8-ch DI 8-ch DO Switch Signal to RS485/232 Converters (WJ60 Series)

Features：

>> Eight channels digital signal input and output

>> Can read input level status via the RS-485/232 interface

>> Can set output state via the RS-485/232 interface

>> Input/output/power supply: no-isolation

>> Wide power supply range: 8 ~ 32VDC

>> High reliability, easy programming, easy application

>> DIN35 Rail-mounted

>> Can programme setting module address, baud rate

>> Support **Modbus RTU** communication protocol

>> Dimensions: 120 mm x 70 mm x 43mm

Applications：

>> level signal measurement, monitoring and control

>> RS-485 remote I / O, data acquisition

>> Intelligent building control, security engineering applications

>> RS-232/485 bus in industrial automation control system

>> Industrial signal isolation and long-term transmission

>> Equipment operation monitoring

>> Sensor signal measurement

>> Industrial data acquisition and recording

>> Medical, industrial product development

>> Switching signal acquisition

Figure 1   WJ60

Product Overview:

WAYJUN WJ60 series products realize the signal acquisition between sensor and host, to measure the switching signal. WJ60 series can be used in RS-232/485 bus industrial automation control system, switching signal measurement, monitoring and control, high and low level signal measurement, industrial field signal isolation and long-term industrial transmission and so on.

Products include power supply conditioning, switch acquisition, switch out and RS485 serial communication. Each serial interface can connect up to 255 pieces WJ60 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.
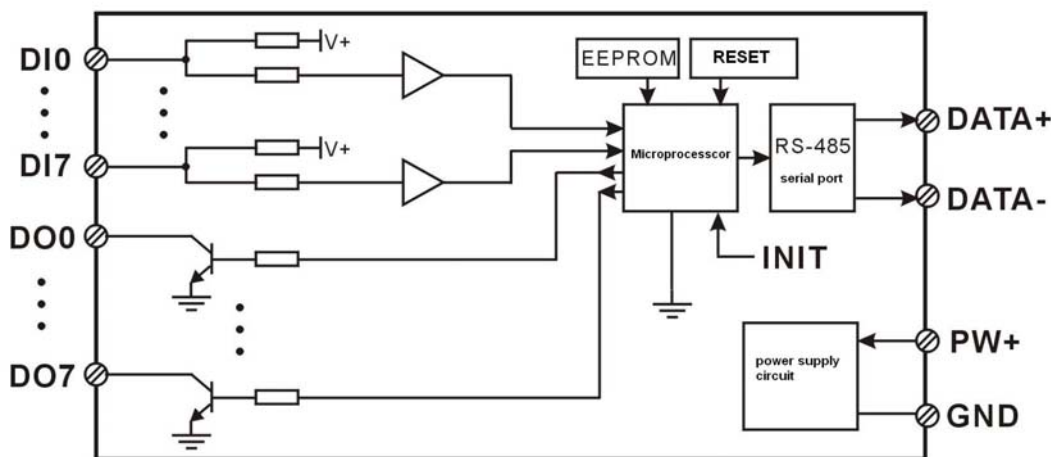
Figure 2: WJ60 Block Diagram

WJ60 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**.

WJ60 products are according to industry standard design, non-isolation between signal input / output, high anti-interference ability and reliability. Operating temperature range is **- 45 ~ +85 °C**.

Function Description:

WJ60 remote I/O module can be used to measure 8 channels switching signal, and 8 channels switch signal output.

1. Switch signal input and output

8 channels switching signal Input, can contact and wet contact. Details refer to the wiring diagram.

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:

WJ60 - ☐

Communication Interface

485： output is RS-485 interface

232： output is RS-232 interface
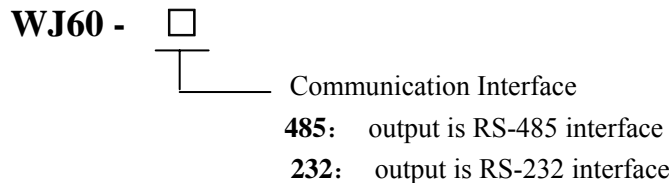
Sample 1:　part No.: **WJ60-232**　means output is RS-232 interface

Sample 2:　part No.: **WJ60-485**　means output is RS-485 interface

WJ61 General parameters:

 (typical @ +25 ℃, Vs is 24VDC)

Input type: switch input(D10~D17)

　　　Low level: input　　<1V

　　　High level: input　 3.5~30V

Input Resistance:>10KΩ

Output type: open collector output, voltage 0~30V,maximum load current:30mA,8 channels(DO0~DO7)

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 0.5W

Operating Temperature: - 45 ~ +85℃

Humidity: 10 ~ 90% (no condensation)

Storage Temperature: - 45 ~ +85℃

Storage Humidity: 10 ~ 95% (no condensation)

Isolation Voltage: non-isolation

Dimensions: 120 mm x 70 mm x 43mm

Footprint Function:

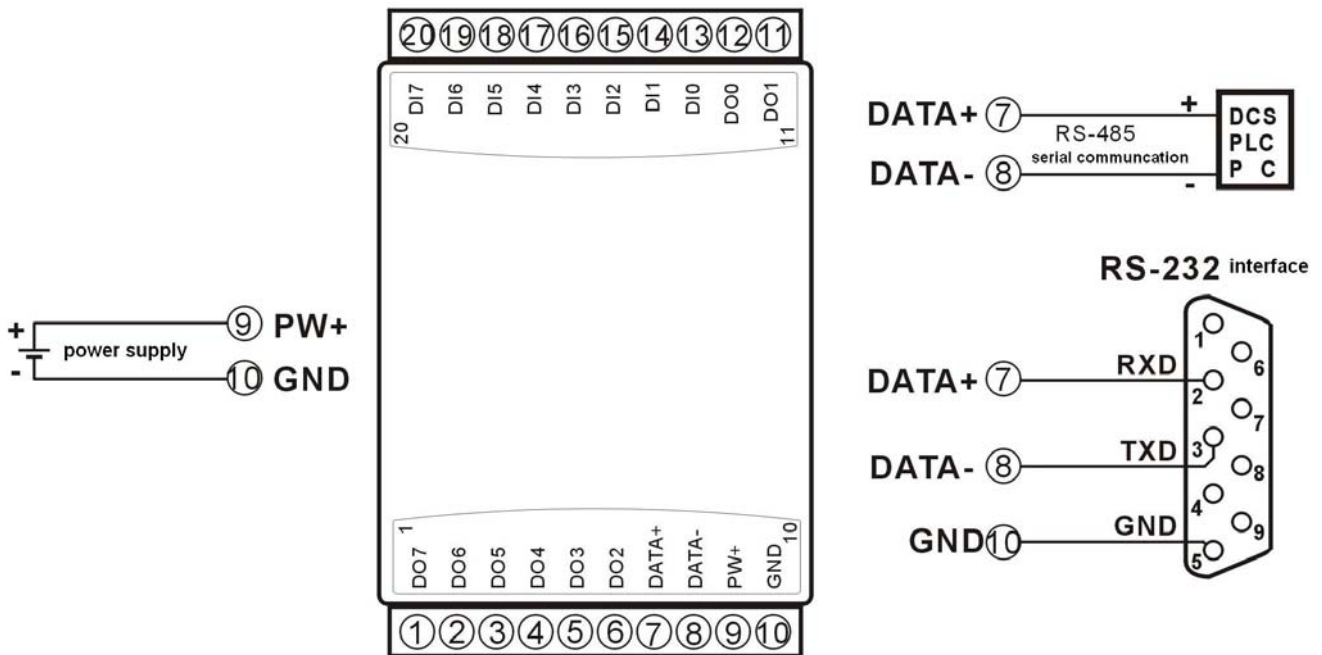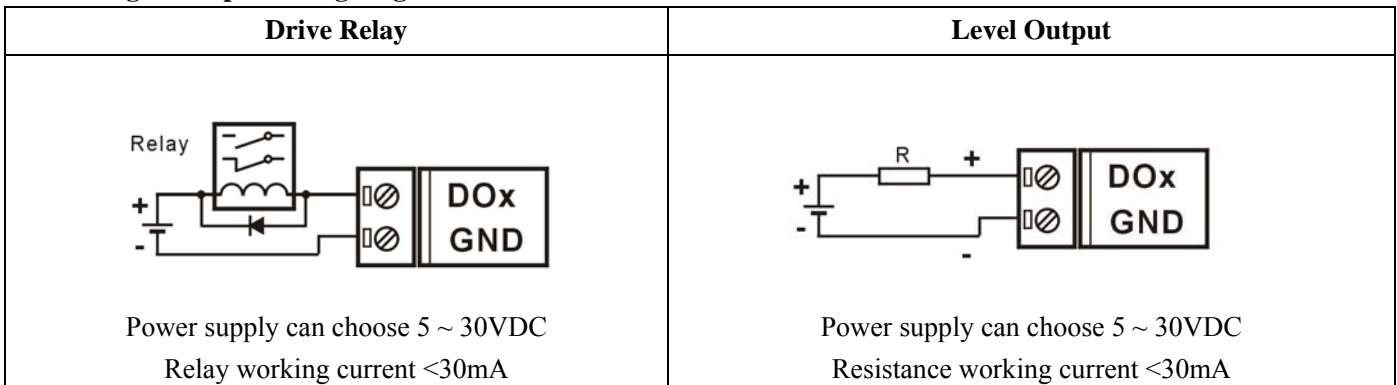| PIN	Name	Function	PIN	Name	Function
1	DO7	Channel 7 switching output	11	DO1	Channel 1 switching output
2	DO6	Channel 6 switching output	12	DO0	Channel 0 switching output
3	DO5	Channel 5 switching output	13	DI0	Channel 0 switching input
4	DO4	Channel 4 switching output	14	DI1	Channel 1 switching input
5	DO3	Channel 3 switching output	15	DI4	Channel 2 switching input
6	DO2	Channel 2 switching output	16	DI3	Channel 3 switching input
7	DATA+	RS-485 signal +	17	DI4	Channel 4 switching input
8	DATA−	RS-485 signal -	18	DI5	Channel 5 switching input
9	PW+	Power supply +	19	DI6	Channel 6 switching input
10	GND	Power supply -, signal ground	20	DI7	Channel 7 switching input

Figure 3   WJ60 Wiring Diagram

Switch signal input wiring diagram

Dry contact	TTL/CMOS Level,24V level input

Open collector input	
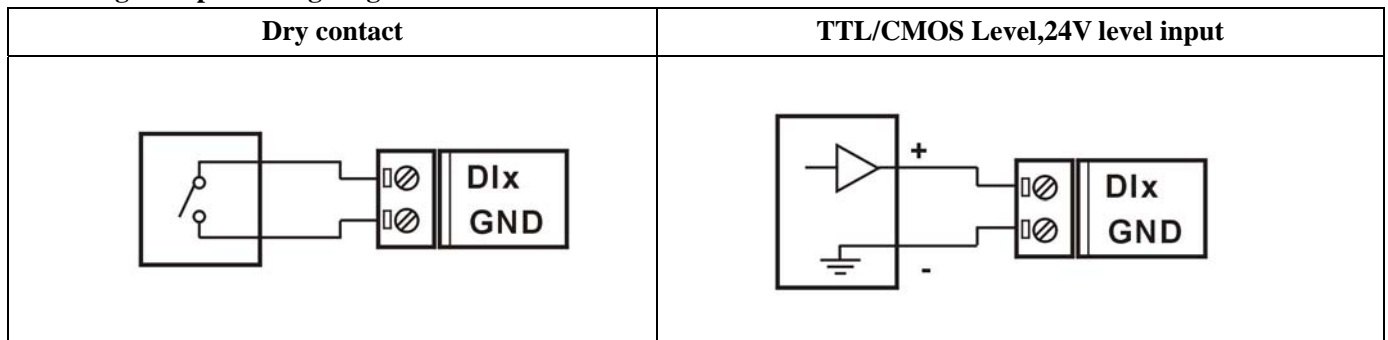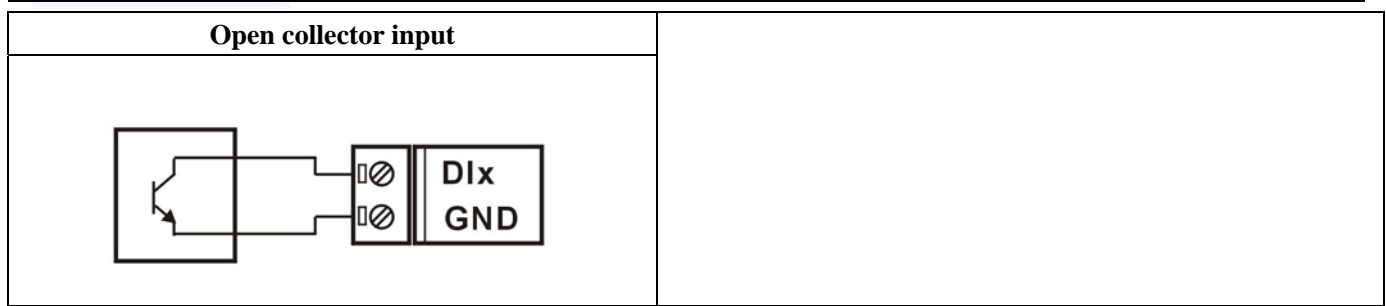
Switch signal output wiring diagram

Drive Relay	Level Output
Power supply can choose 5 ~ 30VDC	Power supply can choose 5 ~ 30VDC
Relay working current <30mA	Resistance working current <30mA

Initialization WJ60 module:

All WJ60 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 WJ61 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 WJ60 module address. WJ60 module can be connected the power cord and RS485 communication lines, through configuration commands to modify the WJ60 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:

WJ60 module has a **INIT** switch, in the flank position. Connecting the **INIT** switch to **INIT** position, then open power, the module into the default state. In this state, the module is configured as follows:

Address code:**00**

Baud rate:**9600 bps**

Checksum is disable

At this time, via configuration commands you can modify WJ60 module baud rate,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 putting the **INIT** switch to **INIT** position, 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: Normally,please put the **INIT** switch to **NORMAL** position.

WJ60 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 WJ61 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 Switch Status Command

Description: Read back all output channels switch state and input channels switch state from the module

Command Format：**$AA6(cr)**

Parameters: **$**   delimiter character. Hexadecimal **24H**

         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 ： **!(dataOutput) (dataInput)00(cr)**   command is valid.

         ?AA(cr)   invalid command or illegal operation.

Parameter Description: **!**   delimiter character, hexadecimal **21H**

     (dataOutput) means read switch status,two 16 hexadecimal

     The first represents **7~4** channel

     The second represents **3~0** channel

     Value 0: output triode non-conduction

     Value 1: output triode conduction

    16 Hexadecimal is each character **ASCII**

DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
dataOutput							

     (dataInput) means read switch status,two 16 hexadecimal

     The first represents **7~4** channel

     The second represents **3~0** channel

     Value 0: input is low level

     Value 1: input is high level

    16 Hexadecimal is each character **ASCII**

DI7	DI6	DI5	DI4	DI3	DI2	DI1	DI0
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
dataInput							

    ?   delimiter character which indicates a invalid command.

    AA   represents input module address

    (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)   **$016(cr)**

           (Hexadecimal format)   **243031360D**

     Module response (character format)   **!221100 (cr)**

           (Hexadecimal format)   **213232313130300D**

Description: read output data is **22**,into 2 hexadecimal is **0010 0010**, then at address **01H** module ,input switch state is:

     Channel 0: triode non-conduction   Channel 1: triode conduction

     Channel 2: triode non-conduction   Channel 3: triode non-conduction

     Channel 4: triode non-conduction   Channel 5: triode conduction

     Channel 6: triode non-conduction   Channel 7: triode non-conduction

     read output data is **11**,into 2 hexadecimal is **0001 0001**, then at address **01H** module ,input switch state is:

Channel 0: high level   Channel 1: low level   Channel 2: low level   Channel 3: low level

Channel 4: high level   Channel 5: low level   Channel 6: low level   Channel 7: low level

2、Set Switch output Command

Description: Set all output channels switch state

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

Parameter :   **#**   delimiter character. 16 hexadecimal is **24H**

     AA   module address, (range **00-FF**) , the factory address is **01**,convert 16 hexadecimal for each characters **ASCII** code.Such as changes address **01** to 16 hexadecimal is **30H** and **31H**

     BB   channel selection,which can select all output channels or single output channel.Set **BB** to **00**,said to set all the output channels.If set single channel,the first character **B** must be set to **1**,the second character **B** can be set to **0~7**,representing **8 DO** output channels.

     (data) output value

    1. If set all channnles（BB=00）,

For two 16 hexadecimal

The first represents 7~4 channel

DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
dataOutput							

Second represents 3~0 channel

Value=0:

Set the output triode non-conduction

Value=1:

Set the output triode conduction

2. If set single channel (**BB**=**1**X, X said the channel to configure),it can only be set to **00** or **01**

00: set X channel output triode non-conduction

01: set X channel output triode conduction

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

Response: >(cr) command is valid

?AA(cr) command is invalid or illegal operation

Parameter Description:

> delimiter character, 16 hexadecimal is **3EH**

? 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.

If you can not input enter characters using a serial communication software, please switch to 16 hexadecimal format.

Example 1: **command**(character format) **#010022(cr)**

(Hexadecimal format) **233031303032320D**

Response(character format) **>(cr)**

(Hexadecimal format) **3E0D**

Description: Module address **01H**, set all channels (BB=00) output 22H, change to 2 hexadecimal is 0010 0010, then address 01H module output switch state:

Channel 0: triode no-conduction   Channel 1: triode conduction

Channel 2: triode no-conduction   Channel 3: triode no-conduction

Channel 4: triode no-conduction   Channel 5: triode conduction

Channel 6: triode no-conduction   Channel 7: triode no-conduction

Example 1: **command**(character format) **#011201(cr)**

(Hexadecimal format) **233031313230310D**

Response(character format) **>(cr)**

(Hexadecimal format) **3E0D**

Description: Module address **01H**, set Channel 2 triode conduction

3、Set WJ60 Module Command

Description: set WJ60 module address, baud rate, checksum. Configuration information in EEPROM.

Command Format: **#AABB(data)(cr)**

Parameter : **%** delimiter character

AA module address, range 00～FF(16 hexadecimal). the factory address is **01**,convert 16 hexadecimal for each characters **ASCII** code. Such as changes address **01** to 16 hexadecimal is **30H** and **31H**

NN new module 16 hexadecimal address, range is from 00 to FF. convert 16 hexadecimal for each characters **ASCII** code. Such as changes address **18** to 16 hexadecimal is **31H** and **38H**

TT 16 hexadecimal indicates type code.**WJ60** must been set **00**

CC Baud Rate code (16 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 bits0 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 code

Bit 7：Reserved bits (must set to 0)

Bit 6：checksum states, if 0:Disabled, if 1: Enabled

Bit 5-bit 0：Not used(must set to 0)

(cr)   terminating character, carriage return (**0DH**)

Response: !AA(cr)   command is valid

?AA(cr) command is invalid or illegal operation, or before changing baud rate or checksum, do not put **INIT** switch to **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 put **INIT** switch to **INIT** position, 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 **WJ60** module original address set to **01H.**

11   indicates new module 16 hexadecimal address is **11H**

00   indicates type code, WJ60 must been set to **00**

06   indicates baud rate: **9600 baud**

00   indicates checksum is disabled

4、Read Set Status Command

Description: Read configuration for a specified WJ60 module.

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

Parameter: **$**   delimiter character

AA   module address, (range **00-FF**) 16 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 WJ60 module address is **30H**

00   indicates input type code

06   represents that baud rate is **9600 baud**

00   represents disable checksum

4、Read Module Name Command

Description: Return the module name from the specified WJ60 module

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

Parameter: **$**   delimiter character

AA   module address, (range 00-FF) 16 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 WJ60

(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   !08WJ60 (cr)

Module is WJ60 at address 08H

5、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) 16 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** protocol

Example 2:   **command**   **$00P0(cr)**

                response   **!00 (cr)**

Set protocol command to characters protocol

Modbus RTU communication protocol:

Module factory default protocol module is character communication protocol, if you want the module is **Modbus RTU** communication protocol, please set according to the following steps:

1. Put the **INIT** switch to **INIT** position.

2. Connect the power line and communication interface line correctly.

3. Switch on the power, module enter into the default state automatically, communication addressis **00**, baud rate is **9600**.

4. Wait 5 seconds, the module initialization.

5. Send the command **$00P1(cr)**, check the answer, if is **!00 (cr)** ,means setting successful.

6. Turn off the power, put **INIT** switch to the **NORMAL** position.

7. The module has been set to the **Modbus RTU** communication protocol.

Communication instructions:

Support the function code **01**, read coil status.

1 represents high level, **0** represents low level.

Support the function code **05**, set single coil.

1 represents triode conduction, **0** represents triode no-conduction

Register Description:

Address 0X（PLC）	Address（PC，DCS）	Data	Property	Data Explanation
00001	0000	Output switch	Read/Write	output status of channel 0
00002	0001	Output switch	Read/Write	output status of channel 1
00003	0002	Output switch	Read/Write	output status of channel 2
00004	0003	Output switch	Read/Write	output status of channel 3
00005	0004	Output switch	Read/Write	output status of channel 4
00006	0005	Output switch	Read/Write	output status of channel 5
00007	0006	Output switch	Read/Write	output status of channel 6
00008	0007	Output switch	Read/Write	output status of channel 7
00033	0032	Input switch	Read Only	level status of channel 0

00034	0033	Input switch	Read Only	level status of channel 1
00035	0034	Input switch	Read Only	level status of channel 2
00036	0035	Input switch	Read Only	level status of channel 3
00037	0036	Input switch	Read Only	level status of channel 4
00038	0037	Input switch	Read Only	level status of channel 5
00039	0038	Input switch	Read Only	level status of channel 6
00040	0039	Input switch	Read Only	level status of channel 7
40211	0210	Module Name	Read Only	High：0x00 Low：0x60

Table 5 Modbus RTU register description

Size(unit:mm)
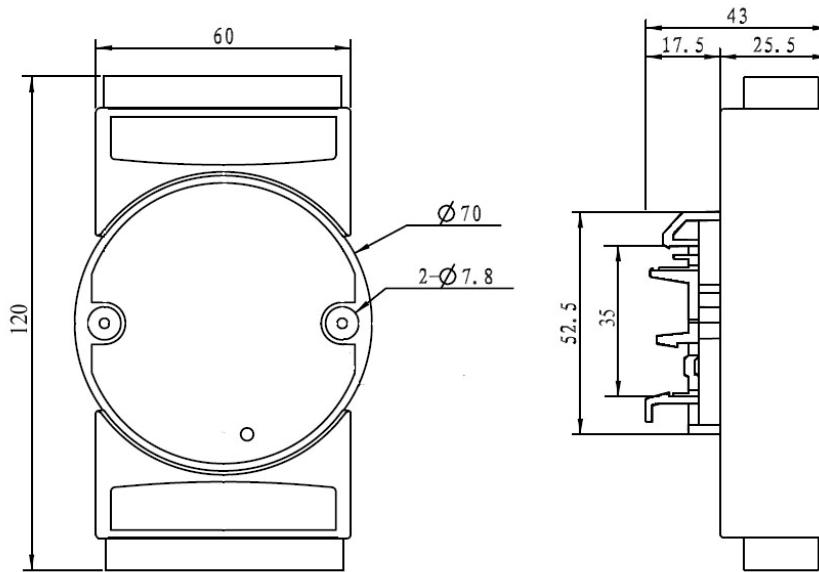
Warranty

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

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