

SPD2□□□-MA Relay Output Control Module

User Manual



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I. Precautions

- Do not operate this product beyond its design limits under any circumstances.
- The power supply for this product is 24V DC. Strictly prohibit the use of 220V AC power.
- This product should be installed in a safe location. The shell's maximum withstand temperature is +85°C.
- When used in environments with strong magnetic interference, Shielded cable is recommended for signal lines.
- Strictly prohibit unauthorized disassembly, modification, or repair of this product.
- Pay attention to the wiring method of this product to ensure correct Wiring and avoid damaging the product.
- Read this manual carefully before installation and use. If you have any questions, please contact our technical support personnel or refer to relevant technical guidance videos.
- Our company is not responsible for damage to components other than this product during use.
- Please download the latest electronic version of the documentation. The content of this manual is for reference only. We continuously improve the user experience, and technical parameters are subject to change without notice.

II. Product Dimensions

- Product dimensions: **106mm (L) X 84mm (W) X 29mm (H)**
- Industrial-grade flame-retardant plastic shell, standard DIN35 rail mounting.

III. Operating Environment

- Do not expose this product to excessively high or low temperatures.
- The surrounding environment must be free from strong vibration, impact, and electromagnetic interference such as large currents and sparks.
- The operating environment must not contain harmful substances that cause severe corrosion to metal or plastic components.
Do not use or store the product in harsh environments, otherwise it will affect the electrical performance of the product.
- Operating Temperature: -40°C ~ +80°C Relative Humidity: 10% ~ 90%RH (non-condensing)

IV. After-Sales Service

We are committed to providing you with comprehensive after-sales service and warranty policy. The product warranty period is three years. During the warranty period, if the product fails due to non-human factors, we will provide free repair or replacement service. Damage caused by violation of operating regulations and requirements will require payment of parts cost and repair fee. After the warranty period expires, we continue to provide technical support and assistance. During this period, replacement parts are provided at cost price.

V. Application Fields



Automation Equipment



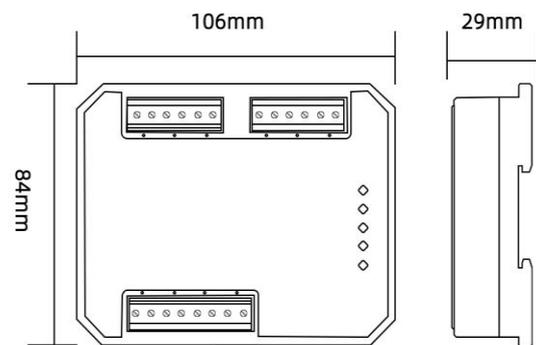
Medical Electronics



Remote Monitoring



Process Control



• Product Introduction

The SPD digital control module is meticulously designed based on a new generation of embedded systems. Equipped with an isolated communication interface, it can communicate independently with a PC or PLC, or networked with multiple communication modules. It also features a transient suppression circuit that effectively suppresses various surges, ensuring reliable operation in harsh environments.

The SPD2□□□-MA series relay output control module controls 4 relay outputs and features an RS485 communication interface using the standard MODBUS-RTU protocol, facilitating communication with a host computer. This allows for rapid networking and monitoring system construction. With isolated output and communication interfaces, it is suitable for controlling a variety of digital signals in industrial settings, meeting demanding measurement requirements in industrial fields, medical electronics, security monitoring, smart buildings, smart homes, power monitoring, and process control.

This product requires an independent power supply and utilizes a standard 35mm DIN rail for mounting, offering simple installation and flexible use, adapting to a variety of field applications.

• Technical Parameters

Basic Parameters	
Power Supply	DC12~36V(DC24V recommended)
Power Consumption	<3.0W
Control Interval	≥50mS
ESD Protection	±15kV
Isolation Voltage	1500VDC
Power Supply Protection	Reverse Polarity Voltage <-40V
Dielectric Strength	1500VAC/1 minute (input, output)
Insulation Resistance	≥100M Ω (input, output)
Electromagnetic Compatibility	Complies with GB/T18268.1 (IEC61326-1)
Applicable Field Devices	Configuration software, PLCs, touch screens, computers, and other devices supporting the MODBUS-RTU protocol
Outputs	
Number of Channels	4 channels
Output Type	Relay
Response Time	≤20mS
Drive Capacity	10A@250VAC; 10A@28VDC
Driven Load	Resistive load
Output Terminal	
Output Signal	RS-485 communication signal
Communication Protocol	Standard MODBUS-RTU protocol
Communication Distance	1200m (typical)
Environmental Conditions	
Operating Temperature	-40°C~+80°C
Storage Temperature	-40°C~+85°C
Relative Humidity	10%~90%RH (non-condensing)
Atmospheric Pressure	80kPa~106kPa

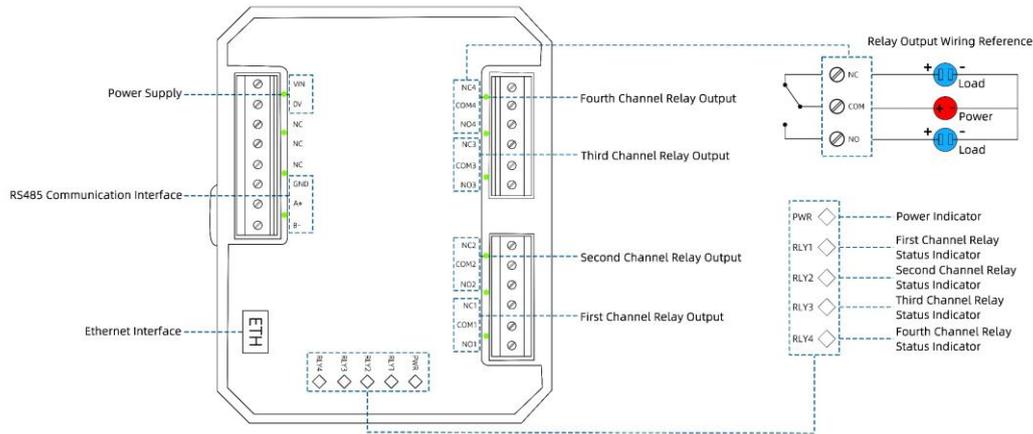
• Terminal Description

Terminal Mark	Function Description
VIN	Power supply positive terminal, DC12-36V input
OV	Power supply negative terminal
NC	No Connection (Empty pin)
NC	No Connection (Empty pin)
NC	No Connection (Empty pin)
GND	RS-485 communication signal ground
A+	RS-485 communication signal positive
B-	RS-485 communication signal negative
NO1	Channel 1 Relay Normally Open Contact
COM1	Channel 1 relay common terminal
NC1	Channel 1 relay normally closed
NO2-	Channel 2 relay normally open
COM2	Channel 2 relay common terminal
NC2	Channel 2 relay normally closed
NO3	Channel 3 relay normally open
COM3	Channel 3 relay common terminal
NC3	Channel 3 relay normally closed
NO4-	Channel 4 relay normally open
COM4	Channel 4 relay common terminal
NC4	Channel 4 relay normally closed
ETH	Ethernet port (optional)

• Indicator Description

Indicator Mark	Function Description
PWR	Power indicator
RLY1	Relay 1 status indicator light, always on when closed
RLY2	Relay 2 status indicator light, always on when closed
RLY3	Relay 3 status indicator light, always on when closed
RLY4	Relay 4 status indicator light, always on when closed

Wiring and indication

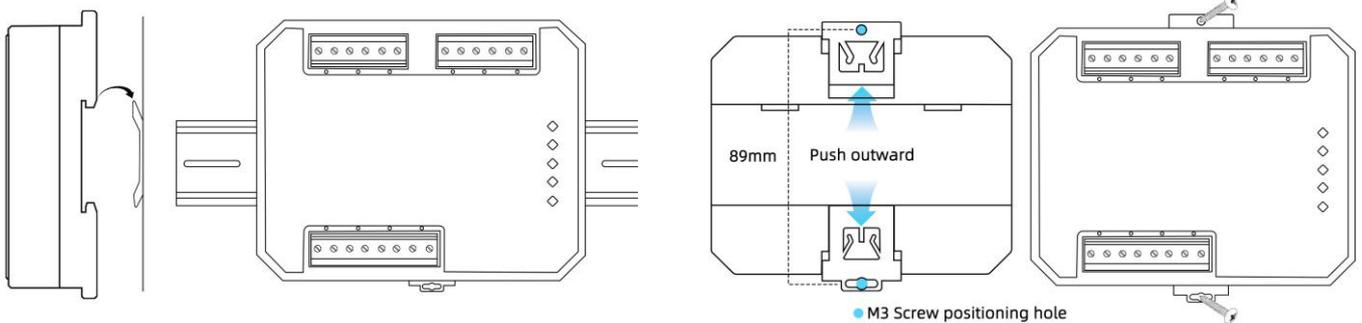


Note:

1. This module is available in three communication versions: RS485, Ethernet (ETH), and RS485 + Ethernet.
2. The Ethernet port is active only in versions equipped with Ethernet functionality.
3. For specific Ethernet features and operation, please refer to the Serial Server Manual.

Installation Instructions

This module uses the DIN35mm rail mounting method. The rail should comply with the installation dimension specifications for the TH35-7.5 type rail according to the national standard GB/T19334-2003. Users can easily install or remove the module on the rail. Installation must be stable and secure. This module also supports screw mounting without a rail.



- Installation method of guide rail -

- Screw installation method -

Product Naming Rules

Take the SPD2040-MA11L as an example: a four-channel relay output control module with RS485 communication, a DC12-36V power supply, and an M-shaped form factor.

SPD	2	04	0	M	A	1	1	L
Product Type	Input/Output	DI/DO Channel Count	AI Channel Count	Product Form Factor	Control Type	Isolation Rating	Comm Method	Power Supply
Switch Control Module	1 Switch Input	00-88	0-8	N Form Factor	A Relay	0 None	0 No Comm	L DC12-36V
	2 Switch Output			K Form Factor	B NPN Output	1 1500V	1 RS485	H AC220V
	3 Input/Output			M Form Factor	C Photoelectric Input	2 3000V	2 ETH	C +12V
	9 Custom			W Form Factor	D Fiber Optic Input	3 Other	3 RS485+ETH	D +24V
				F Form Factor	E Other		4 CAN	
	R Form Factor			9 Other Comm				
	Y Form Factor							
	Q Form Factor							

Product Model Selection Guide

- SPD2040-MA11L-BLE: Module with built-in Bluetooth function for terminal connection
- SPD2040-MA11L-4G: Module with 4G function for terminal connection
- SPD2040-MA11L-WIFI: Module with Wi-Fi function for terminal connection
- SPD2040-MA11L: Basic version, without terminal connection function(default version)

• MODBUS-RTU Communication Protocol

The MODBUS-RTU protocol specifies various function codes to implement different functions. This manual explains the messages for commonly used function codes. This module only supports some of these function codes, including 0X01, 0X05, 0X03, 0X04, and 0X06.

Function Code	Register add	Function Description
0X01	0XXXX	Read Coil Status (bit operation), e.g., read relay or digital output current state (ON/OFF)
0X02	0XXXX	Read Input Status (bit operation), e.g., read one or more groups of digital input states (ON/OFF)
0X05	0XXXX	Write Single Coil (bit operation), e.g., force a relay or digital output ON/OFF
0X03	4XXXX	Read Holding Registers
0X04	4XXXX	Read Input Registers (can be replaced by 0X03)
0X06	4XXXX	Write Single Holding Register
0X10	4XXXX	Write Multiple Holding Registers

• Communication Parameter Settings

Parameter	Setting Range	Default Value
Address	1~247	1
Baud Rate	1200、2400、4800、9600、14400、19200、38400、56000、57600、115200	9600
Parity	None, Even, Odd	None
Stop Bits	1, 2, 0.5, 1.5	1

• Communication Protocol Description

This communication board complies with the MODBUS RTU bus protocol, RS485 interface. The communication format is 11 bits:

1 start bit

8 data bits

1 parity bit (if used)

1 stop bit (with parity), 2 stop bits (without parity)

Data type: Unsigned int

With Parity

Start Bit	1	2	3	4	5	6	7	8	Parity Bit	Stop Bit
-----------	---	---	---	---	---	---	---	---	------------	----------

Without Parity

Start Bit	1	2	3	4	5	6	7	8	Stop Bit	Stop Bit
-----------	---	---	---	---	---	---	---	---	----------	----------

The message frame starts with a silence interval of more than 3.5 character times. The first field transmitted is the module add, followed by the function code, then the register add then the data, followed by the CRC16 check. It ends with a silence interval of more than 3.5 character times. The frame format is as follows:

Start Bit	Module add	Function Code	Register add High Byte	Register add Low Byte	Register Data High Byte	Register Data Low Byte	CRC16 calibration	End
>3.5 Chars	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	2 Byte	>3.5 Chars
	1-247	0X03 0X06	0X00	0X01	0X00	0X01	CRC	

Function Code: 0X01

1. Host Request Frame:

1 Byte	2 Byte	3 Byte	4 Byte	5 Byte	6 Byte	7 Byte	8 Byte
ADR	0X01	Start address Hi	Start address Lo	Qty Hi	Qty Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	coil start address to be read		number of coils to be read		CRC16 checksum from bytes1 to 6	

2. Slave Response Frame (Correct) : Coil status 0 = OFF and 1 = ON

1	2	3	4、5	6、7	.....	N-1、N	N+1	N+2
ADR	0X01	Coil status Byte Count	Coil Status 1 Data	Coil Status 1 Data	.....	Coil Status N Data	CRC16 Lo	CRC16 Hi
Module address (1~247)	Function code	Returns the number of bytes in coil status	Returns the wire net status data (one coil status is two bytes)				CRC16 checksum from bytes 1 to N	

Function Code: 0X02

1. Host Request Frame:

1	2	3	4	5	6	7	8
ADR	0X02	Start address Hi	Start address Lo	Qty Hi	Qty Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	The coil input start address to be read		number of coils to be read		CRC16 checksum from bytes1 to 6	

2. Slave Response Frame (Correct) : Coil status 0 = OFF and 1 = ON

1	2	3	4、5	6、7	.....	N-1、N	N+1	N+2
ADR	0X02	Coil status Byte Count	Coil Status 1 Data	Coil Status 1 Data	.....	Coil Status N Data	CRC16 Lo	CRC16 Hi
Module address (1~247)	Function code	Returns the number of bytes in coil status	Returns multiple coil input status data				CRC16 checksum from bytes1 to N	

Function Code: 0X05

1. Host Request Frame: Coil status 0 = OFF and 1 = ON

1	2	3	4	5	6	7	8
ADR	0X05	Coil address Hi	Coil address Lo	Force Data Hi	Force Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Written coil address		Number of coils written		CRC16 checksum from bytes1 to 6	

2. Slave Response Frame (Correct) :

1	2	3	4	5	6	7	8
ADR	0X05	Coil address Hi	Coil address Lo	Force Data Hi	Force Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Written coil address		Returns coil status data		CRC16 checksum from bytes1 to 6	

Function Code: 0X03

1.Host Request Frame:

1 Byte	2 Byte	3 Byte	4 Byte	5 Byte	6 Byte	7 Byte	8 Byte
ADR	0X03	Start address Hi	Start address Lo	Reg Qty Hi	Reg Qty Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	The register starting address to read is		Number of registers read		CRC16 checksum of bytes 1 to 6	

2.Slave Response Frame (Correct) :

1	2	3	4、5	6、7	.....	N-1、N	N+1	N+2
ADR	0X03	Byte Count	Reg 1 Data Hi	Reg 1 Data Lo	.....	Reg N Data Hi, Reg N Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Returns the effect of reading register bytes	Returns multiple register data (one register data is two bytes)				CRC16 checksum of bytes 1 to N	

Function Code: 0X06

1.Host Request Frame:

1	2	3	4	5	6	7	8
ADR	0X06	Reg address Hi	Reg address Lo	Reg Data Hi	Reg Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Register address to be written		Register data to be written		CRC16 checksum of bytes 1 to 6	

2. Slave Response Frame (Correct) :

1	2	3	4	5	6	7	8
ADR	0X06	Reg address Hi	Reg address Lo	Reg Data Hi	Reg Data Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Returns the register address written		Returns the written register data		CRC16 checksum of bytes 1 to 6	

Function Code: 0X10

1.Host Request Frame:

1	2	3、4	5、6	7	8、9	10、11	.....	N-1、N	N+1	N+2
ADR	0X10	Start Add	Reg Qty	Byte Count	Reg 1 Data	Reg 2 Data	.....	Reg N Data	CRC Check	CRC Check
Module address (1~247)	Function code	The starting address of the register to be written	Validity of register written	Number of register data bytes written	Multiple register data written (One register data is two bytes)				CRC16 checksum of bytes 1 to N	

2. Slave Response Frame (Correct) :

1	2	3	4	5	6	7	8
ADR	0X10	Start Add Hi	Start Add Lo	Reg Qty Hi	Reg Qty Lo	CRC Lo	CRC Hi
Module address (1~247)	Function code	Returns the starting address of the register written		Returns the number of registers written		CRC16 checksum of bytes 1 to 6	

• Register Definition Table

PLC add	Register add (HEX)	Function Definition	R/W Attribute	Value Range and Description
00000		First Relay Output Control	Bit Operation	0xFF00: Relay Closed 0x0000: Relay Opened 0x5500: Relay Flipped
00001		Second Relay Output Control	Bit Operation	Same as the first output value parameters
00002		Third Relay Output Control	Bit Operation	Same as the first output value parameters
00003		Fourth Relay Output Control	Bit Operation	Same as the first output value parameters
00004		Fifth Relay Output Control	Bit Operation	Same as the first output value parameters
00005		Sixth Relay Output Control	Bit Operation	Same as the first output value parameters
00006		Seventh Relay Output Control	Bit Operation	Same as the first output value parameters
00007		Eighth Relay Output Control	Bit Operation	Same as the first output value parameters
40083	52	Communication Address	Read/Write	1-247
40084	53	Baud Rate	Read/Write	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 14400bps 5: 19200bps 6: 38400bps 7: 56000bps 8: 57600bps 9: 115200bps
40085	54	Parity	Read/Write	0: No parity 1: Even parity 2: Odd parity
40086	55	Stop Bit	Read/Write	0: 1 stop bit 1: 0.5 stop bit 2: 2 stop bits
40087	56	Device Number 1	Read Only	0-65536
40088	57	Device Number 2	Read Only	0-65536
40089	58	Firmware Version	Read Only	0-65536
40090	59	Device Type	Read Only	0-65536

Control relay: 0x05			
Relay 1 closed	01 05 00 00 FF 00 8C 3A	Relay 2 closed	01 05 00 01 FF 00 DD FA
Relay 1 opened	01 05 00 00 00 00 CD CA	Relay 2 opened	01 05 00 01 00 00 9C 0A
Relay 1 flipped	01 05 00 00 55 00 F2 9A	Relay 2 flipped	01 05 00 01 55 00 A3 5A
Relay 3 closed	01 05 00 02 FF 00 2D FA	Relay 4 closed	01 05 00 03 FF 00 7C 3A
Relay 3 opened	01 05 00 02 00 00 6C 0A	Relay 4 opened	01 05 00 03 00 00 3D CA
Relay 3 flipped	01 05 00 02 55 00 53 5A	Relay 4 flipped	01 05 00 03 55 00 02 9A
Read relay status: 0x01 0 represents relay open, 1 represents relay closed			
Host sends	01 01 00 FF 00 01 CD FA	to read relay status	
Module returns	01 01 01 00 51 88	All relays are open	
Host sends	01 01 00 FF 00 01 CD FA	to read relay status	
Module returns	01 01 01 01 90 48	The first relay is closed, and the rest are open	