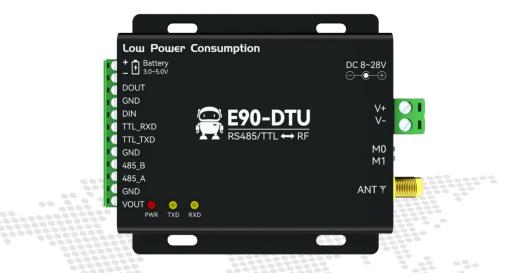


# Wireless Modem

# User Manual



# E90-DTU(400SL30L) Low-power digital radio User Manual

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# **Chapter 1 Product Description**

#### 1.1 Product introduction

E90-DTU (400SL30L) is a wireless data transmission radio using military-grade LoRa modulation technology. It has a variety of transmission methods and works in the (410.125~493.125MHz) frequency band (default 433.125MHz). The radio provides RS485 and TTL two kinds of serial communication Port, support 8~28V DC power supply or 4.2V lithium battery power input, support reverse constant current charging;

The introduction of the Modbus RTU protocol can configure the working mode of the digital radio through the configuration register, which is convenient for customers to access their own configuration system (HMI or SCADA software, etc.) through the Modbus protocol for radio management, and provides the convenience of a host computer that does not need to understand



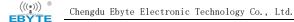
the Modbus protocol. Configuration by users who do not understand the protocol;

Ultra-low power consumption design, the lowest standby current consumption is only 38uA, supports battery power supply (3.7-4.2v) and reverse charging, and the radio integrates switch value acquisition (dry contact) and switch value output (transistor) for remote acquisition control, and the device can provide power for low-power sensors:

Multiple automatic polling commands can be configured to support automatic Modbus CRC check;

#### **1.2 Features**

- Using the latest LoRa technology, the distance is farther and the performance is more powerful than the traditional LoRa digital radio;
- Using military-grade LoRa modulation technology, the transmission is more secure, and the packet length can be configured;
- Oversized single packet, single packet supports up to 240 bytes, and adapts to Modbus protocol;
- Based on standard Modbus RTU design, it is convenient to access different configuration systems;
- Support a variety of serial communication ports (TTL and RS485) to facilitate access to sensors of different protocols;
- Simple and high-efficiency power supply design, support power adapter or pressure line method, support DC 8  $\sim 28V$  wide voltage input;
- Support lithium battery power supply and reverse charging, and support battery voltage detection and low battery feedback;
- The transmission power can reach up to 1W, and supports multi-level adjustment, and all technical indicators meet European industrial standards;



- Ultra-low power design, low power mode standby current is only 38uA;
- The sensor (VOUT) power output can be controlled to adapt to sensors with different power supplies;
- Integrate one switch value acquisition and one switch value output, which can realize device control without external remote IO;
- Support switch value acquisition status change and lithium battery low battery reporting;
- Support wireless sending Modbus commands to remotely configure or read radio parameters;
- ♦ Working temperature range: -40°C ~+85°C, suitable for all kinds of harsh working environment, real industrial grade products;
- All aluminum alloy shell, compact size, easy installation, good heat dissipation; perfect shielding design, good electromagnetic compatibility, strong anti-interference ability;
- Multiple protection functions such as DC input reverse connection protection and antenna surge protection greatly increase the reliability of the radio;
- Powerful host computer, all parameters can be set by programming: such as power, frequency, air rate, address ID, etc., providing a remote configuration interface;

# **Chapter 2 Quick Start**

# 2.1 Hardware preparation

In order to test the E90-DTU (400SL30L), the following hardware is required:

One PC with more than two USB-A ports;

Two low-power output radios E90-DTU (400SL30L) (hereinafter referred to as "radio");

Two DC12V1A power adapters to provide power for low-power digital radio;

RS-485 cable and flat-blade screwdriver for connecting USB to RS-485 and radio;

TX433-JKD-20P, two 433MHz internal thread and internal needle antennas;

| Low Power Consumption<br>Cow Power Consumption<br>DC 8-28V<br>Cov Cov<br>Cov<br>Cov<br>Cov<br>Cov<br>Cov<br>Cov<br>Cov |                         | ~                               |                     |
|--|-------------------------|---------------------------------|---------------------|
| E90-DTU(400SL30L)*2  | Power adapter (12V1A)*2 | USB to RS-485*2                 |                     |
|  |                         |                                 |                     |
| PC   | Several RS485 cables    | Slotted screwdriver<br>(SL-3.0) | TX433-JKD-20P<br>*2 |

# 2.2 Software preparation

The product details on the Ebyte official website provide the configuration host computer "E90-DTU-400SL30L.exe" and the serial port assistant "XCOM.exe" to download, as shown in the figure below. Official website address: https://www.ebyte.com.

| )TU(4005L30L) V1.0   |               |       | 35       | - 🗆 X         | AT XCOM V2.6                                  | >                          |
|--|---------------|-------|----------|---------------|---|----------------------------|
|  | 1 logisticity | 111   |          | 史品            |   | Port                       |
| (*)) * 亿佰特・物联网应用专家 IoT APPLICATION EXPERT  |               |       |          | English       |   | COMS: USB-SERIAL CH34C     |
|  | 1             |       |          |               |   | Baud rate 9600             |
| naker CDVS v Band Rate 9600 v Bata 8 v Parity HDHE v Step 1 v Open Pert                    | D)<br>Read    |       | Factory  | 2.5<br>Bastar |   | Stop bits 1                |
| andig Slave Coulig   |               |       | 14100    |               |   | Data bits 8                |
| quipment Information   |               |       |          |               |   | Parity None                |
| Coafig Role Device Res Rot Alde  |               |       |          |               |   | Operation 🛞 Open           |
| Frein Derice ander Centig abbress Derice nansen  |               |       |          |               |   |                            |
|  |               |       |          |               |   | Save Data Clear Dat        |
| evice Configuration  |               |       |          |               |   | ☑ Hex □ DTR<br>□ RTS □ 自动保 |
| Seriel Part Formatters<br>Bund finte 1200 v Date Bits 8 v Parity Bits MOME v Stop Bits 1 v |               |       |          |               |   | TineStamp 100              |
| ladia frequence farantera  |               |       |          |               | Single Send Walti Sund Protocol Transmit Malp |                            |
| 17 kile Ber kile Dastal  |               |       |          |               | 20 05 00 00 00 00 CB 78                       |                            |
| Airspeed 2.4Ktos v Parket length 2488;te v Preer Level maximum v                           |               |       |          |               |   | Send                       |
| Delivery Mode Transparent - Rele of MOR acceptor - MOR Cycle SHOes -                       |               |       |          |               |   |                            |
| Signal strength  |               |       |          |               |   | Ulear Sep                  |
| allara parameters  |               |       |          |               | Timing Cycle 1000 ms Open File                | Send File Stop Sen-        |
| DI Alers is soubled Disabled v DI alers source Disconnect alers v                          |               | (lear | lace but |               | ☑ Hex Send □ Wordwrap 0% 正点限子论法h              | ttp://www.openedr.com/     |
|  |               |       |          |               | 🔅 - www.openedv.com Si0 R:0 Cur               | rent time17:52:52          |
|  |               |       |          |               |   |                            |
| E90-DTU-400SL30L   | ovo           |       |          |               | XCOM.exe                                      |                            |
| E90-D10-4003L30L   | .exe          |       |          |               | ACOM.EXE                                      |                            |

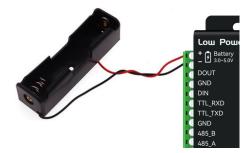
[Note] The pictures provided in the manual may be different from the software provided on the official website, and the official website shall prevail;

#### 2.3 Equipment wiring

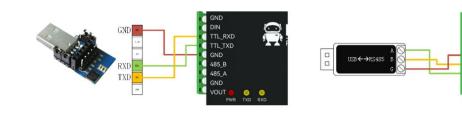
DC power access, support DC 8~28V input:



The battery power supply is connected. After connecting to the DC power supply, the battery power supply can be connected. The following figure takes the 18650 battery box as an example. The red (+), black (-), positive and negative poles must be connected correspondingly, otherwise the equipment will be damaged:



Signal line access, RS-485 or TTL-3.3V, serial ports cannot be used at the same time, only one of them can be used at the same time:



USB to TTL connected device

USB to RS485 connected device

#### 2.4 Quick to use

Switch the radio to configuration mode, as shown below:



Config Mode

Turn on the host computer, confirm the correct baud rate parameter "1", click "Open serial port", confirm whether the host computer configuration mode is checked, the device is in configuration mode, this parameter should be checked, as shown in the following figure:

| E90-DTU(400SL30L) V1.2  |   | - 🗆 🗙                       |
|---|---|-----------------------------|
| ((・シ))*<br>EBYTE 亿佰特・物联网应用专家 IoT APPLICATION EXPERT   | 2 | English                     |
| Port Humber COM4 Saud Rate 9600 Data 8 Parity NONE Stop 1 Open Port   |   | ↓ E ::<br>we Factory Restar |
| Bost Config       Slave Config         Equipment       Information         Versi.       Device ad         Device       Config address         Baud Rate       1280         Data       Bits         Baud Rate       1280         Data       Bits         Radio       Frequency Parameters         RF       Addr         Airspeed       2.4Kbps         Packet       Length         Delivery       Mode         Transparent       Role of WOR         Signal       strength | c | Clear Recv Box              |

The purpose of the "Quick Start" here is to use the device quickly, and the parameters use the factory parameters. If the device has been configured before, click "Factory Settings" to restore the factory parameters:

| E90-DTU(400SL30L) V1.2   |  | -                        |                     |
|--|--|--------------------------|---------------------|
| ((;))*<br>EBYTE 亿佰特・物联网应用专家 IoT APPLICATION EXPERT   |  |                          | <b>만</b><br>English |
| Port Humber COM8 V Baud Rate 9600 Data 8 Parity NONE Stop 1 V Open Port  | Read Save  | Factory                  | Restar              |
| Host Config Slave Config<br>Equipment Information Config Node Device Name E99-DTU(4005L30L) Host Addr Versi 1.0 Device ad 1 Config address Device message  | TX:01 03 18 93 00 0D<br>09:21:18.758<br>RX:01 03 1A FF FF FF<br>FF FF FF FF FF FF FF<br>FF FF FF | FF FF FF F<br>FF FF FF F |                     |
| Device Configuration<br>Serial Port Parameters<br>Baud Rate 9600 V Data Bits 8 V Parity Bits NONE V Stop Bits 1 V<br>Radio Frequency Parameters  | 09:21:18.860<br>RX:01 03 1A FF FF FF<br>FF FF FF FF FF FF FF<br>FF FF FF                         | FF FF FF F               |                     |
| RF Addr     0     Net Addr     0     Channel     23       Airspeed     2.4Kbps v     Packet length     2408yte v     Fover Level     maximum v       Delivery Mode     Transparent v     Role of WOR     sender v     WOR Cycle     2000ms v       Signal strength     0     0     0     0     0     0 | RX:01 03 1A FF FF FF<br>FF FF FF FF FF FF FF<br>FF FF FF   | FF FF FF FF              | F FF FF             |

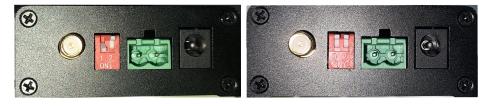
Click "Read Parameters" to know that the default Modbus address of the device is 1. If the serial bus connected to the device already has address 1, the address can be configured to other values here. If Modbus RTU protocol transmission and remote configuration are not performed, it can be ignored. address parameter;

After the configuration is complete, click "Restart Device", and all parameters will take effect after restarting; Use the same method to configure another low-power digital radio, and modify the Modbus address to 2 to avoid address conflict during remote configuration and Modbus RTU transmission. No Modbus RTU protocol transmission and remote configuration can be ignored, as shown in the following figure:

| Equipment Information       09:21:         Config Mode Device Name [E90-DTU(4005L30L)] Host Addr       09:21:         Versi.       1.0       Device at       1         Config address       Device nessage       09:21:         Device Configuration       Serial Port Paraseters       09:21:         Baud Rate 0960       Data Bits 8       Parity Bits NONE       Stop Bits 1         Radio Frequency Parameters       09:21:       TX:01         RF Addr       0       Channel       23         Airropeed       2.4Kbps       Packtel length 2400pte       Power Level maximum   |  | -  |          |
|--|--|--|----------|
| tt Number CONS       Baud Rate 9680       Data       B       Parity NOME       Stop       I       Open Port       Read         st Config       Slave Config       Equipment Information       If Read       If Read       If Read         Image: Config Mode       Device Name       E90-DTU(4005L30L)       Host Addr       Image: Config address       Device nessage       Image: Config address       Image: Config addres | 应用专家 IoT APPLICATION EXPERT  |  | Eng1     |
| Equipment Information       [X:01]         Config Mode Device Name (E90-DTU(4005L30L) Host Addr       [X:01]         Versi.       1.0       Device at 1       Config address       Device message         Device Configuration       1       Config address       Device message       Device message         Serial Port Parameters       Fauld Rate 9660       Data Bits 8       Parity Bits NONE       Stop Bits 1       09:21:         Radio Frequency Parameters       [RF Addr       0       Channel       23       RX:01         RF Addr       0       Net Addr       0       Channel       23       FF FF         Airspeed       2.4Kbps       Packet length 2408yte       Power Level maximum >       FF       FF   | ∨ Data 8 ∨ Parity NONE ∨ Stop 1 ∨ 🛁 🔾  | ⊥ ⊑<br>Save Factory  | Resta    |
| Device Configuration       RX:01         Serial Port Parameters       FF FF         Baud Rate 9600 V Data Bits 8 V Parity Bits NONE V Stop Bits 1 V       Port Parameters         Radio Frequency Parameters       0         RF Addr       0       Net Addr       0         Airspeed       2.4Kbps V Packet length 2408yte V Power Level maximum V       FF FF   | 09:21:18.7           RX:01 03 1           P65L30L) Host Addr           1           Config address           Device message           7           7           7           7   | IA FF FF FF FF FF FF<br>FF FF FF FF FF FF FF<br>FF 85 57<br>759<br>I8 A0 00 0D 82 8D |          |
| RF Addr         0         Net Addr         0         Channel         23         RX:01           FF FF         Airspeed         2.4Kbps         > Packet length         2408yte         > Power Level maximum         >         FF FF   | RX:01 03 1           FF FF FF           V Parity Bits NONE           Stop Bits 1           09:21:18.8  | LA FF FF FF FF FF FF<br>FF FF FF FF FF FF FF<br>FF 85 57<br>361<br>L8 AD 00 0D 13 4E |          |
|  | Addr         0         Channel         23         RX:01:03         1           FF         FF | LA FF FF FF FF FF FF<br>FF FF FF FF FF FF<br>FF 85 57                                | FF FF FF |

#### Click "Reboot Device":

To exit the "configuration mode" only need (M0 dial up), you can send and receive data, as shown in the figure below:



Send and receive as follows:



| XCOM V2.6  | - 🗆 ×                              | 1 XCOM V2.6  | - 🗆 ×  |
|--|------------------------------------|--|--|
| [2022-00-00 11 40 01 [202]<br>Tr: DTTT_200_STBL_1<br>[2022-00-01 14 00 35M]<br>At: DTTT_200_STBL_2                                 | Port<br>COMM5:USB-SERIAL CM34C ~   | 00000-00-00 10 001.000]<br>001:0011200-2000.1000<br>00200-00-01 10 000:003<br>T1:0011_000_2000_2 | Port         COMP.NOB-SEELAL CHOIC           COMP.NOB-SEELAL CHOIC         >           Bued rate (9000 ~)         >           Step bits (1 ~)         >           Data bits (8 ~)         >           Parity Bone ~         >           Operation (1000 Close)         Step Bata Close Data           Step bata (1000 Close)         > |
|  | □ KTS □ 自动保存<br>☑ TineStamp 100 as |  | □ BIS □ 自动保存<br>☑ TimeStamp 100 ns   |
| Single Send Multi Send Protocol Transmit Help  |                                    | Single Send Multi Send Protocol Transmit Help  |  |
| REVIR_DRA_SIND_1   | Send<br>Clear Send                 | IDITE_END_SUB_2  | Send<br>Clear Send   |
| Tising         Cycle         1000         ms         0pen 1           Hex         Send         Wordsrap         0%         r/r/r/# | 'ile Send File Stop Send           | Tining Cycle 1000 ms Open Tile   | Send File Stop Send  |
|  | 0 Current time11:40:04             |  |  |

# **Chapter 3 Product Overview**

# **3.1 Technical parameters**

| Item                      | Description   |  |  |
|---------------------------|---|--|--|
| Operating Voltage         | DC 8~28V Support DC head and terminal power supply access   |  |  |
|                           | Standby current consumption: 11mA @ 12VTransmit current consumption: 288mA @ 12VLow power standby current consumption: 302u@ 12VTransmit power is instantaneous power, standbpower is average power |  |  |
| Working current           | Battery<br>powered  | (a) 4.2V   |  |
| Communication             | TTL   | 3.3V-TTL serial level communication interface    |  |
| Interface                 | RS-485  | Standard RS-485 communication interface          |  |
| Frequency Range           | 410.125~493.125MHz  |  |  |
| channel                   | $0\sim$ 83, the default is 23, the channel interval is 1MHz   |  |  |
| airspeed                  | 2.4, 4.8, 9.6, 19   | .2, 38.4, 62.5Kbps, default 2.4Kbps              |  |
| Power regulation          | Support 4 gear  | transmission power configuration                 |  |
| reverse charging          | 120mA constan   | t current charging, 4.2V preset charging voltage |  |
| Communication<br>distance | 10Km  |  |  |
| User configuration        | Host computer and Modbus RTU command  |  |  |
| Operating mode            | Transparent transmission, Modbus slave, low power consumption, automatic acquisition  |  |  |
| Subcontracting mechanism  | Support configuration as 32, 64, 128, 240Byte, default 240Byte  |  |  |
| Serial port baud<br>rate  | 1200、2400、4800、9600bps(default)   |  |  |
| data bits                 | 7, 8 (default 8)  |  |  |
| stop bit                  | 1, 2 (default 1)  |  |  |
| Check Digit               | NONE, ODD, EVEN (default NONE)  |  |  |



| Antenna interface | SMA-K, external thread internal hole        |  |  |  |  |
|-------------------|---|--|--|--|--|
| Product Size      | 84mm*82mm*25mm (length*width*height)        |  |  |  |  |
| product weight    | $133 \text{ g} \pm 5 \text{ g}$             |  |  |  |  |
| Working           |   |  |  |  |  |
| temperature and   | -40 to +85°C, 5% to 95%RH (non-condensing)  |  |  |  |  |
| humidity          |   |  |  |  |  |
| Storage           |   |  |  |  |  |
| temperature and   | -40 to +105°C, 5% to 95%RH (non-condensing) |  |  |  |  |
| humidity          |   |  |  |  |  |

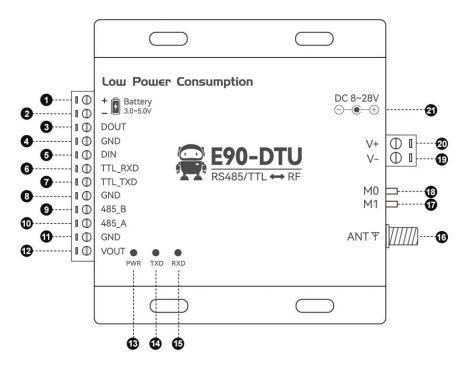
#### [Note] :

1. The test transmission power is an instantaneous value. It is recommended to reserve 50% of the current margin when selecting the power supply, which is conducive to the stable operation of the radio for a long time;

2. The lower the transmit power, the closer the transmission distance is, but the working current will not decrease proportionally. It is recommended to use the maximum transmit power;

3. Use multiple groups of digital radios to communicate one-to-one at the same time in the same area. It is recommended that each group of digital radios set the channel interval to be more than 3MHz;

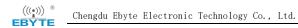
# 3.2 Interface and indicator description



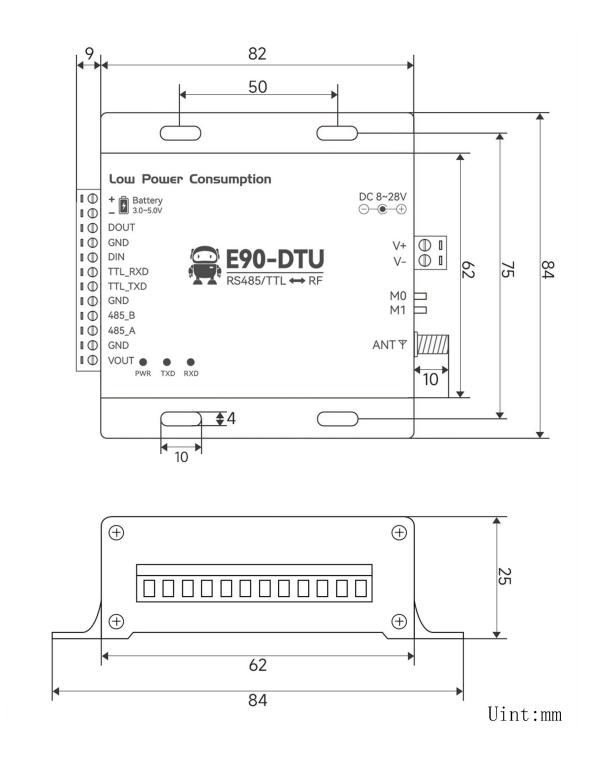
| Item | Tag      | Function                 | Description  |
|------|----------|--------------------------|--|
| 1    | Dattam   | Positive pole of battery | DC $3.0 \sim 5.0$ V, pay attention to the positive |
|      | Battery+ | power supply interface   | and negative poles of the battery, do not          |



|    |           | Negative terminal of   | reverse, support the battery charging      |
|----|-----------|------------------------|--|
| 2  | Battery - | battery power supply   | function                                   |
|    |           | interface              |  |
| 3  | DOUT      | transistor output      | The output wiring mode is NPN, the load    |
| 4  | GND       | Input and output       | voltage is less than 30V, and the maximum  |
| 4  | UND       | common terminal        | allowable current is 100mA                 |
| 5  | DIN       | dry contact input      | Switch input detection                     |
| 6  | TTL-RXD   | TTL-3.3V signal input  | When using TTL, it is necessary to connect |
| 7  | TTL-TXD   | TTL-3.3V signal output | the signal common terminal, and it cannot  |
| 0  | CND       | TTL-3.3V signal        | be used with the RS485 interface at the    |
| 8  | GND       | common terminal        | same time.                                 |
| 9  | 485-В     | B of RS-485 signal     | Cannot be used with TTL interface at the   |
| 10 | 485-A     | A of RS-485 signal     | same time                                  |
| 11 | GND       | Negative power output  | The total current of the load connected    |
| 12 | VOUT      | Positive power output  | through VOUT should be <1A                 |
|    |           |                        | Host: turn on the power and keep on;       |
| 10 | DUID      |                        | Slave: On when the low-power mode wakes    |
| 13 | 13 PWR    | Power Indicator        | up, off when entering low-power mode, and  |
|    |           |                        | always on when not in low-power mode;      |
| 14 | TXD       | send indicator         | Blinks when sending data                   |
| 15 | RXD       | Receive indicator      | Blinks when receiving data                 |
| 16 | ANT       | Antenna interface      | SMA-K                                      |
|    |           | Master-slave           |  |
| 17 | M1        | configuration dial     | Dial down for the host                     |
| 18 | M0        | configuration mode     | Dial down for configuration mode           |
|    |           | Negative pole of DC    | DC 8~28 V, 2*5.08mm phoenix terminal       |
| 19 | V-        | 8~28 V                 | input;                                     |
|    |           | Positive pole of DC    | Do not supply power at the same time as    |
| 20 | V+        | 8~28 V                 | the socket;                                |
|    |           |                        | DC 8~28 V;                                 |
|    |           |                        | In-line round hole, outer diameter 5.5mm,  |
| 21 | DC-IN     | DC power input         | inner diameter 2.0mm;                      |
|    |           |                        | Do not supply power with the terminals at  |
|    |           |                        | the same time;                             |
|    |           |                        | une same unite,                            |



# **3.3 Dimensions**



(((•))) <sup>®</sup> Chengdu Ebyte Electronic Technology Co., Ltd.

# **Chapter 4 Function Introduction**

# 4.1 DIP configuration instructions



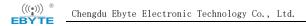
| Icon   | M0 (Dial 2) | M1 (Dial 1) | Mode                      |
|--------|-------------|-------------|---------------------------|
| MODE 1 | I Le        | Devre       | Host Mode (WOR            |
| MODE I | Up          | Down        | Transmitter)              |
| MODE 2 | Up          | Up          | Slave Mode (WOR Receiver) |
| MODE 3 | Down        | X (Random)  | Configuration Mode        |

Note: The external Modbus slave station needs to avoid the address used by the radio to avoid the communication bus address conflict:

# 4.1.1 Configuration mode

M0 (that is, dial code 2) is dialed and the device is in configuration mode, the device uses a fixed baud rate (9600-8N1), a fixed Modbus address (01H), or the Modbus address configured by the device (uncheck "Configuration Mode", and enter the current device address in the "host address" input box, otherwise use a fixed address to access the device), the wireless transmission in the configuration mode enters the dormant state, and wireless transmission and reception cannot be performed.

| EI E90-DTU(400SL3 | 00) V1.2  |    |
|-------------------|---|----|
| EBYTE             | 亿佰特・物联网应用专家 IoT APPLICATION EXPER                       | T  |
| Port Number COM   | 18 - Baud Rate 9600 - Data 8 - Parity NONE - Stop 1 - C |    |
| Fort Number Com   | Open  | Pa |
|                   | Open  |    |
|                   | lave Config ModBus addres:1                             |    |
| Equipmen          | lave Config<br>ModBus addres:1                          |    |
| Equipmen          | lave Config ModBus addres:1                             |    |



#### 4.1.2 Host mode

M1 (bottom) and M0 (top) devices are in host mode. The radio configured in host mode can obtain and configure the Modbus registers of the radio through the serial port. The parameters modified in host mode will take effect immediately. In low power mode HMI, SCADA software and other Modbus registers The host device needs to be connected to the host radio, and Modbus slaves such as PLC and remote IO need to be connected to the slave radio.

In the host mode, the VOUT interface of the radio does not output power, and does not support automatic serial port polling.

#### 4.1.3 Slave mode

Both M1 and M0 dial up and the device is in slave mode. The radio configured as a slave cannot obtain and configure the Modbus register from the serial port of the radio. It can only remotely configure parameters through the connected host radio, and it needs to be restarted to take effect. Write 0001H to the device holding register 07EAH to restart the device.

In slave mode, the radio VOUT interface outputs power and supports serial port automatic polling function.

#### 4.2 Device parameters

#### 4.2.1 Baud rate parameters

| Item        | Range               | Defaults |
|-------------|---------------------|----------|
| baud rate   | 1200、2400、4800、9600 | 9600     |
| data bits   | 7、8                 | 8        |
| check digit | NONE, ODD, EVEN     | NONE     |
| stop bit    | 1, 2                | 1        |

The device only has one serial port that supports RS-485 and 3.3V-TTL serial port protocols, and does not support simultaneous access to both interfaces.

If the RS-485 interface is used, it needs to be connected with the terminal equipment in the way of A to A, B to B, and the GND between the devices can be connected at the same time;

If the 3.3V-TTL interface is used, the TXD needs to be connected to the terminal device RXD, and the RXD is connected to the terminal device TXD, and the GND interface between the devices must be connected.

#### 4.2.2 Local modbus address

The device supports configuration parameters through Modbus RTU protocol, so the device must have a unique device address in the network (non-Modbus RTU protocol transmission can ignore the device address),

support configuration is 1-247 (factory default: 1), when forgetting the device address At this time, you can use address 1 in the configuration mode (see "DIP Configuration Instructions") to read the device address information stored in the holding register 07E8H.

# 4.2.3 Battery level (VBAT) monitoring

By obtaining the 32-bit single-precision floating-point value stored in the holding registers 00C8H and 00C9H, the unit is V, the radio detects the power in a period of 10s in non-low power mode, and the low power mode needs to configure the detection period (holding register 1B5CH is used to store cycle, the factory default is 10 minutes).

[Note] Single-precision floating-point values are stored in standard IEEE754 format.

It supports DC input to charge the battery, using 120mA constant current charging, and the preset charging voltage is 4.2V.

#### 4.2.4 Sensor (VOUT) power configuration

The sensor (VOUT) power supply can select the power source through the configuration holding register 1B5DH, which is configured as 0x00 (ie synchronous DC power supply, the output voltage is DC 8-28V), and configured as 0x01 (ie synchronous VBAT input power supply);

[Note] The total current of the load connected through VOUT should be <1A. Overload use will cause irreversible damage to the device. In addition, the output power of the device is related to the input power supply and has nothing to do with the device.

#### 4.3 Wireless parameters

#### 4.3.1 Basic parameters

The device address is used to distinguish different devices when sending and receiving at a fixed point. For details, see the chapter "Sending at a fixed point". The same address should be configured for transparent transmission, otherwise data cannot be sent and received normally.

0xFFFF (ie 65535) is the broadcast address, which can monitor all data on the same channel.

(2) LORA network address

The network address is used to distinguish different communication networks, and the network addresses of devices that communicate with each other should be set to the same parameters.

The low-power radio cannot be used as a repeater, and can be used with the same series of digital radios (for example: E90-DTU (400SL30) as a repeater to relay data between low-power radios).

When the relay is in use, the low-power radio cannot use the low-power mode, otherwise it will not be able to send and receive data normally.

(3) Airspeed class

The higher the airspeed, the faster the transmission, the closer the transmission distance, the default is 2.4Kbps, and the airspeeds of the devices that communicate with each other must be consistent;

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<sup>(1)</sup> LORA device address

#### (4) Channel

Configure different transmission frequencies, support 84 channels ( $410.125 \sim 493.125$ ), each channel is separated by 1MHz, and the channels of devices that communicate with each other must be consistent (non-fixed-point mode);

(5) Transmit power level

Support four kinds of transmit power adjustment: high (30dBm±0.5), medium (reference value: 27dBm), low (reference value: 24dBm), very low (reference value: 21dBm). The power will not reduce the power consumption of the whole machine in the same proportion, and it is not recommended to reduce the power usage;

(6) Subpackage length

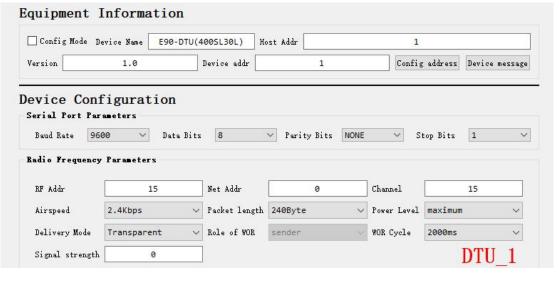
The maximum number of bytes of data in a single frame, data that exceeds the packet length is invalid, and the packet lengths of devices that communicate with each other must be the same;

(7) Signal Strength Feedback (RSSI)

The initial state is 0. After receiving the data, the newly acquired signal strength will be stored in the holding register 0B88H. The closer the 256-RSSI is to 0, the better;

#### 4.3.2 Fixed point sending

Support address function, the radio can transmit data to any address, any channel module, to achieve networking, relay and other applications: For example: DTU\_1 (address is 0x000F, channel is 0x0F) need to send data to the radio DTU\_2 (address is 0x0005, channel is 0x05) transmit data AABBCC (HEX: 414142424343), its communication format is: 000505414142424343 (HEX), where 0005 is the address of the radio station DTU\_2, and 05 is the radio station DTU\_2 channel.





| 🗹 Config Mode Da | evice Name | E90-DTU(4   | 005L30L) H    | lost Addr  |          |                 |          |               |
|------------------|------------|-------------|---------------|------------|----------|-----------------|----------|---------------|
| Version          | 1.0        |             | Device addr   |            | 2        | Config          | address  | Device messag |
| evice Conf       | igurat     | ion         |               |            |          |                 |          |               |
| Serial Port Par  | ameters    |             |               |            |          |                 |          |               |
|                  |            |             |               |            |          |                 |          |               |
| Baud Rate 960    | 90 V       | Data Bits   | 8             | ∨ Parity B | its NONE | ∨ St            | top Bits | 1             |
|                  |            |             | 8             | ✓ Parity B | its NONE | ✓ St            | top Bits | 1 ,           |
|                  | Parameters |             | 8<br>Net Addr | V Parity B | L        | ✓ St<br>Channel | top Bits | 5             |
| adio Frequency   | Parameters | 5           |               |            | L        |                 | top Bits | 5             |
| RF Addr          | Parameter  | s<br>5<br>~ | Net Addr      |            |          | Channel         |          | 5             |

Fixed-point sending demo:

To send DTU\_1 to DTU\_2, you need to add 00 05 05 (HEX) before the data; To send DTU\_2 to DTU\_1, add 00 0F 0F (HEX) before the data;

| XCOM V2.6  | - 🗆 ×  | 8 XCOM V2.6   | – 🗆 ×  |
|--|--|---|--|
| [2022-08-09 16:35:58.188]<br>Tt: 00050541414242243<br>[2022-08-09 16:36:02.192]<br>Xt: 43 43 42 42 41 41 | Port<br>COMB-UEB-SERIAL CH34C ~<br>Bend rate 9600<br>Stop bit 1 ~  | [2022-00-09 16:35:58:604]<br>RT: 41 41 42 42 43 43<br>[2022-00-09 16:36:01.787]<br>TT: 000707434342424141 | Port<br>COM5:USD-SERIAL CHO4C ∨<br>Beed rate [9600 ∨<br>Stop bits 1 ∨<br>Date bits 8 ∨ |
|  | Parity None ~<br>Operation 🛞 Close                                 |   | Parity None V<br>Operation 🕘 Close   |
| DTU_1->DTU_2   | Save Data Clear Data<br>例如: DTE<br>BITS 日前外保存<br>了TimeStamp 100 mr | DTU_2->DTU1   | Save Data<br>「 Hex 」 DTE<br>こ RTS 自劫保存<br>「 TineStamp 100 nz                           |
| Single Send Multi Send Protocol Transmit Help  |  | Single Send Multi Send Protocol Transmit Help   |  |
| 000505414142424343   | Send<br>Clear Send   | 000707434342424141  | <ul> <li>Send</li> <li>Clear Send</li> </ul>   |
| Tining Cycle 1000 ms   | Open File Send File Stop Send                                      | Timing Cycle 1000 ms  | Open File Send File Stop Send  |
| ✓ Hex Send 🗌 Wordwrap  | 0% 正点原子官方论坛http://www.openedw.com/                                 | Hex Send Wordwrap   | 0% 【火爆全网】正点原子IS100手持示波器上市  |
| 🔅 🔸 www.openedv.com S:9 R:6  | CTS=0 DSR=0 DCD=0 Current time16:36:17                             | 🔅 🔹 www.openedv.com S:9 R:6   | CTS=0 DSR=0 DCD=0 Current time16:36:17   |

# 4.4 Remote IO acquisition control

#### 4.4.1 Switch value acquisition

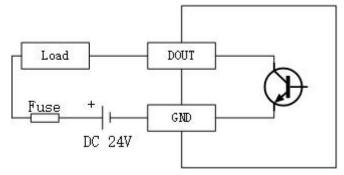
The device has a dry contact input interface for detecting digital input, and the input status can be inquired through the Modbus RTU command (the DI register address is 20001, see "Modbus register table" for details).

In configuration mode, the input status can be queried through Modbus commands (HEX: 01 02 00 00 00 01 B9 CA).



#### 4.4.2 Switch output

The switching value of the equipment adopts the equivalent circuit of transistor output type as shown in the figure below, and the transistor output can only be used for the DC24V load circuit. The output wiring mode is NPN, the load voltage is less than 30V, and the maximum allowable current is 100mA.



#### 4.5 Low power operation

#### 4.5.1 Function description

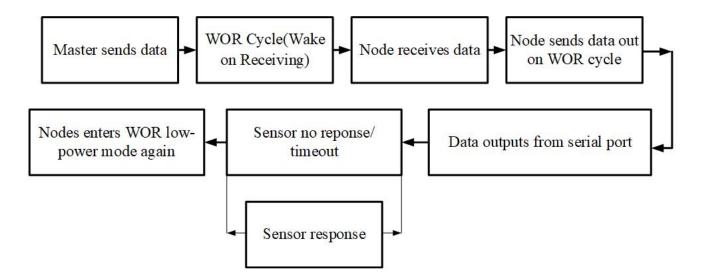
E90-DTU (400SL30L) digital radio supports ultra-low power consumption standby, using 4.2V lithium battery for power supply, the minimum standby power consumption can reach 38uA @ 12V, and can be adapted to outdoor applications where wiring is impossible or difficult.

The low-power mode requires the master and slave to be enabled at the same time. After the master is enabled, it will add a wake-up code before the data to wake up the slave. If the master uses a non-low-power mode, it will cause abnormal communication and cause data loss. The same "WOR period" needs to be used;

The low power consumption mode can only work in a working environment similar to the Modbus request method (that is, the master initiates a request, and the slave responds immediately). " is used to output the sensor power in advance. If the sensor power is not controlled by the "radio", this parameter can be configured as 0. "Sensor response timeout" is used for the time for the slave to receive serial data. Power consumption standby.

| Battery parameters I | .ow power consump | tion parameters           |                 |
|----------------------|-------------------|---------------------------|-----------------|
| LowPower Enable      | Enabled $\vee$    | Sensor Answer Timeout(ms) | 5000            |
| Per-Wakeup Time(ms)  | 5000              | BAT Voltage               | 0               |
| BAT Read Cycle(min)  | 5                 | Sensor Power              | DC Power $\vee$ |

In low power consumption mode, after the host sends data, the slave will not output data from the serial port immediately, but will wait for the "WOR wake-up period" and "early wake-up time" before outputting data, and the slave will only output data when the "sensor response timeout" The data will be sent correctly within the time limit. The specific waiting process is shown in the figure below:



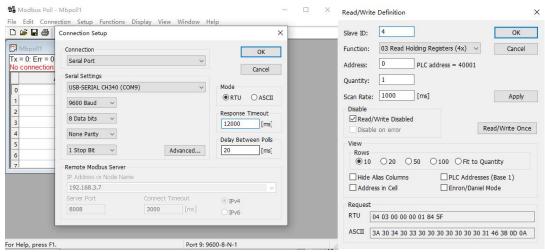
# 4.5.2 Modbus RTU protocol demonstration

First dial down the M0 dial code, after the configuration parameters are completed, switch the host to the left mode and the slave to the right mode, and the host configuration parameters are as shown in the figure below (left), and the slave configuration parameters are as follows (right).

| Equipment Information                                 | Equipment Information                                 |
|---|---|
| Config Node Device Name E90-DTU(400SL30L) Host Addr 1 | Config Mode Device Name E90-DTU(4005L30L) Host Addr 1 |
| Versi 1.0 Device ad 1 Config address Device message   | Versi 1.0 Device ad 2 Config address Device message   |

Use the Modbus simulation master (Modbus Poll) to connect with the "radio" configured as the master mode, and use the Modbus simulation slave (Modbus Slave) to connect with the "radio" configured as the slave mode.

The host timeout time of Modbus Poll simulation needs to be adjusted according to "WOR period", "early wake-up time", "sensor timeout time", Modbus host timeout time = WOR period + early wake-up time + sensor timeout time, read device address configuration For 4, avoid addresses 1 and 2 used by "station";



The slave configuration of Modbus Slave simulation is as follows:

| File Edit Connection Setup Display View Window H   | 1            |  |              |
|--|--------------|--|--------------|
| Image: Series | OK<br>Cancel | Slave ID:<br>Slave ID:<br>Address mode<br>Dec<br>Hex<br>Address:<br>Dec<br>PLC address = 40001<br>Quantity:<br>10<br>View<br>Rows<br>0 10<br>20<br>50<br>100<br>Fit to 0 | OK<br>Cancel |
| 6         7           7         TCP/IP Server           IP Address         192.168.88.100           9         Arry Address           19/Interver         Interver           Interver         Interver  |              | 0 [ms] Response Deby   |              |

The communication effect is as follows, it can be seen that after the Modbus master sends data, it needs to wait for about 7000ms before outputting from the serial port of the slave radio station:

| 🛱 Modbus Poll - Mbpoll1   | - 0          | ×   | Modbus Slave - Mbslave1 -   | $\times$ |
|---|--------------|-----|---|----------|
| File Edit Connection Setup Functions Display View Window Help                                 |              | - 1 | File Edit Connection Setup Display View Window Help   |          |
| 🗅 🖨 🖶 🎒 🗙 🛅 🗒 🏩 🕕 05 06 15 16 17 22 23 TC 🖻 🖀 💡 🌿   |              |     | □ ☞ 🖬 🕾 🗂 🗒 🚊 🖇 😢   |          |
| Tx = 1: Err = 0: ID = 4: F = 03: SR = 1000ms (DISABLED)                                       |              |     |   | ^        |
| Alias 00000 ^   |              |     | Name         00000           0         25           1         0           2         0       |          |
| 3<br>4<br>5<br>6  |              | ]   | a         0           4         0           5         0           6         0               |          |
|   |              |     | 7 0<br>8 0<br>9 0   |          |
| Communication Traffic   |              | ×   | Communication Traffic   | ×        |
| Exit Stop Clear Save Copy Log   | Stop on Erro | ⊠⊺  | T Exit Stop Clear Save Copy Log ☑ Time  | stamp    |
| Tx:000459-16:09:44.742-04 03 00 00 00 01 84 5F<br>Rx:000470-16:09:52.584-04 03 02 00 19 B5 8E |              |     | Rx:000006-16:09:52.052-04 03 00 00 00 184 5F<br>Tx:000007-16:09:52.054-04 03 02 00 19 B5 8E |          |

#### 4.6 Remote configuration

The slave mode radio can be remotely configured through the radio configured as master mode. The Modbus address of the master radio is 1, and the Modbus address of the slave radio is 2. In the host computer slave configuration interface, configure the "slave address" as 2, Appropriately increase the "waiting for slave response time". In order to ensure stable communication, 3000ms is used here. Click "Read Configuration" to get the slave configuration parameters.

|                 | Z佰特・物             | 联网应用            | 专家 IoT                  | APPLIC        | ATION E        | XPERT     |   | 111                                |                                  | tengli   |
|-----------------|-------------------|-----------------|-------------------------|---------------|----------------|-----------|---|------------------------------------|----------------------------------|----------|
|                 |                   |                 |                         |               |                |           | r i i i i i i i i i i i i i i i i i i i |                                    |                                  |          |
| Number COM8 V   | Baud Rate 9600    | Data            | - Parity                |               | op 1           |           | П                                       | ,↓,                                | F                                | 끐        |
| Lamber Cono     | Baud Mate 5000    | bata t          | Tarity                  | IUNIC OF BI   | <b></b>        | Open Port | Read                                    | Save                               | Factory                          | Restar   |
| Config Slave Co | nfig              |                 |                         |               |                |           | 14:02 03 10 7                           | , <del>, , , , , , , , , ,</del> , |                                  |          |
| Equipment ]     | Information       |                 | /                       |               |                | /î        | RX:02 03 1A F                           |                                    | FF FF FF FF FF<br>FF FF FF FF C5 |          |
| Device Name E94 | 0-DTU(400SL30L)   | Slave Address   | 2 S.                    | ave Wait Time | out(ms) 30     | 50        | 14:25:59.782<br>TX:02 03 18 8           | 5 00 0D 63 75                      |                                  |          |
| Version         | 1.0               | Device addr     | 2                       | Config        | address Device | nessage   | 14:25:59.983<br>RX:02 03 1A F           | F FF FF FF FF                      | FF FF FF FF FF                   | FF FF FF |
|                 |                   |                 |                         |               |                |           |   |                                    | FF FF FF FF C5                   |          |
| Device Cont     | figuration        |                 |                         |               |                |           | TX:02 03 18 9                           | 3 00 0D 72 B1                      |                                  |          |
| Serial Port Par | ameters           |                 |                         |               |                |           | 14:26:00.187<br>RX:02 03 1A F           | F FF FF FF FF                      | FE FE FE FE FE                   | FE FE FE |
| Baud Rate 96    | 00 🗸 Data B       | its 8           | Parity Bits NONE        | ∨ s           | top Bits 1     | ~         |   |                                    | FF FF FF FF C5                   |          |
| Radio Frequency |                   |                 |                         |               |                |           | TX:02 03 18 A                           | 0 00 0D 82 BE                      |                                  |          |
| Kadio Frequency | <b>Farameters</b> |                 |                         |               |                |           | 14:26:00.388                            |                                    | FF FF FF FF FF                   |          |
| RF Addr         | 0                 | Net Addr        | 0                       | Channel       | 23             |           | FF FF FF FF F                           |                                    | FF FF FF FF C5                   |          |
| Airspeed        | 2.4Kbps           | V Packet length | 240Bvte v               | Power Level   | mayimum        | ~         | 14:26:00.389<br>TX:02 03 18 A           | D 00 0D 13 7D                      |                                  |          |
| -               |                   | -               | 1997 - <b>1</b> 997 - 1 |               |                |           | 14:26:00.590<br>RX:02 03 14 F           |                                    | FE FE FE FE FE                   |          |
| Delivery Mode   | Transparent       | ∼ Role of WOR   | sender 🗸 🗸              | WOR Cycle     | 2000ms         | ~         | FF FF FF FF F                           |                                    | FF FF FF FF C5                   |          |
|                 | 0                 |                 |                         |               |                |           | 14:26:00.590                            |                                    |                                  |          |

# 4.7 Serial port auto polling

When the device is in slave mode, it supports configuring multiple polling commands for automatic collection. The command length can be configured up to 20 bytes. It supports a variety of serial port protocols (RS485 and 3.3V-TTL cannot be used at the same time), and the collection cycle and command interval can be flexibly configured. Query interval, support automatic verification of Modbus-CRC (open by default).

#### 4.7.1 Configuration instructions

The automatic polling instruction table starts from the holding register (0x1838), and there is a set of polling instruction data for every 13 registers (one register is 2 bytes), and supports configuration of up to 10 instructions. The details of the register bits are as follows:

|                       |  | A set of 13 r           | egisters  |
|-----------------------|--|-------------------------|---|
| register 1            | register 2                                   | register 3              | Register 4 - Register 13 (stores Modbus commands) |
|                       | overtime time                                | instruction<br>interval |   |
| instruction<br>length | instruction<br>length<br>0-255n<br>0-65535ms | 0-255ms                 | Command content (hexadecimal), up to 20 bytes     |

Command length: range (0x01-0x14), indicating the length of the command data, for example, to configure the Modbus command "0x01010000008", you need to configure the length to 0x06;

Timeout time: the configured command wait time for response, and start the command interval timer after the timeout. This parameter has the same meaning as the Modbus timeout time. The configured time needs to be consistent with the request waiting time. For example, the Modbus request needs to be configured with the timeout of the PLC/HMI/PC. The time is the same.

Command interval: the interval for sending the next command after sending one command is completed; Instruction content: store the instruction in hexadecimal, up to 20 bytes can be stored:

# 4.7.2 Configuration demo

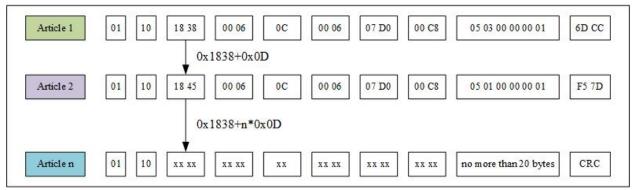
The following demo is based on the Modbus RTU protocol test, which needs to be enabled to automatically add Modbus-CRC check, if other protocols choose to turn off Modbus-CRC check according to actual needs.

Configure the first polling instruction table, the write timeout time is 2000ms, the interval for sending the next instruction is 200ms, and the query holding register address is the content stored in 0000H;

01 10 18 38 00 06 0C 00 06 07 D0 00 C8 05 03 00 00 00 01 6D CC

Configure the second polling command table, the write timeout time is 2000ms, the interval for sending the next command is 200ms, and the query address is the coil status of 0000H;

01 10 18 45 00 06 0C 00 06 07 D0 00 C8 05 01 00 00 00 01 F5 7D



"Article 1" states:

"01": The Modbus address of the device, the configuration mode is fixed to 01H, and the Modbus address corresponding to the device needs to be used for non-configuration;

"10": 13 holding registers need to be operated at the same time, so use the 10H function code for configuration, and can also be modified individually through 06H;

"18 38": the first address of the register, each instruction is separated by 13 registers, and supports up to 10 instructions (n supports up to 10);

"00 06": The number of configuration holding registers is related to the instruction length. For example, the instruction length in the figure is 6 bytes plus the fixed consumption of 6 bytes, so the next bit is "0x0C";

"00 06": The length of the storage instruction, the figure is "0x050300000001", a total of 6 bytes;

"07 D0": Timeout time, the figure is configured as 2000ms;

"00 C8": instruction interval, the configuration shown in the figure is 200ms;

"05030000001": storage instructions, up to 20 bytes of hexadecimal instructions;

# 4.8 Alarm function

When the device is in slave mode, DI status and battery power status feedback can be achieved by enabling the alarm level register combined with DI enable and battery power enable.

#### 4.8.1 Alarm level

Two alarm modes are supported as shown in the table below:

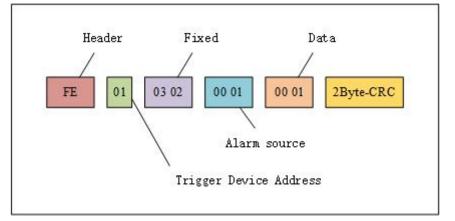
|  |  | Value | Function | Directions |
|--|--|-------|----------|------------|
|--|--|-------|----------|------------|

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| 0x00               | turn off the<br>alarm | Disable alarm function                           |
|--------------------|-----------------------|--|
| 0x01               | send once             | Send an alarm message                            |
| 0x02 at least once |                       | If the clear command is not received, it will be |
| 0x02               | at least once         | reported three times with a cycle of 5s          |

If the level 2 is used, the alarm status register needs to be cleared after the alarm is generated, otherwise the device reports three times to automatically cancel the alarm in a period of 5s, and immediately cancels the alarm status after receiving the clear alarm clear;

The format for reporting an alarm is as follows:



"Header": the first byte, used to identify the data frame as alarm data;

"Trigger Device Address": the second byte, the slave address that triggers the alarm state;

"Fixed": the third and fourth bytes, fixed at 0x0302;

"Alarm source" and "Data":

| Туре            | Alarm source | Data                        |
|-----------------|--------------|-----------------------------|
| DI              | 0x0001       | 0x0001 (fixed)              |
| AI              | 0x0002       | reserved (not<br>supported) |
| battery voltage | 0x0004       | Battery voltage, in mV      |

"2Byte-CRC": The last 2 bytes represent Modbus-CRC checksum data;

## 4.8.2 Alarm status clear

Demonstration of alarm level 2 clearing DI as an example:

| XCOM V2.6  | -                      | o x                    | ATTS XCOM V2.6   | -                      |                            |
|--|------------------------|------------------------|--|------------------------|----------------------------|
| [2022-06-27 15:53:38.129]<br>XX: FE 06 03 02 00 01 00 01 41 30   | Port<br>COM4:USB-      | serial CH34C $\sim$    | [2022-06-27 15:51:58:906]<br>KT: FE 06 03 02 00 01 00 01 41 30   | Port<br>COM4:USB-      | serial ch340 $\sim$        |
| [2022-00-27 15-53 45 967]<br>RX: FE 06 03 02 00 10 00 14 130<br>[2022-00-27 15-53 53 813]<br>RX: FE 06 03 02 00 01 00 01 41 30 | Baud rate<br>Stop bits |                        | [2022-06-27 15 51:58, 791]<br>TX: 00061B6100011867<br>[2022-06-27 15 52:01.361]<br>XX: 06 06 1B 61 00 01 1E 67 | Baud rate<br>Stop bits |                            |
|  | Data bits              | 8 ~                    |  | Data bits              | 8 ~                        |
|  | Parity                 | None $\vee$            |  | Parity                 | None $\sim$                |
|  | Operation              | Open                   |  | Operation              | Open                       |
|  | Save Date              |                        |  |                        | a Clear Data               |
|  | ✓ Hex RTS ✓ TimeSta    | DTR<br>自动保存<br>1000 ms |  | Hex<br>RTS<br>TimeSte  | DTR<br>自动保存<br>amp 1000 ms |
| Single Send Multi Send Protocol Transmit Melp  |                        |                        | Single Send Multi Send Protocol Transmit Help  |                        |                            |
| 06 06 18 61 00 01 12 87  | ŕ                      | Send<br>Clear Send     | 06 06 18 61 00 01 12 87  | ŕ                      | Send<br>Clear Send         |
| Tining Cycle 5000 ms Open Fil.   | e Send File            | Stop Send              | Timing Cycle:5000 ms Open File   | Send File              | *                          |
|  | ]正点原子DS100             | 手持示波器上市                | ✓ Hex Send Wordwrap 0% 【火爆全网】  | 】正点原子DS100             | 手持示波器上市                    |
| A www.openedy.com S-0 R-30 CTS=0.DSR=0.DCD=0   | Current time 15        | 5-54-00                | A www.openedv.com St8 R-18 CTS=0.DSR=0.DCD=0   | Current time19         |                            |

The picture on the left shows the alarm report of the device without clearing after the alarm is generated, and the picture on the right shows the report of the device alarm after manual clearing.

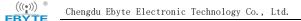
# 4.8.3 Alarm source configuration

#### DI alarm source:

The alarm mode can be configured through the register. The normal mode supports the configuration of the disconnection alarm and the closing alarm. The device cannot use the disconnection alarm when the device is in low power mode. The closed alarm supports low-power wake-up.

Battery Alarm Voltage Configuration:

The configurable range (0x00-0x0F) increases by 0.05V, the minimum configuration is 3.45V (0x00), and the maximum configuration is 4.20V (ie 0x0F);



# **Chapter 5 Host Computer**

| E90-DTU(400SL30L) V1.2   | - 🗆 ×                    |
|--|--------------------------|
| ((・)) <sup>®</sup><br>EBYTE 亿佰特・物联网应用专家 IoT APPLICATION EXPERT   | ሮይ<br>English            |
| Port Bunder COME Jaud Bate 9600 Jata 8 Parity MONE Stop 1 Open Port  | Read Sere Factory Rester |
| Equipment Information  Config Node Derice Nume  Perice Sume E90-DTU(40051301) Hest Addr  Version  1.0  Device Config uration  Serial Fort Farmeters  Bud Rate  9600  Data Bits  Perity Bits  NOME  Stop Bits  23  Airspeed  2.4Kbps  Pecket length  2408yte  Power Level  maximum  Bulivery Nede  Transparent  Ratio # WOR  Signal strength  0 | 4                        |
| Alara parameters   | Clear Recv Box           |

①Area 1 is the parameter configuration area used to connect the radio station, which needs to be configured corresponding to the radio station. For example, if the radio station is configured as 9600-8N1, then you need to select the port number of the USB to serial port connecting the radio station, configure the baud rate to 9600, and the data bit is 8, the parity bit is NONE, and the stop bit is 1;

(2) area is used to display the current device Modbus register configuration, write the newly configured parameters through this area, click "Save Parameters" in (3) area to write the Modbus register;

③area is used to read or write Modbus register parameters, and can also control the device through "factory device" and "restart device";

④area is used to display the operation log of the upper computer;

When the radio is in "configuration mode", the communication address can be fixed by checking the "configuration mode" of the upper computer (Modbus communication address is fixed at 1).

|  | .2   |                                     |  |                     |                              |           |            |           |         |              |
|--|--|-------------------------------------|--|---------------------|------------------------------|-----------|------------|-----------|---------|--------------|
| ((( <u>•</u> )) *<br>вүте 1  | Z佰特・物  | <b>り联网</b> 应月                       | 月专家 107  | T APPLIC            | ATION EX                     | PERT      |            |           |         | te<br>Englis |
| t Number COM8 v  | Baud Bate 9600   | 9 🗸 Data                            | 8 🗸 Parity                                     | NONE V Sto          | p 1 ~                        | Open Port | D)<br>Read | ↓<br>Save | Factory | Restar       |
| t Config Slave Co  | onfig  |                                     |  |                     |                              |           |            |           |         |              |
| Equipment  | Information  |                                     |  |                     |                              | ^         |            |           |         |              |
| Contig Mode D  | Device Name E90-D  | TU(400SL30L) H                      | st Addr  |                     |                              |           |            |           |         |              |
|  |  |                                     | 100  |                     |                              |           |            |           |         |              |
| Version  | 1.0  | Device addr                         | 2  | Config              | address Device m             | essage    |            |           |         |              |
| Version  | 1.0  | Device addr                         | 2  | Config              | address Device m             | essage    |            |           |         |              |
| Device Con   | figuration   | Device addr                         | 2  | Config              | address Device n             | essage    |            |           |         |              |
| Device Con<br>Serial Port Par  | figuration<br>remeters   |                                     |  |                     |                              | essage    |            |           |         |              |
| Device Con<br>Serial Fort Par<br>Baud Rate 96  | figuration<br>rameters<br>500 V Data :   |                                     | 2<br>V Parity Bits NO                          |                     | address Device m<br>p Bits 1 |           |            |           |         |              |
| Device Con<br>Serial Port Par  | figuration<br>rameters<br>500 V Data :   |                                     |  |                     |                              |           |            |           |         |              |
| Device Con<br>Serial Fort Par<br>Baud Rate 96  | figuration<br>rameters<br>500 V Data :   |                                     |  |                     |                              |           |            |           |         |              |
| Device Cont<br>Serial Fort Par<br>Baud Rate 96<br>Radio Frequency                        | figuration<br>remeters<br>500 V Data :<br>y Parameters                           | Bits 8                              | <ul> <li>Parity Bits NOP</li> <li>0</li> </ul> | WE V Sto            | p Bits 1<br>23               |           |            |           |         |              |
| Device Cont<br>Serial Port Par<br>Baud Rate 96<br>Radio Frequency<br>RF Addr             | figuration<br>remeters<br>500 V Data<br>y Parameters<br>0                        | Bits 8                              | <ul> <li>Parity Bits NOP</li> <li>0</li> </ul> | NE V Sto<br>Channel | p Bits 1<br>23               |           |            |           |         |              |
| Device Con:<br>Serial Fort Far<br>Baud Rate 96<br>Redio Frequency<br>RF Addr<br>Airspeed | figuration<br>remeters<br>500 V Data :<br>y Parameters<br>2.4Kbps<br>Transparent | Bits 8<br>Net Addr<br>Packet length | ✓ Parity Bits NOP Ø 240Byte                    | NE V Sto<br>Channel | p Bits 1<br>23<br>maximum    |           |            |           |         |              |

If you remember the device address, you can also modify the device parameters without entering the "configuration mode". For example, the host Modbus address is 1, and the slave Modbus address is 2. You can connect the host radio through the serial port to configure the parameters of the remote slave and local host.

#### Method As follows:

| E90-DTU(4005L30L) V1.2  | ×   | E90-DTU(4005L30L) V1.2  |  | - 0   |
|---|---|---|--|---|
| ((い))* C佰特・物联网应用专家 IoT APPLICATION EXPERT                                   | te<br>English   | ((?))) <sup>*</sup> 亿佰特・物联网应用专家 IoT APPLICATION EXPERT                | <i>Lanna</i> (   | 면<br>Engli                                    |
| ort Rusher COM - Haud Eato 9680 - Data B - Parity HCME - Stop I - Open Fort |   | Part Rusher COM Baud Rate 1600 Data 3 Parity 820 Stop 3 Com Open Port | Read Save  | Factory Eesta                                 |
| The forty intervents  | D.C.W. OF 18 19 NM 90 7 21 Line         A           D.G.M. G. D.Z.         F           D.G.M. G. D.L.         F           D.G.M. G. D.M.         F           D.G.M. G. D.M.         F <td>Tex Cost: Elev Cost: Cost Cost Cost Cost Cost Cost Cost Cost</td> <td>171.002 021 1193 000 1<br/>150.052111.47<br/>KK 02.031 1A FF FF FF<br/>FF FF FF FF FF FF FF FF<br/>FF FF FF FF FF FF FF<br/>FF FF FF FF FF<br/>FF FF FF FF<br/>FF FF FF<br/>FF FF FF<br/>FF FF<br/>FF FF FF<br/>FF FF FF<br/>FF FF<br/>FF FF FF<br/>FF FF FF<br/>FF FF FF<br/>FF FF FF FF<br/>FF FF FF FF FF FF<br/>FF FF FF FF FF FF FF FF<br/>FF FF FF</td> <td>F TF FF FF FF FF FF FF FF<br/>F FF FF FF FF FF</td> | Tex Cost: Elev Cost: Cost Cost Cost Cost Cost Cost Cost Cost          | 171.002 021 1193 000 1<br>150.052111.47<br>KK 02.031 1A FF FF FF<br>FF FF FF FF FF FF FF FF<br>FF FF FF FF FF FF FF<br>FF FF FF FF FF<br>FF FF FF FF<br>FF FF FF<br>FF FF FF<br>FF FF<br>FF FF FF<br>FF FF FF<br>FF FF<br>FF FF FF<br>FF FF FF<br>FF FF FF<br>FF FF FF FF<br>FF FF FF FF FF FF<br>FF FF FF FF FF FF FF FF<br>FF FF | F TF FF FF FF FF FF FF FF<br>F FF FF FF FF FF |

# **Chapter 6 Modbus Protocol Description**

E90-DTU (400SL30L) adopts the standard Modbus RTU protocol for configuration, and the Modbus RTU communication protocol adopts the master-slave response method for data communication. First, the host (PC, HMI, etc.) initiates a request through a unique slave address, and the slave (terminal device) responds according to the host's request, that is, half-duplex communication. This protocol only allows the host to initiate a request and the slave to respond passively, so the slave will not actively occupy the communication line to cause data conflict.

The device provides a host computer developed based on the Modbus protocol for users to use, and can also be compatible with other Modbus host computers through the Modbus protocol. For detailed register descriptions, see "Modbus Register Table".

# 6.1 Introduction to Modbus RTU protocol

#### 6.1.1 Communication format

Information transmission is asynchronous, using hexadecimal for communication, information frame format:

| address code | function code | data area | CRC check code |
|--------------|---------------|-----------|----------------|
| 1 byte       | 1 byte        | N byte    | 2 byte         |

#### 6.1.2 Communication information transmission process

When the communication command is sent by the master to the slave, the slave that matches the address code sent by the master receives the communication command. If the CRC check is correct, the corresponding operation is performed, and then the execution result (data) is returned to the master. The returned information includes address code, function code, executed data and CRC check code. If the address does not match or the CRC check error, nothing will be returned.

#### 6.1.3 Address code

The address code is the first byte of each communication frame, and supports 1 to 247. Each slave must have a unique address on the bus, and only the slave that matches the address code sent by the master can respond to the returned data.

#### 6.1.4 Function code

The function code is the second byte of each communication frame. The host sends, and informs the slave to perform the corresponding operation through the function code.

The device supports the following eight function codes:

| function code | definition                             | operation   |
|---------------|--|---|
| 01H           | read coil                              | Read one or more consecutive coil states                      |
| 05H           | write a single coil                    | Manipulate the status of the coil at the specified position   |
| 0FH           | write multiple coils                   | Manipulate multiple consecutive coil states                   |
| 02H           | Read discrete input                    | Read one or more consecutive discrete input states            |
| 04H           | read input register                    | Read one or more consecutive input register data              |
| 03H           | read holding register                  | Read data from one or more holding registers                  |
| 06H           | Write a single holding<br>register     | Write two hexadecimal data to the corresponding location      |
| 10H           | Write to multiple<br>holding registers | Write 4*N hexadecimal data to N consecutive holding registers |

# 6.1.5 Function code 01H: read coil

For example: if the host wants to read a coil state whose slave address is 01H and the starting coil address is 00H, the host sends:

| Host                  | sends     | Send data (HEX) |
|-----------------------|-----------|-----------------|
| addres                | s code    | 01              |
| functio               | on code   | 01              |
| Start as 1 a 1 hours  | high byte | 00              |
| Start coil address    | low byte  | 00              |
| Normali en el contito | high byte | 00              |
| Number of coils       | low byte  | 01              |
| CDC shash             | low byte  | FD              |
| CRC check             | high byte | СА              |

If the slave register 00H coil is closed, the slave returns:

| Slave ret      | ırn       | Send data (HEX) |
|----------------|-----------|-----------------|
| address co     | ode       | 01              |
| function c     | ode       | 01              |
| number of      | bytes     | 01              |
| Coil Stat      | us        | 01              |
|                | low byte  | 90              |
| CRC check code | high byte | 48              |

# 6.1.6 Function code 05H: write single coil

For example: if the host wants to control the coil state with the slave address of 01H and the coil address of 0000H, the host sends:

| Host sends | Send data (HEX) |
|------------|-----------------|
|------------|-----------------|

| addres         | s code    | 01                    |
|----------------|-----------|-----------------------|
| functio        | on code   | 01                    |
| Coil address   | high byte | 00                    |
| Coll address   | low byte  | 00                    |
| control method | high byte | 00 (open), FF (close) |
| control method | low byte  | 01                    |
| CRC check      | low byte  | XX                    |
| CKC check      | high byte | XX                    |

The slave returns the same as the master request;

# 6.1.7 Function code 0FH: write multiple coils

For example: if the host wants to control 4 coil states whose slave address is 01H and the starting coil address is 00H, the host sends:

| Host sends              |           | Send data (HEX)                |
|-------------------------|-----------|--------------------------------|
| addres                  | s code    | 01                             |
| function code           |           | 0F                             |
|                         | high byte | 00                             |
| Start coil address      | low byte  | 00                             |
|                         | high byte | 00                             |
| Number of coils         | low byte  | 04                             |
| number of bytes written |           | 01                             |
| control method          |           | 00 (all open), 0F (all closed) |
|                         | low byte  | XX                             |
| CRC check               | high byte | XX                             |

Function code 0FH operate, slave return:

| Slave return       |           | Send data (HEX) |
|--------------------|-----------|-----------------|
| address code       |           | 01              |
| function code      |           | 0F              |
| Start coil address | high byte | 00              |
| Start con address  | low byte  | 00              |
|                    | high byte | 00              |
| Number of coils    | low byte  | 04              |
|                    | low byte  | 54              |
| CRC check          | high byte | 08              |

#### 6.1.8 Function code 02H: read discrete input

For example: the host wants to read 4 input states whose slave address is 01H and the starting discrete address is 00H, host sends:

| Host sends        |           | Send data (HEX) |
|-------------------|-----------|-----------------|
| address code      |           | 01              |
| function code     |           | 02              |
| Start discrete    | high byte | 00              |
| address           | low byte  | 00              |
| annah an af acada | high byte | 00              |
| number of reads   | low byte  | 04              |
| CRC check         | low byte  | 79              |
|                   | high byte | С9              |

If all 4 discrete inputs starting from the machine head address 00H detect the input, slave return:

| Slave return         |           | Send data (HEX) |
|----------------------|-----------|-----------------|
| address code         |           | 01              |
| function code        |           | 02              |
| number of bytes      |           | 01              |
| discrete input state |           | 0F              |
| CRC check code       | low byte  | E1              |
| CRC check code       | high byte | 8C              |

# 6.1.9 Function code 04H: read input register

For example: the host wants to read 1 input register data whose slave address is 01H and the starting register address is 02H, host sends:

| Host sends     |           | Send data (HEX) |
|----------------|-----------|-----------------|
| address code   |           | 01              |
| functio        | on code   | 04              |
| start register | high byte | 00              |
| address        | low byte  | 02              |
| Number of      | high byte | 00              |
| registers      | low byte  | 01              |
|                | low byte  | 90              |
| CRC check      | high byte | 0A              |

If the data of slave input register 02H is 3344H, slave return:

| Slave return      |           | Send data (HEX) |
|-------------------|-----------|-----------------|
| address code      |           | 01              |
| function code     |           | 04              |
| number of bytes   |           | 02              |
| Register 05H data | high byte | 33              |
|                   | low byte  | 44              |



| CRC check code | low byte  | AD |
|----------------|-----------|----|
|                | high byte | F3 |

# 6.1.10 Function code 03H: read holding register

For example: the host wants to read the data of 2 holding registers whose slave address is 01H and the starting register address is 05H, host sends:

| Host sends     |           | Send data (HEX) |
|----------------|-----------|-----------------|
| address code   |           | 01              |
| functio        | on code   | 03              |
| start register | high byte | 00              |
| address        | low byte  | 05              |
| Number of      | high byte | 00              |
| registers      | low byte  | 02              |
| CDC strate     | low byte  | D4              |
| CRC check      | high byte | 0A              |

If the data of slave holding registers 05H and 06H are 1122H and 3344H, slave returns:

| Slave return        |           | Send data (HEX) |
|---------------------|-----------|-----------------|
| address code        |           | 01              |
| function code       |           | 03              |
| number of           | bytes     | 04              |
| Descistor 0511 data | high byte | 11              |
| Register 05H data   | low byte  | 22              |
| Decision OGU data   | high byte | 33              |
| Register 06H data   | low byte  | 44              |
| CRC check code      | low byte  | 4B              |
| CKC check code      | high byte | C6              |

# 6.1.11 Function code 06H: write a single holding register

For example: the host writes the data of 9988H to the register with the slave address of 01H and the register address of 0050H, Host sends:

| Host sends       |           | Send data (HEX) |
|------------------|-----------|-----------------|
| address code     |           | 01              |
| function code    |           | 06              |
| register address | high byte | 00              |
|                  | low byte  | 50              |
| write value      | high byte | 99              |
|                  | low byte  | 88              |

| CRC check | low byte  | E3 |
|-----------|-----------|----|
| CKC CHECK | high byte | ED |

Slave return is the same as the host request;

# 6.1.12 Function code 10H: write to multiple holding registers

For example: the host wants to save the data 0005H and 2233H to the two registers whose slave address is 01H and the starting register address is 0020H. Host sends:

| Host sends                |               | Send data (HEX) |
|---------------------------|---------------|-----------------|
| address code              |               | 01              |
| functio                   | on code       | 10              |
| start register            | high byte     | 00              |
| address                   | low byte      | 20              |
| Number of                 | high byte     | 00              |
| registers                 | low byte      | 02              |
| number of b               | oytes written | 04              |
| 0000H                     | high byte     | 00              |
| Register to be<br>written | low byte      | 05              |
| 0001H                     | high byte     | 22              |
| Register to be<br>written | low byte      | 33              |
| CDC CHECK                 | low byte      | B9              |
| CRC CHECK                 | high byte     | 03              |

function code 10H operate, Slave return:

| Slave retu               | ırn       | Send data (HEX) |
|--------------------------|-----------|-----------------|
| address co               | ode       | 01              |
| function c               | ode       | 10              |
| stant na sistan a dahasa | high byte | 00              |
| start register address   | low byte  | 20              |
| Number of registers      | high byte | 00              |
| Number of registers      | low byte  | 02              |
| CRC CHECK                | low byte  | 40              |
|                          | high byte | 02              |

# 6.1.13 Data area

As can be seen from the detailed introduction of these function codes, the data area varies with function codes.

# 6.1.14 Error feedback

Address and CRC CHECK errors will not receive data feedback from the slave, and other errors will return an error code to the master. Adding 0X80 to the second bit of the data frame indicates that the request has an error (illegal function code, illegal data value, etc.), and the error data frame is as follows:

|    | address code      | function code | error code | CRC check code |
|----|-------------------|---------------|------------|----------------|
|    | 1 byte            | 1 byte        | 1 byte     | 2 byte         |
| oc | le is as follows: |               |            |                |

| The error code is as follows: |       |                          |                                 |  |  |  |  |
|-------------------------------|-------|--------------------------|---------------------------------|--|--|--|--|
|                               | value | name                     | illustrate                      |  |  |  |  |
|                               | 01H   | Illegal function and     | This function code operation    |  |  |  |  |
|                               | UIH   | Illegal function code    | register is not supported       |  |  |  |  |
|                               | 0.011 | illegal register address | Registers that are forbidden to |  |  |  |  |
|                               | 02H   | megal register address   | be accessed by the device       |  |  |  |  |
|                               | 03H   | illegal data value       | parameter exceeds limit         |  |  |  |  |
|                               | 04H   |                          | Equipment is working            |  |  |  |  |
|                               | 04H   | Equipment failure        | abnormally                      |  |  |  |  |

# 6.2 Modbus register table

# 6.2.1 Device attribute related

| parameter<br>address | Parameter<br>Description | register type    | Data Format              | Remark   |
|----------------------|--------------------------|------------------|--------------------------|--|
| 0000Н                | DI status                | discrete input   | bit                      | read only  |
| 0000H                | DO status                | coil             | bit                      | read and write   |
| 0064H                | DO power-on<br>state     | coil             | bit                      | read and write   |
| 00C8H                | battery power            | input register   | Float<br>(4Byte-ABCD)    | read only  |
| 07D0H                | Device model             | holding register | String<br>(14Byte-ASCII) | read only  |
| 07DCH                | Firmware<br>version      | holding register | Int16                    | Read-only, high byte is the main<br>version number,<br>low byte is the minor version<br>number,<br>0x0100 represents version 1.0 |
| 07E8H                | Modbus address           | holding register | Int16                    | Read and write, range 1-247,<br>non-config mode is the device<br>Modbus address  |
| 07E9H                | reset                    | holding register | Int16                    | Write only, support 10H function   |



|       |                               |                  |       | code, but cannot be continuously<br>written, write 0x01 device to<br>execute   |
|-------|-------------------------------|------------------|-------|--|
| 07EAH | Reboot the device             | holding register | Int16 | Write only, support 10H function<br>code, but cannot be continuously<br>written, write 0x01 device to<br>execute   |
| 0834H | baud rate                     | holding register | Int16 | Read-write, configuration scope:0x00: 1200bps0x01:2400bps0x02:4800bps0x03:9600bps (default)0x04-0x07: Reserved   |
| 0835H | data bits                     | holding register | Int16 | Read-write, configuration scope:0x00: 8bit (default)0x01: 7bit0x02-0x03: reserved  |
| 0836Н | Check Digit                   | holding register | Int16 | Read-write, configuration scope:<br>0x00:NONE (default)<br>0x01: ODD<br>0x02: EVEN<br>0x03-0x04: reserved  |
| 0837H | stop bit                      | holding register | Int16 | Read-write, configuration<br>scope:<br>0x00: 1bit (default)<br>0x01: reserved<br>0x02: 2bit  |
| 1B5CH | battery power<br>read cycle   | holding register | Int16 | Read and write, configuration<br>range: 0-65535, unit points;<br>If the alarm is enabled and the<br>battery alarm enable is turned on,<br>the battery alarm will be triggered<br>every time the battery voltage is<br>lower than the alarm voltage.; |
| 1B5DH | Sensor Power<br>Configuration | holding register | Int16 | Read-write, configuration scope:<br>0x00: Synchronous DC power<br>0x01: Sync battery power   |

#### [Note]

Float (4Byte-ABCD) represents the single-precision floating point in the standard IEEE754 format, with a total of 32 bits (4 bytes). Single-precision floating-point size end mode is ABCD (high byte first, low byte last); String(14Byte-ASCII) represents a 14-byte ASCII-encoded string;

In configuration mode, the device is fixed to open 01H (and can also be accessed through 07E8H stored value) address monitoring host request, using the fixed baud rate parameter 9600-8N1;

| 6.2.2 Wireless properties related |
|-----------------------------------|
|-----------------------------------|

| parameter<br>address | Parameter<br>Description | register type    | Data Format | Remark  |
|----------------------|--------------------------|------------------|-------------|---|
| 0B6FH                | LORA device<br>address   | holding register | Int16       | Read and write, configuration range: 0-65535  |
| 0B71H                | LORA network<br>address  | holding register | Int16       | Read and write, configuration range: 0-255  |
| 0B74H                | airspeed                 | holding register | Int16       | Read-write, configuration scope:<br>0x00-0x02: 2.4Kbps (default)<br>0x03:4.8Kbps<br>0x04:9.6Kbps<br>0x05:19.2Kbps<br>0x06:38.4Kbps<br>0x07:62.5Kbps |
| 0B75H                | channel                  | holding register | Int16       | Read and write, configuration range 0-83  |
| 0B77H                | transmit power<br>level  | holding register | Int16       | Read-write, configuration scope:<br>0x00: High (default)<br>0x01: Medium<br>0x02: low<br>0x03: very low   |
| 0B78H                | send mode                | holding register | Int16       | Read-write, configuration scope:<br>0x00: transparent transmission<br>(default)<br>0x01: fixed point transmission                                   |
| 0B81H                | Packet length            | holding register | Int16       | Read-write, configuration scope:<br>0x00: 240Byte (default)<br>0x00: 128Byte<br>0x00: 64Byte<br>0x00: 32Byte  |
| 0B88H                | signal strength          | holding register | Int16       | Read-only, refresh after receiving<br>data, the closer 256-RSSI is to 0,<br>the better  |

#### [Note]

Transmit power level: high (30dBm±0.5), medium (reference value 27dBm), low (reference value 24dBm), extremely low (reference value 21dBm), the reference value is only used as a reference and cannot accurately reflect the transmit power of the device, if other transmit power is required It can be customized. Reducing the transmission power of the equipment will not reduce the power consumption of the whole machine in the same proportion. If you need other transmission power, it is recommended to purchase the corresponding power radio.

# 6.2.3 Automatic polling related

| parameter<br>address | Parameter<br>Description             | register type    | Data Format | Remark  |
|----------------------|--------------------------------------|------------------|-------------|---|
| 1838H                | Automatic<br>polling<br>instructions | holding register | 26Byte      | Read and write, every 13 registers<br>is a group of data, and up to 10<br>automatic polling instructions can<br>be configured. For detailed<br>instructions, see "Serial Port<br>Automatic Polling" |
|                      |                                      |                  |             |   |
| 1B58H                | Auto polling<br>enabled              | holding register | Int16       | Read-write, configuration scope:<br>0x00: Disabled (default)<br>0x00: enable  |
| 1B59H                | automatic polling<br>cycle           | holding register | Int16       | Read and write, configuration range: 1-65535, unit points   |
| 1B5AH                | CRC CHECK<br>enable                  | holding register | Int16       | Read-write, configuration scope:<br>0x00: Disabled (default)<br>0x00: enable  |
| 1B5BH                | Clear polling<br>order table         | holding register | Int16       | Write only, write 0x01 to clear the automatic polling command table   |

# 6.2.4 Alarm function related

| parameter<br>address | Parameter<br>Description | register type    | Data Format | Remark  |
|----------------------|--------------------------|------------------|-------------|---|
| 1B60H                | Alarm level              | holding register | Int16       | Read-write, configuration scope:<br>0x00: close the alarm (default)<br>0x01: send once<br>0x02: sent at least once<br>For details, see "Alarm function" |
| 1B61H                | clear alarm status       | holding register | Int16       | For details, see "Alarm function"   |
| 1B62H                | DI alarm enable          | holding register | Int16       | Read-write, configuration scope:<br>0x00: Disabled (default)<br>0x01: enable  |
| 1B63H                | DI alarm source          | holding register | Int16       | Read-write, configuration scope:<br>0x00: disconnect the alarm<br>(default)<br>0x01: close alarm  |
| 1B64H                | Battery Alarm<br>Enable  | holding register | Int16       | Read-write, configuration scope:<br>0x00: Disabled (default)  |



|         |                          |                  |       | 0x01: enable                        |
|---------|--------------------------|------------------|-------|-------------------------------------|
| 1B65H t |                          | holding register | Int16 | Read and write, configuration       |
|         | hattamy alarma           |                  |       | range: 0x00-0x0F, 0x00 is 3.45V     |
|         | battery alarm<br>voltage |                  |       | and increases by 4.20V in turn, the |
|         |                          |                  |       | maximum configurable 4.20V (ie      |
|         |                          |                  |       | 0x0F)                               |

# 6.2.5 Low power consumption

| parameter<br>address | Parameter<br>Description       | register type    | Data Format | Remark  |
|----------------------|--------------------------------|------------------|-------------|---|
| 0B79H                | WOR monitor<br>interval period | holding register | Int16       | Read and write, configuration<br>range: 0x00-0x07;<br>Period T=(1+WOR)*500ms,<br>maximum 4000ms, minimum<br>500ms;<br>The longer the WOR monitoring<br>interval period, the lower the<br>average power consumption, but<br>the greater the data delay;<br>Default: 0x03 (ie 2000ms), both<br>sender and receiver must agree |
| 0B80H                | WOR role                       | holding register | Int16       | Read only, parameter range:<br>0x00: Slave (ie, WOR receiver),<br>working in WOR monitoring<br>mode, the monitoring period is<br>"WOR period", which can save a<br>lot of power consumption<br>0x01: The host (ie the WOR<br>sender) adds a certain time<br>wake-up code when transmitting<br>data                          |
| 1B5EH                | Sensor early<br>wake-up time   | holding register | Int16       | Read and write, configuration<br>range: 0-65535, in milliseconds;<br>Used to output sensor power in<br>advance to avoid abnormal output<br>of sensors that cannot work<br>immediately after power-on  |
| 1B5FH                | Sensor response<br>timed out   | holding register | Int16       | Read and write, configuration<br>range: 0-65535, in milliseconds;<br>In low-power mode, after sending a<br>command, the device waits for the  |



|       |                     |                  |       | configured timeout time (or         |
|-------|---------------------|------------------|-------|-------------------------------------|
|       |                     |                  |       | receives a sensor response) and the |
|       |                     |                  |       | device re-enters the low-power      |
|       |                     |                  |       | mode. After automatic polling is    |
|       |                     |                  |       | enabled, the configured time of the |
|       |                     |                  |       | polling time shall prevail. This    |
|       |                     |                  |       | parameter does not take effect.     |
|       | I any manyor        |                  |       | Read-write, configuration scope:    |
| 1B66H | Low power<br>enable | holding register | Int16 | 0x00: Disabled (default)            |
|       | enable              |                  |       | 0x01: enable                        |

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The final interpretation right belongs to Chengdu Ebyte Electronic Technology Co., Ltd.

# **Modification History**

| Version | revision date | Revision Notes  | Maintenance man |
|---------|---------------|-----------------|-----------------|
| 1.0     | 2022-08-09    | initial version | LC              |
|         |               |                 |                 |
|         |               |                 |                 |

# About us



| Hotline: | 4000-330-990                   | Tel:   | 028-61399028            |  |
|----------|--------------------------------|--|-------------------------|--|
| Support: | support@cdebyte.com            | Website:   | https://www.cdebyte.com |  |
| Address: | Building B5, No. 199, W        | Building B5, No. 199, West District Avenue, High-tech West District, |                         |  |
|          | Chengdu City, Sichuan Province |  |                         |  |

