SmartGen

MAKING CONTROL SMARTER

HGM3020

GENSET CONTROLLER

COMMUNICATION PROTOCOL

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Table 1 Software Version

Date	Version	Content
2025-07-30	V1.0	Original release.

CONTENTS

1 DESCRIPTION

This protocol describes the command format for reading and writing via the controller's RS485 half-duplex serial ports, as well as the definition of internal messages and data to facilitate third-party development and use.

There is one RS485 port on the HGM3020 genset controller.

The controller works as a slave module. It supports the Modbus-RTU protocol but does not support other protocols, such as Modbus-ASCII.

Communication address: 1~254 (Default: 1)
Baud rate: 9600bps
Start bit: 1-bit
Data bit: 8-bit
Parity bit: None
Stop bit: 2-bit

Function code supported: 03H, 05H. Function code 03H is used for reading controller's alarms, status and various kinds of electric parameters; Function code 05H is used for sending remote command.

Data checking method: CRC16.

The register data inside the controller are packed as two bytes per register.

Communication timeout period: over 200ms.

Transmission distance: At a baud rate of 9600bps, the maximum transmission distance can reach up to 1,000 meters with 120-ohm shielded twisted pair cable.

A maximum of 120 registers can be read per request.

It can support the communication of 32 networked controllers.

RS485 cabling must use 120-ohm shielded twisted pair cable, and one end of the shield should be grounded.

2 WIRING DIAGRAM

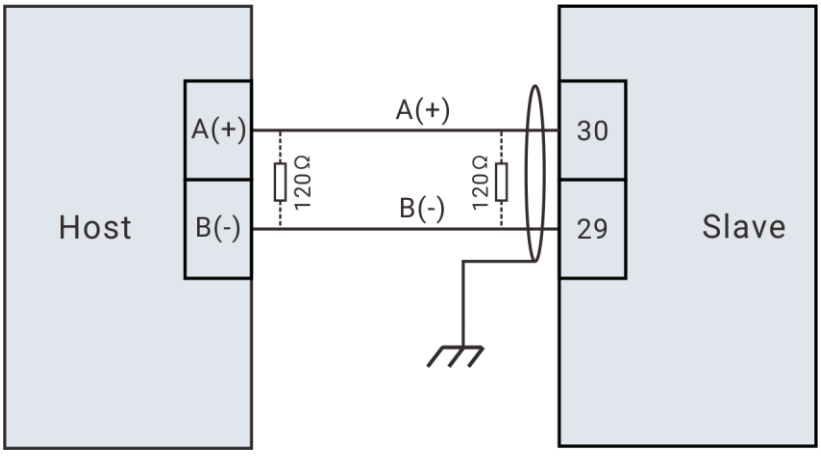

Fig. 1 Single Device Communication Wiring Diagram

NOTE 1: Two 120-ohm resistors can be connected on both ends of the cable according to the site's requirement. See details in the instruction below.

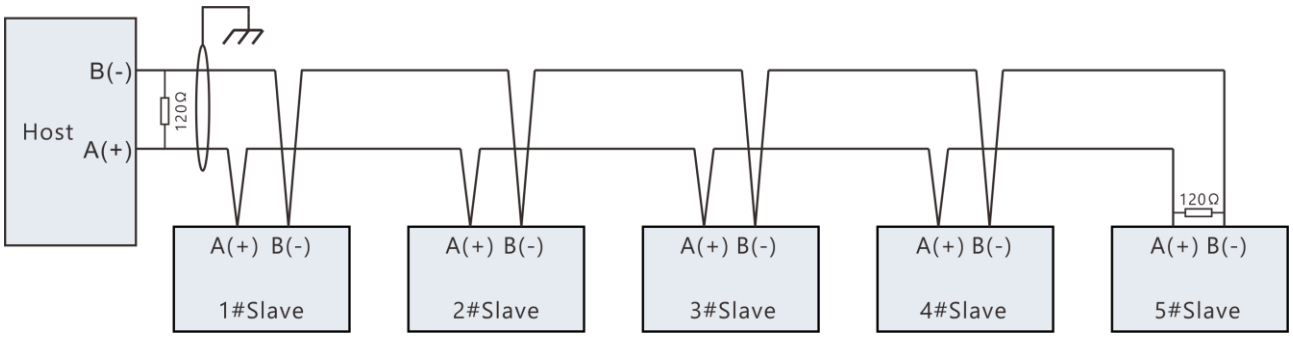

Fig. 2 Multiple Devices Communication Wiring Diagram

NOTE 1: Please configure each controller's communication module address before networking. Same module address is not allowed in one network.

NOTE 2: One end of the communication cable shield should be grounded at the host side.

3 ADDRESS AND DATA OF CONTROLLER INTERNAL REGISTERS

The slash mark ("/") in the following tables means the address is reserved.

3.1 FUNCTION CODE 03H MAPPING ALARM AND STATUS COIL OF DATA FIELD

Table 2 Alarm and Status Coil of Data Field

Modbus Address	PLC Address	Item	Description
000.0	40001.0	Common Alarm	"0" means no common alarm occurs "1" means a common alarm occurs (000.0 means the Boolean value at Bit0 of address 000) The content listed below follows the same rule
000.1	40001.1	Common Warning Alarm	1 as active
000.2	40001.2	Common Shutdown Alarm	1 as active
000.3	40001.3	Remote Mode	1 as active
000.4	40001.4	Idle Mode	1 as active
000.5	40001.5	Instrument Mode	1 as active
000.6	40001.6	Battle Mode	1 as active
000.7	40001.7	/	/
000.8	40001.8	System in Test Mode	1 as active
000.9	40001.9	System in Auto Mode	1 as active
000.10	40001.1	System in Manual Mode	1 as active
000.11	40001.11	System in Stop Mode	1 as active
000.12	40001.12	Mains On-load	1 as active
000.13	40001.13	Gen. On-load	1 as active
000.14	40001.14	/	/
000.15	40001.15	/	/
001.0	40002.0	Emergency Stop	1 as active
001.1	40002.1	Over Speed Shutdown	1 as active

Modbus Address	PLC Address	Item	Description
001.2	40002.2	Under Speed Shutdown	1 as active
001.3	40002.3	Loss of Speed Signal Shutdown	1 as active
001.4	40002.4	Gen. Over Frequency Shutdown	1 as active
001.5	40002.5	Gen. Under Frequency Shutdown	1 as active
001.6	40002.6	Gen. Over Voltage Shutdown	1 as active
001.7	40002.7	Gen. Under Voltage Shutdown	1 as active
001.8	40002.8	Gen. Over Current Shutdown	1 as active
001.9	40002.9	Fail to Start Shutdown	1 as active
001.10	40002.10	High Temp. Shutdown	1 as active
001.11	40002.11	Low Oil Pressure Shutdown	1 as active
001.12	40002.12	No Gen. Shutdown	1 as active
001.13	40002.13	External Shutdown	1 as active
001.14	40002.14	Low Fuel Level Shutdown	1 as active
001.15	40002.15	Low Coolant Level Shutdown	1 as active
002.0	40003.0	Temp. Sensor Open Shutdown	1 as active
002.1	40003.1	Oil Pressure Sensor Open Shutdown	1 as active
002.2	40003.2	Fuel Level Sensor Open Shutdown	1 as active
002.3	40003.3	/	/
002.4	40003.4	/	/
002.5	40003.5	/	/
002.6	40003.6	Over Power Shutdown	1 as active
002.7	40003.7	/	/
002.8	40003.8	/	/
002.9	40003.9	Current Imbalance Shutdown	1 as active
002.10	40003.10	/	/
002.11	40003.11	/	/
002.12	40003.12	/	/
002.13	40003.13	/	/
002.14	40003.14	/	/
002.15	40003.15	/	/
003	40004	/	/
004	40005	/	/
005	40006	/	/
006	40007	/	/
007	40008	/	/
008.0	40009.0	High Temp. Warning	1 as active
008.1	40009.1	Low Oil Pressure Warning	1 as active
008.2	40009.2	Gen. Over Current Warning	1 as active
008.3	40009.3	Fail to Stop Warning	1 as active
008.4	40009.4	Low Fuel Level Warning	1 as active
008.5	40009.5	Charge Alternator Failure Warning	1 as active
008.6	40009.6	Battery Under Voltage Warning	1 as active

Modbus Address	PLC Address	Item	Description
008.7	40009.7	Battery Over Voltage Warning	1 as active
008.8	40009.8	External Warning	1 as active
008.9	40009.9	Loss of Speed Signal Warning	1 as active
008.10	40009.10	Low Coolant Level Warning	1 as active
008.11	40009.11	Temp. Sensor Open Warning	1 as active
008.12	40009.12	Oil Pressure Sensor Open Warning	1 as active
008.13	40009.13	Fuel Level Sensor Open Warning	1 as active
008.14	40009.14	/	/
008.15	40009.15	/	/
009.0	40010.0	/	/
009.1	40010.1	/	/
009.2	40010.2	/	/
009.3	40010.3	/	/
009.4	40010.4	Gen. Over Voltage Warning	1 as active
009.5	40010.5	Gen. Under Voltage Warning	1 as active
009.6	40010.6	Gen. Over Frequency Warning	1 as active
009.7	40010.7	Gen. Under Frequency Warning	1 as active
009.8	40010.8	Charger Fail to Charge Warning	1 as active
009.9	40010.9	Over Power Warning	1 as active
009.10	40010.10	/	/
009.11	40010.11	Fuel Leakage Warning	1 as active
009.12	40010.12	/	/
009.13	40010.13	/	/
009.14	40010.14	/	/
009.15	40010.15	/	/
010	40011	/	/
011	40012	/	/
012	40013	/	/
013	40014	/	/
014	40015	/	/
015.0	40016.0	/	/
015.1	40016.1	Input 1 Status	1 as active
015.2	40016.2	Input 2 Status	1 as active
015.3	40016.3	Input 3 Status	1 as active
015.4	40016.4	Input 4 Status	1 as active
015.5	40016.5	/	/
015.6	40016.6	/	/
015.7	40016.7	/	/
015.8	40016.8	/	/
015.9	40016.9	/	/
015.10	40016.10	/	/
015.11	40016.11	/	/

Modbus Address	PLC Address	Item	Description
015.12	40016.12	/	/
015.13	40016.13	/	/
015.14	40016.14	/	/
015.15	40016.15	/	/
016.0	40017.0	Crank Relay Status	1 as active
016.1	40017.1	Fuel Relay Status	1 as active
016.2	40017.2	Digital Output 1 Status	1 as active
016.3	40017.3	Digital Output 2 Status	1 as active
016.4	40017.4	Digital Output 3 Status	1 as active
016.5	40017.5	Digital Output 4 Status	1 as active
016.6	40017.6	/	/
016.7	40017.7	/	/
016.8	40017.8	/	/
016.9	40017.9	/	/
016.10	40017.10	/	/
016.11	40017.11	/	/
016.12	40017.12	/	/
016.13	40017.13	/	/
016.14	40017.14	/	/
016.15	40017.15	/	/
017.0	40018.0	Mains Fault	1 as active
017.1	40018.1	Mains Normal	1 as active
017.2	40018.2	Mains Over Voltage	1 as active
017.3	40018.3	Mains Under Voltage	1 as active
017.4	40018.4	Mains Loss of Phase	1 as active
017.5	40018.5	Mains Blackout	1 as active
017.6	40018.6	/	/
017.7	40018.7	/	/
017.8	40018.8	/	/
017.9	40018.9	/	/
017.10	40018.10	/	/
017.11	40018.11	/	/
017.12	40018.12	/	/
017.13	40018.13	/	/
017.14	40018.14	/	/
017.15	40018.15	/	/

EXAMPLE:

If “Digital Output 1 Status” needs to be read, check the table above and find its Modbus address is 016.2, so it needs to read one data address.

Assuming the slave (controller) address is 01, the master/host (could be PC) request command is as following:

Table 3 Master (PC) Request Frame

Slave Address	Function Code	Start Address (016)		Request Data Length (1)		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**00**	**10**	**00**	**01**	**85**	**CF**

The slave response is as following:

Table 4 Slave (Controller) Response Frame

Slave Address	Function Code	Data Length (Bytes)	Data		CRC 16	
			Data of Address 016 MSB	Data of Address 016 LSB	LSB	MSB
01	**03**	**02**	**00**	**04**	**B9**	**87**

Table 5 Data Analysis

Address	Data Received (Hex)	Convert to Binary	Meaning
506	0004H	0000 0000 0000 0100 (Mapping to 016.15, 016.14, ..., 016.1, 016.0 respectively)	Data of Bit 2 is 1, which means the status of Digital Output 1 is active.

3.2 FUNCTION CODE 03H MAPPING PARAMETERS OF DATA FIELD

Table 6 Parameters of Data Field

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0024	40025	Mains UA	0~65535	1	V	Unsigned	2Bytes
0025	40026	Mains UB	0~65535	1	V	Unsigned	2Bytes
0026	40027	Mains UC	0~65535	1	V	Unsigned	2Bytes
0027	40028	Mains UAB	0~65535	1	V	Unsigned	2Bytes
0028	40029	Mains UBC	0~65535	1	V	Unsigned	2Bytes
0029	40030	Mains UCA	0~65535	1	V	Unsigned	2Bytes
0030	40031	Mains Frequency	0~100.0	0.01	Hz	Unsigned	2Bytes
0031	40032	Gen. UA	0~65535	1	V	Unsigned	2Bytes
0032	40033	Gen. UB	0~65535	1	V	Unsigned	2Bytes
0033	40034	Gen. UC	0~65535	1	V	Unsigned	2Bytes
0034	40035	Gen. UAB	0~65535	1	V	Unsigned	2Bytes
0035	40036	Gen. UBC	0~65535	1	V	Unsigned	2Bytes
0036	40037	Gen. UCA	0~65535	1	V	Unsigned	2Bytes
0037	40038	Gen. Frequency	0~100.0	0.01	Hz	Unsigned	2Bytes
0038	40039	Phase A Current	0~65535	0.1	A	Unsigned	2Bytes
0039	40040	Phase B Current	0~65535	0.1	A	Unsigned	2Bytes
0040	40041	Phase C Current	0~65535	0.1	A	Unsigned	2Bytes
0041	40042	Water Temp. Value	-32768~ 32767	1	°C	Signed	2Bytes NOTE 1
0042	40043	Water Temp. Resistance Value	0~65535	0.1	Ω	Unsigned	2Bytes
0043	40044	Oil Pressure Value	-32768~ 32767	1	kPa	Signed	2Bytes NOTE 1
0044	40045	Oil Pressure Resistance Value	0~65535	0.1	Ω	Unsigned	2Bytes
0045	40046	Level Value	-32768~ 32767	1	%	Signed	2Bytes NOTE 1
0046	40047	Level Resistance Value	0~65535	0.1	Ω	Unsigned	2Bytes
0047	40048	Speed	0~65535	1	RPM	Unsigned	2Bytes
0048	40049	Battery Voltage	0~65535	0.1	V	Unsigned	2Bytes
0049	40050	D+ Voltage	0~65535	0.1	V	Unsigned	2Bytes
0050	40051	Active Power	-2147483648 ~2147483647	0.1	kW	Signed	4Bytes
0051	40052						
0052	40053	Reactive Power	-2147483648 ~2147483647	0.1	kvar	Signed	4Bytes
0053	40054						
0054	40055	Apparent Power	-2147483648 ~2147483647	0.1	kVA	Signed	4Bytes
0055	40056						
0056	40057	Power Factor	-100.00~ 100.00	0.01	CosΦ	Unsigned	2Bytes

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0057	40058	/					
0058	40059	/					
0059	40060	/					
0060	40061	/					
0061	40062	Controller Running Status: Controller Running Status		1		Unsigned	2Bytes
0062	40063	Delay	0~3600	1		Unsigned	2Bytes
0063	40064	Auto Running Status 0: Start; 1: Stop; 2: No Delay		1		Unsigned	2Bytes
0064	40065	Delay	0~3600	1		Unsigned	2Bytes
0065	40066	ATS Running Status 0: No Delay; 1: Transfer Interval; 2: Mains Closed; 3: Mains Open; 4: Gen. Closed; 5: Gen. Open		1		Unsigned	2Bytes
0066	40067	Delay	0~3600	1		Unsigned	2Bytes
0067	40068	Mains Status 0: Normal; 1: Abnormal; 2: No Delay		1		Unsigned	2Bytes
0068	40069	Delay	0~3600	1		Unsigned	2Bytes
0069	40070	Engine Accumulated Running Time (h) MSB	0~9000	1		Unsigned	2Bytes NOTE 4
0070	40071	Engine Accumulated Running Time (h) LSB	0~9999	1		Unsigned	2Bytes
0071	40072	Engine Accumulated Running Time (min)	0~59	1		Unsigned	2Bytes NOTE 4
0072	40073	Engine Accumulated	0~59	1		Unsigned	2Bytes

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks	
		Running Time (sec)						
0073	40074	Accumulated Start Times MSB	0~9000	1		Unsigned	2Bytes	NOTE 4
0074	40075	Accumulated Start Times LSB	0~9999	1		Unsigned	2Bytes	
0075	40076	Accumulated Electric Energy MSB	0~9000	1		Unsigned	2Bytes	
0076	40077	Accumulated Electric Energy LSB	0~9999	1		Unsigned	2Bytes	
0077	40078	Controller Software Version		0.1		Unsigned	2Bytes	
0078	40079	Controller Hardware Version		0.1		Unsigned	2Bytes	
0079	40080	Phase A Active Power	-32768~ 32767	0.1	kW	Signed	2Bytes	
0080	40081	Phase B Active Power	-32768~ 32767	0.1	kW	Signed	2Bytes	
0081	40082	Phase C Active Power	-32768~ 32767	0.1	kW	Signed	2Bytes	
0082	40083	Load Output Percentage	0~65535	1	%	Unsigned	2Bytes	
0083	40084	/						
0084	40085	/						
0085	40086	/						
0086	40087	/						
0087	40088	/						
0088	40089	/						
0089	40090	/						
0090	40091	/						
0091	40092	/						
0092	40093	/						
0093	40094	/						
0094	40095	/						
0095	40096	/						
0096	40097	/						
0097	40098	/						
0098	40099	/						
0099	40100	/						
0100	40101	/						

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0101	40102	/					
0102	40103	/					
0103	40104	/					
0104	40105	/					
0105	40106	Release Year	0~99	1	Year	Unsigned	2Bytes
0106	40107	Release Month	1~12	1	Month	Unsigned	2Bytes
0107	40108	Released Day	1~31	1	Day	Unsigned	2Bytes
0108	40109	/					

NOTE 1: If the controller detects that the sensor is open, the data is 32766, and "++++" will be shown.

NOTE 2: Actual value = data received * ratio. Take the Frequency as the example: if the data received is 5000 (1388H), ratio is 0.01Hz, then the actual frequency value is 50.00Hz (5000*0.01Hz).

NOTE 3: If the data has 4 bytes, the actual value = high-order bits of data received * 65536 + low-order bits of data received.

NOTE 4: If the data is separated into high-order bits and low-order bits, such as the Electric Energy, the actual value = high-order bits of data received * 10000 + low-order bits of data received.

NOTE 5: Definition of signed number: Take the data received "8000H" as the example, convert it to binary number "1000 0000 0000 0000b". The MSB is 1, which means it is negative. The number minus 1 will get its 1's complement, then inverting it will get the absolute value of the negative number. Finally convert the absolute value to decimal number -32768.

EXAMPLE:

If "Active Power" (current value is 123456kW) needs to be read, check the table above and find its Modbus address is 0050 and 0051, so it needs to read two bytes of data.

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

Table 7 Master Request Command

Slave Address	Function Code	Start Address (0050)		Request Data Length (2)		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**00**	**32**	**00**	**02**	**65**	**C4**

The slave response command is as following:

Table 8 Slave Response Command

Slave Address	Function Code	Data Length (Bytes)	Data				CRC 16	
			Data of Address 0050 MSB	Data of Address 0050 LSB	Data of Address 0051 MSB	Data of Address 0051 LSB	LSB	MSB
01	**03**	**04**	**E2**	**40**	**00**	**01**	**0C**	**5F**

Fill the data received into the address respectively, as shown in the table below.

Table 9 Data Analysis

Address	Data Received (Hex)	Data Combined (Hex)	Active Power (Decimal)
0050	E240H	0001E240H	123456
0051	0001H		

3.3 FUNCTION CODE 05H MAPPING REMOTE COIL FIELD

Table 10 Remote Coil Field

Modbus Address	PLC Address	Item	Description
0000	0001	Remote Engine in Start Status	1 as active (active when sending 0xFF00)
0001	0002	Remote Engine in Stop Status	1 as active (active when sending 0xFF00)
0002	0003	/	1 as active (active when sending 0xFF00)
0003	0004	Remote Engine in Auto Status	1 as active (active when sending 0xFF00)
0004	0005	/	1 as active (active when sending 0xFF00)
0005	0006	Remote Gen. Close/Open Key	1 as active (active when sending 0xFF00)
0006	0007	Remote Mains Close/Open Key	1 as active (active when sending 0xFF00)

NOTE: The remote command in the table above only needs to be sent once.

EXAMPLE:

If the remote controller is in auto mode, check the table first and find its remote address is 0003. Assuming the slave address is 01, the master request command is as following:

Table 11 Master Request Command

Slave Address	Function Code	Remote Address (0003)		Remote Data		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**00**	**03**	**FF**	**00**	**7C**	**3A**

The slave response is as following:

Table 12 Slave Response Command

Slave Address	Function Code	Remote Address (0003)		Remote Data		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**00**	**03**	**FF**	**00**	**7C**	**3A**

To check whether the remote command is successfully executed, you can send function code 03H to read the Auto Mode status of address 000.9.

3.4 CONTROLLER RUNNING STATUS

Table 13 Controller Running Status

Value (No.)	Status
0	Standby
1	Preheat
2	Fuel
3	Crank
4	Crank Rest
5	Safety On
6	Start Idle
7	High Speed Warming Up
8	Wait for On-load
9	Normal Running
10	High Speed Cooling
11	Stop Idle
12	ETS
13	Wait for Stop
14	Fail to Stop

4 REMOTE START/STOP PROCEDURE

Start Procedure:

1) When the controller is in non-auto mode, send function code 05 “Remote Start Key”;
2) The controller receives the command and enters the start process, the genset start process can be obtained by reading the function code 03 "Controller Running Status" address in "Controller Running Status" table;
3) If "Controller Status" is from 1 (Preheat) to 8 (Wait for On-load), the genset enters the start process, otherwise it does not. If it does not enter the start process, repeat step 1 and step 2;
4) If "Controller Status" is "Normal Running", send function code 05 “Remote Gen. Close/Open Key”;
5) The controller receives the command and close the genset switch, the genset closing process can be obtained by reading the function code 03 “ATS Status" address;
6) If "ATS Status" is 5 Gen. Closed, the genset enters the closing process, otherwise it does not. If it does not enter the closing process, repeat step 4 and step 5;
7) When “Controller Running Status” is "Normal Running” and "ATS Status" is “Gen. Closed”, the genset completes on-load running.

Stop Method 1:

1) When the controller is in non-auto mode, and the genset is under on-load running, send function code 05 “Remote Gen. Close/Open Key”;
2) The controller receives the command and open the genset switch, the genset opening process can be obtained by reading the function code 03 “ATS Status" address;
3) If "ATS Status" is 4 Gen. Open, the genset enters the opening process, otherwise it does not. If it does not enter the opening process, repeat step 3 and step 4;
4) When “ATS Status" is not “Gen. Closed”, the genset switch is opened successfully, then send function code 05 “Remote Stop Key”;
5) The controller receives the command and enters the stop process, the genset stop process can be obtained by reading the function code 03 "Controller Running Status" address in "Controller Running Status" table;
6) If "Controller Running Status" is from 10 (High Speed Cooling) to 13 (Wait for Stop), the genset enters the stop process, otherwise it does not. If it does not enter the stop process, repeat step 4 and step 5;
7) When “Controller Running Status” is “Standby”, and the genset completes the stop process.

Stop Method 2 (this method can be used when the controller is in auto or non-auto mode):

1) Send function code 05 "Remote Stop Key” to set the controller in stop mode;
2) Read the data of Address 0000 through the function code 03 to obtain the current mode of the controller, then confirm whether the controller is in stop mode, and if the controller is not in stop mode, repeat step 1 and step 2;
3) When the controller is in the stop mode, the genset enters the stop process;
4) The genset opening process can be obtained by reading the function code 03 “ATS Status". The genset stop process can be obtained by reading "Controller Running Status" address in "Controller Running Status" table;
5) When “Controller Running Status” is “Standby”, and the genset completes the stop process.

NOTE 1: When sending function code 05 remote control key command, it only need to send it once at a time.

NOTE 2: When the "Controller Running Status" is in the start process, the controller receives the "Remote Start Key" command or the start key is pressed, the "Controller Running Status" will jump to the next one, and can quickly enter the genset on-load running status.

NOTE 3: When the "Controller Running Status" is in the stop process, the controller receives the "Remote Stop Key" command or the stop key is pressed, the "Controller Running Status" will jump to the next one and it can quickly enter the stop status.

5 CONFIGURATION OF COMMUNICATION PARAMETERS

5.1 CONFIGURATION OF COMMUNICATION PARAMETERS

1) In the homepage of main screen, press the  key and  key together to enter the menu page;
2) Press the  key to select the “HGM3020 Parameter Setting”, then press the  key to enter the parameters password page;
3) Enter the correct password (default: 00318), press the  key to get into the parameter main page;
4) Press the  key to select “Module Setting”, and press the  key to enter the submenu;
5) Press the  key,  key to select “Module Address”, then press the  key to edit the parameter, the corresponding parameters will be selected;
6) Set the current selected parameter via  key and  key, then press the  key to confirm and end the setting editing, then the selected status will disappear;
7) Press and hold the  key to return the home page.

NOTE 1: The configuration takes effect once the parameter setting is completed.

6 FAQ

6.1 GROUNDING OF THE CABLE SHIELD

To prevent the coupling of interference on the cable, one end of the cable shield should be grounded.

6.2 TERMINATION RESISTOR

At both ends of the linear network (between the two communication ports furthest apart), two 120-ohm termination resistors need to be installed in parallel. According to the signal transmission theory, the termination resistor can avoid the signal reflections and improve the signal integrity effectively. The value of two termination resistor in parallel is basically equal to the characteristic impedance of the transmission cable.

A standard RS-485 network will usually use the termination resistor. The resistor can be avoided while the cable is too short, or it is a temporary or lab test.

6.3 RS485 TO USB CONVERTER

It can communicate with PC via the SmartGen SG72A converter.

6.4 EXTEND TRANSMISSION DISTANCE

Adding two SmartGen SGCAN300 Repeaters can extend the communication distance to at most 10 kilometers.

Fig 3. SGCAN300 Application Diagram

6.5 SOLUTIONS FOR COMMUNICATION FAILURE

1) Check the positive and negative of RS485, or network cable is connected correctly. Check the RS485 converter (if any) is normal;
2) Check the termination resistors are connected correctly or not;
3) Check the communication parameters setting is correct or not. Baud rate, data bit, parity bit and stop bit meet the requirement of controller;
4) Check the Terminal COM is connected correctly with the USB port of PC via RS485 converter;
5) Check the communication address of controller is correct, and the default address is 01;
6) When using function code 03, the maximum data length to be read is 120 addresses, and the ending address can't exceed the greatest Modbus communication address. Please note that for the function code 06 mapping parameters data field, only one address can be written at a time;
7) If there is offset address in the Modbus communication address, the actual Modbus communication address equals to the base address plus offset address;
8) Function code 05 adopts Modbus address to communicate: Although 1 means active, and 0 means inactive, it needs to send FF00H to load corresponding bit as 1, and send 0000H to

load corresponding bit as 0; Function code 05 adopts PLC address to communicate: send 1 as position 1, send 0 as position 0;

9) As for CRC-16, the low-order byte is checked first, the high-order byte is checked later;
10) The frequency of multiple read operations for controller data should not too high, and the recommended interval between two read operations is no less than 500ms;
11) Please configure each controller's communication module address before networking. Same module address is not allowed in one network;
12) Modbus serial protocol does not support multiple masters, so multiple software cannot communicate with the controller at the same time;
13) Disconnect the RS485 cables to the controller, test the voltage difference of RS485 Terminal A and B on the controller, if the result is between -200mV and +200mV, it means the communication port is abnormal;
14) If the cable length is too long, it will result in signal attenuation. So it is recommended to use high-quality cable or add repeaters in the cable.
15) It is recommended to download third-party communication test software to verify whether the serial communication is normal, such as modscan32, modbus poll, etc.