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HAC WRW-E1 Pulse Reader Instruction Manual

HAC WRW-E1 Pulse Reader

The WRW-E1 Pulse Reader integrates hall metering, acquisition, communication, and transmission. It can monitor abnormal conditions such as magnetic interference, low battery voltage, and disassembly in real-time and report it to the management platform. The pulse reader and the gateway form a star network with high reliability and strong scalability. It complies with the LoRaWAN1.0.2 standard protocol.

Product Features

The WRW-E1 Pulse Reader has the following features:

- Maximum transmitting power in accordance with the requirements of power limit in different areas of the LoRaWAN protocol.
- Working temperature range of -20°C to +55°C.
- Working voltage range of +3.2V to +3.8V.
- Transmitting distance of up to 10km.
- Lifespan of 8 years using one ER18505 lithium battery.
- Waterproof degree of IP68.

Product Usage Instructions

To use the WRW-E1 Pulse Reader, follow these steps:

1. Install the software that is supported by the Pulse Reader. Refer to section 6.4 and 6.4.1 of the user manual for more details.
2. **Metering:** Connect the Pulse Reader to the system and ensure that it is powered on. The Pulse Reader will automatically detect magnetic attacks, low battery voltage, and disassembly.
3. **Data Reporting:** The Pulse Reader will report data every 28800S, with a default scheduled reporting time of 6H. The data will be sent to the management platform.
4. **Data Storage:** The Pulse Reader can save 10 years of annual frozen data and monthly frozen data of the last

7 months.

Overview

The Pulse Reader (ID: WRW-E1) integrates hall metering, acquisition, communication and transmission. It can be able to monitor abnormal conditions such as magnetic interference, low voltage of battery and disassembly in real time, and actively report it to the management platform. The pulse reader and the gateway form a star network, which is convenient for network maintenance, with high reliability and strong scalability. It complies with LoRaWAN1.0.2 standard protocol.

Metering Module Feature

The WRW-E1 Pulse Reader has a metering module with the following feature:

- Data reporting every 28800S, with a default scheduled reporting time of 6H.
- Support for 10L/P single hall measurement.
- Support for power-down storage function, where there is no need to re-initialize the measurement value after power-off.

Electrical characteristics

No.	Feature	Function Description
1	Working frequency	It's compatible with LoRaWAN®,EU868,AU915 are optional
2	Maximum transmitting power	It's in accordance with the requirements of power limit in different areas of the LoRaWAN protocol
3	Working temperature	-20℃ +55℃
4	Working voltage	+3.2V +3.8V
5	Transmitting distance	10km
6	Lifespan	8 years use one ER18505 lithium battery
7	Waterproof degree	IP68

Feature Description

No.	Feature	Function Description
1	Data reporting	There are two data reporting methods. Touch to report data: touch the button twice, touch the LED light to light up, lift up the LED light to go out. It must be greater than 2S at the first touch, it must be completed within 5S at the second touch after the first touch and it's less than 2S, otherwise it's invalid. Actively reporting at regular time: The period and time of timing reporting can be set. The value range of the timing reporting period is 600~86400S, and the value range of the timing reporting time is 0~23H. After setting, the reporting time is calculated according to the DeviceEui of the metering module, the regular reporting period, and the scheduled reporting time. The default value of the regular reporting period is 28800S, and the default value of the scheduled reporting time is 6H.
2	Measurement	Support 10L/P single hall
3	Power-down storage	Support power-down storage function,there is no need to re-initialize the measurement value after power-off

4	Magnetic attack detection	It detects every 2S. When a malicious magnetic attack is detected, an alarm flag of magnetic attack and a historical magnetic attack will be generated immediately. If there is no magnetic attack detected for continuous 10 seconds, the alarm flag will be automatically cleared. The historical magnetic attack alarm flag must be successfully reported to the cloud platform before it can be automatically cleared. Neither the detected nor the cleared magnetic attack alarm will actively report data.
5	Low voltage alarm	When the battery voltage is lower than 3.2V and the duration is longer than 30S, a low-voltage alarm flag will be generated; when the battery voltage is greater than 3.4V and the duration is greater than 60S, the low-voltage alarm will be cleared; the battery voltage 3.2V to 3.4V will not handle the low-voltage alarm flag. Neither detection of low-voltage alarm nor clearing of low-voltage alarm will actively report data. The accuracy of voltage detection is less than 0.1V.

| 6	Disassembly alarm	It detects every 2s,when it detects maliciously disassemble,it will generate the alarm sign. Only after malicious disassembly has not been detected for 10 consecutive seconds and the data has been successfully reported to the cloud platform can the disassembly alarm flag be automatically cleared. Neither the detecting nor the clearing of the disassembly alarm will actively report data.
7	Monthly and yearly frozen data storage	It can save 10 years of annual frozen data and monthly frozen data of the last 128 months, and the cloud platform can query historical data.
8	Parameters setting	Support wireless near and remote parameter settings. The remote parameter setting is realized through the cloud platform, and the near parameter setting is realized through the production test tool. There are two ways to set the near field parameters, namely wireless communication and infrared communication.
9	Upgrade application function	Support IR mode to upgrade the application program of metering module
10	Dense acquisition	Support dense acquisition function,it can be set, the value range is: 5, 10, 15, 20, 30, 60, 120, 240, 360, 720 min, and it can be able to store up to 12 pieces of dense acquisition data. The default value of intensive sampling period is 60min.

LED indicator of metering module

No.	Function	LED status description
1	Power-on initialization	The LED of the metering module flashes once when it's powered-on.
2	Networking	When the metering module is connected to the Internet, the LED light will be always on, and the LED light will be off when the connection is successful or the maximum number of connections is reached.
3	Report data regularly	The LED indicator of the metering module will flash for a time when it's reporting the data (it's very short).

No.	Function	LED status description
4	Report data by touch	The metering module LED light of touching and reporting the data flashes quickly for 2S and then flashes once
5	IR upgrade application program	When the infrared upgrades the application, the LED light of the metering module keeps flashing at a frequency of 1 second, until the LED light turns off after the upgrade is completed.

Product Assembly

1. Insert the pulse reader into Elster gas meter,it's shown as below.
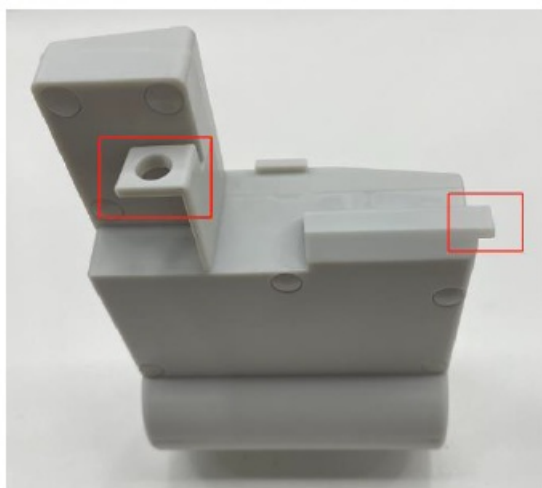
2. The effect after inserting is as shown in the following figure.
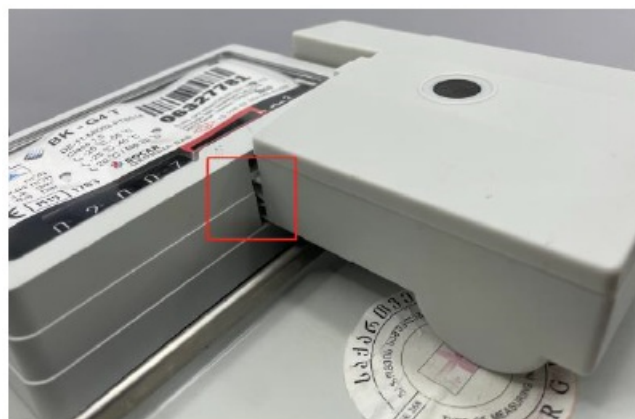
3. Use the spare parts to fasten the pulse reader firmly.

Operating instructions for metering module

1. **Step 1.** Information report and installation: report installation of metering module information (APPK, EUI, etc.) on the cloud platform (which is mainly based on the platform actually used by clients). After the installation is completed, check whether the meter module information is consistent with the platform.
2. **Step 2.** Join the local LoRaWAN network: touch the metering module to initiate networking, the LED light keeps on during the networking process, and the LED light will turn off when the networking is successful.
3. **Step 3.** Report the data: touch the metering module to report data, check whether the reporting parameters and flow data are accurate through the cloud platform. If the data is deviated, it can be modified by setting parameters.
4. **Step 4.** Parameter setting: After the metering module is assembled, use the production test tool provided by HAC (if provided) or the cloud platform for parameter setting. To set the parameters using the cloud platform, you must complete the metering module information installation on the cloud platform.
5. **Step 5.** The metering module goes offline: the metering module fails to report in two consecutive reporting cycles, and the metering module goes offline. The data is reported regularly next time, the network request will be initiated automatically.

Precautions and handling of common problems

1. Touch the button to report the data twice, it must be greater than 2S at the first touch,it must be completed within 5S at the second touch after the first touch and the touch time is less than 2S, otherwise the touch of reporting data is invalid.
2. The touch button reporting function is invalid when the meter module is connected to the Internet (the LED light of module is always on) or when the valve is controlled.
3. The cloud platform cannot check the data reported by touch button. The processing method is as follows:
   - Observe whether the LED indicator status of the meter module meets the described in Chapter 4 when the data is reported by touch button.
   - Check whether the installation information of the cloud platform is consistent with the information of the metering module.

- Still unable to solve the data reporting problem, please contact our technical staff

Instruction of production configuration tool

Tool list

No.	Tool list	Function description
1	HAC-MLW-F-T1-M2	Parameters setting and test data transfer
2	HAC-MLW-F-T2-M2	Monitor the field strength value of X meters from the LoRaWAN water meter (the distance is based on the production environment, select the returned field strength value -80dBm (the default fluctuation is 10 dBm)) to achieve fixed distance monitor.
3	5V RS232 serial cable 2PCS	Data transmission and HAC-MLW-F-T1/2-M2 power supply
4	10cm 915MHz rubber rod antenna 2PCS	AC-MLW-F-T1/2-M2 antenna
5	RS232 to USB serial cable	HAC-MLW-F-T1-M2 data transmission adapter cable

6	QR code scanner	Scan the QR code label to get DeviceEui quickly (which is optional)
7	IR communication device	Parameters setting
8	USB extended cable	Extend infrared communication device

Device connection

1. **Wireless communication device connection**
   1. HAC-MLW-F-T1-M2 device connection, 5V RS232 serial cable DB9 female with power interface connects to HAC-MLW-F-T1-M2, the other end of DB9 female interface transfers RS232 to USB serial cable to connect to the PC. The 5V RS232 serial cable adapter connects to 220V urban electricity.
   2. HAC-MLW-F-T2-M2 device connection, 5V RS232 serial cable DB9 female with power interface connects to HAC-MLW-T2-M2, 5V RS232 serial cable adapter connects to 220V urban electricity (HAC-MLW-F-T2-M2 Please refer to 5.3 sample meter standard data collection for the placement location).
   3. The QR code scanner is connected to the device, and the QR code scanner is connected to the PC.
2. **Infrared communication device connection**
   1. use a USB extended cable to connect the infrared communication device to the PC.

Meter data acquisition (wireless parameters configuration)
Place the HAC-MLW-F-T1-M2 and the standard water meter on the workstation, turn on the host computer and switch to the [Run meter Test] interface, use a magnet to trigger the standard water meter to report data, and wait for the remote end of the HAC-MLW-F-T2-M2 to return data. Adjust the distance between HAC-MLW-F-T2-M2 and the standard water meter so that the returned field strength value is around -80dBm. At this time,fix the position of HAC-MLW-F-T2-M2 , and use the magnet to trigger the standard water meter to obtain 10 packets of remote data. The average of the field strength value of 10 packets' data is the standard field strength value. The standard field strength value is used in the supported software to judge qualified threshold value of the field strength.

- It's shown as below,
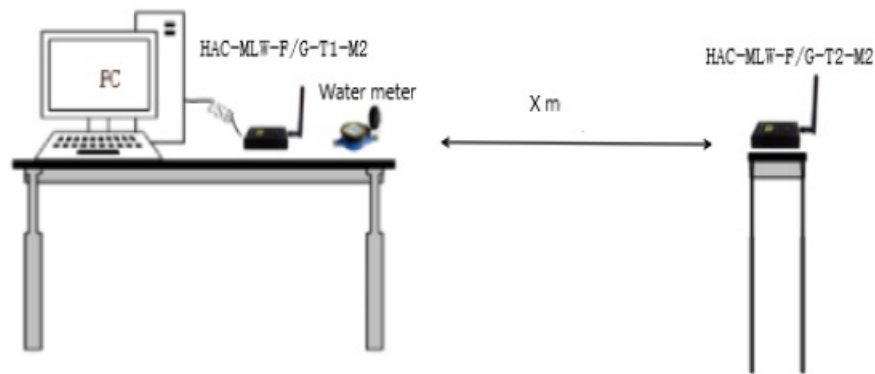
- The interface of parameters setting is below:

- Obtain the value of remote field strength:

Supported software
The software supports two communication methods, namely wireless communication and infrared communication. The software cannot use two communication methods at the same time, only one of them can be Used.

1. **Software installation**

   Don't need to install the supported software. Right-click the execute file (iHAC-Tool-AFP-MLW_V1.0.4_20220330.exe on the desktop and run it with the privilege of administrator.

2. **Interface -[Serial port setting]**

   1. Module serial port configuration, the serial port is selected according to the actual situation (please check the serial port in the device manager), the baud rate is 9600 bps, and no check.

   2. Scanner serial port configuration, there are two ways of scanner data interface: ①Serial port mode, configure it according to the actual situation of scanner; ②USB mode, do not need to configure the serial port parameters, just connect to the computer and use it.

   3. The qualified field strength threshold value of the water meter and HAC-MLW-F-T2-M2 communication, the qualified range of field strength value can be obtained by sampling the standard water meter (the standard value method: trigger the standard water meter by a magnet to obtain 10 packets of remote data, take the average of the field strength values in the 10 packets of data). For more details, please refer to the standard data collection of the sample meter in Figure 7.

   4. The voltage qualified value of battery is set to 3.6V.

   5. Language setting: choose Chinese or English display interface and report data

      It's shown as below:
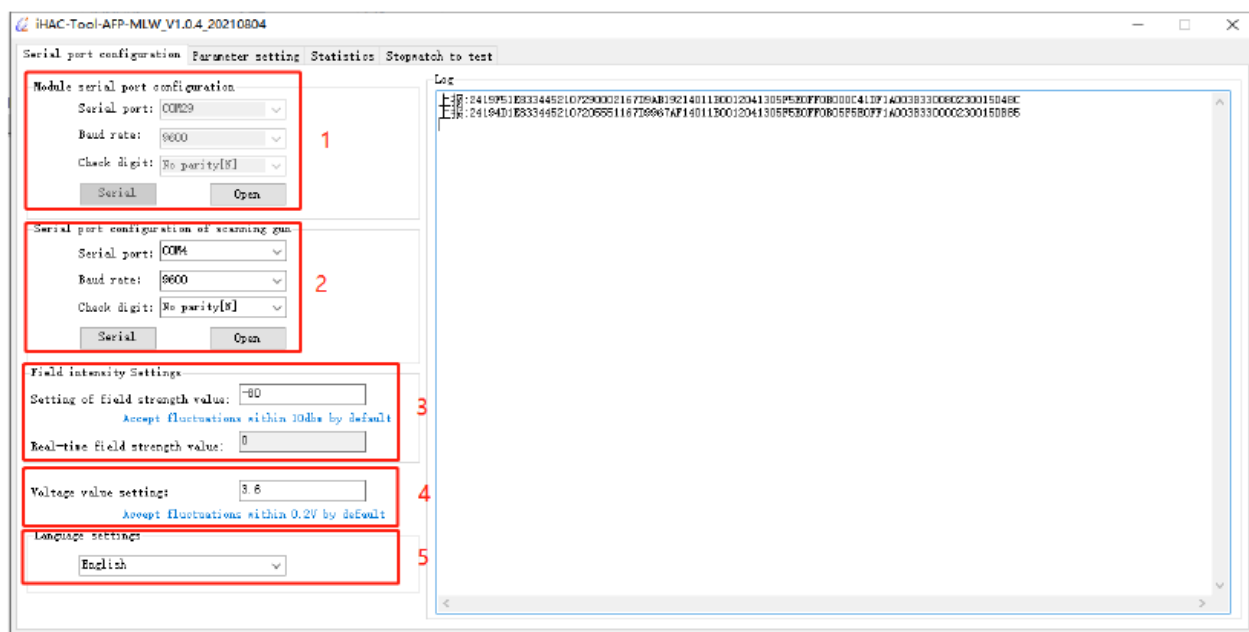
3. **Interface -[Parameters Setting]**

   1. "Use Remote", check "Use Remote" to enable the field strength value monitoring function of the fixed-distance communication between the water meter and HAC-MLW-T2-M2.

   2. "The base meter with valve control", when it detects valve control,it will be executed,otherwise,it will not be executed.

   3. "Parameters setting", preset water meter parameters, including meter type, measurement mode, pulse constant, maximum measurement value, current cumulative flow,meter number etc,among check "meter number automatically +1",the meter number automatically increase by 1 on the basis of the last set successfully,otherwise the meter number will remain unchanged.

   4. "DeviceEui", the DeviceEui of the water meter to be tested, scan the QR code label of the water meter with the scanner to quickly obtain the DeviceEui of the water meter.

   5. Network access parameters: preset DeviceEui, APPEUI, APPKEY of sample water meter. Among them, check "AppKEY transmitted or not", you can set DeviceEui, APPEUI, APPKEY, and if you don't transmit

AppKEY, you can only set DeviceEui.

6. Valve and frequency deviation parameters: preset the valve type and frequency deviation of the sample meter. Check the "valve and frequency deviation parameters" to set the sample meter frequency deviation and valve type, and if you don't select valve and frequency deviation parameters" , the valve type and frequency deviation parameters have been set at the factory, so there is no need to set under the normal condition.

7. Reporting parameter setting: preset the periodic reporting period of the sample meter, the time point of scheduled reporting, and the time of the sample meter. If "Synchronize the system time" is checked, the setting time is the current system time. Otherwise, the time of the sample meter can be customized.

8. Timing time setting: the time of the entire setting process after clicking the "Set" button.

9. After setting and presetting the parameters, click the "Setting" button to start the countdown. If the setting is not completed, the prompt "Failure, detection timeout" will be output on the right.

10. Real-time display of setting parameters and test results.

It's shown as below.

4. **Interface -[Data Statistics]**

After the test is passed, the last reported data will be recorded (the data will not be recorded when the test is unqualified), and the recorded data will be generated into an Excel and stored in the "ExcelFile" file in the installation directory.

It's shown as below:

5. **Interface-[Running Meter Test]**

Real-time display of data in the process of setting parameters, and supports valve control.

1. Valve control: fill in the DeviceEui number, click the button "valve open" or "valve close" , and then use a magnet to trigger the water meter to report data to achieve valve control.

2. Clear the data: click the button "Clear the Data" to clear the data displayed in the list.

It's shown as below:

Production Test Flow

The production setting steps can be referred as below:

1. Check "Use remote" and "Use IR communication".
2. Preset the parameters of sample meter.
3. Use the scanner to scan the QR code label of meter to obtain DeviceEui, or manually enter it.
4. Align the IR device vertically with the IR transceiver diode of the sample meter, and the distance between them is less than 8CM (if it's wireless communication mode,it can skip this step).
5. Touch the button of water meter 2 times immediately after clicking "Settings" (it must be longer than 2S, and the second touch must be completed within 5S after the touch time is less than 2S at the first time).Trigger the water meter to report data and set the parameters. After the setting is completed, the corresponding prompt message will be output on the upper right.

It's shown as below:

IR communication mode:

Precautions for production setup

1. Touch the button to report data twice. It must be greater than 2S at the first touch, and it must be completed within 5S at the second touch after the first touch and the touch time is less than 2S, otherwise the data reported by the touch is invalid

2. DeviceEui is the only address for communication between meter and the supported software. The DeviceEui entered by the supported software must be consistent with the DeviceEui of meter.

3. When the meter is connected to the Internet (the red light is always on) or when re-transmitting, the function of triggering "data report" is invalid.

4. There is a fault flag in the data reported by the meter, and the parameters can be set only after the fault flag is cleared.

5. Infrared communication will affect the communication between the product and infrared tools under strong light. It is necessary to avoid performing infrared communication under strong light.

6. Use wireless communication to set the parameters, try to avoid multi-station simultaneous production settings, and the production settings will interfere with each other. The more stations, the greater the interference, and the greater the probability of parameter failure.

7. When modifying APPKEY, the default value of APPEUI must be modified. The default value of APPEUI is 4841434D4C570001.

Infrared upgrade function

Supported software

1. **Software installation**

   Don't need to install the supported software. Right-click the executable file (iHAC-TOOL-UP-MLW.exe) on the desktop and run it with administrator privileges.

2. **Software interface**

   1. Serial port configuration: select the corresponding tool port according to the actual situation.
   2. Program loading: click "Read" to load the upgrade file (.mup).
   3. Program upgrade: After clicking "Upgrade", the software starts to perform the upgrade function. If it fails to communicate with module within 10 seconds, it will exit the state of upgrade waiting .
   4. Information display column: it shows upgrade status and information prompts in real time.
   5. Version display column: it shows the current version information of module.
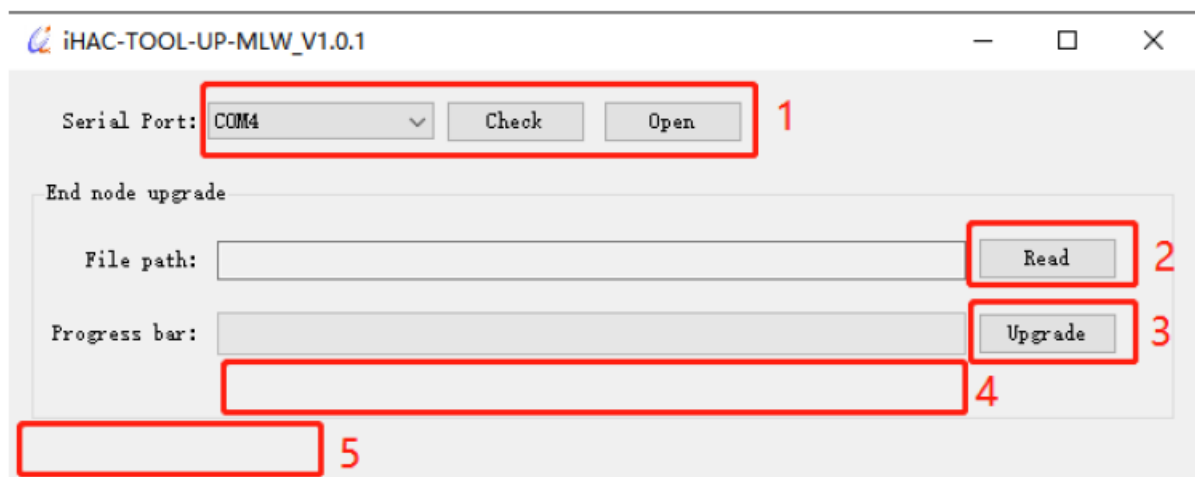

Upgrading Flow
The upgrading steps are as follows:

1. Select the corresponding tool port according to the actual situation.
2. Click "Read" to load the upgrade file (.mup).
3. Align the IR communication device vertically with the IR transceiver diode of the sample meter, and the distance between them is less than 8CM.
4. After clicking "Upgrade", immediately touch the button of meter twice (it must be longer than 2S at the first touch, and it must be completed within 5S at the second touch after the first touch and it's less than 2S) to make the meter enter IR communication mode.
5. Wait for the upgrade procedure to be completed. After the upgrade is completed, the corresponding prompt information will be output in the information display column.

   It's shown as below:
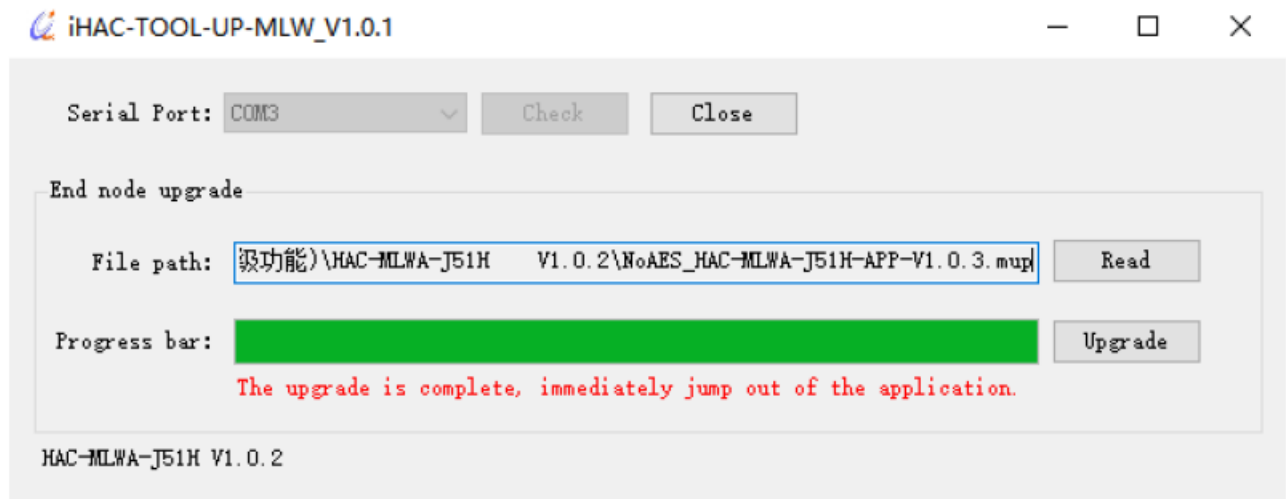
Detection

Magnetic Attack Detection

The Pulse Reader detects every 2S. When a malicious magnetic attack is detected, an alarm flag of magnetic attack and a historical magnetic attack will be generated immediately. If there is no magnetic attack detected for continuous 10 seconds, the alarm flag will be automatically cleared. The historical magnetic attack alarm flag must be successfully reported to the cloud platform before it can be automatically cleared. Neither the detected nor the cleared magnetic attack alarm will actively report data.

Low Voltage Detection

When the battery voltage is lower than 3.2V and the duration is longer than 30S, a low-voltage alarm flag will be generated. When the battery voltage is greater than 3.4V and the duration is greater than 60S, the low-voltage alarm will be cleared. The battery voltage 3.2V to 3.4V will not handle the low-voltage alarm flag. Neither detection of low-voltage alarm nor clearing of low-voltage alarm will actively report data. The accuracy of voltage detection is less than 0.1V.

Disassembly Alarm Detection

The Pulse Reader detects every 2s. When it detects malicious disassembly, it will generate the alarm sign. Only after malicious disassembly has not been detected for 10 consecutive seconds and the data has been successfully reported to the cloud platform can the disassembly alarm flag be automatically cleared. Neither the detecting nor the clearing of the disassembly alarm will actively report data.

Monthly and Yearly Data Storage

The Pulse Reader can save 10 years of annual frozen data and monthly frozen data of the last 7 months.

Disclaimers

Sales and service
You can contact the sales staff of Shenzhen HAC Telecom Technology Co., Ltd. to purchase modules and development kits.

Address: 9th Floor,Block A, Building 1, International Innovation Valley, Xingke 1st street, Nanshan district, Shenzhen, Guangdong
Tellphone: 0755-23981076/1077/1078/1079
Service hotline: 18565749800
Sales Manager: liyy@rf-module-china.com
Website: www.haccom.cn

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.

Documents / Resources

WRW-E1 electronic backpack
Installation and operation instructions

HAC WRW-E1 Pulse Reader [pdf] Instruction Manual
HAC-WRW-E1, WMUHAC-WRW-E1, WMUHACWRWE1, WRW-E1 Pulse Reader, WRW-E1, WRW-E1 Reader, Pulse Reader, Reader

References

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