SmartGen
MAKING CONTROL SMARTER

HMAT880
MEDIUM VOLTAGE BYPASS ATS CONTROLLER
COMMUNICATION PROTOCOL
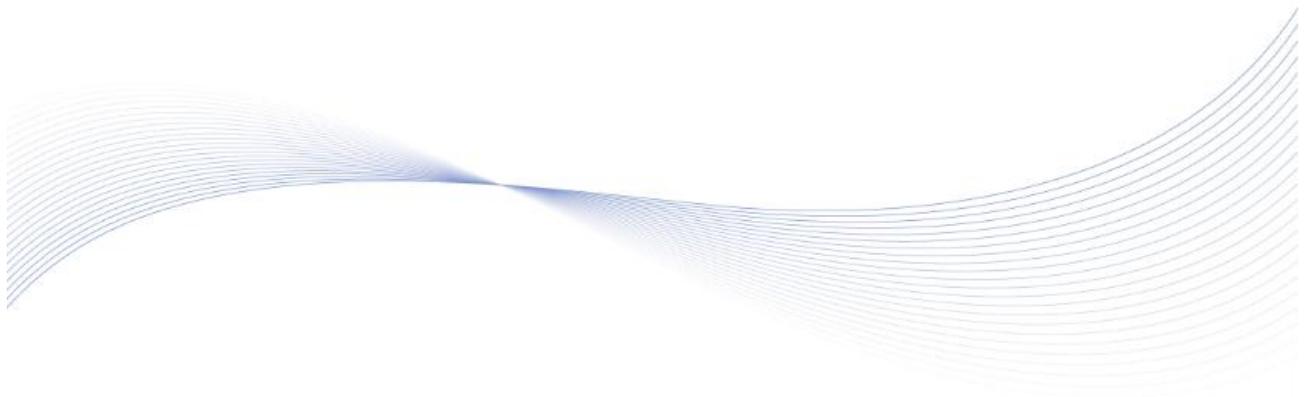
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SmartGen **English trademark**

SmartGen ─ make your generator *smart*

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Table 1 − Software Version

Date	Version	Content
2022-05-25	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.

HMAT880 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.
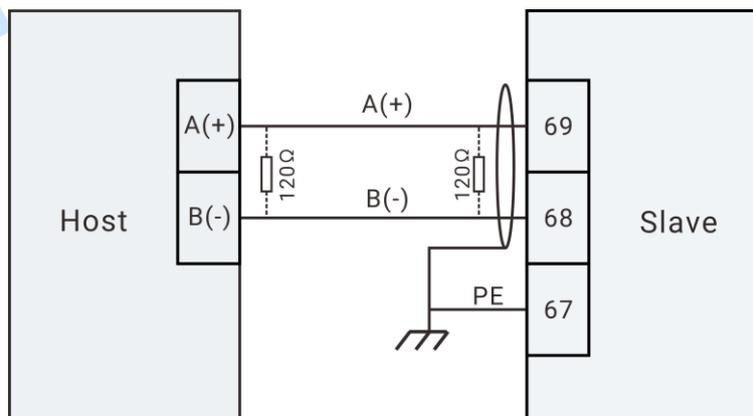
2. WIRING DIAGRAM

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.
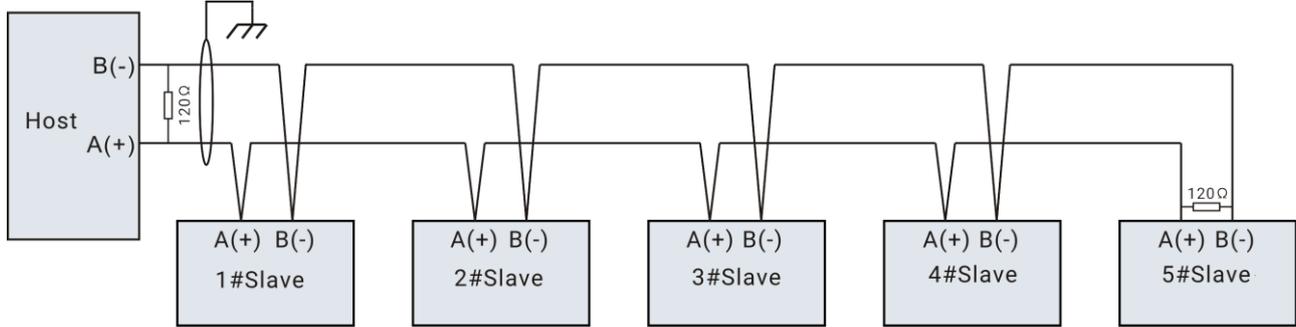
Fig.2 Multi-unit Communication Wiring Diagram

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

3.1　ILLUSTRATION

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

3.2　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	/	
500.10	40501.1	S1 Master	S1 refers to 1# power. 1 means 1# power as common power; 0 means 1# power as backup power.
500.11	40501.11	S2 Master	S2 refers to 2# power. 1 means 2# power as common power; 0 means 2# power as backup power.
500.12	40501.12	/	

Modbus Address	PLC Address	Name	Description
500.13	40501.13	/	
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	
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	S1 Genset Start Output	
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	/	
502.0	40503.0	S2 Voltage Normal	
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	S2 Genset Start Output	
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	/	
503.0	40504.0	ATS Transfer Failure	
503.1	40504.1	S1 Close Failure	
503.2	40504.2	S1 Open Failure	
503.3	40504.3	/	
503.4	40504.4	S2 Close Failure	
503.5	40504.5	S2 Open Failure	
503.6	40504.6	S1 Load End No Power	

Modbus Address	PLC Address	Name	Description
503.7	40504.7	S1 Load End No Power	
503.8	40504.8	S1 Load Overcurrent Trip	
503.9	40504.9	S2 Load Overcurrent Trip	
503.10	40504.10	Forced Open Fault Alarm	
503.11	40504.11	S1 Genset Fault	
503.12	40504.12	S2 Genset Fault	
503.13	40504.13	S1 Breaker Trip Alarm	
503.14	40504.14	Sync. Failure Fault	
503.15	40504.15	S2 Breaker Trip Alarm	
504.0	40505.0	Load Switch Overtime Fault	
504.1	40505.1	Earth Fault	
504.2	40505.2	QTIE Close Failure	
504.3	40505.3	QTIE Open Failure	
504.4	40505.4	QTIE Breaker Trip Alarm	
504.5	40505.5	/	
504.6	40505.6	/	
504.7	40505.7	/	
504.8	40505.8	/	
504.9	40505.9	/	
504.10	40505.10	/	
504.11	40505.11	/	
504.12	40505.12	/	
504.13	40505.13	/	
504.14	40505.14	/	
504.15	40505.15	/	
505.0	40506.0	S1 Load Overcurrent Warn	
505.1	40506.1	S1 Load Overcurrent Warn	
505.2	40506.2	Forced Open Warn	
505.3	40506.3	Battery Undervoltage Warn	
505.4	40506.4	Battery Overvoltage Warn	
505.5	40506.5	Sync. Failure Warn	
505.6	40506.6	/	
505.7	40506.7	Same-side Power Parallel Warn	
505.8	40506.8	S1 PT Break	
505.9	40506.9	S2 PT Break	
505.10	40506.10	Integrated Protection 1 Comm. Failure Warn	
505.11	40506.11	Integrated Protection 2 Comm. Failure Warn	
505.12	40506.12	/	
505.13	40506.13	Load Breaker Trip Warn	
505.14	40506.14	Load Switch Overtime Warn	

Modbus Address	PLC Address	Name	Description
505.15	40506.15	Earth Fault	
506.0	40507.0	Expand Input Module 1 Comm. Fault	Expand Module Comm. Failure Alarm
506.1	40507.1	Expand Input Module 2 Comm. Fault	
506.2	40507.2	Expand Input Module 3 Comm. Fault	
506.3	40507.3	/	
506.4	40507.4	Expand Input Module 1 Comm. Warn	
506.5	40507.5	Expand Input Module 2 Comm. Warn	
506.6	40507.6	Expand Input Module 3 Comm. Warn	
506.7	40507.7	/	
506.8	40507.8	Expand Output Module 1 Comm. Fault	
506.9	40507.9	Expand Output Module 2 Comm. Fault	
506.10	40507.10	Expand Output Module 3 Comm. Fault	
506.11	40507.11	/	
506.12	40507.12	Expand Output Module 1 Comm. Warn	
506.13	40507.13	Expand Output Module 2 Comm. Warn	
506.14	40507.14	Expand Output Module 3 Comm. Warn	
506.15	40507.15	/	
507.0	40508.0	Aux. Input 1 Status	0 means there is no input; 1 means there is input.
507.1	40508.1	Aux. Input 2 Status	
507.2	40508.2	Aux. Input 3 Status	
507.3	40508.3	Aux. Input 4 Status	
507.4	40508.4	Aux. Input 5 Status	
507.5	40508.5	Aux. Input 6 Status	
507.6	40508.6	Aux. Input 7 Status	
507.7	40508.7	Aux. Input 8 Status	
507.8	40508.8	Aux. Input 9 Status	
507.9	40508.9	Aux. Input 10 Status	
507.10	40508.10	Aux. Input 11 Status	
507.11	40508.11	Aux. Input 12 Status	
507.12	40508.12	/	

Modbus Address	PLC Address	Name	Description
507.13	40508.13	/	
507.14	40508.14	/	
507.15	40508.15	/	
508.0	40509.0	Aux. Output 1 Status	1 means there is output; 0 means there is no output.
508.1	40509.1	Aux. Output 2 Status	
508.2	40509.2	Aux. Output 3 Status	
508.3	40509.3	Aux. Output 4 Status	
508.4	40509.4	Aux. Output 5 Status	
508.5	40509.5	Aux. Output 6 Status	
508.6	40509.6	Aux. Output 7 Status	
508.7	40509.7	Aux. Output 8 Status	
508.8	40509.8	Aux. Output 9 Status	
508.9	40509.9	Aux. Output 10 Status	
508.10	40509.10	Aux. Output 11 Status	
508.11	40509.11	Aux. Output 12 Status	
508.12	40509.12	Aux. Output 13 Status	
508.13	40509.13	/	
508.14	40509.14	/	
508.15	40509.15	/	
509.0	40510.0	S1 Close Control Output	
509.1	40510.1	S1 Open Control Output	
509.2	40510.2	S2 Close Control Output	
509.3	40510.3	S2 Open Control Output	
509.4	40510.4	S1 Close Status	
509.5	40510.5	S1 Open Status	
509.6	40510.6	S2 Close Status	
509.7	40510.7	S2 Open Status	
509.8	40510.8	Manual Test (S1)	
509.9	40510.9	Manual Test (S2)	
509.10	40510.10	/	
509.11	40510.11	/	
509.12	40510.12	Remote Start On-load	
509.13	40510.13	Remote Start Off-load	
509.14	40510.14	Genset Start Mains NG	
509.15	40510.15	Scheduled Run	
510.0	40511.0	Cycle Run	
510.1	40511.1	Balanced Time Run	
510.2	40511.2	Master Run	
510.3	40511.3	/	
510.4	40511.4	Scheduled Not Run	
510.5	40511.5	/	
510.6	40511.6	/	

Modbus Address	PLC Address	Name	Description
510.7	40511.7	/	
510.8	40511.8	/	
510.9	40511.9	/	
510.10	40511.10	Start Inhibit	
510.11	40511.11	/	
510.12	40511.12	S1 Close Inhibit	
510.13	40511.13	S2 Close Inhibit	
510.14	40511.14	Wait S1 Close PF Input	
510.15	40511.15	Wait S2 Close PF Input	
511.0	40512.0	NEL1 Trip	
511.1	40512.1	NEL2 Trip	
511.2	40512.2	NEL3 Trip	
511.3	40512.3	/	
511.4	40512.4	/	
511.5	40512.5	Elevator Control	
511.6	40512.6	/	
511.7	40512.7	/	
511.8	40512.8	Bustie Breaker Close Inhibit	
511.9	40512.9	/	
511.10	40512.10	Bustie Breaker Ready PF Input	
511.11	40512.11	Auto Trans./Restore	
511.12	40512.12	Remote Input Inhibit	
511.13	40512.13	Stepwise Switch Pop-up	
511.14	40512.14	/	
511.15	40512.15	/	
512.0	40513.0	QS1 Close Status at Contact Side	
512.1	40513.1	QS2 Close Status at Contact Side	
512.2	40513.2	Bustie Breaker Close Output	
512.3	40513.3	Bustie Breaker Open Output	
512.4	40513.4	/	
512.5	40513.5	/	
512.6	40513.6	/	
512.7	40513.7	Bustie Breaker Closed Input	
512.8	40513.8	/	
512.9	40513.9	/	
512.10	40513.10	/	
512.11	40513.11	/	
512.12	40513.12	/	
512.13	40513.13	/	
512.14	40513.14	/	

Modbus Address	PLC Address	Name	Description
512.15	40513.15	/	
513.0	40514.0	/	
513.1	40514.1	/	
513.2	40514.2	/	
513.3	40514.3	/	
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	Bypass in Auto Mode	
514.0	40515.0	Expand Input 1 Status	Input 1-16 status of expand input module 1.
514.1	40515.1	Expand Input 2 Status	
514.2	40515.2	Expand Input 3 Status	
514.3	40515.3	Expand Input 4 Status	
514.4	40515.4	Expand Input 5 Status	
514.5	40515.5	Expand Input 6 Status	
514.6	40515.6	Expand Input 7 Status	
514.7	40515.7	Expand Input 8 Status	
514.8	40515.8	Expand Input 9 Status	
514.9	40515.9	Expand Input 10 Status	
514.10	40515.10	Expand Input 11 Status	
514.11	40515.11	Expand Input 12 Status	
514.12	40515.12	Expand Input 13 Status	
514.13	40515.13	Expand Input 14 Status	
514.14	40515.14	Expand Input 15 Status	
514.15	40515.15	Expand Input 16 Status	
515.0	40516.0	Expand Input 1 Status	Input 1-16 status of expand input module 2.
515.1	40516.1	Expand Input 2 Status	
515.2	40516.2	Expand Input 3 Status	
515.3	40516.3	Expand Input 4 Status	
515.4	40516.4	Expand Input 5 Status	
515.5	40516.5	Expand Input 6 Status	
515.6	40516.6	Expand Input 7 Status	
515.7	40516.7	Expand Input 8 Status	
515.8	40516.8	Expand Input 9 Status	
515.9	40516.9	Expand Input 10 Status	

Modbus Address	PLC Address	Name	Description
515.10	40516.10	Expand Input 11 Status	
515.11	40516.11	Expand Input 12 Status	
515.12	40516.12	Expand Input 13 Status	
515.13	40516.13	Expand Input 14 Status	
515.14	40516.14	Expand Input 15 Status	
515.15	40516.15	Expand Input 16 Status	
516.0	40517.0	Expand Input 1 Status	Input 1-16 status of expand input module 3.
516.1	40517.1	Expand Input 2 Status	
516.2	40517.2	Expand Input 3 Status	
516.3	40517.3	Expand Input 4 Status	
516.4	40517.4	Expand Input 5 Status	
516.5	40517.5	Expand Input 6 Status	
516.6	40517.6	Expand Input 7 Status	
516.7	40517.7	Expand Input 8 Status	
516.8	40517.8	Expand Input 9 Status	
516.9	40517.9	Expand Input 10 Status	
516.10	40517.10	Expand Input 11 Status	
516.11	40517.11	Expand Input 12 Status	
516.12	40517.12	Expand Input 13 Status	
516.13	40517.13	Expand Input 14 Status	
516.14	40517.14	Expand Input 15 Status	
516.15	40517.15	Expand Input 16 Status	
517.0	40518.0	Expand Output 1 Status	Output 1-16 status of expand output module 1.
517.1	40518.1	Expand Output 2 Status	
517.2	40518.2	Expand Output 3 Status	
517.3	40518.3	Expand Output 4 Status	
517.4	40518.4	Expand Output 5 Status	
517.5	40518.5	Expand Output 6 Status	
517.6	40518.6	Expand Output 7 Status	
517.7	40518.7	Expand Output 8 Status	
517.8	40518.8	Expand Output 9 Status	
517.9	40518.9	Expand Output 10 Status	
517.10	40518.10	Expand Output 11 Status	
517.11	40518.11	Expand Output 12 Status	
517.12	40518.12	Expand Output 13 Status	
517.13	40518.13	Expand Output 14 Status	
517.14	40518.14	Expand Output 15 Status	
517.15	40518.15	Expand Output 16 Status	
518.0	40519.0	Expand Output 1 Status	Output 1-16 status of expand output module 2.
518.1	40519.1	Expand Output 2 Status	
518.2	40519.2	Expand Output 3 Status	
518.3	40519.3	Expand Output 4 Status	
518.4	40519.4	Expand Output 5 Status	

Modbus Address	PLC Address	Name	Description
518.5	40519.5	Expand Output 6 Status	
518.6	40519.6	Expand Output 7 Status	
518.7	40519.7	Expand Output 8 Status	
518.8	40519.8	Expand Output 9 Status	
518.9	40519.9	Expand Output 10 Status	
518.10	40519.10	Expand Output 11 Status	
518.11	40519.11	Expand Output 12 Status	
518.12	40519.12	Expand Output 13 Status	
518.13	40519.13	Expand Output 14 Status	
518.14	40519.14	Expand Output 15 Status	
518.15	40519.15	Expand Output 16 Status	
519.0	40520.0	Expand Output 1 Status	Output 1-16 status of expand output module 3.
519.1	40520.1	Expand Output 2 Status	
519.2	40520.2	Expand Output 3 Status	
519.3	40520.3	Expand Output 4 Status	
519.4	40520.4	Expand Output 5 Status	
519.5	40520.5	Expand Output 6 Status	
519.6	40520.6	Expand Output 7 Status	
519.7	40520.7	Expand Output 8 Status	
519.8	40520.8	Expand Output 9 Status	
519.9	40520.9	Expand Output 10 Status	
519.10	40520.10	Expand Output 11 Status	
519.11	40520.11	Expand Output 12 Status	
519.12	40520.12	Expand Output 13 Status	
519.13	40520.13	Expand Output 14 Status	
519.14	40520.14	Expand Output 15 Status	
519.15	40520.15	Expand Output 16 Status	
520.0	40521.0	Expand Input 1 Status	Input 1-16 status of expand input module 4.
520.1	40521.1	Expand Input 2 Status	
520.2	40521.2	Expand Input 3 Status	
520.3	40521.3	Expand Input 4 Status	
520.4	40521.4	Expand Input 5 Status	
520.5	40521.5	Expand Input 6 Status	
520.6	40521.6	Expand Input 7 Status	
520.7	40521.7	Expand Input 8 Status	
520.8	40521.8	Expand Input 9 Status	
520.9	40521.9	Expand Input 10 Status	
520.10	40521.10	Expand Input 11 Status	
520.11	40521.11	Expand Input 12 Status	
520.12	40521.12	Expand Input 13 Status	
520.13	40521.13	Expand Input 14 Status	
520.14	40521.14	Expand Input 15 Status	
520.15	40521.15	Expand Input 16 Status	

Modbus Address	PLC Address	Name	Description
521.0	40522.0	Expand Input 1 Status	Input 1-16 status of expand input module 5.
521.1	40522.1	Expand Input 2 Status	
521.2	40522.2	Expand Input 3 Status	
521.3	40522.3	Expand Input 4 Status	
521.4	40522.4	Expand Input 5 Status	
521.5	40522.5	Expand Input 6 Status	
521.6	40522.6	Expand Input 7 Status	
521.7	40522.7	Expand Input 8 Status	
521.8	40522.8	Expand Input 9 Status	
521.9	40522.9	Expand Input 10 Status	
521.10	40522.10	Expand Input 11 Status	
521.11	40522.11	Expand Input 12 Status	
521.12	40522.12	Expand Input 13 Status	
521.13	40522.13	Expand Input 14 Status	
521.14	40522.14	Expand Input 15 Status	
521.15	40522.15	Expand Input 16 Status	
522.0	40523.0	Expand Input 1 Status	Input 1-16 status of expand input module 6.
522.1	40523.1	Expand Input 2 Status	
522.2	40523.2	Expand Input 3 Status	
522.3	40523.3	Expand Input 4 Status	
522.4	40523.4	Expand Input 5 Status	
522.5	40523.5	Expand Input 6 Status	
522.6	40523.6	Expand Input 7 Status	
522.7	40523.7	Expand Input 8 Status	
522.8	40523.8	Expand Input 9 Status	
522.9	40523.9	Expand Input 10 Status	
522.10	40523.10	Expand Input 11 Status	
522.11	40523.11	Expand Input 12 Status	
522.12	40523.12	Expand Input 13 Status	
522.13	40523.13	Expand Input 14 Status	
522.14	40523.14	Expand Input 15 Status	
522.15	40523.15	Expand Input 16 Status	
523.0	40524.0	Expand Input Module 4 Comm. Fault	Communication failure alarm of expand module (expand input module 4-6).
523.1	40524.1	Expand Input Module 5 Comm. Fault	
523.2	40524.2	Expand Input Module 6 Comm. Fault	
523.3	40524.3		
523.4	40524.4	Expand Input Module 4 Comm. Warn	
523.5	40524.5	Expand Input Module 5 Comm. Warn	

Modbus Address	PLC Address	Name	Description
523.6	40524.6	Expand Input Module 6 Comm. Warn	
523.7	40524.7	/	
523.8	40524.8	/	
523.9	40524.9	/	
523.10	40524.10	/	
523.11	40524.11	/	
523.12	40524.12	/	
523.13	40524.13	/	
523.14	40524.14	/	
523.15	40524.15	/	
524.0	40525.0	/	
524.1	40525.1	/	
524.2	40525.2	/	
524.3	40525.3	/	
524.4	40525.4	/	
524.5	40525.5	/	
524.6	40525.6	/	
524.7	40525.7	/	
524.8	40525.8	/	
524.9	40525.9	/	
524.10	40525.10	/	
524.11	40525.11	/	
524.12	40525.12	/	
524.13	40525.13	/	
524.14	40525.14	/	
524.15	40525.15	/	
525.0	40526.0	Load Breaker 1 Close Failure	
525.1	40526.1	Load Breaker 2 Close Failure	
525.2	40526.2	Load Breaker 3 Close Failure	
525.3	40526.3	Load Breaker 4 Close Failure	
525.4	40526.4	Load Breaker 5 Close Failure	
525.5	40526.5	Load Breaker 6 Close Failure	
525.6	40526.6	Load Breaker 7 Close Failure	
525.7	40526.7	Load Breaker 8 Close Failure	
525.8	40526.8	Load Breaker 9 Close Failure	
525.9	40526.9	Load Breaker 10 Close Failure	
525.10	40526.10	Load Breaker 11 Close Failure	
525.11	40526.11	Load Breaker 12 Close Failure	
525.12	40526.12	Load Breaker 13 Close	

Modbus Address	PLC Address	Name	Description
		Failure	
525.13	40526.13	Load Breaker 14 Close Failure	
525.14	40526.14	Load Breaker 15 Close Failure	
525.15	40526.15	Load Breaker 16 Close Failure	
526.0	40527.0	Load Breaker 17 Close Failure	
526.1	40527.1	Load Breaker 18 Close Failure	
526.2	40527.2	Load Breaker 19 Close Failure	
526.3	40527.3	Load Breaker 20 Close Failure	
526.4	40527.4	Load Breaker 21 Close Failure	
526.5	40527.5	Load Breaker 22 Close Failure	
526.6	40527.6	Load Breaker 23 Close Failure	
526.7	40527.7	Load Breaker 24 Close Failure	
526.8	40527.8	/	
526.9	40527.9	/	
526.10	40527.10	/	
526.11	40527.11	/	
526.12	40527.12	/	
526.13	40527.13	/	
526.14	40527.14	/	
526.15	40527.15	/	
527.0	40528.0	Load Breaker 1 Open Failure	
527.1	40528.1	Load Breaker 2 Open Failure	
527.2	40528.2	Load Breaker 3 Open Failure	
527.3	40528.3	Load Breaker 4 Open Failure	
527.4	40528.4	Load Breaker 5 Open Failure	
527.5	40528.5	Load Breaker 6 Open Failure	
527.6	40528.6	Load Breaker 7 Open Failure	
527.7	40528.7	Load Breaker 8 Open Failure	
527.8	40528.8	Load Breaker 9 Open Failure	
527.9	40528.9	Load Breaker 10 Open Failure	
527.10	40528.10	Load Breaker 11 Open Failure	
527.11	40528.11	Load Breaker 12 Open Failure	

Modbus Address	PLC Address	Name	Description
527.12	40528.12	Load Breaker 13 Open Failure	
527.13	40528.13	Load Breaker 14 Open Failure	
527.14	40528.14	Load Breaker 15 Open Failure	
527.15	40528.15	Load Breaker 16 Open Failure	
528.0	40529.0	Load Breaker 17 Open Failure	
528.1	40529.1	Load Breaker 18 Open Failure	
528.2	40529.2	Load Breaker 19 Open Failure	
528.3	40529.3	Load Breaker 20 Open Failure	
528.4	40529.4	Load Breaker 21 Open Failure	
528.5	40529.5	Load Breaker 22 Open Failure	
528.6	40529.6	Load Breaker 23 Open Failure	
528.7	40529.7	Load Breaker 24 Open Failure	
528.8	40529.8	/	
528.9	40529.9	/	
528.10	40529.10	/	
528.11	40529.11	/	
528.12	40529.12	/	
528.13	40529.13	/	
528.14	40529.14	/	
528.15	40529.15	/	
529.0	40530.0	Load Breaker 1 Trip	
529.1	40530.1	Load Breaker 2 Trip	
529.2	40530.2	Load Breaker 3 Trip	
529.3	40530.3	Load Breaker 4 Trip	
529.4	40530.4	Load Breaker 5 Trip	
529.5	40530.5	Load Breaker 6 Trip	
529.6	40530.6	Load Breaker 7 Trip	
529.7	40530.7	Load Breaker 8 Trip	
529.8	40530.8	Load Breaker 9 Trip	
529.9	40530.9	Load Breaker 10 Trip	
529.10	40530.10	Load Breaker 11 Trip	
529.11	40530.11	Load Breaker 12 Trip	
529.12	40530.12	Load Breaker 13 Trip	
529.13	40530.13	Load Breaker 14 Trip	
529.14	40530.14	Load Breaker 15 Trip	
529.15	40530.15	Load Breaker 16 Trip	
530.0	40531.0	Load Breaker 17 Trip	
530.1	40531.1	Load Breaker 18 Trip	
530.2	40531.2	Load Breaker 19 Trip	
530.3	40531.3	Load Breaker 20 Trip	
530.4	40531.4	Load Breaker 21 Trip	
530.5	40531.5	Load Breaker 22 Trip	
530.6	40531.6	Load Breaker 23 Trip	

Modbus Address	PLC Address	Name	Description
530.7	40531.7	Load Breaker 24 Trip	
530.8	40531.8	/	
530.9	40531.9	/	
530.10	40531.10	/	
530.11	40531.11	/	
530.12	40531.12	/	
530.13	40531.13	/	
530.14	40531.14	/	
530.15	40531.15	/	
531.0	40532.0	Load Breaker 1 Close Output	
531.1	40532.1	Load Breaker 2 Close Output	
531.2	40532.2	Load Breaker 3 Close Output	
531.3	40532.3	Load Breaker 4 Close Output	
531.4	40532.4	Load Breaker 5 Close Output	
531.5	40532.5	Load Breaker 6 Close Output	
531.6	40532.6	Load Breaker 7 Close Output	
531.7	40532.7	Load Breaker 8 Close Output	
531.8	40532.8	Load Breaker 9 Close Output	
531.9	40532.9	Load Breaker 10 Close Output	
531.10	40532.10	Load Breaker 11 Close Output	
531.11	40532.11	Load Breaker 12 Close Output	
531.12	40532.12	Load Breaker 13 Close Output	
531.13	40532.13	Load Breaker 14 Close Output	
531.14	40532.14	Load Breaker 15 Close Output	
531.15	40532.15	Load Breaker 16 Close Output	
532.0	40533.0	Load Breaker 17 Close Output	
532.1	40533.1	Load Breaker 18 Close Output	
532.2	40533.2	Load Breaker 19 Close Output	
532.3	40533.3	Load Breaker 20 Close Output	
532.4	40533.4	Load Breaker 21 Close Output	
532.5	40533.5	Load Breaker 22 Close	

Modbus Address	PLC Address	Name	Description
		Output	
532.6	40533.6	Load Breaker 23 Close Output	
532.7	40533.7	Load Breaker 24 Close Output	
532.8	40533.8	/	
532.9	40533.9	/	
532.10	40533.10	/	
532.11	40533.11	/	
532.12	40533.12	/	
532.13	40533.13	/	
532.14	40533.14	/	
532.15	40533.15	/	
533.0	40534.0	Load Breaker 1 Open Output	
533.1	40534.1	Load Breaker 2 Open Output	
533.2	40534.2	Load Breaker 3 Open Output	
533.3	40534.3	Load Breaker 4 Open Output	
533.4	40534.4	Load Breaker 5 Open Output	
533.5	40534.5	Load Breaker 6 Open Output	
533.6	40534.6	Load Breaker 7 Open Output	
533.7	40534.7	Load Breaker 8 Open Output	
533.8	40534.8	Load Breaker 9 Open Output	
533.9	40534.9	Load Breaker 10 Open Output	
533.10	40534.10	Load Breaker 11 Open Output	
533.11	40534.11	Load Breaker 12 Open Output	
533.12	40534.12	Load Breaker 13 Open Output	
533.13	40534.13	Load Breaker 14 Open Output	
533.14	40534.14	Load Breaker 15 Open Output	
533.15	40534.15	Load Breaker 16 Open Output	
534.0	40535.0	Load Breaker 17 Open Output	
534.1	40535.1	Load Breaker 18 Open Output	
534.2	40535.2	Load Breaker 19 Open Output	
534.3	40535.3	Load Breaker 20 Open Output	
534.4	40535.4	Load Breaker 21 Open Output	
534.5	40535.5	Load Breaker 22 Open Output	
534.6	40535.6	Load Breaker 23 Open Output	
534.7	40535.7	Load Breaker 24 Open Output	
534.8	40535.8	/	
534.9	40535.9	/	
534.10	40535.10	/	
534.11	40535.11	/	
534.12	40535.12	/	
534.13	40535.13	/	

Modbus Address	PLC Address	Name	Description
534.14	40535.14	/	
534.15	40535.15	/	
535.0	40536.0	Load Breaker 1 Close Status	
535.1	40536.1	Load Breaker 2 Close Status	
535.2	40536.2	Load Breaker 3 Close Status	
535.3	40536.3	Load Breaker 4 Close Status	
535.4	40536.4	Load Breaker 5 Close Status	
535.5	40536.5	Load Breaker 6 Close Status	
535.6	40536.6	Load Breaker 7 Close Status	
535.7	40536.7	Load Breaker 8 Close Status	
535.8	40536.8	Load Breaker 9 Close Status	
535.9	40536.9	Load Breaker 10 Close Status	
535.10	40536.10	Load Breaker 11 Close Status	
535.11	40536.11	Load Breaker 12 Close Status	
535.12	40536.12	Load Breaker 13 Close Status	
535.13	40536.13	Load Breaker 14 Close Status	
535.14	40536.14	Load Breaker 15 Close Status	
535.15	40536.15	Load Breaker 16 Close Status	
536.0	40537.0	Load Breaker 17 Close Status	
536.1	40537.1	Load Breaker 18 Close Status	
536.2	40537.2	Load Breaker 19 Close Status	
536.3	40537.3	Load Breaker 20 Close Status	
536.4	40537.4	Load Breaker 21 Close Status	
536.5	40537.5	Load Breaker 22 Close Status	
536.6	40537.6	Load Breaker 23 Close Status	
536.7	40537.7	Load Breaker 24 Close Status	
536.8	40537.8	/	
536.9	40537.9	/	
536.10	40537.10	/	
536.11	40537.11	/	
536.12	40537.12	/	
536.13	40537.13	/	
536.14	40537.14	/	
536.15	40537.15	/	
537.0	40538.0	Load Breaker 1 in Work Position	
537.1	40538.1	Load Breaker 2 in Work Position	
537.2	40538.2	Load Breaker 3 in Work Position	
537.3	40538.3	Load Breaker 4 in Work Position	
537.4	40538.4	Load Breaker 5 in Work	

Modbus Address	PLC Address	Name	Description
		Position	
537.5	40538.5	Load Breaker 6 in Work Position	
537.6	40538.6	Load Breaker 7 in Work Position	
537.7	40538.7	Load Breaker 8 in Work Position	
537.8	40538.8	Load Breaker 9 in Work Position	
537.9	40538.9	Load Breaker 10 in Work Position	
537.10	40538.10	Load Breaker 11 in Work Position	
537.11	40538.11	Load Breaker 12 in Work Position	
537.12	40538.12	Load Breaker 13 in Work Position	
537.13	40538.13	Load Breaker 14 in Work Position	
537.14	40538.14	Load Breaker 15 in Work Position	
537.15	40538.15	Load Breaker 16 in Work Position	
538.0	40539.0	Load Breaker 17 in Work Position	
538.1	40539.1	Load Breaker 18 in Work Position	
538.2	40539.2	Load Breaker 19 in Work Position	
538.3	40539.3	Load Breaker 20 in Work Position	
538.4	40539.4	Load Breaker 21 in Work Position	
538.5	40539.5	Load Breaker 22 in Work Position	
538.6	40539.6	Load Breaker 23 in Work Position	
538.7	40539.7	Load Breaker 24 in Work Position	
538.8	40539.8	/	
538.9	40539.9	/	
538.10	40539.10	/	
538.11	40539.11	/	

Modbus Address	PLC Address	Name	Description
538.12	40539.12	/	
538.13	40539.13	/	
538.14	40539.14	/	
538.15	40539.15	/	
539.0	40540.0	Load Breaker 1 in Test Position	
539.1	40540.1	Load Breaker 2 in Test Position	
539.2	40540.2	Load Breaker 3 in Test Position	
539.3	40540.3	Load Breaker 4 in Test Position	
539.4	40540.4	Load Breaker 5 in Test Position	
539.5	40540.5	Load Breaker 6 in Test Position	
539.6	40540.6	Load Breaker 7 in Test Position	
539.7	40540.7	Load Breaker 8 in Test Position	
539.8	40540.8	Load Breaker 9 in Test Position	
539.9	40540.9	Load Breaker 10 in Test Position	
539.10	40540.10	Load Breaker 11 in Test Position	
539.11	40540.11	Load Breaker 12 in Test Position	
539.12	40540.12	Load Breaker 13 in Test Position	
539.13	40540.13	Load Breaker 14 in Test Position	
539.14	40540.14	Load Breaker 15 in Test Position	
539.15	40540.15	Load Breaker 16 in Test Position	
540.0	40541.0	Load Breaker 17 in Test Position	
540.1	40541.1	Load Breaker 18 in Test Position	
540.2	40541.2	Load Breaker 19 in Test Position	
540.3	40541.3	Load Breaker 20 in Test	

Modbus Address	PLC Address	Name	Description
		Position	
540.4	40541.4	Load Breaker 21 in Test Position	
540.5	40541.5	Load Breaker 22 in Test Position	
540.6	40541.6	Load Breaker 23 in Test Position	
540.7	40541.7	Load Breaker 24 in Test Position	
540.8	40541.8	/	
540.9	40541.9	/	
540.10	40541.10	/	
540.11	40541.11	/	
540.12	40541.12	/	
540.13	40541.13	/	
540.14	40541.14	/	
540.15	40541.15	/	
541.0	40542.0	BPS1 Close Output	
541.1	40542.1	BPS1 Open Output	
541.2	40542.2	BPS2 Close Output	
541.3	40542.3	BPS2 Open Output	
541.4	40542.4	BPS1 Close Status	
541.5	40542.5	BPS2 Close Status	
541.6	40542.6	Bypass Switch Unlock Status	
541.7	40542.7	Main Switch in Work Position	
541.8	40542.8	Main Switch in Test Position	
541.9	40542.9	Main Switch in Isolation Position	
541.10	40542.10	Main Switch Unlock Status	
541.11	40542.11	Bypass Switch in Work Position	
541.12	40542.12	Bypass Switch in Test Position	
541.13	40542.13	Bypass Switch in Isolation Position	
541.14	40542.14	Main Switch Unlock Input	
541.15	40542.15	Bypass Switch Unlock Input	

Example:

If need to read "Aux. Output 1 Status" and "S1 Close Status", firstly get their corresponding address is 508.0 and 509.4 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 (508)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	03	01	FC	00	02	05	C7

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 508	Data LSB of Address 508	Data MSB of Address 509	Data LSB of Address 509	LSB	MSB
01	03	04	00	01	00	10	AA	3F

Table 5 – Data Analysis

Address	Received Data (Hex)	Convert to Binary	Data Signification
508	0001H	0000 0000 0000 0001 (correspond to 508.15, 508.14.......508.1, 508.0)	Data of bit 0 is 1 indicates that aux. output 1 is active.
509	0010H	0000 0000 0001 0000 (correspond to 509.15, 509.14.......509.1, 509.0)	Data of bit 509.4 is 1 indicates S1 is closed.

3.3 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

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
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 Frequency)	0~100.00	0.01	Hz	16-bit Unsigned	
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	0~100.00	0.01	Hz	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Frequency)					
1030	41031	S1S2 Volt Diff. (1#/2# Power Volt Diff.)	-32768~ +32767	1	V	16-bit signed	
1031	41032	S1S2 Freq. Diff. (1#/2# Power Freq. Diff.)	-100.00~ +100.00	0.01	Hz	16-bit signed	NOTE4
1032	41033	S1S2 Phase Diff. (1#/2# Power Phase Diff.)	-180.0~ +180.0	0.1	°	16-bit signed	
1033	41034	/					
1034	41035	/					
1035	41036	/					
1036	41037	/					
1037	41038	/					
1038	41039	/					
1039	41040	/					
1040	41041	S1 A Phase Current	0~65000	0.1	A	16-bit Unsigned	
1041	41042	S1 B Phase Current	0~65000	0.1	A	16-bit Unsigned	
1042	41043	S1 C Phase Current	0~65000	0.1	A	16-bit Unsigned	
1043	41044	S1 N Phase Current (Zero-sequence Current)	0~65000	0.1	A	16-bit Unsigned	
1044	41045	S1 A Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1045	41046	S1 B Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1046	41047	S1 C Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1047	41048	S1 N Phase Current Phase (Zero-sequence Current)	0~360.0	0.1	°	16-bit Unsigned	
1048	41049	A Phase Active Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	NOTE2
1049	41050	A Phase Active Power (MSB)					
1050	41051	B Phase Active Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1051	41052	B Phase Active Power (MSB)					
1052	41053	C Phase Active Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1053	41054	C Phase Active Power (MSB)					
1054	41055	Total Active Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1055	41056	Total Active Power (MSB)					
1056	41057	A Phase Reactive Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1057	41058	A Phase Reactive Power (MSB)					
1058	41059	B Phase Reactive Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1059	41060	B Phase Reactive Power (MSB)					
1060	41061	C Phase Reactive Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1061	41062	C Phase Reactive Power (MSB)					
1062	41063	Total Reactive Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1063	41064	Total Reactive Power (MSB)					
1064	41065	A Phase Apparent Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1065	41066	A Phase Apparent Power (MSB)					
1066	41067	B Phase Apparent Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1067	41068	B Phase Apparent Power (MSB)					
1068	41069	C Phase Apparent Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1069	41070	C Phase Apparent Power					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		(MSB)					
1070	41071	Total Apparent Power (LSB)	-2147483648~ 2147483647	0.1	kW	32-bit Signed	
1071	41072	Total Apparent Power (MSB)					
1072	41073	A Phase Power Factor	-100~100	0.01		16-bit Signed	
1073	41074	B Phase Power Factor	-100~100	0.01		16-bit Signed	
1074	41075	C Phase Power Factor	-100~100	0.01		16-bit Signed	
1075	41076	Average Power Factor	-100~100	0.01		16-bit Signed	
1076	41077	/					
1077	41078	/					
1078	41079	/					
1079	41080	/					
1080	41081	/					
1081	41082	S1 Zero-sequence Current	0~65000	0.1	A	16-bit Signed	
1082	41083	S1 Zero-sequence Current PCT On Rated Current	0~1000	0.1	%	16-bit Unsigned	
1083	41084	/					
1084	41085	/					
1085	41086	Current C/O Load Breaker	0~24	No			
1086	41087	Load Breaker Trip Label	0~24	No			
1087	41088	Load Breaker C/O Fault Label	0~24	No			
1088	41089	S1 Volt Status	0~65535	No		16-bit Unsigned	See S1 Power Status
1089	41090	S1 Volt Delay	0~65535	1	s	16-bit Unsigned	
1090	41091	S2 Volt Status	0~65535	No		16-bit Unsigned	See S2 Power Status
1091	41092	S2 Volt Delay	0~65535	1	s	16-bit Unsigned	
1092	41093	Genset Status	0~65535	No		16-bit Unsigned	See Genset

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1093	41094	Genset Delay	0~65535	1	s	16-bit Unsigned	Status
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	/					
1097	41098	/					
1098	41099	Master Status	0~1	No		0: S1 Master; 1: S2 Master	
1099	41100	/					
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: Second	0~59	1	s	16-bit Unsigned	
1107	41108	/					
1108	41109	/					
1109	41110	/					
1110	41111	/					
1111	41112	Current Continuous Supply Time (h)	0~65535	1	h	16-bit Unsigned	
1112	41113	Current Continuous Supply Time (min)	0~59	1	min	16-bit Unsigned	
1113	41114	Continuous Supply Time (s)	0~59	1	s	16-bit Unsigned	
1114	41115	Last Continuous Supply Time (h)	0~65535	1	h	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1115	41116	Last Continuous Supply Time (min)	0~59	1	min	16-bit Unsigned	
1116	41117	Last Continuous Supply Time (s)	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. 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 (LSB)	0-99999999	0.1	kWh	32-bit Signed	NOTE2
1126	41127	S1 Accum. Active Power kWh (MSB)					
1127	41128	S1 Accum. Reactive Power kvarh (LSB)	0-99999999	0.1	kvarh	32-bit Signed	
1128	41129	S1 Accum. Reactive Power kvarh (MSB)					
1129	41130	S1 Accum. Close Times (LSB)	0~4294967296	1	times	32-bit Unsigned	
1130	41131	S1 Accum. Close Times (MSB)					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1131	41132	S2 Accum. Active Power kWh (LSB)	0-99999999	0.1	kWh	32-bit Signed	
1132	41133	S2 Accum. Active Power kWh (MSB)					
1133	41134	S2 Accum. Reactive Power kvarh (LSB)	0-99999999	0.1	kvarh	32-bit Signed	
1134	41135	S2 Accum. Reactive Power kvarh (MSB)					
1135	41136	S2 Accum. Close Times (LSB)	0~4294967296	1	times	32-bit Unsigned	
1136	41137	S2 Accum. Close Times MSB)					
1137	41138	Accum. Auto Transfer Times (LSB)	0~4294967296	1	times	32-bit Unsigned	
1138	41139	Accum. Auto Transfer Times (MSB)					
1139	41140	Mains No Transfer Times (LSB)	0~4294967296	1	times	32-bit Unsigned	
1140	41141	Mains No Transfer Times (MSB)					
1141	41142	Accum. Auto Transfer Run Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	
1142	41143	Accum. Auto Transfer Run Time (h) MSB					
1143	41144	Accum. Auto Transfer Run Time (min)	0~59	1	min	16-bit Unsigned	
1144	41145	Accum. Auto Transfer Run Time (s)	0~59	1	s	16-bit Unsigned	
1145	41146	BPS1 Accum. Close Times LSB	0~4294967296	1	times	32-bit Unsigned	NOTE2
1146	41147	BPS1 Accum.					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Close Times MSB					
1147	41148	BPS2 Accum. Close Times LSB	0~4294967296	1	times	32-bit Unsigned	
1148	41149	BPS2 Accum. Close Times MSB					
1149	41150	/					
1150	41151	/					
1151	41152	S2 A Phase Current	0~65000	0.1	A	16-bit Unsigned	
1152	41153	S2 B Phase Current	0~65000	0.1	A	16-bit Unsigned	
1153	41154	S2 C Phase Current	0~65000	0.1	A	16-bit Unsigned	
1154	41155	S2 N Line Current (Zero-sequence Current, Ground Current)	0~65000	0.1	A	16-bit Unsigned	
1155	41156	S2 A Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1156	41157	S2 B Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1157	41158	S2 C Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1158	41159	S2 N Line Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1159	41160	S2 Zero-sequence Current	0~65000	0.1	A	16-bit Signed	
1160	41161	S2 Zero-sequence Current PCT	0~1000	0.1	%	16-bit Unsigned	
1161	41162	/					
1162	41163	/					
1163	41164	/					
1164	41165	/					
1165	41166	/					
1166	41167	/					
1167	41168	/					
1168	41169	/					
1169	41170	/					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1170	41171	/					
1171	41172	/					
1172	41173	/					
1173	41174	/					
1174	41175	/					
1175	41176	/					
1176	41177	/					
1177	41178	/					
1178	41179	/					
1179	41180	/					

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 1129 and 1130 by checking the table, then it is known that you need to read 2 bytes' 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 (1129)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**04**	**69**	**00**	**02**	**15**	**27**

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 1129	Data LSB of Address 1129	Data MSB of Address 1130	Data LSB of Address 1130	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)
1129	E240H	0001E240H	123456
1130	0001H		

3.4 REMOTE COIL FIELD CORRESPONDING TO FUNCTION CODE 05H

Table 10 – Remote Coil Field

Modbus Address	PLC Address	Name	Description
400	401	Remote MS1 Close	Only send FF00H active
401	402	Remote MS Open	Only send FF00H active
402	403	Remote MS2 Close	Only send FF00H active
403	404	Remote MS Open (same as address 401H)	Only send FF00H active
404	405	Auto/Manual	Manual Mode: Only send 0000H active Auto Mode: Only send FF00H active
405	406	S1 Master Status Set	Only send FF00H active
406	407	S2 Master Status Set	Only send FF00H active
407	408	Alarm Reset	Only send FF00H active
408	409	Remote Genset Start (S1)	Only send FF00H active
409	410	Remote Genset Stop (S1)	Only send FF00H active
410	411	Remote Genset Start (S2)	Only send FF00H active
411	412	Remote Genset Stop (S2)	Only send FF00H active
412	413	Remote Output 1 Output	Only send FF00H active
413	414	Remote Output 2 Output	Only send FF00H active
414	415	Remote Output 3 Output	Only send FF00H active
415	416	Remote Output 4 Output	Only send FF00H active
416	417	Remote Output 5 Output	Only send FF00H active
417	418	Remote Output 6 Output	Only send FF00H active
418	419	Remote Output 7 Output	Only send FF00H active
419	420	Remote Output 8 Output	Only send FF00H active
420	421	Remote Output 9 Output	Only send FF00H active
421	422	Remote Output 10 Output	Only send FF00H active
422	423	Remote Output 11 Output	Only send FF00H active
423	424	Remote Output 12 Output	Only send FF00H active
424	425	Remote Output 13 Output	Only send FF00H active
425	426	/	Only send FF00H active
426	427	Window Prompt Confirm	Only send FF00H active
427	428	Window Prompt Cancel	Only send FF00H active
428	429	/	Only send FF00H active
429	430	/	Only send FF00H active
430	431	Load 1 Close Control	Only send FF00H active
431	432	Load 1 Open Control	Only send FF00H active
432	433	Load 2 Close Control	Only send FF00H active
433	434	Load 2 Open Control	Only send FF00H active
434	435	Load 3 Close Control	Only send FF00H active
435	436	Load 3 Open Control	Only send FF00H active
436	437	Load 4 Close Control	Only send FF00H active
437	438	Load 4 Open Control	Only send FF00H active

Modbus Address	PLC Address	Name	Description
438	439	Load 5 Close Control	Only send FF00H active
439	440	Load 5 Open Control	Only send FF00H active
440	441	Load 6 Close Control	Only send FF00H active
441	442	Load 6 Open Control	Only send FF00H active
442	443	Load 7 Close Control	Only send FF00H active
443	444	Load 7 Open Control	Only send FF00H active
444	445	Load 8 Close Control	Only send FF00H active
445	446	Load 8 Open Control	Only send FF00H active
446	447	Load 9 Close Control	Only send FF00H active
447	448	Load 9 Open Control	Only send FF00H active
448	449	Load 10 Close Control	Only send FF00H active
449	450	Load 10 Open Control	Only send FF00H active
450	451	Load 11 Close Control	Only send FF00H active
451	452	Load 11 Open Control	Only send FF00H active
452	453	Load 12 Close Control	Only send FF00H active
453	454	Load 12 Open Control	Only send FF00H active
454	455	Load 13 Close Control	Only send FF00H active
455	456	Load 13 Open Control	Only send FF00H active
456	457	Load 14 Close Control	Only send FF00H active
457	458	Load 14 Open Control	Only send FF00H active
458	459	Load 15 Close Control	Only send FF00H active
459	460	Load 15 Open Control	Only send FF00H active
460	461	Load 16 Close Control	Only send FF00H active
461	462	Load 16 Open Control	Only send FF00H active
462	463	Load 17 Close Control	Only send FF00H active
463	464	Load 17 Open Control	Only send FF00H active
464	465	Load 18 Close Control	Only send FF00H active
465	466	Load 18 Open Control	Only send FF00H active
466	467	Load 19 Close Control	Only send FF00H active
467	468	Load 19 Open Control	Only send FF00H active
468	469	Load 20 Close Control	Only send FF00H active
469	470	Load 20 Open Control	Only send FF00H active
470	471	Load 21 Close Control	Only send FF00H active
471	472	Load 21 Open Control	Only send FF00H active
472	473	Load 22 Close Control	Only send FF00H active
473	474	Load 22 Open Control	Only send FF00H active
474	475	Load 23 Close Control	Only send FF00H active
475	476	Load 23 Open Control	Only send FF00H active
476	477	Load 24 Close Control	Only send FF00H active
477	478	Load 24 Open Control	Only send FF00H active
478	479	/	Only send FF00H active
479	480	/	Only send FF00H active
480	481	Remote BPS1 Close	Only send FF00H active

Modbus Address	PLC Address	Name	Description
481	482	Remote BPS Open	Only send FF00H active
482	483	Remote BPS2 Close	Only send FF00H active
483	484	Remote BPS Open (same as address 481H)	Only send FF00H active
484	485	Main and Bypass Switch Unlock	Only send FF00H active

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 404 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 (404)		Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	05	01	94	FF	00	CC	2A

Slave response command is as following:

Table 12 – Slave Response Command

Slave Address	Function Code	Remote Address (404)		Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	05	01	94	FF	00	CC	2A

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.

3.5 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

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.

3.6 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
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

3.7 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	S1 Cycle Start	Delay (Unit: s)
5	S2 Cycle Start	Delay (Unit: s)
6	S1 Genset Start	No Delay
7	S2 Genset Start	No Delay
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.

3.8 ATS STATUS DESCRIPTION

Table 16 – ATS Status Description

Value (No.)	Status	Delay
0	Ready to Transfer	No Delay
1	MS1/BPS1 Closing	Delay (Unit: s)
2	MS1/BPS1 Opening	Delay (Unit: s)
3	MS2/BPS2 Closing	Delay (Unit: s)
4	MS2/BPS2 Opening	Delay (Unit: s)
5	Transfer Rest	Delay (Unit: s)
6	Closing MS1/BPS1 Again	Delay (Unit: s)
7	Opening MS1/BPS1 Again	Delay (Unit: s)
8	Closing MS2/BPS2 Again	Delay (Unit: s)
9	Opening MS2/BPS2 Again	Delay (Unit: s)
10	Wait for Sync	Delay (Unit: s)
11	MS1/BPS1 Sync. Close	Delay (Unit: s)
12	MS2/BPS2 Sync. Close	Delay (Unit: s)
13	Wait MS1/BPS1 PF Input	Delay (Unit: s)
14	Wait MS2/BPS2 PF Input	Delay (Unit: s)
15	Elevator Control Delay	Delay (Unit: s)
16	MS1 On-load	No Delay
17	MS2 On-load	No Delay
18	Off-load	No Delay
19	BPS1 Closing	Delay (Unit: s)
20	BPS1 Opening	Delay (Unit: s)
21	BPS2 Closing	Delay (Unit: s)
22	BPS2 Opening	Delay (Unit: s)
23	BPS1 On-load	No Delay
24	BPS2 On-load	No Delay
25	S1 Parallel On-load	No Delay
26	S2 Parallel On-load	No Delay
27	/	
28	/	
29	/	
30	/	
31	QTIE Closing	Delay (Unit: s)
32	QTIE Opening	Delay (Unit: s)
33	S1 Load Stepwise Close	No Delay
34	S1 Load Stepwise Open	No Delay
35	S2 Load Stepwise Close	No Delay
36	S2 Load Stepwise Open	No Delay

4. COMMUNICATION PARAMETER VIEW AND CONFIGURATION

4.1 VIEW CURRENT COMMUNICATION PARAMETERS

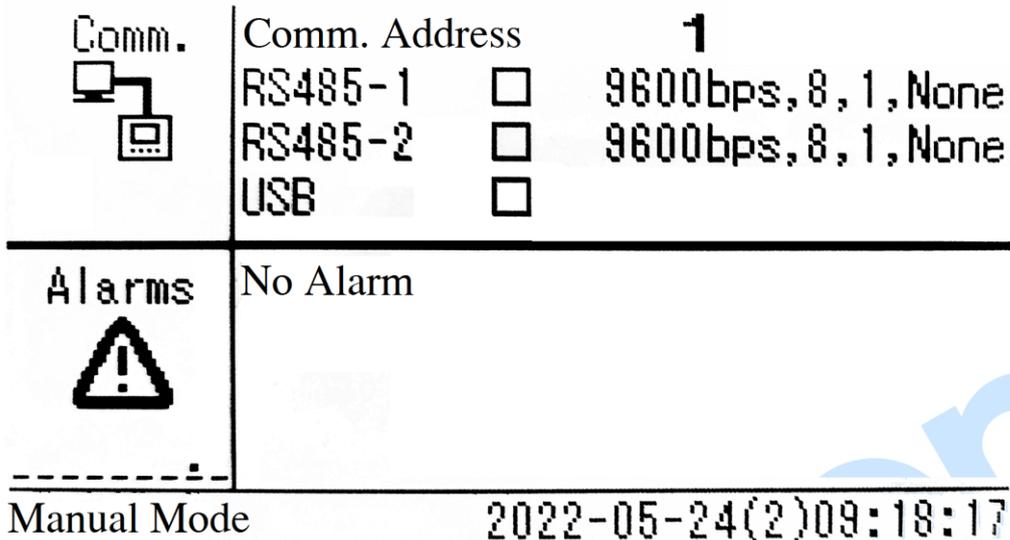In controller main interface, press ▼ key, the following interface is displayed.

Fig.3 Comm. Parameters Interface

This interface displays **RS485-1   9600bps, 8, N, None**, which indicates that the current communication rate of RS485-1 is 9600bps, data bit is 8-bit, stop bit is 2-bit, no parity (N: No parity/O: Odd parity/E: Even parity).

4.2 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 needs 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.4 SGCAN300 Application Diagram

5.5 COMMON SOLUTIONS OF COMMUNICATION FAILURE

1) Check whether the positive and negative of RS485 is correctly connected;
2) Check whether the communication parameter setting in parameter setting is correct;
3) Check whether the RS485 converter (if configured) is normal;
4) Check whether the terminal resistor is correctly connected;
5) Disconnect the connection line of controller's RS485, measure the voltage difference of RS485's A and B terminal. If the difference is between ±200mV, it means communication port has abnormal situation;
6) It is recommended to download third-party communication software such as modscan32, modbus poll to check whether communication is normal.

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