The Manhole Cover Monitoring Sensor

User Manual

(Rev 1.2)

1. Introduction

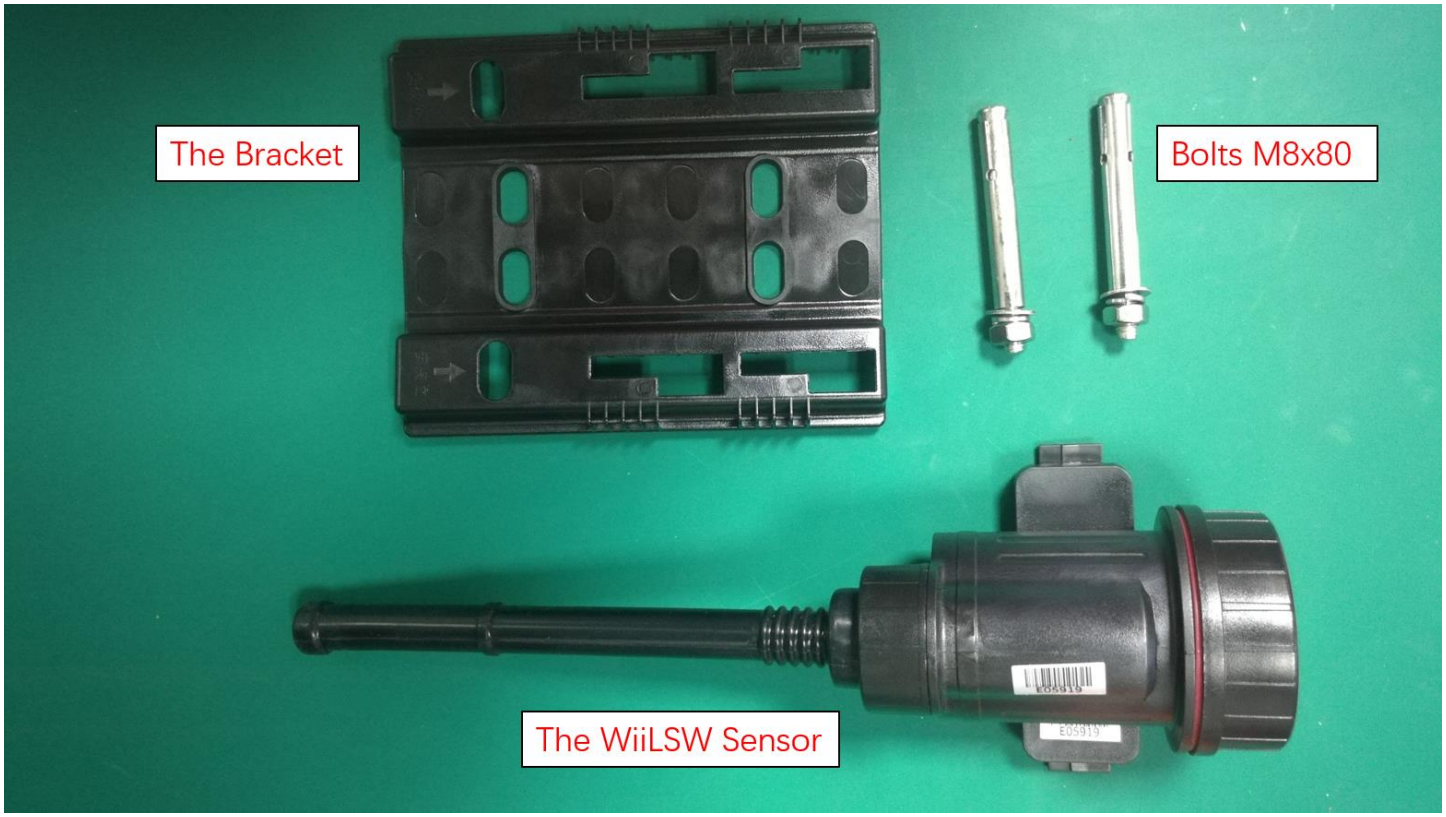
This manual contains instructions to be followed during preparation and installation of the manhole cover sensor. It also provides a systematic demo to show how the WiiMOC (It was formerly coded WiiLSW before) sensor works and to help customers understand the MQTT message service better.

It is suggested that you read the whole document through, before getting hands on the installation or operation of the product.

2. Hardware Preparation

2.1 Hardware & components

After you unpack the package, you will see the WiiMCO hardware and its components:



2.2 Install the SIM card

The WiiMCO sensor doesn't have SIM card installed. And it hasn't been powered on. So, you will need to disassemble the WiiMCO hardware, insert a local SIM card of your country, and connect the battery to its circuit board. Fortunately, it is not a hard job.

Below are the steps to follow:

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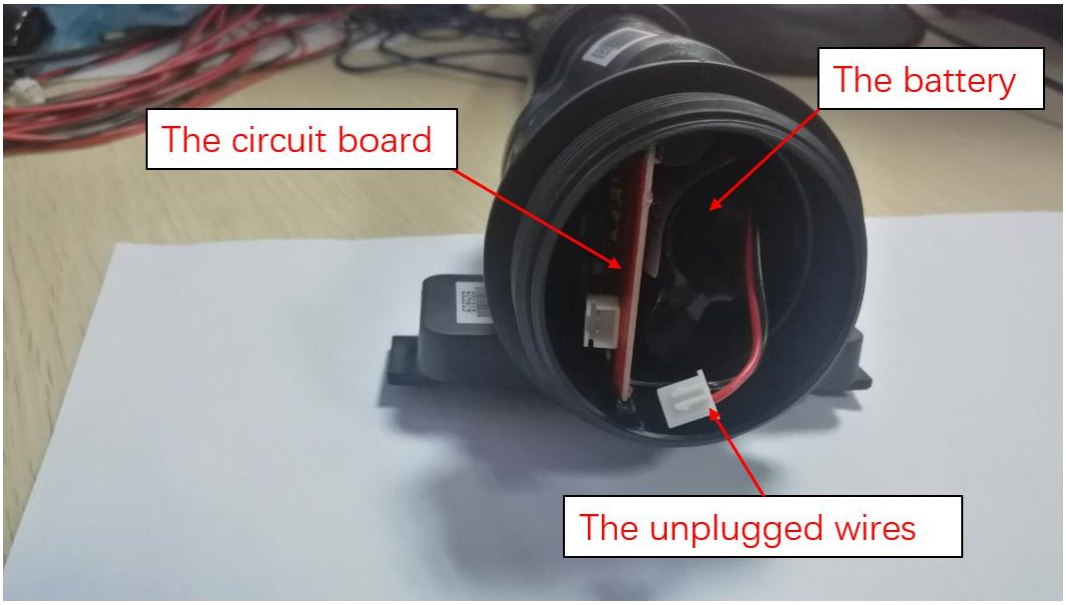
Step 1 – Unscrew the back cover

Unscrew the back cover in a counter-clockwise direction.

Look inside, you will see the internal circuit board and battery.

The battery wires are not connected, so the circuit board isn't powered on.



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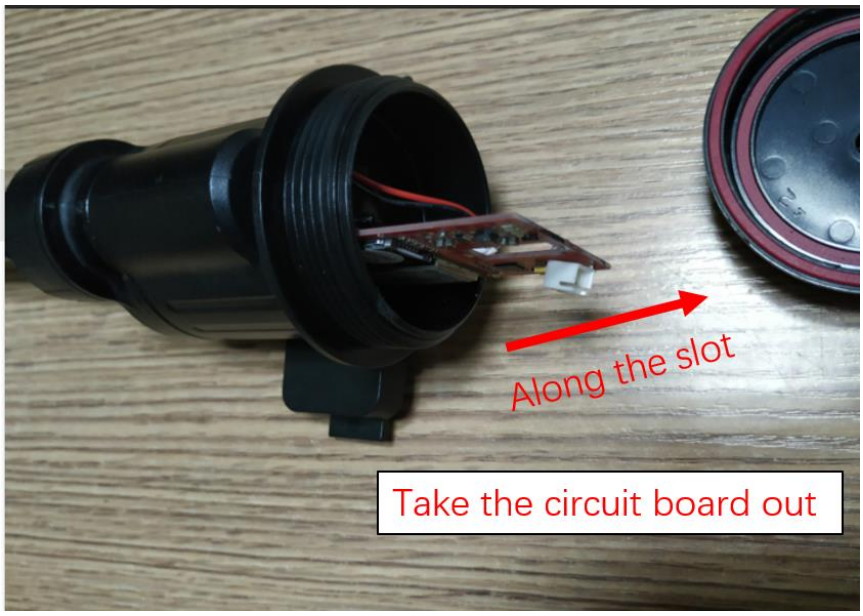
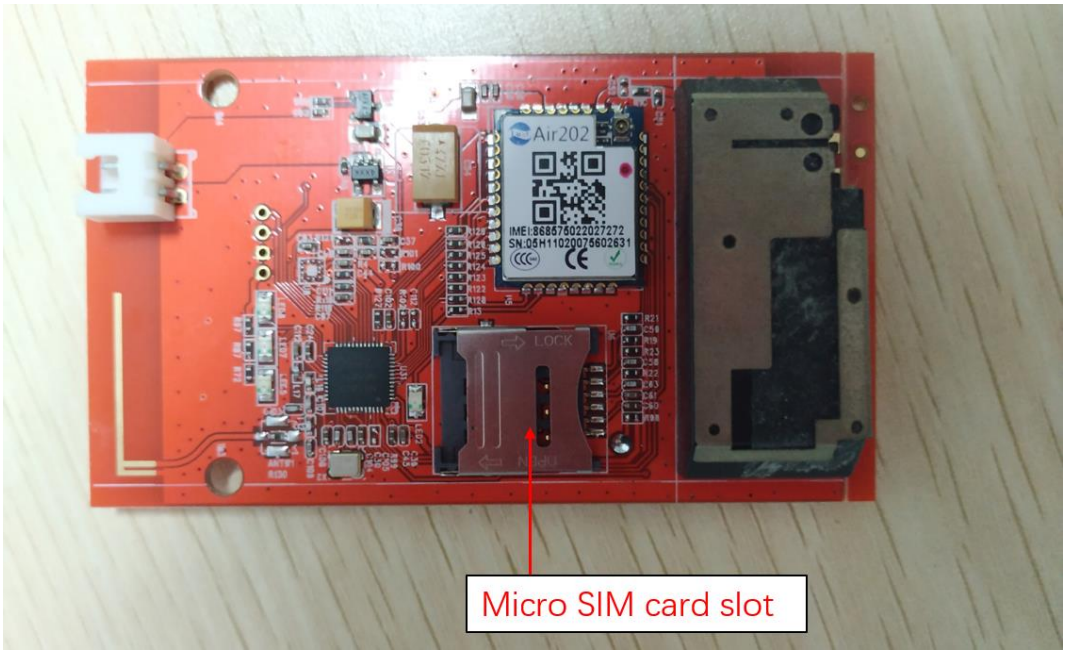
Step 2 – Take out the circuit board

Pull the circuit board out gently along the slot.



Step 3 – Install the SIM card

Identify the Micro SIM card slot on the circuit board:



Prepare your local SIM card:

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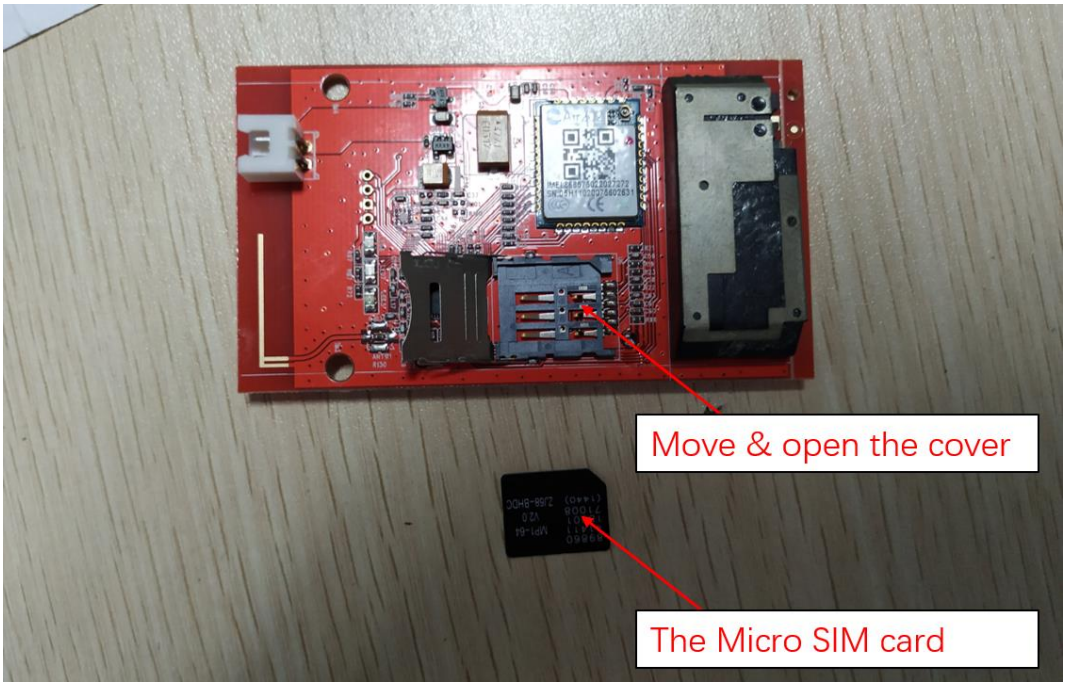
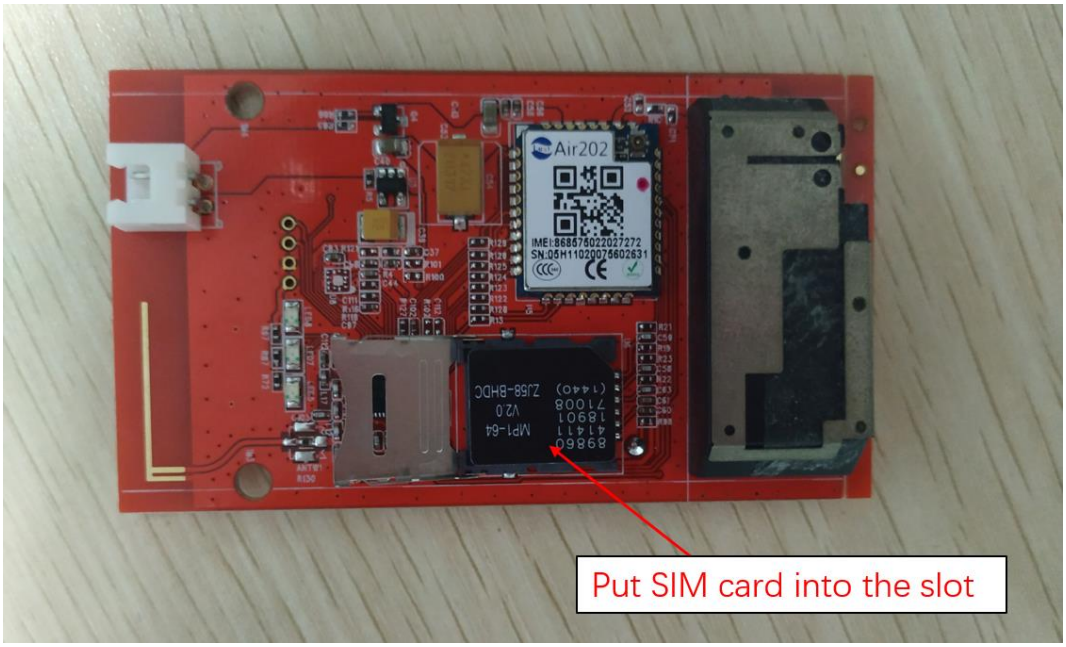


Put the SIM card into the slot:



Close and lock the cover:

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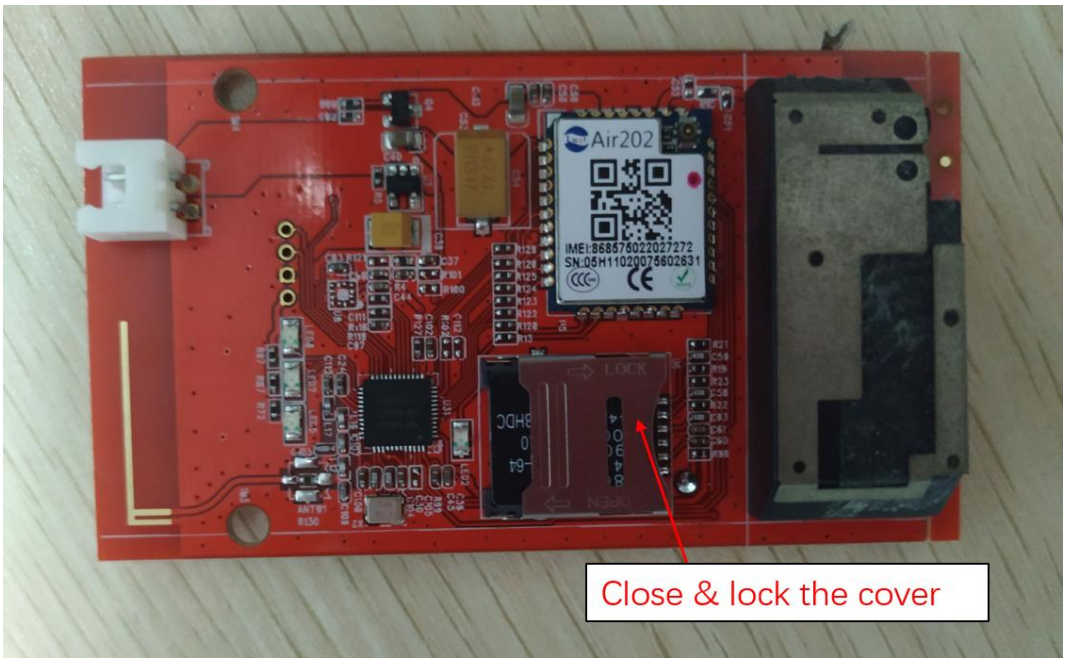
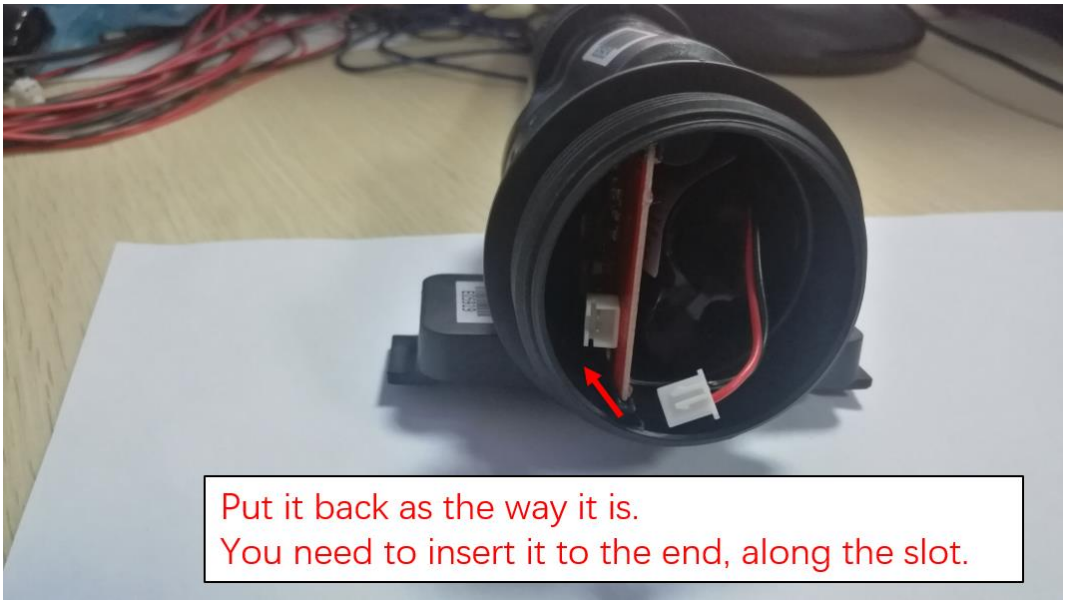


Step 4 – Put back the circuit board

Put the circuit board back along the slot. Be sure to insert it to the end.



Step 5 – Make the circuit board firmly fixed

You will need the hot melt glue to fix the circuit board firmly.

Keep in mind the board should be pushed till the end of the slot. Only apply the glue to

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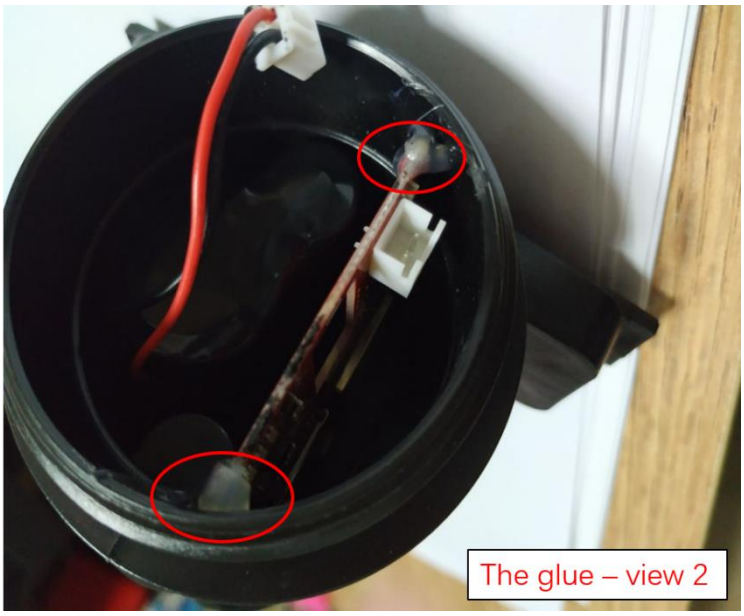
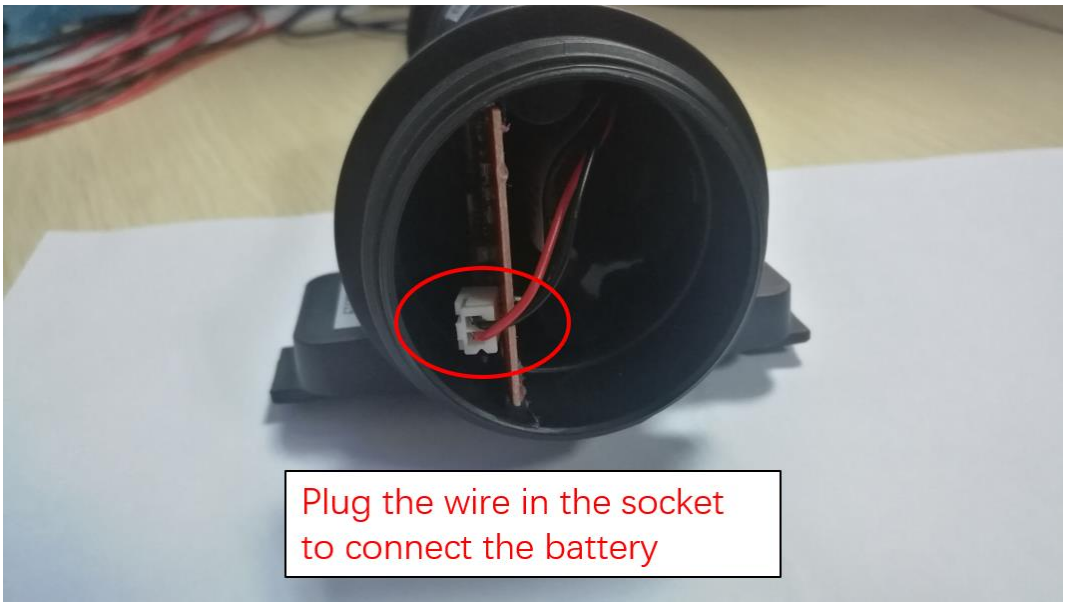
the tail ends of the slot and the corners of the board. No need to use too much glue.



Step 6 – Connect the battery

Plug the wire in the socket to connect the battery to the circuit board:



Step 7 – Place the foam

There is a piece of foam in the back cover.

Take it out and place it at the end of the circuit board.

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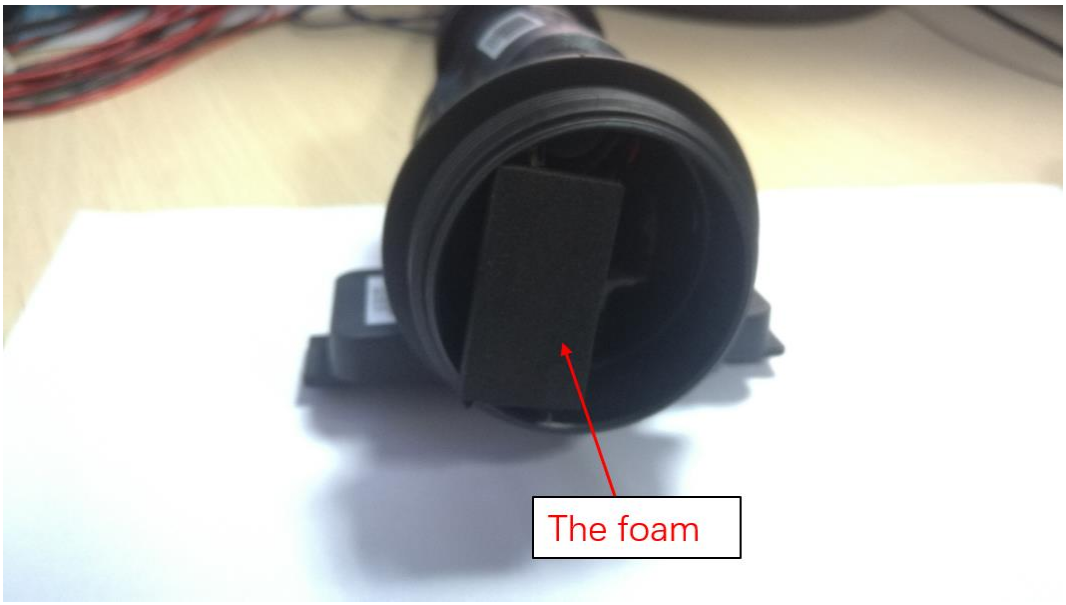

Step 8 – Screw the back cover

Screw the back cover in a clockwise direction. And tighten it.

The hardware preparation job is done.

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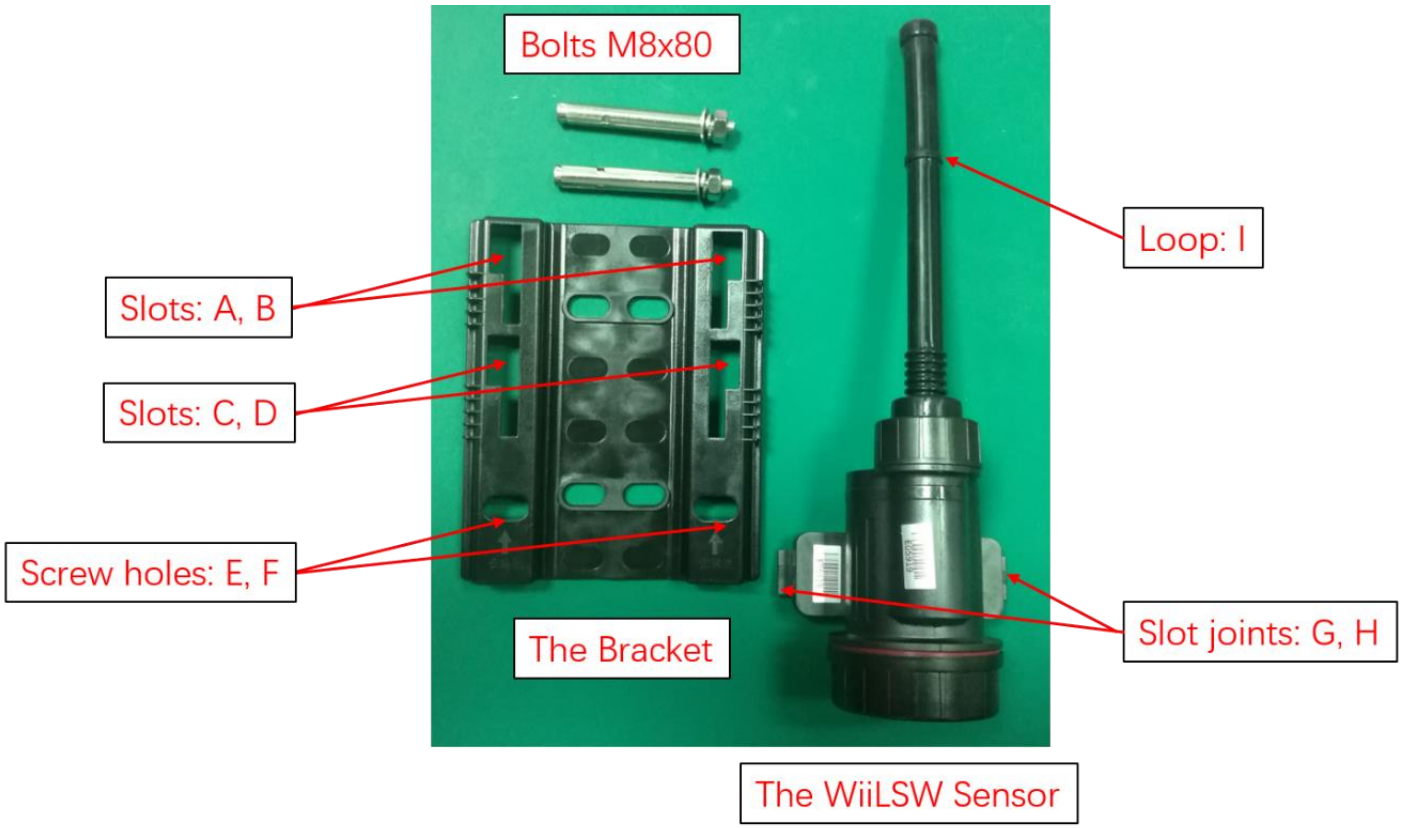
3. Hardware Installation

3.1 Graphical representation of the hardware



The reference character index:

- A & B: a pair of slots for the sensor to be attached on the bracket (high position).
- C & D: a pair of slots for the sensor to be attached on the bracket (low position).
- E & F: the screw holes for the M8*80 bolts.
- G & H: a pair of slot joints to attach the sensor onto the bracket.
- I: the loop to indicate the installation position of the sensor.

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3.2 Wall mounting

3.2.1 The overall procedures

The overall procedures include:

Step (1): measure the installation position;

Step (2): mount the sensor on the wall;

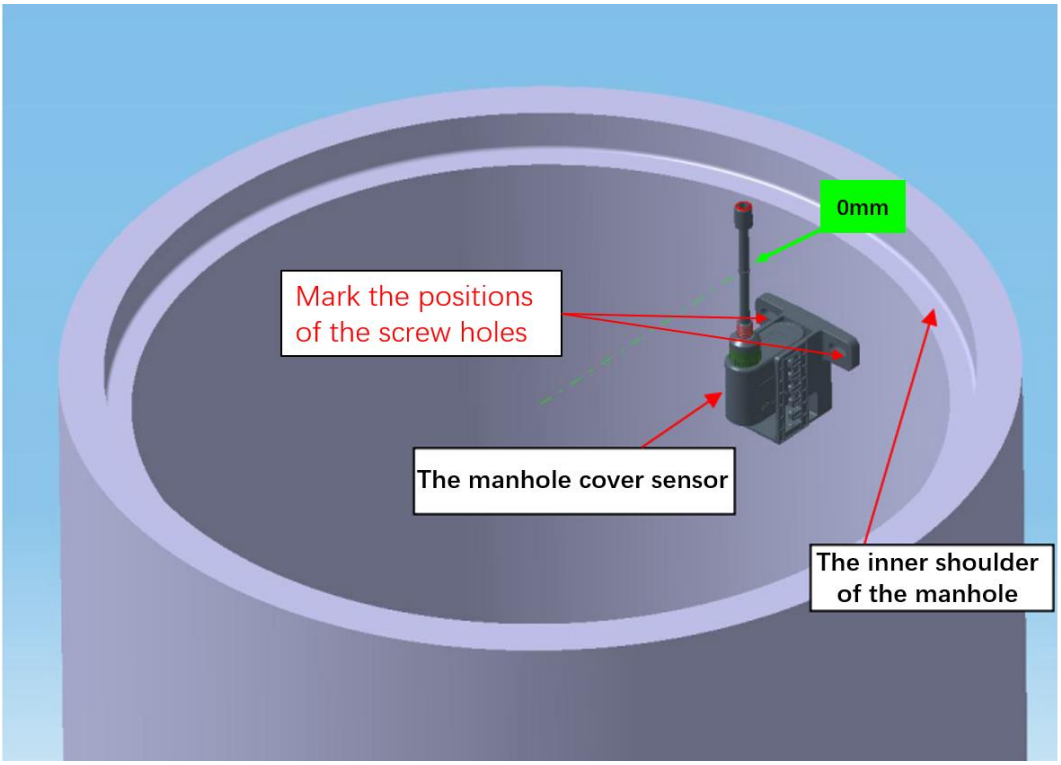
Step (3): place the manhole cover on it;

Step (4): reopen the manhole cover (in the future);

3.2.2 The installation positions

In this step, you need to measure and mark the screw holes' positions on the wall.

Please follow the instructions in the blew figures:



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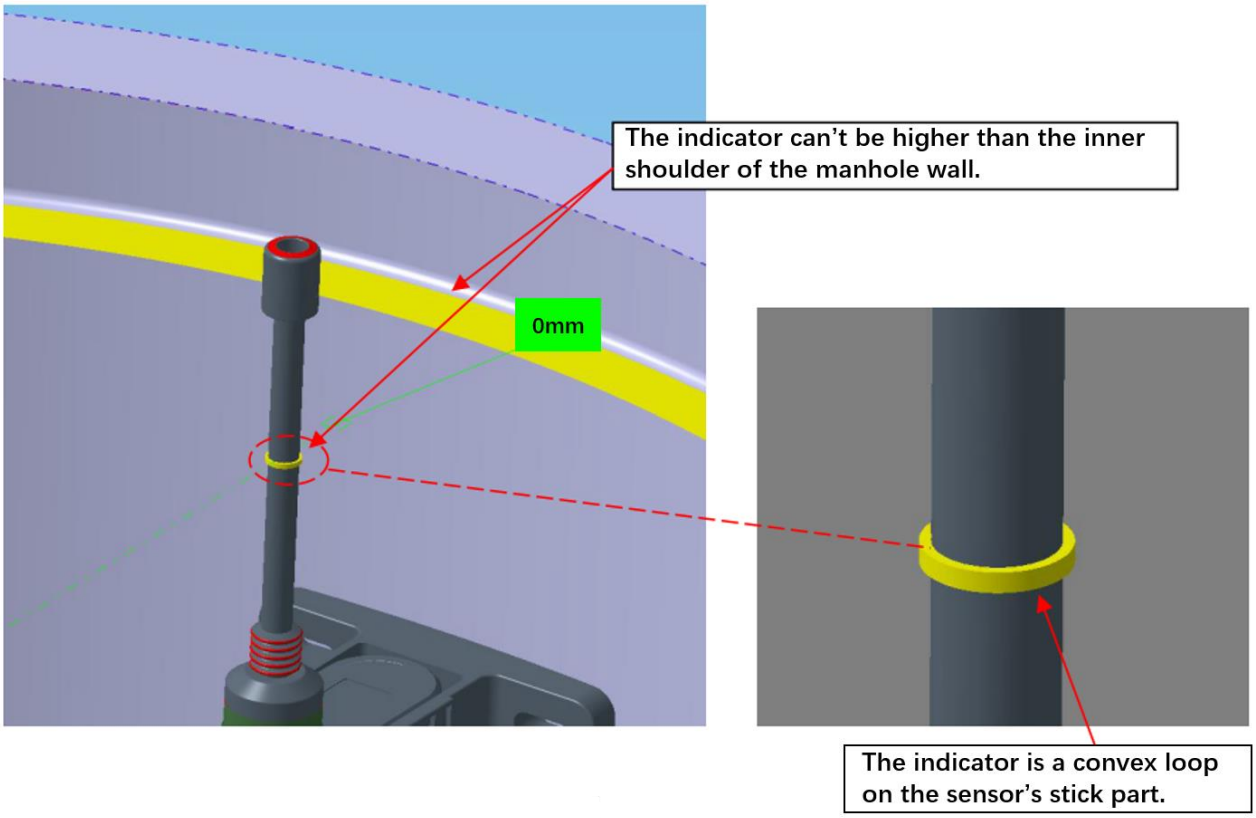

3.2.3 Mount the sensor on the wall

In this step, you can mount the bracket on the wall by screwing the two bolts.

The bracket has two pairs of slots – slots A&B (the high position) or slots C&D (the low position), as you can see in the section 3.1. Both pairs of slots can be used to attach the sensor. You can choose a suitable one to adjust the sensor to the right mounting height.

3.2.4 How to place the manhole cover

The right way: the manhole cover is placed slowly, gently and vertically downward to the manhole and the sensor. (see figure 1 below)

The wrong way: the manhole cover is placed sideling downward to the manhole, or the

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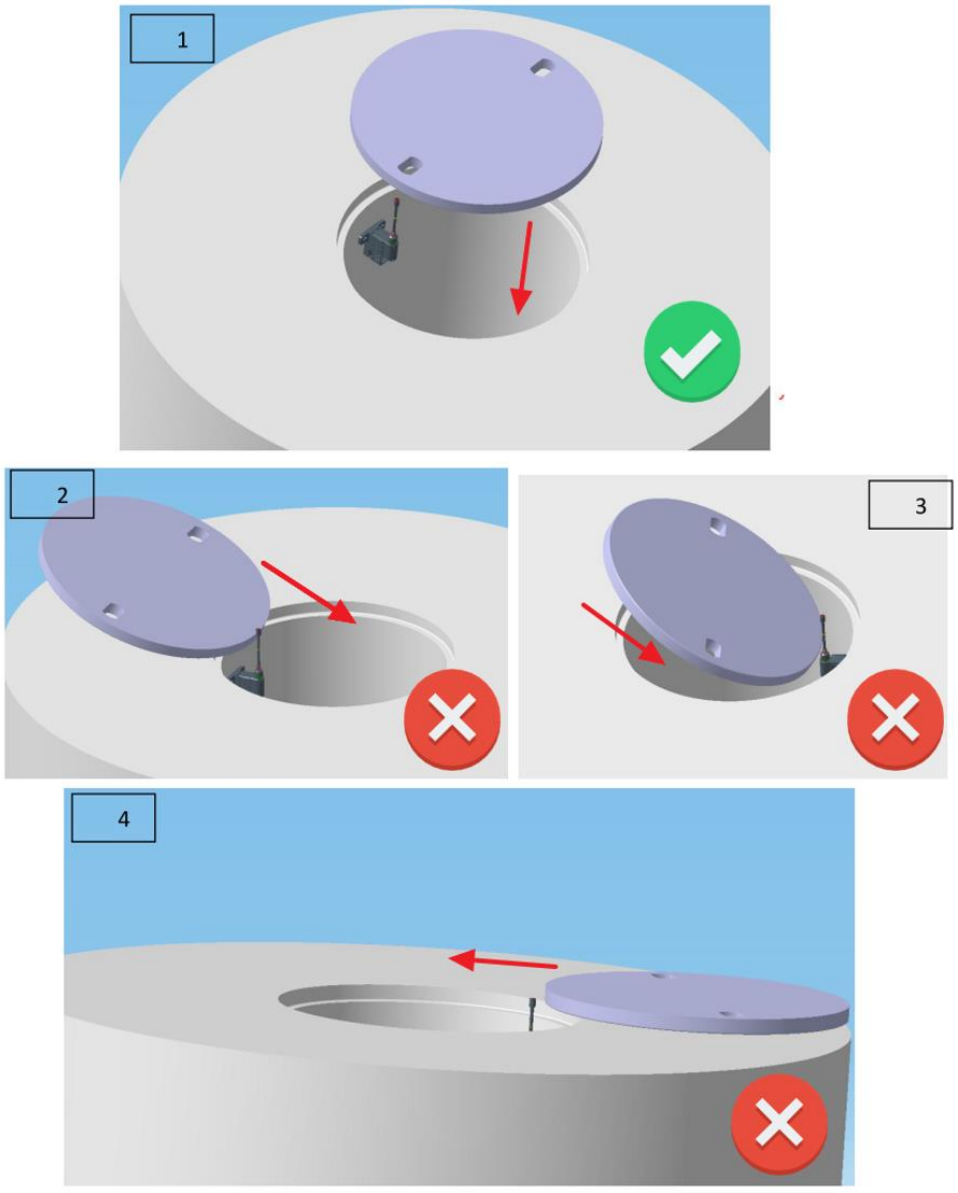
manhole cover is pushed horizontally to the manhole, or the manhole cover is placed or hit on the sensor very harshly. (see figure 2~4 below)



3.2.5 Reopen the manhole cover (in case it's necessary)

When you need to reopen the manhole cover in the future, there is a tip to follow:

Open the manhole cover slightly, and peer inside to see the sensor's position. Go to the sensor's position, slowly pull the cover up from this side. By doing so, it is less likely to hit the manhole cover on the sensor's body directly or harshly.

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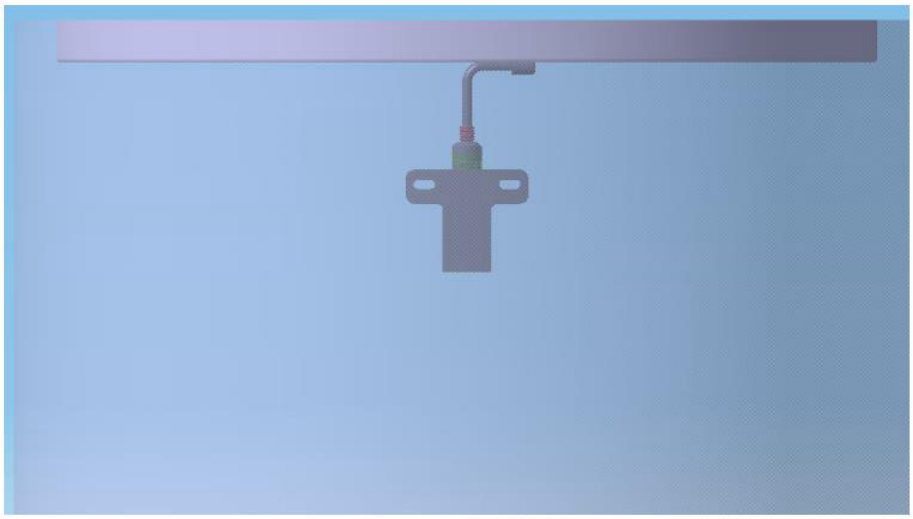
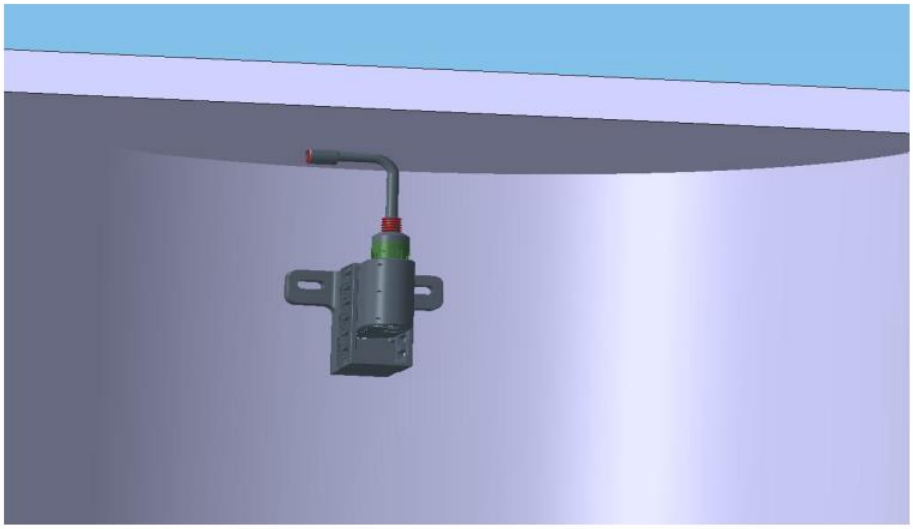
3.2.6 The simulation

Below is the simulation of a sensor after its installation, and the manhole cover is on it:





4. System Demo

This chapter shows how to use the demo and the software system.

After you have prepared the WiiMCO hardware in the chapter 2, you can demonstrate the manhole sensor's functionality now in your office or laboratory, no need to do the

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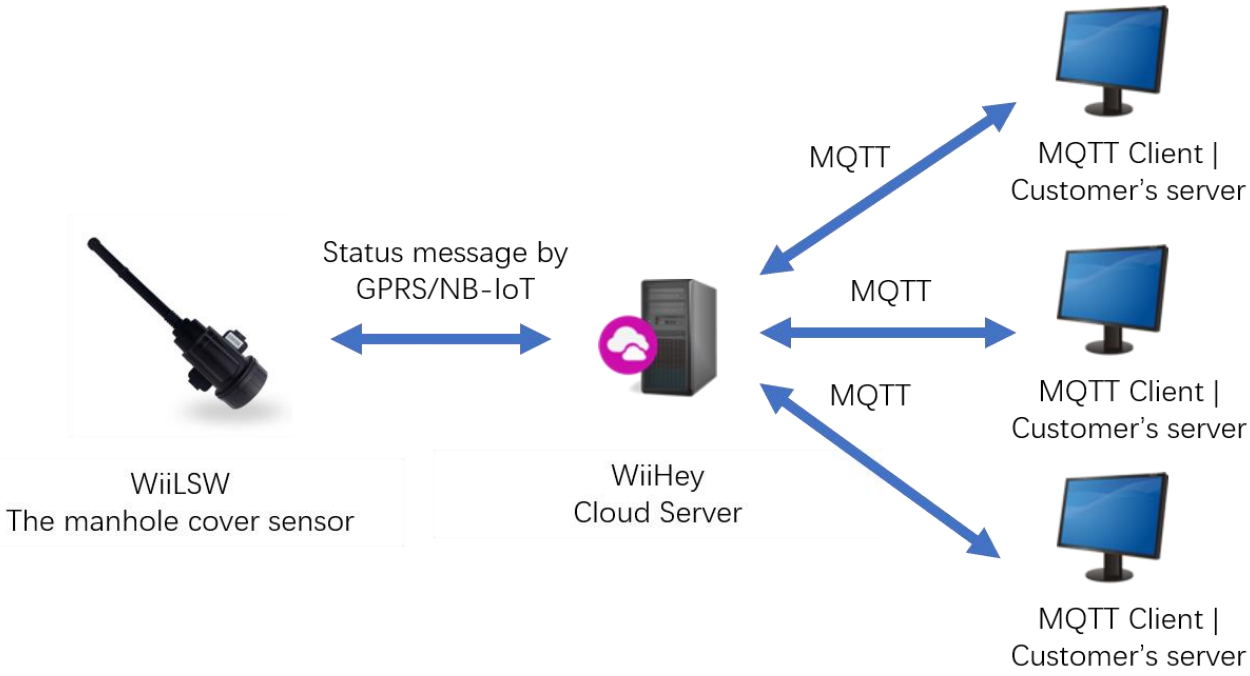
actual installation in this chapter.

The prerequisites are:

(1) The SIM card has been installed and the WiiMCO sensor has been powered on. If not, please refer to chapter 2 for the hardware preparation.

(2) A computer runs as a standard MQTT client. It should be connected to the Internet and supports MQTT stacks.

4.1 The system networks



For more updated information, please refer to document: WiiHey MQTT Manual.

4.2 Change status and receive MQTT messages

4.2.1 Imitate the "cover closed" status

Bend the sensor's stick to imitate the "cover closed" status, as shown in the below picture:

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4.2.2 Imitate the “cover opened” status

Leave the sensor’s stick straighten, to imitate the “cover open” status, as shown in the below picture:

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4.2.3 Receive messages on the MQTT client

You can find your devices' messages in the log by searching its device ID.

4.2.4 Important notes

The WiiMCO sensor sends message when it detects status changed. If you bend and unbend the sensor's stick quickly (e.g., to switch the statuses in seconds), the sensor may judge it as status of bouncing. It will wait till the stable status is detected before it sends correct message. Therefore, when you test the product, try to switch the different statuses in minutes, not in seconds, so as to get the correct results.

Another note is, when the WiiMCO sensor sends message, depending on the network quality, it will take 20 seconds to two minutes to establish a data connection with the cloud server. So, you probably will encounter some message latency during the demo, this is normal.

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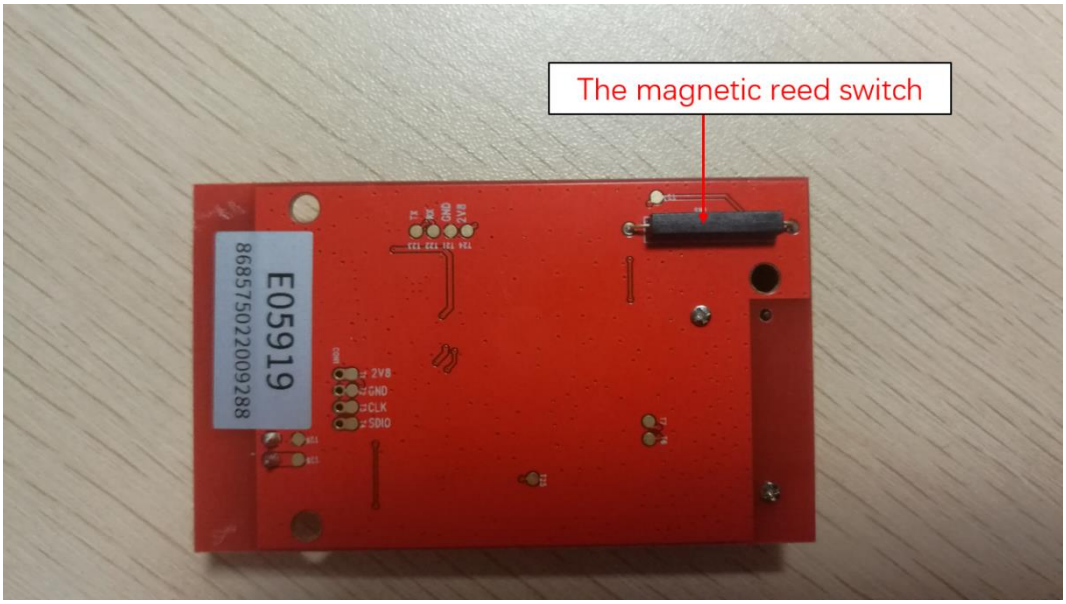
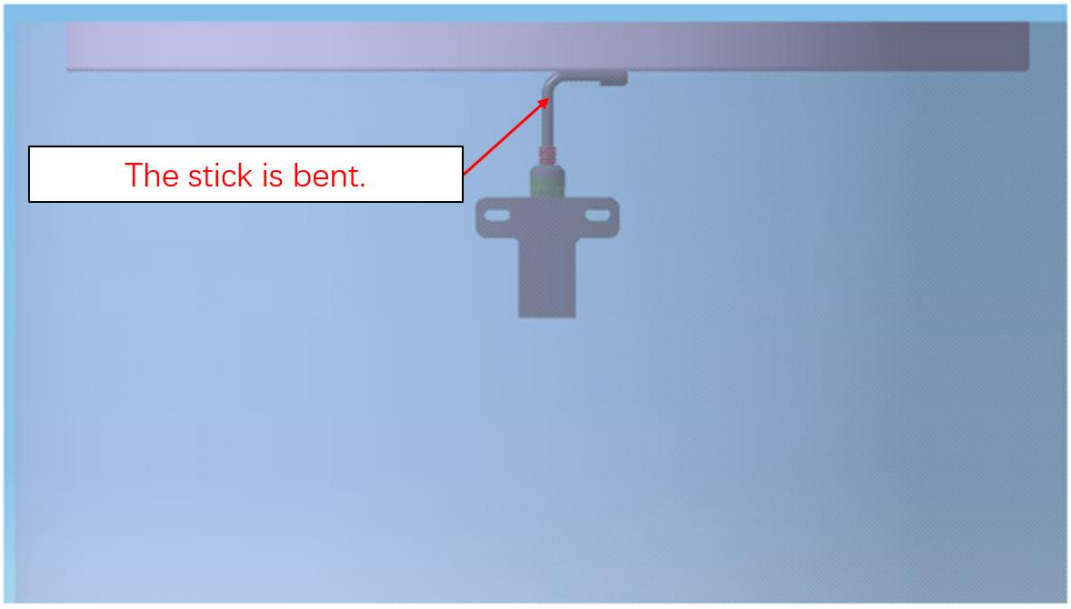
5. Q&A

5.1 How does the WiiMCO sensor detect the cover status?





When the stick is bent, the end of the stick leaves the reed switch, then the sensor judges the cover as closed. When the stick is straightened, the end of the stick stays near the reed switch, then the sensor judges the cover as open.

So, during the SIM card installation, it is important to fix the circuit board firmly.

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5.2 Where can I find my sensor's device ID?

You can find your device ID labeled on the sensor's main body:

5.3 If the manhole cover remains the same status, does the WiiMCO sensor still send out messages?

The sensor sends message out when it detects the cover's status changed.

During the normal operation, if the cover's status remains unchanged, the sensor would still send out heat-beat message to report its status. The frequency of the heat-beat message is 3 days.

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