



Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual



E70-DTU(433NW30)

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E70-DTU (433NW30) is star network modem designed by Ebyte, operating at 433MHz, with coordinator and terminal as a whole.

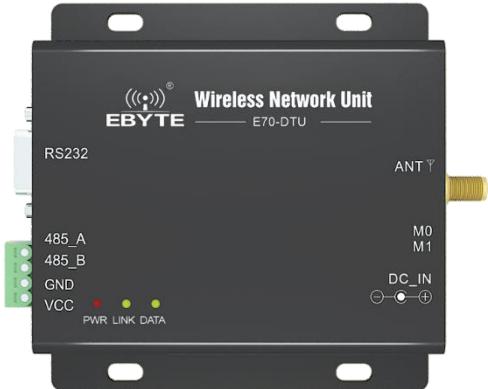
The modem features long range and high-speed transmission modes. Maximum 200 nodes can send data to one coordinator. Use industry-standard AT commands for operating configuration, which greatly simplifies user operations. With stable batch production, the modem is suitable for various wireless communication network applications.

Features

- ❖ Use AT command to configure parameters.
- ❖ In the coordinator mode, support broadcast transmission, short address transmission and long address transmission;
- ❖ E70-DTU (433NW30) supports multi-slave & single master transmission, maximum support 50 nodes and send data at the same time;
- ❖ The modem features with long range and high-speed transmission modes;
- ❖ Use AES128 data encryption to ensure data packet security and reliability;
- ❖ The interactive data meets the 802.15.4 standard and adopts CSMA/CA channel access technology;
- ❖ Support 8~28V power supply;
- ❖ The RS485 circuit uses electrical isolation, lightning protection, anti-surge, with anti-interference performance.

1. How to test

1.1. Testing tool

	
E70-DTU (433NW30)	12V Power Supply 1 piece
	
USB to RS485 cable or USB to RS232 cable	Sucker antenna 1 piece

Connecting the hardware such as power supply and antenna before test.

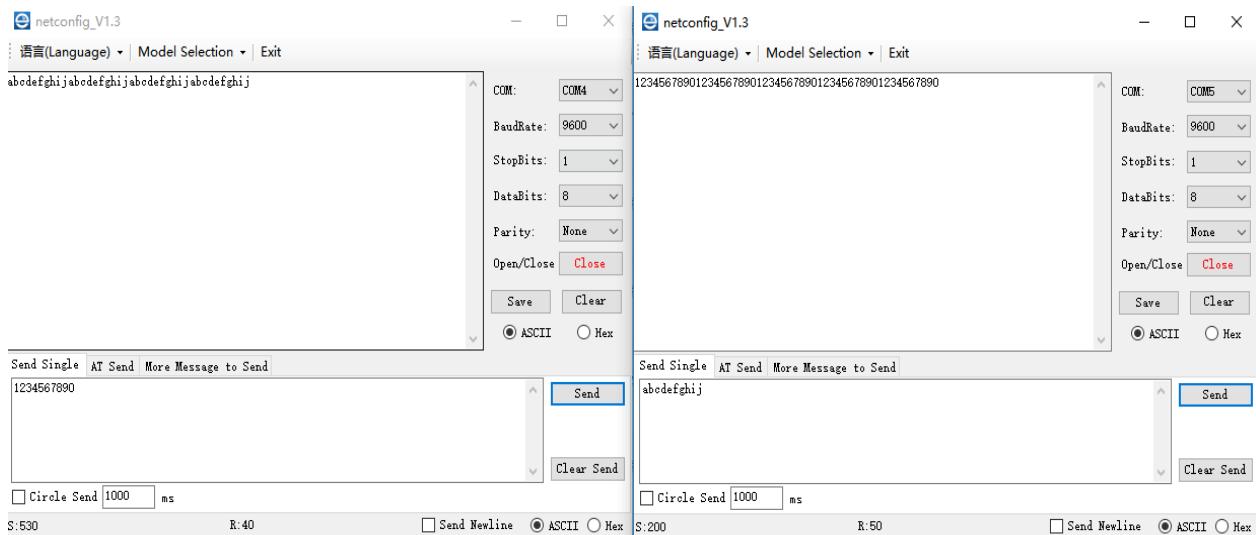
1.2. Data transmission test

Software tools:

This datasheet chooses serial port assistant “netconfig_V1.3”, Please download the software driver from Ebyte official website.

1.2.1. Test procedure

The device is mode 4 as default, (using the external hardware to choose the operation mode), turn switch M0&M1 of device A to ON position (M1=0, M0=0), LINK (yellow light) blinks, the device A is in coordinator mode. Turn switch M1 of device B to ON position (M1=0, M0=1). after 10s LINK (yellow light) blinks, indicating that device B has been connected to device A. Device A can communicate with device B at this time.



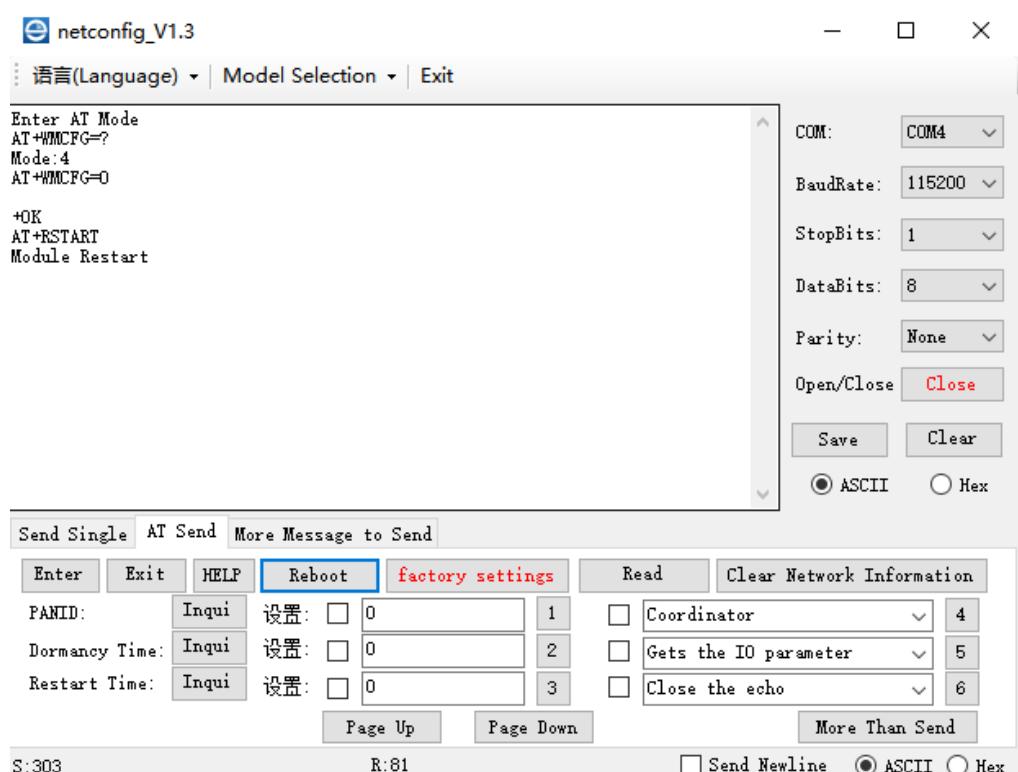
Use serial port assistant to change the mode of E70-DTU (433NW30).

Enters "+++" into AT Command

AT+WMCFG=? Reading current operation mode

AT+WMCFG=0 Change to 0 mode (coordinator mode)

AT+RSTART Module restart

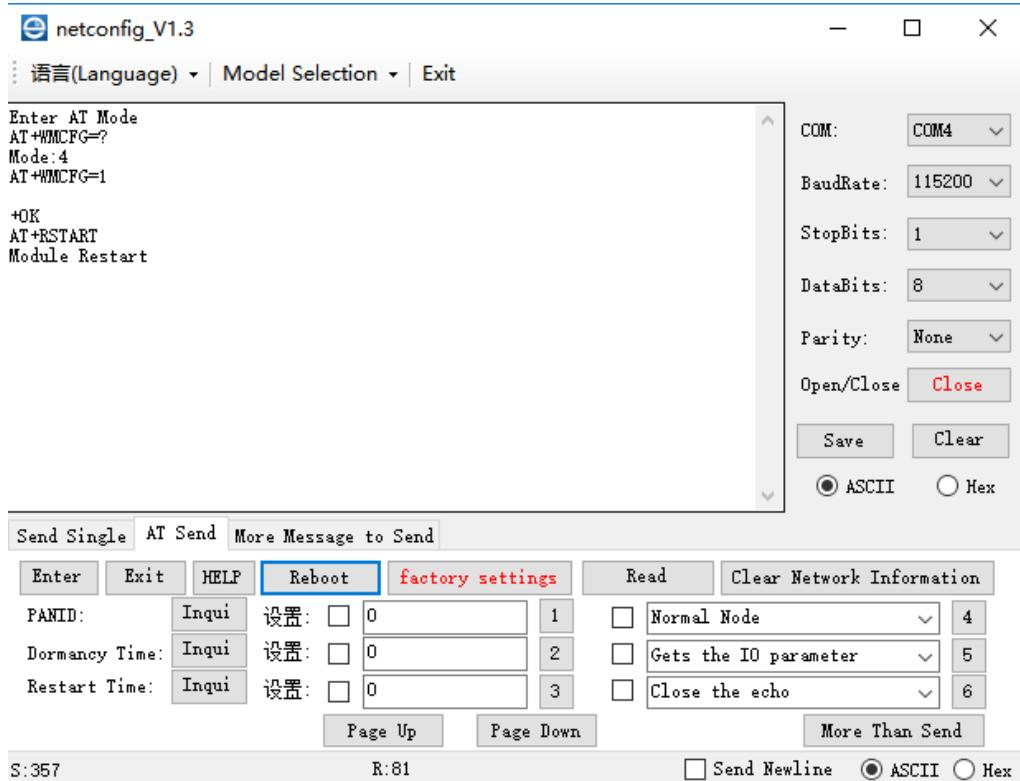


Enters "+++" into AT Command

AT+WMCFG=? Reading the current operation mode

AT+WMCFG=1 Change to 1 mode (node mode)

AT+RSTART Module restart



Note: When turning switch M0&M1(M0=1, M1=1) to OFF position, the device will be forced into the sleep mode. In this mode, the serial communication parameters of the device are: 115200, 8 N 1

2. Product Introduction

2.1. Electrical Parameter

No	Parameter Name	Description
1	Size	82 * 62 *25mm
2	Weight	116g±2g
3	Working frequency	433MHz
4	Transmitting power	30dBm
5	Power supply	8~28V DC, Note: Higher than 28V will cause permanent damage to the modem
6	Communication interface	8N1,8E1, 8O1, eight kinds of UART baud rate, from 1200 to 115200bps(default 115200)
7	Antenna Connector	SMA
8	Interface	RS232、RS485
9	Transmitting length	128 bytes
10	Receiving length	128 bytes
11	Drive mode	Can be configured to push-pull/high pull, open-drain

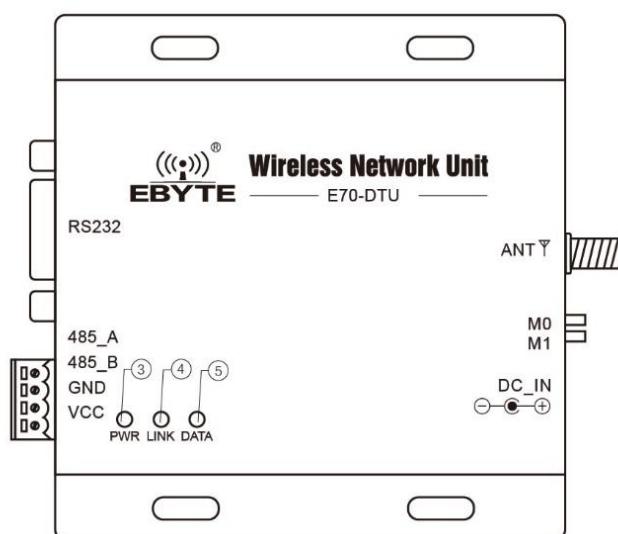
12	User configuration	AT instruction configuration
13	RSSI	Available
14	Operating current	Transmitting: 468mA@12V, Receiving : 24.2mA@12V
15	Operating temperature	-40 ~ +85°C, Industrial grade
16	Operating humidity	10% ~ 90%,
17	Storage temperature	-40 ~ +125°C, Industrial grade

2.2. E70 Series

Model No.	Interface	Frequen cy Hz	Power dBm	Distan ce km	Air data rate bps	Size mm	Packing	Connector
E70-DTU (433NW30)	UART	433M	30	6.5	5/50K	82 * 62	RS232/RS485	SMA

3. Function Description

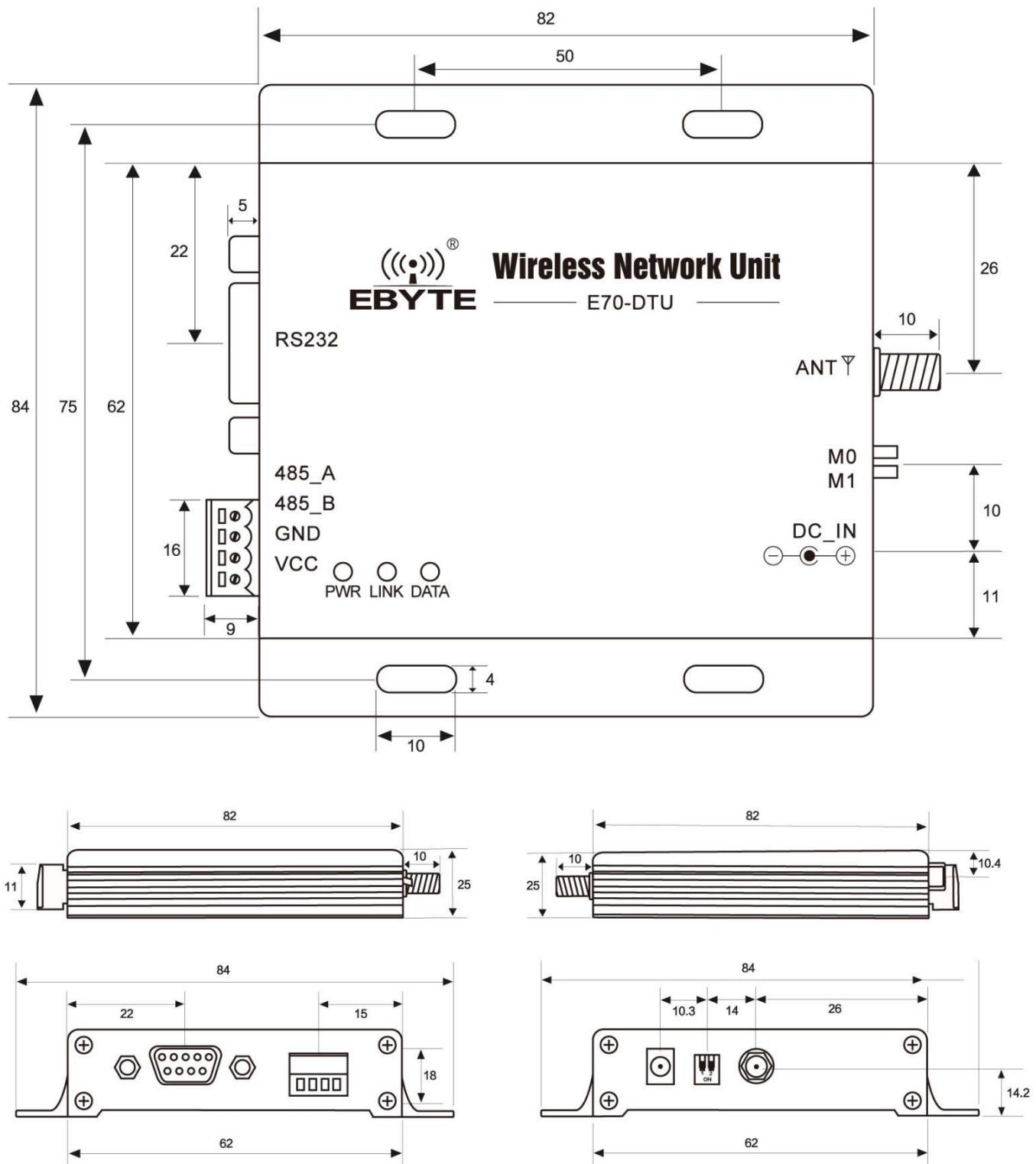
3.1. Pin description



3.2. Pin definition

No	Pin	Function
1	RS232	RS232 interface
2	485_A	RS-485 interface A
3	485_B	RS-485 interface B
4	GND	Ground
5	VCC	Power supply: DC8-28V
6	PWR	Power Indicator
7	LINK	Network successfully established indicator
8	WORK	Indicator light
9	DC8~28V	Power supply:8~28VDC
10	M1	Operation mode selection
11	M0	Operation mode selection
12	ANT	Antenna (50Ω characteristic impedance)

3.3. Dimension



4. FAQ

[Failed to access the network]: Please check if the node PANID setting is consistent with the coordinator when the nodes are unable to access the network

[Garbled]: One reason is that the serial baud rate does not match. The other reason is that the power supply capacity is insufficient.

[High delay]: When the node sends data, if the current channel noise is too cloud, it will actively back off. After waiting for a period, the node will idle and start sending.

[Receive response time]: When the node is configured as dormant node, the maximum receiving delay may be equal to the configured period

[Unable to communicate]: The modem must be connected to the network to communicate with the coordinator

[Unable to read parameter]: Check whether the baud rate of the serial port is correct. You can query in the configuration mode.

[Into the network is too long]: During the network access process, the node and the coordinator have a large number of information exchanges. This process does not have any protection mechanism and the information is easily interfered. After a node fails to access the network for a single time, it will request again after a certain period of time.

5. Firmware Transmitting mode

5.1. Transparent transmission

	Format	Values
When the coordinator is set to transparent transmission, the coordinator will send broadcast message. At this time, all non-dormant nodes in the entire network will receive data.		

5.2. Short address transmission

	Format	Values
Coordinator short address transmission format: short address + valid data		
00 00 or FF FF are broadcast address;	-	-
Coordinator	HEX	Sending: 00 01 AA BB CC
Node A address 00 01	HEX	Receiving: AA BB CC
Node B address 00 02	HEX	Null
Node C address 00 03		
-	-	-
Coordinator	HEX	FF FF AA BB CC

Node A address 00 01	HEX	AA BB CC
Node B address 00 02	HEX	AA BB CC

5.3. Long address transmission

	Format	Values
Coordinator short address transmission format: short address + valid data		
00 00 00 00 00 00 00 00 00 00 or FF FF FF FF FF FF FF FF FF are broadcast address;		
Coordinator	HEX	Sending: 0A 01 AA 45 65 13 12 44 AABB CC
Node A address:		
0A 01 AA 45 65 13 12 44	HEX	Receiving: AA BB CC
Node B address:		
0D 55 18 42 1A 27 29 64	HEX	Null
Node C address:		
A4 78 02 46 B5 1C 5A 02	HEX	Null

6. Operating Mode

	M1	M0	Description	Remarks
Coordinator Mode	0	0	Set up a network to manage network node information	Transfer data according to input and output modes
Normal Mode	0	1	Send and receive data at any time	High real-time performance
Dormant Mode	1	0	Low-power reception, sending data at any time	Receive delay, send need to wake up the serial port
Sleep Mode	1	1	Cannot send and receive data, system sleeps	The fixed baud rate is 115200 8N1

6.1. Coordinator mode

If the user configures the operating mode 4, (M0=0,M1=0) or the user configures the operating mode as 0, the modem works in the coordinator mode. In the coordinator mode, the coordinator can set up the network, coordinator is the central node of the network, there must be a coordinator in the network.

The coordinator configurable data input mode is:

Broadcast transmission. When configured to broadcast, all non-dormant devices on the entire network will receive data. The ACK pin indicates transmission successfully all the time.

Short address transmission, when configured to short address transmission, the user must specify the short address

before sending data.

Long address transmission. When configured to long address transmission, the user must specify the long address before sending data.

6.2. Normal node

If the user configures the operating mode 4, ($M0=0, M1=1$) or the user configures the operating mode as 1, the modem works in the normal node mode. In the normal node mode, the data can be received and sent in real time. It is suitable for application with low power consumption but high real-time requirement.

6.3. Dormant node

If the user configures the operating mode as 4, $M0=1, M1=0$, or the user configures the operating mode as 2, the modem works in the dormant node mode. The device request if there is data transmitted by coordinator according to the user-configured sleep period. The non-broadcast data sent by the coordinator will be temporarily stored inside the coordinator. The device is in low power consumption during the sleep period. If the sleep node wants to send data actively, the user should send no more than two bytes to wake up the device. After the byte data is used to wake up the device and the wake-up byte is sent, the user needs to wait for more than 100ms to send the real data. After the wake-up byte is sent, the user needs to wait for 100ms to send the real data and the wake-up data will be discarded. After the device was waken up, the modem will open the serial port, receiving AT command, if more than 2 seconds, there is no data input, the modem will close serial port and go to sleep. The sleep node is suitable for applications where the user requires high power consumption but does not require high real-time data.

6.4. Configuration Mode

When $M0=1, M1=1$, the device will switch to configuration mode. In the this mode, the serial port parameters are: 115200, 8N1, and the average operating current is 2uA. In this mode, the modem cannot send and receive data. When the external AT instruction is configured, needs the serial port to send no more than two bytes data to wake up the device. After the wake-up byte is sent, the user needs to wait for 100ms to send the real data and the wake-up data will be discarded. After the device was waken up, the modem will open the serial port, receiving AT command, if more than 2 seconds, there is no data input, the modem will close serial port and go to sleep.

6.5. Mode switching

No	Remarks
1	The user can decide the operating mode by the combination of M1 and M0
2	In any work mode, the user can configure the operating mode through the AT command
3	When $M0=1, M1=1$, the serial port parameters are 115200, 8N1(fixed)

7. AT command

When the serial port enters AT mode, it needs to open the serial port assistant, set the serial port (default parameter) baud rate 115200, data bit 8 bit, stop bit 1 bit, open the serial port, input "+++" without carriage return. All parameter settings will reply "\r\n+OK\r\n".

	Enters "+++" into AT Command	
1	+++	Parameter Description: Nonparametric Response: Enter AT Mode
	Example: +++	
	Note: 1. The AT command can be used only after entering the AT command mode 2. After entering the AT command mode, the AT command mode can be used again only after exiting the AT command mode, reset or restart the modem 3. When writing this instruction, the serial debugging assistant must be set not to send new lines; writing other AT commands must be set to send new lines.	
	AT+EXIT Exit AT command mode	
2	AT+EXIT	Parameter Description: Null Response: Exit AT Mode
	Example: AT+EXIT	
	Note: AT commands are invalid after exiting AT command mode	
	AT+HELP Help command	
3	AT+HELP	Parameter Description: Null Response: All instructions and help information
	Example: AT+HELP	
	AT+WMCFG Setting/Querying working mode (reboot valid) Set/Query the operation mode configuration of the device (restart takes effect)	
4	AT+WMCFG=?	Description: Gets working mode Response: WMCFG: 4
	AT+WMCFG=Value	Description: Value: 0~4 0, Coordinator; 1, Normal node; 2, Dormant Node; 3, Sleep mode; 4, (factory default), dial switch control
	Example: AT+WMCFG=4	
	Note: 1. After setting a new mode, it needs to be reset or power off and restart	
	AT+DINFO Get facility information	
5	AT+DINFO=ALLNODE	Description: Query the short and long address of all node, and return by UART. It works only when the device works in the coordinator mode
	AT+DINFO=SELFS	Description: Get short address and return by UART
	AT+DINFO=SELFE	Description: Get long address and return by UART
	Example: AT+DINFO=SELFE	
6	AT+TFOCFG Setting/Querying output format configuration (reboot valid)	

	AT+TFOCFG=?	Description: Gets output format configuration Response: TFOCFG:0
	AT+TFOCFG=Value	Description: Value: 0~7 0: Output: valid data (transparent transmission)) 1: Output: Valid Data +Long Address 2: Output: Valid Data +Short Address 3: Output: Valid Data+RSSI 4: Output: Valid Data+Long Address+Short Address 5: Output: Valid Data+Long Address+RSSI 6: Output: Valid Data+Short Address+RSSI 7: Output: Valid Data+Long Address+Short Address+RSSI
	Example: AT+TFCFG=0	
	AT+TFICFG Setting/Querying input transmission format configuration (reboot valid)	
7	AT+TFICFG=?	Description: Gets input transmission format configuration Response: TFICFG:0
	AT+TFICFG=Value (This instruction is valid for coordinator only)	Description: Value: 0~2 0: Input Broadcast(Only the coordinator works) 1: Input Short Address+Data (0x0000 0xffff) are broadcast address 2: Input Long Address+Data (0x000000000000 0xffffffffffff) are broadcast address
	Example: AT+TFICFG=0	
	AT+TMCFG Setting/Querying transport mode configuration (reboot valid)	
8	AT+TMCFG=?	Description: Gets transport mode configuration Response: TMCFG:0
	AT+TMCFG=Value	Description: Value: 0 or 1 0: Long Range mode, LRM 1: Standard transmission mode,GFSK
	Example: AT+TMCFG=0 Note: The coordinator and node should have the same transmission mode before they can access the network.	
	AT+PIDCFG Setting/Querying PANID configuration (reboot valid)	
9	AT+PIDCFG=?	Description: Gets PANID configuration Response: PIDCFG:65535
	AT+PIDCFG=Value	Description: Value:0~65535
	Example: AT+PIDCFG=65535 Note: The node can only join the same network as its PANID (any network can be added when it is configured as 65535)	
	AT+DMCFG Setting/Querying dormancy time configuration(reboot valid)	
10	AT+DMCFG=?	Description: Gets dormancy time configuration Response: DMCFG:0~60
	AT+DMCFG=Value	Description: Configure wakeup period of sleep node Value: dormant time, per unit second (S). 0~60 S. Note: When configured as 0, the node will never wake up, that is, the node cannot receive data but can upload data
	Example: AT+DMCFG=0	
11	AT+RSCFG Setting/Querying the reboot parameter configuration (reboot valid)	

	AT+RSCFG=?	Description: Gets the reboot parameter configuration Response: RSCFG:0
	AT+RSCFG=Value	Description: Value: 0 or 60~65535 (S) When the value less than 60s, the system judges 60, equals 0s, does not restart
Example: AT+RSCFG=0		
Note: This parameter can be used for node disconnection detection. It is recommended to open it.		
	AT+UBCFG Setting/Querying the baud rate parameter (reboot valid)	
12	AT+UBCFG=?	Description: Obtains the baud rate parameter Response: UBCFG:7
	AT+UBCFG=Value	Description: Value:0~7 0: 1200 1: 2400 2: 4800 3: 9600 4: 19200 5: 38400 6: 57600 7: 115200
Example: AT+UBCFG=7		
	AT+UPCFG Setting/Querying the device parity parameter(reboot valid)	
13	AT+UPCFG=?	Description Gets the device parity parameter Response: UPCFG:0
	AT+UPCFG=Value	Description: Value:0~2 0: None 1: Odd parity 2: Even parity
Example: AT+UPCFG=0		
	AT+PWCFG Setting /Querying the power parameter(reboot valid)	
14	AT+PWCFG=?	Description: Gets the power parameter Response: PWCFG:3
	AT+PWCFG=Value	Description: Value:0~3 0: Polar Altitude 1: High 2: Medium 3: Low
Example: AT+ PWCFG=3		
	AT+IOCFG Setting/Querying the IO parameter	
15	AT+IOCFG=?	Description: Gets the IO parameter Response: IOCFG:0
	AT+IOCFG=Value	Description: Value: 0 or 1 0: Push-pull 1: open-drain

	Example: AT+IOCFG=0	
16	AT+DFCFG Restore the default parameter	
	AT+DFCFG	Description: Null Restore the default parameter
	Example: AT+DFCFG	
17	AT+RSTART Device Restart	
	AT+RSTART	Description: Null Device Restart
	Example: AT+RSTART	
18	AT+ECHO Sets up the AT instruction to turn off the back display	
	AT+ECHO=Value	Description: Value:0 or 1 1: Close the echo 0: Open the echo
	Example: AT+ECHO=1	
19	Note: This setting only applies when the power is turned on. After the restart, the default settings are restored and the echo is enabled by default.	
	AT+VER Reding the version number	
	AT+VER	Description:
20	Example: AT+VER	
	AT+CLINFO Clearing network information	
	AT+CLINFO	Description:
21	Example: AT+CLINFO	
	Note: The network cannot be re-established after the module is cleared (this command can clear all the information when the number of coordinator node devices reaches 50).	
	AT+TLCFG Setting/Querying the concurrency performance parameter (reboot valid)	
21	AT+TLCFG=?	Description: Gets the concurrency performance parameter Response: TLCFG:0
	AT+TLCFG=value	Description: Value:0~3 0: Low concurrency 1: Medium concurrency 2: High concurrency 3: Highest concurrency
	Example: AT+TLCFG=0 (Note: This parameter is mainly used to configure the concurrency performance of the modem. That is, when various nodes concurrently transmit data, the maximum number of nodes is supported. The higher the performance, the greater the number of concurrent systems, but the delay in sending data. The average power consumption of the nodes will increase; the lower the performance, the higher the real-time performance of the data sent by the nodes, but the data may be lost when the environment has large interference or multiple nodes transmit simultaneously.)	

8. Note

- In sleep mode, The serial port parameters are 115200, 8N1(fixed). If the user forget the current baud rate, they can use this At command to reconfigure.
- After the node is associated with the coordinator, the node information will be saved, and the information will still exist after the node is disconnected from the network, this mechanism has two advantages:
When the same node joins the network established by the coordinator, the network access speed will be increased.
After a node enters the network, the short address will never change as long as the current network exists.

- If the coordinator has associated more than 200 devices and wants to continue associating new devices, you need to call the AT+CLINFO command to clear the current network information.
- The average power consumption of low power nodes depends on the wake up period of user configuration. The larger the cycle, the lower the power consumption, but the delay of receiving coordinator will be even higher.
- Low-power node cannot receive broadcast data which transmitted by the coordinator
- The system will be reset if the node is powered on for more than 60 seconds and it has not yet entered the network.
- When node PANID is set to 0Xffff (65535), the node can join any network, otherwise it will only be able to join the same network as its PANID.

9. Important statement

1. CDEBYTE reserves the right of final interpretation and modification of all the contents of this manual.
2. As the hardware and software products continuously improving, this manual may subject to change without notice, please refer to the latest version.

Revision history

version	Date	Description	Issued by
1.20	2019-04-12	initial version	Molly
1.00	2018/03/29	Initial version	huaa

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