



# **Data Acquisition Module**

## **E820-AIO**

### **User Manual**

This manual may be modified based on product upgrade, please refer to the latest version.  
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| Version | Date       | Description     | Issued by |
|---------|------------|-----------------|-----------|
| 1.00    | 2018/01/23 | Initial version | huaa      |



E820-AIO is the analog signal collection product designed by Ebyte. With RS485 communication network, E820-AIO transmits the analog signal of scattered field data point via AD transformation to master or control remote home site via the PC. Built-in watch dog (0.2s reset), the system won't be halted easily. E820-AIO analog acquisition module features measurement data collection, measured data collection, device switch status collection etc, mainly used for the data collection, controlling and device display of various measurement and control terminal, suitable for the automation and information systems in various industries.

## Features

- Wide working temperature range: working at  $-40^{\circ}\text{C} \sim +65^{\circ}\text{C}$ , suitable for harsh working environment.
- Non directional design of input power: This can avoid misconnection and over connection damage, increasing the reliability.
- Modbus protocol: Q&A communication, easy to use and featuring cheap hardware and strong universal property.
- High acquisition accuracy: it's  $\leq 0.1\%\text{FS}$ .
- All aluminum alloy shell: Good EMS performance, compact size, easy installation and good heat dissipation.
- Watch dog: This can conduct the precise time layout. Once any exception occurs, the module will restart in 0.2s and continue to work as previous parameters.

# 1. Electrical Parameters

## 1.1 E820-DTU (AI-485-4-5)

| No | Parameter Name        | Parameter value         | Description                                                                      |
|----|-----------------------|-------------------------|----------------------------------------------------------------------------------|
| 1  | Size                  | 82 * 84 *25mm           | Pressing line interface is not included.                                         |
| 2  | Average weight        | 150g                    | Pressing line interface is not included.                                         |
| 3  | Input signal type     | 0—20mA/0-5V             | Analog signal input range.                                                       |
| 4  | Acquisition channel   | 4 channel input         | 4 channel current collection and all differential voltage acquisition.           |
| 5  | Acquisition rate      | Full channel 10Hz       | Acquisition rate for analog signal.                                              |
| 6  | Interface             | RS485 : 1 * 5 * 3.81 mm | Pressing line                                                                    |
| 7  | Supply voltage        | 8 ~ 28V DC              | Note: The module will be destroyed if the voltage is higher than 28V.            |
| 8  | Working current       | 40mA                    | The over 100mA output current is recommended(when the output power is not used). |
| 9  | Communication level   | RS232/RS485             | RS232 or RS485.                                                                  |
| 10 | Communication address | 1-250                   | 1-250 can be configurable, the default is 1.                                     |
| 11 | Acquisition accuracy  | 0.1%FS                  | Accuracy of analog signal collection.                                            |
| 12 | Baud rate             | Default: 9600           | It can be configured from 1200~115200.                                           |
| 13 | Working temperature   | -40°C ~ +65°C           | Industrial grade.                                                                |
| 14 | Isolation protection  | 4000vDC                 | Lightening strike, Surge protection.                                             |

## 1.2 E820-DTU (II-485-4-20)

| No | Parameter Name        | Parameter value         | Description                                                                      |
|----|-----------------------|-------------------------|----------------------------------------------------------------------------------|
| 1  | Size                  | 82 * 84 *25mm           | Pressing line interface is not included.                                         |
| 2  | Average weight        | 150g                    | Pressing line interface is not included.                                         |
| 3  | Input signal type     | 0—20mA                  | Analog signal input range.                                                       |
| 4  | Acquisition channel   | 4 channel input         | 4 channel Single-ended input of analog signal.                                   |
| 5  | Acquisition rate      | Full channel 10Hz       | Acquisition rate for analog signal.                                              |
| 6  | Interface             | RS485 : 1 * 5 * 3.81 mm | Line pressing                                                                    |
| 7  | Supply voltage        | 10 ~ 28V DC             | Note: The module will be destroyed if the voltage is higher than 28V.            |
| 8  | Working current       | 31mA                    | The over 100mA output current is recommended(when the output power is not used). |
| 9  | Communication level   | RS232/RS485             | RS232 or RS485                                                                   |
| 10 | Communication address | 1-250                   | 1-250 can be configurable, the default is 1.                                     |
| 11 | Acquisition accuracy  | 0.1%FS                  | Accuracy of analog signal collection.                                            |
| 12 | Baud rate             | Default: 9600           | It can be configured from 1200~115200.                                           |
| 13 | Working temperature   | -40°C ~ +65°C           | Industrial grade.                                                                |
| 14 | Isolation protection  | 4000vDC                 | Lightening strike, Surge protection.                                             |

## 1.3 Series products

| Model Number           | Interface | Signal type | Acquisition accuracy | Analog channel | Protection level VDC | Size     |
|------------------------|-----------|-------------|----------------------|----------------|----------------------|----------|
| E820-DTU (II-485-4-20) | RS485     | 0-20mA      | 0.1%FS               | 4              | 3000                 | 82*84.25 |
| E820-DTU (VI-485-4-5)  | RS485     | 0-5V        | 0.1%FS               | 4              | 3000                 | 82*84.25 |

## 1.4 FAQ

| No. | Questions                 | Description                                                                                                          |
|-----|---------------------------|----------------------------------------------------------------------------------------------------------------------|
| 1   | Change baud rate          | When using the upper computer, users need to close the upper computer first and reopen after changing the baud rate. |
| 2   | Forget the device address | Users can use 03 command to read FF monitoring.                                                                      |

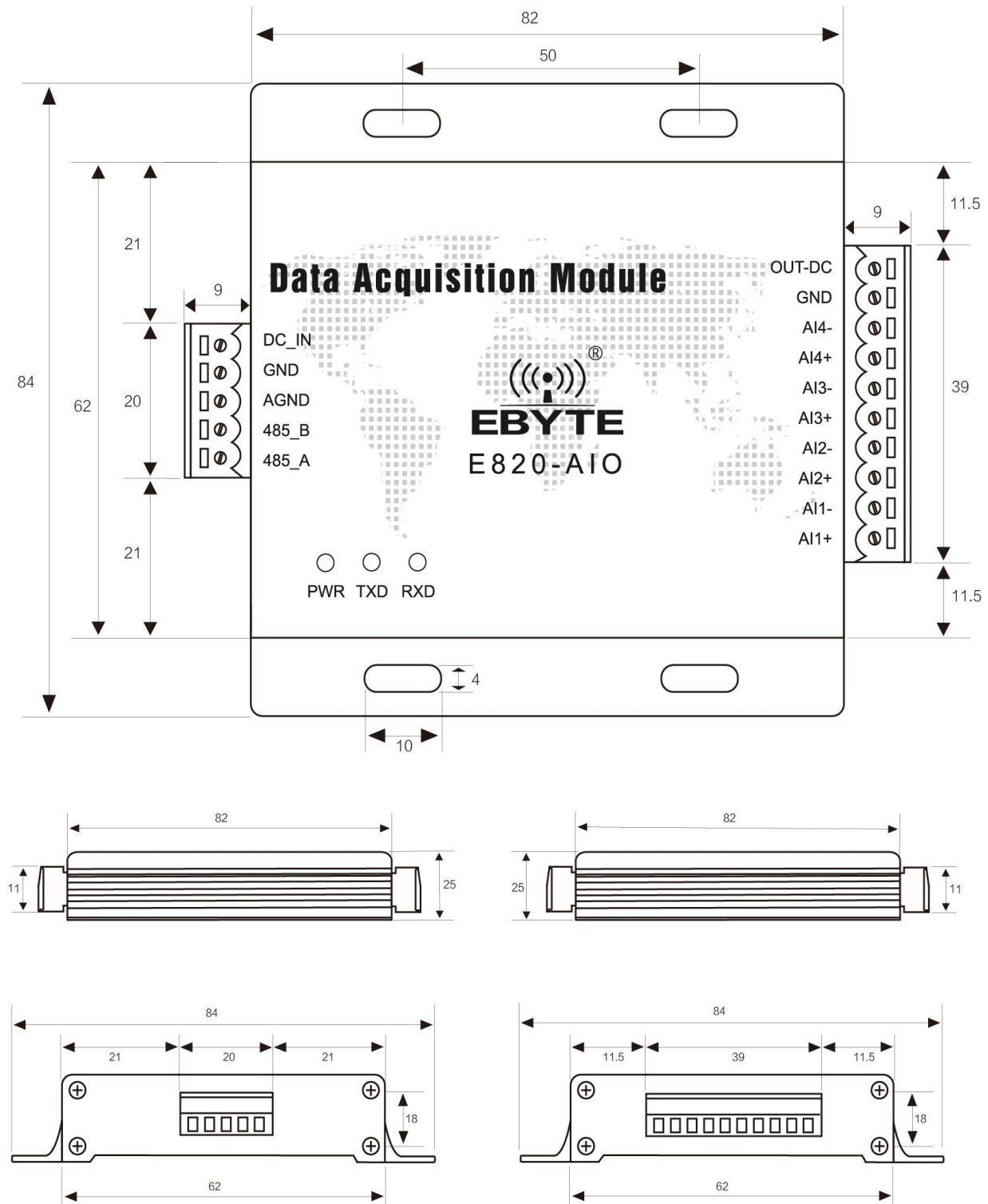
## 1.5 Notice

| No. | Notice                   | Description                                                                                                                                                                         |
|-----|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Communication connection | In connecting with other RS485 device, users need to pay attention to the match of A, B line and add 120R matching resistance.                                                      |
| 2   | Input voltage            | Only DC power supply is available, and the DC input voltage should be 10-28V<br>The device won't work when lower than 10V, while the device will be destroyed when higher than 28V. |
| 3   | Output power supply      | The positive and negative directions of output power is same with the input power. See more details in Pin definition.                                                              |
| 4   | Analog input interface   | The collection signal is 0-20Ma/0-5V, so user do not input the exceed nominal measured value, or it may cause damage.                                                               |
| 5   | Waterproof               | The device is not waterproof, please do not get the device wet, or it will be damaged.                                                                                              |

## 2. Function Description

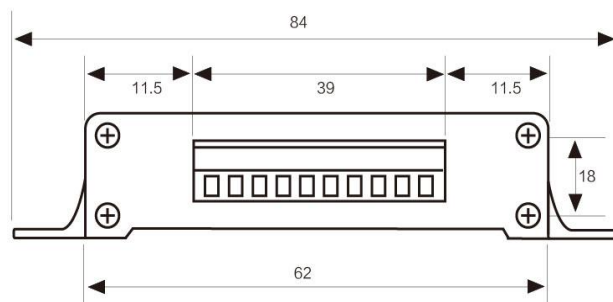
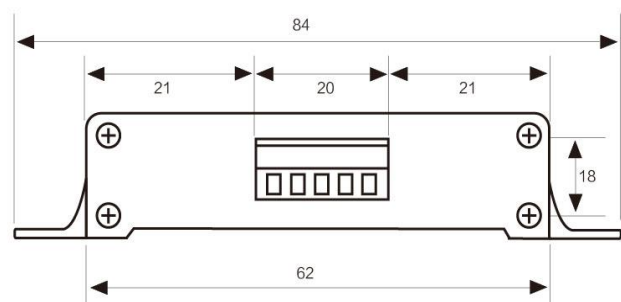
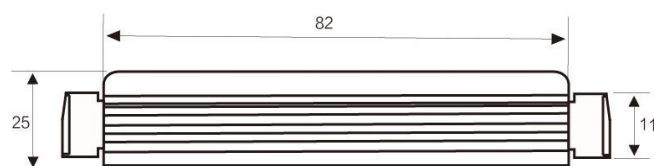
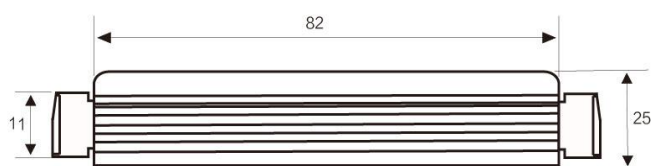
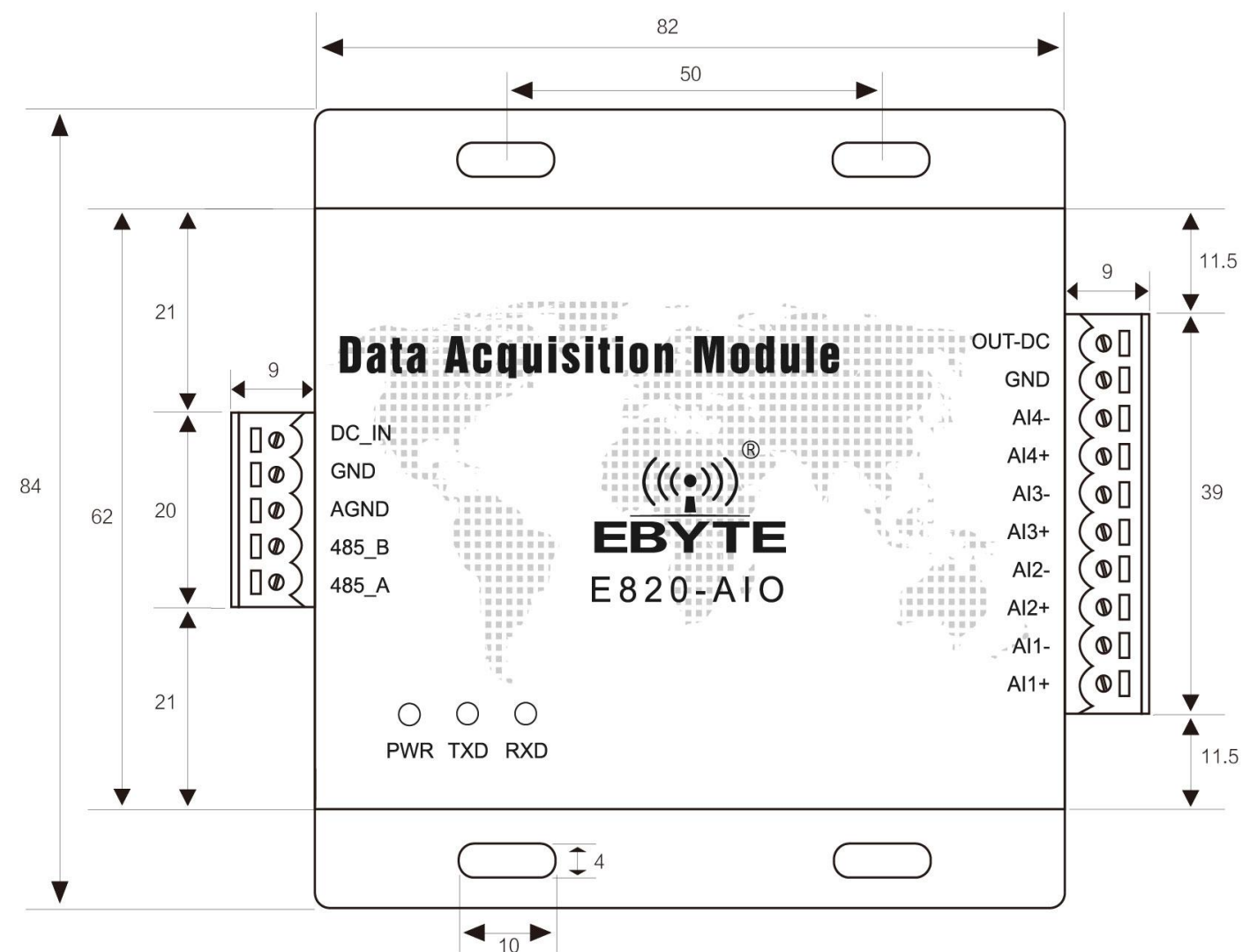
### 2.1 Pin definition

#### 2.1.1 E820-DTU (AI-485-4-5)



| Pin | Definition | Function                               | Description                                                                                                     |
|-----|------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1   | DC-IN      | Pressing line power input positive     | Power input, range: DC10-28V. 12V, and 24V are recommended.                                                     |
| 2   | GND        | Pressing line power input negative     | Power supply GND.                                                                                               |
| 3   | AGND       | Communication common ground            | When communicating with RS485, the DTU won't be used, while when communicating with RS232, it will be grounded. |
| 4   | RS485_B    | Interface B of RS-485                  | Interface B of RS-485 connected to Device B.                                                                    |
| 5   | RS485_A    | Interface A of RS-485                  | Interface A of RS-485 connected to Device A.                                                                    |
| 6   | AI1+       | Analog signal input channel 1 positive | Input pin of analog signal forms the input with the GND1 pin.                                                   |
| 7   | AI1-       | Analog signal input channel 1 negative | To be used in pairs with VI1+.                                                                                  |
| 8   | AI2+       | Analog signal input channel 2 positive | Input pin of analog signal, forms the input with the GND2 pin.                                                  |
| 9   | AI2-       | Analog signal input channel 2 negative | To be used in pairs with VI2+.                                                                                  |
| 10  | AI3+       | Analog signal input channel 3 positive | Input pin of analog signal, forms the input with the GND3 pin.                                                  |
| 11  | AI3-       | Analog signal input channel 3 negative | To be used in pairs with VI3+.                                                                                  |
| 12  | AI4+       | Analog signal input channel 4 positive | Input pin of analog signal forms the input with the GND4 pin.                                                   |
| 13  | AI4-       | Analog signal input channel 4 negative | To be used in pairs with VI4+.                                                                                  |
| 14  | GND        | Power supply output negative           | The negative internal of power supply connected to pin 2 GND.                                                   |
| 15  | OUT-DC     | Power supply output positive           | Power supply output, the voltage is decided by the pin 1(internal connecting to pin 1).                         |

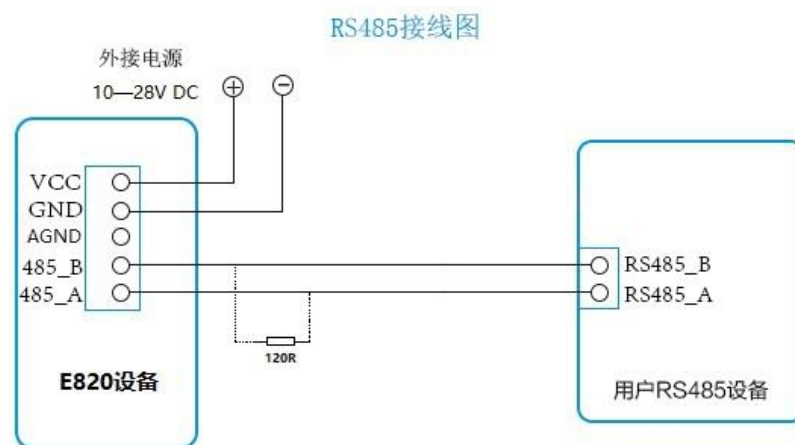
## 2.1.2 E820-DTU (II-485-4-20)



| Pin | Definition | Function                               | Description                                                                                                     |
|-----|------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| 1   | DC8-28V    | Pressing line power input positive     | Power input, range: DC10-28V. 12V, and 24V are recommended.                                                     |
| 2   | AI-        | Pressing line power input negative     | Power supply AI-.                                                                                               |
| 3   | AAI-       | Communication common ground            | When communicating with RS485, the DTU won't be used, while when communicating with RS232, it will be grounded. |
| 4   | RS485_B    | Interface B of RS-485                  | Interface B of RS-485 connected to Device B.                                                                    |
| 5   | RS485_A    | Interface A of RS-485                  | Interface A of RS-485 connected to Device A.                                                                    |
| 6   | AI1+       | Analog signal input channel 1 positive | Input pin of analog signal forms the input with the AI1-.                                                       |
| 7   | AI1-       | Analog signal input channel 1 negative | To be used in pairs with AI1+.                                                                                  |
| 8   | AI2+       | Analog signal input channel 2 positive | Input pin of analog signal forms the input with the AI2-.                                                       |
| 9   | AI2-       | Analog signal input channel 2 negative | To be used in pairs with AI2+.                                                                                  |
| 10  | AI3+       | Analog signal input channel 3 positive | Input pin of analog signal forms the input with the AI3-.                                                       |
| 11  | AI3-       | Analog signal input channel 3 negative | To be used in pairs with AI3+.                                                                                  |
| 12  | AI4+       | Analog signal input channel 4 positive | Input pin of analog signal forms the input with the AI4-.                                                       |
| 13  | AI4-       | Analog signal input channel 4 negative | To be used in pairs with AI4+.                                                                                  |
| 14  | AI-        | Power supply output negative           | The negative internal of power supply connected to AI-.                                                         |
| 15  | OUT-DC     | Power supply output positive           | Power supply output, the voltage is decided by the pin 1 (internal connecting to pin 1).                        |

## 2.2 Connection method

### 2.2.1 RS485 connection method



## 3. Register configuration table

### 3.1 ModBus address table

40001—40012, 40017—40028, 40042—40049 is not used in this device.

| ModBus register address table |      |                                 |            |                                                                                                                                                              |
|-------------------------------|------|---------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Address                       | Byte | variable names                  | Type       | Description                                                                                                                                                  |
| 40013                         | 2    | AI1 input                       | Read only  | Unit 0.001mA/0.001V                                                                                                                                          |
| 40014                         | 2    | AI2 input                       | Read only  |                                                                                                                                                              |
| 40015                         | 2    | AI3 input                       | Read only  |                                                                                                                                                              |
| 40016                         | 2    | AI4 input                       | Read only  |                                                                                                                                                              |
| 40029                         | 2    | reference voltage for channel 1 | Read/write | Default 2400, Max. 3300, Min 2000, Unit 0.001V                                                                                                               |
| 40030                         | 2    | reference voltage for channel 2 | Read/write |                                                                                                                                                              |
| 40031                         | 2    | reference voltage for channel 3 | Read/write |                                                                                                                                                              |
| 40032                         | 2    | reference voltage for channel 4 | Read/write |                                                                                                                                                              |
| 40033                         | 2    | ModBus address                  | Read/write | 1-250 (0xff is the monitoring address)                                                                                                                       |
| 40034                         | 2    | Baud rate                       | Read/write | see more in baud rate table                                                                                                                                  |
| 40035                         | 2    | parity bit                      | Read/write | see more in parity bit table                                                                                                                                 |
| 40036                         | 2    | Lower limit register            | Read/write | 0-65535 (Lower limit register must be less than the Upper limit register . After the configuration, channel 1-4 will be the range of upper and lower limits. |
| 40037                         | 2    | Upper limit register            | Read/write |                                                                                                                                                              |
| 40038                         | 2    | Conversion value for channel 1  | Read only  | The original data value transformed by the analog quantity of channel 1                                                                                      |
| 40039                         | 2    | Conversion value for channel 2  | Read only  | The original data value transformed by the analog quantity of channel 2                                                                                      |
| 40040                         | 2    | Conversion value for channel 3  | Read only  | The original data value transformed by the analog quantity of channel 3                                                                                      |
| 40041                         | 2    | Conversion value for channel 3  | Read only  | The original data value transformed by the analog quantity of channel 4                                                                                      |

### 3.2 Baud rate code table

| Baud rate code table |         |
|----------------------|---------|
| 0                    | 1200    |
| 1                    | 2400    |
| 2                    | 4800    |
| 3 (default)          | 9600    |
| 4                    | 19200   |
| 5                    | 38400   |
| 6                    | 57600   |
| 7                    | 1152200 |

### 3.3 Parity bit code table

| Parity bit code table |             |
|-----------------------|-------------|
| 0 (default)           | No parity   |
| 1                     | Even parity |
| 2                     | Odd parity  |

## 4. Instruction format

### 4.1 Input “03” to read the command of single register

Users input “03” to read the command of register value. Below is the command to read the value of baud rate:

| 01             | 03              | 00 21                           | 00 01                          | D4 00           |
|----------------|-----------------|---------------------------------|--------------------------------|-----------------|
| ModBus Address | To read command | To read the address of register | To read the length of register | CRC parity code |

Send above command via the serial assistant to module, then below value will be returned:

| 01             | 03              | 02                       | 00 03                                                                                                  | F8 48           |
|----------------|-----------------|--------------------------|--------------------------------------------------------------------------------------------------------|-----------------|
| ModBus Address | To read command | To read the return bytes | The value of 40034 is 3, which means the baud rate is 9600, see more details in baud rate value table. | CRC parity code |

Note: With the known baud rate, to use FF monitoring address can read the unremembered register value, Such as, send FF 03 00 21 00 01 c1de to read the address of device. CRC parity check code can be calculated by CRC16 system, the assistant software can be downloaded in official website.

### 4.2 Input “03” to read the command of multiple registers

Users input “03” to read the command of register value. Below is the command to read the address of 40034 to 40036:

| 01             | 03              | 00 21                           | 00 03                          | 55 C1           |
|----------------|-----------------|---------------------------------|--------------------------------|-----------------|
| ModBus address | To read command | To read the address of register | To read the length of register | CRC parity code |

Send above command via the serial assistant to module, then below value will be returned:

| 01             | 03              | 06                       | 00 03                                                                                                  | 00 00                                                                                                        | 00 00                   | 65 75           |
|----------------|-----------------|--------------------------|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------|-----------------|
| ModBus address | To read command | To read the return bytes | The value of 40034 is 3, which means the baud rate is 9600, see more details in baud rate value table. | The value of 40035 is 0, the parity bit of device is no parity, see more details in parity check code table. | The value of 40036 is 0 | CRC parity code |

### 4.3 Input “06” to write the command of register

Input “06” to write single command, below is the command to change the baud rate as 19200:

| 01             | 06               | 00 21                   | 00 04                                                                                                    | D8 03           |
|----------------|------------------|-------------------------|----------------------------------------------------------------------------------------------------------|-----------------|
| ModBus address | To write command | Write in 40034 register | The write value of 40034 is 4, the corresponding baud rate is 19200, see more details in baud rate table | CRC parity code |

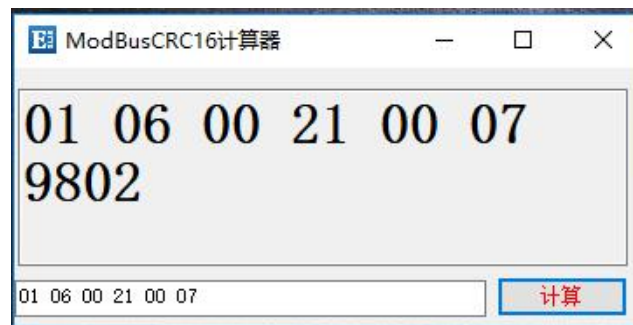
If the revision is successful, module will return 01 06 00 21 00 04 d803.

### 4.4 Factory default value

| Device address     | Baud rate                         | Voltage for reference | Parity check code                    |
|--------------------|-----------------------------------|-----------------------|--------------------------------------|
| 40033 address is 1 | 9600, that is, 40034 address is 3 | 2400                  | No parity check : 40035 address is 0 |

## 5. Software instructions

### 5.1. MoBusCRC16 calculator



Ebyte will provide the MoBusCRC16 calculator for your convenience, which will automatically add the CRC16 parity check code after the input data. Please pay attention to the format, if it's less than 6, then should add 0 in the front, such as 01, 06, and each digit should be followed by a blank.

### 5.2. E820 testing software

In the upper monitor software, the start address of register is set in the address column, the length should be from start address to end address. For example, address is 1, which means to read from 40001. The length of 49 should read 49 registers from 40001-40049. Analog quantity input(1,2,3,4) should be the real current value input by the current channel. Channel (1,2,3,4) conversion value shows that the analog signal of current channel converted to the original value after collection.

## 6. Important Statement

1. CDEBYTE reserves the right of final interpretation and modification of all the contents in this manual.
2. As the hardware and software products continuously improving, this manual may subject to change without notice, please refer to the latest version.
3. Users who use this product need to pay attention to the product dynamics on the official website so that users can get the latest information of this product in time.

## 7. About Us

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