NTC to RS-485, Thermistor Temperature Modbus Data Acquisition Module WJ126

Product features:

●NTC10K/NTC20K resistance isolation conversion RS-485 output
●Internal MCU performs linear processing on the input resistance value
●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

diagram 1 WJ126 module appearance diagram

Typical applications:

●NTC thermistor 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 WJ126 product implements multi-channel signal acquisition between sensors and hosts to detect temperature signals. The WJ126 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 WJ126 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 programr

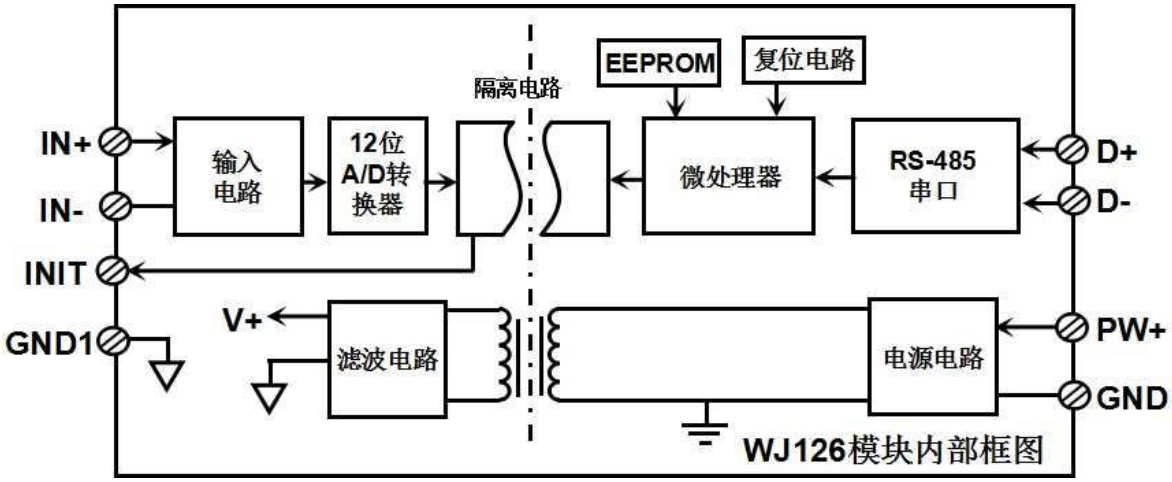


Figure 2 Internal Block Diagram of WJ126 Module

The WJ126 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 WJ126 series products are designed and manufactured according to industrial standards, with isolation between signal inputs/outputs. They can withstand 1000VDC isolation voltage, have strong anti-interference ability, and high reliability. The working temperature range is -45 ℃ to+85 ℃.

Function Introduction:

The WJ126 signal isolation acquisition module can be used to measure one temperature signal.

1、 Temperature signal input

12 bit acquisition accuracy, 1 temperature signal input. All signal input ranges have been calibrated before the product leaves the factory. During use, users can also easily program and calibrate themselves.

2、 Communication Protocol

Communication interface: 1 standard RS-485 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:

WJ126 - Z□ - T□ - 485

Input type: NTC	Temperature range: T	communication interface
NTC1K	**T1:** -20-100℃	**485**: Output as RS-485 interface
NTC5K	**T2:** 0-100℃	
NTC10K	**T3:** 0-150℃	
NTC20K	**T4:** 0-200℃	
NTC50K	**T5:** 0-400℃	
NTC100K	**Tu:** User defined	
Other NTC		

Selection Example 1: Model: **WJ126-NTC10K-T1-485** indicates Input: NTC10K, Temperature Range: -20~100 ℃,

Output: RS-485

Selection example 2: Model: **WJ126-NTC20K-T4-485** indicates input: NTC20K, temperature range: 0~200 ℃, output is RS-485

Selection example 3: Model: **WJ126-NTC3K-Tu-485** indicates input: NTC3K, temperature range: 0~50 ℃, output is RS-485

WJ126 General Parameters:

(Typical @+25 ℃, Vs is 24VDC)

Input type: NTC resistor input

Accuracy: 0.1%

Temperature drift: ± 50 ppm/℃ (± 100 ppm/℃, 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: RS-485 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 ℃

Working humidity: 10~90% (no condensation)

Storage temperature: -45~+80 ℃

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: 106 mm x 59mm x 24mm

Pin definition:

Pin	name	Description	Pin	name	Description
one	PW+	Positive end of power supply	**five**	INIT	Initial state setting
two	GND	Negative end of power supply	**six**	GND1	Digital signal ground
three	DATA+	RS-485 signal positive terminal	**seven**	IN-	Negative input terminal of thermistor
four	DATA-	RS-485 signal negative terminal	**eight**	IN+	Positive input terminal of thermistor

Table 1 Pin Definition

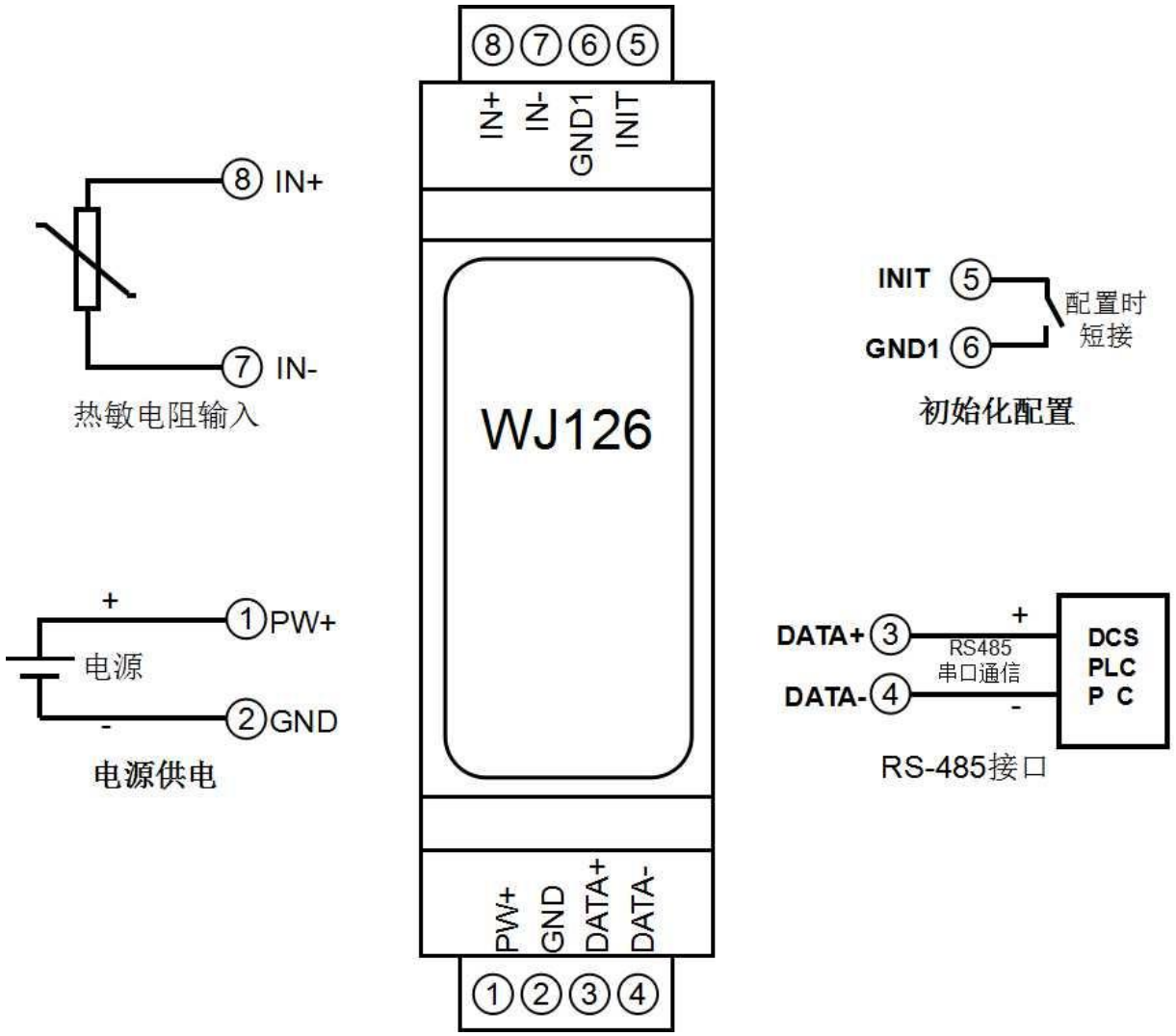


Figure 3 Wiring diagram of WJ126 module

WJ126 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 WJ126 module. After connecting the power line and RS485 communication line of the WJ126 module, the address of the WJ126 module can be modified through configuration commands. 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:

The WJ126 module has a special pin labeled as Initiat. Short circuit the Initiat pin to the GND1 pin, and then turn on the power. At this point, the module enters 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 WJ126 module can be modified through configuration commands. When the specific configuration of a module is uncertain, the Initiat pin can also be short circuited to the GND1 pin, and then the power can be turned on to put the module into default state, and then the module can be reconfigured.

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

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

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**

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**

Module response**! 00020600 (cr)**

Enable checksum

User command **$002B6**

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.

1. Read analog input module data 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 that the thermistor is disconnected,
If the data is 888.88, it indicates a short circuit in the thermistor.

Command format: **# 01**

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.

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 retrieved data. 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) **# 01**

(Hexadecimal format) **233031**

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

(Hexadecimal format): **3E2B3031382E30300D**

Explanation: The input on address 01H module is:+018.00 ℃

2. Configure WJ126 module command

Explanation: Set the address, input range, baud rate, and checksum status for a WJ126 module. The configuration information is stored in non-volatile memory EEPROM.

Command format:**% AANNTTCCFF**

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 WJ126 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 the checksum. Note that from bits0 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 Checksum Code

Bit7: Reserved bit, must be set to zero

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

Bit5-bit0: No need, it must be set to zero.

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 and input range. AA equals the currently configured address, 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**

Module response**! 11(cr)**

Explanation:**%** delimiter.

01 means that the original address of the WJ126 module you want to configure is 01H.

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

00 type code, WJ126 product must be set to 00.

06 represents a baud rate of 9600 baud.

00 indicates that checksum is prohibited.

3. Read configuration status command

Explanation: Read configuration for a designated WJ126 module.

Command format: **$012**

Parameter description: **$**delimiter.

01 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 **$012**

Module response**! 0100600(cr)**

Explanation:**!** Boundary symbol.

01 indicates that the WJ126 module address is 01H.

00 represents the input type code.

06 represents a baud rate of 9600 baud.

00 indicates that checksum is prohibited.

4. 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.

5. 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 (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**

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.

6. 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

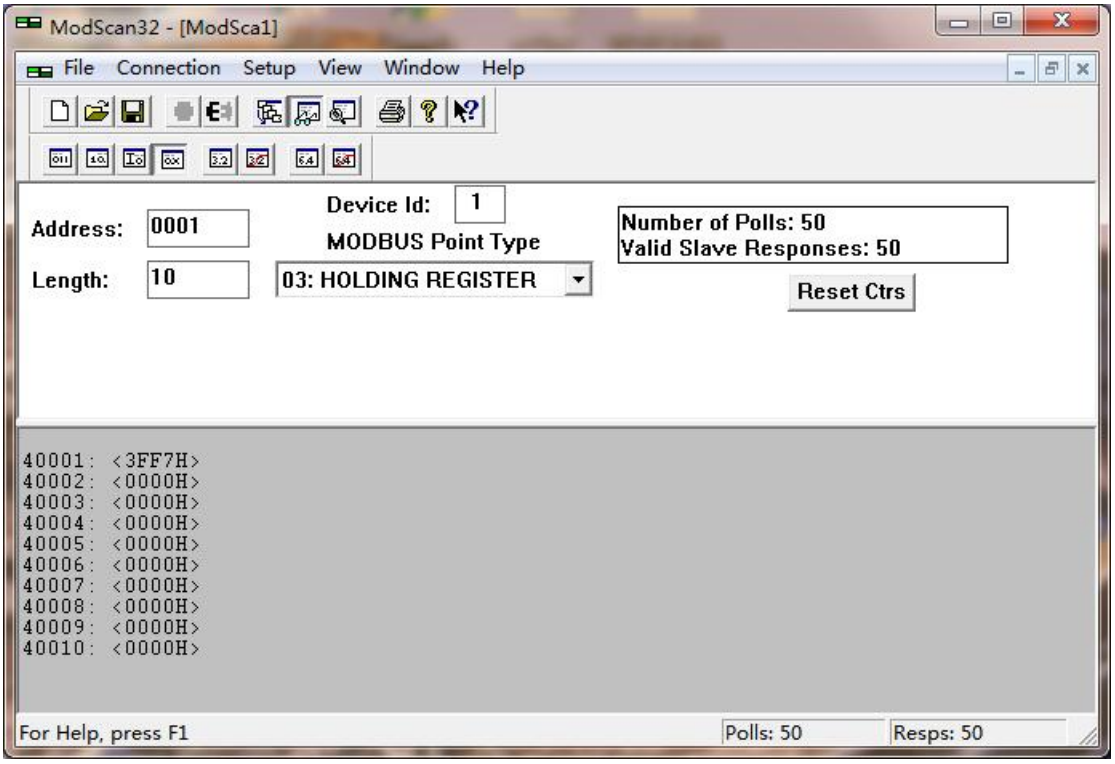
Baud rate 9600 bps

Method to put the module into default state:

The WJ126 module has a special pin labeled as Initiat. Short circuit the Initiat pin to the GND1 pin, and then turn on the power. At this point, the module enters 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.

Supports Modbus RTU communication protocol **function code 03** (read hold register) and **function code 06** (write single register), with command format following the standard Modbus RTU communication protocol.

Modbus software testing example:



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 eleven	0010	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 that the thermistor is disconnected, If the data is 8888, it indicates a short circuit in the thermistor.
40031~40032	0030~0031	Floating point temperature value	read-only	Measured temperature data, 32-bit floating-point number, The lower 16 bits are in register 40031, The high 16 bits are in register 40032 If the data is -888.88, it indicates that the thermistor is disconnected, If the data is 888.88, it indicates a short circuit in the thermistor.

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 0x0000-0x0003, The factory default is 2. Please recalibrate the module after modification. 0x0000 = 2.5 SPS，0x0001 = 5 SPS， 0x0002 = 10 SPS， 0x0003 = 20 SPS

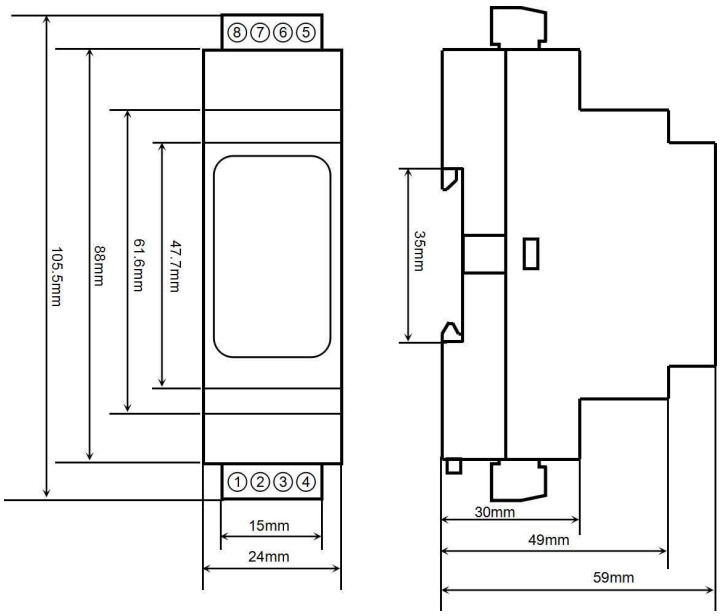
Communication example: If the module address is 01, send in hexadecimal: **0103000A0001A408** to retrieve the data from register 40011.

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 ℃.

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

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.

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