WJ28 series 8-ch Analog Signal to RS485/232 Converter

(24Bits A/D Converter, data acquisition)

Features:

>> Eight analog signal acquisition, isolated converter RS-485/232 output

>> 24-bit AD converter, testing accuracy>0.05%

>> Can Program and calibrate modules accuracy via RS-485/232 interface

>> Signal input/output: 3000VDC Isolation

>> Wide power supply: 8~32VDC

>> High reliability, easy programming, easy installation.

>> Can program setting module address, baud rate

>> Supports Modbus RTU protocol

>> DIN35 Rail-mounted

>> Size:120x60x43mm

Figure 1   WJ28

Typical Application:

>> 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

>> 4-20mA or 0-5V signal acquisition

Product Overview:

   WJ28 series products realize the signal acquisition between sensor and host, to measure analog signals. WJ28 products can be applied to RS-232/485 bus industrial automation control system,4-20mA / 0-5V signal measurement, monitoring and control,0-75mV ,0-100mV and other small-signal measurement and signal isolation and long-term industrial   transmission 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 WJ28 Series modules, communication using ASCII code or MODBUS RTU communication protocol, and its instruction set compatible with the ADAM modules, baud rate can been set by the code, with other manufacturers control module hang in the same RS-485 bus for easy programming.
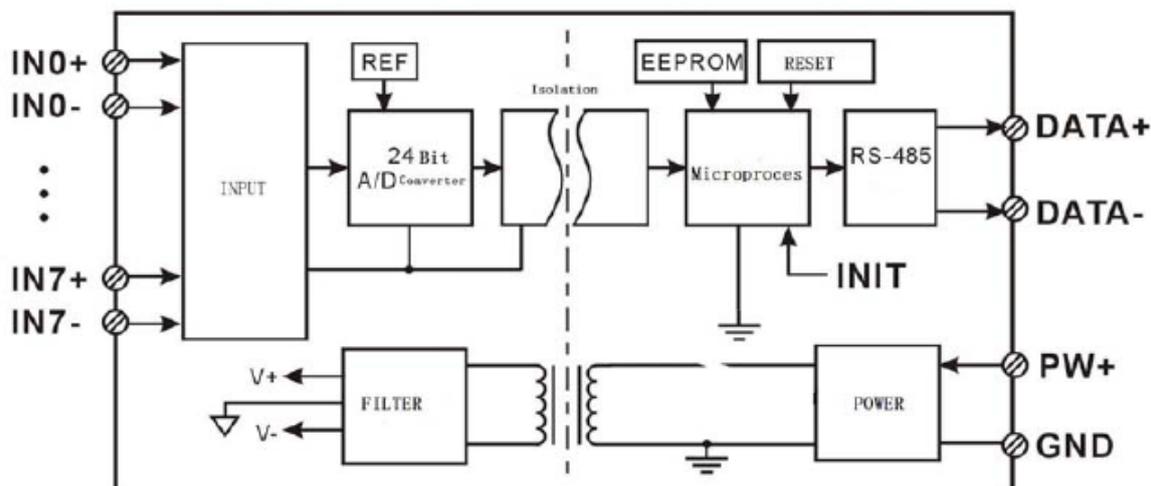
Figure 2   WJ28 Block Diagram

WJ28 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.

WJ28 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 ℃.

Function Description:

WJ28 signal isolation acquisition module can be used to measure one channel voltage or current signal,

1. Analog signal input

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

About the specific current or voltage input range, please see product selection.

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 bps) 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:

WJ28 U(A) □ - □

Input Voltage or Current Signal ——┘   └—— Interface
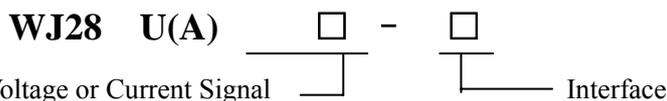
U1：0-5V	**A1**：0-1mA	**485**： output is RS-485 interface
U2：0-10V	**A2**：0-10mA	**232**： output is RS-232 interface
U3：0-75mV	**A3**：0-20mA	
U4：0-2.5V	**A4**：4-20mA	
U5：0-±5V	**A5**：0-±1mA	
U6：0-±10V	**A6**：0-±10mA	
U7：0-±100mV	**A7**：0-±20mA	
U8：user-defined	**A8**：user-defined	

Sample 1: part No.:**WJ28-A4-485**   4-20mA input signal，output is RS485 interface

Sample 2: part No.:**WJ28-U1-232**   0-5V input signal，output is RS232 interface

Sample 3: part No.:**WJ28-U8(U8:0-12V)-485**   0-12V input signal，output is RS485 interface

WJ28 General parameters:

(typical @ +25 ℃, Vs to 24VDC)

Input type: Input current / voltage input

Accuracy: 0.05%

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

Input Resistance: 50Ω (4-20mA/0-20mA/0- ± 20mA current input)

　　　　　　　100Ω (0-10mA/0- ± 10mA current input)

　　　　　　　1KΩ (0-1mA/0- ± 1mA current input)

　　　　　　　>200K(5V/10V voltage input)

　　　　　　　>1MΩ(below 2.5V voltage input)

Bandwidth:　-3 dB 10 Hz

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 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 ℃

Humidity: 10 ~ 90% (no condensation)

Storage Temperature: - 45 ~ +80 ℃

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	Function	PIN	Name	Function
1	IN5+	Channel 5 input +	11	IN0−	Channel 0 input -
2	IN5−	Channel 5 input -	12	IN0+	Channel 0 input +
3	IN6+	Channel 6 input +	13	IN1−	Channel 1 input -
4	IN6−	Channel 6 input -	14	IN1+	Channel 1 input +
5	IN7+	Channel 7 input +	15	IN2−	Channel 2 input -
6	IN7−	Channel 7 input -	16	IN2+	Channel 2 input +
7	DATA+	RS-485 signal+	17	IN3−	Channel 3 input -
8	DATA−	RS-485 signal-	18	IN3+	Channel 3 input +
9	PW+	Power Supply+	19	IN4−	Channel 4 input -
10	GND	Power supply -,Output ground	20	IN4+	Channel 4 input +
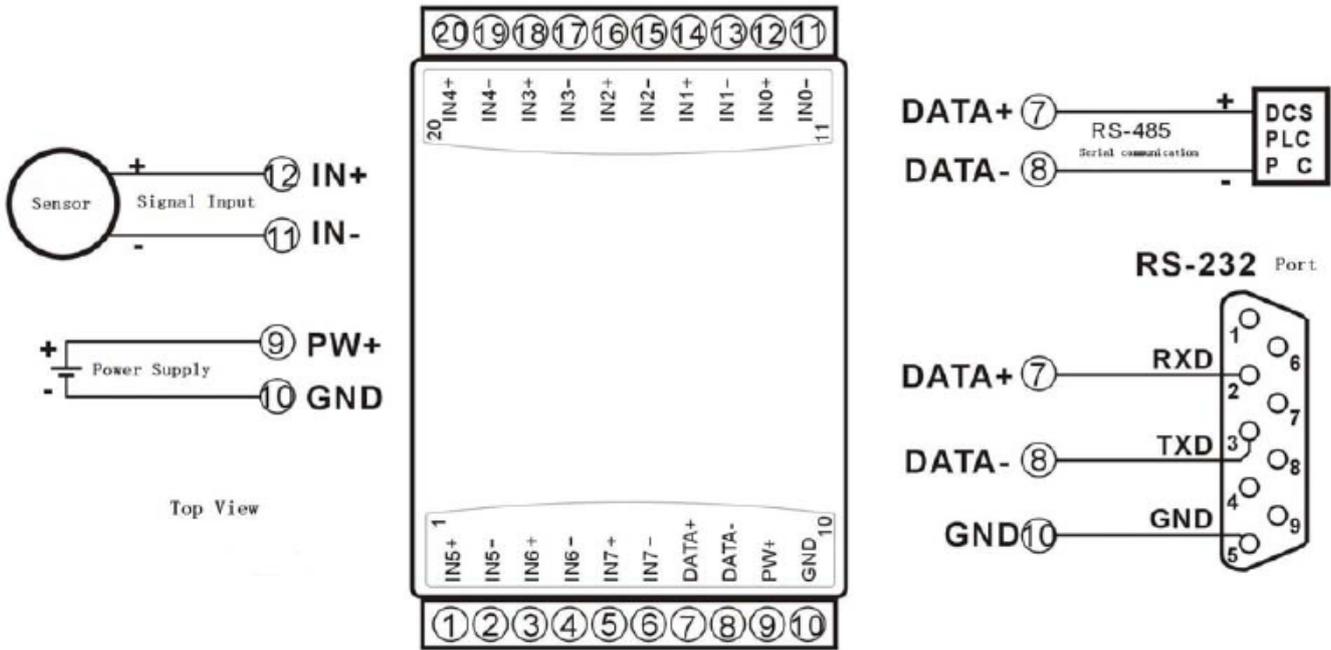
Figure 3   WJ28 Wiring Diagram

Initialization WJ28 modules:

All WJ28 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 WJ28 module uses a factory initial settings, as follows:

Address code: 01

Baud rate: 9600 bps

Checksum is disable

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 WJ28 module address. WJ28 module can be connected the power cord and RS485 communication lines, through configuration commands to modify the WJ28 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:

WJ28 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 WJ28 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.

WJ28 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 WJ28 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. **1 - Character**

(Addr) module address code, if not specified below, range is from 00 ~ FF (hexadecimal). **2 - Character**

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

[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 - Character**

(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

(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 2 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) **>+12.000+16.000+16.000+16.000+16.000+16.000+16.000+18.168 (cr)**

(Hexadecimal format) **3E2B31322E3030302B31362E3030302B31362E3030302B31362E303030**
2B31362E3030302B31362E3030302B31362E3030302B31382E3136380D

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

Channel 0: +12.000mA　Channel 1: +16.000mA　Channel 2: +16.000mA　Channel 2: +16.000mA

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

Input **#01**, then click the Sending Command or hitting the Enter Key, note do not enter(cr),it represents the Enter Key.

Upon receiving the data row, it will be displayed**>+00.000+00.000+00.000+00.000+00.000+00.000+00.000+00.000**

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 0~7, 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 or ohms.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) **>+18.000 (cr)**

    (Hexadecimal format) **3E2B31382E3030300D**

At address 01H module, channel 0 input signal is +18.000mA(Data format is engineering units)

3. Set WJ28 Module Command

    Description: Set address, input ranges, baud rate, data formats, checksum and state for a WJ28 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

    NN   indicates new module hexadecimal address, value NN range is 00~FF

    TT   hexadecimal indicates type code.WJ28 must been set 00

    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

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

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

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=00 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 install command string, make them in listening 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

        00   indicates you want to configure the WJ28 module original address set to 01H.

        11   indicates new module hexadecimal address is 11H

        00   indicates type code, WJ28 must been set to 00

        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 WJ28 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: !AATTCCFF(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   **!300F0600(cr)**

        !   delimiter character

        30   indicates WJ28 module address is 30H

        00   indicates input type code

        06   represents that baud rate is 9600 baud

        00   represents that data format is Engineering Units, disable checksum

5. Offset Calibration Command

Description: Calibrates an analog 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   represents 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, WJ28 modules need to be connected to the input of the appropriate input signal. Different input range requires a different input voltage or current. (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 errors

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 voltage or current. (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 WJ28 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 WJ28

  (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 **!08WJ28 (cr)**

 Module is WJ28 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: one represents Channel 7 to 4

the second represents Channel 3 ~ 0

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

    0：Disable

    1：enable

  (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.

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: one 3~0 represents Channel 7 to 4

the second 3~0 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 and 1111, means all channels are enabled at address 18H.

10. 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

WJ28 uses three data formats: 　00：Engineering Units

01：% of FSR

10：Twos complement hexadecimal

Input Range	Data Format	+F.S	ZERO	-F.S	Displayed Resolution
A1：0-1mA A5：0-±1mA	Engineering Units	+1.0000	±0.0000	-1.0000	0.1uA
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB
A2：0-10mA A6：0-±10mA	Engineering Units	+10.000	±00.000	-10.000	1uA
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB
A3：0-20mA A4：4-20mA A7：0-±20mA	Engineering Units	+20.000	±00.000	-20.000	1uA
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB
U1：0-5V U5：0-±5V	Engineering Units	+5.0000	±0.0000	-5.0000	100uV
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB
U2：0-10V U6：0-±10V	Engineering Units	+10.000	±00.000	-10.000	1mV
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB
U3：0-75mV	Engineering Units	+75.000	±00.000	-75.000	1uV
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB
U4：0-2.5V	Engineering Units	+2.5000	±0.0000	-2.5000	100uV
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB
U7：0-100mV	Engineering Units	+100.00	±000.00	-100.00	10uV
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB
A8：user-defind U8：user-defined	Engineering Units	+100.00	±000.00	-100.00	0.01%
	% of FSR	+100.00	±000.00	-100.00	0.01%
	Twos complement　hexadecimal	7FFFFF	000000	800000	1LSB

Table 4 Input Range and Data Format

Example:

1. Input Range is A4:4-20mA, Input is 4mA:

<div align="center">

Command **#010(cr)**

</div>

Engineering Units   Response **>+04.000(cr)**

Percent of FSR   Response **>+020.00(cr)**

Twos complement   Response **>199999(cr)**

2. Input Range is U1:0-5V, Input is 3V:

<div align="center">

Command **#010(cr)**

</div>

Engineering Units   Response **>+3.0000(cr)**

Percent of FSR   Response **>+060.00(cr)**

Twos complement   Response **>4CCCCC(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 high-precision voltage / current measuring instruments to monitor the accuracy of the input signal

Calibration:

1. According to the module input range, connects to the corresponding input signal.

Which WJ28 module zero calibration is at input 0,full scale calibration is at the input full-scale 120% . For example, input signal is **4-20mA**, when calibrate zero, input **0mA**, when full-scale calibration, input **24mA**.

input signal is **0-5V**, when calibrate zero, input **0V**, when the full-scale calibration, input **6V**.

2. To WJ28 module input zero signal, usually is **0mA** or **0V**.
3. Until the signal stabilized, send the offset calibration **$ AA1N** command to WJ28 module.（N means channel code）
4. To WJ28 module input 120% of full scale current or voltage signal
5. Until the signal is stable, send the gain calibration **$ AA0N** command to WJ28 module.
6. Finished

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 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.

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
40011	0010	Input Analog Signal	Read Only	Channel 0 Data Low 8
40012	0011	Input Analog Signal	Read Only	Channel 1 Data Low 8
40013	0012	Input Analog Signal	Read Only	Channel 2 Data Low 8
40014	0013	Input Analog Signal	Read Only	Channel 3 Data Low 8
40015	0014	Input Analog Signal	Read Only	Channel 4 Data Low 8
40016	0015	Input Analog Signal	Read Only	Channel 5 Data Low 8
40017	0016	Input Analog Signal	Read Only	Channel 6 Data Low 8
40018	0017	Input Analog Signal	Read Only	Channel 7 Data Low 8
40021	0020	4-20mA special	Read Only	Channel 0 Data High 16

40022	0021	4-20mA special	Read Only	Channel 1 Data High 16
40023	0022	4-20mA special	Read Only	Channel 2 Data High 16
40024	0023	4-20mA special	Read Only	Channel 3 Data High 16
40025	0024	4-20mA special	Read Only	Channel 4 Data High 16
40026	0025	4-20mA special	Read Only	Channel 5 Data High 16
40027	0026	4-20mA special	Read Only	Channel 6 Data High 16
40028	0027	4-20mA special	Read Only	Channel 7 Data High 16
40211	0210	Module Name	Read Only	High:0x00 Low:0x28
40221	0220	Channel status	Read/Write	High:0x00 Low: (0xFF)

Table 5 Modbus RTU register description

Support Modbus RTU communication protocol **Function Code 03**(Read Holding Registers), command format as standard Modbus RTU protocol.

Example 1: If the module address is 01,hexadecimal sent: 010300000001840A,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 4-20mA or A3:0-20mA,conversion 0x1999*20mA/0x7FFF= 4mA.That indicates the input current is 4mA.

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

Example 2: Rang is A4:4-20mA,you can also read the data 4-20mA special register data, register address 40021~40028, 4mA correspond 0x0000,20mA correspond 0x7FFF.As followings:

If the module address is 01,hexadecimal sent: **01030020000185C0,**to get the data register data 40021**.**

01	03	00	20	00	01	85	C0
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 4-20mA,conversion 0x1999*16mA/0x7FFF= 3.2mA,then adds ZERO 4mA,That indicates the input current is 7.2mA.

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

MODBUS protocol range and high data 16bits corresponding relationship:

Input Range	+F.S	ZERO	-F.S
A1：0-1mA **A2：0-10mA** **A3：0-20mA** **A4：4-20mA** **A5：0-±1mA** **A6：0-±10mA** **A7：0-±20mA** **A8：user-defined** **U1：0-5V** **U2：0-10V** **U3：0-75mV** **U4：0-2.5V** **U5：0-±5V** **U6：0-±10V** **U7：0-100mV** **U8：user-defined**	0x7FFF	0x0000	0x8000
A4：4-20mA register **40021~40028** **4-20mA special** register range corresponding relationship	0x7FFF （20mA）	0x0000 （4mA）	0x0000

Size(unit:mm)　　　　DIN35 Rail Mounted
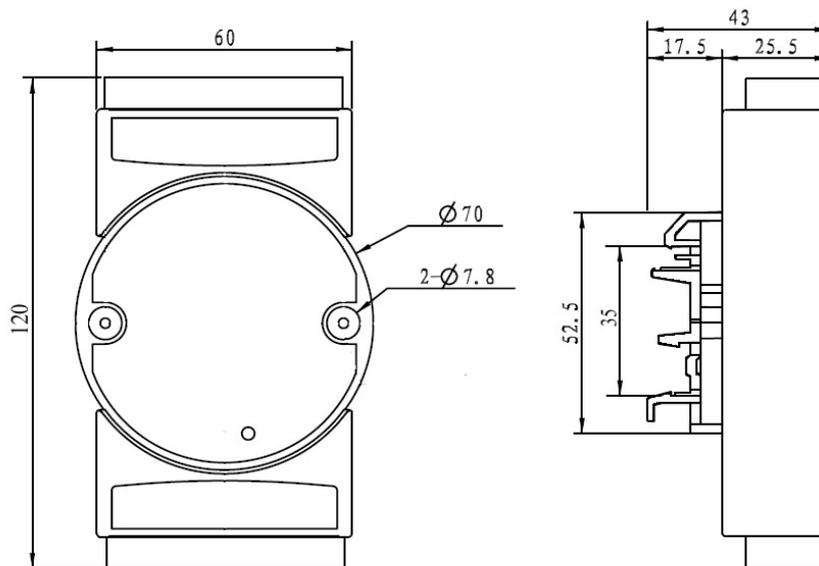
Warranty

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

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