



Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



E840-TTL-4G02E

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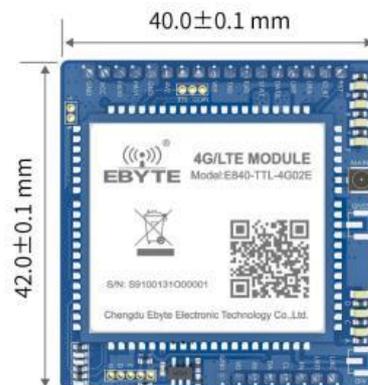
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1 Introduction

1.1 Brief Introduction

E840-TTL-4G02E is an LTE transmission module launched by Ebyte. This product has complete software functions and covers most common application scenarios. You can easily use this product to achieve two-way data transparent transmission from serial to network.

The module with 2.0 mm pin header is good for embedded development by a wide voltage of 5.0V to 20.0V. It supports 4G cards of CMCC, CUCC and CTCC. Compatible levels for communication and LED indication, the default 3.3V can be applied to 5V level, with anti-interference ability, can adapt to use in some environments with strong electromagnetic interference, like in some power industries.



1.2 Features

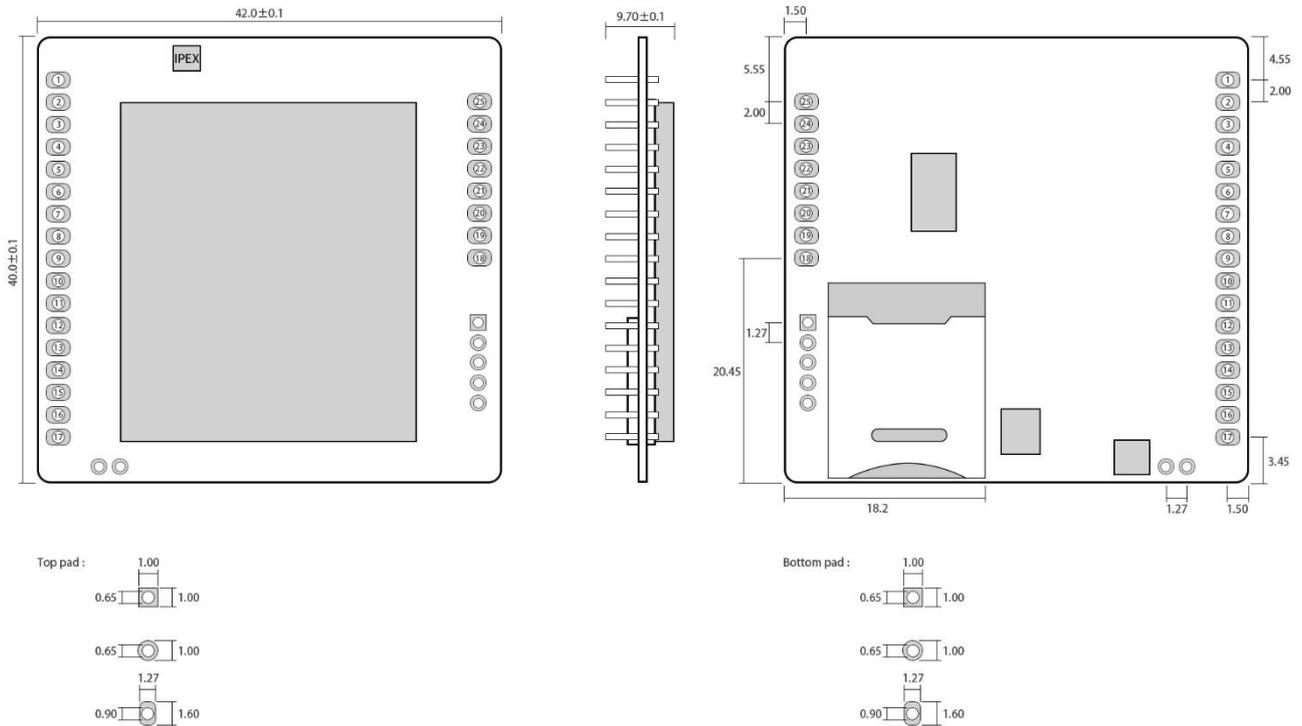
- Almost meet all M2M application demands;
- Support data transparent transmission, support TCP, UDP network protocol, support heartbeat package, registration package function;
- Support two-way serial transmission from device to network server for 460800 serial port baud rate and below;
- Support serial port large cache function, the serial port data can be cached locally before the server is established;
- Support SMS sending and receiving, SMS remote query / configuration device parameters;
- Support multiple Socket links to send and receive at the same time;
- Support Modbus RTU and Modbus TCP to automatically convert each other;
- LTE-FDD: Max downstream rate of 150Mbps, Max upstream rate of 50Mbps;
- With software/hardware double watchdog design, the system is stable, will never crash.

2 Specification and parameter

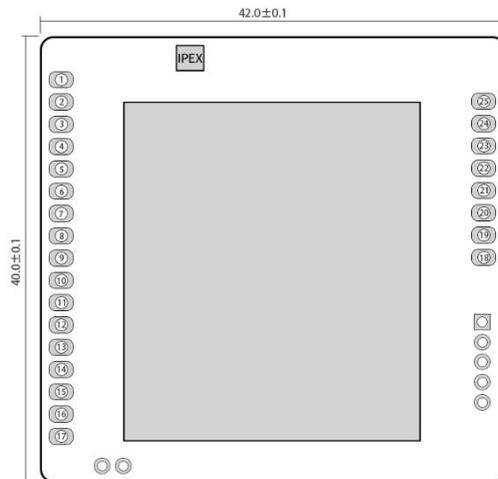
2.1 Module parameter

Parameter	Value	Description
Characteristic	Frequency	LTE-FDD: B1/B3/B7/B8/B20/B28A; WCMD: B1/B8; GSM:900M/1800MHZ;
	Network Protocol Features	Support TCP/UDP protocol
Hardware	Power supply(V)	DC 5V~18V
	Antenna	IPEX
	Interface	TTL
	Baud rate	Support Max.921600bps, default 115200bps
	Consumption (Typical)	Standby:104mA @ 5V
		Network:191mA @ 5V
		Transfer:212mA @ 5V
	Weight	11.9±0.1g
	Size	42 * 40 * 9.7mm
Operating Temperature(°C)	-40~85 (INDUSTRIAL GRADE)	

2.2 Size and pin definition



Weight : 11.90±0.1g
Pad quantity : 25
Unit : mm



Pin No.	Name	Description
1	RST	Reset pin
2	IO_RT	The low level lasts for 3~10S, the module parameters will be restored to the factory settings, and will be restarted immediately.
3	LIKA	SocketA link connection status indicator pin, corresponding to the onboard left 1 LED. High: SocketA is successfully connected to the web server; Low: SocketA did not successfully connect to the network server;

4	LIK B	The SocketB link connection status indicator pin corresponds to the onboard left 2 LED. High: SocketB is successfully connected to the web server; Low: SocketB did not successfully connect to the network server;
5	DATA	The data TX and RX indication pin, when the network receives the data or the serial port receives the data (50ms high/10ms low), corresponding to the onboard left 3LED light.
6	STAT	The device status indication pin corresponds to the onboard left 4 LED. Low: The device is powered on to search for SIM card 1800ms low, 200ms high: the device checks the correct SIM card and is attaching to the network; High: The device is attached to the network successfully.
7	RXD	Data receiving pin, default 3.3V, compatible with 5V communication level.
8	TXD	Data transmitting pin, default 3.3V, compatible with 5V communication level.
9	VEF	Drive level power supply pin, if you need to achieve serial communication and LED indication is 5V drive level, you need to input 5V level on this pin.
10、11、14、15、23	MOD、SLE、PA11、PA10、EN	NC
12	4V2	Lithium battery power supply pin, power supply range: 3.8V~4.3V. This pin is prohibited from being reversed and is not allowed to be supplied with VCC.
16	VCC	DC power supply pin, power supply range: 5V~18V. This pin is prohibited from being reversed and is not allowed to be supplied with VCC.
19	VD	External SIM card power supply pin, if the onboard SIM card holder is used, the pin remains NC
20	RS	External SIM card reset pin, if the onboard SIM card holder is used, the pin remains NC
21	DA	External SIM card data pin, if the onboard SIM card holder is used, the pin remains NC
22	CL	External SIM card clock pin, if the onboard SIM card holder is used, the pin remains NC
24	LIK D	SocketD link connection status indicator pin, corresponding to the onboard right 3 LED. High: SocketD is successfully connected to the web server; Low: SocketD did not successfully connect to the network server;
25	LIK C	SocketC link connection status indicator pin, corresponding to the onboard right 2 LED. High: SocketC is successfully connected to the web server; Low: SocketC did not successfully connect to the network server;
13、17、18	GND	Ground

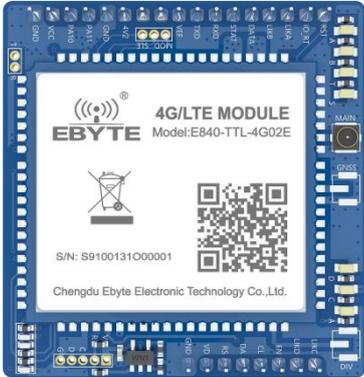
3 Quick start

This chapter is a quick start introduction for E840-TTL-4G02E, build the easiest hardware environment to test the network transmission function of E840-TTL-4G02E, to achieve bidirectional transparent transmission of data from serial device (here refers to the computer) to the network server.

3.1 Hardware

Hardware for test are as follows:

Before test, connect the serial cable according to the recommended circuit, insert SIM card (the notch is facing outwards), prepare antennas and other hardware.

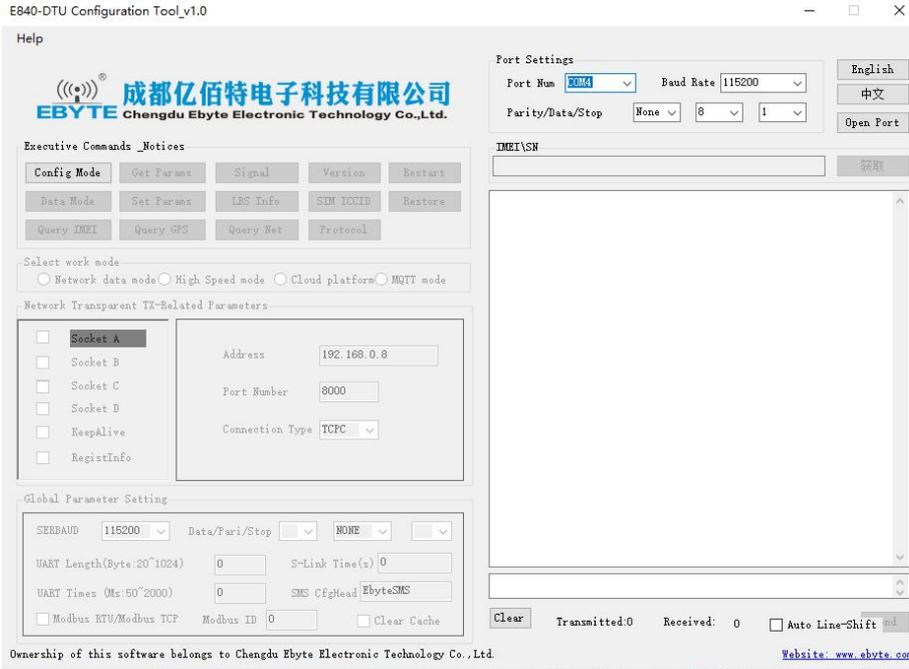
	
<p>E840-TTL-4G02E</p>	<p>5V—20V power adapter or 4.2V lithium battery</p>
	
<p>USB to TTL convertor</p>	<p>4G/LTE sucker antenna, GPS antenna and two IPEX to SMA adapter cables</p>

Serial cable connected according to recommended circuit diagram, SIM card and antenna.
Connect the power supply, antenna, SIM card, serial cable and other hardware before testing.

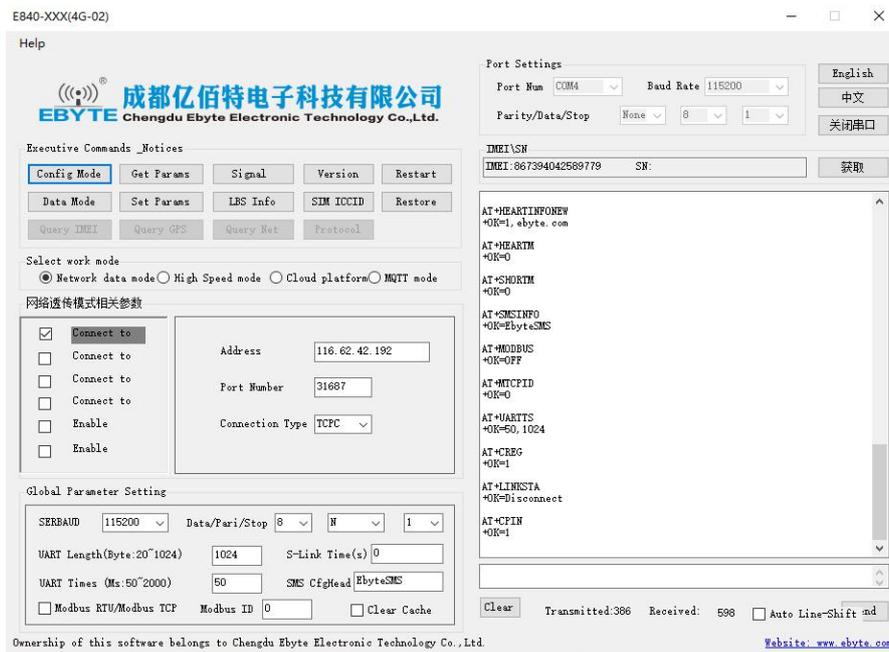
3.2 Software and configuration

Step 1. Access the official website of EBYTE: www.ebyte.com, to download the latest GPRS/E840-TTL-4G02E series product configuration tool, install USB to 232/485 driver, run the software.

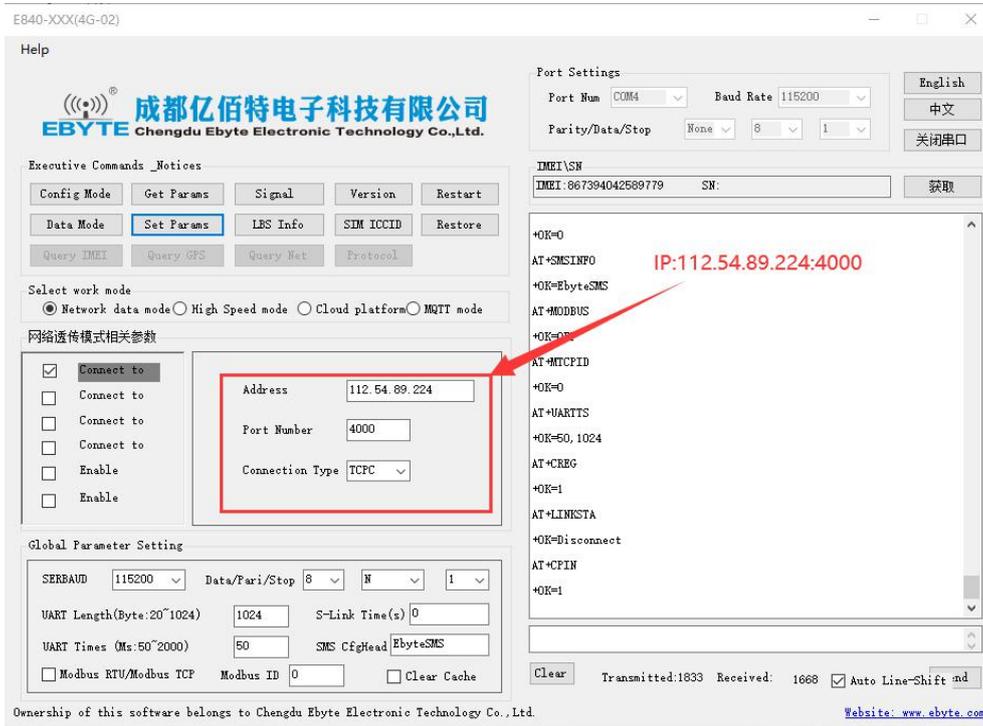
Step 2. Select the corresponding COM port number. The factory default serial port baud rate is 115200, 8N1, as shown below:



Step 3. Click the tool "Enter Configuration Status" button and wait for the device parameters to be automatically obtained. After completion, the following figure is displayed:



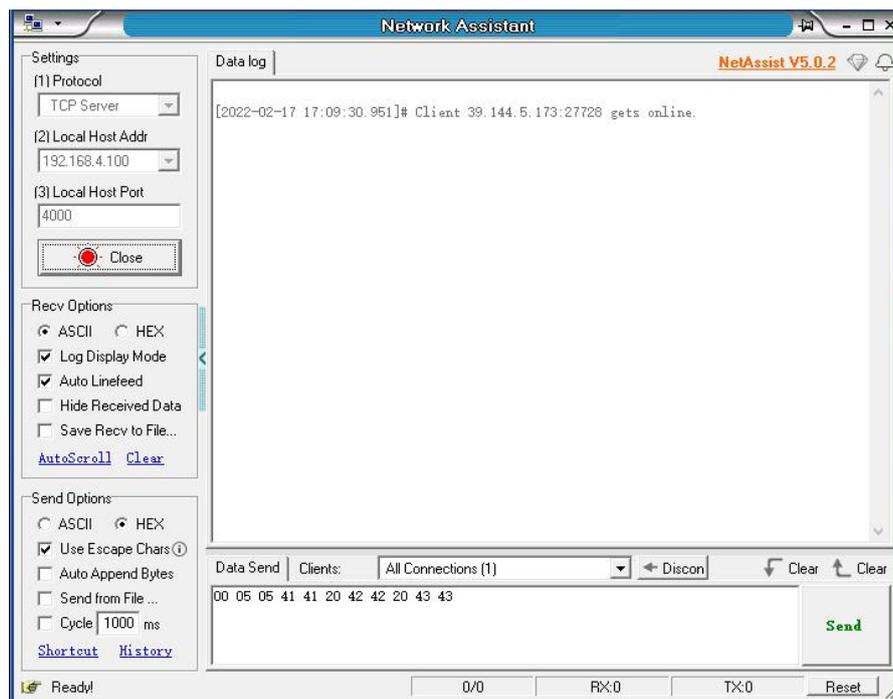
Step 4. Set the device connection server IP and port number to: 112.54.89.224:4000 (non-LAN IP address, public network address is required, the IP address here is only for demonstration), and finally click "Save all parameters", the final picture is as follows:



Step 5. Click the tool "Module Restart" button and wait for the device LINK light to be on.

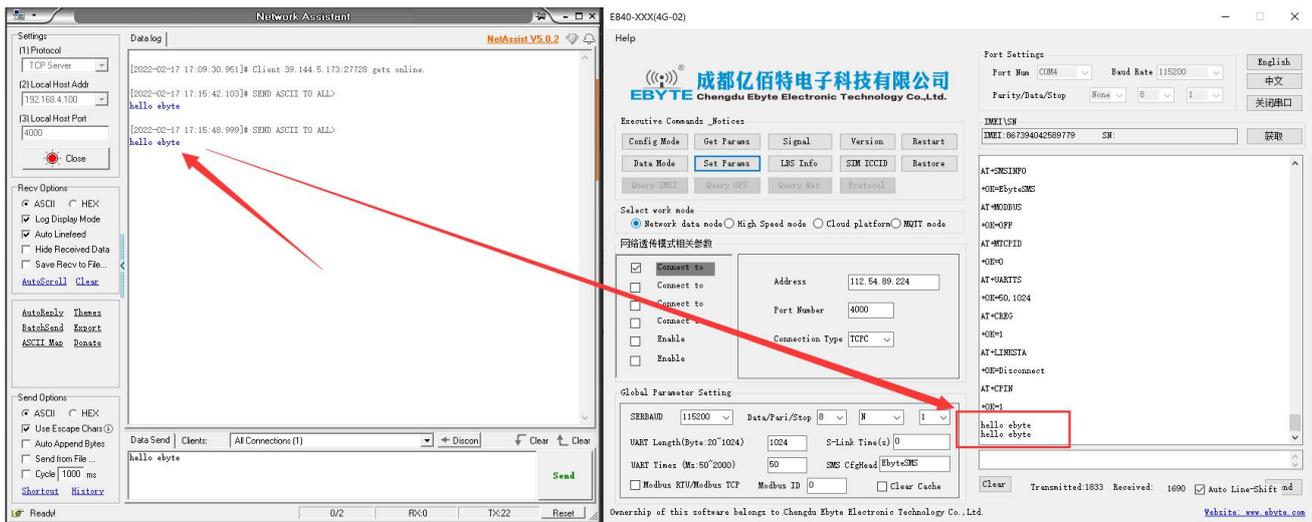
3.3 Data transfer test

Step 6. Use the PC to open "NetAssist.exe" and start the public network server, as shown in the following figure:



Step 7. Use the PC-side tool to send data to, and use the mobile phone to send data to the device. The

communication test result is as shown below:



4 Module function

4.1 Operating mode

4.1.1 Transparent transmission mode

After power-on, the radio works in the transparent transmission mode by default, and automatically starts the network connection. When the connection is established with the server, any data received by the serial port will be transparently transmitted to the server. At the same time, it can also receive data from the server. After receiving the server data, the module will output directly through the serial port. The maximum length of data supported by this module is 10 bytes. When multiple links are connected to the server at the same time, the data packet will be sent to the four links at the same time. When there are data to be sent from any network link, the radio will transparently output the data.

4.1.2 4-channel Socket connections

This module supports 4-channel Socket connections. For each socket users can configured it as TCP Client or UDP Client. When sending data, users can use protocol transmission or transparent transmission. The maximum length of data supported by this module is 1024 bytes.

Protocol transmission format (please open the protocol transmission mode, refer to "E840-TTL-4G02E-AT instruction set" for details)

Send: 0x55 0xFE 0xAA ID data

For example: 55 FE AA 00 AA BB CC //00: SOCK0 link, AA BB CC: the data that the user actually needs to transmit

Receive: 0xAA 0xFE 0x55 ID data length Data

For example: AA FE 55 00 00 03 11 22 33 //00: SOCK0 link, 00 03: the valid data length received this time

11 22 33: real data

Demonstration:

Take SOCK0 as an example:

Send: +++(do not add new line for transmitting) //enter AT command

Send: AT+VER(add new line for transmitting) //read version info. And enter AT command setting at the same

time

Back: +OK=E840-DTU(4G-02E)_V1.0

Send: AT+SOCK=TCPC,116.62.42.192,31687 //Open SOCK0, and set the network server parameters that SOCK0 will connect to (the parameter used here is Ebyte test server, not recommended for users)

Back: +OK

Send: AT+LINKSTA //check if SOCK2 has started connection with server

Back: +OK=Connect

Send: AT+POTOCOL=ON //open protocol transmission mode

Back: +OK

Send: AT+POTOCOL //inquire if protocol transmission is on

Back: +OK=ON

AT+REBT //restart

Back: +OK

Waiting for the radio to restart, SOCK will automatically establish a connection with the server. After the connection is started, data can be transmitted to each other via protocol.

4.1.3 AT Configuration Mode

Under this mode, all UART data is considered as AT command. In the transparent transmission mode, after the serial port receives the "+++" frame data, the RX pin receives any AT command within 3 seconds, and the mode switches to the AT mode. In AT mode, send AT+EXAT<CR><LF> to switch to transparent transmission mode.

Please read "E840-TTL-4G02E-AT Command Set" carefully when using AT command configuration mode.

4.2 Network function

4.2.1 Short connection

In TCP Client mode, open the short connection, if no data is received through the serial port or network port within the set time, the network connection will be automatically disconnected. The short connection function is not enabled by default. When enabled, the connection time can be set from 2 to 255 seconds. When the connection time is set to 0, the function is turned off.

4.2.2 Registration package

The registration package function is not enabled by default. There are a total 4 types of registration package can be

configured. ①Send physical address (IMEI code) when connecting. ②Send custom data when connecting. ③Add the physical address before each packet when connecting. ④Add custom data before each packet when connecting. The maximum length of the custom registration data packet is 40 bytes (with HEX format, the maximum length is 20 bytes).

4.2.3 Heartbeat packet

In idle state of network communication, heartbeat packets are used for network status maintenance. The heartbeat cycle can be set from 0 to 65535 seconds, and the maximum length of the heartbeat packet is 40 bytes (when set to HEX format, the maximum length is 20 bytes). Supports two heartbeat types: network heartbeat and serial heartbeat.

Network heartbeat: from the communication idle time, send heartbeat packets to the server according to the configured heartbeat period.

Serial port heartbeat: from the communication idle, send heartbeat packets to the serial port according to the configured heartbeat period.

4.2.4 Clear cache

Before connecting to the server, the data received by the serial port will be cached. After connection, you can choose to clear the cached data or not. By default, the cache will be cleared. The maximum size of each Socket in the local cache is 10 bytes, and each Socket buffer is independent of each other.

4.3 High speed mode

The E840-TTL-4G02E is designed with a separate high-speed mode. In this mode, both the network and the device can transmit any packet length data, such as file, picture, and video.

Configure/query the high-speed mode state through the AT+HSPEED command. After the high-speed mode is enabled, the device can transmit any packet length data at 460800 serial port baud rate.

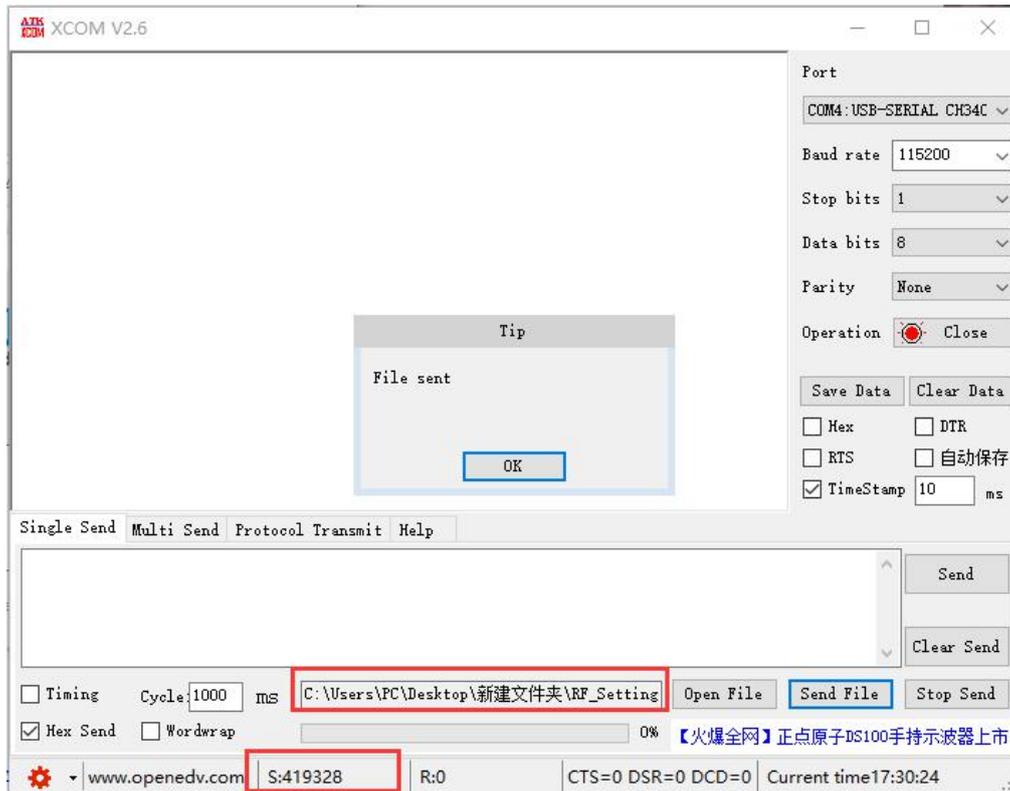
The E840-TTL-4G02E file transfer process will be demonstrated below:

Step 1. Turn on the high-speed mode: After the device enters the AT mode, send AT+HSPEED=ON to enable the high-speed mode, configure the connected server address, and restart the device.

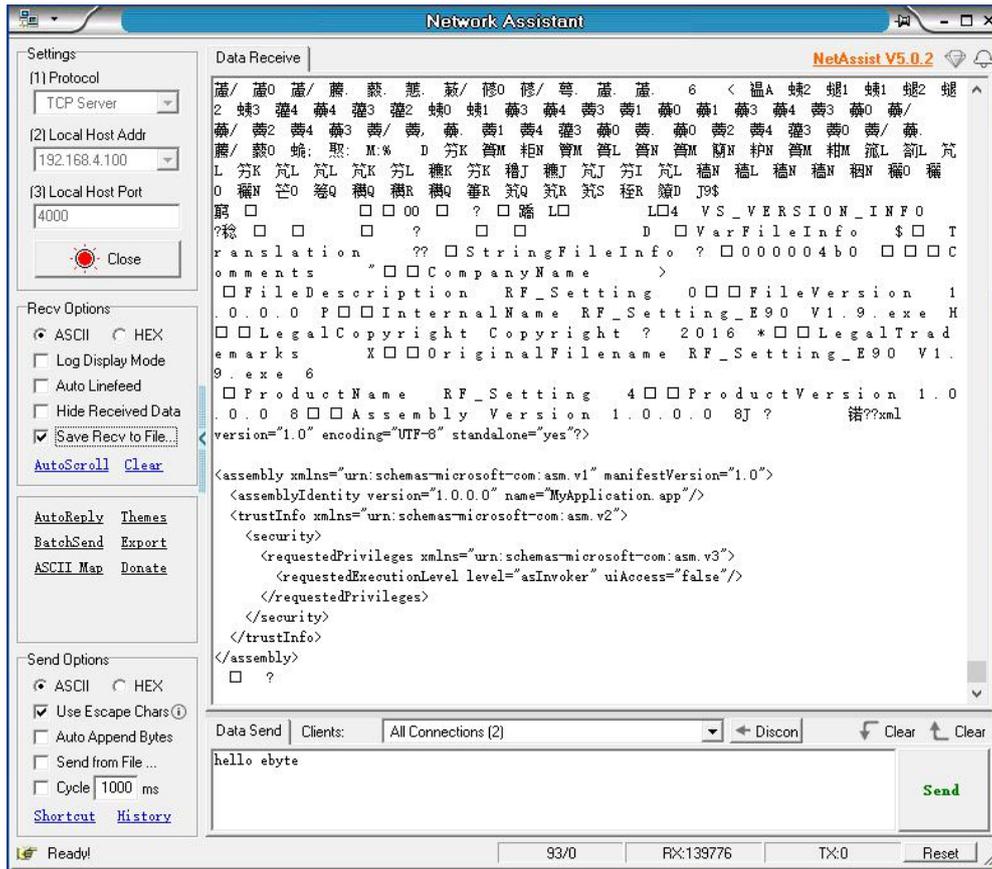
Step 2. Prepare files for transfer, RF_Setting_E90.exe. The file is an executable file. After startup, the following interface is displayed:



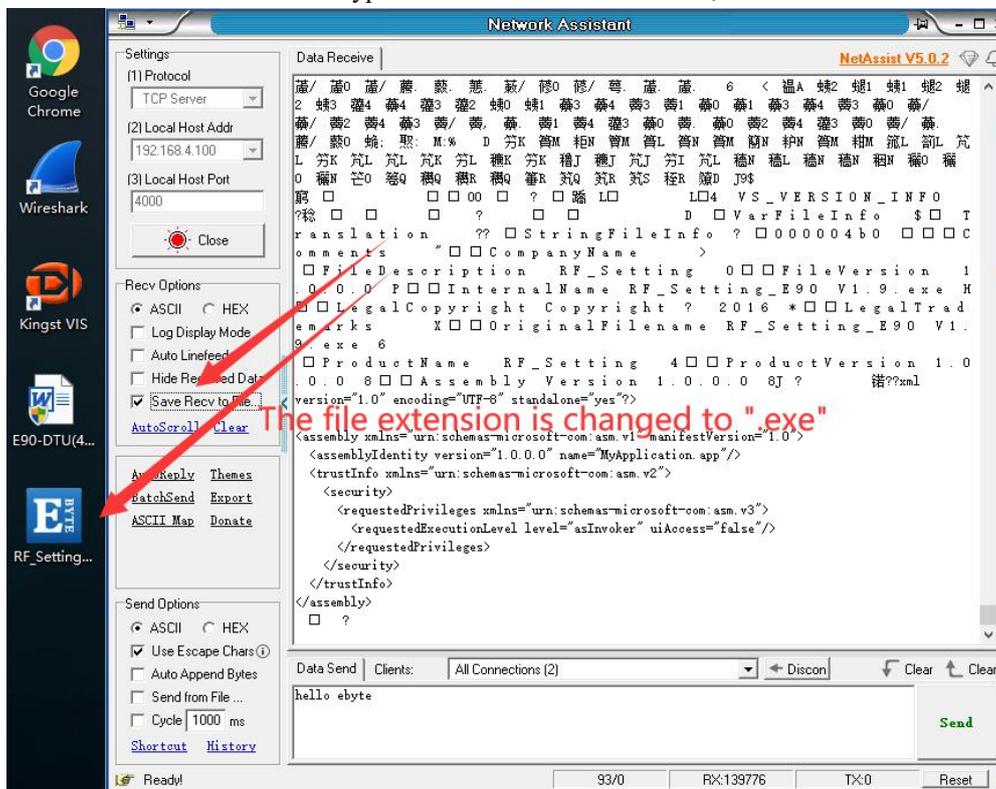
Step 3. Open the serial port tool and use the file sending method to open RF_Setting3.49.exe. After the device is connected to the network server normally, click “send file” and the sending is completed as shown below.:



Step 4. The server (the external network mapping used for this demo, the server is the TCP debugging tool), after receiving the data, as below:



Step 5. Save the data as an .exe trial file type. This time it is named RF.exe, as below:



Step 6. Click on the server to run RF_Setting.exe to test the file, as below:



In summary, the E840-TTL-4G02E completes the remote transfer of files from the serial port to the network server.

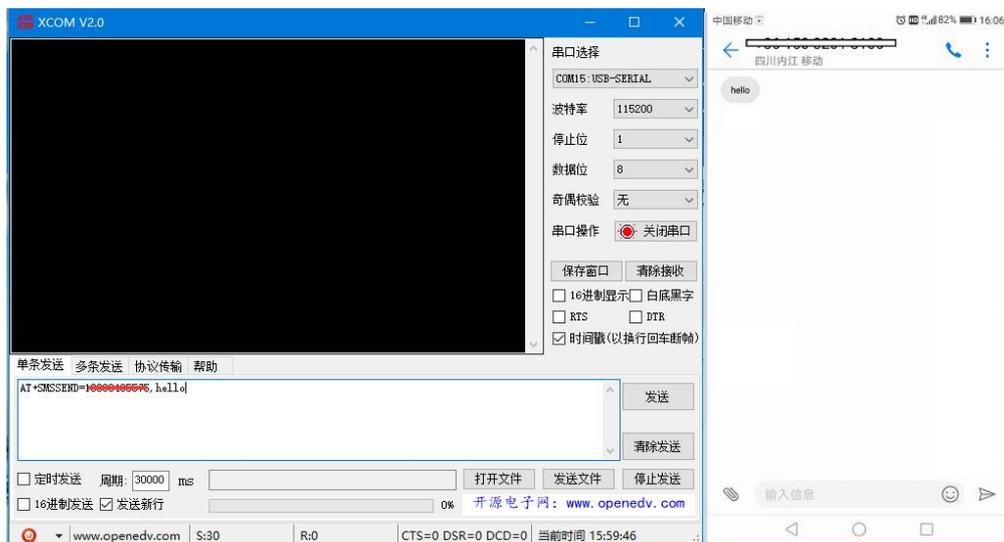
4.4 SMS function

E840-TTL-4G02E supports SMS sending and receiving, SMS remote configuration function (inserted SIM card needs to support SMS service).

4.4.1 SMS sending

Under AT mode, send AT+SMSSEND=number,data to complete the SMS sending. The number refers to the receiving number, and data refers to the data to be sent.

Like below:



4.4.2 SMS receiving

The device can receive remote SMS content in transparent transmission mode. The format is as follows:

+SMS REC: number

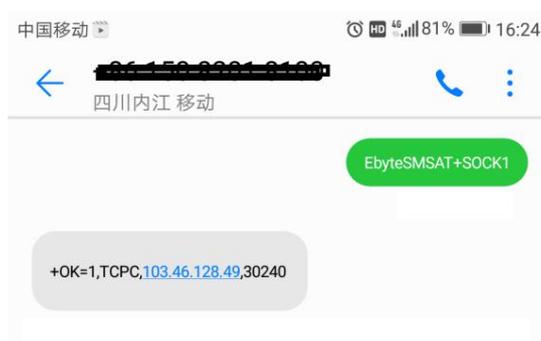
data, the number is the sender's mobile phone number and data is the received short message content.

4.4.3 SMS configuration/query

The device supports SMS remote configuration/inquiry parameters in transparent transmission mode. The format of the command is:

<Head>AT+CMD, <Head>is the device SMS identifier, The factory default is “EbyteSMS”, CMD is the corresponding command. For more informations, please check”E840-TTL-4G02E AT commands”.

In this demo, use the mobile phone to query the SOCK1 link information of the device remotely.



4.5 Interconversion between Modbus RTU and Modbus TCP

E840-TTL-4G02E supports the interconversion between Modbus RTU and Modbus TCP. Enable this function, after receiving data, the device will detect whether they are the Modbus RTU or Modbus TCP protocol. If data belong to one of the two protocols, they will be converted. If not, only supports output/send raw data.

For example, the serial port receives the Modbus RTU write-out command in the following format (hexadecimal):

01 06 00 01 00 01 19 CA (Modbus RTU)

When the interconversion function is enabled, data received by the network is:

00 01 00 00 00 06 01 06 00 01 00 01 (Modbus TCP)

Data sent by the network is:

00 01 00 00 00 06 01 06 00 01 00 01 (Modbus TCP)

The serial port will output data as:

01 06 00 01 00 01 19 CA (Modbus RTU)

Note: In the Modbus TCP standard protocol, the transaction element identifier needs to be specified. In E840-TTL-4G02E, the user can configure the value through AT+MTCPID, and when the value is configured to 0, the receiving end will parse all data conforming to the Modbus TCP protocol, otherwise only packets with the same application packet identifier and device configuration identifier will be converted.

4.6 Base station positioning function

The E840-TTL-4G02E supports the base station positioning function. The user can send the AT+LBS command in the AT mode to read the current LBS information of the device. The device returns the data format as follows:

+OK=LAC,xxxx;CID,xxxx

The “LAC” is the unique identification number of the global cell, “CID” is the base station number, (xxxx is the hexadecimal value);

The LAC and CID number can be used to query the current location information of the device. For the query method, refer to the link: <http://www.gpspg.com/bs.htm>

Note: This website may not be available, it is not maintained by Ebyte. You can search for available websites through keyword "base station location".

4.7 Serial port packaging function

E840-TTL-4G02E serial port break time and packing length can be configured. The user can configure the frame break time and the package length through the AT+UARTTS command. Please refers to the AT command for the specific configuration .

a) Frame break time: When the serial port receives data, it will continuously detect the interval between two bytes. If it is greater than the configuration time (50-2000ms), the device will automatically send the previously received data as a data packet to Network side;

b) Packing length: When the serial port receives data, it will continuously check the length of the currently received data. If the length of the configuration is exceeded (20~1024 bytes), the device will automatically send the previously received data as a data packet to Network side.

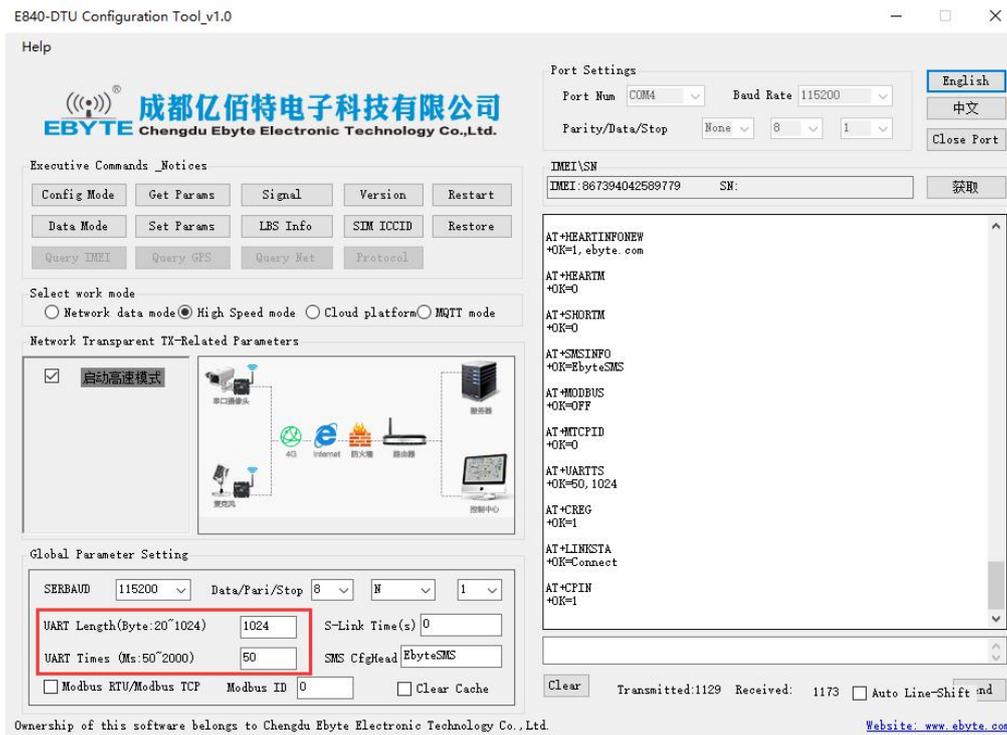
4.8 Network AT commands function

E840-TTL-4G02E supports connection on web pages, and when the module works in transparent transmission mode. Through the connected web pages, it can inquiry or configure parameters remotely. The command format is:

<Head>AT+CMD, The <Head> is the device network AT identifier, the default value is: EbyteNET, CMD is the corresponding command, you can view the AT command for details;

(*Note: For the incorrect network AT command, it will return + ERRER)

Here is an example of query baud rate:



5 Notes

- The first Socket of this module will always be opened. After the initialization is successful, it will automatically establish a connection with the configured network server.
- After the module is powered on, it cannot be initialized successfully. That is, the State indicator has no indication for more than 30 seconds. In this case, check whether the module is installed properly, whether the SIM card is properly inserted, and whether the SIM has failed.
- Short connection function can be used to reduce the connection pressure of multiple devices to the server. When the short connection function is enabled (AT+SHORTM>2), the module will actively disconnect the connection when the network or serial port has no data for more than the short connection setting period. After the disconnection, the network cannot send data and the local serial port sends. For valid data, the module will immediately establish a connection with the server. If the local clear cache function is turned off, the packet will be cached (maximum 10K bytes). After the connection is successful, the data will be sent to the server. The local cache function is cleared and the packet will be discarded.
- The heartbeat function is used to maintain the connection after the module and the server are successfully connected. 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 chain. The road exists but cannot send and receive data. Therefore, in actual use, it is recommended to enable the heartbeat packet function to ensure the reliability of the network link.
- In actual use, it is normal for the data delay of the two communications to be different.
- After the protocol is closed, the maximum single packet length supported by a single link is 10K bytes. A local serial port or a network sending a packet exceeding this length may cause packet abnormality. The distribution protocol is enabled. Each Socket is enabled. The link single packet can support up to 1024 bytes (user-configured serial port packing length).
- In the high-speed serial transmission mode, the EMBMAC and EMBCSTM registration package functions

cannot be enabled, and in the high-speed mode, the short message transmission and reception function is not supported. Only the first Socket effective link is valid, and the protocol distribution data is not supported.

- After the EBYTE cloud transparent transmission function is enabled, the high-speed mode is invalid.
- When the device serial port outputs the words “ pdp error, device will be reset! ” , it indicates that the PDP context is disabled by the network. The SIM card may be loose or the current network channel is occupied abnormally.
- The SMS function needs to insert the SIM card to support the SMS service. The IoT card cannot send and receive SMS messages. When the device sends a text message, the device responds with OK only to indicate that the module has sent the SMS, which does not mean that the device has received the SMS.
- After modifying the serial port break time, the AT command must be configured according to the frame break time. For example, after setting the parameter to 2000ms, you need to configure the device parameters after power-on. You need to send '+++'. , Send a valid AT command within the period of more than 2000ms and less than 3000ms to enter the AT mode normally.
- The network AT command will fail in high speed mode.

6 Important Statement

- All rights to interpret and modify this manual belong to Ebyte.
- This manual will be updated based on the upgrade of firmware and hardware, please refer to the latest version.
- Please refer to our website for new product information.

7 Reversion History

Version	Edit date	Description	Issued by
1.0	2019/04/12	Initial version	--
1.1	2019/08/08	Format revision	Lyl
1.2	2019/08/21	Parameter modification	Lyl
1.3	2019/08/23	Delete content	Lyl
1.4	2021/01/28	Change content	LY
1.5	2022/02/17	Change content	LC

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Thank you for using Ebyte products! Please contact us with any questions or suggestions: info@cdebyte.com

Phone: +86 028-61399028

Web: www.ebyte.com

Address: B5 Mould Park, 199# Xiqu Ave, High-tech District, Sichuan, China

 **Chengdu Ebyte Electronic Technology Co.,Ltd.**