Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

E821-DTU(212-400SL)



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Chapter 1 Overview

1.1 Introduction

E821-DTU (2I2-400SL) is a remote control product that supports analog quantity following and control acquisition. It supports wireless Modbus RTU protocol in control acquisition mode. This product is highly easy to use and users can easily and quickly integrate it into their own system to achieve remote control based on 433MHz wireless. The analog output of the receiving end can follow the analog input of the sending end. After being configured as bidirectional following, the analog output of the sending end can follow the analog input of the receiving end.

1.2 Features

- Support 2-way analog input, default current detection;
- Support 2-channel analog output, default current output;
- Support analog data remote transmission via 433MHz wireless;
- Support analog quantity following and control acquisition;
- Support 4 working modes: follow-up transmission, follow-up reception, control acquisition, and configuration mode;
- Support two-way following mode;
- Support non-native modbus address forwarding function;
- The control acquisition mode uses Modbus RTU protocol data processing;
- Support Reset touch button, long press for 5s to configure the device address and restore to factory settings;
- Built-in watchdog, with high reliability;
- 3 two-color indicator lights show working status;
- The power supply has good over-current, over-voltage, reverse connection protection and other functions;
- When the equipment is well grounded, the power input terminal can withstand level 3 surge impact (common mode ±2000V, differential mode ±1000V), level 3 pulse group interference (common mode ±2000V, differential mode ±1000V) and level 4 electrostatic interference (air discharge ±15kV, contact discharge ±8kV);
- When the equipment is well grounded, the 485 communication signal port can withstand level 3 surge impact (common mode ±2000V, differential mode ±1000V), level 3 pulse group interference (common mode ±2000V, differential mode ±1000V) and level 4 electrostatic interference (air discharge ±15kV, contact discharge ±8kV).

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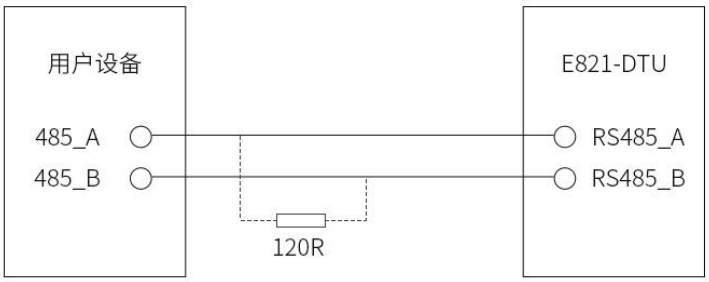
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Chapter 2 Quick Start

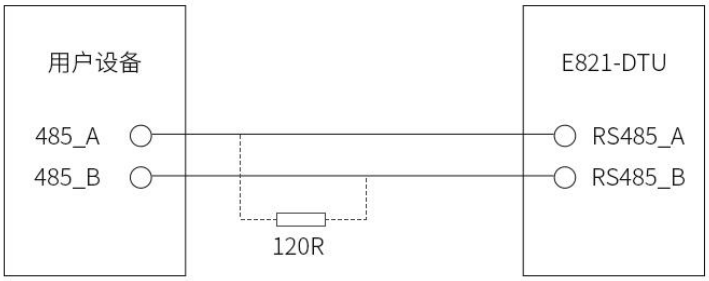
This chapter is a quick introduction to the E821-DTU (2I2-400SL) series products. It is recommended that users read this chapter systematically and follow the instructions to have a systematic understanding of the product. Users can also select chapters of interest to read as needed. For specific details and instructions, please refer to the subsequent chapters.

2.1 Product Connection

2.1.1 RS485 connection



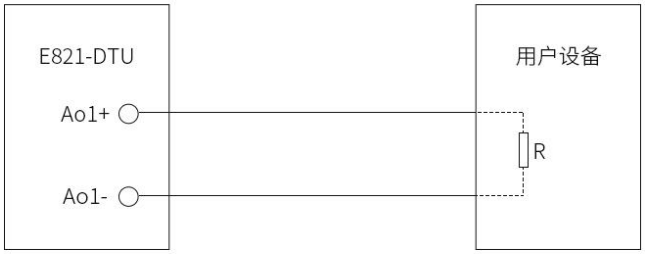
2.1.2 Analog input connection (positive and negative connection are both acceptable)



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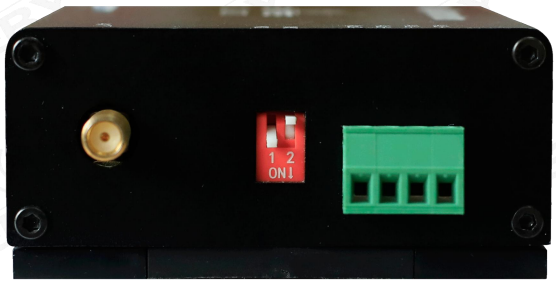
2.1.3 Analog output connection



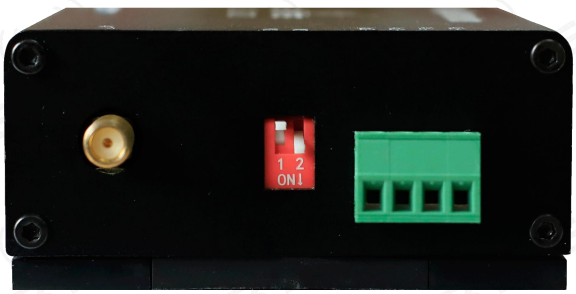
Note: The current input sampling resistance of the user equipment cannot be greater than 400 ohms.

2.2 (A) Normal follow function

Prepare two E821-DTU (2I2-400SL) devices, device A and device B, and ensure that the parameter configuration is consistent (use the default parameters). Use the DIP switch to configure the working mode. Device A is configured to follow the transmission mode, and device B is configured to follow the receiving mode. Device A uses analog input connection, and device B uses analog output connection. Device A and device B can realize the following function.



Device A, i.e. the transmitter, has its DIP switches configured to M1=0, M0=1. After configuration, it needs to be powered on again .



Device B, i.e. the receiving end, has its DIP switches configured to M1=1, M0=0. After configuration, it needs to be powered on again .

For example, if device A channel 1 collects analog 10mA, then device B channel 1 outputs analog 10mA; if device A channel 1

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has no input, then device B channel 1 has no output. When device A transmits data once, A1 and A2 blue lights flash once, and when device B receives data once, A1 and A2 green lights flash once.



Notice:

In the follow function state, at this time, the analog output interface of device A does not work, and the analog input interface of device B does not work.

2.3 (B) Bidirectional follow mode

In normal follow mode, the analog output interface of device A does not work, and the analog input interface of device B does not work. However, in bidirectional follow mode, after device B receives the data from device A, in addition to processing it in the normal follow mode, it will also send the current value collected by its (device B) analog input interface to device A. At this time, device A working in bidirectional follow mode will receive the data and output it to its (device A) analog output interface. Note: Device A working in normal mode will not receive and process the data.

modbus register address that controls the opening and closing of this mode is 0x59; writing 1 to this register turns on the bidirectional follow mode, and writing 0 to restore to the normal follow mode. The position of the dip switch in the bidirectional follow mode should also be the same as that in the normal mode.

modbus command to open the bidirectional follow mode of the device :

01	06	00 59	00 01	98 19
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

Data returned:

01	06	00 59	00 01	98 19
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

modbus command to turn off the bidirectional follow mode of the device :

01	06	00 59	00 00	59 D9
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

Data returned:

01	06	00 59	00 00	59 D9

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Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

2.4 Non-local address forwarding

In the acquisition control mode, wireless acquisition can be performed through the E22/E90-DTU (SLP) series products, and 485 local acquisition can also be supported; when the wireless data received by the device is not a local Modbus acquisition instruction, the data can be transparently output through 485; when the data received by 485 is not a local Modbus acquisition instruction, it is sent wirelessly.

For example, if the Modbus address of the current device is 0x01, when the Modbus address of the Modbus command sent by the E90 radio is not 0x01, after the device receives the data, the data will be transparently output through the 485 interface of the current device. Similarly, when the Mosbus command address received by the 485 port of this device is not 0x01, the data will be sent through the wireless port.

This function needs to be enabled by writing 1 to the modbus register at address (0x005B) , and disabled by writing 0. When not enabled , the device will not forward data , and the function is disabled by default.

Modbus command to enable forwarding function:

01	06	00 5B	00 01	39 D9
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

The command returns :

01	06	00 5B	00 01	39 D9
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

Modbus command to disable forwarding function :

01	06	00 5B	00 00	F8 19
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

The command returns :

01	06	00 5B	00 00	F8 19
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

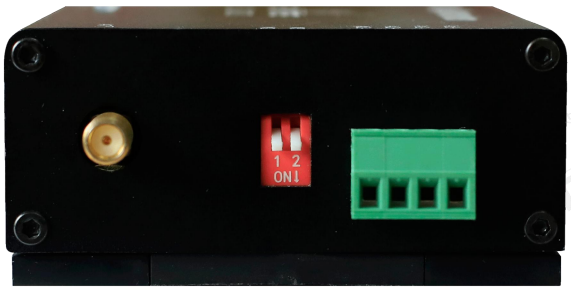
2.5 Control Collection

Prepare an E821-DTU (2I2-400SL) device and an E90-DT U (400SL30P) radio. The wireless communication of the devices adopts the Modbus RTU protocol. Refer to the wireless channel code value table and wireless response time code value table below to configure the wireless parameters of the E90-DTU (400SL30P) radio to be consistent with the E821-DTU (2I2-400SL) device.

the E821-DTU (2I2-400SL) device through the DIP switch .

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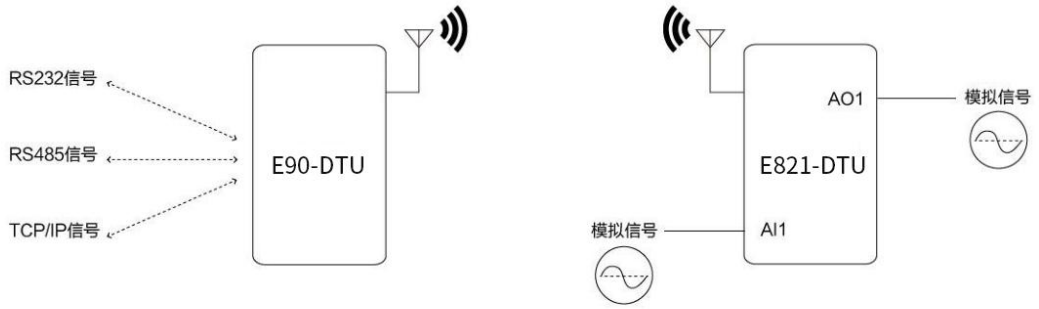


???

Control the acquisition mode, configure the dip switches to M1=0, M0=0, and power on again after configuration .

In the acquisition mode, for example, the E90-DTU (400SL30P) radio can read the 1-channel input of the E821-DTU (2I2-400SL) device through the command 01 03 00 11 00 01 D4 0F . If the input is 10mA, the ideal data returned can be 01 03 02 27 10 A2 78. Among them, 0x2710H can be converted to 10000D , that is, 10.000mA.

In control mode, for example, the E90-DTU (400SL30P) radio can control the 1-channel output of the E821-DTU (2I2-400SL) device through the command 01 06 00 41 27 10 C3 E2. The output is 10mA. If written correctly, the returned data is 01 06 00 41 27 10 C3 E2 .



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Chapter 3 Related Parameters

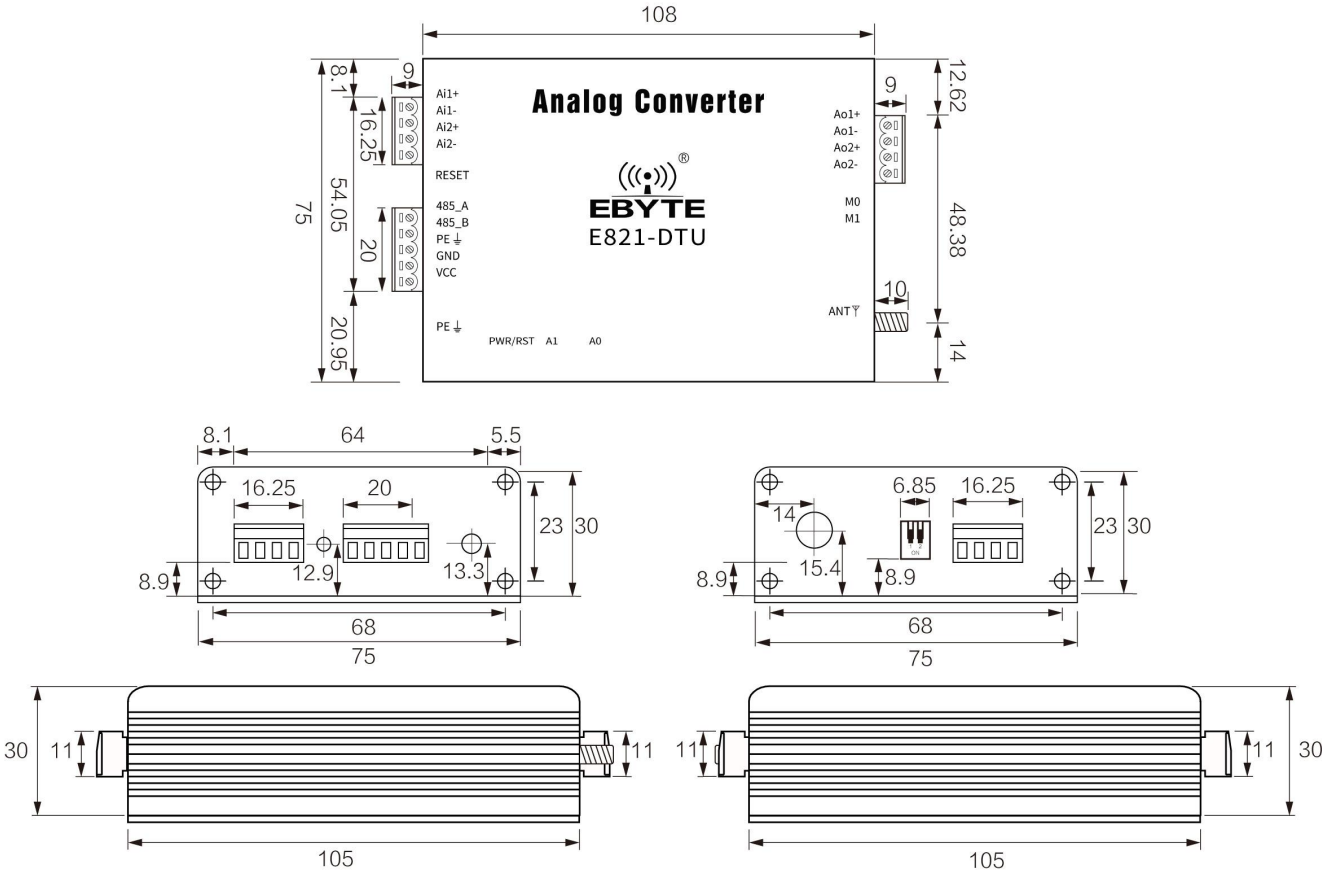
3.1 Basic parameters

	Main parameters	index
Wireless parameters	Standard frequency band	433MHz
	Transmit power	1W
Hardware Parameters	Product size (H*W*D)	109*175*35mm±1mm
	Product Weight	245g±5g
	Operating temperature	-20℃~+70℃
	Storage temperature	-40℃~+85℃
	Operating humidity	5%~95%
	Storage humidity	1%~95%
	Operating voltage	8V~28V
	Current acquisition range	0mA~20mA
	Current output range	0mA~20mA
	Accuracy	0.2%
	Data Interface	RS485: 9600bps
Software Parameters	Working Mode	Follow transmission, follow reception, control acquisition, configuration mode
	Configuration Commands	Modbus RTU

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3.2 Dimensions and interface description



Serial number	Port and other definitions	Function	illustrate
1	Ai1+	Analog signal input channel 1 positive	Analog signal input pin, forming an input with AI1-
2	Ai1-	Analog signal input channel 1 negative	Used in pairs with AI1+
3	Ai2+	Analog signal input channel 2 positive	Analog signal input pin, forming an input with AI1-
4	Ai2-	Analog signal input channel 2 negative	Used in pairs with AI2
5	RESET	Reset button	Long press for 5s to reset the device address
6	485_A	RS_485 interface A	RS_485 interface A is connected to device A interface
7	485_B	RS_485 interface B	RS_485 interface B is connected to device B interface
8	PE	Grounding	Grounding
9	GND	Press-wire power input negative pole	Power reference ground
10	VCC	Press-wire power input	Power input terminal, DC 8V~28V, 12V/24V recommended

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		positive terminal	
11	PE	Grounding	Grounding
12	PWR /RST	Power/reset successful indication	Two-color light, blue light is the power indicator, green light is the reset success indicator
13	A1	Wireless transmit/receive data indication	Two-color light, blue light indicates transmitting data, green light indicates receiving data (channel 1)
14	A0	Wireless transmit/receive data indication	Two-color light, blue light indicates transmitting data, green light indicates receiving data (channel 2)
15	ANT	Antenna interface	433MHz Antenna
16	Dip switch	Mode Selection	M1M0 (00, 01, 10, 11)
17	AO2-	Analog signal output channel 2 negative	Used in pairs with AO-
18	AO2+	Analog signal output channel 2 positive	Analog signal output pin, forming output with AO2-
19	AO1-	Analog signal output channel 1 negative	Used in pairs with AO+
20	AO1+	Analog signal output channel 1 positive	Analog signal output pin, forming output with AO1-

Notice:

Grounding: It is recommended to connect the shell to the ground

3.3 Reset button description

Long press for 5 seconds is effective. After the reset is successful, the RST light flashes. (Only valid in follow-receive, control acquisition, and configuration modes, and only reset the device address to 0x01H)

3.4 A1 and A2 lamp description

In follow or control acquisition mode, A1 and A2 are used for wireless data indication.

In the follow-up transmission mode, each time data is transmitted, the A1 and A2 blue lights flash once; in the follow-up receiving mode, each time data is received, the A1 and A2 green lights flash once.

In the control acquisition mode, when there is data interaction in channel 1, the blue light of A1 flashes once, and when there is data interaction in channel 2, the blue light of A2 flashes once.

3.5 DIP switch description

The working mode is established by the DIP switch (the status of M1M0, downward is "0"), and it will take effect only after power is turned on again.

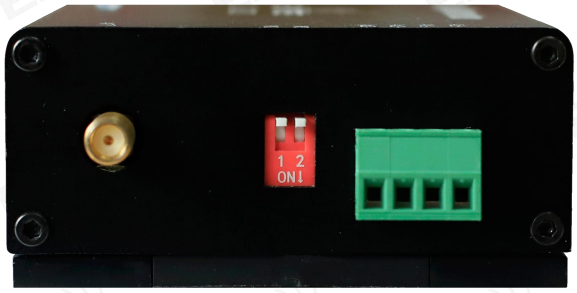
	Mode Category	**M1**	**M0**	**Notes**
Mode 0	Control Collection	0	0	Wireless control acquisition function

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Mode 1	Follow the launch	0	1	When the following function is used, the transmitter
Mode 2	Follow Receive	1	0	When the follow function is used, the receiving end
Mode 3	Configuration parameters	1	1	Host computer configuration related parameters

Chapter 4 Configuration



In configuration mode, the DIP switches are configured to M1=1, M0=1. After configuration, power must be turned on again.

4.1 Parameter configuration steps

1. Select the corresponding serial port and open

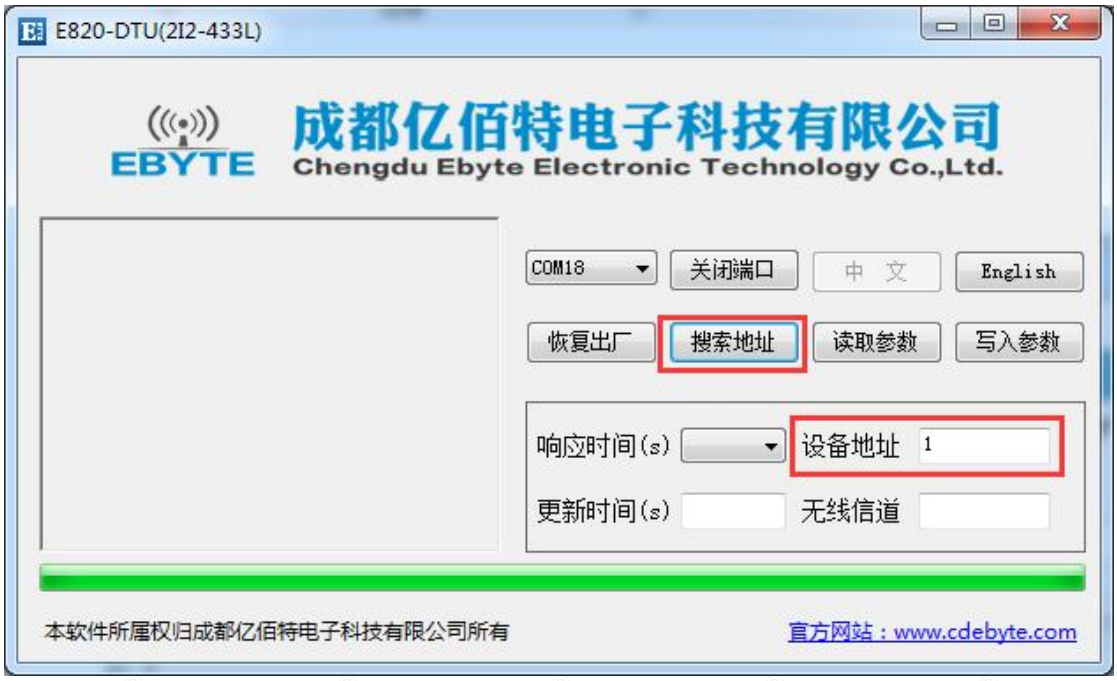


2. Click "Search Address" to search the current device address of the device. You can see that the device address is displayed as

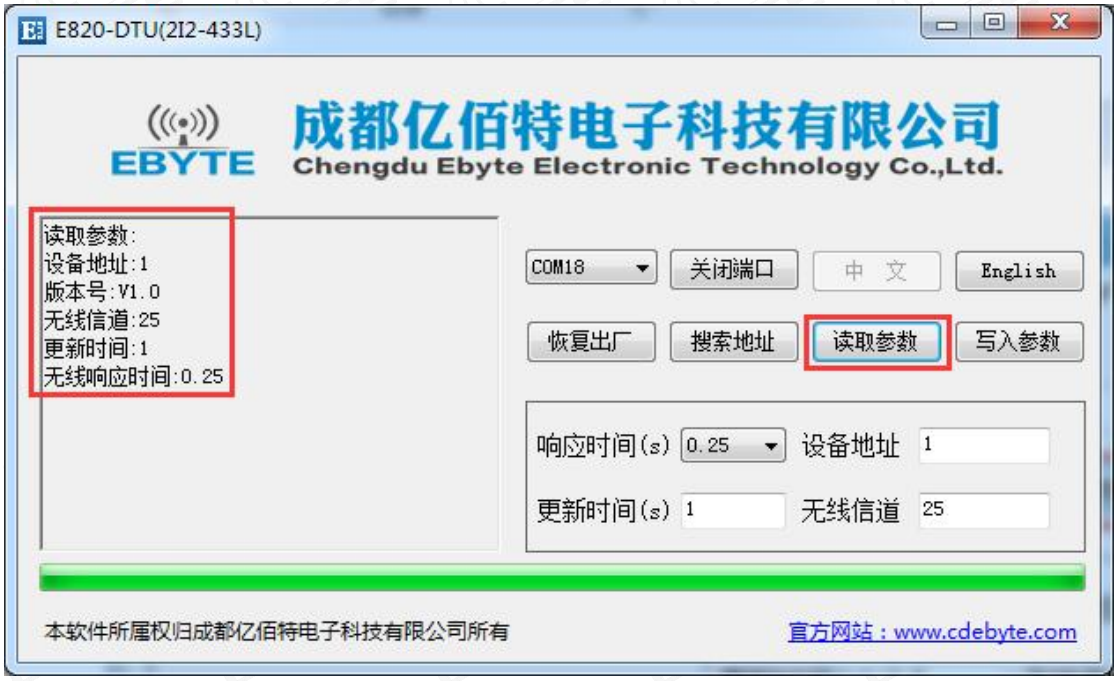
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1. After changing the device address, please click "Search Address" first when operating .



3．Reading parameters



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4. Write Parameters



4.2 Parameters and button meanings

1. Factory Reset

Restore all parameters to default settings.

2. Response time

There are 8 levels, namely 1.5s, 0.5s, 0.25s, 0.2s, 0.15s, 0.1s, 0.065s, 0.035s, and the default is 0.25s. The response time between communication devices must be consistent . The longer the response time, the longer the transmission distance; and the response time must be less than or equal to the update time.

3. Update time

It only works in follow mode. The minimum update time is 0.5s and the maximum is 600s. It can only be a multiple of 0.5, such as 14.5s, 300s, etc. The default is 1s. The update time refers to how often the follower receiver changes data. The update time between communication devices must be consistent.

4. Device Address

The device address refers to the current address of the device, the minimum is 1, the maximum is 247, and the default is 1.

5. Wireless Channel

Wireless channel, that is, the communication channel of the device, has a minimum value of 0 and a maximum value of 31. The default value is 25. The wireless channels of the communication devices must be consistent.

The response time level can be modified by writing the corresponding value to the register at Modbus address 0x0055 .

For example: Change the response time to 0.065s

01	06	00 55	00 06	19 D8
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

Modify the response time to 0.035s

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01	06	00 55	00 07	D8 18
Device ModBus address	Write Command	Register Address	Writing Data	CRC checksum

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Chapter 5 ModBus

5.1 Register Configuration Table

5.1.1 ModBus address table

this device are reserved and not used, the baud rate is fixed at 9600bps, and the check bit is fixed at no check.

ModBus Register Address Table				
address	Return Bytes	Variable Name	type	illustrate
40018 (0x0011)	2	AI1 input, actual value (mA)	Read-only	0-20000
40019 (0x0012)	2	AI2 input, actual value (mA)	Read-only	
40066 (0x0041)	2	AO1 output, actual value (mA)	Read/Write	0-20000
40067 (0x0042)	2	AO2 output, actual value (mA)	Read/Write	
40082 (0x0051)	2	Device Address	Read/Write	1-247
40085 (0x0054)	2	Wireless Channel	Read/Write	0-31
40086 (0x0055)	2	Wireless response time	Read/Write	0-7
40090 (0x0059)	2	Normal/two-way follow mode	Read/Write	0-1
40092 (0x005B)	2	485 interface/wireless interface forwarding	Read/Write	0-1

5.1.2 Wireless Channel Code Value Table

Wireless channel code value table		E90-DTU corresponding frequency channel and module address	
0	0	0	0x00
1	1	1	0x01
2	2	2	0x02
…	…	…	…
29	29	29	0x1d
30	30	30	0x1e
31	31	31	0x1f

5.1.3 Wireless response time code value table

Wireless response time code value table		E90-DTU corresponding air rate
0	1.5s	300bps
1	0.5s	1200bps

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2	0.25s	2400bps
3	0.2s	4800bps
4	0.15s	9600bps
5	0.1s	19200bps
6	0.065s	38400bps
7	0.035s	62500bps

5.2 Instruction Format

5.2.1 “03” reads a register

Use command 03 to read register values. For example, read the analog input value of channel 1 of the device (ideal value 10mA):

01	03	00 11	00 01	D4 0F
Device ModBus address	Read Command	Start reading register address	Read register length	CRC checksum

After sending the above command to the device via E90-DTU (400SL30P), the device will return the following values:

01	03	02	27 10	A2 78
Device ModBus address	Read Command	Read returns the number of bytes	Reading the return value	CRC checksum

The above 0x2710H converts to 10000D, which is 10.000mA (ideal value).

5.2.2 “03” Read multiple registers

Use command 03 to read register values, for example, to read the analog input of channels 1 and 2 of the device (ideal values are 10mA and 20mA):

01	03	00 11	00 02	94 0E
Device ModBus address	Read Command	Start reading register address	Read register length	CRC checksum

After sending the above command to the device via E90-DTU (400SL30P), the device will return the following values:

01	03	04	27 10	4E 20	C5 3A
Device ModBus address	Read Command	Read returns the number of bytes	Reading the return value	Reading the return value	CRC checksum

The above 0x2710H is converted to 10000D, that is, 10.000mA (ideal value); 0x4e20H is converted to 20000D, that is, 20.000mA (ideal value).

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5.2.3 “06” writes a register

Use the 06 command to write a single command, for example, to change the device address to 2:

01	06	00 51	00 02	59 DA
Device ModBus address	Write Command	Write to 40081 register	Write the value 2 to 40081 .	CRC checksum

After sending the above command to the device via E90-DTU (400SL30P), the device will return the following values:

01	06	00 51	00 02	59 DA
Device ModBus address	Write Command	Write to the 40081 register	Write the value 2 to 40081 .	CRC checksum

If the modification is successful, the device address will be changed to 2.

5.2.4 Default Parameters

equipment	Device Address	Wireless Channel		Wireless response time
E821-DTU(2I2-400SL)	0x01H	0x19H		0.25s
E90- DTU(400SL30 P)	-	Frequency Channel	Module Address	Air speed
		0x19H	0x19H	2400bps

Chapter 6 Precautions for use

1. Do not operate this radio in flammable places (such as coal mines) or near explosive and dangerous objects (such as detonators) .
2. A suitable DC regulated power supply should be selected, which is required to have strong resistance to high-frequency interference, small ripple, and sufficient load capacity; it is best if it also has overcurrent, overvoltage protection and lightning protection functions to ensure the normal operation of the digital radio station .
3. Do not use the device in an environment that exceeds the environmental characteristics of the digital radio , such as high temperature, humidity, low temperature, strong electromagnetic field, or dusty environment.
4. Do not allow the digital radio to continuously operate at full load, otherwise the transmitter may burn out.
5. the digital radio should be well connected with the ground wire of the external device (such as PC, PLC, etc.) and the ground wire of the power supply, otherwise it is easy to burn out the communication interface, etc.; never plug or unplug the serial port when it is powered on.
6. When testing a digital radio station, a matching antenna or a 50 Ω dummy load must be connected, otherwise the transmitter may be easily damaged. If an antenna is connected, the distance between the human body and the antenna should be more than 2 meters to avoid injury. Do not touch the antenna during transmission.
7. Wireless data transmission stations often have different communication distances in different environments. The communication distance is often affected by temperature, humidity, obstacle density, obstacle volume, and electromagnetic environment. In order to ensure stable communication, it is recommended to reserve more than 50% of the communication distance margin.

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8. If the measured communication distance is not ideal, it is recommended to analyze and improve the communication distance from the perspective of antenna quality and antenna installation method. You can also contact support@cdebyte.com for help.
9. When selecting a power supply, in addition to retaining a 50% current margin as recommended, you should also pay attention to the ripple not exceeding 100mV.

Chapter VII Important Statement

1. Ebyte reserves the final right of interpretation and modification of all contents in this manual.
2. Due to the continuous improvement of the product hardware and software, this manual may be changed without prior notice. The latest version of the manual shall prevail.

Revision History

Version	Revision Date	Revision Notes	Maintainer
1. 2	2025-05-27	Modified Versions	huaa

About us

Technical support: support@cdebyte.com

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

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