SmartGen

MAKING CONTROL SMARTER

HGM6100N-4G

GENSET CONTROLLER

COMMUNICATION PROTOCOL

郑州众智科技股份有限公司
SMARTGEN(ZHENGZHOU)TECHNOLOGY CO.,LTD.

SmartGen **Registered trademark**
No. 28 Xuemei Street, Zhengzhou, Henan, China
Tel: +86-371-67988888/67981888/67992951
+86-371-67981000(overseas)
Fax: +86-371-67992952
Web: www.smartgen.com.cn/
www.smartgen.cn/
Email: sales@smartgen.cn

Table 1 Software Version

Date	Version	Content
2020-12-18	V1.0	Original release.
2024-12-18	V1.1	1. Modify it according to the new protocol format; 2. Update the contents of function code 01 and 03; 3. Add the instruction and example of accumulated data.

CONTENTS

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 HGM6100N-4G controller has 1 RS485 port, which can be used as the slave, using Modbus-RTU protocol, and does not support other protocols such as Modbus-ASCII.

Data format:
Communication address: 1~254 (default: 1)
Baud rate: 2400/4800/9600/19200/115200bps (default: 9600bps)
Start bit: 1-bit
Data bit: 8-bit
Parity bit: None, odd parity, even parity (default: none)
Stop bit: 2-bit

Supported function code: 01H, 03H, 05H and 06H. Function code 01H is used for reading various coils inside the device (such as breaker close, open, fault, auto or manual status, etc.); 03H is used for reading value register inside the device (value register saves measured set value of various analog and parameters); 05H is used for sending remote command. 05H is used for saving the single-point data into the device's internal memory.

Data calibration method: CRC16.
Internal registers of controller are in the unit of “byte (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 line.
Once maximum 120 data of byte register can be read.
Up to 32 controllers can be deployed for network communication.
When RS485 is connected, 120Ω twisted pair line with shielding layer shall be used, and the shielding layer shall be grounded at one end.

2 WIRING DIAGRAM

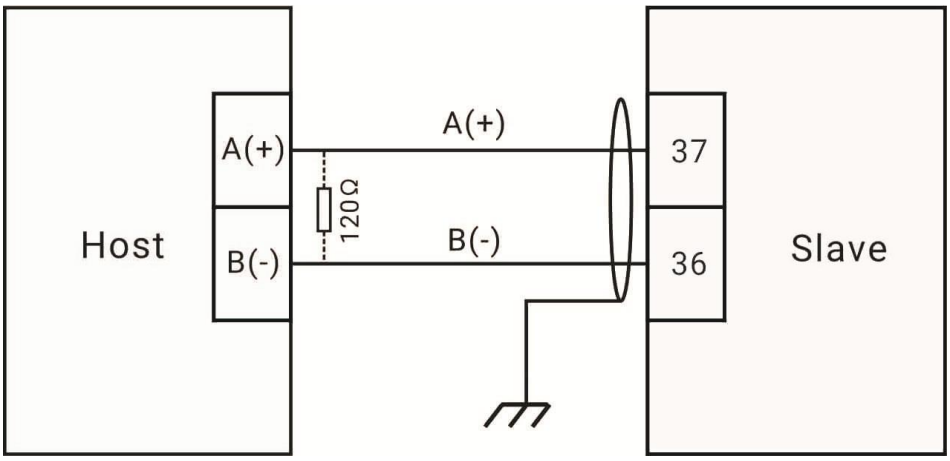

Fig.1 Single Unit Communication Wiring Diagram

NOTE: 120Ω resistor at controller side is controlled by setting match resistor enable item. When it is enabled, controller internal 120Ω resistor is connected to controller's RS485A, RS485. (configuration item is defaulted as enable)

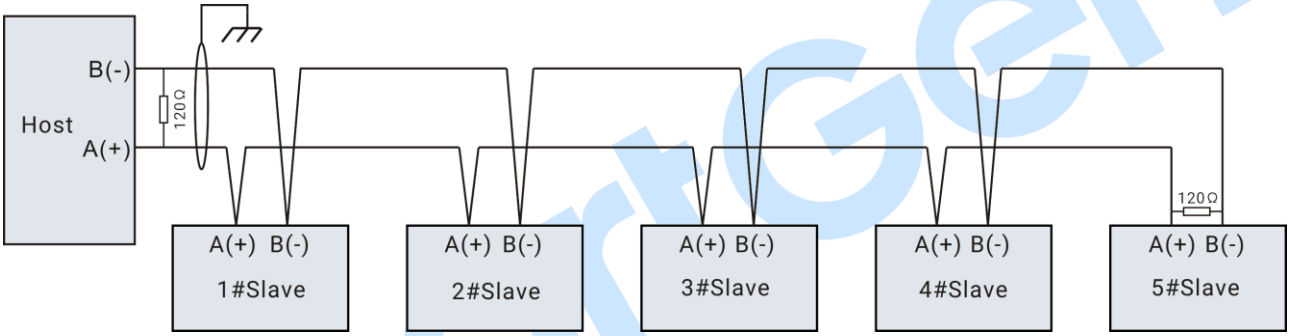

Fig.2 Multi-unit Communication Wiring Diagram

NOTE 1: Please set each controller's communication module address before networking. Same module address is inhibited in the same network.

NOTE 2: The shielding layer of communication line is single-end grounded on the host side.

3 CONTROLLER INTERNAL REGISTER ADDRESS AND DATA

3.1 FUNCTION CODE 01H MAPPLING COIL FIELD

Table 2 Alarm, Status Coil Data Field

Modbus Address	PLC Address	Item	Description
0000	0001	Common Alarm	0 represents there is no common alarm; 1 represents there is common alarm, and so on.
0001	0002	Common Warning Alarm	1 for active
0002	0003	Common Shutdown Alarm	1 for active
0003	0004	Remote Mode	1 for active
0004	0005	Remote Lock	1 for active
0005	0006	Reserved	1 for active
0006	0007	Mains On-load	1 for active
0007	0008	Gen On-load	1 for active
0008	0009	Emergency Stop	1 for active
0009	0010	Overspeed Alarm Shutdown	1 for active
0010	0011	Underspeed Alarm Shutdown	1 for active
0011	0012	Speed Signal Loss Shutdown	1 for active
0012	0013	Overfrequency Alarm Shutdown	1 for active
0013	0014	Underfrequency Alarm Shutdown	1 for active
0014	0015	Overvoltage Alarm Shutdown	1 for active
0015	0016	Undervoltage Alarm Shutdown	1 for active
0016	0017	Gen Overcurrent Shutdown	1 for active
0017	0018	Crank Failure	1 for active
0018	0019	High Water Temp. Alarm Shutdown	1 for active
0019	0020	Low Oil Pressure Alarm Shutdown	1 for active
0020	0021	Frequency Loss Alarm	1 for active
0021	0022	Input Shutdown Alarm	1 for active
0022	0023	Low Fuel Level Shutdown Alarm	1 for active
0023	0024	Low Coolant Level Shutdown Alarm	1 for active
0024	0025	High Water Temp. Warning Alarm	1 for active
0025	0026	Low Oil Pressure Warning Alarm	1 for active
0026	0027	Gen Overcurrent Warning Alarm	1 for active
0027	0028	Stop Failure Warning Alarm	1 for active
0028	0029	Low Fuel Level Warning	1 for active
0029	0030	Charging Failure Warning	1 for active
0030	0031	Battery Undervoltage Warning Alarm	1 for active
0031	0032	Battery Overvoltage Warning Alarm	1 for active
0032	0033	Input Warning Alarm	1 for active
0033	0034	Speed Signal Loss Warning	1 for active
0034	0035	Low Coolant Level Warning	1 for active
0035	0036	Temp. Sensor Open Warning	1 for active

Modbus Address	PLC Address	Item	Description
0036	0037	Oil Pressure Sensor Open Warning	1 for active
0037	0038	Maintenance Time Due Warning	1 for active
0038	0039	Charger Fail to Charge Warning	1 for active
0039	0040	Overpower Warning	1 for active
0040	0041	Test Mode	1 for active
0041	0042	Auto Mode	1 for active
0042	0043	Manual Mode	1 for active
0043	0044	Stop Mode	1 for active
0044	0045	Temp. Sensor Open Shutdown	1 for active
0045	0046	Oil Pressure Sensor Open Shutdown	1 for active
0046	0047	Maintenance Time Due Shutdown Alarm	1 for active
0047	0048	Overpower Shutdown Alarm	1 for active
0048	0049	Emergency Stop Input	1 for active
0049	0050	Aux. Input 1	1 for active
0050	0051	Aux. Input 2	1 for active
0051	0052	Aux. Input 3	1 for active
0052	0053	Aux. Input 4	1 for active
0053	0054	Aux. Input 5	1 for active
0054	0055	Reserved	1 for active
0055	0056	Reserved	1 for active
0056	0057	Crank Relay Output	1 for active
0057	0058	Fuel Relay Output	1 for active
0058	0059	Aux. Output 1	1 for active
0059	0060	Aux. Output 2	1 for active
0060	0061	Aux. Output 3	1 for active
0061	0062	Aux. Output 4	1 for active
0062	0063	Overcurrent Shutdown Input	1 for active
0063	0064	Overspeed Shutdown Input	1 for active
0064	0065	Mains Fault	1 for active
0065	0066	Mains Normal	1 for active
0066	0067	Mains Overvoltage	1 for active
0067	0068	Mains Undervoltage	1 for active
0068	0069	Mains Loss Phase	1 for active
0069	0070	Reserved	1 for active
0070	0071	Reserved	1 for active
0071	0072	Reserved	1 for active
0072	0073	Gen Normal	1 for active
0073	0074	Gen Overvoltage	1 for active
0074	0075	Gen Undervoltage	1 for active
0075	0076	Gen Overfrequency	1 for active
0076	0077	Gen Underfrequency	1 for active
0077	0078	Gen Overcurrent	1 for active

Modbus Address	PLC Address	Item	Description
0078	0079	Scheduled Not Run Time Indication	1 for active
0079	0080	Reserved	1 for active
0080	0081	ECU Shutdown Alarm	1 for active
0081	0082	ECU Comm. Failure Alarm	1 for active
0082	0083	Reserved	1 for active
0083	0084	Reserved	1 for active
0084	0085	Reserved	1 for active
0085	0086	Reserved	1 for active
0086	0087	Reserved	1 for active
0087	0088	Reserved	1 for active
0088	0089	ECU Warning	1 for active
0089	0090	GSM Comm. Failure Warning	1 for active
0090	0091	Reserved	1 for active
0091	0092	Reserved	1 for active
0092	0093	Reserved	1 for active
0093	0094	Reserved	1 for active
0094	0095	Reserved	1 for active
0095	0096	Reserved	1 for active
0096	0097	Reserved	1 for active
0097	0098	SVS	1 for active
0098	0099	Cruise Control Indication	1 for active
0099	0100	Water in Fuel	1 for active
0100	0101	Exhaust Brake	1 for active
0101	0102	Low Urea Level Warning	1 for active
0102	0103	Driver Alarm	1 for active
0103	0104	DPF	1 for active
0104	0105	Reserved	1 for active
0105	0106	Reserved	1 for active
0106	0107	Gen Running Indication	1 for active
0107	0108	Gen Stop Indication	1 for active
0108	0109	Mains On-load Indication	1 for active
0109	0110	Gen On-load Indication	1 for active
0110	0111	Non-Auto Mode Indication	1 for active
0111	0112	Reserved	1 for active
0112	0113	Reserved	1 for active
0113	0114	DPF Inhibit Indication	1 for active
0114	0115	Reserved	1 for active
0115	0116	Reserved	1 for active
0116	0117	Reserved	1 for active
0117	0118	High Aftertreatment Exhaust Temp.	1 for active
0118	0119	Do not close the switch with load during regeneration	1 for active
0119	0120	Please regenerate when water temp.	1 for active

Modbus Address	PLC Address	Item	Description
		is above 50°C	

Example:

If the status of "Emergency Stop" and "Input Warning Alarm" needs to be read, firstly get their corresponding addresses are 0008 and 0032 by checking the table above, then it is known that 40 coils need to be read.

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 (0000)		Request Data Qty. (40)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**01**	**00**	**00**	**00**	**28**	**3C**	**14**

The slave response command is as following:

Table 4 Slave (Controller) Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data					CRC 16 Calibration	
			Content of Address 07-00	Content of Address 15-08	Content of Address 23-16	Content of Address 31-17	Content of Address 39-32	LSB	MSB
01	**01**	**05**	**07**	**01**	**00**	**00**	**01**	**E4**	**AE**

Table 5 Data Analysis

Address	Received Data (Hex)	Binary	Data Signification
Data of Address 15-08	01H	0000 0000 0000 0001	Data of bit 08 is 1, represents emergency stop alarm is active.
Data of Address 39-32	01H	0000 0000 0000 0001	Data of bit 32 is 1, represents input warning alarm is active.

3.2 FUNCTION CODE 03H MAPPING DATA FIELD

Table 6 Value Data Field

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0000	40001	Mains UA	0~65535	1	V	Unsigned	2Bytes
0001	40002	Mains UB	0~65535	1	V	Unsigned	2Bytes
0002	40003	Mains UC	0~65535	1	V	Unsigned	2Bytes
0003	40004	Mains UAB	0~65535	1	V	Unsigned	2Bytes
0004	40005	Mains UBC	0~65535	1	V	Unsigned	2Bytes
0005	40006	Mains UCA	0~65535	1	V	Unsigned	2Bytes
0006	40007	Mains Freq.	0~100.0	0.1	Hz	Unsigned	2Bytes
0007	40008	Gen UA	0~65535	1	V	Unsigned	2Bytes
0008	40009	Gen UB	0~65535	1	V	Unsigned	2Bytes
0009	40010	Gen UC	0~65535	1	V	Unsigned	2Bytes
0010	40011	Gen UAB	0~65535	1	V	Unsigned	2Bytes
0011	40012	Gen UBC	0~65535	1	V	Unsigned	2Bytes
0012	40013	Gen UCA	0~65535	1	V	Unsigned	2Bytes
0013	40014	Gen Freq.	0~100.0	0.1	Hz	Unsigned	2Bytes
0014	40015	A Phase Current	0~65535	0.1	A	Unsigned	2Bytes
0015	40016	B Phase Current	0~65535	0.1	A	Unsigned	2Bytes
0016	40017	C Phase Current	0~65535	0.1	A	Unsigned	2Bytes
0017	40018	Water Temp. Value		1	°C	Unsigned	2Bytes
0018	40019	Water Temp. Resist. Value		0.1	Ω	Unsigned	2Bytes
0019	40020	OP Value		1	kPa	Unsigned	2Bytes
0020	40021	OP Resist. Value		0.1	Ω	Unsigned	2Bytes
0021	40022	Level Value		1	%	Unsigned	2Bytes
0022	40023	Level Resist. Value		0.1	Ω	Unsigned	2Bytes
0023	40024	Speed	0~65535	1	RPM	Unsigned	2Bytes
0024	40025	Battery Voltage	0~65535	0.1	V	Unsigned	2Bytes
0025	40026	D+ Voltage	0~65535	0.1	V	Unsigned	2Bytes
0026	40027	Active Power	0~65535	1	kW	Signed	2Bytes
0027	40028	Reactive Power	0~65535	1	kvar	Signed	2Bytes
0028	40029	Apparent Power	0~65535	1	kVA	Signed	2Bytes
0029	40030	Power Factor		0.01		Signed	2Bytes
0030	40031	MaintenanceCountdown h		1	h	Unsigned	2Bytes
0031	40032	Maintenance Countdown min	0~59	1	min	Unsigned	2Bytes
0032	40033	Reserved				Unsigned	2Bytes
0033	40034	Reserved				Unsigned	2Bytes
0034	40035	Controller		No.		Genset Status	2Bytes

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
		Running Status					
0035	40036	Delay			s	Unsigned	2Bytes
0036	40037	Auto Running Status				Remote Start Status	2Bytes
0037	40038	Delay			s	Unsigned	2Bytes
0038	40039	ATS Running Status				Unsigned	2Bytes
0039	40040	Delay			s	Unsigned	2Bytes
0040	40041	Mains Status 0 Normal 1 Abnormal 2 No Delay				Unsigned	2Bytes
0041	40042	Delay			s	Unsigned	2Bytes
0042	40043	Accum. Oil Engine Running Time (h) MSB	0~99	1	h	Unsigned	2Bytes
0043	40044	Accum. Oil Engine Running Time (h) LSB	0~9999	1	h	Unsigned	2Bytes
0044	40045	Accum. Oil Engine Running Time (min)	0~59	1	min	Unsigned	2Bytes
0045	40046	Accum. Oil Engine Running Time (s)	0~59	1	s	Unsigned	2Bytes
0046	40047	Accum. Start Times MSB	0~9999			Unsigned	2Bytes
0047	40048	Accum. Start Times LSB	0~9999			Unsigned	2Bytes
0048	40049	Accum. Energy MSB	0~9000	1	kWh	Unsigned	2Bytes
0049	40050	Accum. Energy LSB	0~9999	1	kWh	Unsigned	2Bytes
0050	40051	SW		0.1		Unsigned	2Bytes
0051	40052	HW		0.1		Unsigned	2Bytes
0052	40053	A Phase Active Power	0~65535	1	kW	Signed	2Bytes
0053	40054	B Phase Active Power	0~65535	1	kW	Signed	2Bytes
0054	40055	C Phase Active Power	0~65535	1	kW	Signed	2Bytes
0055	40056	Load Output Percentage				Unsigned	2Bytes

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0056	40057	Air-fuel Ratio		0.01		Signed	Only support ECU genset
0057	40058	Throttle Percentage		0.1	%	Signed	
0058	40059	Coolant Level		1	%	Signed	
0059	40060	Oil Temp.		1	°C	Signed	
0060	40061	Coolant Pressure		1	kPa	Signed	
0061	40062	Fuel Pressure		1	kPa	Signed	
0062	40063	Fuel Temp.		1	°C	Signed	
0063	40064	Air Inlet Temp.		1	°C	Signed	
0064	40065	Exhaust Outlet Temp.		1	°C	Signed	
0065	40066	Turbo Pressure		1	kPa	Signed	
0066	40067	Fuel Consump.		0.1	L/h	Signed	
0067	40068	Intake Pressure		1	kPa	Signed	
0068	40069	Accum. Fuel Consump.		1	L	Signed	
0069	40070						
0070	40071	Reserved				Signed	2Bytes
0071	40072	Controller Model				Unsigned	2Bytes
0072	40073	Controller Time: Year	0~99	1		Unsigned	2Bytes
0073	40074	Controller Time: Month	1~12	1		Unsigned	2Bytes
0074	40075	Controller Time: Day	1~31	1		Unsigned	2Bytes
0075	40076	Controller Time: Week	0~6	1		Unsigned	2Bytes
0076	40077	Controller Time: h	0~23	1		Unsigned	2Bytes
0077	40078	Controller Time: min	0~59	1		Unsigned	2Bytes
0078	40079	Controller Time: s	0~59	1		Unsigned	2Bytes
0079	40080	Release Year	0~99	1		Unsigned	2Bytes
0080	40081	Release Month	1~12	1		Unsigned	2Bytes
0081	40082	Release Day	1~31	1		Unsigned	2Bytes
0082	40083	Ignition Speed		1	RPM	Unsigned	Only support ECU genset
0083	40084	Urea Level			%	Unsigned	
0084	40085	ECU Temp.			°C	Signed	
0085	40086	Ambient Pressure			kPa	Signed	
0086	40087	ECU Running Time			h	Signed	
0087	40088						
0088	40089	MTU FC			RPM	Unsigned	
0089	40090	MTU Droop			%	Unsigned	
0090	40091	MTU Demand Source				Unsigned	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0091	40092	MTU SSD				Unsigned	
0092	40093	Gen UA Phase	0~360	1	°	Signed	2Bytes
0093	40094	Gen UB Phase	0~360	1	°	Signed	2Bytes
0094	40095	Gen UC Phase	0~360	1	°	Signed	2Bytes
0095	40096	Mains UA Phase	0~360	1	°	Signed	2Bytes
0096	40097	Mains UB Phase	0~360	1	°	Signed	2Bytes
0097	40098	Mains UC Phase	0~360	1	°	Signed	2Bytes
0098	40099	GPS Longitude		0.000 0001	°	Signed	2Bytes
0099	40100						2Bytes
0100	40101	GPS Latitude		0.000 0001	°	Signed	2Bytes
0101	40102						2Bytes
0102	40103	GPS Altitude		0.1	m	Signed	2Bytes
0103	40104						2Bytes
0104	40105	GPS Quantity				Unsigned	2Bytes
0105	40106	GSM Energy				Unsigned	2Bytes
0106	40107	MCUID_H1				Unsigned	2Bytes
0107	40108						2Bytes
0108	40109	MCUID_H2				Unsigned	2Bytes
0109	40110						2Bytes
0110	40111	MCUID_L				Unsigned	2Bytes
0111	40112						2Bytes
0112	40113	DM1 Alarm 1				SPN Low 16-bit	Only support ECU genset
0113	40114					SPN High 16-bit	
0114	40115					High 8-bit: OC Low 8-bit: FMI	
0115	40116	DM1 Alarm 2				SPN Low 16-bit	
0116	40117					SPN High 16-bit	
0117	40118					High 8-bit: OC Low 8-bit: FMI	
0118	40119	DM1 Alarm 3				SPN Low 16-bit	
0119	40120					SPN High 16-bit	
0120	40121					High 8-bit: OC Low 8-bit: FMI	
0121	40122	DM1 Alarm 4				SPN Low 16-bit	
0122	40123					SPN High 16-bit	
0123	40124					High 8-bit: OC Low 8-bit: FMI	
0124	40125	DM1 Alarm 5				SPN Low 16-bit	
0125	40126					SPN High 16-bit	
0126	40127					High 8-bit: OC Low 8-bit: FMI	
0127	40128	DM1 Alarm 6				SPN Low 16-bit	
0128	40129					SPN High 16-bit	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0129	40130					High 8-bit: OC Low 8-bit: FMI	
0130	40131	DM1 Alarm 7				SPN Low 16-bit	
0131	40132					SPN High 16-bit	
0132	40133					High 8-bit: OC Low 8-bit: FMI	
0133	40134	DM1 Alarm 8				SPN Low 16-bit	
0134	40135					SPN High 16-bit	
0135	40136					High 8-bit: OC Low 8-bit: FMI	
0136	40137	DM1 Alarm 9				SPN Low 16-bit	
0137	40138					SPN High 16-bit	
0138	40139					High 8-bit: OC Low 8-bit: FMI	
0139	40140	DM1 Alarm 10				SPN Low 16-bit	
0140	40141					SPN High 16-bit	
0141	40142					High 8-bit: OC Low 8-bit: FMI	
0142	40143	DM2 Alarm 1				SPN Low 16-bit	
0143	40144					SPN High 16-bit	
0144	40145					High 8-bit: OC Low 8-bit: FMI	
0145	40146	DM2 Alarm 2				SPN Low 16-bit	
0146	40147					SPN High 16-bit	
0147	40148					High 8-bit: OC Low 8-bit: FMI	
0148	40149	DM2 Alarm 3				SPN Low 16-bit	
0149	40150					SPN High 16-bit	
0150	40151					High 8-bit: OC Low 8-bit: FMI	
0151	40152	DM2 Alarm 4				SPN Low 16-bit	
0152	40153					SPN High 16-bit	
0153	40154					High 8-bit: OC Low 8-bit: FMI	
0154	40155	DM2 Alarm 5				SPN Low 16-bit	
0155	40156					SPN High 16-bit	
0156	40157					High 8-bit: OC Low 8-bit: FMI	
0157	40158	DM2 Alarm 6				SPN Low 16-bit	
0158	40159					SPN High 16-bit	
0159	40160					High 8-bit: OC Low 8-bit: FMI	
0160	40161	DM2 Alarm 7				SPN Low 16-bit	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0161	40162					SPN High 16-bit	
0162	40163					High 8-bit: OC Low 8-bit: FMI	
0163	40164	DM2 Alarm 8				SPN Low 16-bit	
0164	40165					SPN High 16-bit	
0165	40166					High 8-bit: OC Low 8-bit: FMI	
0166	40167	DM2 Alarm 9				SPN Low 16-bit	
0167	40168					SPN High 16-bit	
0168	40169					High 8-bit: OC Low 8-bit: FMI	
0169	40170	DM2 Alarm 10				SPN Low 16-bit	
0170	40171					SPN High 16-bit	
0171	40172					High 8-bit: OC Low 8-bit: FMI	
0172	40173	ECU Shutdown No.				Unsigned	
0173	40174	ECU Warning No.				Unsigned	
0174	40175	Instant Fuel Consumption		0.1	km/L	Unsigned	
0175	40176	Reserved				Unsigned	2Bytes
0176	40177	IMEI				Unsigned	8Bytes
0177	40178						
0178	40179						
0179	40180						
0180	40181	Reserved				Unsigned	2Bytes
0181	40182	Reserved				Unsigned	2Bytes
0182	40183	Reserved				Unsigned	2Bytes
0183	40184	Reserved				Unsigned	2Bytes
0184	40185	Reserved				Unsigned	2Bytes
0185	40186	Reserved				Unsigned	2Bytes
0186	40187	Reserved				Unsigned	2Bytes
0187	40188	DPF Carbon Deposit			g	Unsigned	Only support ECU genset
0188	40189	DPF Pressure Deposit		0.1	kPa	Signed	
0189	40190	Throttle Value Position 2		0.1	%	Signed	
0190	40191	Ignition Advance Angle		1	CA	Signed	
0191	40192	Intake Temp.		1	°C	Signed	
0192	40193	Gas Pressure		1	kPa	Signed	
0193	40194	Gas Pressure 2		0.1	kPa	Signed	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
0194	40195	Exhaust Oxygen Content		0.01	%	Unsigned	
0195	40196	Turbo Inlet Temp.		1	°C	Signed	
0196	40197	Fuel Valve Position		1	%	Unsigned	
0197	40198	Urea Temp.		1	°C	Signed	
0198	40199	DPF Regen. Reminder		1		DPF Regen. Reminder	
0199	40200	DPF Regen. Inhibit				Regen. Inhibit	
0200	40201	DPF Regen. Status				Regen. Status Indication	
0201	40202	Reserved					
0202	40203	Driver Alarm				Driver Alarm	

NOTE 1: Actual value=received data*ratio. Take the frequency as the example, if the received data is 5000 (1388H), ratio is 0.01Hz, then the actual frequency value is 50.00Hz (5000*0.01Hz);

NOTE 2: Instruction for accumulated data (accumulated running time/start times/energy)

Take the Accumulated Running Time (Hour) as the example: if the high order bits of data received are 0x01, the low high order bits are 0x04, so the actual Accumulated Running Time is 10004h (1*10000+4=10004).

NOTE 3: For 4-byte data, actual value=received data MSB*65536+received data LSB;

NOTE 4: When received data is 32766, it represents no normal data, "###" will display;

NOTE 5: 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:

If need to read battery voltage, D+ voltage data, firstly get its address is 0024 and 0025 by checking the table, then it is known that you need to read 2 bytes of data.

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

Table 7 Master (Computer) Request Command

Slave Address	Function Code	Starting Address (0024)		Request Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**00**	**18**	**00**	**02**	**44**	**0C**

The slave response command is as following:

Table 8 Slave (Controller) Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data				CRC 16 Calibration	
			Data MSB of Address 0024	Data LSB of Address 0024	Data MSB of Address 0025	Data LSB of Address 0025	LSB	MSB
01	**03**	**04**	**01**	**12**	**00**	**00**	**5B**	**CA**

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

Table 9 Data Analysis

Address	Data Received (Hex)	Decimal	Data Signification
0024	0112H	274	Ratio is 0.1, battery voltage is 27.4V.
0025	0000H	0	Ratio is 0.1, D+ voltage is 0V.

3.3 FUNCTION CODE 05H MAPPING COIL FIELD

Table 10 Remote Coil Field

Modbus Address	PLC Address	Item	Description	
0000	0001	Remote Oil Engine in Start Status	Only send 00FFH for active	
0001	0002	Remote Oil Engine in Stop Status	Only send 00FFH for active	
0002	0003	Reserved	Only send 00FFH for active	
0003	0004	Remote Oil Engine in Auto Status	Only send 00FFH for active	
0004	0005	Remote Oil Engine in Manual Status	Only send 00FFH for active	
0005	0006	Remote Gen Close/Open	Only send 00FFH for active	HGM6120
0006	0007	Remote Mains Close/Open	Only send 00FFH for active	
0005	0006	Remote Gen Open	Only send 00FFH for active	HGM6110
0006	0007	Remote Gen Close	Only send 00FFH for active	

NOTE: The above remote command only can be sent once only.

Example:

Remote control controller to work in auto mode, firstly get its remote address is 0003.

Assume 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 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**00**	**03**	**FF**	**00**	**7C**	**3A**

The slave response command is as following:

Table 12 Slave Response Command

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

Whether the remote command is active can be checked by sending function code 01H to read the status of address 0041.

3.4 GENSET STATUS

Table 13 Genset Status

No.	Item	Description
0	Standby	No delay value for this status
1	Preheat	
2	Fuel Output	
3	Crank	
4	Crank Rest	
5	Safety Run	
6	Start Idle	
7	High Speed Warming Up	
8	Wait for Load	No delay value for this status
9	Normal Running	No delay value for this status
10	High Speed Cooling	
11	Stop Idle	
12	ETS	
13	Wait for Stop	
14	Stop Failure	No delay value for this status
15	After Stop	

3.5 REMOTE START STATUS

Table 14 Remote Start Status

Value (No.)	Item	Description
0	No Delay	No delay value for this status
1	Start Delay	
2	Stop Delay	

3.6 DPF REGENERATION REMINDER

Table 15 DPF Regeneration Reminder

Value (No.)	Item	Description
0	No icon displayed	Other aftertreatment gensets
1	The icon is always on	
2	The icon flashes	
4		
0	No icon displayed	Genset 44: YUCHAI-T4
1	The icon is always on	
2	The icon flashes slowly	
3	The icon flashes quickly	

3.7 REGENERATION INHIBIT

Table 16 Regeneration Inhibit

Value (No.)	Item	Description
0	No icon displayed	
1	The icon is always on	

3.8 DRIVER ALARM

Table 17 Driver Alarm

Value (No.)	Item	Description
0	No icon displayed	
1	The icon is always on	NCD Alarm
2	The icon is always on	NCD limit will be activated soon
3	The icon is always on	NCD Primary Limit
4	The icon is always on	NCD Severe Limit
5	The icon is always on	Driver Alarm
6	The icon flashes	
7	Alarm is triggered, and no icon is displayed	

3.9 REGENERATION STATUS INDICATION

Table 18 Regeneration Status Indication

Value (No.)	Item	Description
0	No icon displayed	
1	The icon is always on	

4 COMMUNICATION PARAMETER VIEWING AND CONFIGURATION

1) press  key, input correct password (default 0318) can enter the parameter setting menu;

2) Select “Module Address” via  key,

3) Press  key again, corresponding parameters will be in the selected status;

4) Set the current selected content via  ,  key, then press  key to confirm, after editing, then the selected status will disappear;

5) Press  key to return the main interface.

NOTE: After parameter setting is completed, the configuration takes effect.

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 fiber optical relay modules.

Fig.3 SGCAN300 Application Diagram

5.5 COMMON SOLUTIONS OF COMMUNICATION FAILURE

1) Check whether the positive and negative of RS485 is correctly connected;
2) Check whether the communication parameter 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.