Smart Recloser-MT53RAs

---- Modbus RTU Communication Protocol

Document version	V 1.0
Release date	2021-5-21

Shanghai Matis Electric Co., Ltd.

matismart
AIoT Electric

Contents

CONTENTS **2**

1. PROTOCOL DESCRIPTION **3**

2. FRAME FORMAT **4**

2.1 ADDRESS CODE 4
2.2 FUNCTION CODE 4
2.3 DATA FIELD 4
2.4 CHECK CODE 5
2.5 MODBUS EXCEPTION RESPONSE FRAME 6

3. REGISTER DEFINITION **7**

3.1 REGISTER ADDRESS 7
3.2 MODBUS REGISTER 10

4. VERSION EVENTS **12**

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 1~32 (0x01~0x20), 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

- Any frame data containing 2 bytes (except CRC) has the high byte first and the low byte last.
- 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 station 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 station. The exception response frame format is shown in the following table:

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	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

Hex Address	Data Item	Property	Value/ Range	Default Value	Data Type	Byte Length	Unit
0000	Communication address	R/W	1~254	1	word	2	
0001	Communication baud rate	R/W	1：2400 2：4800 3：9600	3	word	2	
0002	Communication check bit	R/W	1：NONE 2：EVEN 3：ODD	1	word	2	
0003	Communication stop bit	R/W	1：1bit 2：1.5bit 3：2bit	1	word	2	
0004	System status control	R/W	Enter 2020 to reset and restart	0	word	2	
0005	System upgrade control	R/W	Enter 2025 to upgrade mode	0	word	2	MHz
0006	System clock high bit	R			word	2	S
0007	System clock low bit	R			word	2	S
0008	Hardware identification number	R			word	2	
0009	Firmware version number	R			word	2	
000A (10)	Automatic reclosing enable	R/W	1: ON 0: OFF	1	word	2	
000B	Automatic reclosing timing	R			word	2	S

000C (12)	Display status	R	1: The red light is always on 2: The green light is always on 4: Red light flashes 5: Green light flashes		word	2	
000D	AUX output status	R	0: No output 1: With output	0	word	2	
000E	Padlock status	R	0: No padlock 1: With padlock		word	2	
000F (15)	Location hall (Trigger is 1)	R	Bit 0: Opening hall Bit 1: Reset hall Bit 2: Closing hall Bit 3: Motor fault		word	2	
0010 (16)	Reclosing status	R	Bit1: Command opening (0x0002) Bit2: Command closing (0x0004) Bit3: Command lock (0x0008) Bit4: Command unlock (0x0010) Bit5: Automatic opening (0x0020) (The initial status after power-on is opening) Bit6: Automatic closing (0x0040) Bit10: External closing (0x0400) Bit11: Fault opening (0x0800) Bit15: padlock status (0x8000 for padlock, 0 for unpadlocked) In the initial status, the device itself malfunctions and the gear is not reset. (0x0000)		word	2	
0011 (17)	Control ON/OFF	W	1: Opening 2: Closing 3: Lock 4: Unlock		word	2	

0012	Device mode	R/W			word	2	
0013	Automatic reclosing times setting	R/W		3	word	2	
0014	Closing delay compensation	R/W	1~300	25	word	2	MS
0015	Opening delay compensation	R/W	1~300	0	word	2	MS
0016	Closing reset compensation	R/W	1~300	15	word	2	MS
0017	Opening reset compensation	R/W	1~300	20	word	2	MS
0018	Closing action time	R			word	2	MS
0019	Opening action time	R			word	2	MS
001A	Closing reset time	R			word	2	MS
001B	Opening reset time	R			word	2	MS
001C	Opening lock time	R			word	2	MS
001D	Unlock reset time	R			word	2	MS
001F	Motor running time	R			word	2	
002B	Command closing times	R			word	2	
002C	Command opening times	R			word	2	
002D	Command lock times	R			word	2	
002E	Manual padlock times	R			word	2	
002F	Manual closing times	R			word	2	
0030	Stable timed waiting	R					
0031	Reclosing times mark	R					
0032	Reclosing 1 time	R/W	1~3600	10	word	2	S
0033	Reclosing 2 time	R/W	1~3600	60	word	2	S
0034	Reclosing 3 time	R/W	1~3600	300	word	2	S
003C	Stable 1 time	R/W	1~3600	60	word	2	S
003D	Stable 2 time	R/W	1~3600	60	word	2	S

003E	Stable 3 time	R/W	1~3600	60	word	2	S

3.2 Modbus Register

Address	Property	Value/Range	Default value	Unit	Length(char)	Data item
0000	R/W	1~254	1		2	Communication address
0001	R/W	1: 2400 2: 4800 3: 9600 4: 19200 5: 115200	3		2	Serial baud rate
0002	R/W	1: NONE 2: EVEN 3: ODD	1		2	Communication check bit
0003	R/W	1: 1 bit	1		2	Communication stop bit
0004	W		0		2	System status control
0005	W		0		2	System upgrade control
0006	R				2	System clock high bit
0007	R				2	System clock low bit
0008	R				2	Hardware identification number
0009	R				2	Firmware version number

Added functions:

1. In the padlocked status, the device responds to the broadcast address 0, but in the non-padlocked status it does not respond to the padlock address 0;
2. When modifying the factory default configuration parameters, a password is in need to unlock it.
3.

Broadcast access address:

[TX] - 00 03 00 00 00 01 85 DB

[RX] - 01 03 02 00 01 79 84

Broadcast change address:

[TX] - 00 06 00 00 00 02 09 DA

[RX] - 02 06 00 00 00 02 08 38

Read address to get all registers

[TX] - 01 03 00 00 00 1E C5 C2 (default address 1)

[RX] - 01 03 3C 00 01 00 04 00 01 00 02 00 00 00 00 00 00 01 2E 00 00 03 E2 00 01 00 00 00 01 00 01 00 00 00 03 00 00 00 00 00 00 00 00 03 20 00 0A 00 2D 00 05 00 10 00 10 00 00 00 00 00 04 00 05 34 4E

4. Version Events

Date	Version	Event	Operated by
20210521	V1.0	Initial version	Tang Qi

matismart AIoT Electric SHANGHAI MATIS ELECTRIC CO.,LTD. 上海麦豆电气有限公司

Web: www.matismart.com

Email: info@matismart.com

Phone: +86 21 60503668

Mobile: +86 186 2187 9631

Address: Room 318-320, No. 83, Huanhu West 3rd Road, Pudong, Shanghai, China 201306