VT-M2M-DTU-LORA Industrial DTU

User Manual

Version: 1.4

© Vantron Technology, Inc. All rights reserved.

Revision History

No.	Description	Date
V1.0	First release	Dec. 27, 2023
V1.1	Updated AT commands	Jan. 12, 2024
V1.2	Added description on uploading heartbeat data	Mar. 7, 2024
V1.3	Added command 'ATV' and the response to the command	Mar. 25, 2024
V1.4	Added description for firmware upgrade	May 21, 2024

Table of Contents

Foreword

Thank you for purchasing VT-M2M-DTU-LORA industrial data transmission unit ("the DTU" or "the Product"). This manual intends to provide guidance and assistance necessary on setting up, operating and maintaining the Product. Please read this manual and make sure you understand the structure and functionality of the Product before putting it into use.

Intended Users

This manual is intended for:

- Network administrators
- Technical support engineers
- Other users

Copyright

Vantron Technology, Inc. ("Vantron") reserves all rights of this manual, including the right to change the content, form, product features, and specifications contained herein at any time without prior notice. An up-to-date version of this manual is available at www.vantrontech.com.

The trademarks in this manual, registered or not, are properties of their respective owners. Under no circumstances shall any part of this user manual be copied, reproduced, translated, or sold. This manual is not intended to be altered or used for other purposes unless otherwise permitted in writing by Vantron. Vantron reserves the right of all publicly released copies of this manual.

Disclaimer

While all information contained herein has been carefully checked to assure its accuracy in technical details and typography, Vantron does not assume any responsibility resulting from any error or features of this manual, nor from improper uses of this manual or the software.

It is our practice to change part numbers when published ratings or features are changed, or when significant structure changes are made. However, some specifications of the Product may be changed without notice.

Technical Support and Assistance

Should you have any question about the Product that is not covered in this manual, contact your sales representative for solution. Please include the following information in your question:

- Product name and PO number;
- Complete description of the problem;
- Error message you received, if any.

Vantron Technology, Inc.

Address: 48434 Milmont Drive, Fremont, CA 94538
Tel: (650) 422-3128
Email: sales@vantrontech.com

Regulatory Information

The Product is designed to comply with:

- FCC
- ISED

Please refer to Appendix B for Regulatory Compliance Statement.

Symbology

This manual uses the following signs to prompt users to pay special attention to relevant information.

	Caution for latent damage to system or human injury
	Attention to important information or regulations

General Safety Instructions

The Product is supposed be installed by knowledgeable, skilled persons familiar with local and/or international electrical codes and regulations. For your safety and prevention of damage to the Product and other equipment connected to it, please read and observe carefully the following safety instructions prior to installation and operation. Keep this manual well for future reference.

- Do not disassemble or otherwise modify the Product. Such action may cause heat generation, ignition, electronic shock, or other damages including human injury, and may void your warranty.
- Keep the Product away from heat source, such as heater, heat dissipater, or engine casing.
- Do not insert foreign materials into any opening of the Product as it may cause the Product to malfunction or burn out.
- To ensure proper functioning and prevent overheating of the Product, do not cover or block the ventilation holes of the Product.
- Follow the installation instructions with the installation tools provided or recommended.
- The use or placement of the operation tools shall comply with the code of practice of such tools to avoid short circuit of the Product.
- Cut off the power before inspection of the Product to avoid human injury or product damage.

Precautions for Power Cables and Accessories

⚠ Use proper power source only. The Product supports 9V-36V power supply. Make sure the supply voltage falls within the specified range.

⚠ Place the cables properly at places without extrusion hazards.

⚠ Use only approved antenna(s). Non-approved antenna(s) may produce spurious or excessive RF transmitting power which may violate FCC limits.

⚠ Cleaning instructions:

- Power off the Product before cleaning
- Do not use spray detergent
- Clean with a damp cloth
- Do not try to clean exposed electronic components unless with a dust collector

⚠ Power off and contact Vantron technical support engineer in case of the following faults:

- The Product is damaged
- The temperature is excessively high
- Fault is still not solved after troubleshooting according to this manual

⚠ Do not use in combustible and explosive environment:

- Keep away from combustible and explosive environment
- Keep away from all energized circuits
- Unauthorized removal of the enclosure from the Product is not allowed
- Do not change components unless the power cable is unplugged
- In some cases, the Product may still have residual voltage even if the power cable is unplugged. Therefore, it is a must to remove and fully discharge the Product before replacement of the components.

CHAPTER 1 INTRODUCTION

1.1 Overview

VT-M2M-DTU-LoRa is an entry-level data transmission unit (DTU) that leverages LoRa spread spectrum modulation technology that features high sensitivity for long-range, reliable wireless data transmission while consuming less than 3W of power under load.

VT-M2M-DTU-LoRa provides a reliable and efficient way to connect field devices to a central network. Field data from sensors or actuators is transmitted to the device via the RS232 or RS485 serial port. Such data is then transmitted through a LoRa gateway and finally received by a LoRa network server. This enables real-time monitoring and status tracking of field devices.

With a compact form factor and flexible deployment options, VT-M2M-DTU-LoRa simplifies installation and maintenance for users. Additionally, it supports 9V~36V wide input voltage and operates at an industrial-grade extended temperature range from -20℃ to +70℃, making it an optimal solution for industries such as smart agriculture, smart city, and smart logistics. Typical application of the device includes temperature and humidity control, hazardous air and water flow monitoring, and cargo tracking.

1.2 Unpacking

The Product has been carefully packed with special attention to quality. However, should you find anything damaged or missing, please contact your sales representative in due time.

- 1 x VT-M2M-DTU-LORA industrial data transmission unit
- 1 x LoRa antenna (default robber, optional magnetic)
- 12V 1A DC power adapter & power cord
- 1 x DC power connector
- 1 x Serial port terminal connector

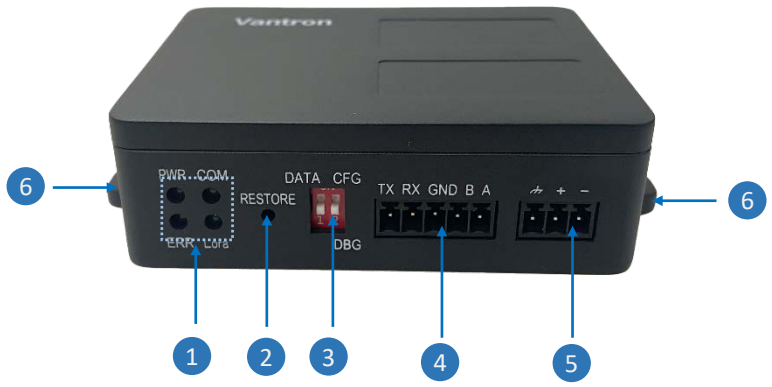
Actual accessories might vary slightly from the list above as the customer order might differ from the standard configuration options.

1.3 Specifications

VT-M2M-DTU-LoRa		
Communication	Wired	RS232/RS485
	Wireless	LoRa
LoRa Features	Frequency	915MHz
	Transmit power	15dBm ~ 22dBm
	Data rate	0.3~5.5kbps
	Receive sensitivity	-148dBm (at 10.4kHz, spreading factor 12)
	Transmission distance	1km (indoor)
	Antenna impedance	50Ω
I/Os	Serial port	1 x RS232 for data communication, device configuration & debug (115200, 8N1)
		1 x RS485 for data communication (115200, 8N1)
	DIP switch	2 x DIP switch for RS232 (Data mode: switch 1 up; Config mode: switch 1 down, switch 2 up; Debug mode: switch 1 down, switch 2 down)
	Antenna	1 x LoRa antenna
System Control	LED indicator	1 x Power indicator
		1 x Error indicator
		1 x Serial port status indicator
		1 x LoRa communication indicator
	Button	1 x Restore button (1~5s: Restart; > 5s: Factory reset)
Mechanical	Enclosure	Plastic
	Dimensions	110mm x 73mm x 28mm (including the mounting brackets)
	MTBF	> 30,000H
	Installation	Wall mount
	IP rating	IP30
Power	Input	9V~36V DC
		1 x Power terminal (3-pin, 3.81mm)
	Consumption	< 3W (load)
Software	Configuration tool	VT Dtool
	Southbound protocol	Modbus
	Northbound protocol	MQTT
Environment Condition	Temperature	Operating: -20℃ ~ +70℃
		Storage: -40℃ ~ +85℃
	Humidity	Operating: 5%-95% RH (Non-condensing)
	EMC level	EMC Level 3
	Certification	FCC, ISED

1.4 Product View

1.4.1 Front view



I/O description:

No.	Name	Description	
1	4 x LED indicator	PWR	ON: Device powered on
		COM	Upon bootup: Blinking fast for about 5s when the RS232 port is set to the configuration mode
			Solid: RS232/RS485 data communication in process
			OFF: No serial communication
		ERR	Solid: Issue with LoRa connectivity
			Blinking: Peripheral abnormality
			OFF: No faults/abnormalities
		LoRa	Solid: LoRa connectivity established
			Blinking slowly: Establishing LoRa connectivity
			Blinking fast: LoRa data communication in process
			OFF: LoRa connectivity failed

No.	Name	Description
2	Restore button	1~5s: Restart; > 5s: Factory reset
3	DIP switches for RS232	Refer to the details in 2.4
4	RS232 & RS485	RS232: Data communication, device configuration & debug (default parameters: 115200, 8N1)
		RS485: Data communication (default parameters: 115200, 8N1)
5	Power terminal	9~36V DC input
6	Mounting brackets	For mounting the device

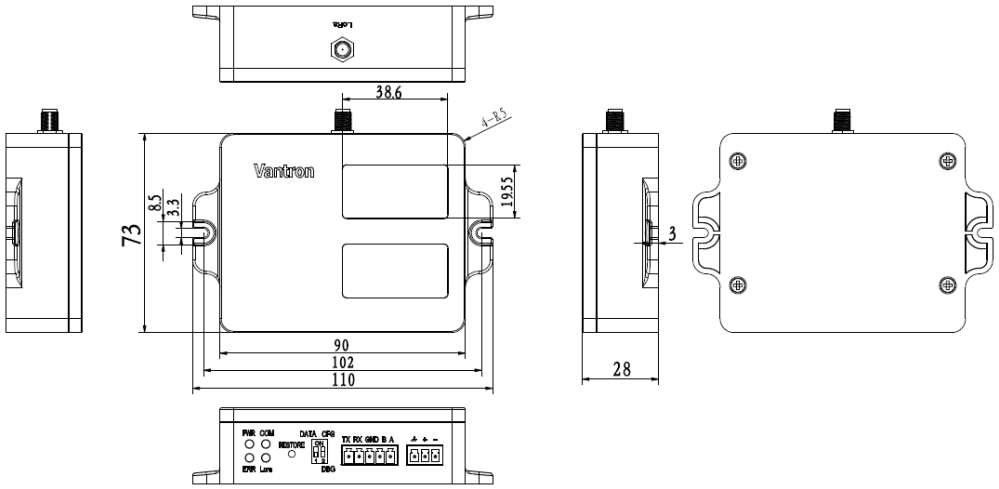
1.4.2 Back view

I/O description:

No.	Name	Description
1	Antenna SMA connector	LoRa antenna connector, for enhanced signal strength

1.5 Mechanical Dimensions

- 110mm x 73mm x 28mm (including the mounting brackets)



1.6 Power Supply and Consumption

VT-M2M-DTU-LORA industrial DTU works with 9V-36V DC power input supplied via the power terminal on the front panel of the device. The power consumption of the device is less than 3W with load.

CHAPTER 2 HARDWARE SETUP

2.1 Setting up the Device

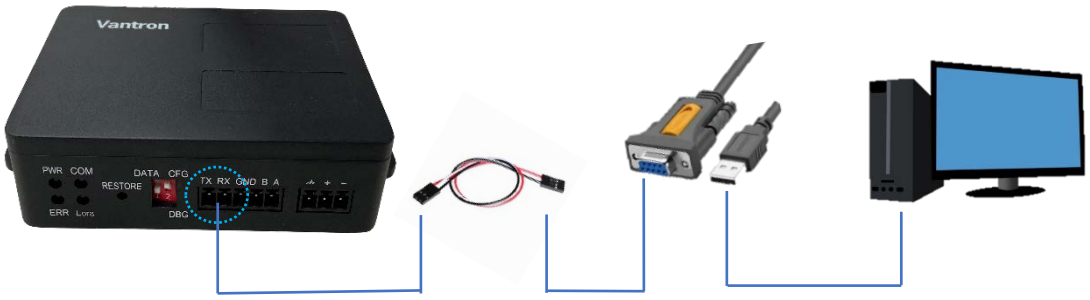
Before you proceed with the configuration of the DTU, follow the steps below to finish hardware connection.

1. Use two screws (M4 x 6 / M4 x 8 recommended) to fasten the DTU on the wall or desktop;
2. Install the LoRa antenna to the SMA antenna connector at the back of the DTU and tighten the connector;

3. Install the serial port terminal connector to the RS232 & RS485 terminal;

4. If you are configuring the device via AT commands, dial the RS232 DIP switch to the configuration mode (1: Down, 2: Up);

5. Use DuPont wires and a serial to USB adapter or other way to connect the DTU to the host computer via the RS232/RS485 port;



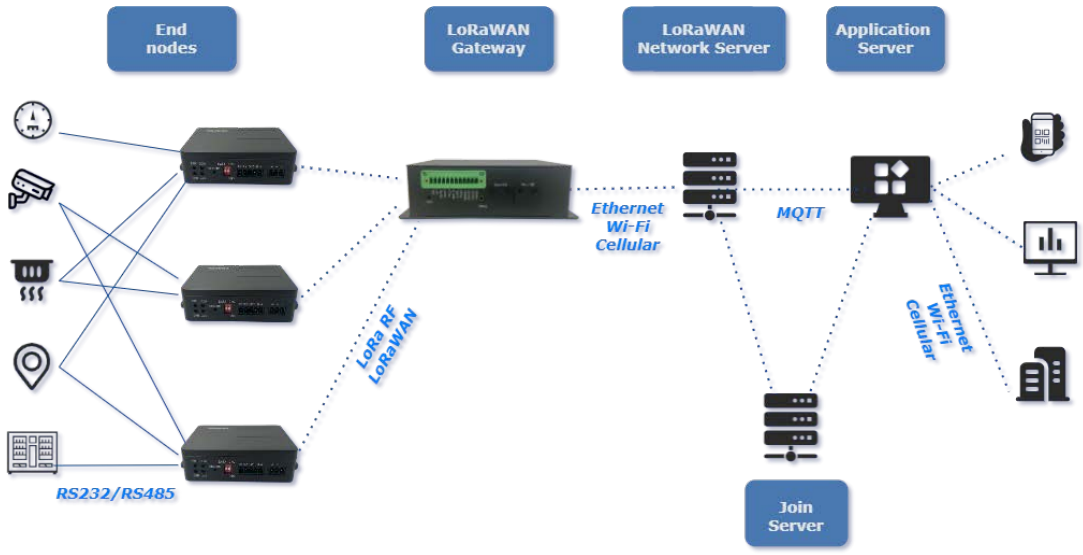
6. Connect the terminal end of the female DC power connector to the power terminal of the DTU-LoRa and the round end to the 12V/24V DC power adapter;

7. Power on the DTU-LoRa and the PWR indicator will turn solid green.

2.2 Device Topology

VT-M2M-DTU-LoRa is designed to transfer RS232/RS485 data collected from non-LoRa end nodes to a LoRa gateway via the LoRa technology. The data can be then upload to an IoT cloud. Conversely, data from the IoT cloud can be distributed back through the LoRa gateway to the VT-M2M-DTU-LoRa and ultimately delivered to the non-LoRa end nodes.

The following is a typical application topology of the DTU.



2.3 LED Indicators

The Power indicator will turn solid green when the device is powered on.

When the DTU is powered on and the RS232 port is set to the **configuration mode** (1: Down, 2: Up), the COM indicator will blink fast for about 5 seconds, signaling that the device is in the upgrade mode. Subsequently, the COM indicator will turn off as the device transitions to the operation mode.

When there is data communication between the DTU and the LoRa gateway, both the COM and LoRa indicators will blink rapidly, indicating ongoing data exchange. Upon completion of the data communication, the COM indicator will turn off and the LoRa indicator will remain solid green, indicating uninterrupted LoRa connectivity.

After registering the DTU on the network server, re-powering the DTU or pressing the **Restore** button briefly (1~5s) will connect the DTU to the LoRa gateway, during which the LoRa indicator will blink slowly, denoting the initiation of a LoRa connectivity. Upon successful connection, the LoRa indicator will turn solid green. In the case of a connection failure, the Error indicator will display and the device will restart in 30 seconds to attempt to re-connect to the gateway.

Upon successful connection with a LoRa gateway, the DTU will detect a disconnection in about 1 minute after the gateway shuts down. Following this, the Error indicator will illuminate for about 30 seconds, then the LoRa indicator will blink slowly until the gateway comes back online and re-establishes the connection to cause the LoRa indicator to turn solid green. Otherwise, the Error indicator will blink again.

2.4 RS232 Mode Configuration

With the use of the DIP switches on the DTU, the RS232 port can be configured in different modes.

DIP switch position	RS232 mode	Description
1: Up, 2: Optional	Data mode	Facilitates LoRa data transfer
1: Down, 2: Down	Debug mode	Allows printing of the device debug data
1: Down, 2: Up	Configuration mode	Enables configuration of the device parameters

In both debug mode and configuration mode, the parameters of RS232 are fixed at 115200, 8N1. In the data mode, the RS232 parameters are subject to user configurations, with a default setting of 115200, 8N1.

CHAPTER 3 DEVICE PROVISIONING

3.1 Connecting a LoRa Gateway

This section is going to involve Vantron G335-LoRa edge computing gateway for the illustration of connecting VT-M2M-DTU-LoRa to a LoRa gateway via LoRa.

The G335-LoRa gateway is based on the full-featured G335 industrial gateway, enhanced with integrated LoRa functionality. Please refer to Appendix A for the specifications of G335.

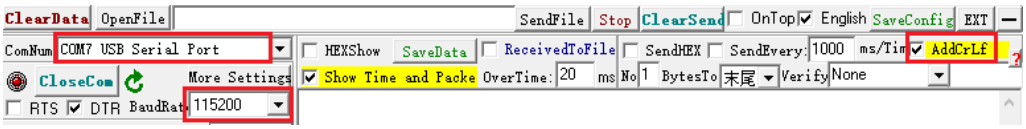
Prerequisites:

- VT-M2M-DTU-LoRa (“DTU”)
- Vantron G335-LoRa industrial edge computing gateway (“gateway”)
- A windows host computer
- A power adapter for powering up the DTU
- A power adapter for powering up the gateway
- A LoRa antenna for the DTU
- A LoRa antenna for the gateway
- An Ethernet cable
- A serial to USB adapter for connecting the DTU to the host computer
- A DB9 male to 3.5mm serial adapter for connecting the gateway to the host computer
- DuPont wires as necessary

3.1.1 Checking the DTU Information

Follow the steps set out in 2.1 to finish the basic setup of the device and connect it to a host computer. Make sure the RS232 port is set to the **configuration** mode (1: Down, 2: Up), then proceed with the following steps for communicating with the device via AT commands.

1. Launch a serial debugger that can send AT commands (for instance, sscom) on the Windows host and open the RS232 port of the DTU using the following parameters: 115200, 8N1;



2. Send the AT command ATV to check the software information of the DTU;

```
[17:04:10.755]OUT→◇ATV
□
[17:04:10.758]IN←◆VT-M2M-DTU-LORA
[17:04:10.782]IN←◆70
FIRMWARE:V1.0.1
HW_LORAWAN:V2.4.0
HW_RADIO:V1.2.0
L2_SPEC:V1.0.3
RP_SPEC:V1-1.0.3
```

3. Send the AT command AT&DEVEUI to check the general device information of the DTU, and save the device EUI for the later device registration;

```
[17:16:43.575]OUT→◇AT&DEVEUI
□
[17:16:43.582]IN←◆+DEVEUI: 80:E1:00:15:05:28:27:81

OK
```

4. Send the AT command AT&APPKEY to check the application key of the DTU, and save it for the later device registration.

```
[17:19:57.769]OUT→◇AT&APPKEY
□
[17:19:57.780]IN←◆+APPKEY:
2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C

OK
```

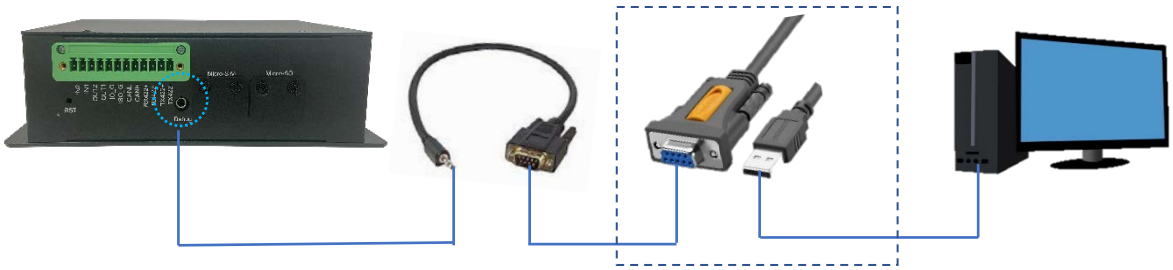
More AT commands are available in Chapter 4, allowing you to use for the configuration of the DTU.

3.1.2 Setting up the LoRa Gateway

1. Install the LoRa antenna to the LoRa/ZigBee (sometimes silk screened as RF) SMA connector on the G335-LoRa gateway;

2. Plug an Ethernet cable into ETH0 to connect the gateway to Internet;

3. Use a DB9 male to 3.5mm serial adapter or other way to connect the gateway to the host computer (sometimes a USB to RS232 female adapter might be needed);

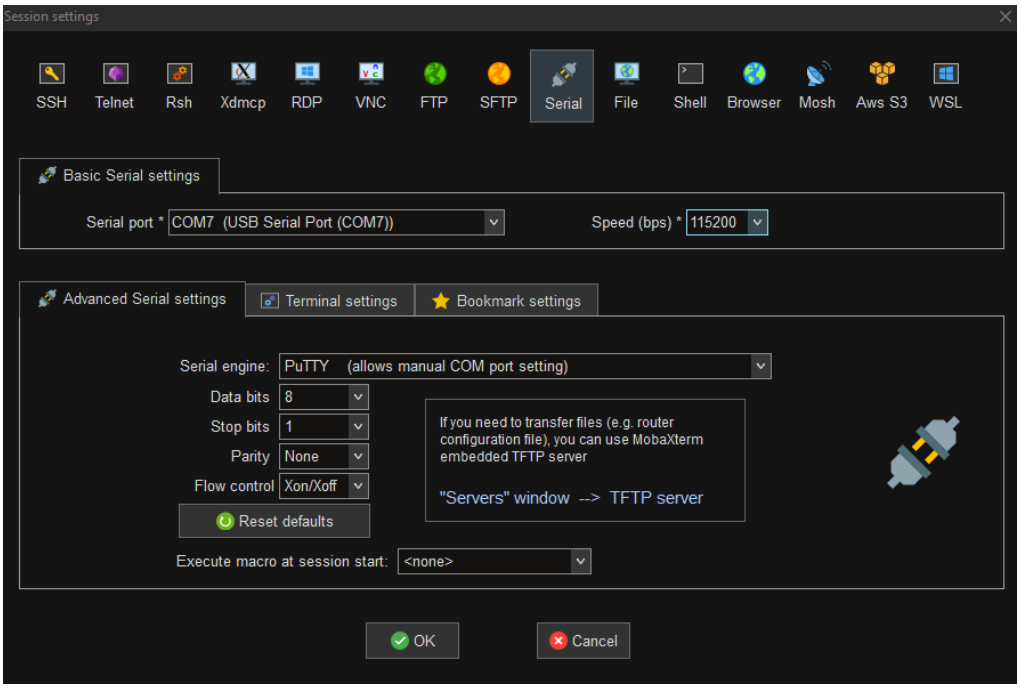


4. Connect the terminal end of the female DC power connector to the power terminal of the gateway and the round end to the 12V/24V DC power adapter;

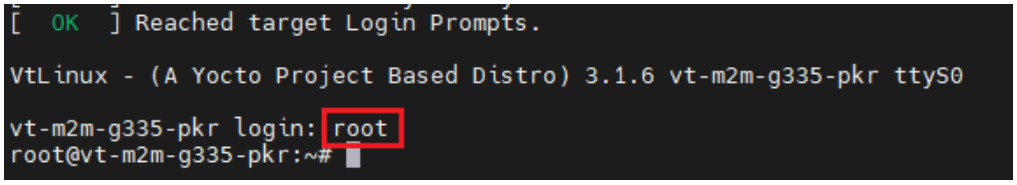
5. Power on the gateway and the PWR indicator will turn solid green.

3.1.3 Registering the DTU on the Network Server

1. Open a serial emulator (for instance, MobaXterm) on the window host;
2. Launch a serial session for the LoRa gateway using the following parameters (115200, 8N1);

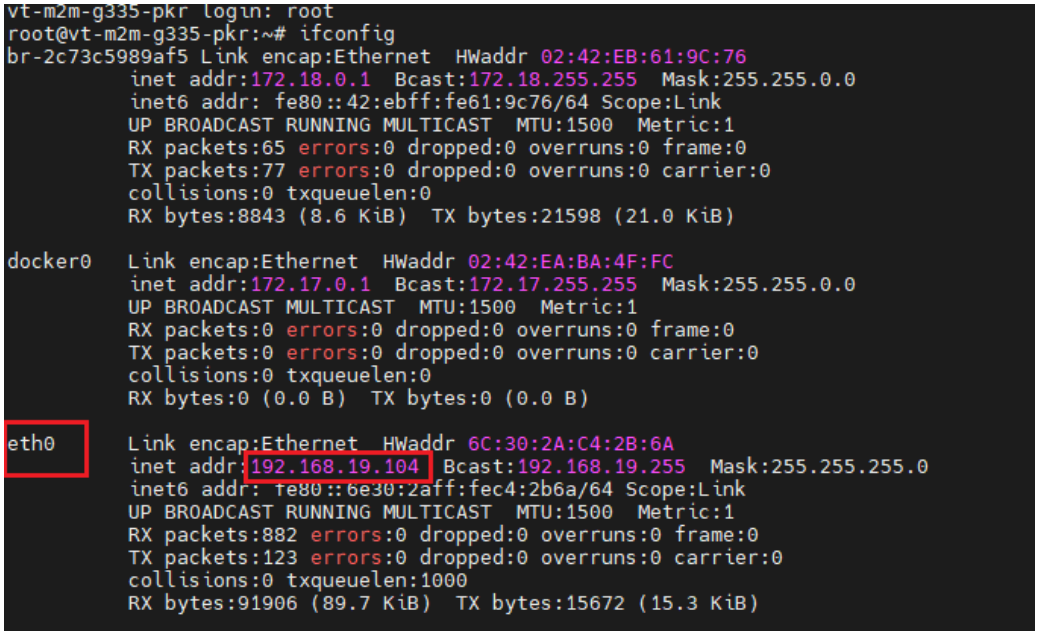


3. Wait for the device printing process and enter “root” as the password to log into the kernel of the gateway;

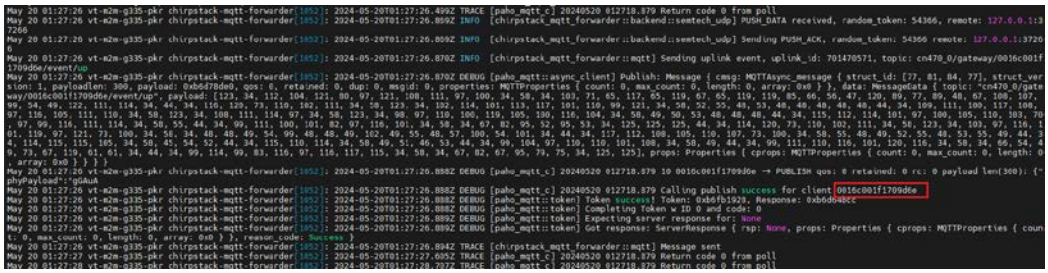


If the emulator does not respond, please re-power the gateway and try again.

4. Check the network information of the gateway using the ifconfig command;

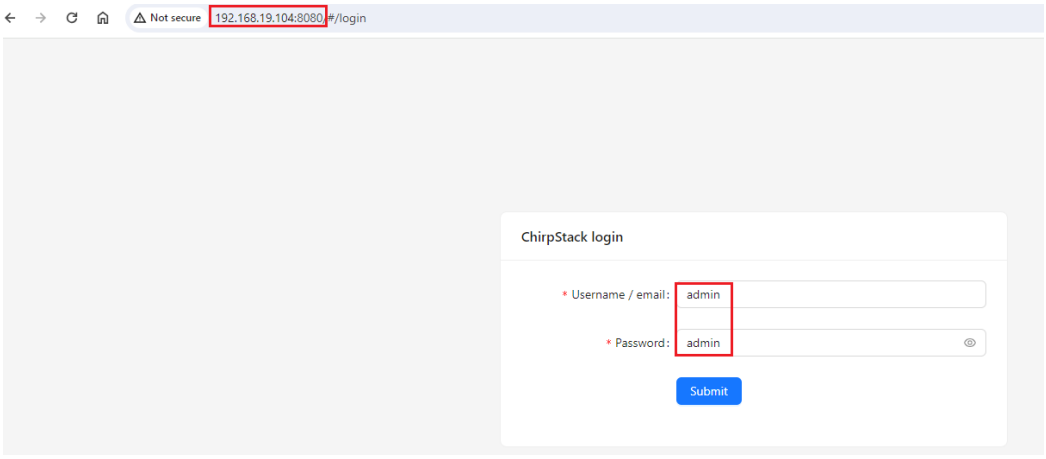


5. Enter the command journalctl -f to check the device log and identify the gateway ID for later use;



6. Enter the IP address of eth0 in the browser with 8080 as the port number to access the web page of the gateway;

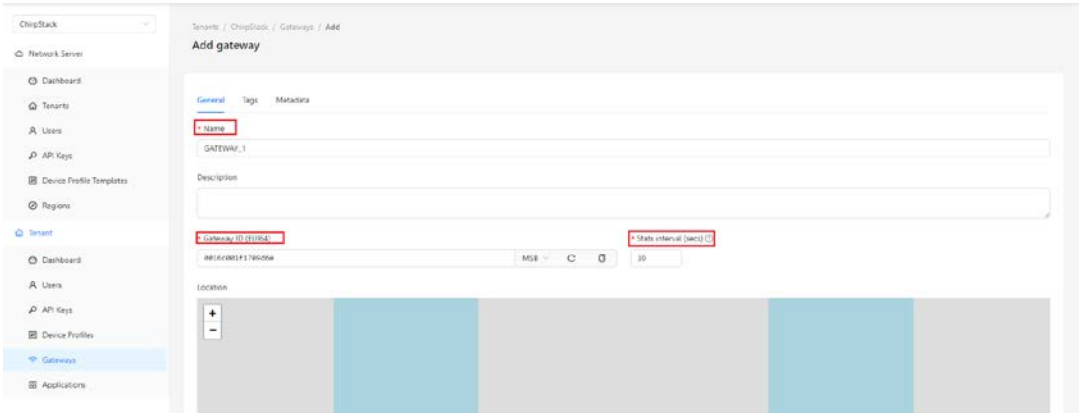
7. Log in the web page using “admin” as the username and password;



8. For the first-time login, navigate to **Tenant > Gateways > Add gateway** to add the gateway;

9. Fill in the mandatory fields as prompted and click **Submit** to confirm the settings;

   - Enter a device name for the gateway;
   - Input the ID identified in step 5;
   - Set an interval for refreshing the statistics of the gateway (30 seconds by default).

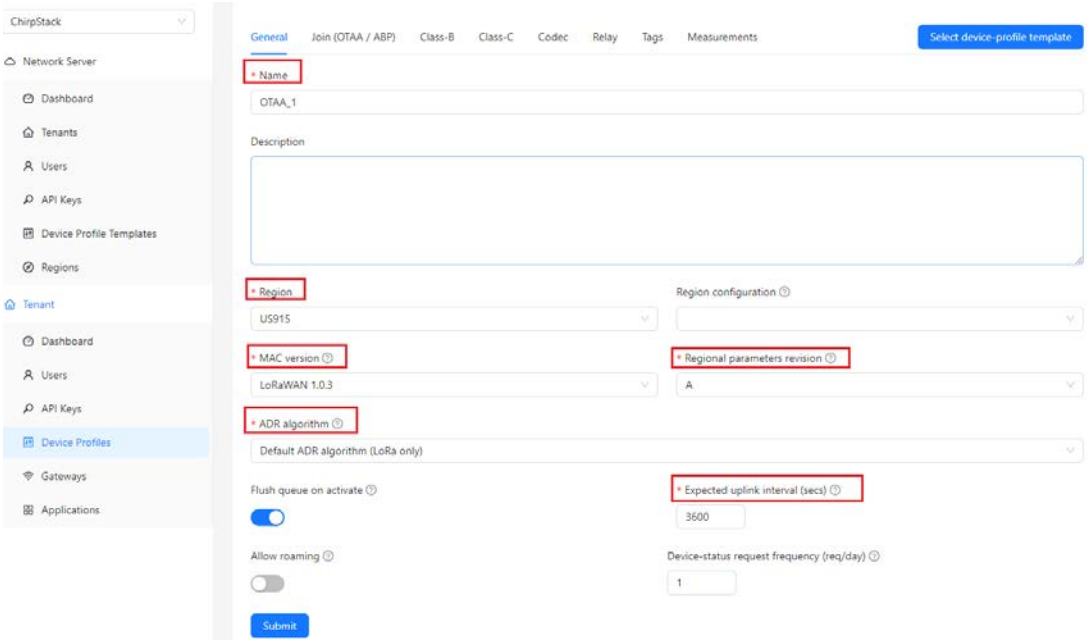


*You can check the gateway status by clicking on the **Gateway** menu again.*

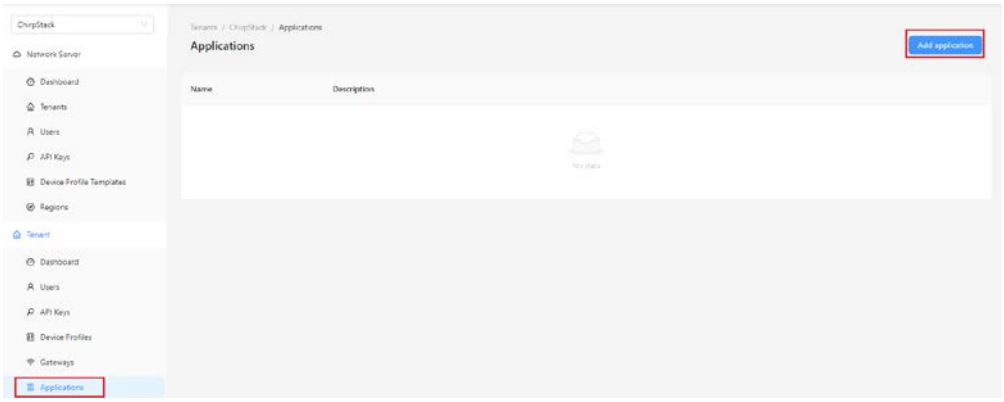
10. Navigate to **Tenant > Device Profiles > Add device profile** to set up a profile for the DTU;

11. Fill in the mandatory fields as prompted and click **Submit** to confirm the settings;
    - Enter a name for the device profile;
    - Select the region based on the frequency band the device is currently using;
    - Select the LoRaWAN MAC version that the DTU supports (1.0.3 by default);
    - Select the regional parameters revision, ADR algorithm and the interval that the DTU sends uplink messages.

    Leave them to the default if you are not sure which one to select.

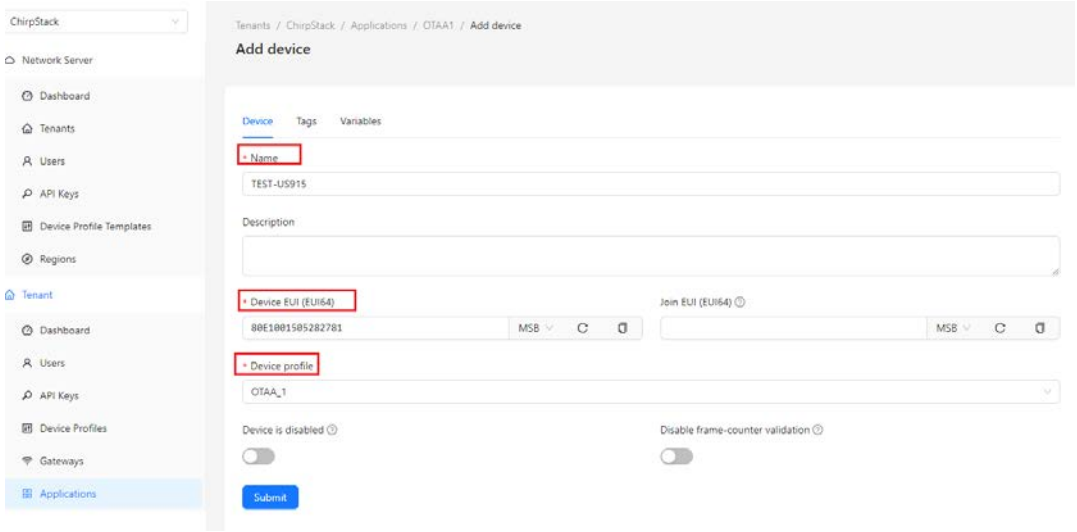


12. Navigate to **Tenant > Application** and click the **Add application** button;

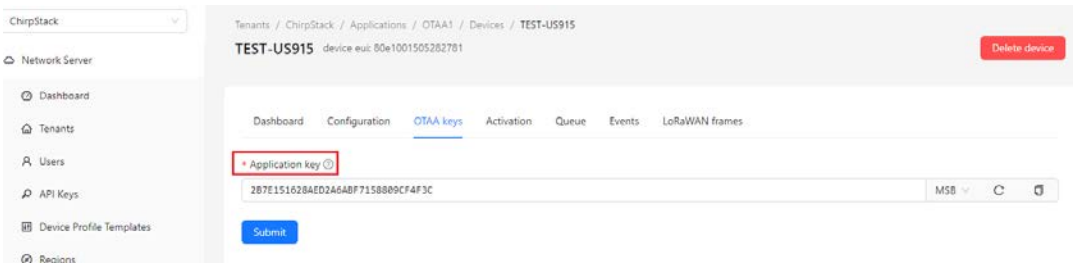


13. Enter a name and description for the application, and you will be redirected to the device window;
14. Click the **Add device** button to add a DTU;

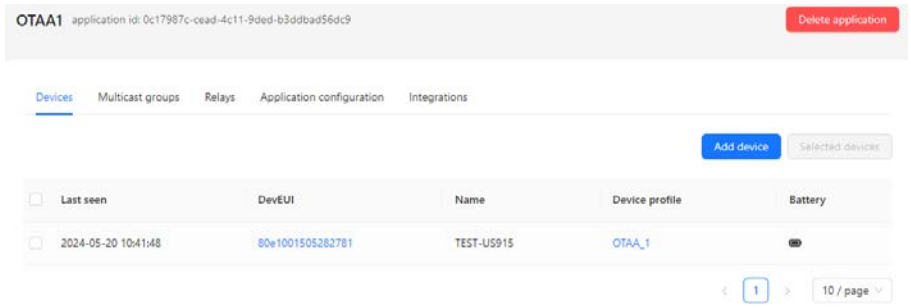
15. Fill in the mandatory fields as prompted and click **Submit** to confirm the settings;
    - Enter a device name for the DTU;
    - Enter the EUI obtained by using the AT command ATI as described in 3.1.1;
    - Select the device profile configured via the **Device Profiles** menu and make sure the actual frequency band of the DTU coincides with the one set up in the profile.



16. After adding the device, click the **OTAA keys** tab and fill in the application key that is identified using the AT command AT&APPKEY as set out in 3.1.1, then click **Submit**;



17. The device will be activated and registered in a few seconds and you can click **Applications > Application name** to check the status;



18. After re-powering the DTU or performing a short press on the **Restore** button, the DTU will connect to the LoRa gateway right away. Once connected, the LoRa LED indicator will turn solid green, indicating successful connection.

3.2 Data Communication Testing

This section demonstrates how to upload the DTU data to a LoRa gateway and distribute data from the gateway to the DTU.

Before starting the data communication, please make sure to dial the RS232 DIP switch to the **data mode** (1: Up, 2: Optional) if you intend to use the RS232 port.

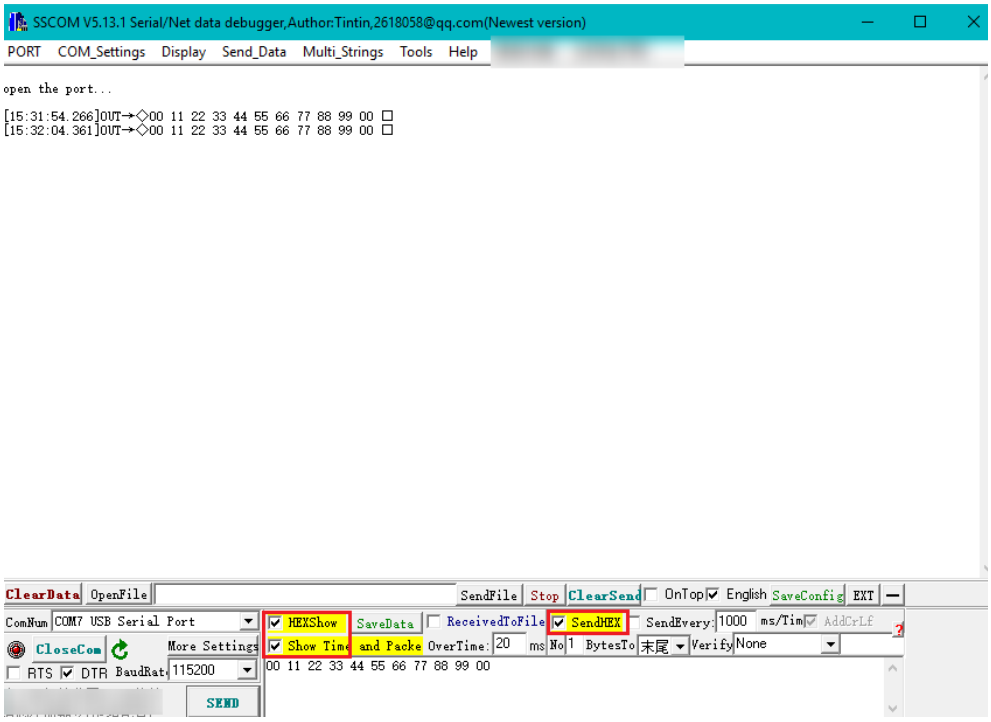
You also have the option to use the RS485 port for the testing.

The serial port parameters for RS232 (data mode) and RS485 are: 115200, 8N1 by default. If you have modified the parameters using the AT command AT+COMO as described in chapter 4, please remember to use the new parameters to open and use the port.

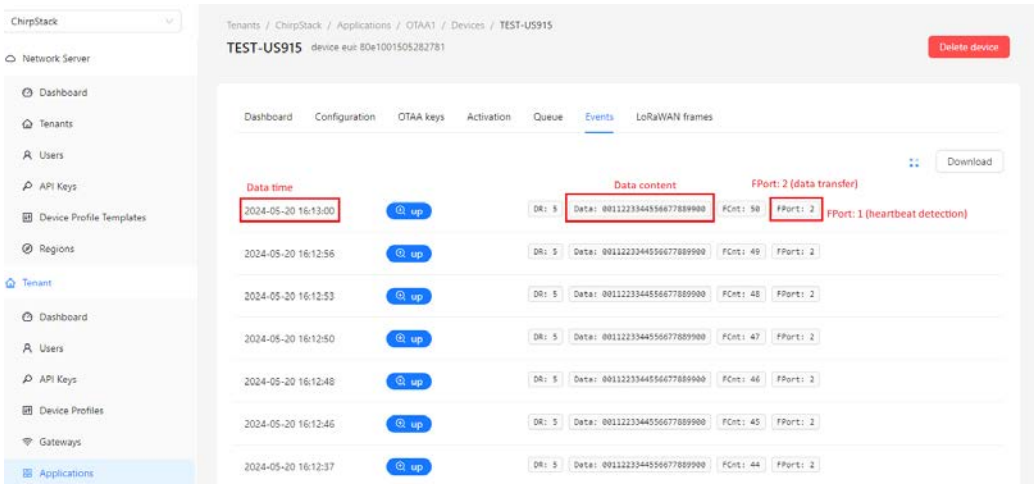
3.2.1 DTU to LoRa Gateway

1. Use DuPont wires and a serial to USB adapter or other way to connect the DTU to the host computer via the RS232 (data mode)/RS485 port;
2. Use the DB9 male to 3.5mm serial adapter or other way to connect the debug port of the LoRa gateway to the host computer;
3. Follow the steps set out in 3.1.3 to register the DTU and connect it to the LoRa gateway;

4. Launch the serial debugger and open the serial port on the DTU for communication using the following parameters: 115200 (default), 8N1;



5. Check the data received by the gateway via **Applications > Application > DTU device > Events** on the web page.

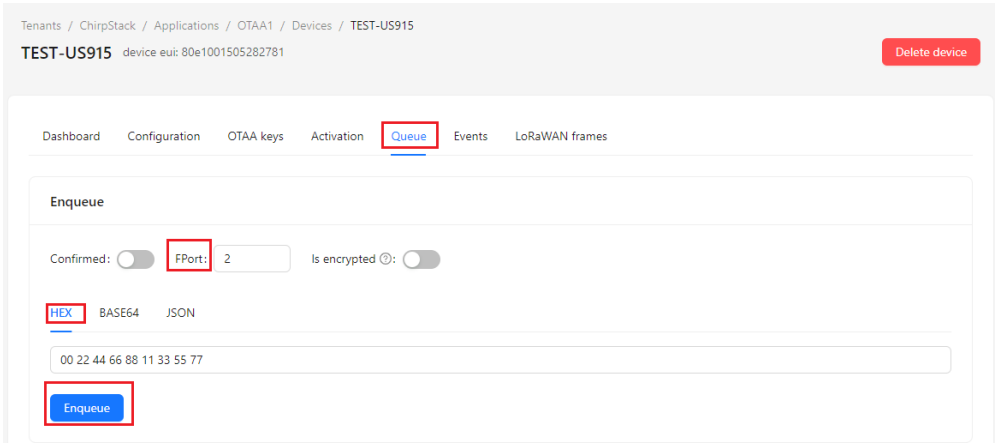


*When data is transferred via the RS232/RS485 port, the data content is the data itself, and the FPort value is **2**.*

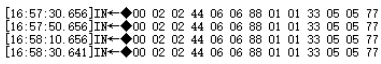
*If no data transfer occurs, heartbeat data will be refreshed every 20 seconds with the data content being the DevEUI of the DTU, allowing users to verify the DTU's connection status to the LoRa gateway. In this scenario, the FPort value is **1**.*

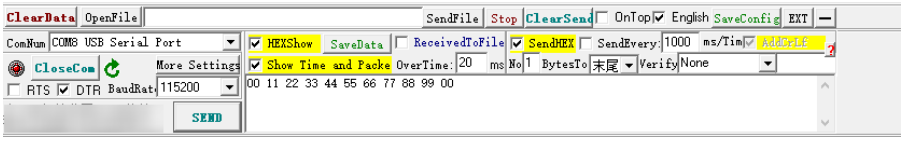
3.2.2 Gateway to DTU

1. Use DuPont wires and a serial to USB adapter or other way to connect the DTU to the host computer via the RS232 (**data mode**)/RS485 port;
2. Use the DB9 male to 3.5mm serial adapter or other way to connect the debug port of the LoRa gateway to the host computer;
3. Follow the steps set out in 3.1.3 to register the DTU and connect it to the LoRa gateway;
4. Navigate to **Applications > Application > DTU device > Queue** on the web page;
5. Set the FPort to **2**, select the data format (HEX by default) to send to the DTU, and click the **Enqueue** button to send the data;



6. Launch the serial debugger and open the serial port on the DTU using the following parameters: 115200 (default), 8N1;
7. Check the data received from the gateway.





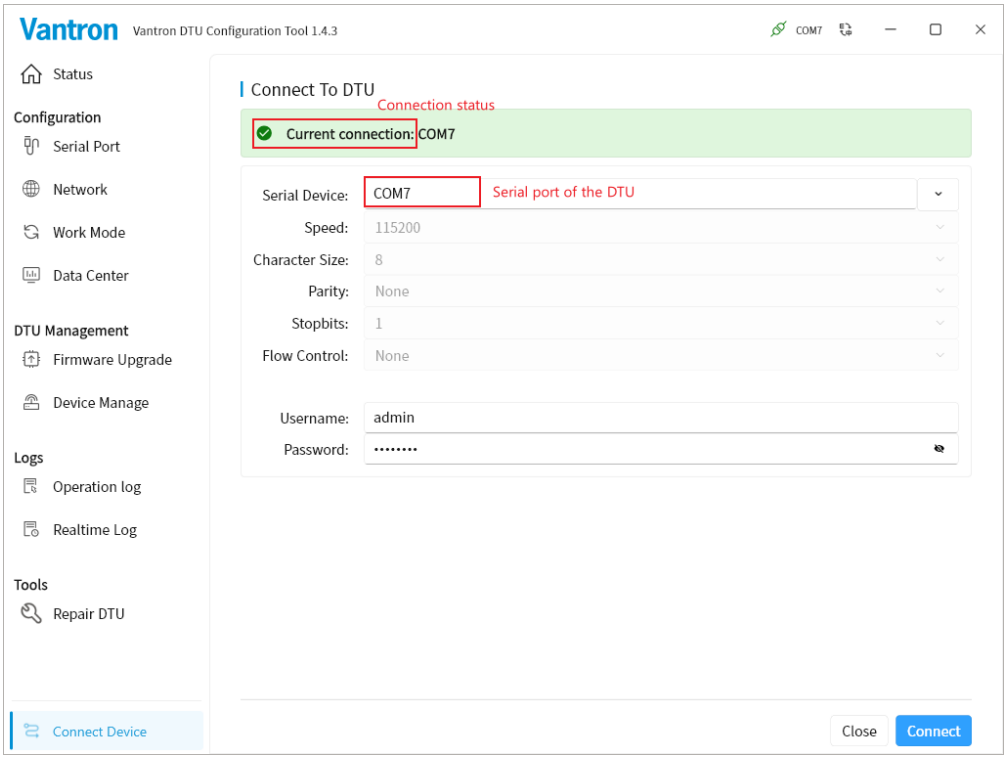
3.3 Firmware Upgrade

Vantron DTOOL offers users an easy way to upgrade Vantron DTU devices. DTOOL is located at: /Tools/DTOOL-xxx in the release package.

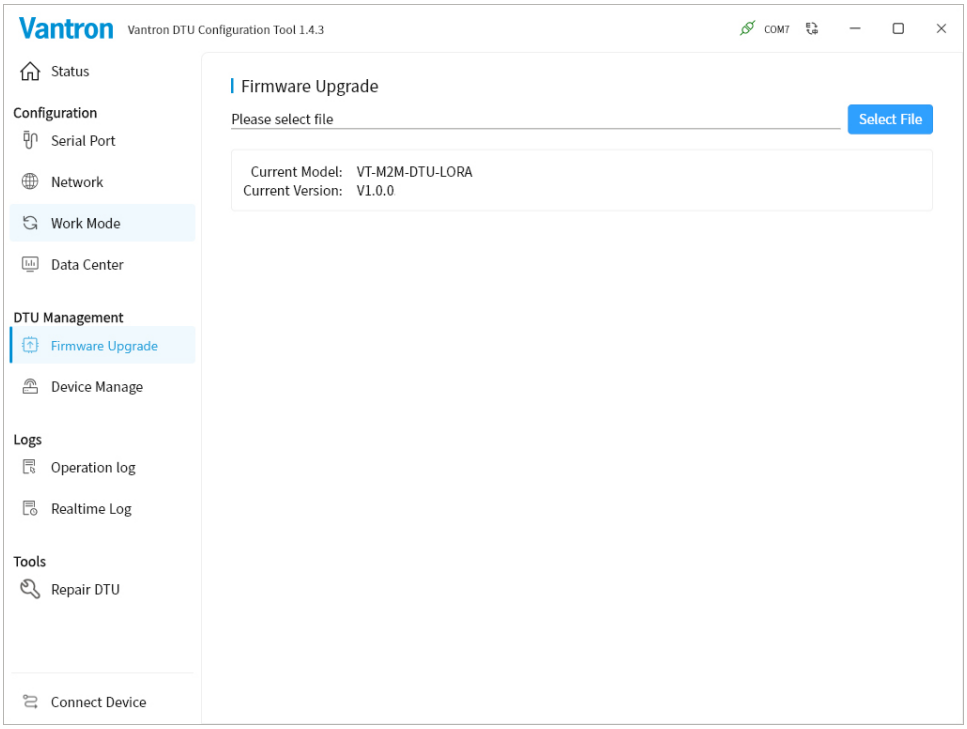
The firmware file is available at: /Firmware/Upgrade in the release package.

Make sure the RS232 port is set to the **configuration mode** (1: Down, 2: Up) before proceeding with the upgrade. The serial port parameters in this mode are: 115200, 8N1.

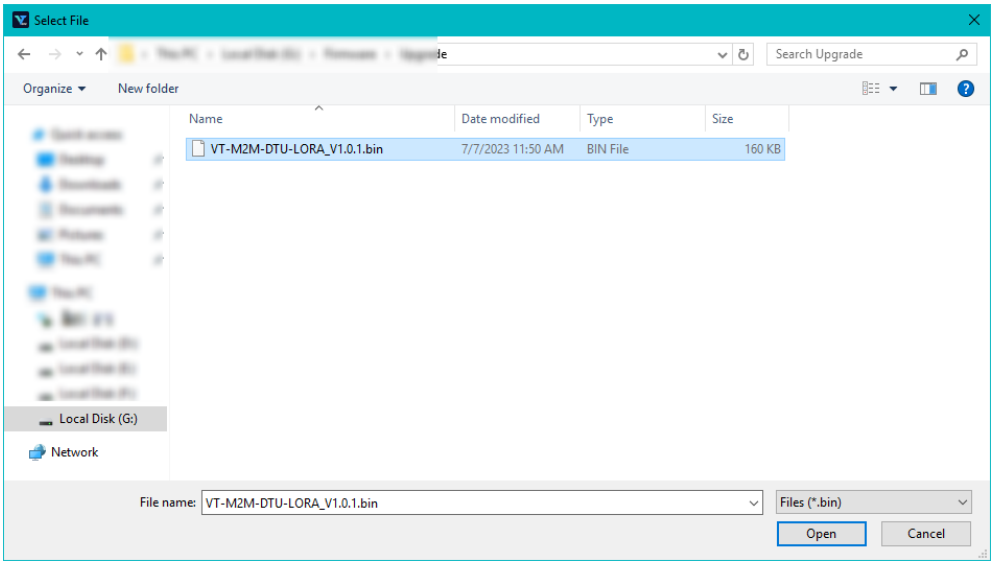
1. Use DuPont wires and a serial to USB adapter or other way to connect the DTU to the host computer through the RS232 port (configuration mode);
2. Launch DTOOL and it will prompt you to connect the DTU by selecting the corresponding COM number and click the **Connect** button;



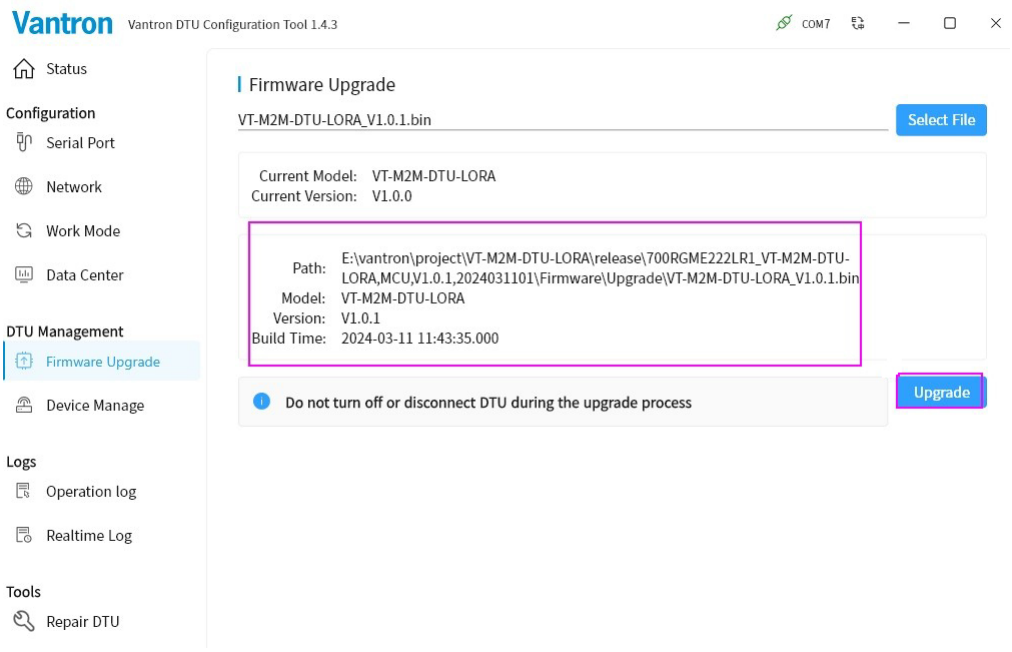
3. Navigate to **DTU Management > Firmware Upgrade** to check the current firmware version of the device;



4. Click the **Select File** button to upload the .bin file from the release package provided by Vantron (usually in the path: /Firmware/Upgrade);



5. Once uploaded, the firmware information will be displayed for verification. Click **Upgrade** to proceed;



6. When the upgrade completes, a prompt message will display.

3.4 DTU Information Printing

When the RS232 port of VT-M2M-DTU-LoRa is set to the **debug mode** (1: Down, 2: Down), real-time device information can be printed. The serial port parameters in this mode are: 115200, 8N1.

1. Connect the DTU to the Windows host computer via the RS232 port (debug mode);
2. Open a serial emulator;
3. Launch a serial session for the DTU using the following parameters (115200, 8N1);
4. The real-time device information will be printed.

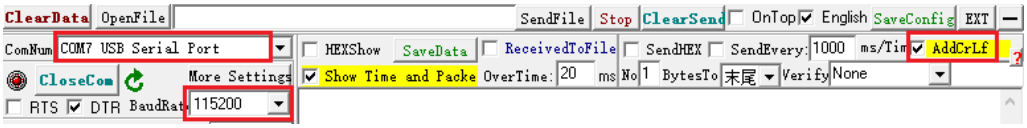
```
###### OTAA ######
###### AppKey:      2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
###### NwkKey:      2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
###### ABP  ######
###### AppSKey:     2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
###### NwkSKey:     2B:7E:15:16:28:AE:D2:A6:AB:F7:15:88:09:CF:4F:3C
###### IDs  ######
###### DevEui:      80:E1:00:15:05:28:27:81
###### AppEui:      01:01:01:01:01:01:01:01
###### DevAddr:     05:28:27:81
TX on freq 470700000 Hz at DR 2
RX_1 on freq 500700000 Hz at DR 2
RX_C on freq 505300000 Hz at DR 0
Switch to Class C done

###### = JOINED = OTAA ======================
###### MCRootKey:   7D:F7:6B:0C:1A:B8:99:B3:3E:42:F0:47:B9:1B:54:6F
###### MCKEKey:     8C:B8:66:5E:0C:0E:0B:64:5B:2E:D9:E4:8A:19:27:7C
###### NwkSKey:     92:06:0F:E8:82:AA:D8:66:4A:19:A3:78:8C:10:60:D2
###### AppSKey:     9D:A8:25:4D:9D:99:EB:45:3A:B5:DC:BC:96:C9:96:9A
###### D/L FRAME:0000 | PORT:88 | DR:0 | SLOT:1 | RSSI:-14 | SNR:8
TX on freq 471100000 Hz at DR 2
RX_C on freq 505300000 Hz at DR 0
RX_1 on freq 501100000 Hz at DR 2

###### ========== MCPS-Confirm =============
###### U/L FRAME:0001 | PORT:1 | DR:2 | PWR:0 | MSG TYPE:CONFIRMED [ACK]
RX_C on freq 505300000 Hz at DR 0
TX on freq 470700000 Hz at DR 5
RX_C on freq 505300000 Hz at DR 0
RX_1 on freq 500700000 Hz at DR 5

###### ========== MCPS-Confirm =============
###### U/L FRAME:0002 | PORT:1 | DR:5 | PWR:0 | MSG TYPE:CONFIRMED [ACK]
###### D/L FRAME:0001 | PORT:2 | DR:5 | SLOT:1 | RSSI:-16 | SNR:10
RX_C on freq 505300000 Hz at DR 0
TX on freq 471700000 Hz at DR 5
RX_C on freq 505300000 Hz at DR 0
RX_1 on freq 501700000 Hz at DR 5
```

CHAPTER 4 TYPICAL AT COMMANDS

VT-M2M-DTU-LoRa offers a collection of AT commands for configuring or querying the information of the device.

When using AT commands, make sure you have dialed the RS232 DIP switch to the **configuration** mode (1: Down, 2: Up) and connected the DTU to the Windows host computer via the RS232 port.

Lauch a serial debugger to execute the AT commands and the serial port parameters in this mode are: 115200, 8N1.



Remember to use '\n' as the line break after each command. Every time when you change a parameter, please restart the device to allow the settings to take effect.

1. AT&L: To list the AT commands supported by the device

AT command	Response	Description
AT&L	ATI ATV ATSTI AT&L AT&RST AT&RSSI AT&SNR AT&CON AT&DEVEUI AT&APPKEY AT&UPGRADE AT&REBOOT AT+COMO OK	To list the AT commands supported by the device

2. ATV: To query the firmware version and LoRa version of the device

AT command	Response	Description
ATV	VT-M2M-DTU-LORA-US915 FIRMWARE:V1.0.2 MW_LORAWAN:V2.4.0 MW_RADIO:V1.2.0 L2_SPEC:V1.0.3 RP_SPEC:V1-1.0.3 OK	Device model Firmware version LoRa version

3. ATI: To query the basic device information

AT command	Response	Description
ATI	+CLASS: C +MODE: OTAA +REGION:US915 +DEVEUI: 80 E1 00 15 05 28 0D 33 +APPKEY: 2B 7E 15 16 28 AE D2 A6 AB F7 15 88 09 CF 4F 3C OK	Device class (class C) Device activation mode (OTAA) LoRa frequency band (US915) Device DEVEUI APPKEY

4. ATSTI: To query the device status

AT command	Response	Description
ATSTI	ATSTI=<model>,<sn>,<version>, <boot_mode>,<systime>	Model: device name; sn: device serial number; version: firmware version; boot mode (boot options): 0- boot up on power, 1- reboot on 'reboot' command; 2- reboot on 'reset' command; 3- reboot upon completion of upgrade; 4- abnormal reboot; 5- reboot on module upgrade; system time: time in seconds

5. AT&DEVEUI: To query the DEVEUI of the device

AT command	Response	Description
AT+DEVEUI	+DEVEUI: 00:80:E1:15:05:28:0B:09 OK	The DEVEUI consists of 8 bytes

6. AT&APPKEY: To query the APPKEY of the device

AT command	Response	Description
AT+APPKEY	+APPKEY: 2B:7E:15:16:28:AE:D2:A6:AB:F7 :15:88:09:CF:4F:3C OK	The APPKEY consists of 16 bytes

7. AT+COMO: To query/set up the serial port parameters

AT command	Response	Description
AT+COMO?	+COMO: <port>,<baud rate>,<data bit>,<stop bit>,<parity>,<flow control> **Default:** +COMO: 0,115200,8,1,0,0 +COMO: 1,115200,8,1,0,0	To query the current serial port parameters

AT command	Description
AT+COMO=<port>,<baud rate>,<data bit>,<stop bit>,<parity>,<flow control>	To set up the serial port parameters Port: **0 for RS485, 1 for RS232**; baud rate options: 2400, 4800, 9600, 19200, 38400, 57600, 115200; data bit: 7 or 8; stop bit: 1 or 2; parity: none/1 (odd)/2 (even); flow control: none

Once the parameters are set, they will be applicable for data communication between the DTU and the LoRa gateway.

8. AT&RST: To restore the device parameters to the default settings

AT command	Response	Description
AT&RST	OK	To restore the parameters of RS232/RS485 to 115200, 8N1 and restore the default values of DEVEUI and APPKEY

9. AT&REBOOT: To restart the device

AT command	Response	Description
AT&REBOOT	OK	To reboot the device instantly

10. AT+LOGIN: To switch users

AT command	Description
AT+LOGIN=<username>,<password>	To switch users using corresponding username and password

11. AT&RSSI: To query the received signal strength

AT command	Response	Description
AT&RSSI	+RSSI: -28 OK	The received signal strength is -28dBm

12. AT&SNR: To query the signal-to-noise ratio

AT command	Response	Description
AT&SNR	+SNR: 8 OK	The signal-to-noise ratio is 8dB

13. AT&CON: To query the connection status between the DTU and the LoRa gateway

AT command	Response	Description
AT&CON	+CONNECT: OK	OK: Connected Failed: Not connected

CHAPTER 5 DISPOSAL AND WARRANTY

5.1 Disposal

When the device comes to end of life, you are suggested to properly dispose of the device for the sake of the environment and safety.

Before you dispose of the device, please back up your data and erase it from the device.

It is recommended that the device is disassembled prior to disposal in conformity with local regulations. Please ensure that the abandoned batteries are disposed of according to local regulations on waste disposal. Do not throw batteries into fire or put in common waste canister as they are explosive. Products or product packages labeled with the sign of “explosive” should not be disposed of like household waste but delivered to specialized electrical & electronic waste recycling/disposal center.

Proper disposal of this sort of waste helps avoid harm and adverse effect upon surroundings and people’s health. Please contact local organizations or recycling/disposal center for more recycling/disposal methods of related products.

5.2 Warranty

Product warranty

VANTRON warrants to its CUSTOMER that the Product manufactured by VANTRON, or its subcontractors will conform strictly to the mutually agreed specifications and be free from defects in workmanship and materials (except that which is furnished by the CUSTOMER) upon shipment from VANTRON. VANTRON's obligation under this warranty is limited to replacing or repairing, at its option, of the Product which shall, within 24 months after shipment, effective from invoice date, be returned to VANTRON's factory with transportation fee paid by the CUSTOMER and which shall, after examination, be disclosed to VANTRON's reasonable satisfaction to be thus defective. VANTRON shall bear the transportation fee for the shipment of the Product to the CUSTOMER.

Out-of-Warranty Repair

VANTRON will furnish the repair services for the Product which are out-of-warranty at VANTRON's then-prevailing rates for such services. At customer's request, VANTRON will provide components to the CUSTOMER for non-warranty repair. VANTRON will provide this service as long as the components are available in the market; and the CUSTOMER is requested to place a purchase order up front. Parts repaired will have an extended warranty of 3 months.

Returned Products

Any Product found to be defective and covered under warranty pursuant to Clause above, shall be returned to VANTRON only upon the CUSTOMER's receipt of and with reference to a VANTRON supplied Returned Materials Authorization (RMA) number. VANTRON shall supply an RMA, when required within three (3) working days of request by the CUSTOMER. VANTRON shall submit a new invoice to the CUSTOMER upon shipping of the returned products to the CUSTOMER. Prior to the return of any products by the CUSTOMER due to rejection or warranty defect, the CUSTOMER shall afford VANTRON the opportunity to inspect such products at the CUSTOMER's location and no Product so inspected shall be returned to VANTRON unless the cause for the rejection or defect is determined to be the responsibility of VANTRON. VANTRON shall in turn provide the CUSTOMER turnaround shipment on defective Product within fourteen (14) working days upon its receipt at VANTRON. If such turnaround cannot be provided by VANTRON due to causes beyond the control of VANTRON, VANTRON shall document such instances and notify the CUSTOMER immediately.

Appendix A Specifications of G335 Edge Computing Gateway

G335			
System	CPU	TI, AM335x, ARM Cortex-A8, 32−Bit, 1GHz	
	Memory	512MB	
	Storage	16GB	1 x Micro SD card
Communication	Ethernet	2 x Giga Ethernet Port (One port with PoE function)	
	4G LTE	CAT M/CAT 4 (Optional)	2 x SMA antenna connector
	Wi-Fi & Bluetooth	Wi-Fi 802.11 a/b/g/n/ac + BT 5.0	1 x SMA antenna connector
	Local RF module	ZigBee/LoRa module (Optional)	1 x SMA antenna connector
	GNSS	GPS (Optional)	1 x SMA antenna connector
I/Os	Serial port	1 x RS232, for debugging 1 x RS232/RS485 (DB9) 1 x RS232/RS485/RS422 (Reserved on the terminal block)	
	USB	1 x USB 2.0 Type-A	
	GPIO	2 x Input, 2 x Output, isolated (Optional)	
	Alarm	1 x Buzzer alarm (Optional)	
	RTC	Supported	
	CAN	1 x CAN 2.0b (Reserved on the terminal block)	
System Control	Button	1 x Reset button	1 x Renew button
	LED indicator	1 x Power indicator	1 x Status indicator
Mechanical	Dimensions	155mm x 105mm x 50mm (Enclosure only) 177mm x 105mm x 50mm (With wall mounting bracket)	
	Enclosure	Metal	
	Installation	DIN rail mounting, wall mounting	
	IP rating	IP30	
	Heat dissipation	Fanless	
Power	Input	6-36V DC, Over-current protection, Reverse polarity protection	
	Terminal	3-pin 3.81mm power terminal	
	Consumption	1.8W on average (Without considering wireless module consumption)	
Software	OS	VantronOS	
	Custom development	SDK available, C/C++/Python/Node-Red/Node JS supported	
	Device management platform	Vantron BlueSphere GWM	
	Northbound protocol	MQTT	
	Edge computing script	JavaScript, MicroPython	
	Southbound protocol	Modbus TCP, Modbus RTU, EtherNet/IP, ISO-on-TCP, CC-link, etc.	
	IPK import	Supported	
	Interface language	Chinese and English (Default) Other languages (Optional)	
	Log	Supported	
	Configuration mode	Local, remote	
	Upgrade	Local, OTA update	
Network	NAT	Supported	
	Network management	SNMP v1/v2c/v3	
	NTP	Supported	
	IP application	Ping, Traceroute, Nslookup	
	Routing	Static routing	
Security & Reliability	Firewall	Supported	
	VPN	OpenVPN, L2TP, PPTP, IPSec	
	Multi-level permission	Supported	
	Link detection	Heartbeat detection, automatic re-connection	
	Network reliability	Failover supported, link backup between Ethernet, Wi-Fi and 4G/LTE	
Environment Condition	Temperature	Operating: -20℃ ~ +70℃ (Optional: -40℃ ~ +85℃) Storage: -40℃~+85℃	
	Humidity	RH 5%-95% (Non-condensing)	
	Certification	FCC, PTCRB	

Appendix B Regulatory Compliance Statement

This product has been determined to be compliant with the applicable standards, regulations, and directives for the countries where the product is marketed.

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of 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.

Note: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate this equipment.

RF Radiation Exposure Statement:

1. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.
2. The device has been evaluated to meet general RF exposure requirement.

IC Statement

This device complies with ISED's licence-exempt RSSs. 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.

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

Le présent appareil est conforme aux CNR d' ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: