SmartGen

MAKING CONTROL SMARTER

HED300

ENGINE CAN MONITORING MODULE

COMMUNICATION PROTOCOL

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CONTENT

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Table 1 Software Version

Date	Version	Content
2024-04-28	V1.0	Original release.
2024-06-05	V1.1	Add 05H and 06H function codes; Modify some parameters of 03H function codes.

1 DESCRIPTION

This protocol describes the module RS485 half-duplex serial port's reading and writing command format, and the definition of internal information & data for the third-party to develop and use.

The module works as a slave module, and uses Modbus-RTU protocol, but it doesn't support other protocols, such as Modbus-ASCII, etc.

Communication address: 1~254 (Default: 1)

Baud rate: 9600/19200/38400bps (Default: 9600bps)

Start bit: 1 bit

Data bit: 8 bits

Parity bit: None

Stop bit: 1 bit or 2 bits (Default: 1 bit)

Function code supported: 03H, 05H and 06H. Function code 03H is used for reading the alarms, status and various kinds of electric parameters. Function code 05H is used for is used for sending remote control command. Function code 06H is used for writing single point register.

Data checking method: CRC16.

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

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 modules.

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

2 WIRING DIAGRAM

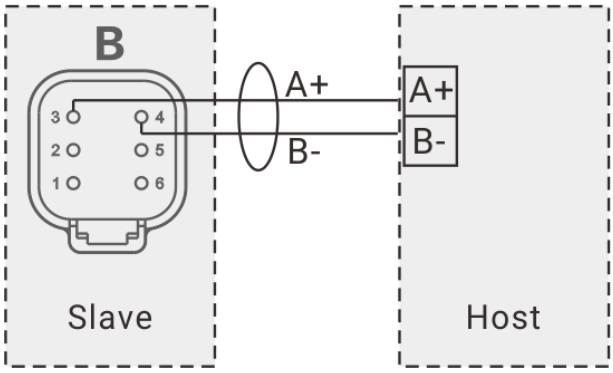

Fig. 1 Single Device Communication Wiring Diagram

NOTE: There are 120-ohm resistors inside of the controller, and the resistors can be connected according to the site's requirement.

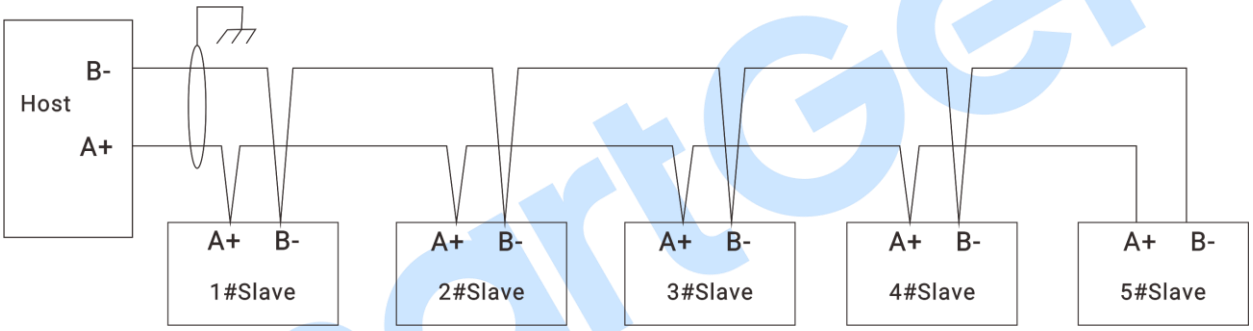

Fig. 2 Multiple Devices Communication Wiring Diagram

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

3 MODULE INTERNAL REGISTER ADDRESS AND DATA

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

Table 2 Alarm and Coil Status of Data Field

Modbus Address	Item	Description
000.0	Common Alarm	"0" means there is no common alarm "1" means there are common alarms (000.0 means the Boolean value at bit 0 of address 000) The content listed below follows the same rule
000.1	Common Warning	
000.2	ECU Comm. Failure	
000.3	Normal Running	
000.4	LCD Heating Status	
000.5	/	
000.6	/	
000.7	/	
000.8	/	
000.9	/	
000.10	/	
000.11	/	
000.12	/	
000.13	/	
000.14	Input 1 Status	
000.15	Input 2 Status	
001.0	Sensor 1 Open Warning	
001.1	Sensor 1 High Warning	
001.2	Sensor 1 Low Warning	
001.3	Sensor 1 Error	
001.4	Sensor 2 Open Warning	
001.5	Sensor 2 High Warning	
001.6	Sensor 2 Low Warning	
001.7	Sensor 2 Error	
001.8	Maintenance 1 Warning	
001.9	Maintenance 2 Warning	
001.10	Maintenance 3 Warning	
001.11	Maintenance 4 Warning	
001.12	Maintenance 5 Warning	
001.13	Battery Undervoltage Warning	
001.14	Battery Overvoltage Warning	
001.15	Engine Overspeed Warning	
002.0	ECU Warning	

Modbus Address	Item	Description
002.1	ECU Shutdown	
002.2	DPF Regeneration Warning	
002.3	/	
002.4	DPF Fault	
002.5	Input 1 Warning	
002.6	Input 2 Warning	
002.7	/	
002.8	/	
002.9	Low DEF Level Warning	
002.10	High Coolant Temp. Warning	
002.11	Low Coolant Temp. Warning	
002.12	High Oil Pressure Warning	
002.13	Low Oil Pressure Warning	
002.14	/	
002.15	/	
003	/	
004	/	
005	/	
006	/	
007	/	
008	/	
009	/	
010	/	
011	/	
012	/	
013	/	
014	/	

3.2 FUNCTION CODE 03H MAPPING PARAMETERS OF DATA FIELD

Table 3 Parameters of Data Field

Address	Item	Ratio	Unit	Description	Remarks
0015	Engine Speed	1	rpm	16-bit Unsigned	
0016	Engine Running Hours	1	h	32-bit Signed	
0017					
0018	Battery Voltage	0.1	V	16-bit Signed	
0019	/	/	/	/	
0020	Engine Load Percentage	1	%	16-bit Signed	
0021	Coolant Temp.	1	°C	16-bit Signed	
0022	Engine Oil Pressure	1	kPa	16-bit Signed	
0023	Instant Fuel Consumption	0.1	L/h	16-bit Signed	
0024	Intake Manifold Air Pressure	1	kPa	16-bit Signed	
0025	Intake Manifold Air Temp.	1	°C	16-bit Signed	
0026	Total Fuel Consumption	1	L	32-bit Signed	

Address	Item	Ratio	Unit	Description	Remarks
0027					
0028	Throttle Pedal Percentage	1	%	16-bit Signed	
0029	Fuel Filter Differential Pressure	1	kPa	16-bit Signed	
0030	Water in Fuel	/	/	16-bit Signed	
0031	Lubricating Oil Level	1	%	16-bit Signed	
0032	Lubricating Oil Filter Differential Pressure	1	kPa	16-bit Signed	
0033	Crankcase Pressure	1	kPa	16-bit Signed	
0034	Air Inlet Pressure	1	kPa	16-bit Signed	
0035	Fuel Temp.	1	°C	16-bit Signed	
0036	Lubricating Oil Temp.	1	°C	16-bit Signed	
0037	Coolant Pressure	1	kPa	16-bit Signed	
0038	Coolant Level	1	%	16-bit Signed	
0039	Fuel Pressure	1	kPa	16-bit Signed	
0040	Gearbox Pressure	1	kPa	16-bit Signed	
0041	Rail Pressure	0.1	MPa	16-bit Signed	
0042	Exhaust Temp.	1	°C	16-bit Signed	
0043	Transmission Oil Temp.	1	°C	16-bit Signed	
0044	Urea Level	1	%	16-bit Signed	
0045	Total Gas Consumption/m	1	kg	32-bit Signed	
0046					
0047	Total Gas Consumption/V	1	m^3	32-bit Signed	
0048					
0049	Instant Gas Consumption/m	1	kg/h	16-bit Signed	
0050	Instant Gas Consumption/V	1	m^3/h	16-bit Signed	
0051	Vehicle Speed	1	km/h	16-bit Signed	
0052	Atmospheric Pressure	1	kPa	16-bit Signed	
0053	Frictional Torque	1	%	16-bit Signed	
0054	/				
0055	Aux. Sensor 1 Resistance/Current	0.1/0.01	Ω/mA	16-bit Unsigned	
0056	Aux. Sensor 1 Value	1		16-bit Signed	
0057	Aux. Sensor 2 Resistance/Current	0.1/0.01	Ω/mA	16-bit Unsigned	
0058	Aux. Sensor 2 Value	1		16-bit Signed	
0059	Number of Event Log	1		16-bit Unsigned	
0060	/				
0061	/				
0062	/				
0063	SCM Temp.	0.1	°C	16-bit Signed	
0064	LCD Temp.	0.01	°C	16-bit Signed	
0065	Controller Model			16-bit Unsigned	
0066	Controller Software Version	0.1		16-bit Unsigned	
0067	Controller Hardware Version	0.1		16-bit Unsigned	
0068	Release Year	1		16-bit Unsigned	Save the last two digits of

Address	Item	Ratio	Unit	Description	Remarks
					the Year only.
0069	Release Month	1		16-bit Unsigned	
0070	Released Day	1		16-bit Unsigned	
0071	/				
0072	Controller Date: Year	1		16-bit Unsigned	Save the last two digits of the Year only.
0073	Controller Date: Month	1		16-bit Unsigned	
0074	Controller Date: Day	1		16-bit Unsigned	
0075	Controller Date: Week	1		16-bit Unsigned	
0076	Controller Time: Hour	1	h	16-bit Unsigned	
0077	Controller Time: Minute	1	min	16-bit Unsigned	
0078	Controller Time: Second	1	s	16-bit Unsigned	
0079	/				
0080	Maintenance 1 Countdown Hour	1	h	16-bit Unsigned	
0081	Maintenance 1 Countdown Minute	1	min	16-bit Unsigned	
0082	Maintenance 1 Countdown Second	1	s	16-bit Unsigned	
0083	Maintenance 2 Countdown Hour	1	h	16-bit Unsigned	
0084	Maintenance 2 Countdown Minute	1	min	16-bit Unsigned	
0085	Maintenance 2 Countdown Second	1	s	16-bit Unsigned	
0086	Maintenance 3 Countdown Hour	1	h	16-bit Unsigned	
0087	Maintenance 3 Countdown Minute	1	min	16-bit Unsigned	
0088	Maintenance 3 Countdown Second	1	s	16-bit Unsigned	
0089	Maintenance 4 Countdown Hour	1	h	16-bit Unsigned	
0090	Maintenance 4 Countdown Minute	1	min	16-bit Unsigned	
0091	Maintenance 4 Countdown Second	1	s	16-bit Unsigned	
0092	Maintenance 5 Countdown Hour	1	h	16-bit Unsigned	
0093	Maintenance 5 Countdown Minute	1	min	16-bit Unsigned	
0094	Maintenance 5 Countdown Second	1	s	16-bit Unsigned	
0095	Key1 Count Value	1		16-bit Unsigned	
0096	Key2 Count Value	1		16-bit Unsigned	
0097	Key3 Count Value	1		16-bit Unsigned	
0098	Key4 Count Value	1		16-bit Unsigned	
0099	/				
00100	/				
00101	/				
00102	/				
00103	/				
00104	/				
00105	/				
00106	/				
00107	/				
00108	/				
00109	/				

Address	Item	Ratio	Unit	Description	Remarks
00110	/				
00111	/				
00112	/				
00113	/				
00114	/				
00115	/				
00116	/				
00117	/				
00118	/				
00119	/				
00120	/				
00121	/				
00122	/				
00123	/				
00124	/				
00125	/				
00126	/				
00127	/				
00128	/				
00129	/				
00130	/				
00131	/				
00132	/				
00133	/				
00134	/				
00135	Alarm 1 SPN			32-bit Unsigned	
00136					
00137	Alarm 1 FMI			16-bit Unsigned	
00138	Alarm 2 SPN			32-bit Unsigned	
00139					
00140	Alarm 2 FMI			16-bit Unsigned	
00141	Alarm 3 SPN			32-bit Unsigned	
00142					
00143	Alarm 3 FMI			16-bit Unsigned	
00144	Alarm 4 SPN			32-bit Unsigned	
00145					
00146	Alarm 4 FMI			16-bit Unsigned	
00147	Alarm 5 SPN			32-bit Unsigned	
00148					
00149	Alarm 5 FMI			16-bit Unsigned	
00150	Alarm 6 SPN			32-bit Unsigned	
00151					
00152	Alarm 6 FMI			16-bit Unsigned	
00153	Alarm 7 SPN			32-bit Unsigned	

Address	Item	Ratio	Unit	Description	Remarks
00154					
00155	Alarm 7 FMI			16-bit Unsigned	
00156	Alarm 8 SPN			32-bit Unsigned	
00157					
00158	Alarm 8 FMI			16-bit Unsigned	
00159	Alarm 9 SPN			32-bit Unsigned	
00160					
00161	Alarm 9 FMI			16-bit Unsigned	
00162	Alarm 10 SPN			32-bit Unsigned	
00163					
00164	Alarm 10 FMI			16-bit Unsigned	
00165	/				
00166	/				
00167	/				
00168	/				
00169	/				
00170	/				
00171	/				
00172	/				
00173	/				
00174	/				
00175	/				
00176	/				
00177	/				
00178	/				
00179	/				
00180	/				
00181	/				
00182	/				
00183	/				
00184	/				
00185	/				
00186	/				
00187	/				
00188	/				
00189	/				
00190	/				
00191	/				
00192	/				
00193	/				
00194	/				
00195	/				
00196	/				
00197	/				

Address	Item	Ratio	Unit	Description	Remarks
00198	/				
00199	/				
00200	Comm. Speed Adjustment Target Value	1	rpm	16-bit Unsigned	

3.3 FUNCTION CODE 05H MAPPING REMOTE COIL FIELD

Table 4 Remote Coil Field

Modbus Address	Item	Description
0000	Speed Up x1	1 as active
0001	Speed Down x1	1 as active
0002	Speed Up x10	1 as active
0003	Speed Down x10	1 as active

3.4 FUNCTION CODE 06H MAPPING DATA REGISTER FIELD

Table 5 Data Register Field

Modbus Address	Item	Ratio	Description	Remarks
0000-0072	/			
0072	Controller: Year	1	16-bit Unsigned	Save the last two digits of the Year only.
0073	Controller: Month	1	16-bit Unsigned	
0074	Controller: Day	1	16-bit Unsigned	
0075 - 00199	/			
00200	Comm. Speed Adjustment Target Value	1	16-bit Unsigned	

4 EXAMPLES OF MESSAGE FRAME FORMAT

4.1 FUNCTION CODE 03H

With the slave address 01 and the start address 0026H, three pieces of data are as follows (each data length is 2 bytes).

Table 6 Examples of Data Address

Address	Data (Hex)
0026H	0014
0027H	0014
0028H	0005

Table 7 Examples of 03H Master/Host Request

Master/Host Request	Bytes	Examples (Hex)	
Slave Address	1	01	Send to the slave address 01
Function Code	1	03	Read single point register
Start Address	2	00 26	Start address is 0026H
Quantity of Registers	2	00 03	Read 3 registers (6 bytes in total)
CRC Code	2	E4 00	CRC code calculated by the master/host

Table 8 Examples of 03H Slave Response

Slave Response	Bytes	Examples (Hex)	
Slave Address	1	01	Return the slave address 01
Function Code	1	03	Read single point register
Quantity of Bytes	1	06	Read 3 registers (6 bytes in total)
Point 1 Data	2	00 14	Content of Address 0026H
Point 2 Data	2	00 14	Content of Address 0027H
Point 3 Data	2	00 05	Content of Address 0028H
CRC Code	2	91 71	CRC code calculated by the slave

4.2 FUNCTION CODE 05H

With the slave address 01 and one coil in the start address 0002H, write the 0002H unit as 1.

Table 9 Examples of Data Address

Address	Data (Hex)
0000	0
0001	1
0002	0

NOTE: The hexadecimal value FF00 is forced written as 1, and the 000H is forced written as 0. Other values are illegal and do not affect the status of the coil value.

Table 10 Examples of 05H Master/Host Request

Master/Host Request	Bytes	Examples (Hex)
Slave Address	1	01 Send to the slave address 01
Function Code	1	05 Forced written
Start Address	2	00 Start address is 0000H 00
Data	2	FF Write the coil as 1 00
CRC Code	2	CD CRC code calculated by the master/host FB

Table 11 Examples of 05H Slave Response

Slave Response	Bytes	Examples (Hex)
Slave Address	1	01 Return the slave address 01
Function Code	1	05 Forced written
Start Address	2	00 Start address is 0000H 00
Data	2	FF Write the coil as 1 00
CRC Code	2	CD CRC code calculated by the slave FB