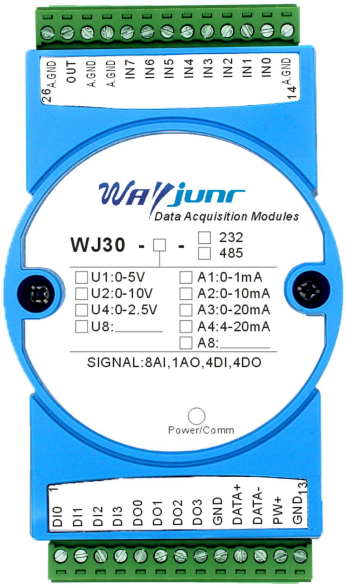
8AI, 4DI, 4DO mixed signal to RS-485/232, MODBUS data acquisition module WJ30



1 WJ30 module appearance **diagram**

Product features:

- ●Eight 4-20mA input Modbus RTU communication protocol
- ●Four channel switch input, four channel switch output
- ●The precision of the calibration module can be programmed through the RS-485/232 interface
- ●Isolation and voltage resistance between signal input/output 3000VDC
- ●Wide power supply range: 8~32VDC
- ●High reliability, easy programming, and easy application
- ●Standard DIN35 rail installation, convenient for centralized wiring
- ● Users can program module addresses, baud rates, etc
- ● Supports Modbus RTU communication protocol and automatic recognition protocol
- ●Low cost, small volume modular design

Typical applications:

- ● Signal measurement, monitoring, and control
- ●RS-485 remote I/O, data acquisition
- ●Intelligent building control, security engineering and other application systems
- ●RS-232/485 bus industrial automation control system
- ●Industrial site signal isolation and long-distance transmission
- ● Equipment operation monitoring
- ● Measurement **diagram** of sensor signal
- ● Acquisition and recording of industrial field data
- ●Development of medical and industrial control products
- ● 4-20mA or 0-5V signal acquisition

Product Overview:

The WJ30 product implements signal acquisition between sensors and hosts for detecting analog signals. The WJ30 series products can be applied to industrial automation control systems with RS-232/485 bus, 4-20mA/0-5V signal measurement, monitoring and control, as well as industrial field signal isolation and long-term transmission, etc.

The product includes power isolation, signal isolation, linearization, A/D conversion, and RS-485 serial communication. Each serial port can connect up to 255 WJ30 series modules, and the communication method supports MODBUS RTU communication protocol. The default address is 01, the baud rate is 9600, and the data format is 10 bits, 1 start bit, 8 data bits, 1 stop bit, and no checksum. It also supports ASCII communication protocol, and the baud rate can be set by code. It can be hung on the same RS-485 bus as other manufacturers' control modules, making it easy for computer programming.

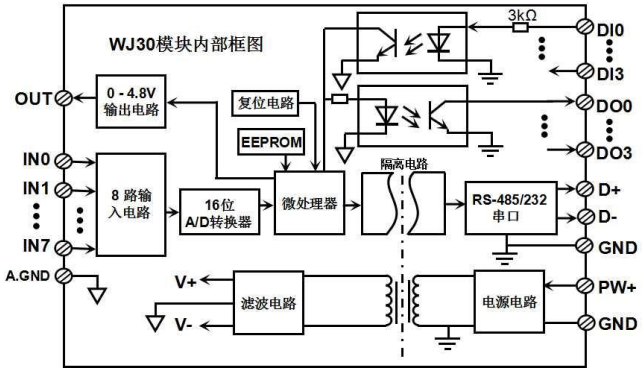


Figure 2 Internal Block Diagram of WJ30 Module

The WJ30 series products are intelligent monitoring and control systems based on microcontrollers. All user set calibration values, addresses, baud rates, data formats, checksum statuses, and other configuration information are stored in non-volatile memory EEPROM.

The WJ30 series products are designed and manufactured according to industrial standards, with isolation between signal inputs/outputs. They can withstand an isolation voltage of 3000VDC, have strong anti-interference ability, and high reliability. The working temperature range is -45 ℃ to+85 ℃.

Function Introduction:

The WJ30 remote I/O module can be used to measure eight analog signals, four switch signals, and has four switch outputs and one 0~4.8V voltage signal output.

1、 Analog signal input

16 bit acquisition accuracy, 8 analog signal inputs. All signal input ranges have been calibrated before the product leaves the factory. During use, users can also easily program and calibrate themselves. Please refer to the product selection for specific current or voltage input range.

2、 Switching signal input and output, one channel of 0~4.8V voltage signal output

4-channel switch signal input, can be connected to dry and wet contacts, please refer to the wiring diagram for details; 4-channel switch signal output with open collector output.

A 0~4.8V voltage signal output can be used for analog signal control.

3、 Communication Protocol

Communication interface: 1 standard RS-485 communication interface or 1 standard RS-232 communication interface, please specify when ordering and selecting.

Communication Protocol: Supports two protocols, the character protocol defined by the command set and the MODBUS RTU communication protocol. The module automatically recognizes communication protocols and can achieve network communication with various brands of PLCs, RTUs, or computer monitoring systems.

Data format: 10 digits. 1 start bit, 8 data bits, and 1 stop bit.

The communication address (0-255) and baud rate (2400, 4800, 9600, 19200, 38400, 57600, 115200bps) can be set; The communication network can reach a maximum distance of 1200 meters and is connected through twisted pair shielded cables.

High anti-interference design of communication interface, ± 15KV ESD protection, communication response time less than 100mS.

4、 anti-interference

Checksums can be set as needed. There is a transient suppression diode inside the module, which can effectively suppress various surge pulses, protect the module, and the internal digital filter can also effectively suppress power frequency interference from the power grid.

Product selection:

WJ30 - U(A)□ - □

Input voltage or current signa — value communication interface

U1:0-5V **A1**:0-1mA **485**: Output via RS-485 interface

U2: 0-10V **A2**: 0-10mA **232**: Output via RS-232 interface

A3：0-20mA

U4：0-2.5V **A4**：4-20mA

U8: User defined **A8:** User defined

Selection Example 1: Model: **WJ30-A4-485** indicates eight 4-20mA signal inputs and outputs via RS-485 interface
Selection Example 2: Model: **WJ30-U1-232** indicates eight 0-5V signal inputs and outputs via RS-232 interface
Selection example 3: Model: **WJ30-U2-485** represents eight channels of 0-10V signal input, and the output is RS-485 interface

WJ30 General Parameters:

(Typical @+25 ℃, Vs is 24VDC)

Analog input: current input/voltage input

Accuracy: 0.1%

Temperature drift: ± 50 ppm/℃ (± 100 ppm/℃, maximum)

Input resistance: 100 Ω (4-20mA/0-20mA/0-10mA current input)

2K Ω (0-1mA current input)

Greater than 200K (5V/10V voltage input)

Bandwidth: -3 dB 10 Hz

AD conversion rate: 10 SPS (factory default value, users can modify the conversion rate by issuing commands.)

The AD conversion rates of 2.5 SPS, 5 SPS, 10 SPS, 20 SPS, 40 SPS, 80 SPS, 160 SPS, 320 SPS, 500 SPS, and 1000 SPS can be set through the 40204 register. (Channel conversion rate=AD conversion rate/number of open channels)

Note: Please recalibrate the **module after modifying** the **conversion rate, otherwise** the **measured data may have deviations. You can also specify the conversion rate when placing an order, and we will recalibrate the product according to the conversion rate you require when it leaves the factory.**

Common mode rejection (CMR): 120 dB (1k Ω Source Imbalance @ 50/60 Hz)

Normal mode suppression (NMR): 60 dB (1k Ω Source Imbalance @ 50/60 Hz)

Input protection: overvoltage protection, overcurrent protection

Switch input: 4-channel (DI0~DI3).

Low level: Input<1V

High level: Input 4~30V

Input resistance: 3K Ω

Switching output: open collector output, voltage 0~30V, maximum load current 30mA, 4-channel (DO0~DO3).

Analog output: voltage 0~4.8V, output load greater than 2K ohms.

Communication: RS-485 or RS-232 standard character protocol and MODBUS RTU communication protocol

Baud rates (2400, 4800, 9600, 19200, 38400, 57600, 115200bps) can be selected by software

The address (0-255) can be selected by software

Communication response time: 100 ms maximum

Working power supply:+8~32VDC wide power supply range, with internal anti reverse and overvoltage protection circuits

Power consumption: less than 2W

Working temperature: -45~+80 ℃

Working humidity: 10~90% (no condensation)

Storage temperature: -45~+80 ℃

Storage humidity: 10~95% (no condensation)

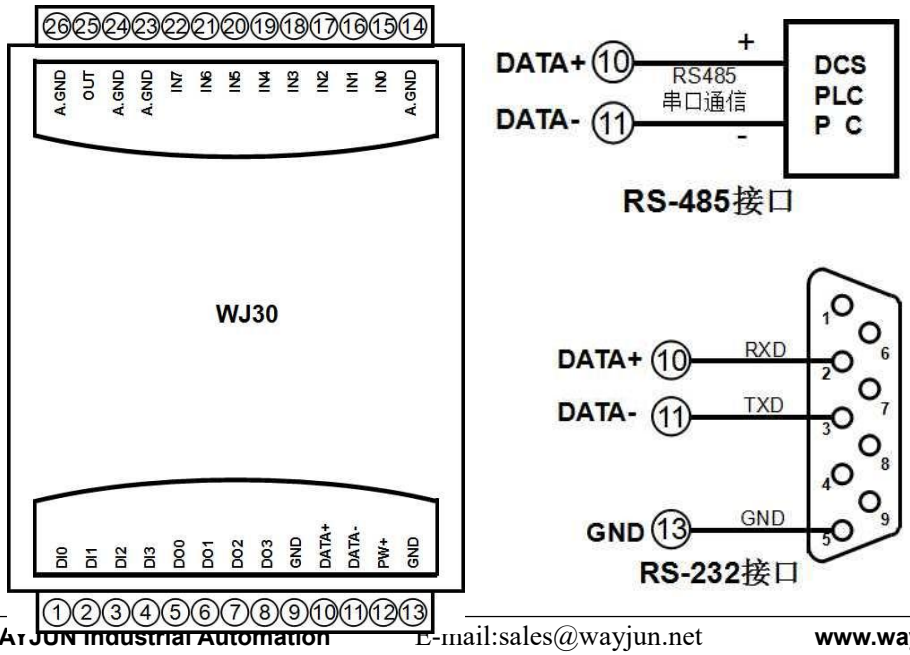
Isolation and voltage resistance: The analog signal and switch signal are isolated at 3000V, and the switch signal and power supply are grounded together.

Dimensions: 120mm x 70mm x 43mm

Pin definition and wiring:

Pin	name	Description	Pin	name	Description
one	DI0	Channel 0 switch signal input terminal	**fourteen**	A.GND	Analog signal public ground
two	DI1	Channel 1 switch signal input terminal	**fifteen**	IN0	Channel 0 analog signal input positive terminal
three	DI2	Channel 2 switch signal input terminal	**sixteen**	IN1	Channel 1 analog signal input positive terminal
four	DI3	Channel 3 switch signal input terminal	**seventeen**	IN2	Channel 2 analog signal input positive terminal
five	DO0	Channel 0 switch signal output terminal	**eighteen**	IN3	Channel 3 analog signal input positive terminal
six	DO1	Channel 1 switch signal output terminal	**nineteen**	IN4	Channel 4 analog signal input positive terminal
seven	DO2	Channel 2 switch signal output terminal	**twenty**	IN5	Channel 5 analog signal input positive terminal
eight	DO3	Channel 3 switch signal output terminal	**twenty-one**	IN6	Channel 6 analog signal input positive terminal
nine	GND	Negative terminal of power supply, common ground for switch signal	**twenty-two**	IN7	Channel 7 analog signal input positive terminal
ten	DATA+	Positive end of RS-485/232 signal	**twenty-three**	A.GND	Analog signal public ground
eleven	DATA-	Negative terminal of RS-485/232 signal	**twenty-four**	A.GND	Analog signal public ground
twelve	PW+	Positive end of power supply	**twenty-five**	OUT	Analog signal output terminal
thirteen	GND	Negative terminal of power supply, common ground for switch signal	**twenty-six**	A.GND	Analog signal public ground

Note: **The** pins **with the** same name are internally connected



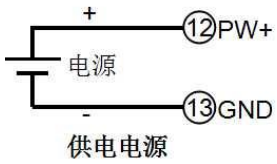
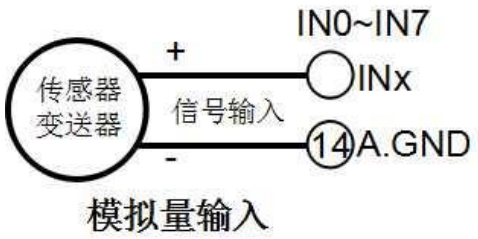
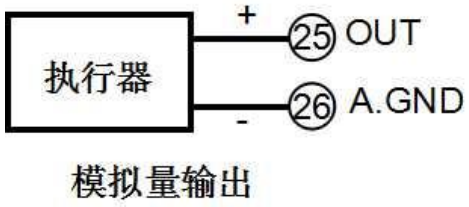
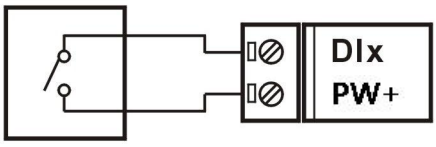
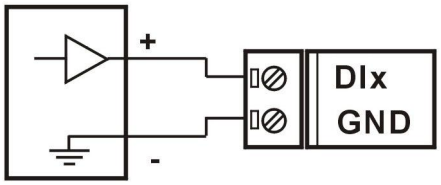


Figure 5 Wiring diagram of WJ80 module

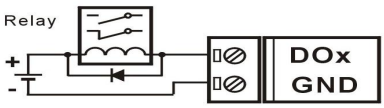
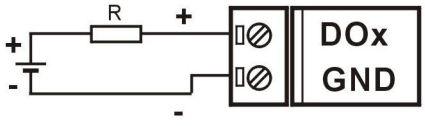
Analog signal input and output wiring diagram

Analog signal input	Analog signal output
	

Wiring diagram for switch signal input

Dry contact input	TTL/CMOS level, 24V level input
	
Open collector input	
	

Wiring diagram for switch signal output

Drive Relay	Level output
	
External power supply can be selected from 5~30VDC It can also be a power source that supplies power to the module	External power supply can be selected from 5~30VDC It can also be a power source that supplies power to the module

The working current of the relay is less than 30mA	The working current of the resistor is less than 30mA

WJ30 Character Protocol Command Set:

The factory initial settings of the module are as follows:

The address code is 01

Baud rate 9600 bps

Prohibition of checksum verification

If using an RS-485 network, a unique address code must be assigned, which is a hexadecimal number between 00 and FF. Since the address codes of new modules are the same, their addresses will conflict with other modules. Therefore, when building the system, you must reconfigure the addresses of each WJ30 module. You can modify the address of the WJ30 module by configuring commands after connecting the power line and RS485 communication line of the WJ30 module. The baud rate and checksum status also need to be adjusted according to the user's requirements. Before modifying the baud rate and checksum status, the module must first enter the default state, otherwise it cannot be modified.

Method to put the module into default state:

There is an Initiate switch located on the side of the WJ30 module. Turn the Initiat switch to the Initiat position, then turn on the power, and the module will enter the default state. In this state, the configuration of the module is as follows:

The address code is 00

Baud rate 9600 bps

Prohibition of checksum verification

At this point, the baud rate, checksum status, and other parameters of the WJ30 module can be modified through configuration commands. When unsure of the specific configuration of a module, the Initiat switch can also be turned to the Initiat position to put the module into default mode, and then the module can be reconfigured.

Note: Please turn the Initiat switch to the NORMAL position during normal use.

The character protocol command consists of a series of characters, such as the prefix, address ID, variables, optional checksum bytes, and a command terminator **(cr)** used to display the command. The host only commands one WJ30 module at a time, except for synchronous commands with wildcard address "* *".

Command format: **(Leading Code) (Addr) (Command) [data] [checksummary] (cr)**

The **leading code** is the first letter in the command. All commands require a command prefix, such as%, $, #, @ Wait. **1-character**

The address code of the **(Addr)** module, if not specified below, ranges from 00 to FF (hexadecimal). **2-character**

(Command) displays command code or variable values. **Variable length**

[data] Some data required for output commands. **Variable length**

The **Checksum** in parentheses is an optional parameter that is only required when checksum is enabled. **2-character**

(cr) is a control code symbol used for recognition, and (cr**)** serves as the carriage return terminator with a value of 0x0D. **1-character**

When checksum is enabled, [Checksum] is required. It occupies 2 characters. Both commands and responses must be accompanied by checksum features. The checksum is used to check all input commands to help you detect errors in host to module commands and module to host responses. The checksum character is placed after the command or response character and before the carriage return.

Calculation method: Two characters, hexadecimal number, which is the sum of the ASCII code values of all the characters previously sent, and then combined with the hexadecimal number 0xFF to obtain the result.

Application example: Prohibit checksum

User command **$002 (cr)**

Module response**! 00020600 (cr)**

Enable checksum

User command **$002B6 (cr)**

Module response**! 00020600 A9 (cr)**

'$' = 0x24 '0' = 0x30 '2' = 0x32

B6=(0x24+0x30+0x30+0x32) AND 0xFF

'**!**' = 0x21 '0' = 0x30 '2' = 0x32 '6' = 0x36

A9=(0x21+0x30+0x30+0x30+0x32+0x30+0x36+0x30+0x30) AND 0xFF

Response to Command:

The response information depends on various commands. The response also consists of several characters, including the initial code, variables, and ending identifier. There are two types of initial codes for response signals, '**!**' Or '**>**' represents a valid command while '**?**' It represents invalidity. By checking the response information, it is possible to monitor whether the command is valid

Note: In some cases, many commands use the same command format. To ensure that the address you are using is correct in a command, if you use the wrong address that represents another module, the command will take effect in that module, resulting in an error.

2. Commands must be entered in uppercase letters.

3. (cr) represents the Enter key on the keyboard, do not write it directly, it should be typed with the Enter key.

1. Read measurement data command

Explanation: Read back the measurement data of all channel analog inputs from the module in the current configured data format.

Command format: **# AA (cr)**

Parameter description: # delimiter. Hexadecimal is 23H

AA module address, with a value range of 00 to FF (hexadecimal). The factory address is 01, which is converted to hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Response format:**>(AI data), (DI data), (DO data), (DO Reset data), (AO data), (AO Reset data)**, **(cr)** commands are valid.

? The **AA (cr)** command is invalid or an illegal operation.

Parameter description:>delimiter. Hexadecimal is 3EH

(AI data) represents AI analog data. The data format can be engineering units, percentage of FSR, hexadecimal complement. For detailed instructions, please refer to Article 3 of the command set. Hexadecimal is the ASCII code for each character.

(DI data) represents the status of DI switch quantity. 4 numbers, arranged in the order of DI3~DI0, with a value of 0: input is low level;

Value 1: Input is high level

(DO data) represents the state of DO switch quantity. 4 numbers, arranged in the order of DO3~DO0, with a value of 0: output transistor disconnected;

Value 1: Output transistor conducting

(DO Reset data) represents the status of the DO switch after reset. 4 numbers, arranged in the order of DO3~DO0,

Value 0: Output transistor disconnected; Value 1: Output transistor conducting

(AO data) represents the output value of AO analog quantity. 4 numbers, ranging from 0000 to 4800, representing voltage 0 to 4.8V

(AO Reset data) represents the output value of AO analog quantity after reset. 4 numbers, ranging from 0000 to 4800, representing voltage 0 to 4.8V

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If there is a formatting or communication error, the module will not respond.

If a channel has been closed, the read data will be displayed as a space character or 0.

If the serial communication software you are using cannot input the enter key character, please switch to hexadecimal format for communication.

Application example: User command (character format) **# 01**

Module response (character format):

>+12.000+16.000+16.000+16.000+16.000+16.000+16.000+18.168,1110,1111,0000,2000,0000 (cr)

Explanation: The input on the module is (data format in engineering units):

Channel 0:+12.00mA Channel 1:+16.000mA Channel 2:+16.000mA Channel 3:+16.000mA

Channel 4:+16.000mA Channel 5:+16.000mA Channel 6:+16.000mA Channel 7:+18.168mA

DI3, DI2, DI1 are high level, DI0 is low level;

The current state of DO3, DO2, DO1, and DO0 is that the output transistor is conducting; After resetting DO3, DO2, DO1, and DO0, the transistor disconnects;

The voltage output by AO is 2V, and after AO reset, it outputs 0V.

After entering **# 01,** click on the send command or press the enter key. Please **note not** to **enter (cr),** as **it represents** the **enter key.**

The received data row will display:

>+12.000+16.000+16.000+16.000+16.000+16.000+16.000+18.168,1110,1111,0000,2000,0000

2. Read channel N analog input module data command

Explanation: Read back the analog input data of channel N from the module in the current configured data format.

Command format: **# AAN (cr)**

Parameter description: # delimiter.

AA module address, with a value range of 00 to FF (hexadecimal). The factory address is 01, which is converted to hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

Channel codes 0-7 are AI, 8 is DI, 9 is DO, and A is AO.

Response format: The**>(data) (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation or channel is closed.

Parameter description:>delimiter.

(data) represents the read back data of channel N. The data format can be engineering units, percentage of FSR, hexadecimal complement. For detailed instructions, please refer to Article 3 of the command set.

(cr) End symbol, enter key on the upper computer (0DH).

Other instructions: If there is a syntax or communication error, the module will not respond.

Application example: User command (character format) **# 010**

(Hexadecimal format) **23303130**

Module response (character format)**>+18.000 (cr)**

(Hexadecimal format): **3E2B31382E3030300D**

Explanation: The input for module channel 0 is (data format in engineering units):+18.000mA

3. Configure WJ30 module command

Description: Set the address, input range, baud rate, data format, and checksum status for a WJ30 module. The configuration information is stored in non-volatile memory EEPROM.

Command format:**% AANNTTCCFF (cr)**

Parameter description:**%** delimiter.

AA module address, with a value range of 00 to FF (hexadecimal). The factory address is 01, which is converted to hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

NN represents the new module hexadecimal address, with values ranging from 00 to FF. Convert to hexadecimal to ASCII code for each character. If address 18 is replaced with hexadecimal as 31H and 38H.

TT uses hexadecimal to represent type encoding. The WJ30 product must be set to 00.

CC uses hexadecimal to represent baud rate encoding.

Baud rate code	Baud rate
04	2400 bps
05	4800 bps
06	9600 bps
07	19200 bps
08	38400 bps
09	57600 bps

Table 2 Baud rate codes

FF uses 8-bit hexadecimal to represent data format and checksum. Note that from bits2 to bits5, it is not necessary to set it to zero.

Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0

Table 3 Data format, checksum code

Bit7: Reserved bit, must be set to zero

Bit6: checksum status, 0: prohibited; For 1: Allow

Bit5-bit2: No need, it must be set to zero.

Bit1-bit0: Data format bit. 00: Engineering Units

01: Percentage of Full Scale (% of FSR)

10: Two complement in hexadecimal

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Response format:**!** The **AA (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation, or the Initiat switch is not turned to the Initiat position before changing the baud rate or checksum.

Parameter description:**!** The delimiter indicates that the command is valid.

? The delimiter indicates that the command is invalid.

AA represents the input module address

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If you are configuring the module for the first time, AA=01H, NN equals the new address. If the module is reconfigured to change the address, input range, and data format, AA equals the currently configured address, and NN equals the current or new address. If you want to reconfigure the module to change the baud rate or checksum status, you must turn the Initiat switch to the Initiat position to enter the default state of the module. At this time, the module address is 00H, that is, AA=00H, NN is equal to the current or new address.

If the format is incorrect, the communication is incorrect, or the address does not exist, the module will not respond.

Application example: User command**% 0111000600 (cr)**

Module response**! 11(cr)**

Explanation:**%** delimiter.

01 means that the original address of the WJ30 module you want to configure is 01H.

11 indicates that the new module's hexadecimal address is 11H.

00 type code, WJ30 product must be set to 00.

06 represents a baud rate of 9600 baud.

00 indicates that the data format is in engineering units and checksum is prohibited.

4. Read configuration status command

Explanation: Read configuration for a specified WJ30 module.

Command format: **$AA2 (cr)**

Parameter description: **$**delimiter.

AA module address, with a value range of 00 to FF (hexadecimal).

2 represents the command to read the configuration status

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Response format:**!** The **AATTCCFF (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation.

Parameter description:**!** Boundary symbol.

AA represents the input module address.

TT stands for type code.

CC stands for baud rate encoding. See Table 2

FF is shown in Table 3

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If the format is incorrect, the communication is incorrect, or the address does not exist, the module will not respond.

Application example: User command **$302 (cr)**

Module response**! 300F0600(cr)**

Explanation:**!** Boundary symbol.

30 indicates that the WJ30 module address is 30H.

00 represents the input type code.

06 represents a baud rate of 9600 baud.

00 indicates that the data format is in engineering units and checksum is prohibited.

5. Set WJ30 module range command

Explanation: Set the data format, decimal point, range, and channel status for a WJ30 module. The configuration information is stored in non-volatile memory EEPROM.

Command format: **$AA0DNNNNNABCD**

Parameter description: $delimiter.

AA module address, with a value range of 00 to FF (hexadecimal). The factory address is 01, which is converted to hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

0 Set analog range command

The decimal point position of **D** data ranges from 1 to 5. Indicate the number before the decimal point, for example, 3 represents 000.00.

NNNNN represents the data range, with values ranging from 00000 to 99999 (decimal). For example, 10000 represents a range of 10000.

ABCD are four hexadecimal numbers,

The first and second numbers are both 0

The third number represents channels 7 to 4

The fourth number represents channels 3 to 0

Bit value 0: Prohibit channel

Bit value 1: Enable channel

0	0	0	0	0	0	0	0
A				B			
IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0

Response format:**!** The **AA (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation.

Application example: User command **$01022000000FF**

Module response**! 01(cr)**

Explanation: **$**delimiter.

01 Module Address

02 represents two numbers before the decimal point.

20000 represents a range of 20000.

00FF means all channels are open.

6. Read range command

Explanation: Read the range of the WJ30 module.

Command format: **$AA1**

Response format:**!** The **AAFDNNNNNABCD (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation.

Parameter description: $delimiter.

AA module address, with a value range of 00 to FF (hexadecimal). The factory address is 01, which is converted to hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

1. Read the analog range command

The decimal point position of **D** data ranges from 1 to 5. Indicate the number before the decimal point, for example, 3 represents 000.00.

NNNNN represents the data range, with values ranging from 00000 to 99999 (decimal). For example, 10000 represents a range of 10000.

ABCD are four hexadecimal numbers,

The first and second numbers are both 0

The third number represents channels 7 to 4

The fourth number represents channels 3 to 0

Bit value 0: Prohibit channel

Bit value 1: Enable channel

0	0	0	0	0	0	0	0
A				B			
IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If there is a formatting or communication error, the module will not respond.

Application example: User command **$011**

Module response**! 01015000000FF (cr)**

Explanation:**!** Boundary symbol.

01 Module Address

01 represents one number before the decimal point.

50000 represents a range of 50000.

00FF means all channels are open.

7. Read module name command

Explanation: Read the module name for a specified WJ30 module.

Command format: **$AAM (cr)**

Parameter description: **$**delimiter.

AA module address, with a value range of 00 to FF (hexadecimal).

M represents the command to read the module name

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Response format:**!** The **AA (Modulus** Name**) (cr)** command is valid.

? Invalid or illegal operation of **AA (cr)** command

Parameter description:**!** The delimiter indicates that the command is valid.

? The delimiter indicates that the command is invalid.

AA represents the input module address.

Module Name WJ30

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If the format is incorrect, the communication is incorrect, or the address does not exist, the module will not respond.

Application example: User command **$08M (cr)**

Module response**! 08WJ30 (cr)**

Explanation: The module at address 08H is WJ30.

8. Set module AD conversion rate

Description: Set the AD conversion rate of the module. Among them, channel conversion rate=AD conversion rate/number of opened channels. The slower the sampling rate, the more accurate the data collected. Users can adjust it according to their needs. The default conversion rate at the factory is 10SPS.

Note: Please recalibrate the **module after modifying** the **conversion rate, otherwise** the **measured data may have**

deviations. You can also specify the conversion rate when placing an order, and we will recalibrate the product according to the conversion rate you require when it leaves the factory.

Command format: **$AA3R (cr)**

Parameter description: **$**delimiter.

AA module address, with a value range of 00 to FF (hexadecimal).

3 represents the command to set conversion rate

R conversion rate code, which can range from 0 to 9

Code R	0	one	two	three	four	five	six	seven	eight	nine
Conversion rate	2.5 SPS	5 SPS	10 SPS	20 SPS	40 SPS	80 SPS	160 SPS	320 SPS	500 SPS	1000 SPS

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Response format:**!** The **AA (cr)** command is valid.

? Invalid or illegal operation of **AA (cr)** command

Parameter description:**!** The delimiter indicates that the command is valid.

? The delimiter indicates that the command is invalid.

AA represents the input module address.

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If the format is incorrect, the communication is incorrect, or the address does not exist, the module will not respond.

Application example 1: User command **$0036 (cr)**

Module response**! 00 (cr)**

Explanation: Set the AD conversion rate to 160SPS.

Application example 2: User command **$0035 (cr)**

Module response**! 00 (cr)**

Explanation: Set the AD conversion rate to 80SPS.

9. Read module AD conversion rate

Explanation: Read the AD conversion rate of the module. Among them, channel conversion rate=AD conversion rate/number of opened channels. The slower the sampling rate, the more accurate the data collected.

Command format: **$AA4 (cr)**

Parameter description: **$**delimiter.

AA module address, with a value range of 00 to FF (hexadecimal).

4 represents the read conversion rate command

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Response syntax:**!** The **AAR (cr)** command is valid.

? Invalid or illegal operation of **AA (cr)** command

Parameter description:**!** The delimiter indicates that the command is valid.

? The delimiter indicates that the command is invalid.

AA represents the input module address.

R conversion rate code, which can range from 0 to 9

Code R	0	one	two	three	four	five	six	seven	eight	nine
Conversion rate	2.5 SPS	5 SPS	10 SPS	20 SPS	40 SPS	80 SPS	160 SPS	320 SPS	500 SPS	1000 SPS

(cr) End symbol, enter key on the upper computer (0DH).

Other instructions: If there is a syntax error, communication error, or if the address does not exist, the module will not respond.

Application example 1: User command **$004 (cr)**

Module response**! 006 (cr)**

Explanation: The current AD conversion rate is 160SPS.

Application example 2: User command **$004 (cr)**

Module response**! 005 (cr)**

Explanation: The current AD conversion rate is 80SPS.

10. Set DO output command

Description: Set the status of the DO switch quantity.

Command format: **$AA5XXXX**

Response format:**!** The **AA (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation.

Parameter description: **$**delimiter.

AA module address, with a value range of 00 to FF (hexadecimal).

5 represents setting the DO command.

XXXX represents the DO switch status. 4 numbers, arranged in the order of DI3~DI0, with a value of 0: output transistor disconnected;

Value 1: Output transistor conducting

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If there is a formatting or communication error, the module will not respond.

Application example: User command (character format) **$0150011**

Module response (character format):**! 01 (cr)**

Explanation: Set the states of DO3 and DO2 to output transistor off, and the states of DO1 and DO0 to output transistor on.

11. Set DO reset output command

Explanation: Set the reset state of the DO switch quantity.

Command format: **$AA6XXXX**

Response format:**!** The **AA (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation.

Parameter description: **$**delimiter.

AA module address, with a value range of 00 to FF (hexadecimal).

6 represents the command to set the DO reset state.

XXXX represents the DO switch reset state. 4 numbers, arranged in the order of DI3~DI0, with a value of 0: the output transistor is reset and disconnected; Value 1: The output transistor conducts after resetting

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If there is a formatting or communication error, the module will not respond.

Application example: User command (character format) **$0160011**

Module response (character format):**! 01 (cr)**

Explanation: Set the reset state of DO3 and DO2 to turn off the output transistor, and the reset state of DO1 and DO0 to turn on the output transistor.

12. Set AO analog output command

Description: Set the AO analog output value.

Command format: **$AA7XXXX**

Response format:**!** The **AA (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation.

Parameter description: **$**delimiter.

AA module address, with a value range of 00 to FF (hexadecimal).

7 represents setting the AO analog output command.

XXXX represents the AO analog output value. 4 numbers, ranging from 0000 to 4800, representing voltage 0 to 4.8V

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If there is a formatting or communication error, the module will not respond.

Application example: User command (character format) **$0172000**

Module response (character format):**! 01 (cr)**

Explanation: Set the AO analog output value to 2V.

13. Set AO analog reset output command

Explanation: Set the AO analog reset output value.

Command format: **$AA8XXXX**

Response format:**!** The **AA (cr)** command is valid.

? The **AA (cr)** command is invalid or an illegal operation.

Parameter description: **$**delimiter.

AA module address, with a value range of 00 to FF (hexadecimal).

8 represents setting the AO analog reset output command.

XXXX represents the AO analog reset output value. 4 numbers, ranging from 0000 to 4800, representing voltage 0 to 4.8V

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If there is a formatting or communication error, the module will not respond.

Application example: User command (character format) **$0181000**

Module response (character format):**! 01 (cr)**

Explanation: Set the AO analog reset output value to 1V.

14. Reset all parameters set by the above character command to factory settings.

Explanation: The parameters set by the above character commands in the module will be reset to factory settings, and the module will automatically restart after completion.

Command format: **$AA900 (cr)** Set parameters to factory settings.

Parameter description: **AA** module address, value range 00~FF (hexadecimal). The factory address is 01, which is converted to hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Response format:**! AA (cr)** indicates successful setup, and the module will automatically restart.

Application example: User command (character format) **$01900**

Module response (character format)**! 01(cr)**

Explanation: Parameters are reset to factory settings.

Input range and data format:

The WJ30 module uses three data formats: 00: Engineering Units 01: Percentage of Full Scale (% of FSR)
10: Two complement in hexadecimal

Input Range	data format	Full range positive	zero	Negative full range	Display resolution
A1：0-1mA	Engineering unit	+1.0000	±0.0000	-1.0000	0.1uA
	Percentage of Full Scale	+100.00	±000.00	-100.00	0.01%
	Hexadecimal complement	7FFF	000000	eight thousand	1LSB
A2：0-10mA	Engineering unit	+10.000	±00.000	-10.000	1uA
	Percentage of Full Scale	+100.00	±000.00	-100.00	0.01%
	Hexadecimal complement	7FFF	000000	eight thousand	1LSB
A3：0-20mA **A4：4-20mA**	Engineering unit	+20.000	±00.000	-20.000	1uA
	Percentage of Full Scale	+100.00	±000.00	-100.00	0.01%
	Hexadecimal complement	7FFF	000000	eight thousand	1LSB
U1：0-5V	Engineering unit	+5.0000	±0.0000	-5.0000	100uV
	Percentage of Full Scale	+100.00	±000.00	-100.00	0.01%
	Hexadecimal complement	7FFF	000000	eight thousand	1LSB
U2：0-10V	Engineering unit	+10.000	±00.000	-10.000	1mV
	Percentage of Full Scale	+100.00	±000.00	-100.00	0.01%
	Hexadecimal complement	7FFF	000000	eight thousand	1LSB
A8: User defined	Engineering unit	+100.00	±000.00	-100.00	0.01%

U8: User defined	Percentage of Full Scale	+100.00	±000.00	-100.00	0.01%
	Hexadecimal complement	7FFF	000000	eight thousand	1LSB

Table 4 Input Range and Data Format

Application example:

1. The input range is A4: 4~20mA. When the input is 4 mA:

User command **# 010 (cr)**

Engineering unit module response**>+04.000 (cr)**

Full scale percentage module response**>+020.00 (cr)**

Hexadecimal complement module response**>1999 (cr)**

2. The input range is U1: 0~5V. When the input is 3V:

User command **# 010 (cr)**

Engineering unit module response**>+3.0000 (cr)**

Full scale percentage module response**>+060.00 (cr)**

Hexadecimal complement module response**>4CCC (cr)**

Modbus RTU communication protocol:

The factory initial settings of the module are as follows:

The Modbus address is 01

Baud rate 9600 bps

Data format: 10 bits, 1 start bit, 8 data bits, 1 stop bit, no checksum.

Method to put the module into default state:

There is an Initiate switch located on the side of the WJ30 module. Turn the Initiat switch to the Initiat position, then turn on the power, and the module will enter the default state. In this state, the module temporarily returns to its default state: address 01, baud rate 9600. When unsure of the specific configuration of a module, users can query the address and baud rate registers 40201-40202 to obtain the actual address and baud rate of the module, or modify the address and baud rate as needed.

Note: Please turn the Initiat switch to the NORMAL position during normal use.

Supports Modbus RTU communication protocol **function codes 01** (read single coil)**, 05** (write single coil), **03** (read hold register), and **06** (write single register), with command formats following the standard Modbus RTU communication protocol.

Modbus software testing example:

Register Address Description for WJ30

The registers supporting function codes 01 and 05 are as follows:

Address 0X (PLC)	Address (PC, DCS)	Data content	attribute	Data Explanation
00031	0030	Input switch quantity	read-only	The level status of switch input channels 0-3, where 1 represents high level and 0 represents low level.
00032	0031	Input switch quantity	read-only	
00033	0032	Input switch quantity	read-only	
00034	0033	Input switch quantity	read-only	
00041	0040	Output switch quantity	Read/ Write	Integer, the output state of channels 0-3, where 1 indicates transistor conduction and 0 indicates transistor disconnection.
00042	0041	Output switch quantity	Read/ Write	
00043	0042	Output switch quantity	Read/ Write	
00044	0043	Output switch	Read/	

		quantity	Write	
00045	0044	Switching power on output	Read/ Write	Integer, power on and reset output status of channels 0-3.
00046	0045	Switching power on output	Read/ Write	
00047	0046	Switching power on output	Read/ Write	
00048	0047	Switching power on output	Read/ Write	

The registers supporting function codes 03 and 06 are as follows:

Address 4X (PLC)	**Address (PC, DCS)**	**Data content**	**attribute**	**Data Explanation**
forty thousand and one	0000	Input analog quantity	read-only	Integer, channel 0-7 data, 0x0000-0x7FFF
forty thousand and two	0001	Input analog quantity	read-only	
forty thousand and three	0002	Input analog quantity	read-only	
forty thousand and four	0003	Input analog quantity	read-only	
forty thousand and five	0004	Input analog quantity	read-only	
forty thousand and six	0005	Input analog quantity	read-only	
forty thousand and seven	0006	Input analog quantity	read-only	
forty thousand and eight	0007	Input analog quantity	read-only	
forty thousand and twenty-one	0020	4-20mA dedicated	read-only	Integer, channel 0-7 data, 4mA=0x0000，20mA=0x7FFF
forty thousand and twenty-two	0021	4-20mA dedicated	read-only	
forty thousand and twenty-three	0022	4-20mA dedicated	read-only	
forty thousand and twenty-four	0023	4-20mA dedicated	read-only	
forty thousand and twenty-five	0024	4-20mA dedicated	read-only	
forty thousand and twenty-six	0025	4-20mA dedicated	read-only	
forty thousand and twenty-seven	0026	4-20mA dedicated	read-only	

forty thousand and twenty-eight	0027	4-20mA dedicated	read-only	
forty thousand and thirty-one	0030	Input switch quantity	read-only	Integer, switch input channel 0-3 level state, 1 represents high level, 0 represents low level.
forty thousand and thirty-two	0031	Input switch quantity	read-only	
forty thousand and thirty-three	0032	Input switch quantity	read-only	
forty thousand and thirty-four	0033	Input switch quantity	read-only	
Address 4X (PLC)	**Address (PC, DCS)**	**Data content**	**attribute**	**Data Explanation**
forty thousand and forty-one	0040	Output switch quantity	Read/ Write	Integer, the output state of channels 0-3, where 1 indicates transistor conduction and 0 indicates transistor disconnection.
forty thousand and forty-two	0041	Output switch quantity	Read/ Write	
forty thousand and forty-three	0042	Output switch quantity	Read/ Write	
forty thousand and forty-four	0043	Output switch quantity	Read/ Write	
forty thousand and forty-five	0044	Switching power on output	Read/ Write	Integer, power on and reset output status of channels 0-3.
forty thousand and forty-six	0045	Switching power on output	Read/ Write	
forty thousand and forty-seven	0046	Switching power on output	Read/ Write	
forty thousand and forty-eight	0047	Switching power on output	Read/ Write	
forty thousand and fifty-one	0050	Analog output	Read/ Write	Integer, 0~4800 represents 0~4.8VDC
forty thousand and fifty-two	0051	Analog power on output	Read/ Write	Integer, voltage value of power on and reset output
forty thousand and sixty-one	0060	Input analog quantity	read-only	Integer, channel 0~7 data, range defined by registers 40161~40168
forty thousand and sixty-two	0061	Input analog quantity	read-only	
forty thousand and sixty-three	0062	Input analog quantity	read-only	
forty thousand and sixty-four	0063	Input analog quantity	read-only	

forty thousand and sixty-five	0064	Input analog quantity	read-only	
forty thousand and sixty-six	0065	Input analog quantity	read-only	
forty thousand and sixty-seven	0066	Input analog quantity	read-only	
forty thousand and sixty-eight	0067	Input analog quantity	read-only	
40081 ~ 40088	0080 ~ 0087	Customize 4-20mA	read-only	Integer, channel 0~7 data, range defined by registers 40181~40188. When the data is less than 4mA, it is displayed as 0, and when the data is 20mA, it is displayed as the set value. Display in proportion in the middle.
forty thousand one hundred and one	0100	Channel 0 calibration	Read/ Write	The product has been calibrated before leaving the factory, and users can use it directly without calibration. If recalibration is necessary, please refer to the calibration section and follow the steps.
forty thousand one hundred and two	0101	Channel 1 calibration	Read/ Write	
forty thousand one hundred and three	0102	Channel 2 calibration	Read/ Write	
forty thousand one hundred and four	0103	Channel 3 calibration	Read/ Write	
forty thousand one hundred and five	0104	Channel 4 calibration	Read/ Write	
forty thousand one hundred and six	0105	Channel 5 calibration	Read/ Write	
forty thousand one hundred and seven	0106	Channel 6 calibration	Read/ Write	
forty thousand one hundred and eight	0107	Channel 7 calibration	Read/ Write	
Address 4X (PLC)	**Address (PC, DCS)**	**Data content**	**attribute**	**Data Explanation**
forty thousand one hundred and sixty	0159	Channel 0~7 range	write	Integer, 0x0001-0x7FFF. If the range of all channels is the same, this register can be set. After setting, the 40161~40168 registers will be modified to the same value as the current register at once.

forty thousand one hundred and sixty-one	0160	Channel 0 range	Read/ Write	Integer, 0x0001-0x7FFF, convert the data in registers 40061~40068 according to this range after modification
forty thousand one hundred and sixty-two	0161	Channel 1 range	Read/ Write	
forty thousand one hundred and sixty-three	0162	Channel 2 range	Read/ Write	
forty thousand one hundred and sixty-four	0163	Channel 3 range	Read/ Write	
forty thousand one hundred and sixty-five	0164	Channel 4 Range	Read/ Write	
forty thousand one hundred and sixty-six	0165	Channel 5 range	Read/ Write	
forty thousand one hundred and sixty-seven	0166	Channel 6 Range	Read/ Write	
forty thousand one hundred and sixty-eight	0167	Channel 7 range	Read/ Write	
forty thousand one hundred and eighty	0179	Customize 4-20mA Channel 0~7 range	write	Integer, 0x0001-0x7FFF. If the range of all channels is the same, this register can be set. After setting, the 40181~40187 registers will be modified to the same value as the current register at once.
40181 ~ 40188	0180 ~ 0187	Customize 4-20mA Channel 0~7 range	Read/ Write	Integer, 0x0001-0x7FFF, convert the data in registers 40081~40088 according to this range after modification
forty thousand and two hundred	0199	Parameter reset to factory settings	Read/ Write	If set to FF00, all register parameters of the module will be restored to factory settings, and the module will automatically restart after completion
forty thousand two hundred and one	0200	Module address	Read/ Write	Integer, effective after restart, range 0x0000-0x00FF
forty thousand two hundred and two	0201	Baud rate	Read/ Write	Integer, effective after restart, range 0x0004-0x000A 0x0004 = 2400 bps，0x0005 = 4800 bps 0x0006 = 9600 bps，0x0007 = 19200 bps 0x0008 = 38400 bps，0x0009 = 57600 bps

				0x000A = 115200bps
forty thousand two hundred and four	0203	Conversion rate	Read/ Write	Integer, range 0x0000-0x0009, The factory default is 2. Please recalibrate the module after modification. 0x0000 = 2.5 SPS，0x0001 = 5 SPS， 0x0002 = 10 SPS， 0x0003 = 20 SPS， 0x0004 = 40 SPS， 0x0005 = 80 SPS， 0x0006 = 160 SPS，0x0007 = 320 SPS， 0x0008 = 500 SPS，0x0009 = 1000 SPS
forty thousand two hundred and eleven	0210	Module Name	read-only	High bit: 0x00 Low bit: 0x30
forty thousand two hundred and twenty-one	0220	Channel status	Read/ Write	High bit: 0x00 Low bit: Channel status (0xFF)

Communication example 1: If the module address is 01, send **010300000001840A** in hexadecimal to retrieve the data from register 40001.

01	03	00	00	00	01	eighty-four	0A
Module address	Read and hold register	Register Address High Bit	Low bit register address	Register quantity high	Low register quantity	CRC check low bit	CRC check high bit

If the module replies: 010302199973BE, the read data is 0x1999. If the range is A4: 4-20mA or A3: 0-20mA, Convert 0x1999 * 20mA/0x7FFF=4mA. This indicates that the current being inputted is 4mA.

01	03	02	nineteen	ninety-nine	seventy-three	BE
Module address	Read and hold register	The number of bytes in the data	data-high	data-low	CRC check low bit	CRC check high bit

Communication example 2: When the range is A4: 4-20mA, data from the 4-20mA dedicated register can also be read, with register addresses 40021~40022. 4mA corresponds to 0x0000, and 20mA corresponds to 0x7FFF. For example, as follows

If the module address is 01, send in hexadecimal: **0103001400001C401** to retrieve the data from register 40021.

01	03	00	fourteen	00	01	C4	01
Module address	Read and hold register	Register Address High Bit	Low bit register address	Register quantity high	Low register quantity	CRC check low bit	CRC check high bit

If the module replies: **010302199973BE**, the read data is 0x1999 with a range of 4-20mA. Converted to 0x1999 * 16mA/0x7FFF=3.2mA, plus 4mA at the zero point, it indicates that the current input is 7.2mA.

01	03	02	nineteen	ninety-nine	seventy-three	BE
Module	Read and hold	The number of	data-high	data-low	CRC check low bit	CRC check high bit

address	register	bytes in the data				

Calibration module:

The product has been calibrated before leaving the factory, and users can use it directly without calibration.

During use, you can also use the product's calibration function to recalibrate the module. When in school, the module needs to input appropriate signals, and different input ranges require different input signals.

To improve calibration accuracy, it is recommended to use the following equipment for calibration:

1. A DC voltage/current signal source with stable output and low noise
2. A voltage/current measuring instrument with a precision of 5 and a half bits or higher is used to monitor the accuracy of input signals

Calibration process

1. Connect the corresponding input signal to the channel that needs to be calibrated according to the input range of the module.

   The zero point of the WJ30 module is calibrated when the input is 0, and the full degree is calibrated when the input is 100% full degree. For example, when inputting 4-20mA, input 0mA for zero calibration and 20mA for full calibration. When inputting 0-5V, input 0V for zero calibration and 5V for full calibration.

2. Input zero point signals to the channels that need to be calibrated for the WJ30 module, usually 0mA or 0V.

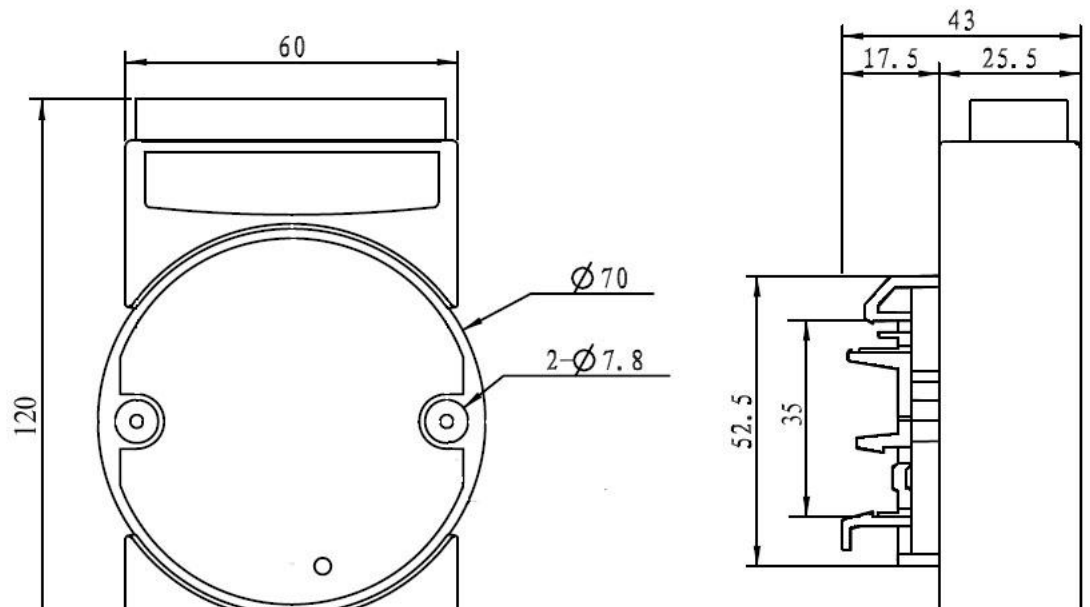
After the signal stabilizes, the Modbus protocol modifies register 40101 (channel 0) to 0xFF00, and the module will perform zero calibration. (To calibrate other channels, please modify the corresponding channel register data to 0xFF00).

4. Input 100% current or voltage signal at full capacity to the channels that need to be calibrated for the WJ30 module.

After the signal stabilizes, the Modbus protocol modifies register 40101 (channel 0) to 0xFFFF, and the module will perform full calibration. (To calibrate other channels, please modify the corresponding channel register data to 0xFFFF).

6. Calibration completed

Dimensions: (Unit: mm)



Can be installed on standard DIN35 rails

matters needing attention:

1. Before use, carefully check and confirm the quantity, model, and specifications of the product according to the packing list and product label.
2. When using, it is necessary to follow the wiring reference diagram corresponding to the selected product model, correctly connect the signal input, output, and power lines, check for errors, and then connect the power and signal.
3. When measuring signals directly with probes, please tighten the terminals.
4. The usage environment should be free of conductive dust and corrosive gases that can damage insulation and metals.
5. When installing centrally, the installation spacing should be ≥ 10mm.
6. The product has been calibrated before leaving the factory, please do not adjust it arbitrarily. If on-site calibration is necessary, please contact our company.
7. The product is an integrated structure that cannot be disassembled, and collision and falling should be avoided. This product comes with a 2-year warranty, during which our company provides free maintenance or replacement. Any label on the product that is intentionally damaged, altered, or torn off will not be returned or exchanged.
8. There is no lightning protection circuit installed inside the product. When the input and output feeders of the product are exposed to harsh outdoor weather conditions, please take lightning protection measures.
9. Product specifications may be updated without prior notice.

Communication testing software:

After receiving the product, users can contact sales personnel and provide their QQ number or email address to receive the WAYJUN Test software. This testing software is used for communication testing between computers and WJ30 products.

guarantee:

Within two years from the date of sale, if the user complies with the storage, transportation, and usage requirements and the product quality is lower than the technical specifications, it can be returned to the factory for free repair. If damage is caused due to violation of operating regulations and requirements, device fees and maintenance fees shall be paid.

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