

ADM-4188

8-Channels Digital Input / 8-Channels Digital Output

Modbus-RTU Protocol

Acquisition Module

User's Manual

1. Product Overview

1.1 Product Introduction

ADM-4188 is 8-Channels isolated digital input and output module, which is widely used in industrial field, signal acquisition, monitoring and control. The communication interface adopts RS-485 interface, supports standard Modbus-RTU protocol, and can be directly connected with configuration software, PLC, DCS, industrial control touch screen, etc.

1.2 Functional Features

1. 8-Channels isolated digital input
2. 8-Channels isolated NPN transistor Open collector output
3. 8-Channels digital input 16 Bit counter, pulse < 200Hz
4. Digital input and output have LED indication function
5. Internal software watchdog to ensure stable operation of the module
6. Modbus RTU protocol, RS-485 interface output
7. RS-485 interface adopts photoelectric isolation TVS+PTC protection measures
8. Windows tool software is used to set module parameters and acquisition discrete signal
9. DC9~30V power supply, low power consumption, less than 3W at 24V power supply
10. 35mm DIN rail installation, industrial design

1.3 Technical Specifications

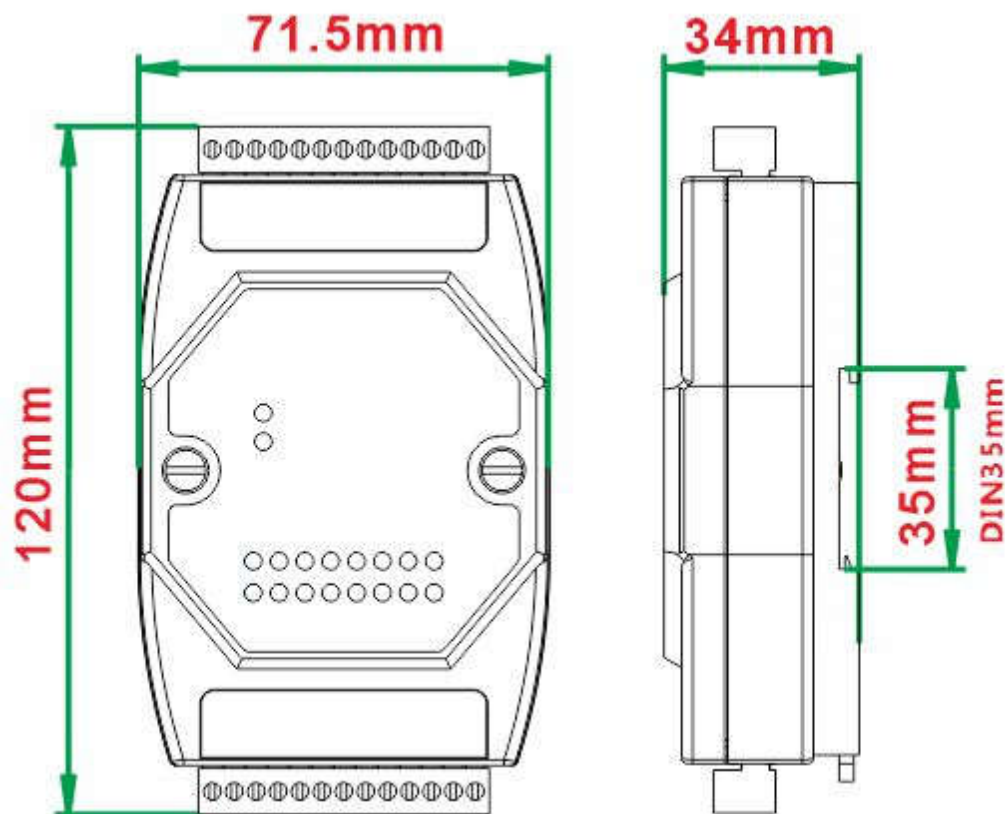
Digital input	
Input Channel	8-Channels Isolated Digital Input
Input Type	Dry Contact, Level Signal, PNP Sensor, NPN Sensor
Input Range	High Level: 10~30VDC, Low Level: 0~1VDC
Isolation Voltage	1.5kV
Sampling Frequency	1 KHz
Counter	8-Channels 16Bit Counter (DI0~DI7), Switching Pulse < 200Hz
Digital Output	
Output Channel	8-Channels isolated NPN transistor Open collector output
Load Capacity	Voltage: 40V, Current: 150mA, Power: 625mW
Output Refresh Rate	1 KHz
RS-485 Communication Interface	
Baud Rate	1200 ~ 115200bps
Parity	None, Odd, Even
Protocol	Modbus-RTU
System Parameter	
Watchdog	Internal software watchdog
Power supply	DC9~30V, with power reverse connection protection
Power dissipation	Less than 3W @ 24VDC
Working temperature	-20°C~ +75°C
Storage temperature	-40°C~ +85°C

1.4 Interface Definition

No.	Symbol	Function Definition	No.	Symbol	Function Definition
1	VS+	Power Input +	14	DO7	Digital Output 7
2	VS-	Power Input -	15	DO6	Digital Output 6
3	RS485+	RS-485(A)	16	DO5	Digital Output 5
4	RS485-	RS-485(B)	17	DO4	Digital Output 4
5	DICOM1	DI Common Terminal	18	COM4-7	DO4-7 Positive Common
6	DI0	Digital Input 0	19	DOGND	DO Negative Common
7	DI1	Digital Input 1	20	DO3	Digital Output 3
8	DI2	Digital Input 2	21	DO2	Digital Output 2
9	DI3	Digital Input 3	22	DO1	Digital Output 1
10	DI4	Digital Input 4	23	DO0	Digital Output 0
11	DI5	Digital Input 5	24	COM0-3	DO0-3 Positive Common
12	DI6	Digital Input 6	25	DOGND	DO Negative Common
13	DI7	Digital Input 7	26	INIT	Use Default Parameters

COM0-3 and COM4-7 are internally connected to FWD (fly-wheel diode)

1.5 Dimension



2. Module Instructions

2.1 Default Communication Parameters

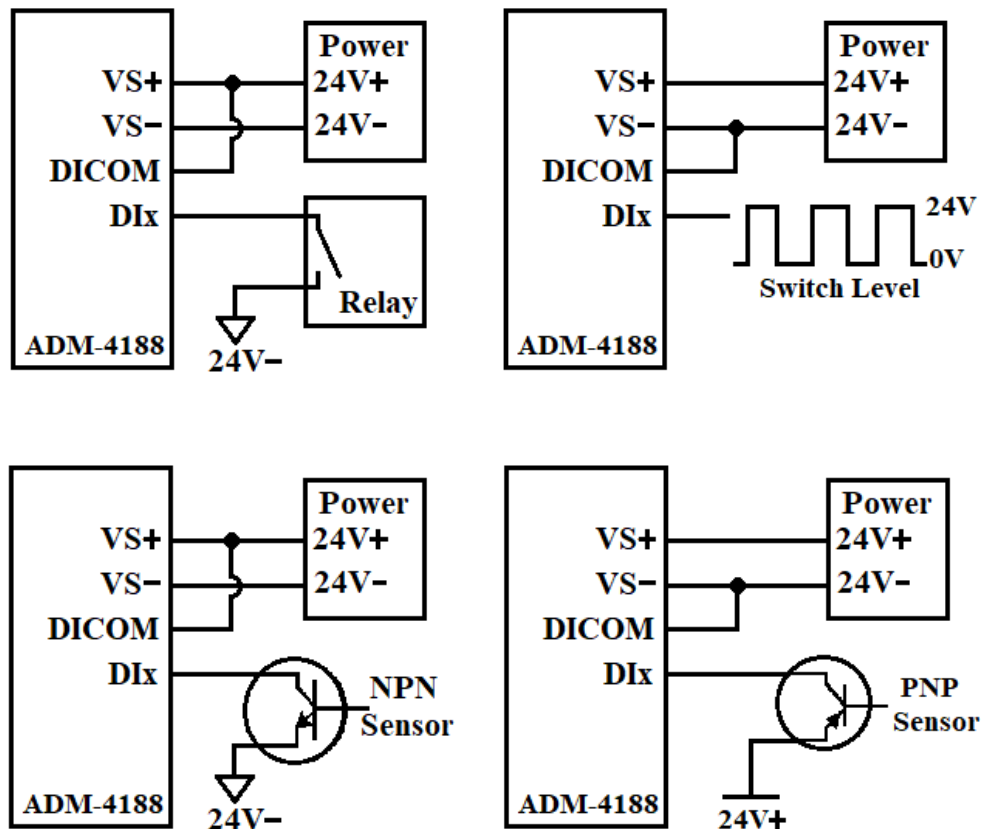
The default communication parameters of the module are Baud rate=9600, Data bit=8, Parity bit=None, Stop bit=1, Slave ID=1. The user can change Slave ID, Baud rate and Parity bit.

There is a **user parameter area** and a **default parameter area** inside the module. The user parameter area stores the communication parameters modified by the user, and the default parameter area stores the default communication parameters (9600, 8, N, 1, Slave ID=1). When INIT pin is not connected, the module loads user parameter area to communicate after startup. When the user forgets the modified communication parameters, short the INIT to DOGND before starting the module, and the module loads the default parameters to communicate. At this time, the user can read the user parameters area to view the user parameters.

2.2 Module LED Description

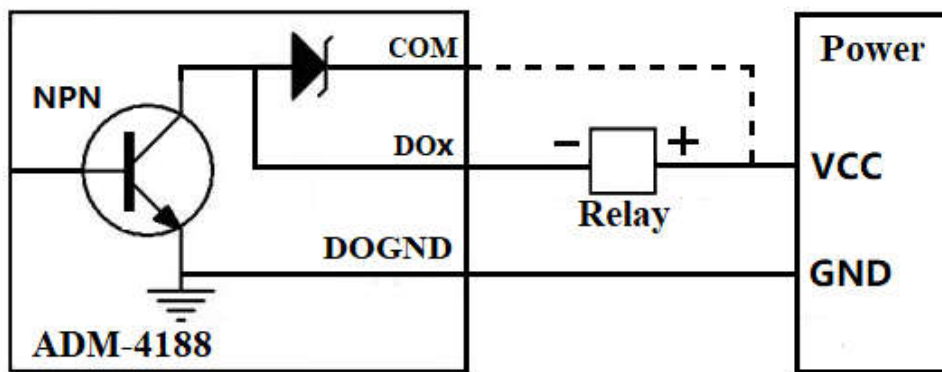
The module has one power indicator (red), one RS-485 communication indicator (yellow), eight digital input indicators (green), and eight digital output indicators (yellow). When the power supply is normal, the power indicator is always red. When the communication is normal, the COMM indicator flashes, and the flashing frequency is related to the acquisition frequency of the Modbus master station. When the digital input is 1, the DI0~DI7 indicators are on, and when the digital input is 0, the DI0~DI7 indicators are off. When the digital output is 1, the DO0~DO7 indicators are on, and when the digital output is 0, the DO0~DO7 indicators are off.

2.3 Digital Input and Output Connection



ADM-4188 module has 8-Channels digital input and 8-Channels NPN digital output functions. The digital input connection method is shown in the figure above: DI0~DI7 can be connected to Dry contact/Relay, Level Signal, NPN Sensor, PNP Sensor and other signal sources. DICOM is the common terminal of digital input. When DICOM is connected to the positive pole of external power supply, it is a common anode input mode. When DICOM is connected to the negative pole of the external power supply, it is a common cathode input mode.

The 8-Channels digital output can be connected to 5V, 12V and 24V Relay Coils. As shown in the figure below, the positive pole (VCC) of the power supply is connected to one end of the Relay Coil, and the DO0~DO7 of the module is connected to the other end of the Relay Coil. The DOGND of the module is connected to the negative pole of the power supply (GND), and COM0~3 and COM4~7 can be disconnected or connected to the positive pole of the power supply (VCC). Note: DO0~DO7 are not allowed to be short circuited with the power VCC, otherwise the DO port of the module will be damaged.



2.4 Register Description

1. Digital Input Register (Supports 0x02 Function Code)

Address	Address Hex	Signal	R/W	Min	Max	Register Description
10001	Area 1 0x0000	DI0	R	0	1	Digital Input 0
10002	Area 1 0x0001	DI1	R	0	1	Digital Input 1
10003	Area 1 0x0002	DI2	R	0	1	Digital Input 2
10004	Area 1 0x0003	DI3	R	0	1	Digital Input 3
10005	Area 1 0x0004	DI4	R	0	1	Digital Input 4
10006	Area 1 0x0005	DI5	R	0	1	Digital Input 5
10007	Area 1 0x0006	DI6	R	0	1	Digital Input 6
10008	Area 1 0x0007	DI7	R	0	1	Digital Input 7

2. Digital Output Register (Supports 0x01, 0x05, 0x0F Function Code)

Address	Address Hex	Signal	R/W	Min	Max	Register Description
00001	Area 0 0x0000	DO0	R/W	0	1	Digital Output 0
00002	Area 0 0x0001	DO1	R/W	0	1	Digital Output 1
00003	Area 0 0x0002	DO2	R/W	0	1	Digital Output 2
00004	Area 0 0x0003	DO3	R/W	0	1	Digital Output 3
00005	Area 0 0x0004	DO4	R/W	0	1	Digital Output 4
00006	Area 0 0x0005	DO5	R/W	0	1	Digital Output 5
00007	Area 0 0x0006	DO6	R/W	0	1	Digital Output 6
00008	Area 0 0x0007	DO7	R/W	0	1	Digital Output 7

3. Counter Mode Register (Supports 0x03, 0x06 and 0x10 Function Codes)

Address	Address Hex	Signal	R/W	Min	Max	Register Description
40033	Area 4 0x0020	DI0	R/W	0	4	DI0~DI7 Counter Mode 0: Closed (Default) 1: Up 2: Down 3: Loop Up 4: Loop Down
40034	Area 4 0x0021	DI1	R/W	0	4	
40035	Area 4 0x0022	DI2	R/W	0	4	
40036	Area 4 0x0023	DI3	R/W	0	4	
40037	Area 4 0x0024	DI4	R/W	0	4	
40038	Area 4 0x0025	DI5	R/W	0	4	
40039	Area 4 0x0026	DI6	R/W	0	4	
40040	Area 4 0x0027	DI7	R/W	0	4	

After the module starts, the counter mode register will load the value of the global mode register.

Closed: Counter Disabled

Up: Digital input from 0 to 1, counter plus 1

Down: Digital input from 0 to 1, counter minus 1

Loop Up: Counter Up, When the counter is greater than 65535, return to 0 and continue

Loop Down: Counter Down, when the counter is less than 0, return to 65535 to continue

4. Digital Input Counter Register (Supports 0x03, 0x06 and 0x10 Function Codes)

Address	Address Hex	Signal	R/W	Min	Max	Register Description
40001	Area 4 0x0000	DI0	R/W	0	65535	Digital Input Counter 0
40002	Area 4 0x0001	DI1	R/W	0	65535	Digital Input Counter 1
40003	Area 4 0x0002	DI2	R/W	0	65535	Digital Input Counter 2
40004	Area 4 0x0003	DI3	R/W	0	65535	Digital Input Counter 3
40005	Area 4 0x0004	DI4	R/W	0	65535	Digital Input Counter 4
40006	Area 4 0x0005	DI5	R/W	0	65535	Digital Input Counter 5
40007	Area 4 0x0006	DI6	R/W	0	65535	Digital Input Counter 6
40008	Area 4 0x0007	DI7	R/W	0	65535	Digital Input Counter 7

5. Module Parameter Register (Supports 0x03 and 0x06 Function Codes)

Address	Address Hex	Signal	R/W	Min	Max	Register Description
40161	Area 4 0x00A0	Slave ID	R/W	1	254	Communication Address ID Default = 1
40162	Area 4 0x00A1	RS-485 Baud Rate	R/W	0	7	0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps (Default) 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 115200 bps
40163	Area 4 0x00A2	RS-485 Parity bit	R/W	0	2	0: None (Default) 1: Odd 2: Even
40164	Area 4 0x00A3	Counter Global Mode	R/W	0	4	Counter Global Mode Register 0: Closed (Default) 1: Up 2: Down 3: Loop Up 4: Loop Down
<i>After the above four registers are modified, the module will save the settings and reset automatically.</i>						

2.5 Modbus-RTU Communication Example

1. 0x03 Function Code Read Holding Register

For example, Read module parameters, Register address: 40161~40164

Host sends data	01 03 00 A0 00 04 44 2B
Module slave ID	01
Function Code	03
Register start address	00 A0 (40161)
Number of registers	00 04
CRC Check Code	44 2B

Module Response	01 03 08 00 01 00 03 00 00 00 00 C1 17
Module slave ID	01
Function Code	03
Number of bytes	08
Slave ID	00 01 (ID = 1)
Baud Rate	00 03 (9600)
Parity Bit	00 00 (None)
Counter Mode	00 00 (All counters are off)
CRC Check Code	C1 17

2. 0x06 Function Code Write Holding Register

For example, Write Slave ID, Register address: 40161

Host sends data	01 06 00 A0 00 02 08 29
Module slave ID	01
Function Code	06
Register Address	00 A0 (40161)
Slave ID	00 02
CRC Check Code	08 29

Module Response	01 06 00 A0 00 02 08 29
Module slave ID	01
Function Code	06
Register Address	00 A0 (40161)
Slave ID	00 02 (The module slave ID has been modified to 2)
CRC Check Code	08 29

3. 0x02 Function Code Reading Digital Input Register

For example, Read DI0~DI7, Register address: 10001~10008

Host sends data	01 02 00 00 00 08 79 CC
Module slave ID	01
Function Code	02
Register start address	00 00 (10001)
Number of registers	00 08
CRC Check Code	79 CC

Module Response	01 02 01 80 A0 28
Module slave ID	01
Function Code	02
Number of bytes	01
Register Value	80 (DI0~DI6 = 0, DI7 = 1)
CRC Check Code	A0 28

4. 0x0F Function Code Writing Multi Digital Output

For example, Writing DO0~DO7, Register address: 00001~00008

Host sends data	01 0F 00 00 00 08 01 0F BE 91
Module slave ID	01
Function Code	0F
Register start address	00 00 (00001)
Number of registers	00 08
Number of bytes	01
DO0~DO7 Values	0F (DO0~DO3 = 1) (DO4~DO7 = 0)
CRC Check Code	BE 91

Module Response	01 0F 00 00 00 08 54 0D
Module slave ID	01
Function Code	0F
Register start address	00 00
Number of registers	00 08
CRC Check Code	54 0D

5. 0x05 Function Code Writing Single Digital Output

For example, write DO4, Register address: 00005

Host sends data	01 05 00 04 FF 00 CD FB
Module slave ID	01
Function Code	05
Register Address	00 04 (00005)
Register Value	FF 00 (DO4 = 1)
CRC Check Code	CD FB

Module Response	01 05 00 04 FF 00 CD FB
Module slave ID	01
Function Code	05
Register Address	00 04 (00005)
Register Value	FF 00 (DO4 = 1)
CRC Check Code	CD FB

6. 0x03 Function Code Reading Digital Input Counter Register

For example, Read DI0~DI7 Input Counter, Register address: 40001~40008

Host sends data	01 03 00 00 00 08 44 0C
Module slave ID	01
Function Code	03
Register start address	00 00 (40001)
Number of registers	00 08 (8)
CRC Check Code	44 0C

Module Response	01 03 10 00 00 00 00 00 00 00 00 00 00 00 00 00 01 F4 E4 4E
Module slave ID	01
Function Code	03
Number of bytes	10 (16)
Register Value	00 00 (DI0~DI6 Counter = 0) 01 F4 (DI7 Counter = 500)
CRC Check Code	E4 4E

7. 0x03 Function Code Reading Counter Mode Register

For example, Read DI0~DI7 Counter Mode, Register address: 40033~40040

Host sends data	01 03 00 20 00 08 45 C6
Module slave ID	01
Function Code	03
Register start address	00 20 (40033)
Number of registers	00 08 (8)
CRC Check Code	45 C6

Module Response	01 03 10 00 01 00 01 00 01 00 01 00 00 00 00 00 00 00 2E B4
Module slave ID	01
Function Code	03
Number of bytes	10 (16)
Register Value	00 01 (DI0~DI3 Counter Mode = Up) 00 00 (DI4~DI7 Counter Mode = Closed)
CRC Check Code	2E B4

8. 0x06 Function Code Write Counter Register

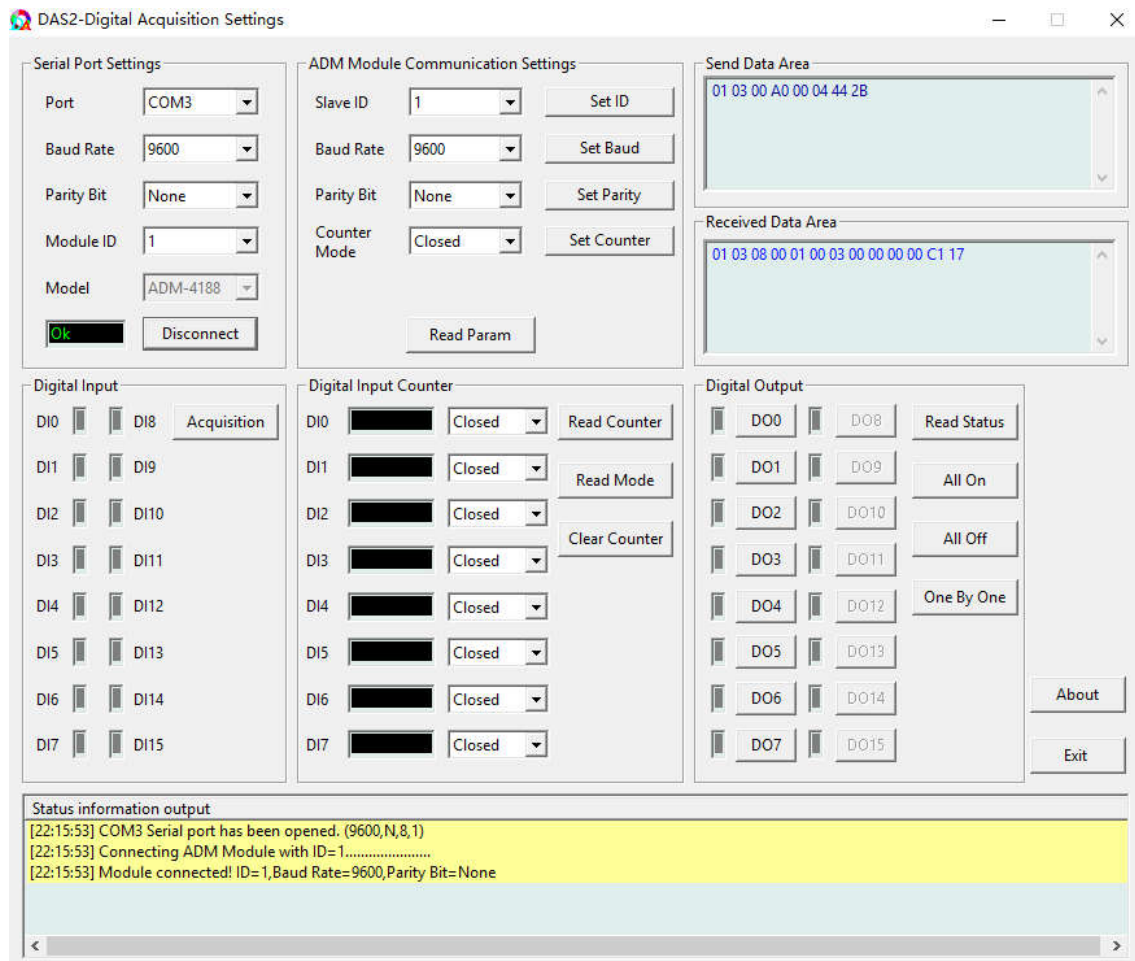
For example, write DI4 Counter, Register address: 40005

Host sends data	01 06 00 04 13 88 C5 5D
Module slave ID	01
Function Code	06
Register Address	00 04 (40005)
Register Value	13 88 (Set DI4 Counter = 5000)
CRC Check Code	C5 5D

Module Response	01 06 00 04 13 88 C5 5D
Module slave ID	01
Function Code	06
Register Address	00 04 (40005)
Register Value	13 88
CRC Check Code	C5 5D

3. DAS2 Software Instructions

3.1 DAS2 Software Interface



3.2 Introduction to DAS2 software functions

1. Serial Port Setting

Item	Function
Serial Port	COM port number of computers
Baud Rate	Baud rate of computer COM port
Parity Bit	Parity bit of computer COM port
Module ID	Slave ID of the module connected to the COM port of the computer
Model	Model of the module connected to the COM port of the computer
Connect / Disconnect	Connect the module and read the module parameters / Disconnect the software from the module No: The software and module are not connected OK: Software and module connected

2. ADM Module Communication Settings

Item	Function
Slave ID	Slave ID of the module (Address)
Baud Rate	Baud rate of RS-485 interface of module
Parity Bit	Parity bit of RS-485 interface of module
Counter Mode	Global mode of counters
Set Button	Send parameter setting command to the module
Read Param Button	Read module parameters

3. Send Data Area and Receive Data Area

Item	Function
Send Data Area	Data frame sent by the software to the module, which is updated in real time
Receive Data Area	Data frame returned by the module to the software, which is updated in real time

4. Digital Input

Item	Function
DI0~DI7 Status	Digital input status indication, 1 = Green / 0 = Gray
Acquisition Button	Read DI0~DI7 digital input status

5. Digital Input Counter

Item	Function
DI0~DI7 Counter	Display module DI0~DI7 counter value
Counter Mode List	Display and set the mode of module DI0~DI7 counters
Read Counter Button	Read the value of module DI0~DI7 counters
Read Mode Button	Reading module DI0~DI7 counter mode
Clear Counter Button	Set module DI0~DI7 counters to 0

6. Digital Output

Item	Function
DO0~DO7 Status	Digital output status indication, 1 = Green / 0 = Gray
DO0~DO7 Button	Change digital output status
Read Status Button	Read the digital output status of DO0~DO7
All On Button	Set DO0~DO7 output 1
All Off Button	Set DO0~DO7 output 0
One By One Button	DO0~DO7 cycle outputs 1 and 0 in proper order, only used when testing modules

7. Status Information Output

Item	Function
Information Output	Real time output of status information after software operation