WISENMESHNET® L-Series Smart Gateway (C-Type) User Manual

Model Name: 6005

Wuxi Wisen Innovation Co., Ltd.

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Revision History and Clarification

Rev.	Issue Date	Revisions	Written By	Revised By
V1.0	01/11/2019	1st Issue	Xiaoyan Huang	Dr. Yan Wu

Document Definition:

It defines the specifications (i.e., introduction, technical features, deployment and maintenance methods) of the WISENMESHNET® Smart Gateway, which is one of the key components in WISENMESHNET® Low Power, Intelligent, Wireless Sensor Network (WSN) Monitoring system. It is responsible to:

- Form a time-synchronized WSN with all the nodes in the system;
- Receive the data packets from all the nodes including sensor nodes and interface nodes;
- Issue network command in order to optimise the network reliability, such as sampling interval, frequency hop, relay period, RSSI threshold modifications, etc.;
- Forward data and system information to a server via public wireless network or local cabled network connections.

Scope:

Customer Site Project Managers and Engineers, Wisen Service Engineers, etc.

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1. Product Introduction

The WISENMESHNET® Gateway is one of the key products in our patented WISENMESHNET® geotechnical safety monitoring system. Working together with the WISENMESHNET® Node products, it intelligently collects, converts and delivers the real-time information on the deformation of a structure to a remote server via its embedded 2G/3G/4G module. The WISENMESHNET® Gateway is powered with:

A. Qty. x 4 (3.6V D-Cell ER34615, 2Amp Output) as primary power supply;

B. 7V - 32VDC (Min. Current >= 2Amp).

This product operates using our core technology, i.e., WISENMESHNET® Low Power, Intelligent, Wireless Sensor Network protocol. This product satisfies the three fundamental identities of the system:

A. Network Life Span: to maximise battery life across the mesh network as a whole;

B. Network Data Arrival Rate: to minimise data packet loss;

C. Single Node Environmental Coverage: to maximise radio coverage.

Our product has IP66 and is designed to work in a tough environment. It is small in size, reliable in performance, easy for maintenance, and has strong immunity to radio-interference.

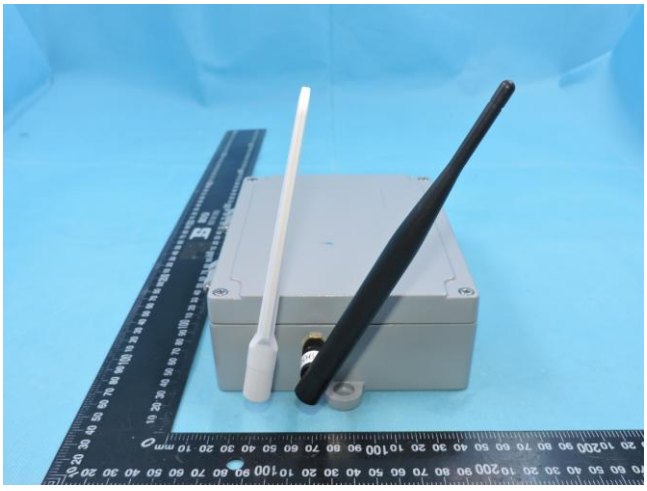

Figure 1. Gateway Overview in Photos.

2. System Structure Layout

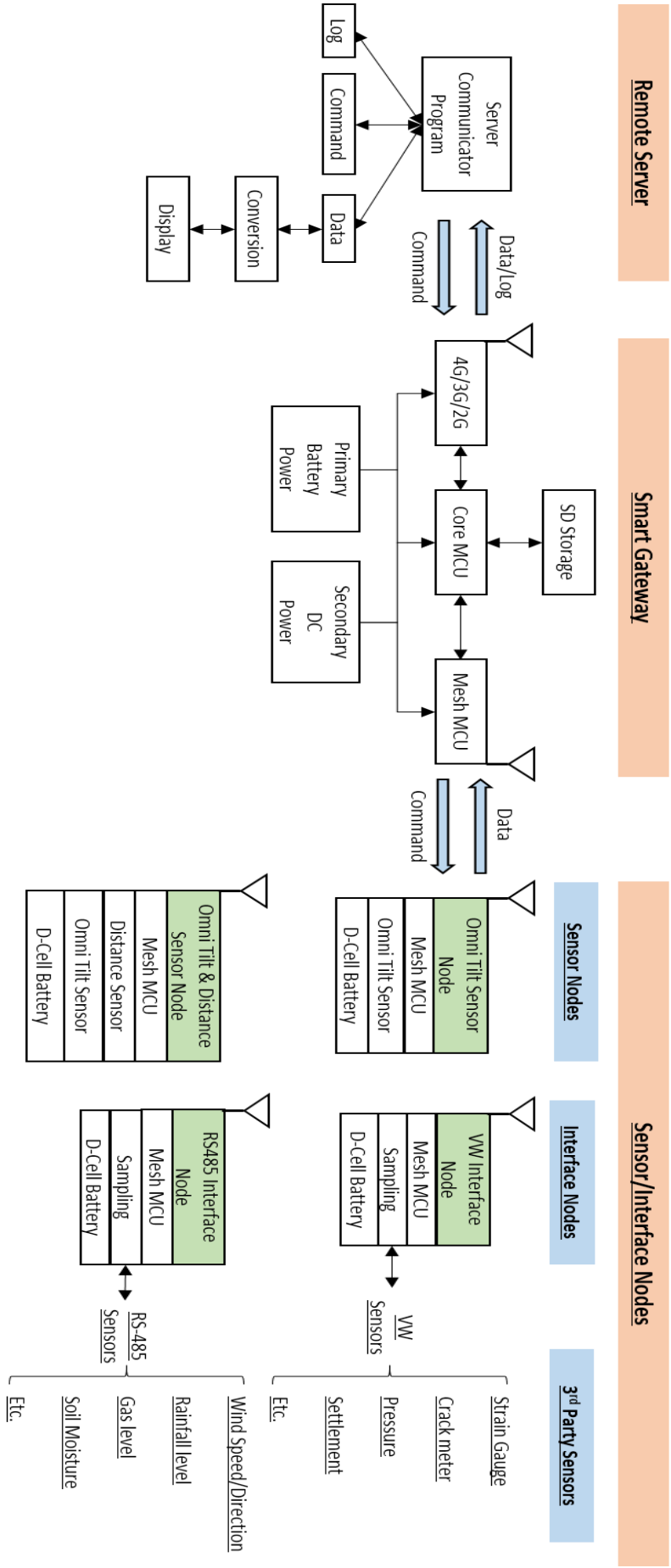

Figure 2. System Structure Layout.

3. Gateway & Radio Features

Node Features:

Basics	
Primary Battery Power (Internal)	Qty. x 4 (3.6V Lithium primary D-Cell ER34615)
Battery Connection	Standard Aluminium Battery Holder
Secondary DC Power (External)	7V - 32VDC (Max. Current >= 2Amp, e.g. 110-240VAC to 12VDC adaptor)
Tertiary Power (External)	3.6VDC Battery Unit or Solar Unit
Mobile Network Stop Voltage	>= 2.30VDC
Local Storage	8GB (Min. 1.5 Yrs Storage)
L x W x H	180 x 140 x 60mm
Weight	<= 2.0kg
Cable Gland	Qty. 1 x EMC-CMA12 for external RS232 connection Qty. 1 x EMC-CMA14 for external DC input power connection
Wire Connection	DC In - Spring type wiring terminal
External Interface	
Wireless Module	Compatible with 2G/3G/4G of Micro SIM card
Wired Port	RS232
WSN Interface	
WSN Protocol	WISENMESHNET® Protocol
Low Power Mode	T>=5min and Server Connection Ratio DTU_T = [1,99]T
Standard System Parameter	
Temperature	Measurement Range: -40 to 85°C; Accuracy: +/-1°C, typical 0.5°C; Resolution: 0.1°C
Voltage	Accuracy: +/-0.1V
Re-Calibration Method	
Inspection Period	Every 3 Years by Manufacturer (or inspected by arranged methods)
Industrial Standard	
Casing and Painting Materials	Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)
IP Rating	>= IP66
Operating Temperature	-40 to 85°C

Radio Features:

	FCC 915MHz System	
Radio Band	902-928MHz	
Central Frequency (**Default**)	**905**/910/915/920/925MHz	
Default Transmit Power	15dBm	
Receive Sensitivity	-112dBm	
Bandwidth	500kHz	
Transmission Speed	19.2kb/s	
No. of Mesh Hop* Supported	6 Hops	
Sampling Interval	1-60mins	
Antenna Description	Mesh Antenna	Omni-directional (20cm in length) or Customised
	2/3/4G-Antenna	Omni-directional 3.5dBi (20cm in length) or Customised
	Antenna Connector	SMA (M)

* E.g., the radio link from a gateway to the 1st layer node is called the 1st hop.

4. Gateway Terminologies

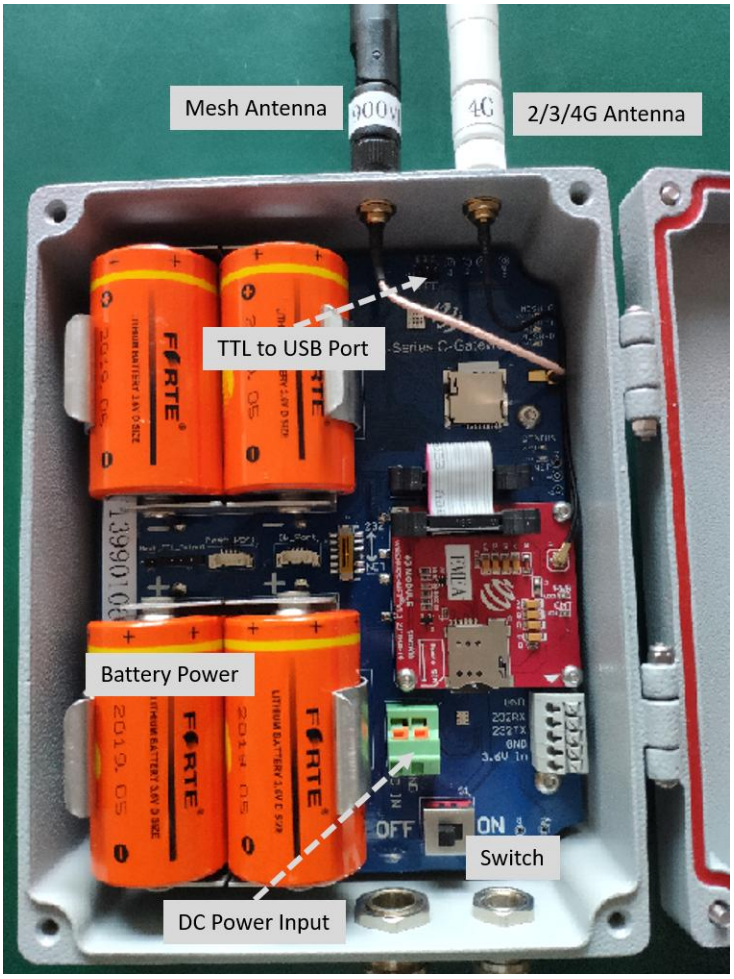

Figure 3. Gateway Internal Configuration Terminologies.

5. Operation Procedures

5.1. Gateway Location Choices

Location: There are two fundamental considerations that are used by Wisen to identify available location for a Gateway:

1) Firstly, the mesh coverage is the primary factor to be considered. It is vital to arrange the wireless mesh topology so that all the nodes in the system are connected. The recommended location of a Gateway is in the centre of the network;
2) Secondly, 2G/3G/4G coverage in the site must be available to ensure communication between a gateway and

a remote server. The simplest way to check the signal availability on site will be to use a mobile phone having the same service operator as that of the Gateway;

Once the location is chosen, you are ready to deploy your WISENMESHNET® system.

5.2. Deployment Procedures

1) Open the packaging box: Take the Gateway out of the package, open its lid;
2) 2G/3G/4G modems selections: Gateway has various choices of 2G/3G/4G modems. As each of the modems can only work in certain regions due to the large diversity of mobile network modulations. Please do talk with us to confirm the modem availability in your area.
3) SIM Card Installation: To insert/replace the SIM card, you MUST Turn off the power!
   A. As shown in the figure below, insert a sim card, and make sure it is right way around (i.e., the sim chip is pointing downward and the cut-corner bit is pointing outward to the card slot);
   B. Push the SIM card all the way into the holder until you hear a click.

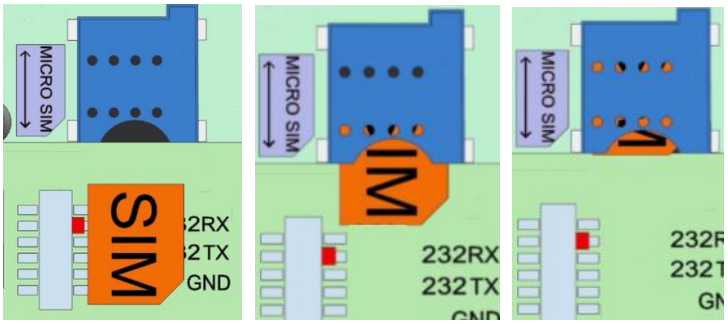

Figure 4. SIM Card Insertion.

4) Antenna Installation: screw the antennas firmly onto the Gateway.

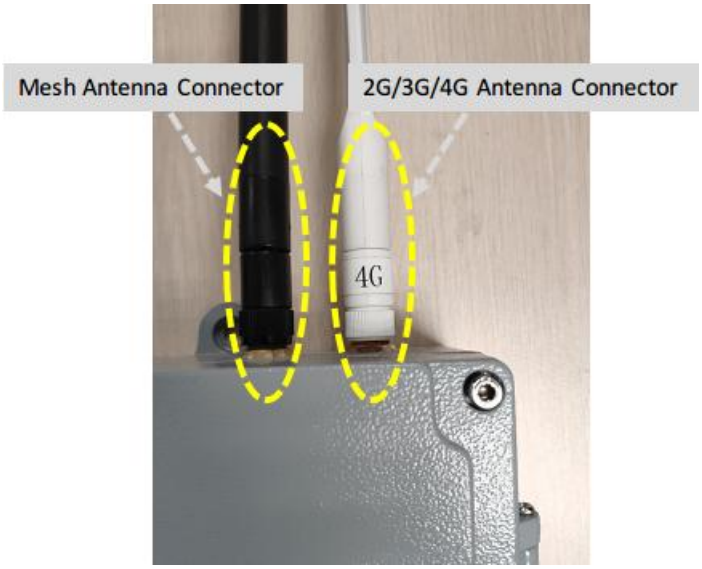

Figure 5. Mesh Antenna (left) and 2G/3G/4G Antenna (right).

5) Power on: by default, the internal battery power is in place. However, when a DC power is applied, use a Multi-meter to check if it fits to the one stated in the Feature table (i.e., 7-32VDC at minimum 2A). Please follow

the figure below to make the DC power connections to “DC_IN” and “GND” terminal plugs.

Warning: incorrect power connection will cause serious damage.

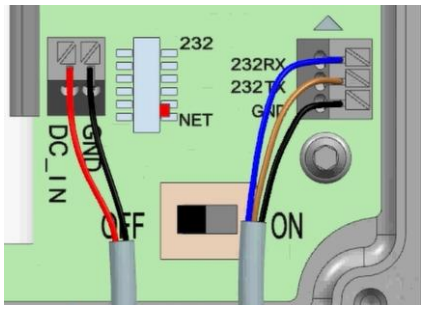

Figure 6. DC Cable & RS232 Connections.

LED flashing sequence: You should see three Mesh LEDs flashing 3 times, then green LED on for 1s, then a quick flash on the 3 LEDs, then Off. If not, power off the gateway, and leave it fully discharged for 180s before the next powering-on.

6) Gateway should have its antennas point upwards.

7) 2G/3G/4G Signal Check: Providing the local 2G/3G/4G signal is good for connection and the correct APN setting of the corresponding SIM mobile service operator is configured in the gateway, it takes about 30-40s to connect to a server. Once the gateway is connected to the server, the “NET” LED will be on.

8) Tighten the 4 Cap-Hex-Head screws on Gateway lid.

9) To validate the gateway data, please visit WISENMESHNET® Visualisation Platform for further details.

5.3. Mounting Options

Gateway can be deployed with various methods. However, the priciple is to make sure it is firmly attached to the installation surface.

Notice:

1) When the deployment is complete, please ensure that power is turned on and the cable glands are tightened. Any unused gland should be sealed properly to maintain the IP rating of the box;

2) Ensure that data is seen from the remote server.

6. General Maintenance and Notification

1) Once the WISENMESHNET® Smart Gateway is installed and working, please do not interfere with it unless it is absolutely necessary;

2) The Gateway relies on radio signals to communicate with the nodes. It must be deployed before the nodes and please ensure that it is not covered by any materials, which would block the radio signals, for example, chicken wire, aluminum sheet hoardings, etc.;

3) If no data is received from the Gateway, then please carry out investigations in the following two stages:

A. Remote Inspection of historical data, to identify:

a) Whether the heart-beat message has been sent back successfully at each time interval;

b) Whether the voltage in the heart-beat message is as expected, if not, please check the batteries;

c) Whether the signal strength has become significantly weaker, if yes, please check the antenna has been screwed on firmly;

d) Whether the SIM card contract is valid and that payment is paid up to date.

B. On-site Inspection: if all above are good, please arrange for an on-site inspection to check:

a) Whether the Serial Gateway has visible external damage;

b) Please check that the 2G/3G/4G and Mesh antennas have not been screwed to the wrong connectors;

c) Whether the antenna is bent or damaged and the node (gateway or sensor node) is not blocked by new construction, e.g., hoardings.

d) When it is possible, check that the signal strength is normal by using a spectrum analyser;

e) Whether any connectors are loose.

Notices:

i. Case One: If any change has been made from the list above, please inspect the data from the remote server;

ii. Case Two: If all the actions from the list above have not cured the problem, please contact Wisen. We will be happy to help.

7. Package Information

Standard:

No.	Items	Dimension (mm)	Qty.
1	WISENMESHNET® Smart Gateway	200x150x60	1
2	Mesh Antenna	200	1

3	4G Antenna	200	1
4	Cap-Hex-Head Screw	M6x14	4
5	User Manual*	Downloadable from WISENMESHNET® Visualisation Platform.	
6	Inspection Report*		

8. Safety and Warning

Warning: Please read the following instructions carefully.

1) Operation Safety

- Before taking any action, please read all the information provided carefully, and keep the guidance documents safe;
- Ensure that any procedure and installation are correctly carried out. This product has been designed to a certain water-proof level. However, it is vulnerable to water ingress when the lid is open or if the cable gland has not been sealed properly.

2) Electrical Safety

- To install the batteries into a holder, please follow the “+” (positive) and “-” (negative) signs in any Wisen product. Wrong orientation of a battery could potential cause unit damage. Notice: The orientation of battery can vary among products.
- When disconnecting the battery, please take special care not to apply excessive force, otherwise the battery holder and the nearby circuitry may be damaged.

3) Warning

- This product must not be disassembled under any circumstances, to do so will void the warranty and may leave the product in a dangerous state;
- If all the above are not followed, the manufacturer cannot be held responsible for any damage and injury caused to the users.

4) Caution

- Danger of explosion if battery is incorrectly replaced. Replace only with the type recommended by the manufacturer. Observe any warnings specified by the battery manufacturer.

- When disposing of the batteries, please contact your local authorities or dealer and ask for the correct method of disposal.

9. Contact

- Wuxi Wisen Innovation Co., Ltd.: www.wisencn.com
- Email: marketing@wisencn.com

10.FCC Warning

- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
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- Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
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- **Note:** 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 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.
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- This equipment complies with FCC 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.

Contains FCC ID:UDV-201709