wanwave

Product Manual
Network Gateway
WNG-20M-GSM

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ABOUT THIS DOCUMENT

This manual contains instructions for installing and operating the WNG-20M-GSM network gateway (software version 8.4).

The manual is intended for personnel familiar with the rules for performing installation work in the field of electronic and electrical equipment.

wanwave LTD. reserves the right to make changes to this document related to improving equipment and software, as well as to eliminate document deficiencies.

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1. BASIC INFORMATION ABOUT THE DEVICE AND ITS PURPOSE

1.1 General information

Full name of the device:
Network gateway WNG-20M-GSM (software version 8.4).

Abbreviated name of the device:
WNG-20M-GSM

1.2 Purpose and operating principles of the device

The WNG-20M-GSM is a network gateway for the specialized LPWAN radio network developed by **wanwave**. It is designed to deliver reliable multi-channel radio reception throughout its entire coverage area within the license-free frequency band.

The gateway facilitates automated, configuration-free reception of messages from end-user devices via the unlicensed radio frequency range, transmitting them to the **wanwave** server using TCP/IP over standard GSM, UMTS, or LTE networks.

Out of the box, the WNG-20M-GSM requires no configuration, server pairing, or end-device pairing, and it operates without requiring regular maintenance. All gateway settings can be managed through the user's personal account on the **wanwave** portal.

The device features a robust, dust- and moisture-resistant, all-weather design, enabling direct installation on an antenna mast. It is suitable for deployment in both stationary and mobile environments.

1.3 Compliance with requirements and standards

The network gateway operates in any of the following unlicensed frequency ranges (the specific range will be set for you, in accordance with your territory's regulations, as part of the manufacturing process): 863.0-870.0 MHz, 920.0-925.0 MHz.

Due to the fact that the gateway is an LPWAN receiver and does not have the ability to transmit messages to LPWAN devices, registration of the gateway in the territorial regulatory bodies is not required.

1.4 Delivery set

A WNNG-20M-GSM installation kit is supplied with the following items:

- WNG-20M-GSM with pre-installed:
  - Internal GSM antenna;
  - Connecting cable for the external receiving antenna;

- Product passport.

- Depending on the delivery terms, the set may also include:
  - External 12V power supply;
  - External 12V power supply and protective circuit breaker in a plastic case;
  - External receiving pin antenna (license-free frequency range);
  - External receiving panel antenna (license-free frequency range).

1.5 Additional equipment

For operation of the network gateway, the following is additionally required:

- Receiving LPWAN antenna;
- 12V 10W power supply.

Considering that each specific case of using the network gateway may require different types of antenna and power supply, the following are available for order on the manufacturer's website:

- Power supplies:
  - 12V power supply for indoor use;
  - Power supply for outdoor mounting (housing, circuit breaker, 12V power supply).

- LPWAN receiving antennas:
  - 9dB rod antenna;
  - 11dB rod antenna, larger size;
  - LPWAN receiving panel antenna;
  - Directional (sectoral) antenna.

- Fastener kit for installing the network gateway on the LPWAN antenna mast.

2. OPERATING THE NETWORK GATEWAY

2.1 General appearance and arrangement of components

The network gateway is housed in a single robust enclosure with an IP68 protection rating. The enclosure features two sealed entries for connecting the power cable and the RF cable of the LPWAN receiving antenna. It also includes a waterproof ventilation valve to equalize internal and external air pressure. The following operational indicators are provided (refer to Fig. 1):

- Power
- LPWAN
- GSM

The gateway is maintenance-free during operation.
The standard delivery package includes the following pre-installed components:

- A coaxial cable for connecting the receiving antenna to an N-male connector
- A GSM antenna

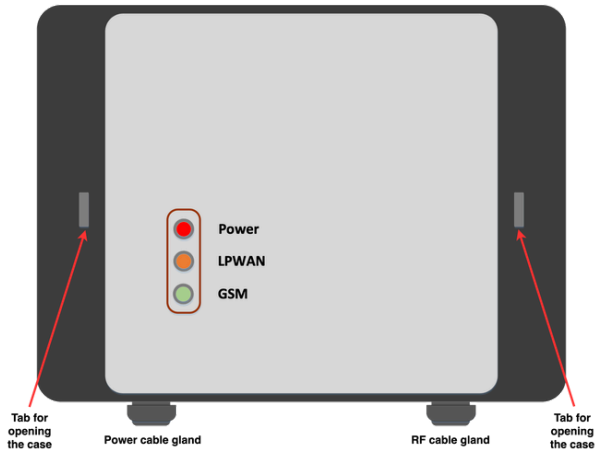

FIG. 1 FRONT PANEL OF THE GATEWAY

To activate the gateway, install the device and antenna, connect the power supply, and attach the receiving antenna. Guidelines for selecting an installation location and detailed installation instructions are provided in Section 3: Installation.

The gateway operates on a 12V DC power supply, with the connection block located at the bottom of the board (see Section 3.2.2: Power Supply of the Network Gateway for details).
Upon installation, the gateway is configured to receive messages within the license-free frequency range of your region and end-user devices are pre-configured to transmit within the corresponding frequency range. In specific locations, interference may necessitate adjustments to the receiver frequency. If this occurs, contact the support team for diagnostic assistance and guidance on modifying the receiving channel frequency.

2.2 SIM Card

Depending on the kit you purchased, the network gateway may be supplied with a pre-installed, prepaid SIM card. By default, the SIM card includes roaming capabilities for data transfer, enabling the gateway to operate in most regions worldwide. In certain cases or if your purchased kit does not include a SIM card, it may be necessary to install a SIM card from a local telecom operator.

When using the gateway in areas without access to public communication networks, replace the SIM card with one from an available operator. Keep the following requirements in mind when replacing the SIM card:

- The operator must support data transfer via EDGE or LTE.
- The SIM card must have an active data transfer service for one of the specified protocols.
- The SIM card's PIN code must be deactivated.

The network gateway typically transmits no more than 75 MB of data per month, though the exact amount may vary based on the pricing policies of individual telecom operators.

In regions requiring additional terminal registration with the mobile network, follow the instructions provided by the local telecom operator.

2.3 Managing the Network Gateway

All network gateways registered to the user are displayed in the personal account of the network server. For users of the **wanwave** cloud server, the personal account can be accessed at https://my.wanwave.com.

To view the list of network gateways, navigate to the "Gateways" menu. This page includes:

- A list of gateways
- A map
- A section displaying downtime information

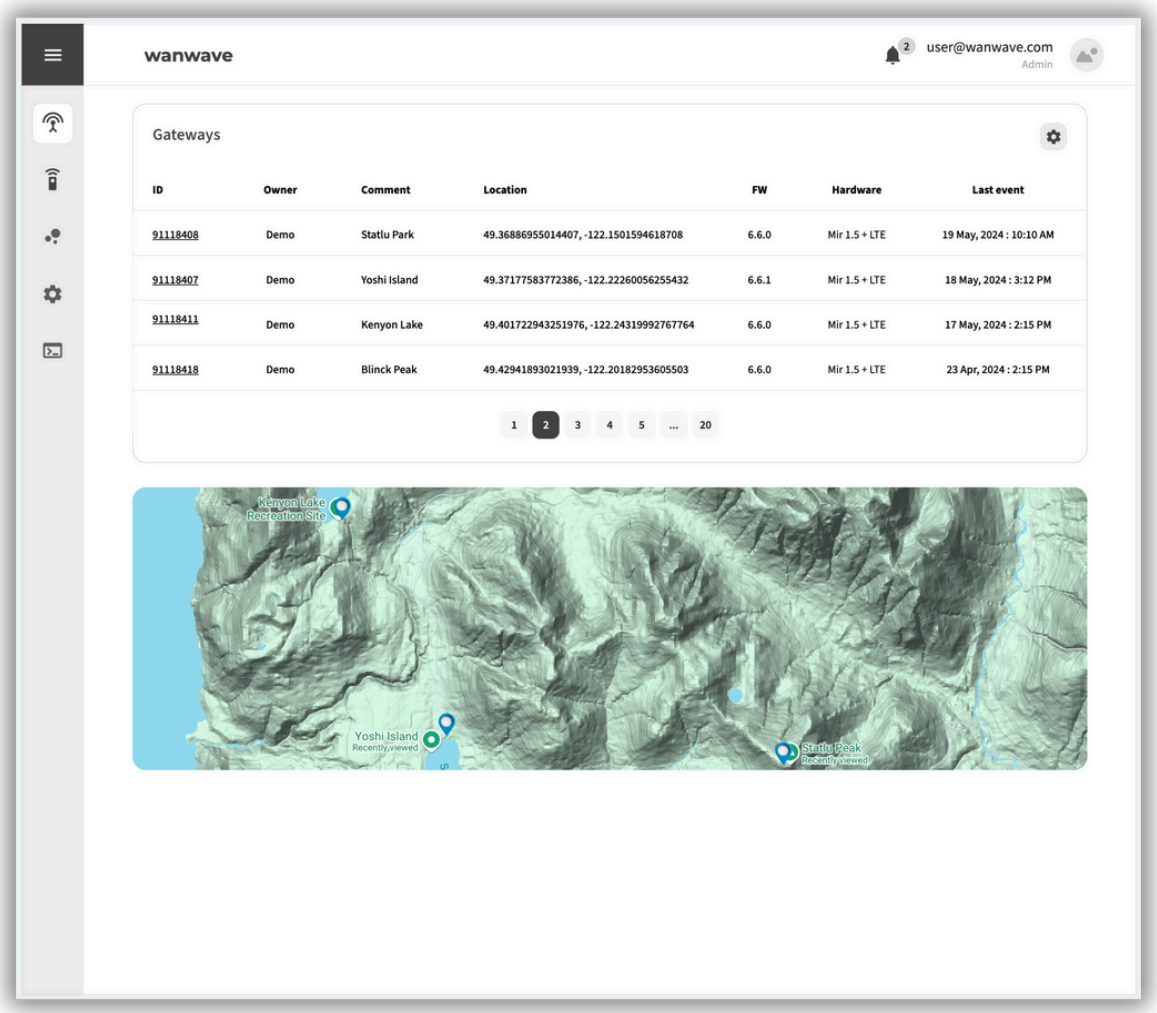

FIG. 2 LOCATION OF USER GATEWAYS ON THE MAP

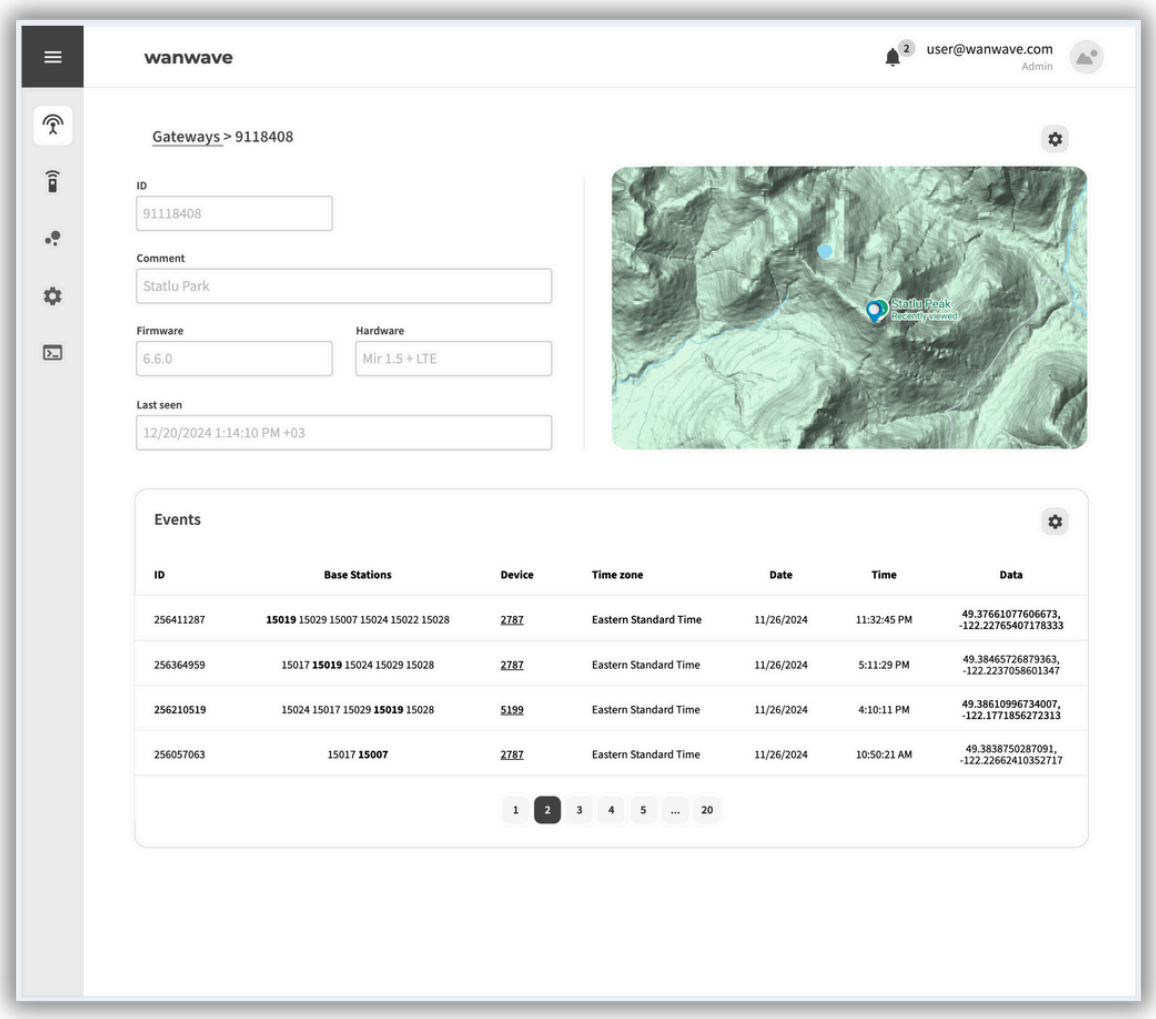

FIG. 3 NETWORK GATEWAY PROFILE PAGE

You can locate a specific gateway using the "SEARCH" field or by scrolling through the list. Searches can be performed by:

- Gateway number
- Owner name
- The "comment" field associated with the gateway

The map page displays all gateways assigned to the user, based on the coordinates specified in the gateway settings. Each gateway's profile page provides:

- General information about the gateway
- Its location on the map
- Details of the last received messages

It is important to differentiate between information about the last received messages and data from control messages. Control messages sent by the network gateway include details such as:

- The current time on the gateway
- Message reception quality
- Average noise levels
- In some cases, the gateway's coordinates

Keep in mind that sensors may transmit each message multiple times. As a result, the list may include all messages with varying reception levels but approximately the same timestamp.

Your **wanwave** cloud account provides access to device management, gateway management and much more. For more information please consult the **wanwave** cloud platform manual.

3. INSTALLATION

3.1 Choosing a Placement Location

3.1.1 Placement of the LPWAN receiving antenna

Proper placement of the network gateway and its antenna is crucial for ensuring optimal signal reception from sensors.

Key Placement Factors
The primary factor influencing reception range is the height of the antenna. A higher antenna improves sensor signal reception and expands the gateway's coverage area. Ideally:

- The antenna should be positioned 1.5–2 times higher than the surrounding structures.
- If this condition cannot be met, place the antenna on the roof of the tallest building in the area.

Placement Considerations
Avoid installing the antenna on dual-purpose supports, such as those commonly used for cellular equipment. These locations are typically inefficient for signal coverage. For example:

- In dense urban areas, an antenna on dual-purpose supports at ~30 m height might only receive signals from sensors up to 2 km away.
- By contrast, a base station on a residential building ~50 m high can extend reception to up to 5 km, increasing coverage over sixfold.

Placement Guidelines
Follow these principles to optimize antenna placement:

- Install the antenna on the roof of the tallest building in the area.
- Use a mast with a height of at least 2 meters.
- Ensure the top of the antenna is at least 3 meters above nearby objects (e.g., walls, ledges, fences, or other equipment).
- Avoid placing the antenna near other antennas, parapets, or structures.
- Keep the antenna as far as possible from power lines, large metal objects, and reinforced concrete walls.

For specific antenna types:

- **Pin Antennas**: Mount strictly vertically in the designated fastening location.
- **Panel Antennas**: Install on a wall or roof edge, ensuring the front panel faces the area where end devices are located.

Coverage Estimation

The area of stable reception roughly corresponds to the visible area from the antenna's installation site. However, consider the pin antenna's directional pattern:

- Horizontal Plane: Provides circular coverage.
- Vertical Plane: Coverage may diminish directly beneath the antenna, resulting in better signal quality at a distance.

3.1.2 Location of the network gateway

When selecting a location for installing the network gateway, avoid areas prone to precipitation accumulation. The ideal installation site for the gateway is a dry, ventilated room. However, installation at the antenna mounting point is also permissible if the following conditions are met:

- **Positioning**: The gateway must be installed above the snow cover level.
- **Cable Tension**: The antenna coaxial cable and power supply wires must not be under tension.
- **UV Protection**: All cables must be securely protected from ultraviolet radiation. Electrical tape is not suitable for UV protection.
- **Ice Damage Prevention**: Take precautions to prevent the antenna coaxial cable and power supply wires from breaking due to icing.

FIG. 4 EXAMPLE OF CORRECT ANTENNA MOUNTING

FIG. 5 EXAMPLE OF CORRECT ANTENNA MOUNTING

3.2 Preparing the network gateway

3.2.1 Replacing the SIM card

To replace the SIM card in the network gateway, follow these steps:

1. Insert a flat-head screwdriver into the slot (shown by the arrow in Fig. 6) on the top cover of the gateway and move the side cover to the side;
2. Carefully lift the front panel of the gateway without damaging the connecting cable;
3. Slide the SIM card tray cover to the side, lift it, replace the card, and close the tray;
4. Close the front panel and snap the side cover into place.

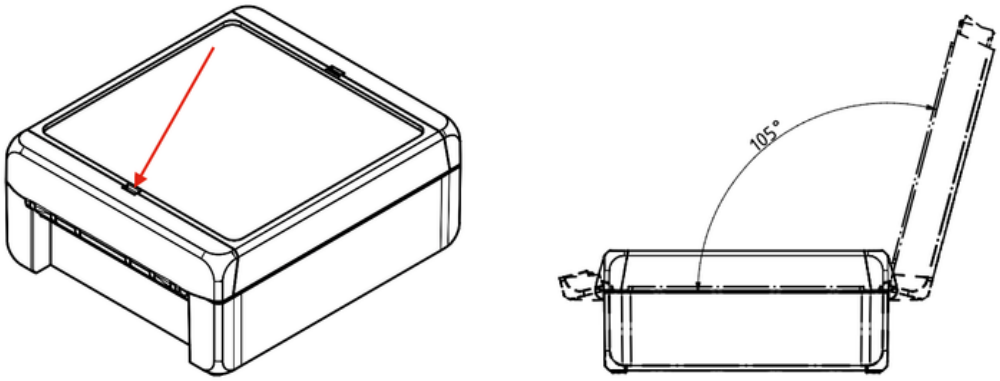

FIG. 6 OPENING THE NETWORK GATEWAY CASE

WARNING: The SIM card must be installed at a temperature not lower than room temperature. If the device was in low temperatures, then before installing the SIM card, the device must first be kept at room temperature for 2 hours.

3.2.2 Power Supply of the Network Gateway

The network gateway is powered by an external 12V power supply unit with a minimum output of 15W.

Power Supply Options

1. Internal Power Supply Unit (Manufacturer-Provided):
   - The gateway case includes a power supply connector.
   - Simply connect the power supply unit to the provided connector.
2. External Power Supply Unit or Other Power Sources:
   - Connect the power supply cable to the power connector located on the gateway board.
   - Refer to Fig. 7 for the connection diagram when using an external power supply unit from the manufacturer.

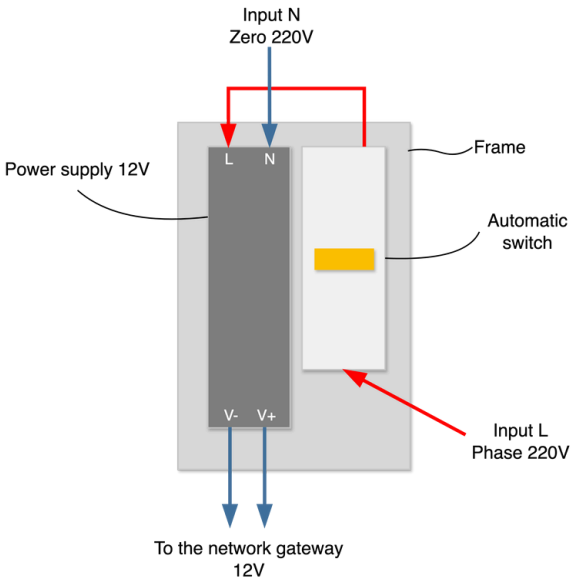

FIG. 7. POWER SUPPLY CONNECTION DIAGRAM

Connection Guidelines

- Route the power supply cable through the cable gland located opposite the terminal block at the bottom of the case.
- Connect the cable to the terminal block as follows:
  - "+" terminal on the upper terminal
  - "–" terminal on the gateway board

Distance and Cable Specifications

- The gateway can be installed up to 50 meters from the power supply unit.
- Use low-current 2-core cables with a minimum cross-section of 0.5 mm^2.

Outdoor Installations

When installing the gateway outdoors:

- Ensure all ports on the case are securely sealed to prevent water or dust ingress.

3.2.3 Connecting the Antenna

The network gateway includes a 1-meter cable for antenna connection. If the gateway cannot be installed near the antenna, a longer cable may be used, but note that increasing the cable length will reduce the radio coverage area. It is not advisable to use an antenna cable longer than 4 meters.

To replace the antenna cable:

1. Insert a flat-head screwdriver into the slot indicated by the arrow in Fig. 6 and slide the side panel aside.
2. Gently lift the front panel of the gateway, taking care not to damage the connecting cables.
3. Unscrew the existing cable at its connection point on the network gateway board.
4. Loosen the port where the cable enters the gateway and carefully remove the cable.
5. Insert the new cable, assemble the port with the gaskets correctly, and securely tighten it.
6. Replace the front panel and snap the side panel back into position.

Ensure all components are securely fastened to maintain optimal performance.

3.3 Installing a network gateway

Pre-Installation Check and Installation Procedure

Pre-Installation Check
Before heading to the installation site, verify the functionality of the gateway, antenna, and their connections:

1. Connect the antenna to the gateway and power it on.
2. Use a **wanwave** sensor near the antenna to test signal reception.
   - The reception level should be at least 110, as shown in the **wanwave** portal personal account.
3. If the reception level is lower:
   - Check the integrity of the antenna and its connections.
   - Inspect the antenna cable and retest.

Installation Steps
Perform the installation in the following sequence:

1. Install the antenna.
2. Install the gateway.
3. Connect the antenna to the gateway.
4. Connect the power supply to the gateway.
5. Plug the power supply into the network.
6. Test functionality to ensure proper operation.

WARNING: Do not connect the network gateway to the power supply without the receiving antenna connected. This may cause the gateway to fail and is not covered by the warranty.

Antenna and Gateway Installation
The antenna must be attached securely to the designated lower mounting section. Ensure the following:

- The antenna is firmly fixed to withstand wind loads and vibrations.
- The gateway is securely mounted in accordance with the guidelines provided in Section 3.1.2: Location of the Network Gateway.

3.4 Functionality Check

Once the wiring and power supply are connected, verify the proper operation of the network gateway by following these steps:

1. **Confirm Startup**: Ensure the gateway powers on and completes its startup sequence.
2. **Log in to the Personal Account**: Access the user's personal account on the **wanwave** portal to perform the following checks:
   - Verify that the gateway has sent a control message.
   - Ensure the noise level is below 30.
   - Confirm that the gateway is receiving messages from **wanwave** sensors and that these messages are visible in the personal account.
   - Check that the reception level from a sensor located near the antenna is not lower than 110.

3.5 Configuring System Parameters

The network gateway allows configuration of the following parameters:

- **Network server address and port:**
  - Supplied preconfigured for the **wanwave** cloud server. This parameter should only be changed when using a local server. Addresses can be specified in either IP or URI format.
- **NTP server addresses:**
  - Can also be specified in IP or URI format.
- **Central frequency of the receiving range:**
  - Configured based on the end user's country regulations. Changes to this parameter require spectrum analysis, and the transmission frequency on sensors must also be updated.

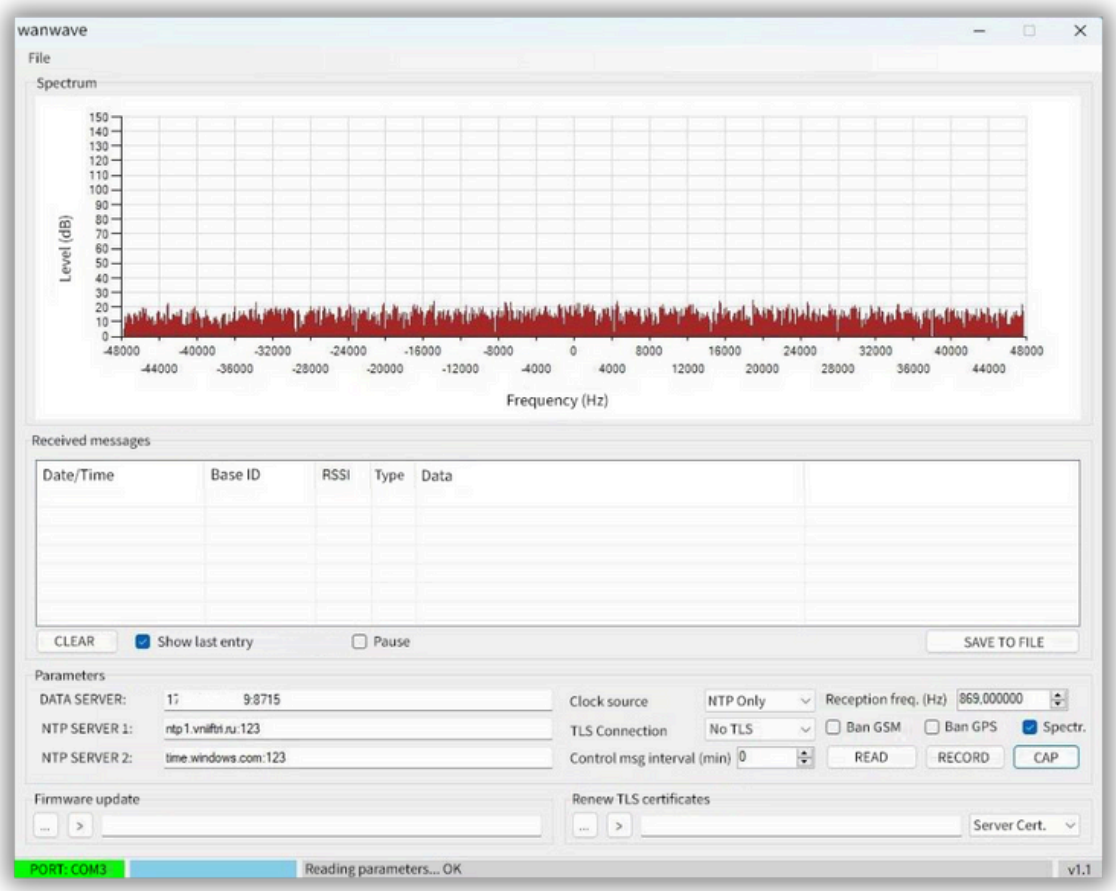

FIG. 8 GENERAL VIEW OF THE NETWORK GATEWAY CONFIGURATION PROGRAM

Steps for Configuring Parameters

- **Open the Network Gateway:**
  - Carefully remove the cover.
- **Connect via USB:**
  - Attach a USB cable to the gateway configuration port and a Windows computer.
  - Turn on the gateway.
- **Install Necessary Drivers:**
  - If needed, download and install USB drivers from Silicon Labs (https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads).
- **Run the Configurator Program:**
  - Ensure the USB connection is established (check status messages in the configurator application).
  - Click the READ button to load current settings.
- **Make Changes:**
  - Modify parameters as required in the configurator program.
  - Click the WRITE button to save changes.
  - Confirm successful saving via status messages in the application.
- **Disconnect and Close:**
  - Remove the USB cable from the gateway.
  - Carefully replace the cover, ensuring internal cables are not pinched.

These steps ensure proper configuration and maintain the gateway's optimal performance.

4. DIAGNOSTICS AND TROUBLESHOOTING

4.1 Diagnostics via the **wanwave** portal

To assess the operability of the network gateway, follow these steps:

1. **Access the Personal Account:**
   a. Log in to the user's personal account on the **wanwave** portal to check the status and functionality of the gateway.
2. **Evaluate Control Messages:**
   - Primary Check: Review the control messages to assess the gateway's operability.
   - Secondary Check: Evaluate the data received from sensors. Note that there may be no sensors in the radio coverage area, or sensors may not send messages at the time of the check.
3. **Interference Detection:**
   - A high noise level (above 20) in control messages indicates interference at the gateway's location, which reduces signal reception quality.
   - Solution: Adjust the position of the gateway or relocate the receiving antenna.
4. **Transmission Issues:**
   - A high lag in control messages (more than 3–5 seconds) suggests poor cellular network quality, caused by low bandwidth or unstable data transmission.
   - Solution: Change the telecom operator, move the gateway to a location with better coverage, or install a more efficient GSM antenna.
5. **Review Statistics and Downtime:**
   - Statistics Tab: View a graph of the number of messages received by the gateway over the past 7 days. This helps evaluate changes in:
     - The number of sensors in the coverage area.
     - Message reception quality after relocating the gateway or antenna.
   - Downtime Tab: Check for periods longer than 20 minutes when no sensor messages were received.

By systematically addressing these factors, the performance and efficiency of the network gateway can be optimized.

4.2 Indication of Network Gateway States

The front panel has LEDs for status monitoring:

- Power
- LPWAN
- GSM

The following table describes the network gateway status indicated by each of the LEDs:

LED	OFF	FLASHING	ON
POWER	-	Self-test completed with errors	The gateway is operating normally.
LPWAN	-	Receiving data from LPWAN sensors	-
GSM	GSM/LTE network not found	No connection to the server or the SIM card is not registered in the network	Connection to the server established

FIG. 9 GENERAL VIEW OF THE NETWORK GATEWAY

4.3 Radio Environment Analysis

To perform a detailed analysis of the radio interference environment at the gateway's location, follow these steps using the configurator program:

Steps for Radio Environment Analysis:

1. Prepare the Network Gateway:
   - Open the gateway case.
   - Connect a USB cable to the configuration port on the gateway and a Windows computer.
   - Turn on the gateway.
2. Install USB Drivers (if necessary):
   - Download and install USB drivers from Silicon Labs (https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads).
3. Run the Configurator Program:
   - Launch the configurator program on your computer.
4. Access the Spectrum Analyzer:
   - In the configurator, click the "SPECTRUM" button.
   - The spectrum display for the frequency range configured in the gateway will appear at the top of the program interface.

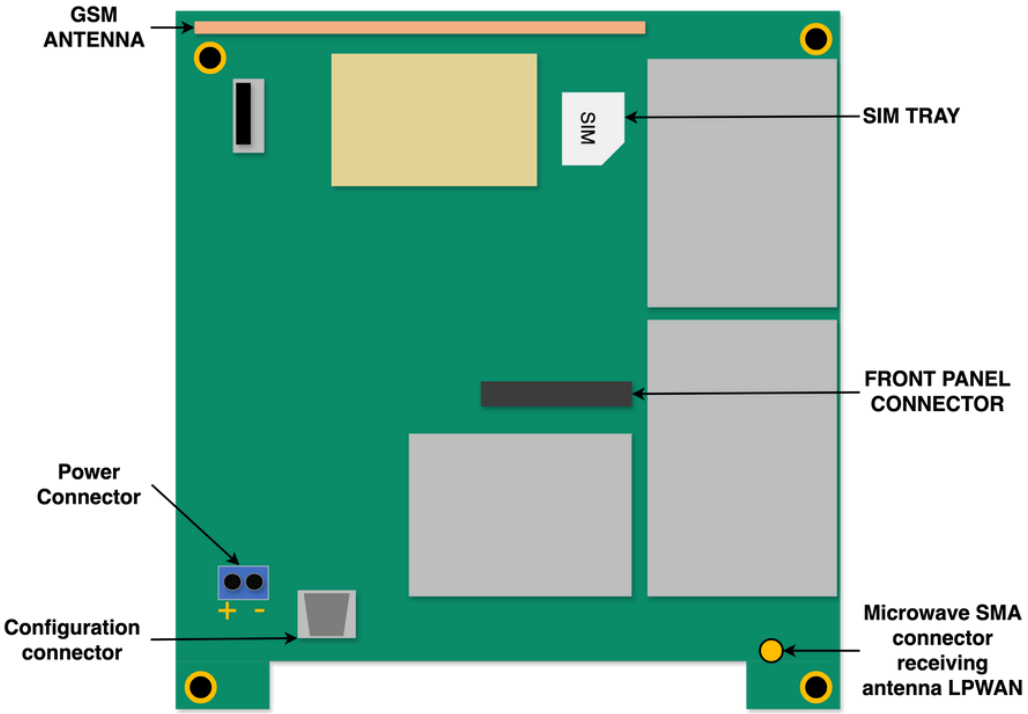

FIG. 10 LOCATION OF THE MAIN COMPONENTS ON THE MAIN BOARD

Interpreting the Spectrum Analysis Results:

- Normal Radio Environment:
  - Low noise level with no significant interference in the gateway's operating frequency range (see Fig. 11).
  - The horizon level in the spectrum analyzer should not exceed 20 units.
- Abnormal Radio Environment:
  - Elevated noise levels or visible interference spikes indicate potential disruptions.

Using this analysis, adjustments can be made to optimize the gateway's positioning or frequency settings, ensuring stable and reliable performance.

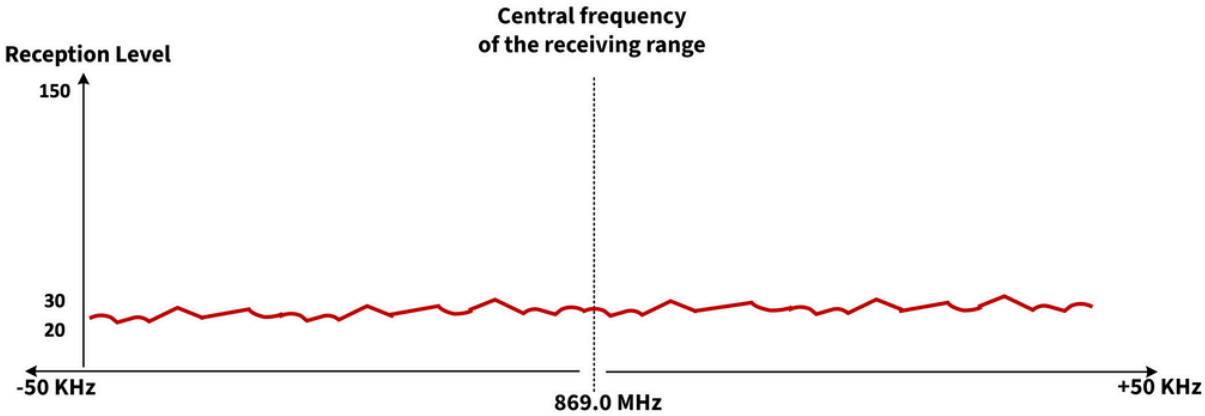

FIG. 11. APPROXIMATE VIEW OF A NORMAL RADIO ENVIRONMENT

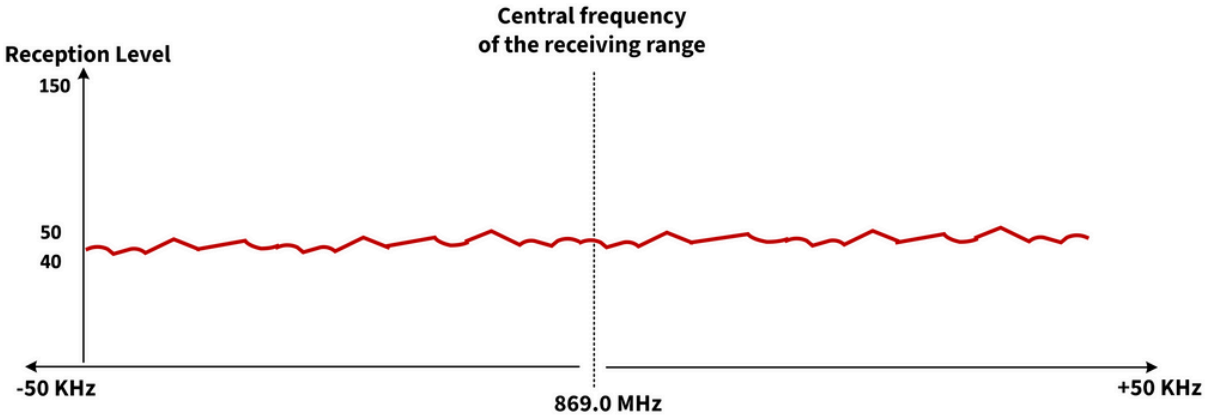

FIG. 12 APPROXIMATE SPECTRUM VIEW WITH HIGH NOISE LEVEL

Messages from **wanwave** sensors will appear as thin "bars". The taller the bar, the higher the reception level (the closer the sensor is to the antenna).

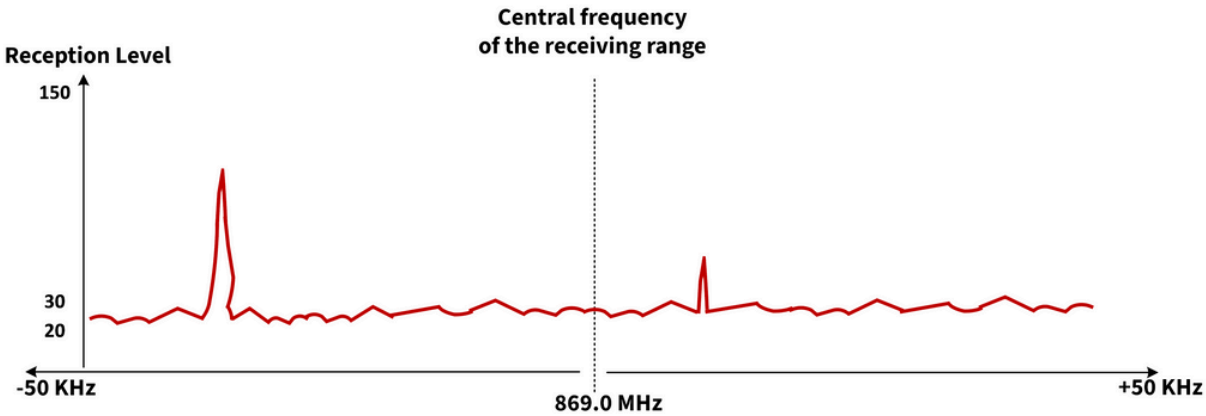

FIG. 13 APPROXIMATE VIEW OF WANWAVE MESSAGES ON THE SPECTRUM

Interference on a spectrum analyzer will appear as a temporary "lift" in part of the spectrum or as bars of medium or large width.

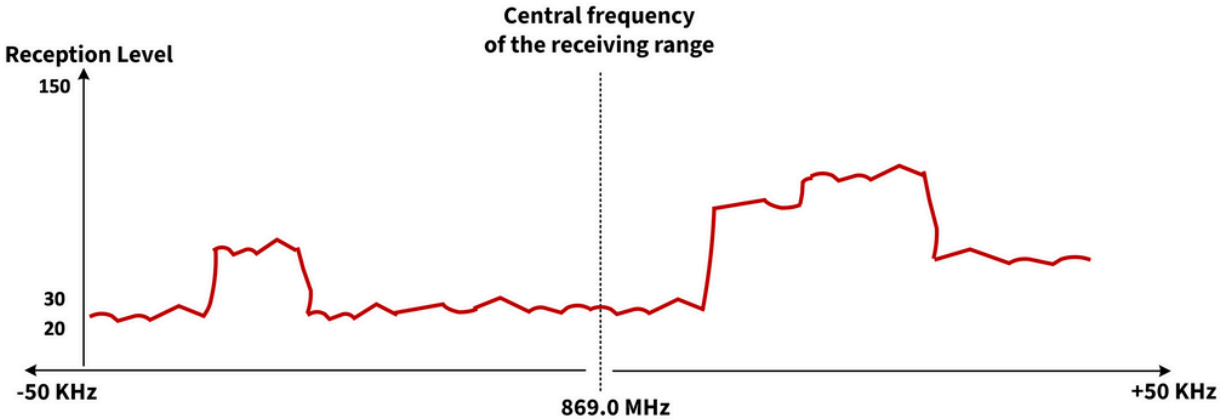

FIG. 14. APPROXIMATE VIEW OF THE SPECTRUM WITH INTERFERENCE

If the gateway installation location has a high noise level and there is pulse (temporary) interference, then it is necessary to change the installation location of the antenna and gateway or the type of antenna. If the range is "occupied" by other radio systems, then it is necessary to change the frequency of the gateway and sensors. Changing the frequency of the sensors is possible for models with BLE control.

4.4 Technical Support

For technical assistance, contact the **wanwave** support team at support@wanwave.com. Note that support will be provided based on the SLA terms provided at the time of purchase of the equipment.

To ensure a faster and more effective response, please include the following details in your inquiry:

- **Organization Name**: Provide the name of your organization and the contact information for the person requesting support.
- **Issue Description**: Clearly describe the nature of the issue and the time it occurred.
- **Device Information**: Include the device number.
- **Visual Documentation**: Attach relevant screenshots or photographs that illustrate the problem, if applicable.

Providing this information will help expedite the resolution process.

5 TECHNICAL SPECIFICATIONS

5.1 Manufacturer Information

Manufacturer
wanwave LTD.

Physical address
12 Woodlands Park, Bridgend, CF33 6DY, UK

Mailing address
12 Woodlands Park, Bridgend, CF33 6DY, UK

Contact information
info@wanwave.com

Technical support
support@wanwave.com

5.2 Main parameters and characteristics

The WNG-20M-GSM network gateway has the following parameters and characteristics:

#	PARAMETER	UNIT	VALUE
1	Operating temperature range	°C	From -40 to +80
2	Protection against external influences (in accordance with IEC 60529:2013	Class	IP68
3	Power supply	Type	External
4	Nominal supply voltage	V	12
5	Power consumption (no more than)	W	15
6	Receiving antenna	Type	External
7	External antenna connector	Type	N-Male
8	Frequency range for receiving messages from end devices	MHz	863.0 - 870.0 920.0 - 925.0
9	Processed frequency band for receiving messages from end devices	KHz	100
10	Sensitivity	dBm	-144
11	Adjacent Channel Selectivity	dB	75
12	Selectivity for blocking interference	dB	120
13	Intermodulation selectivity	dB	80
14	Dynamic range	dB	120

#	PARAMETER	UNIT	VALUE
15	Error-correcting coding	Type	convolutional coding, Halley code
16	Lightning protection	Type	Built-in
17	SIM card format	-	3FF
18	GSM transmitter transmitting antenna	Type	Internal
19	GSM transmitter output power	W	1
20	Weight	g	450
21	Measurements	mm	150x130x60

THANK YOU

CONTACT

WANWAVE **Ltd.**
12 Woodlands Park
Bridgend
CF33 6DY, UK

www.wanwave.com
info@wanwave.com