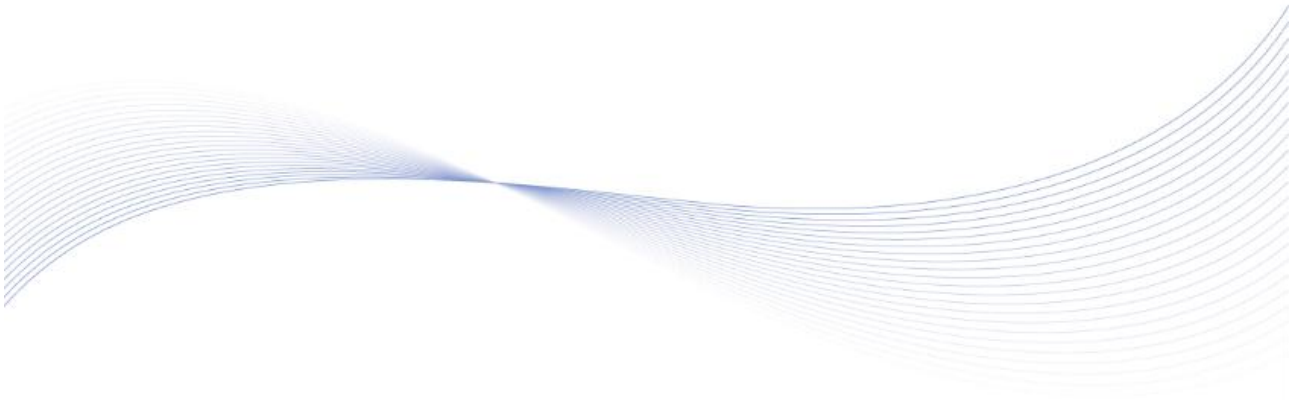
SmartGen

MAKING CONTROL SMARTER

HAT835

THREE POWER BUS TIE CONTROLLER

COMMUNICATION PROTOCOL



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SmartGen众智 **Chinese trademark**

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Table 1 – Software Version

Date	Version	Content
2022-05-20	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.

HAT835 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 parity
Stop bit: 1 or 2 bits (default: 2-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

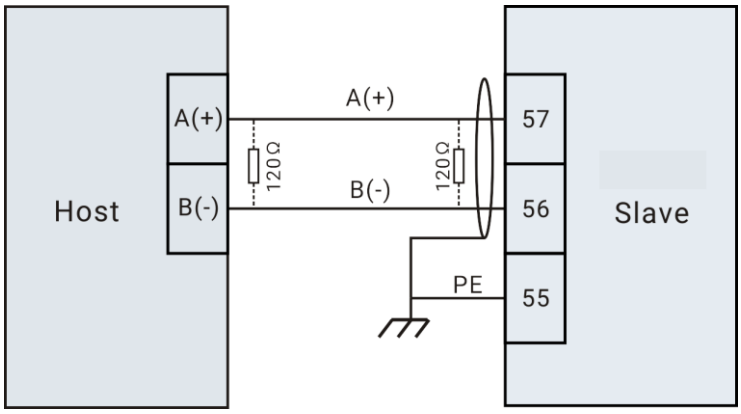

Fig.1 Single Unit Communication Wiring Diagram

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.

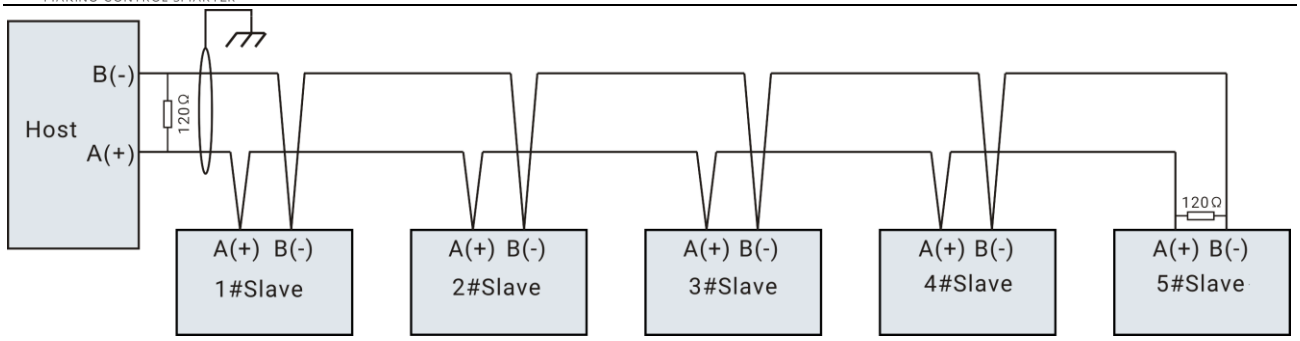

Fig.2 Multi-unit Communication Wiring Diagram

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, S3 refers to 3# 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	Local Mode	
500.8	40501.8	Manual/Auto Mode	0: Manual Mode 1: Auto Mode
500.9	40501.9	/	
500.10	40501.10	/	
500.11	40501.11	/	
500.12	40501.12	/	
500.13	40501.13	/	
500.14	40501.14	/	

Modbus Address	PLC Address	Name	Description
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	/	
501.8	40502.8	S1 Blackout	
501.9	40502.9	S1 Over Voltage	
501.10	40502.10	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	/	
502.8	40503.8	S2 Blackout	
502.9	40503.9	S2 Over Voltage	
502.10	40503.10	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	S2 Close Failure	
503.4	40504.4	S2 Open Failure	
503.5	40504.5	S3 Close Failure	
503.6	40504.6	S3 Open Failure	
503.7	40504.7	QTIE1 Close Failure	
503.8	40504.8	QTIE1 Open Failure	

Modbus Address	PLC Address	Name	Description
503.9	40504.9	QTIE2 Close Failure	
503.10	40504.10	QTIE2 Open Failure	
503.11	40504.11	Forced Open Fault	
503.12	40504.12	Breaker Trip Alarm	
503.13	40504.13	QS1 Trip Alarm	
503.14	40504.14	QS2 Trip Alarm	
503.15	40504.15	QS3 Trip Alarm	
504.0	40505.0	QTIE1 Trip Alarm	
504.1	40505.1	QTIE2 Trip Alarm	
504.2	40505.2	S1 Genset Fault	
504.3	40505.3	S2 Genset Fault	
504.4	40505.4	S3 Genset Fault	
504.5	40505.5	Exp. Input Module 1 Comm. Fault	
504.6	40505.6	Exp. Input Module 2 Comm. Fault	
504.7	40505.7	Exp. Input Module 3 Comm. Fault	
504.8	40505.8	Exp. Output Module 1 Comm. Fault	
504.9	40505.9	Exp. Output Module 2 Comm. Fault	
504.10	40505.10	Exp. Output Module 3 Comm. Fault	
504.11	40505.11	/	
504.12	40505.12	/	
504.13	40505.13	/	
504.14	40505.14	/	
504.15	40505.15	/	
505.0	40506.0	/	
505.1	40506.1	/	
505.2	40506.2	/	
505.3	40506.3	/	
505.4	40506.4	/	
505.5	40506.5	/	
505.6	40506.6	/	
505.7	40506.7	/	
505.8	40506.8	/	
505.9	40506.9	/	
505.10	40506.10	/	
505.11	40506.11	/	
505.12	40506.12	/	
505.13	40506.13	/	

Modbus Address	PLC Address	Name	Description
505.14	40506.14	/	
505.15	40506.15	/	
506.0	40507.0	Forced Open Warn	
506.1	40507.1	DC Power Undervoltage Warn	
506.2	40507.2	DC Power Overvoltage Warn	
506.3	40507.3	Exp. Input Module 1 Comm. Warn	
506.4	40507.4	Exp. Input Module 2 Comm. Warn	
506.5	40507.5	Exp. Input Module 3 Comm. Warn	
506.6	40507.6	Exp. Output Module 1 Comm. Warn	
506.7	40507.7	Exp. Output Module 2 Comm. Warn	
506.8	40507.8	Exp. Output Module 3 Comm. Warn	
506.9	40507.9	/	
506.10	40507.10	/	
506.11	40507.11	/	
506.12	40507.12	/	
506.13	40507.13	/	
506.14	40507.14	/	
506.15	40507.15	/	
507.0	40508.0	Aux. Input 1 Status	0 means input is inactive; 1 means input is active.
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	/	
507.13	40508.13	/	
507.14	40508.14	/	
507.15	40508.15	/	

Modbus Address	PLC Address	Name	Description
508.0	40509.0	Aux. Output 1 Status	
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	L Supply Output Port Status	
508.13	40509.13	N Supply Output Port Status	
508.14	40509.14	/	
508.15	40509.15	/	
509.0	40510.0	S1 Close Status	
509.1	40510.1	S2 Close Status	
509.2	40510.2	S3 Close Status	
509.3	40510.3	QTIE1 Close Status	
509.4	40510.4	QTIE2 Close Status	
509.5	40510.5	/	
509.6	40510.6	/	
509.7	40510.7	/	
509.8	40510.8	Wait S1 Close PF Input	
509.9	40510.9	Wait S2 Close PF Input	
509.10	40510.10	Wait S3 Close PF Input	
509.11	40510.11	Wait QTIE1 Close PF Input	
509.12	40510.12	Wait QTIE2 Close PF Input	
509.13	40510.13	/	
509.14	40510.14	/	
509.15	40510.15	/	
510.0	40511.0	S1 Close Output	
510.1	40511.1	S1 Open Output	
510.2	40511.2	S2 Close Output	
510.3	40511.3	S2 Open Output	
510.4	40511.4	S3 Close Output	
510.5	40511.5	S3 Open Output	
510.6	40511.6	QTIE1 Close Output	
510.7	40511.7	QTIE1 Open Output	
510.8	40511.8	QTIE2 Close Output	
510.9	40511.9	QTIE2 Open Output	
510.10	40511.10	/	

Modbus Address	PLC Address	Name	Description
510.11	40511.11	/	
510.12	40511.12	/	
510.13	40511.13	/	
510.14	40511.14	/	
510.15	40511.15	/	
511.0	40512.0	Remote Start On-load	
511.1	40512.1	Remote Start Off-load	
511.2	40512.2	Mains Abnormal Start	
511.3	40512.3	/	
511.4	40512.4	/	
511.5	40512.5	/	
511.6	40512.6	Scheduled Run	
511.7	40512.7	Scheduled Not Run	
511.8	40512.8	Start Inhibit	
511.9	40512.9	/	
511.10	40512.10	/	
511.11	40512.11	/	
511.12	40512.12	/	
511.13	40512.13	/	
511.14	40512.14	/	
511.15	40512.15	/	
512.0	40513.0	S1 Genset Start	
512.1	40513.1	S1 Genset Start	
512.2	40513.2	S3 Genset Start	
512.3	40513.3	/	
512.4	40513.4	/	
512.5	40513.5	/	
512.6	40513.6	/	
512.7	40513.7	/	
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	/	
512.15	40513.15	/	
513.0	40514.0	S1 Close Inhibit	
513.1	40514.1	S2 Close Inhibit	
513.2	40514.2	S3 Close Inhibit	
513.3	40514.3	/	
513.4	40514.4	/	
513.5	40514.5	Reserved	

Modbus Address	PLC Address	Name	Description
513.6	40514.6	Elevator Control	
513.7	40514.7	/	
513.8	40514.8	/	
513.9	40514.9	/	
513.10	40514.1	/	
513.11	40514.11	/	
513.12	40514.12	/	
513.13	40514.13	/	
513.14	40514.14	/	
513.15	40514.15	/	
514.0	40515.0	S3 Voltage Normal	
514.1	40515.1	S3 Voltage Abnormal	
514.2	40515.2	S3 Volt Instant. Abnormal	
514.3	40515.3	/	
514.4	40515.4	/	
514.5	40515.5	/	
514.6	40515.6	/	
514.7	40515.7	/	
514.8	40515.8	S3 Voltage Blackout	
514.9	40515.9	S3 Over Voltage	
514.10	40515.10	S3 Undervoltage	
514.11	40515.11	S3 Overfrequency	
514.12	40515.12	S3 Underfrequency	
514.13	40515.13	S3 Loss of Phase	
514.14	40515.14	S3 Reverse Phase Seq.	
514.15	40515.15	/	
515.0	40516.0	Aux. Input 1 Status	Expand input module 1 status.
515.1	40516.1	Aux. Input 2 Status	
515.2	40516.2	Aux. Input 3 Status	
515.3	40516.3	Aux. Input 4 Status	
515.4	40516.4	Aux. Input 5 Status	
515.5	40516.5	Aux. Input 6 Status	
515.6	40516.6	Aux. Input 7 Status	
515.7	40516.7	Aux. Input 8 Status	
515.8	40516.8	Aux. Input 9 Status	
515.9	40516.9	Aux. Input 10 Status	
515.10	40516.10	Aux. Input 11 Status	
515.11	40516.11	Aux. Input 12 Status	
515.12	40516.12	Aux. Input 13 Status	
515.13	40516.13	Aux. Input 14 Status	
515.14	40516.14	Aux. Input 15 Status	
515.15	40516.15	Aux. Input 16 Status	
516.0	40517.0	Aux. Input 1 Status	Expand input module 2 status

Modbus Address	PLC Address	Name	Description
516.1	40517.1	Aux. Input 2 Status	
516.2	40517.2	Aux. Input 3 Status	
516.3	40517.3	Aux. Input 4 Status	
516.4	40517.4	Aux. Input 5 Status	
516.5	40517.5	Aux. Input 6 Status	
516.6	40517.6	Aux. Input 7 Status	
516.7	40517.7	Aux. Input 8 Status	
516.8	40517.8	Aux. Input 9 Status	
516.9	40517.9	Aux. Input 10 Status	
516.10	40517.10	Aux. Input 11 Status	
516.11	40517.11	Aux. Input 12 Status	
516.12	40517.12	Aux. Input 13 Status	
516.13	40517.13	Aux. Input 14 Status	
516.14	40517.14	Aux. Input 15 Status	
516.15	40517.15	Aux. Input 16 Status	
517.0	40518.0	Aux. Input 1 Status	Expand input module 3 status
517.1	40518.1	Aux. Input 2 Status	
517.2	40518.2	Aux. Input 3 Status	
517.3	40518.3	Aux. Input 4 Status	
517.4	40518.4	Aux. Input 5 Status	
517.5	40518.5	Aux. Input 6 Status	
517.6	40518.6	Aux. Input 7 Status	
517.7	40518.7	Aux. Input 8 Status	
517.8	40518.8	Aux. Input 9 Status	
517.9	40518.9	Aux. Input 10 Status	
517.10	40518.10	Aux. Input 11 Status	
517.11	40518.11	Aux. Input 12 Status	
517.12	40518.12	Aux. Input 13 Status	
517.13	40518.13	Aux. Input 14 Status	
517.14	40518.14	Aux. Input 15 Status	
517.15	40518.15	Aux. Input 16 Status	
518.0	40519.0	Aux. Output 1 Status	Expand output module 1 status
518.1	40519.1	Aux. Output 2 Status	
518.2	40519.2	Aux. Output 3 Status	
518.3	40519.3	Aux. Output 4 Status	
518.4	40519.4	Aux. Output 5 Status	
518.5	40519.5	Aux. Output 6 Status	
518.6	40519.6	Aux. Output 7 Status	
518.7	40519.7	Aux. Output 8 Status	
518.8	40519.8	Aux. Output 9 Status	
518.9	40519.9	Aux. Output 10 Status	
518.10	40519.10	Aux. Output 11 Status	
518.11	40519.11	Aux. Output 12 Status	

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

Example:

If need to read “Aux. Input 1 Status” and “Aux. Output 5 Status”, firstly get their corresponding coil address is 507.0 and 508.4 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 (507)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**01**	**FB**	**00**	**02**	**B4**	**06**

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 507	Data LSB of Address 507	Data MSB of Address 508	Data LSB of Address 508	LSB	MSB
01	**03**	**04**	**00**	**01**	**00**	**10**	**AA**	**3F**

Table 5 – Data Analysis

Address	Received Data (Hex)	Convert to Binary	Data Signification
507	0001H	0000 0000 0000 0001 (correspond to 507.15, 507.14……507.1, 507.0)	Data of bit 0 is 1 indicates that Aux. input 1 is active.
508	0010H	0000 0000 0001 0000 (correspond to 508.15, 508.14……508.1, 508.0)	Data of bit 508.4 is 1 indicates that Aux. output 5 is active.

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	0~360.0	0.1	°	16-bit	NOTE3

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		(1# A Phase)				Signed	
1007	41008	UB1 Phase (1# B Phase)	0~360.0	0.1	°	16-bit Signed	
1008	41009	UC1 Phase (1# C Phase)	0~360.0	0.1	°	16-bit Signed	
1009	41010	Frequency 1 (1# Power Frequency)	0~100.00	0.01	Hz	16-bit Signed	
1010	41011	UAB3 (3# AB Line Voltage)	0~65000	1	V	16-bit Unsigned	
1011	41012	UBC3 (3# BC Line Voltage)	0~65000	1	V	16-bit Unsigned	
1012	41013	UCA3 (3# CA Line Voltage)	0~65000	1	V	16-bit Unsigned	
1013	41014	UA3 (3# A Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1014	41015	UB3 (3# B Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1015	41016	UC3 (3# C Phase Voltage)	0~65000	1	V	16-bit Unsigned	
1016	41017	UA3 Phase (3# A Phase)	0~360.0	0.1	°	16-bit Signed	
1017	41018	UB3 Phase (3# B Phase)	0~360.0	0.1	°	16-bit Signed	
1018	41019	UC3 Phase (3# C Phase)	0~360.0	0.1	°	16-bit Signed	
1019	41020	Frequency 3 (3# Power Frequency)	0~100.00	0.01	Hz	16-bit Unsigned	
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	0~65000	1	V	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Voltage)					
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 Signed	
1027	41028	UB2 Phase (2# B Phase)	0~360.0	0.1	°	16-bit Signed	
1028	41029	UC2 Phase (2# C Phase)	0~360.0	0.1	°	16-bit Signed	
1029	41030	Frequency 2 (2# Power Frequency)	0~100.00	0.01	Hz	16-bit Unsigned	
1030	41031	/					
1031	41032	/					
1032	41033	/					
1033	41034	/					
1034	41035	/					
1035	41036	/					
1036	41037	/					
1037	41038	/					
1038	41039	/					
1039	41040	/					
1040	41041	/					
1041	41042	/					
1042	41043	/					
1043	41044	/					
1044	41045	/					
1045	41046	/					
1046	41047	/					
1047	41048	/					
1048	41049	/					
1049	41050	/					
1050	41051	/					
1051	41052	/					
1052	41053	/					
1053	41054	/					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1054	41055	/					
1055	41056	/					
1056	41057	/					
1057	41058	/					
1058	41059	/					
1059	41060	/					
1060	41061	/					
1061	41062	/					
1062	41063	/					
1063	41064	/					
1064	41065	/					
1065	41066	/					
1066	41067	/					
1067	41068	/					
1068	41069	/					
1069	41070	/					
1070	41071	/					
1071	41072	/					
1072	41073	/					
1073	41074	/					
1074	41075	/					
1075	41076	/					
1076	41077	/					
1077	41078	/					
1078	41079	/					
1079	41080	/					
1080	41081	Battery Voltage (Measured Volt of Controller DC Power Input Port)	0~3276.7	0.1	V	16-bit Unsigned	
1081	41082	/					
1082	41083	/					
1083	41084	/					
1084	41085	/					
1085	41086	/					
1086	41087	/					
1087	41088	/					
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	See S2

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
						Unsigned	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 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	S3 Volt Status	0~65535	No		16-bit Unsigned	See S3 Power Status
1097	41098	S3 Volt Delay	0~65535	1	s	16-bit Unsigned	
1098	41099	/					
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: Sun 1: Mon~ Sat
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	Load1 Current Continuous Supply Time (h)	0~65535	1	h	16-bit Unsigned	
1112	41113	Load1 Current Continuous Supply Time (min)	0~59	1	min	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1113	41114	Load1 Current Continuous Supply Time (s)	0~59	1	s	16-bit Unsigned	
1114	41115	Load2 Current Continuous Supply Time (h)	0~65535	1	h	16-bit Unsigned	
1115	41116	Load2 Current Continuous Supply Time (min)	0~59	1	min	16-bit Unsigned	
1116	41117	Load2 Current Continuous Supply Time (s)	0~59	1	s	16-bit Unsigned	
1117	41118	Load3 Current Continuous Supply Time (h)	0~65535	1	h	16-bit Unsigned	
1118	41119	Load3 Current Continuous Supply Time (min)	0~59	1	min	16-bit Unsigned	
1119	41120	Load3 Current Continuous Supply Time (s)	0~59	1	s	16-bit Unsigned	
1120	41121	Load1 Last Continuous Supply Time (h)	0~65535	1	h	16-bit Unsigned	
1121	41122	Load1 Last Continuous Supply Time (min)	0~59	1	min	16-bit Unsigned	
1122	41123	Load1 Last Continuous Supply Time (s)	0~59	1	s	16-bit Unsigned	
1123	41124	Load2 Last Continuous Supply Time (h)	0~65535	1	h	16-bit Unsigned	
1124	41125	Load2 Last Continuous Supply Time (min)	0~59	1	min	16-bit Unsigned	
1125	41126	Load2 Last Continuous Supply Time (s)	0~59	1	s	16-bit Unsigned	
1126	41127	Load3 Last	0~65535	1	h	16-bit	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Continuous Supply Time (h)				Unsigned	
1127	41128	Load3 Last Continuous Supply Time (min)	0~59	1	min	16-bit Unsigned	
1128	41129	Load3 Last Continuous Supply Time (s)	0~59	1	s	16-bit Unsigned	
1129	41130	Load1 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1130	41131	Load1 Accum. Supply Time (h) MSB					
1131	41132	Load 1 Accum. Supply Time (min)	0~59	1	min	16-bit Unsigned	
1132	41133	Load 1 Accum. Supply Time (s)	0~59	1	s	16-bit Unsigned	
1133	41134	Load 2 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1134	41135	Load 2 Accum. Supply Time (h) MSB					
1135	41136	Load 2 Accum. Supply Time (min)	0~59	1	min	16-bit Unsigned	
1136	41137	Load 2 Accum. Supply Time (s)	0~59	1	s	16-bit Unsigned	
1137	41138	Load 3 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1138	41139	Load 3 Accum. Supply Time (h) MSB					
1139	41140	Load 3 Accum. Supply Time (min)	0~59	1	min	16-bit Unsigned	
1140	41141	Load 3 Accum. Supply Time (s)	0~59	1	s	16-bit Unsigned	
1141	41142	S1 Accum.	0~4294967296	1	h	32-bit	NOTE2

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Supply Time (h) LSB				Unsigned	
1142	41143	S1 Accum. Supply Time (h) MSB					
1143	41144	S1 Accum. Supply Time (min)	0~59	1	min	16-bit Unsigned	
1144	41145	S1 Accum. Supply Time (s)	0~59	1	s	16-bit Unsigned	
1145	41146	S2 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1146	41147	S2 Accum. Supply Time (h) MSB					
1147	41148	S2 Accum. Supply Time (min)	0~59	1	min	16-bit Unsigned	
1148	41149	S2 Accum. Supply Time (s)	0~59	1	s	16-bit Unsigned	
1149	41150	S3 Accum. Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1150	41151	S3 Accum. Supply Time (h) MSB					
1151	41152	S3 Accum. Supply Time (min)	0~59	1	min	16-bit Unsigned	
1152	41153	S3 Accum. Supply Time (s)	0~59	1	s	16-bit Unsigned	
1153	41154	S1 Accum. Close Times (LSB)	0~4294967296	1	time	32-bit Unsigned	NOTE2
1154	41155	S1 Accum. Close Times (MSB)					
1155	41156	S2 Accum. Close Times (LSB)	0~4294967296	1	time	32-bit Unsigned	
1156	41157	S2 Accum. Close Times (MSB)					
1157	41158	S3 Accum. Close Times (LSB)	0~4294967296	1	time	32-bit Unsigned	
1158	41159	S3 Accum. Close					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Times (MSB)					
1159	41160	QTIE1 Accum. Close Times (LSB)	0~4294967296	1	time	32-bit Unsigned	
1160	41161	QTIE1 Accum. Close Times (MSB)					
1161	41162	QTIE2 Accum. Close Times (LSB)	0~4294967296	1	time	32-bit Unsigned	
1162	41163	QTIE2 Accum. Close Times (MSB)					
1163	41164	Accum. Auto Transfer Run Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	
1164	41165	Accum. Auto Transfer Run Time (h) MSB					
1165	41166	Accum. Auto Transfer Run Time (min)	0~59	1	min	16-bit Unsigned	
1166	41167	Accum. Auto Transfer Run Time (s)	0~59	1	s	16-bit Unsigned	

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 1153 and 1154 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 (1153)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**04**	**81**	**00**	**02**	**95**	**13**

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 1153	Data LSB of Address 1153	Data MSB of Address 1154	Data LSB of Address 1154	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)
1153	E240H	0001E240H	123456
1154	0001H		

3.4 REMOTE COIL FIELD CORRESPONDING TO FUNCTION CODE 05H

Table 10 – Remote Coil Field

Modbus Address	PLC Address	Name	Description
400	115001	/	Only send FF00H active
401	115002	/	Only send FF00H active
402	115003	/	Only send FF00H active
403	115004	/	Only send FF00H active
404	115005	Auto/Manual	Manual Mode: Only send 0000H active Auto Mode: Only send FF00H active
405	115006	/	
406	115007	/	
407	115008	Alarm Reset	Only send FF00H active
408	115009	Remote Genset 1 Start	Only send FF00H active
409	115010	Remote Genset 1 Stop	Only send FF00H active
410	115011	Remote Genset 2 Start	Only send FF00H active
411	115012	Remote Genset 2 Stop	Only send FF00H active
412	115013	Remote Output 1 Output	Only send FF00H active
413	115014	Remote Output 2 Output	Only send FF00H active
414	115015	Remote Output 3 Output	Only send FF00H active
415	115016	Remote Output 4 Output	Only send FF00H active
416	115017	Remote Output 5 Output	Only send FF00H active
417	115018	Remote Output 6 Output	Only send FF00H active
418	115019	Remote Output 7 Output	Only send FF00H active
419	115020	Remote Output 8 Output	Only send FF00H active
420	115021	Remote Output 9 Output	Only send FF00H active
421	115022	Remote Output 10 Output	Only send FF00H active
422	115023	Remote Output 11 Output	Only send FF00H active

Modbus Address	PLC Address	Name	Description
423	115024	Remote Output 12 Output	Only send FF00H active
424	115025	Remote Genset 3 Start	Only send FF00H active
425	115026	Remote Genset 3 Stop	Only send FF00H active
426	115027	/	
427	115028	/	
428	115029	/	
429	115030	/	
430	115031	/	
431	115032	/	
432	115033	Remote QS1 Transfer	Only send FF00H active
433	115034	Remote QTIE1 Transfer	Only send FF00H active
434	115035	Remote QS2 Transfer	Only send FF00H active
435	115036	Remote QTIE2 Transfer	Only send FF00H active
436	115037	Remote QS3 Transfer	Only send FF00H active
437	115038	Mute Input	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 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.

3.5 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 S3 POWER STATUS DESCRIPTION

Table 15 – S3 Power Status Description

Value (No.)	Status	Delay
0	S3 Available	Delay (Unit: s)
1	S3 Unavailable	Delay (Unit: s)
2	S3 Voltage Normal	No Delay
3	S3 Blackout	No Delay
4	S3 Over Voltage	No Delay
5	S3 Under Voltage	No Delay
6	S3 Over Frequency	No Delay
7	S3 Under Frequency	No Delay
8	S3 Loss of Phase	No Delay
9	S3 Reverse Phase Sequence	No Delay

3.8 GENSET STATUS DESCRIPTION

Table 16 – 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	S3 Cycle Start	Delay (Unit: s)
7	S1 Genset Start	No Delay
8	S2 Genset Start	No Delay
9	S3 Genset Start	No Delay
10	Genset Start	No Delay
11	Genset Standby	No Delay

Example:

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

If the content of address 1092 is 7, it indicates that 1# power corresponding genset has been started.

3.9 ATS STATUS DESCRIPTION

Table 17 – 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	QS3 Closing	Delay (Unit: s)
6	QS3 Opening	Delay (Unit: s)
7	QTIE1 Closing	Delay (Unit: s)
8	QTIE1 Opening	Delay (Unit: s)
9	QTIE2 Closing	Delay (Unit: s)
10	QTIE2 Opening	Delay (Unit: s)
11	Transfer Rest	Delay (Unit: s)
12	/	
13	/	
14	/	
15	/	
16	/	
17	/	
18	Wait QS1 PF Input	Delay (Unit: s)
19	Wait QS2 PF Input	Delay (Unit: s)
20	Wait QS3 PF Input	Delay (Unit: s)
21	Wait QTIE1 PF Input	Delay (Unit: s)
22	Wait QTIE2 PF Input	Delay (Unit: s)
23	Elevator Delay	Delay (Unit: s)
24	S1 On-load	No Delay
25	S2 On-load	No Delay
26	S3 On-load	No Delay
27	S1S2S3 On-load	No Delay
28	S1S2 On-load	No Delay
29	S1S3 On-load	No Delay
30	S2S3 On-load	No Delay
31	Off-load	No Delay

4. COMMUNICATION PARAMETERS VIEW AND CONFIGURATION

4.1 VIEW CURRENT COMMUNICATION PARAMETERS

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

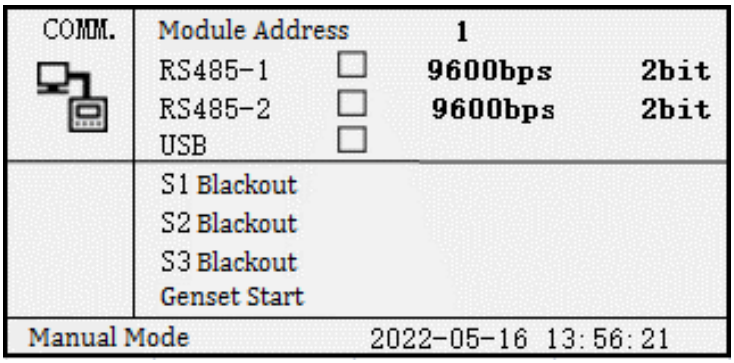

Fig.3 Communication Parameters Interface

This interface displays **RS485-1 9600bps, 2bit**, which indicates that the current communication rate of RS485-1 is 9600bps, data bit is 8-bit, no parity, stop bit is 2-bit.

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.

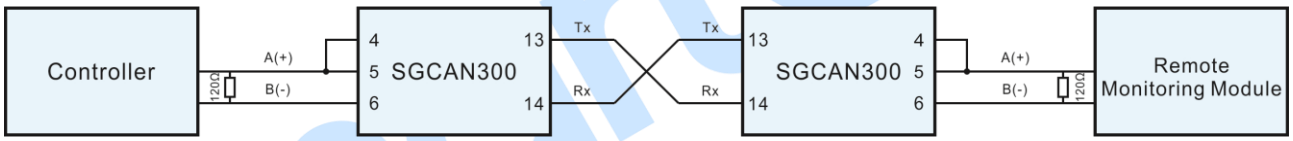

Fig.4 SGCAN300 Application Diagram

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.