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The M2M Enabler

RTCU NX-200+

Advanced Industrial M2M/IoT Gateway



Technical Manual

Version 1.00

Introduction

The **RTCU NX-200+** is the most advanced automotive IIoT Gateway product available on the market today. Based on the successful hardware architecture from the RTCU NX-400, it features an added range of sophisticated automotive features like a full-motion sensor suite, dual CAN bus interfaces, Worldwide LTE, and a slick aluminium encapsulation with an apparent reference to the popular **RTCU MX2 turbo**!

The device is based on the new **NX32L** (NX32 for Linux) architecture, which embraces many new technologies and, at the same time, maintains full backward compatibility, which ensures already implemented and tested NX32 applications can execute without changes.

The **RTCU NX-200+** is designed to meet the ever-increasing security challenges. It offers full TLS on all major protocols and includes a hardened protected execution environment with dual-boot and automatic fallback and recovery.

The **RTCU NX-200+** device is an automotive-grade device that is designed from the ground up for professional M2M / IIoT applications with its strong onboard I/O capabilities and multiple communication interfaces such as Worldwide cellular LTE, WLAN, Bluetooth Classic / Low-Energy, dual CAN bus, Ethernet, dual RS232, RS485, and 1-Wire.

The **RTCU NX-200+** also sports two USB host port interfaces allowing for the expansion of the device with accessories such as an RFID reader, additional Ethernet port, and additional RS232/RS485 ports

The onboard I/O system can be expanded almost indefinitely and completely transparently by adding Modbus I/O modules.

The **RTCU NX-200+** is fully software and hardware compatible with the **RTCU MX2 turbo**.

The advanced power-management features on the **RTCU NX-200+** combined with the onboard high-capacity Li-Ion battery allow the device to stay in a power-saving mode for a longer period still being connected to the cellular network and capable of waking up on, for example, cellular activity, change of digital inputs or a vibration sensor

This manual contains technical documentation on the installation and usage of the **RTCU NX-200+** device. In addition, please refer to the RTCU IDE documentation for detailed information on the product's programming and software configuration.

For detailed information on the powerful RTCU M2M Platform, please refer to the ***RTCU M2M Platform datasheet*** and the RTCU IDE documentation.

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Important Information



Thank you very much for using a product from Logic IO Aps. Our products are designed for professional use, and therefore, this manual assumes technical knowledge and practice working with such products.

This documentation does not entail any guarantee on the part of Logic IO Aps with respect to technical processes described in the manual or any product characteristics set out in the manual. We do not accept any liability for any printing errors or other inaccuracies in the manual, unless it can be proven, that we are aware of such errors or inaccuracies, or that we are unaware of these as a result of gross negligence and Logic IO Aps has failed to eliminate these errors or inaccuracies for this reason.

This product is a complex and sensitive electronic product. Please act carefully and ensure that only qualified personnel will handle and use the device. In the event of damage to the device caused by failure to observe the information in this manual and on the device, Logic IO Aps shall not be required to honor a warranty claim even during the warranty period and shall be exempted from the statutory accident liability obligation. Any attempts to repair or modify the product also voids all warranty claims. Do not open the product. There are no user-serviceable parts inside.

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Technical Highlights

Platform:

- Based on the RTCU M2M Platform.
- NX32L (NX32 for Linux) execution architecture.
  - RTCU IDE development tool.
  - Operates under a full and highly optimized Linux variant.
  - Open and extendable with Platform SDK.

Hardware Core:

- Cortex-A5 32-bit ARM processor operating at 500 Mhz.
- Hardware floating-point and DSP instructions.
- 128 MByte LP-DDR RAM.
- 512 MByte NAND Flash (file-system).
- 16 MByte NOR flash (system boot).
- 128 KB SRAM with battery backup (unlimited endurance).
- Real-time clock with battery backup.

Security:

- Embedded firewall.
- TLS/SSL support with full certificate management.
- TLS/SSL support for all major TCP protocols, such as SMTP, MQTT, and sockets.
- Hardware assisted encryption/authentication: AES-128, AES-192, AES-256, DES, TripleDES, HASH, RND and RSA signature.

Wireless Communication:

- Worldwide LTE Cat. 4 Multi-Band Cellular Engine.
- Dual SIM-card readers and support for eSIM.
- Wireless LAN (Wi-Fi).
- Classic and Low-Energy Bluetooth.
- RTCU NX-200+: Multi-constellation L1 GNSS.
- RTCU NX-200DR+: GNSS with UDR / ADR.

Wired Communication:

- 100 Mbps Ethernet LAN interface.
- 2 x full CAN 2.0B controller with hardware filtering and multi-speed support.
- 1-Wire bus for accessories such as ID-button reader, temperature sensors, etc.
- 2 x USB host port for expandability.
- 2 x RS232 channels and 1 x RS485 channels.

I/O Interfaces:

- 5 x digital inputs and 4 x high-power solid-state digital outputs.
- 4 x flex inputs with dual-mode analog /digital operation.
- 2 x analog inputs with 12 bits resolution.
- Expandable I/O with standard Modbus modules.

User Interaction:

- 4 x bi-colour LED and dual DIP-switches.
- Virtual jumpers for RS485 and CAN termination.
- Reset / recovery switch.
- High-speed Mini-USB service-port connector.

Sensors:

- 3-axis Accelerometer with 16g scale.
- 3-axis Gyroscope with 2000 dps scale.
- 3-axis Magnetometer with 50 gauss scale.
- Temperature sensor.

Audio:

- Fully digitized audio system.
- Transfer, store, and play audio.
- Amplified speaker output.
- Microphone input.
- Digitized cellular audio.
- DTMF support for Interactive Voice Response applications.

Storage:

- Internal flash drive with up-to 512 MByte capacity.
- Persistent memory and circular datalogger.
- Standard SD-CARD reader.
- USB flash media.

Power and Battery:

- Operating voltage from 8 to 36VDC.
- Onboard 2.6 Ah Li-Ion battery with intelligent charging.

Encapsulation:

- Exclusive and durable aluminum encapsulation.

Regulatory Approvals:

- 2007/46/EC UN ECE R10 Rev. 05 (E1).
- 2014/53/EU Radio Equipment Directive.
- 2011/65/EU RoHS Directive.



Graphical overview:







External connections

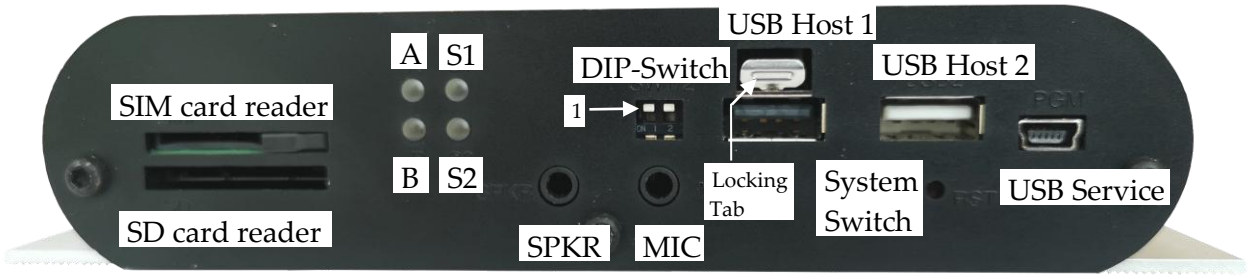
Overview

Connections to external equipment are made via the connectors that are located on the back and front sides of the product.

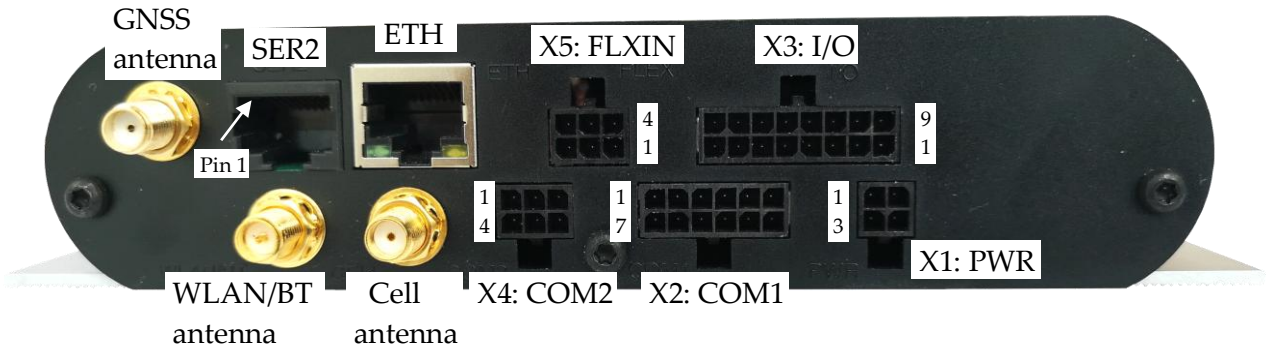
The front panel is equipped with connectors commonly accessed by the user: SIM-Card, SD-Card, DIP-Switches, audio input and output, LEDs, dual USB host ports, and USB slave service port.

The back panel holds all connectors necessary for installation: 4-pin (X1) power and ignition, 6-pin (X4) for RS232 and CAN (channel 2), 12-pin (X2) for different communications interfaces, 16-pin (X3) for analog and digital I/O, and 6-pin (X5) flex-inputs.

A graphical overview of the front- and back are shown below:



Front-side view



Back-side view

Signal Overview

X4: COM2			
RD1	4	1	TD1
SGND	5	2	CAN2-H
SGND	6	3	CAN2-L

X2: COM1			
1-WIRE LED	7	1	1-WIRE
SGND	8	2	SGND
CAN1-L	9	3	CAN1-H
SGND	10	4	NC
SGND	11	5	RS485+
DC-Out	12	6	RS485-

X1: PWR			
SUPPLY	3	1	SUPPLY
PGND	4	2	DIN5 /IGN

X5: FLXIN			
AGND	3	6	AGND
FLXIN3	2	5	FLXIN4
FLXIN1	1	4	FLXIN2

X3: I/O			
AIN2	8	16	AGND
AIN1	7	15	AGND
DIN5/IGN	6	14	SGND
DIN3	5	13	DIN4
SGND	4	12	SGND
DIN1	3	11	DIN2
DOUT3	2	10	DOUT4
DOUT1	1	9	DOUT2

Connector X1: 4 pin PWR connector overview

Pin	Name	Description
1	SUPP	Power supply, positive (+) connection
2	DIN5/IGN	Digital input 5 / Ignition input (Shared with X3)
3	SUPP	Power supply, positive (+) connection
4	PGND	Power Ground

Connector X2: 12 pin COM1 connector overview

Pin	Name	Description
1	1Wire	1-Wire bus
2	SGND	Signal Ground
3	CAN1-H	CAN-bus channel 1 H-signal
4	NC	Internally not connected
5	RS485+	RS485 non-inverting signal
6	RS485-	RS485 inverting signal
7	1W-LED	1-Wire ID-Button LED
8	SGND	Signal Ground
9	CAN1-L	CAN-bus channel 1 L-signal
10	SGND	Signal Ground
11	SGND	Signal Ground
12	DC-OUT	5V/500mA DC-Out for external equipment

Connector X3: 16 pin I/O connector overview

Pin	Name	Description
1	DOUT1	Digital output 1
2	DOUT3	Digital output 3
3	DIN1	Digital input 1
4	SGND	Signal Ground
5	DIN3	Digital input 3
6	DIN5/IGN	Digital input 5 / Ignition input (Shared with X1)
7	AIN1	Analog input 1
8	AIN2	Analog input 2
9	DOUT2	Digital output 2
10	DOUT4	Digital output 4
11	DIN2	Digital input 2
12	SGND	Signal Ground
13	DIN4	Digital input 4
14	SGND	Signal Ground
15	AGND	Analog Ground
16	AGND	Analog Ground

Connector X4: 6 pins COM2 connector overview

Pin	Name	Description
1	TD	Transmit Data from serial port 1, RS232 compatible
2	CAN2-H	CAN-bus channel 2 H-signal
3	CAN2-L	CAN-bus channel 2 L-signal
4	RD	Receive Data for serial port 1, RS232 compatible
5	SGND	Signal Ground
6	SGND	Signal Ground

Connector X5: 6 pins FLXIN connector overview

Pin	Name	Description
1	FLXIN1	Flex input 1
2	FLXIN3	Flex input 3
3	AGND	Analog Ground
4	FLXIN2	Flex input 2
5	FLXIN4	Flex input 4
6	AGND	Analog Ground

Connector SER2: RJ45 connector overview, fully RS232 compatible

Pin	Name	Description
1	DSR	Data Set Ready
2	DCD	Data Carrier Detect
3	DTR	Data Terminal Ready
4	SGND	Signal Ground
5	RD	Receive Data for serial port 2
6	TD	Transmit Data from serial port 2
7	CTS	Clear To Send
8	RTS	Request To Send

Accessories for cable assembly.

Order-code	Name
RT-O-TYCO-H4 TYCO p/n: 794617-4	Tyco, Connector house 4 pins. Bag with 10 pcs
RT-O-TYCO-H6 TYCO p/n: 794617-6	Tyco, Connector house 6 pins. Bag with 10 pcs
RT-O-TYCO-H12 TYCO p/n: 1-794617-2	Tyco, Connector house 12 pins. Bag with 10 pcs
RT-O-TYCO-H16 TYCO p/n: 1-794617-6	Tyco, Connector house 16 pins. Bag with 10 pcs
RT-O-TYCO-CR TYCO p/n: 794606-1	Tyco, Crimp Contacts for connector house. Wire size 0.2 to 0.5 mm^2. Bag with 100 pcs.
RT-O-TYCO-TOOL TYCO p/n: 91501-1	Tyco, Crimp hand tool for easy assembly of TYCO crimp contacts. Wire size 0.2 to 0.5 mm^2
Recommended tool:	Tyco 91501-1 (0.20 to 0.50mm^2) RS 495-9675, Farnell 1111475
Alternative tools:	Tyco 91502-1 (0.05 to 0.15mm^2) RS 495-9675, Farnell 1111476
Extraction tool:	Tyco 843996-6 extraction tool. RS 495-9704, Farnell 1111477

Connector Mini USB-B
The USB port is for programming and communication with the RTCU IDE (RACP compliant application). A standard USB cable with a connector length of 10mm on the USB-B end can be used between the device and the PC

Connector Ethernet
This is a standard 10Base-T/100Base-TX IEEE 802.3 compliant Ethernet connector. Please use an appropriate connector and cable, such as a standard CAT-5 twisted pair patch cable

Connector USB-Host
These are standard full-speed USB-A host port connectors used for communication with accessories connected to the host port. These ports are supplied internally, and current consumption is limited to 500mA

Power supply

The RTCU NX-200+ device must be supplied with 8..36 VDC from an external DC power source connected to the 4 pin power connector. Positive power is applied to the SUPP pin, and the ground is connected to the PGND pin.
The connector has two "SUPP" supply pins as these also supplies power to the digital outputs. If the total current consumption on the digital outputs exceeds 1.5A, then power must be applied to both pins. Otherwise, one pin is sufficient.

There are three different labels for the ground connections: Power Ground (PGND), Signal Ground (SGND), and Analog Ground (AGND). The signal and analog grounds are filtered from the power ground. Power ground must only be used as a power supply return path. The signal ground is used as a ground reference for digital I/O's and serial interfaces. The analog ground is used as a low-noise analog ground reference for the analog inputs.

The RTCU NX-200+ is protected against wrong polarity. If a chassis or system grounds are connected to either SGND or AGND, a wrong polarity on the supply lines will destroy the internal GND connection. To avoid such a scenario, a fuse can be installed on the positive supply.

The RTCU also contains an internal high-capacity backup battery that will supply the RTCU if the external power supply should fail or is disconnected. By default, the RTCU is powered down when a power failure occurs. This setting, however, can be changed. Please consult the RTCU IDE documentation for additional information.

Disabling the external DC power from the application interface and forcing the device to operate on the internal backup battery is supported. Please consult the RTCU IDE documentation for additional information.

When the ignition input is activated with a logical high, the RTCU device will wake up if it is in power-down mode. The ignition input (digital input 5) is available on the power connector to minimize the need for connectors in minimal installations, but it is also available on the X3 connector (digital I/O and analog Inputs) - only one should be used at a time.

X1: 4 pin PWR connector overview.

Pin	Name	Description
1	SUPP	Power supply, positive (+) connection
2	DIN5/IGN	Digital input 5 / Ignition input (Shared with 16 pin connector)
3	SUPP	Power supply, positive (+) connection
4	PGND	Power Ground

Digital outputs

The digital outputs control four "high-side" switches. They function like a contact, where one side is connected to the positive supply of the RTCU unit, and the other is the output. The switches are protected against short circuit, ESD and electronic kickback from inductive loads such as relays, etc. The maximum switch-able inductance is 20mH and must not be exceeded.

The digital outputs are supplied through the X1 power connector that also supplies the rest of the RTCU unit. As this power is also the RTCU NX-200+ main power, a power-fail would also affect the digital outputs.

The RTCU unit offers advanced power management that makes it possible to have one or more outputs enabled while the RTCU is in low power mode. Please consult the RTCU IDE documentation for additional information.

When using the function pmExternalPower to disable the external supply, it should be observed that any activated digital outputs will draw approx. 0.6 mA @ 12VDC from the external power source.

X3: 16 pin I/O connector overview.

Pin	Name	Description
1	DOUT 1	Digital output 1
9	DOUT 2	Digital output 2
2	DOUT 3	Digital output 3
10	DOUT 4	Digital output 4

Specification for each digital output

Type	Min.	Max.	Unit	
Solid state	5.5	36	VDC	Short-circuit, Overload, Overvoltage, ESD,
	-	1.5	A	Inductive kick-back protected up to 20mH (single pulse).
	-	280	mΩ	On-state resistor per channel

Please note: Special attention to wiring must be taken; if the total current consumption of the digital outputs exceeds 1.5A, then PGND must be used as a return path for the output(s).
If the total current consumption of the digital outputs exceeds 5A, the two SUPP pins and PGND must be used for supply.

Digital Inputs / Ignition Input

The digital inputs are all low pass filtered and transient protected. To activate the inputs, connect a positive voltage between the input and the GND connector.

Please note: The DIN 5/IGN input is special as it also functions as the ignition input. If the ignition input is activated with a logically high or low (Wait For Event mode only), when the RTCU is in low power mode, it will wake-up the unit. A power apply will also wake-up the unit, if it is in power-down mode or WaitForEvent mode with power Apply and/or ignition selected for wake-up. The ignition is debounced with a period between 1-2 ms, when used as a digital input. So, any logical level applied to this input must be greater than 2 ms to be valid. The DIN 5/IGN input is available on both the X1 power connector and the X3 connector together with the other digital inputs – only one should be used at a time.

The power management allows the possibility to configure a wake-up on one or more digital inputs with individually configured falling- or rising edge detection. Please consult the RTCU IDE documentation for additional information.

X3: 16 pin I/O connector overview.

Pin	Name	Description
3	DIN 1	Digital input 1
11	DIN 2	Digital input 2
5	DIN 3	Digital input 3
13	DIN 4	Digital input 4
6	DIN5/IGN	Digital input 5 / Ignition input. (Shared with X1)
4	SGND	Signal Ground
12	SGND	Signal Ground
14	SGND	Signal Ground

Specification for each digital input:

	Min.	Typ.	Max.	Unit	
Logic “High”	8	12	40	VDC	Protected against transients and
Logic "Low"	-5	-	3	VDC	low-pass filtered
Cut-off frequency	-	25	-	kHz	
Bandwidth		12		kHz	@12V
Input impedance	-	14	-	kΩ	

Analog Inputs

The analog inputs are voltage inputs specified with an operating range of 0V to 10V DC. The conversion resolution is up to 12 bit (0..4095). Please consult the RTCU IDE documentation for further details.

The input signal is connected between AINx and AGND. AGND must be connected to the reference of the connected equipment. Please be aware that deviations may occur, as the system is very noise sensitive. Avoid long unshielded wires and large fast-changing signals routed parallel to the analog signals.

The inputs are low-pass filtered, ESD- and transient protected.

X3: 16 pin I/O connector overview.

Pin	Name	Description
7	AIN 1	Analog input 1
8	AIN 2	Analog input 2
15	AGND	Analog Ground
16	AGND	Analog Ground

Specification for each analog input:

	Min.	Typ.	Max.	Unit	
	0	-	10	VDC	Protected against transients and
Resolution	-	-	12	Bit	low-pass filtered
Precision	-	0.15	0.3	%FSR	Precision is based on
Cut-off frequency	-	4.5	-	kHz	measurements @ 25 ˚C
Input impedance	-	40	-	kΩ	

Flex Inputs

The flex inputs are multi-mode inputs that can be configured to operate as either analog or as digital inputs. The operating range is from 0V to 30V DC and is configurable as digital inputs with customized threshold values.

The flex inputs can also be used as digital inputs, behaving the same way as the normal digital inputs with the same threshold values or using different threshold values for more advanced features.

The same flex input can be used for multiple digital inputs with different settings, e.g., different threshold values or debounce timing.

Configuring the flex input for band matching allows triggering the digital inputs at specific values, making it possible to connect circuits that generate different voltages for different states and then read the state directly.

An example could be using switches and resistors to create an R2R ladder that allows for connecting multiple switches to a single flex input.

See the RTCU IDE documentation for more details about how to configure the flex inputs as digital inputs.

The input signal is connected between FLXINx and AGND. AGND must be connected to the reference of the connected equipment. Please be aware that deviations may occur, as the system is very noise sensitive. Avoid long unshielded wires and large, fast-changing signals routed parallel to the analog signals.

The inputs are low-pass filtered, ESD- and transient protected.

X5: 6 pin FLXIN connector overview

Pin	Name	Description
1	FLXIN1	Flex input 1
4	FLXIN2	Flex input 2
2	FLXIN3	Flex input 3
5	FLXIN4	Flex input 4
3	AGND	Analog Ground
6	AGND	Analog Ground

Specification for each flex input:

	Min.	Typ.	Max.	Unit	
	0	-	30	VDC	Protected against transients and
Resolution	-	-	12	Bit	low-pass filtered
Precision	-	0.4	0.5	%FSR	Precision is based on
Cut-off frequency	-	4.5	-	kHz	measurements @ 25 ˚C
Input impedance	-	120	-	kΩ	

CAN communication port

The RTCU provides the physical layer for the CAN (Controller Area Network) serial communication interface in accordance with the ISO 11898 standard. The CAN bus is designed for high-speed (up to 1Mbit) robust communication in especially harsh environments like those found in the automotive industry.

The CAN interface can be connected to an existing CAN network with a common protocol like the J1939 standard, to retrieve information for surveillance or information purposes. The interface can also be used as a robust serial data link with a non-standard protocol. Please consult the RTCU IDE documentation for more information.

The physical layer consists of a two-wire (CAN-H and CAN-L) differential bus and a signal ground for reference.

If the RTCU is connected to a "non-existing" network, a 120 ohm resistor must be connected between CAN-H and CAN-L on each end of the transmission line in order to terminate it and avoid signal reflections. This resistor can be connected by activating the software jumper in the user application. Please consult the RTCU IDE document for the software jumper for a detailed description.

Be aware that connecting the RTCU to a CAN network can be dangerous. If the RTCU is not configured with the correct network parameters, it will lead to network corruption and may interfere with other connected equipment on the bus. Especially in vehicles, great precautions must be observed to prevent communication interruptions.

By default, the write capability on the CAN bus channel 1 is disabled. This can be enabled by the jumper that is located on the front-side of the device.

By default, the write capability on the CAN bus channel 2 is enabled and it is not possible to disable

A wide range of software functions is available for easy access to the network. Please consult the RTCU IDE documentation for further information.

X2: 12 pin COM1 connector overview.

Pin	Name	Description
3	CAN1-H	CAN-bus channel 1 H-signal
9	CAN1-L	CAN-bus channel 1 L-signal
8	SGND	Signal Ground

X4: 6 pin COM1 connector overview.

Pin	Name	Description
2	CAN2-H	CAN-bus channel 2 H-signal
3	CAN2-L	CAN-bus channel 2 L-signal
6	SGND	Signal Ground

RS232 port 1

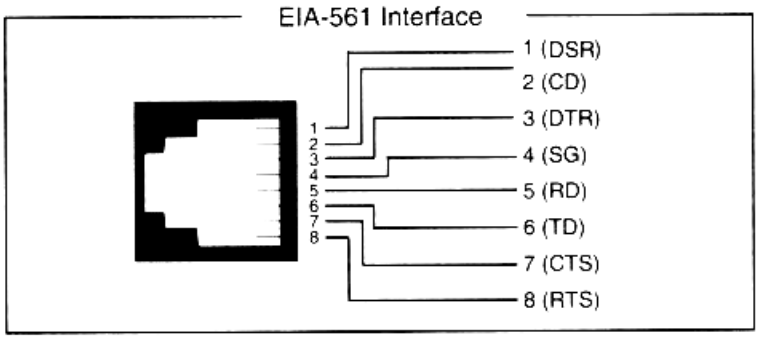
This port can be used as a general-purpose RS232 serial port and does not support handshaking. This port can also be used for communication with the RTCU accessories.

X4: 6 pin SER1 connector overview.

Pin	Name	Description
1	TD	Transmit Data from serial port 1, RS232 compatible
4	RD	Receive Data for serial port 1, RS232 compatible
5	SGND	Signal Ground

RS232 port 2

The port is a general-purpose RS232 port with all control signals according to EIA-561, which defines RS232 on a modular connector.



The signals are available on the RJ-45 connector located on the top side of the RTCU NX-200+ device.

Connector SER2: RJ-45 connector overview, fully RS232 compatible

Pin	Name	Description
1	DSR	Data Set Ready
2	DCD	Data Carrier Detect
3	DTR	Data Terminal Ready
4	GND	Signal Ground
5	RD	Receive Data for serial port 2
6	TD	Transmit Data from serial port 2
7	CTS	Clear To Send
8	RTS	Request To Send

RS485 communication ports (EIA/TIA-485-A compatible)

RS485 is a multi-drop network with a maximum of 32 nodes connected simultaneously to the bus. The RS485 bus contains an RS485+ (*also known as RS485 A, non-inverting*) and an RS485- (*also known as RS485 B, inverting*) signal as well as a signal ground which must always be connected to the common signal ground for all nodes connected to the RS485 bus!

The maximum cable length for the RS485 bus is according to the EIA/TIA-485-A standard (max. 1000m @ <100kbit); this limit is highly influenced by the quality of the cable, signaling rate, noise etc.

At longer cable lengths, noisy environments, or high communication speeds, it might be necessary to terminate the transmission line with a 120[1] ohm resistor at each end of the transmission line to terminate it and avoid signal reflections. If the RTCU NX-200+ is used as an endpoint node, the software jumper for both RS485 ports separately can be activated through the user application in order to terminate the RS485 communication lines with 120Ω.

By default, the RS485 communication lines are not terminated with 120 Ω. Please consult the RTCU IDE documentation for further information on using the software jumpers.

Please note: For best performance, protection, and noise immunity shielded cable is advised to be used to connect the device to the RS485 communications bus.

X2: 12 pin COM connector overview.

Pin	Name	Description
5	RS485+	RS485 non-inverting signal (A)
6	RS485-	RS485 inverting signal (B)
11	SGND	Signal Ground

1-Wire bus

The 1-Wire bus is available on the X2 connector. All 1-Wire communication goes through a single connection, and all 1-Wire devices connected to this connection retrieve their power directly from the bus (called parasitic power). For this, only two wires are needed – the 1-wire signal and the ground reference – allowing minimal cable installations.

For 1-Wire ID-Button readers, which include a built-in LED, a dedicated output is available for this purpose. Please consult the RTCU IDE documentation for further information.

2 Assuming use of a CAT5 twisted pair cable

X2: 12 pin COM connector overview.

Pin	Name	Description
1	1Wire	1-Wire bus for ID-Button / Temperature sensor
7	1W-LED	1-Wire ID-Button LED
2	SGND	Signal Ground

DC-Out

A 5V DC output is available on the X2 connector. It is possible to control the output in order to save power. The output is short circuit- (to ground), ESD- and transient protected. Make sure not to exceed the current specification of the output and be aware that inrush currents of the external equipment may exceed the specifications. It is recommended to install a fuse to protect the output.

This output must be enabled from the application. Please consult the RTCU IDE online manual for more information.

X2: 12 pin COM connector overview.

Pin	Name	Description
12	DC-Out	+5V/500mA DC-Out for external equipment.
11	SGND	Signal Ground

Ethernet

The RTCU NX-200+ offers an onboard IEEE 802.3 compatible 100BASE-T Ethernet MAC controller and transceiver for communication with peripherals and back-end systems over standard Ethernet. Please refer to the RTCU IDE documentation for details on the usage of this interface.

USB Host interface

The RTCU NX-200+ offers two high-speed USB host ports on a standard USB A connector for the connection of various USB devices. The host port 1 connector includes a locking latch that locks the USB cable connector in position. The locking tab needs to be pushed slightly until the locking latch is released to remove the USB cable. The USB host ports can supply the external USB device with up to 500mA each.

Please notice: To reduce the total power consumption, then DC-Out, USB host 1 and USB host 2 can not be enabled simultaneously. Only two out of these three interfaces can be simultaneously enabled. Please consult the RTCI IDE online help for further information.

Audio interface

The audio interface is available on the three 3.5mm jack connectors on the front side of the device. The audio interface includes a microphone input and speaker output.



3 pin SPK Out

Pin	Name	Description
Tip	SPK_OUT_P	Differential speaker positive (+) output
Ring	SPK_OUT_N	Differential speaker negative (-) output
Sleeve	N.A.	Not connected internally

3 pin MIC In

Pin	Name	Description
Tip	MIC_BIAS	Bias voltage to the microphone
Ring	MIC_IN	Audio signal from the microphone
Sleeve	GND	Signal ground

The specifications on the audio interface connectors are as following:

Parameter	Min.	Typ.	Max.	Unit	Description
Impedance	4	-	-	Ω	
Output power	-	-	2.1	W	@ 4 ohm 50pF load
	-	-	1.4	W	@ 8 ohm 50pF load
Headphone impedance	16	-	-	Ω	AC coupled
Full -scale input voltage	-	-	0.74	Vrms	
Mic. bias voltage	-	2.5	-	V	±10%

3D movement sensor

The RTCU NX-200+ device contains a 3-axis accelerometer, 3-axis gyroscope, and 3-axis magnetometer in order to detect vibration and motion. This sophisticated range of movement sensors allows for detecting movement and position change in 3 directions, X-Y-Z with force as high as 16g in acceleration, 2000 dps in rotation, and 50 gauss in a magnetic field. The most straightforward use is with the power management detecting when the vehicle is moved and the most advanced analytical applications such as driving behavior/eco-driving.
Please consult the RTCU IDE documentation for more detailed information.

The positions of the 3-axis are as follows:



Specification:

			Unit	
Resolution	Accelerometer	±16	g	The acceleration can be set as relative to motion, or relative to earth gravity
	Gyroscope	±2000	dps	
	Magnetometer	±50	gauss	

LED Indicators

Four bi-colored (red and green) LED indicators are present on the device's front (see graphical overview).

Two bi-colored LED's (A and B) are available to the user, and the remaining two LED's (S1 and S2) are signaling the status and possible errors of the RTCU device.

User LED A and B

LED A and B are composed of four individually controllable LEDs:

- LED named A on the front consists of LED 1 (green) and LED 2 (red).
- LED named B on the front consists of LED 3 (green) and LED 4 (red).

They are easily accessed from within the application program, and it is possible to mix the LED's to obtain a third color: yellow. Please consult the RTCU IDE documentation for more information.

System LED S1 and S2

The RTCU is equipped with two system LED's, which shows the status and possible errors of the RTCU device.

The different patterns are listed in the table below. If the color of the system LED S1 is yellow, the device is actively communicating with the RTCU IDE (or another program, supporting the RTCU RACP protocol).

The LED S2 is signaling either the cellular module activity or, if all other LED's are off, that the RTCU is in the "wait for event" low power state.

S1: System LED1 pattern overview

Pattern	Description
Fastest blinking, green	The device is initializing, preparing to start the application.
Fast blinking, green S2 On, green	The device is installing an update. Depending on the kind of update, it may take some time. The progress can also be observed on the display.
Fast blinking, green[1]	The device has been forced into recovery mode with the use of the system switch. The application is not executing.
500ms On / 500ms Off green1	The device is executing the application program
1.5s On / 0.5s Off. green1	The device is executing the application program, while charging the internal backup battery.
Fast blinking, red1	A runtime error has been detected in the program. Use the RTCU IDE to obtain the fault log.

3 Or yellow when communicating with the RTCU IDE or another program, supporting the RTCU RACP protocol).

Alternating Fast/Slow, red1	The device has lost its firmware! This can only happen if, during a firmware upgrade, the RTCU device loses power or the communication is lost completely. In this case, simply upload the firmware to the device again.
75ms On / 925ms Off, green	Execution speed is different from full-speed.
On yellow (and all other LEDs OFF)	The device is booting, initializing the system

S2: System LED2 pattern overview (Cellular activity and "Wait For Event")

Pattern	Operating Status
Off	The cellular engine is turned off
600 ms On / 600 ms Off green	Missing SIM card or PIN code. Network search and logon in progress.
75 ms On / 3 s Off green	Logged on to the network.
75 ms On / 75 ms Off / 75 ms On / 3 s OFF green	A Packet/GPRS session is active.
Flashing green	Indicates Packet/ GPRS data transfer.
On green (and all other LEDs OFF)	The system is booting into recovery mode
10 s OFF / 50 ms ON green (and all other LEDs OFF)	The RTCU device is in low-power "Wait For Event" state.

Switches

DIP-switch

The RTCU NX-200+ device contains two dip-switches. The dip switches are located on the front side of the device for easy user access (see graphical overview).

System switch (RST)

The RTCU NX-200+ device contains a combined reset/diagnostic switch. This switch is accessible from the front of the unit (see graphical overview). It is necessary to use a small thin object with a diameter of approximately 2 mm, for example, a straightened-out paper clip.

By activating the switch shortly, the RTCU device will completely reset as if the power was removed and reapplied.

If the reset switch is held down for approx. 3 seconds[1] the device will instead enter recovery mode[2] where the application will not be started. In recovery mode, the system will automatically turn on any communication channel and establish a connection to the RTCU Gateway (if configured).

Pressing reset will also activate the device when in power-down mode. If external power is removed and the backup battery is disabled, the reset switch can still be used to boot into recovery mode, as long as there is enough power left on the battery.

5 System LED S2 will flash green three times when this state is entered.

6 System LED S1 will indicates this state by fast blinking green or yellow.

Internal Li-Ion battery

The RTCU contains an internal Li-Ion battery for operation even when the external power is absent, making it possible to report power loss etc. Please note that when external power is removed, the device will be powered down by default. This setting can be changed as documented in the RTCU IDE documentation.

The analog outputs will be disabled when power failure occurs as the internal battery cannot provide the supply voltage needed.

The battery charging is completely automated and handled internally by the RTCU device – leaving no need for user interaction. Different kinds of functions (Battery low, Charger enable, Charging status, etc.) are available to the user application.

The charge current is relatively high, for shorter charge time, as specified in the technical specification. Make sure both power supply and cables can handle the high current.

The battery will be charged whenever a power fail occurred to establish the capacity, thus making the battery ready for the next power failure. A maintenance charge will start every 20 days after the last charge. This is to compensate for the battery self-discharge etc.

By default, the battery cannot be charged above 45°C or below 0°C. The RTCU offers to charge down to -10 ˚C using a specialized algorithm to protect the battery.

If the temperature is above 45°C the charging will not start and will be postponed until it is below this threshold.

The temperature has a very strong influence on the battery capacity. At 0°C the capacity has dropped to 60% of the initial capacity, and it falls dramatically at lower temperatures.

The battery cycle (numbers of charges and discharges) also influences the capacity. After 300 cycles the capacity has dropped to approximately 80% of the initial capacity.

Warning
Misusing the RTCU device may cause the built-in battery security circuit to be damaged.

- *Do not place the RTCU device in high-temperature locations such as in direct sunlight or near engines. Using the RTCU device in this environment may result in loss of battery performance and a shortened life expectancy.*
- *Do not expose the device to water, saltwater or allow the battery to get wet.*
- *Avoid strong impacts and shocks.*

For more information regarding the environmental limitations, see "Specifications for RTCU NX-200+" below or consult the RTCU NX-200+ datasheet.

Worldwide LTE Cat. 4 Cellular Engine

The RTCU NX-200+ uses an LTE/UMTS/HSPA engine with the following features:

- Max. 150Mbps down / 50Mbps upload (Cat 4)
- LTE-FDD: B1/ B2/ B3/ B4/ B5/ B7/ B8/ B12/ B13/ B18/ B19/ B20/ B25/ B26/ B28.
- LTE-TDD: B38/ B39/ B40/ B41
- WCDMA: B1/ B2/ B4/ B5/ B6/ B8/ B19
- GSM: 850/900/1800/1900 MHz
- SMS (Text and PDU)
- UMTS release 7, max. 42Mbps down / 5.76Mbps upload, (Cat 6)
- Digitized audio / DTMF capability.

WLAN and Bluetooth

The RTCU NX-200+ device contains a combined WLAN (Wi-Fi) and Dual-mode Bluetooth radio that shares the same antenna interface.

WLAN Technical Data

- 2.4 GHz ISM band
- IEEE 801.11b/g/n/d/e/h/i
- WPA/WPA2 certification
- Up-to 150 Mbps

Bluetooth Technical Data

- Classic and Low-Energy (LE) Bluetooth
- Bluetooth 2.1 + EDR up-to 3Mbps
- Bluetooth 3.0 and 4.0 Dual-mode
- Intelligent co-existence with WLAN

Multi-GNSS receiver

The standard RTCU NX-200+ (SKU: RT-NX200+) uses a single-band L1, multi-constellation GNSS receiver.

Parameter	Receiver specification
Receiver	Quectel LC26G (AB); single-band L1.
Constellations	GPS, GLONASS, Galileo, BeiDou and QZSS.
Augmentation	SBAS: WAAS, EGNOS, MSAS and GAGAN. AGNSS with EASY / EPO support.
Receiver update rate	1 Hz default; up to 10 Hz (receiver capability).
Horizontal accuracy	1.5 m CEP: 50%, 24 hours static, -130 dBm, more than six satellites.
Velocity accuracy	0.1 m/s without aiding.
Sensitivity	Acquisition: -147 dBm; reacquisition: -159 dBm; tracking: -166 dBm.
TTFF without AGNSS	Cold start: 28 s; warm start: 25 s; hot start: 1 s.
TTFF with EASY	Cold start: 15 s; warm start: 2 s; hot start: 1 s.
Interference rejection	Integrated LNA and multi-tone active interference cancellation.
Receiver output	NMEA 0183 positioning messages.

These are receiver-module specifications. Navigation output and assistance features depend on RTCU firmware and configuration.

Unaided TTFF figures apply at room temperature with satellite signals at -130 dBm. EASY TTFF figures assume open sky and an active high-precision GNSS antenna.

Receiver data: Quectel LC26G (AB) Hardware Design V1.0, section 1.3.

Multi-GNSS receiver with Dead Reckoning

The RTCU NX-200DR+ (SKU: RT-NX200DR+) uses a single-band GNSS receiver with an integrated inertial measurement unit (IMU).

Parameter	Receiver specification
Receiver	u-blox NEO-M9V; 92-channel M9 engine; single-band L1.
Constellations	GPS, GLONASS, Galileo, BeiDou and QZSS.
SBAS	WAAS, EGNOS, MSAS and GAGAN.
Dead Reckoning	Integrated IMU with Untethered Dead Reckoning (UDR) and Automotive Dead Reckoning (ADR).
Navigation update rate	Up to 50 Hz with four concurrent GNSS (receiver capability).
Horizontal accuracy	1.5 m CEP with SBAS; 2.0 m CEP without SBAS.
ADR position error	2% of distance travelled without GNSS.
UDR position error	10% of distance travelled without GNSS, for outages shorter than 60 seconds.
Sensitivity	Tracking/navigation and hot start: -159 dBm; reacquisition: -158 dBm; cold start: -147 dBm.
Time to first fix	Cold start: 24 s; aided start: 3 s; hot start: 2 s.
Signal integrity	RF interference, jamming and spoofing detection and reporting.
Receiver protocols	NMEA 4.11 and UBX binary.

These are receiver-module specifications. Navigation output and assistance features depend on RTCU firmware and configuration.

The RTCU NX-200DR+ does not support antenna present or short-circuit detection.

To configure Dead Reckoning and wheel-tick data, please refer to the RTCU IDE API documentation.

Receiver data: u-blox NEO-M9V Product summary, UBX-21032008, R07.

Internal / External SIM-Card readers

The RTCU NX-200+ device contains both an internal and an external reader. The external reader is located on the front side of the unit (see graphical overview) for easy access. The SIM card reader has a push/push eject system and a mechanical lock for secure installation of the SIM card. The internal reader is located on the top side of the PCB board. It is possible to install a SIM-card in both readers simultaneously and switch programmatically between them from the application[1]. Please refer to Appendix A for a SIM card installation guide. The RTCU NX-200+ is prepared for eSIM internally, which shares the SIM-card signals with the external SIM-reader. Please contact Logic IO for this option.

It is possible to detect the state of both the SIM Insert and SIM lock status from the application. Please consult the RTCU-IDE online manual for more information.

If the SIM card is removed during the cellular operation, the device will be rejected from the network shortly after.

Antennas

Cellular antenna

The RTCU NX-200+ device contains an SMA female connector for connecting a suitable antenna. When installing the antenna, please make sure that the antenna is not in close proximity to metallic parts or anything else that can influence the antenna's efficiency.
Please consult the installation guide that follows the antenna.

GNSS antenna

Both models support single-band L1 reception of GPS, GLONASS, Galileo, BeiDou and QZSS. Use a suitable 3V active multi-GNSS antenna with an SMA male connector.
Failing to use a suitable antenna may result in inferior performance or spurious antennas short-circuit detection.

When installing the antenna, please make sure that the antenna has a good view of the sky to receive the weak signals from the satellites. Please also consult the installation guide that follows the antenna.

WLAN / Bluetooth Antenna

The RTCU NX-200+ device contains an RP-SMA connector for connecting a suitable WLAN / Bluetooth antenna. The WLAN and Bluetooth communication circuit shares the same antenna, so only one single antenna is required.

7 The GSM module restarts automatically after switching the active SIM-card reader

When installing the antenna, please make sure that the antenna is not close to metallic parts or anything else that can influence the antenna's efficiency. Please consult the installation guide, that follows the antenna

SD-CARD reader

The RTCU NX-200+ device has a standard SD-CARD reader located on the bottom side of the device (see graphical overview). The RTCU NX-200+ supports a FAT filesystem for standard PC compatibility with up to 32 GB capacity support.

The SD-CARD features a push/push eject system for reliable insertion and operation. Please refer to Appendix B for an SD-Card installation guide.

Approved SD-CARDs

To ensure the highest performance and compatibility, it is important to use SD-CARDs that has been approved and tested by Logic IO.

Commercial grade SD-CARDs can be used in applications where the limited write endurance is acceptable - for example if the SD-CARD is often replaced. Commercial grade SD-CARDs should ***not*** be used in applications where a potential failure on the media is considered mission-critical.

For applications that use the SD-CARD media extensively and where failure is critical, it is recommended to use approved **Industrial Grade** SD-CARDs.

Logic IO has approved and recommends industrial-grade SD-CARDs from **ATP** that is available in capacities from 512 MB to 32 GB.

ATP Industrial Grade SD/SDHC Cards are optimized for demanding industrial applications with consistent performance in all conditions. ATP uses reliable SLC flash technology with a flash endurance more than 20 times higher than commercial grade products with MLC flash.

The differences in write endurance between commercial-grade MLC flash and ATP Industrial grade SLC flash is quite remarkable for write-intensive applications:

Product Line	Details	Total Writeable Data Prediction @ 1GB	Time Prediction @ 500 writes a day (1GB)
ATP Industrial Grade	SLC Flash + Advanced Wear Leveling	80,000GB or 2,800,000 writes	**5,740 days** or **15.7 years**
Commercial Grade	Grade A MLC (2 bits per cell) + Advanced Wear Leveling	4,000GB or 140,000 writes	**280 days**

Product Identification Label with Barcode

The RTCU NX-200+ product identification is found on the exterior of the device and contains a unique serial number in readable form and as a barcode.

The first three digits in the serial number identify the device type: 389 for the RTCU NX-200+ and 388 for the RTCU NX-200DR+.

The barcode format used: 2/5 Interleaved with Check Digit.

Power consumption

The table below shows detailed information about the typical power consumption for the RTCU NX-200+ device while it is running.

Power consumption: Device operating in normal mode

	12V	24V	BAT		
Device active	85	35	225	mA	
Device active with Cellular on LTE*	110	55	300	mA	Cell idle @ -65 dBm*
Device active with GPRS on LTE*	300	150	700	mA	Cell @ -65 dBm. Active communication. Battery not charging*
Device active with GNSS on	100	45	280	mA	Mode 4
Device active with WLAN on	100	55	305	mA	Connected to AP, in idle
Device active with Ethernet on	100	45	310	mA	Connected to switch, in idle
Device active while charging	600	300	-	mA	

Note: Values marked with (*) is an average and should be considered as guidelines as they may vary depending on the Cellular signal level.
Note: Power consumption was measured from a fully charged battery.

The table below shows detailed information about the typical power consumption for the RTCU NX-200+ device when it is in power-saving modes.

The following power-saving modes are used:

- Mode 1: LED blinks every ~10 s, resumes the application when it is awoken.
- Mode 2: Does not blink, resumes the application when it is awoken.
- Mode 3: Does not blink, resets the device when it is awoken.

See the RTCU IDE online manual for information about how to use the power saving modes.

Power consumption: Device operating in power-saving modes

	Mode 1			Mode 2			Mode 3			
Wake-up source:	**12V**	**24V**	**BAT**	**12V**	**24V**	**BAT**	**12V**	**24V**	**BAT**	
Cellular	20	10	50	-	-	-	-	-	-	mA
CAN 1	4.5	2.5	15	-	-	-	-	-	-	mA
CAN 2	8.5	4.5	24	-	-	-	-	-	-	mA
RS232 1 *mode 0 / 1*	4.5 / 4	2.4 / 2.2	14 / 13	-	-	-	-	-	-	mA
RS232 2 *mode 0 / 1*	5 / 4.5	2.7 / 2.5	15 / 14	-	-	-	-	-	-	mA
RS485	4.5	2.5	14	-	-	-	-	-	-	mA
Time	1.1	0.7	2.9	0.7	0.4	1.6	0.4	0.3	0.7	mA
Din 1-5	1.1	0.7	2.9	0.7	0.4	1.6	0.4	0.3	0.75	mA
Power Failure	1.1	0.7	2.9	0.7	0.4	1.6	0.4	0.3	0.75	mA
Power Apply	1.1	0.7	2.9	0.7	0.4	1.6	0.4	0.3	0.75	mA
Vibration	1.2	0.7	3.2	0.7	0.4	1.9	0.5	0.5	1.1	mA

Note: If wake-up on both power fail and power apply are enabled, mode 2 and 3 are not supported.

Note: Power consumption was measured from a fully charged battery.

Note: The RS232 ports have support for two different wake-up configurations. Mode 0 will wake on valid data while mode 1 will wake on any change on the interface.

Note: The power consumption for CAN 1 has been measured with write disabled.

Appendix A – Installing the external SIM-Card

The external accessible SIM card reader has a push/push eject system and a mechanical lock for secure installation of the SIM card.

Orientate the card as shown below and insert it into the card reader. Push the card into the reader until a click sound occurs – the card will now stay in its position. It might be necessary to use a small tool or pencil as the card, for protection purposes, it is placed underneath the enclosure surface. Furthermore, a mechanical slide lock can be used to prevent it from being removed accidentally.

Slide the lock to its unlocked position to remove the card and push the card into the reader until a slight click sound occurs. The reader will now eject the card. It might be necessary to use a small tool or pencil to push the card into the reader.



SIM card orientation

Appendix B – Installing the internal SIM-Card

WARNING: *Disassembling the device must be performed by a professional personal.*

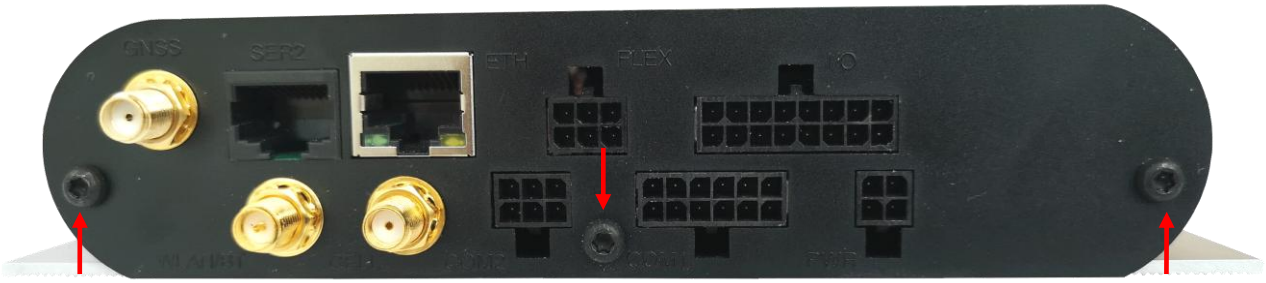


ATTENTION: The device internal electronics are sensitive to Electrostatic Discharge (ESD) and must be handled only in an ESD safe environment.
Avoid touching the electronics components and parts.

The internal accessible SIM card reader is a hinged reader with a mechanical lock for secure installation of the SIM card.

To gain access to the internal card reader, the circuit board must be pushed out. This operation is described in the following steps:

1. Remove the three screws on the backplate.



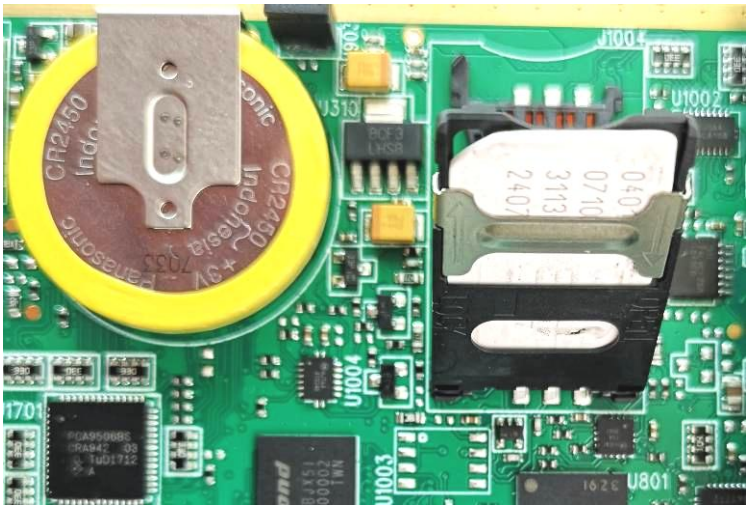
2. Pull gently and slowly the backplate near the GNSS antenna connector. The circuit board is fixed inside the encapsulation due to the internal battery holder and may require a small amount of force. You may push from the front side through the USB Host port 1 connector; please do not push hard nor use any tools that can damage the connector.

3. It's important to pull the circuit board evenly on both sides.

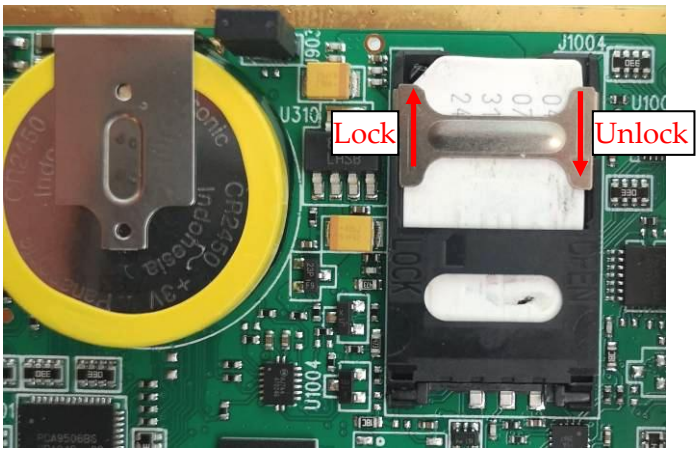
4. The circuit board will not have to be removed entirely from the housing. The SIM-card orientation on the reader is as follows:



5. Insert the SIM-card in the hinge

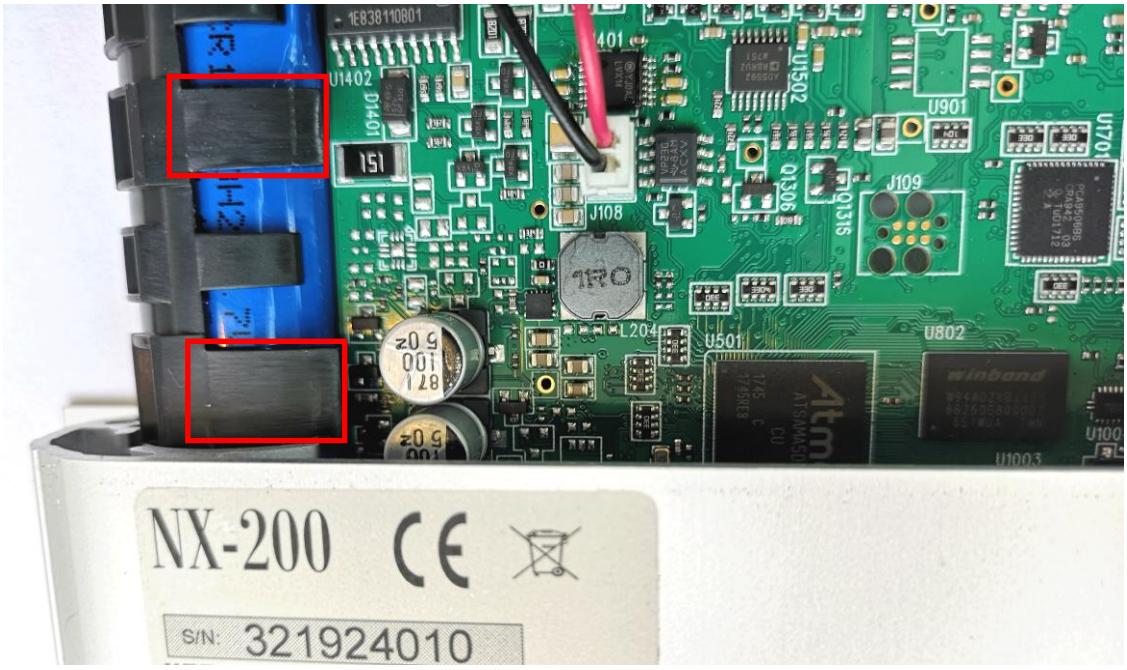


6. Close and lock the card reader



7. Push the circuit board into the encapsulation gently until the internal battery holder hits the battery compartment of the encapsulation. The circuit board can't be pushed further until the fixing flaps of the battery holder are squeezed inside the battery compartment of the encapsulation.

8. Squeeze the first flaps with two fingers on both the top and bottom sides of the battery holder, push into the encapsulation, and squeeze the second flap.



9. When the baseboard is pushed into the encapsulation, align the backplate with the connectors and secure the endplate with the three screws removed in step 1.

Appendix C – Installing the SD-CARD

To insert a card into the reader, orientate it as shown below and push the card into the reader until a click sound occurs. Remove the card by pushing it into the reader until it clicks, and the reader will eject the card. Avoid removing the SD-CARD during access to the card.



SD-CARD orientation

Appendix D - Enabling the CAN bus channel 1 write capability

Connecting the RTCU to a CAN network can be dangerous. If the RTCU is not configured with the correct network parameters, it can lead to network corruption and may interfere with other connected equipment on the bus. Especially in vehicles, great precautions must be observed to prevent interruption of communication.
By default, reading from the CAN bus is enabled and writing to the CAN bus is disabled by a hardware jumper inside the unit.

Installing this jumper, and thereby enabling the CAN-bus Write capability of the unit, is done on the sole responsibility of the user. Logic IO can not be held responsible for any problems, or damage due to the decision to enable the CAN-bus Write capability.

The following steps must be taken to enable the CAN bus Write capability of the unit:

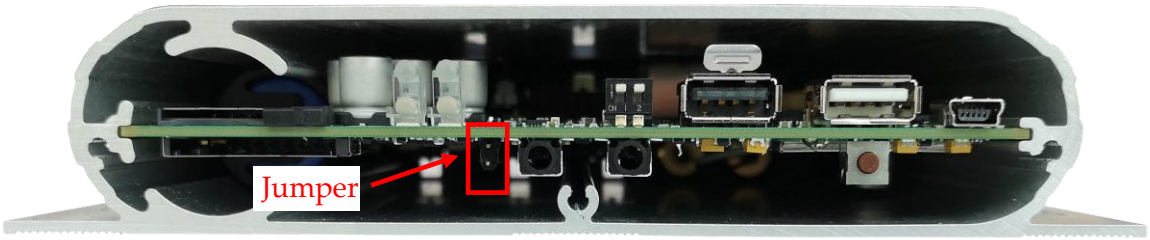


ATTENTION: The device internal electronics are sensitive to Electrostatic Discharge (ESD) and must be handled only in an ESD safe environment.
Avoid touching the electronics components and parts.

1. Remove the frontplate by removing the three screws.



2. The jumper is located on the bottom side of the circuit board, near the audio jack connector.



3. Insert the jumper. **Please pick a suitable jumper, that is not too long to conflict with the endplate.**
4. Place the frontplate, so the connectors fit the openings, then tighten the two screws. **Be careful not to tighten the screws too much, thereby damaging the aluminum.**

Appendix E - Open Source Disclaimer

The RTCU NX-200+ products include several open-source software tools. This open-source software is governed by the terms and conditions of the applicable open source license, and you are bound by the terms and conditions of the applicable open source license in connection with your use and distribution of the open-source software in this product.

Please refer to the separate document "**RTCU Open Source Licenses.pdf**" for detailed information about the packages used in the RTCU NX-200+ product.

RTCU NX-200+ Specifications

RTCU M2M Platform

- NX32L Execution Architecture.
- Fully NX32 compatible.
- Larger capacity and higher performance compared to NX32.
- Open and user-extendable API.
- RTCU M2M Platform SDK.

NX32L Hardware Core

- Cortex-A5 32-bit ARM processor.
- Hardware floating point and DSP.
- 128 MByte LP-DDR RAM.
- 512 MByte NAND flash.
- 16 MByte NOR flash.
- 128 KByte SRAM with battery-backup.
- Real-time clock with battery-backup.

Security

- Embedded firewall.
- TLS/SSL support with full certifcate management.
- TLS/SSL support for SMTP, MQTT, FTP, HTTP, RCH, and TCP/IP sockets.
- Hardware assisted strong encryption/ authentication: AES-128, AES-192, AES 256, DES, TripleDES, HASH, RND, and RSA signature.

Storage

- Persistent data flash.
- Non-volatile SRAM.
- Internal flash drive (Up-to 512 MByte).
- Circular datalogger.
- SD-CARD.
- USB flash media.

Cellular Engine

- **LTE Cat.4 Engine (Worldwide).**
  Max 150 Mbps(DL)/Max 50 Mbps(UL).
  LTE FDD: 15 bands.
  LTE-TDD: 4 bands.
  WCDMA: 7 bands.
  GSM: Quad-band.
- DTMF decoding / transmission.
- Digitized voice playback / IVR.
- Dual SIM card reader, with Mini-SIM 1.8/3 volt.
- Application controlled SIM card.
- Optional eSIM.

Wireless LAN

- WiFi at 2,4 GHz ISM bands.
- IEEE 802.11b/g/n/d/e/h/i.
- WPA/WPA2 certification.
- Up-to 150 Mbps.

GNSS

- Multi-constellation L1 positioning.
- GPS, GLONASS, Galileo, BeiDou and QZSS.
- SBAS: WAAS, EGNOS, MSAS, GAGAN.
- Active 3 volt GNSS antenna.

NX-200+

- Quectel LC26G engine.
- AGNSS (EASY / EPO) capable.
- 1.5 m CEP horizontal accuracy.
- Active interference cancellation.

NX-200DR+

- u-blox NEO-M9V with integrated IMU.
- Untethered Dead Reckoning (UDR).
- Automotive Dead Reckoning (ADR).
- Accuracy: 1.5 m CEP with SBAS; 2.0 m CEP without SBAS.
- Jamming and spoofing detection.

Bluetooth

- Classic and Low Energy (LE).
- Bluetooth 2.1 + EDR up-to 3 Mbps
- Bluetooth 3.0 and 4.0 Dual mode.
- Intelligent co-existence with WLAN.

Wired Communication

- 100BASE-T Ethernet interface.
- 2 x Full CAN2.0B with hardware filtering and multi-speed support.
- 2 x RS232. One with control signals.
- 1 x RS485.
- 1-Wire bus.
- 2 x USB host port. One with lock.
- USB service/programming port.

Audio

- Fully digitized audio system.
- Transfer, store and play audio.
- Amplified speaker output.
- Microphone input.
- Digitized GSM audio.

User Interaction

- 4 x bi-colour LED.
- DIP-switches.
- Virtual jumpers for RS485 and CAN termination.
- CAN write enable jumper on one port.
- Reset / recovery switch.



I/O Interface

- 4 x digital solid-state digital output.
  Max. 36 volt / 1.5 A per. channel.
  Short-circuit, ESD, Inductive kick-back protected up to 20 mH.
- 5 x digital inputs with ignition.
  Logic high: 8 to 40 VDC.
  Logic low: -5 to 3 VDC.
  Impedance: 14 kohm @ 12V.
- 4 x flex-inputs. Dual mode operation:
  Analog mode: 0..30VDC
  Digital mode: 0..30VDC.
  Impedance: 120 kohm @ 12V.
  Multi configuration support.
- 2 x analog inputs.
  Range is 0..10VDC.
  Resolution: 12 bit
  Accuracy: Typ. ±0.3% FSR @ 25°C.
  Impedance: 40 kohm (V).
- Protected against transients and low-pass filtered.

Sensors

- Temperature sensor.
- 3-axis Accelerometer. ±16g@16b.
- 3-axis Gyroscope. ±2000dps @16b.
- 3-axis Magnetometer. ±50 gauss @16b.

Electrical

- Operating voltage: 8 to 36 VDC.
- Short and reverse power protected.
- 5 VDC-out @ 300 mA.
- Dual USB 5 VDC @ 500 mA.

Battery and Charger

- On-board 2.6Ah (nominal) Li-Ion battery.
- Intelligent charger with temperature throttle and sub-zero degrees support.

Power Management

- Low-power modes.
- Wait for Event: Timer, Digital input, accelerometer, RS232, RS485, CAN, Cellular, Power change state.
- Wait for event, from: 0.4 mA@12V.
- Supervision of supply voltage / type.

External Interfaces

- **Plug-compatible with the MX2 turbo.**
- SIM-card slots for mini-SIM card.
- SD-CARD slot.
- 2 x mini-jack for audio in/out.
- 4 x LED indicators and 2 x DIP switches.
- Reset/recovery switch.
- RJ45 for RS232 with full control signals.
- SMA Female connector for cellular.
- SMA-RP connector for WLAN and BT.
- SMA Female connector for GNSS.
- USB 2.0 Host port connectors.
- USB 2.0 Slave mini-USB connector.
- TE-Connectivity "Mate'n'Lok': RS232, RS485, CAN I/O, Power, Communicaton.

Expandable

- I/O expansion Modbus modules.
- Additional Ethernet port.
- Additional RS232 / RS485 ports.
- Industrial USB hub.
- Camera with HD video streaming.
- Speaker and microphone.

Physical Characteristics

- Encapsulation: Aluminium profile.
- Colour: Anodized natural grey.
- Material: Aluminum and plastic.
- Approx. 500 gram without accessories.
- W 148 x H 34 x D 122 mm.
  (without connectors / mounting flange).

Environmental Specification

- Operating temperature: -40 to 65°C.
- Battery charge temperature:
  -10 to 45 °C.
- Recommended storage temperature:
  0 to 45°C.
- Humidity: 5..90% (non condensing).
- Ingress Protection: IP20 .

Approvals

- 2007/46/EC UN ECE R10 Rev. 05 (E1).
- 2014/53/EU Radio Equipment Directive.
- 2011/65/EU RoHS Directive.
- Cellular:
  GCF/CE/FCC/PTCRB/IC/Anatel/SRRC/NAL/CCC/KC/NCC/JATE/TELEC/RCM/IFETEL/FAC/NBTC/ICASA.

Warranty

- Two-years return to factory parts and labor.
- Optional warranty up to 5 years. (restrictions apply).



Technical data are subject to changes.

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