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GTW-200 Operational Manual

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2. Revision History

Rev. #	Description	Date
01	Initial release	September 19, 2023
02	Added regulatory information and specifications	January 11, 2024
03	Added mounting provisions section	January 18, 2024
04	Updated Safety section, operating temperature specifications	March 4, 2024
05	Updated FCC/IC compliance statements	June 4, 2024
06	Added ISED Antenna Statement	June 6, 2024

3. Document Links

Document #	Document Name
N/A	N/A

4. Acronyms

BLE	Bluetooth Low Energy
GTW	Gateway
LTE	Long-Term Evolution
LoRa	Long Range
LED	Light Emitting Diode
MQTT	Message Queuing Telemetry Transport
RSSI	Received Signal Strength Indicator
RAT	Radio Access Technology
WIFI	Wireless Fidelity
ID	Identifier

5. ISED Non-Interference Disclaimer

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

This device complies with the Canadian ICES-003 Class A specifications. CAN ICES-003(A) / NMB-003 (A).

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempt de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

6. RSS-Gen Transmit Antenna Statement

This radio transmitter IC: 26661-GTW02 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio IC: 26661-GTW02 a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Under Innovation, Science and Economic Development regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by ISED. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Innovation, Sciences et Développement économique Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Innovation, Sciences et Développement économique Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

6.1. Approved Antenna Type

Maximum Gain:	2 dBi
Antenna Type:	Dipole, Tilt
Radiation Pattern:	Omni-Directional
Impedance:	50 Ω
Connector Type:	SMA Male

7. FCC Class A Compliance Statement

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

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation. Please note that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Changes or modifications not expressly approved by Electronics4All Inc. could void the user's authority to operate the equipment.

8. RF Exposure Statement

This equipment complies with FCC and ISED RSS-102 radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. In order to avoid the possibility of exceeding the FCC and ISED RSS-102 radio frequency exposure limits, this equipment should be installed and operated with minimum distance 20 cm (7.8 inches) between the antenna and your body during normal operation. Users must follow the specific operating instructions for satisfying RF exposure compliance.

Cet équipement est conforme aux limites d'exposition aux rayonnements FCC et ISED CNR-102 établies pour un environnement non contrôlé. Cet émetteur ne doit pas être installé ou utilisé en conjonction avec une autre antenne ou un autre émetteur. Afin d'éviter la possibilité de dépasser les limites d'exposition aux radiofréquences FCC et ISED, cet équipement doit être installé et utilisé avec une distance minimale de 20 cm (7.8 pouces) entre l'antenne et votre corps pendant le fonctionnement normal. Les utilisateurs doivent suivre les instructions spécifiques d'utilisation pour respecter la conformité à l'exposition aux RF.

9. Safety

WARNING

If the device is installed or operated in manner not specified in this manual, any protection provided by the device may be impaired.

1. Ensure only qualified personnel perform the installation.
2. Operate the device only with the specified accessories.
3. The device is intended for use only in a clean and dry indoor environment.
4. Always wear personal protective equipment appropriate to the environment where the device is installed and operated.
5. Do not make or break connections while circuits are live unless the area is known to be non-hazardous.
6. The device contains no user serviceable parts. Do not attempt to repair the device. See the Contact Information section for support or repair.

10. Installation

10.1. Intended Use

The device is intended to be installed and operated in an indoor industrial environment. The wireless system is Class A equipment and may cause radio interference in residential areas.

11. Product Disposal

The GTW-200 may be recycled by Electronics4All Inc. See the Contact Information section to recycle the GTW-200 or any supplied accessories.

12. Maintenance and Cleaning

Clean the enclosure using a clean dry cloth.

13. Contact Information

Electronics4All Inc.
250 Herzberg Road
Kanata, Ontario, Canada
K2K 2A1
www.electronics4all.ca
1-613-595-0303

14. Symbols

Certification mark indicating that the device has been evaluated against FCC part 15.

Certification mark indicating that the device has been evaluated against IEC 61010-1.

Caution: Follow the terminal block connection instructions and pin assignment. See Section 16.2 and Section 23.7 for the terminal block connection information and specifications.

15. GTW-200

The GTW-200 is a quad-band gateway designed for monitoring environmental sensors in an industrial environment.

The GTW-200 pairs with Electronics4All Inc. Bluetooth sensors (e.g., BMS-100-TH, CLS-4-20, TP-100-TH, AT-105).

Sensor data is pushed to a network database using MQTT. The network connection can be Ethernet, LTE, or Wi-Fi.

A LoRa interface can also be used to link gateways together when a network connection is not available in a specific location.

16. Connections

Number	Connector	Description
1	DB-9	RS-232 Interface (Not Active)
2	5.5 mm OD, 2.5 mm ID Barrel	12 VDC Power Input
3	RJ-45	Ethernet and PoE+
4	3.5 mm 10-Pin Terminal Header	Analog and Digital Inputs, Relay Outputs
5	USB-C	Power Input and Serial Interface
6	Micro-USB	LTE Test Interface

16.1. Antennas

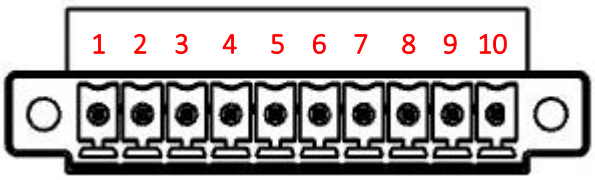
The GTW-200 is supplied with four antennas. Only the supplied antennas are approved for use.

16.2. Terminal Block

CAUTION

Observe the discrete signal pin assignment for the terminal block provided in the table below.

Pin Number	Description
1	Relay 1 SW
2	Relay 1 COM
3	Relay 0 SW
4	Relay 0 COM
5	Digital IN2 +
6	Digital IN1 +
7	Current IN - / Digital IN -
8	Current IN +
9	Analog Voltage IN -
10	Analog Voltage IN +



Relay Outputs

The GTW-200 contains two (2) independent relay contacts on the terminal block. The relays are rated to switch resistive loads up to 2 A at 30 VDC, and 0.9 A at 60 VDC.

Digital Inputs

The GTW-200 contains two (2) IEC 61131-2 type 1 and type 3 compliant digital inputs. The digital inputs are referenced to pin 7 on the terminal block.

Current Input

The GTW-200 contains a 4 mA to 20 mA current input on pin 8 (+) and pin 7 (-) on the terminal block.

Analog Input

The GTW-200 contains a ± 10 VDC analog input on pin 10 (+) and pin 9 (-) on the terminal block.

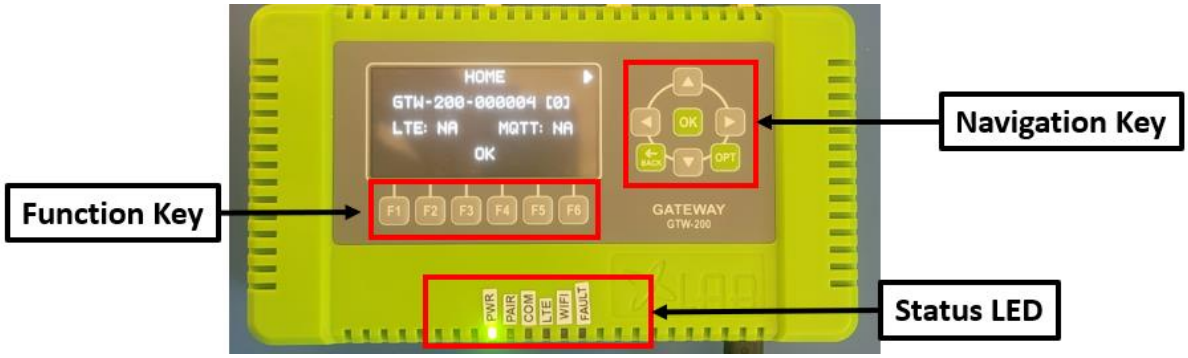
16.3. SD Card Slot and SIM Card Slot

The SD card slot (1) and LTE SIM card slot (2) are accessed by removing the side panel.

The GTW-200 accepts standard SIM cards (25 mm × 15 mm).

Note that the SD card is currently only used for firmware updates. See the **Error! Reference source not found.** section for more information.

17. Button Interfaces and Status LEDs



Function Key	Function
F1	Use to go to Sub menu of the menu besides which [F1] is mentioned. Also used to enter password when require entering the password.
F2	Use to go to Sub menu of the menu besides which [F2] is mentioned. Also used to enter password when require entering the password.
F3	Only used to enter password when require entering the password at this time.
F4	Only used to enter password when require entering the password at this time.
F5	To turn on the pairing mode and used to enter password when require entering the password.
F6	To refresh screen manually and used to enter password when require entering the password.

Navigation Key	Function
Right	To navigate in right direction when right arrow is visible on top right corner of the screen.
Left	To navigate in left direction when left arrow is visible on top left corner of the screen.
Up	To increase the reporting interval in “Interval” submenu of BLE menu.
Down	To decrease the reporting interval in “Interval” submenu of BLE menu.
Option	Use to go to Sub menu of the menu besides which “[OPT]” is mentioned.
Ok	To confirm the action by pressing OK key where “[OK]” is mentioned.
Back	To go back to the upper menu of submenu.

Status LED	Colour	Function
PWR	GREEN	Indicates unit is powered, as well as indicating LoRa comms states, as per GTW-100
PAIR	GREEN	To indicate that the pairing mode is ON when LED is ON. This LED turn ON when F5 is pressed once. (See ‘Setup’ description below)
COM	RED	(As per GTW-100)
LTE	GREEN RED	GREEN when there is no error and LTE is working. RED when there is error and LTE is not working.

WIFI	GREEN RED	GREEN when there is no error and Wi-Fi is working. RED when there is error and Wi-Fi is not working.
FAULT	RED	FAULT LED is ON when any fault is present.

18. Power

The GTW-200 accepts three separate sources of power: 12 VDC input, Power over Ethernet (PoE), and USB-C. Multiple power connections may be connected simultaneously; however, PoE will be automatically disabled if either the DC input or USB-C inputs are connected. If the DC input and USB-C connections are removed, PoE operation will be automatically re-enabled. Note that this will cause a power cycle on the GTW-200.

ATTENTION

- When powering the GTW-200 using the AC/DC adapter, the GTW-200 should be operated in an ambient temperature environment of between 0 °C and 40 °C.

- For GTW-200 firmware versions 4015 and below, when USB-C is used as the sole source of power, the GTW-200 should be reset after the initial power connection. This may be performed by following the directions in the Reset section.

19. GTW-200 Set-Up / Configuration

19.1. MQTT Broker

MQTT Broker configuration is performed using the USB-C port and a serial terminal program on a host computer.

1. Connect the USB-C port to a host computer
2. Open a serial terminal program and select the COM port assigned to the GTW-200. Note that if no COM port is assigned by the operating system, the "Load VCP" option must be enabled in Device Manager. Contact Electronics4All Inc. for more information. The GTW-200 serial port operates with the following parameters: 115200 baud, 8 data bits, 1 stop bit, no parity

3. Once the terminal is connected to the GTW-200, select [z] to invoke the main option menu
4. Select option [1] to display the configuration (programming) option menu

```
Please choose among the following options:
 1) Programming Mode.
 2) Reading Mode.
 3) Normal Mode.
 4) LOG Level.
 5) Firmware Update.
 6) Exit.
Choice:
```

5. Select option [2] to display the Broker configuration options

```
Please choose among the following options:
 1) Program Node ID.
 2) Program Broker Params.
 3) Program LoRa Params.
 4) Program Reporting Interval
 5) Return.
Choice:
```

6. Broker configuration parameters may be entered by selecting options [1] to [6]
7. Select [7] to save the new settings and return to the option menu, [5] to return to the main menu, and then [6] to Exit

```
Please choose among the following options:
 1) Select Broker (Local/Cloud)
 2) Local Broker IP
 3) Cloud Broker URL
 4) Cloud Broker Username
 5) Cloud Broker Password
 6) Cloud Broker Communication Port
 7) Return
Choice:
```

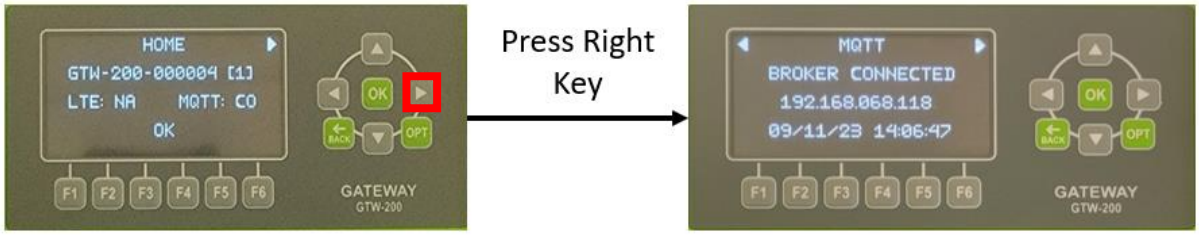
20. Menu Navigation

20.1. Home

Number	Description
1	It is the GTW-200 ID of gateway and [x] indicates the current number of sensors paired to this gateway.
2	It indicates the status of LTE but not functional currently. (Work under progress).
3	It indicates the status of MQTT broker. Where two alphabets beside MQTT: is as follows: **NA:** Not Applicable **MC:** Missing Configuration **NC:** Not Connected **CI:** Connecting **TS:** Waiting for Timestamp

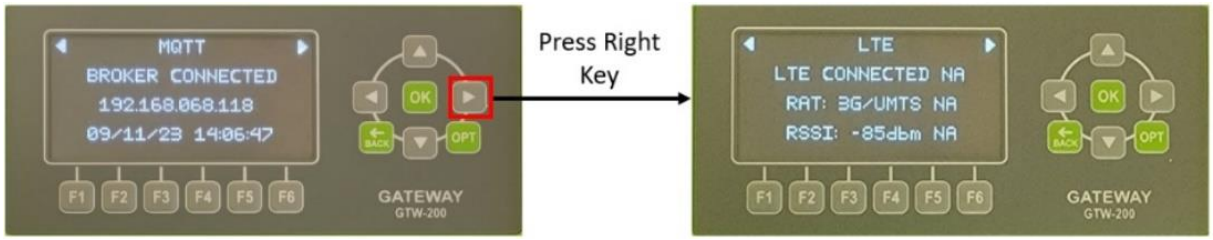
	CO: Connected
4	It indicates the GTW Status but not functional currently. (Work under progress).

20.2. MQTT



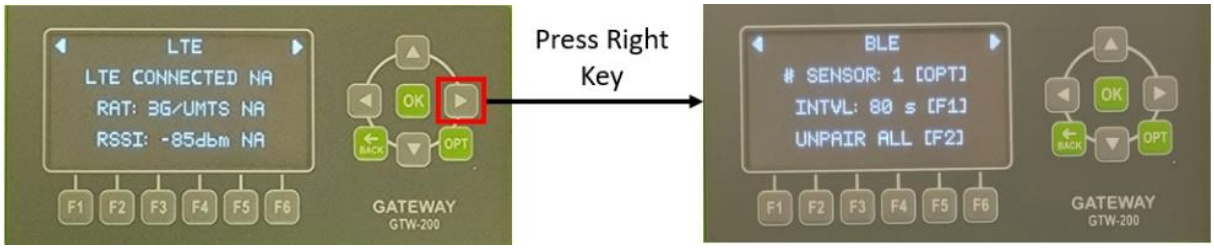
Number	Description
1	First row indicates broker status. Types of broker status are as follows: BROKER NA (where NA: Not Applicable) BROKER NOT CONNECTED BROKER IS CONNECTING BROKER TIMESTAMP ER (where ER: Error) BROKER CONNECTED
2	Second row indicates the configured Broker IP address.
3	Third row indicates the gateway timestamp.

20.3. LTE

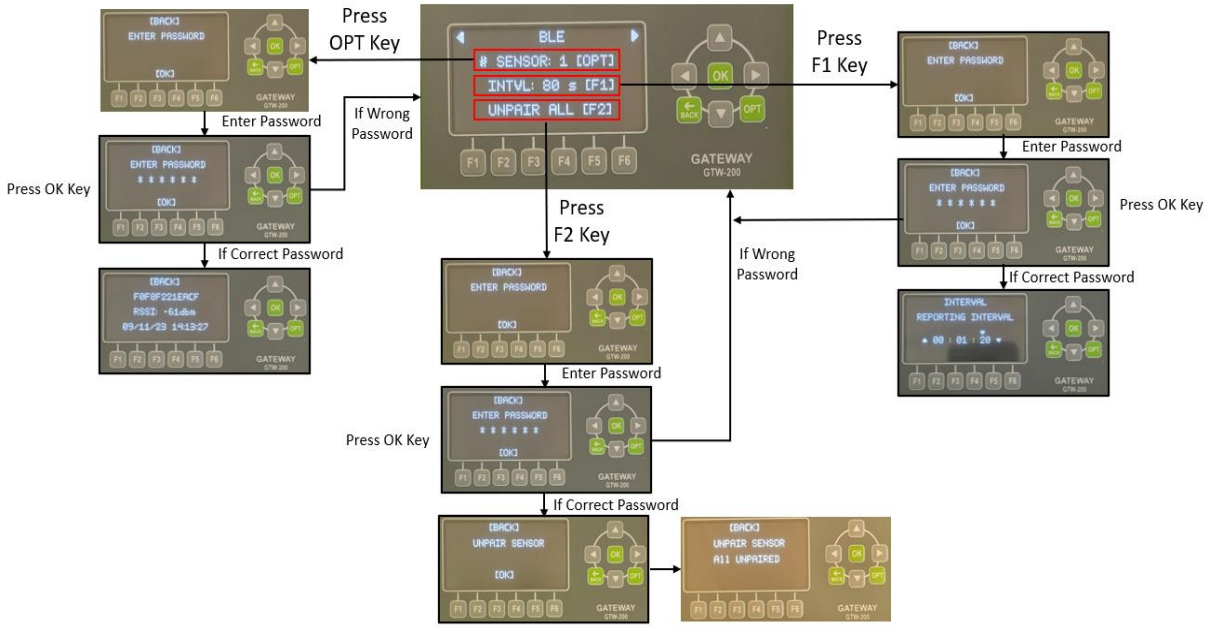


Number	Description
1	First row indicates LTE status but currently not functional. (work is under Progress)
2	Second row indicates the connected network but currently not functional. (work is under Progress)
3	Third row indicates the RSSI but currently not functional. (work is under Progress)

20.4. Bluetooth



Number	Description
1	First row indicates the number of sensors paired at the moment and submenu can be accessed by pressing “OPT” key to get more detailed information of each connected sensors.
2	Second row indicates the current set reporting interval and submenu can be accessed by pressing “F1” key to set new reporting interval.
3	Third row indicates that the ‘unpair all’ submenus can be accessed by pressing “F2” key to unpair all paired sensors at once.

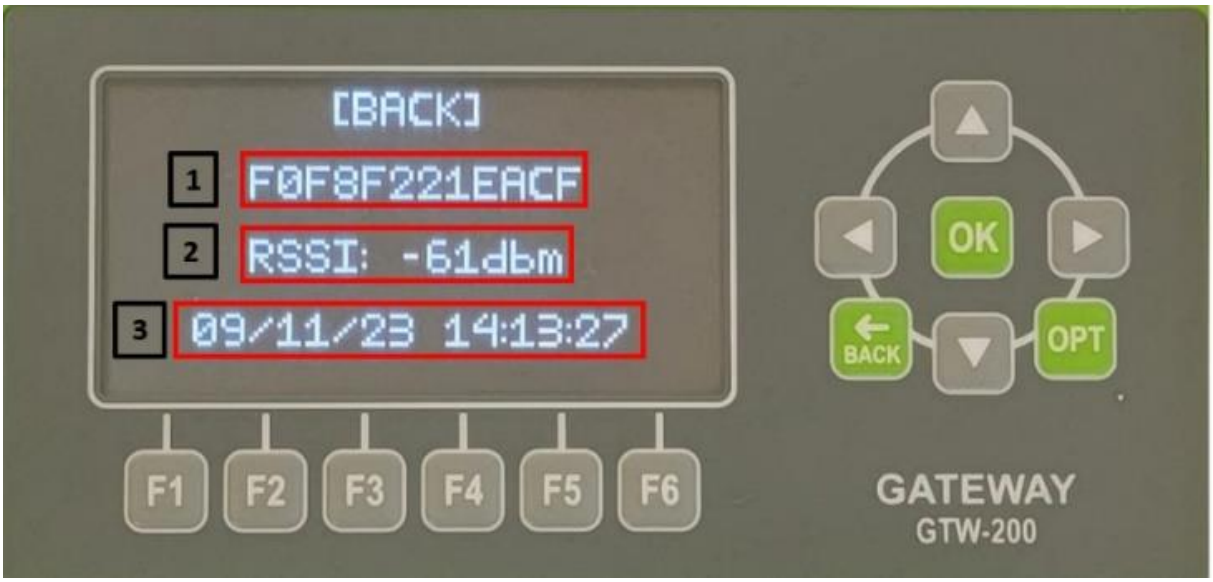


All submenus are password protected. The default password is [F1] [F2] [F1] [F2] [F1] [F2]. If the [BACK] key is pressed at any point while navigating in sub menu leads back to the upper menu (main menu) of that submenu.

17.4.1. Sensor Pairing

To pair an Electronics4All Inc. Bluetooth sensor to a GTW-200, press the [F5] button. The green COM LED will turn on indicating that the GTW-200 is in pairing mode. Follow the instructions for the Bluetooth sensor to complete the pairing process. The green COM LED on the GTW-200 will turn off when pairing is complete, and the newly paired sensor information will be available in the Sensor Status Information screen.

17.4.2. Sensor Status Information



Number	Description
1	First row indicates the MAC address of the paired sensor
2	Second row indicates the last received RSSI
3	Third row indicates the last received report timestamp

Sensor screens automatically refresh every 6 seconds. Note that during active pairing of new sensors, these screens will automatically update to reflect the latest paired sensor.

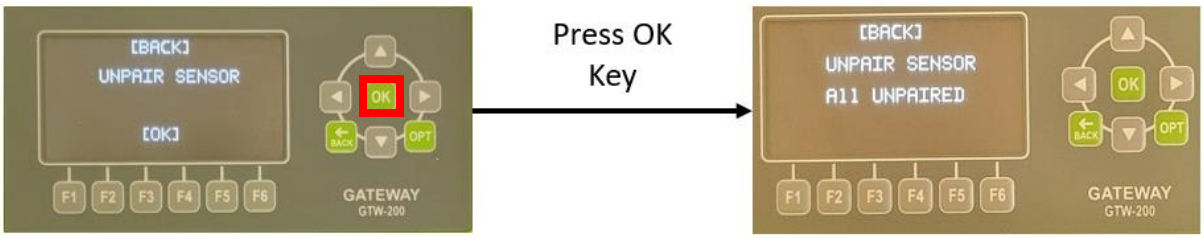
7.4.2 Sensor Reporting Interval

The reporting interval of a sensor may be configured on the GTW-200 using the Reporting Interval screen.

Number	Description
HH : MM : SS 00 : 01 : 20	Below given picture indicates the set reporting interval and user can change it by pressing left, right, up, and down key. Left and right key is used to move curser from one to another position. Up and down key is used to increase or decrease the number where the curser is pointing.

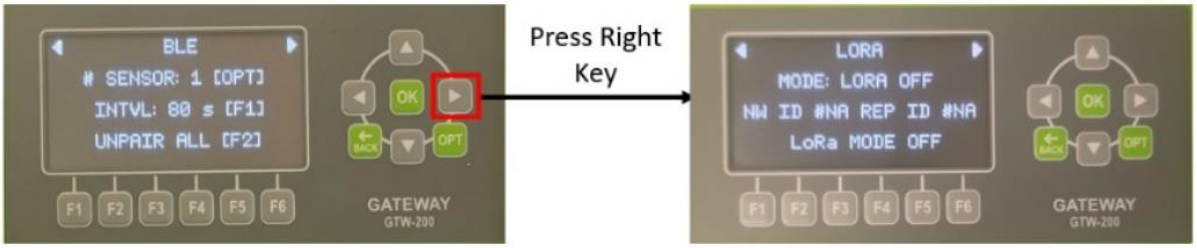
To save the set reporting interval and come back to the upper menu press back button.

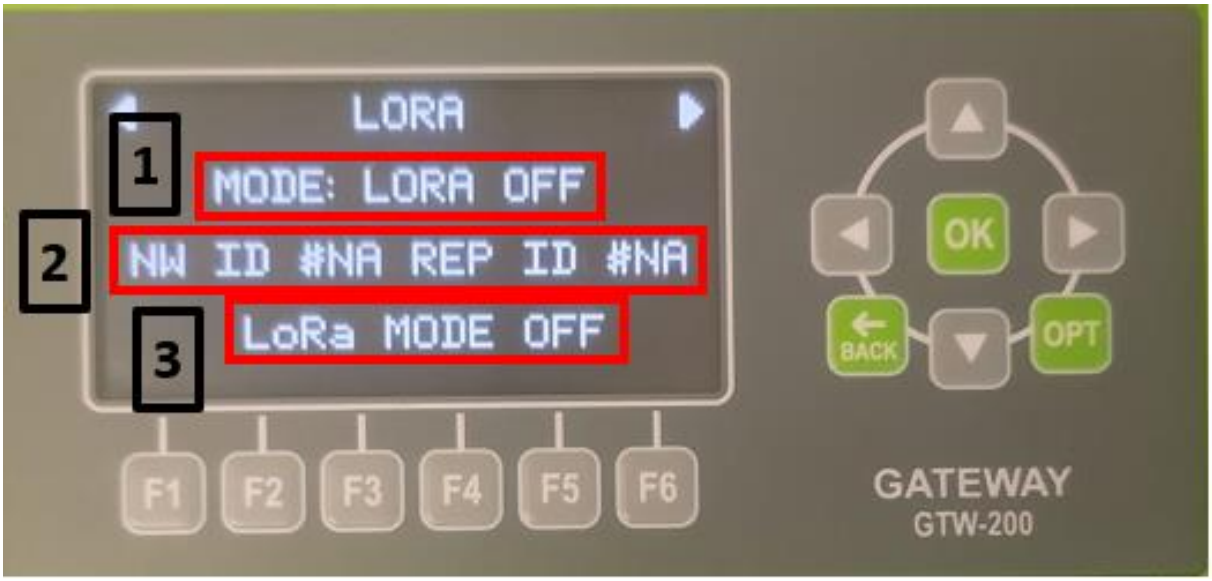
7.4.3 Unpair All Sensors



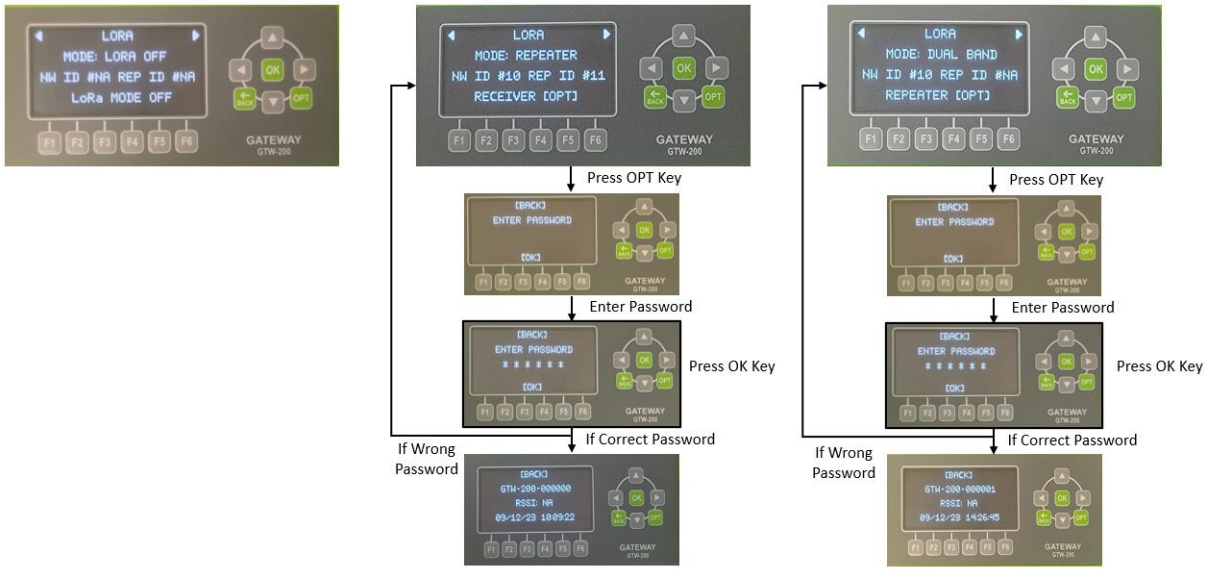
Press [OK] to unpair all sensors at once and press [BACK] key to go back to upper menu.

20.5. LoRa



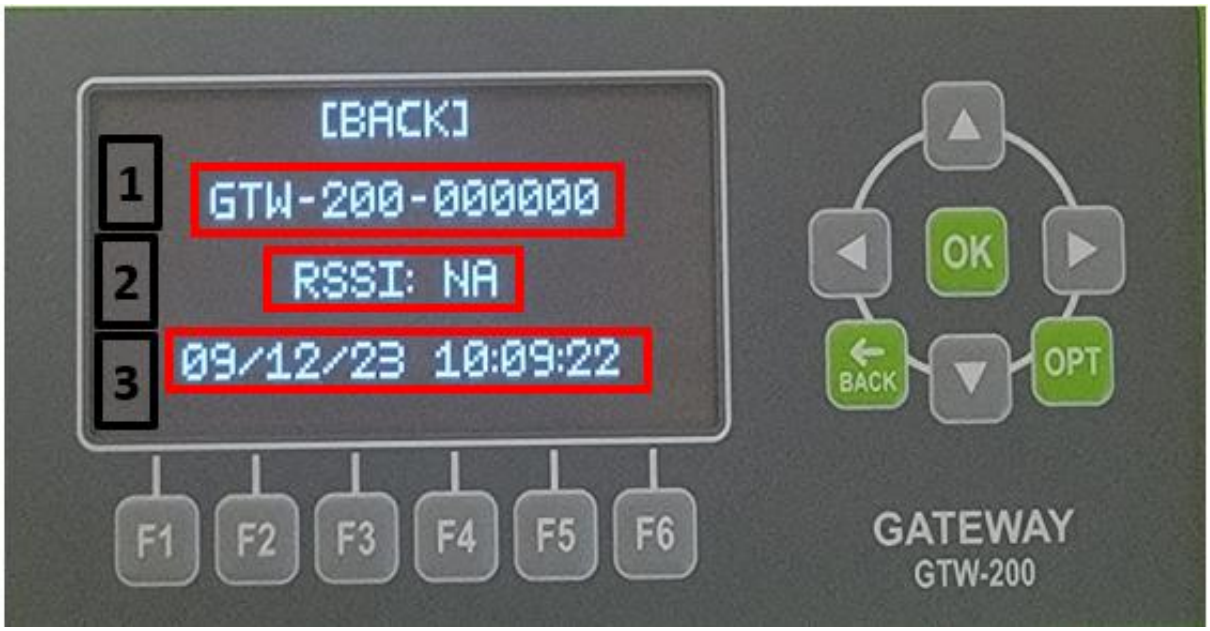


Number	Description
1	First row indicates the current LoRa mode. All three modes are as follows: LORA OFF REPEATER MODE DUAL MODE
2	Second row indicates the network id and repeater id.
3	Third row information changes as per the set LoRa mode When LORA OFF row 3 shows “LoRa MODE OFF” When REPEATER MODE row 3 shows “RECEIVER [OPT]” When DUAL MODE row 3 shows “REPEATER [OPT]” Submenu is accessible by pressing OPT key only when LoRa is in dual or repeater mode



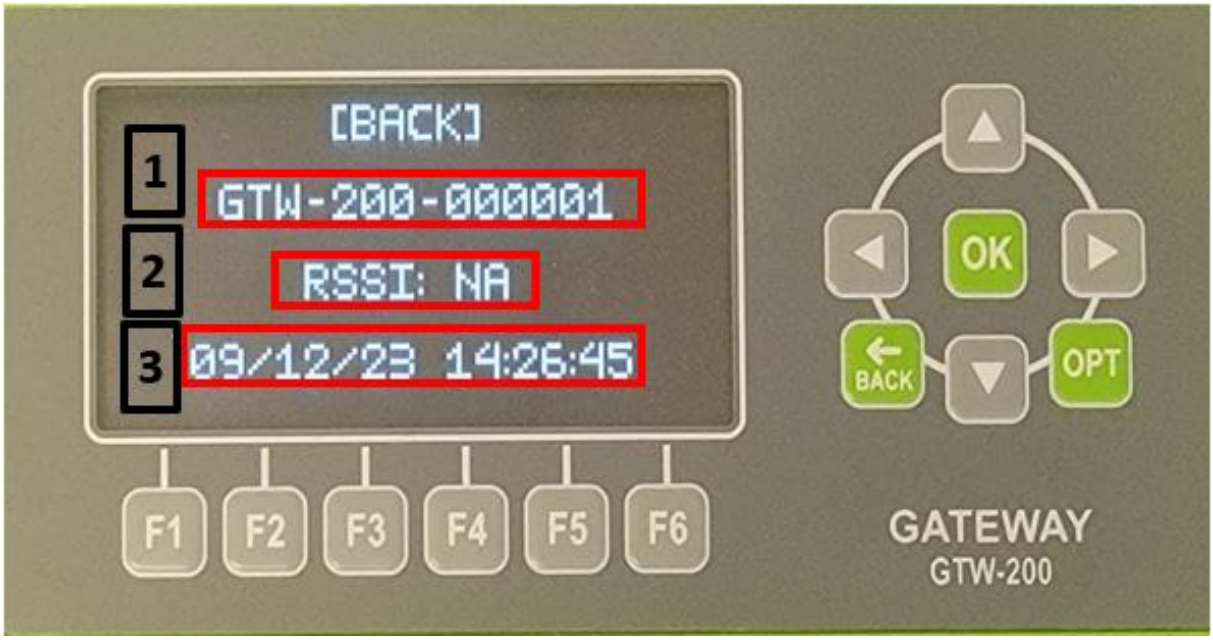
All submenus are password protected. The default password is [F1] [F2] [F1] [F2] [F1] [F2]. If the [BACK] key is pressed at any point while navigating in sub menu leads back to the upper menu (main menu) of that submenu.

7.5.1 Submenu When in Dual Mode



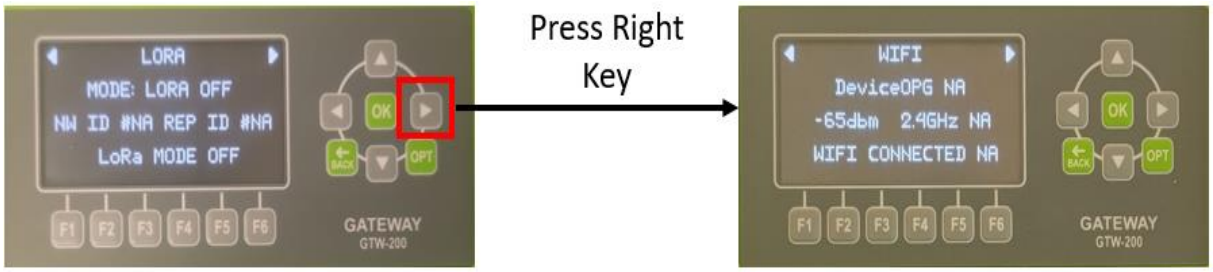
Number	Description
1	First row indicates the GTW ID of last reported repeater.
2	No RSSI available in LoRa
3	Third row indicates that timestamp of last repeater report received.

7.5.2 Submenu When in Repeater Mode



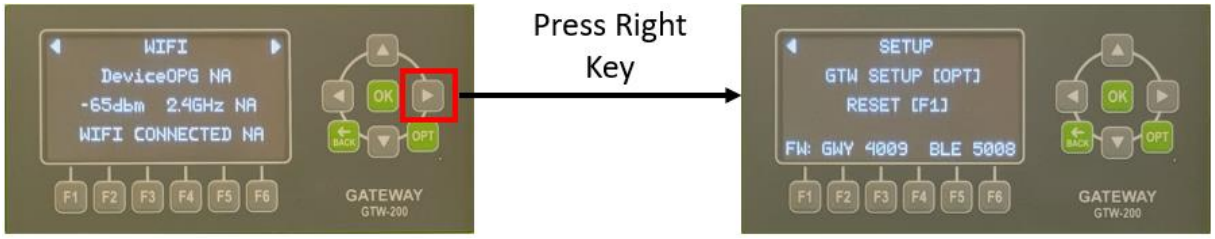
Number	Description
1	First row indicates the GTW ID of receiver gateway.
2	No RSSI available in LoRa
3	Third row indicates that timestamp of last receiver report.

20.6. Wi-Fi

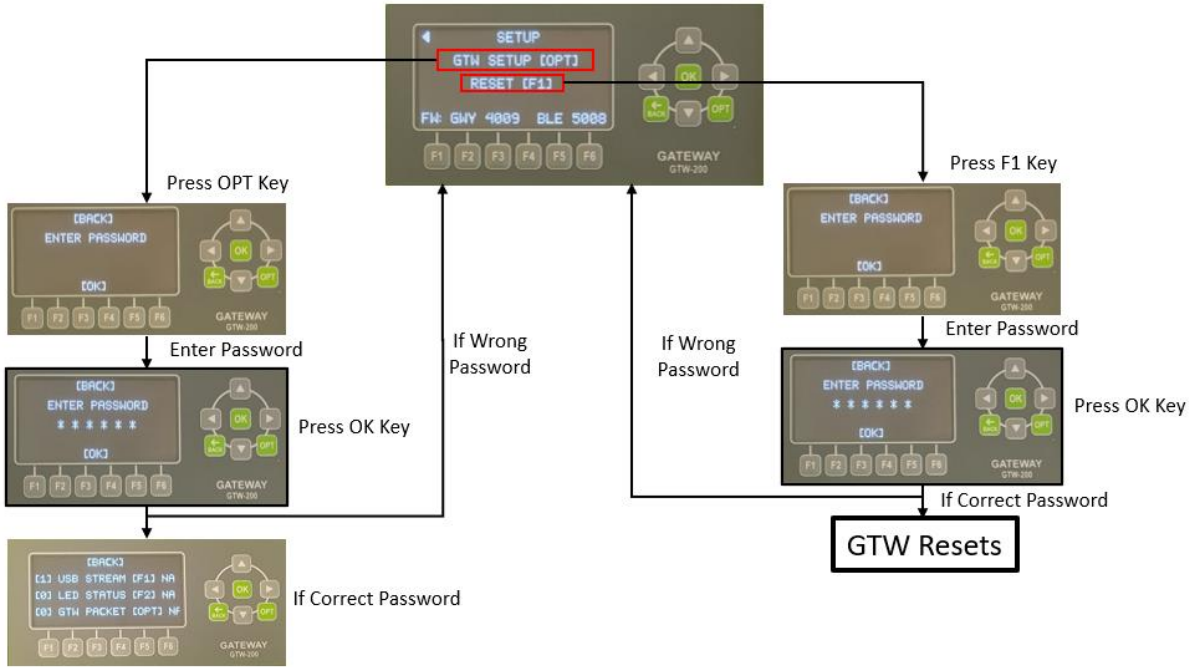


Number	Description
1	First row indicates the name of connected WIFI network but currently not functional. (work is under Progress)
2	Second row indicates the network strength but currently not functional. (work is under Progress)
3	Third row indicates the WIFI status but currently not functional. (work is under Progress)

20.7. GTW-200 Information and Set-up



Number	Description
1	First row indicates that GTW SETUP submenu can be accessed by pressing OPT key but currently not functional. (work is under Progress)
2	Second row indicates that gateway can be reset by accessing the RESET submenu when F1 is pressed.
3	Third row indicates the GTW firmware and BLE firmware.



All submenus are password protected. The default password is [F1] [F2] [F1] [F2] [F1] [F2]. If the [BACK] key is pressed at any point while navigating in sub menu leads back to the upper menu (main menu) of that submenu.

The submenus of GTW SETUP are work under progress. Reset menu reset gateway after entering correct password.

20.8. Firmware Update via SD Card

Follow the steps below to update the main MCU firmware and/or the BLE firmware using a standard SD card. The recommended SD card size is 32 GB.

New firmware files are distributed using the following naming conventions:

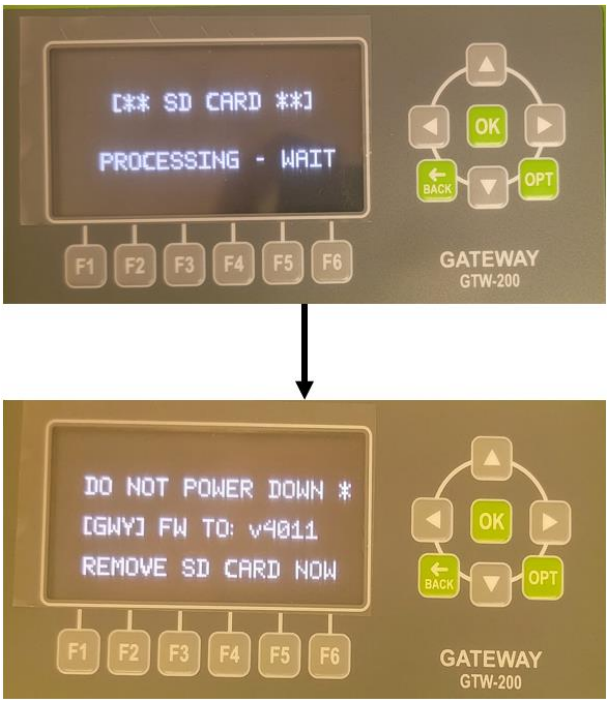
Nxxxx_BMS_Gateway.bin
N = Network type firmware (i.e., targets the main MCU)
xxxx = The 4-digit unique firmware version number

Bnnnn_GWY-200_BLE.bin
B = BLE type firmware (i.e., targets the BLE MCU)
nnnn = the 4-digit unique firmware version number

1. Copy the distributed firmware file(s) to the SD card. Note that no more than ONE file of either of the above file types may reside on the SD card.

2. Insert the SD card into the SD card slot of the gateway. Press and hold [F1] and [F6] for 5 seconds to reset the gateway.

3. When the gateway restarts, it will automatically start the upgrade process. Follow any further screen instructions if/when prompted. Upon completion, the gateway will automatically restart and operate with the new firmware image. The newly installed firmware version number can be verified on the 'Setup' screen.



21. Reset

To reset the GTW-200, press and hold the [F1] and [F6] buttons for 5 seconds. The OLED screen will go black when the reset has been accepted. Release the [F1] and [F6] buttons, and the GTW-200 will execute a system re-boot.

22. Mounting

22.1. Placement

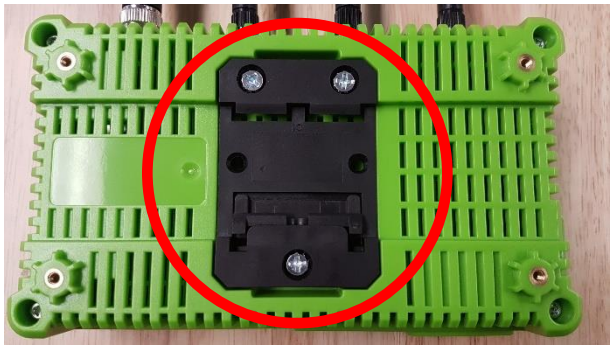
The GTW-200 should not be installed in a location where it will be exposed to moisture or excessive heat.

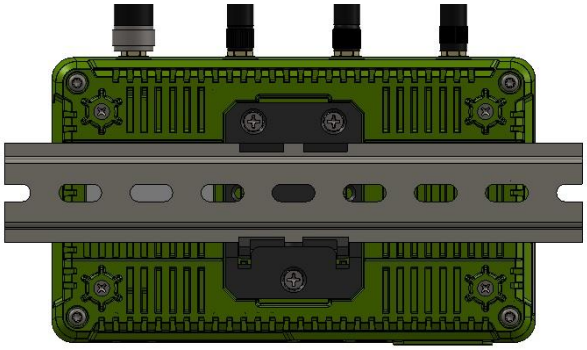
Ensure that all cable connections to the GTW-200 are secured in such a manner that they do not create a snag or tripping hazard.

The GTW-200 can be placed on a horizontal surface. For best wireless performance, when the GTW-200 is installed horizontally, orient the antennas in a vertical arrangement as shown in the picture to the right.

22.2. 35 mm DIN Rail

The GTW-200 is supplied with a 35 mm DIN rail bracket on the rear of the enclosure.





22.3. Magnetic Feet

The GTW-200 is designed to support magnetic feet attachments that allow for securing the device to a steel structure.

Only use the magnetic feet specified in the Accessories section.

For best wireless performance, mount the GTW-200 in a vertical position, and ensure that the antennas are angled in a vertical direction.

23. Specifications

23.1. Certifications

FCC ID	2AXVKGTW02
Industry Canada Certification Number	26661-GTW02
Safety	IEC 61010-1

23.2. Bluetooth

Frequency Range	2404 MHz to 2480 MHz
Channels	0 -39
Maximum Output Power into Antenna	3.5 dBm / 2.2 mW
Antenna	Pulse Electronics W1010
Antenna Gain	2 dBi @ 2.4 – 2.5 GHz

23.3. LoRa

FCC ID	T9JRN2903
Industry Canada Certification Number	6514A-RN2903
Frequency Range	902 MHz to 928 MHz
Maximum Output Power into Antenna	17.5 dBm / 56 mW
Antenna	Abracon LLC APAMS-118
Antenna Gain	2 dBi @ 900 MHz

23.4. Wi-Fi

Wi-Fi Alliance Certification ID	WFA117537

FCC ID	XPYNINAW13
Industry Canada Certification Number	8595A-NINAW13
Wi-Fi Standards	802.11b/g/n
Frequency Range	2.412 GHz to 2.484 GHz, Channels 1 to 14
Maximum Output Power into Antenna	+16.7 dBm / 46.8 mW (Channel 1)
Antenna	Pulse Electronics W1010
Antenna Gain	2 dBi @ 2.4 – 2.5 GHz

23.5. LTE

LTE Category	LTE Cat 1
Supported Bands	LTE-FDD B2, B4, B12
Maximum Output Power into Antenna	+28 dBm / 630 mW (B12)
Maximum Supported Data Rate	10 Mbps DL, 5 Mbps UL
Carrier Certification (Canada)	Rogers / Telus
Carrier Certification (U.S.)	AT&T / T-Mobile / U.S. Cellular
FCC ID	XMR201606EC21A
Industry Canada Certification Number	10224A-201611EC21A
SIM Card	Standard SIM (25 mm × 15 mm)
Antenna	Multi-Tech Systems ANLTE3-xHRA (x = 2, 10, 50)
Antenna Gain	1 dBi

23.6. Power

DC Input	9 VDC to 12 VDC
DC Input Jack	5.5 mm OD, 2.5 mm ID Centre Pin Positive
AC/DC Power Adapter	CUI Inc. SWI24-12-N-P6
Power over Ethernet	PoE+, IEEE 802.3at, Mode A and B
USB-C	USB Type-C / USB 3.0 PD Sink, 15 W
Typical Power Consumption	2.1 W (Bluetooth, LCD, Ethernet Active)

23.7. I/O

Ethernet	10BASE-T/100BASE-TX
Analog Voltage Inputs	± 10 VDC, ± 20 VDC Maximum, 24-bit
Current Inputs	0 mA to 20 mA, -0.5 mA to 24 mA Maximum, 24-bit
Relay Contacts	30 VDC @ 2 A, 60 VDC MAX @ 900 mA
Digital Inputs	IEC 61131-2 Type 1 and Type 3
RS-232	Full Duplex, No Flow Control

23.8. Mechanical

Dimensions (No Attachments)	170 mm (L) × 100 mm (H) × 54.5 mm (W)
Dimensions (With Antennas)	170 mm (L) × 294 mm (H) × 54.5 mm (W)
Dimensions (With Antennas and Magnets)	170 mm (L) × 294 mm (H) × 59.5 mm (W)
Weight (With Antennas and Magnets)	550 g

23.9. Environmental

Ingress Protection Rating	IP30
Pollution Degree	2
Operating Temperature (DC)	0 °C to 40 °C
Operating Temperature (PoE+, USB-C)	-20 °C to 60 °C
Storage Temperature	-40 °C to 85 °C
Permissible Humidity	20 % to 85 % RH (Operation and Storage)
Maximum Altitude	2000 m

23.10. Accessories

LoRa Antenna	Abracon LLC APAMS-118
Bluetooth Antenna	Pulse Electronics W1010
Wi-Fi Antenna	Pulse Electronics W1010
LTE Antenna	Multi-Tech Systems ANLTE3-xHRA (x = 2, 10, 50)
Magnetic Mounting Feet	J & K Magnetics Inc. MM-A-16
AC/DC Adapter	CUI Inc. SWI24-12-N-P6
10-Pin Terminal Block Plug	Phoenix Contact 1966172 Phoenix Contact 1863084 Phoenix Contact 1863385 Phoenix Contact 1847204