16-ch DI Switch Signal to RS485/232 Converters (WJ61 Series)

Features：

>> Sixteen channels switch signal acquisition,isolated RS-485/232 output

>> Support 16-ch dry contact input or 16-ch wet contact input

>> Can read level status of each channel via the RS-485/232 interface

>> Input/output: 3000VDC 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   WJ61

Product Overview:

WAYJUN WJ61 series products realize the signal acquisition between sensor and host, to measure the switching signal. WJ61 series can be used in RS-232/485 bus industrial automation control system,switching signal measurement, monitoring and control, high and low leveal signal measurement,industrial field 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 WJ61 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.
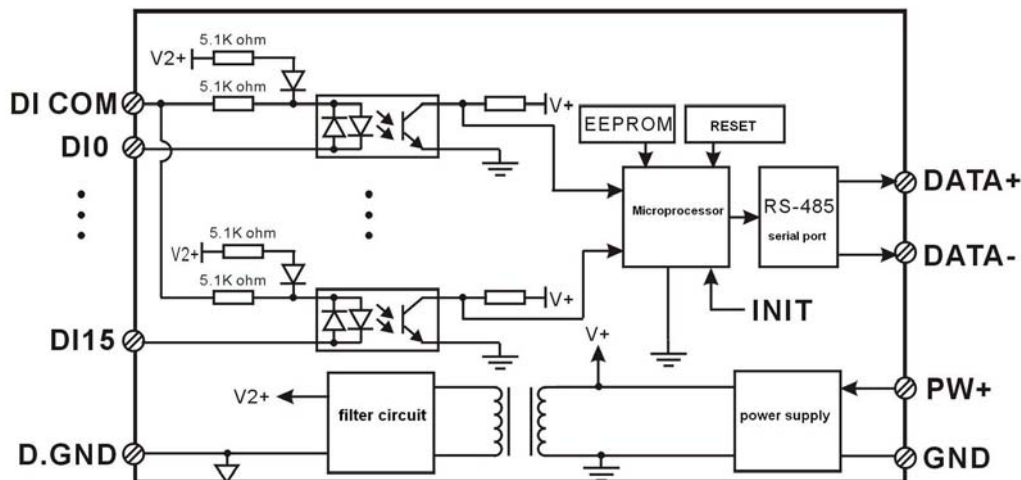

Figure 2: WJ61 Block Diagram

WJ61 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**.

WJ61 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:

WJ61 Switch signal isolation acquisition module can be used to measure 16 channels switching signal.

1. Switch signal input

16 channels switching signal. input/output is isolated. Support 16-ch dry contact input or 16-ch wet contact input

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:

$$\textbf{WJ61 - } \square$$

Communication Interface

485： output is RS-485 interface

232： output is RS-232 interface
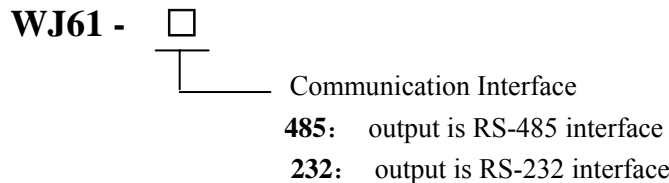
Sample 1: part No.: **WJ61-232** means output is RS-232 interface

Sample 2: part No.: **WJ61-485** means output is RS-485 interface

WJ61 General parameters:

(typical @ +25 ℃, Vs is 24VDC)

Input type: wet contact input

Low level(**0**): input <3V

High level(**1**): input 10-50V

dry contact input

Low level(**0**):disconnect

High level(**1**):connect to **D.GND**

Input Resistance:5.1KΩ

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: input / output: 3KVDC, 1 minute, leak 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	D. GND	switching signal ground	14	DI0	Channel 0 switching input
2	DI11	Channel 11 switching input	15	DI1	Channel 1 switching input
3	DI12	Channel 12 switching input	16	DI2	Channel 2 switching input
4	DI13	Channel 13 switching input	17	DI3	Channel 3 switching input
5	DI14	Channel 14 switching input	18	DI4	Channel 4 switching input
6	DI15	Channel 15 switching input	19	DI5	Channel 5 switching input
7	DI COM	switching input common	20	DI COM	switching input common
8	NC	No connect	21	DI6	Channel 6 switching input
9	NC	No connect	22	DI7	Channel 7 switching input
10	DATA+	RS-485 signal +	23	DI8	Channel 8 switching input
11	DATA-	RS-485 signal -	24	DI9	Channel 9 switching input
12	PW+	Power supply +	25	DI10	Channel 10 switching input
13	GND	Power supply -	26	D. GND	switching signal ground
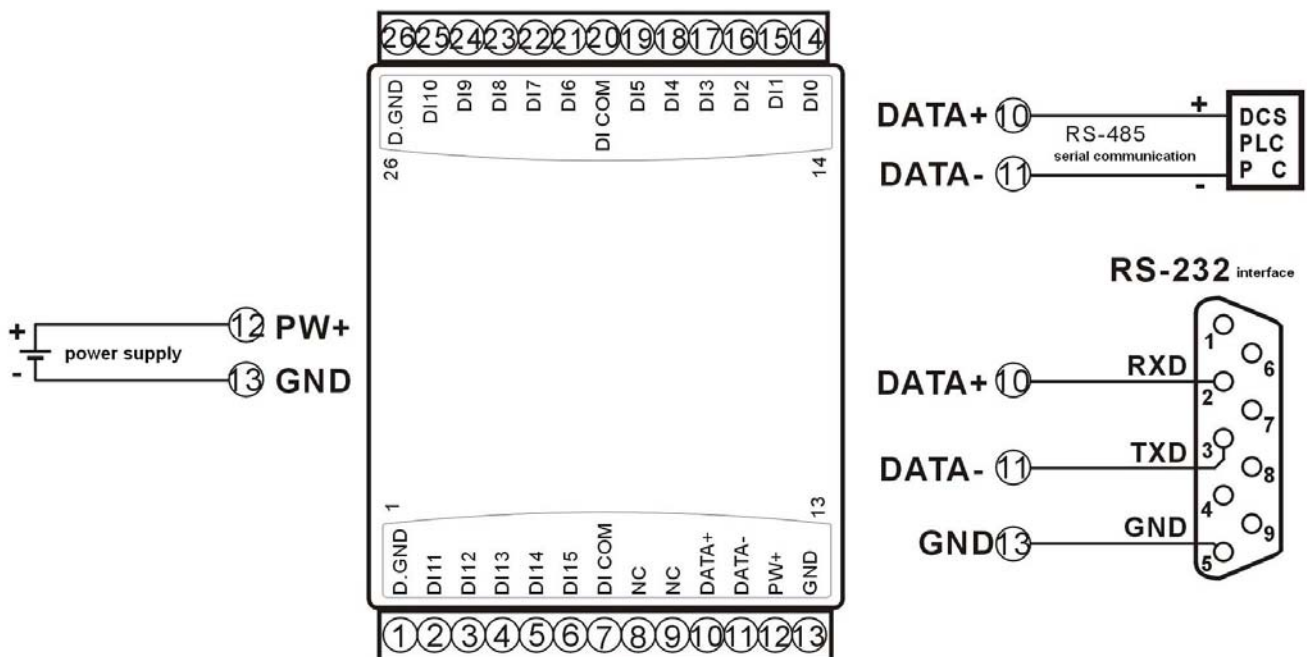
Figure 3   WJ61 Wiring Diagram

Switch signal input wiring diagram

Dry contact	Wet contact
Open collector input	
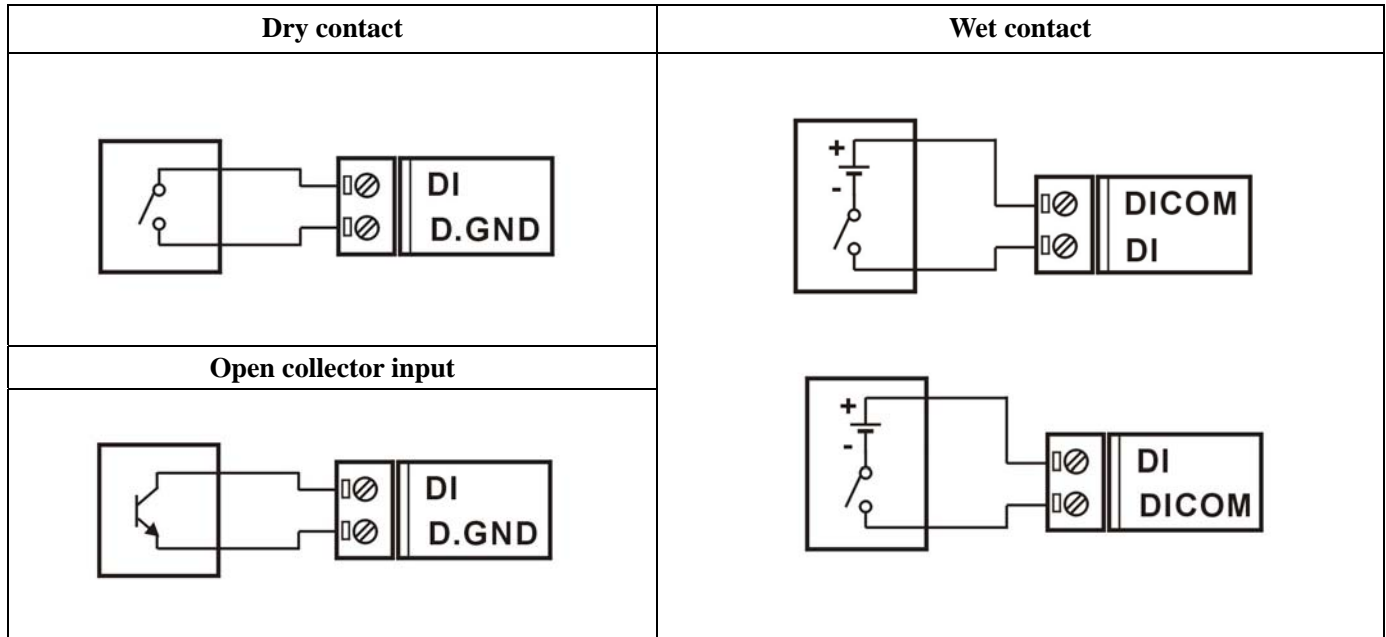
Initialization WJ61 module:

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

WJ62 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 WJ61 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.

WJ61 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 all channels switch input 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： **!(dataInputHigh) (dataInputLow)00(cr)** command is valid.

?AA(cr) invalid command or illegal operation.

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

(**dataInputHigh**) means read switch status,two 16 hexadecimal

The first represents **15~12** channel

The second represents **11~8** channel

Value 0:input is low level

Value 1:input is high level

IN15	IN14	IN13	IN12	IN11	IN10	IN9	IN8
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
dataInputHigh							

16 Hexadecimal is each character **ASCII**

(**dataInputLow**) 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

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

16 Hexadecimal is each character **ASCII**

(**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 data is **18**,into 2 hexadecimal is **00010001**, 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

Channel 8: low level   Channel 9: high level   Channel 10: low level   Channel 11: low level

Channel 12: low level   Channel 13: high level   Channel 14: low level   Channel 15: low level

2、Set WJ61 Module Command

Description: Set address, input ranges, baud rate, checksum state for a WJ61 module, counter data are stored in a EEPROM.

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

Parameter :   **%**   delimiter character

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**

NN   indicates new module 16 hexadecimal address, value **NN** range is **00~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.**WJ61** 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 **WJ61** module original address set to **01H.**

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

00   indicates type code, WJ62 must been set to **00**

06   indicates baud rate: **9600 baud**

00   indicates checksum is disabled

3、Read Set Status Command

Description: Read configuration for a specified WJ61 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 WJ61 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 WJ61 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 WJ61

(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 **!08WJ61 (cr)**

Module is WJ61 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.

Register Description:

Address 0X（PLC）	Address（PC，DCS）	Data	Property	Data Explanation
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
00041	0040	Input switch	Read Only	level status of channel 8
00042	0041	Input switch	Read Only	level status of channel 9
00043	0042	Input switch	Read Only	level status of channel 10
00044	0043	Input switch	Read Only	level status of channel 11
00045	0044	Input switch	Read Only	level status of channel 12
00046	0045	Input switch	Read Only	level status of channel 13
00047	0046	Input switch	Read Only	level status of channel 14
00048	0047	Input switch	Read Only	level status of channel 15
40211	0210	Module Name	Read Only	High：0x00 Low：0x61

Table 5 Modbus RTU register description

Size(unit:mm)
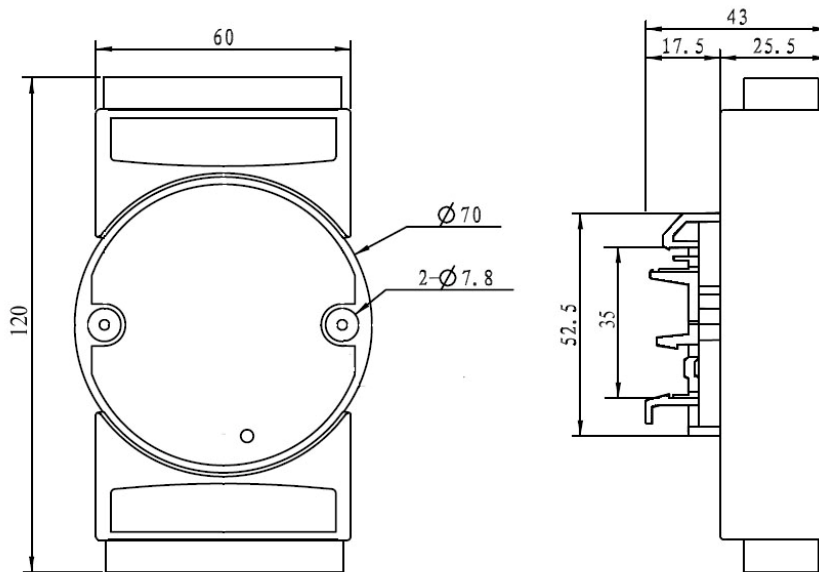
Warranty

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

Copyright

Copyright © 2011 **Shenzhen WAYJUN Industrial Automation**

Specifications subject to change without notice.

Brand

In this manual, mentioned other trademarks and copyright belongs to their respective owners.