SmartGen

MAKING CONTROL SMARTER

HAT821SI

DUAL POWER BUS TIE ATS CONTROLLER

COMMUNICATION PROTOCOL

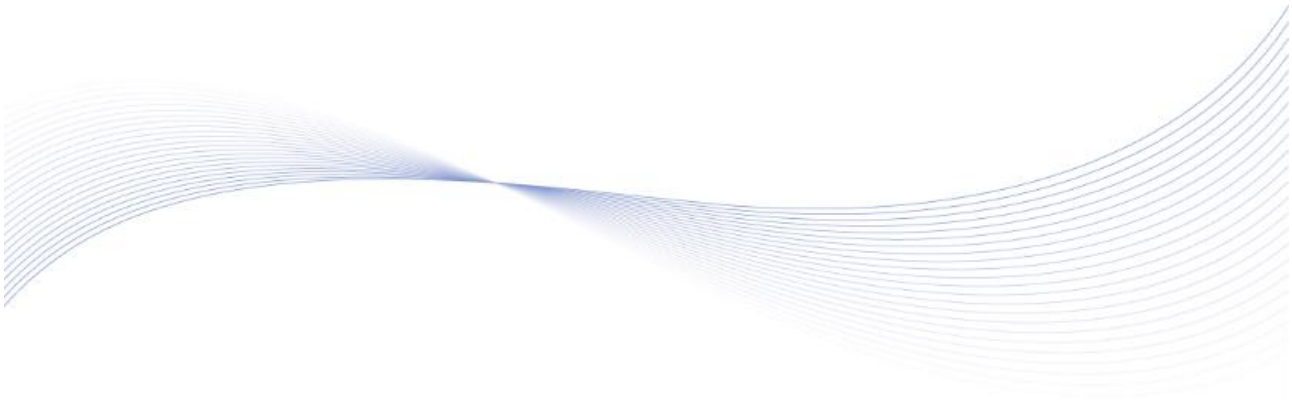

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Table 1 – Software Version

Date	Version	Content
2023-11-22	V1.0	Original release.

CONTENT

1. DESCRIPTION

This protocol describes read and write command format of RS485 half-duplex serial port communication and definition of internal information data for the third-party to develop and use.

HAT821SI controller has 2 RS485 interfaces with same communication protocol.

The controller is used as a slave, using Modbus-RTU protocol, and does not support other protocols such as Modbus-ASCII.

Communication address: 1~254 (default: 1)
Baud rate: 2400/4800/9600/19200bps (default: 9600bps)
Start bit: 1-bit
Data bit: 8-bit
Parity bit: No/Odd/Even Parity (default: no parity)
Stop bit: 1 or 2 bits (default: 1-bit)

Supported function code: 03H, 05H. Function code 03H is used for reading controller alarm, status information and various electricity data; while function code 05H is used for sending remote command.

Data check mode: CRC16.

Internal registers of controller are in the unit of "word (double bytes)".

Communication timeout period: over 200ms.

Communication distance: 9600 baud rate, the longest distance can reach 1,000m when using 120Ω shielding twisted pair.

Once maximum 120 data of word register can be read.

Up to 32 controllers can be connected together for network communication.

When RS485 is connected, 120Ω twisted pair with shielding layer shall be used, and the shielding layer shall be grounded at one end.

2. WIRING DIAGRAM

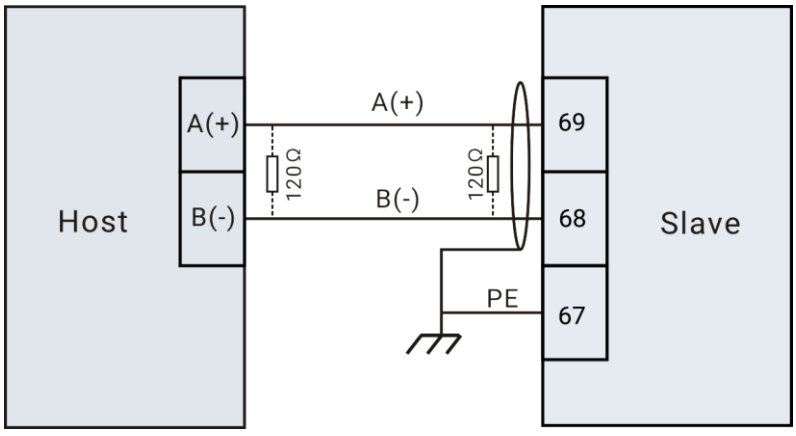

Fig.1 Single Unit Communication Wiring Diagram

NOTE1: 2 120Ω impedance resistors can be connected automatically according to site situation, details refer to the following description.

NOTE2: This figure is RS485-1 wiring diagram, RS485-2 wiring diagram is as above.

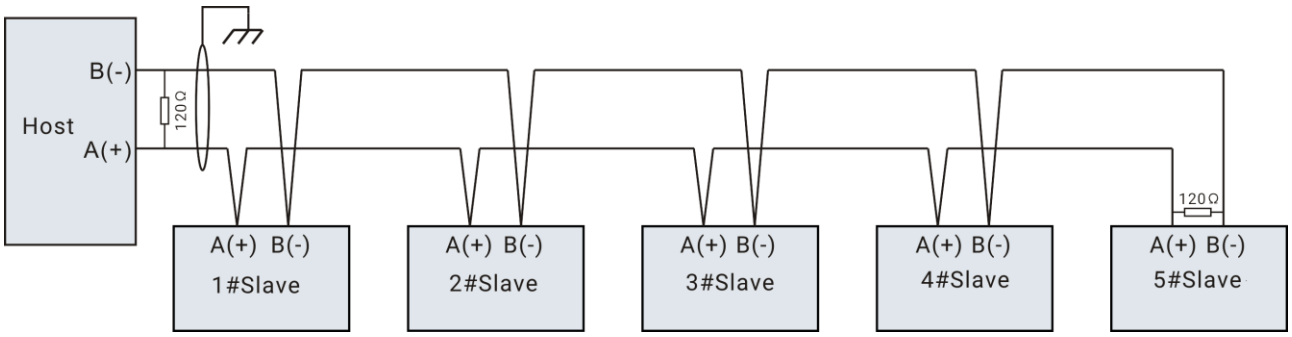

Fig.2 Multi-unit Communication Wiring Diagram

NOTE1: Please set each controller's communication module address before networking. Same module address is inhibited in the same network.

NOTE2: The shielding layer of communication line is single-end grounded on the host side.

3. CONTROLLER INTERNAL REGISTER ADDRESS AND DATA

In the following table, S1 refers to 1# power, S2 refers to 2# power, "/" means this item is reserved.

3.1 ALARM, STATUS COIL DATA FIELD CORRESPONDING TO FUNCTION CODE 03H

Table 2 – Alarm, Status Coil Data Field

Modbus Address	PLC Address	Name	Description
500.0	40501.0	Common Alarm	0 means no common alarm occurs; 1 means there is common alarm. (500.0 is the boolean value of bit 0 of address 500) The following contents in turn.
500.1	40501.1	Common Warn Alarm	
500.2	40501.2	Common Fault Alarm	
500.3	40501.3	/	
500.4	40501.4	/	
500.5	40501.5	/	
500.6	40501.6	Audible Alarm	
500.7	40501.7	/	
500.8	40501.8	Auto Mode	0: Manual Mode 1: Auto Mode
500.9	40501.9	Local Mode	
500.10	40501.1	S1 Master	S1 refers to 1# power. 1 means 1# power as normal power; 0 means 1# power as standby power.
500.11	40501.11	S2 Master	S2 refers to 2# power. 1 means 2# power as normal power; 0 means 2# power as standby power.
500.12	40501.12	Loop Closing Mode	The controller is in loop closing mode

Modbus Address	PLC Address	Name	Description
			currently.
500.13	40501.13	Remote Control Mode	Can remote control via PC.
500.14	40501.14	/	
500.15	40501.15	Genset Start Output	0 means genset start signal not output; 1 means genset start signal outputs.
501.0	40502.0	S1 Voltage Normal	S1 Power Status
501.1	40502.1	S1 Voltage Abnormal	
501.2	40502.2	S1 Volt Instant. Abnormal	
501.3	40502.3	/	
501.4	40502.4	/	
501.5	40502.5	/	
501.6	40502.6	/	
501.7	40502.7	/	
501.8	40502.8	S1 Blackout	
501.9	40502.9	S1 Over Voltage	
501.10	40502.1	S1 Under Voltage	
501.11	40502.11	S1 Over Frequency	
501.12	40502.12	S1 Under Frequency	
501.13	40502.13	S1 Loss of Phase	
501.14	40502.14	S1 Reverse Phase Seq.	
501.15	40502.15	S1 Reverse Power	
502.0	40503.0	S2 Voltage Normal	S2 Power Status
502.1	40503.1	S2 Voltage Abnormal	
502.2	40503.2	S2 Volt Instant. Abnormal	
502.3	40503.3	/	
502.4	40503.4	/	
502.5	40503.5	/	
502.6	40503.6	/	
502.7	40503.7	/	
502.8	40503.8	S2 Blackout	
502.9	40503.9	S2 Over Voltage	
502.10	40503.1	S2 Under Voltage	
502.11	40503.11	S2 Over Frequency	
502.12	40503.12	S2 Under Frequency	
502.13	40503.13	S2 Loss of Phase	
502.14	40503.14	S2 Reverse Phase Seq.	
502.15	40503.15	S2 Reverse Power	
503.0	40504.0	ATS Transfer Failure	Alarms
503.1	40504.1	S1 Close Failure	
503.2	40504.2	S1 Open Failure	
503.3	40504.3	GND Fault	
503.4	40504.4	S2 Close Failure	
503.5	40504.5	S2 Open Failure	

Modbus Address	PLC Address	Name	Description
503.6	40504.6	QS1 GND & Overcurrent Fault	
503.7	40504.7	QS2 GND & Overcurrent Fault	
503.8	40504.8	S1 Load Overcurrent Trip	
503.9	40504.9	S2 Load Overcurrent Trip	
503.10	40504.1	Forced Open Fault Alarm	
503.11	40504.11	S1 Genset Fault	
503.12	40504.12	S2 Genset Fault	
503.13	40504.13	ATS Tripping Fault Alarm	
503.14	40504.14	Sync. Failure Fault	
503.15	40504.15	QTIE Tripping Fault	
504.0	40505.0	S1 Load Overcurrent Warn	
504.1	40505.1	S2 Load Overcurrent Warn	
504.2	40505.2	Forced Open Warn	
504.3	40505.3	Over Load Alarm	
504.4	40505.4	S1 PT Broken Wire	
504.5	40505.5	Sync. Failure Warn	
504.6	40505.6	S2 PT Broken Wire	
504.7	40505.7	GND Fault Warn	
504.8	40505.8	/	
504.9	40505.9	Genset Fault	
504.10	40505.1	/	
504.11	40505.11	ATS Parallel Connection Alarm	
504.12	40505.12	QTIE Close Failure	
504.13	40505.13	QTIE Open Failure	
504.14	40505.14	QS1 Tripping Fault	
504.15	40505.15	QS2 Tripping Fault	
505.0	40506.0	Aux. Input 1 Status	0 means input port not work; 1 means input port works.
505.1	40506.1	Aux. Input 2 Status	Refer to “Aux. Input 1 Status” description.
505.2	40506.2	Aux. Input 3 Status	
505.3	40506.3	Aux. Input 4 Status	
505.4	40506.4	Aux. Input 5 Status	
505.5	40506.5	Aux. Input 6 Status	
505.6	40506.6	Aux. Input 7 Status	
505.7	40506.7	Aux. Input 8 Status	
505.8	40506.8	Aux. Input 9 Status	
505.9	40506.9	Aux. Input 10 Status	
505.10	40506.1	Aux. Input 11 Status	
505.11	40506.11	Aux. Input 12 Status	
505.12	40506.12	/	

Modbus Address	PLC Address	Name	Description
505.13	40506.13	/	
505.14	40506.14	/	
505.15	40506.15	/	
506.0	40507.0	Aux. Output 1 Status	1 means output port works; 0 means output port not work.
506.1	40507.1	Aux. Output 2 Status	Refer to "Aux. Output 1 Status" description.
506.2	40507.2	Aux. Output 3 Status	
506.3	40507.3	Aux. Output 4 Status	
506.4	40507.4	Aux. Output 5 Status	
506.5	40507.5	Aux. Output 6 Status	
506.6	40507.6	Aux. Output 7 Status	
506.7	40507.7	Aux. Output 8 Status	
506.8	40507.8	Aux. Output 9 Status	
506.9	40507.9	Aux. Output 10 Status	
506.10	40507.1	Aux. Output 11 Status	
506.11	40507.11	Aux. Output 12 Status	
506.12	40507.12	L Supply Output Status	
506.13	40507.13	N Supply Output Status	
506.14	40507.14	Aux. Output 13 Status	
506.15	40507.15	Aux. Output 14 Status	
507.0	40508.0	S1 Close Control Output	
507.1	40508.1	S1 Open Control Output	
507.2	40508.2	S2 Close Control Output	
507.3	40508.3	S2 Open Control Output	
507.4	40508.4	S1 Closed	
507.5	40508.5	S2 Closed	
507.6	40508.6	/	
507.7	40508.7	/	
507.8	40508.8	/	
507.9	40508.9	/	
507.10	40508.1	/	
507.11	40508.11	/	
507.12	40508.12	Remote Start On-load	
507.13	40508.13	Remote Start Off-load	
507.14	40508.14	Mains Abnormal Start	
507.15	40508.15	Scheduled Run	
508.0	40509.0	Cycle Start	
508.1	40509.1	Balanced Running Start	
508.2	40509.2	Master Start	
508.3	40509.3	/	
508.4	40509.4	Scheduled Not Run	
508.5	40509.5	/	
508.6	40509.6	/	

Modbus Address	PLC Address	Name	Description
508.7	40509.7	/	
508.8	40509.8	/	
508.9	40509.9	/	
508.10	40509.10	Start Inhibit	
508.11	40509.11	/	
508.12	40509.12	S1 Close Inhibit	
508.13	40509.13	S2 Close Inhibit	
508.14	40509.14	Wait for S1 PF Input	
508.15	40509.15	Wait for S2 PF Input	
509.0	40510.0	NEL1 Trip Control	
509.1	40510.1	NEL2 Trip Control	
509.2	40510.2	NEL3 Trip Control	
509.3	40510.3	/	
509.4	40510.4	/	
509.5	40510.5	Elevator Control	
509.6	40510.6	Stepwise Transfer Man. Pop-up	
509.7	40510.7	/	
509.8	40510.8	QTIE Close Inhibit	
509.9	40510.9	/	
509.10	40510.1	Wait for QTIE PF Input	
509.11	40510.11	Auto Trans./Restore Digital Input	
509.12	40510.12	Remote Inhibit Digital Input	
509.13	40510.13	S1 Supply QTIE Close Inhibit	
509.14	40510.14	S2 Supply QTIE Close Inhibit	
509.15	40510.15	/	
510.0	40511.0	/	
510.1	40511.1	/	
510.2	40511.2	QTIE Close Control Output	
510.3	40511.3	QTIE Open Control Output	
510.4	40511.4	/	
510.5	40511.5	/	
510.6	40511.6	/	
510.7	40511.7	QTIE Closed	
510.8	40511.8	/	
510.9	40511.9	/	
510.10	40511.10	QS1 QTIE Close Inhibit	
510.11	40511.11	QS2 QTIE Close Inhibit	
510.12	40511.12	/	
510.13	40511.13	/	

Modbus Address	PLC Address	Name	Description
510.14	40511.14	/	
510.15	40511.15	/	
511.0	40512.0	Expansion Input Module 1 Comm. Failure	Expansion Module Comm. Failure Alarm
511.1	40512.1	Expansion Input Module 2 Comm. Failure	
511.2	40512.2	Expansion Input Module 3 Comm. Failure	
511.3	40512.3	Expansion Input Module 4 Comm. Failure	
511.4	40512.4	Expansion Input Module 5 Comm. Failure	
511.5	40512.5	Expansion Input Module 6 Comm. Failure	
511.6	40512.6	/	
511.7	40512.7	/	
511.8	40512.8	Expansion Output Module 1 Comm. Failure	
511.9	40512.9	Expansion Output Module 2 Comm. Failure	
511.10	40512.10	Expansion Output Module 3 Comm. Failure	
511.11	40512.11	Expansion Output Module 4 Comm. Failure	
511.12	40512.12	S1 Reverse Power Fault	
511.13	40512.13	S2 Reverse Power Fault	
511.14	40512.14	L1 ATS Transfer Failure Fault	
511.15	40512.15	L2 ATS Transfer Failure Fault	
512.0	40513.0	Expansion Input Module 1 Comm. Warn	Expansion Module Comm. Warn Alarm
512.1	40513.1	Expansion Input Module 2 Comm. Warn	
512.2	40513.2	Expansion Input Module 3 Comm. Warn	
512.3	40513.3	Expansion Input Module 4 Comm. Warn	
512.4	40513.4	Expansion Input Module 5 Comm. Warn	
512.5	40513.5	Expansion Input Module 6 Comm. Warn	
512.6	40513.6	Load ATS Trip Warn	

Modbus Address	PLC Address	Name	Description
512.7	40513.7	/	
512.8	40513.8	Expansion Output Module 1 Comm. Warn	
512.9	40513.9	Expansion Output Module 2 Comm. Warn	
512.10	40513.10	Expansion Output Module 3 Comm. Warn	
512.11	40513.11	Expansion Output Module 4 Comm. Warn	
512.12	40513.12	/	
512.13	40513.13	/	
512.14	40513.14	L1 ATS Transfer Failure Warn	
512.15	40513.15	L2 ATS Transfer Failure Warn	
513.0	40514.0	S1 Smart Unloading	
513.1	40514.1	S2 Smart Unloading	
513.2	40514.2	S1 Recovery with Load	
513.3	40514.3	S2 Recovery with Load	
513.4	40514.4	/	
513.5	40514.5	/	
513.6	40514.6	/	
513.7	40514.7	/	
513.8	40514.8	/	
513.9	40514.9	/	
513.10	40514.10	/	
513.11	40514.11	/	
513.12	40514.12	/	
513.13	40514.13	/	
513.14	40514.14	/	
513.15	40514.15	/	
514.0	40515.0	Expansion Input 1 Status	Input Ports 1~16 Status of Expansion Input Module 1
514.1	40515.1	Expansion Input 2 Status	
514.2	40515.2	Expansion Input 3 Status	
514.3	40515.3	Expansion Input 4 Status	
514.4	40515.4	Expansion Input 5 Status	
514.5	40515.5	Expansion Input 6 Status	
514.6	40515.6	Expansion Input 7 Status	
514.7	40515.7	Expansion Input 8 Status	
514.8	40515.8	Expansion Input 9 Status	
514.9	40515.9	Expansion Input 10 Status	
514.10	40515.10	Expansion Input 11 Status	

Modbus Address	PLC Address	Name	Description
514.11	40515.11	Expansion Input 12 Status	
514.12	40515.12	Expansion Input 13 Status	
514.13	40515.13	Expansion Input 14 Status	
514.14	40515.14	Expansion Input 15 Status	
514.15	40515.15	Expansion Input 16 Status	
515.0	40516.0	Expansion Input 1 Status	Input Ports 1~16 Status of Expansion Input Module 2
515.1	40516.1	Expansion Input 2 Status	
515.2	40516.2	Expansion Input 3 Status	
515.3	40516.3	Expansion Input 4 Status	
515.4	40516.4	Expansion Input 5 Status	
515.5	40516.5	Expansion Input 6 Status	
515.6	40516.6	Expansion Input 7 Status	
515.7	40516.7	Expansion Input 8 Status	
515.8	40516.8	Expansion Input 9 Status	
515.9	40516.9	Expansion Input 10 Status	
515.10	40516.10	Expansion Input 11 Status	
515.11	40516.11	Expansion Input 12 Status	
515.12	40516.12	Expansion Input 13 Status	
515.13	40516.13	Expansion Input 14 Status	
515.14	40516.14	Expansion Input 15 Status	
515.15	40516.15	Expansion Input 16 Status	
516.0	40517.0	Expansion Input 1 Status	Input Ports 1~16 Status of Expansion Input Module 3
516.1	40517.1	Expansion Input 2 Status	
516.2	40517.2	Expansion Input 3 Status	
516.3	40517.3	Expansion Input 4 Status	
516.4	40517.4	Expansion Input 5 Status	
516.5	40517.5	Expansion Input 6 Status	
516.6	40517.6	Expansion Input 7 Status	
516.7	40517.7	Expansion Input 8 Status	
516.8	40517.8	Expansion Input 9 Status	
516.9	40517.9	Expansion Input 10 Status	
516.10	40517.10	Expansion Input 11 Status	
516.11	40517.11	Expansion Input 12 Status	
516.12	40517.12	Expansion Input 13 Status	
516.13	40517.13	Expansion Input 14 Status	
516.14	40517.14	Expansion Input 15 Status	
516.15	40517.15	Expansion Input 16 Status	
517.0	40518.0	Expansion Input 1 Status	Input Ports 1~16 Status of Expansion Input Module 4
517.1	40518.1	Expansion Input 2 Status	
517.2	40518.2	Expansion Input 3 Status	

Modbus Address	PLC Address	Name	Description
517.3	40518.3	Expansion Input 4 Status	
517.4	40518.4	Expansion Input 5 Status	
517.5	40518.5	Expansion Input 6 Status	
517.6	40518.6	Expansion Input 7 Status	
517.7	40518.7	Expansion Input 8 Status	
517.8	40518.8	Expansion Input 9 Status	
517.9	40518.9	Expansion Input 10 Status	
517.10	40518.10	Expansion Input 11 Status	
517.11	40518.11	Expansion Input 12 Status	
517.12	40518.12	Expansion Input 13 Status	
517.13	40518.13	Expansion Input 14 Status	
517.14	40518.14	Expansion Input 15 Status	
517.15	40518.15	Expansion Input 16 Status	
518.0	40519.0	Expansion Input 1 Status	Input Ports 1~16 Status of Expansion Input Module 5
518.1	40519.1	Expansion Input 2 Status	
518.2	40519.2	Expansion Input 3 Status	
518.3	40519.3	Expansion Input 4 Status	
518.4	40519.4	Expansion Input 5 Status	
518.5	40519.5	Expansion Input 6 Status	
518.6	40519.6	Expansion Input 7 Status	
518.7	40519.7	Expansion Input 8 Status	
518.8	40519.8	Expansion Input 9 Status	
518.9	40519.9	Expansion Input 10 Status	
518.10	40519.10	Expansion Input 11 Status	
518.11	40519.11	Expansion Input 12 Status	
518.12	40519.12	Expansion Input 13 Status	
518.13	40519.13	Expansion Input 14 Status	
518.14	40519.14	Expansion Input 15 Status	
518.15	40519.15	Expansion Input 16 Status	
519.0	40520.0	Expansion Input 1 Status	Input Ports 1~16 Status of Expansion Input Module 6
519.1	40520.1	Expansion Input 2 Status	
519.2	40520.2	Expansion Input 3 Status	
519.3	40520.3	Expansion Input 4 Status	
519.4	40520.4	Expansion Input 5 Status	
519.5	40520.5	Expansion Input 6 Status	
519.6	40520.6	Expansion Input 7 Status	
519.7	40520.7	Expansion Input 8 Status	
519.8	40520.8	Expansion Input 9 Status	
519.9	40520.9	Expansion Input 10 Status	
519.10	40520.10	Expansion Input 11 Status	
519.11	40520.11	Expansion Input 12 Status	

Modbus Address	PLC Address	Name	Description
519.12	40520.12	Expansion Input 13 Status	
519.13	40520.13	Expansion Input 14 Status	
519.14	40520.14	Expansion Input 15 Status	
519.15	40520.15	Expansion Input 16 Status	
520.0	40521.0	Expansion Output 1 Status	Output Ports 1~16 Status of Expansion Output Module 1
520.1	40521.1	Expansion Output 2 Status	
520.2	40521.2	Expansion Output 3 Status	
520.3	40521.3	Expansion Output 4 Status	
520.4	40521.4	Expansion Output 5 Status	
520.5	40521.5	Expansion Output 6 Status	
520.6	40521.6	Expansion Output 7 Status	
520.7	40521.7	Expansion Output 8 Status	
520.8	40521.8	Expansion Output 9 Status	
520.9	40521.9	Expansion Output 10 Status	
520.10	40521.10	Expansion Output 11 Status	
520.11	40521.11	Expansion Output 12 Status	
520.12	40521.12	Expansion Output 13 Status	
520.13	40521.13	Expansion Output 14 Status	
520.14	40521.14	Expansion Output 15 Status	
520.15	40521.15	Expansion Output 16 Status	
521.0	40522.0	Expansion Output 1 Status	Output Ports 1~16 Status of Expansion Output Module 2
521.1	40522.1	Expansion Output 2 Status	
521.2	40522.2	Expansion Output 3 Status	
521.3	40522.3	Expansion Output 4 Status	
521.4	40522.4	Expansion Output 5 Status	
521.5	40522.5	Expansion Output 6 Status	
521.6	40522.6	Expansion Output 7 Status	
521.7	40522.7	Expansion Output 8 Status	
521.8	40522.8	Expansion Output 9 Status	
521.9	40522.9	Expansion Output 10 Status	
521.10	40522.10	Expansion Output 11 Status	
521.11	40522.11	Expansion Output 12 Status	
521.12	40522.12	Expansion Output 13 Status	
521.13	40522.13	Expansion Output 14 Status	
521.14	40522.14	Expansion Output 15 Status	
521.15	40522.15	Expansion Output 16 Status	
522.0	40523.0	Expansion Output 1 Status	Output Ports 1~16 Status of Expansion Output Module 3
522.1	40523.1	Expansion Output 2 Status	
522.2	40523.2	Expansion Output 3 Status	
522.3	40523.3	Expansion Output 4 Status	

Modbus Address	PLC Address	Name	Description
522.4	40523.4	Expansion Output 5 Status	
522.5	40523.5	Expansion Output 6 Status	
522.6	40523.6	Expansion Output 7 Status	
522.7	40523.7	Expansion Output 8 Status	
522.8	40523.8	Expansion Output 9 Status	
522.9	40523.9	Expansion Output 10 Status	
522.10	40523.10	Expansion Output 11 Status	
522.11	40523.11	Expansion Output 12 Status	
522.12	40523.12	Expansion Output 13 Status	
522.13	40523.13	Expansion Output 14 Status	
522.14	40523.14	Expansion Output 15 Status	
522.15	40523.15	Expansion Output 16 Status	
523.0	40524.0	LOAD1 ATS1 Closing Failure	LOAD1 ATS Closing Failure
523.1	40524.1	LOAD1 ATS2 Closing Failure	
523.2	40524.2	LOAD1 ATS3 Closing Failure	
523.3	40524.3	LOAD1 ATS4 Closing Failure	
523.4	40524.4	LOAD1 ATS5 Closing Failure	
523.5	40524.5	LOAD1 ATS6 Closing Failure	
523.6	40524.6	LOAD1 ATS7 Closing Failure	
523.7	40524.7	LOAD1 ATS8 Closing Failure	
523.8	40524.8	LOAD1 ATS9 Closing Failure	
523.9	40524.9	LOAD1 ATS10 Closing Failure	
523.10	40524.10	LOAD1 ATS11 Closing Failure	
523.11	40524.11	LOAD1 ATS12 Closing Failure	
523.12	40524.12	/	
523.13	40524.13	/	
523.14	40524.14	/	
523.15	40524.15	/	
524.0	40525.0	LOAD2 ATS1 Closing Failure	LOAD2 ATS Closing Failure
524.1	40525.1	LOAD2 ATS2 Closing	

Modbus Address	PLC Address	Name	Description
		Failure	
524.2	40525.2	LOAD2 ATS3 Closing Failure	
524.3	40525.3	LOAD2 ATS4 Closing Failure	
524.4	40525.4	LOAD2 ATS5 Closing Failure	
524.5	40525.5	LOAD2 ATS6 Closing Failure	
524.6	40525.6	LOAD2 ATS7 Closing Failure	
524.7	40525.7	LOAD2 ATS8 Closing Failure	
524.8	40525.8	LOAD2 ATS9 Closing Failure	
524.9	40525.9	LOAD2 ATS10 Closing Failure	
524.10	40525.10	LOAD2 ATS11 Closing Failure	
524.11	40525.11	LOAD2 ATS12 Closing Failure	
524.12	40525.12	/	
524.13	40525.13	/	
524.14	40525.14	/	
524.15	40525.15	/	
525.0	40526.0	LOAD1 ATS1 Opening Failure	LOAD1 ATS Opening Failure
525.1	40526.1	LOAD1 ATS2 Opening Failure	
525.2	40526.2	LOAD1 ATS3 Opening Failure	
525.3	40526.3	LOAD1 ATS4 Opening Failure	
525.4	40526.4	LOAD1 ATS5 Opening Failure	
525.5	40526.5	LOAD1 ATS6 Opening Failure	
525.6	40526.6	LOAD1 ATS7 Opening Failure	
525.7	40526.7	LOAD1 ATS8 Opening Failure	
525.8	40526.8	LOAD1 ATS9 Opening Failure	

Modbus Address	PLC Address	Name	Description
525.9	40526.9	LOAD1 ATS10 Opening Failure	
525.10	40526.10	LOAD1 ATS11 Opening Failure	
525.11	40526.11	LOAD1 ATS12 Opening Failure	
525.12	40526.12	/	
525.13	40526.13	/	
525.14	40526.14	/	
525.15	40526.15	/	
526.0	40527.0	LOAD2 ATS1 Opening Failure	LOAD2 ATS Opening Failure
526.1	40527.1	LOAD2 ATS2 Opening Failure	
526.2	40527.2	LOAD2 ATS3 Opening Failure	
526.3	40527.3	LOAD2 ATS4 Opening Failure	
526.4	40527.4	LOAD2 ATS5 Opening Failure	
526.5	40527.5	LOAD2 ATS6 Opening Failure	
526.6	40527.6	LOAD2 ATS7 Opening Failure	
526.7	40527.7	LOAD2 ATS8 Opening Failure	
526.8	40527.8	LOAD2 ATS9 Opening Failure	
526.9	40527.9	LOAD2 ATS10 Opening Failure	
526.10	40527.10	LOAD2 ATS11 Opening Failure	
526.11	40527.11	LOAD2 ATS12 Opening Failure	
526.12	40527.12	/	
526.13	40527.13	/	
526.14	40527.14	/	
526.15	40527.15	/	
527.0	40528.0	LOAD1 ATS1 Trip	LOAD1 ATS Trip Input
527.1	40528.1	LOAD1 ATS2 Trip	
527.2	40528.2	LOAD1 ATS3 Trip	
527.3	40528.3	LOAD1 ATS4 Trip	
527.4	40528.4	LOAD1 ATS5 Trip	

Modbus Address	PLC Address	Name	Description
527.5	40528.5	LOAD1 ATS6 Trip	
527.6	40528.6	LOAD1 ATS7 Trip	
527.7	40528.7	LOAD1 ATS8 Trip	
527.8	40528.8	LOAD1 ATS9 Trip	
527.9	40528.9	LOAD1 ATS10 Trip	
527.10	40528.10	LOAD1 ATS11 Trip	
527.11	40528.11	LOAD1 ATS12 Trip	
527.12	40528.12	/	
527.13	40528.13	/	
527.14	40528.14	/	
527.15	40528.15	/	
528.0	40529.0	LOAD2 ATS1 Trip	LOAD2 ATS Trip Input
528.1	40529.1	LOAD2 ATS2 Trip	
528.2	40529.2	LOAD2 ATS3 Trip	
528.3	40529.3	LOAD2 ATS4 Trip	
528.4	40529.4	LOAD2 ATS5 Trip	
528.5	40529.5	LOAD2 ATS6 Trip	
528.6	40529.6	LOAD2 ATS7 Trip	
528.7	40529.7	LOAD2 ATS8 Trip	
528.8	40529.8	LOAD2 ATS9 Trip	
528.9	40529.9	LOAD2 ATS10 Trip	
528.10	4059.10	LOAD2 ATS11 Trip	
528.11	40529.11	LOAD2 ATS 2 Trip	
528.12	40529.12	/	
528.13	40529.13	/	
528.14	40529.14	/	
528.15	40529.15	/	
529.0	40530.0	LOAD1 ATS1 Closing Output	LOAD1 ATS Closing Output
529.1	40530.1	LOAD1 ATS2 Closing Output	
529.2	40530.2	LOAD1 ATS3 Closing Output	
529.3	40530.3	LOAD1 ATS4 Closing Output	
529.4	40530.4	LOAD1 ATS5 Closing Output	
529.5	40530.5	LOAD1 ATS6 Closing Output	
529.6	40530.6	LOAD1 ATS7 Closing Output	
529.7	40530.7	LOAD1 ATS8 Closing Output	

Modbus Address	PLC Address	Name	Description
529.8	40530.8	LOAD1 ATS9 Closing Output	
529.9	40530.9	LOAD1 ATS10 Closing Output	
529.10	40530.10	LOAD1 ATS11 Closing Output	
529.11	40530.11	LOAD1 ATS12 Closing Output	
529.12	40530.12	/	
529.13	40530.13	/	
529.14	40530.14	/	
529.15	40530.15	/	
530.0	40531.0	LOAD2 ATS1 Closing Output	LOAD2 ATS Closing Output
530.1	40531.1	LOAD2 ATS2 Closing Output	
530.2	40531.2	LOAD2 ATS3 Closing Output	
530.3	40531.3	LOAD2 ATS4 Closing Output	
530.4	40531.4	LOAD2 ATS5 Closing Output	
530.5	40531.5	LOAD2 ATS6 Closing Output	
530.6	40531.6	LOAD2 ATS7 Closing Output	
530.7	40531.7	LOAD2 ATS8 Closing Output	
530.8	40531.8	LOAD2 ATS9 Closing Output	
530.9	40531.9	LOAD2 ATS10 Closing Output	
530.10	40531.10	LOAD2 ATS11 Closing Output	
530.11	40531.11	LOAD2 ATS12 Closing Output	
530.12	40531.12	/	
530.13	40531.13	/	
530.14	40531.14	/	
530.15	40531.15	/	
531.0	40532.0	LOAD1 ATS1 Opening Output	LOAD1 ATS Opening Output
531.1	40532.1	LOAD1 ATS2 Opening	

Modbus Address	PLC Address	Name	Description
		Output	
531.2	40532.2	LOAD1 ATS3 Opening Output	
531.3	40532.3	LOAD1 ATS4 Opening Output	
531.4	40532.4	LOAD1 ATS5 Opening Output	
531.5	40532.5	LOAD1 ATS6 Opening Output	
531.6	40532.6	LOAD1 ATS7 Opening Output	
531.7	40532.7	LOAD1 ATS8 Opening Output	
531.8	40532.8	LOAD1 ATS9 Opening Output	
531.9	40532.9	LOAD1 ATS10 Opening Output	
531.10	40532.10	LOAD1 ATS11 Opening Output	
531.11	40532.11	LOAD1 ATS12 Opening Output	
531.12	40532.12	/	
531.13	40532.13	/	
531.14	40532.14	/	
531.15	40532.15	/	
532.0	40533.0	LOAD2 ATS1 Opening Output	LOAD2 ATS Opening Output
532.1	40533.1	LOAD2 ATS2 Opening Output	
532.2	40533.2	LOAD2 ATS3 Opening Output	
532.3	40533.3	LOAD2 ATS4 Opening Output	
532.4	40533.4	LOAD2 ATS5 Opening Output	
532.5	40533.5	LOAD2 ATS6 Opening Output	
532.6	40533.6	LOAD2 ATS7 Opening Output	
532.7	40533.7	LOAD2 ATS8 Opening Output	
532.8	40533.8	LOAD2 ATS9 Opening Output	

Modbus Address	PLC Address	Name	Description
532.9	40533.9	LOAD2 ATS10 Opening Output	
532.10	40533.10	LOAD2 ATS11 Opening Output	
532.11	40533.11	LOAD2 ATS12 Opening Output	
532.12	40533.12	/	
532.13	40533.13	/	
532.14	40533.14	/	
532.15	40533.15	/	
533.0	40534.0	LOAD1 ATS1 Closing Status	LOAD1 ATS Closing Status
533.1	40534.1	LOAD1 ATS2 Closing Status	
533.2	40534.2	LOAD1 ATS3 Closing Status	
533.3	40534.3	LOAD1 ATS4 Closing Status	
533.4	40534.4	LOAD1 ATS5 Closing Status	
533.5	40534.5	LOAD1 ATS6 Closing Status	
533.6	40534.6	LOAD1 ATS7 Closing Status	
533.7	40534.7	LOAD1 ATS8 Closing Status	
533.8	40534.8	LOAD1 ATS9 Closing Status	
533.9	40533.9	LOAD1 ATS10 Closing Status	
533.10	40534.10	LOAD1 ATS11 Closing Status	
533.11	40534.11	LOAD1 ATS12 Closing Status	
533.12	40534.12	/	
533.13	405034.13	/	
533.14	40534.14	/	
533.15	40534.15	/	
534.0	40535.0	LOAD2 ATS1 Closing Status	LOAD2 ATS Closing Status
534.1	40535.1	LOAD2 ATS2 Closing Status	
534.2	40535.2	LOAD2 ATS3 Closing Status	
534.3	40535.3	LOAD2 ATS4 Closing Status	
534.4	40535.4	LOAD2 ATS5 Closing Status	
534.5	40535.5	LOAD2 ATS6 Closing Status	
534.6	40535.6	LOAD2 ATS7 Closing Status	
534.7	40535.7	LOAD2 ATS8 Closing Status	
534.8	40535.8	LOAD2 ATS9 Closing Status	
534.9	40535.9	LOAD2 ATS10 Closing Status	
534.10	40535.10	LOAD2 ATS11 Closing Status	
534.11	40535.11	LOAD2 ATS12 Closing	

Modbus Address	PLC Address	Name	Description
		Status	
534.12	40535.12	/	
534.13	40535.13	/	
534.14	40535.14	/	
534.15	40535.15	/	
535.0	40536.0	LOAD1 ATS1 in Work Position	LOAD1 ATS in Working Position
535.1	40536.1	LOAD1 ATS2 in Work Position	
535.2	40536.2	LOAD1 ATS3 in Work Position	
535.3	40536.3	LOAD1 ATS4 in Work Position	
535.4	40536.4	LOAD1 ATS5 in Work Position	
535.5	40536.5	LOAD1 ATS6 in Work Position	
535.6	40536.6	LOAD1 ATS7 in Work Position	
535.7	40536.7	LOAD1 ATS8 in Work Position	
535.8	40536.8	LOAD1 ATS9 in Work Position	
535.9	40536.9	LOAD1 ATS10 in Work Position	
535.10	40536.10	LOAD1 ATS11 in Work Position	
535.11	40536.11	LOAD1 ATS12 in Work Position	
535.12	40536.12	/	
535.13	40536.13	/	
535.14	40536.14	/	
535.15	40536.15	/	
536.0	40537.0	LOAD2 ATS1 in Work Position	LOAD2 ATS in Working Position
536.1	40537.1	LOAD2 ATS2 in Work Position	
536.2	40537.2	LOAD2 ATS3 in Work Position	
536.3	40537.3	LOAD2 ATS4 in Work Position	
536.4	40537.4	LOAD2 ATS5 in Work Position	

Modbus Address	PLC Address	Name	Description
536.5	40537.5	LOAD2 ATS6 in Work Position	
536.6	40537.6	LOAD2 ATS7 in Work Position	
536.7	40537.7	LOAD2 ATS8 in Work Position	
536.8	40537.8	LOAD2 ATS9 in Work Position	
536.9	40537.9	LOAD2 ATS10 in Work Position	
536.10	40537.10	LOAD2 ATS11 in Work Position	
536.11	40537.11	LOAD2 ATS12 in Work Position	
536.12	40537.12	/	
536.13	40537.13	/	
536.14	40537.14	/	
536.15	40537.15	/	
537.0	40538.0	LOAD1 ATS1 in Testing Position	LOAD1 ATS in Testing Position
537.1	40538.1	LOAD1 ATS2 in Testing Position	
537.2	40538.2	LOAD1 ATS3 in Testing Position	
537.3	40538.3	LOAD1 ATS4 in Testing Position	
537.4	40538.4	LOAD1 ATS5 in Testing Position	
537.5	40538.5	LOAD1 ATS6 in Testing Position	
537.6	40538.6	LOAD1 ATS7 in Testing Position	
537.7	40538.7	LOAD1 ATS8 in Testing Position	
537.8	40538.8	LOAD1 ATS9 in Testing Position	
537.9	40538.9	LOAD1 ATS10 in Testing Position	
537.10	40538.10	LOAD1 ATS11 in Testing Position	
537.11	40538.11	LOAD1 ATS12 in Testing Position	
537.12	40538.12	/	

Modbus Address	PLC Address	Name	Description
537.13	40538.13	/	
537.14	40538.14	/	
537.15	40538.15	/	
538.0	40539.0	LOAD2 ATS1 in Testing Position	LOAD2 ATS in Testing Position
538.1	40539.1	LOAD2 ATS2 in Testing Position	
538.2	40539.2	LOAD2 ATS3 in Testing Position	
538.3	40539.3	LOAD2 ATS4 in Testing Position	
538.4	40539.4	LOAD2 ATS5 in Testing Position	
538.5	40539.5	LOAD2 ATS6 in Testing Position	
538.6	40539.6	LOAD2 ATS7 in Testing Position	
538.7	40539.7	LOAD2 ATS8 in Testing Position	
538.8	40539.8	LOAD2 ATS9 in Testing Position	
538.9	40539.9	LOAD2 ATS10 in Testing Position	
538.10	40539.10	LOAD2 ATS11 in Testing Position	
538.11	40539.11	LOAD2 ATS12 in Testing Position	
538.12	40539.12	/	
538.13	40539.13	/	
538.14	40539.14	/	
538.15	40539.15	/	
539.0	40540.0	L1-1Smart Unloading	
539.1	40540.1	L1-2 Smart Unloading	
539.2	40540.2	L1-3 Smart Unloading	
539.3	40540.3	L1-4 Smart Unloading	
539.4	40540.4	L1-5 Smart Unloading	
539.5	40540.5	L1-6 Smart Unloading	
539.6	40540.6	L1-7 Smart Unloading	
539.7	40540.7	L1-8 Smart Unloading	
539.8	40540.8	L1-9 Smart Unloading	
539.9	40540.9	L1-10 Smart Unloading	
539.10	40540.10	L1-11 Smart Unloading	
539.11	40540.11	L1-12 Smart Unloading	

Modbus Address	PLC Address	Name	Description
539.12	40540.12	/	
539.13	40540.13	/	
539.14	40540.14	/	
539.15	40540.15	/	
540.0	40541.0	L2-1 Smart Unloading	
540.1	40541.1	L2-2 Smart Unloading	
540.2	40541.2	L2-3 Smart Unloading	
540.3	40541.3	L2-4 Smart Unloading	
540.4	40541.4	L2-5 Smart Unloading	
540.5	40541.5	L2-6 Smart Unloading	
540.6	40541.6	L2-7 Smart Unloading	
540.7	40541.7	L2-8 Smart Unloading	
540.8	40541.8	L2-9 Smart Unloading	
540.9	40541.9	L2-10 Smart Unloading	
540.10	40541.10	L2-11 Smart Unloading	
540.11	40541.11	L2-12 Smart Unloading	
540.12	40541.12	/	
540.13	40541.13	/	
540.14	40541.14	/	
540.15	40541.15	/	
541.0	40542.0	L1-1 Recovery with Load	
541.1	40542.1	L1-2 Recovery with Load	
541.2	40542.2	L1-3 Recovery with Load	
541.3	40542.3	L1-4 Recovery with Load	
541.4	40542.4	L1-5 Recovery with Load	
541.5	40542.5	L1-6 Recovery with Load	
541.6	40542.6	L1-7 Recovery with Load	
541.7	40542.7	L1-8 Recovery with Load	
541.8	40542.8	L1-9 Recovery with Load	
541.9	40542.9	L1-10 Recovery with Load	
541.10	40542.10	L1-11 Recovery with Load	
541.11	40542.11	L1-12 Recovery with Load	
541.12	40542.12	/	
541.13	40542.13	/	
541.14	40542.14	/	
541.15	40542.15	/	
542.0	40543.0	L2-1 Recovery with Load	
542.1	40543.1	L2-2 Recovery with Load	
542.2	40543.2	L2-3 Recovery with Load	
542.3	40543.3	L2-4 Recovery with Load	
542.4	40543.4	L2-5 Recovery with Load	
542.5	40543.5	L2-6 Recovery with Load	
542.6	40543.6	L2-7 Recovery with Load	

Modbus Address	PLC Address	Name	Description
542.7	40543.7	L2-8 Recovery with Load	
542.8	4053.8	L2-9 Recovery with Load	
542.9	40543.9	L2-10 Recovery with Load	
542.10	40543.10	L2-11 Recovery with Load	
542.11	40543.11	L2-12 Recovery with Load	
542.12	40543.12	/	
542.13	40543.13	/	
542.14	40543.14	/	
542.15	40543.15	/	
543.0	40544.0	Expansion Output 1 Status	1~16 Status of Expansion Output Module 4
543.1	40544.1	Expansion Output 2 Status	
543.2	40544.2	Expansion Output 3 Status	
543.3	40544.3	Expansion Output 4 Status	
543.4	40544.4	Expansion Output 5 Status	
543.5	40544.5	Expansion Output 6 Status	
543.6	40544.6	Expansion Output 7 Status	
543.7	40544.7	Expansion Output 8 Status	
543.8	40544.8	Expansion Output 9 Status	
543.9	40544.9	Expansion Output 10 Status	
543.10	40544.10	Expansion Output 11 Status	
543.11	40544.11	Expansion Output 12 Status	
543.12	40544.12	Expansion Output 13 Status	
543.13	40544.13	Expansion Output 14 Status	
543.14	40544.14	Expansion Output 15 Status	
543.15	40544.15	Expansion Output 16 Status	

NOTE: ①So ATS transfer failure includes: S1 closing failure, S1 opening failure, S2 closing failure, S2 opening failure;
②Common alarm includes: fault alarm and warning alarm.

Example:

If need to read “Aux. Output 1 Status” and “S1 Closed”, firstly get their corresponding address is 506.0 and 507.4 by checking the table, it is known that you need to read 2 addresses’ data.

Assume the slave (controller) address is 01, the master (can be computer) request command is as following:

Table 3 – Master (Computer) Request Command

Slave Address	Function Code	Starting Address (506)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**01**	**FA**	**00**	**02**	**E5**	**C6**

Slave response command is as following:

Table 4 – Slave (Controller) Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data				CRC 16 Calibration	
			Data MSB of Address 506	Data LSB of Address 506	Data MSB of Address 507	Data LSB of Address 507	LSB	MSB
01	**03**	**04**	**00**	**01**	**00**	**10**	**AA**	**3F**

Table 5 – Data Analysis

Address	Received Data (Hex)	Convert to Binary	Data Signification
506	0001H	0000 0000 0000 0001 (correspond to 506.15, 506.14…….506.1, 506.0)	Data of bit 0 is 1 indicates that Aux. output 1 status is output.
507	0010H	0000 0000 0001 0000 (correspond to 507.15, 507.14…….507.1, 507.0)	Data of bit 507.4 is 1 indicates that S1 switch is closed.

3.2 VALUE DATA FIELD CORRESPONDING TO FUNCTION CODE 03H

Table 6 – Value Data Field

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1000	41001	UAB1 (1# AB Line Voltage)	0~65000	1	V	16-bit Unsigned	
1001	41002	UBC1 (1# BC Line Voltage)	0~65000	1	V	16-bit Unsigned	
1002	41003	UCA1 (1# CA Line Voltage)	0~65000	1	V	16-bit Unsigned	
1003	41004	UA1 (1# A Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1004	41005	UB1 (1# B Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1005	41006	UC1 (1# C Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1006	41007	UA1 Phase (1# A Phase)	0~360.0	0.1	°	16-bit Unsigned	NOTE3
1007	41008	UB1 Phase (1# B Phase)	0~360.0	0.1	°	16-bit Unsigned	
1008	41009	UC1 Phase (1# C Phase)	0~360.0	0.1	°	16-bit Unsigned	
1009	41010	Frequency 1 (1# Power	0~100.00	0.01	Hz	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Frequency)					
1010	41011	/					
1011	41012	/					
1012	41013	/					
1013	41014	/					
1014	41015	/					
1015	41016	/					
1016	41017	/					
1017	41018	/					
1018	41019	/					
1019	41020	/					
1020	41021	UAB2 (2# AB Line Voltage)	0~65000	1	V	16-bit Unsigned	
1021	41022	UBC2 (2# BC Line Voltage)	0~65000	1	V	16-bit Unsigned	
1022	41023	UCA2 (2# CA Line Voltage)	0~65000	1	V	16-bit Unsigned	
1023	41024	UA2 (2# A Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1024	41025	UB2 (2# B Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1025	41026	UC2 (2# C Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1026	41027	UA2 Phase (2# A Phase)	0~360.0	0.1	°	16-bit Unsigned	
1027	41028	UB2 Phase (2# B Phase)	0~360.0	0.1	°	16-bit Unsigned	
1028	41029	UC2 Phase (2# C Phase)	0~360.0	0.1	°	16-bit Unsigned	
1029	41030	Frequency 2 (2# Power Frequency)	0~100.00	0.01	Hz	16-bit Unsigned	
1030	41031	S1S2 Volt. Diff. (1/2# Power Volt. Difference)	-32768~ +32767	1	V	16-bit Signed	NOTE4
1031	41032	S1S2 Freq. Diff. (1/2# Power	-100.00~ +100.00	0.01	Hz	16-bit Signed	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Freq. Difference)					
1032	41033	S1S2 Phase Diff. (1/2# Power Phase Difference)	-180.0~ +180.0	0.1	°	16-bit Signed	
1033	41034	S1 Volt. Unbalance (Percentage)					
1034	41035	S2 Volt. Unbalance (Percentage)					
1035	41036	/					
1036	41037	/					
1037	41038	/					
1038	41039	/					
1039	41040	/					
1040	41041	S1 A-phase Current					
1041	41042	S1 B-phase Current					
1042	41043	S1 C-phase Current					
1043	41044	S1 N-phase Current (Zero-sequence Current Ground Current)					
1044	41045	S1 A-phase Current Phase					
1045	41046	S1 B-phase Current Phase					
1046	41047	S1 C-phase Current Phase					
1047	41048	S1 N-phase Current Phase					
1048	41049	A-phase Active Power					
1049	41050						
1050	41051	B-phase Active Power					
1051	41052						
1052	41053	C-phase Active Power					
1053	41054						
1054	41055	Total Active Power					
1055	41056						

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1056	41057	A-phase Reactive Power					
1057	41058						
1058	41059	B-phase Reactive Power					
1059	41060						
1060	41061	C-phase Reactive Power					
1061	41062						
1062	41063	Total Reactive Power					
1063	41064						
1064	41065	A-phase Apparent Power					
1065	41066						
1066	41067	B-phase Apparent Power					
1067	41068						
1068	41069	C-phase Apparent Power					
1069	41070						
1070	41071	Total Apparent Power					
1071	41072						
1072	41073	A-phase Power Factor					
1073	41074	B-phase Power Factor					
1074	41075	C-phase Power Factor					
1075	41076	Average Power Factor					
1076	41077	/					
1077	41078	/					
1078	41079	/					
1079	41080	S1 Zero-sequence Current					
1080	41081	Percentage of S1 Zero-sequence Current and Rated					
1081	41082	/					
1082	41083	/					
1083	41084	Sync. Failure Delay					
1084	41085	ATS Transfer Alarm Delay					
1085	41086	/					
1086	41087	L1 Load ATS Trip No.					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1087	41088	L2 Load ATS Trip No.					
1088	41089	S1 Voltage Status	0~65535	No		16-bit Unsigned	See S1 Power Status
1089	41090	S1 Voltage Delay	0~65535	1	s	16-bit Unsigned	
1090	41091	S2 Voltage Status	0~65535	No		16-bit Unsigned	See S2 Power Status
1091	41092	S2 Voltage Delay	0~65535	1	s	16-bit Unsigned	
1092	41093	Genset Status	0~65535	No		16-bit Unsigned	See Genset Status
1093	41094	Genset Delay	0~65535	1	s	16-bit Unsigned	
1094	41095	ATS Status	0~65535	No		16-bit Unsigned	See ATS Status
1095	41096	ATS Delay	0~65535	1	s	16-bit Unsigned	
1096	41097	L1 Load ATS Act No.					
1097	41098	L2 Load ATS Act No.					
1098	41099	L1 Load Switch Transfer Failure No.					
1099	41100	L2 Load Switch Transfer Failure No.					
1100	41101	Controller Time: Year	0~100	1	year	16-bit Unsigned	
1101	41102	Controller Time: Month	1~12	1	month	16-bit Unsigned	
1102	41103	Controller Time: Day	1~31	1	day	16-bit Unsigned	
1103	41104	Controller Time: Week	0~6	/		16-bit Unsigned	0: Sunday 1~6: Monday~ Saturday
1104	41105	Controller Time: Hour	0~23	1	h	16-bit Unsigned	
1105	41106	Controller Time: Minute	0~59	1	min	16-bit Unsigned	
1106	41107	Controller Time:	0~59	1	s	16-bit	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Second				Unsigned	
1107	41108	Parallel Mode					
1108	41109	Continuous Supply Time (h) (LOAD2)					
1109	41110	Continuous Supply Time (min) (LOAD2)					
1110	41111	Continuous Supply Time (s) (LOAD2)					
1111	41112	Continuous Supply Time (h) (LOAD1)	0~65535	1	h	16-bit Unsigned	
1112	41113	Continuous Supply Time (min) (LOAD1)	0~59	1	min	16-bit Unsigned	
1113	41114	Continuous Supply Time (s) (LOAD1)	0~59	1	s	16-bit Unsigned	
1114	41115	Last Continuous Supply Time (h) (LOAD1)	0~65535	1	h	16-bit Unsigned	
1115	41116	Last Continuous Supply Time (min) (LOAD1)	0~59	1	min	16-bit Unsigned	
1116	41117	Last Continuous Supply Time (s) (LOAD1)	0~59	1	s	16-bit Unsigned	
1117	41118	S1 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1118	41119	S1 Accum. Supply Time (h) MSB					
1119	41120	S1 Accum. Supply Time (min)	0~59	1	min	16-bit Unsigned	
1120	41121	S1 Accum. Supply Time (s)	0~59	1	s	16-bit Unsigned	
1121	41122	S2 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1122	41123	S2 Accum.					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Supply Time (h) MSB					
1123	41124	S2 Accum. Supply Time (min)	0~59	1	min	16-bit Unsigned	
1124	41125	S2 Accum. Supply Time (s)	0~59	1	s	16-bit Unsigned	
1125	41126	S1 Accum. Active Power kwh (Low)					
1126	41127	S1 Accum. Active Power kwh (High)					
1127	41128	S1 Accum. Reactive Power kVarh (Low)					
1128	41129	S1 Accum. Reactive Power kVarh (High)					
1129	41130	S2 Accum. Active Power kwh (Low)	0~4294967296	1	time	32-bit Unsigned	NOTE2
1130	41131	S2 Accum. Active Power kwh (High)					
1131	41132	S2 Accum. Reactive Power kVarh (Low)					
1132	41133	S2 Accum. Reactive Power kVarh (High)					
1133	41134	S1 Accum. Close Times (LSB)					
1134	41135	S1 Accum. Close Times (MSB)					
1135	41136	S2 Accum. Close Times (LSB)	0~4294967296	1	time	32-bit Unsigned	NOTE2
1136	41137	S2 Accum. Close Times MSB)					
1137	41138	QTIE Accum. Close Times (LSB)	0~4294967296	1	time	32-bit Unsigned	NOTE2
1138	41139	QTIE Accum. Close Times					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		MSB)					
1139	41140	/					
1140	41141	/					
1141	41142	/					
1142	41143	/					
1143	41144	/					
1144	41145	/					
1145	41146	/					
1146	41147	/					
1147	41148	/					
1148	41149	/					
1149	41150	/					
1150	41151	/					
1151	41152	/					
1152	41153	/					
1153	41154	/					
1154	41155	/					
1155	41156	Last Continuous Supply Time (h) (LOAD2)					
1156	41157	Last Continuous Supply Time (min) (LOAD2)					
1157	41158	Last Continuous Supply Time (s) (LOAD2)					
1158	41159	LOAD1 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1159	41160	LOAD1 Accum. Supply Time (h) MSB					
1160	41161	LOAD1 Accum. Supply Time (min)					
1161	41162	LOAD1 Accum. Supply Time (s)					
1162	41163	LOAD2 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1163	41164	LOAD2 Accum. Supply Time (h) MSB					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1164	41165	LOAD2 Accum. Supply Time (min)					
1165	41166	LOAD2 Accum. Supply Time (s)					
1166	41167	S2 A-phase Current					
1167	41168	S2 B-phase Current					
1168	41169	S2 C-phase Current					
1169	41170	S2 N-phase Current (Zero-sequence Current Ground Current)					
1170	41171	S2 A-phase Current Phase					
1171	41172	S2 B-phase Current Phase					
1172	41173	S2 C-phase Current Phase					
1173	41174	S2 N-phase Current Phase					
1174	41175	S2 A-phase Active Power					
1175	41176						
1176	41177	S2 B-phase Active Power					
1177	41178						
1178	41179	S2 C-phase Active Power					
1179	41180						
1180	41181	S2 Total Active Power					
1181	41182						
1182	41183	S2 A-phase Reactive Power kVarh					
1183	41184						
1184	41185	S2 B-phase Reactive Power kVarh					
1185	41186						
1186	41187	S2 C-phase Reactive Power kVarh					
1187	41188						
1188	41189	S2 Total Reactive Power					
1189	41190						

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		kVarh					
1190	41191	S2 A-phase Apparent Power					
1191	41192						
1192	41193	S2 B-phase Apparent Power					
1193	41194						
1194	41195	S2 C-phase Apparent Power					
1195	41196						
1196	41197	S2 Total Apparent Power					
1197	41198						
1198	41199	S2 A-phase Power Factor					
1199	41200	S2 B-phase Power Factor					
1200	41201	S2 C-phase Power Factor					
1201	41202	S2 Average Power Factor					
1202	41203	S2 Zero-sequence Current					
1203	41204	Percentage of S2 Zero-sequence Current and Rated					

NOTE1: Actual value=Received Data*Ratio. Take frequency as the example, received data is 5000 (1388H), ratio is 0.01Hz, so the actual frequency value is 50.00Hz (5000*0.01Hz);

NOTE2: For 4-byte data, the actual value=Received Data MSB*65536+ Received Data LSB;

NOTE3: When the received data is 32766, it means no normal data, "###" can be displayed;

NOTE4: Definition of signed number. Take received data 8000H as the example, transfer it to binary 1000 0000 0000 0000b, the MSB is 1, which is a negative number. One's complement is obtained by subtracting 1 from it, which is inverted to obtain the absolute value of the negative number. Then transfer it to -32768 in decimal.

Example:

Read "S1 Accum. Close Times (current is 123456 times)", firstly get their corresponding address is 1133 and 1134 by checking the table, then it is known that you need to read 2 words' data.

Assume the slave address is 01, the master request command is as following:

Table 7 – Master Request Command

Slave Address	Function Code	Starting Address (1133)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**04**	**6D**	**00**	**02**	**54**	**E6**

Slave response command is as following:

Table 8 – Slave Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data				CRC 16 Calibration	
			Data MSB of Address 1133	Data LSB of Address 1133	Data MSB of Address 1134	Data LSB of Address 1134	LSB	MSB
01	**03**	**04**	**E2**	**40**	**00**	**01**	**0C**	**5F**

Fill the received data into the corresponding address, as shown in the table below:

Table 9 – Data Analysis

Address	Received Data (Hex)	Combination (Hex)	S1 Accum. Close Times (Decimal)
1133	E240H	0001E240H	123456
1134	0001H		

3.3 REMOTE COIL FIELD CORRESPONDING TO FUNCTION CODE 05H

Table 10 – Remote Coil Field

Modbus Address	PLC Address	Name	Description
15000	15001	/	Place 1 Closed, place 0 inactive
15001	15002	/	Place 1 Closed, place 0 inactive
15002	15003	/	Place 1 Closed, place 0 inactive
15003	15004	/	Place 1 Closed, place 0 inactive
15004	15005	Auto/Manual	0: Manual 1: Auto
15005	15006	S1 Master Status Set	0: Standby 1: Master
15006	15007	S2 Master Status Set	0: Standby 1: Master
15007	15008	Alarm Reset	1 for active
15008	15009	Genset Start	
15009	15010	Genset Stop	
15010	15011	/	
15011	15012	/	
15012	15013	Remote Output 1 Output	1 for active
15013	15014	Remote Output 2 Output	1 for active
15014	15015	Remote Output 3 Output	1 for active
15015	15016	Remote Output 4 Output	1 for active
15016	15017	Remote Output 5 Output	1 for active
15017	15018	Remote Output 6 Output	1 for active
15018	15019	Remote Output 7 Output	1 for active
15019	15020	Remote Output 8 Output	1 for active
15020	15021	Remote Output 9 Output	1 for active
15021	15022	Remote Output 10 Output	1 for active
15022	15023	Remote Output 11 Output	
15023	15024	Remote Output 12 Output	

Modbus Address	PLC Address	Name	Description
15024	15025	Remote Output 13 Output	
15025	15026	/	
15026	15027	/	
15027	15028	/	
15028	15029	/	
15029	15030	/	
15030	15031	Remote ATS Transfer 000 (all opening)	1 for active
15031	15032	Remote ATS Transfer 101	1 for active
15032	15033	Remote ATS Transfer 110	1 for active
15033	15034	Remote ATS Transfer 011	1 for active
15034	15035	Remote ATS Transfer 100	1 for active
15035	15036	Remote ATS Transfer 001	1 for active
15036	15037	Window Reminder Confirmation	Stepwise transfer manual pop-up confirmation function.
15037	15038	Window Reminder Cancel	
15038	15039	/	
15039	15040	/	
15040	15041	1# LOAD1 Closing Control	
15041	15042	1#LOAD1 Opening Control	
15042	15043	1# LOAD2 Closing Control	
15043	15044	1#LOAD2 Opening Control	
15044	15045	1# LOAD3 Closing Control	
15045	15046	1#LOAD3 Opening Control	
15046	15047	1# LOAD4 Closing Control	
15047	15048	1#LOAD4 Opening Control	
15048	15049	1# LOAD5 Closing Control	
15049	15050	1#LOAD5 Opening Control	
15050	15051	1# LOAD6 Closing Control	
15051	15052	1#LOAD6 Opening Control	
15052	15053	1# LOAD7 Closing Control	
15053	15054	1#LOAD7 Opening Control	
15054	15055	1# LOAD8 Closing Control	
15055	15056	1#LOAD8 Opening Control	
15056	15057	1# LOAD9 Closing Control	
15057	15058	1#LOAD9 Opening Control	
15058	15059	1#LOAD10 Closing Control	
15059	15060	1#LOAD10 Opening Control	
15060	15061	1#LOAD11 Closing Control	
15061	15062	1#LOAD11 Opening	

Modbus Address	PLC Address	Name	Description
		Control	
15062	15063	1#LOAD12 Closing Control	
15063	15064	1#LOAD12 Opening Control	
15064	15065	2# LOAD1 Closing Control	
15065	15066	2#LOAD1 Opening Control	
15066	15067	2# LOAD2 Closing Control	
15067	15068	2#LOAD2 Opening Control	
15068	15069	2# LOAD3 Closing Control	
15069	15070	2#LOAD3 Opening Control	
15070	15071	2# LOAD4 Closing Control	
15071	15072	2#LOAD4 Opening Control	
15072	15073	2# LOAD5 Closing Control	
15073	15074	2#LOAD5 Opening Control	
15074	15075	2# LOAD6 Closing Control	
15075	15076	2#LOAD6 Opening Control	
15076	15077	2# LOAD7 Closing Control	
15077	15078	2#LOAD7 Opening Control	
15078	15079	2# LOAD8 Closing Control	
15079	15080	2#LOAD8 Opening Control	
15080	15081	2# LOAD9 Closing Control	
15081	15082	2#LOAD9 Opening Control	
15082	15083	2#LOAD10 Closing Control	
15083	15084	2#LOAD10 Opening Control	
15084	15085	2#LOAD11 Closing Control	
15085	15086	2#LOAD11 Opening Control	
15086	15087	2#LOAD12 Closing Control	
15087	15088	2#LOAD12 Opening Control	

NOTE: Remote command in the above table can be sent once only.

Example:

Remotely control controller to work in auto mode, firstly get its remote address is 15004 by checking the table.

Assume that slave address is 01, the master request command is as following:

Table 11 – Master Request Command

Slave Address	Function Code	Remote Address (15004)		Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**3A**	**9C**	**FF**	**00**	**40**	**CC**

Slave response command is as following:

Table 12 – Slave Response Command

Slave Address	Function Code	Remote Address (15004)		Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**3A**	**9C**	**FF**	**00**	**40**	**CC**

Then whether the remote command is executed successfully can be confirmed by reading the auto mode status of address 500.8 via function code 03H.

3.4 S1 POWER STATUS DESCRIPTION

Table 13 – S1 Power Status Description

Value (No.)	Status	Delay
0	S1 Available	Delay (Unit: s)
1	S1 Unavailable	Delay (Unit: s)
2	S1 Voltage Normal	No Delay
3	S1 Blackout	No Delay
4	S1 Over Voltage	No Delay
5	S1 Under Voltage	No Delay
6	S1 Over Frequency	No Delay
7	S1 Under Frequency	No Delay
8	S1 Loss of Phase	No Delay
9	S1 Reverse Phase Sequence	No Delay
10	S1 Reverse Power	No Delay

Example:

If the content of address 1088 is 1, 1089 is 5, it indicates that currently 1# power is in voltage abnormal delay, countdown 5s.

If the content of address 1088 is 4, it indicates that currently 1# power has over voltage.

3.5 S2 POWER STATUS DESCRIPTION

Table 14 – S2 Power Status Description

Value (No.)	Status	Delay
0	S2 Available	Delay (Unit: s)
1	S2 Unavailable	Delay (Unit: s)
2	S2 Voltage Normal	No Delay
3	S2 Blackout	No Delay
4	S2 Over Voltage	No Delay

Value (No.)	Status	Delay
5	S2 Under Voltage	No Delay
6	S2 Over Frequency	No Delay
7	S2 Under Frequency	No Delay
8	S2 Loss of Phase	No Delay
9	S2 Reverse Phase Sequence	No Delay
10	S2 Reverse Power	No Delay

3.6 GENSET STATUS DESCRIPTION

Table 15 – Genset Status Description

Value (No.)	Status	Delay
0	Start Delay	Delay (Unit: s)
1	Stop Delay	Delay (Unit: s)
2	Scheduled Not Run	Delay (Unit: s)
3	Scheduled Run	Delay (Unit: s)
4	/	/
5	/	/
6	/	/
7	/	/
8	Genset Start	No Delay
9	Genset Standby	No Delay

Example:

If the content of address 1092 is 1, 1093 is 50, it indicates that genset is preparing to start, countdown 50s.

If the content of address 1092 is 6, it indicates that 1# power corresponding genset has been started.

3.7 ATS STATUS DESCRIPTION

Table 16 – ATS Status Description

Value (No.)	Status	Delay
0	Ready to Transfer	No Delay
1	QS1 Closing	Delay (Unit: s)
2	QS1 Opening	Delay (Unit: s)
3	QS2 Closing	Delay (Unit: s)
4	QS2 Opening	Delay (Unit: s)
5	Transfer Rest	Delay (Unit: s)
6	/	Delay (Unit: s)
7	/	Delay (Unit: s)
8	/	Delay (Unit: s)
9	QTIE Sync. Close	Delay (Unit: s)
10	Wait for Sync.	Delay (Unit: s)
11	QS1 Sync. Close	Delay (Unit: s)
12	QS2 Sync. Close	Delay (Unit: s)
13	Wait QS1 PF	Delay (Unit: s)

Value (No.)	Status	Delay
14	Wait QS2 PF	Delay (Unit: s)
15	Elevator Control Delay	Delay (Unit: s)
16	S1 On-load	No Delay
17	S2 On-load	No Delay
18	Off-load	No Delay
19	Wait QTIE PF	Delay (Unit: s)
20	QTIE Closing	Delay (Unit: s)
21	QTIE Opening	Delay (Unit: s)
22	QS1 Closed QTIE Closed	No Delay
23	QS2 Closed QTIE Closed	No Delay
24	QS1 Closed QS2 Closed	No Delay
25	QTIE Closed	No Delay
26	L1 Load Stepwise Closed	Follow by closed/open No.
27	L1 Load Stepwise Open	Follow by closed/open No.
28	L2 Load Stepwise Closed	Follow by closed/open No.
29	L2 Load Stepwise Open	Follow by closed/open No.
30	Loop Closing Running	No Delay

4. COMMUNICATION PARAMETERS CONFIGURATION

1) In the home page of main interface, press ⚙/OK key to enter menu interface;
2) Press Down key to select “Parameter Setting”, then press ⚙/OK key to enter parameter password interface;
3) Input correct password (*default 01234*), press ⚙/OK key to enter the main interface of parameter;
4) Select “Module Setting” via ▼ key, press ⚙/OK key to enter submenu;
5) Select “Module Address” via ▲, ▼ key, Press ⚙/OK key to enter parameter edit function, corresponding parameters will be in the selected status;
6) Set the current selected content via ▲, ▼ key, press ⚙/OK key to complete editing, then the selected status disappear;
7) Long press ↩/⌂ key to return the main interface.

NOTE: The configuration will be active after parameter setting is completed.

5. FAQ

5.1 COMMUNICATION LINE SHIELDING LAYER GROUNDED

In order to prevent coupled interference signal on communication line, its single end need to be grounded.

5.2 TERMINAL RESISTOR

At both ends of the linear network (on the two communication ports furthest apart), it is necessary to connect 120Ω terminal resistor in parallel on a pair of communication lines. According to the transmission line theory, the terminal resistor can absorb reflected waves on the network, effectively enhancing the signal strength. The value of two terminal resistors in parallel should be approximately equal to the characteristic impedance of the transmission line at the communication frequency.

A regular RS485 network usually uses terminal resistor. It can also be not used in the case of network connection line is very short, temporary or laboratory test.

5.3 RS485 TO USB COMMUNICATION ADAPTOR

PC can communicate with SG72A module produced by our company.

5.4 EXTENDED COMMUNICATION DISTANCE

Long distance (up to 10km) communication can be realized by a pair of SGCAN300 CANBUS relay modules.

Fig.3 SGCAN300 Application Diagram

5.5 COMMON SOLUTIONS OF COMMUNICATION FAILURE

1) Check whether the positive and negative of RS485 is correctly connected; Check whether the RS485 converter (if configured) is normal;
2) Check whether the terminal resistor is correctly connected;
3) Check whether the communication parameter is correct; the baud rate, data bit and parity bit and stop bit should be the same as the requirement of the controller;
4) Whether the selected COM port corresponds to the USB port where RS485 converter is connected;
5) Whether the communication address is correct, factory default is 01;
6) When using 03 function code, up to 120 addresses can be read of data length for each time, and the last address can't exceed the max. Modbus communication address.
7) 05 function code using Modbus address for communication: despite 1 for active, 0 for inactive, only sending FF00H can make corresponding bit as 1, sending 0000H can make corresponding bit as 0; while using PLC address for communication: sending 1 to position 1, sending 0 to position 0;
8) Whether CRC-16 LSB first and MSB last are correct;
9) It is better not read controller data too fast for multiple times, the interval for 500ms is recommended.

10) Please configure the communication module address of the controller before networking. Don not have the same the module address in the same network;
11) Since the Modbus serial protocol does not support the multiple masters, multiple software can't communicate with the controller at the same time;
12) Disconnect the RS485 wiring and measure the voltage difference between terminal A and B of RS485. If the voltage difference is between +-200mV, the communication port is abnormal.
13) If the long communication distance results in the signal attenuation, it is better to replace the cable with high quality, or add a repeater in the middle of the communication cable;
14) The third-party software of serial port communication, such as modscan32 and modbus poll are recommended, which can verify the communication is normal or not;