

## 1 General

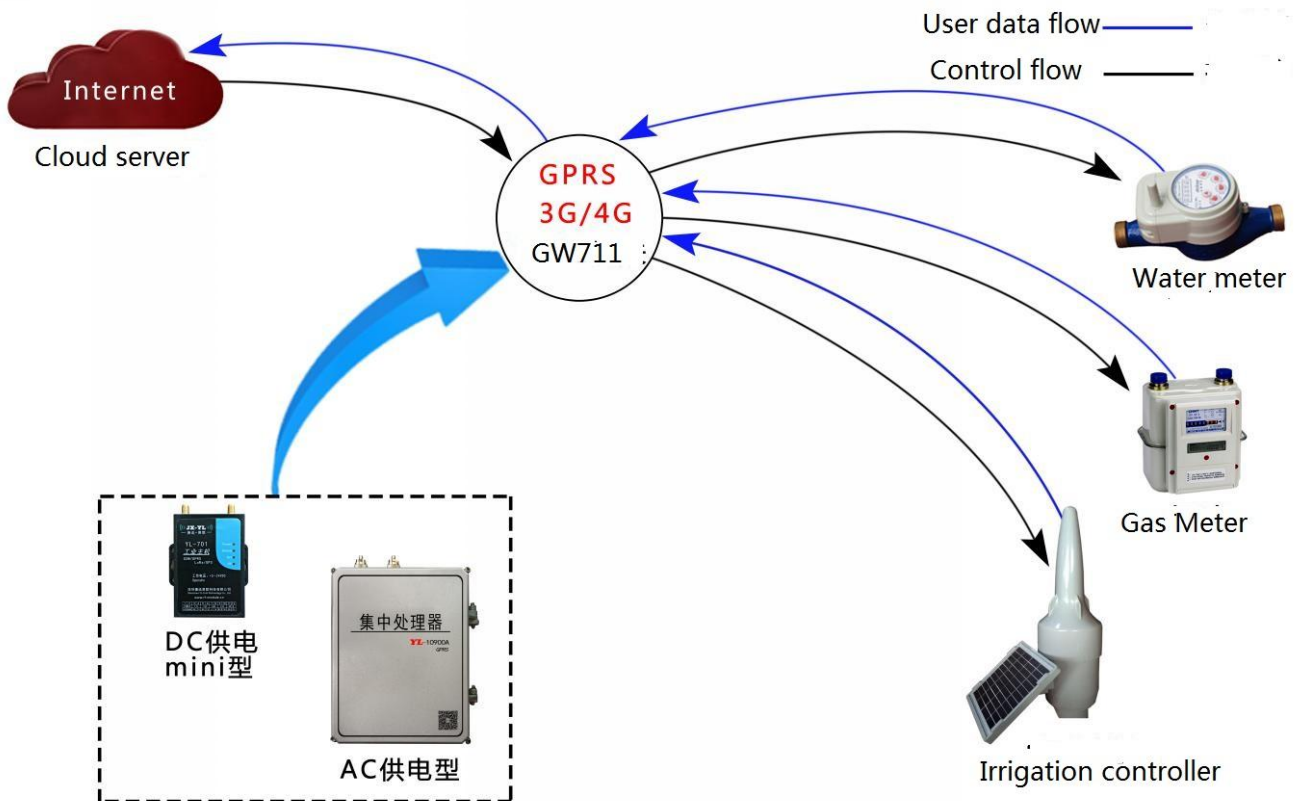
The document mainly introduces direct communication between the gateway and the server. This system is mainly suitable for active control of water meters, gas meters, and agricultural irrigation and node low power consumption. Customers only need to do their own server application to achieve control.

The main frameworks are nodes, gateways, and cloud servers. The following picture indicates the nodes, gateways, and cloud servers in the network.

GW711 is a high-performance, low-power, long-distance micro-power star wireless network gateway module. It adopts internal automatic spread spectrum calculation and preamble CRC error correction processing which provide a transparent link. This gateway can not only realizes the direct communication with the cloud server, but also realizes the direct communication with the LoRa node. The RF chip is based on spread-spectrum frequency hopping technology.

# LoRa gateway GW711 V2.0





## 2 Features

- Public GPRS/LTE network transmission
- Based on LoRa spread spectrum modulation
- 420-450MHz free application band, other frequency bands can be customized
- Standard power transmission, standard 2w, 7 levels adjustable.
- Receive sensitivity up to -148dBm, maximum transmit power +33dBm
- High performance industrial grade 32-bit communication processor
- Adopt a complete anti-drop mechanism to ensure that the data terminal is always online
- Built-in 15KV ESD protection for SIM/UIM card interface
- Industrial terminal interface, especially suitable for industrial field applications
- Production free debugging, 5V-24V wide voltage range

- Support serial software upgrade and remote maintenance
- Embedded standard TCP/IP protocol stack for transparent data transmission
- High efficiency forward error correction coding technology and frequency hopping mechanism, strong anti-interference ability and low bit error rate
- Flexible setting of module parameters via software or microcontroller commands
- Built-in watchdog to ensure long-term reliable and stable operation
- Open and effective communication distance of 6-8 km

### 3 Application:

- Automated Meter Reading (AMR)
- Remote control, remote measurement system
- Access control
- Data collection
- Identification system
- IT household appliance
- Wireless alarm system

### 4 Maximum specification

Item	Specification	
Mode&band	2G	GSM850/900/1800/1900MHz GSM phase 2/2+
	4G	FDD-LTE/TDD-LTE/WCDMA/TD-SCDMA/CDMA/GSM
Bandwidth	2G	GSM: Downlink≤85.6Kbps, Uplink≤42.8Kbps
	4G	FDD-LTE : Downlink≤100Mbps, Uplink≤50Mbps TDD-LTE : Downlink≤61Mbps , Uplink≤18Mbps WCDMA : Downlink≤42Mbps , Uplink≤5.76Mbps

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		TD-SCDMA: Downlink $\leq$ 4.2Mbps, Uplink $\leq$ 2.2Mbps CDMA : Downlink $\leq$ 5.4Mbps, Uplink $\leq$ 14.7Mbps
Output power	2G	GSM850/900 : $\leq$ 33dBm GSM1800/1900: $\leq$ 30dBm
	4G	GSM850/EGSM900 : 33dBm $\pm$ 2dB; DCS1800/PCS1900: 30dBm $\pm$ 2dB; CDMA : 24dBm+6/-1dB WCDMA : 24dBm+1/-3dB; TD-SCDMA : 24dBm+1/-3dB LTE FDD : 23dBm $\pm$ 2dB; LTE TDD : 23dBm $\pm$ 2dB
Sensitivity	2G	$\leq$ -107dBm
	4G	GSM850/PCS1900: -109dBm CDMA : -107 dBm WCDMA : -110dBm TD-SCDMA: -109dBm LTE FDD : -99dBm LTE TDD: -98dBm
CPU	Cortex M3	
Serial Baudrate	4800—115200 bit/s	
Antenna Connector	SMA	
SIM/UIM interface	SIM/UIM card interface standard drawer user card interface, support 1.8V/3V SIM/UIM card, 15KV ESD protection	
Power interface	Industrial socket. built-in power supply reverse phase protection and overvoltage protection	
Standard power	DC 12V/1A	
Voltage range	DC 5V—24V	
Power consumption	50-90mA@12VDC; 115-165mA@5VDC	
Enclosure	Metal, IP30 level	
Dimension	91mm*72.5mm*21.8mm	
Operation	-25~+65 °C (-13~+149°F)	

Temperature	
Storage Temperature	-40~+85 ℃ (-40~+185°F)
Operation Humidity	10%-95%

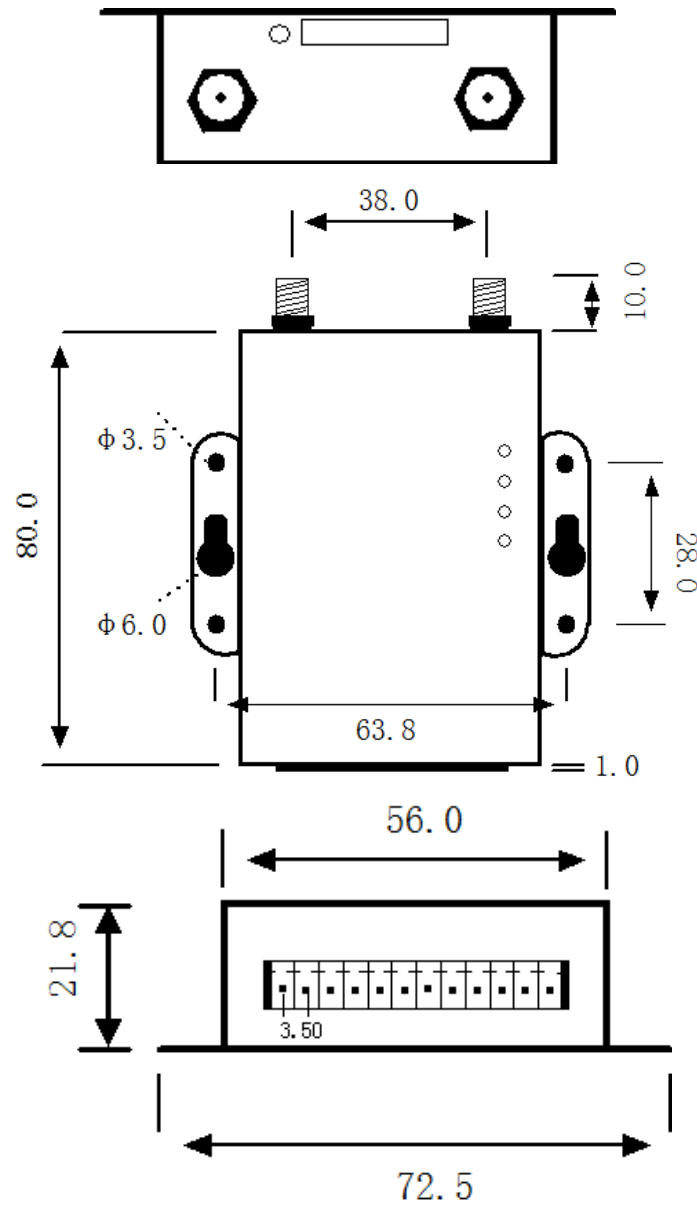
## 5 Pin Out:

GW711 module has 12 pins. Refers to the Table 1:

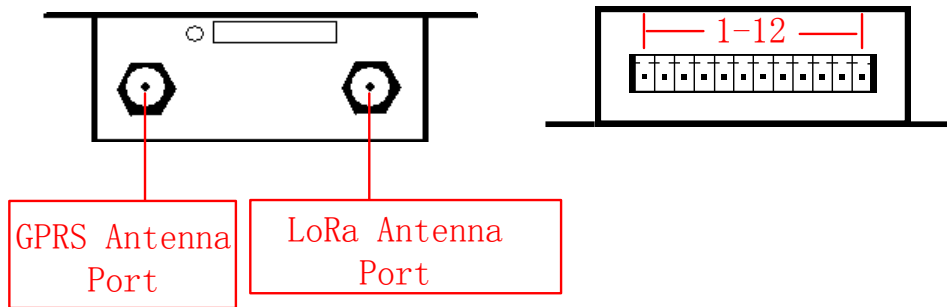
GW711			
Pin NO.	Pin Name	Function	Description
1	VCC	Power	Power supply DC 4.5V-6.5V
2	GND	Ground	Grounding of Power Supply
3	TX0	Input	TXD: UART User data output, TTL level
4	RX0	Output	RXD: UART User data input, TTL level
5	P0	GPIO	General Output/Input pin
6	P1	GPIO	General Output/Input pin
7	P2	GPIO	General Output/Input pin
8	P3	GPIO	General Output/Input pin
9	TX1	Input	TXD: Configuration command output, TTL level
10	RX1	Output	RXD: Configuration command input, TTL level
11	P4	GPIO	General Output/Input pin
12	P5	GPIO	General Output/Input pin

**Table 1: Pin definition**

## 6 Dimension



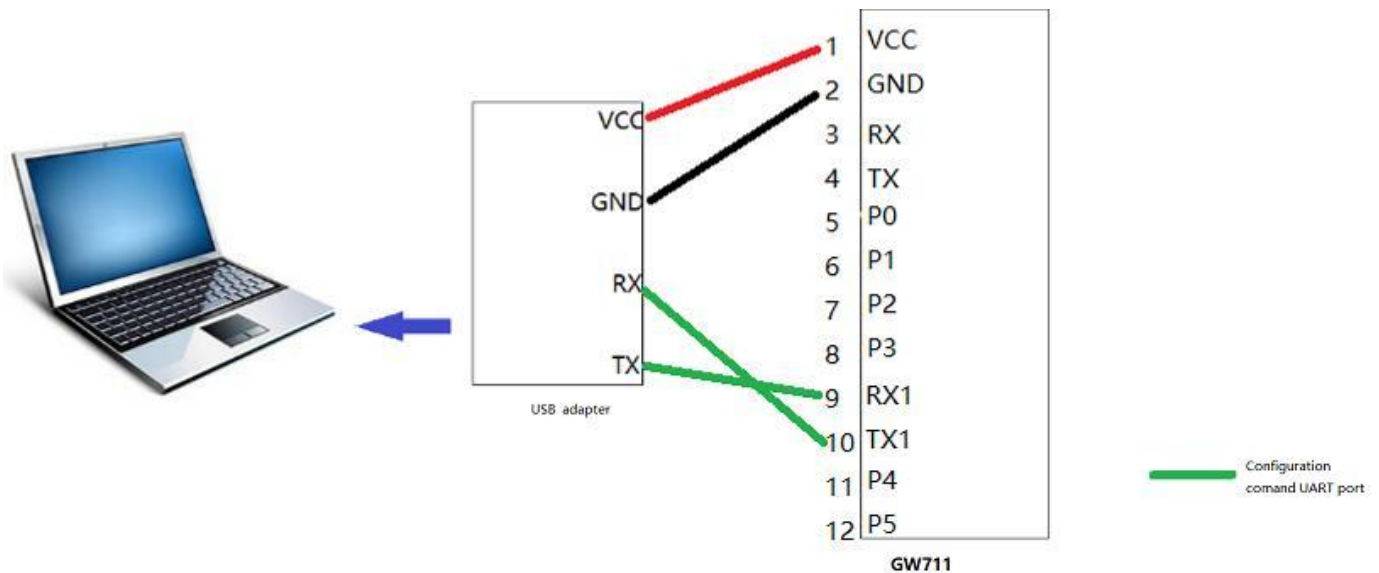
Unit:mm



## 7 Parameter Configuration

### 7.1 GPRS/4G configuration

1, Connecting gateway with the Windows Laptop. User can adopt USB adapter connect gateway with laptop via USB port. As it is shown in 7.1



After finish the hardware connection, users can insert the SIM card into the gateway and power it on.  
 For 2G: The red light is always on. When the yellow light flashes and the green light flashes slowly, the Gateway initialization is complete before the setting operation can be performed.  
 For 4G: The red light is always on, waiting for the yellow light to finish flashing, the blue light is on to



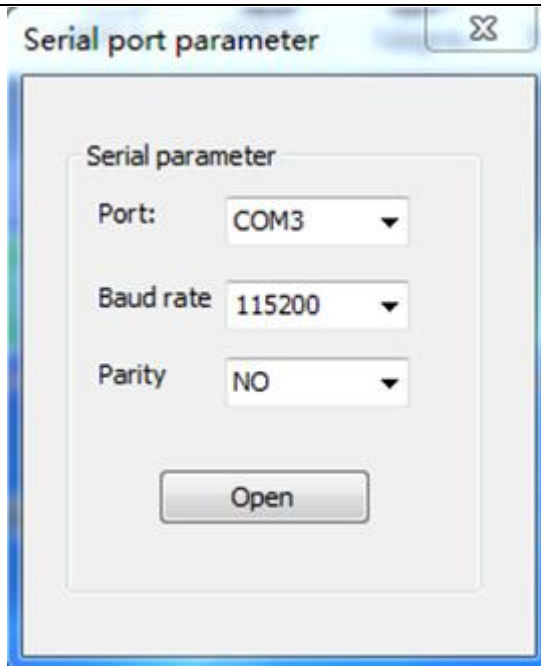
## LoRa gateway GW711 V2.0

indicate that there is 4G signal, the red light is on to indicate that there are other network signals, and the Gateway initialization is completed before the setting operation can be performed.

According to the GW711, we develop this RF tool to configure the parameter of Gateway GW711. The RF tool consists of serial port parameter, DTU parameter. We will introduce the RF tool as follow:



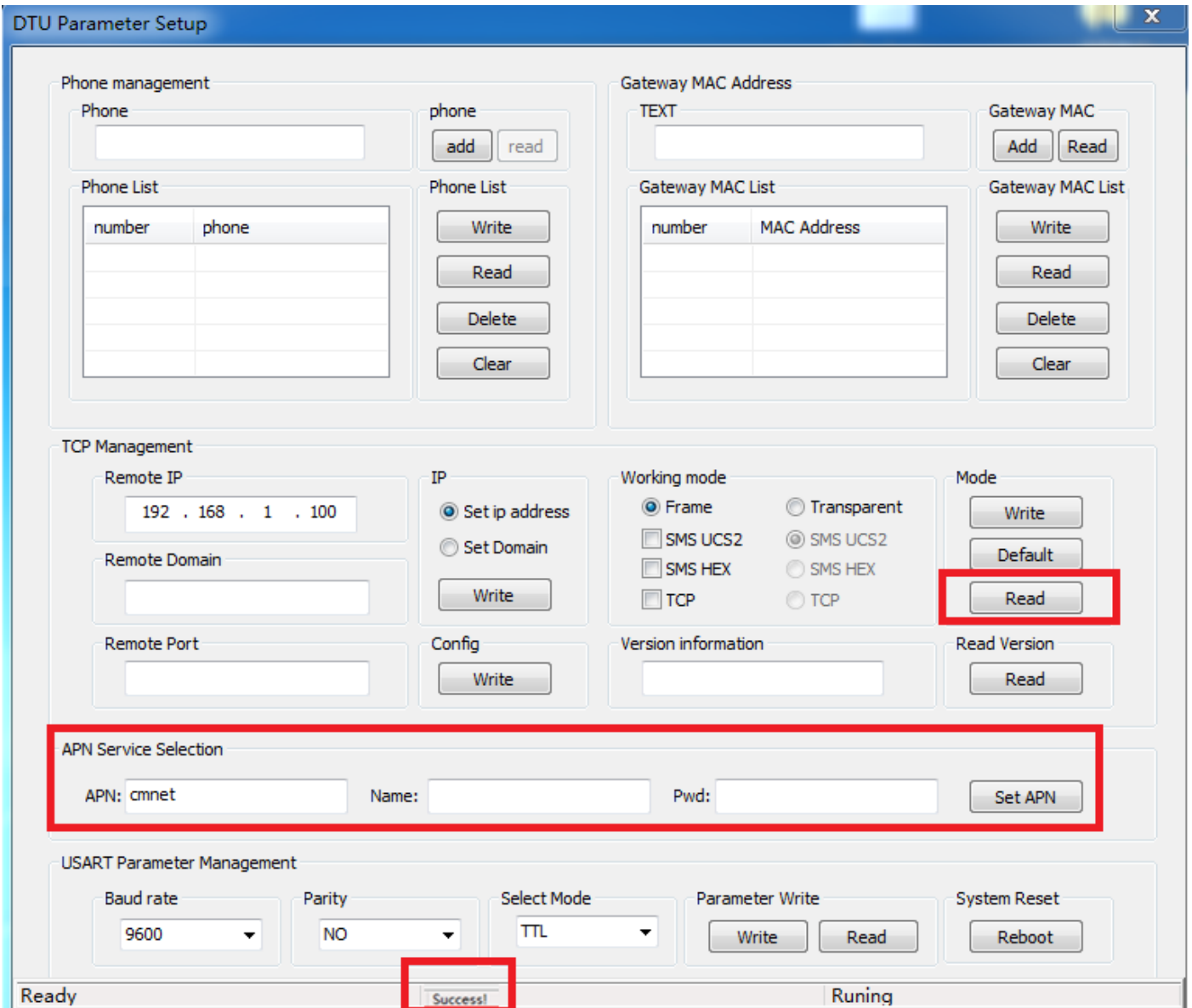
Serial port parameter: mainly for the connection between the computer and GW711, you can select the serial port, choose to set the serial port number of the serial port connection, select the baud rate 115200, verify the default NO, open the serial port.



DTU parameter setting: mainly used for TCP server management of modules to add server address and port number

Communication ID Management: Read Gateway MAC address

Successful setting will have a success reminder in the bottom.



We add the APN configuration for some private APN setting.

## 7.2 Hex command Between Gateway GW711 and cloud server.

This chapter describes the hex command about the data transfer between the gateway and the cloud server. They are the parameter configuration of LoRa parameters and the acknowledge after the hex command is executed.

Hex command Structure:

Head code	Gateway MAC address	Command Class	Command Type	Length	data	CRC	End bit
0X68	6 bytes	1 byte	1 byte	LEN(2 bytes)	N bytes	CRC(2bytes)	0X16

Frame header: Fixed 0x68.

Gateway MAC address: The Mac address of gateway. This is Gateway ID that can not be modified.

Command Class: The class of hex command.

Command Type: The type of hex command.

Data Length: The length of the data. It indicates how many bytes the data have.

Data: Data that needs to be delivered or excuted.

Check CRC: Check the previous data for CRC16.

End of frame: fixed 0x16.

## 7.2.1 LoRa parameter configuration command: 0xE1, 0xA5

Command Class: 0XE1

Command Type: 0xA5

Command Description: This command is used for lora parameter configuration of GW711.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

## LoRa gateway GW711 V2.0

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA5 0x00 0x07 NN (7Byte parameter) CRC  
0x16

Acknowledge from gateway: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA5 0x00 0x01 XX CRC  
0x16

XX=0; Configuration successfully;

XX=1; Configuration failed, CRC error.

The LoRa parameter has 7 bytes. There are Frequency(3 bytes), Breath Time(1 byte), Breath Period(1 byte), Network ID(1 byte), Transmit Power(1 byte)

Frequency	Breath period	Wake timer	Net ID	Output power
3 Bytes	1 byte	1 byte	1 byte	1 byte

Parameter	Unit	Length(Byte)	Decription
Frequency	KHz	3	XX YY ZZ The calculation fomula is frequency *10 <sup>9</sup> /61035 and convert it to Hex value. For example: 433MH: 433*10 <sup>9</sup> /61035=7094290 Convert Demical value 7094290 to Hex value 6C4012. So the Hex code for 433MHz is 0x6C, 0x40, 0x12.
Breath period	Chips	1	00=2s, 01=4s, 02=6s, 03=8s, 04=10s
Wake Timer	Kbs	1	00=2 ms, 01=4 ms, 02=8 ms, 03=16 ms, 04=32 ms, 05=64ms
Net ID		1	The net ID should be same as LoRa module.
Output power	dBm	1	1~7; 1 refers to 20dBm and 7 for 33dBm

### 7.2.2 Restart gateway command: 0xE1, 0xA6

Command Class: 0XE1

Command Type: 0xA6

Command Description: This command is used for restart gateway.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA6 0x00 0x01 0x00 CRC 0x16

Acknowledge from gateway: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA6 0x00 0x01 XX CRC  
0x16

XX=0; Restart successfully;

XX=1; Restart failed, CRC error.

### 7.2.3 Set the cloud server domain of Gateway

Command Class: 0XE1

Command Type: 0xA7

Command Description: This command is used for set the cloud server domain of Gateway.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA7 0x00 0x26 "www.appconwireless.com"  
CRC 0x16

Acknowledge from gateway: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA7 0x00 0x01 XX CRC  
0x16

XX=0; Set successfully;

XX=1; Set failed, CRC error.

[www.appconwireless.com](http://www.appconwireless.com) is the domain of cloud server. Users should be active the parameter after the gateway restart.

## 7.2.4 Set the cloud server IP of gateway

Command Class: 0XE1

Command Type: 0xA8

Command Description: This command is used for set the cloud server IP of Gateway.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA8 0x00 0x04 AA BB CC DD CRC 0x16

Acknowledge from gateway: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA8 0x00 0x01 XX CRC  
0x16

XX=0; Set successfully;

XX=1; Set failed, CRC error.

AA BB CC DD is the IP of cloud server. Users should be active the parameter after the gateway restart.

## 7.2.5 Set the cloud server port of gateway

Command Class: 0XE1

Command Type: 0xA9

Command Description: This command is used for set the cloud server port of Gateway.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA9 0x00 0x02 AA BB CRC 0x16

Acknowledge from gateway: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA9 0x00 0x01 XX CRC  
0x16

XX=0; Set successfully;

XX=1; Set failed, CRC error.

AA BB is the port of cloud server. Users should be active the parameter after the gateway restart.

### 7.2.6 Read the cloud server IP of gateway

Command Class: 0XE1

Command Type: 0xAA

Command Description: This command is used for read the cloud server IP of Gateway.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xAA 0x00 0x01 00 CRC 0x16

Acknowledge from gateway: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xA9 0x00 0x01 XX CRC  
0x16

XX is the port of Cloud server.

### 7.2.7 Read the LoRa parameter of gateway

Command Class: 0XE1

Command Type: 0xAB

Command Description: This command is used for read the LoRa parameter of Gateway.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)



Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xAB 0x00 0x01 00 CRC 0x16

Acknowledge from gateway: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE1 0xAB 0x00 0x07 XX CRC  
0x16

XX is the lora parameter.

### **7.2.8 Cloud server send the data to the Lora module via gateway(Central and Node mode)**

Command Class: 0XE4

Command Type: 0xA1

Command Description: This command is used for Cloud server send the data to LoRa module via the Gateway. The lora module is in the CAD listening mode such as RF1276T module. The gateway send the preamble to wake up the lora module. The RF1276T module should be set as Node module. The Gateway is running in the Central mode.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE4 0xA1 NN(2 Bytes) MM(data) CRC 0x16

There is no acknowledge from gateway.

NN is the length of data.

The LoRa module RF1276T should be in the Node mode. It opens the CAD listening function to receive the preamble from gateway. The parameters of wake timer, breath period and network ID should be the same for both gateway GW711 and RF1276T module.

### **7.2.9 Cloud server send the data to the Lora module via gateway(Standard mode)**

Command Class: 0XE4

Command Type: 0xA2

Command Description: This command is used for Cloud server send the data to LoRa module via the Gateway. The LoRa module is in the standard mode such as RF1276, RF1276T and RF1276D27.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE4 0xA2 NN(2 Bytes) MM(data) CRC 0x16

There is no acknowledge from gateway.

NN is the length of data.

Gateway	RF1276 parameter	
Wake timer 2ms	RF_factor 128	RF_BW 125K
Wake timer 4ms	RF_factor 256	RF_BW 125K
Wake timer 8ms	RF_factor 512	RF_BW 125K
Wake timer 16ms	RF_factor 1024	RF_BW 125K
Wake timer 32ms	RF_factor 4096	RF_BW 250K
Wake timer 64ms	RF_factor 4096	RF_BW 125K

### 7.2.10 Cloud server send the data to the Lora module via gateway(Express communication mode)

Command Class: 0XE4

Command Type: 0xA3

Command Description: This command is used for Cloud server send the data to LoRa module via the Gateway. The LoRa module is RF1276T and RF1276TS. The RF1276T is in the Node mode and run at Express communication mode.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE4 0xA3 NN(2 Bytes) MM(data) CRC 0x16

There is no acknowledge from gateway.

NN is the length of data.

### 7.2.11 The heart-beat data packet between Cloud server and the gateway

Command Class: 0XE5

Command Type: 0x00

Command Description: This command is used for the heart-beat packet between Cloud server and gateway.

E.g: (0x00 0x00 0x00 0x00 0x00 0x01 is the mac address of gateway)

Command: 0x68 0x00 0x00 0x00 0x00 0x00 0x01 0xE5 0x00 NN(2 Bytes) MM(data) CRC 0x16

There is no acknowledge from gateway.

NN is the length of data.

MM is the data which can be customized by user.

Note: After logging into the server, The heart-beat packet is the gateway send to the cloud server. If there are other commands, the heartbeat will be delayed. The period of heart-beat packet is 40 second .

GW711 resever the DTU transparent transmission function. If the cloud server sends the data not in the format of hex command, the data will output from the user data serial port(3 pin, 4 pin). And also the user data serial port will transfer the data to cloud server.

- a) GW711-GPRS
- b) GW711-LTE

## 9 Q&A:

Questions and Answers	
Can not communicate between two devices	1. The communication protocol is different between two modules, for instance: data rate and checkout.
	2. The frequency or RF data rate is different between two communicated modules.
	3. They are not the same kind products.
	4. The connection between module and terminal is wrong.
	5. The module is wrong.
	6. The setting of EN is wrong.
	7. The communication distance exceeds the range, or the connection of antenna is bad.
Short	1. The supply voltage exceeds range

communication distance	2. The ripple of power is too big.
	3. The connection of antenna is bad or it is a wrong kind of antenna
	4. Antenna is too close to the surface of metal or the ground
	5. Receiving circumstance is very bad, for instance buildings and strong interference.
	6. There is interference of the same frequency
	1. Wrong setting of COM, for example, Baud rate is wrong
Receive wrong data	2. The connection of UART is wrong.
	3. The cable to the UART is too long.

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