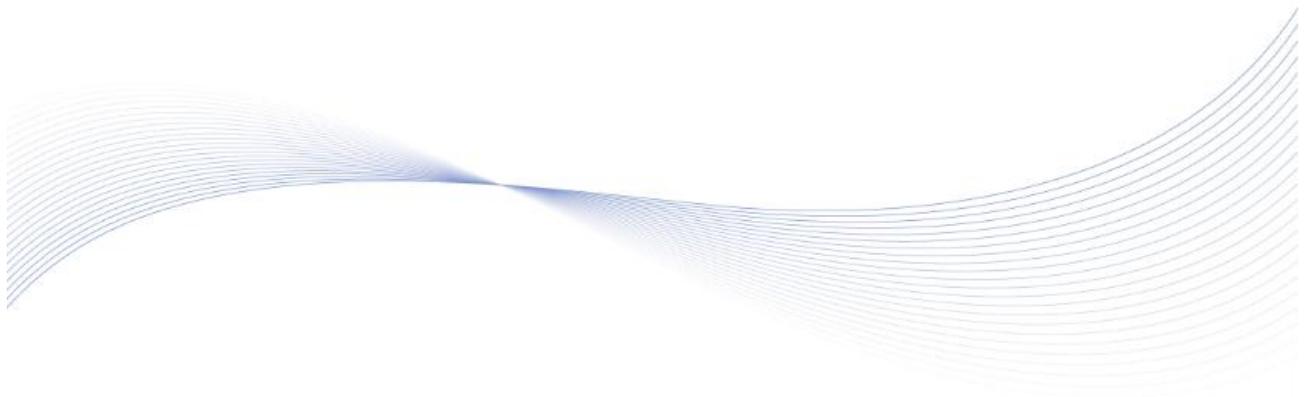# HAT660
ATS CONTROLLER

COMMUNICATION PROTOCOL

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SmartGen **Registered trademark**

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Table 1 Software Version

Date	Version	Content
2023-01-10	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.

The controller is used as the 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 byte register can be read.

Up to 32 controllers can be connected for network communication.
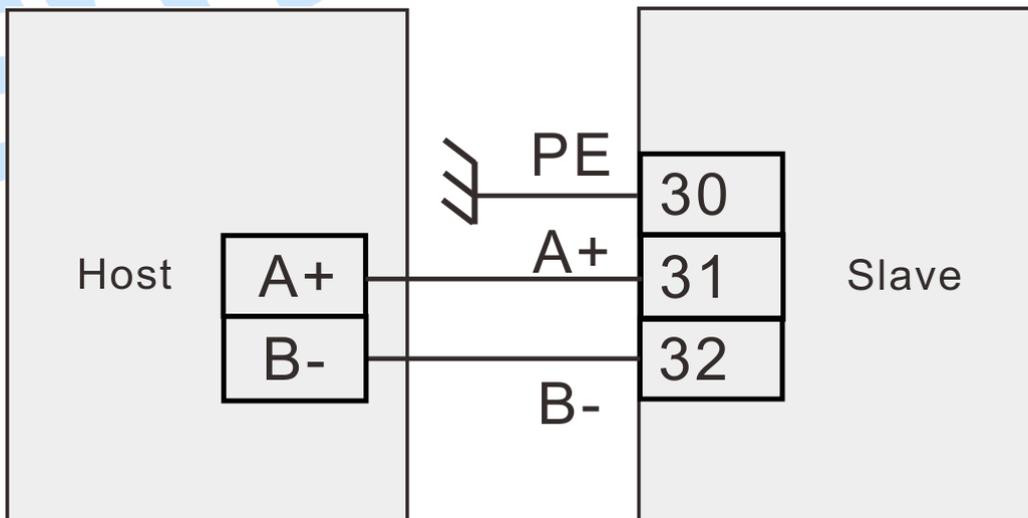
2. WIRING DIAGRAM

Fig.1 Single Unit Communication Wiring Diagram

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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; 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	Manual/Auto Mode	0: Manual Mode 1: Auto Mode
500.9	40501.9	Local Mode	
500.10	40501.10	S1 Master	S1 refers to 1# power, 1 represents 1# power is the common power. 0 represents 1# power is the backup power.
500.11	40501.11	S2 Master	S2 refers to 2# power, 1 represents 2# power is the common power. 0 represents 2# power is the backup power.
500.12	40501.12	/	
500.13	40501.13	/	
500.14	40501.14	/	
500.15	40501.15	Genset Start Output	0 represents genset start signal not output; 1 represents 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	S1 Volt Instant. Normal	

Modbus Address	PLC Address	Name	Description
501.4	40502.4	/	
501.5	40502.5	/	
501.6	40502.6	/	
501.7	40502.7	S1 Genset Output	
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	S2 Volt Instant. Normal	
502.4	40503.4	/	
502.5	40503.5	/	
502.6	40503.6	/	
502.7	40503.7	S2 Genset Output	
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	/	
503.4	40504.4	S2 Close Failure	
503.5	40504.5	S2 Open Failure	
503.6	40504.6	/	
503.7	40504.7	/	
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	ATS Trip Fault Alarm	
503.14	40504.14	Sync. Failure Fault	

Modbus Address	PLC Address	Name	Description
503.15	40504.15	Simultaneous Close Fault	
504.0	40505.0	S1 Load Overcurrent Warning	
504.1	40505.1	S2 Load Overcurrent Warning	
504.2	40505.2	Forced Open Warning	
504.3	40505.3	/	
504.4	40505.4	/	
504.5	40505.5	Sync. Failure Warning	
504.6	40505.6	/	
504.7	40505.7	/	
504.8	40505.8	ATS Output Voltage Abnormal Fault	
504.9	40505.9	S1 Trip Alarm	
504.10	40505.10	S2 Trip Alarm	
504.11	40505.11	/	
504.12	40505.12	/	
504.13	40505.13	/	
504.14	40505.14	Bus Voltage Abnormal Warning	
504.15	40505.15	ATS Output Voltage Abnormal Warning	
505.0	40506.0	Aux. Input 1 Status	0 represents input is inactive, 1 represents input is active.
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	/	
505.8	40506.8	/	
505.9	40506.9	/	
505.10	40506.10	/	
505.11	40506.11	/	
505.12	40506.12	/	
505.13	40506.13	/	
505.14	40506.14	/	
505.15	40506.15	/	
506.0	40507.0	Aux. Output 1 Status	1 represents output is active, 0 represents output is inactive.
506.1	40507.1	Aux. Output 2 Status	Refer to "Aux. Output 1 Status" description.
506.2	40507.2	Aux. Output 3 Status	

Modbus Address	PLC Address	Name	Description
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	LONO Output	
506.8	40507.8	/	
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	/	
507.1	40508.1	/	
507.2	40508.2	/	
507.3	40508.3	/	
507.4	40508.4	/	
507.5	40508.5	/	
507.6	40508.6	/	
507.7	40508.7	/	
507.8	40508.8	/	
507.9	40508.9	/	
507.10	40508.10	/	
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 Start	
508.0	40509.0	Cycle Start	
508.1	40509.1	Balanced Run 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	/	
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	

Modbus Address	PLC Address	Name	Description
508.14	40509.14	/	
508.15	40509.15	/	
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	Fire Linkage Output	
509.7	40510.7	/	
509.8	40510.8	/	
509.9	40510.9	/	
509.10	40510.10	/	
509.11	40510.11	Auto Transfer/Restore Digital Input	
509.12	40510.12	Remote Inhibit Digital Input	
509.13	40510.13	/	
509.14	40510.14	/	
509.15	40510.15	/	
510.0	40511.0	/	
510.1	40511.1	/	
510.2	40511.2	/	
510.3	40511.3	/	
510.4	40511.4	/	
510.5	40511.5	/	
510.6	40511.6	/	
510.7	40511.7	/	
510.8	40511.8	/	
510.9	40511.9	/	
510.10	40511.10	/	
510.11	40511.11	/	
510.12	40511.12	/	
510.13	40511.13	/	
510.14	40511.14	/	
510.15	40511.15	/	

Example:

If need to read "Aux. Input 1 Status" and "Aux. Output 1 Status", firstly get their corresponding address is 505.0 and 506.0 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 (505)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	03	01	F9	00	02	15	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 505	Data LSB of Address 505	Data MSB of Address 506	Data LSB of Address 506	LSB	MSB
01	03	04	00	01	00	20	AA	2B

Table 5 Data Analysis

Address	Received Data (Hex)	Convert to Binary	Data Signification
505	0001H	0000 0000 0000 0001 (correspond to 505.15, 505.14…….505.1, 505.0)	Data of bit 0 is 1 indicates that Aux. input 1 is active.
506	0020H	0000 0000 0001 0000 (correspond to 506.15, 506.14…….506.1, 506.0)	Data of bit 506.5 is 1 indicates that Aux. output 6 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	0~65000	1	V	16-bit	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		(1# C Phase Voltage)				Unsigned	
1006	41007	UA1 Phase (1# A Phase)	0~360.0	0.1	°	16-bit Unsigned	
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	NOTE3
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	NOTE3

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
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 Voltage Difference (1#/2# Power Voltage Difference)	-32768~+32767	1	V	16-bit Signed	
1031	41032	S1S2 Frequency Difference (1#/2# Power Frequency Difference)	-100.00~+100.00	0.01	Hz	16-bit Signed	NOTE4
1032	41033	S1S2 Phase Difference (1#/2# Power Phase Difference)	-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	A Phase Current	0~65000	0.1	A	16-bit Signed	
1041	41042	B Phase Current	0~65000	0.1	A	16-bit Signed	
1042	41043	C Phase Current	0~65000	0.1	A	16-bit Signed	
1043	41044	/					
1044	41045	A Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1045	41046	B Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1046	41047	C Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
1047	41048	/					
1048	41049	A Phase Active Power (LSB)	2147483648~2147483647	0.1	kW	32-bit Signed	NOTE2

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1049	41050	A Phase Active Power (MSB)					
1050	41051	B Phase Active Power (LSB)	2147483648 ~2147483647	0.1	kW	32-bit Signed	
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	kvar	32-bit Signed	
1057	41058	A Phase Reactive Power (MSB)					
1058	41059	B Phase Reactive Power (LSB)	-2147483648 ~2147483647	0.1	kvar	32-bit Signed	
1059	41060	B Phase Reactive Power (MSB)					
1060	41061	C Phase Reactive Power (LSB)	-2147483648 ~2147483647	0.1	kvar	32-bit Signed	
1061	41062	C Phase Reactive Power (MSB)					
1062	41063	Total Reactive Power (LSB)	-2147483648 ~2147483647	0.1	kvar	32-bit Signed	
1063	41064	Total Reactive Power (MSB)					
1064	41065	A Phase Apparent Power (LSB)	-2147483648 ~2147483647	0.1	kVA	32-bit Signed	
1065	41066	A Phase Apparent Power (MSB)					
1066	41067	B Phase Apparent Power (LSB)	-2147483648 ~2147483647	0.1	kVA	32-bit Signed	
1067	41068	B Phase Apparent Power (MSB)					
1068	41069	C Phase	-2147483648	0.1	kVA	32-bit	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Apparent Power (LSB)	~2147483647			Signed	
1069	41070	C Phase Apparent Power (MSB)					
1070	41071	Total Apparent Power (LSB)	-2147483648 ~2147483647	0.1	kVA	32-bit Signed	
1071	41072	Total Apparent Power (MSB)					
1072	41073	A Phase Power Factor	-1.00~1.00	0.01		16-bit Signed	
1073	41074	B Phase Power Factor	-1.00~1.00	0.01		16-bit Signed	
1074	41075	C Phase Power Factor	-1.00~1.00	0.01		16-bit Signed	
1075	41076	Average Power Factor	-1.00~1.00	0.01		16-bit Signed	
1076	41077	/					
1077	41078	/					
1078	41079	/					
1079	41080	/					
1080	41081	/					
1081	41082	/					
1082	41083	/					
1083	41084	Sync. Failure Delay	0-65535	1	s	16-bit Signed	
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 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 Status
1093	41094	Genset Delay	0~65535	1	s	16-bit Unsigned	
1094	41095	ATS Status	0~65535	No		16-bit	See ATS

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
						Unsigned	Status
1095	41096	ATS Delay	0~65535	1	s	16-bit Unsigned	
1096	41097						
1097	41098	Mutual Backup Active Status	0~65535			16-bit Unsigned	
1098	41099	/					
1099	41100	Auto Transfer/Restore Setting	0~65535			16-bit Unsigned	
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	Continuous Supply Time (h)	0~65535	1	h	16-bit Unsigned	
1112	41113	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	
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	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1117	41118	S1 Accumulated Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1118	41119	S1 Accumulated Supply Time (h) MSB					
1119	41120	S1 Accumulated Supply Time (min)	0~59	1	min	16-bit Unsigned	
1120	41121	S1 Accumulated Supply Time (s)	0~59	1	s	16-bit Unsigned	
1121	41122	S2 Accumulated Supply Time (h) LSB	0~4294967296	1	h	32-bit Unsigned	NOTE2
1122	41123	S2 Accumulated Supply Time (h) MSB					
1123	41124	S2 Accumulated Supply Time (min)	0~59	1	min	16-bit Unsigned	
1124	41125	S2 Accumulated Supply Time (s)	0~59	1	s	16-bit Unsigned	
1125	41126	S1 Accumulated Active Energy kWh (LSB)	-2147483648 ~2147483647	0.1	kWh	32-bit Signed	
1126	41127	S1 Accumulated Active Energy kWh (MSB)					
1127	41128	S1 Accumulated Reactive Energy kvarh (LSB)	-2147483648 ~2147483647	0.1	kvarh	32-bit Signed	NOTE2
1128	41129	S1 Accumulated Reactive Energy kvarh (MSB)					
1129	41130	S1 Accumulated Close Times LSB	0~4294967296	1	times	32-bit Unsigned	
1130	41131	S1 Accumulated Close Times MSB					
1131	41132	S2 Accumulated Active Energy kWh (LSB)	-2147483648 ~2147483647	0.1	kWh	32-bit Signed	
1132	41133	S2 Accumulated					

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
		Active Energy kWh (MSB)					
1133	41134	S2 Accumulated Reactive Energy kvarh (LSB)	-2147483648 ~2147483647	0.1	kvarh	32-bit Signed	
1134	41135	S2 Accumulated Reactive Energy kvarh (MSB)					
1135	41136	S2 Accumulated Close Times LSB	0~4294967296	1	times	32-bit Unsigned	
1136	41137	S2 Accumulated Close Times MSB					
1137	41138	/					
1138	41139	/					
1139	41140	/					
1140-1149	41141-41150	UA1 Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	
1150-1159	41151-41160	UB1 Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	
1160-1169	41161-41170	UC1 Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	
1170-1179	41171-41180	UA2 Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	
1180-1189	41181-41190	UB2 Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	
1190-1199	41191-41200	UC2 Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	
1200-1209	41201-41210	IA Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	
1210-1219	41211-41220	IB Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	
1220-1229	41221-41230	IC Harmonic Ratio (3-21 Odd Harmonic)	0~65000	0.1	%	16-bit Unsigned*10	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Remark
1230	41231	UA1 THD	0-65535	0.1	%	16-bit Unsigned	
1231	41232	UB1 THD	0-65535	0.1	%	16-bit Unsigned	
1232	41233	UC1 THD	0-65000	0.1	%	16-bit Unsigned	
1233	41234	UA2 THD	0-65535	0.1	%	16-bit Unsigned	
1234	41235	UB2 THD	0-65535	0.1	%	16-bit Unsigned	
1235	41236	UC2 THD	0-65535	0.1	%	16-bit Unsigned	
1236	41237	IA THD	0-65535	0.1	%	16-bit Unsigned	
1237	41238	IB THD	0-65535	0.1	%	16-bit Unsigned	
1238	41239	IC THD	0-65535	0.1	%	16-bit Unsigned	
1239	41240	/					
1240	41241	/					
1241	41242	/					
1242	41243	/					
1243	41244	/					
1244	41245	/					
1245	41246	/					
1246	41247	/					
1247	41248	/					
1248	41249	/					

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 Accumulated 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 Accumulated 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	Item	Description
15000	15001	Remote S1 Close	Only send FF00H active
15001	15002	Remote S1 Open	Only send FF00H active
15002	15003	Remote S2 Close	Only send FF00H active
15003	15004	Remote S2 Open	Only send FF00H active
15004	15005	Auto/Manual	Manual Mode: Only send 0000H active Auto Mode: Only send FF00H active
15005	15006	S1 Master Set	Only send FF00H active
15006	15007	S2 Master Set	Only send FF00H active
15007	15008	Alarm Reset	Only send FF00H active
15008	15009	Remote Genset Start	Only send FF00H active
15009	15010	Remote Genset Stop	Only send FF00H active
15010	15011	/	Only send FF00H active
15011	15012	/	Only send FF00H active
15012	15013	Remote Output 1 Output	Only send FF00H active
15013	15014	Remote Output 2 Output	Only send FF00H active
15014	15015	Remote Output 3 Output	Only send FF00H active
15015	15016	Remote Output 4 Output	Only send FF00H active
15016	15017	Remote Output 5 Output	Only send FF00H active

Modbus Address	PLC Address	Item	Description
15017	15018	Remote Output 6 Output	Only send FF00H active
15018	15019	Remote Output 7 Output	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 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 stop, 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	S1 Closing	Delay (Unit: s)
2	S1 Opening	Delay (Unit: s)
3	S2 Closing	Delay (Unit: s)
4	S2 Opening	Delay (Unit: s)
5	Transfer Rest	Delay (Unit: s)
6	S1 Re-closing	Delay (Unit: s)
7	S1 Re-opening	Delay (Unit: s)
8	S2 Re-closing	Delay (Unit: s)
9	S2 Re-opening	Delay (Unit: s)
10	Wait for Sync.	Delay (Unit: s)
11	S1 Sync. Close	Delay (Unit: s)
12	S2 Sync. Close	Delay (Unit: s)
13	Wait S1 PF Input	Delay (Unit: s)
14	Wait S2 PF Input	Delay (Unit: s)
15	Elevator Delay	Delay (Unit: s)
16	S1 On-load	No Delay
17	S2 On-load	No Delay
18	Off-load	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) Long press ↩/⌂ key to return the main interface.

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 RS485 TO USB COMMUNICATION ADAPTOR

PC can communicate with SG72A module produced by our company.

5.3 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) 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;
5) It is recommended to download third-party communication software such as modscan32, modbus poll to check whether communication is normal.

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