

## Three DI and ten DO relay outputs, RS-485/232 remote I/O module WJ71



- •Intelligent building control, security engineering and other application systems
- •RS-232/485 bus industrial automation control system
- •Industrial site signal isolation and long-distance transmission
- Equipment operation monitoring and control
- •Measurement of sensor signals
- Acquisition and recording of industrial field data

## **Product Overview:**

The WJ71 product realizes signal acquisition and control between sensors and hosts, used to detect switch signals or control device operation. The WJ71 series products can be applied in industrial automation control systems with RS-232/485 bus, measurement and control of switch signals, measurement and output of high and low level signals, as well as industrial field signal isolation and long-distance transmission, etc.

The product includes power conditioning, switch quantity acquisition, relay output, and RS-485 serial communication. Each serial port can connect up to 255 WJ71 series modules, and the communication method adopts ASCII code communication protocol or MODBUS RTU communication protocol. The baud rate can be set by code and can be hung on the same RS-485 bus as control modules from other manufacturers, making it easy for computer





## Figure 2 Internal Block Diagram of WJ71 Module

The WJ71 series products are intelligent monitoring and control systems based on microcontrollers. All user set configuration information such as address, baud rate, data format, checksum status, etc. are stored in non-volatile memory EEPROM.

The WJ71 series products are designed and manufactured according to industrial standards, with no isolation between signal inputs/outputs, strong anti-interference ability, and high reliability. The working temperature range is -45 °C to+85 °C.

## **Function Introduction:**

The WJ71 remote I/O module can be used to measure four switch signals and has four relay signal outputs.

1. Switching signal input and output

Three channel switch signal input, capable of connecting dry contacts and wet contacts. Please refer to the wiring diagram for details; Ten relay normally open contact output.

2, Communication Protocol

Communication interface: 1 standard RS-485 communication interface or 1 standard RS-232 communication interface, please specify when ordering and selecting.

Communication Protocol: Supports two protocols, the character protocol defined by the command set and the MODBUS RTU communication protocol. The module automatically recognizes communication protocols and can achieve network communication with various brands of PLCs, RTUs, or computer monitoring systems.

Data format: 10 digits. 1 start bit, 8 data bits, and 1 stop bit.

The communication address (0-255) and baud rate (2400, 4800, 9600, 19200, 38400, 57600, 115200bps) can be set; The communication network can reach a maximum distance of 1200 meters and is connected through twisted pair shielded cables.

High anti-interference design of communication interface,  $\pm 15$ KV ESD protection, communication response time less than 100mS.

3, anti-interference

Checksums can be set as needed. There is a transient suppression diode inside the module, which can effectively suppress various surge pulses and protect the module.

## **Product selection:**

WJ71 - 🗆

Communication interface

485: Output as RS-485 interface

232: Output as RS-232 interface

Selection Example 1: Model: **WJ71-232** indicates that the communication interface is RS-232 Selection Example 2: Model: **WJ71-485** indicates that the communication interface is RS-485

## **WJ71 General Parameters:**

(Typical @+25 °C, Vs is 24VDC) Input type: switch input, 3-channel (DI0~DI2). Low level: Input<1V High level: Input 4~30V

Shenzhen WAYJUN Industrial Automation



Input resistance: $3K \Omega$
Output type: A-type relay output, 10 channels (DO0~DO9). Normally open output.
Contact load capacity: 5A 250VAC/30VDC.
Contact form: 1H
Maximum switching voltage: 250VAC/30VDC
Maximum switching current: 5A
Maximum switching power: 1250VA/150W
Communication: RS-485 or RS-232 standard character protocol and MODBUS RTU communication protocol
Baud rates (2400, 4800, 9600, 19200, 38400, 57600, 115200bps) can be selected by software
The address (0-255) can be selected by software
Communication response time: 100 ms maximum
Working power supply:+8~32VDC wide power supply range, with internal anti reverse and overvoltage protection
circuits
Power consumption: less than 3W
Working temperature: -45~+80 °C
Working humidity: 10~90% (no condensation)
Storage temperature: -45~+80 °C
Storage humidity: 10~95% (no condensation)
Isolation and voltage resistance: 3 isolates between input and output power supplies, with an isolation voltage of
1500VAC
Dimensions: 120mm x 70mm x 43mm

Pin	name	Description	Pin	name	Description			
0.000	RL0COM	Relay 0 common output terminal	sixtee	DI0	Channel 0 switch signal input			
one			n		terminal			
two	RL0NO	Relay 0 normally open output	sevent	DI1	Channel 1 switch signal input			
two		terminal	een		terminal			
three	RL1COM	Relay 1 common output terminal	eighte	DI2	Channel 2 switch signal input			
tifree	three				terminal			
four	RL1NO	Relay 1 normally open output	ninete	DICOM	Switching signal common terminal			
Iour		terminal	en					
fivo	RL2COM	Relay 2 common output terminal	twent	NC	Empty feet			
live			У					
siv	RL2NO	Relay 2 normally open output	twent	RL9NO	Relay 9 normally open output			
51X		terminal	y-one		terminal			
souch	RL3COM	Relay 3 common output terminal	twent	RL9COM	Relay 9 common output terminal			
seven			y-two					
	RL3NO	Relay 3 normally open output	twent	RL8NO	Relay 8 normally open output			
eight		terminal	y-thre		terminal			
			e					
ninc	RL4COM	Relay 4 common output terminal	twent	RL8COM	Relay 8 common output terminal			
			y-four					
ton	RL4NO	Relay 4 normally open output	twent	RL7NO	Relay 7 normally open output			
		terminal	y-five		terminal			

## Pin definition:



alayan	NC	Empty feet	twent	RL7COM	Relay 7 common output terminal
cieven			y-six		
	DATA+	RS-485 signal positive terminal	twent	RL6NO	Relay 6 normally open output
twelve			y-seve		terminal
			n		
thirto	DATA-	RS-485 signal negative terminal	twent	RL6COM	Relay 6 common output terminal
an			y-eigh		
en			t		
fourte	PW+	Positive end of power supply	twent	RL5NO	Relay 5 normally open output
en			y-nine		terminal
fifteen	GND	Negative end of power supply,	thinty	RL5COM	Relay 5 common output terminal
Inteen		communication ground wire			

Table 1 Pin Definition



Figure 3 Wiring diagram of WJ71 module

<b>TT</b> 7' '	1.	C	• 1	• 1	• ,
M/1ring	diagram	tor	cuutch.	cimpol	100111
<b>vv</b> II III 9	ulayiani	нол	SWILLI	SIVILAL	IIII)UIL
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## Wiring diagram for switch signal output



## WJ71 Character Protocol Command Set:

The factory initial settings of the module are shown below. If the parameters are forgotten, after holding down the Initiat switch for 2 seconds while powered on, the power light will turn off and the module can be restored to its factory settings by releasing it.

Address 01

Baud rate 9600 bps

Prohibition of checksum verification

## 1. Read switch status command

Description: Read back all output channel switch status, switch reset status, and input channel switch status from the module.

Command format: # AA

Parameter description: # delimiter. Hexadecimal is 23H

AA module address, with a value range of 00 to FF (hexadecimal). The factory address is 01, which is converted to

hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

Response format:>AAAAAAAA, BBBBBBBB, CCC (cr) command is valid.

? The **01** (**cr**) command is invalid or an illegal operation.

Parameter description:>delimiter. Hexadecimal is 3EH

AAAAAAAAA represents the read output switch status, consisting of 10 numbers arranged in the order of DO9~DO0,

Value 0: Output relay disconnected; Value 1: Output relay connected

**BBBBBBBB** represents the output switch state after the reset is read, consisting of 10 numbers arranged in the order of DO9~DO0.

Value 0: Output relay disconnected; Value 1: Output relay connected

CCC represents the input switch status read, consisting of 3 numbers arranged in the order of DI2~DI0,

Value 0: Input low level; Value 1: Input high level

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.



Application example: User command (character format) # 01

Module response (character format)>00000 100000001010111 (cr)

Explanation: The module output switch status is 00011000, arranged in the order of DO9~DO0

Channel 0: Relay Disconnected Channel 1: Relay Disconnected Channel 2: Relay Disconnected Channel 3: Relay Connected

Channel 4: Relay on Channel 5: Relay off Channel 6: Relay off Channel 7: Relay off

Channel 8: Relay disconnection Channel 9: Relay disconnection

After resetting the module, the output switch status is 00001010, arranged in the order of DO9~DO0

Channel 0: Relay disconnected Channel 1: Relay connected Channel 2: Relay disconnected Channel 3: Relay connected

Channel 4: Relay Disconnect Channel 5: Relay Disconnect Channel 6: Relay Disconnect Channel 7: Relay Disconnect

Channel 8: Relay disconnection Channel 9: Relay disconnection

The input switch status of the module is 111, and the arrangement order is DI2~DI0 Channel 0: High Level Channel 1: High Level Channel 2: High Level

#### 2. Set relay output command

Description: Set the status of all output channel relays.

Command format: # AABB (data)

Parameter description: # delimiter. Hexadecimal is 24H

AA module address, with a value range of 00 to FF (hexadecimal). The factory address is 01, which is converted to hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

**BB** channel selection, can choose all output channels or a single output channel. Setting BB to 00 means setting all output channels. If setting a single channel, the first character B must be set to 1, and the second character B can be set to 0-A, representing 4 relay DO output channels. If BB is set to FF, it means setting the power on output values for all channels.

(Data) Output value.

1, If it is set for all channels (BB=00), (BB=FF, power on output)

Then there are four hexadecimal numbers,

The first number must be 0

The second number represents channels 9 to 8

The third number represents channels 7 to 4

The fourth number represents channels 3 to 0

Bit value 0: Set output relay to disconnect

Bit value 1: Set the output relay to turn on

0	0	0	0	0	0	DO9	DO8	DO7	DO6	DO5	DO4	DO3	DO2	DO1	DO0
Bit15	Bit 14	Bit 13	Bit 12	Bit 11	Bit10	Bit 9	Bit 8	Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0
	dataOutput														

2. If it is set for a single channel (BB=1X, where X represents the channel to be set), it can only be set to 0000 or 0001,

0000: Set the X-channel output relay to disconnect

0001: Set the X-channel output relay to turn on

Response format:>(cr) command is valid.



? The AA (cr) command is invalid or an illegal operation.

Parameter description:>delimiter. Hexadecimal is 3EH.

The delimiter indicates that the command is invalid.

AA represents the input module address

WAYJUN

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If the format is incorrect, the communication is incorrect, or the address does not exist, the module will not respond.

If the serial communication software you are using cannot input the enter key character, please switch to hexadecimal format for communication.

Application Example 1: User Command (Character Format) # 01000002

Module response (character format)>(cr)

Explanation: Module address 01H, set the output of all channels (BB=00) to 0x0002H, and convert it to binary to 0000 0010. Therefore, the switch status of the output on module address 01H is:

Channel 0: Relay Disconnected Channel 1: Relay Connected Channel 2: Relay Disconnected Channel 3: Relay Disconnected

Channel 4: Relay Disconnect Channel 5: Relay Disconnect Channel 6: Relay Disconnect Channel 7: Relay Disconnect

Channel 8: Relay disconnection Channel 9: Relay disconnection

Application Example 2: User Command (Character Format) # 01120001

Module response (character format)>(cr)

Explanation: Module address 01H, set the relay for channel 2 to be connected.

#### 3. Configure WJ71 module command

Explanation: Set the address, baud rate, and checksum status for a WJ71 module. The configuration information is stored in non-volatile memory EEPROM.

#### Command format:% AANNTTCCFF (cr)

Parameter description:% delimiter.

AA module address, with a value range of 00 to FF (hexadecimal). The factory address is 01, which is converted to hexadecimal as the ASCII code for each character. If address 01 is replaced with hexadecimal, it will be 30H and 31H.

NN represents the new module hexadecimal address, with values ranging from 00 to FF. Convert to hexadecimal to ASCII code for each character. If address 18 is replaced with hexadecimal as 31H and 38H.

TT uses hexadecimal to represent type encoding.

The WJ71 product must be set to 00.

CC uses hexadecimal to represent baud rate encoding.

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



Table 2 Baud rate codes

FF uses 8-bit hexadecimal to represent data format and checksum. Note that from bits0 to bits5, it is not necessary to set it to zero.

		Bit7	Bit 6	Bit 5	Bit 4	Bit 3	Bit2	Bit 1	Bit 0	ļ
--	--	------	-------	-------	-------	-------	------	-------	-------	---

Table 3 Data format, checksum code

Bit7: Reserved bit, must be set to zero

**Bit6:** checksum status, 0: prohibited; For 1: Allow

Bit5-bit0: No need, it must be set to zero.

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Response format:! The AA (cr) command is valid.

? The AA (cr) command is invalid or an illegal operation, or the Initiat switch is not turned to the Initiat position before changing the baud rate or checksum.

Parameter description:! The delimiter indicates that the command is valid.

- ? The delimiter indicates that the command is invalid.
- AA represents the input module address

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

- Other instructions: If you are configuring the module for the first time, AA=01H, NN equals the new address. If the module is reconfigured to change the address, input range, and data format, AA equals the currently configured address, and NN equals the current or new address. If you want to reconfigure the module to change the baud rate or checksum status, you must turn the Initiat switch to the Initiat position to enter the default state of the module. At this time, the module address is 00H, that is, AA=00H, NN is equal to the current or new address.
  - If the format is incorrect, the communication is incorrect, or the address does not exist, the module will not respond.

Application example: User command% 0111000600 (cr)

Module response! 11(cr)

Explanation:% delimiter.

01 means that the original address of the WJ71 module you want to configure is 01H.

11 indicates that the new module's hexadecimal address is 11H.

**00** type code, WJ71 product must be set to 00.

**06** represents a baud rate of 9600 baud.

**00** indicates that checksum is prohibited.

## 4. Read configuration status command

Explanation: Read configuration for a specified WJ71 module.

Command format: \$AA2

Parameter description: \$delimiter.

 ${\bf AA}$  module address, with a value range of 00 to FF (hexadecimal).

2 represents the command to read the configuration status

Response format:! The AATTCCFF (cr) command is valid.

? The AA (cr) command is invalid or an illegal operation.

Parameter description:! Boundary symbol.

AA represents the input module address.

TT stands for type code.



**CC** stands for baud rate encoding. See Table 2

**FF** is shown in Table 3

(cr) End symbol, upper computer enter key, hexadecimal is 0DH.

Other instructions: If the format is incorrect, the communication is incorrect, or the address does not exist, the module will not respond.

Application example: User command \$302

Module response! 30000600(cr)

Explanation: Boundary symbol.

**30** indicates that the WJ71 module address is 30H.

**00** represents the input type code.

06 represents a baud rate of 9600 baud.

**00** indicates that checksum is prohibited.

## Modbus RTU communication protocol:

The factory initial settings of the module are shown below. If the parameters are forgotten, after holding down the Initiat switch for 2 seconds while powered on, the power light will turn off and the module can be restored to its factory settings by releasing it.

Modbus address 01, Baud rate 9600 bps



The command format follows the standard Modbus RTU communication protocol. Support function codes 01, 03, 05, 06, 15, and 16.

#### Register Description:

Supports registers with function codes 01, 05, and 15

Address 0X	Address (PC, DCS)	Data content	attri	Data Explanation
(PLC)			bute	
00001	0	Relay 0	Read/	Output status of relay channel 0
			Write	
00002	one	Relay 1	Read/	Output status of relay channel 1
			Write	
00003	two	Relay 2	Read/	Output status of relay channel 2
			Write	
00004	three	Relay 3	Read/	Output status of relay channel 3
			Write	
00005	four	Relay 4	Read/	Output status of relay channel 4
			Write	
00006	five	Relay 5	Read/	Output status of relay channel 5
			Write	
00007	six	Relay 6	Read/	Output status of relay channel 6
			Write	
00008	seven	Relay 7	Read/	Output status of relay channel 7
			Write	
00009	eight	Relay 8	Read/	Output status of relay channel 8
			Write	
00010	nine	Relay 9	Read/	Output status of relay channel 9
			Write	
00011	ten	Relay 0 power on	Read/	Power on output status of
		output	Write	channel 0
00012	eleven	Relay 1 power on	Read/	Power on output status of
		output	Write	channel 1
00013	twelve	Relay 2 power on	Read/	Power on output status of
		output	Write	channel 2
00014	thirteen	Relay 3 power on	Read/	Power on output status of
		output	Write	channel 3
00015	fourteen	Relay 4 power on	Read/	Power on output status of
		output	Write	channel 4
00016	fifteen	Relay 5 power on	Read/	Power on output status of
		output	Write	channel 5
00017	sixteen	Relay 6 power on	Read/	Power on output status of
		output	Write	channel 6



00018	seventeen	Relay 7 power on	Read/	Power on output status of
		output	Write	channel 7
00019	eighteen	Relay 8 power on	Read/	Power on output status of
		output	Write	channel 8
00020	nineteen	Relay 9 power on	Read/	Power on output status of
		output	Write	channel 9
00033	thirty-two	Input the switch	read-	The level status of input channel
		value of 0	only	0
00034	thirty-three	Input the switch	read-	Level status of input channel 1
		value of 1	only	
00035	thirty-four	Input the switch	read-	Level status of input channel 2
		value of 2	only	

Supports registers with function codes 03, 06, and 16

Address 4X	Address (PC, DCS)	Data content	attrib	Data Explanation
(PLC)			ute	
forty thousand	0	Output relay	Read/	0x0000~0x03FF,
and one			Write	Status of relay channels 9-0
forty thousand	ten	Output relay	Read/	0x0000~0x03FF, power on output
and eleven			Write	values for channels 9~0
forty thousand	thirty-two	Input switch	read-o	0x0000~0x0007, channels 3~0
and thirty-three		quantity	nly	
forty thousand	two hundred	Module address	Read/	Integer, effective after restart, range
two hundred and			Write	0x0000-0x00FF
one				
forty thousand	two hundred and	Baud rate	Read/	Integer, effective after restart, range
two hundred and	one		Write	0x0004-0x000A
two				0x0004 = 2400 bps,
				0x0005 = 4800  bps
				0x0006 = 9600  bps,
				0x0007 = 19200 bps
				0x0008 = 38400 bps,
				0x0009 = 57600  bps
				0x000A = 115200bps
forty thousand	two hundred and ten	Module Name	read-o	High bit: 0x00 Low bit: 0x71
two hundred and			nly	

	Signal I	solators &	<b>Conditioners</b>
eleven			

Table 5 Modbus Rtu Register Description

## Example of Modbus RTU communication protocol application:

1. Supports Modbus RTU communication protocol function code 01 (reading coil status), with command format

following the standard Modbus RTU communication protocol.

. . . . . . . . . .

Communication example: If the module address is 01, send **010100000083DCC** in hexadecimal to obtain the data in the register.

01	01	00	00	00	08	3D	CC
Module	Read coil status	High position of	Low position of	High number of	Low number of	CRC check low	CRC check high
address		coil address	coil address	coils	coils	bit	bit

If the module replies: **010101031189**, the read data is 0x03, which is converted to binary as 0000 0011.

This indicates that the output relay channels 1 and 0 are now connected.

01	01	01	03	eleven	eighty-nine
Module	Read coil status	The number of	data	CRC check low bit	CRC check high bit
address		bytes in the data			

2. Supports Modbus RTU communication protocol function code 05 (setting a single coil), and the command format follows the standard Modbus RTU communication protocol.

Communication example: If the module address is 01, send in hexadecimal: **01050000FF008C3A**, and the data is 0xFF00, indicating that the relay is turned on. If the data is 0x0000, it means the relay is disconnected (command: **01050000000CDCA**)

01	05	00	00	FF	00	8C	3A
Module	Set up a single	High position of	Low position of	data-high	data-low	CRC check low	CRC check high
address	coil	coil address	coil address			bit	bit

If the module replies: **01050000FF008C3A**, the setting is successful

01	05	00	00	FF	00	8C	3A
Module	Set up a single	High position of	Low position of	data-high	data-low	CRC check low	CRC check high
address	coil	coil address	coil address			bit	bit

3. Supports Modbus RTU communication protocol function code 03 (read hold register), with command format

following the standard Modbus RTU communication protocol.

Communication example: If the module address is 01, send in hexadecimal: **01030000001840A** to retrieve the data from the register.

01	03	00	00	00	01	eighty-four	0A
Module	Read and hold	Register Address	Low bit register	Register quantity	Low register	CRC check low	CRC check high
address	register	High Bit	address	high	quantity	bit	bit

If the module replies: 0103020003F845, the read data is 0x0003, which is converted to binary as 0000 0000 0011.



This indicates that output channels 1 and 0 are currently connected, while other relay channels are disconnected.

01	03		02			00	03	F8	forty-five
Module	Read an	nd hold	The	number	of	data-high	data-low	CRC check low bit	CRC check high bit
address	register		bytes	in the data					

4. Supports Modbus RTU communication protocol function code 06 (write to a single register), with command format following the standard Modbus RTU communication protocol.

Communication example: If the module address is 01, send in hexadecimal: **0106000000FC9CE**, and replace it with binary: 0000 0000 0000 0011, that is, output channels 3-0 are connected.

01	06	00	00	00	0F	С9	CE
Module	Write a single	Register Address	Low bit register	data-high	data-low	CRC check low	CRC check high
address	register	High Bit	address			bit	bit

#### If the module replies: **0106000000FC9CE**, the setting is successful

01	06	00	00	00	0F	С9	CE
Module	Write a single	Register Address	Low bit register	data-high	data-low	CRC check low	CRC check high
address	register	High Bit	address			bit	bit

## **Dimensions: (Unit: mm)**



Can be installed on standard DIN35 rails

#### guarantee:

Within two years from the date of sale, if the user complies with the storage, transportation, and usage requirements and the product quality is lower than the technical specifications, it can be returned to the factory for free repair. If damage is caused due to violation of operating regulations and requirements, device fees and maintenance fees shall be paid.



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