



Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



E90-DTU (400SL22-GPRS)

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1.Overview

1.1 Introduction



E90-DTU (400SL22-GPRS) is a data transmission station from radio frequency to GPRS network server, which realizes the transparent data transmission between sub-1g and GPRS network. The sub-1g radio frequency transceiver is based on SEMTECH SX1262 radio frequency chip and supports LoRa spread spectrum technology. It is equipped with high-performance MCU internally, which enables the module to have a variety of transmission modes. At the network end of GPRS network, the radio supports LTE-FDD/TTE-TDD /WCDMA/ TD-SCDMA /CDMA/GSM wireless communication data transmission, and supports LTE-FDD, LTE-TDD, dc-HSDPA, HSPA+, HSDPA, HSUPA, WCDMA, TD-SCDMA, CDMA, EDGE and GPRS network data connection.

E90-DTU (400SL22-GPRS) can be directly connected to the upper computer via USB cable for parameter configuration, without the need to install the driver, it is easy to change user-defined parameters.

This chapter is a quick introduction to E90-DTU (400SL22-GPRS) products. It builds the simplest hardware environment to test the network transmission function of E90-DTU (400SL22-GPRS), that is, to realize the two-way transmission of data from RF module to the network server.

1.2 Features

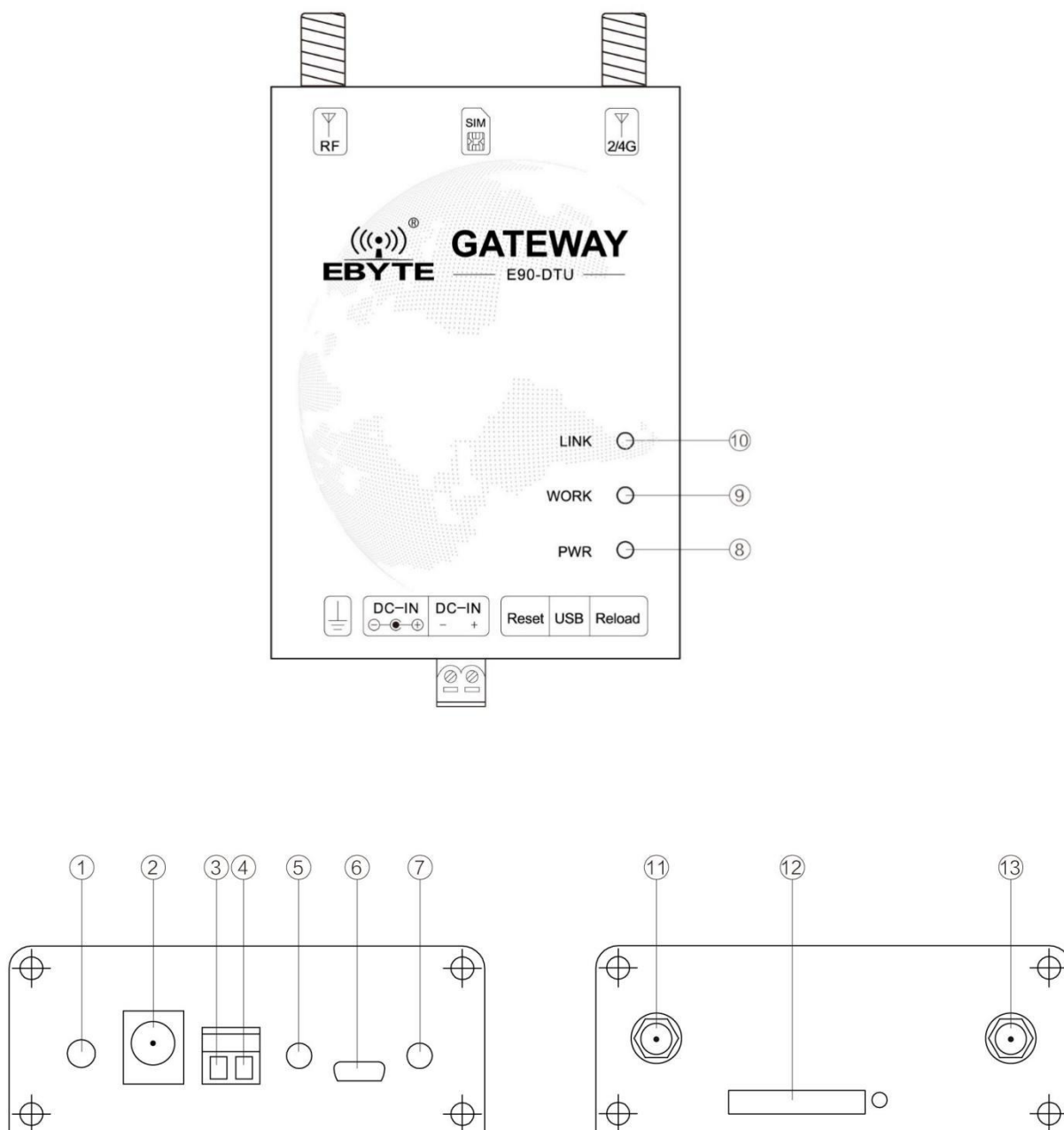
- Can meet almost all M2M application needs;
- Support transparent data transmission, support TCP, UDP network protocol, support heartbeat package, registration package;
- Support serial port caching function, the serial data can be cached to local before establishing connection with the server;
- The maximum downlink rate of GPRS data was 85.6 KBPS, and the maximum uplink rate was 85.6 KBPS.
- Software/hardware dual door design, system stability, never crash;
- Sub-1g radio frequency;
- The measured communication distance of RF can reach 5km.
- Support global license-free ISM 433mhz, including 470mhz for metering reading;
- Support data transmission rate of 0.3kbps ~ 62.5kbps;
- Based on SX1262/1268 development, support the new generation of LoRa technology;
- Support RSSI for evaluating signal quality, improving communication network, ranging;
- Support LBT, monitor channel environment noise before sending, improve communication success rate;
- Industry-standard design, support - 40 ~ 85 ° C for a long time use;
- Use USB to connect the computer, no need to install the driver, connected to the computer can be configured parameters.
- Support 8~28V wide voltage supply, DC power supply base and terminal power supply.
- The power supply has good over current, over voltage, anti - reverse connection and other functions.

1.3 Station system parameters

| Parameter type | Parameter Name | The parameter value | Description |
|------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Characteristic parameters | Support Frequency | Quad-frequency: GSM850, EGSM900, DCS1800, PCS1900 Module can automatically search frequency Frequency selection can be set with the AT command Conform to GSM Phase 2/2+ | - |
| | GPRS Connection characteristics | GPRS multi-slot class 12 (default) GPRS multi-slot class 1~12 (configurable) GPRS mobile station class B | - |
| | GPRS Data features | GPRS data downlink transmission: up to 85.6 KBPS GPRS uplink data transfer: up to 85.6 KBPS Coding formats: cs-1, cs-2, cs-3 and cs-4 Supports the PAP (password verification protocol) protocol commonly used for PPP connections Support for protocols commonly used for CHAP (query handshake authentication protocol) The built-in protocols: TCP/UDP/FTP/PPP/HTTP/NTP/MMS/SMTP/PING, etc. Support for unstructured supplementary data services (USSD) | - |
| | The antenna interface | SMA interface, NET signal output, 50ohm characteristic impedance | - |
| | Transmission Power | Class 4 (2W): GSM850 and EGSM900 Class 1 (1W): DCS1800 and PCS1900 | - |
| RF Characteristic parameters | The air rate | 2.4kbps | 8 adjustable level (0.3、1.2、2.4、4.8、9.6、19.2、38.4、62.5kbps) |
| | WOR role | receiver | Can be configured as a receiver/sender |
| | WOR cycle | 2000ms | 500ms~4000ms It can be configured as 500ms~4000ms |
| | Transport mode | Transparent Transmission | Can be configured for transparent transmission or fixed-point transmission |
| | The module address | 0~65535 | Default address 0 |
| | working frequency | 410.125MHz-493.125 | Default 433.125MHz, channel number 80, channel interval 1MHz |
| | Transmission power | 22dBm | level 4 adjustable (22, 17, 13, 10dBm) |
| | Receiving sensitivity | -138dbm@0.3kbps | The receiver sensitivity is independent of the baud rate and delay time |
| | Baud rate | 115200 bps | No modification supported |
| | The antenna interface | SMA Interface | RF signal output, 50 ohm characteristic impedance |
| Station system parameters | Flow loss value (typical value) | 66.5mA@12V | Idle state, no data transmission |
| | Working temperature | -30°C~+70°C | Extended to 40 °C ~ + 85 °C temperature |
| | Working voltage | DC 8~28V | Recommend 12V/24V power supply |
| | Size | 108*75*37mm | Overall size (excluding antenna) |

| 3GPP Frequency | 1 Timeslot | 2 Timeslot | 4 Timeslot |
|----------------|------------|------------|------------|
| CS-1 | 9.05kbps | 18.1kbps | 36.2kbps |
| CS-2 | 13.4kbps | 26.8kbps | 53.6kbps |
| CS-3 | 15.6kbps | 31.2kbps | 62.4kbps |
| CS-4 | 21.4kbps | 42.8kbps | 85.6kbps |

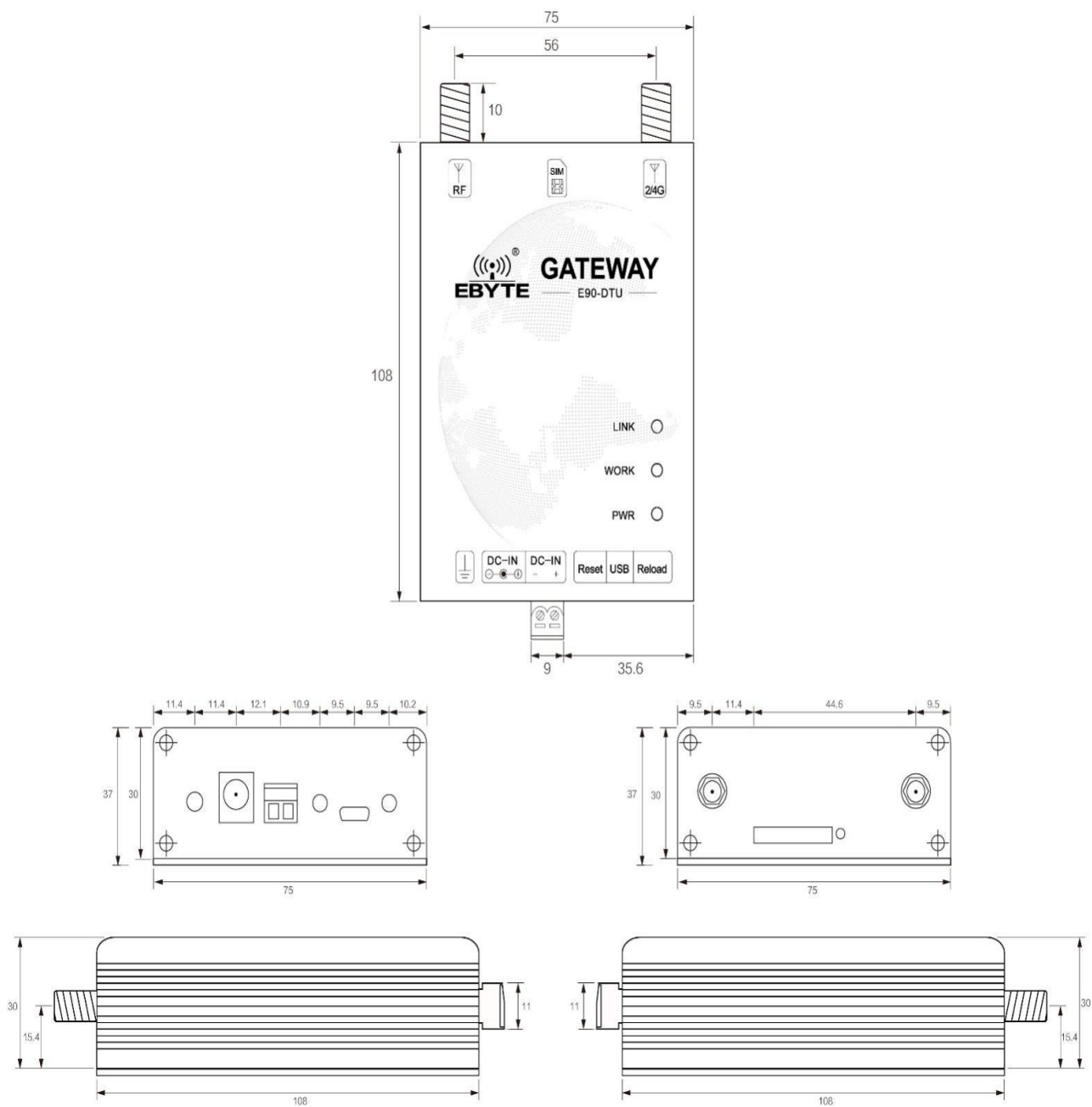
1.4 Pin Description



| No. | Name. | Function |
|-----|-----------------|-------------------------------------------------------------------------------------------------|
| 1 | Grounding screw | Ground connection |
| 2 | DC_IN | Power adapter interface, power supply range 8~28V, recommended 12V/24V |
| 3 | DC_IN- | Power reference ground |
| 4 | DC_IN+ | Power input, power supply range 8~28V, recommended 12V/24V |
| 5 | Reset | System reset button, long press time no requirement |
| 6 | USB | Micro USB: parameter configuration interface |
| 7 | Reload | Press 4~10s to restore the factory Settings |
| 8 | PWR | Red: power indicator |
| 9 | WORK | Yellow: data transmission indicator light; The light flashes when there is data transmission |
| 10 | LINK | Yellow: network indication, always on after net |
| 11 | NET | 4 G/GPRS antenna interface (SMA - K external thread hole, 50 Ω characteristic impedance) |
| 12 | SIM | SIM card slot |
| 13 | RF | RF antenna interface (SMA - K external thread hole, 50 Ω characteristic impedance) |

Note: it is recommended to connect the housing with the earth through grounding screws.



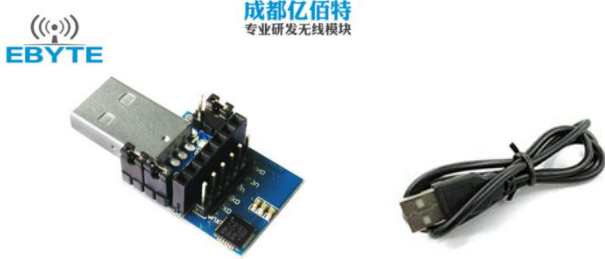

1.5 Size



2 Quick start

2.1 Hardware preparation and communication testing

Before the test, connect the power supply, USB cable, SIM card (insert the gap outwards), antenna and other hardware according to the recommended circuit. If the power cable is successfully connected, the PWR indicator will always be on.

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
|  | <p>12V/1A电源 放心的电源适配器 3C认证，使用安心</p>  |
| <p>E90-DTU (400SL22- GPRS) device and E22-400TXXS module</p>  | <p>5V—20V Power adapter</p>  |
| <p>USB switch to TTL module and USB wire</p> | <p>GPRS/LTE Sucker antenna</p> |

Computer browser visit Chengdu Ebyte official website: www.ebyte.com, download the latest E90-DTU (400SL22-GPRS) series product configuration tools, E22 series product configuration software and serial assistant (this article USES XCOM), install USB 232/485 driver, run the software!

1. After connecting the E22-400TXXS module with the USB-to TTL module, open the officially provided E22 configuration tool and select the corresponding COM number. If the COM number cannot be selected, check whether the serial driver is installed correctly.



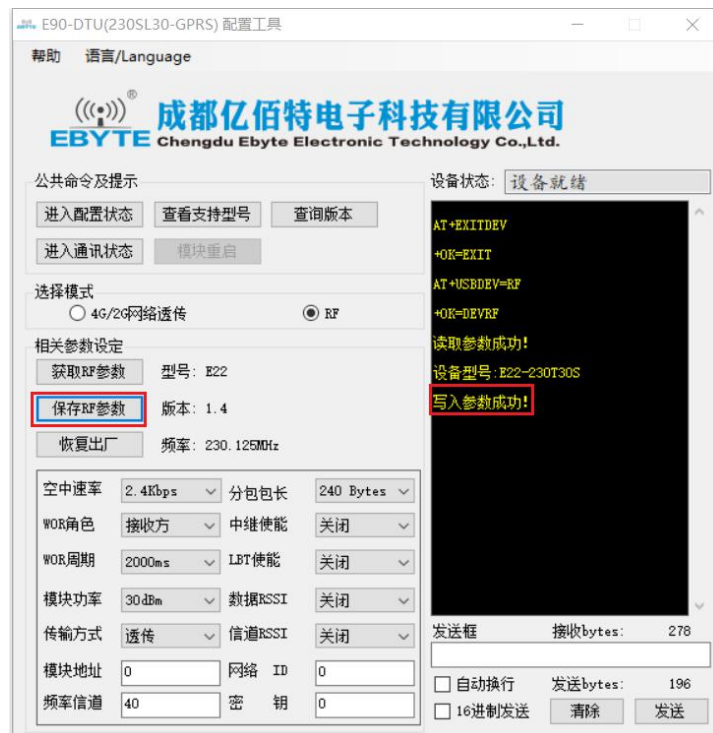
- Open the officially provided E90-DTU (400SL22-GPRS) configuration tool. If the USB is correctly connected, the message box on the right side will prompt "device ready".



- After entering the GPRS/2G network pass-through configuration mode, the parameters of GPRS/2G module can be configured in the "setting relevant parameters" box. After the configuration is completed, click the "save NET parameters" button, and the upper computer will prompt "save all parameters successfully". After completion, as shown in the following figure:



- Switch from "GPRS/2G network transmission" to "RF", and the device model information will be displayed in the message box on the right. The user configures the RF module in the "setting of relevant parameters". After the configuration is completed, click the "save RF parameters" button. After completion, as shown in the following figure:



- After the configuration of module parameters, if the parameters in the mode of "GPRS/2G network transmission" are modified, the "GPRS/2G network transmission" mode shall be modified again. Click the button of "module restart" in the box of "public commands and prompts" to make the modified GPRS/2G parameters take effect and

automatically enter the communication state; If the parameters in the mode of "GPRS/2G network transmission" are not modified, there is no need to click the "module restart" button and directly click the "enter communication state" button in the RF mode. After completion, as shown in the following figure:

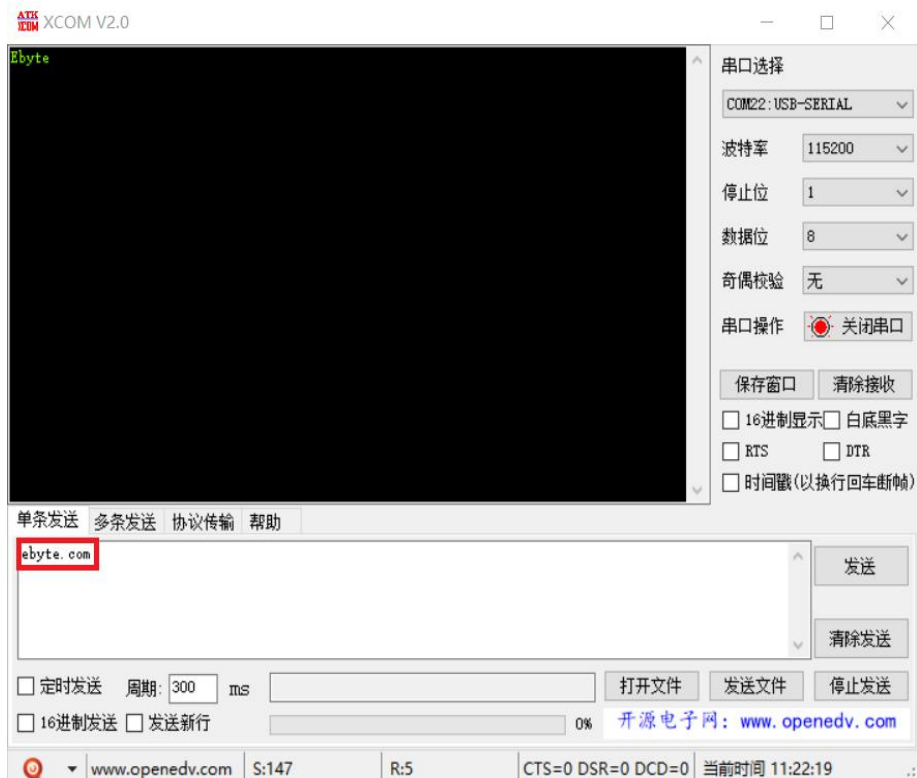


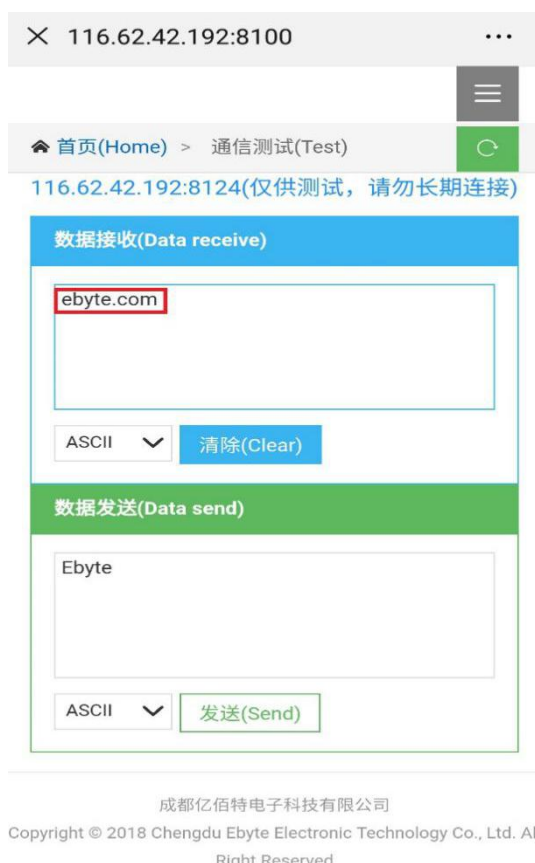
6. Within 30 seconds after the communication state is entered, if the LINK indicator is always on, it indicates that the server has been connected, then the network can be transparently transmitted.
7. Follow the WeChat official account of "亿佰特物联网应用专家" on mobile phone, enter the page and click successively: customer support -> device test. The screen shot of mobile phone is as follows:



8. Use the serial port assistant to send data to E22-400TXXS module. If E90-DTU (400SL22-GPRS) receives the data sent by E22-400TXXS, the WORK indicator light flashes.

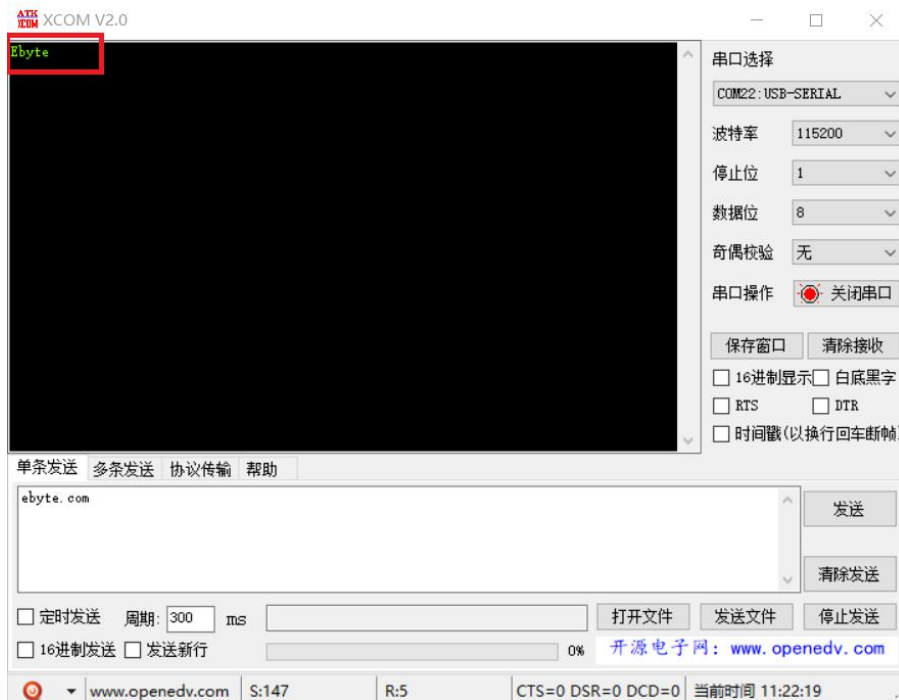
(a) E22-400TXXS sends data to E90-DTU (400SL22-GPRS)





(b) E90-DTU (400SL22-GPRS) sends data to E22-400TXXS





2.2 Working mode and functions

- 1、 Working modes are divided into communication mode and configuration mode, which are subdivided into GPRS/2G network pass-through configuration mode and RF configuration mode.

(a) Communication mode: the radio works in the communication mode by default after power on, and automatically starts the network connection. When the connection is established with the server, any data received by the radio will be transmitted to the server. At the same time, it can also receive data from the server. After receiving the data from the server, the module will output directly through the rf module. This module supports a maximum length of 512 bytes per packet.

(b) GPRS/2G network pass-through configuration mode: in this mode, the user can configure radio GPRS/2G network pass-through parameters.

(c) RF configuration mode: this mode allows users to configure radio RF parameters.

(d) Mode switch: use the official E90-DTU (230SL30-GPRS) to configure the upper computer for mode switch and parameter configuration. Note that after using the upper computer to enter the configuration state, the system is in the configuration mode. At this time, click the "module restart" button or "enter the communication button", and the system will switch to the communication mode. After entering the configuration state, unplug the USB cable and the system will automatically switch to the communication mode. At this time, if the parameters are not saved in advance or the GPRS/2G network transmission parameters are modified but the "module restart" button is not clicked, the modified parameters will not take effect.

- 2、 Base station positioning function;

E90-DTU (400SL22-GPRS) supports the base station positioning function. Users can use the officially provided E90-DTU (400SL22-GPRS) configuration software and click the "query LBS information" button in the GPRS/2G network transmission configuration mode to read the LBS information of the device in the current period.

3、Inquire the signal strength of the connection between the network module and the base station

Users can use the officially provided E90-DTU (400SL22-GPRS) configuration software. In the configuration mode of GPRS/2G network transmission, click the "query signal strength" button to obtain the current signal strength information.

4、Network function

Registration Package: registration packet off by default, the user can configure four registered package types, optional respectively connected when sending a physical address, connection when sending a custom data, additional physical address before every packet data, additional custom data before every packet data, custom registration packet maximum length 40 bytes (when set to HEX format, the maximum length of 20 bytes).

- a) In the idle state of network communication, heartbeat packet is used for network state maintenance. Its heartbeat cycle can be set to 0~65535 seconds, and the maximum length of heartbeat packet is 40 bytes (when set to HEX format, the maximum length is 20 bytes). Support two types of heartbeat: network heartbeat and serial heartbeat. When network heartbeat is selected, it will start timing with communication idle and send heartbeat packets to the server according to the configured heartbeat cycle. Select heartbeat as serial port, start timing with communication idle, and send heartbeat packet to serial port according to configured heartbeat cycle.

- b) Clear the cache: before establishing a connection with the server, the data received by the serial port will be cached.

When establishing a connection with the server, you can choose whether to clear the cached data.

By default, clearing the cache will be closed. The maximum packet length from the local cache is 256 bytes.

7、The cloud transmission function of Ebyte IOT platform

Users can use the official E90 - DTU (400SL22 - GPRS) configuration software, GPRS / 2 G network passthrough configuration mode, click on the "cloud passthrough" option, open module Ebyte cloud platform passthrough function, after open, the user configuration information such as heartbeat, registration package will be failure, users only need to a platform set up corresponding device passthrough forward relations between devices can be realized data. For specific operation, please refer to the guide for transmission of Ebyte cloud platform.

8、Radio frequency function

(1)RF RSSI： Signal strength indicating function. Internal radio frequency module supports data packet signal strength output. Can be used to evaluate radio frequency signal quality, improve communication network, ranging. Support environment noise signal strength output to network server. Can be used to manually implement LBT functions.

(2) Radio frequency has FEC forward error correction algorithm: its coding efficiency is high, error correction ability is strong, in the case of sudden interference, can take the initiative to correct the packet interference, greatly improve the reliability and transmission distance; In the absence of an FEC, such packets can only be discarded.

(3) Networking function: this station can realize multi-level relay networking with E22 series modules or E90-DTU (XXXSLXX) series stations. Multistage relay is suitable for ultra long distance communication. Multiple networks are running in the same region at the same time, truly realizing the mutual forwarding of multiple LANS to the Internet of things, and building the real Internet of things model. Please refer to the chapter "application model" for details.

(4) The radio frequency terminal has the function of Listen before talk (LBT), which enables the radio station to actively Listen to the environmental noise of the channel after sending data to the server. If the noise exceeds the threshold, the transmission will be delayed. This function can greatly improve the success rate of radio communication with radio frequency in harsh environment. This function can be used for network transmission and conflict prevention.

(5) Fixed point transmission: support address function, radio frequency terminal can transmit data to other wireless devices at any address and any channel to achieve networking, relay and other applications: for example, the radio needs to transmit data to E22 cofrequency series module B (address 0x00 01, channel 0x80), and its communication format is: 0001 80 AA BB CC, where 0001 is the address of module B and 80 is the channel of module B, then module B can receive AA BB CC, and other modules do not receive data (the same is true for E90-DTU (xxx-SLXX) series stations).

(6) LoRa spread spectrum: LoRa direct sequence spread spectrum technology will bring more communication distance; Low transmission power density, not easy to cause interference to other equipment;

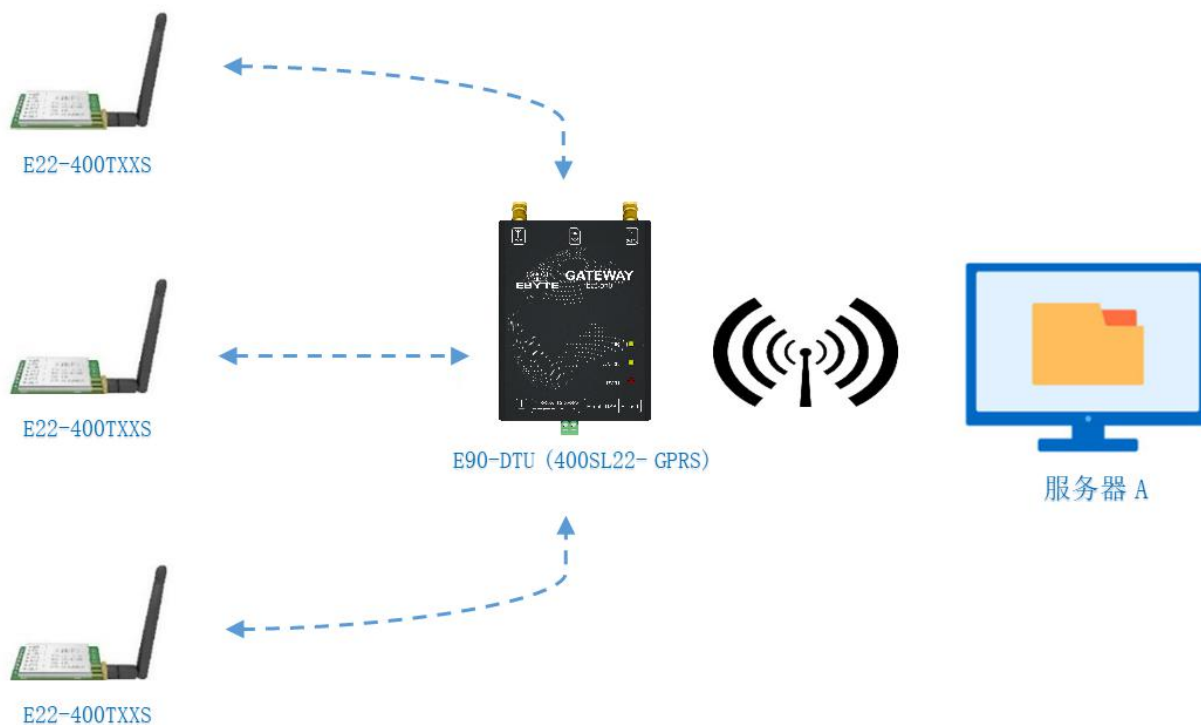
9、Factory recovery

There are two ways to restore the factory:

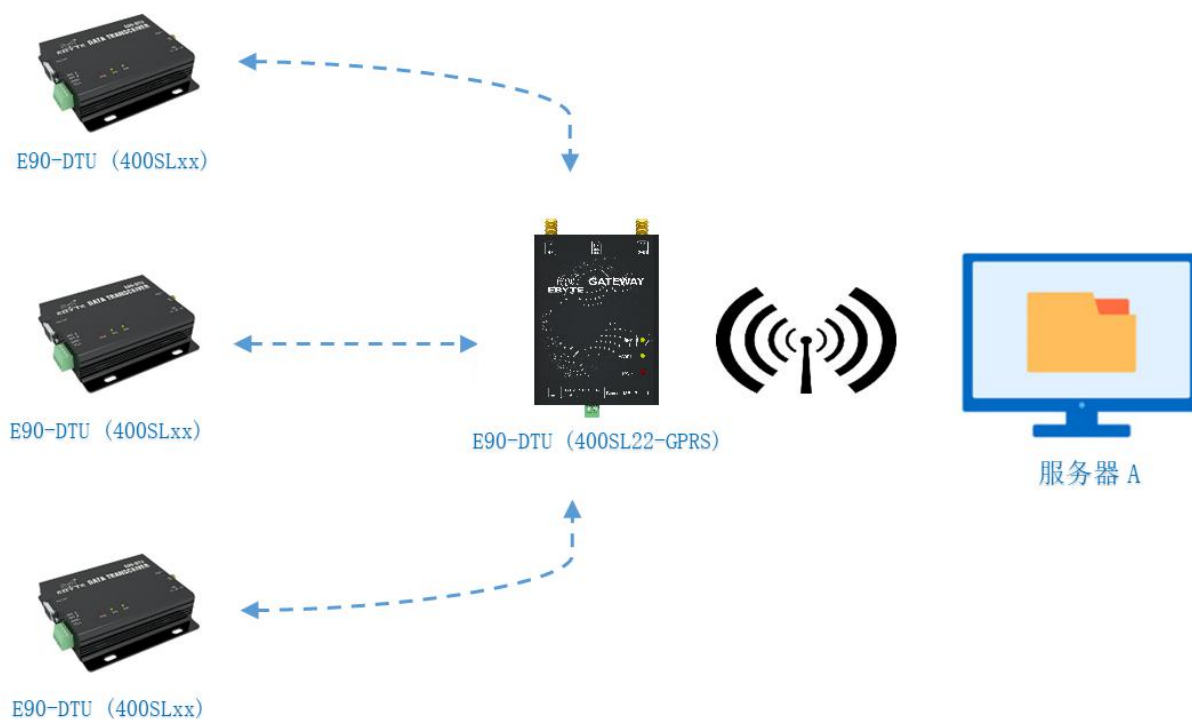
- Software restore factory: users can configure software through the E90-DTU (400SL22-GPRS) officially provided. In the configuration mode of GPRS/2G network transmission and RF configuration mode, click the "restore from factory" button to reset the GPRS/2G module and RF module. Note: if the "restore factory" button is clicked in the configuration mode of GPRS/2G network pass-through, after all parameter modification operations are completed, the "module restart" button should be clicked again to enable the restored factory or configured GPRS/2G network pass-through parameters to take effect.
- Hardware restore factory: The user can press the Reload button on the side of the radio station for 4~10S and all parameters will be restored to the factory setting. At this time, the system will automatically switch to the communication mode.

3 Application model

(1) E22-400TXXS + E90-DTU(400SL22- GPRS) + Server A



(2) E90-DTU(400SLxx) + E90-DTU(400SL22- GPRS) + Server A



(3) Ebyte cloud transmission



(4) Application in buildings



4 Note

- PC click "to enter configuration mode", the system in the configuration state, press the Reload button 4 ~ 10 s, products will be back to factory Settings, and automatically switch to a communication status, "choice mode", the switch at this time the upper machine message box will pop up "parameter error \ r \ n try click enter configuration status button" message, at this time to enter the configuration state, the "public order and prompt" click on the upper machine box "to enter configuration mode" button, if you want to keep communication, do not click the "enter configuration mode" button.
- If the upper computer prompts wrong parameters or the module fails to respond, please try to solve the problem by pressing the Reset button, re-entering the configuration state, checking whether the USB connection is correct, and checking whether the module is powered on normally.
- Enter the configuration state, check whether the USB connection is correct, check whether the module is powered on normally.
- The status bar of the upper computer device shows "no valid device found". Check whether the USB cable and power cord are connected correctly. If they are connected, try to press the Reset button, re-plug the power cord or re-plug the USB.
- Server A of this product is always open. After successful initialization, it will automatically establish connection with the configured network server.
- After the product is powered on, it has been unable to be successfully initialized, that is, the State indicator light of more than 30 seconds has no indication. At this time, it should check whether the module installation is normal, whether the SIM card is inserted normally and whether the SIM card has been invalid.
- Heartbeat function is used to maintain the connection after the successful establishment of connection between the product and the server. In the network, if the client and the network server successfully establish a connection and there is no data transmission for a long time, the Socket link may appear "dead", that is, the link exists, but the data cannot be sent or received. Therefore, in practical use, it is recommended to enable heartbeat packet function to ensure the reliability of network links.
- In practice, it is normal that there are differences in data delay between two communications.

| Version | Date | Revision note | By. |
|---------|------------|------------------|-----------|
| 1.00 | 2019/04/25 | Original version | Lizhibing |

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