

EPR60/EPT60

Modbus TCP User Manual



1. Drive hardware manual

1.1 Product review

Thank you for choosing Rtelligent stepper driver based on Ethernet technology. I hope that our products can help you successfully complete your motion control project.

The EP series is a stepper motor driver based on the MODBUS /TCP communication protocol. It integrates intelligent motion control functions, built-in trapezoidal and S-shaped acceleration/deceleration curves, and can independently set acceleration and deceleration. The drive uses a standard Ethernet interface and is compatible with 10M/100M bps network interfaces. Compared with MODBUS/RTU products (NT60, NR60, maximum speed 115200 bps), the communication speed is greatly improved. Compatible with standard Ethernet layouts at a low cost.

1.2 Characteristic

- **Power supply** 24 - 48VDC
- **Output current** Maximum 6.0A (peak)
- **Current control** New pentagon connection SVPWM algorithm and PID control
- **Revolution setting** 200 ~ 65535
- **Matched motor** 2 Phase / 3 Phase stepper motor
- **System self-test** Detect motor parameters during drive power-on initialization and optimize current control gain based on voltage conditions
- **Instruction smoothing** S-shaped curve optimization, 1~512 levels can be set
- **Input port** 6 input ports, 2 of which can receive 5V to 24V differential signals for quadrature encoder signal access (EPT60) and 4 channels for 24V single-ended signals.
- **Output port** 2 optically isolated outputs, maximum withstand voltage 30V, maximum sink current or current sink 100mA
- **Communication interface** One RJ45 network port for bus communication and one USB port for parameter configuration

and firmware upgrade

■ **Motion control**

Acceleration, deceleration, speed, stroke can be set, optional S-shaped curve. Zero return function

1.3 Electrical index

Drive parameter	Minimum	Typical	maximum	Unit
Power supply	24	-	48	VDC
Output current (peak)	0.5	-	6.0	A
Control signal conduction current	6	10	15	mA
Undervoltage protection point	-	20	-	VDC
Overvoltage protection point	-	60	-	VDC
Input signal voltage	3.3	5	7	VDC
Drive initialization time	-	-	9	S

1.4 Safety instructions

The transportation, installation, use or maintenance of this product must be carried out by personnel who are professionally qualified and familiar with the above operations.

In order to minimize potential safety hazards, you should comply with all local and national safety regulations when using this equipment. Different areas have different safety regulations. You should ensure that the equipment is installed and used in accordance with your region. specification.

System errors can also result in equipment damage or personal injury. We do not guarantee that this product is suitable for your specific application and we cannot be held responsible for the reliability of your system design.

Be sure to read all relevant documents before installation and use. Improper use may result in equipment damage or personal injury. Please strictly observe the relevant technical requirements during installation. Be sure to confirm the grounding of each device in the system. Ungrounded systems cannot guarantee safe use of electricity.

Some components inside the product may be damaged by external static electricity. Before touching the product, the operator should ensure that there is no static electricity and avoid contact with objects that are easily electrostatically charged (chemical fiber, plastic film, etc.).

If your device is placed in the control cabinet, please close the control cabinet cover or the door during operation, otherwise it may cause equipment damage or personal injury.

It is strictly forbidden to hot plug the cable while the system is running. The arc generated by hot plugging may cause harm to operators and equipment.

Wait at least 3 seconds after turning off the power to touch the product or remove the wiring. Capacitive devices may still store dangerous electrical energy after power failure and require some time to release. To ensure safety, you can measure it with a multimeter before touching the product.

Please observe the important safety instructions presented in this manual, including clear warning symbols for potential safety hazards, and read and become familiar with these instructions before installation, operation and maintenance. The purpose of this paragraph is to inform users of the necessary safety instructions and to reduce the risk of personal injury and equipment safety. Miscalculations of the importance of safety prevention can cause serious damage or render the device unusable.

2 Hardware connection

The following sections provide a detailed description of the hardware and how to use it. The hardware diagram is as follows:

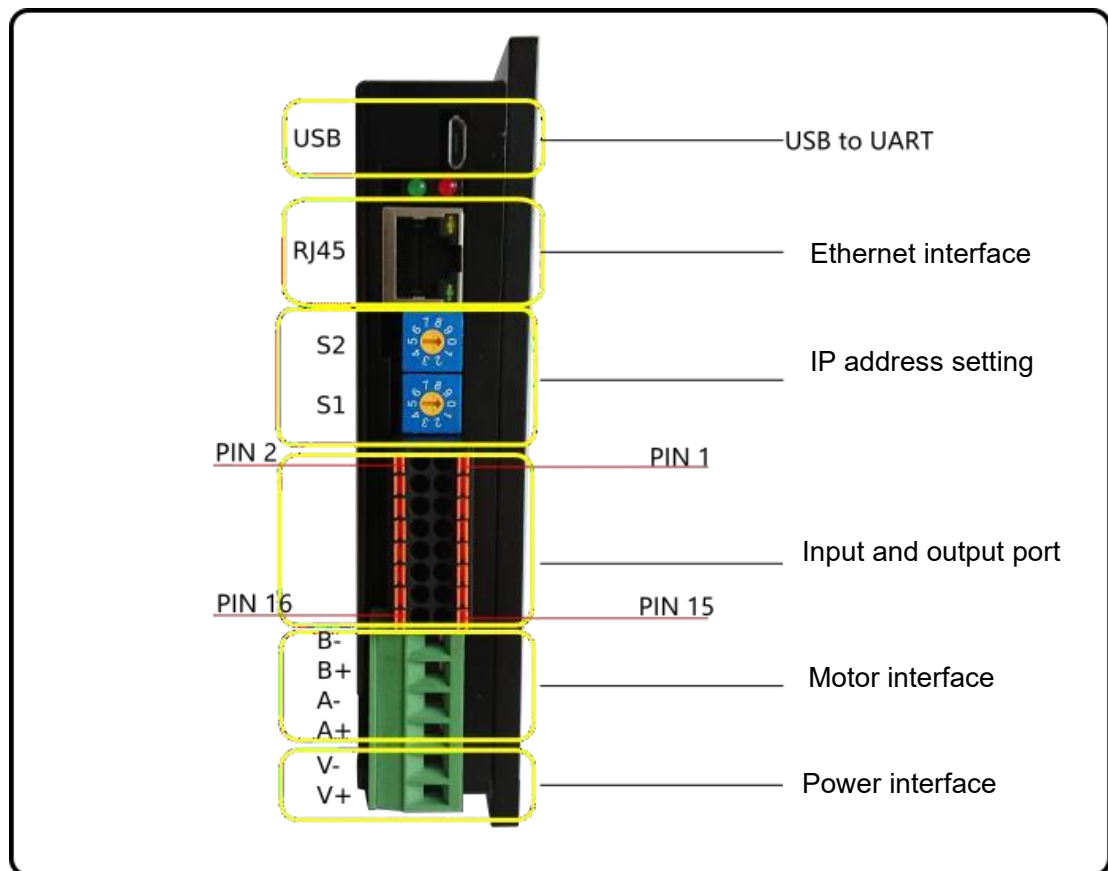


Figure 1 EPR60/EPT60 Port

2.1 Power supply connection

Connect the drive to the DC power supply: V+ is connected to the DC power supply **positive**, V- connected DC power supply is **negative**

The maximum input voltage of the EPR60/EPT60 is **24~48VDC**. Do not exceed this specification.

If your power output does not have a fuse or some other device that

limits the short-circuit current, place a properly sized fast-blow fuse (no more than 10Amps) between the power supply and the drive to protect the drive and power supply. Between the positive side of the power supply and the V+ of the drive.

Connect the positive terminal of the power supply to the V+ of the drive and the negative terminal of the power supply to the V- of the drive.

!!! Please be careful not to reverse the connection, the drive damage caused by the power supply is not guaranteed. Choose the appropriate power supply voltage.

The chopper driver continuously changes the magnitude and direction of the voltage at the winding end of the motor while detecting current to obtain accurate phase current.

If both high efficiency and low noise are to be guaranteed, the drive supply voltage is at least 5 times the rated phase voltage of the motor (ie the rated phase current of the motor \times phase resistance).

If you need a motor for better high speed performance, you need to increase the drive supply voltage. If using a regulated power supply, the supply voltage must not exceed 48V.

If using an unregulated power supply, the required voltage must not exceed 34V.

Current

The maximum supply current should be the sum of the two phase currents. Normally, the current you need depends on the motor model, voltage, speed, and load conditions. The actual supply current value is much lower than this maximum current value because the driver uses a switching amplifier that converts high voltage and low current into low voltage and high current. The more the supply voltage exceeds the motor voltage, the less supply current is required. When the motor is connected to a 48V power supply, the power supply output current is half of the 24V power supply output current.

2.2 Motor connection

If the motor you are using is our brand stepper motor, connect the four wires of black, green, red and blue to the A+, A-, B+, B- ports of the drive.

The default drive motor model is a two-phase stepper motor. If the

user needs to match the three-phase stepper motor, first modify the motor type through the commissioning software and then connect the three-phase stepper motor.

2.3 Digital input and output port

The EP series driver has 6 digital inputs and 2 digital outputs. Digital input and output ports can be freely configured with various functions according to their own application requirements.

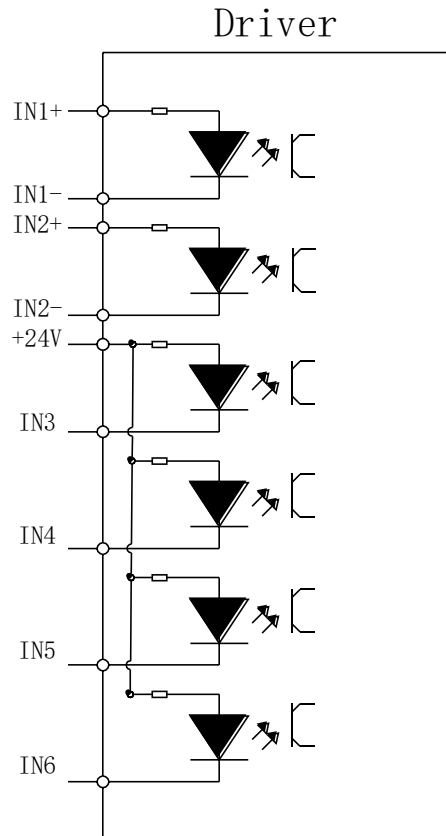
2.3.1 Pin definition

The pin distribution of CN is as follows:

Pin	Name	Description
1	EXT5V	The drive outputs a 5V power supply for external signals. The maximum load is 150mA. Can be used for photoelectric encoder power supply
2	EXTGND	
3	IN6+	Differential input signal interface, 5V ~ 24V compatible. In open-loop external pulse mode, it can receive direction, double pulse signal In closed loop mode, this port is used to receive the quadrature encoder phase A signal.
4	IN6-	
5	IN5+	Differential input signal interface, 5V ~ 24V compatible. In open-loop external pulse mode, it can receive direction, double pulse signal In closed loop mode, this port is used to receive the quadrature encoder B phase signal
6	IN5-	
7	IN3	Universal input port 3, default receiving 24V/0V level signal
8	IN4	Universal input port 4, default receiving 24V/0V level signal
9	IN1	Universal input port 1, default receiving 24V/0V level signal
10	IN2	Universal input port 2, default receiving 24V/0V level signal
11	COM24V	External IO signal power supply 24V positive
12, 14	COM0V	Internal power supply output GND
13	COM5V	External IO signal power supply 5V positive
15	OUT2	Output port 2, open collector, output current capability up to 30mA
16	OUT1	Output port 1, open collector, output current capability up to 30mA

2.3.2 Input

The schematic diagram of the input port is shown below, and the user can perform system wiring according to the schematic diagram.



2.3.2.1 IN1, IN2, IN3, IN4 Single-ended input signal

IN1, IN2, IN3 and IN4: Optically isolated, single-ended input, minimum pulse width 100 μ s, maximum pulse frequency 5KHz. The high level can directly receive 5V or 24V signals, and the 5V signal and 24V signal use different common input ports COM5V and COM24V.

Since the input circuit is an optocoupler isolation circuit, a 5-24V power supply is required. For example, when connected to a PLC, you can use the power of the PLC; when using a relay or mechanical switch, you need an external power supply. COM5V, COM24V is the common end of single-ended input signals. The common wiring methods are as follows:

Use the NTConfigurator software to configure the functions of IN1, IN2, IN3 and IN4.

2.3.2.2 IN5, IN6 Differential input signal

IN5, IN6 are used to receive encoder differential signals and can also be used for other single-ended signals. 5~24V signal compatible.

2.3.3 Output

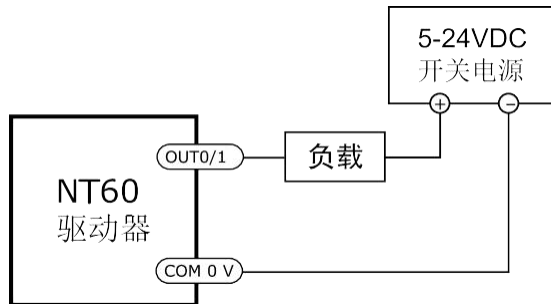
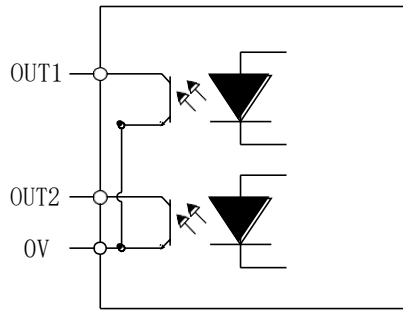
The EP family of drivers contains two opto-isolated output signals.

- OUT1, OUT2 have an output current capability of 30mA.

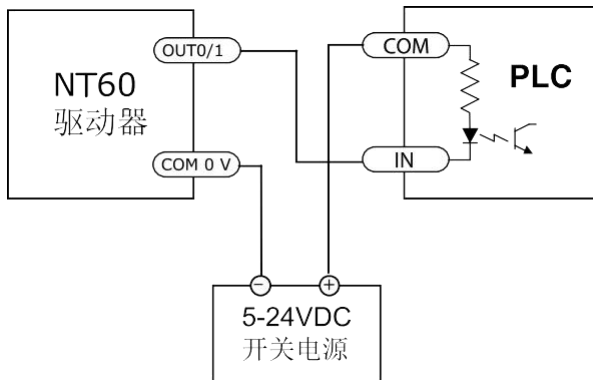
The digital output ports are all normally open by default, and the NTConfigurator debugging software can be used to change the polarity of the output port.

The interface diagram of the output port is as follows:

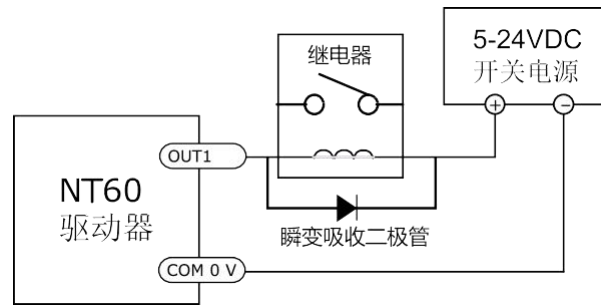
Driver



Connect output OUT1/OUT2 to sinking output



Connect OUT1/OUT2 to sinking type output, connected to the input of the PLC



Connect output OUT1 to the relay

2.4 Network connection and IP address settings

Before you start, please confirm that you have the following components::

- A stepper motor that matches the drive
- A small slotted screwdriver for tightening the connector screws
- A computer with Microsoft Windows XP/Vista/Windows 7/Windows 8/Windows 10 (32-bit or 64-bit) operating system installed
- NTConfigurator software (can be downloaded from [Rtelligent](#) website)
- A network cable is used for drive parameter configuration or for connection of the drive to the controller

2.4.1 Installation of NTConfigurator

- Download and install the NTConfigurator software;
- Click Start / All Programs / RETELLIGENT / NTConfigurator to run the software;

2.4.2 Connect your drive and computer with Ethernet

The RJ-45 connector on the EPR60 drive is a 100BASE-TX (100Mbps) compliant interface that can be connected using a standard network cable. Please use a CAT5 or CAT5e (or higher) network cable.

The process of connecting a drive to a computer requires three steps:

2.4.2.1 Connection to your network from the Physical Layer

Connection method 1: Connect the drive to your LAN

If you have an alternate port attached to the switch or router, you can set the drive's IP address and be compatible with your network.

This is a simple connection method. This technology also allows you to connect multiple drives to your computer.

Connection method 2: Connect the drive to your computer

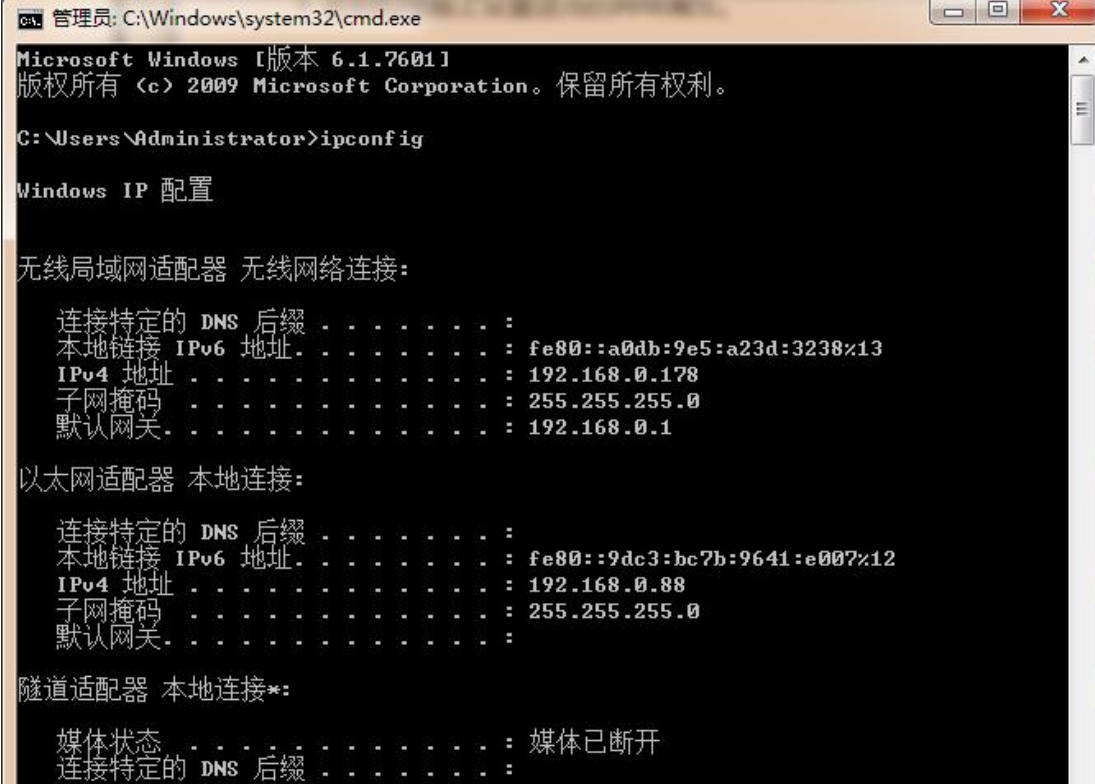
The specific operations are as follows:

Connect one end of the network cable to the network card on your computer and the other end to the drive.

2.4.2.2 Setting the IP Address of the Drive

Each device must have a unique IP address on the Ethernet network. If two devices need to communicate with each other, they must be connected to the network and must have an IP address under the same subnet. A subnet is a logical partition in a large network. Devices under one subnet are generally not able to communicate with devices under another subnet unless they are connected through a special network device (such as a router). A subnet consists of a selected IP address and subnet mask.

If you want to know the IP address and subnet mask of your computer, select Start... Run. Then type "cmd", then type "ipconfig /all" and press Enter. You should see something like this:



```

ca. 管理员: C:\Windows\system32\cmd.exe
Microsoft Windows [版本 6.1.7601]
版权所有 (c) 2009 Microsoft Corporation。保留所有权利。

C:\Users\Administrator>ipconfig

Windows IP 配置

无线局域网适配器 无线网络连接:

    连接特定的 DNS 后缀 . . . . . :
    本地链接 IPv6 地址. . . . . : fe80::a0db:9e5:a23d:3238%13
    IPv4 地址 . . . . . : 192.168.0.178
    子网掩码 . . . . . : 255.255.255.0
    默认网关. . . . . : 192.168.0.1

以太网适配器 本地连接:

    连接特定的 DNS 后缀 . . . . . :
    本地链接 IPv6 地址. . . . . : fe80::9dc3:bc7b:9641:e007%12
    IPv4 地址 . . . . . : 192.168.0.88
    子网掩码 . . . . . : 255.255.255.0
    默认网关. . . . . :

隧道适配器 本地连接*:

    媒体状态 . . . . . : 媒体已断开
    连接特定的 DNS 后缀 . . . . . :
  
```

If your computer's subnet mask is set to 255.255.255.0, such a setting is called a Class C subnet mask, then your machine can only communicate with the same network device with the first three bytes of the other IP address. (The number between the IP address data points is called a byte.) For example, if your computer is a Class C subnet mask and the IP address is 192.168.0.20, it can communicate with devices with an IP address of 192.168.0.40.

However, it cannot communicate with devices with an IP address of 192.168.1.40. If you change your subnet mask to 255.255.0.0 (Class B Subnet Mask) you can communicate with any device with the same 2 bytes of the first subnet mask.

The IP address is formatted as follows:

IPADD0. IPADD1. IPADD2. IPADD3

Default IPADD0=192, IPADD1=168, IPADD2=0,

The EP series driver has two 10-bit rotary switch combinations that set the IP address of IPADD3.

$IPADD3 = (S1 * 10) + S2 + 10;$

The factory default addresses are listed in the table.

Dial combination value	IP 地址
0	10.10.10.10
1	192.168.0.11
2	192.168.0.12
3	192.168.0.13
4	192.168.0.14
5	192.168.0.15
...	192.168.0. IP Low address
99	192.168.0.109

The switch 0 bit is always "10.10.10.10", the universal recovery address. If someone wants to change another IP address but has no records, once the address is forgotten. Then only connect through the universal recovery address.

Users can set the upper three digits of the IP address, subnet mask, gateway and other parameters through the "10.10.10.10" address. For details, see ["IP Settings"](#).

2.4.2.1 Set the appropriate network properties on your computer

Set the drive's two rotary DIP switches to 0 and the IP address to 10.10.10.10.

a. In Windows XP, right click on "My Network" and select "Properties". Windows 7, click on the computer. Scroll down the wheel until you see "Network" in the left pane. Right click and select "Properties". Select "Change Adapter Settings"

b. You should see an icon for your network interface card (network card). Right click and select "Properties".

c. Scroll down until you see "Internet Protocol (TCP/IP)". Select this item and click the Properties button. Windows 7 and vista, looking for "(Transmission Control Protocol / IP v4)"




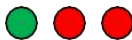

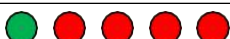

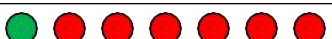

d. Select the option "Use the following IP address". Enter the address "10.10.10.11". This will give your computer an IP address similar to the one on the same subnet.

e. Next, enter the subnet mask as "255.255.255.0".

f. Be sure to leave the "Default Gateway" blank. This will prevent your computer from finding a router from this subnet.

g. Because the drive is directly connected to the computer, your computer will have a message bubble at the corner of the screen to indicate that the network cable is unplugged when the drive is powered off.

2.5 Alarm code

LED 状态		驱动器状态
	Green indicator is on for long time	Driver not enabled
	Green indicator is flickering	Driver working normally
	One green indicator and one red indicator	Driver overcurrent
	One green indicator and two red indicator	Driver input power overvoltage
	One green indicator and three red indicator	The internal voltage of the driver is wrong
	One green indicator and four red indicator	Encoder out of tolerance alarm
	One green indicator and five red indicator	Encoder error
	One green indicator and six red indicator	Parameter verification error
	One green indicator and seven red indicator	Motor phase loss alarm

3 Protocol

3.1 Modbus/TCP Introduction

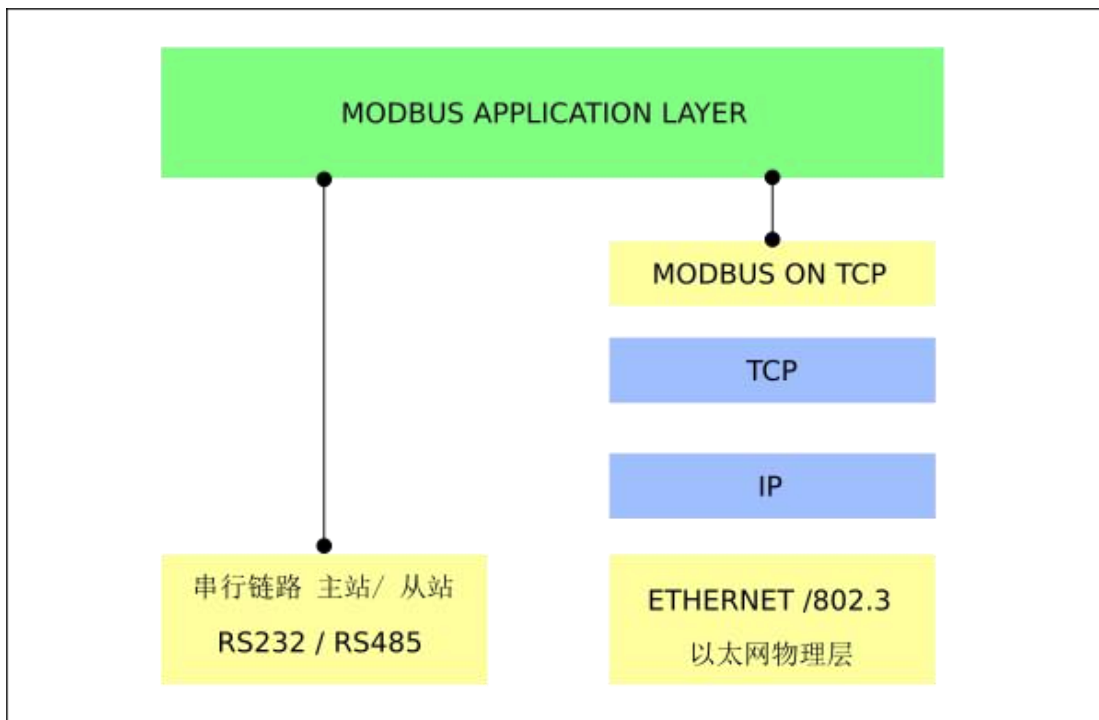
Modbus is a communication protocol developed by MODICON in 1979 and is an industrial fieldbus protocol standard. In 1996, Schneider introduced the MODBUS protocol based on Ethernet TCP/IP, ModbusTCP. Modbus is an application layer messaging protocol for client/server communication between devices connected on different types of buses or networks.

MODBUSTCP is a transport protocol running on TCP/IP. (IANA-Internet Number Assignment Authority) assigns 502 ports to MODBUS/TCP, which is the only port currently assigned to the instrumentation and automation industry.

It is usually used on the following media:

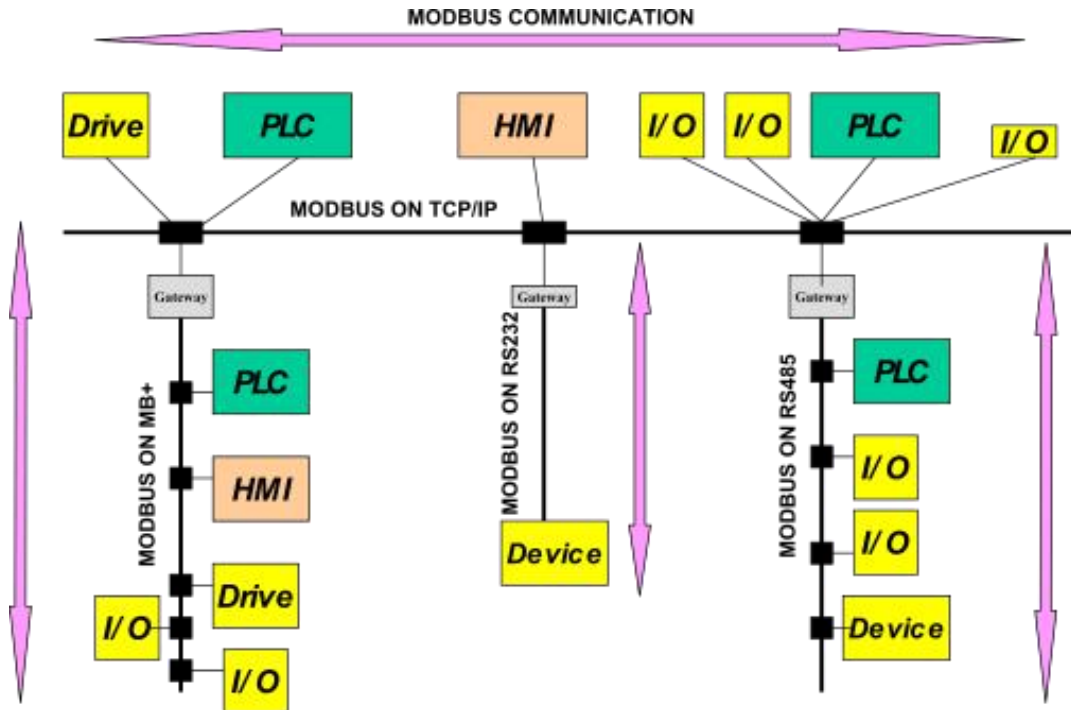
- TCP over Ethernet:

Various asynchronous serial transmission media: RS-232, RS-422, RS-485



The MODBUS protocol allows for easy communication across all types of network architectures.

MODBUS network architecture example



1) Function code supported by Modbus/TCP

The RTELLIGENT EP series drives currently support the following Modbus function codes:

- a) 0x03: read holding register
- b) 0x06: write a single register
- c) 0x10: write multiple registers

2) Modbus/TCP register

Register address description

The MODBUS register starts with 0. In the touch screen, PLC, the address of the register is usually expressed as 400x type, starting with 1. and so:

$$\text{PLC address} = \text{MODBUS address} + 1$$

Register operation type

R-read only

W-write only

R/W-readable/writable

Type of data:

MODBUS defaults to one 16-bit register. Two consecutive registers form a 32-bit data, low

16 bits are first and 16 are high.

SHORT — **16bit**

LONG — **32bit**

3.2 Register summary

Note: The register addresses in the following register summary table are all decimal.

Table 2-1 Register Summary

Register address (decimal)	Operation type	Type of data	Description of function	Remark
0	R	<i>SHOR</i> <i>T</i>	Alarm Code, Alarm sign	
1	R	<i>SHOR</i> <i>T</i>	Status Code, Drive status flag	
2	R	<i>SHOR</i> <i>T</i>	Current input port value	
3	R	<i>SHOR</i> <i>T</i>	Current output port value	
4	R	<i>SHOR T</i>	Universal input port conduction trigger status	
5	R	<i>SHOR</i> <i>T</i>	Universal input port disconnect trigger status	
6	W	<i>SHOR T</i>	Turn-on trigger status clear register	
7	W	<i>SHOR</i> <i>T</i>	Disconnect trigger status clear register	
8	R	<i>SHOR</i> <i>T</i>	In the internal pulse mode, the current absolute position is lower by 16 bits	Form a LONG type data
9	R	<i>SHOR T</i>	In the internal pulse mode, the current absolute position is 16 bits high	
10	R	<i>SHOR</i> <i>T</i>	Given speed RPM	
11	R	<i>SHOR T</i>	Bus voltage mV	
12	R	<i>SHOR</i>	闭环模式时的电机跟踪误差低 16 位	Form a LONG type data

		<i>T</i>		
13	R	<i>SHOR</i> <i>T</i>	The tracking error of the motor in closed loop mode high16 bits	
14	R	<i>SHOR</i> <i>T</i>	External pulse counter low 16 bits	Form a LONG type data
15	R	<i>SHOR</i> <i>T</i>	External pulse counter high 16 bits	
16	W	<i>SHOR</i> <i>T</i>	Clear external pulse counter	
17	R/W	<i>SHOR</i> <i>T</i>	Instruction mode: internal command or external pulse	
18	R/W	<i>SHOR</i> <i>T</i>	Motion command with internal command mode and application mode 0	
19	R	<i>SHOR</i> <i>T</i>	Pulse command form when external pulse	
20	R/W	<i>SHOR</i> <i>T</i>	Application mode selection in internal command mode	
21	R/W	<i>SHOR</i> <i>T</i>	Motor type selection: two-phase or three-phase	
22	R/W	<i>SHOR</i> <i>T</i>	Motor control mode selection: open loop, servo mode one, servo mode two	
23	R/W	<i>SHOR</i> <i>T</i>	Reverse the running direction of the motor	
24	R/W	<i>SHOR</i> <i>T</i>	Motor subdivision (pulse number / revolution)	
25	R/W	<i>SHOR</i> <i>T</i>	Operating current (mA)	
26	R/W	<i>SHOR</i> <i>T</i>	Standby current percentage (%)	
27	R/W	<i>SHOR</i> <i>T</i>	Time to enter standby after the pulse stops (ms)	

28	R/W	<i>SHOR</i> <i>T</i>	S-shaped acceleration and deceleration time	
29	R	<i>SHOR</i> <i>T</i>	Encoder current position (number of pulses)	
30	R/W	<i>SHOR</i> <i>T</i>	Enable automatic recognition of drive parameters	
31	R	<i>SHOR</i> <i>T</i>	Automatically recognized resistance value mOhm	
32	R	<i>SHOR</i> <i>T</i>	Automatically recognized inductance value mH	
33	R/W	<i>SHOR</i> <i>T</i>	User-set resistance value when canceling automatic recognition	
34	R/W	<i>SHOR</i> <i>T</i>	User-set electrical steel value when canceling automatic recognition	
35	R/W	<i>SHOR</i> <i>T</i>	Motor torque factor, reserved for internal use of the drive	
36	R/W	<i>SHOR</i> <i>T</i>	Current loop proportional gain	
37	R/W	<i>SHOR</i> <i>T</i>	Current loop integral gain	
38	R/W	<i>SHOR</i> <i>T</i>	Current loop phase lead gain	
39	R/W	<i>SHOR</i> <i>T</i>	Current loop step test	
40	R/W	<i>SHOR</i> <i>T</i>	Motor encoder resolution	
41	R/W	<i>SHOR</i> <i>T</i>	Tracking error alarm threshold	
42	R/W	<i>SHOR</i> <i>T</i>	Positioning completion accuracy	
43	R/W	<i>SHOR</i> <i>T</i>	Positioning completion time	

44	R/W	<i>SHOR</i> <i>T</i>	The pulse stops until the time when the detection is completed is completed.	
45	R/W	<i>SHOR</i> <i>T</i>	Maximum current	
46	R/W	<i>SHOR</i> <i>T</i>	Basic current	
47	R/W	<i>SHOR</i> <i>T</i>	Primary speed feedback filter	
48	R/W	<i>SHOR</i> <i>T</i>	Secondary speed feedback filter	
49	R/W	<i>SHOR</i> <i>T</i>	Servo mode - low speed anti-resonance gain	
50	R/W	<i>SHOR</i> <i>T</i>	Servo mode two position loop proportional gain	
51	R/W	<i>SHOR</i> <i>T</i>	Servo mode two position loop integral gain	
52	R/W	<i>SHOR</i> <i>T</i>	Servo mode two speed loop damping 1	
53	R/W	<i>SHOR</i> <i>T</i>	Servo mode two speed loop damping 2	
54	R/W	<i>SHOR</i> <i>T</i>	Servo mode two speed loop feed forward gain	
55	R/W	<i>SHOR</i> <i>T</i>	Servo mode two gravity compensation	
56	R/W	<i>SHOR</i> <i>T</i>	Servo mode two acceleration gain	
57	R/W	<i>SHOR</i> <i>T</i>	Servo mode two acceleration feed forward gain	
58	R/W	<i>SHOR</i> <i>T</i>	Servo mode two speed loop output filter	
59	R/W	<i>SHOR</i> <i>T</i>	Servo mode two acceleration feedforward filter	

60	R/W	SHOR T	Input port 1 setting register	
61	R/W	SHOR T	Input port 2 setting register	
62	R/W	SHOR T	Input port 3 setting register	
63	R/W	SHOR T	Input port 4 setting register	
64	R/W	SHOR T	Input port 5 setting register	
65	R/W	SHOR T	Input port 6 setting register	
66	R/W	SHOR T	Output port 1 setting register	
67	R/W	SHOR T	Output port 2 setting register	
68	R/W	SHOR T	Output port 1, 2 output value setting register in general output mode	
69	R	SHOR T	Input function status	
70	R/W	SHOR T	Point-to-point motion acceleration(r/s^2)	
71	R/W	SHOR T	Point-to-point motion deceleration(r/s^2)	
72	R/W	SHOR T	Point-to-point motion maximum speed(RPM)	
73	R/W	SHOR T	Point-to-point motion travel is 16 bits low (PUISE)	Form a LONG type data
74	R/W	SHOR T	Point-to-point motion travel is 16 bits high (PUISE)	
75	R/W	SHOR T	Acceleration initiated during continuous operation (R/S^2)	
76	R/W	SHOR T	Deceleration at deceleration stop during	

			continuous operation (R/S ²)	
77	R/W	SHOR T	Speed during continuous operation (RPM)	
78	R/W	SHOR T	Deceleration during emergency stop	
79	R/W	SHOR T	Zero return mode selection	
80	R/W	SHOR T	Zero return high speed	
81	R/W	SHOR T	Zero return low speed	
82	R/W	SHOR T	Zero return acceleration	
83	R/W	SHOR T	Position offset after completion of zero return	
84	R/W	SHOR T	Position mode selection: incremental motion and absolute motion	
85	R/W	SHOR T	Internal instruction counter clear	
88	R/W	SHOR T	Incomplete alarm is invalid	
89	R/W	SHOR T	Servo mode-integral gain	
90	R/W	SHOR T	Writing 1 will save the current parameter and then automatically clear it	
91	R/W	SHOR T	Writing 1 will restore the factory settings and then automatically clear	
92	R	SHOR T	Vendor reserved, do not write any value in this register	
93	R	SHOR T	Driver ID	

94	R	<i>SHOR</i> <i>T</i>	Driver version	
95	R	<i>SHOR</i> <i>T</i>	Non-label	
100	R/W	<i>SHOR</i> <i>T</i>	IO switching effective time in speedometer and position table mode	
101	R/W	<i>SHOR</i> <i>T</i>	Current step test current (mA)	
102	R/W	<i>SHOR</i> <i>T</i>	Output port 3 setting register	
103	R/W	<i>SHOR</i> <i>T</i>	Output port 4 setting register	
104	R	<i>SHOR</i> <i>T</i>	Output port mark	
105	R/W	<i>SHOR</i> <i>T</i>	Internal speed 0	
106	R/W	<i>SHOR</i> <i>T</i>	Internal speed 1	
107	R/W	<i>SHOR</i> <i>T</i>	Internal speed 2	
108	R/W	<i>SHOR</i> <i>T</i>	Internal speed 3	
109	R/W	<i>SHOR</i> <i>T</i>	Internal speed 4	
110	R/W	<i>SHOR</i> <i>T</i>	Internal speed 5	
111	R/W	<i>SHOR</i> <i>T</i>	Internal speed 6	
112	R/W	<i>SHOR</i> <i>T</i>	Internal speed 7	
113	R/W	<i>SHOR</i> <i>T</i>	Internal speed 8	
114	R/W	<i>SHOR</i> <i>T</i>	Internal speed 9	

115	R/W	SHOR T	Internal speed 10	
116	R/W	SHOR T	Internal speed 11	
117	R/W	SHOR T	Internal speed 12	
118	R/W	SHOR T	Internal speed 13	
119	R/W	SHOR T	Internal speed 14	
120	R/W	SHOR T	Internal speed 15	
121	R/W	SHOR T	Currently triggered position table	
122	R/W	SHOR T	Default parameter ID number	
125	R/W	SHOR T	Internal position 0 low 16 bits	Form a LONG type data
126	R/W	SHOR T	Internal position 0 high 16 bits	
127	R/W	SHOR T	Internal position 1 low 16 bits	Form a LONG type data
128	R/W	SHOR T	Internal position 1 high 16 bits	
129	R/W	SHOR T	Internal position 2 low 16 bits	Form a LONG type data
130	R/W	SHOR T	Internal position 2 high 16 bits	
131	R/W	SHOR T	Internal position 3 low 16 bits	Form a LONG type data
132	R/W	SHOR T	Internal position 3 high 16 bits	
133	R/W	SHOR T	Internal position 4 low 16 bits	

134	R/W	<i>SHOR</i> <i>T</i>	Internal position 4 high 16 bits	Form a LONG type data
135	R/W	<i>SHOR</i> <i>T</i>	Internal position 5 low 16 bits	Form a LONG type data
136	R/W	<i>SHOR</i> <i>T</i>	Internal position 5 high 16 bits	
137	R/W	<i>SHOR</i> <i>T</i>	Internal position 6 low 16 bits	Form a LONG type data
138	R/W	<i>SHOR</i> <i>T</i>	Internal position 6 high 16 bits	
139	R/W	<i>SHOR</i> <i>T</i>	Internal position 7 low 16 bits	Form a LONG type data
140	R/W	<i>SHOR</i> <i>T</i>	Internal position 7 high 16 bits	
141	R/W	<i>SHOR</i> <i>T</i>	Internal position 8 low 16 bits	Form a LONG type data
142	R/W	<i>SHOR</i> <i>T</i>	Internal position 8 high 16 bits	
143	R/W	<i>SHOR</i> <i>T</i>	Internal position 9 low 16 bits	Form a LONG type data
144	R/W	<i>SHOR</i> <i>T</i>	Internal position 9 high 16 bits	
145	R/W	<i>SHOR</i> <i>T</i>	Internal position 10 low 16 bits	Form a LONG type data
146	R/W	<i>SHOR</i> <i>T</i>	Internal position 10 high 16 bits	
147	R/W	<i>SHOR</i> <i>T</i>	Internal position 11 low 16 bits	Form a LONG type data
148	R/W	<i>SHOR</i> <i>T</i>	Internal position 11 high 16 bits	
149	R/W	<i>SHOR</i> <i>T</i>	Internal position 12 low 16 bits	Form a LONG type data
150	R/W	<i>SHOR</i> <i>T</i>	Internal position 12 high 16 bits	

151	R/W	<i>SHOR</i> <i>T</i>	Internal position 13 low 16 bits	Form a LONG type data
152	R/W	<i>SHOR</i>	Internal position 13 high 16 bits	
153	R/W	<i>SHOR</i> <i>T</i>	Internal position 14 low 16 bits	Form a LONG type data
154	R/W	<i>SHOR</i> <i>T</i>	Internal position 14 high 16 bits	
155	R/W	<i>SHOR</i> <i>T</i>	Internal position 15 low 16 bits	Form a LONG type data
156	R/W	<i>SHOR</i> <i>T</i>	Internal position 15 high 16 bits	
157	R/W	<i>SHOR</i> <i>T</i>	Torque mode speed loop proportional gain	
158	R/W	<i>SHOR</i> <i>T</i>	Torque mode speed loop integral gain	
160	R/W	<i>SHOR</i> <i>T</i>	Customized, reserved	
161	R/W	<i>SHOR</i> <i>T</i>	Customized, reserved	
162	R/W	<i>SHOR</i> <i>T</i>	Customized, reserved	
163	R/W	<i>SHOR</i> <i>T</i>	Customized, reserved	
164	R/W	<i>SHOR</i> <i>T</i>	Customized, reserved	
166	R/W	<i>SHOR</i> <i>T</i>	Customized, reserved	
190	R/W	<i>SHOR</i> <i>T</i>	Motor speed setting	
191	R/W	<i>SHOR</i> <i>T</i>	Torque operation setting	

192	R/W	<i>SHOR</i> <i>T</i>	Clear alarm status	
200	R/W	<i>SHOR</i> <i>T</i>	Motor start and stop	
201	R/W	<i>SHOR</i> <i>T</i>	Coherent action execution	
202	R/W	<i>SHOR</i> <i>T</i>	Motor jog	
203	R/W	<i>SHOR</i> <i>T</i>	Torque running	
204	R/W	<i>SHOR</i> <i>T</i>	Coherent action absolute position is low 16 bits	Form a LONG type data
205	R/W	<i>SHOR</i> <i>T</i>	Coherent action absolute position is high 16 bits	
206	R/W	<i>SHOR</i> <i>T</i>	Motor running pulse number is low 16 bits	Form a LONG type data
207	R/W	<i>SHOR</i> <i>T</i>	Motor running pulse number is high 16 bits	
208	R/W	<i>SHOR</i> <i>T</i>	Motor running to absolute position low 16 bits	Form a LONG type data
209	R/W	<i>SHOR</i> <i>T</i>	Motor running to absolute position high 16 bits	
212	R/W	<i>SHOR</i> <i>T</i>	Motor offline / enable	

3.3 Register details

Drive flag register[0 ~ 1]

Alarm flag register[0]

All alarm flags for the drive are defined. MODBUS address: 0

15							11	10	9	8
Reserved									ECDE1	
R-0						R-0				
7	6	5	4	3	2	1	0			
POSE	MPE	MEM	OT	UV	OV	OC	IVE			
R-0	R-0	R-0	R-0	R-0	R-0	R-0	R-0	R-0		

BIT	Name	描述
9 ~ 15	Reserved	Read always returns 0
8	ECDE1	Encoder failure 0: The encoder signal is normal. 1: Encoder signal is abnormal
7	POSE	Tracking error alarm 0: No tracking error alarm 1: A tracking error alarm occurs and the motor cannot follow the encoder normally. The possible effects are as follows: <ul style="list-style-type: none"> ● Location error alarm threshold ● Encoder wiring ● Motor wiring ● the setting of parameters such as speed and acceleration
6	MPE	Motor phase loss alarm 0: no phase loss alarm 1: A phase loss alarm occurs, and the drive cannot detect the power of the motor winding normally. flow. Need to detect motor wiring, motor type
5	MEM	Parameter verification error 0: Parameter verification is correct 1: Parameter verification error.
4	OT	Over temperature alarm flag 0: The drive temperature is normal 1: The internal temperature of the driver is too high
3	UV	Undervoltage alarm flag 0: no undervoltage alarm 1: Undervoltage of the driver
2	OV	Overvoltage alarm flag 0: no overvoltage alarm 1: The drive has an overvoltage and needs to be tested as follows: <ul style="list-style-type: none"> ● Check the input power ● Check the pump voltage when the motor is decelerating

1	OC	<p>Overcurrent alarm flag</p> <p>0: no overcurrent alarm</p> <p>1: An overcurrent alarm has occurred on the drive.</p> <p>Possible causes:</p> <ul style="list-style-type: none"> ● Short circuit of motor winding ● The current set by the driver is too large, causing the motor to burn out. ● Damage to internal components of the drive
0	IVE	<p>Internal voltage error alarm flag</p> <p>0: No internal voltage error</p> <p>1: Internal voltage error, usually caused by damage to internal components of the drive</p>

Drive status register [1]

Some status flags inside the drive are defined. MODBUS address: 1

15				11	10	9	8
Reserved				TC	POW	NL	PL
R-0							
7	6	5	4	3	2	1	0
CLAMP	ARRSPD	RDY	HOME	MOV	INPOS	ALM	ENA
R-0	R-0	R-0	R-1	R-0	R-0	R-0	R-1

BIT	Name	Decription
8 ~ 15	Reserved	Read always returns 0
11	TC	<p>Torque arrival state</p> <p>0: The torque has not reached the set value</p> <p>1: torque reaches the set value</p>
10	POW	<p>Power status</p> <p>0: The drive is not powered</p> <p>1: Drive power supply</p>
9	NL	<p>Negative limit valid status</p> <p>0: not in the negative limit position</p> <p>1: in the negative limit position</p>

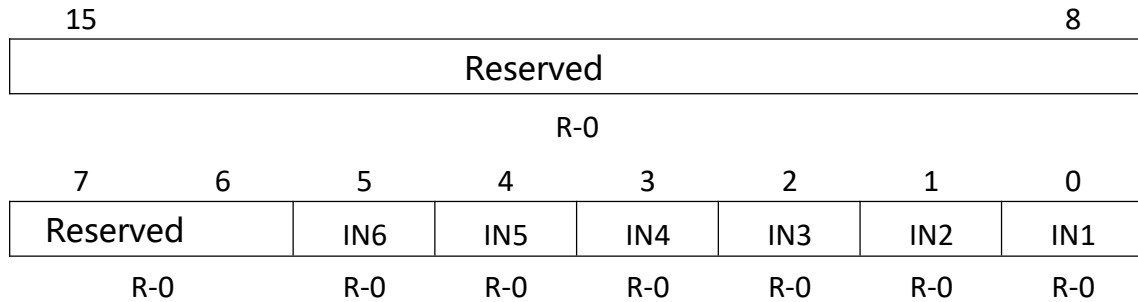
8	PL	Positive limit validity 0: not in the positive position 1: in the positive position
7	CLAMP	Motor mechanical brake state 0: Brake is not open, mechanically locks the motor shaft 1: The brake is open and the motor can run
6	ARRSPD	Whether the motor runs to the set speed 0: Speed has not arrived 1: speed has arrived In the internal pulse command mode, it is used to indicate whether the motor has reached the set speed.
5	RDY	Drive ready flag 0: not ready 1: ready Normally the drive is in the ready state when it is enabled. However, it takes 100ms for the motor to be in the ready state during the transition from the enable to the enable. Automatic identification of parameters as above, current level The jump test will cause the motor to be in an inactive state.
4	HOME	Zero mark 0: zero return is not completed 1: zero return has been completed
3	MOV	Motor movement sign 0: Motor stop state 1: The motor is running When the motor is running, it cannot respond to new motion commands and can only respond to stop commands.
2	INPOS	Motor positioning completion flag in closed loop mode 0: Positioning is not completed 1: Positioning completed
1	ALM	Drive alarm flag 0: The drive has no alarm 1: The drive has an alarm. Please check the status of the register REG_ALMCODE (address 0).

0	ENA	Drive enable flag 0: Drive is not enabled 1: The drive is enabled The default drive is powered on.
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Input and output status register [2 ~ 7]

Input port value register [2]

Used to indicate the value of the current input port. Since the input port is optically isolated, for ease of understanding, the optocoupler is used to indicate the state of the input port. MODBUS address: 2



BIT	Name	Description
6 ~ 15	Reserved	Read always returns 0
5	IN6	Input port IN6 level status 0: Input port 6 does not conduct 1: input port 6 conduction
4	IN5	Input port IN5 level status 0: Input port 5 is not conductive 1: input port 5 conduction
3	IN4	Input port IN4 level status 0: Input port 4 is not conducting 1: input port 14 conduction
2	IN3	Input port IN3 level status 0: Input port 3 is not conductive 1: input port 3 conduction
1	IN2	Input port IN2 level status 0: Input port 2 is not conducting 1: input port 2 conduction

0	IN1	Input port IN1 level status 0: Input port 1 is not conductive 1: input port 1 conduction
---	-----	--

Current output port value [3]

Output port value register. MODBUS Address: 3

15					8
Reserved					
R-0					
7	4	3	2	1	0
Reserved		OUT4	OUT3	OUT2	OUT1
R-0		R-0	R-0	R-0	R-0

BIT	Name	Description
4 ~ 15	Reserved	Read always returns 0
3	OUT4	Level status of output port 4 (used by other products) 0: Output port 4 is not conducting 1: output port 4 conduction
2	OUT3	Level status of output port 3 (used by other products) 0: Output port 3 is not conducting 1: output port 3 conduction
1	OUT2	Output port 2 level status 0: Output port 2 is not conducting 1: output port 2 conduction
0	OUT1	Output port 1 level status 0: Output port 1 is not conducting 1: output port 1 conduction

Input port conduction edge latch register [4]

Each time the port changes from the off state to the on state, the driver will latch this change edge. MODBUS Address: 4

15					8
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Reserved	
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R-0

7	6	5	4	3	2	1	0
Reserved	IN6	IN5	IN4	IN3	IN2	IN1	

R-0

R-0

R-0

R-0

R-0

R-0

R-0

BIT	Name	Description
6 ~ 15	Reserved	Read always returns 0
5	IN6	Input port IN6 turn-on edge latch flag 0: Input port 6 has not been turned on. 1: Input port 6 has a conduction edge
4	IN5	Input port IN5 turn-on edge latch flag 0: Input port 5 has not been turned on. 1: Input port 5 has a conduction edge
3	IN4	Input port IN4 turn-on edge latch flag 0: Input port 4 has not been turned on. 1: Input port 4 has a conduction edge
2	IN3	Input port IN3 turn-on edge latch flag 0: Input port 3 has not been turned on. 1: Input port 3 has a conduction edge
1	IN2	Input port IN2 turn-on edge latch flag 0: Input port 2 has not been turned on. 1: Input port 2 has a conduction edge
0	IN1	Input port IN1 turn-on edge latch flag 0: Input port 1 has not been turned on. 1: Input port 1 has a conduction edge

Input port shutdown edge latch register [5]

Each time the port changes from on to off, the driver will latch this change edge. MODBUS address: 5

15

8

Reserved

R-0							
7	6	5	4	3	2	1	0
Reserved	IN6	IN5	IN4	IN3	IN2	IN1	
R-0	R-0	R-0	R-0	R-0	R-0	R-0	R-0

BIT	Name	Description
6 ~ 15	Reserved	Read always returns 0
5	IN6	Input port IN6 turn-off edge latch flag 0: Input port 6 has not had a shutdown edge 1: input port 6 has a shutdown edge
4	IN5	Input port IN5 turn-off edge latch flag 0: Input port 5 has not experienced a shutdown edge 1: Input port 5 has a shutdown edge
3	IN4	Input port IN4 turn-off edge latch flag 0: Input port 4 has not experienced a shutdown edge 1: input port 4 has a shutdown edge
2	IN3	Input port IN3 turn-off edge latch flag 0: Input port 3 has not experienced a shutdown edge 1: Input port 3 has a shutdown edge
1	IN2	Input port IN2 turn-off edge latch flag 0: Input port 2 has not experienced a shutdown edge 1: Input port 2 has a shutdown edge
0	IN1	Input port IN1 turn-off edge latch flag 0: Input port 1 has not experienced a shutdown edge 1: input port 1 has a shutdown edge

Input port conduction edge clear register [6]

Used to clear the latched on-edge flag. MODBUS Address: 6

15							8
Reserved							
R-0							
7	6	5	4	3	2	1	0

Reserved	IN6	IN5	IN4	IN3	IN2	IN1
R-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0

BIT	Name	Description
6 ~ 15	Reserved	Read always returns 0
5	IN6	Clear the on-latch latch status flag of IN6 0: no effect 1: Clear the on-edge latch flag of the IN6 port
4	IN5	Clear the on-latch latch status flag of IN5 0: no effect 1: Clear the on-edge latch flag of the IN5 port
3	IN4	Clear the on-latch latch status flag of IN4 0: no effect 1: Clear the on-edge latch flag of the IN4 port
2	IN3	Clear the on-latch latch status flag of IN3 0: no effect 1: Clear the on-edge latch flag of the IN3 port
1	IN2	Clear the on-latch latch flag of IN2 0: no effect 1: Clear the on-edge latch flag of the IN2 port
0	IN1	Clear the on-latch latch status flag of IN1 0: no effect 1: Clear the on-edge latch flag of the IN1 port

Input port shutdown edge clear register [7]

A shutdown edge flag used to clear the latch. MODBUS Address: 7

15	Reserved						8
R-0							
7	6	5	4	3	2	1	0
Reserved	IN6	IN5	IN4	IN3	IN2	IN1	
R-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0	R/W-0

BIT	Name	Description
6 ~ 15	Reserved	Read always returns 0
5	IN6	Clear the off-edge latch status flag of IN6 0: no effect 1: Clear the shutdown edge latch flag of the IN6 port
4	IN5	Clear the shutdown edge latch status flag of IN5 0: no effect 1: Clear the shutdown edge latch flag of the IN5 port
3	IN4	Clear the off-edge latch status flag of IN4 0: no effect 1: Clear the shutdown edge latch flag of the IN4 port
2	IN3	Clear the shutdown edge latch status flag of IN3 0: no effect 1: Clear the shutdown edge latch flag of the IN3 port
1	IN2	Clear the off-edge latch status flag of IN2 0: no effect 1: Clear the shutdown edge latch flag of the IN2 port
0	IN1	Clear the shutdown edge latch status flag of IN1 0: no effect 1: Clear the shutdown edge latch flag of the IN1 port

Motor current position, speed related register[8 ~ 16]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
8	16	R	0	[0,65535]	In the internal pulse mode, the current absolute position is lower by 16 bits.
9	16	R	0	[0,65535]	In the internal pulse mode, the current absolute position is 16 bits high.
10	16	R	0	[-	Current command speed. Signed 16-bit data in RPM

				3000,3 000]	
11	16	R	-	[0,100]	Current bus voltage value in mV
12	16	R	0	[0,6553 5]	Motor tracking error is 16 bits lower in closed loop mode Unit: encoder resolution
13	16	R	0	[0,6553 5]	Motor tracking error is 16 bits high in closed loop mode
14	16	R	0	[0,6553 5]	External pulse counter low 16 bits
15	16	R	0	[0,6553 5]	External pulse counter high 16 bits
16	16	R/W	0	[0,1]	Clear external pulse counter Write 0 has no effect, read always returns 0 Writing a 1 clears the external pulse counter and the value of registers 14, 15 becomes zero. then This register will become 0.

Drive control mode setting[17 ~ 23]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
17	16	R/W	0	[0,1]	Command mode setting register, set the source of the pulse command of the driver 0: internal pulse command 1: external pulse command
18	16	R/W	0	[0,6]	Control instruction in internal pulse mode 0: Waiting state. The drive receives any control commands and will resume the bit wait state after processing by the drive. So reading this register always returns 0. 1: fixed length forward. In the relative position mode, the motor runs in the forward direction according to the 70 to 74 register parameters. In absolute position mode, the operating status is determined by the current position and the absolute position set by 70 to 74.

				<p>2: Fixed length reversal.</p> <p>In the relative position mode, the motor runs in reverse according to the 70 to 74 register parameters. In absolute position mode, the operating status is determined by the current position and the absolute position set by 70 to 74.</p> <p>3: Speed mode, continuous forward rotation.</p> <p>The motor performs forward acceleration according to the 75 and 76 registers.</p> <p>4: Speed mode, continuous reversal.</p> <p>The motor performs reverse acceleration operation according to the 75 and 76 registers.</p> <p>5: Emergency stop.</p> <p>The motor decelerates and stops according to the 77 register</p> <p>6: Deceleration stops.</p> <p>Position mode, the motor decelerates and stops according to the 71 register</p> <p>Speed mode, the motor decelerates and stops according to the 76 register</p> <p>Other: No effect.</p> <ul style="list-style-type: none"> ● This register only works when the internal pulse mode register 20 value is 0.
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19	16	R/W	0	[0,2]	<p>External pulse command mode setting register 0: IN1 is the pulse input port and IN2 is the direction input port</p> <p>1: IN1 is the positive pulse input port and IN2 is the reverse pulse input port.</p> <p>2: IN1 is the quadrature encoder A phase input port, IN2 is quadrature encoder B phase input port other: invalid</p> <ul style="list-style-type: none"> ● Note the mode 2 here. Although the driver receives the quadrature encoder signal, the driver only follows it, which is a form of instruction. It is not the position feedback signal of the stepper motor itself. This function can be used to follow the encoder signal output by other devices such as servo drives.
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20	16	R/W	0	[0,5]	<p>Preset application selection in internal pulse mode</p> <p>0: response to the 18 register instruction</p> <p>1: zero return mode</p> <p>2: Preset IO control mode 1: start and stop + direction</p> <p>3: Preset IO control mode 2: forward + reverse</p> <p>4: Preset IO Control Mode 3: Internal Speedometer</p> <p>5: Preset IO Control Mode 4: Internal Position Table</p> <p>6: Preset IO control mode 5: step position</p> <p>7: Customization 1</p> <p>8: Customization 2</p> <p>9: Customization 3</p> <p>10: Customization 4</p> <p>11: Customization 5</p>
21	16	R/W	0	[0,1]	<p>Motor type setting register</p> <p>0: two-phase stepper motor</p> <p>1: three-phase stepper motor</p>
22	16	R/W	0	[0,2]	<p>Motor operating mode setting register</p> <p>0: open loop operation</p> <p>1: Servo mode one</p> <p>2: Servo mode 2</p>
23	16	R/W	0	[0,1]	<p>Motor direction inversion setting register</p> <p>0: default running direction</p> <p>1: Reverse the running direction of the motor</p>

Open loop operation parameter setting [24 ~ 29]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
24	16	R/W	4000	[200,65535]	Segmentation settings Set the breakdown of the drive runtime
25	16	R/W	3000	[0,6000]	Open loop operating current The sine peak of the drive when it is open loop. Unit: mA
26	16	R/W	50	[0,100]	Standby current percentage Set the open-loop operating mode of the drive to enter the standby state. The percentage of the line current. unit:%
27	16	R/W	500	[10,65535]	Standby time setting When setting the drive open loop operation, after the pulse stops for a certain period of time, the drive enters the standby The time of the machine state. Unit: ms
28	16	R/W	128	[1,512]	Pulse command filter For smoothing pulse commands (both internal and external), filter time = set value * 50us
29	16	R	-	-	Current position of the encoder (number of pulses)

Motor and current loop parameters [30 ~ 39]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
30	16	R/W	0	[0,1]	Automatic PI enable function The drive has built-in parameter identification and gain optimization algorithms. Usually good results can be achieved. If the customer needs optimization, this feature can be disabled. 0: Do not use the automatic PI function 1: Use automatic PI function
31	16	R	-	[100,6535]	Automatically recognized resistance value Read the motor winding resistance value automatically recognized by the drive. Unit: mOhm
32	16	R	-	[1,6535]	Automatically recognized inductance value Read the motor winding inductance value automatically recognized by the drive. Unit: mH
33	16	R/W	1000	[100,10000]	User-set resistance value When the automatic PI function is canceled, the user-set resistance value is valid. Unit: mOhm
34	16	R/W	1	[1,10]	User-set inductance value In the case of canceling the automatic PI function, the user-set inductance value is effective. Unit: mH

35	16	R/W	200	[0,100 0]	Motor torque constant The parameter is valid only when the motor control mode is servo mode 2
36	16	R/W	1000	[200,1 0000]	Current loop proportional gain Current loop KP in the PI algorithm. When the automatic PI function is enabled, ILOOPKP is automatically generated. When the automatic PI function is not enabled, the user can modify ILOOPKP.

Closed loop control motor parameters [40 ~ 48]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
40	16	R/W	4000	[256,65535]	Encoder feedback resolution The driver is capable of receiving quadrature encoder input signals and performing 4x processing. Encoder resolution = number of encoder lines X 4
41	16	R/W	2000	[100,65535]	Tracking error alarm threshold The alarm threshold is in encoder resolution.
42	16	R/W	10	[1,65535]	The positioning completion accuracy is in units of encoder resolution.
43	16	R/W	50	[1,65535]	Positioning completion duration After setting the motor to the completion accuracy, the duration, duration = set value X 50us
44	16	R/W	100	[1,65535]	The time when the positioning is completed and the detection is started. After setting the drive to stop receiving pulses, the set time is elapsed, and then it is judged whether the positioning is completed. Set time = set value X 50us
45	16	R/W	4000	[0,5000]	Maximum current of closed loop control Set the maximum allowable current when the drive is closed-loop, sinusoidal peak,

					unit: mA
46	16	R/W	50	[0,100]	Base current percentage for closed loop control
47	16	R/W	200	[10,5000]	Primary speed filter, unit: Hz
48	16	R/W	600	[10,5000]	Secondary speed filtering, unit: Hz

Closed loop servo parameter [49 ~ 59]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
49	16	R/W	0	[0,500]	Servo mode - low speed anti-resonance gain
50	16	R/W	3000	[0,65535]	Servo mode two position loop proportional gain
51	16	R/W	1000	[0,65535]	Servo mode two position loop integral gain
52	16	R/W	0	[0,65535]	Servo mode two speed loop damping 1
53	16	R/W	800	[0,65535]	Servo mode two speed loop damping 2
54	16	R/W	600	[0,65535]	Servo mode two speed loop feed forward gain
55	16	R/W	512	[0,1024]	Servo mode two gravity compensation
56	16	R/W	0	[0,65535]	Servo mode two acceleration gain
57	16	R/W	0	[0,65535]	Servo mode two acceleration feed forward gain
58	16	R/W	5000	[10,5000]	Servo mode two speed loop output filter
59	16	R/W	2000	[10,5000]	Servo mode two acceleration feedforward filter

Input and output setting register [60 ~ 69], [102 ~ 104]

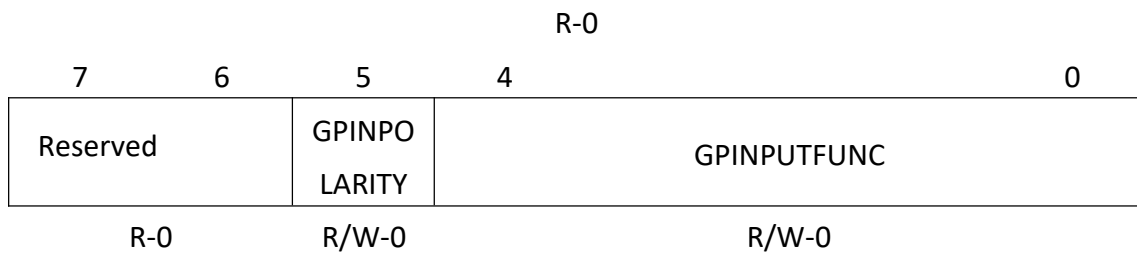
Input setting register [60 ~ 65]

The drive contains 6 inputs, each of which is set up in the same way.

15

8

Reserved



BIT	Name	Description
-----	------	-------------

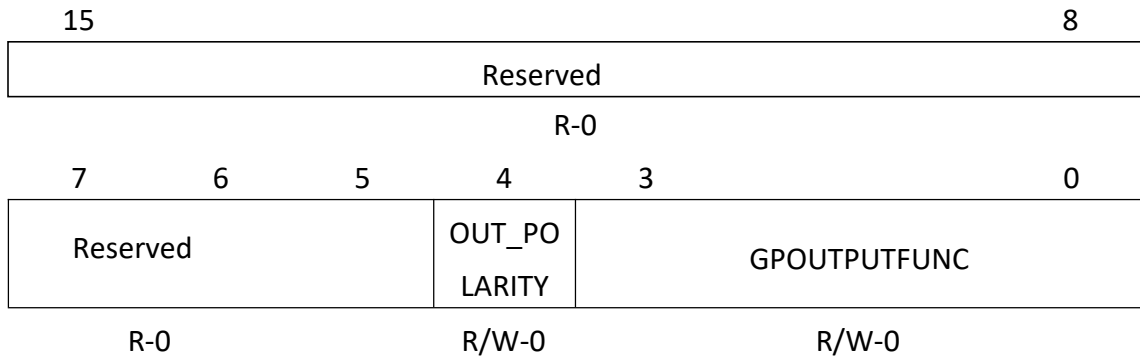
6 ~ 15	Reserved	Read always returns 0
5	GPINPOLARIT Y	Active level of the input port 0: normally closed 1: Normally open (default)
0 ~ 4	GPINPUTFUN C	Input port function selection 0: pulse input 1: direction input 2: Quadrature encoder A phase input 3: Quadrature encoder B phase input 4: Motor offline 5: Clear the fault 6: Emergency stop 7: Jog forward/start/stop 8: Jog reverse / direction 9: Positive limit input 10: Reverse limit input 11: Zero signal 12: Start zero return 13: Reverse the running direction of the motor 14: Multi-speed control 0 15: Multi-speed control 1 16: Multi-speed control 2 17: Multi-speed control 3 18: Multi-segment position control 0 19: Multi-segment position control 1 20: Multi-segment position control 2 21: Multi-segment position control 3 Other: The input port has no effect, only the ordinary input port

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
60	16	R/W	0	[0,21]	Input port 1 setting register

61	16	R/W	1	[0,21]	Input port 2 setting register
62	16	R/W	4	[0,21]	Input port 3 setting register
63	16	R/W	7	[0,21]	Input port 4 setting register
64	16	R/W	12	[0,21]	Input port 5 setting register
65	16	R/W	11	[0,21]	Input port 6 setting register

Output port setting register [66 ~ 69]

驱动器包含两个输出口，每个输出口的设置方式相同

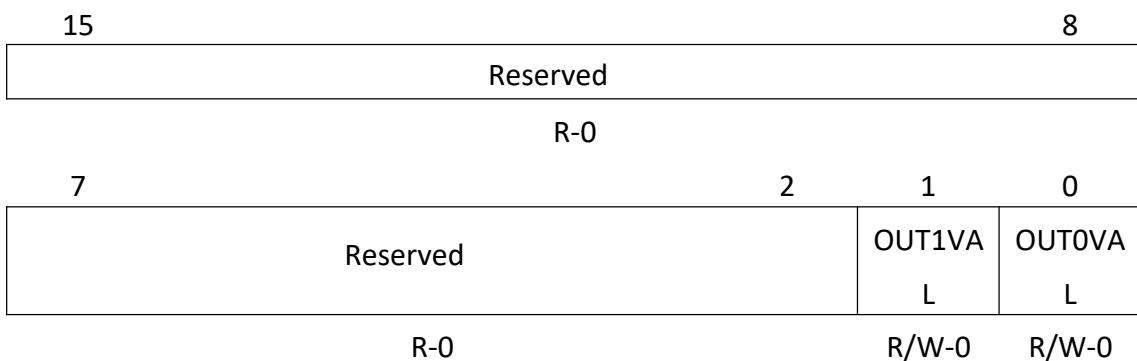


BIT	Name	Description
5 ~ 15	Reserved	Read always returns 0
4	OUT_POLARITY	Output port polarity 0: normally closed 1: Normally open (default)
0 ~ 3	GPOUTPUTFUNC	Output port function selection 0: normal output, user control 1: Alarm output, OUT0 default value 2: Brake signal output 3: In-position signal output 4: Speed reaches output, OUT1 default value 5: Return to zero to complete the output 6: The drive is ready for output 7: Motor stop status output 8: Positive limit output 9: Negative limit output

		<p>10: Power indicator output</p> <p>11: Torque reaches the output</p> <p>Other: The input port has no effect, only the ordinary input port</p>
--	--	---

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
66	16	R/W	1	[0,11]	Output port 1 setting register
67	16	R/W	4	[0,11]	Output port 2 setting register
102	16	R/W	1	[0,11]	Output port 3 setting register (other products)
103	16	R/W	4	[0,11]	Output port 4 setting register (other products)

- When the output port 1/2 setting register value is set to 0 (normal output, user control function), the register with MODBUS address 68 is used to set whether the output port is turned on. It should be noted that the output port polarity in MODBUS address 66/67 still works. The MODBUS address 68 register description is as follows:



BIT	Name	Description
2 ~ 15	Reserved	Read always returns 0
1	OUT1VAL	Set the level status of the output port OUT1 0: Output port 1 is not conducting 1: output port 1 conduction
0	OUT0VAL	Set the level status of the output port OUT0 0: Output port 0 is not conducting 1: output port 0 conduction

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
68	16	R/W	0	[0,1]	Output status setting when OUT0, OUT1 are used as normal outputs
69	16	R	-	-	Current input function valid flag (consistent with digital input port function) 0: The corresponding function is invalid. 1: Corresponding function is valid
104	16	R	-	-	Current output function valid flag (consistent with digital output port function) 0: The corresponding function is invalid. 1: Corresponding function is valid

Point motion parameter setting [70 ~ 74]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
70	16	R/W	200	[10,1000]	Acceleration during point motion, in: r/s^2
71	16	R/W	200	[10,1000]	Deceleration during point motion, unit: r/s^2
72	16	R/W	600	[0,3000]	Maximum speed during point motion, in: RPM
73	16	R/W	2000	[0,3000]	Low running distance for point motion 16-bit unit: number of pulses, based on the subdivision setting
74	16	R/W	0	[0,3000]	High running distance for point motion 16-bit unit: number of pulses, based on the subdivision setting

The 73, 74 registers form a 32-bit signed register.

- In the incremental mode, the absolute values of 73 and 74 indicate the distance traveled. Write 1 or 2 to register 18 to control whether the motor is running in the forward or reverse direction.

In absolute position mode, the signed data consisting of 73 and 74 indicates the target position, and writing 1 to 18 causes the motor to run to the set distance.

Continuous speed mode parameter setting [75 ~ 78]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
75	16	R/W	100	[10,1000]	Acceleration during continuous motion, unit: r/s^2
76	16	R/W	100	[10,1000]	Deceleration during continuous motion, unit: r/s^2
77	16	R/W	100	[0,3000]	Maximum speed during continuous motion, in: RPM
78	16	R/W	500	[10,1000]	Deceleration during emergency stop, unit: r/s^2

Zero return parameter setting [79 ~ 83]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
79	16	R/W	0	[0,1]	Zero return mode selection 0: with a negative limit of zero 1: with a positive limit of zero Other values are invalid
80	16	R/W	200	[0,600]	Speed when returning to zero quickly, the unit: RPM
81	16	R/W	40	[0,600]	Speed at slow return to zero, in: RPM

82	16	R/W	100	[0,1000]	Acceleration and deceleration when returning to zero, unit: R/S^2
83	16	R/W	100	[0,1000]	Pulse offset after completion of zero return Unit: number of pulses, based on the subdivision setting

Internal pulse control parameter [84 ~ 89]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
84	16	R/W	0	[0,1]	0: incremental position mode 1: absolute position mode
85	16	R/W	0	[0,1]	0: Write 0 is invalid, read returns 0 1: Internal pulse instruction counter is cleared
88	16	R/W	0	[0,1]	0: The over tolerance alarm is valid 1: Out of tolerance alarm is invalid
89	16	R/W	50	[0,500]	Servo mode-integral gain

Drive basic parameter register [90 ~ 99]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
90	16	R/W	0	[0, 1]	0: Write 0 is invalid, read returns 0 1: Write 1 Save the current parameters
91	16	R/W	0	[0, 1]	0: Write 0 is invalid, read returns 0 1: Write 1 will restore factory settings
92	-	-	-	-	The manufacturer retains the use and the user prohibits the writing of data.
93	16	R	-	-	Drive ID number
94	16	R	-	-	Drive version number
95	16	R	-	-	Non-label

Built-in speedometer parameter settings [100 ~ 120]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
100	16	R/W	200	[0,65535]	IO switching effective time in speedometer and position table mode = setting value x 62.5us
101	16	R/W	1000	[0,3000]	Current step test current setting
105	16	R/W	0	[0,3000]	Internal speed 0, unit: RPM
106	16	R/W	100	[0,3000]	Internal speed 1, unit: RPM
107	16	R/W	200	[0,3000]	Internal speed 2, unit: RPM
108	16	R/W	300	[0,3000]	Internal speed 3, unit: RPM
109	16	R/W	400	[0,3000]	Internal speed 4, unit: RPM
110	16	R/W	500	[0,3000]	Internal speed 5, unit: RPM
111	16	R/W	600	[0,3000]	Internal speed 6, unit: RPM
112	16	R/W	700	[0,3000]	Internal speed 7, unit: RPM
113	16	R/W	800	[0,3000]	Internal speed 8, unit: RPM
114	16	R/W	900	[0,3000]	Internal speed 9, unit: RPM
115	16	R/W	1000	[0,3000]	Internal speed 10, unit: RPM
116	16	R/W	1100	[0,3000]	Internal speed 11, unit: RPM
117	16	R/W	1200	[0,3000]	Internal speed 12, unit: RPM
118	16	R/W	1300	[0,3000]	Internal speed 13, unit: RPM
119	16	R/W	1400	[0,3000]	Internal speed 14, unit: RPM
120	16	R/W	1500	[0,3000]	Internal speed 15, unit: RPM

Built-in location table parameter settings [121 ~ 156]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
121	16	R	-	-	Currently triggered position table
122	16	R/W	100	[100,10]	Default parameter ID number (do not modify)
125	16	R/W	0	[0,65535]	Internal position 0 low 16 bits
126	16	R/W	0	[0,65535]	Internal position 0 high 16 bits
127	16	R/W	0	[0,65535]	Internal position 1 low 16 bits
128	16	R/W	0	[0,65535]	Internal position 1 high 16 bits
129	16	R/W	0	[0,65535]	Internal position 2 low 16 bits
130	16	R/W	0	[0,65535]	Internal position 2 low 16 bits
131	16	R/W	0	[0,65535]	Internal position 3 low 16 bits
132	16	R/W	0	[0,65535]	Internal position 3 low 16 bits
133	16	R/W	0	[0,65535]	Internal position 4 low 16 bits
134	16	R/W	0	[0,65535]	Internal position 4 high 16 bits
135	16	R/W	0	[0,65535]	Internal position 5 low 16 bits
136	16	R/W	0	[0,65535]	Internal position 5 low 16 bits
137	16	R/W	0	[0,65535]	Internal position 6 low 16 bits
138	16	R/W	0	[0,65535]	Internal position 6 low 16 bits

139	16	R/W	0	[0,655 35]	Internal position 7 high 16 bits
140	16	R/W	0	[0,655 35]	Internal position 7 low 16 bits
141	16	R/W	0	[0,655 35]	Internal position 7 low 16 bits
142	16	R/W	0	[0,655 35]	Internal position 8 low 16 bits
143	16	R/W	0	[0,655 35]	Internal position 9 low 16 bits
144	16	R/W	0	[0,655 35]	Internal position 9 high 16 bits
145	16	R/W	0	[0,655 35]	Internal position 10 low 16 bits
146	16	R/W	0	[0,655 35]	Internal position 10 low 16 bits
147	16	R/W	0	[0,655 35]	Internal position 11 low 16 bits
148	16	R/W	0	[0,655 35]	Internal position 11 low 16 bits
149	16	R/W	0	[0,655 35]	Internal position 12 high 16 bits

Torque mode register [157 ~ 164]

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
157	16	R/W	1000	[0,65535]	Torque mode speed loop proportional gain
158	16	R/W	15000	[0,65535]	Torque mode speed loop integral gain
160	16	R/W	5	[0,3000]	Customized, reserved
161	16	R/W	120	[0,1000]	Customized, reserved
162	16	R/W	5	[0,3000]	Customized, reserved
163	16	R/W	5000	[0,6000]	Customized, reserved
164	16	R/W	200	[0,1000]	Customized, reserved
166	16	R/W	200	[0,1000]	Customized, reserved

IP Setting

The IP address is formatted as follows:

IPADD0. IPADD1. IPADD2. IPADD3

The default is 192.168.0. IPADD3

The gateway is formatted as:

GW0. GW1. GW2. GW3

The default is 192.168.0.1

The subnet mask format is:

MSK0. MSK1. MSK2. MSK3

The default is 255.255.255.0

Modbus Address	Number of digits	Attributes	Defaults	Range	Description
170	8	R/W	192	[0,255]	IPADD0
171	8	R/W	168	[0, 255]	IPADD1
172	8	R/W	0	[0, 255]	IPADD2
173	8	R/W	192	[0, 255]	GW0
174	8	R/W	168	[0, 255]	GW1
175	8	R/W	0	[0, 255]	GW2
176	8	R/W	1	[0, 255]	GW3
177	8	R/W	255	[0, 255]	MSK0
178	8	R/W	255	[0, 255]	MSK1
179	8	R/W	255	[0, 255]	MSK2
180	8	R/W	0	[0, 255]	MSK3

Appendix Modbus/RTU16-bit CRC check routine

The CRC routines are written in C language specifications, making it easy for users to migrate to a variety of platforms.

The CRC_Checksum.c file contains two functions for calculating the CRC.

Try the CRC in a computational way:

```

unsigned short CalcCRCbyAlgorithm(unsigned char* pDataBuffer,
unsigned long usDataLen)
{
    /* Use the Modbus algorithm as detailed in the Watlow comms
    guide */

    const unsigned short POLYNOMIAL = 0xA001;
    unsigned short wCrc;
    int iByte, iBit;

    /* Initialize CRC */
    wCrc = 0xFFFF;

    for (iByte = 0; iByte < usDataLen; iByte++)
    {
        /* Exclusive-OR the byte with the CRC */
        wCrc ^= *(pDataBuffer + iByte);

        /* Loop through all 8 data bits */

        for (iBit = 0; iBit <= 7; iBit++)
        {
            /* If the LSB is 1, shift the CRC and XOR the polynomial
            mask with the CRC */

            /* Note - the bit test is performed before the rotation,
            so can't move the << here */

```

```

    if (wCrc & 0x0001)
    {
        wCrc >>= 1;
        wCrc ^= POLYNOMIAL;
    }
    else
    {
        /* Just rotate it */
        wCrc >>= 1;
    }
}

return wCrc;
}

```

Calculate the CRC by looking up the table:

```

/* Table Of CRC Values */
const unsigned short TABLE_CRC16[] =
{
    0x0000, 0xC0C1, 0xC181, 0x0140, 0xC301, 0x03C0, 0x0280,
    0xC241,
    0xC601, 0x06C0, 0x0780, 0xC741, 0x0500, 0xC5C1, 0xC481,
    0x0440,
    0xCC01, 0x0CC0, 0x0D80, 0xCD41, 0x0F00, 0xCFC1, 0xCE81,
    0x0E40,
    0x0A00, 0xCAC1, 0xCB81, 0x0B40, 0xC901, 0x09C0, 0x0880,
    0xC841,
    0xD801, 0x18C0, 0x1980, 0xD941, 0x1B00, 0xDBC1, 0xDA81,
    0x1A40,
    0x1E00, 0xDEC1, 0xDF81, 0x1F40, 0xDD01, 0x1DC0, 0x1C80,
    0xDC41,
    0x1400, 0xD4C1, 0xD581, 0x1540, 0xD701, 0x17C0, 0x1680,
    0xD641,

```

0xD201, 0x12C0, 0x1380, 0xD341, 0x1100, 0xD1C1, 0xD081,
 0x1040,
 0xF001, 0x30C0, 0x3180, 0xF141, 0x3300, 0xF3C1, 0xF281,
 0x3240,
 0x3600, 0xF6C1, 0xF781, 0x3740, 0xF501, 0x35C0, 0x3480,
 0xF441,
 0x3C00, 0xFCC1, 0xFD81, 0x3D40, 0xFF01, 0x3FC0, 0x3E80,
 0xFE41,
 0xFA01, 0x3AC0, 0x3B80, 0xFB41, 0x3900, 0xF9C1, 0xF881,
 0x3840,
 0x2800, 0xE8C1, 0xE981, 0x2940, 0xEB01, 0x2BC0, 0x2A80,
 0xEA41,
 0xEE01, 0x2EC0, 0x2F80, 0xEF41, 0x2D00, 0xEDC1, 0xEC81,
 0x2C40,
 0xE401, 0x24C0, 0x2580, 0xE541, 0x2700, 0xE7C1, 0xE681,
 0x2640,
 0x2200, 0xE2C1, 0xE381, 0x2340, 0xE101, 0x21C0, 0x2080,
 0xE041,
 0xA001, 0x60C0, 0x6180, 0xA141, 0x6300, 0xA3C1, 0xA281,
 0x6240,
 0x6600, 0xA6C1, 0xA781, 0x6740, 0xA501, 0x65C0, 0x6480,
 0xA441,
 0x6C00, 0xACC1, 0xAD81, 0x6D40, 0xAF01, 0x6FC0, 0x6E80,
 0xAE41,
 0xAA01, 0x6AC0, 0x6B80, 0xAB41, 0x6900, 0xA9C1, 0xA881,
 0x6840,
 0x7800, 0xB8C1, 0xB981, 0x7940, 0xBB01, 0x7BC0, 0x7A80,
 0xBA41,
 0xBE01, 0x7EC0, 0x7F80, 0xBF41, 0x7D00, 0xBDC1, 0xBC81,
 0x7C40,
 0xB401, 0x74C0, 0x7580, 0xB541, 0x7700, 0xB7C1, 0xB681,
 0x7640,
 0x7200, 0xB2C1, 0xB381, 0x7340, 0xB101, 0x71C0, 0x7080,
 0xB041,

```

    0x5000, 0x90C1, 0x9181, 0x5140, 0x9301, 0x53C0, 0x5280,
0x9241,
    0x9601, 0x56C0, 0x5780, 0x9741, 0x5500, 0x95C1, 0x9481,
0x5440,
    0x9C01, 0x5CC0, 0x5D80, 0x9D41, 0x5F00, 0x9FC1, 0x9E81,
0x5E40,
    0x5A00, 0x9AC1, 0x9B81, 0x5B40, 0x9901, 0x59C0, 0x5880,
0x9841,
    0x8801, 0x48C0, 0x4980, 0x8941, 0x4B00, 0x8BC1, 0x8A81,
0x4A40,
    0x4E00, 0x8EC1, 0x8F81, 0x4F40, 0x8D01, 0x4DC0, 0x4C80,
0x8C41,
    0x4400, 0x84C1, 0x8581, 0x4540, 0x8701, 0x47C0, 0x4680,
0x8641,
    0x8201, 0x42C0, 0x4380, 0x8341, 0x4100, 0x81C1, 0x8081,
0x4040
};

```

```

unsigned short CalcCRC_TAB(unsigned char* pDataBuffer, unsigned
long usDataLen)
{
    unsigned char nTemp;
    unsigned short wCRCWord = 0xFFFF;

    while (usDataLen--)
    {
        nTemp = wCRCWord ^ *(pDataBuffer++);
        wCRCWord >>= 8;
        wCRCWord ^= TABLE_CRC16[nTemp];
    }

    return wCRCWord;
}

```

