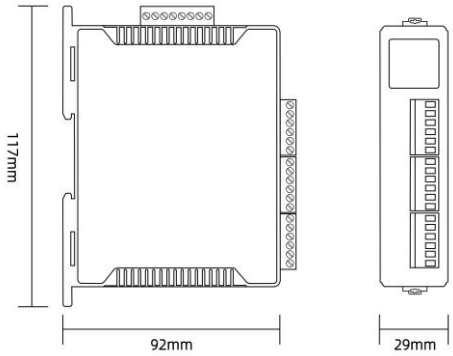
# SPD2□□□-WA Relay Output Control Module

# User Manual

## 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: **117mm (L) X 92mm (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℃～+80℃ 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□□□-WA series relay output control module controls 4/8 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.

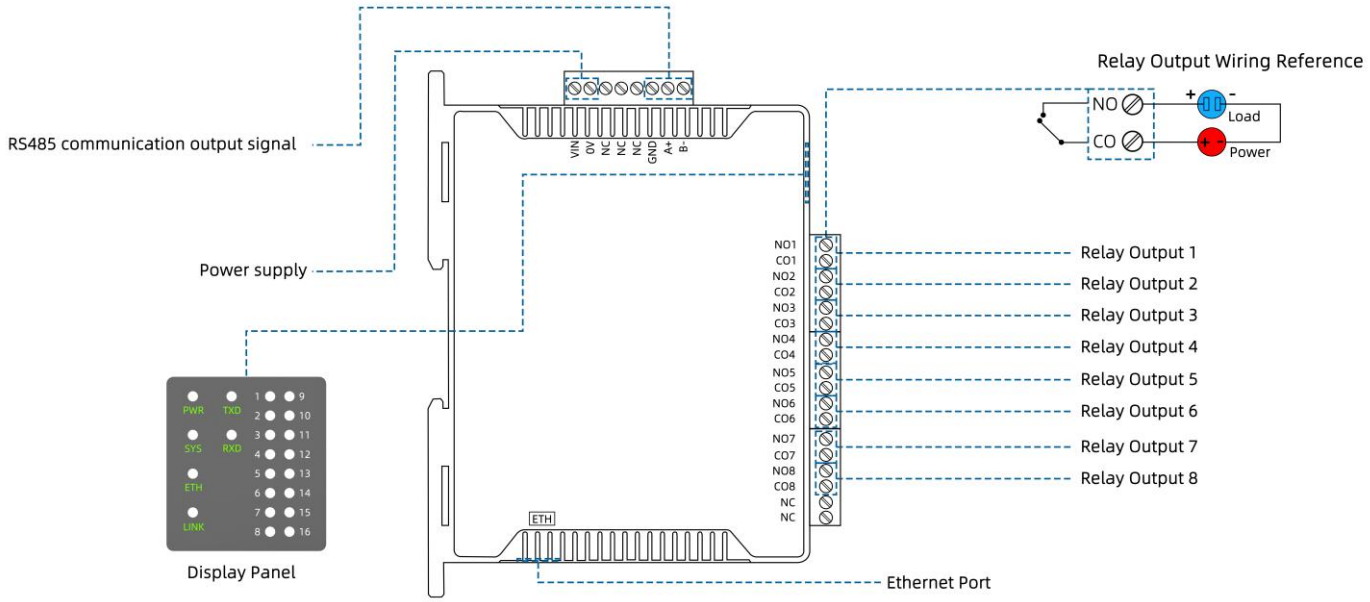
## · Technical Parameters

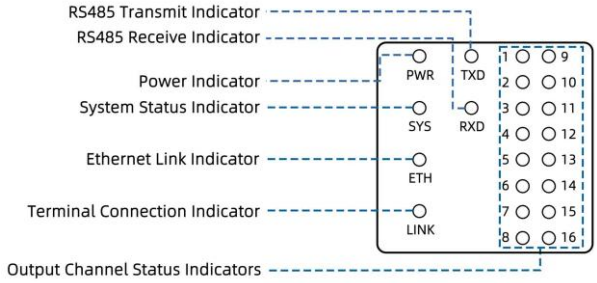
| Basic Parameters | |
|---|---|
| Power Supply | DC12～36V(DC24V recommended) |
| Power Consumption | <3.0W |
| Control Interval | ≥50mS |
| ESD Protection | ±15kV |
| Isolation Voltage | 1500VDC |
| Power Supply Protection | Reverse Polarity Voltage <-40V |
| Dielectric Strength | 1500VAC/1 minute (input, output) |
| Insulation Resistance | ≥100MΩ (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 | 4/8 channels |
| Output Type | Relay |
| Response Time | ≤20mS |
| Drive Capacity | 10A@250VAC; 10A@28VDC |
| Driven Load | Resistive load |
| **Output Terminal** | |
| Output Signal | RS-485/ Ethernet |
| Communication Protocol | Standard MODBUS-RTU protocol |
| Communication Distance | 1200m (RS-485 typical) |
| **Environmental Conditions** | |
| Operating Temperature | -40℃～+80℃ |
| Storage Temperature | -40℃～+85℃ |
| 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 | Relay 1 normally open contact |
| CO1 | Relay 1 common contact |
| NO2 | Relay 2 normally open contact |
| CO2 | Relay 2 common contact |
| NO3 | Relay 3 normally open contact |
| CO3 | Relay 3 common contact |
| NO4 | Relay 4 normally open contact |
| CO4 | Relay 4 common contact |
| NO5 | Relay 5 normally open contact |
| CO5 | Relay 5 common contact |
| NO6 | Relay 6 normally open contact |
| CO6 | Relay 6 common contact |
| NO7 | Relay 7 normally open contact |
| CO7 | Relay 7 common contact |
| NO8 | Relay 8 normally open contact |
| CO8 | Relay 8 common contact |
| NC | No Connection (Empty pin) |
| NC | No Connection (Empty pin) |
| ETH | Ethernet port（optional） |

## · Wiring and indication




| Indicator Mark | Function Description |
|---|---|
| PWR | Power indicator |
| SYS | System status indicator, flashes when abnormal |
| ETH | Ethernet link indicator |
| LINK | Terminal connection indicator |
| TXD | RS485 Transmit indicator, flashes when sending data |
| RXD | RS485 Receive indicator, flashes when receiving data |
| 1–16 | Channel 1-16 signal indicator, lights up when a signal is received |

**Note:**

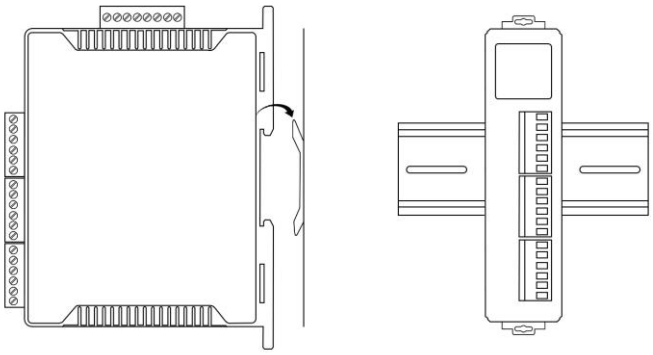
1. This module is available in three communication versions: RS485/Ethernet (ETH)/ RS485 + Ethernet.

2. The Ethernet port is active only in versions equipped with Ethernet functionality.

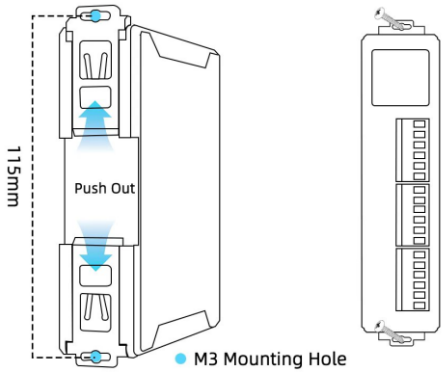
3. For specific Ethernet features and operation, please refer to the Serial Server Manual.

## · 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 SPD2080-WA11L as an example: a eight-channel relay output control module with RS485 communication, a DC12-36V power supply, and an W-shaped form factor.

| SPD | 2 | 08 | 0 | W | 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 |
| Serial Port I/O Control Module | 1 Switch Input<br>2 Switch Output<br>3 Input/Output<br>9 Custom | 00-88 | 0-8 | N Form Factor<br>K Form Factor<br>M Form Factor<br>W Form Factor<br>F Form Factor<br>R Form Factor<br>Y Form Factor<br>Q Form Factor | A Relay<br>B NPN Output<br>C Photoelectric Input<br>D Fiber Optic Input<br>E Other | 0 None<br>2 1500V<br>3 3000V<br>9 Other Classes | 0 No Comm<br>1 RS485<br>2 ETH<br>3 RS485+ETH<br>4 CAN<br>9 Other Comm | L DC12-36V<br>H AC220V<br>C +12V<br>D +24V |

## · Product Model Selection Guide

SPD2080-WA11L -BLE: Module with built-in Bluetooth function for terminal connection (default version)

SPD2080-WA11L -4G: Module with 4G function for terminal connection

SPD2080-WA11L -WIFI: Module with Wi-Fi function for terminal connection

SPD2080-WA11L: Basic version, without terminal connection function

## · 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<br>0x0000: Relay Opened<br>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<br>1: 2400bps<br>2: 4800bps<br>3: 9600bps<br>4: 14400bps<br>5: 19200bps<br>6: 38400bps<br>7: 56000bps<br>8: 57600bps<br>9: 115200bps |
| 40085 | 54 | Parity | Read/Write | 0: No parity<br>1: Even parity<br>2: Odd parity |
| 40086 | 55 | Stop Bit | Read/Write | 0: 1 stop bit<br>1: 0.5 stop bit<br>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 | | |