

# **WiSen Vision Unit (TR)**

## **User Manual**

3004

**Wuxi Wisen Innovation Co., Ltd.**

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## Revision History

| Rev. | Issue Date | Revisions | Written By | Revised By |
|------|------------|-----------|------------|------------|
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### Document Definition:

This document defines the specifications (i.e., introduction, technical features, deployment and maintenance methods) of the WiSen Vision Unit, which is one of the key components in Wisen Low Power, Intelligent, Wireless Sensor Network (WSN) Monitoring system. It is responsible to:

- Capture high-definition images (8MP) even in ultra-low light conditions;
- Issue visual (LED) and audible (buzzer) warnings on-site;
- Form a time-synchronised WSN with other nodes in the system;
- Transmit image data to a server via public wireless network or local WiFi / cabled network connections.

Overall, Vision Unit follows the basic procedures as shown below:

- Imaging: All Vision Units capture images periodically at interval T;
- Trigger Listening: The built-in radio chip listens for trigger ping signals from nodes on the same frequency band for activation;
- Activation Response: Upon activation, the unit immediately captures an image and simultaneously activates the audible (buzzer) and visual (LED) warnings.

### Scope:

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

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# 1. Product Introduction



The WiSen Vision Unit is one of the key products in our patented WisenMeshWAN® and WISENMESHNET® geotechnical safety monitoring system. Working together with Wisen nodes and gateways, it includes a high-definition 8MP black-light-grade camera with automatic flash, and an LED/buzzer warning system. The unit is powered by primary batteries or external DC (7-32V) and uses its embedded 2G/3G/4G or WiFi/Ethernet modules for image transmission.

This product operates using our core technology, i.e., WisenMeshWAN® and 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 a minimum IP68 rate 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.

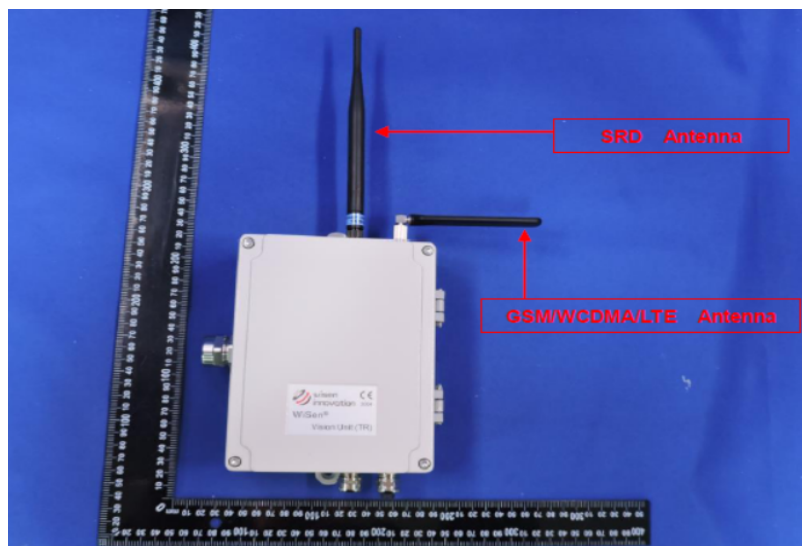


Figure. WiSen Vision Unit Overview in Photos.

## 2. System Structure Layout

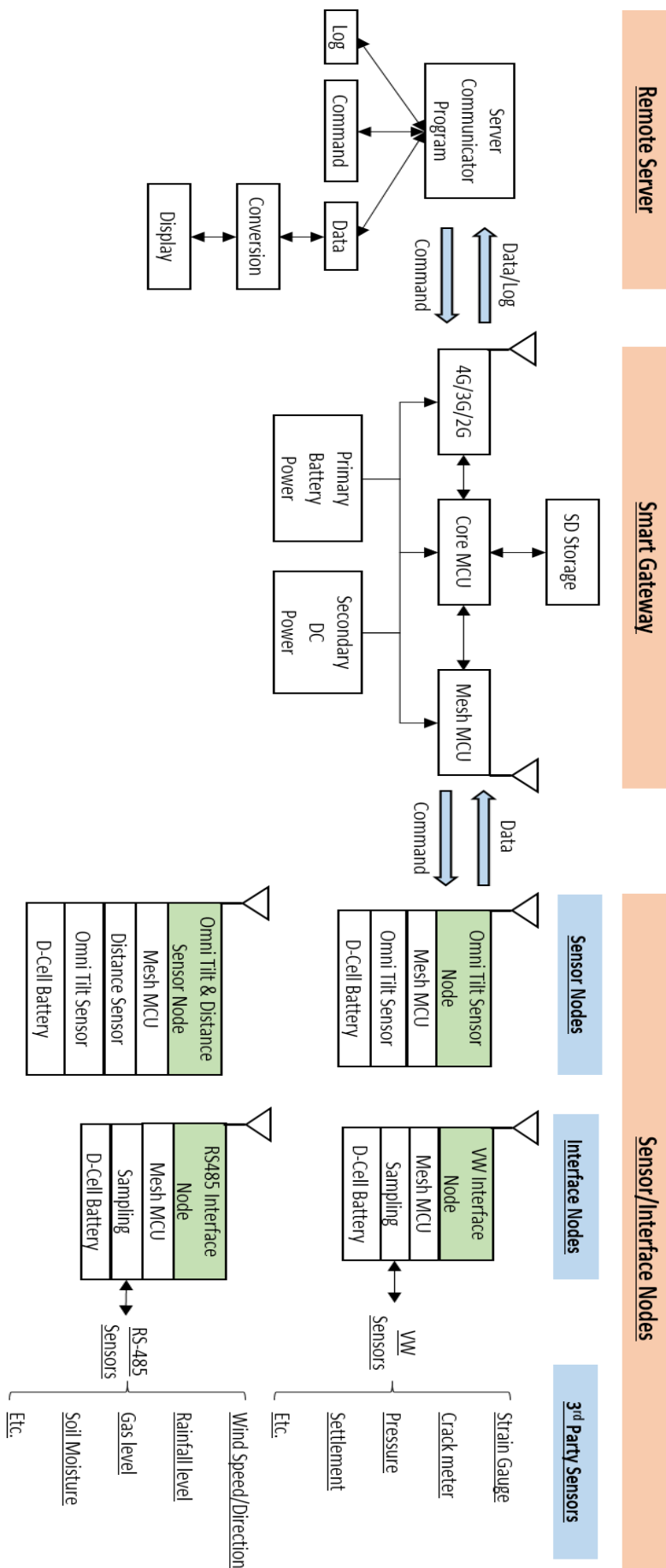


Figure. System Structure Layout.

### 3. WiSen Vision Unit & Radio Features

#### WiSen Vision Unit Features:

| Basics                                                                               |                                                                                         |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Primary Battery Power                                                                | Qty. x 4 (3.6V Lithium primary D-Cell ER34615)                                          |
| Secondary DC Power                                                                   | 7 - 32VDC @ Min. 2A                                                                     |
| 4G Network Stop Voltage                                                              | 2.1V                                                                                    |
| Local Storage                                                                        | ≥ 100 days @ T=60min (2600 Images)                                                      |
| Dimension (L x W x H)                                                                | 180 x 140 x 60mm                                                                        |
| Weight                                                                               | ≤ 2.6kg                                                                                 |
| Cable Gland                                                                          | Qty. 1 x EMC-CMA20 for Camera & LED/Buzzer;<br>Qty. 1 x EMC-CMA14 for external DC input |
| External Camera – High Definition 8MP / Full Colour / Black Light Grade / Waterproof |                                                                                         |
| Image Resolution                                                                     | 3840 x 2160                                                                             |
| Image Compression                                                                    | JPEG                                                                                    |
| HD Lens                                                                              | 5.0mm                                                                                   |
| Angle of View                                                                        | Horizontal 93° / Vertical 50°                                                           |
| Camera Flash Range                                                                   | White flash, 20-30m+ in complete darkness                                               |
| Warm-up Time                                                                         | 48s                                                                                     |
| Operating Temperature                                                                | -20°C to 65°C                                                                           |
| IP Rating                                                                            | IP68                                                                                    |
| Enclosure Material                                                                   | Aluminium alloy                                                                         |
| External LED / Buzzer On-Site Warning                                                |                                                                                         |
| Buzzer Volume                                                                        | ≥ 90dB @ 10cm                                                                           |
| LED Colours                                                                          | Off / Green / Yellow / Orange / Red                                                     |

|                                  |                                                                                             |
|----------------------------------|---------------------------------------------------------------------------------------------|
| <b>Basics</b>                    |                                                                                             |
| Warning Pattern                  | Yellow LED + buzzer beeping once per second (default)                                       |
| <b>Operating Modes</b>           |                                                                                             |
| Mode 1 (Default)                 | Photo automatically taken at every T (3min to 24hrs)                                        |
| Mode 2 (Passive)                 | Photo taken only upon command                                                               |
| Mode 3 (Trigger)                 | Photo taken when any node in trigger mesh system is triggered                               |
| <b>External Interface</b>        |                                                                                             |
| Wireless Module                  | 4G Daughter Board (default) or 2.4GHz WiFi Daughter Board                                   |
| Wired Port                       | RS232 on Board / Ethernet Daughter Board                                                    |
| <b>WSN Interface</b>             |                                                                                             |
| Mesh Wireless Interface          | Wisen Protocol                                                                              |
| <b>Standard System Parameter</b> |                                                                                             |
| Temperature                      | Range: -40 to 85°C; Accuracy: $\pm 0.1^{\circ}\text{C}$ ; Resolution: $0.1^{\circ}\text{C}$ |
| Humidity                         | Range: 0 to 100%RH; Accuracy: $\pm 1.5\% \text{RH}$                                         |
| Voltage                          | Accuracy: $\pm 0.1\text{V}$                                                                 |
| <b>Industrial Standard</b>       |                                                                                             |
| Casing and Painting Materials    | Aluminium-Alloy Die Castings 12 (Epoxy Polyester Powder Coating)                            |
| IP Rating                        | $\geq \text{IP67}$                                                                          |
| Operating Temperature            | -40 to 85°C                                                                                 |

#### 4G General Features:

|                         |                                     |
|-------------------------|-------------------------------------|
| Frequency Bands         | LTE-TDD B41                         |
|                         | LTE-FDD BB2/B4/B5                   |
|                         | B12/B13/B25/B26/B66                 |
|                         | UMTS/HSPA+ B1/B2/B4/B5/B6/B8/B19    |
|                         | GSM/GPRS/EDGE 850/900/1800/1900 MHz |
| Supply Voltage          | 3.4V ~ 4.2V, Typ: 3.8V              |
| Control Via AT Commands |                                     |
| Operation Temperature   | -40°C ~ +85°C                       |

## 4. WiSen Vision Unit Terminologies

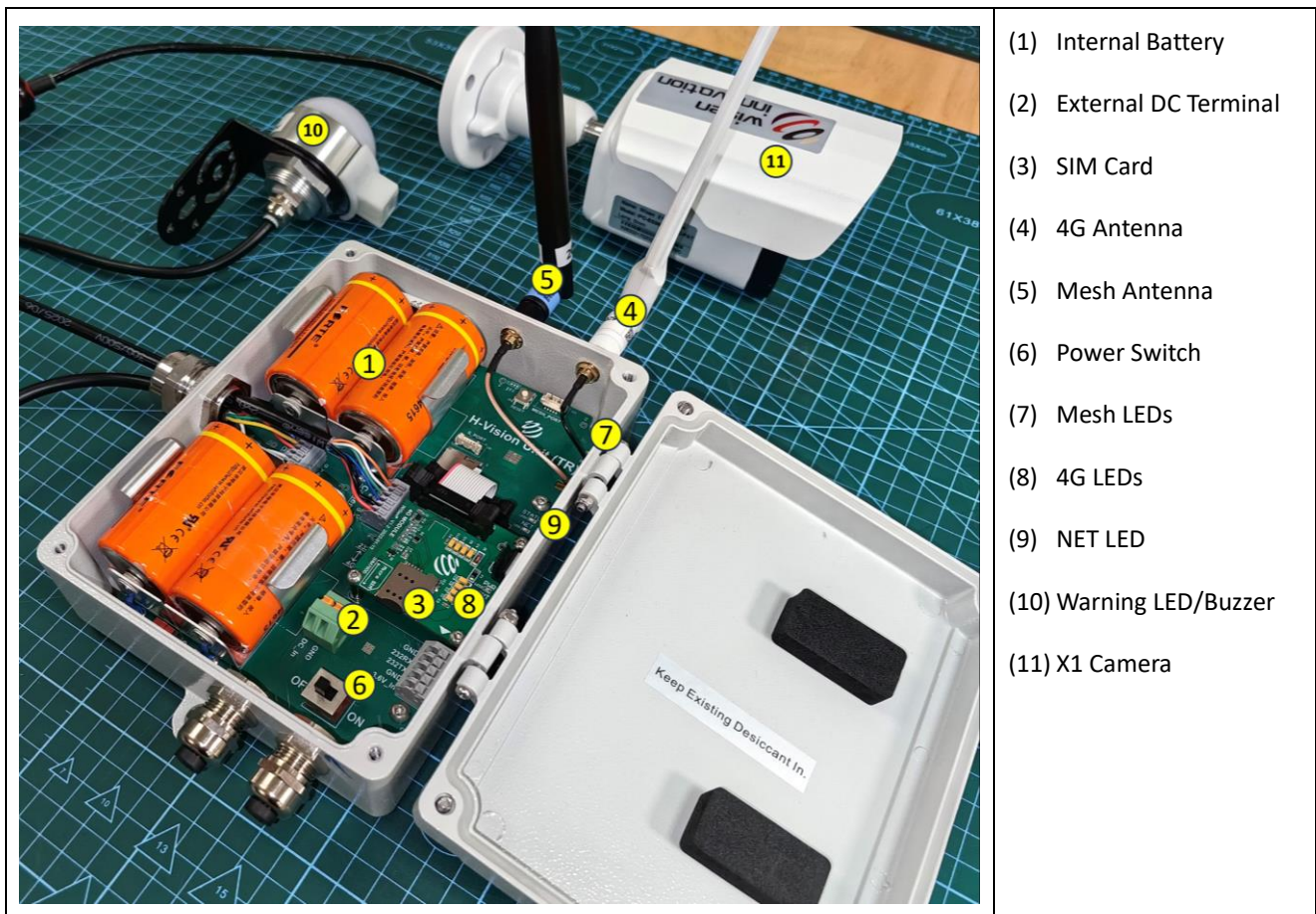


Figure. Vision Unit Terminologies.

## 5. Operation Procedures



### 5.1. WiSen Vision Unit Location Choices

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

- 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 Vision Unit is next to the gateway, where wireless trigger pings from nodes can always be received;
- 2) Secondly, 2G/3G/4G coverage (or equivalent when WiFi, Ethernet modules are used) in the site must be available to ensure communication between a Vision Unit 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 Vision Unit;
- 3) Camera placement: avoid nearby objects that may reflect flash; avoid facing strong light sources.

### 5.2. Deployment Procedures

- 1) Open packaging, take out unit, open lid;
- 2) Insert 4 x ER34615 batteries (observe polarity);
- 3) Insert Micro SIM card into 4G daughter board (golden chip facing PCB, cut-corner outward);

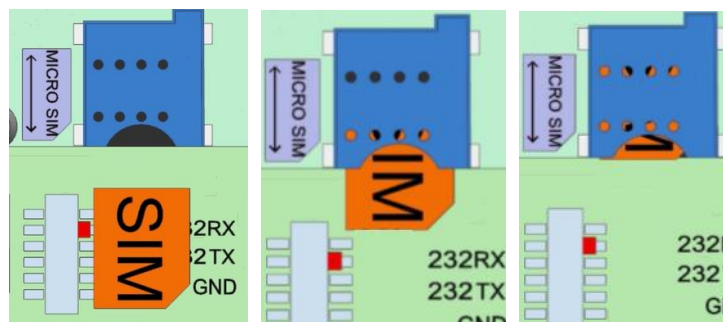


Figure. SIM Card Insertion.

Note:

- A. SIM Card Installation: To insert/replace the SIM card, you MUST Turn off the power!
- B. Push the SIM card all the way into the SIM holder until you hear a click, which means a secured insertion is made.

- 4) Install antennas (mesh and 4G) firmly;

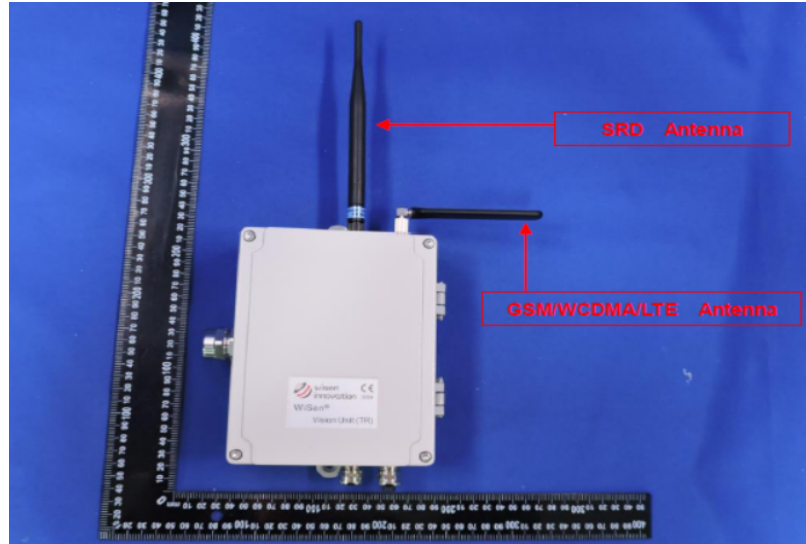


Figure. Mesh Antenna (left) and 2G/3G/4G Antenna (right).

- 5) Connect external camera:

- Orange -> R-; White -> R+; Green -> T-; Blue -> T+; Black -> GND; Red -> VCC

- 6) Connect LED/Buzzer (if used):

- Green -> G; Yellow -> Y; Red -> R; White -> Buzzer; Black -> VCC

- 7) Connect external DC power if needed (DC\_IN and GND terminals);

Warning: incorrect power connection will cause serious damage.

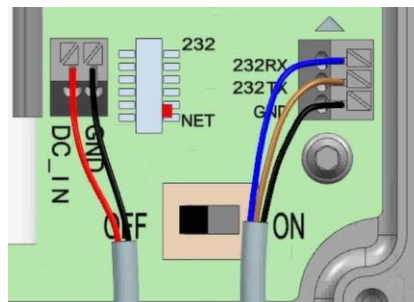


Figure. DC Cable & RS232 Connections.

- 8) Power on a Vision Unit: observe LED sequence: Red, Yellow, Green flash once each, then warning colour flashes 3 times with buzzer;
- 9) On the 4G daughter board, the LED flashing sequence is as shown below:
  - A. "PWR" (power supply) turns on;
  - B. "CNT": slow flashes (meaning searching for a valid network), then quick flashes (meaning registering to the found network);
  - C. On the Vision Unit main board, "NET" LED turns to solid green (meaning a successful connection to the cloud sever was established).

It overall takes about 30-40s to connect to a server.

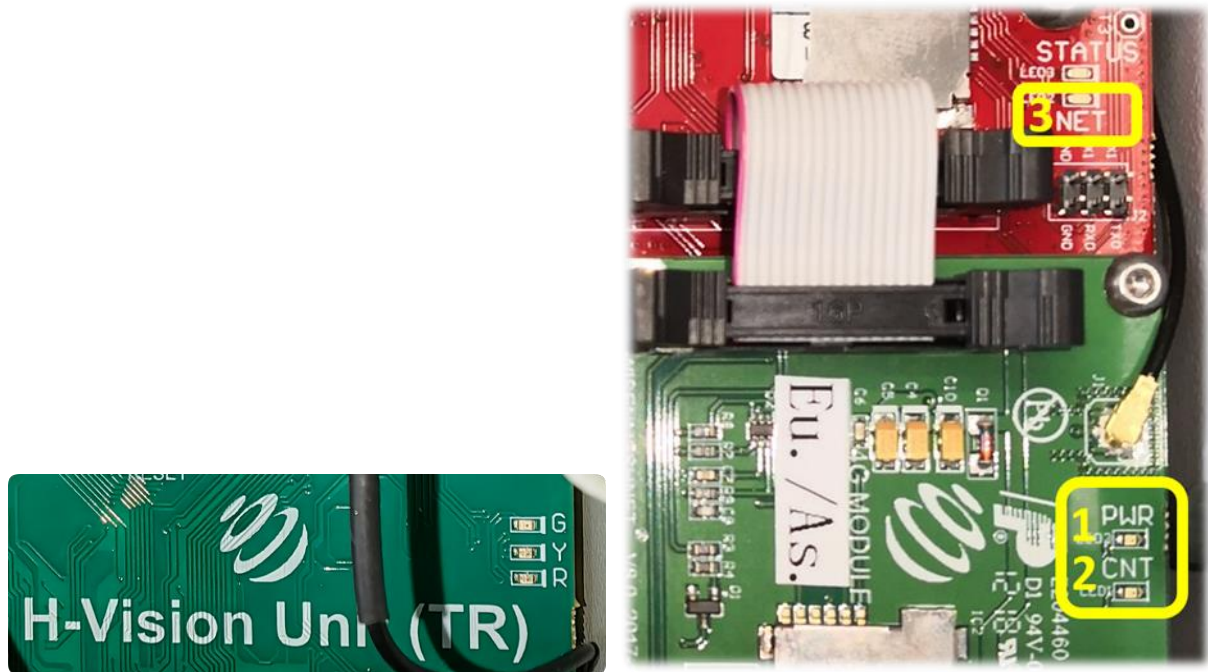


Figure. Mesh LED and 4G Daughter Board LEDs.

10) After initial 2 intervals (3min each), unit reverts to configured T;

- ONLY if connection to server is available, the 2nd Time Interval takes one photo and sends back to the server.

11) Tighten lid and cable glands;

12) Validate image data on Wisen Visualisation Platform.

### 5.3. Mounting Options

Mount unit securely on pole or wall using fixing bracket. Ensure camera has clear view of target area and is not obstructed.

## 6. General Maintenance and Notification



- 1) Once the Vision Unit is installed and working, please do not interfere with it (e.g., moving around, power cycling) unless it is absolutely necessary;

- 2) The Vision Unit relies on radio signals to communicate with the nodes. It must be wirelessly reachable by 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 Vision Unit, 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 Vision Unit 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 it is not blocked by new construction, e.g., hoardings;
    - d) Whether any live and high voltage cable is directly hanging right next to the Vision Unit 4G antenna; [If so, remove and keep a minimum 0.5m distance];
    - e) If an external DC power is used on a Vision Unit, then ensure it is NOT shared with any other heavy machinery, which will cause a power surge;
    - f) Whether any connectors are loose.

#### Notices📢:

- i. Case One: If any improvement has been made from the list above, please inspect the data from the Wisen Visualisation Platform;
- ii. Case Two: If all the actions from the list above have not cured the problem, please do take high quality photos during the site inspection and share with the Wisen support team for further consultancy (if needed).

## 7. Package Information



**Standard:**

| No. | Items                                | Dimension (mm)                                 | Qty. |
|-----|--------------------------------------|------------------------------------------------|------|
| 1)  | WiSen Vision Unit                    | 200x180x60                                     | 1    |
| 2)  | Wisen X1 Camera (with 1m cable)      | 68x68x174                                      | 1    |
| 3)  | Mesh Antenna                         | 200                                            | 1    |
| 4)  | 4G Antenna                           | 200                                            | 1    |
| 5)  | LED/Buzzer Warning Unit (with cable) | -                                              | 1    |
| 6)  | Cap-Hex-Head Screw (lid)             | M4x20                                          | 4    |
| 7)  | Cap-Hex-Head Screw (back)            | M6x14                                          | 4    |
| 8)  | User Manual*                         | Downloadable from Wisen Visualisation Platform |      |
| 9)  | 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 potentially 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

- Notice:

It should be ensured that only maintenance personnel is allowed to open the Vision Unit to:

- A. Access both local firmware upgrade ports.

Note: Local firmware upgrade ports contain two parts:

- a. S\_PORT, for Vision Unit control;
- b. MESH\_PORT, for Mesh network control.



Figure. S\_PORT, MESH\_PORT and Reset Button.

- B. Use the Reset button.
- C. Turn on or off the power switch;
- D. Replace TF card.

Note: TF storage card must NOT be removed without notifying Wisen Support team first.

In case, if TF storage card is indeed damaged for some reason during usage, please contact Wisen Support team, we will guide a user to the official website link corresponding to the industrial grade TF storage card. Or we will send out a new TF storage card to the user for replacements.

- 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 the incorrectly specified type. ONLY use 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. Website: [www.wisencn.com](http://www.wisencn.com)
- Email: [support@wisencn.com](mailto:support@wisencn.com)

### - 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.
- 
- Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- 
- **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.
- 
- 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.

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## *End of User Manual*

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