SmartGen

MAKING CONTROL SMARTER

ACC1700/ACC1700CAN

DIESEL AIR COMPRESSOR 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
2024-07-24	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 ACC1700 controller.

The RS485 port is used as 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: 9600/19200/38400bps (Default: 9600bps)
Start bit: 1 bit
Data bit: 8 bits
Parity bit: no parity, odd parity and even parity (Default: no parity)
Stop bit: 1 bit or 2 bits (Default: 1 bit)

Function code supported: 03H, 05H. Function code 03H is used for reading the controller's alarms, status and related parameters or data; Function code 05H is used for sending remote commands.

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

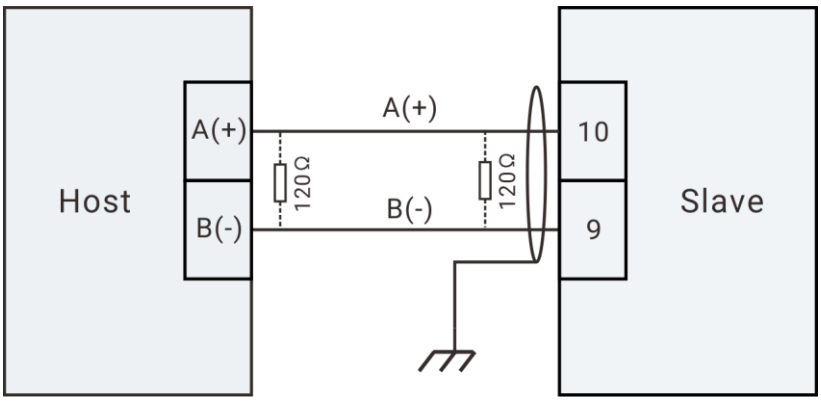

Fig. 1 Single Device Communication Wiring Diagram

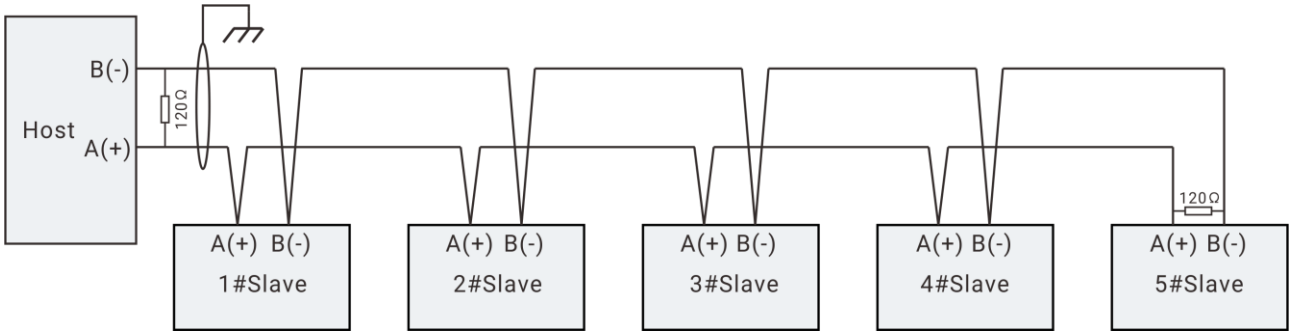

Fig. 2 Multiple Devices Communication Wiring Diagram

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

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

Table 2 Alarm and Coil Status of Data Field

Modbus Address	PLC Address	Item	Description
0000.0	40001.0	Common Alarm	"0" means there is no common alarm "1" means there are common alarms (0000.0 means the Boolean value of bit 0 at address 0) The content listed below follows the same rule
0000.1	40001.1	Common Shutdown	
0000.2	40001.2	Common Warning	
0000.3	40001.3	Reserved	
0000.4	40001.4	Reserved	
0000.5	40001.5	Reserved	
0000.6	40001.6	Reserved	
0000.7	40001.7	Reserved	
0000.8	40001.8	Reserved	
0000.9	40001.9	Reserved	
0000.10	40001.10	In Manual Mode	
0000.11	40001.11	In Stop Mode	
0000.12	40001.12	Reserved	
0000.13	40001.13	Reserved	
0000.14	40001.14	Manual Heating Status	
0000.15	40001.15	Lock Mode	
0001.0	40002.0	Emergency Stop	
0001.1	40002.1	Overspeed Shutdown	
0001.2	40002.2	Underspeed Shutdown	

Modbus Address	PLC Address	Item	Description
0001.3	40002.3	Loss of Speed Signal Alarm	
0001.4	40002.4	Reserved	
0001.5	40002.5	Reserved	
0001.6	40002.6	Reserved	
0001.7	40002.7	Reserved	
0001.8	40002.8	Start Failure Shutdown	
0001.9	40002.9	Reserved	
0001.10	40002.10	Reserved	
0001.11	40002.11	ECU Shutdown	
0001.12	40002.12	Reserved	
0001.13	40002.13	Low Coolant Level Input Shutdown	
0001.14	40002.14	High Temp. Input Shutdown	
0001.15	40002.15	Low Oil Pressure Input Shutdown	
0002.0	40003.0	ECU Comm. Failure Shutdown	
0002.1	40003.1	High Engine Temp. Shutdown	
0002.2	40003.2	Reserved	
0002.3	40003.3	Reserved	
0002.4	40003.4	Reserved	
0002.5	40003.5	Reserved	
0002.6	40003.6	Low Engine Oil Pressure Shutdown	
0002.7	40003.7	Reserved	
0002.8	40003.8	Aux. Sensor 1 Open Shutdown	
0002.9	40003.9	Aux. Sensor 1 High Shutdown	
0002.10	40003.10	Aux. Sensor 1 Low Shutdown	
0002.11	40003.11	Reserved	
0002.12	40003.12	Aux. Sensor 2 Open Shutdown	
0002.13	40003.13	Aux. Sensor 2 High Shutdown	
0002.14	40003.14	Aux. Sensor 2 Low Shutdown	
0002.15	40003.15	Reserved	
0003.0	40004.0	Aux. Sensor 3 Open Shutdown	
0003.1	40004.1	Aux. Sensor 3 High Shutdown	
0003.2	40004.2	Aux. Sensor 3 Low Shutdown	
0003.3	40004.3	Reserved	
0003.4	40004.4	Aux. Sensor 4 Open Shutdown	
0003.5	40004.5	Aux. Sensor 4 High Shutdown	
0003.6	40004.6	Aux. Sensor 4 Low Shutdown	
0003.7	40004.7	Reserved	
0003.8	40004.8	Aux. Sensor 5 Open Shutdown	
0003.9	40004.9	Aux. Sensor 5 High Shutdown	
0003.10	40004.10	Aux. Sensor 5 Low Shutdown	
0003.11	40004.11	Reserved	
0003.12	40004.12	Reserved	
0003.13	40004.13	Reserved	

Modbus Address	PLC Address	Item	Description
0003.14	40004.14	Reserved	
0003.15	40004.15	Reserved	
0004.0	40005.0	Reserved	
0004.1	40005.1	Reserved	
0004.2	40005.2	Reserved	
0004.3	40005.3	Reserved	
0004.4	40005.4	Reserved	
0004.5	40005.5	Reserved	
0004.6	40005.6	Reserved	
0004.7	40005.7	Reserved	
0004.8	40005.8	Reserved	
0004.9	40005.9	High Discharge Pressure Shutdown	
0004.10	40005.10	Reserved	
0004.11	40005.11	Reserved	
0004.12	40005.12	Reserved	
0004.13	40005.13	Reserved	
0004.14	40005.14	Reserved	
0004.15	40005.15	Reserved	
0005.0	40006.0	Input 1 Shutdown	
0005.1	40006.1	Input 2 Shutdown	
0005.2	40006.2	Input 3 Shutdown	
0005.3	40006.3	Input 4 Shutdown	
0005.4	40006.4	Input 5 Shutdown	
0005.5	40006.5	Reserved	
0005.6	40006.6	Reserved	
0005.7	40006.7	Reserved	
0005.8	40006.8	Reserved	
0005.9	40006.9	Reserved	
0005.10	40006.10	Reserved	
0005.11	40006.11	Reserved	
0005.12	40006.12	Reserved	
0005.13	40006.13	Reserved	
0005.14	40006.14	Reserved	
0005.15	40006.15	Reserved	
0006.0	40007.0	Fuel Filter Time Over Shutdown	
0006.1	40007.1	Fuel/Water Separator Time Over Shutdown	
0006.2	40007.2	Air Filter Time Over Shutdown	
0006.3	40007.3	Lubricant Time Over Shutdown	
0006.4	40007.4	Engine Oil Filter Time Over Shutdown	
0006.5	40007.5	Engine Fuel Filter Time Over Shutdown	

Modbus Address	PLC Address	Item	Description
0006.6	40007.6	Engine Lubricant Time Over Shutdown	
0006.7	40007.7	Engine Air Filter Time Over Shutdown	
0006.8	40007.8	Maintenance 9 Over Shutdown	
0006.9	40007.9	Maintenance 10 Over Shutdown	
0006.10	40007.10	Reserved	
0006.11	40007.11	Reserved	
0006.12	40007.12	Reserved	
0006.13	40007.13	Reserved	
0006.14	40007.14	Reserved	
0006.15	40007.15	Reserved	
0007 ~0019	40008 ~40020	Reserved	
0020.0	40021.0	Overspeed Warning	
0020.1	40021.1	Underspeed Warning	
0020.2	40021.2	Loss of Speed Signal Warning	
0020.3	40021.3	Please Regenerate Manually	
0020.4	40021.4	NCD Error	
0020.5	40021.5	Reserved	
0020.6	40021.6	Reserved	
0020.7	40021.7	Reserved	
0020.8	40021.8	Stop Failure Warning	
0020.9	40021.9	Charging Failure Warning	
0020.10	40021.10	Battery Overvoltage Warning	
0020.11	40021.11	Battery Undervoltage Warning	
0020.12	40021.12	Reserved	
0020.13	40021.13	Reserved	
0020.14	40021.14	Reserved	
0020.15	40021.15	ECU Warning	
0021.0	40022.0	Reserved	
0021.1	40022.1	High Engine Temp. Warning	
0021.2	40022.2	Low Engine Temp. Warning	
0021.3	40022.3	Reserved	
0021.4	40022.4	Reserved	
0021.5	40022.5	Reserved	
0021.6	40022.6	Low Engine Oil Pressure Warning	
0021.7	40022.7	Reserved	
0021.8	40022.8	Aux. Sensor 1 Open Warning	
0021.9	40022.9	Aux. Sensor 1 High Warning	
0021.10	40022.10	Aux. Sensor 1 Low Warning	
0021.11	40022.11	Reserved	
0021.12	40022.12	Aux. Sensor 2 Open Warning	

Modbus Address	PLC Address	Item	Description
0021.13	40022.13	Aux. Sensor 2 High Warning	
0021.14	40022.14	Aux. Sensor 2 Low Warning	
0021.15	40022.15	Reserved	
0022.0	40023.0	Aux. Sensor 3 Open Warning	
0022.1	40023.1	Aux. Sensor 3 High Warning	
0022.2	40023.2	Aux. Sensor 3 Low Warning	
0022.3	40023.3	Reserved	
0022.4	40023.4	Aux. Sensor 4 Open Warning	
0022.5	40023.5	Aux. Sensor 4 High Warning	
0022.6	40023.6	Aux. Sensor 4 Low Warning	
0022.7	40023.7	Aux. Sensor 4 Error	
0022.8	40023.8	Aux. Sensor 5 Open Warning	
0022.9	40023.9	Aux. Sensor 5 High Warning	
0022.10	40023.10	Aux. Sensor 5 Low Warning	
0022.11	40023.11	Reserved	
0022.12	40023.12	Reserved	
0022.13	40023.13	Reserved	
0022.14	40023.14	Reserved	
0022.15	40023.15	Reserved	
0023.0	40024.0	Reserved	
0023.1	40024.1	Reserved	
0023.2	40024.2	Reserved	
0023.3	40024.3	Reserved	
0023.4	40024.4	Reserved	
0023.5	40024.5	Reserved	
0023.6	40024.6	Reserved	
0023.7	40024.7	Reserved	
0023.8	40024.8	Reserved	
0023.9	40024.9	High Discharge Pressure Warning	
0023.10	40024.10	Reserved	
0023.11	40024.11	Reserved	
0023.12	40024.12	Reserved	
0023.13	40024.13	Reserved	
0023.14	40024.14	Reserved	
0023.15	40024.15	Reserved	
0024.0	40025.0	Input 1 Warning	
0024.1	40025.1	Input 2 Warning	
0024.2	40025.2	Input 3 Warning	
0024.3	40025.3	Input 4 Warning	
0024.4	40025.4	Input 5 Warning	
0024.5	40025.5	Reserved	
0024.6	40025.6	Reserved	
0024.7	40025.7	Reserved	

Modbus Address	PLC Address	Item	Description
0024.8	40025.8	Reserved	
0024.9	40025.9	Reserved	
0024.10	40025.10	Reserved	
0024.11	40025.11	Reserved	
0024.12	40025.12	Reserved	
0024.13	40025.13	Reserved	
0024.14	40025.14	Reserved	
0024.15	40025.15	Reserved	
0025.0	40026.0	Fuel Filter Time Over Warning	
0025.1	40026.1	Fuel/Water Separator Time Over Warning	
0025.2	40026.2	Air Filter Time Over Warning	
0025.3	40026.3	Lubricant Time Over Warning	
0025.4	40026.4	Engine Oil Filter Time Over Warning	
0025.5	40026.5	Engine Fuel Filter Time Over Warning	
0025.6	40026.6	Engine Lubricant Time Over Warning	
0025.7	40026.7	Engine Air Filter Time Over Warning	
0025.8	40026.8	Maintenance 9 Over Warning	
0025.9	40026.9	Maintenance 10 Over Warning	
0025.10	40026.10	Reserved	
0025.11	40026.11	Reserved	
0025.12	40026.12	Reserved	
0025.13	40026.13	Reserved	
0025.14	40026.14	Reserved	
0025.15	40026.15	Reserved	
0026 ~0032	40027 ~40033	Reserved	
0033.0	40034.0	Input 1 Indication	
0033.1	40034.1	Input 2 Indication	
0033.2	40034.2	Input 3 Indication	
0033.3	40034.3	Input 4 Indication	
0033.4	40034.4	Input 5 Indication	
0033.5	40034.5	Reserved	
0033.6	40034.6	Reserved	
0033.7	40034.7	Reserved	
0033.8	40034.8	Reserved	
0033.9	40034.9	Reserved	
0033.10	40034.10	Reserved	
0033.11	40034.11	Reserved	
0033.12	40034.12	Reserved	
0033.13	40034.13	Reserved	

Modbus Address	PLC Address	Item	Description
0033.14	40034.14	Reserved	
0033.15	40034.15	Reserved	
0034.0	40035.0	Fuel Filter Time Over Indication	
0034.1	40035.1	Fuel/Water Separator Time Over Indication	
0034.2	40035.2	Air Filter Time Over Indication	
0034.3	40035.3	Lubricant Time Over Indication	
0034.4	40035.4	Engine Oil Filter Time Over Indication	
0034.5	40035.5	Engine Fuel Filter Time Over Indication	
0034.6	40035.6	Engine Lubricant Time Over Indication	
0034.7	40035.7	Engine Air Filter Time Over Indication	
0034.8	40035.8	Maintenance 9 Over Indication	
0034.9	40035.9	Maintenance 10 Over Indication	
0034.10	40035.10	Reserved	
0034.11	40035.11	Reserved	
0034.12	40035.12	Reserved	
0034.13	40035.13	Reserved	
0034.14	40035.14	Reserved	
0034.15	40035.15	Reserved	
0035.0	40036.0	Emergency Input Status	“0” means there is no signal input. “1” means there is signal input.
0035.1	40036.1	Input 1 Status	
0035.2	40036.2	Input 2 Status	
0035.3	40036.3	Input 3 Status	
0035.4	40036.4	Input 4 Status	
0035.5	40036.5	Input 5 Status	
0035.6	40036.6	Reserved	
0035.7	40036.7	Reserved	
0035.8	40036.8	Reserved	
0035.9	40036.9	Reserved	
0035.10	40036.10	Reserved	
0035.11	40036.11	Reserved	
0035.12	40036.12	Reserved	
0035.13	40036.13	Reserved	
0035.14	40036.14	Reserved	
0035.15	40036.15	Reserved	
0036	40037	Reserved	
0037.0	40038.0	Fuel Relay Output Status	“1” means there is signal output. “0” means there is no signal output.

Modbus Address	PLC Address	Item	Description
0037.1	40038.1	Crank Relay Output Status	
0037.2	40038.2	Aux. Output 1 Status	
0037.3	40038.3	Aux. Output 2 Status	
0037.4	40038.4	Aux. Output 3 Status	
0037.5	40038.5	Aux. Output 4 Status	
0037.6	40038.6	Reserved	
0037.7	40038.7	Reserved	
0037.8	40038.8	Reserved	
0037.9	40038.9	Reserved	
0037.10	40038.10	Reserved	
0037.11	40038.11	Reserved	
0037.12	40038.12	Reserved	
0037.13	40038.13	Reserved	
0037.14	40038.14	Reserved	
0037.15	40038.15	Reserved	
0038 ~0042	40039 ~40043	Reserved	
0043.0	40044.0	Reserved	“1” means the status indicator is on “0” means the status indicator is off
0043.1	40044.1	Reserved	
0043.2	40044.2	Reserved	
0043.3	40044.3	Reserved	
0043.4	40044.4	Running Status Indicator	
0043.5	40044.5	Load Valve Output Status	
0043.6	40044.6	Load Indicator	
0043.7	40044.7	Wait Discharge Pressure Drop Shutdown	
0043.8	40044.8	Idle Running Status	
0043.9	40044.9	Reserved	
0043.10	40044.10	Reserved	
0043.11	40044.11	Reserved	
0043.12	40044.12	Reserved	
0043.13	40044.13	Reserved	
0043.14	40044.14	Reserved	
0043.15	40044.15	Reserved	
0044.0	40045.0	DPF Fault	
0044.1	40045.1	DPF Request	
0044.2	40045.2	DPF Inhibition Indicator	
0044.3	40045.3	DPF Exhaust Temp. Indicator	
0044.4	40045.4	DPF Response Indicator	
0044.5	40045.5	Driver Alarm Indicator	
0044.6	40045.6	Reserved	
0044.7	40045.7	DPF Regeneration Status	

Modbus Address	PLC Address	Item	Description
0044.8	40045.8	Engine Preheating Status	
0044.9	40045.9	Engine Fault Status	
0044.10	40045.10	Reserved	
0044.11	40045.11	Reserved	
0044.12	40045.12	Reserved	
0044.13	40045.13	Reserved	
0044.14	40045.14	Overload Protection Status	
0044.15	40045.15	Reserved	
0045.0	40046.0	Input 1 Active	“0” means the input is inactive. “1” means the input is active.
0045.1	40046.1	Input 2 Active	
0045.2	40046.2	Input 3 Active	
0045.3	40046.3	Input 4 Active	
0045.4	40046.4	Input 5 Active	
0045.5	40046.5	Reserved	
0045.6	40046.6	Reserved	
0045.7	40046.7	Reserved	
0045.8	40046.8	Reserved	
0045.9	40046.9	Reserved	
0045.10	40046.10	Reserved	
0045.11	40046.11	Reserved	
0045.12	40046.12	Reserved	
0045.13	40046.13	Reserved	
0045.14	40046.14	Reserved	
0045.15	40046.15	Reserved	
0046	40047	Reserved	

EXAMPLE:

If “Overspeed Shutdown” and “High Engine Temp. Shutdown” need to be read, check the table above and find their coil addresses are 0001.1 and 0002.1, so it needs to read two data addresses.

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 (0001)		Request Data Length (2)		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**00**	**01**	**00**	**02**	**95**	**CB**

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 0001 MSB	Data of Address 0001 LSB	Data of Address 0002 MSB	Data of Address 0002 LSB	LSB	MSB
01	**03**	**04**	**00**	**02**	**00**	**02**	**DA**	**32**

Table 5 Data Analysis

Address	Data Received (Hexadecimal)	Convert to Binary	Meaning
0001	0002H	0000 0000 0000 0010 (Mapping to 0001.15, 0001.14, ..., 0001.1, 0001.0 respectively)	Data of 0001.1 is 1, which means "Overspeed Shutdown" is active
0002	0002H	0000 0000 0000 0010 (Mapping to 0002.15, 0002.14, ..., 0002.1, 0002.0 respectively)	Data of 0002.1 is 1, which means "High Engine Temp. Shutdown" 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
47 ~49	40048 ~40050	Reserved					
50	40051	Engine Speed	(0~6000)	1	RPM	16-bit Unsigned	
51	40052	Battery Voltage	(0~600)	0.1	V	16-bit Unsigned	
52	40053	Charger Voltage	(0~600)	0.1	V	16-bit Unsigned	
53	40054	Reserved					
54	40055	Reserved					
55	40056	Reserved					
56	40057	Reserved					
57	40058	Sensor 1 Resistance	(0~65535)	0.1	Ω	16-bit Unsigned	
58	40059	Sensor 1 Value (Aux. 1)	(-50~+32767)			16-bit Signed	
59	40060	Sensor 2 Resistance	(0~65535)	0.1	Ω	16-bit Unsigned	
60	40061	Sensor 2 Value (Aux. 2)	(-50~+32767)			16-bit Signed	
61	40062	Sensor 3 Resistance	(0~65535)	0.1	Ω	16-bit Unsigned	
62	40063	Sensor 3 Value (Aux. 3)	(-50~+32767)			16-bit Signed	
63	40064	Sensor 4 Resistance/Current/ Voltage Value	(0~65535)	0.1	Ω	16-bit Unsigned	The ratio of current or voltage is 0.01
64	40065	Sensor 4 Value (Aux. 4)	(-50~+32767)			16-bit Signed	
65	40066	Sensor 5 Current	(0~65535)	0.01	mA	16-bit Unsigned	
66	40067	Sensor 5 Value (Aux. 5)	(-50~+32767)			16-bit Signed	
67	40068	Reserved					

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
~76	~40077						
77	40078	Coolant Pressure	(0~32767)	1	kPa	16-bit Signed	
78	40079	Coolant Level	(0~100)	1	%	16-bit Signed	
79	40080	Fuel Pressure	(0~32767)	1	kPa	16-bit Signed	
80	40081	Fuel Temp.	(-40~+32767)	1	°C	16-bit Signed	
81	40082	Oil Temp.	(-40~+32767)	1	°C	16-bit Signed	
82	40083	Air Inlet Temp.	(-40~+32767)	1	°C	16-bit Signed	
83	40084	Turbo Pressure	(0~32767)	1	kPa	16-bit Signed	
84	40085	Exhaust Outlet Temp.	(-40~+32767)	1	°C	16-bit Signed	
85	40086	Fuel Consumption	(0~32767)	0.1	L/h	16-bit Signed	
86 87	40087 40088	Total Fuel Consumption	(0~99999999)	1	L	32-bit Signed	
88	40089	Reserved					
89	40090	Reserved					
90	40091	Engine Load Ratio	(0~250)	1	%	16-bit Signed	
91	40092	Torque Percentage	(-125~+125)	1	%	16-bit Signed	
92	40093	Water in Fuel Status	(0~1)	1		16-bit Signed	
93	40094	Ash Percentage	(-125~+125)	1	%	16-bit Signed	
94	40095	Engine Running Status	(0-15)	No.		16-bit Unsigned	
95	40096	Engine Delay	(0-3600)	1	s	16-bit Unsigned	
96 ~100	40097 ~40101	Reserved					
101	40102	Total Running Hours	(0-65535)	1	h	16-bit Unsigned	
102	40103	Total Running Minutes	(0~59)	1	min	16-bit Unsigned	
103	40104	Total Running Seconds	(0~59)	1	s	16-bit Unsigned	
104	40105	Total Start Times	(0-65535)	1		16-bit Unsigned	
105 ~112	40106 ~40113	Reserved					
113	40114	Controller Model					
114	40115	Controller Software Version					
115	40116	Controller Hardware Version					
116	40117	Release Year	(0-99)	1		Save the last two digits of the Year only.	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
117	40118	Release Month	(1-12)	1		16-bit Unsigned	
118	40119	Released Day	(1-31)	1		16-bit Unsigned	
119	40120	PC Software Version	(0-65535)	1		16-bit Unsigned	
120	40121	Number of Event Logs	(0-99)	1		16-bit Unsigned	
121	40122	Reserved					
122	40123	Reserved					
123	40124	Reserved					
124	40125	Reserved					
125	40126	Reserved					
126	40127	Reserved					
127	40128	Reserved					
128	40129	Current Running Hours	(0-65535)	1	h	16-bit Unsigned	
129	40130	Current Running Minutes	(0~59)	1	min	16-bit Unsigned	
130	40131	Current Running Seconds	(0~59)	1	s	16-bit Unsigned	
131 ~159	40132 ~40160	Reserved					
160	40161	Maintenance 1 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
161	40162	Maintenance 1 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
162	40163	Maintenance 1 Countdown Second	(0~59)	1	s	16-bit Unsigned	
163	40164	Maintenance 2 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
164	40165	Maintenance 2 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
165	40166	Maintenance 2 Countdown Second	(0~59)	1	s	16-bit Unsigned	
166	40167	Maintenance 3 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
167	40168	Maintenance 3 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
168	40169	Maintenance 3 Countdown Second	(0~59)	1	s	16-bit Unsigned	
169	40170	Maintenance 4 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
170	40171	Maintenance 4 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
171	40172	Maintenance 4 Countdown Second	(0~59)	1	s	16-bit Unsigned	
172	40173	Maintenance 5 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
173	40174	Maintenance 5 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
174	40175	Maintenance 5 Countdown Second	(0~59)	1	s	16-bit Unsigned	
175	40176	Maintenance 6 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
176	40177	Maintenance 6 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
177	40178	Maintenance 6 Countdown Second	(0~59)	1	s	16-bit Unsigned	
178	40179	Maintenance 7 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
179	40180	Maintenance 7 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
180	40181	Maintenance 7 Countdown Second	(0~59)	1	s	16-bit Unsigned	
181	40182	Maintenance 8 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
182	40183	Maintenance 8 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
183	40184	Maintenance 8 Countdown Second	(0~59)	1	s	16-bit Unsigned	
184	40185	Maintenance 9 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
185	40186	Maintenance 9 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
186	40187	Maintenance 9 Countdown Second	(0~59)	1	s	16-bit Unsigned	
187	40188	Maintenance 10 Countdown Hour	(0-65535)	1	h	16-bit Unsigned	
188	40189	Maintenance 10 Countdown Minute	(0~59)	1	min	16-bit Unsigned	
189	40190	Maintenance 10 Countdown Second	(0~59)	1	s	16-bit Unsigned	
190	40191	Engine Temperature	(-50~+32767)	1	°C	16-bit Signed	
191	40192	Engine Oil Pressure	(0~32767)	1	kPa	16-bit Signed	
192	40193	Engine Fuel Level	(0~32767)	1	%	16-bit Signed	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remarks
193	40194	Air Compressor Discharge Pressure	(0~32767)	1	kPa	16-bit Signed	
194	40195	Air Compressor Discharge Temp.	(-50~+32767)	1	°C	16-bit Signed	
195 ~199	40196 ~40200	Reserved					

NOTE 1: Actual value = data received * ratio. Take the Voltage as the example: if the data received is 276 (114H), ratio is 0.1V, then the actual voltage value is 27.6V (276*0.1V).

NOTE 2: The 4-byte data uses CDAB byte order, so the actual value = high order bits of data received * 65536 + low order bits of data received.

NOTE 3: If data received is 32766, it means there is no normal data, and "###" will be shown.

NOTE 4: If data received is 32767, it means there is no normal data, and "+++" will be shown.

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 "Total Fuel Consumption" (current value is 123456L) needs to be read, check the table above and find its Modbus address is 0086 and 0087, 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 (0086)		Request Data Length (2)		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**00**	**56**	**00**	**02**	**24**	**1B**

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 0086 MSB	Data of Address 0086 LSB	Data of Address 0087 MSB	Data of Address 0087 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)	Total Fuel Consumption (Decimal)
0086	E240H	0001E240H	123456
0087	0001H		

4 FUNCTION CODE 05H MAPPING REMOTE COIL FIELD

Table 10 Remote Coil Field

Modbus Address	PLC Address	Item	Description
0	1	Remote Start Key	Active only when sending FF00H
1	2	Remote Stop Key	Active only when sending FF00H
2	3	Reserved	
3	4	Remote Load/Unload Key	Active only when sending FF00H
4	5	Reserved	
5	6	Reserved	
6	7	Reserved	
7	8	Reserved	
8	9	Remote Down Key	Active only when sending FF00H
9	10	Reserved	
10	11	Reserved	
11	12	Reserved	
12	13	Reserved	
13	14	Reserved	
14	15	Reserved	
15	16	Reserved	
16	17	Reserved	
17	18	Reserved	
18	19	Remote Unlock	Active only when sending FF00H
19	20	Remote Lock	Active only when sending FF00H
20	21	Remote Output 1	Active only when sending FF00H
21	22	Remote Output 2	Active only when sending FF00H
22	23	Remote Output 3	Active only when sending FF00H
23	24	Remote Output 4	Active only when sending FF00H
24	25	Reserved	
25	26	Reserved	
26	27	Reserved	
27	28	Reserved	
28	29	Reserved	
29	30	Reserved	

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

EXAMPLE:

If the controller is controlled remotely to load or unload, check the table above first and find its remote address is 3.

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

Table 11 Master Request Command

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

5 APPENDIX

5.1 ENGINE RUNNING STATUS

Table 13 Engine Running Status

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

6 REMOTE START/STOP PROCEDURE

Start Procedure:

1) Send the “Remote Start Key” command using function code 05;
2) The controller receives the command and enters the start process, the engine start process can be obtained by reading the data of “Engine Running Status" address in "Engine Running Status" table via function code 03;
3) If "Engine Running Status" is from 1 (Preheat) to 7 (High Speed Warming Up), the engine enters the start process, otherwise it does not. If it does not enter the start process, repeat step 1 and step 2;
4) If "Engine Running Status" is "Idle Running", send the “Remote Load/Unload” command using function code 05;
5) The controller receives the command and starts to load, the load status can be obtained by reading the data of “Load Status Indicator" address using function code 03;
6) When “Engine Running Status" is in "Normal Running”, and the engine completes on-load running;
7) If unload operation is required, send the “Remote Load/Unload” command using function code 05 again, then the engine will start to unload. The engine is under idle running.

Stop Procedure:

1) Send the "Remote Stop Key” command using function code 05 to set the controller to 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 has been in stop mode. If the controller is not in stop mode, repeat step 1 and step 2;
3) When the controller is in the stop mode, the engine enters the stop process;
4) And the engine stop process can be obtained by reading the data of “Engine Running Status" address in "Engine Running Status" table using function code 03;
5) When “Engine Running Status” is in “Standby”, and the engine completes the stop process.

NOTE 1: When sending remote control key command using function code 05, it only needs to be sent once at a time.

7 CONFIGURATION OF COMMUNICATION PARAMETERS

In the homepage of main screen, press the Down key and hold it for 3s to enter the menu page;

1) Press the Down key to select the “Parameter Setting”, then press the Confirm key to enter the parameters password page;
2) Enter the correct password (default: 01234), press the Confirm key to get into the parameter setting menu;
3) Press the Down key to select “Module Setting”, and press the Confirm key to enter the submenu;
4) Press the Up and Down key to select “Comm. Address”, then press the Confirm key to edit the parameter, the corresponding parameters will be selected;
5) Set the current selected parameter via Up and Down key, then press the Confirm key to confirm and end the setting, then the selected status will disappear;
6) The setting of “RS485 Comm. Setting” is same as the method above, and parameters of “Baud Rate”, “Stop Bit” and “Parity Bit” are available to set in the “RS485 Comm. Setting”.

NOTE: The configuration takes effect once the RS485 communication setting is completed.

8 FAQ

8.1 GROUNDING OF THE CABLE SHIELD

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

8.2 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 stable RS485 network usually requires the termination resistor. The resistor can be avoided while the cable is too short, or it is a temporary or lab test.

8.3 RS485 TO USB CONVERTER

It can communicate with PC via the SmartGen SG72A converter.

8.4 EXTEND TRANSMISSION DISTANCE

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

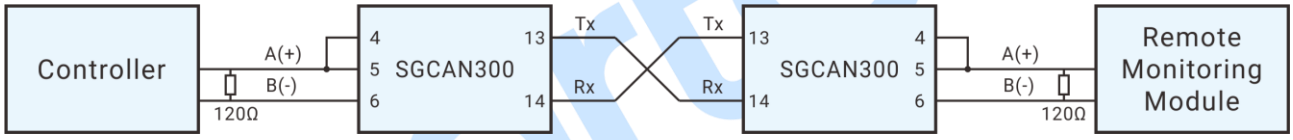

Fig. 3 SGCAN300 Application Diagram

8.5 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; If function code 05 adopts PLC address to communicate: It needs to send 1 to load corresponding bit as 1, and send 0 to load corresponding bit as 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 can not 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.