

8-channel Pt100/Pt1000 to RS-485/232, thermal resistance temperature Modbus data acquisition module WJ225

Product features:

- Pt100/Pt1000 thermal resistance isolation conversion RS-485 output
- Standard 3-wire measurement method with automatic long line compensation
- Using a 12 bit AD converter, the measurement accuracy is better than 0.1%
- The accuracy of the calibration module can be programmed through the RS-485 interface
- Isolation withstand voltage between signal input/output 1000VDC
- 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
- Industrial flame retardant shell, RS485 port surge protection
- The AD conversion rate can be programmed and set

Typical applications:

- Pt100 temperature signal measurement
- RS-485 remote I/O, data acquisition
- Intelligent building control, security engineering and other application systems
- RS485 bus industrial automation control system
- Industrial site signal isolation and long-distance transmission
- Equipment operation monitoring
- Measurement of sensor signals
- Acquisition and recording of industrial field data
- Development of medical and industrial control products

Product Overview:

The WJ225 product implements multi-channel signal acquisition between sensors and hosts to detect temperature signals. The WJ225 series products can be applied in RS-485 bus industrial automation control systems, temperature signal measurement, monitoring, and control, 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 WJ225 series modules, and the communication method adopts ASCII code communication protocol or MODBUS RTU communication protocol. The address and baud rate can be set by code, and can be hung on the same RS-485 bus with control modules from other manufacturers for easy computer programming.

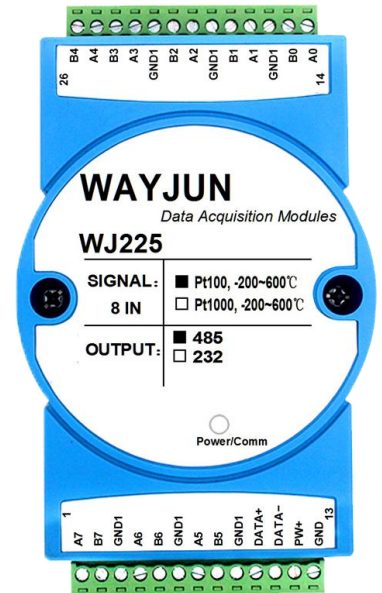


diagram 1 WJ225 module appearance diagram

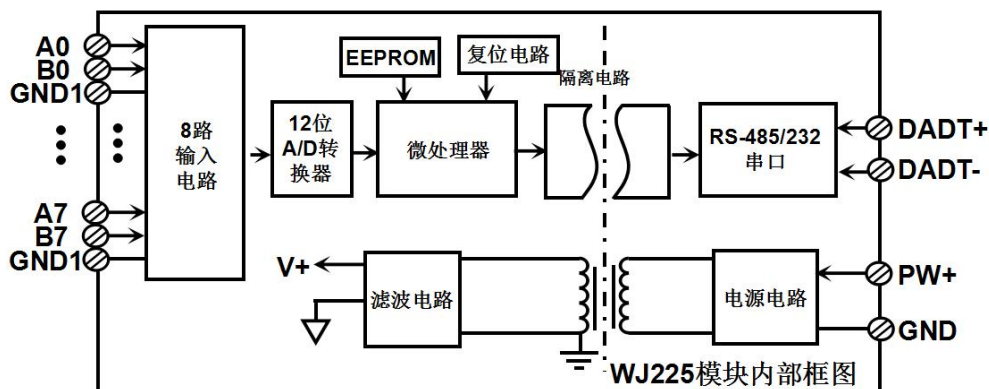


Figure 2 Internal Block Diagram of WJ225 Module

The WJ225 series products are intelligent monitoring and control systems based on microcontrollers. All user set calibration values, addresses, baud rates, data formats, parity checks, and other configuration information are stored in non-volatile memory EEPROM.

The WJ225 series products are designed and manufactured according to industrial standards, with isolation between signal inputs/outputs, capable of withstanding 1000VDC isolation voltage, strong anti-interference ability, and high reliability. The working temperature range is -45 °C to +85 °C.

Function Introduction:

The WJ225 signal isolation acquisition module can be used to measure 8 temperature signals.

1、 Temperature signal input

12 bit acquisition accuracy, 8 temperature signal inputs. Measure temperature range -200~600 degrees. The product has been fully calibrated before leaving the factory. During use, users can also easily program and calibrate themselves.

2、 Communication Protocol

Communication interface: 1 standard RS-485 or RS-232 communication interface.

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;

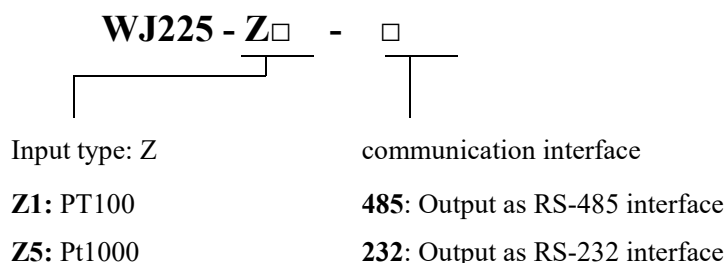
The communication network can reach a maximum distance of 1200 meters and is connected through twisted pair shielded cables.

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

3、 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:



Selection example 1: Model: **WJ225- Z1-485** indicates input: Pt100, temperature range: -200~600 °C, output is RS-485 interface

Selection Example 2: Model: **WJ225- Z5-485** Input: Pt1000, Temperature Range: -200~600 °C, Output: RS-485

Interface

Selection Example 3: Model: **WJ225- Z1-232** Input: Pt100, Temperature Range: -200~600 °C, Output: RS-232 Interface

WJ225 General Parameters:

(Typical @+25 °C, Vs is 24VDC)

Input type: Pt100 input/Pt1000 input

Measurement temperature range: -200~600 °C

Accuracy: 0.1%

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

Bandwidth: -3 dB 10 Hz

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

You can set the AD conversion rate to 2.5 SPS, 5 SPS, 10 SPS, and 20 SPS by sending commands. (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

Communication: Protocol RS-485/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 1W

Working temperature: -45~+80 °C

Working humidity: 10~90% (no condensation)

Storage temperature: -45~+80 °C

Storage humidity: 10~95% (no condensation)

Isolation withstand voltage: 1KVDC between input/output, 1 minute, leakage current 1mA

The RS-485 output and power supply are grounded together.

Surge resistant voltage: 1KVAC, 1.2/50us (peak value)

Dimensions: 120mm x 70mm x 43mm

Pin definition:

Pin	name	Description	Pin	name	Description
one	A7	Terminal A of thermistor input 7	fourteen	A0	The A terminal of the thermistor input 0
two	B7	B1 terminal of thermistor input 7	fifteen	B0	B1 terminal of thermistor input 0
three	GND1	Simulate signal ground, B2 terminal of thermistor input	sixteen	GND1	Simulate signal ground, B2 terminal of thermistor input
four	A6	Terminal A of thermistor input 6	seventeen	A1	Terminal A of thermistor input 1
five	B6	B1 terminal of thermistor input 6	eighteen	B1	B1 terminal of thermistor input 1
six	GND1	Simulate signal ground, B2 terminal of	nineteen	GND1	Simulate signal ground, B2 terminal

		thermistor input	en		of thermistor input
seven	A5	Terminal A of thermistor input 5	twenty	A2	Terminal A of thermistor input 2
eight	B5	B1 terminal of thermistor input 5	twenty	B2	B1 terminal of thermistor input 2
			-one		
nine	GND1	Simulate signal ground, B2 terminal of thermistor input	twenty	GND1	Simulate signal ground, B2 terminal of thermistor input
			-two		
ten	DATA+	RS-485 signal positive terminal	twenty	A3	Terminal A of thermistor input 3
			-three		
eleven	DATA-	RS-485 signal negative terminal	twenty	B3	B1 terminal of thermistor input 3
			-four		
twelve	PW+	Positive end of power supply	twenty	A4	Terminal A of thermistor input 4
			-five		
thirteen	GND	Negative end of power supply	twenty	B4	B1 terminal of thermistor input 4
n			-six		

Note: All GND1 are internally conductive and isolated from GND.

Table 1 Pin Definition

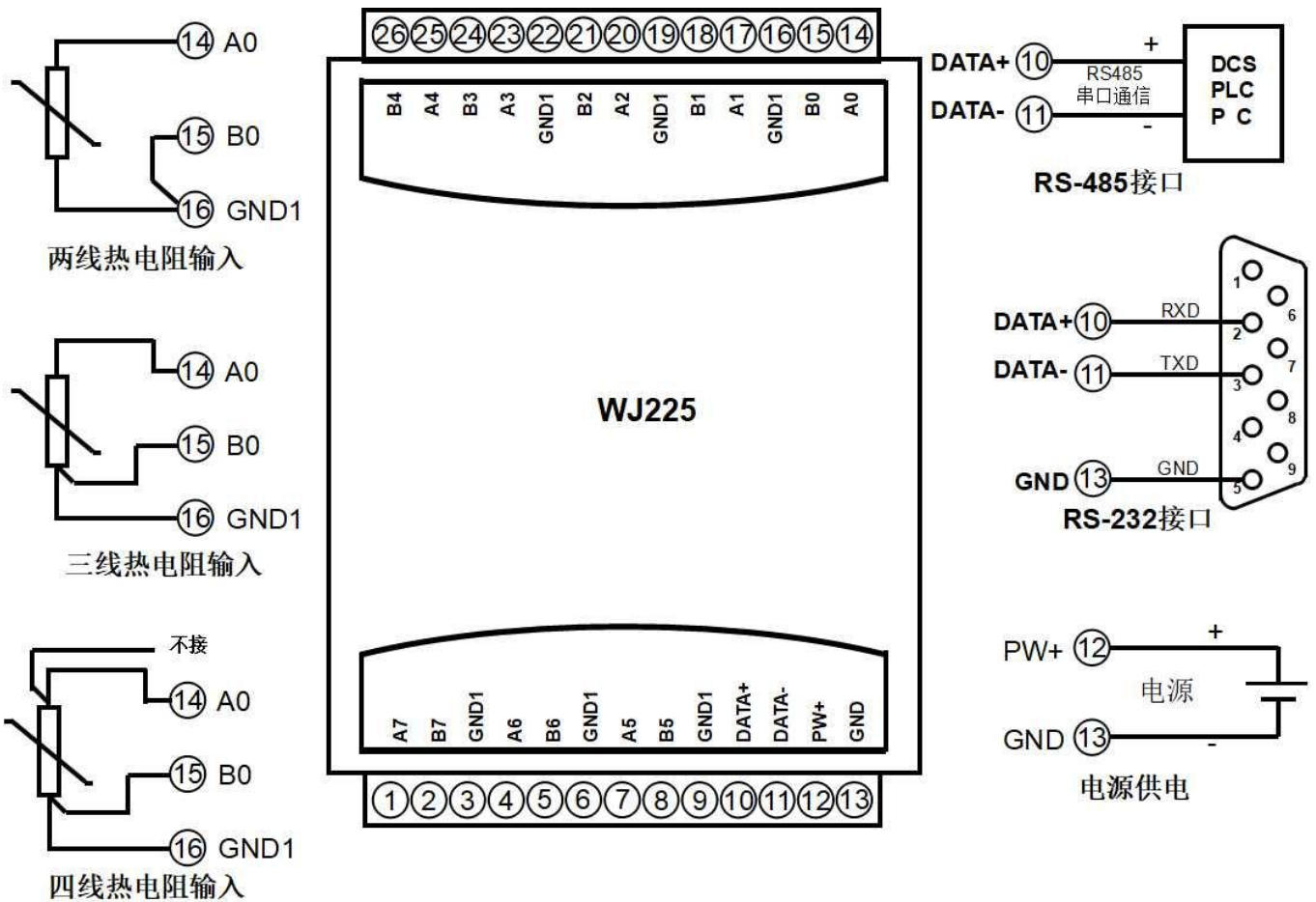


Figure 3 Wiring diagram of WJ225 module

WJ225 Character Protocol Command Set:

The factory initial settings of the module are as follows:

The address code is 01

Baud rate 9600 bps

No verification

If using an RS-485 network, a unique address code must be assigned, with a hexadecimal value between 00 and FF. Since the address codes of new modules are the same, their addresses will conflict with those of other modules. Therefore, when building the system, you must reconfigure the addresses of each WJ225 module. After connecting the power line and RS485 communication line of the WJ225 module, the address of the WJ225 module can be modified through configuration commands. The baud rate and parity check also need to be adjusted according to the user's requirements.

Method to put the module into default state:

There is an Initiat switch located on the side of the WJ225 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

No verification

When unsure of the specific configuration of a module, you can also turn the Initiat switch to the Initiat position, then turn on the power to put the module into default mode, and then reconfigure the module.

The character protocol command consists of a series of characters, such as the prefix, address ID, and variables.

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.

1. Read the measured temperature value command

Explanation: Read back the temperature data of the thermistor from the module, which is the actual temperature value.

If the data is -888.88, it indicates a short circuit in the thermal resistance,

If the data is 888.88, it indicates a thermoelectric blocking line.

Command format: **# 01**

Parameter description: # delimiter. Hexadecimal is 23H

01 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

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

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

Parameter description: >delimiter. Hexadecimal is 3EH

(data) represents the retrieved data. The data format is temperature values.

(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 (character format) **# 01**

Module response (character format) **>+020.00+018.00+018.00+018.00+018.00+018.00+018.00+018.00-888.88+888.88 (cr)**

Explanation: Temperature values collected on module 01H at address:

Channel 0:+020.00 degrees Channel 1:+018.00 degrees Channel 2:+018.00 degrees Channel 3:+018.00 degrees

Channel 4:+018.00 degrees Channel 5:+018.00 degrees Channel 6: Thermal resistance short circuit Channel 7: Thermal blocking wire

2. Command to read the temperature value measured by channel N

Explanation: Read back the temperature data of channel N thermistor from the module, which is the actual temperature value. If the data is -888.88, it indicates a short circuit in the thermal resistance,

If the data is 888.88, it indicates a thermoelectric blocking line.

Command format: # 010

Parameter description: # delimiter.

01 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 code 0-7, hexadecimal 30H~37H

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 is temperature values.

(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: User command (character format) # 010

Module response (character format)>+018.00 (cr)

Explanation: The temperature value of channel 0 on address 01H module is+018.00 degrees

3. Configure WJ225 module command

Explanation: Set the address, baud rate, and parity for a WJ225 module. The configuration information is stored in non-volatile memory EEPROM.

Command format:% AANNTCCFF

Parameter description:% delimiter.

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

NN represents the new module hexadecimal address, with values ranging from 00 to FF.

TT uses hexadecimal to represent type encoding. The WJ225 product must be set to 00.

CC uses hexadecimal to represent baud rate encoding.

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

Table 2 Baud rate codes

FF uses 8 bits in hexadecimal to represent parity check.

00: No verification
10: Odd verification
20: Even verification

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

? The **AA (cr)** command is invalid or an illegal operation, or a configuration jumper is not installed 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=00, NN equals the 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% **0011000600**

Module response! **11(cr)**

Explanation:% delimiter.

00 means that the original address of the WJ225 module you want to configure is 00H.

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

00 type code, WJ225 product must be set to 00.

06 represents a baud rate of 9600 baud.

00 indicates no verification.

4. Read configuration status command

Explanation: Read configuration for a specified WJ225 module.

Command format: **\$AA2**

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 **AATTCFF (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 represents verification

(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 **\$012**

Module response! **01000600(cr)**

Explanation: Boundary symbol.

01 indicates that the WJ225 module address is 01H.

00 represents the input type code.

06 represents a baud rate of 9600 baud.

00 indicates no verification.

5. 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**

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 3

Code R	0	one	two	three						
Conversion rate	2.5 SPS	5 SPS	10 SPS	20 SPS						

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 **\$0032**

Module response: ! **00 (cr)**

Explanation: Set the AD conversion rate to 10SPS.

Application example 2: User command **\$0033**

Module response: ! **00 (cr)**

Explanation: Set the AD conversion rate to 20SPS.

6. 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**

Parameter description: \$delimiter.

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

4 represents the read conversion rate command

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 3

Code R	0	one	two	three						
Conversion rate	2.5 SPS	5 SPS	10 SPS	20 SPS						

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

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**

Module response! **002 (cr)**

Explanation: The current AD conversion rate is 10SPS.

Application Example 2: User Command **\$004**

Module response! **003 (cr)**

Explanation: The current AD conversion rate is 20SPS.

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

Explanation: The parameters set by the module using the above character commands are restored to factory settings.

Command format: **\$AA900** 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.

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.

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 digits. 1 start bit, 8 data bits, and 1 stop bit. No verification.

Method to put the module into default state:

There is an Initiat switch located on the side of the WJ225 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 03** (read hold register), **06** (write single register), and **16** (write multiple registers), with command formats following the standard Modbus RTU communication protocol.

Register supporting function codes 03, 06, and 16:

Address 4X (PLC)	Address (PC, DCS)	Data content	attribute	Data Explanation
forty thousand and eleven	ten	Channel 0 integer temperature value	read-only	The measured temperature data, signed integer, divided by 10 equals the actual temperature. If the data is -8888, it indicates a short circuit in the thermal resistance, If the data is 8888, it indicates a thermoelectric blocking line.
forty thousand and twelve	eleven	Channel 1 integer temperature value	read-only	
forty thousand and thirteen	twelve	Channel 2 integer temperature value	read-only	
forty thousand and fourteen	thirteen	Channel 3 integer temperature value	read-only	

forty thousand and fifteen	fourteen	Channel 4 integer temperature value	read-only	
forty thousand and sixteen	fifteen	Channel 5 integer temperature value	read-only	
forty thousand and seventeen	sixteen	Channel 6 integer temperature value	read-only	
forty thousand and eighteen	seventeen	Channel 7 integer temperature value	read-only	
40031~40032	30~31	Channel 0 floating point temperature value	read-only	<p>Measured temperature data, 32-bit floating-point number, For example, channel 0, the low 16 bits are in register 40031, The high 16 bits are in register 40032, and the same applies to other channels. If the data is -888.88, it indicates a short circuit in the thermal resistance, If the data is 888.88, it indicates a thermoelectric blocking line.</p>
40033~40034	32~33	Floating point temperature value of channel 1	read-only	
40035~40036	34~35	Floating point temperature value of channel 2	read-only	
40037~40038	36~37	Floating point temperature value of channel 3	read-only	
40039~40040	38~39	Channel 4 Floating Point Temperature Value	read-only	
40041~40042	40~41	Channel 5 Floating Point Temperature Value	read-only	
40043~40044	42~43	Channel 6 Floating Point Temperature Value	read-only	
40045~40046	44~45	Floating point temperature value of channel 7	read-only	
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 two	two hundred and two	Parity check	Read/Write	Integer, takes effect after restart 0: No verification

three				1: Odd verification 2: Even verification
forty thousand two hundred and four	0203	Conversion rate	Read/Write	Integer, range 0x0000-0x0003, The factory default is 2. Please recalibrate the module after modification. 0x0000 = 2.5 SPS, 0x0001 = 5 SPS, 0x0002 = 10 SPS, 0x0003 = 20 SPS

Communication example: If the module address is 01, send in hexadecimal: **0103000A0001A408** to retrieve the data from register 40011.

01	03	00	0A	00	01	A4	08
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: **0103020BB8BF06**, the read data is 0x0BB8, converted to decimal 3000, and then divided by 10, it indicates that the current input temperature is 300.0 °C.

01	03	02	nineteen	ninety-nine	BF	06
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

Calibration module:

The product has been calibrated before leaving the factory, and users can use it directly without calibration. Non professionals are not allowed to calibrate it at will.

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.

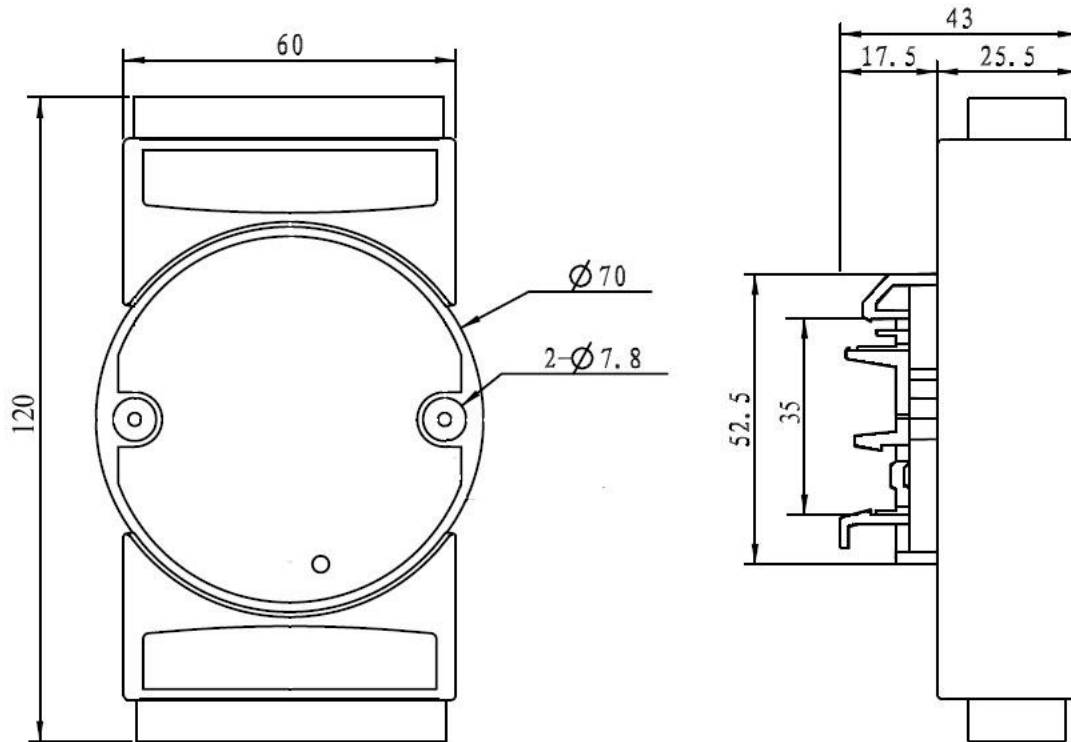
To improve calibration accuracy, it is recommended to use the following equipment for calibration:

1. A high-precision resistor box that can be precise to 0.01 ohms

Calibration process

- (1) 1. Connect the corresponding input signal to the channel that needs to be calibrated according to the input range of the module.
- (2) 2. Input 0 ohms to the WJ225 module.
- (3) 3. After the signal stabilizes, send the offset calibration \$01C0N command to the WJ25 module. N is the current calibrated channel number.
- (4) 4. Input the resistance signal corresponding to 600 degrees to the WJ225 module.
- (5) For example, Pt100, with a full range of 600 degrees, adjust the resistance of the resistance box to 313.708 ohms
- (6) For example, Pt1000, with a full range of 600 degrees, adjust the resistance of the resistance box to 3137.08 ohms
- (7) 5. After the signal stabilizes, send the gain calibration \$01C1N command to the WJ225 module. N is the current calibrated channel number.
6. Calibration completed

Dimensions: (Unit: mm)



Can be installed on standard DIN35 rails

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.

Copyright:

Copyright © 2022 Shenzhen Weijunrui Technology Co., Ltd.

Without permission, no part of this manual may be copied, distributed, translated, or transmitted. This manual is subject to modification and update without prior notice.

Trademark:

The other trademarks and copyrights mentioned in this manual belong to their respective owners.

Version number: V1.0

Date: September 2022