Matis Electric Smart Recloser-MT51RS
---- Modbus Communication Protocol

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Contents

1. Protocol Description

This is the smart control recloser Modbus protocol, which facilitates users to read and write device parameters using Modbus commands. In this protocol, the transmission and return values of communication are all hexadecimal numbers unless otherwise noted.

2. Frame Format

Modbus Frame Format

Address Code	Function Code	Data Field	Check Code

2.1 Address Code

➤ 1 byte

➤ A device terminal corresponds to an address code, the address range is 1~247 (0x01~0xF7), 0 is the broadcast address, and the data can be read by broadcast, but the configuration cannot be broadcast;

2.2 Function Code

➤ 1 byte

➤ According to the function code definition of the standard Modbus protocol, two commonly used basic function codes are selected as the read and write function codes of this protocol.

Function Code Definition

Function Code	Function
0x03	Read holding register
0x06	Write single register

2.3 Data Field

➤ The format of the data field is determined by the function code.

➤ Read register 0x03

➤ When reading a register, you need to know the starting address and length of the reading register, so the data field consists of the starting address of the register and the number of registers; the data field of the returned response frame is the number of bytes and data in the corresponding range register

0x03 Read Register Frame Format

Request Frame			Response Frame		
Frame format	Value /Range	Number of Bytes	Frame Format	Value /Range	Number of Bytes
Address code	0～247	1	Address code	0～247	1
Function code	0x03	1	Function code	0x03	1
Register starting address	0 ～ 0xFFFF	2	Register starting address	2*N	1
Number of consecutive registers N	1～125	2	Number of consecutive registers N	2～250	2*N
CRC check		2	CRC check		2

Note: 1. Any frame data containing 2 bytes (except CRC) has the high byte first and the low byte last.

2. In the request frame, if the read consecutive register contains undefined registers, an error will be reported;

➢ Write single register 0x06

Write a single holding register, mainly used to configure parameters, occupying 8 bytes in total, and the return frame is consistent with the request frame. The register value is the written value.

0x06 Write Single Register Frame Format

Request Frame			Response Frame		
Frame Format	Value /Range	Number of Bytes	Frame Format	Value /Range	Number of Bytes
Address code	0～247	1	Address code	0～247	1
Function code	0x06	1	Function code	0x06	1
Register address	0～ 0xFFFF	2	Register address	0～0xFFFF	2
Register value	0～ 0xFFFF	2	Register value	0～0xFFFF	2
CRC check		2	CRC check		2

2.4 Check Code

The check code is calculated using CRC-16 (the generator polynomial is A001), **with the low byte first and the high byte last.**

2.5 MODBUS Exception Response Frame

When the device receives the request frame from the master and successfully performs the data processing of the request frame, the device returns a normal response frame to the master; when the device fails to receive the request frame from the master, it does not perform any operation and has no Return, the master can set the timeout time as a basis for judging device fault;

When the device receives a request frame from the master, but the function code or register of the request frame does not meet the data definition requirements, the device cannot perform the data processing of the request frame, and the device must return an exception response frame to the master. The exception response frame format is shown in the following:

MODBUS Exception Response Frame Format

Exception Response Frame		
Frame Format	Value /Range	Number of Bytes
Address code	0~247	1
Function code	0x80 + request function code	1
Exception code	01/02/03	1
CRC check		2

The function code is to set the high bit of the function code of the received request frame to 1, indicating that the frame is an exception response frame;

Exception codes are defined in the following table:

MODBUS Exception Code

Exception Code	Name	Meaning
01	Illegal function code	The function code of the request frame is undefined
02	Illegal register address	The register address of the request frame is undefined
03	Illegal register value	The register value or register length of the request frame does not conform to the defined format.

3. Register Definition

3.1 Register Address Classification

Type of data	Register base address range
Configuration parameter data	0x0000 above
Smart electric operating parameters	0x1000 above

3.2 Register Address

	Parameter data: 03H function read		06H 10H function write			
Decimal Address	Hexadecimal Address	Data Item	Number of Bytes	WORD	Read / Write Property
0	0x0000	Read and write address Default address 1 (The range of decimal values allowed to be set 1~247)	2	1	R/W
4	0x0004	Read and write baud rate 0x0000 (baud rate 2400) 0x0001 (baud rate 4800) Default 0x0002 (baud rate 9600) 0x0003 (baud rate 19200)	2	1	R/W
5	0x0005	Read and write data bit, parity bit, stop bit Default 8n1 (0x0011) 8o1 (0x0021) 8e1 (0x0041) 8n2 (0x0012) 8o2 (0x0022) 8e2 (0x0042)	2	1	R/W
4096	0x1000	The value read is fixed at (0x00 00)	2	1	R

		Write data: Control closing: (0x00 01) Control opening: (0x00 02)	2	1	W
4097	0x1001	Read the firmware version number Default value: (0x00 01)	2	1	R
4098	0x1002	Read the opening and closing status Read data: Handle in the middle: (0x00 00) The handle is in the closing position: (0x00 01) The handle is in the opening position: (0x00 02)	2	1	R
4099	0x1003	The reclosing waiting time gear set by the knob (according to the actual position of the panel knob, please see the code details on the side of the product) Unable to write data; Only can read data: Disable auto-reclosing-gear (0x00 00) Automatic reclosing waiting gear 1 (0x00 01) Automatic reclosing waiting gear 2 (0x00 02) . . . Automatic reclosing waiting gear 9 (0x00 09)	2	1	R
4100	0x1004	The allowed number of reclosings set by the knob (according to the actual position of the panel knob) Write data: (0x00 01) Read data: Disable auto-reclosing-gear (0x00 00) Reclosing allowed 1 time (0x00 01) Reclosing allowed 2 times (0x00 02) . . . Reclosing allowed 9 times (0x00 09)	2	1	R

4101	0x1005	Cumulative automatic reclosing times Clear the cumulative automatic reclosing times Write data: (write any data to clear the reclosing times) Example: Clear (0x00 01)			RW
4102	0x1006	Read data: Current number of reclosings in this round	2	1	RW
		Write data: write any data to clear the reclosing times Example: Clear (0x00 01)			
4103	0x1007	Automatic clearing time (also called stabilization time) unit: time (seconds) Default 900; Allowed setting range: 1-65535	2	1	R/W
4104	0x1008	Read system fault: Bit4 set to 1: motor failure Other bits are reserved and default to 0	2	1	R

Note 1: Since the RTU mode has been specified, the data bits are fixed to 8 data bits. There is no corresponding register for read and write operations and cannot be changed. Communication can be completed by only considering the check bit and stop bit;

Note 2: Writing operations to the total reclosing times (0x1005) and the current number of reclosing failures (0x1006) will clear the total reclosing times and the current number of reclosing failures;

Note 4: The read and write address 0x00 is a broadcast address. Access to this address can access all units, but there will be no response;

Note 5: The read and write address 0xFF is a public address. Access to this address can access all units and respond normally.

4. Complete Command Example

4.1 Communication Fault Code (Return to the Highest Bit 1 of the Function Code)

		Send	Return
Invalid function code	0x01	01 26 10 00 00 01 CD 0D	01 A6 01 9A 60
Invalid register address	0x02	01 06 20 00 00 01 43 CA	01 86 02 C3 A1
Invalid value	0x03	01 06 10 00 00 03 CD 0B	01 86 03 02 61

4.2 Communication Command

Select Hex format for both sending and receiving

Read address   01 03 00 00 00 01 84 0A (default 1)

Write address   01 06 00 00 00 02 08 0B (address 1 changed to 2)

                        02 06 00 00 00 01 48 39 (address 2 changed to 1)

The following takes address 1 as an example:

Read baud rate   01 03 00 01 00 01 D5CA(default 9600)

Write baud rate   01 06 00 01 00 00 D80A(2400)

                       01 06 00 01 00 01 19CA(4800)

                       01 06 00 01 00 02 59CB(9600)

                       01 06 00 01 00 03 980B(19200)

Control closing   01 06 10 00 00 01 4C CA

Control opening   01 06 10 00 00 02 0C CB

Read firmware version number

01 03 10 01 00 01 D1 0A (current version number is 2)

Read the opening and closing status

01 03 10 02 00 01 21 0A (0x0001 opening in place 0x0002 closing in place)

Read the total reclosing times

01 03 10 05 00 01 90 CB (total reclosing times of actual device)

Write to clear the total reclosing times

01 06 10 05 00 01 DD 0A (write any number to clear the total reclosing times)

Read the current reclosing times of the recloser

01 03 10 06 00 01 60 CB (current reclosing times of the device)

Write to clear current reclosing times

01 06 10 06 00 01 AC CB (write any number to clear the current number of reclosings)

Read system fault
01 03 10 08 00 01 01 08 (read system fault, now only determine it to motor fault)

4.3 Test

Read address

2015/12/1 20:28:09.39 [TX] - 01 03 00 00 00 01 84 0A

2015/12/1 20:28:09.42 [RX] - 01 03 02 00 01 79 84

Read baud rate

2015/12/1 20:30:31.34 [TX] - 01 03 00 04 00 01 C5 CB

2015/12/1 20:30:31.37 [RX] - 01 03 02 00 02 39 85

Control closing

2015/12/1 20:31:00.60 [TX] - 01 06 10 00 00 01 4C CA

2015/12/1 20:31:00.64 [RX] - 01 06 10 00 00 01 4C CA

Control opening

2015/12/1 20:31:11.12 [TX] - 01 06 10 00 00 02 0C CB

2015/12/1 20:31:11.16 [RX] - 01 06 10 00 00 02 0C CB

Read version number

2022/7/1 20:31:30.09 [TX] - 01 03 10 01 00 01 D1 0A

2022/7/1 20:31:30.13 [RX] - 01 03 02 00 02 39 85

Read the opening and closing status

2015/12/1 20:31:40.32 [TX] - 01 03 10 02 00 01 21 0A

2015/12/1 20:31:40.35 [RX] - 01 03 02 00 00 B8 44

Read the total reclosing times

2015/12/1 20:32:01.00 [TX] - 01 03 10 05 00 01 90 CB

2015/12/1 20:32:01.04 [RX] - 01 03 02 00 03 F8 45 (Total reclosing times: 3 times)

Write to clear the total reclosing times

2015/12/1 20:32:17.49 [TX] - 01 06 10 05 00 01 DD 0A (Write any number to clear the total reclosing times)

2015/12/1 20:32:17.53 [RX] - 01 06 10 05 00 01 DD 0A

Read the current reclosing times of the recloser

2015/12/1 20:32:37.84 [TX] - 01 03 10 06 00 01 60 CB

2015/12/1 20:32:37.87 [RX] - 01 03 02 00 01 79 84 (The recloser recloses once currently)

Write to clear the current reclosing times of the recloser

2015/12/1 20:32:56.80 [TX] - 01 06 10 06 00 01 AC CB (write any number to clear the current number of reclosings)

2015/12/1 20:32:56.86 [RX] - 01 06 10 06 00 01 AC CB

Read system fault

2015/12/1 20:32:56.80 [TX] - 01 06 10 06 00 01 AC CB

215/12/1 20:32:56.86 [RX] - 01 06 10 06 00 10 6C C7

5. Version Events

Date	Version	Event	Operated by
20180725	V2.0	Sort and file	Wynn
2022-12-26	V2.1	● The value of the opening and closing status register is different from the Wuxi version before and has been changed to the same value now. ● Add automatic reclosing delay T gear display register ● Add automatic reclosing N gear display register	Chen Pingyan

Instruction Manual

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