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Pico Next Gateway
User Guide

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Revision History

Revision	Date	Description
.001	Aug. 19, 2021	Browan first release
.002	Feb. 15, 2022	Add Regulatory and change LED function
.003	Apr. 28, 2022	Add WiFi Station configuration
.004	Aug. 5, 2022	Add Packet Forwarder Whitelist Filter, OpenVPN Client configuration, and Professional Installation instructions
.005	Oct. 6, 2022	Add firmware upgrade details. Update Whitelist Filter and Channel Scan
.006	Oct. 31, 2022	Add passive PoE data
.007	Jan. 13, 2023	Add Auto OTA update, file export, PLMN ID for LTE, and packet forwarder restore to default

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Regulatory

Federal Communication Commission Statement (FCC, U.S.)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interferencewill not occur in an 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 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 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 anyinterference received, including interference that may cause undesired operation.

Radiation Exposure Statement

This device complies with RF 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.
This device must operate with a minimum distance of 20 cm between the radiator and user body.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment

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IC WARNING

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

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 exempts 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.

Radiation Exposure Statement:

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corp.

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Professional Installation Instructions

1. Installation personal

This product is designed for specific applications and needs to be installed by a qualified person who has RF and related rules knowledge. The general user shall not attempt to install or change the settings.

2. Installation location

The product shall be installed at a location where the radiating antenna can be kept 20 cm from nearby persons in normal operation conditions to meet regulatory RF exposure requirements.

3. External antenna

Use only the antennas that have been approved by the applicant. Non-approved antenna(s) may produce unwanted spurious or excessive RF transmitting power, which may lead to the violation of FCC/IC limits and is prohibited.

4. Installation procedure

Please refer to user's manual for details.

5. Warning

Please carefully select the installation position and make sure that the final output power does not exceed the limits set forth in relevant rules. Violation of the rules could lead to serious federal penalties.

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Instructions d'installation professionnelle

1. Installation

Ce produit est destine a un usage specifique et doit etre installe par un personnel qualifie maitrisant les radiofrequences et les regles s'y rapportant. L'installation et les reglages ne doivent pas etre modifies par l'utilisateur final.

2. Emplacement d'installation

En usage normal, afin de respecter les exigences reglementaires concernant l'exposition aux radiofrequences, ce produit doit etre installe de facon a respecter une distance de 20 cm entre l'antenne emettrice et les personnes.

3. Antenn externe.

Utiliser uniiquement les antennes approuvees par le fabricant. L'utilisation d'autres antennes peut conduire a un niveau de rayonnement essentiel ou non essentiel depassant les niveaux limites definis par FCC/IC, ce qui est interdit.

4. Procedure d'installation

Consulter le manuel d'utilisation.

5. Avertissement

Choisir avec soin la position d'installation et s'assurer que la puissance de sortie ne depasse pas les limites en vigueur. La violation de cette regle peut conduire a de serieuses penalites federales.

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1 Product Overview

1.1 Product Features

The Pico Next Gateway is a LoRa gateway with GPS, using numerous ways of connection: ethernet, LTE, and Wi-Fi. Depending upon the SKU, some functions might not be available. Pico Next is specifically designed for wide-area IoT applications. Applications include, but are not limited to, home security, automatic meter-reading, monitoring fault-indicators, and monitoring streetlights. This gateway is very suitable for small businesses or private area uses like at parking lots, exhibition centers, and campuses.

1.2 LED Functions

LED Functions	Constant	Flashing	Off
Power	Power On	Booting /OTA	OFF
Internet	Internet Available	Checking Internet	RFU
Service	LNS Connected	RFU	LNS Not Connected
LoRa	LoRa Working	Initializing	LoRa Not Working

1.3 Reset Button

Reboot:
By pressing and holding the RESET Button, the Power LED will start flashing. The “reboot” procedure will be triggered when the RESET Button is released while the Power LED light is flashing.

Restore to Default:
By pressing and holding the RESET Button, the Power LED will start flashing. The “restore to default” procedure will be triggered when the RESET Button released after the Power LED light becomes constant.

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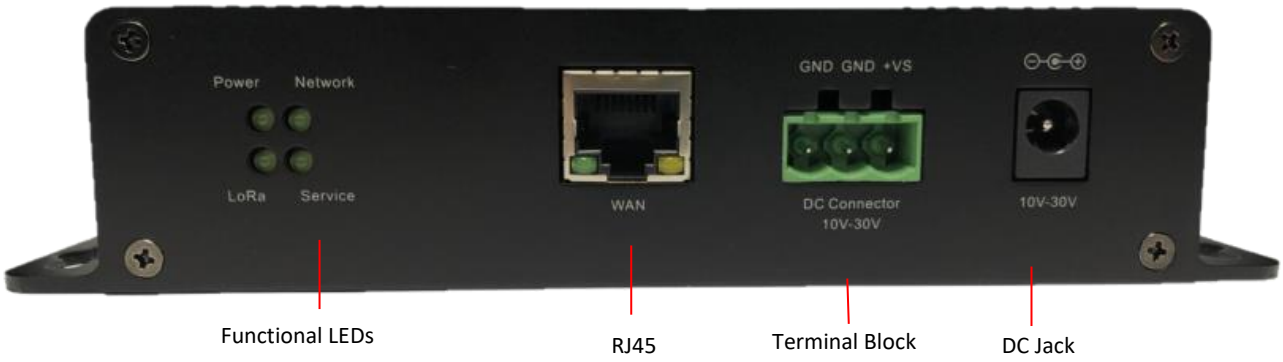
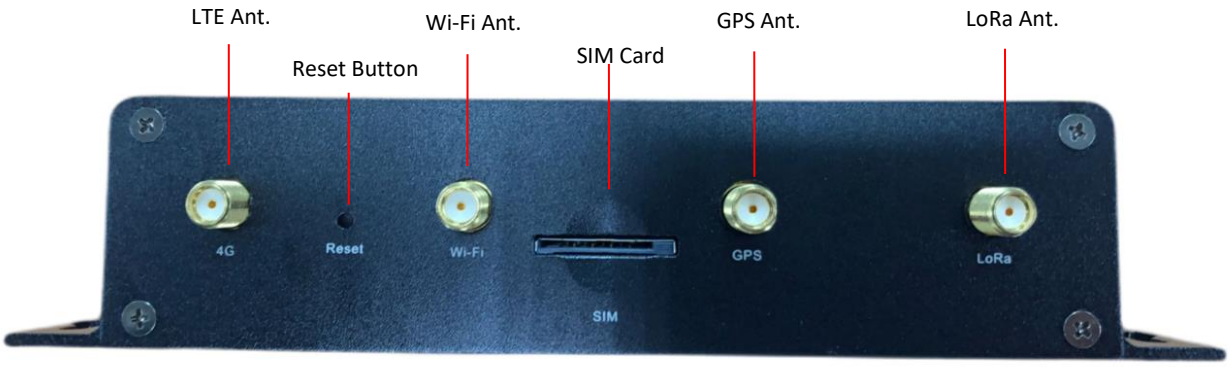
1.4 I/O Ports

Front Panel -



Back Panel -



1.5 Accessories

Different SKUs would provide accessories pertaining to that country or SKU, such as the adapter plug model and GPS antenna. LTE and Wireless antennas are interchangeable; they have the same specifications.
*Please note that the GPS antenna needs to be purchased separately. *

Adapter

LoRa Antenna

LTE and Wi-Fi Antenna

GPS Antenna *

2 Installation

2.1 Power up

Power up Pico Next through the following ways.

2.1.1 DC Adapter

Connect the power adapter provided to the DC jack In. Pico Next will automatically turn on after powering up.

2.1.2 Terminal Block

Connect a power supply to Pico Next with a 3-pin pluggable male terminal block.

2.1.3 Ethernet

Connect a RJ45 Ethernet cable to Power-over-Ethernet in (WAN port). Connect the other end of the ethernet cable to a passive PoE that ensures a power of 12V / 1.5A DC. Provide power to the passive PoE.

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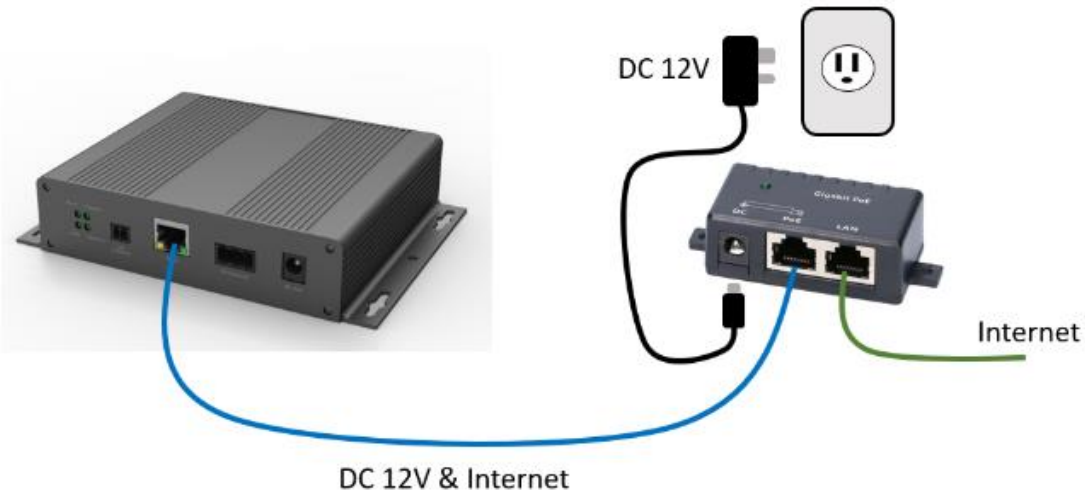
2.1.3.1 Passive PoE

Passive PoE, passive Power over Ethernet, is a non-standard PoE. It can deliver power over the Ethernet lines, but without the negotiation or communication process; the power is "always-on". It requires using passive PoE injectors for networks, which send electric current out over the Ethernet cable at a certain voltage.

Pins at RJ45 Connector	Passive PoE (DC on Spares)
Pin 1	Rx+
Pin 2	Rx-
Pin 3	Tx+
Pin 4	DC +9V~+30V
Pin 5	DC +9V~+30V
Pin 6	Tx-
Pin 7	Ground
Pin 8	Ground

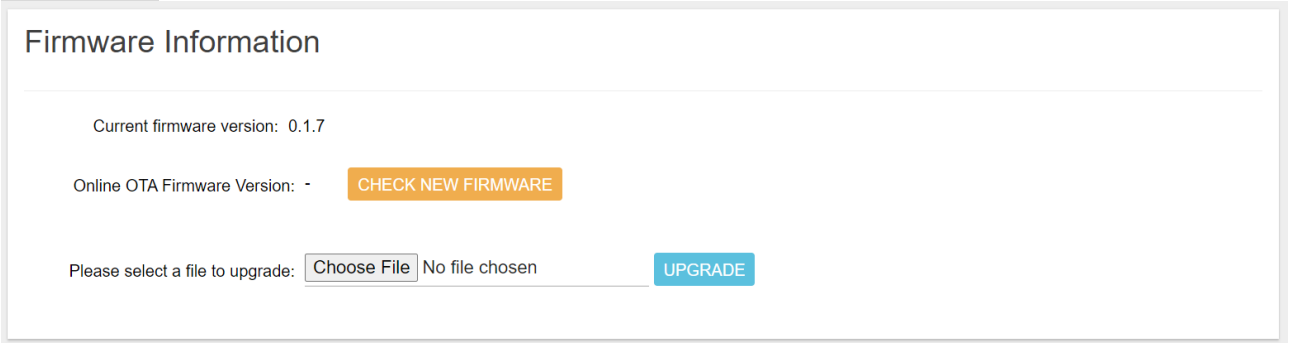
In general, a Passive PoE Injector has three connectors: DC jack, RJ45 for PoE and RJ45 for LAN. Simply connect a power source (output range of power adapter must be between 10V~30V) to the DC jack on the injector and the LED indicator will turn on. Then, use an ethernet cable to connect the LAN port on injector to your network, and use another ethernet cable to connect the PoE port on injector to your PicoNext Gateway.



2.2 Upgrade Firmware

Upgrade to the newest firmware with Web GUI following below "**3.1 Open Admin GUI**" page 13 instructions and upgrading with "**4.3 System Firmware**" page 15 instructions. By clicking the " Check New Firmware" button, the gateway may upgrade to the latest firmware version.

Figure 2.2-A Firmware Upgrade



3 GUI Access

3.1 Open Admin GUI

Default mode of Pico Next Gateway is DHCP. Once Pico Next is turned on through plugging in the DC adapter, it will automatically link to available servers. Pico Next's IP address can be found from the DHCP server. Access Pico Next WebUI via the DHCP IP on Chrome. The default username is "**admin**", and the password can be found on the back label.

Figure 3.1-A Admin GUI

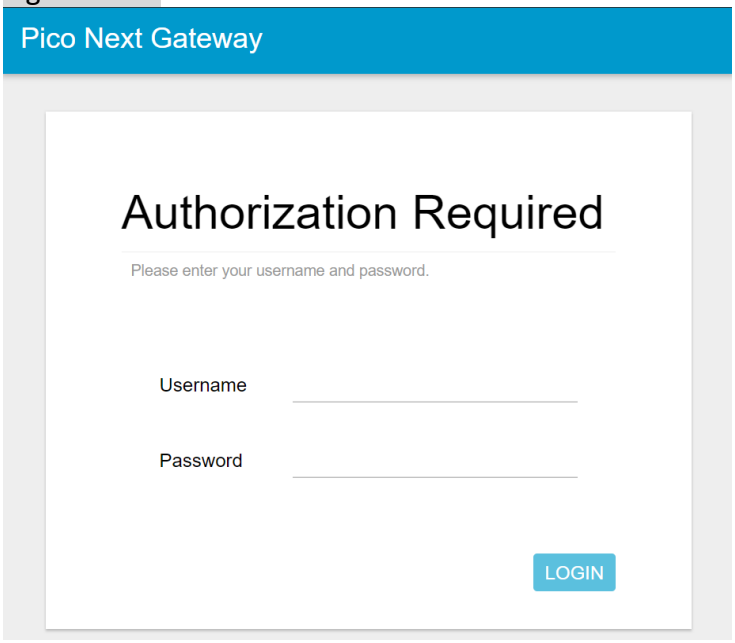


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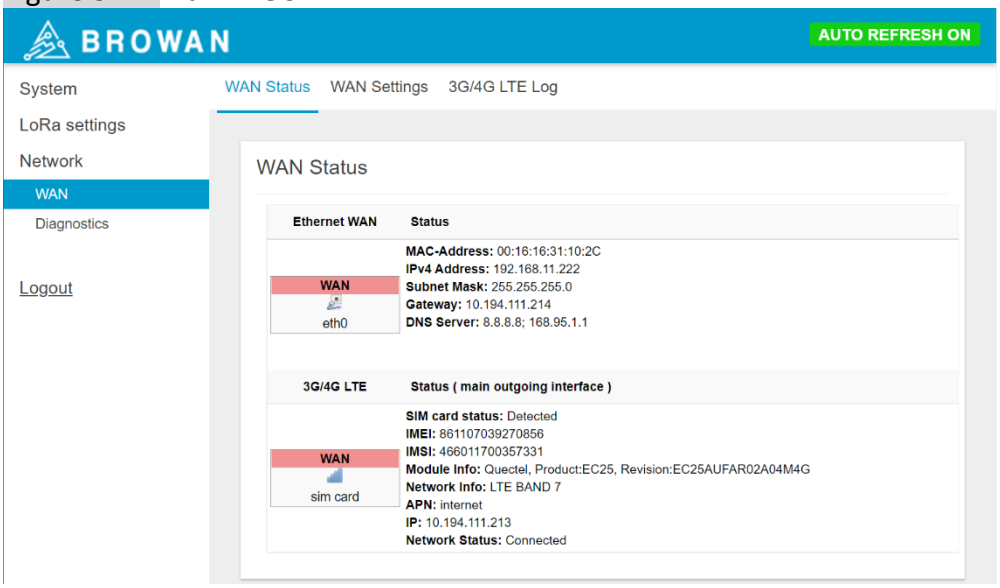
Figure 3.1-B Admin GUI



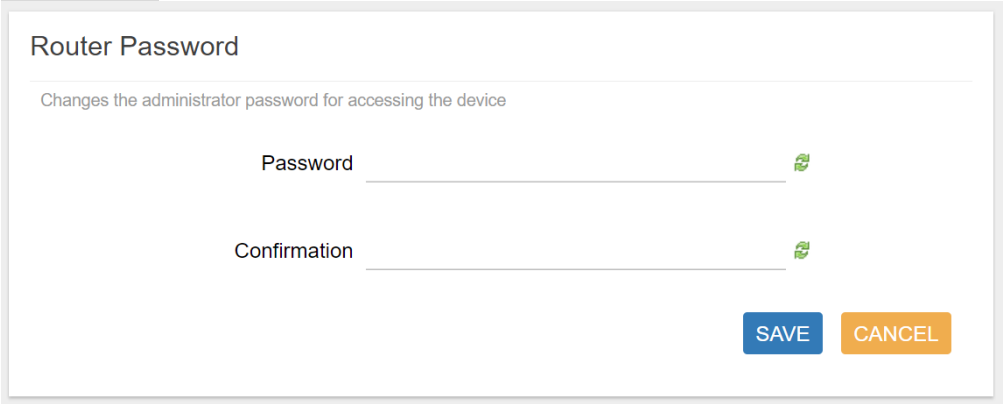
4 System

The System menu consists of the following categories: ***Administration, Restore, System Firmware*** and ***Support***. An introduction of each category will be distinctly stated in individual paragraphs.

4.1 Administration

Pico Next login password can be configured on this page.

Figure 4.1-A Router Password



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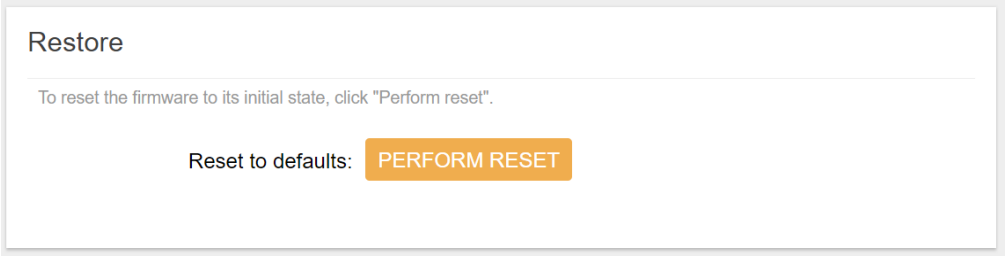
4.2 Restore

Restore the ***Password Credential***, ***LoRa Setting*** and ***Network Setting*** to the default configurations.

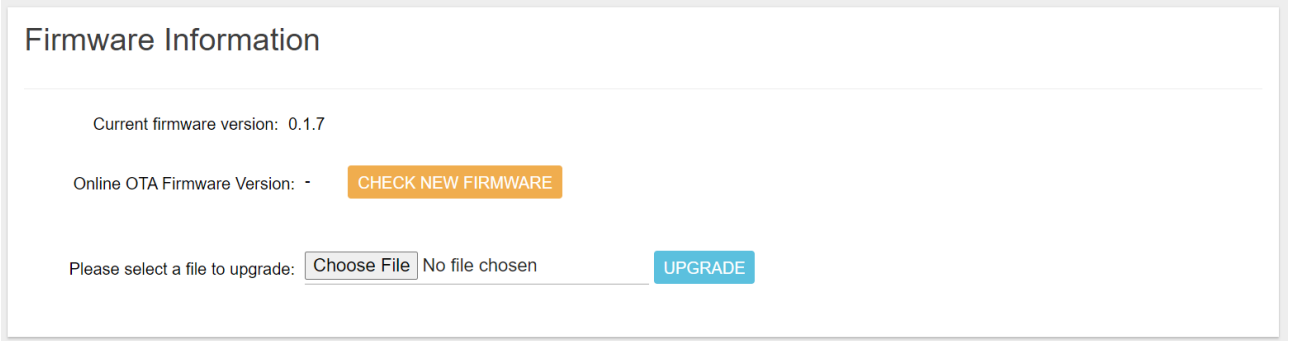
Figure 4.2-A Restore



4.3 System Firmware

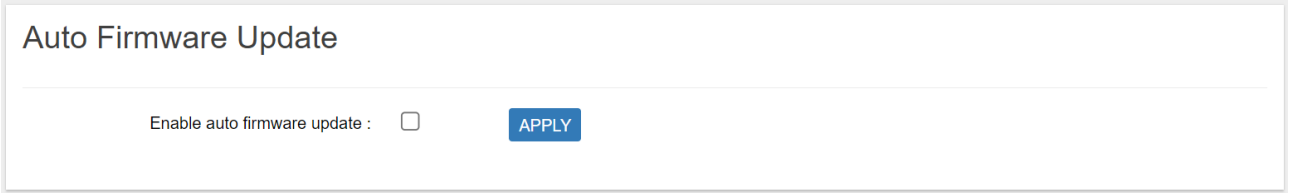
Here the current firmware version can be found. Click the "Choose File" button to upload the newest system firmware. Click the "UPGRADE" button to upgrade the system firmware.

Figure 4.3-A System Firmware



The Auto Firmware Update can be enabled, and the device will check the OTA server for new firmware versions daily.

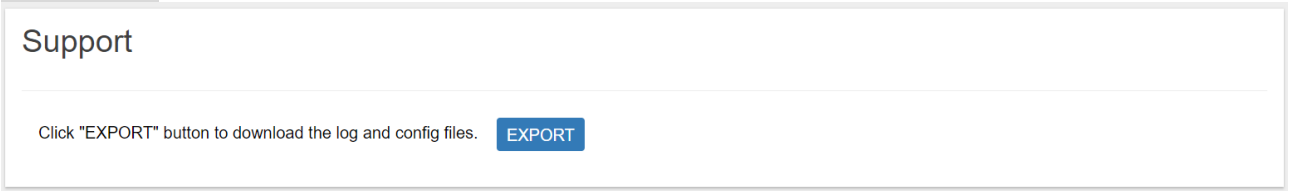
Figure 4.3-B System Firmware



4.4 Support

Click the “EXPORT” button to download the log and config files.

Figure 4.4-A Export Log



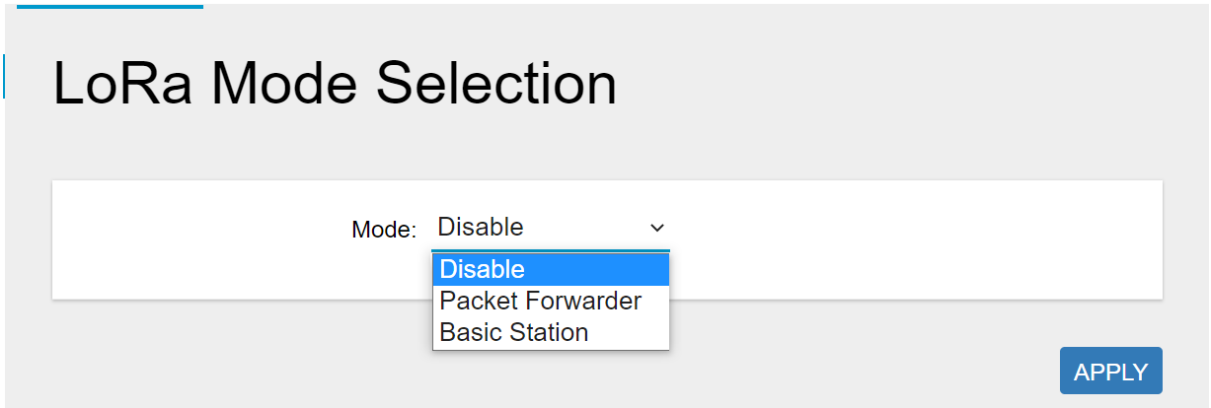
5 LoRa Settings

The LoRa menu consists of the following categories: ***Mode Selection, Channel Scan*** and ***Log***. An introduction of each category will be distinctly stated in individual paragraphs.

5.1 Mode Selection

By default, the LoRa Mode is disabled. Configure the "***Packet Forwarder***" or "***Basic Station***" by using the dropdown list.

Figure 5.1-A LoRa Mode Selection



5.1.1 Packet Forwarder

Choose the "***Packet Forwarder***" option and click the "***APPLY***" button to Enable the Packet Forwarder mode. After applying the setting, the "Packet Forwarder" field can be found on the left menu.

Figure 5.1.1-A LoRa Mode Selection - Packet Forwarder

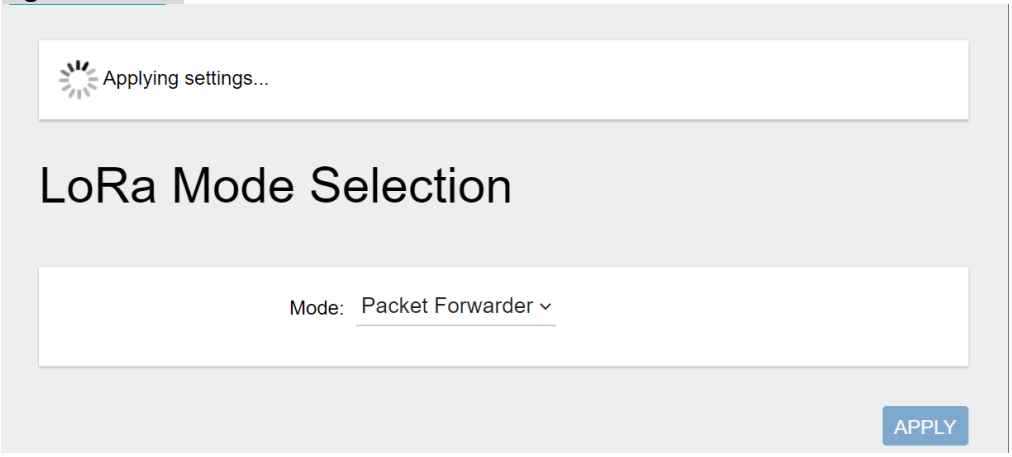
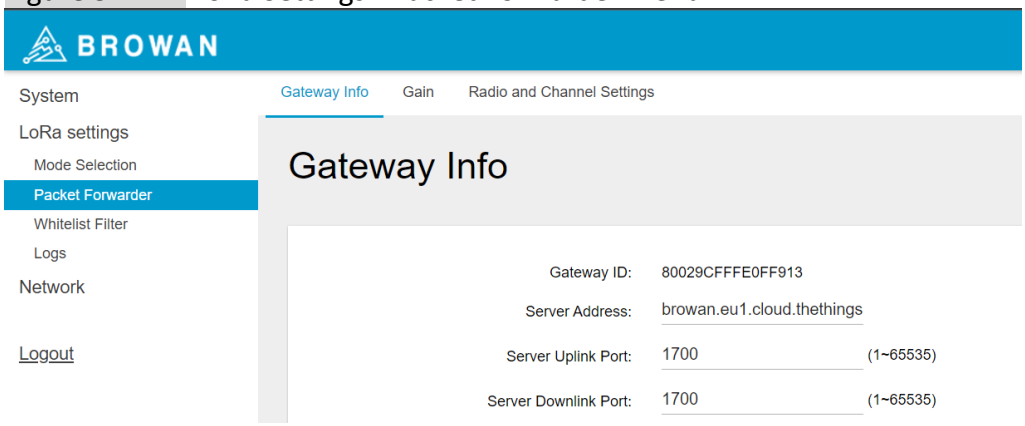


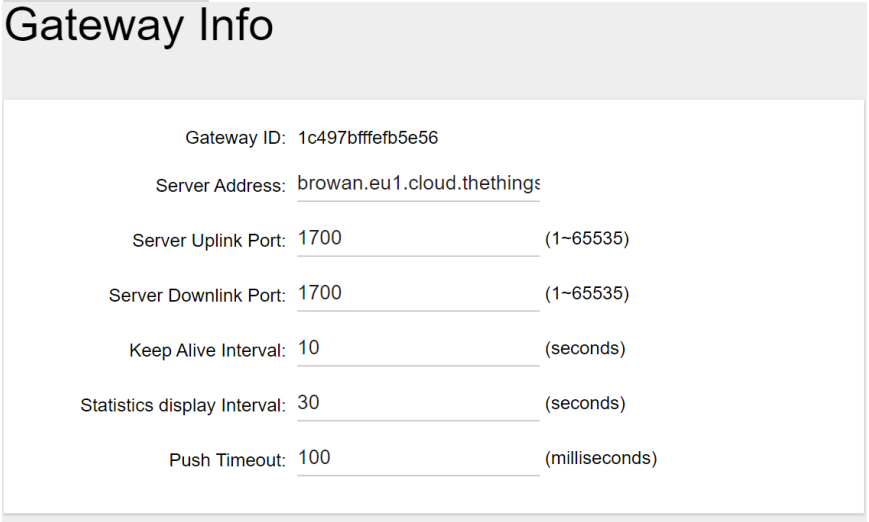
Figure 5.1.1-B LoRa Settings - Packet Forwarder menu



5.1.1.1 Gateway Info

This page is for setting up the LoRa configuration including ***Gateway ID***, ***Server Address***, ***Server Uplink Port***, ***Server Downlink Port***, ***Keep-Alive Interval***, ***Statistics Display Interval***, and ***Push Timeout***.

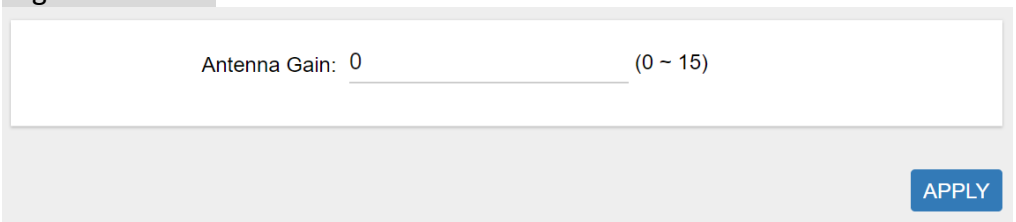
Figure 5.1.1.1-A Gateway Info



5.1.1.2 Antenna Gain

This page is for setting up the ***antenna gain*** of Lora.

Figure 5.1.1.2-A Antenna Gain



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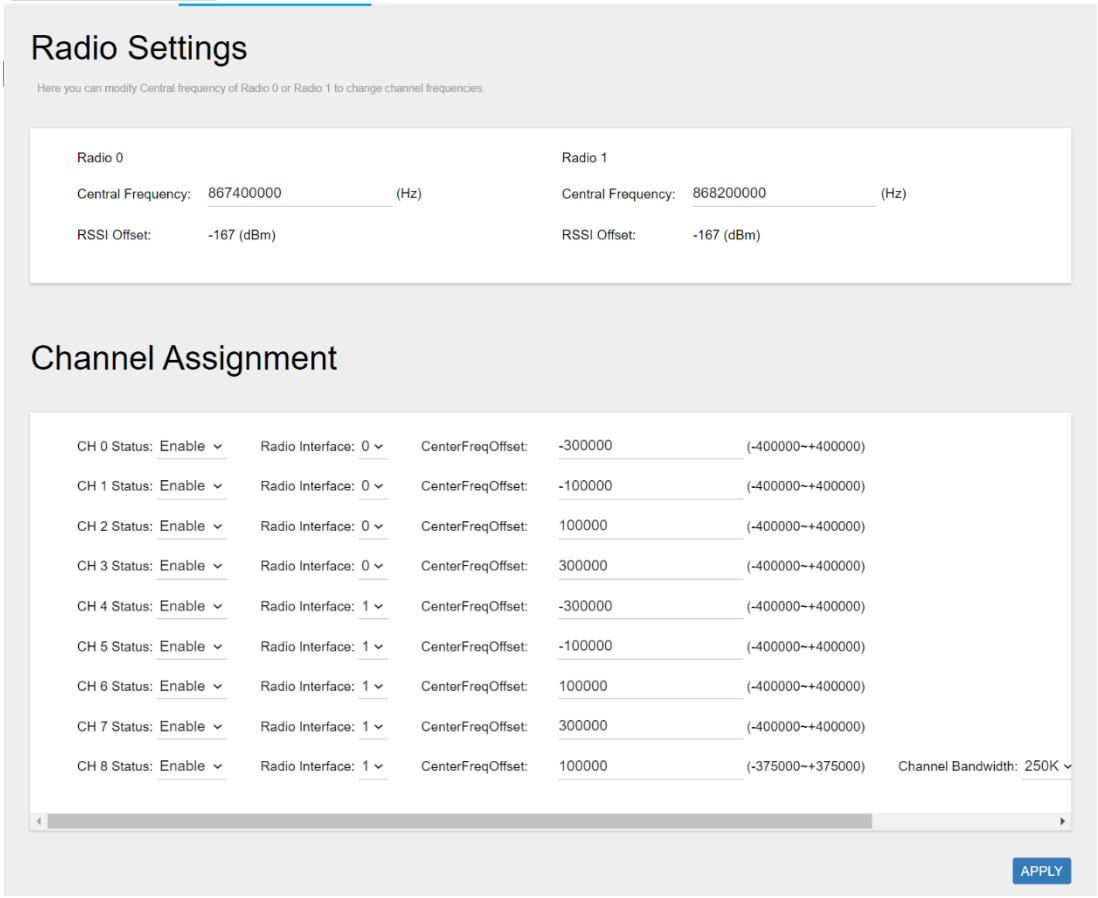
5.1.1.3 Radio and Channel Settings

This page is for configuring the radio 0 and radio 1 configurations of Lora, including ***Central Frequency***, ***Channel Status***, and ***Center frequency offset***.

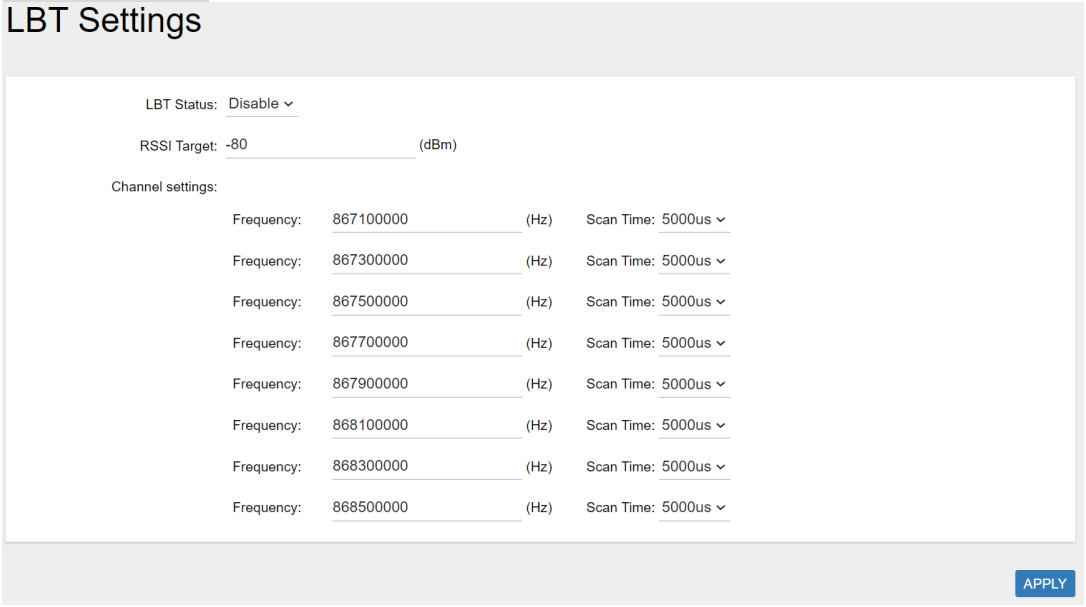
Figure 5.1.1.3-A Radio and Channel Settings



5.1.1.4 LBT Settings

For some regions (i.e. Japan), the Listen Before Talk (LBT) function is a must. This page is for setting up the LBT configuration of Lora, including ***LBT Status, RSSI Target, Channel settings.***

Figure 5.1.1.4-A LBT Settings



5.1.2 Whitelist Filter

To reduce unnecessary data traffic, this page configures the whitelist filter for the Packet Forwarder through ***Fport Filter*** and ***DevAddr Filter***.

If the “FPort” or the “DevAddr” of an end-device matches with the information on the whitelist, the lora package will then be forwarded to the network server. On the other hand, Join-Request packages are always allowed to be forwarded to the network server.

FPort:
The filter port range is from 1 to 223. Fill in with “-1” if Fport checking is not needed.

DevAddr:
If the end-device is activated by OTAA, the DevAddr can usually be found on the network server. Each DevAddr (4 bytes) can be split into 64 bits. Every 4 bits form a group which is called “NABBLE”. The DevAddr filter will check each “NABBLE” individually. Fill in with the alphabet “X” if DevAddr checking is not needed.

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Figure 5.1.2-A Whitelist Filter

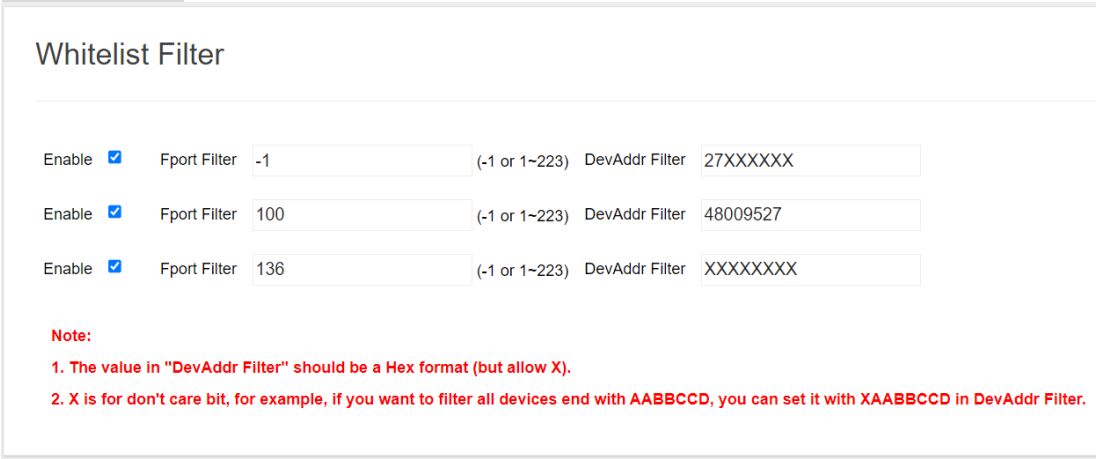
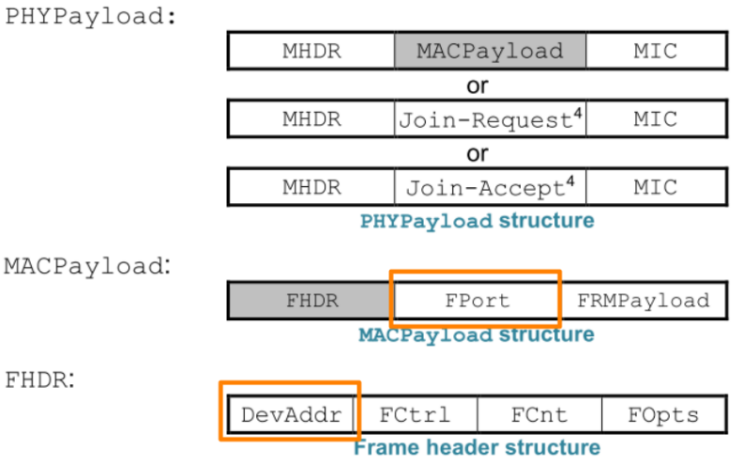


Figure 5.1.2-B LoRaWAN frame format elements



5.1.2.1 Examples of Whitelist Filter

Case 1:

Only forward messages from Fport=120 to the network server. DevAddr is not checked in this case.

Figure 5.1.2.1-A Whitelist Filter Case 1

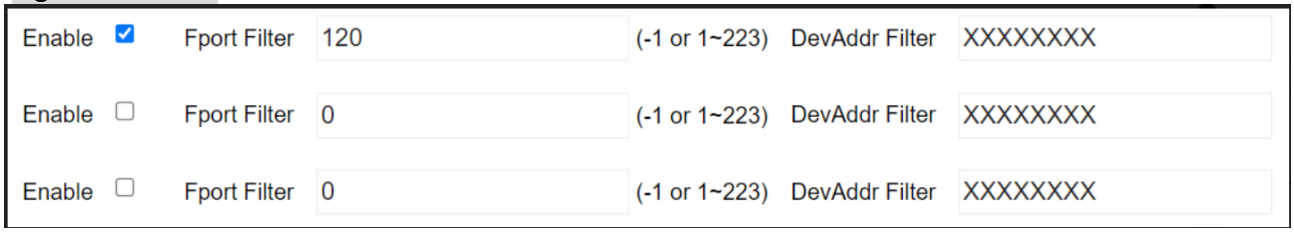


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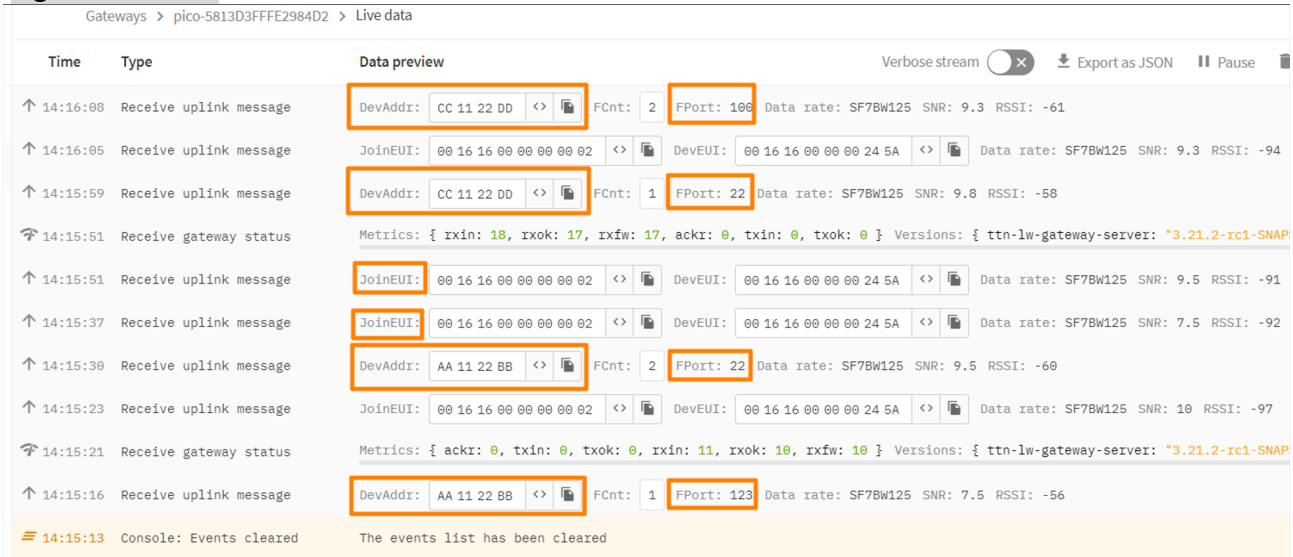
Figure 5.1.2.1-B Network Server Case 1

Case 2:

Only forward the messages from DevAddr: "XX***1122***XX" to the network server. Fport is not checked in this case.

Figure 5.1.2.1-C Whitelist Filter Case 2

Figure 5.1.2.1-D Network Server Case 2



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Case 3:

Only forward the messages from DevAddr=0922ABCD and Fport=99 to the network server.

Figure 5.1.2.1-E Whitelist Filter Case 3

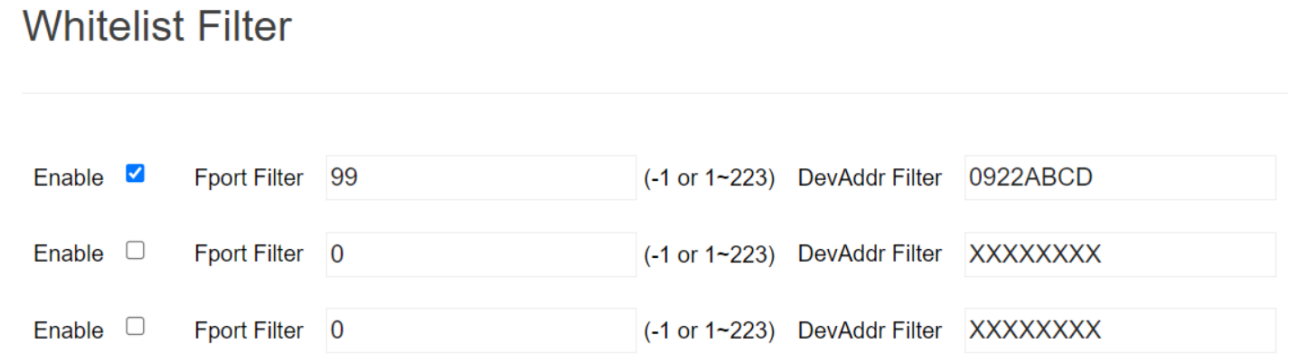
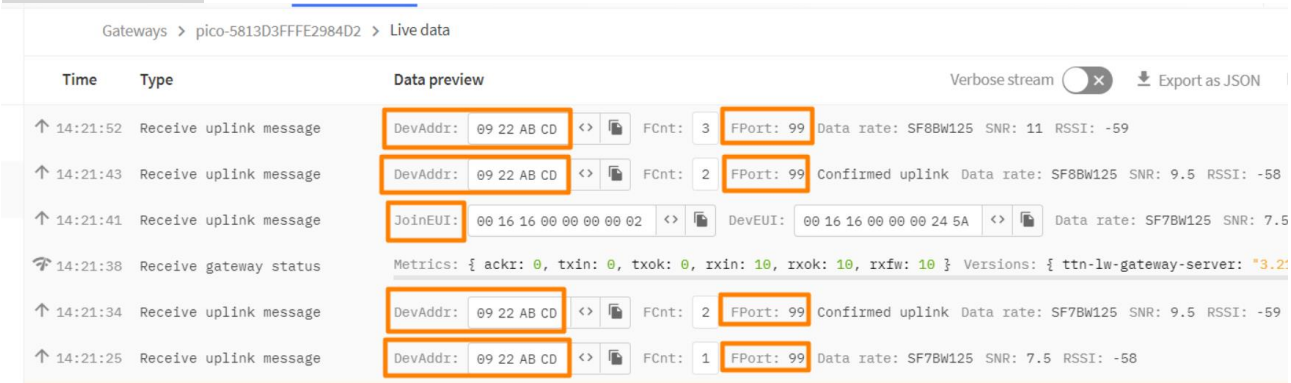


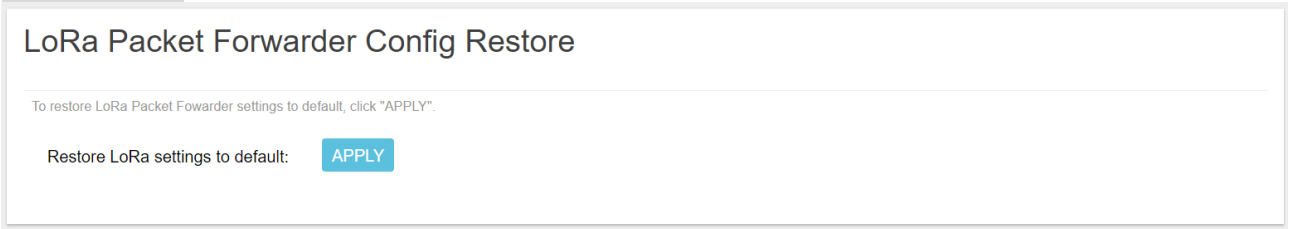
Figure 5.1.2.1-F Network Server Case 3



5.1.3 Config Restore

Click the “APPLY” button to restore LoRa Packet Forwarder settings to the default value.

Figure 5.1.3-A LoRa Packet Forwarder Config Restore



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5.1.4 Basic Station

Choose the "***Basic Station***" option and click the "***APPLY***" button to Enable the Basic Station mode. After applying the setting, the "Basic Station" field can be found on the left menu.

Figure 5.1.4-A LoRa Mode Selection - Basic Station

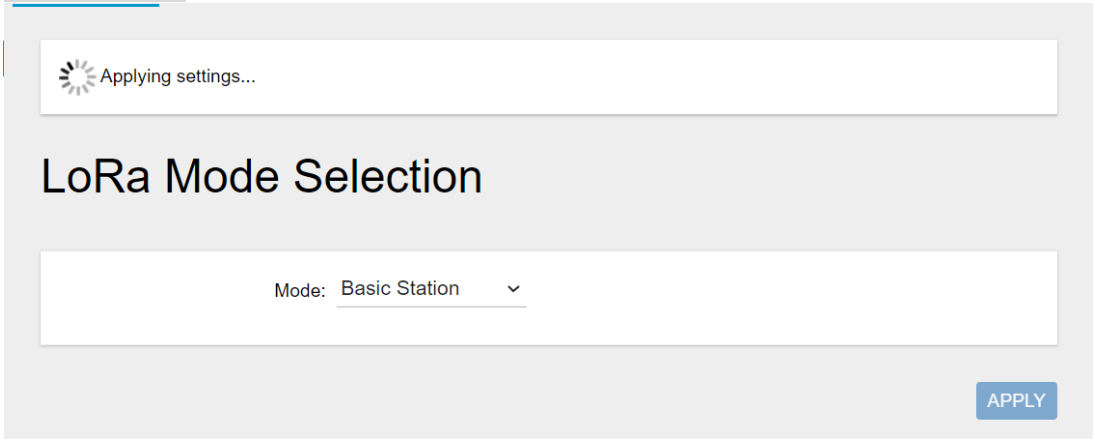
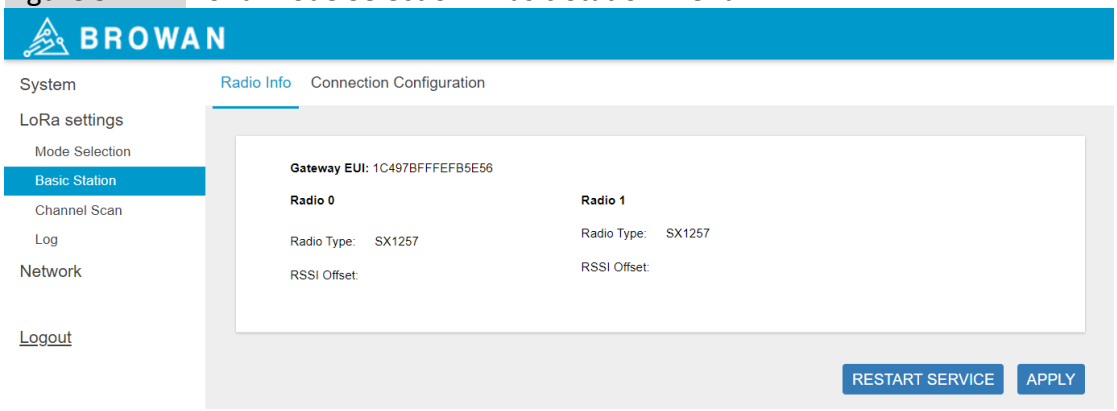


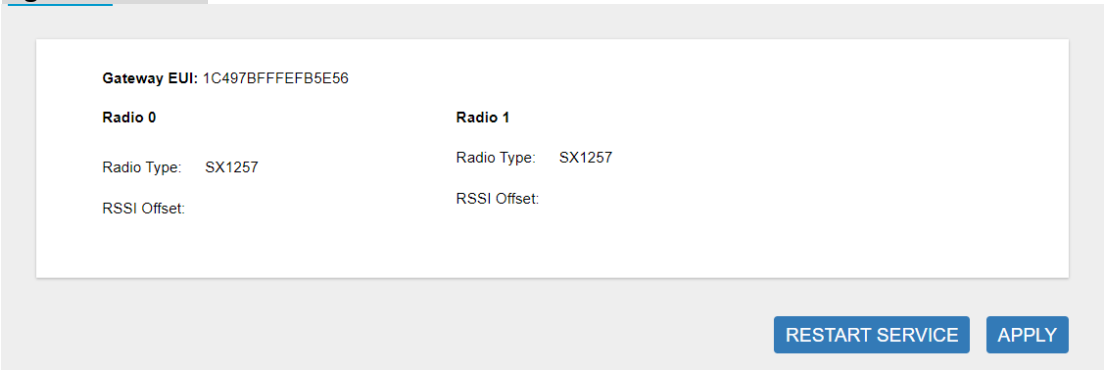
Figure 5.1.4-B LoRa Mode Selection - Basic Station menu



5.1.4.1 Radio Info

This page shows the ***Gateway EUI*** information***.***

Figure 5.1.4.1-A Radio Info



5.1.4.2 Connection Configuration

This page is for setting up the basic station configuration, including ***Basic Station Mode, Protocol, Server Address, Server Port*** and ***Credentials.***

- LNS Mode

Configure the LNS Mode settings and click the "APPLY" button.

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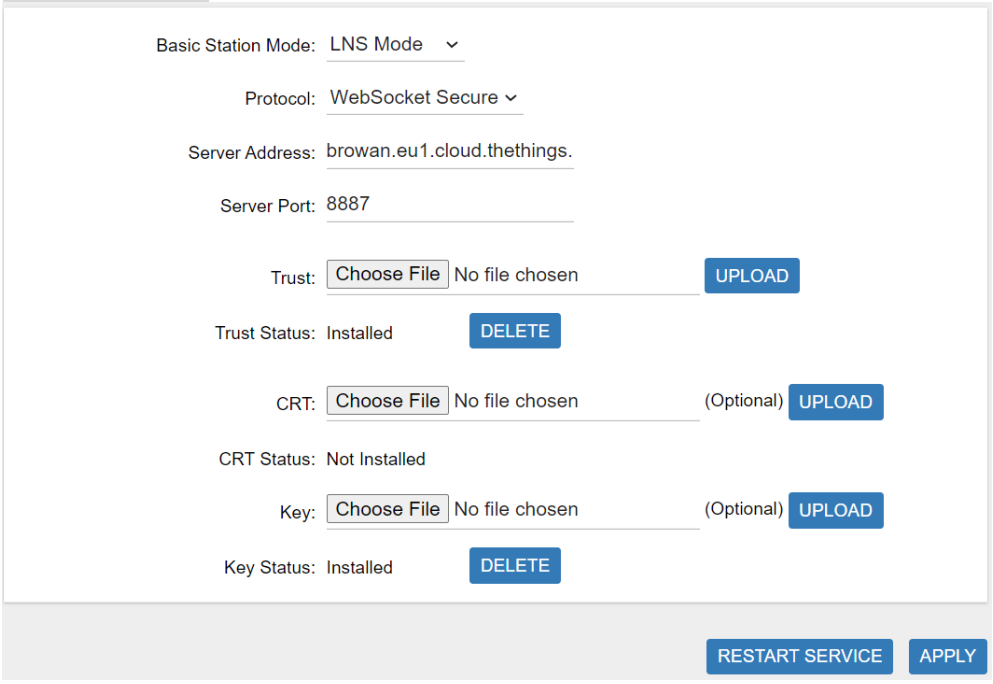
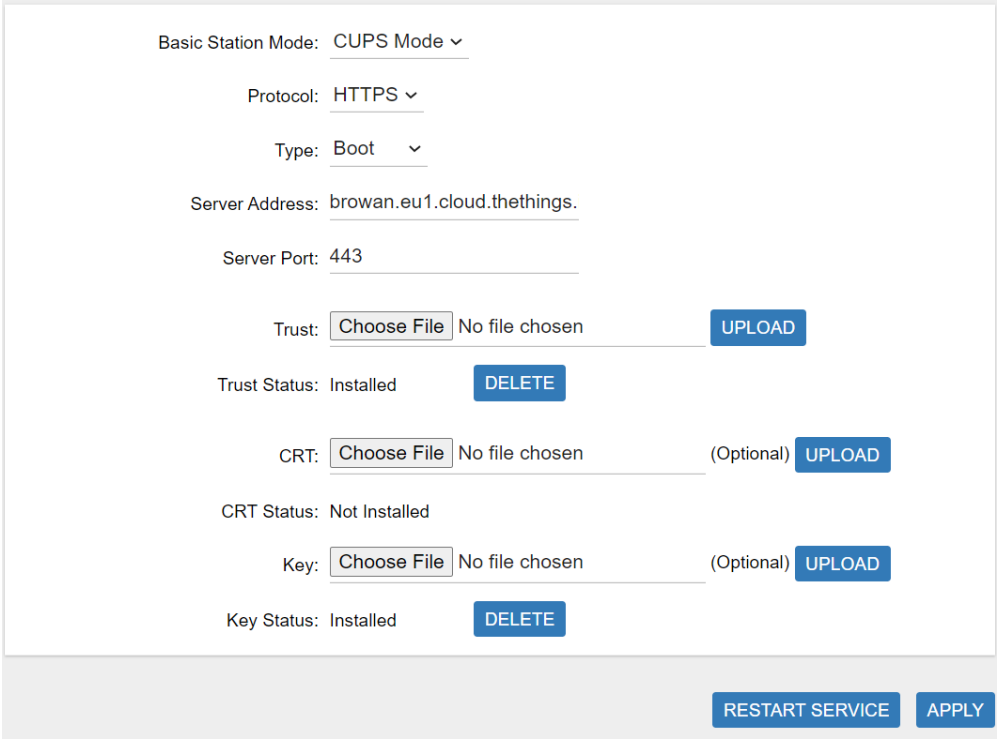
Figure 5.1.4.2-A LNS Mode



- CUPS Mode

Configure the CUPS Mode settings and click the "APPLY" button.

Figure 5.1.4.2-B CUPS Mode



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5.2 Channel Scan

Click the "SCAN" button to scan the RF signal. Then click the "EXPORT" button to export the scan result.

Figure 5.2-A Channel RSSI Scan

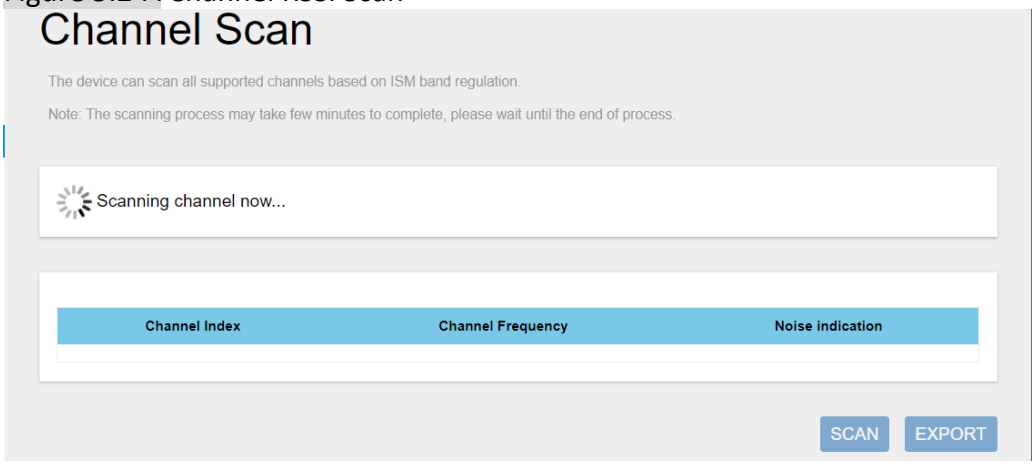
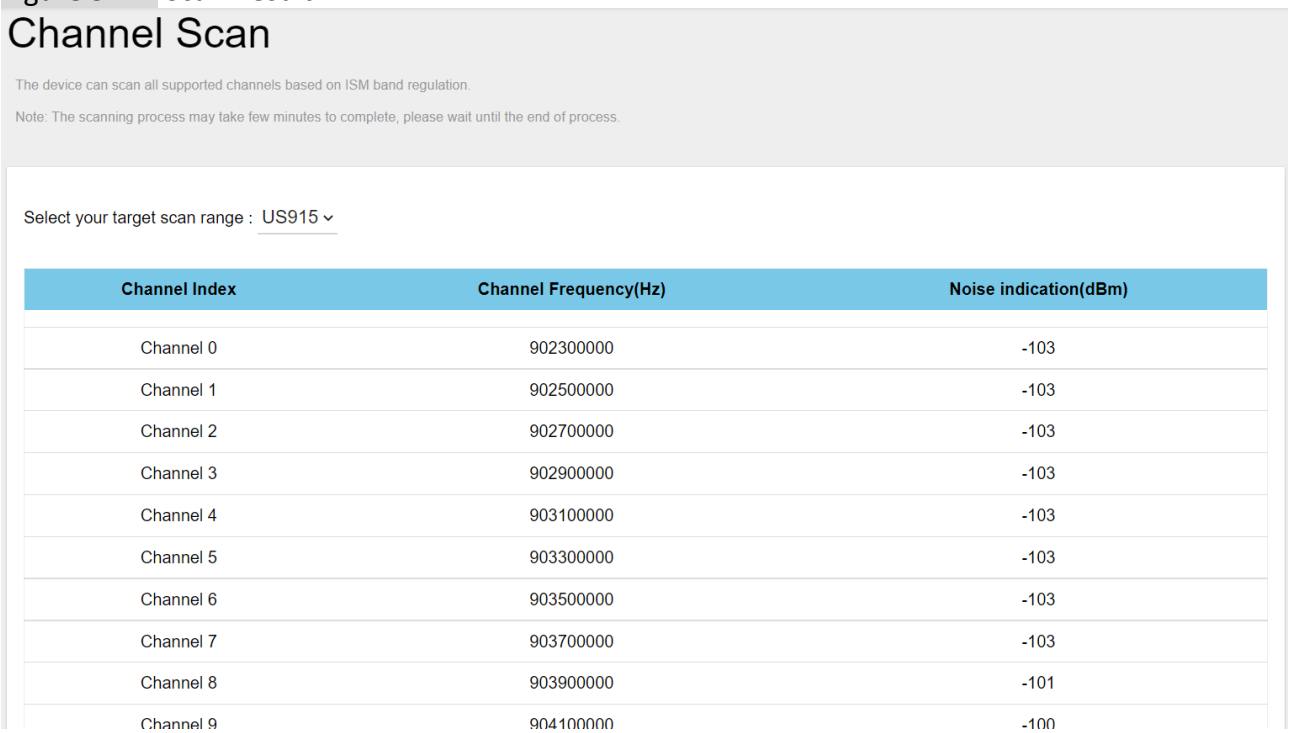


Figure 5.2-B Scan Result



Channel Index	Channel Frequency(Hz)	Noise indication(dBm)
Channel 0	902300000	-103
Channel 1	902500000	-103
Channel 2	902700000	-103
Channel 3	902900000	-103
Channel 4	903100000	-103
Channel 5	903300000	-103
Channel 6	903500000	-103
Channel 7	903700000	-103
Channel 8	903900000	-101
Channel 9	904100000	-100

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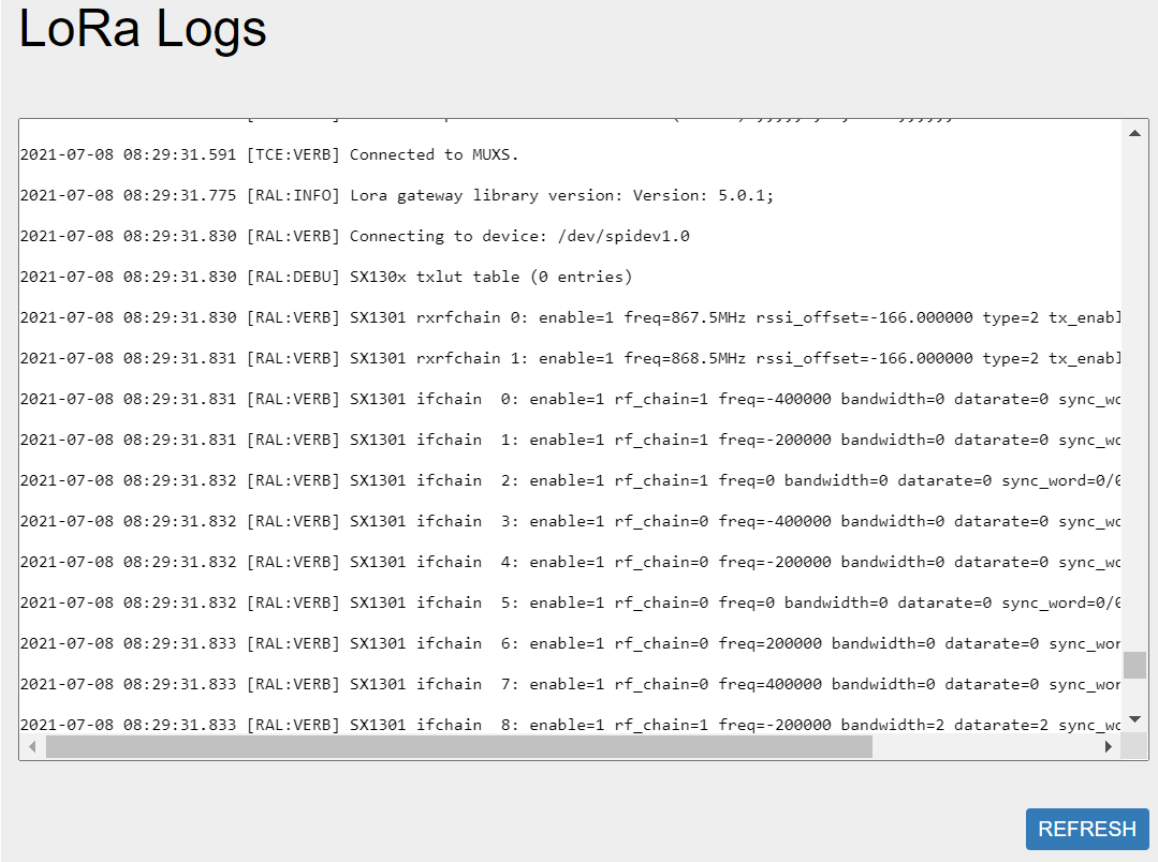
5.3 Log

The LoRa logs will be shown on this page, showing recent LoRa logs with a maximum limit of 500 lines.

Figure 5.3-A Logs



6 Network

The Network menu consists of the following categories: ***WAN*** and ***Diagnostics***. Introduction and input procedures for each category are described in the following paragraphs.

6.1 WAN

The purpose of this category is to view current WAN settings. This category is further divided into three sectors: ***WAN Status***, ***Wan Settings*** and ***3G/4G LTE Log***. These individual options are lodged and labeled above the main content.

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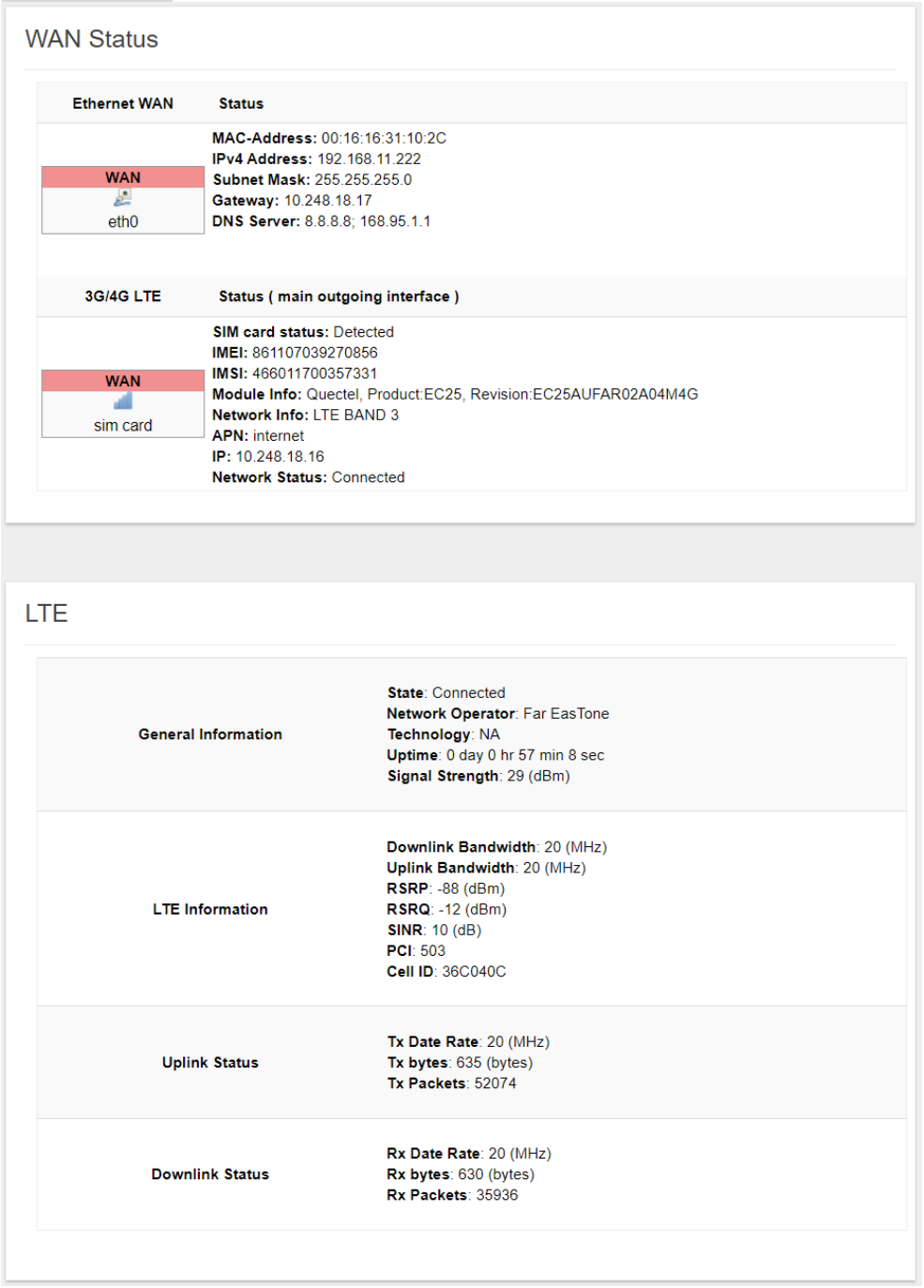
6.1.1 WAN Status

The current network status will be shown on this page.

Figure 6.1.1-A WAN Status



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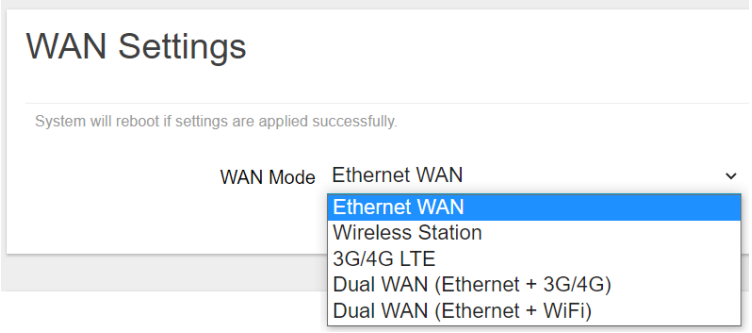
6.1.2 WAN Settings

Pico Next supports 5 WAN Modes: ***Ethernet WAN, 3G/4G LTE, Wi-Fi Station, Dual WAN (Ethernet+3G/4G) and Dual WAN(Ethernet+WiFi)***.

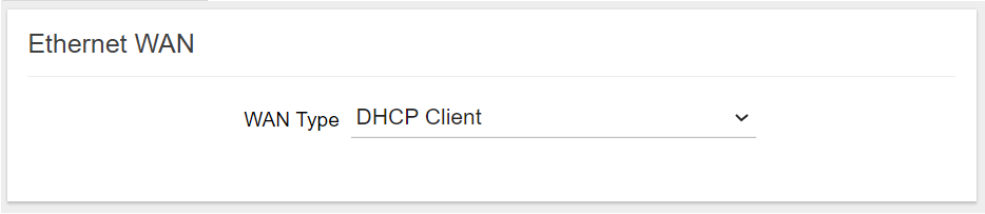
Figure 6.1.2-A WAN Mode



6.1.2.1 Ethernet WAN

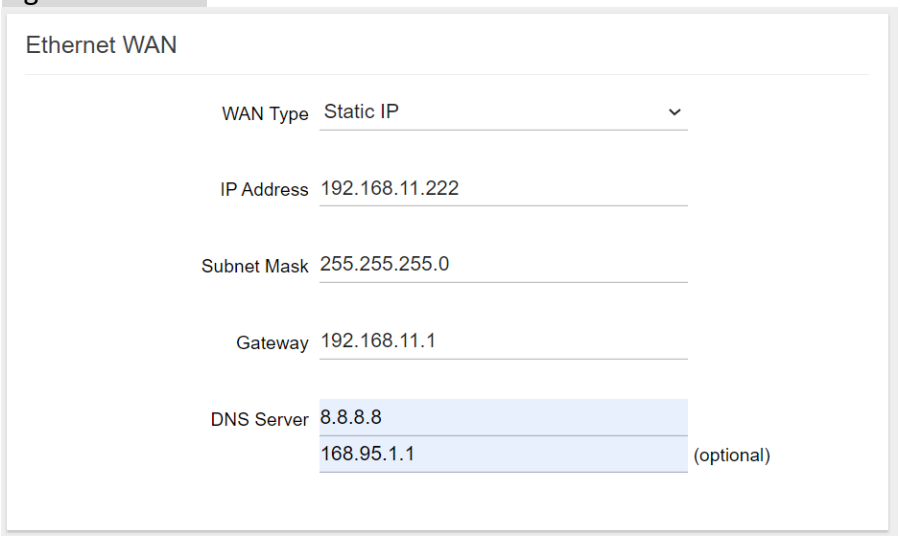
- DHCP Client

Figure 6.1.2.1-A DHCP Client



- Static IP

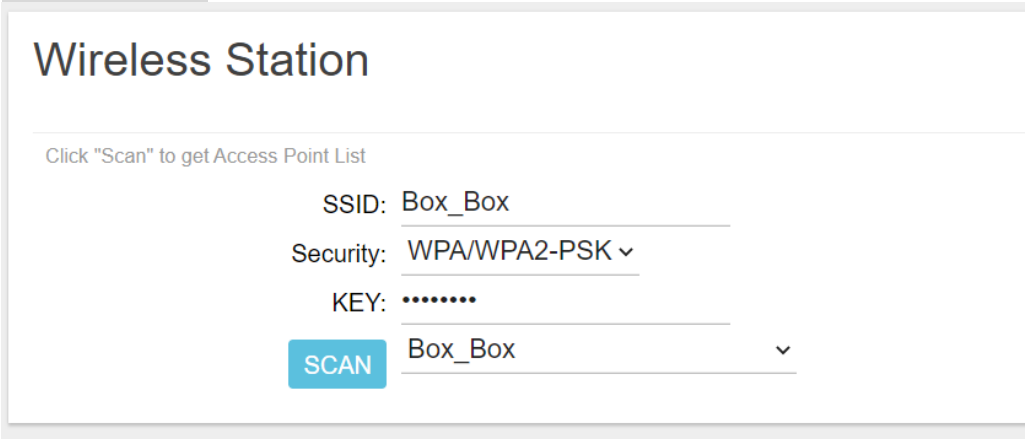
Figure 6.1.2.1-B Static IP



6.1.2.2 Wireless Station

Configure “WiFi Access Point” information.

Figure 6.1.2.2-A Wireless Station Settings



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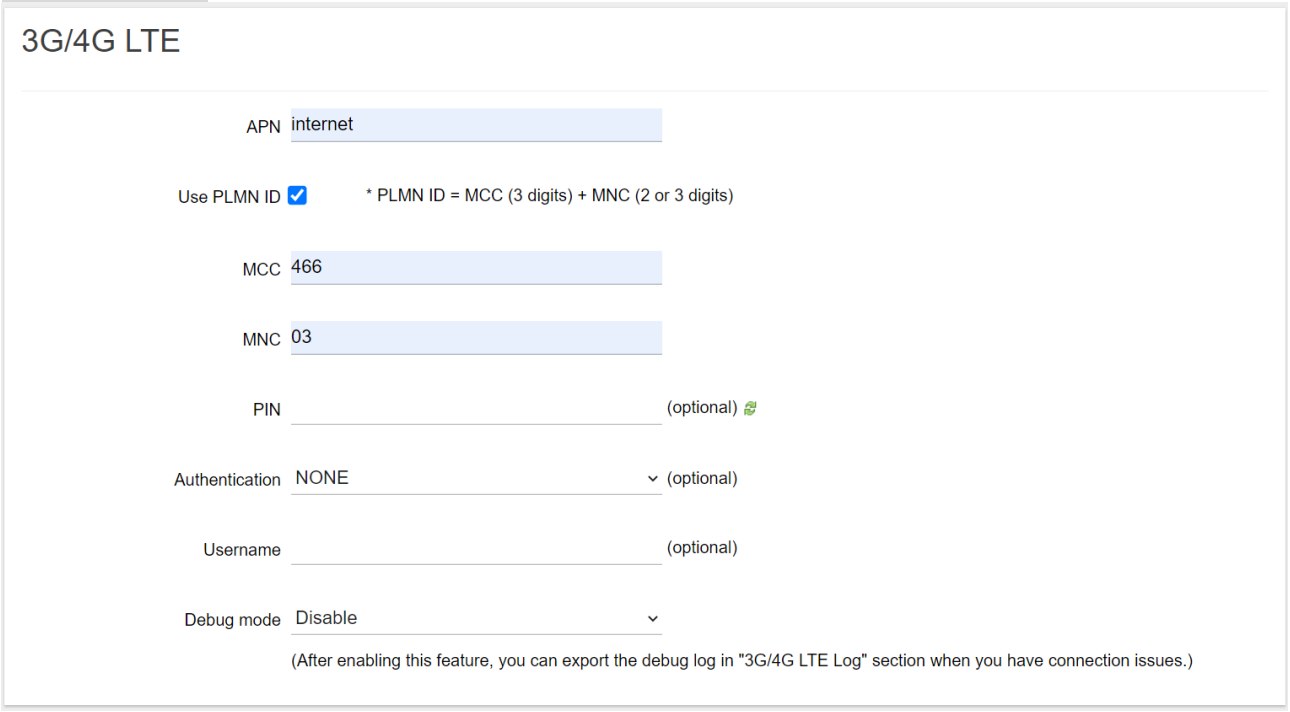
6.1.2.3 3G/4G LTE

Configure “APN” information according to mobile service provider requirements. The PLMN ID also can be supported.

Figure 6.1.2.3-A LTE Settings



6.1.2.4 Dual WAN (Ethernet+3G/4G)

Configure the Ethernet Setting and LTE Setting at the same time. If the Dual WAN mode is selected, the primary interface needs to be specified by default. Pico Next Gateway will automatically set the other workable interface to be the backhaul.

Figure 6.1.2.4-A Network Primary

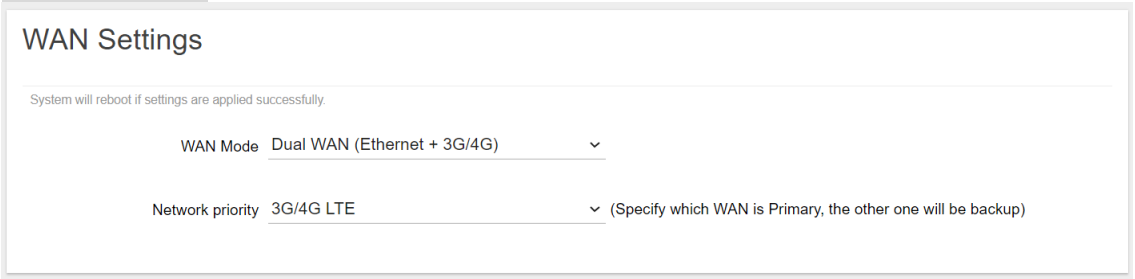
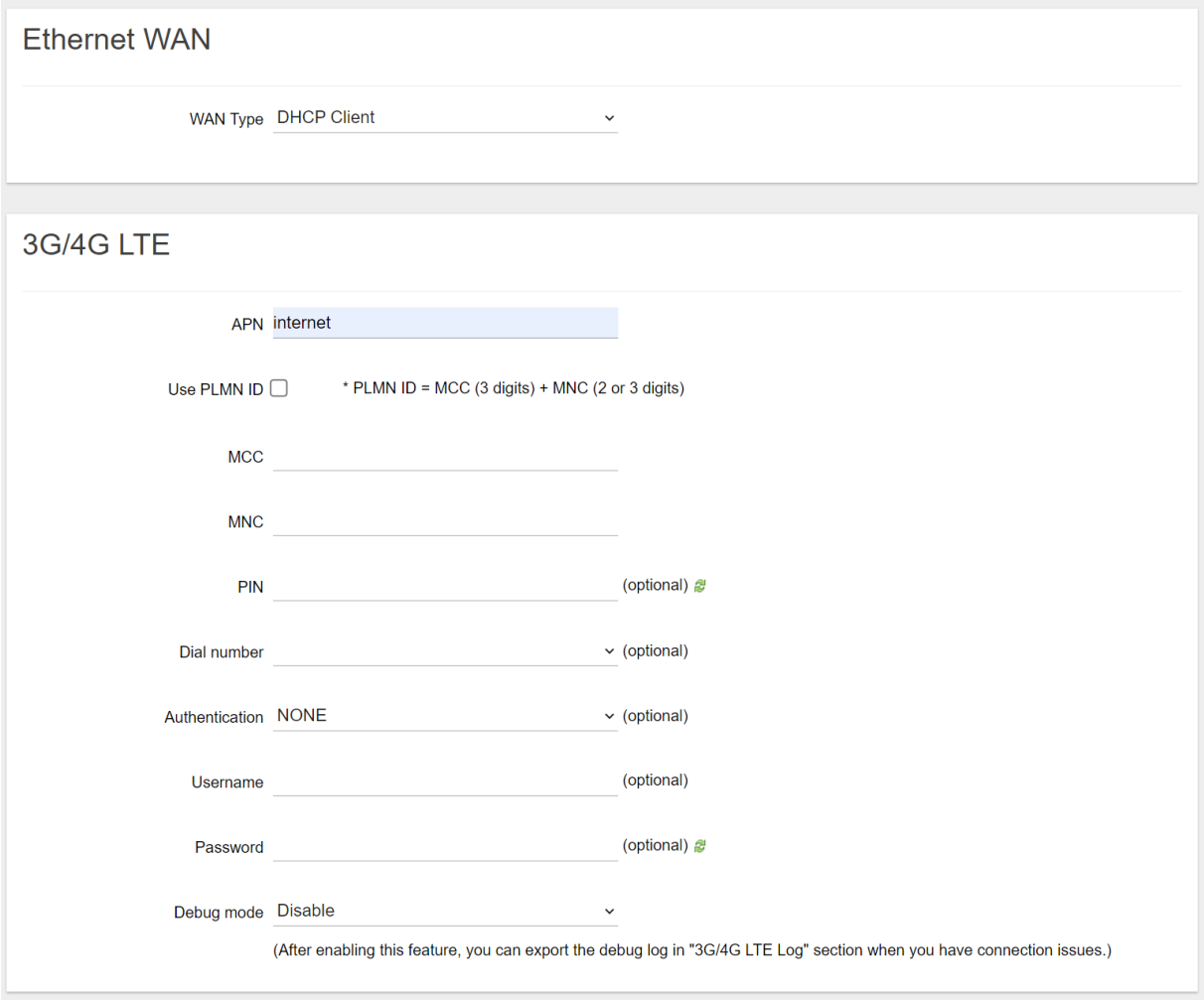


Figure 6.1.2.4-B Ethernet and LTE Configuration



6.1.2.5 Dual WAN (Ethernet+WiFi)

Configure the Ethernet Setting and Wi-Fi Station Setting at the same time. If the Dual WAN mode is selected, the primary interface needs to be specified by default. Pico Next Gateway will automatically set the other workable interface to be the backhaul.

Figure 6.1.2.5-A Network Primary

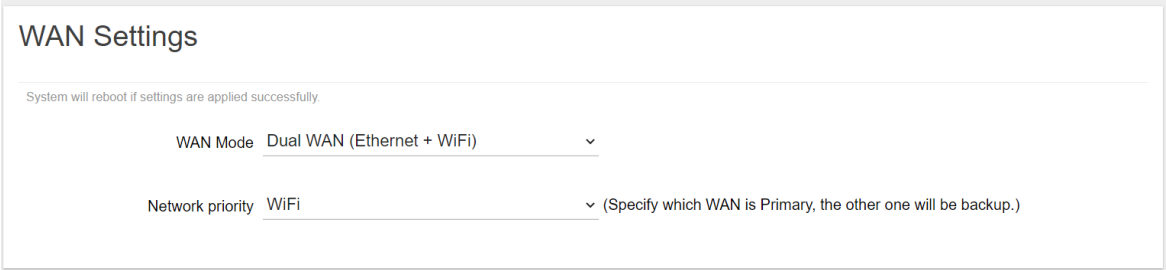


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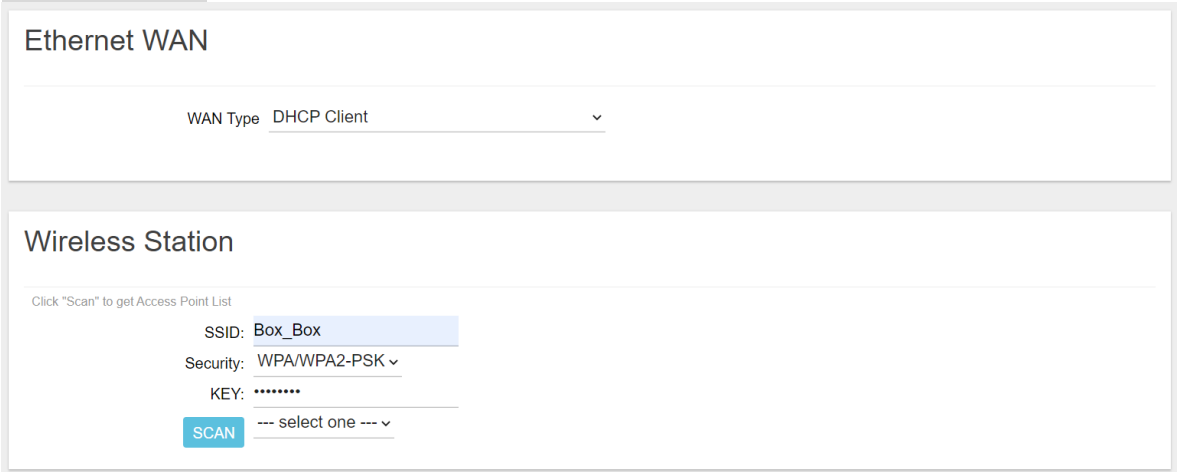
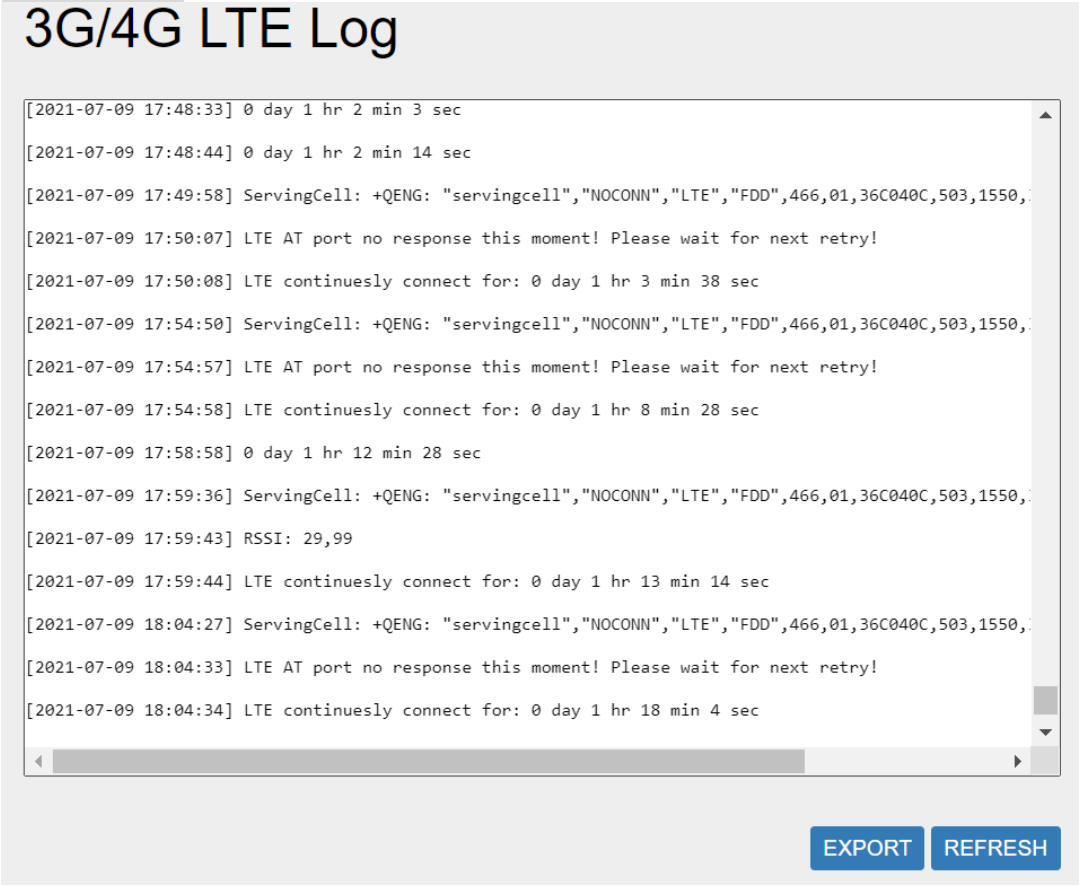
Figure 6.1.2.5-B Ethernet and WiFi Station Configuration



6.1.3 3G/4G LTE Log

If LTE Debug Mode is enabled, the LTE connection logs will be shown on this page. Click the "EXPORT" button to export the log.

Figure 6.1.3-A 3G/4G LTE Log



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6.2 VPN

The VPN menu consists of the following categories: ***VPN Settings*** and ***VPN Log***. An introduction for each category and input procedures are described in the following paragraphs.

6.2.1 VPN Settings

This page is for configuring OpenVPN Client settings, including ***Import a config file*** or ***Customize a config file***.

Figure 6.2.1-A Import a config file

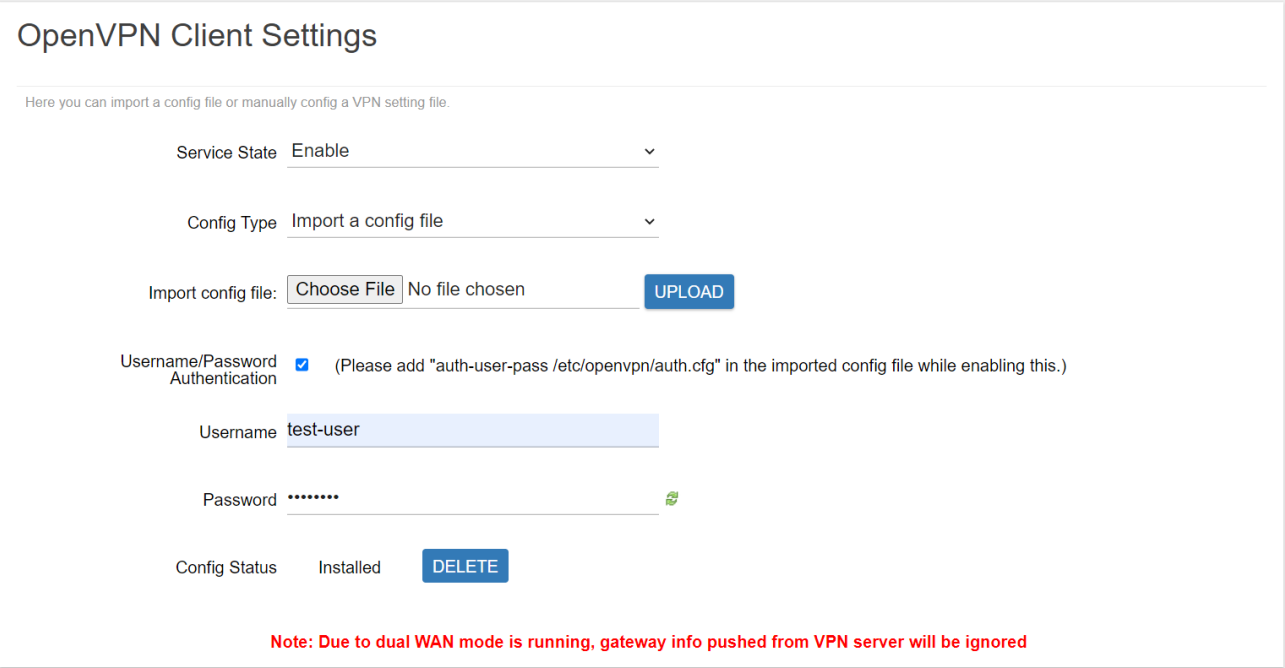

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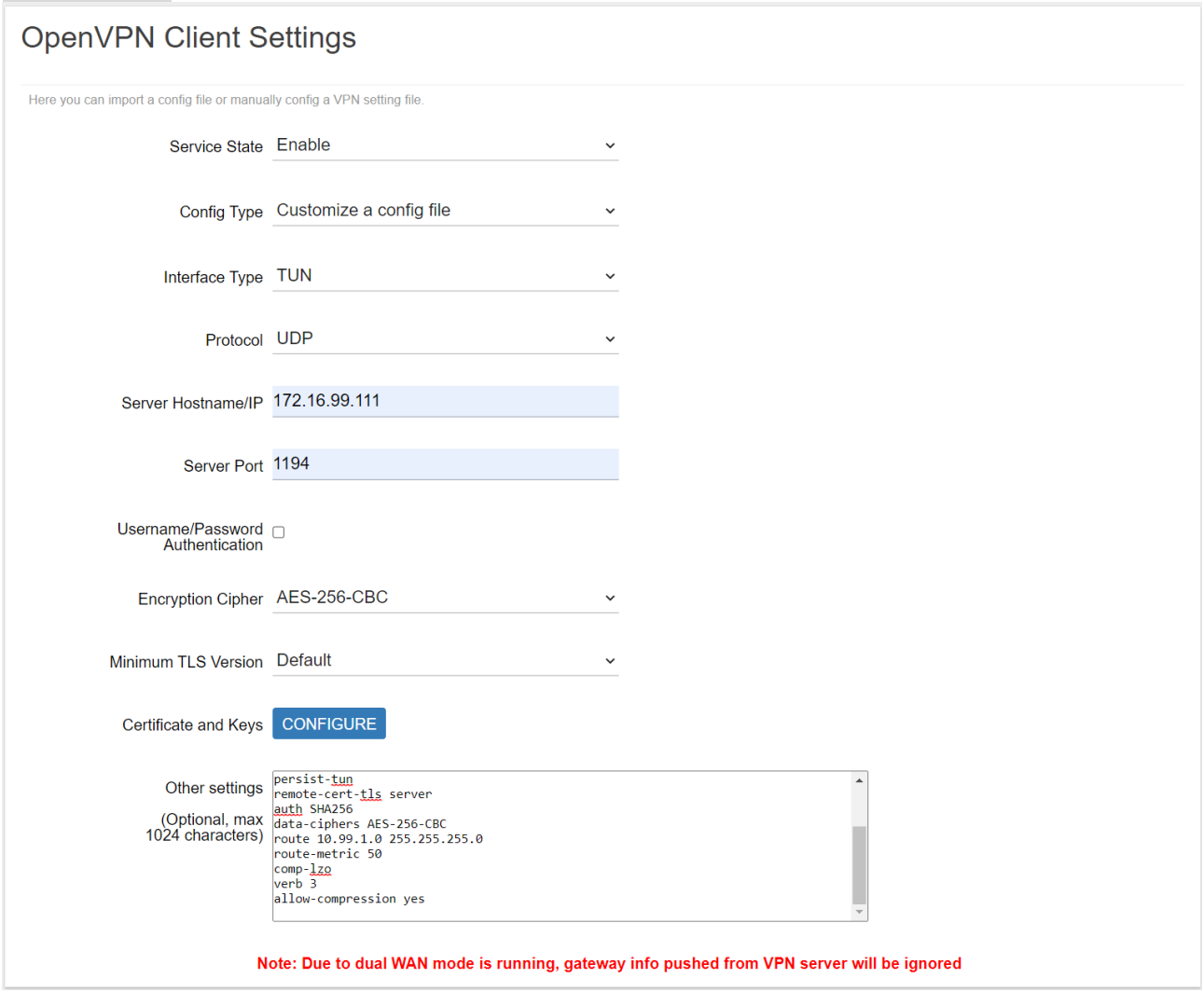
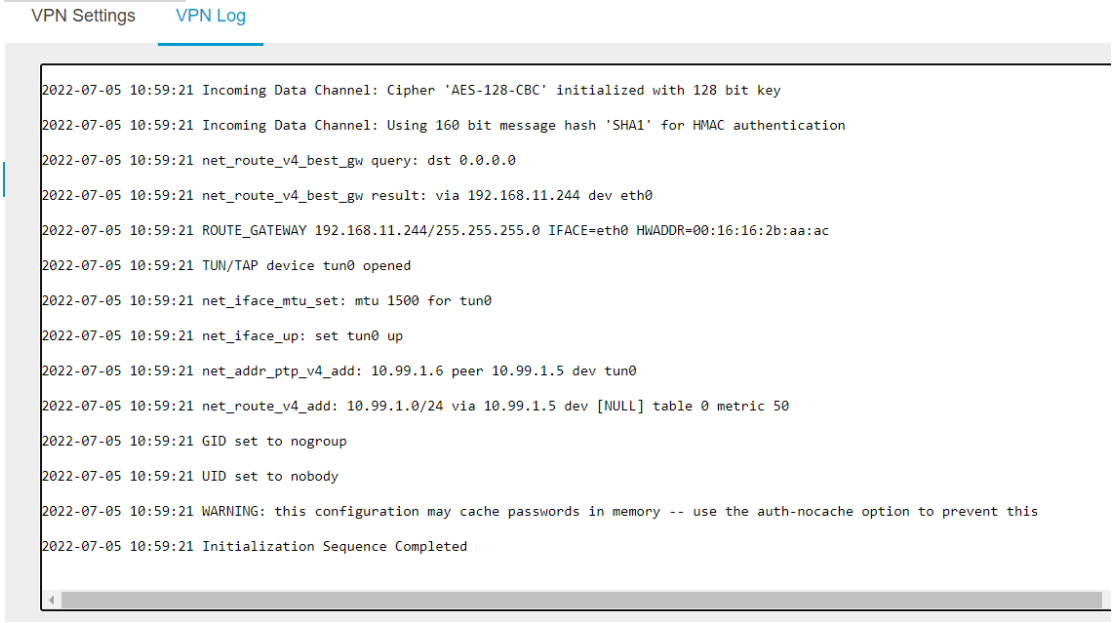
Figure 6.2.1-B Customize a config file



6.2.2 VPN Log

The VPN connection log will be shown on this page.

Figure 6.2.2-A VPN Log



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6.3 Diagnostics

Input a specific URL in the text field. Click the "*PING*" button to ping the URL specified

Figure 6.3-A Network Utilities