4-ch DI 4-ch Relay Output, RS485/232 Remote Data Acquisition Module I/O
(WJ70 Series)

Features：

>> Four switch input, four relay 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: three-isolation (1500VAC)

>> Isolation between each input,isolation between each output

>> 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   WJ70

Product Overview:

WAYJUN WJ70 series products realize the signal acquisition between sensor and host, to measure the switching signal. WJ70 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 WJ70 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.
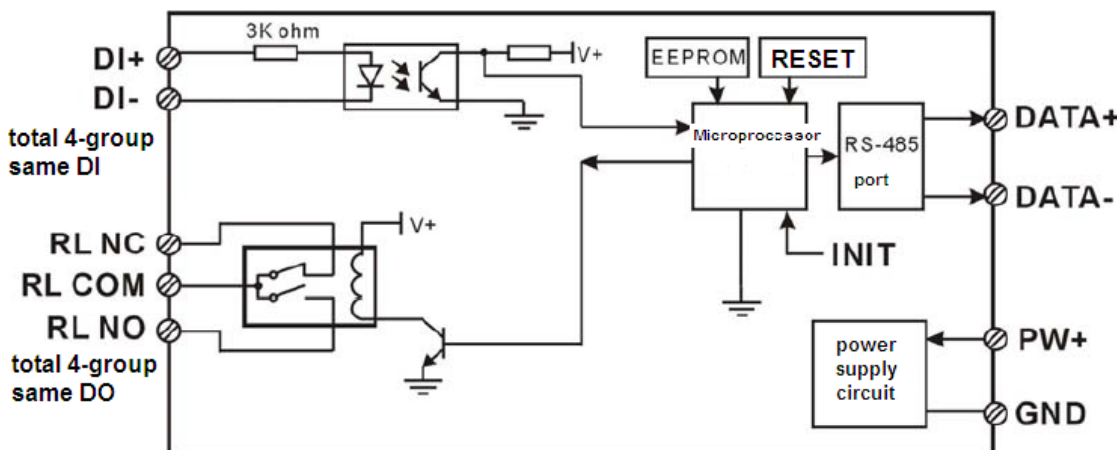

Figure 2: WJ70 Block Diagram

WJ70 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**.

WJ70 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:

WJ70 remote I/O module can be used to measure 4 channels switching signal, and 4 channels relay signal output.4-channel C type relay signal output,there are often open and close nodes.

1. Switch signal input and output

4 channels switching signal Input, can connect dry 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:

WJ70 - ☐

                        Communication Interface

                    485：   output is RS-485 interface

                    232：   output is RS-232 interface

Sample 1:   part No.: **WJ70-232**   means output is RS-232 interface

Sample 2:   part No.: **WJ70-485**   means output is RS-485 interface

WJ70 General parameters:

  (typical @ +25 ℃, Vs is 24VDC)

Input type: switch input,4 channels (DI0~DI3)

          Low level: input   <1V

          High level: input   4 ~30V

Input Resistance: 3KΩ

Output type:C type relay signal output,4 channels (DO0~DO3) .Normally open/normally closed and public

          Contact load capacity: 1A 125VAC or 2A 30VDC .

          Contact form: 2Z

          Maximum switching voltage: 240VAC / 120VDC

          Maximum switching current: 2A

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: Isolation between each input,isolation between each output. Input/output/power supply: three-isolation (1500VAC)

Dimensions: 120 mm x 70 mm x 43mm

Footprint Function:

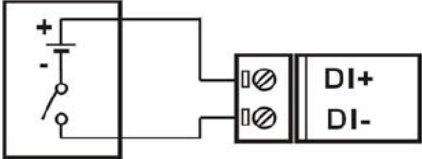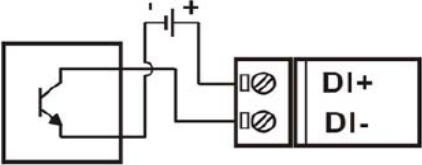| PIN	Name	Function	PIN	Name	Function
1	DI0+	Channel 0 switching signal input+	14	RL0NC	Relay 0 normally closed output
2	DI0−	Channel 0 switching signal input-	15	RL0COM	Relay 0 public output
3	DI1+	Channel 1 switching signal input+	16	RL0NO	Relay 0 normally open output
4	DI1−	Channel 1 switching signal input-	17	RL1NC	Relay 1 normally closed output
5	DI2+	Channel 2 switching signal input+	18	RL1COM	Relay 1 public output
6	DI2−	Channel 2 switching signal input-	19	RL1NO	Relay 1 normally open output
7	DI3+	Channel 3 switching signal input+	20	NC	NO connecting
8	DI3−	Channel 3 switching signal input-	21	RL2NC	Relay 2 normally closed output
9	NC	NO connecting	22	RL2COM	Relay 2 public output
10	DATA+	RS-485 signal +	23	RL2NO	Relay 2 normally open output
11	DATA−	RS-485 signal -	24	RL3NC	Relay 3 normally closed output
12	PW+	Power supply +	25	RL3COM	Relay 3 public output
13	GND	Power supply -	26	RL3NO	Relay 3 normally open output
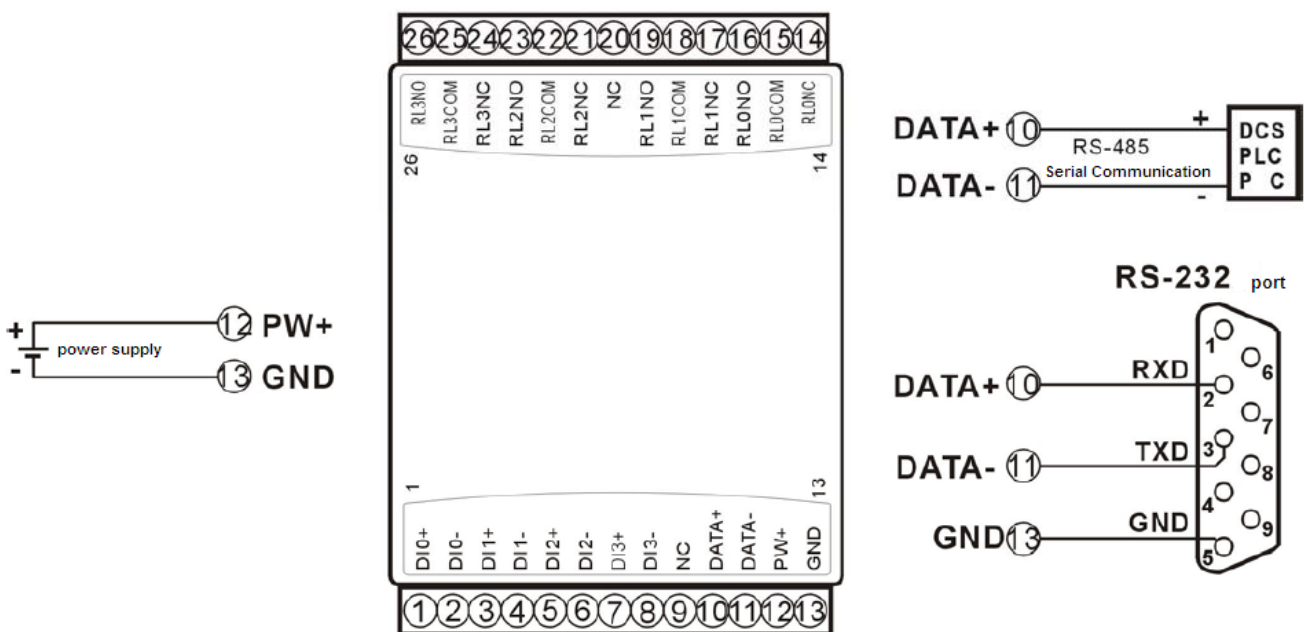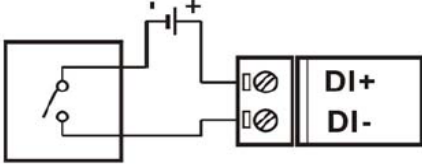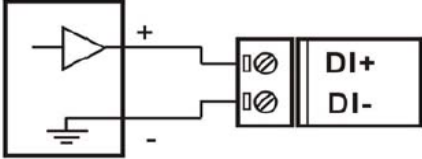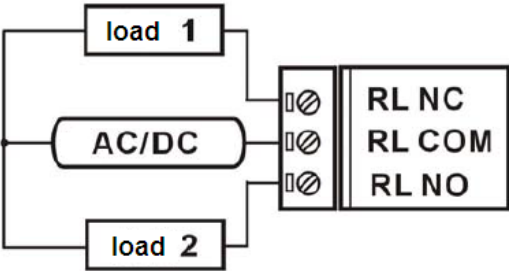
Figure 3　WJ70 Wiring Diagram

Switch signal input wiring diagram

Relay signal output wiring diagram

0: relay disconnect,load 1 work,load 2 stop

1: relay connect,load 1 stop,load 2 work

Initialization WJ70 module:

All WJ70 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 WJ70 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 WJ70 module address. WJ70 module can be connected the power cord and RS485 communication lines, through configuration commands to modify the WJ70 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:

WJ70 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 WJ70 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.

WJ70 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 WJ70 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

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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 **0**

　　　　The second represents **3~0** channel

0	0	0	0	DO3	DO2	DO1	DO0
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
dataOutput							

　　　　Value 0: output relay disconnect

　　　　Value 1: output relay connect

　　　16 Hexadecimal is each character **ASCII**

　　　　　(dataInput) means read switch status,two 16 hexadecimal

　　　　The first represents 0

　　　　The second represents **3~0** channel

0	0	0	0	DI3	DI2	DI1	DI0
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
dataInput							

　　　　Value 0: input is low level

　　　　Value 1: input is high level

　　　16 Hexadecimal is each character **ASCII**

　　?　　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)　**!020100 (cr)**

　　　　　　　(Hexadecimal format)　　**213032303130300D**

Description: read output data is **02**,into 2 hexadecimal is **0000 0010**, then at address **01H** module ,input switch state is:

　　　　Channel 0: Relay disconnect　　　Channel 1: Relay connect

　　　　Channel 2: Relay disconnect　　　Channel 3: Relay disconnect

　　　　read output data is **01**,into 2 hexadecimal is **0000 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

2、Set Relay output Command

Description: Set all output channels relays state

Command Format: **#AABB(data)(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 **0~3**,representing **4 DO** output channels.If set BB to FF,represents setting all channels output value.

(data) output value

1. If set all channels（BB=00）, （BB=FF,connected power output value）,

For two 16 hexadecimal

The first represents 0

Second represents 3~0 channel

0	0	0	0	DO3	DO2	DO1	DO0
Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
dataOutput							

Value=0:

Set the output relay disconnect

Value=1:

Set the output relay connect

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 relay disconnect

01: set X channel output relay connect

(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) **#010002(cr)**

(Hexadecimal format) **233031303030320D**

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

(Hexadecimal format) **3E0D**

Description: Module address **01H**, set all channels (BB=00) output 02H, change to 2 hexadecimal is 0000 0010, then address 01H module output switch state:

Channel 0: relay disconnect   Channel 1: relay connect

Channel 2: relay disconnect   Channel 3: relay disconnect

Example 2: command(character format) **#011201(cr)**

(Hexadecimal format) **233031313230310D**

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

(Hexadecimal format) **3E0D**

Description: Module address 01H,set channel 2 relay connect

3、Set WJ70 Module Command

Description: set WJ70 module address, baud rate, checksum. Configuration information in EEPROM.

Command Format: **%AANNTTCCFF(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.**WJ70** 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 **WJ70** module original address set to **01H.**

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

   00   indicates type code, WJ70 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 WJ70 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 WJ70 module address is **30H**

00 indicates input type code

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

00 represents disable checksum

5、Read Module Name Command
Description: Return the module name from the specified WJ70 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 WJ70

(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 **!08WJ70 (cr)**

Module is WJ70 at address 08H

6、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.address 0X

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

Support the function code **05**, set single coil status.address 0X

1 represents output relay connect, **0** represents output relay disconnect.

Support the function code **03**,read hold register.address 4X

Support the function code **06**,set single hold register.address 4X

Register Description:

Address 0X（PLC）	Address（PC，DCS）	Data	Property	Data Explanation

00001	0000	Output relay	Read/Write	output status of channel 0
00002	0001	Output relay	Read/Write	output status of channel 1
00003	0002	Output relay	Read/Write	output status of channel 2
00004	0003	Output relay	Read/Write	output status of channel 3
00011	0010	Relay Connected power Output	Read/Write	output status of channel 0
00012	0011	Relay Connected power Output	Read/Write	Connected power output status of channel 1
00013	0012	Relay Connected power Output	Read/Write	Connected power output status of channel 2
00014	0013	Relay Connected power Output	Read/Write	Connected power output status of channel 3
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
Address 0X（PLC）	Address（PC，DCS）	Data	Property	Data Explanation
40001	0000	Output relay	Read/Write	0x0000~0x000F, 3~0 channel
40011	0010	Output relay	Read/Write	0x0000~0x000F, 3~0 channel connected power output value
40033	0032	Input switch	Read/Write	0x0000~0x000F, 3~0 channel
40211	0210	Module Name	Read Only	High：0x00 Low：0x70

Table 5 Modbus RTU register description

Modbus RTU communication protocol applications:

1. support RTU Modbus communication protocol **function code 01** (read coil state),command format accordance with the standard RTU Modbus protocol.

Communication example: if the module address is 01,sending(16 hexadecimal):**0101000000083DCC**,can get the register data.

01	01	00	00	00	08	3D	CC
Module address	read coil status	Coil address high	Coil address low	Coil address high	Coil address low	CRC check low	CRC check high

If module response:**010101031189** read data 0x03,the last one changes 2 hexadecimal into 0011.

Means current output relay channel 2 and 3 disconnected,channel 1 and 0 connected.

2.support RTU Modbus communication protocol **function code 05** (set single coil),command format accordance with the standard RTU Modbus protocol.

Communication example: if the module address is 01,sending(16 hexadecimal):**01050000FF008C3A**,data 0xFF00 means setting relay connected.

If data 0x0000 means cut off relay(command:**010500000000CDCA**)

01	05	00	00	FF	00	8C	3A
Module address	Set single coil	Coil address high	Coil address low	Data high level	Data low level	CRC check low	CRC check high

If module response:**01050000FF008C3A** setting success.

01	05	00	00	FF	00	8C	3A
Module address	Set single coil	Coil address high	Coil address low	Data high level	Data low level	CRC check low	CRC check high

3.support RTU Modbus communication protocol **function code 03** (read hold register),command format accordance with the standard RTU Modbus protocol.

Communication example: if the module address is 01,sending(16 hexadecimal):**010300000001840A**,can get data register.

01	03	00	00	00	01	84	0A
Module address	Read hold register	Register address high	Register address low	Register number high	Register number low	CRC check low	CRC check high

If module response:**0103020003F845** read data 0x0003,the last one changes 2 hexadecimal into 0011.

Means current output relay channel 2 and 3 disconnected,channel 1 and 0 connected.

01	03	02	00	03	F8	45
Module address	Read hold register	Data bytes number	Data high level	Data low level	CRC check low	CRC check high

4.support RTU Modbus communication protocol **function code 06** (write single register),command format accordance with the standard RTU Modbus protocol.

 Communication example: if the module address is 01,sending(16 hexadecimal):**01060000000FC9CE,**the last one changes 2 hexadecimal into 1111,output relay all channels connected.

01	06	00	00	00	0F	C9	CE
Module address	Write single register	Register address high	Register address low	Data high level	Data low level	CRC check low	CRC check high

If module response:**01060000000FC9CE ,**setting success.

01	06	00	00	00	0F	C9	CE
Module address	Write single register	Register address high	Register address low	Data high level	Data low level	CRC check low	CRC check high

Size(unit:mm)
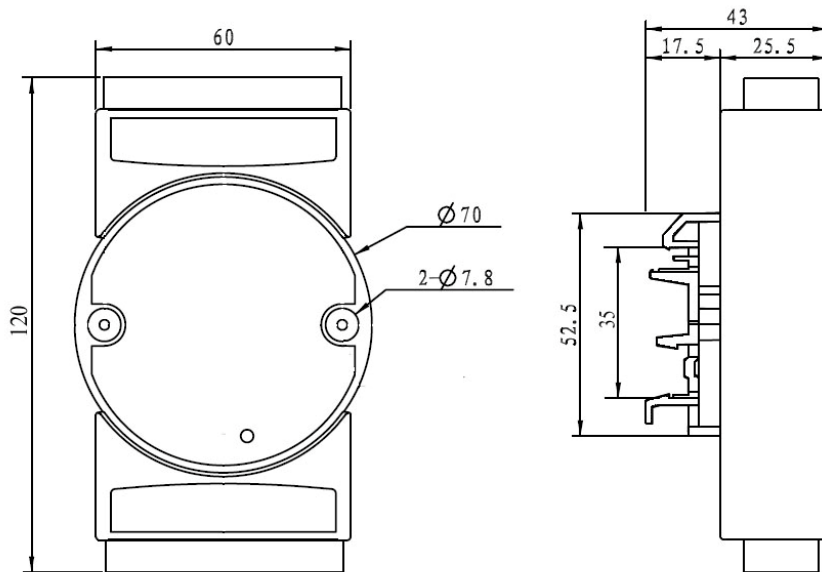
Warranty

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

Copyright

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