

8-CH Thermocouple Signal to RS485/232 Acquisition Converter

(WJ27 series 24Bits A/D Converter, data acquisition)

Features:

- >> Eight channels thermocouple signal acquisition, isolated converter RS-485/232 output
- >> 24-bit AD converter, testing accuracy>0.05%
- >> Can be programmed to calibrate the module accuracy via RS485/232 interface
- >> J/ K/ T/ E/ R/ S/ B type thermocouple signal input
- >> 3000VDC Isolation between signal input and signal output
- >> Wide power supply range: 8~32VDC
- >> Supports MODBUS RTU communication protocol
- >> DIN35 Rail-mounted
- >> Users can set module address, baud rate and so on



Figure 1 WJ27

Typical Application:

- >> Temperature signal measurement/monitoring/control
- >> RS-485 remote I / O, data acquisition
- >> RS-232/485 bus industrial automation control system
- >> Industrial field signal data acquisition and recording
- >> Industrial field signal isolation and long-term transmission
- >> Medical, industrial product development
- >> Various types of thermocouple signal acquisition

Product Overview:

WAYJUN WJ27 series products realize the signal acquisition between sensor and host, to measure eight channels thermocouple signal. WJ27 series products can be applied to RS-232/485 bus industrial automation control system, J/ K/ T/ E/ R/ S/ B type thermocouple signal measurement, monitoring and control and so on.

Products include power supply isolation, signal isolation, linearization, A/D conversion and RS-485 serial communication. Each serial interface can connect up to 255 pieces WJ27 Series modules, communication using ASCII code or MODBUS RTU communication protocol, and its instruction set compatible with the ADAM modules, baud rate can be set by the code, with other manufacturers control module hang in the same RS-485 bus for easy programming.

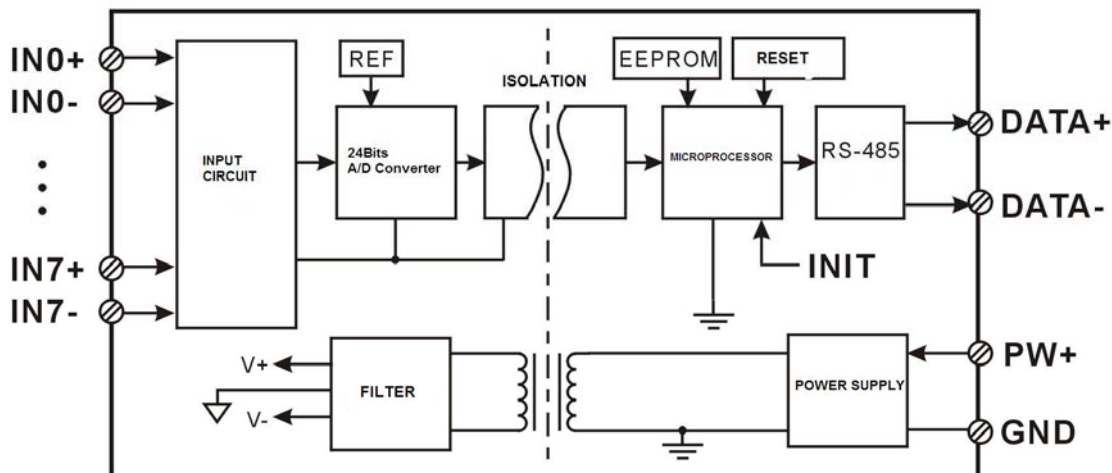


Figure 2 WJ27 Block Diagram

WJ27 series products are based on SCM's intelligent monitoring and control system, users set the calibration value, address, baud rate, data format, checksum status, and configuration information are all stored in nonvolatile memory EEPROM.

WJ27 products are according to industry standard design, isolation between signal input / output, can withstand voltage 3000VDC, high anti-interference ability and reliability. Operating temperature range is - 45 ~ +85 °C.

Function Description:

WJ27 signal isolation acquisition module can be used to measure eight channels thermocouple signal

1. Temperature signal input

24-Bit acquisition accuracy, 8-CH thermocouple signal input. All products signal input range have been calibrated. In use, users also can program calibration easily.

2. Communication protocol

Communication Interface: one channel standard RS-485 communication interface, or one standard RS-232 communication interface, specify when ordering.

Communication Protocols: supports two protocols, characters protocol of the command set defined and MODBUS RTU communication protocol. Can be programmed using the kind of communication protocol, can be achieved with PLC, RTU of many Brands or computer monitoring system for network communication.

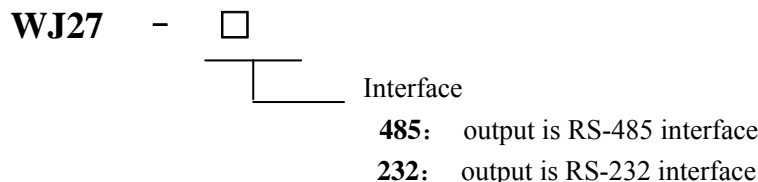
Data Format: 10 Bits. 1 start bit,8 data bits,1 stop bit.

Address: (0 to 255) and baud rate (2400,4800,9600,19200,38400,57600,115200bps) can be set, the most long-distance about communication networks is up to 1200 meters, through the twisted-pair shielded cable. Communication interface of high anti-jamming design, ± 15KV ESD protection, communication response time is less than 100mS.

3. Anti-jamming

According to need to set the checksum. Module internal has transient suppression diodes, can inhibit a variety of surge pulse, protection module, and internal digital filter can also be well suppressed from the grid frequency interference.

Product Selection:



Part No.:**WJ27-485** means 8 channels thermocouple signal input, output is RS485 interface

Part No.:**WJ27-232** means 8 channels thermocouple signal input, output is RS232 interface

WJ27 General parameters:

(typical @ +25 °C, Vs to 24VDC)

Input type: thermocouple signal input, supports a variety of thermocouple signal, J/K/T/E/R/S/ B type thermocouple

Accuracy: 0.1% (not contains cold junction sensor error)

Temperature drift: ± 30 ppm / °C (± 50 ppm / °C, maximum)

Input resistance: >1MΩ

Cold junction compensation sensor accuracy: ± 0.5 °C

Bandwidth: -3 dB 10 Hz

AD Conversion rate: 10 Sps

Common Mode Rejection (CMR): 120 dB (1kΩ Source Imbalance @ 50/60 Hz)

Normal Mode Rejection (NMR): 60 dB (1kΩ Source Imbalance @ 50/60 Hz)

Input Protection: over-voltage protection, over-current protection

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

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

Address (0 to 255) can be selected via software

Communication Response Time: 100 ms maximum

Power Supply: +8 ~ 32VDC wide range power supply, internal anti-reverse and over-voltage protection circuit

Power Loss: less than 1W

Operating Temperature: - 45 ~ +80 °C

Humidity: 10 ~ 90% (no condensation)

Storage Temperature: - 45 ~ +80 °C

Storage Humidity: 10 ~ 95% (no condensation)

Isolation Voltage: input / output: 3KVDC, 1 minute, leakage current: 1mA

Which output signal and power supply are common ground.

Shock Voltage: 3KVAC, 1.2/50us (peak)

Dimensions: 120 mm x 70 mm x 43mm

Footprint Function:

PIN	Name	Description	PIN	Name	Description
1	IN5+	Channel 5 thermocouple signal input +	11	IN0-	Channel 0 thermocouple signal input -
2	IN5-	Channel 5 thermocouple signal input -	12	IN0+	Channel 0 thermocouple signal input +
3	IN6+	Channel 6 thermocouple signal input +	13	IN1-	Channel 1 thermocouple signal input -
4	IN6-	Channel 6 thermocouple signal input -	14	IN1+	Channel 1 thermocouple signal input +
5	IN7+	Channel 7 thermocouple signal input +	15	IN2-	Channel 2 thermocouple signal input -
6	IN7-	Channel 7 thermocouple signal input -	16	IN2+	Channel 2 thermocouple signal input +
7	DATA+	RS-485 signal +	17	IN3-	Channel 3 thermocouple signal input -
8	DATA-	RS-485 signal -	18	IN3+	Channel 3 thermocouple signal input +
9	PW+	Power supply +	19	IN4-	Channel 4 thermocouple signal input -
10	GND	Power supply-, digital signal output ground	20	IN4+	Channel 4 thermocouple signal input +

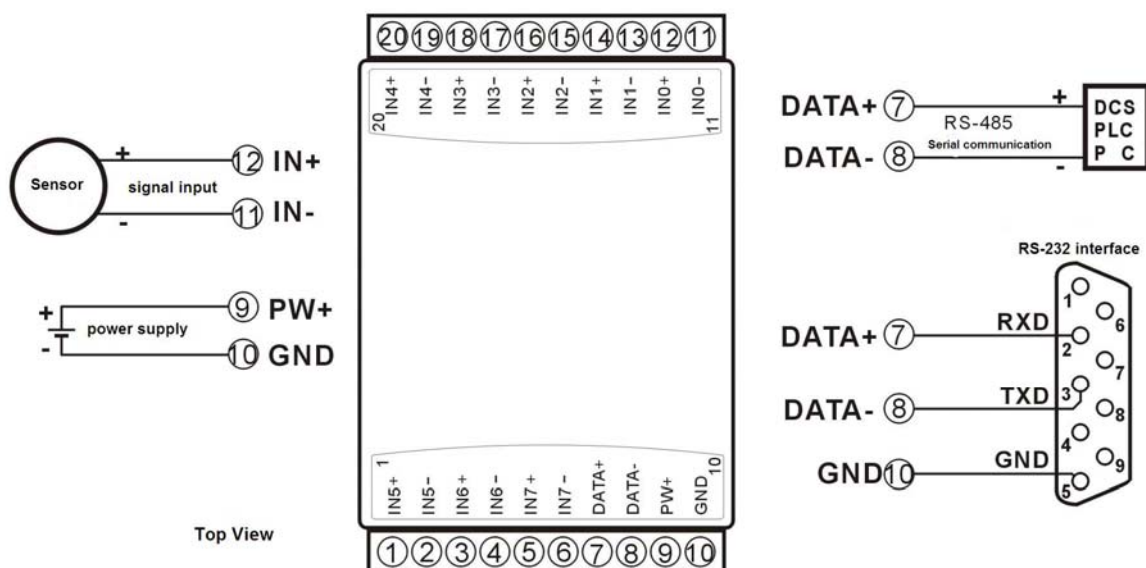


Figure 3 WJ27 Wiring Diagram

Initialization WJ27 modules:

All WJ27 modules, if you use RS-485 network, must be assigned a unique address code, address code value of hexadecimal numbers between 00 and FF. However, all new WJ27 modules uses a factory initial settings, as follows:

- Address code: 01
- Baud rate: 9600 bps
- Checksum is disable

Character Communication Protocol (If you need to set MODBUS RTU communication protocol, please refer to **chapter about MODBUS RTU Communication Protocol**)

As the new module address codes are the same, their address will be contradictory to other modules, so when you set up the system, you must reconfigure each WJ27 module address. WJ27 module can be connected the power cord and RS485 communication lines, through configuration commands to modify the WJ27 module address. Baud rate, parity and status, communication protocols also need to be adjusted according to user requirements. In the modified baud rate, parity and status, communication protocol, you must first enter the module to the default state, or can not be modified.

Let the module into the default state:

WJ27 module has a special INIT pin. Connecting the INIT PIN to ground (GND PIN), then open power, the module into the default state. In this state, the module is configured as follows:

- Address code 00
- 9600 bps baud rate
- Checksum is disable

At this time, via configuration commands you can modify the WJ27 module baud rate, parity, checksum state and other parameters, by setting the module communication protocol command to select the communication protocol. When are not sure a module specific configuration, can also be configured by installing the jumper, so that the module into the default state, then reconfigure the module. If clients need set the module to MODBUS RTU communication protocol, see the MODBUS protocol section for instructions.

Note: In normal use, put the INIT switch to the NORMAL position.

WJ27 character protocol command set:

Order is by a series of characters, such as first code, address ID, variables, an optional checksum byte and a terminator (**cr**) which can show command. In addition to wildcard address “**”synchronization command, the host only commands a WJ25 module once.

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

(Leading code) prefix is the first letter of the command. All commands require a command prefix, such as %, \$, #, @, ... etc.

(Addr) module address code, if not specified below, range is from 00 ~ FF (hexadecimal). **1 - Character**

(Command) shows the command code or variable values. **2 - Character**

[Data] some output command needs data **Variable length**

[Checksum] brackets Checksum (checksum) shows an optional parameter, only the checksum is enabled, need this option. **2 -**

(Cr) a control code character as identify , **(cr)** as a carriage return character, its value is 0x0D. **1 -**

Character

When enabled checksum (checksum), users need [Checksum]. It accounted for 2 - character. Commands and responses must be attached checksum feature. Checksum used to check all input commands to help you find the host to the module command module to the host response to errors and mistakes. Checksum characters placed in command or in

response to the character after the carriage return before.

Calculated as follows: two characters, the hexadecimal number for all issued prior to the ASCII values of and, then with hexadecimal digits 0xFF phase proceeds.

Examples: Disable checksum (checksum)

command: **\$002(cr)**

response: **!00020600 (cr)**

Enable checksum

command: **\$002B6 (cr)**

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

Command response:

Response message depends on a variety of commands. Response also is consists of several characters, includes leading code, variables and end tags. The first code of response signal has two: '!' Or '>' indicates that a valid command and '?' means invalid. By checking the response information, you can monitor whether the command is valid

Note:

1. In some cases, many commands use the same command format. To ensure that you use a command in the address is correct, if you use the wrong address and this address represents another module, then the command will take effect in another module, resulting in an error.
2. the command must be entered in uppercase letters.

1. Read Measurement Data Command

Description: Returns the analog input measurement data from the module in the currently configured data format

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

Parameters: # delimiter character. Hexadecimal 23H

AA module address, range is 00-FF(hexadecimal). Factory address is 01, converted to hexadecimal ASCII code for each character. Such as address 01 into hexadecimal are 30H and 31H.

(cr) is the terminating character, carriage return (0Dh)

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

?AA(cr) invalid command or illegal operation.

Parameter Description: > delimiter character. Hexadecimal is 3EH

(data) Returns data. The data format is in Engineering Units, Percent of FSR, Two' s complement hexadecimal, Hexadecimal is each character ASCII code .Refer to Chapter 3 Command Set.

(cr) terminating character, carriage return (0Dh)

There is no response if the module is format error or communication error or address does not exist, the module does not respond. If you are using serial communication software, but can not enter the return key characters, please switch to hexadecimal format for communicate

Example: Commands (character format) **#01(cr)**

(Hexadecimal format) **2330310D**

Module response (character format) **>+500.00+500.00+500.00+500.00+500.0+500.00+500.00+500.00 (cr)**

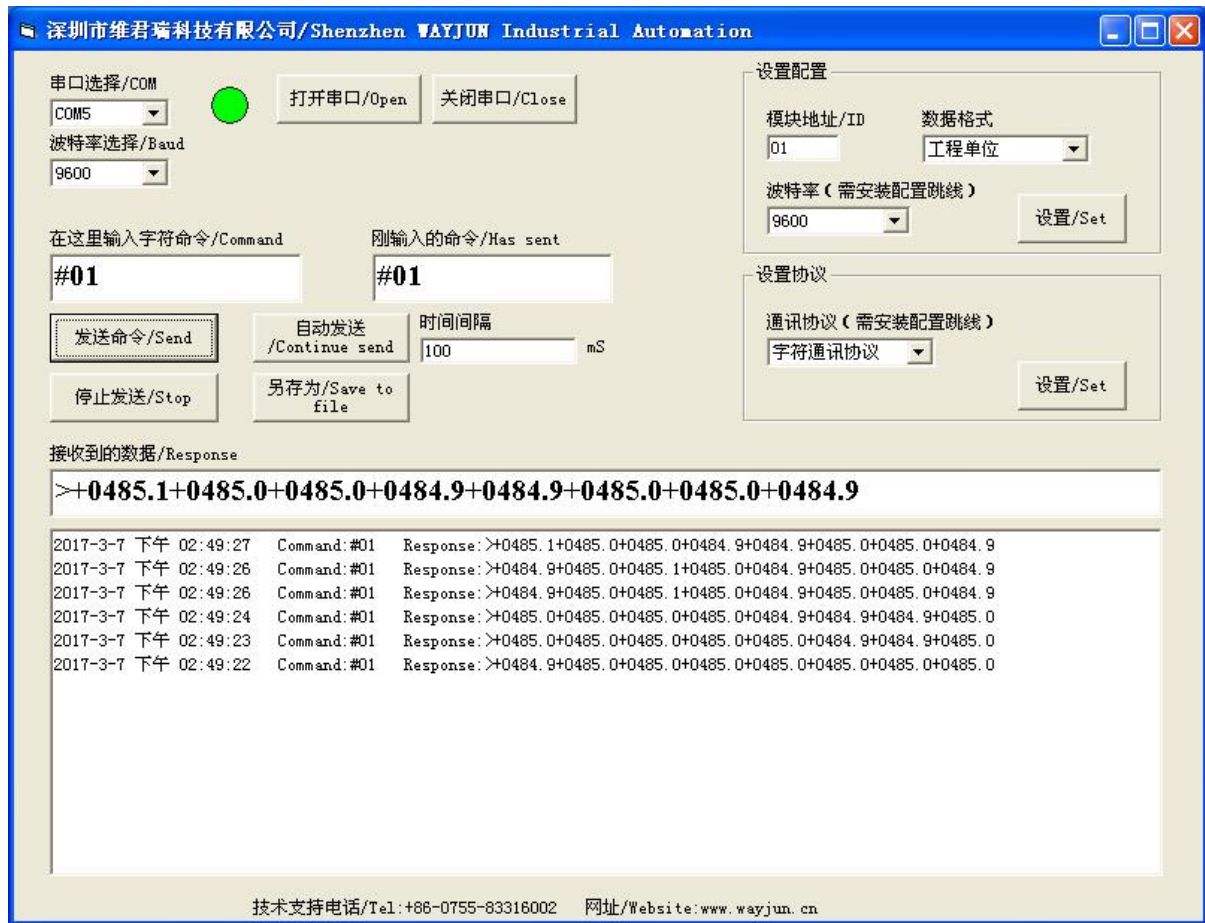
(Hexadecimal format) **3E2B3530302E30302B3530302E30302B3530302E30302B3530302E30**

302B3530302E30302B3530302E30302B3530302E30302B3530302E30300D

Description: In the address 01H module, input is (Data format is engineering units):

Channel 0: +500.00deg.C Channel 1: +500.00deg.C Channel 2: +500.00deg.C Channel 3: +500.00deg.C
 Channel 4: +500.00deg.C Channel 5: +500.00deg.C Channel 6: +500.00deg.C Channel 7: +500.00deg.C

Read data command example:



2. Read Channel N Analog Module Data Command

Description: Read back channel N analog input data from the module, as the current data formats

Command Format: #AAN(cr)

Parameters: # delimiter character.

AA module address, range is 00-FF(hexadecimal). Factory address is 01, converted to hexadecimal ASCII code for each character. Such as address 01 into hexadecimal are 30H and 31H.

N channel code 0~F, if hexadecimal: 30H~ 37H

(cr) is the terminating character, carriage return (0Dh)

Response : >(data)(cr) command is valid.

?AA(cr) invalid command or illegal operation.

Parameters: > delimiter character

(data) Returns data. The data format is in Engineering Units, Percent of FSR, Two's complement hexadecimal. Refer to Chapter 3 Command Set.

(cr) terminating character, carriage return (0Dh)

There is no response if the module is format error or communication error or address does not exist.

Example: Commands (character format) #010(cr)

(Hexadecimal format) 233031300D

Module response (character format) >+0200.0 (cr)

(Hexadecimal format) 3E2B303230302E300D

At address 01H module, channel 0 input signal is +0200.0deg.C (Data format is engineering units)

3. Set WJ27 Module Command

Description: Set address, input ranges, baud rate, data formats, checksum and state for a WJ27 analog input module, counter data are stored in a EEPROM.

Command Format: %AANNTTCCFF(cr)

Parameter : % delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal. Factory address is 01, converted to hexadecimal ASCII code for each character. Such as address 01 into hexadecimal are 30H and 31H.

NN indicates new module hexadecimal address, value NN range is 00~FF. converted to hexadecimal ASCII code for each character. Such as address 18 into hexadecimal are 31H and 38H.

TT hexadecimal indicates type code. Indicates the measured thermocouple type. See Table 1

Module Name	Type Code	Input Range
WJ27	00	Type J thermocouple, 0°C ~760°C
	01	Type K thermocouple, 0°C ~1000°C
	02	Type T thermocouple, -100°C ~400°C
	03	Type E thermocouple, 0°C ~1000°C
	04	Type R thermocouple, 500°C ~1750°C
	05	Type S thermocouple, 500°C ~1750°C
	06	Type B thermocouple, 500°C ~1800°C

Table 1 temperature range code

CC Baud Rate code (hexadecimal)

Baud rate code	Baud rate
04	2400 baud
05	4800 baud
06	9600 baud
07	19200 baud
08	38400 baud
09	57600 baud
0A	115200 baud

Table 2 Baud rate code

FF Hexadecimal 8-bit represents the data format, checksum. Note from bits2 to bits5 not be set to zero.

Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
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Table 3 Data format, checksum and code

Bit7: Reserved bits (must set to 0)

Bit6: checksum states, if 0:Disabled, if 1: Enabled

Bit5-bit2: Not used(must set to 0)

Bit1-bit0: Data Format Bit

00: Engineering Units

01: % of FSR

10: Twos complement hexadecimal

(cr) terminating character, carriage return (0Dh)

Response: !AA(cr) command is valid

?AA(cr) command is invalid or illegal operation, or do not set up line before changing baud rate or

checksum, the INIT switch is not set to the INIT position.

Parameter Description:

- ! delimiter character which indicates a valid command.
- ? delimiter character which indicates a invalid command.
- AA represents input module address
- (cr) terminating character, carriage return (0Dh)

If you configure module for the first time, AA=01H and NN equal to new address. If reconfigure module changing address, input range, data formats, AA equals to present configured address, NN equals to the current or new address. If reconfigure module changing baud rate or checksum state, must set INIT switch to the INIT position, make module into the default mode, module address is 00H, also AA=00H, NN=present or new address.

There is no response if the format error or communication error or address does not exist.

Example: **command** **%0111000600(cr)**
 response **!11(cr)**

- Description:**
- % delimiter character
 - 01 indicates you want to configure the WJ27 module original address set to 01H.
 - 11 indicates new module hexadecimal address is 11H
 - 00 type code, indicates measured J type thermocouple
 - 06 indicates baud rate: 9600 baud
 - 00 indicates data format is Engineering Units, checksum is disabled

4. Read Set Status Command

Description: Read configuration for a specified WJ27 module.

Command Format: **\$AA2(cr)**

- Parameter:
- \$ delimiter character
 - AA module address, (range 00-FF) represents the 2-character hexadecimal
 - 2 indicates read set state command
 - (cr) terminating character, carriage return (0Dh)

- Response:**
- !AATTCFF(cr) command is valid
 - ?AA(cr) command is invalid or illegal operation
 - ! delimiter character
 - AA represents input module address
 - TT type code
 - CC Baud rate code, Table 2
 - FF Table 3
 - (cr) terminating character, carriage return (0Dh)

There is no response if the format error or communication error or address does not exist.

Example: **command** **\$302(cr)**
 response **!30F0600(cr)**

- ! delimiter character
- 30 indicates WJ27 module address is 30H
- 00 indicates input type code J type thermocouple
- 06 represents that baud rate is 9600 baud
- 00 represents that data format is Engineering Units, disable checksum

5. Offset Calibration Command

Description: Calibrate a input module channel N offset errors

Command Format: **\$AA1N(cr)**

Parameter: **\$** delimiter character
AA module address, (range 00-FF) represents the 2-character hexadecimal
1 Offset calibration command
N channel code 0~7
(cr) terminating character, carriage return (0Dh)

Response: **!AA (cr)** command is valid
?AA(cr) command is invalid or Illegal operation
! delimiter character which indicates a valid command.
? delimiter character which indicates a invalid command.
AA represents input module address
(cr) terminating character, carriage return (0Dh)

Products have been calibrated, user can use them directly. After calibrating offset command, then calibrate gain errors. During calibration, WJ27 modules need to be connected to the input of the appropriate input signal. Different input range requires a different input thermal resistance. (See following Calibration information)

There is no response if the format error or communication error or address does not exist.

Example: command \$0110(cr)
response !01 (cr)

Calibrate module channel 0 offset at address 01H.

6. Gain Calibration Command

Description: Calibrates an analog input module channel N gain

Command Format: **\$AA0N(cr)**

Parameter: **\$** delimiter character
AA module address, (range 00-FF) represents the 2-character hexadecimal
0 represents gain calibration command
N channel code 0~7
(cr) terminating character, carriage return (0Dh)

Response: **!AA(cr)** command is valid
?AA(cr) command is invalid or illegal operation
! delimiter character which indicates a valid command.
? delimiter character which indicates a invalid command.
AA represents input module address
(cr) terminating character, carriage return (0Dh)

Products have been calibrated, user can use them directly. After calibrating offset command, then calibrate gain errors. During calibration, module needs to be connected to the input of the appropriate input signal. Different input range requires a different input thermal resistance. (See following Calibration information)

There is no response if the format error or communication error or address does not exist.

Example: command \$0103(cr)
Response !01 (cr)

Calibrate module channel 3 gain errors at address 01H.

7. Read Module Name Command

Description: Return a WJ27 module name from the specified analog input module

Command Format: **\$AAM(cr)**

Parameter: **\$** delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

M represents Read module name command

(cr) terminating character, carriage return (0Dh)

Response: !AA(Module Name)(cr) command is valid

?AA(cr) command is invalid or illegal operation

! delimiter character which indicates a valid command.

? delimiter character which indicates a invalid command.

AA represents input module address

(Module Name) module name WJ27

(cr) terminating character, carriage return (0Dh)

There is no response if the format error or communication error or address does not exist.

Example: command \$08M(cr)

response !08WJ27(cr)

Module is WJ27 at address 08H

8. Enable or Disable Channel Command

Description: Send enable or disable module data acquisition channel command to a specified module.

Command Format: **\$AA5VV(cr)**

Parameters: **\$** delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

5 enable or disable module data acquisition channel command

VV Two hex: the first one represents Channel 7~4
the second represents Channel 3 ~ 0

0: Disable

1: enable

(cr) terminating character, carriage return (0Dh)

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

Response: !AA(cr) command is valid

?AA(cr) command is invalid or illegal operation

! delimiter character which indicates a valid command.

? delimiter character which indicates a invalid command.

AA represents input module address

(cr) terminating character, carriage return (0Dh)

There is no response if the format error or communication error or address does not exist.

Example: command \$08537(cr)

response !08 (cr)

Description: set channel value: 0x37

3 is 0011, means enable Channel 5 and 4, disable Channel 7 and 6

7 is 0111, means enable Channel 2, 1 and 0, disable Channel 3.

9. Read Channel Status Command

Description: Read channel status command to a specified analog input module

Command Format: **\$AA6(cr)**

Parameter: **\$** delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

6 read channel status command
(cr) terminating character, carriage return (0Dh)

Response: !AAVV(cr) command is valid
?AA(cr) command is invalid or illegal operation
! delimiter character which indicates a valid command.
? delimiter character which indicates a invalid command.
AA represents input module address
VV Two hex: the first represents Channel 7~4
the second represents Channel 3 ~ 0
0: Disable
1: enable
(cr) terminating character, carriage return (0Dh)

There is no response if the format error or communication error or address does not exist.

Example: command \$186 (cr)
response !18FF (cr)

Description: The current Channel status value is 0xFF.

0xFF is 1111, 1111 mean all channels are enabled at address 18H.

10. CJC Offset Calibration Command

Description: CJC (cold junction compensation) offset calibration can be used to calibrate the CJC offset error

Command Format: **\$AA9(Counts)(cr)**

Parameter: **\$** delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

9 indicates the CJC offset calibration command

(Counts) CJC offset value, the factory default value is +000.0. The command is 4 characters and a decimal point with a symbol of + or -, range is 000.0 to 999.9. Indicates 0 to 999.9 deg.C.

For example: +001.5 that increase 1.5 °C

-010.0 indicates a decrease of 10 °C

(cr) terminating character, carriage return (0Dh)

!AA(cr) command is valid

?AA(cr) command is invalid or illegal operation

! delimiter character which indicates a valid command.

? delimiter character which indicates a invalid command.

AA represents input module address

(cr) terminating character, carriage return (0Dh)

There is no response if the format error or communication error or address does not exist.

Example: command \$019+001.0(cr)
response !01(cr)

The temperature of the CJC sensor increases 1 deg.C.

12. Read the CJC status command

Description: Read the value of the CJC sensor and return the value in ° C.

Command Format: **\$AAA(cr)**

Parameter: **\$** delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

A CJC status command

(cr) terminating character, carriage return (0Dh)

Response: !(data)(cr) command is valid

?AA(cr) command is invalid or illegal operation

> delimiter character which indicates a valid command.

? delimiter character which indicates a invalid command.

(data) represents the value of the CJC sensor in ° C. Format: a "+" or "-" symbol followed by 5 decimal digits and a decimal point. The decimal point is fixed with a resolution of 0.1 ° C.

AA module address

(cr) terminating character, carriage return (0Dh)

There is no response if the format error or communication error or address does not exist.

Example: command \$01A(cr)

response >+0024.9(cr)

The temperature of the CJC sensor at address 01H module is 24.9 ° C.

12. Thermocouple disconnection detection command

Description: Check if the thermocouple is disconnected.

Command Format: \$AAB(cr)

Parameter: \$ delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

B thermocouple disconnection detection command

(cr) terminating character, carriage return (0Dh)

Response: !AA0(cr) If the thermocouple is not disconnection

!AA1(cr) If the thermocouple is disconnection

?AA(cr) command is invalid or illegal operation, or do not set thermocouple signal input

! delimiter character which indicates a valid command.

? delimiter character which indicates a invalid command.

AA represents input module address

(cr) terminating character, carriage return (0Dh)

There is no response if the format error or communication error or address does not exist.

Example: command \$06B (cr)

response ! 060 (cr)

Description: on the address 06H module, thermocouple is not disconnection

13. Set Communication Protocol Command

Description: Set the module communication protocol to characters protocol or Modbus RTU protocol.

Command Format: \$AAPV(cr)

Parameter: \$ delimiter character

AA module address, (range 00-FF) represents the 2-character hexadecimal

P set communication protocol command

V protocol code, 0 or 1

0: characters protocol

1: Modbus RTU protocol

(cr) terminating character, carriage return (0Dh)

Response: !AA(cr) command is valid

?AA(cr) command is invalid or illegal operation

! delimiter character which indicates a valid command.

? delimiter character which indicates a invalid command.

AA represents input module address

(cr) terminating character, carriage return (0Dh)

There is no response if the format error or communication error or address does not exist.

Set command protocol must be effective by default.

Example 1: **command** **\$00P1(cr)**
 response **!00 (cr)**

Set protocol command to Modbus RTU

Example 2: **command** **\$00P0(cr)**
 response **!00 (cr)**

Set protocol command to characters protocol

Input Ranges & Data Formats

WJ27 uses three data formats: 00: Engineering Units
 01: % of FSR
 10: Twos complement hexadecimal

code	Input Range	Data Format	+F.S	-F.S	Displayed Resolution
00	J(0°C~760°C)	Engineering Units	+760.00	+000.00	0.01°C
		% of FSR	+100.00	+000.00	0.01%
		Twos complement hexadecimal	7FFFFFFF	000000	1LSB
01	K(0°C~1000°C)	Engineering Units	+1000.0	+0000.0	0.1°C
		% of FSR	+100.00	+000.00	0.01%
		Twos complement hexadecimal	7FFFFFFF	000000	1LSB
02	T(-100°C~400°C)	Engineering Units	+400.00	-100.00	0.01°C
		% of FSR	+100.00	-025.00	0.01%
		Twos complement hexadecimal	7FFFFFFF	DFFFFFFF	1LSB
03	E(0°C~1000°C)	Engineering Units	+1000.0	+0000.0	0.1°C
		% of FSR	+100.00	+000.00	0.01%
		Twos complement hexadecimal	7FFFFFFF	000000	1LSB
04	R(500°C~1750°C)	Engineering Units	+1750.0	+0500.0	0.1°C
		% of FSR	+100.00	+028.57	0.01%
		Twos complement hexadecimal	7FFFFFFF	24924A	1LSB
05	S(500°C~1750°C)	Engineering Units	+1750.0	+0500.0	0.1°C
		% of FSR	+100.00	+028.57	0.01%
		Twos complement hexadecimal	7FFFFFFF	24924A	1LSB
06	B(500°C~1800°C)	Engineering Units	+1800.0	+0500.0	0.1°C
		% of FSR	+100.00	+027.77	0.01%
		Twos complement hexadecimal	7FFFFFFF	238E39	1LSB

Table 4 Input Range and Data Format

Example:

1. Input Range is 00, J type thermocouple, Input is 76 deg.C:

Command **#010(cr)**

Engineering Units	Response >+076.00(cr)
Percent of FSR	Response >+010.00(cr)
Twos complement	Response >0CCCC(cr)

2. Input Range is 01, K type thermocouple, Input is 500 deg.C

Command **#010(cr)**

Engineering Units	Response >+0500.0(cr)
Percent of FSR	Response >+050.00(cr)
Twos complement	Response >3FFFFFF(cr)

Module Calibration:

We have calibrated the module, the user can use directly.

You can also use the product calibration function to re-calibrate the module. During calibration, the module need to been entered the appropriate signal, different input range needs different input signals.

In order to improve calibration accuracy, it is recommended to calibrate using the following equipment:

1. A stable output, low noise DC voltage / current signal source
2. A five and a half or more precision voltage / current measurement instrument to monitor the accuracy of the input signal

Calibration:

1. According to the module input range, connects to the corresponding input signal.
2. Connect the correct offset voltage to the analog input module channel N, about the thermocouple signal calibration voltage value please refer to the following table.
3. Until the signal stabilized, send the offset calibration \$ **AA1N** command to WJ27 module.
4. Connect the correct input voltage to the analog input module, about the thermocouple signal calibration voltage value please refer to the following table.
5. Until the signal is stable, send the gain calibration \$ **AA0N** command to WJ27 module.
6. Finished

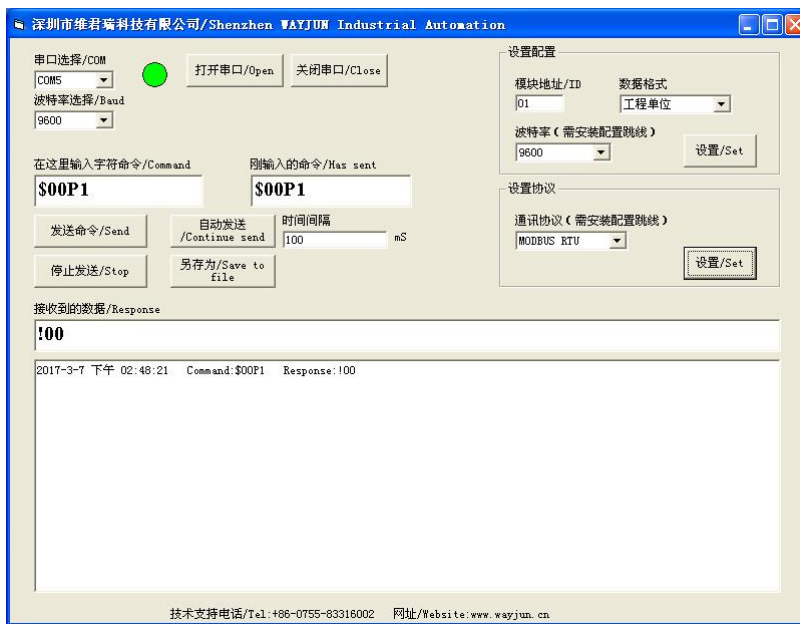
Calibration voltage for thermocouple signal

Code	Thermocouple input range	Offset calibration voltage	Gain calibration voltage
00	J(0°C ~ 760°C)	0mV	+50mV
01	K(0°C ~ 1000°C)	0mV	+45mV
02	T(-100°C ~ 400°C)	0mV	+25mV
03	E(0°C ~ 1000°C)	0mV	+78mV
04	R(500°C ~ 1750°C)	0mV	+22mV
05	S(500°C ~ 1750°C)	0mV	+20mV
06	B(500°C ~ 1800°C)	0mV	+15mV

Modbus RTU communication protocol:

Module default protocol is character communications protocol. If you need to set the module to Modbus RTU protocol, please follow these settings:

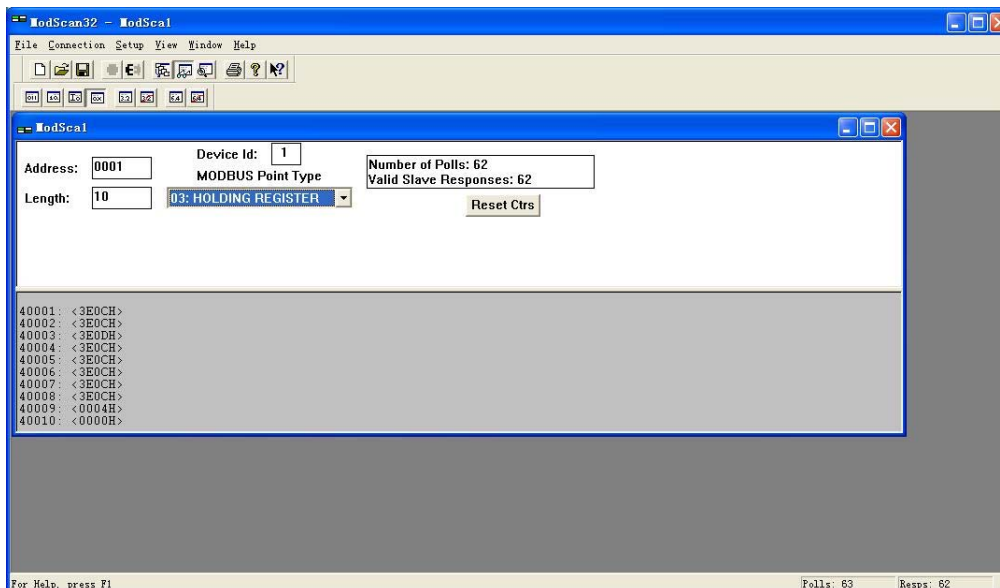
1. Put INIT switch to INIT position.
2. Connect the power cord and the communication interface cable.
3. Turn on the power, the module enters the default state automatically, address 00, baud rate 9600.
4. Wait 5s, module is initialization.
5. Send the command **\$00P1(cr)**, check the response, if is **!00 (cr)**, set successfully.
6. Turn off the power, **INIT switch is set to the NORMAL position.**
7. The module has been set to the Modbus RTU protocol mode successfully.



Appears **!00** in the received data, set successfully.

If as the above figure, did not respond or respond incorrectly, it indicates setting unsuccessful. Please turn off the power and check all wiring and INIT switch, then turn on the power testing.

MODBUS software test example:



Register Description: (Common applications reading high 16-bit data to meet the accuracy requirements)

Address 4X (PLC)	Address (PC, DCS)	Data	Property	Data Explanation
40001	0000	Input Analog Signal	Read Only	Channel 0 Data High 16
40002	0001	Input Analog Signal	Read Only	Channel 1 Data High 16
40003	0002	Input Analog Signal	Read Only	Channel 2 Data High 16
40004	0003	Input Analog Signal	Read Only	Channel 3 Data High 16
40005	0004	Input Analog Signal	Read Only	Channel 4 Data High 16
40006	0005	Input Analog Signal	Read Only	Channel 5 Data High 16
40007	0006	Input Analog Signal	Read Only	Channel 6 Data High 16
40008	0007	Input Analog Signal	Read Only	Channel 7 Data High 16
40009	0008	CJC sensor temperature	Read Only	Cold end sensor temperature value, unit is 0.1 degrees. For example, read out the value of 0x00C9, converted into decimal 201, that the temperature is 20.1 degrees
40010	0009	Thermocouple fault detection	Read Only	0 means normal, 1 is broken
40011	0010	Input Analog Signal	Read Only	Channel 0 Data High 8 bit
40012	0011	Input Analog Signal	Read Only	Channel 1 Data High 8 bit
40013	0012	Input Analog Signal	Read Only	Channel 2 Data High 8 bit
40014	0013	Input Analog Signal	Read Only	Channel 3 Data High 8 bit
40015	0014	Input Analog Signal	Read Only	Channel 4 Data High 8 bit
40016	0015	Input Analog Signal	Read Only	Channel 5 Data High 8 bit
40017	0016	Input Analog Signal	Read Only	Channel 6 Data High 8 bit
40018	0017	Input Analog Signal	Read Only	Channel 7 Data High 8 bit
40211	0210	Module name	Read Only	High: 0x00 Low:0x27
40221	0220	Channel status	Read/write	High:0x00 Low: channel status (0xFF)

Table 5 Modbus RTU register description

Supports MODBUS RTU communication protocol function **code 03** (read hold register), command format according to standard MODBUS RTU communication protocol.

Example 1:

If the module address is 01,hexadecimal sent: 01030000001840A,to get the data register data 40001.

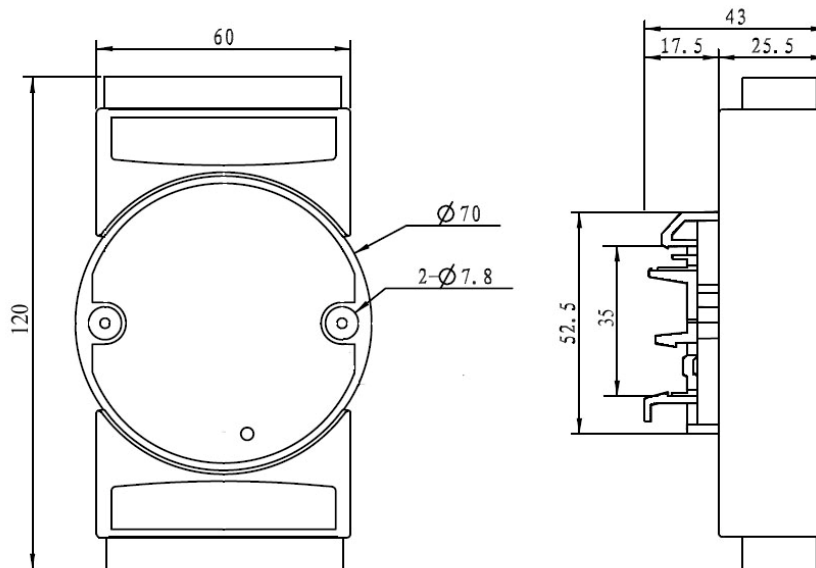
01	03	00	00	00	01	84	0A
Module address	Read holding register	Register address High	Register address low	Register quantity high	Register quantity low	CRC check low	CRC check high

If module reply: **010302199973BE** read data: 0x1999, If the range is 00: J type 0-760 degrees,

Conversion $0x1999 * 760 \text{ degrees} / 0x7FFF = 152 \text{ degrees}$, which means that the input temperature is 152 degrees; if the range is 00: K type 0-1000 degrees, conversion $0x1999 * 1000 \text{ degrees} / 0x7FFF = 200 \text{ degrees}$, which means that the current input temperature is 200 degrees.

01	03	02	19	99	BE	73
Module address	Read holding register	Data Bytes	Data High	Data Lower	CRC check low	CRC check high

Size(unit:mm) DIN35 Rail Mounted



Warranty

Two years (but violate operating rules and requirements to create damage, clients need pay maintenance costs)

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