GPS/Glonass/QZSS/Galileo/Beidou
- Optional modules with dead reckoning available
- G Sensor (3-axis, 10-bit resolution)

LAN and Power over Ethernet

- nROK 7251-WI-7C4IP, nROK 7251-7C4
 - 4 x Independent LAN, 10/100/1000 Mbps I210-IT GbE, PoE 802.3af/at, max. 60W
 - 1 x LAN, 10/100/1000 Mbps I219 support iAMT and WOL
- nROK 7251-7A
 - 2 x LAN, 10/100/1000 Mbps I210/I219 (support iAMT and WOL)

Security

- TPM 2.0: Infineon SLB9665TT2.0FW5.62 (BOM optional)

I/O Interface-Front

- nROK 7251-WI-7C4IP, nROK 7251-7C4
 - 21 x LED indicators (including 4 x programmable LED)
- nROK 7251-7A
 - 14 x LED indicators (including 4 x programmable LED)
- 6 x Externally accessible SIM card sockets (4 x WWAN + 8 x SIM, BOM optional) w/ cover

- 1 x Reset button
- 2 x 2.5" external SSD/HDD
- 12 x SMA antenna holes
- nROK 7251-WI-7C4IP
 - 3 x USB 3.1 Gen1 Type A (5V/1A) w/ cover
 - 1 x USB 3.1 Gen2 Type A (5V/1A) w/ cover
- nROK 7251-7C4, nROK 7251-7A
 - 3 x USB 3.1 Gen1 Type A (5V/1A)
 - 1 x USB 3.1 Gen2 Type A (5V/1A)

I/O Interface-Rear

- nROK 7251-WI-7C4IP, nROK 7251-7C4:
 - 4 x M12 X-coded PoE 802.3af/at, max. 60W
 - 1 x M12 X-coded LAN port, 10/100/1000 Mbps
- nROK 7251-7A:
 - 2 x M12 X-coded LAN port, 10/100/1000 Mbps
- 1 x Waterproof DC input connector with ignition, male type
- 1 x M8 for 1 x Mic-in, 1 x Line-out
- 2 x Waterproof DB9 (COM1/COM2) for full RS232 (isolation)
- 1 x Waterproof DB9 (COM3) for full RS232/422/485 (isolation)
- 1 x M12 A-coded 10-pin (DIO)
 - 4 x DI and 4 x DO (isolation)
 - Power in for DIO isolation, 9~36VDC
- 1 x M12 A-coded for 2 x USB 2.0
- 1 x VGA
- 1 x HDMI (nROK 7251-7C4, nROK 7251-7A)

Power Management & Software Support

- nROK 7251-WI-7C4IP: power input 24~110 VDC w/ isolation
- nROK 7251-7C4, nROK 7251-7A: power input 24 VDC w/o isolation
- 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 10
- Linux

Dimensions

- nROK 7251-WI-7C4IP: 260 x 256 x 110 (W x D x H) (mm)
- nROK 7251-7C4, nROK 7251-7A: 260 x 256 x 84 (W x D x H) (mm)

Weight

- nROK 7251-WI-7C4IP: 6.5kg
- nROK 7251-7C4: 4.6kg
- nROK 7251-7A: 4.3kg

Environment

- Operating temperatures
 - EN 50155, class OT4 (-40~70°C), 85°C for 10 minutes (w/ 35W TDP CPU, industrial SSD) with air flow
- Storage temperatures: -40°C~80°C
- Relative humidity: 90% (non-condensing)
- Vibration (random)
 - 2g@5~500 Hz (in operation, SSD)
- Vibration (SSD)
 - Operating: MIL-STD-810G, Method 514.6, Category 4, common carrier US highway truck vibration exposure

- Storage: MIL-STD-810G, Method 514.6, Category 24, minimum integrity test
- Shock (SSD)
 - Operating: MIL-STD-810G, Method 516.6, Procedure I, functional shock=40g
 - Non-operating: MIL-STD-810G, Method 516.6, Procedure V, crash hazard shock test=75g

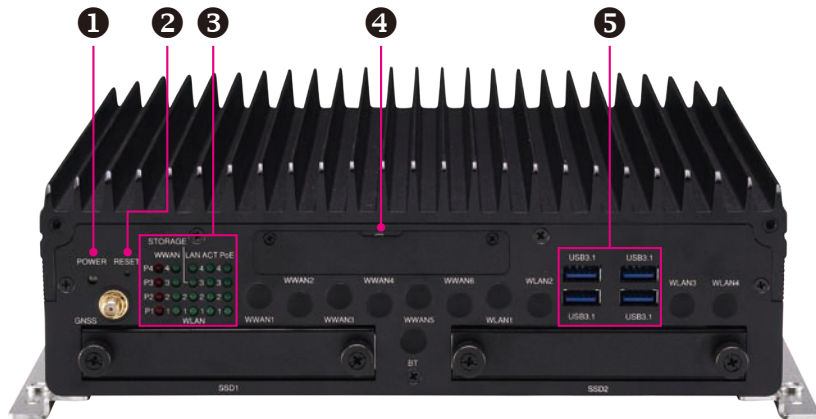
Certifications

- CE
- FCC Class A
- EN 50155: 2017
 - Ambient temperature EN 50155, Class OT4 (-40~70°C), 85°C for 10 minutes
 - Interruptions of voltage supply class S1, S2 (S2 for nROK 7251-WI-7C4IP: 36~110VDC@70% load)
 - 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: 2013+A1:2015

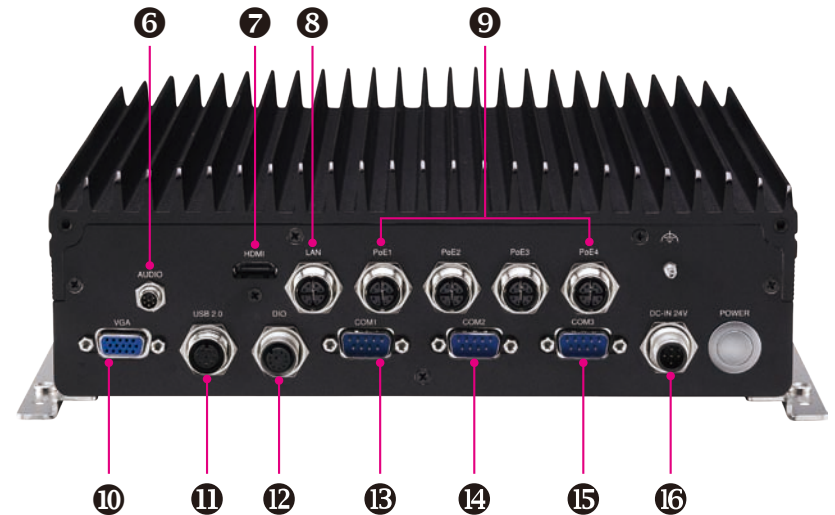
Connector Numbering

The following diagrams indicate the numbers of the connectors. Use these numbers to locate the connectors' respective pinout assignments on chapter 2 of the manual.

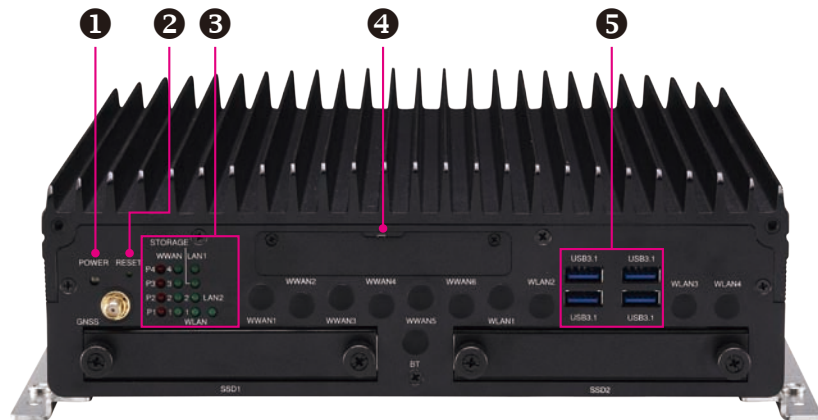
nROK 7251-7C4 Front View



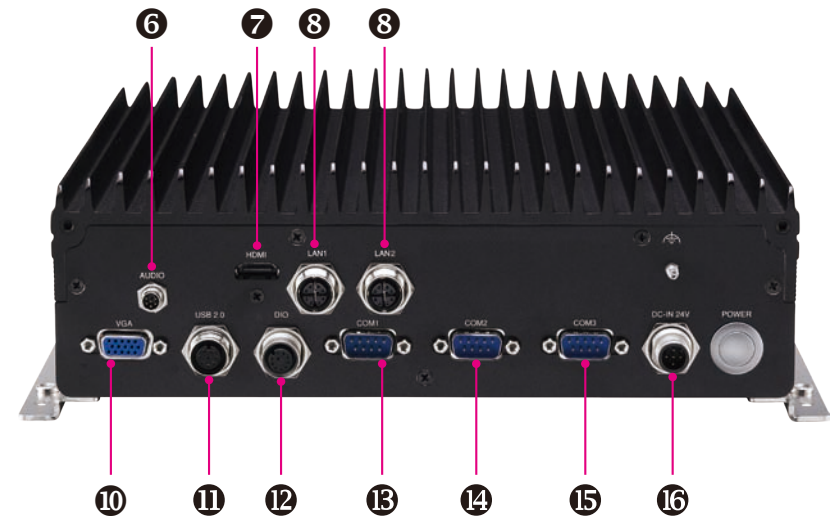
nROK 7251-7C4 Rear View



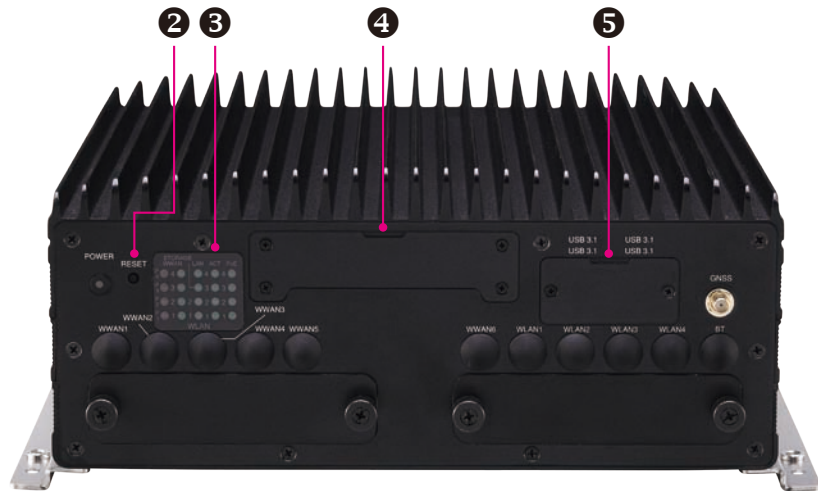
nROK 7251-7A Front View



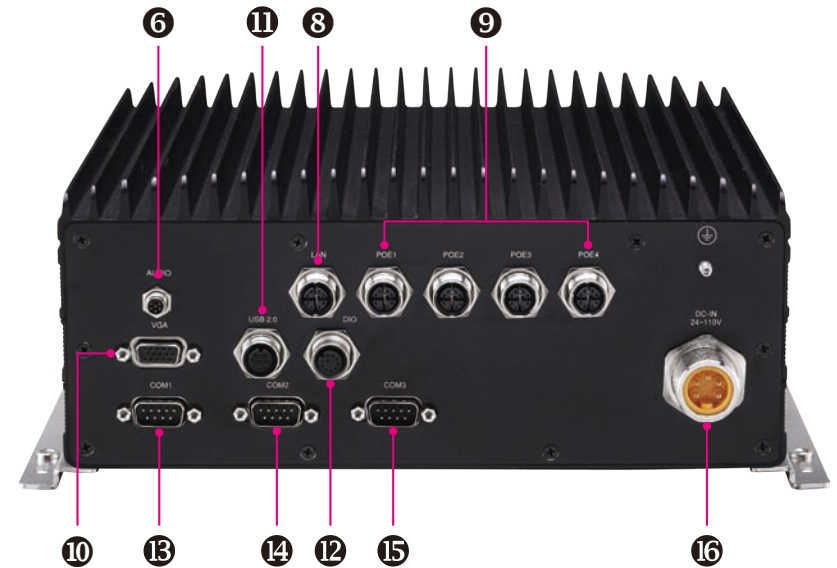
nROK 7251-7A Rear View



nROK 7251-WI-7C4IP Front View



nROK 7251-WI-7C4IP Rear View



CHAPTER 2: EXTERNAL CONNECTORS PINOUT DESCRIPTION

Power LED

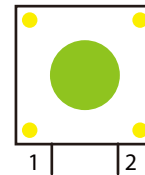
Connector number: 1



Color	Behavior
Blue On	Power On
Blue Off	Power Off
Red On	System power failure

Reset Button

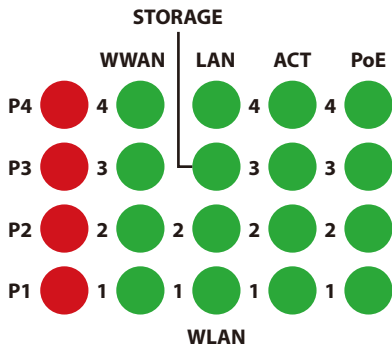
Connector number: 2



Pin	Definition
1	GND
2	RST_BTN#

LED Indicators (nROK 7251-7C4/7251-WI-7C4IP)

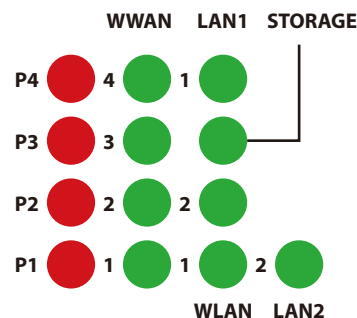
Connector number: 3



LED	LED Behavior
P1 – P4	Red On: Programmable LED
WWAN1 – WWAN4	Green On: WWAN active
LAN	Green On/Blinking: LAN active/access
STORAGE	Green Blinking: Storage access
WLAN1 – WLAN2	Green On: WLAN active
ACT1 – ACT4	Green On/Blinking: PoE LAN active/access
PoE1 – PoE4	Green On: Power active on PoE port

LED Indicators (nROK 7251-7A)

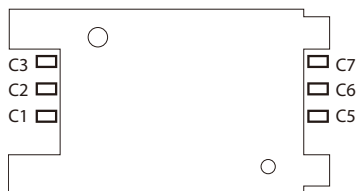
Connector number: 3



LED	LED Behavior
P1 – P4	Red On: Programmable LED
WWAN1 – WWAN4	Green On: WWAN active
LAN1/LAN2	Green On/Blinking: LAN active/access
STORAGE	Green Blinking: Storage access
WLAN1 – WLAN2	Green On: WLAN active

SIM1-1/1-2 to SIM4-1/4-2 Mini-SIM Sockets

Connector number: 4



SIM1-1/1-2 to SIM4-1/4-2

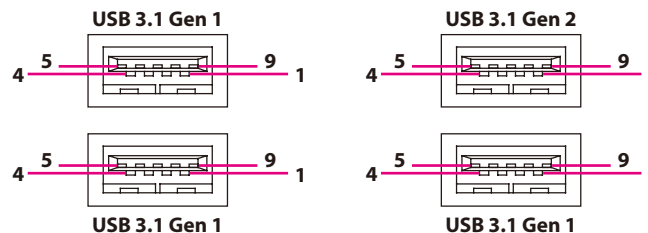
Pin	Definition	Pin	Definition
C1	UIM_PWR	C5	NC
C2	UIM_RST	C6	UIM_DAT
C3	UIM_CLK	C7	NC



Note: SIM4-1/4-2 (BOM optional)

USB 3.1 Ports

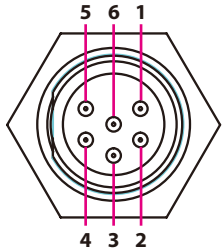
Connector Number: 5



Pin	Definition	Pin	Definition
1	5V	2	USB2.0_DATA-
3	USB2.0_DATA+	4	GND
5	USB3.1_RX_N	6	USB3.1_RX_P
7	GND	8	USB3.1_TX_N
9	USB3.1_TX_P		

M12 Audio Connector

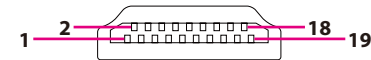
Connector Number: 6



Pin	Definition	Pin	Definition
1	FRONT_OUT_L	2	FRONT_OUT_JD
3	FRONT_OUT_R	4	MIC_L
5	MIC_JD	6	MIC_AGND

HDMI Connector

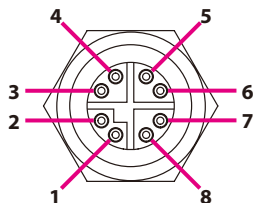
Connector number: 7



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

M12 LAN1/2 Connectors (LAN2 for nROK 7251-7A)

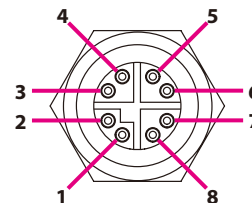
Connector Number: 8



Pin	Definition	Pin	Definition
1	MDI0P	2	MDI0N
3	MDI1P	4	MDI1N
5	MDI2P	6	MDI2N
7	MDI3P	8	MDI3N

PoE1 to PoE4 M12 Connectors (nROK 7251-7C4 and nROK 7251-WI-7C4IP)

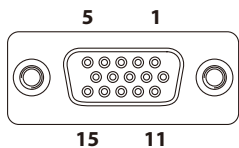
Connector Number: 9



Pin	Definition	Pin	Definition
1	MDI0P	2	MDI0N
3	MDI1P	4	MDI1N
5	MDI2P	6	MDI2N
7	MDI3P	8	MDI3N

VGA Connector

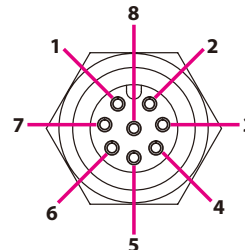
Connector number: 10



Pin	Definition	Pin	Definition
1	VGA_RED	2	VGA_GREEN
3	VGA_BLUE	4	NC
5	GND	6	GND
7	GND	8	GND
9	+5V	10	GND
11	NC	12	VGA_DATA
13	VGA_HS	14	VGA_VS
15	VGA_CLK		

M12 USB 2.0 Connector

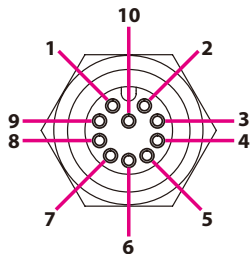
Connector Number: 11



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

DIO Connector

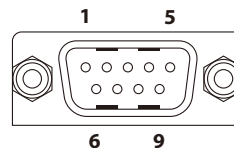
Connector Number: 12



Pin	Definition	Pin	Definition
1	GPI1	2	GPI2
3	GPI3	4	GPI4
5	GPO1	6	GPO2
7	GPO3	8	GPO4
9	VIN_GPIO	10	GND

COM1 RS232 Connector

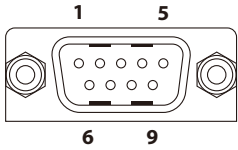
Connector number: 13



Pin	Definition	Pin	Definition
1	DCD	2	RXD
3	TXD	4	DTR
5	ISO_GND	6	DSR
7	RTS	8	CTS
9	RI		

COM2 RS232 Connector

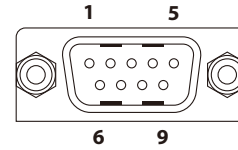
Connector number: 14



Pin	Definition	Pin	Definition
1	DCD	2	RXD
3	TXD	4	DTR
5	ISO_GND	6	DSR
7	RTS	8	CTS
9	RI		

COM3 RS232/RS422/RS485 Connector

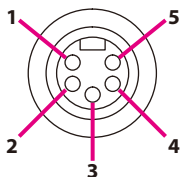
Connector number: 15



Pin	Definition	Pin	Definition
1	RS232 DCD#/RS422 TX- / RS485_DATA-	2	RS232 RX/RS422_TX+ / RS485_DATA+
3	RS232 TX/RS422_RX+	4	RS232 DTR#/RS422_RX-
5	GND	6	DSR#
7	RTS#	8	CTS#
9	RI		

DC Input (nROK 7251-WI-7C4IP)

Connector Number: 16



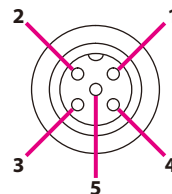
Pin	Definition	Pin	Definition
1	VIN	2	VIN
3	GND	4	GND
5	IGNITION		



Note: The power wattage of the power supply should be 2 times the power consumption of the system. (Please refer to Appendix G for system power consumption.)

DC Input (nROK 7251-7C4 and nROK 7251-7A)

Connector Number: 16



Pin	Definition	Pin	Definition
1	DC IN +	2	DC IN +
3	DC IN -	4	DC IN -
5	IGNITION		



Note: The power wattage of the power supply should be 2 times the power consumption of the system. (Please refer to Appendix G for system power consumption.)

CHAPTER 3: JUMPERS AND SWITCHES

This chapter describes how to set the jumpers on the nROK 7251 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 environment 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 the 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:

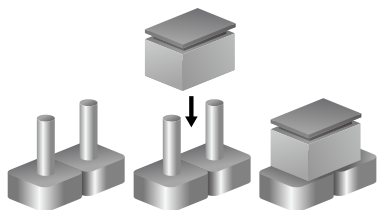
- Always disconnect the unit from the power outlet whenever you are working inside the case.
- If possible, wear a grounded wrist strap when you are working inside the computer case. Alternatively, discharge any static electricity by touching the bare metal chassis of the unit case, or the bare metal 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

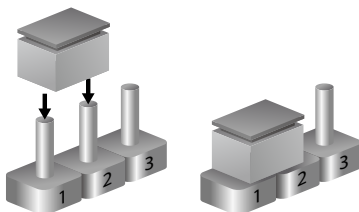
A jumper is the simplest kind of electric switch. It consists of two metal pins and a cap. When setting the jumpers, ensure that the jumper caps are placed on the correct pins. When the jumper cap is placed on both pins, the jumper is short. If you remove the jumper cap, or place the jumper cap on just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



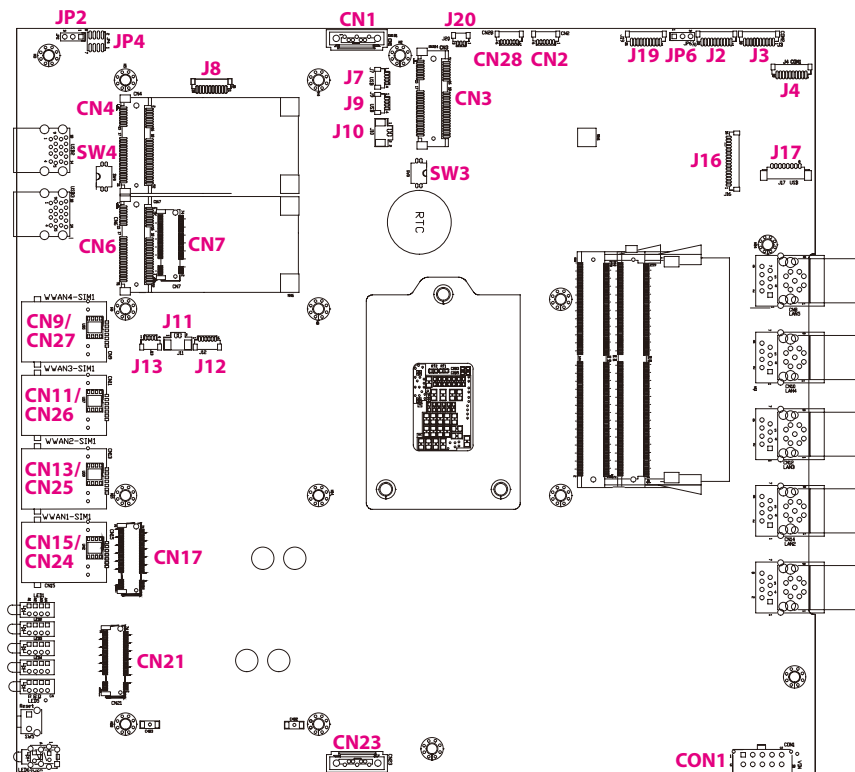
Three-Pin Jumpers: Pins 1 and 2 are Short



nROK 7251 Series Connector Specification & Jumper Setting

The figure below is the carrier board used in the nROK 7251 series. It shows the locations of the jumpers and connectors.

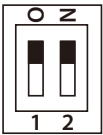
Locations of the Jumpers and Connectors for the Carrier Board



DIP Switch and Jumper Settings

RTC Clear Selection

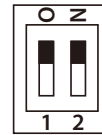
Connector location: SW3



SW	RTC (Pin1)	SRTC/ME (Pin2)
OFF	Normal	Normal
ON	Clear CMOS	Clear ME

Input Voltage Setup Selection

Connector location: SW4



POWERSW (Pin1)	12V24V (Pin2)	Result
OFF	OFF	12V
OFF	ON	24V
ON	ON	9~36V

GPIO Pull Power

Connector type: 1x3 3-pin header

Connector location: JP6



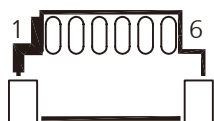
Pin	Settings
2-3 On	Internal ISO_5V

Internal Connectors

GPS Wire to Board Connector

Connector size: 1 x 6 = 6-pin header

Connector location: J12



Pin	Definition	Pin	Definition
1	3.3V	2	GPS LED
3	TX	4	RX
5	GND	6	3.3V

GPS Wafer Connector

Connector size: 1 x 4 = 4-pin header

Connector location: J13

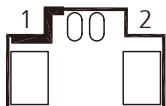


Pin	Definition	Pin	Definition
1	GND	2	NC
3	ODOMETER	4	DIRECTION

GPS Battery Connector

Connector size: 1 x 2 = 2-pin header

Connector location: J11

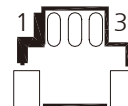


Pin	Definition
1	GND
2	VBAT

GPS DR In Connector

Connector size: 1 x 3 = 3-pin header

Connector location: J20

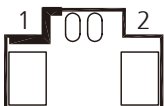


Pin	Definition
1	ODOMETER IN
2	DIRECTION IN
3	GND

RTC Battery Connector

Connector size: 1 x 2 = 2-pin header

Connector location: J10



Pin	Definition
1	GND
2	VBAT

GPIO Connector

Connector size: 1 x 10 = 10-pin header

Connector location: J19



Pin	Definition	Pin	Definition
1	GND	2	GPIO_Vin(max 36V)
3	GPO-4	4	GPO-3
5	GPO-2	6	GPO-1
7	GPI-4	8	GPI-3
9	GPI-2	10	GPI-1

COM1 RS232 DB9 Connector

Connector size: 1 x 10 = 10-pin header

Connector location: J4



Pin	Definition	Pin	Definition
1	GND	2	GND
3	CTS1	4	DSR1
5	DTR1	6	RXD1
7	RI1	8	RTS1
9	TXD1	10	DCD1

COM2 RS232 DB9 Connector

Connector size: 1 x 10 = 10-pin header

Connector location: J3



Pin	Definition	Pin	Definition
1	GND	2	GND
3	CTS2	4	DSR2
5	DTR2	6	RXD2
7	RI2	8	RTS2
9	TXD2	10	DCD2

COM3 RS232/RS422/RS485 DB9 Connector

Connector size: 1 x 10 = 10-pin header

Connector location: J2

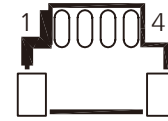


Pin	Definition	Pin	Definition
1	GND	2	GND
3	CTS#	4	DSR#
5	DTR#_RX-	6	RX_TX+
7	RI#_PW	8	RTS#
9	TX_RX+	10	DCD#_TX-

USB Connectors (Reserved)

Connector size: 1 x 4 = 4-pin header

Connector location: J7 and J9



Pin	Definition	Pin	Definition
1	GND	2	USB_P
3	USB_N	4	POWER

USB Connector (For USB M12 Connector)

Connector size: 1 x 8 = 8-pin header

Connector location: J17

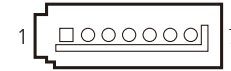


Pin	Definition	Pin	Definition
1	POWER	2	USB_2N
3	USB_2P	4	GND
5	POWER	6	USB_1N
7	USB_1P	8	GND

SATA Connectors

Connector size: 1 x 7 = 7-pin header

Connector location: CN1 and CN23



Pin	Definition	Pin	Definition
1	GND	2	SATA_TXP0
3	SATA_TXN0	4	GND
5	SATA_RXN0	6	SATA_RXP0
7	GND		

MCU Debug Port

Connector size: 1 x 3 = 3-pin header

Connector location: JP2

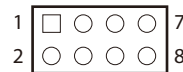


Pin	Definition
1	TX
2	RX
3	GND

MCU Download Port

Connector size: 2 x 4 = 8-pin header

Connector location: JP4

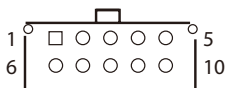


Pin	Definition	Pin	Definition
1	3.3V	2	MCU_TRST
3	MCU_TCK	4	MCU_TDO
5	MCU_RST	6	MCU_TDI
7	MCU_TMS	8	GND

DC IN Connector

Connector size: 2 x 5 = 10-pin header

Connector location: CON1



Pin	Definition	Pin	Definition
1	VIN (9~36V, default 12V/200W)	2	VIN (9~36V, default 12V/200W)
3	GND_IN	4	GND_IN
5	IGN	6	VIN (9~36V, default 12V/200W)
7	VIN (9~36V, default 12V/200W)	8	GND_IN
9	GND_IN	10	NC

Audio Connectors

Connector size: 1 x 6 = 6-pin header

Connector location: CN2 and CN28



Pin	Definition	Pin	Definition
1	Front_out_L/Surr_out_L	2	Front_out_JD/Surr_out_JD
3	Front_out_R/Surr_out_R	4	MIC_L/MIC_R
5	MIC_JD	6	GND

VGA Connector

Connector size: 1 x 16 = 16-pin header

Connector location: J16



Pin	Definition	Pin	Definition
1	GND	2	VGA_5V
3	VGA_CLK	4	VGA_DAT
5	VGA_VSYNC	6	VGA_HSYNC
7	GND	8	GND
9	GND	10	GND
11	VGA_BLUE	12	GND
13	VGA_GREEN	14	GND
15	VGA_RED	16	GND

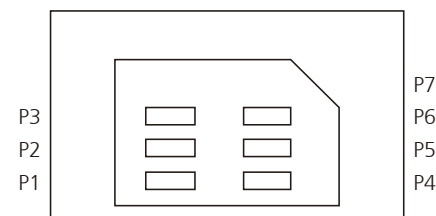
SIM1-1/SIM1-2 to SIM4-1/SIM4-2 Mini-SIM Slots

SIM1-1/SIM1-2 connector location: CN15/CN24

SIM2-1/SIM2-2 connector location: CN13/CN25

SIM3-1/SIM3-2 connector location: CN11/CN26

SIM4-1/SIM4-2 (BOM optional) connector location: CN9/CN27



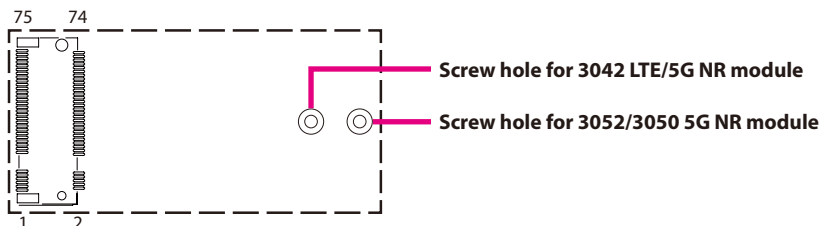
Pin	Definition	Pin	Definition
P1	UIM_PWR	P2	UIM_RST
P3	UIM_CLK	P4	GND
P5	NC	P6	UIM_DAT
P7	NC		

M.2 3042/3050/3052 Key B Socket (USB 2.0, USB 3.1 Gen2) for LTE/5G NR Module with 2 x External SIM

Connector location: WWAN1, CN21

SIM socket: SIM 1-1

SIM socket: SIM 1-2



Pin	Definition	Pin	Definition
1	M2B1_CONFIG3	2	+V3.3A_MINI_1
3	GND	4	+V3.3A_MINI_1
5	GND	6	M2B1_POWER_OFF#
7	PCIE1_USB_P_T	8	M2B1_W1_DIS#
9	PCIE1_USB_N_T	10	WWAN1_LED#
11	NC	20	NC
21	M2B1_CONFIG0	22	NC
23	SMS1_RI_3.5G_R	24	NC
25	NC	26	M2B1_W2_DIS#
27	GND	28	NC
29	PCIE1_USB3_RXN (Default set to USB3)	30	PCIE1_UIM_RST_A
31	PCIE1_USB3_RXP (Default set to USB3)	32	PCIE1_UIM_CLK_A
33	GND	34	PCIE1_UIM_DAT_A
35	PCIE1_USB3_TXN (Default set to USB3)	36	PCIE1_UIM_PWR_A

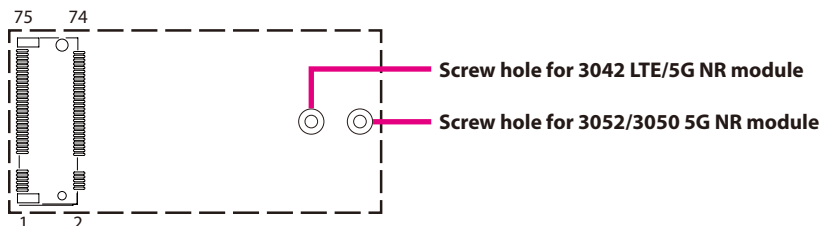
Pin	Definition	Pin	Definition
37	PCIE1_USB3_TXP (Default set to USB3)	38	NC
39	GND	40	NC
41	PCIE1_U8_RXN (BOM optional)	42	NC
43	PCIE1_U8_RXP (NC_BOM optional)	44	NC
45	GND	46	NC
47	PCIE1_U8_TXN (NC_BOM optional)	48	NC
49	PCIE1_U8_TXP (NC_BOM optional)	50	PCIERST# (NC_BOM optional)
51	GND	52	PCIE_CLKREQ4# (NC_BOM Optional)
53	PCIE1_CLKN (NC_BOM Optional)	54	M2A_PEWAKE#
55	PCIE1_CLKP (NC_BOM Optional)	56	M2B1_SM1_D
57	GND	58	M2B1_SM1_C
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	P1_3.5G_RST#	68	M2A_SUSCLK_R
69	M2B1_CONFIG1	70	+V3.3A_MINI_1
71	GND	72	+V3.3A_MINI_1
73	GND	74	+V3.3A_MINI_1
75	M2B1_CONFIG2		

M.2 3042/3050/3052 Key B Socket (USB 2.0, USB 3.1 Gen2) for LTE/5G NR Module with 2 x External SIM

Connector location: WWAN2, CN17

SIM socket: SIM 2-1

SIM socket: SIM 2-2



Pin	Definition	Pin	Definition
1	M2B2_CONFIG3	2	+V3.3A_MINI_2
3	GND	4	+V3.3A_MINI_2
5	GND	6	M2B2_POWER_OFF#
7	PCIE2_USB_P	8	M2B2_W1_DIS#
9	PCIE2_USB_N	10	WWAN2_LED#
11	NC	20	NC
21	M2B2_CONFIG0	22	NC
23	TP_SMS2_RI_3.5G_R	24	NC
25	NC	26	M2B2_W2_DIS#
27	GND	28	NC
29	PCIE2_USB3_RXN (Default set to USB3)	30	PCIE2_UIM_RST_A
31	PCIE2_USB3_RXP (Default set to USB3)	32	PCIE2_UIM_CLK_A
33	GND	34	PCIE2_UIM_DAT_A
35	PCIE2_USB3_TXN (Default set to USB3)	36	PCIE2_UIM_PWR_A

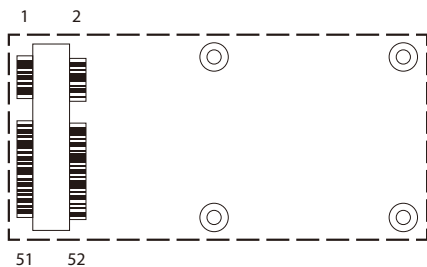
Pin	Definition	Pin	Definition
37	PCIE2_USB3_TXP (Default set to USB3)	38	NC
39	GND	40	NC
41	NC	42	NC
43	NC	44	NC
45	GND	46	NC
47	NC	48	NC
49	NC	50	NC
51	GND	52	PCIE_CLKREQ0# (NC_BOM Optional)
53	PCIE2_CLKN (NC_BOM Optional)	54	NC
55	PCIE2_CLKP (NC_BOM Optional)	56	M2B2_SM1_D
57	GND	58	M2B2_SM1_C
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	P2_3.5G_RST#	68	NC
69	M2B2_CONFIG1	70	+V3.3A_MINI_2
71	GND	72	+V3.3A_MINI_2
73	GND	74	+V3.3A_MINI_2
75	M2B2_CONFIG2		

Full Size Mini-PCIe Socket (USB 2.0) for LTE Module with 2 x External SIM

Connector location: WWAN3, CN6

SIM socket: SIM 3-1

SIM socket: SIM 3-2



Pin	Definition	Pin	Definition
1	SMS3_RI_3.5G_R_1	2	+V3.3A_MINI_3
3	NC	4	GND
5	NC	6	NC
7	PCIE3_CLKREQ1# (NC_BOM Optional)	8	PCIE3_UIM_PWR_A
9	GND	10	PCIE3_UIM_DAT_A
11	PCIE3_CLKN (NC_BOM Optional)	12	PCIE3_UIM_CLK_A
13	PCIE3_CLKP (NC_BOM Optional)	14	PCIE3_UIM_RST_A
15	GND	16	NC
17	NC	18	GND
19	NC	20	MINIPCI3_DIS#
21	GND	22	P3_3.5G_RST#
23	PCIE3_U3_RXN (NC_BOM Optional)	24	+V3.3A_MINI_3

Pin	Definition	Pin	Definition
25	PCIE3_U3_RXP (NC_BOM Optional)	26	GND
27	GND	28	NC
29	GND	30	NC
31	PCIE3_U3_TXN (NC_BOM Optional)	32	NC
33	PCIE3_U3_TXP (NC_BOM Optional)	34	GND
35	GND	36	PCIE3_USB_N
37	GND	38	PCIE3_USB_P
39	+V3.3A_MINI_3	40	GND
41	+V3.3A_MINI_3	42	PCIE3_WWAN
43	GND	44	PCIE3_WLAN
45	NC	46	NC
47	NC	48	NC
49	NC	50	GND
51	NC	52	+V3.3A_MINI_3

(BOM Optional)**M.2 3042 Key B Socket (USB 2.0, USB 3.1 Gen2) for LTE/5G NR Module with 2 x External SIM**

Connector location: WWAN3, CN7

SIM socket: SIM 3-1

SIM socket: SIM 3-2



Pin	Definition	Pin	Definition
1	M2B2_CONFIG3	2	+V3.3A_MINI_2
3	GND	4	+V3.3A_MINI_2
5	GND	6	M2B3_POWER_OFF#
7	PCIE3_USB_P	8	M2B3_W1_DIS#
9	PCIE3_USB_N	10	WWAN3_LED#
11	NC	20	NC
21	M2B3_CONFIG0	22	NC
23	TP_SMS3_RI_3.5G_R	24	NC
25	NC	26	M2B3_W2_DIS#
27	GND	28	NC
29	PCIE3_USB3_RXN (Default set to USB3)	30	PCIE3_UIM_RST_A
31	PCIE3_USB3_RXP (Default set to USB3)	32	PCIE3_UIM_CLK_A
33	GND	34	PCIE3_UIM_DAT_A
35	PCIE3_USB3_TXN (Default set to USB3)	36	PCIE3_UIM_PWR_A

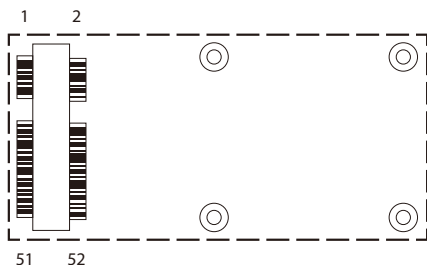
Pin	Definition	Pin	Definition
37	PCIE3_USB3_TXP (Default set to USB3)	38	NC
39	GND	40	NC
41	PCIE_RXN6 (NC_BOM Optional)	42	NC
43	PCIE_RXP6 (NC_BOM Optional)	44	NC
45	GND	46	NC
47	PCIE_TXN6 (NC_BOM Optional)	48	NC
49	PCIE_TXP6 (NC_BOM Optional)	50	PCIERST# (NC_BOM Optional)
51	GND	52	PCIE_CLKREQ1# (NC_BOM Optional)
53	PCIE3_CLKN (NC_BOM Optional)	54	NC
55	PCIE3_CLKP (NC_BOM Optional)	56	M2B3_SM1_D
57	GND	58	M2B3_SM1_C
59	NC	60	NC
61	NC	62	NC
63	NC	64	NC
65	NC	66	NC
67	P3_3.5G_RST#	68	NC
69	M2B3_CONFIG1	70	+V3.3A_MINI_3
71	GND	72	+V3.3A_MINI_3
73	GND	74	+V3.3A_MINI_3
75	+V3.3A_MINI_3		

Full Size Mini-PCIe Socket (USB 2.0, PCIe 3.0/SATA 3.0 [BIOS Selection])

Connector location: WWAN4/WLAN2, CN4

SIM socket: SIM 4-1 (BOM optional)

SIM socket: SIM 4-2 (BOM optional)

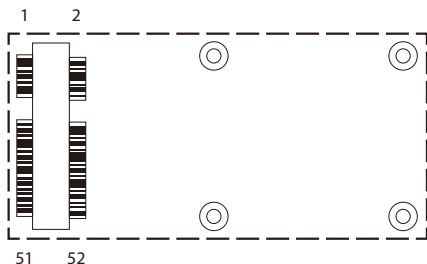


Pin	Definition	Pin	Definition
1	NC	2	+V3.3A_MINI_4
3	NC	4	GND
5	NC	6	PCIE4_1.5V_3
7	PCIE4_CLKREQ2#_R	8	PCIE4_UIM_PWR (NC_BOM Optional)
9	GND	10	PCIE4_UIM_DAT (NC_BOM Optional)
11	PCIE4_CLKN	12	PCIE4_UIM_CLK (NC_BOM Optional)
13	PCIE4_CLKP	14	PCIE4_UIM_RST (NC_BOM Optional)
15	GND	16	NC
17	NC	18	GND
19	NC	20	MINIPCI4_DIS#
21	GND	22	P4_3.5G_RST#
23	PCIE4_U3_RXN (Default set to PCIE/SATA)	24	+V3.3A_MINI_4

Pin	Definition	Pin	Definition
25	PCIE4_U3_RXP (Default Set to PCIE/SATA)	26	GND
27	GND	28	PCIE4_1.5V_2
29	GND	30	NC
31	PCIE4_U3_TXN (Default set to PCIE/SATA)	32	NC
33	PCIE4_U3_TXP (Default set to PCIE/SATA)	34	GND
35	GND	36	PCIE4_USB_N
37	GND	38	PCIE4_USB_P
39	+V3.3A_MINI_4	40	GND
41	+V3.3A_MINI_4	42	WWAN4_LED#
43	GND	44	WIFI_LED#
45	NC	46	NC
47	NC	48	PCIE4_1.5V_1
49	NC	50	GND
51	NC	52	+V3.3A_MINI_4

Full Size Mini-PCIe Socket (USB 2.0, PCIe 3.0/SATA 3.0 [BIOS Selection])

Connector location: WLAN1, CN3



Pin	Definition	Pin	Definition
1	NC	2	+V3.3A_MINI_5
3	NC	4	GND
5	NC	6	PCIE5_1.5V_3
7	PCIE_CLKREQ3#	8	NC
9	GND	10	NC
11	PCIE5_CLKN	12	NC
13	PCIE5_CLKP	14	NC
15	GND	16	NC
17	NC	18	GND
19	NC	20	MINIPCI5_DIS#
21	GND	22	P5_RST#
23	PCIE5_U3_RXN	24	+V3.3A_MINI_5
25	PCIE5_U3_RXP	26	GND

Pin	Definition	Pin	Definition
27	GND	28	PCIE5_1.5V_2
29	GND	30	W_SM2_C
31	PCIE5_U3_TXN	32	W_SM2_D
33	PCIE5_U3_TXP	34	GND
35	GND	36	PCIE5_USB_N
37	GND	38	PCIE5_USB_P
39	+V3.3A_MINI_5	40	GND
41	+V3.3A_MINI_5	42	NC
43	GND	44	WLAN_LED#
45	NC	46	NC
47	NC	48	PCIE5_1.5V_1
49	NC	50	GND
51	MBT_DIS#	52	+V3.3A_MINI_5

CHAPTER 4: SYSTEM SETUP

Removing the Chassis Cover



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.

For nROK 7251-7C4/nROK 7251-7A:

1. Remove the screw on the front panel.



2. Remove the screw on the rear panel.



3. Remove the screws on both sides of the chassis then remove the bottom cover.



For nROK 7251-WI-7C4IP:

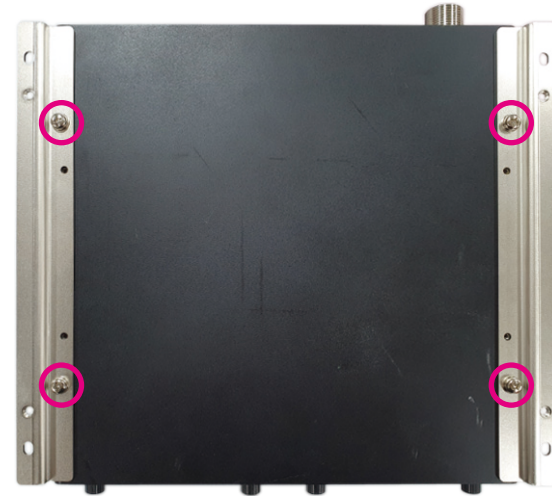
1. Remove the screws on the front panel.



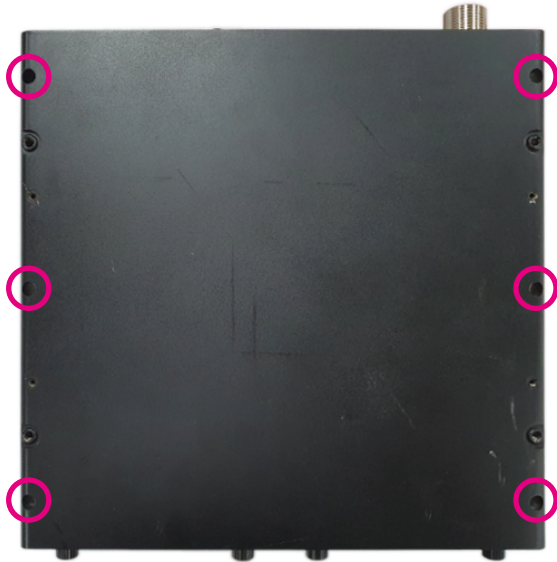
2. Remove the screws on the rear panel.



3. Remove the mounting bracket screws on the bottom of the enclosure.



4. After removing the brackets, loosen the screws on the bottom then remove the bottom cover.

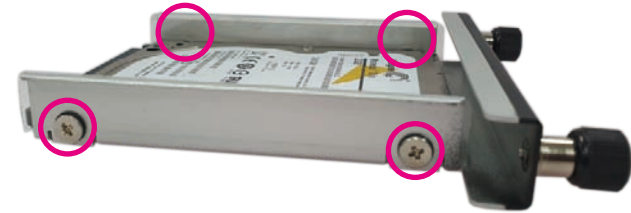


Installing a SSD/HDD Drive

1. Loosen the thumb screws on the SSD/HDD drive bays and slide the drive bays out.



2. Place the storage drive into the drive bay and align the storage drive's mounting holes with the mounting holes on the drive bay, then use the provided screws to secure the storage drive in place.



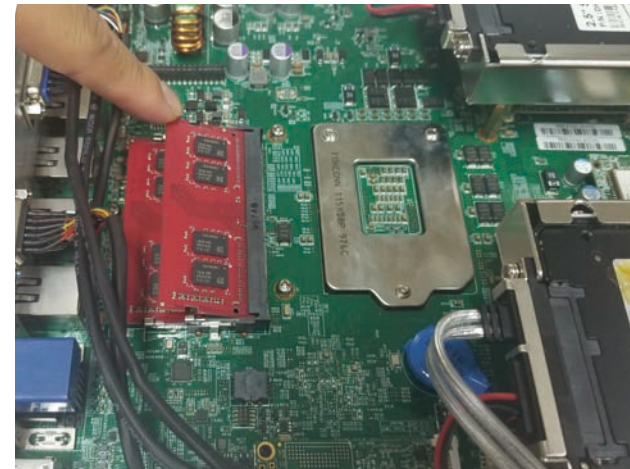
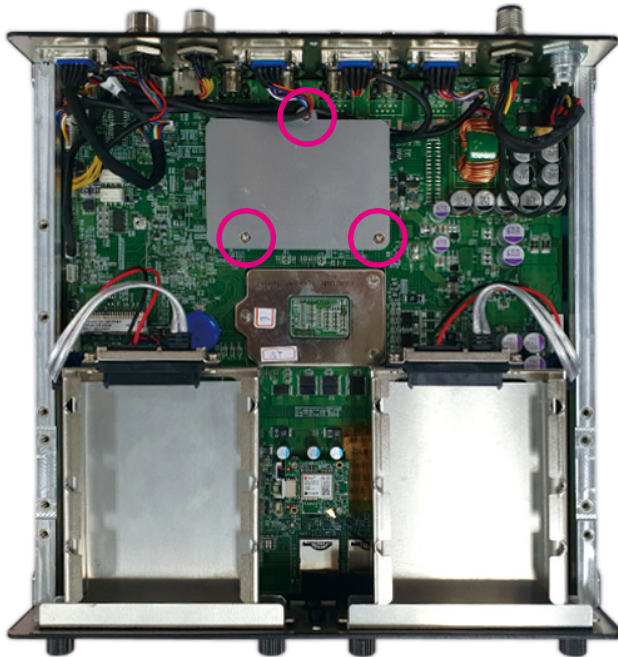
3. Insert the drive bays back in the SSD/HDD slots and tighten the thumb screws to secure them in place.



Installing a SO-DIMM Memory Module

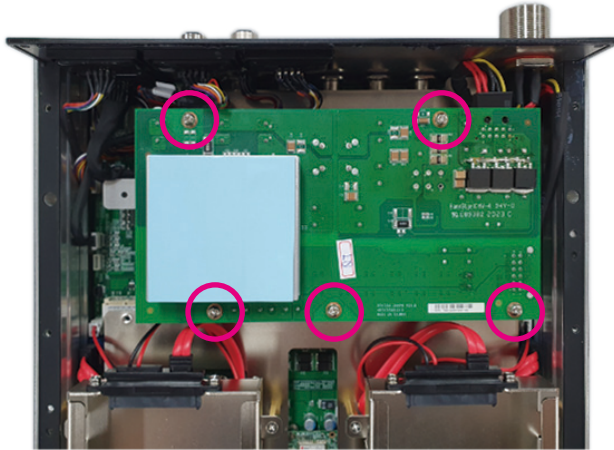
For nROK 7251-7C4/nROK 7251-7A:

1. Loosen the screws on the heat sink and remove the heat sink.
2. Push the ejector tabs which are at the ends of the socket outward. Then insert the 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.

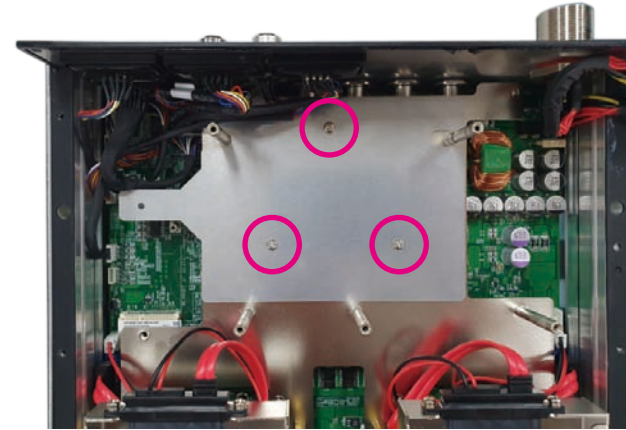


For nROK 7251-WI-7C4IP:

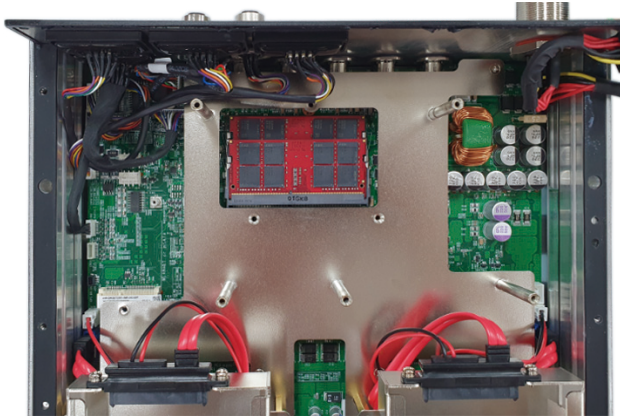
1. Loosen the screws on the power board and remove the power board.



2. Loosen the screws on the heat sink and remove the heat sink.



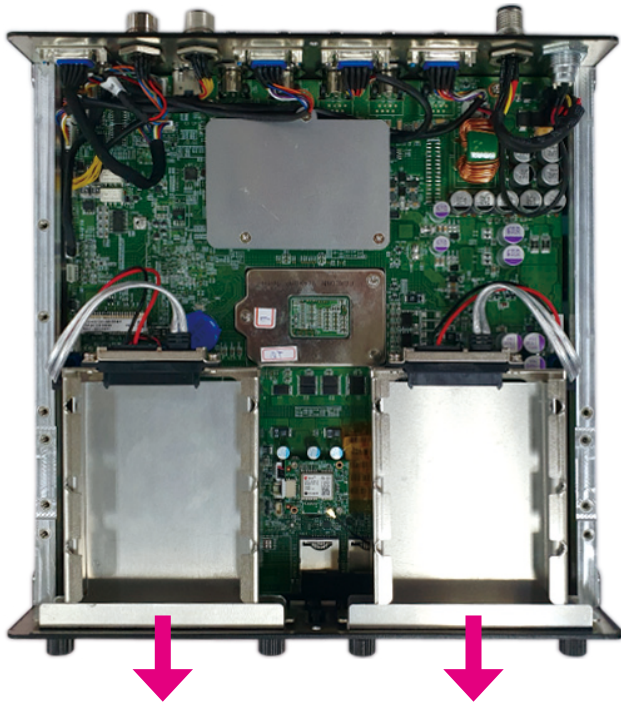
3. Push the ejector tabs which are at the ends of the socket outward. Then insert the module into the socket at an approximately 30 degrees angle. Apply firm even pressure to each end of the module until it slips down into the socket. The contact fingers on the edge of the module will almost completely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



Removing the Storage Trays Before Installing Modules

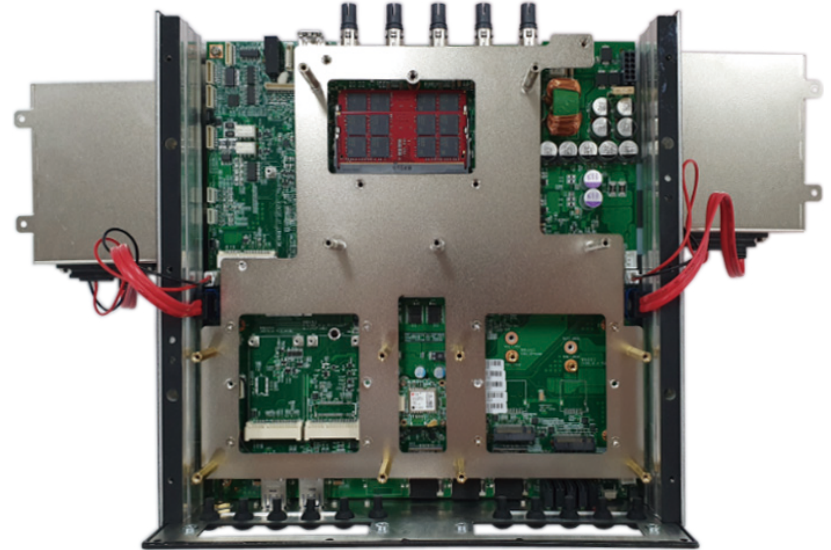
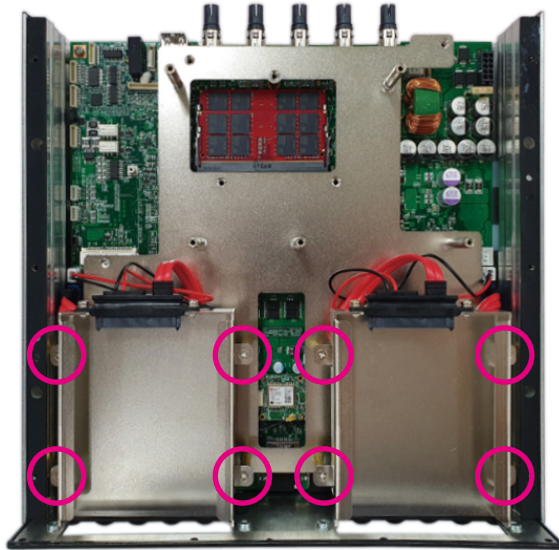
For nROK 7251-7C4/nROK 7251-7A:

1. Remove the storage trays.



For nROK 7251-WI-7C4IP:

1. Remove the screws on the storage trays.



Installing a WLAN Module

1. Locate the WLAN mini PCI Express slot (CN3 or CN4). 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 WWAN Module (Mini-PCIe)

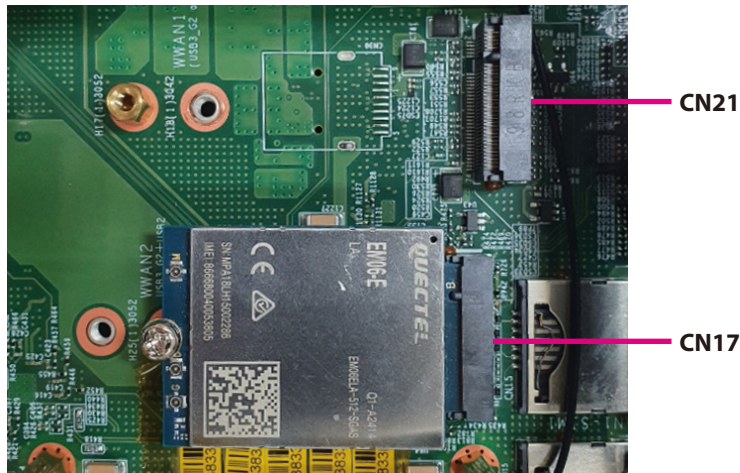
1. Locate the WWAN mini PCI Express slot (CN6). Insert the module into the mini PCI Express slot at a 45 degrees angle until the gold-plated connector on the edge of the module completely disappears inside the slot. Then fasten screws into the mounting holes to secure the module.



Installing a WWAN Module (M.2)

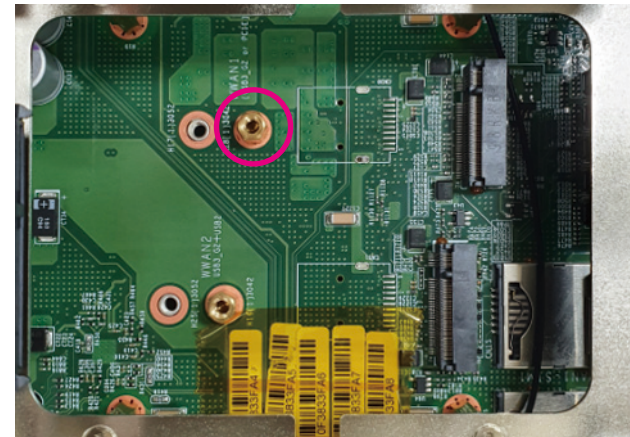
For M.2 3042:

1. Locate the WWAN M.2 slot (CN17 or CN21). 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.

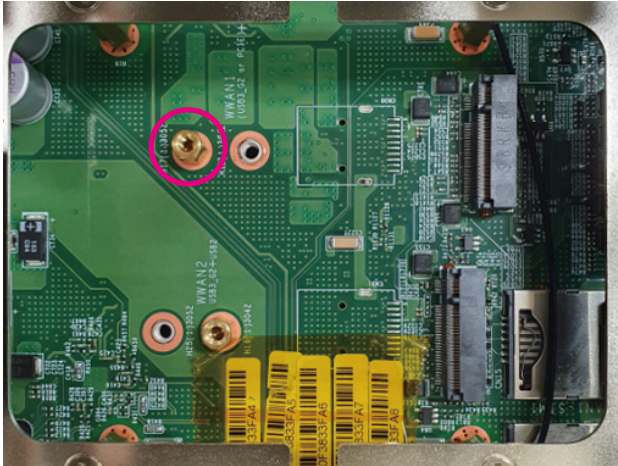


For M.2 3050/3052:

1. Locate the WWAN M.2 slot (CN17 or CN21). 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.



Installing an mSATA Module

1. Locate the mini PCI Express slot (CN3 or CN4). 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. Please be noted that you have to select the mSATA setting in the BIOS setup menu.



Installing a GPS Module

1. Insert the GPS module into the GPS slot. Then fasten screws into the mounting holes to secure the module. Connect the cables between the module and the motherboard as shown below. The internal dead reckoning signal cable (circled in red) is only available for the M&L module.



Inserting the SIM Cards

1. 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.



Installation direction
for top slot



Mini-SIM



Installation direction
for bottom slot



Mini-SIM

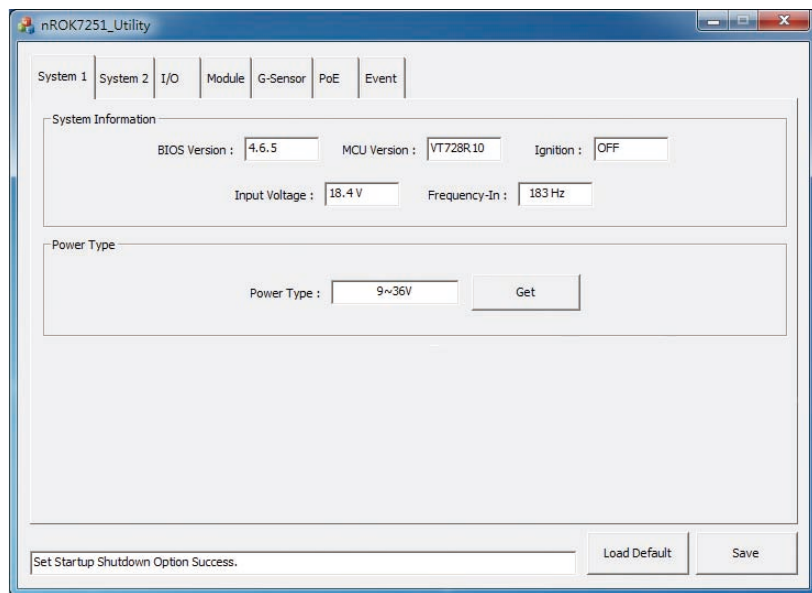
APPENDIX A:

SOFTWARE DEMO UTILITY FOR I/O PORTS OF FUNCTION CONTROL

NEXCOM's software demo utility enables users to test and control different I/O port functions on nROK 7251. This section shows how to use the utility. There are also source code files of the utility in the CD. Users can refer to the source codes to develop their applications.

Menu Screen

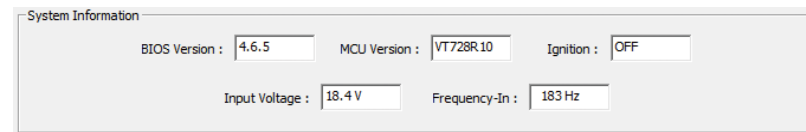
1. System 1



1.1 System Information

Displays basic information of the system.

- 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.



1.2 Power Type

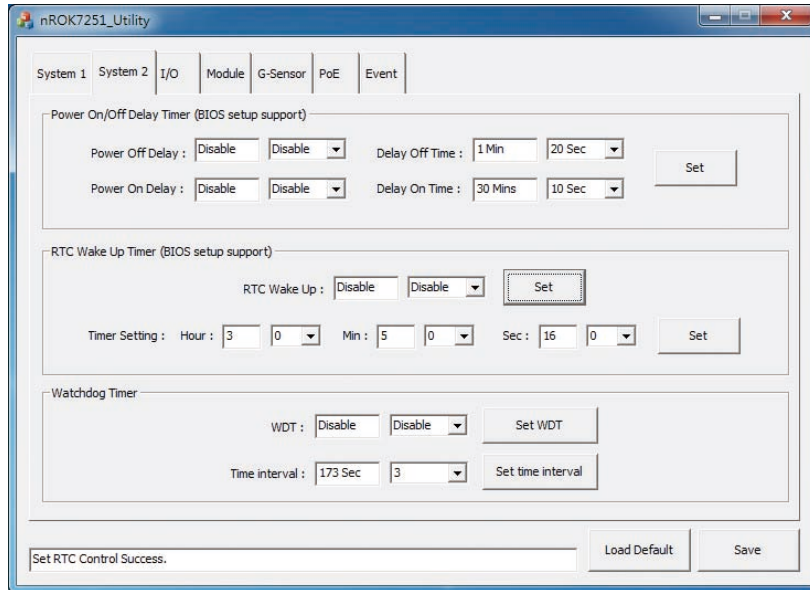
Shows the DIP switch setting of input voltage.

- 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.



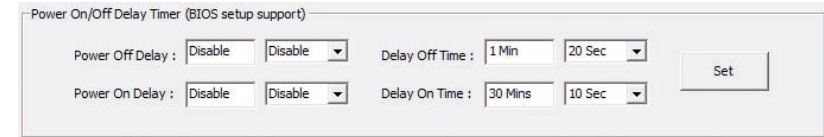
The screenshot shows a window titled "Power Type". Inside the window, there is a label "Power Type :" followed by a text input field containing "9~36V" and a "Get" button.

2. System 2



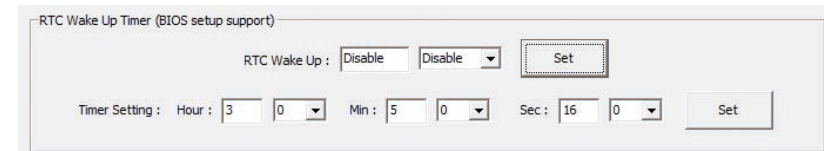
2.1 Power On/Off Delay Timer

Enables or disables the delay time function. There are several selections of delay time.



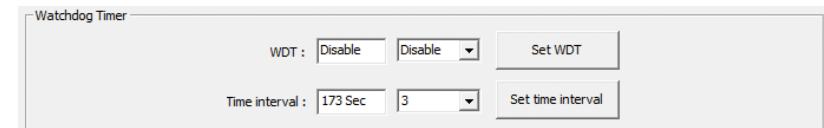
2.2 RTC Wake Up Timer

Enables or disables the alarm wake up function. Once this function is enabled, the timer setting of alarm timer can be configured.

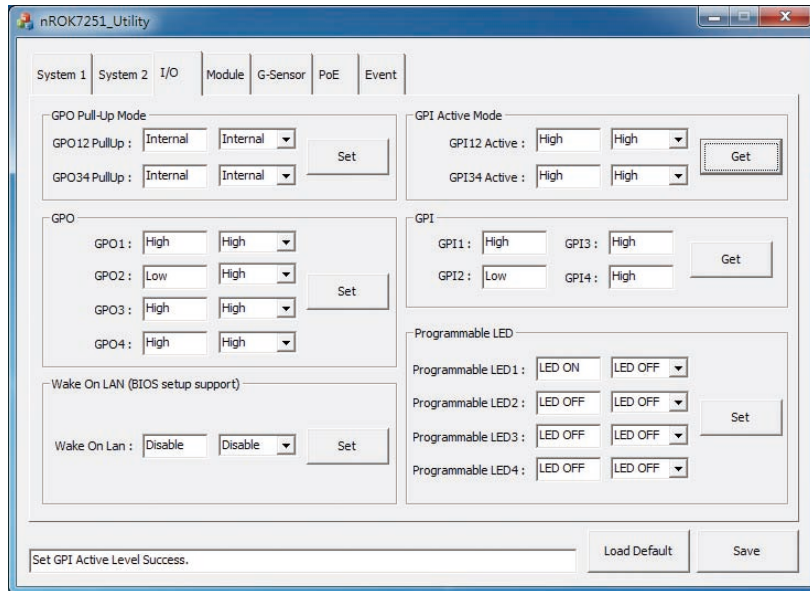


2.3 Watchdog Timer

Enables or disables the WDT function. There are several selections of time. The timer of WDT can also be cleared by the Set WDT button.

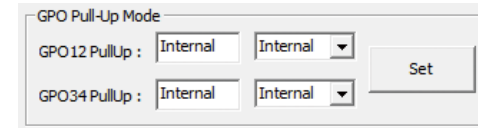


3. I/O



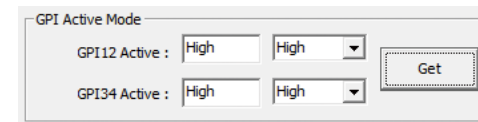
3.1 GPO

Configures GPO Pull-Up mode as internal or external.



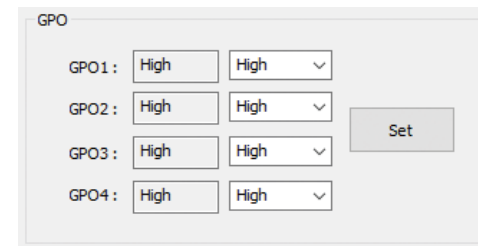
3.2 GPI Active Mode

Reads the status of GPI active.



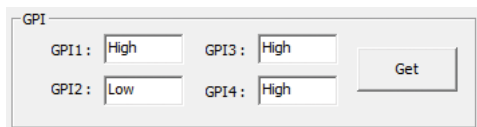
3.3 GPO

Configures GPO as high voltage level or low voltage level.



3.4 GPI

Reads the status (voltage level) of GPI.

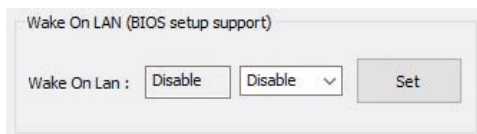


GPI

GPI1 :	High	GPI3 :	High	Get
GPI2 :	Low	GPI4 :	High	

3.5 Wake On LAN

Enables or disables the Wake On LAN function on LAN.

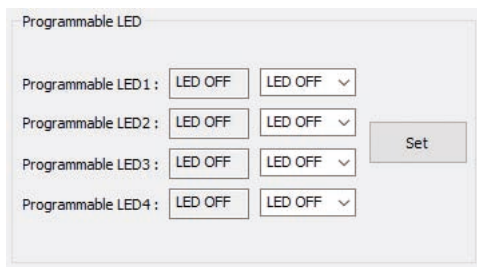


Wake On LAN (BIOS setup support)

Wake On Lan :

3.6 Programmable LED

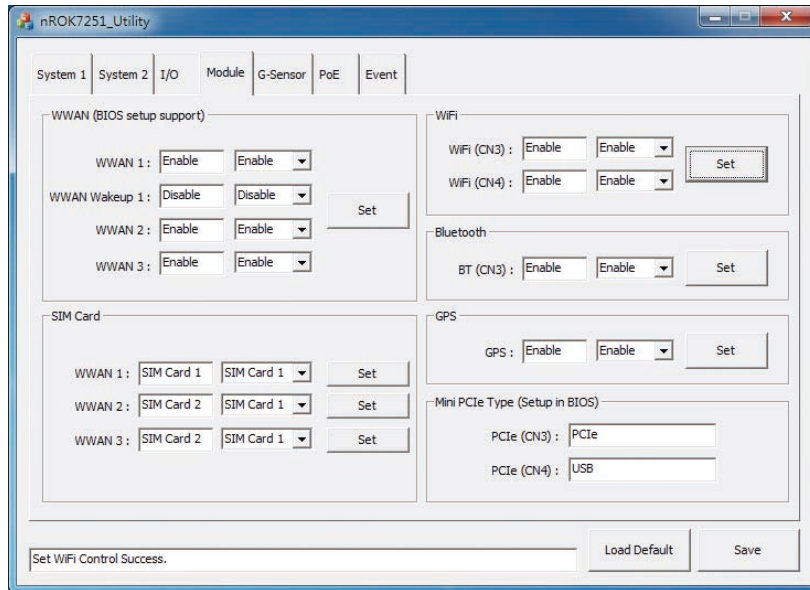
Defines the programmable LEDs as ON or OFF.



Programmable LED

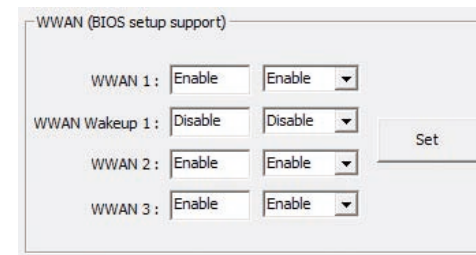
Programmable LED 1 :	LED OFF	LED OFF	Set
Programmable LED 2 :	LED OFF	LED OFF	
Programmable LED 3 :	LED OFF	LED OFF	
Programmable LED 4 :	LED OFF	LED OFF	

4. Module



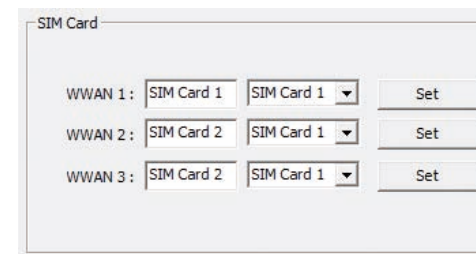
4.1 WWAN

Enables or disables the WWAN1 function on CN20/CN21.
 Enables or disables the WWAN1 wakeup function.
 Enables or disables the WWAN2 function on CN16/CN17.
 Enables or disables the WWAN3 function on CN6/CN7.
 The setting can also be cleared by the Set button.



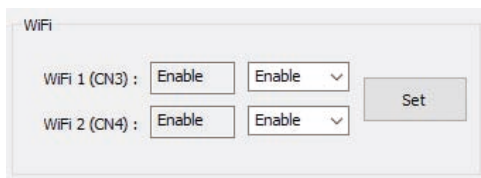
4.2 SIM Cards

Selects whether the SIM card setting on WWAN1 is from SIM card 1 or SIM card 2.
 Selects whether the SIM card setting on WWAN2 is from SIM card 1 or SIM card 2.
 Selects whether the SIM card setting on WWAN3 is from SIM card 1 or SIM card 2.
 The setting can also be cleared by the Set button.



4.3 WiFi

Enables or disables the Wi-Fi module function on the CN3 mini PCIe socket.
Enables or disables the Wi-Fi module function on the CN4 mini PCIe socket.
The setting can also be cleared by the Set button.



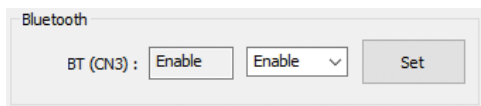
WiFi

WiFi 1 (CN3) :

WiFi 2 (CN4) :

4.4 Bluetooth

Enables or disables the BT function on the CN3 mini PCIe socket.
The setting can also be cleared by the Set button.

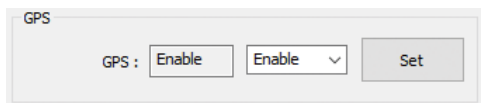


Bluetooth

BT (CN3) :

4.5 GPS

Enables or disables the GPS function.

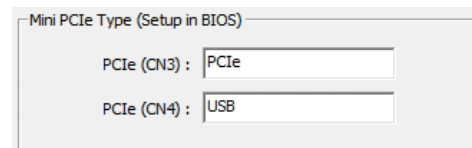


GPS

GPS :

4.6 Mini PCIe Type

Selects the slot type (SATA/USB/PCIe) on the CN3 mini PCIe socket.
Selects the slot type (SATA/USB/PCIe) on the CN4 mini PCIe socket.

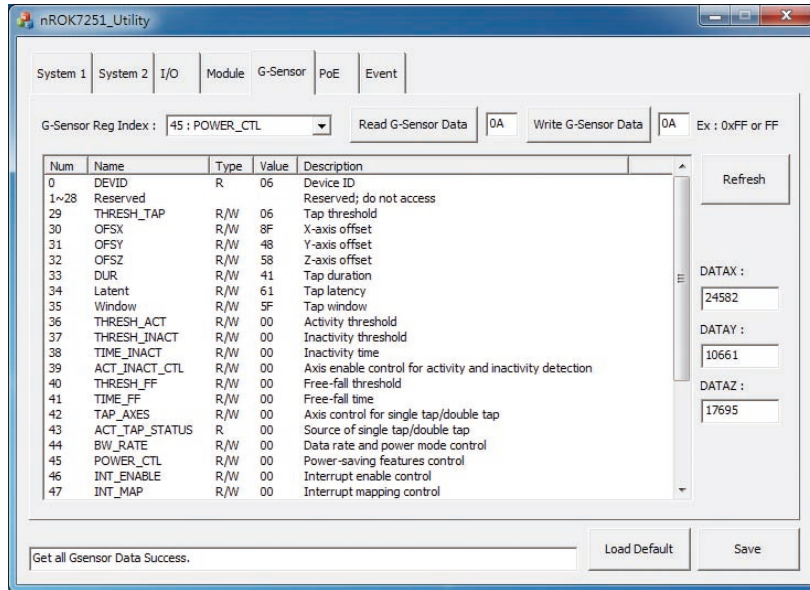


Mini PCIe Type (Setup in BIOS)

PCIe (CN3) :

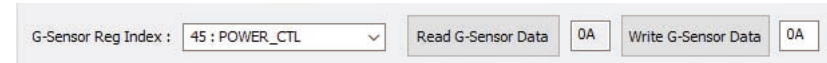
PCIe (CN4) :

5. G-Sensor



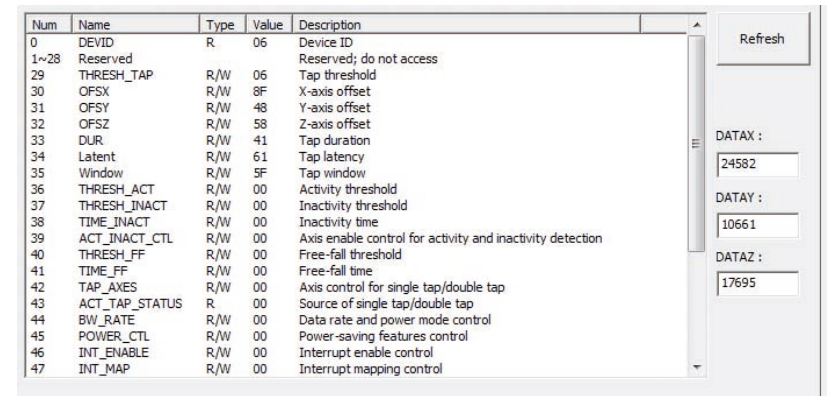
5.1 G-Sensor Register Index

Selects the registers inside G-Sensor to read or write the data.



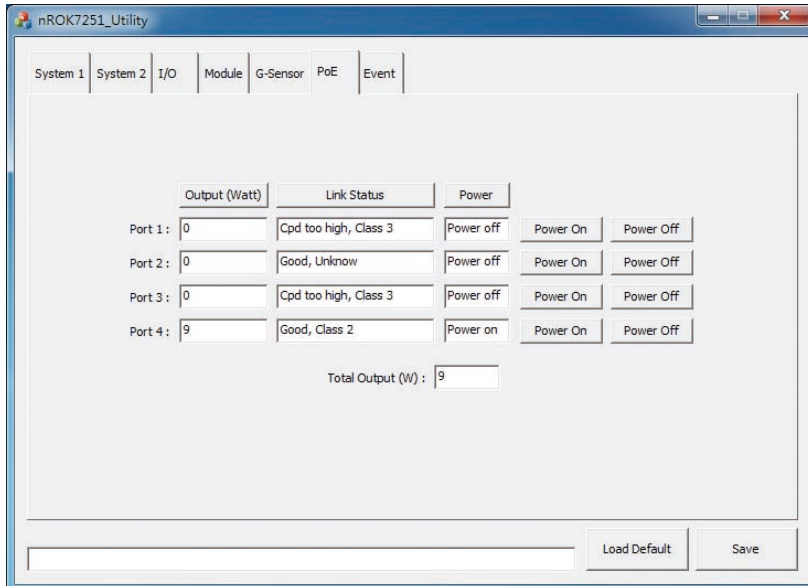
5.2 Register Table

Shows the value of all registers in G-Sensor, once the Refresh button is pressed.

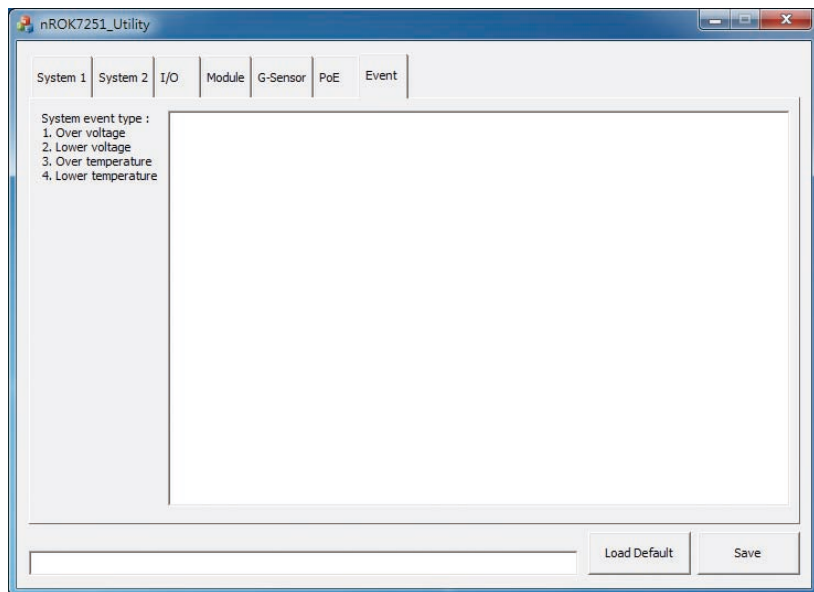


6. PoE (nROK 7251-7C4 and nROK 7251-WI-7C4IP)

The PoE menu tab displays the status (Power on or Power off) of the PoE ports and other PoE related information.



7. Event



The Event menu tab shows the events of nROK 7251.

1. Over voltage alarm
2. Lower voltage alarm
3. Over temperature alarm
4. Lower temperature alarm

(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: Define when the tracker function starts after ignition signal becomes low.

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

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

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

IMEI: IMEI of the WWAN module will be shown.

APPENDIX B: GPS FEATURE

uBlox-NEO M8 Overview

The NEO-M8 series of standalone concurrent GNSS modules is built on the exceptional performance of the u-blox M8 GNSS (GPS, GLONASS, Galileo, BeiDou, QZSS and SBAS) engine in the industry proven NEO form factor.

The NEO-M8 series provides high sensitivity and minimal acquisition times while maintaining low system power. The NEO-M8M is optimized for cost sensitive applications, while NEO-M8N and NEO-M8Q provide best performance and easier RF integration. 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-M8 combines a high level of robustness and integration capability with flexible connectivity options. The future-proof NEO-M8N includes an internal Flash that allows simple firmware upgrades for supporting additional GNSS systems. This makes NEO-M8 perfectly suited to industrial and automotive applications.

The DDC (I²C compliant) interface provides connectivity and enables synergies with most u-blox cellular modules. For RF optimization the NEO-M8N/Q features an additional front-end LNA for easier antenna integration and a front-end SAW filter for increased jamming immunity.

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

Technical Specifications

Features

Receiver type	72-channel u-blox M8 engine GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1 SBAS L1 C/A: WAAS, EGNOS, MSAS Galileo-ready E1B/C (NEO-M8N)		
Nav. update rate¹	Single GNSS: up to 18 Hz Concurrent GNSS: up to 10 Hz		
Position accuracy	2.0 m CEP		
Acquisition		NEO-M8N/Q	NEO-M8M
	Cold starts:	26 s	27 s
	Aided starts:	2 s	4 s
	Reacquisition:	1 s	1 s
Sensitivity			
	Tracking & Nav:	-167 dBm	-164 dBm
	Cold starts:	-148 dBm	-147 dBm
	Hot starts:	-156 dBm	-156 dBm
Assistance	AssistNow GNSS Online AssistNow GNSS Offline (up to 35 days) AssistNow Autonomous (up to 6 days) OMA SUPL & 3GPP compliant		
Oscillator	TCXO (NEO-M8N/Q), Crystal (NEO-M8M)		
RTC crystal	Built-in		
Noise figure	On-chip LNA (NEO-M8M). Extra LNA for lowest noise figure (NEO-M8N/Q)		

Features cont.

Anti jamming	Active CW detection and removal. Extra onboard SAW band pass filter (NEO-M8N/Q)
Memory	ROM (NEO-M8M/Q) or Flash (NEO-M8N)
Supported antennas	Active and passive
Odometer	Travelled distance
Data-logger	For position, velocity, and time (NEO-M8N)

¹ For NEO-M8M/Q

Electrical data

Supply voltage	1.65 V to 3.6 V (NEO-M8M) 2.7 V to 3.6 V (NEO-M8N/Q)
Power consumption²	23 mA @ 3.0 V (continuous) 5 mA @ 3.0 V Power Save Mode (1 Hz, GPS only)
Backup Supply	1.4 to 3.6 V

² NEO-M8M

Interfaces

Serial interfaces	1 UART 1 USBV2.0 full speed 12 Mbit/s 1 SPI (optional) 1 DDC (I ² C compliant)
Digital I/O	Configurable timepulse 1 EXTINT input for Wakeup
Timepulse	Configurable 0.25 Hz to 10 MHz
Protocols	NMEA, UBX binary, RTCM

VIOB-GPS-02 Module Connector Pin Definitions



J2 (GPS Side)



J12 (PC 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

J12 Pin Definition

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

COM Port for GPS: COM 4
Baud Rate: 9600

APPENDIX C: GPS WITH DEAD RECKONING FEATURE

uBlox-NEO M8L 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-ready¹, BeiDou, QZSS and SBAS) engine in the compact and industry proven NEO form factor.

The NEO-M8L delivers a complete, self-contained solution for road-vehicle 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 multi-level 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 (I²C 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-Fix³	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
Sensitivity⁶	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 accuracy⁸	Autonomous	2.5 m	2.5 m	2.5 m
	SBAS	2.0 m	2.0 m	2.0 m
Velocity accuracy⁹		0.05 m/s	0.05 m/s	0.05 m/s
Heading accuracy⁹		0.3 degree	0.3 degree	0.3 degree
ADR position error¹⁰	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 latency¹²		300 ms nominal		
Maximum sensor measurement message output rate		10 Hz		
Sensor measurement message output bandwidth¹³		nominal 50% of output rate		
Accuracy of time pulse signal	RMS 99%	30 ns 60 ns	30 ns 60 ns	30 ns 60 ns
Operational limits	Dynamics		≤ 4G	
	Altitude		50,000m	
	Velocity		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)



J12 (PC Side)



J3 (GPS Side)



J13 (PC 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

J12 Pin Definition

Pin	Definition	Pin	Definition
1	3.3V	2	GPS LED
3	TX	4	RX
5	GND	6	3.3V

COM Port for GPS: COM 4
Baud Rate: 9600

J3 Pin Definition

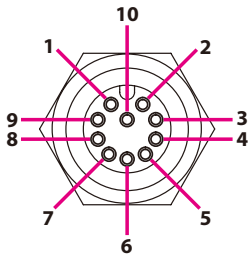
Pin	Definition	Pin	Definition
1	DR_DIRECTIO_M_R	2	DR_ODOMETER_M_R
3	1PPS_R	4	GND

J13 Pin Definition

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

APPENDIX D: SIGNAL CONNECTION OF MCU DI/DO

GPIO Pinout Description



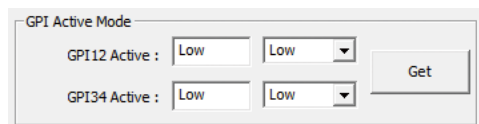
Pin	Definition	Pin	Definition
1	GPI1	2	GPI2
3	GPI3	4	GPI4
5	GPO1	6	GPO2
7	GPO3	8	GPO4
9	VIN_GPIO	10	GND

Digital Input

The GPIO connector (DIO, connector number: 12) for GPI signal (digital signal input). The GPIO has 4 digital input channels by default.

Wet Contact (default)

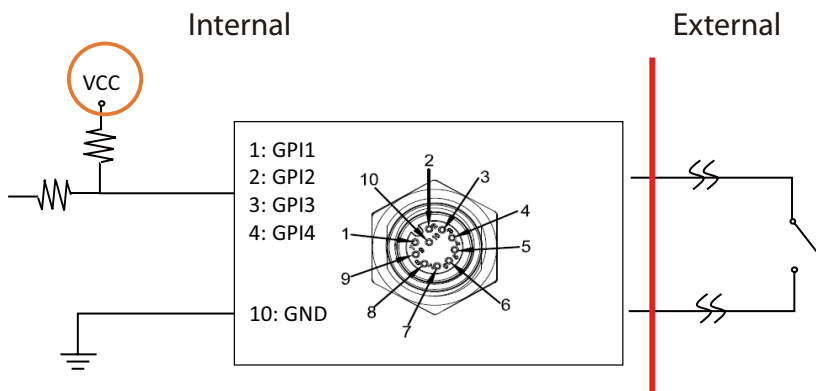
The "GPI Active" needs to set to "Low" in Software Demo Utility as shown below or SDK. The GPI signals have a pull up resistor to Vin Voltage internally.



Note: Example of GPI 1 and GPI 2 as a pair, and GPI 3 and GPI 4 as a pair.

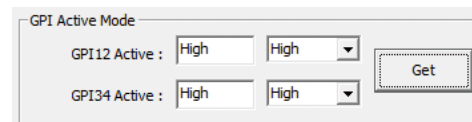
The figure below shows how to connect an external output source to one of the input channels.

Internal Sourcing (Default)



Dry Contact:

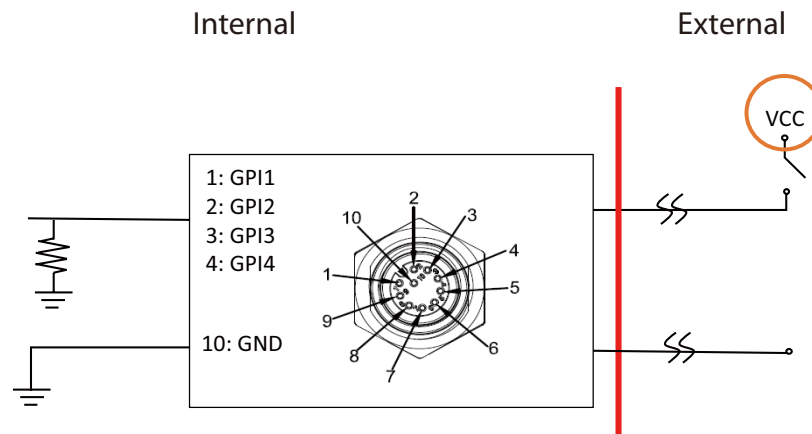
The "GPI Active" needs to set to "High" in Software Demo Utility as shown below or SDK. The GPI signal will not have a pull up resistor internally.



Note: Example of GPI 1 and GPI 2 as a pair, and GPI 3 and GPI 4 as a pair.

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

External Sourcing



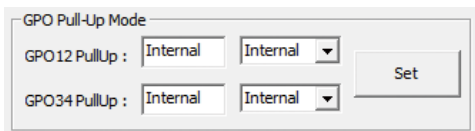
Digital Output

The GPIO (DIO, connector number: 12) connector 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. The output signal has two states, one is low level (driven to 0V from GPO signal) other is open (high voltage is provided from external device).

Wet Contact (default)

The “GPO PullUp” needs to set to “Internal” in Software Demo Utility as shown below or SDK. The GPO signal will have a pull up resistor to Vin Voltage internally.



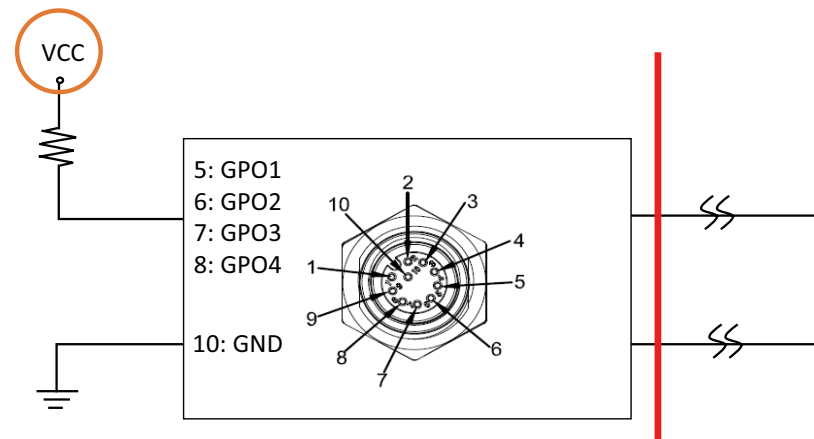
Note: Example of GPO 1 and GPO 2 as a pair, and GPO 3 and GPO 4 as a pair.

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

Internal Sourcing (Default)

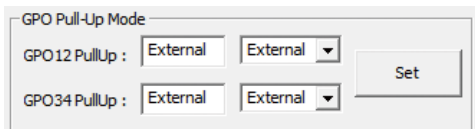
Internal

External



Dry Contact

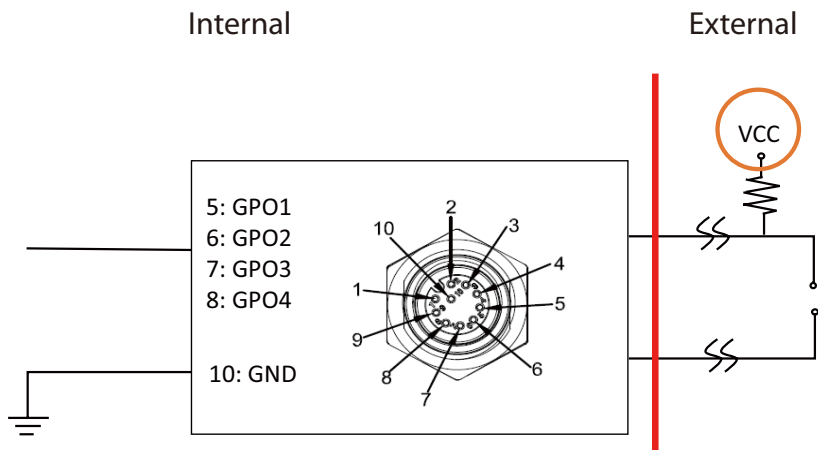
The “GPO PullUp” needs to set to “External” in Software Demo Utility as shown below or SDK. The GPO signal will not have a pull up resistor internally.



Note: Example of GPO 1 and GPO 2 as a pair, and GPO 3 and GPO 4 as a pair.

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

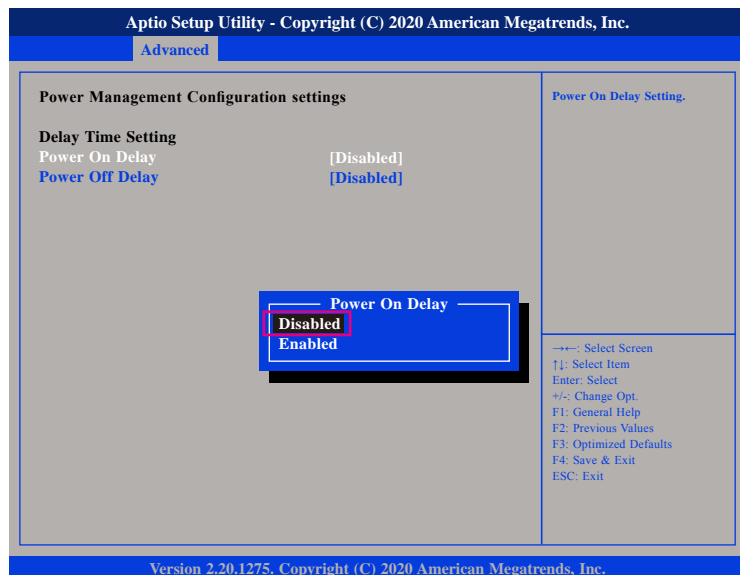
External Sourcing



APPENDIX E: VEHICLE POWER MANAGEMENT/CN16 WLAN/mSATA SETUP

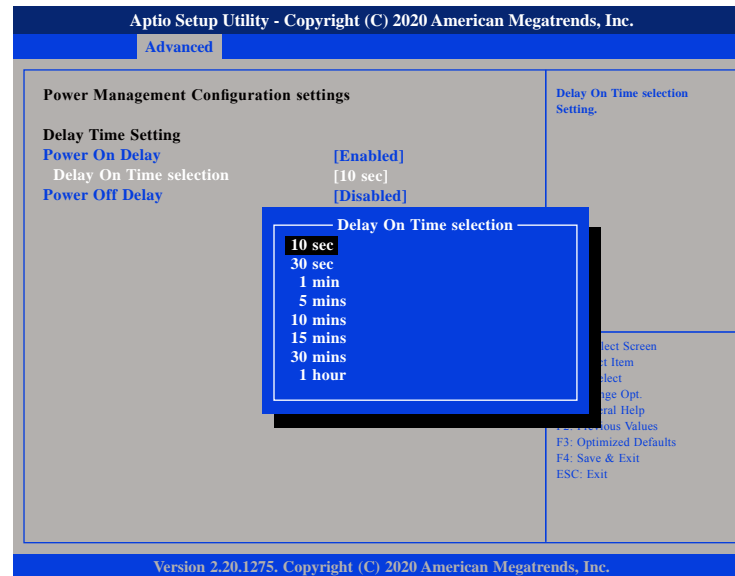
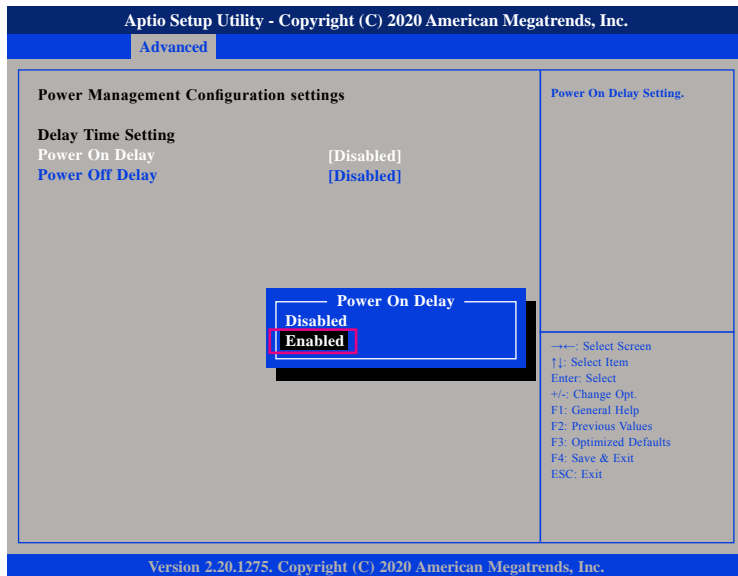
Power-on Delay Setting

Disable Power-on Delay



Enable Power-on Delay

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



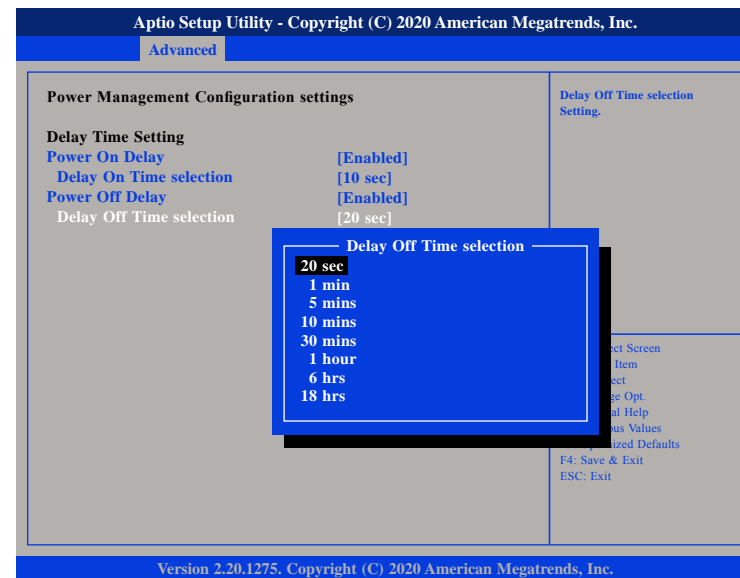
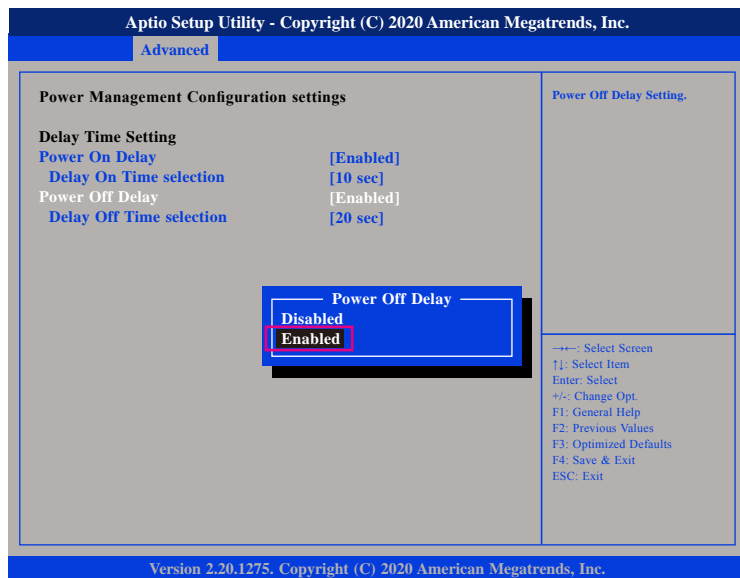
Power-off Delay Setting

Disable Power-off Delay



Enable Power-off Delay

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

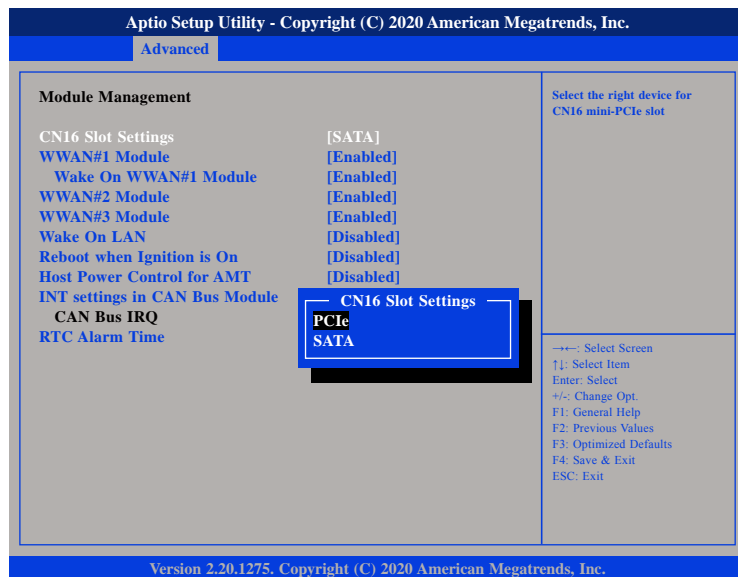


CN16 Signal Setting

Selecting the application type of the CN16 signal

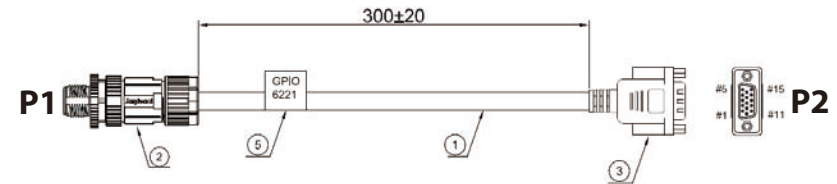
For Wi-Fi or mini-PCIe modules, please select **PCIe** (PCIe + USB 2.0).

For mSATA modules, please select **SATA**.

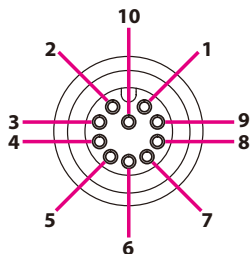


APPENDIX F: PIN DEFINITION FOR THE MULTIPOINT CABLE

DIO: The multiport consists of a 10-pin male M12 connector and an output connector. The tables in this appendix list the pin signals of the P1 connector and its corresponding pin signals to the output connector.



P1 Connector Pinout

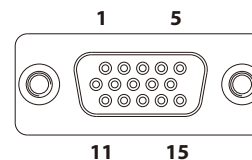


Pin	Definition	Pin	Definition
1	GPI1	2	GPI2
3	GPI3	4	GPI4
5	GPO1	6	GPO2
7	GPO3	8	GPO4
9	VIN_GPIO	10	GND

P2 Connector Pinout

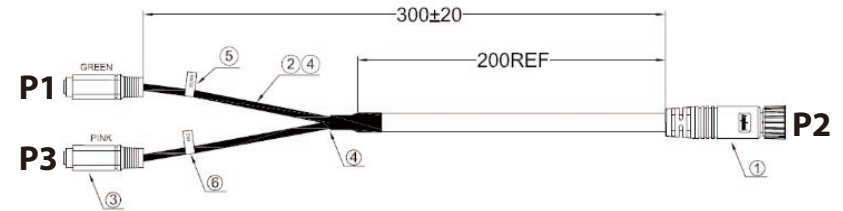
GPIO Connector

Connector location: P2

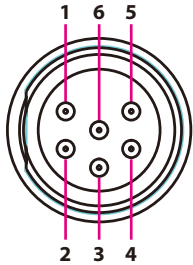


P1 Pin	P2 Pin	Definition
1	1	GPI1
2	2	GPI2
3	3	GPI3
4	4	GPI4
5	5	GPO1
6	6	GPO2
7	7	GPO3
8	8	GPO4
9	9	VIN_GPIO
10	10	GND

Audio: The audio port consists of a 6-pin female connector and multiple output connectors. The tables in this appendix list the pin signals of the P2 connector and its corresponding pin signals to the output connectors.



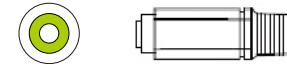
P2 Connector Pinout



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

P1 and P3 Connector Pinouts Green (Line-out) Connector

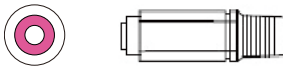
Connector location: P1



P2 Pin	P1 Pin	Definition
1	L	FRONT_L
2	G	FRONT_JD
3	R	FRONT_R

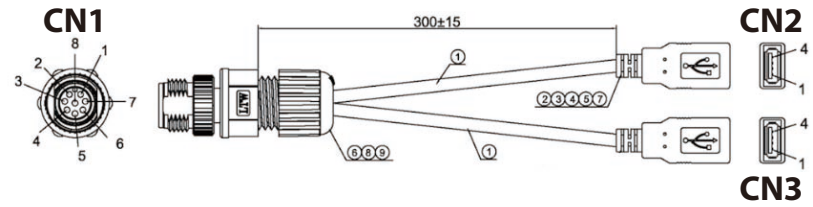
Pink (Mic-in) Connector

Connector location: P3

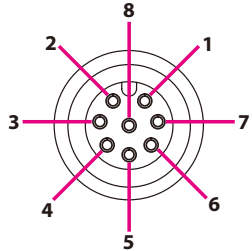


P2 Pin	P3 Pin	Definition
4	L	MIC_L
5	G	MIC_JD
6	G	AGND

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



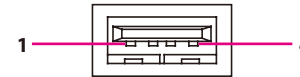
CN1 Connector Pinout



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

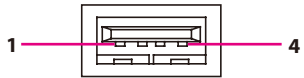
Connector location: CN2



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

USB Connector

Connector location: CN3



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

APPENDIX G: POWER CONSUMPTION



Note: The power wattage of the power supply should be 2 times the power consumption of the system. Please refer to the following tables for system power consumption in different situations.

Idle	Full	Full + load
<ul style="list-style-type: none"> ▪ Into OS ▪ Display x 2 ▪ Keyboard & mouse ▪ Audio ▪ All storages (Storage x 2, total 15w) ▪ Modules (mSATA x 2 + LTE modules x 3) 	<ul style="list-style-type: none"> ▪ Idle status ▪ Modules (LTE modules x 2) ▪ Mini card dummy load (3.3w + 4.36w + 4.36w) ▪ Burn in at 100% (CPU + 2D + 3D + Disk + Sound + RAM + Video Playback + GPU) ▪ Play video ▪ COM transmission (COM1 + COM2 + COM3) ▪ GPS link 	<ul style="list-style-type: none"> ▪ Full load status ▪ USB 3.0 dummy load (5V/1A x 4) ▪ USB 2.0 dummy load (5V/0.5A x 4) ▪ PoE dummy load (30w x 2)

nROK 7251-7C4/nROK 7251-7A

Item	Device	Test Case		Result			
				Average		Peak	
		Configuration	Voltage	Current(A)	Watt(W)	Current(A)	Watt(W)
1	S0 State i7-9700TE 35W	Idle State	12V	1.76	21.12	7.21	86.52
			24V	0.93	22.32	3.71	89.04
			36V	0.66	23.76	2.51	90.36
		Full State	12V	6.29	75.48	8.06	96.72
			24V	3.27	78.48	4.41	105.84
			36V	2.21	79.56	2.96	106.56
		Full State + Loading	12V	9.08	108.96	11.52	138.24
			24V	4.56	109.44	5.77	138.48
			36V	3.18	114.48	3.99	143.64
		Full State + Loading (+ PoE 60W, nROK 7251-7C4)	12V	14.84	178.08	17.92	215.04
			24V	7.43	178.32	7.97	191.28
			36V	5.02	180.72	5.46	196.56
2	S3 State	Full State Sleep Mode	12V	0.915	10.98	N/A	N/A
			12V WWAN	0.935	11.22	N/A	N/A
3	IGN OFF	Full State IGNITION OFF	12V	0.03	0.36	N/A	N/A
			12V WWAN	0.18	2.16	N/A	N/A
			24V	0.03	0.72	N/A	N/A
			24V WWAN	0.12	2.88	N/A	N/A
			36V	0.05	1.8	N/A	N/A
			36V WWAN	0.12	4.32	N/A	N/A

*WWAN: Enable wakeup function of WWAN module

nROK 7251-WI-7C4IP

Item	Device	Test Case		Result			
				Average		Peak	
		Configuration	Voltage	Current(A)	Watt(W)	Current(A)	Watt(W)
1	S0 State i7-9700TE	Idle State	24V	1.07	25.68	4.96	119.04
			36V	0.74	26.64	3.1	111.6
			48V	0.57	27.36	2.24	107.52
			72V	0.38	27.75	1.39	104.25
			110V	0.22	24.2	0.98	107.8
		Full State (Burn-in)	24V	3.56	85.44	6.3	151.2
			36V	2.42	87.12	3.72	133.92
			48V	1.82	87.36	2.49	119.52
			72V	1.21	87.72	1.66	124.5
			110V	0.78	85.8	1.12	123.2
		Full State + Loading	24V	4.73	113.52	7.29	174.96
			36V	3.15	113.4	4.77	171.72
			48V	2.24	107.52	3.48	167.04
			72V	1.47	105.84	2.23	167.25
			110V	0.97	106.7	1.52	167.2
		Full State (+ PoE 60W)	24V	6.11	146.72	9.37	224.88
			36V	4.09	147.24	6.33	228.12
			48V	3.09	148.56	4.48	215.28
			72V	2.06	148.96	2.96	213.75
			110V	1.33	147.06	1.92	212

nROK 7251-WI-7C4IP

Item	Device	Test Case		Result			
				Average		Peak	
		Configuration	Voltage	Current(A)	Watt(W)	Current(A)	Watt(W)
1	S0 State i7-9700TE	Full State + Loading (+ PoE 60W)	24V	7.43	183.12	10.62	254.88
			36V	5.18	186.48	7.17	258.12
			48V	3.89	186.72	5.11	245.28
			72V	2.6	187.2	3.25	243.75
			110V	1.68	184.8	2.2	242
2	S3 State	Full State Sleep Mode	24V	0.71	17.04	N/A	N/A
			24V wake up WWAN	0.717	17.208	N/A	N/A
			110V	0.14	15.4	N/A	N/A
			110V wake up WWAN	0.14	15.4	N/A	N/A
3	IGN OFF	Full State IGNITION OFF	24V	0.206	4.944	N/A	N/A
			24V wake up WWAN	0.212	5.088	N/A	N/A
			36V	0.134	4.824	N/A	N/A
			36V wake up WWAN	0.139	5.004	N/A	N/A
			48V	0.1	4.8	N/A	N/A
			48V wake up WWAN	0.103	4.944	N/A	N/A
			72V	0.066	4.72	N/A	N/A
			72V wake up WWAN	0.072	5.18	N/A	N/A
			110V	0.021	2.31	N/A	N/A
110V wake up WWAN	0.021	2.31	N/A	N/A			

*WWAN: Enable wakeup function of WWAN module