SmartGen

MAKING CONTROL SMARTER

HGM6120T

GENSET CONTROLLER

COMMUNICATION PROTOCOL

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Table 1 Software Version

Date	Version	Note
2022-11-28	1.0	Original release.

CONTENT

1. INTRODUCTION

This protocol describes read and write command format of PC serial port and the definition of internal information data for the third-party to develop and use.

MODBUS communication protocol allows the module to transfer information and data effectively with PLC, RTU, SCADA, system of international brands (such as, Schneider, Siemens, and Modicon), and DCS or third-party monitoring system compatible with MODBUS. The monitoring system can be set up if only adding central communication master software (such as Kingview, Intouch, FIX, Synall) basing on PC (or IPC).

2. MODBUS BASIC RULES

- All communication loops should follow the master-slave mode. If so, data can be transferred between a master (e.g. PC) and 32 slaves.
- No communication can start from slaves.
- In communication loop, all communication should be transmitted in “information frame”.
- If received information frame contains unknown command, no response will be given.

3. DATA FRAME FORMAT

Communication is asynchronously transferred, using byte (data frame) as unit. Between master and slave, every transmitted data frame is 10-bit (stop bit: 1) or 11-bit (stop bit: 2) serial data stream.

Table 2 Data Frame Format

Item	Bits
Start bit	1-bit
Data bit	8-bit
Parity bit	No parity
Stop bit	1-bit or 2-bit can be set.
Baud rate	9600bps

4. COMMUNICATION PROTOCOL

4.1 ILLUSTRATION

When communication command is sent to the instrument, device who accords with the address code receives the communication command, then removes address code, and read the information. If no mistakes, it will execute commands, and sends the result back to the sender. Response information includes address code, function code of implemented action, data after implemented action and CRC. If an error occurs in receipt of the command, it will send no information.

4.2 INFORMATION FRAME FORMAT

Table 3 Information Frame Format

Initiating Structure	Address Code	Function Code	Data Field	CRC	End Structure
Delay (equivalent to 4 bytes)	1 byte 8-bit	1 byte 8-bit	N bytes N*8-bit	2 bytes 16-bit	Delay (equivalent to 4 bytes)

4.3 ADDRESS CODE

Address code is the first data frame (8-bit) in each transmitted information frame. Device address range is 1-255, this byte shows that the slave defined by users will receive the information sent by the master. Each slave has a unique address code, and responses begin with the address code. The address code issued by the master means the slave address to be sent to, while address code issued by slave means the responded slave address.

4.4 FUNCTION CODE

4.4.1 ILLUSTRATION

This is the second data of each transmission. ModBus communication protocol defines function code as 1-255 (01H-0FFH). This controller uses part of it. Master sends the request and the slave executes actions according to the function code. By slave response slave can show that it has responded to the master and conducted the action as the function code issued by the slave is the same as the one issued by the master. If the function code MSB is 1 (function code range>127), it means there is no response or response has error.

The following table shows the specific signification and operation of function code.

Table 4 ModBus Partial Function Code

Function code	Definition	Operation
03H	Read Registers	Read one or multiple registers data
05H	Place Single Coil	Place single coil
06H	Write Single Register	Write a 16-bit binary number into the register

4.4.2 03H READ REGISTERS

With function code 03H command, the master can read the numerical registers inside the device (numerical registers contain various collected analog and parameter setting values). Input register values of function code 03H mapping data field are 16 bits (2 bytes). So, from the device reads registers values are 2 bytes. Maximum number of readable registers is 125 each time.

The slave received command format is slave address, function code, data field and the CRC code. The data of data field is in double bytes with every two bytes for a group, and high byte is in advance.

4.4.3 05H PLACE SINGLE COIL

Master uses this command to save a single coil data into bit registers in the device (such as ATS transfer control). The slave also uses this function code to respond information to the master.

4.4.4 06H WRITE SINGLE REGISTER

Master uses this command to save a single register data into registers in the device. The register in ModBus communication protocol refers 16-bit (2 bytes), and high byte is in advance. Thus all points of the device are 2 bytes. Format of command is slave address, function code, data field and CRC code.

4.5 DATA FIELD

4.5.1 ILLUSTRATION

Data field varies with different function codes.

4.5.2 CORRESPONDING DATA FIELD FORMAT TO FUNCTION CODE 03H

Table 5 Master Request

Data Sequence	Data Signification	Byte Count
1	Starting address	2
2	Read registers number	2

Table 6 Slave Response

Data Sequence	Data Signification	Byte Count
1	Loopback bytes	1
2	N - register data	N

4.5.3 CORRESPONDING DATA FIELD FORMAT TO FUNCTION CODE 05H

Table 7 Master Request

Data Sequence	Data Signification	Byte Count
1	Coil address	2
2	Forced single coil value	2

Table 8 Slave Response

Data Sequence	Data Signification	Byte Count
1	Coil address	2
2	Single coil value	2

4.5.4 CORRESPONDING DATA FIELD FORMAT TO FUNCTION CODE 06H

Table 9 Master Request

Data Sequence	Data Signification	Byte Count
1	Register address	2
2	Register value (2 bytes)	2

Table 10 Slave Response

Data Sequence	Data Signification	Byte Count
1	Register address	2
2	Register value (2 bytes)	2

4.6 ERROR CHECK CODE (CRC)

The Error Check Code allows the receiving device to detect a packet that has been corrupted with transmission errors. Sometimes, the transmission information occurs imperceptible changes due to electronic noise and other interference and the CRC code ensures the error information does not work to increase the system's safety and efficiency. CRC applies CRC-16 calibration method.

For 2 bytes CRC, low byte is in the front and high byte is in the back.

NOTE: All information frame formats are same: address code, function code, data field and CRC code.

CRC includes 2 bytes, which is 16-bit binary number. CRC is counted by the sender and placed at the end of the transmitted information. Responded device will recalculate whether the CRC code of the received information is the same as that received. If they are different, then it means there is an error.

CRC counting method: first place 16-bit register as 1. Then gradually tackle with 8-bit data information. Only 8-bit data bit is used in the process of CRC counting. Start bit and stop bit are not included.

In the process of CRC counting, 8-bit data is Exclusive OR with the register data. The obtained result moves 1 bit to the low byte direction and fill MSB with 0. Check LSB again and if LSB is 1, then make register contents Exclusive OR with the preset values. If LSB is 0, then do not do Exclusive OR counting.

This process is repeated for many times. After the eighth bit move, the next 8-bit shall Exclusive OR with the current register contents. This also repeated for 8 times as the last one. Until all data information is handled, the last register contents are CRC value.

CRC-16 Code Calculation Procedure:

1) Place a 16-bit CRC register as hex FFFF.
2) Make the 8-bit data Exclusive OR with the low 8-bit of the CRC register, and put the result in the CRC register.
3) Shift the contents of CRC register one bit to the right, and fill MSB with 0. Examine the moved-out bit.
4) If LSB was 0: repeat Step 3 (another shift).
   If LSB was 1: CRC register Exclusive OR the with hex A001.
5) Repeat Step 3 and 4 until 8 right shifts have been performed. When this is done, all 8–bit data are processed.
6) Repeat Step 2 to 5 for the next data processing.
7) The final CRC register value is the CRC code. Low 8-bit data is transmitted first and high 8-bit data is at the last.

NOTE: The calculating of CRC code starts from <slave address> and except for all bytes of <CRC code>.

4.7 EXAMPLES OF INFORMATION FRAME FORMAT

4.7.1 FUNCTION CODE 03H

Slave address is 01, starting address is 3 data of 0026H (each data with 2 bytes).

Table 11 Point Data Address

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

Table 12 Function Code 03H Master Request Example

Request	Bytes	Example (Hex)
Slave Address	1	01 Send to the slave 01
Function Code	1	03 Read registers
Starting Address	2	00 Starting address is 0026H 26
Read Number	2	00 Read 3 data (total 6 bytes) 03
CRC Code	2	E4 CRC code which calculated by PC. 00

Table 13 Function Code 03H Slave Response Example

Response	Bytes	Example (Hex)
Slave Address	1	01 Respond to the slave 01
Function Code	1	03 Read registers
Read Bytes	1	06 3 points (total 6 bytes)
Point 1 Data	2	00 The content of address 0026H 14
Point 2 Data	2	00 The content of address 0027H 14
Point 3 Data	2	00 The content of address 0028H 05
CRC Code	2	91 CRC code which calculated by slave. 71

4.7.2 FUNCTION CODE 05H

Slave address is 01 and starting address is 1 coil of 0000H. Set 0000H unit as 1.

Table 14 Coil Data Address

Address	Data (Hex)
0000	0
0001	1
0002	0

Illustration: Hex value FF00 forced coil is 1. 0000H is forced as 0. Other values are illegal and do not affect the state of the coil.

Table 15 Function Code 05H Master Request Example

Request	Bytes	Example (Hex)
Slave Address	1	01 Send to the slave 01
Function Code	1	05 Forced coil
Starting Address	2	00 Starting address for 0000H 00
Data	2	FF Set coil as 1 00
CRC Code	2	CD CRC code which calculated by PC. FB

Table 16 Function Code 05H Slave Response Example

Response	Bytes	Example (Hex)
Slave Address	1	01 Respond to the slave 01
Function Code	1	05 Forced coil
Starting Address	2	00 Starting address is 0000H 00
Data	2	FF Set coil as 1 00
CRC Code	2	CD CRC code which calculated by PC. FB

4.7.3 FUNCTION CODE 06H

Slave address is 01, place 1 point content with starting address 00E3H as 0002H.

Table 17 Function Code 06H Master Request Example

Request	Bytes	Example (Hex)
Slave Address	1	01 Send to the slave 01
Function Code	1	06 Write single register
Starting Address	2	00 Starting address is 00E3H E3
Data	2	00 Place 1 point data (total 2 bytes) 02
CRC Code	2	F9 CRC code which calculated by PC. FD

Table 18 Function Code 06H Slave Response Example

Response	Bytes	Example (Hex)
Slave Address	1	01 Respond to the slave 01
Function Code	1	06 Write single register
Starting Address	2	00 Starting address is 00E3H E3
Data	2	00 Place 1 point data (total 2 bytes) 02
CRC Code	2	F9 CRC code which calculated by PC. FD

4.8 ERROR HANDLING

When device detected other errors except the CRC code, the slave must send information to the master. The function code MSB is 1, which means the response function code by slave should add 128 based on the function code. The following codes show that unexpected errors have occurred.

CRC error received from the master will be ignored by the device.

Table 19 Frame Format of Error Code Responded by Slave (CRC excluded)

Item	Bytes
Address Code	1 byte
Function Code	1 byte (MSB is 1)
Error Code	1 byte
CRC Code	2 bytes

Error code:

01 illegal function code

The function code received in the query is not an allowable action for the slave.

02 illegal data address

The data address received in the query is not an allowable address for the slave.

03 illegal data value

A value contained in the query data field is not an allowable value for the slave.

5. ATTACHMENT: ADDRESS AND DATA

5.1 FUNCTION CODE 03H, 06H MAPPING COIL FIELD

06H function code can only be written to address 0309-0314 and 0376-0387, other addresses cannot be written.

Table 20 Function Code 03H, 06H Mapping Coil Field

Address	Item	Description	Bit
0000	Common Alarm 0	1 for active (LSB)	1bit
0001	Common Warning Alarm	1 for active	1bit
0002	Common Shutdown Alarm	1 for active	1bit
0003	Remote Mode	1 for active	1bit
0004	Reserved	1 for active	1bit
0005	Reserved	1 for active	1bit
0006	Mains On-load	1 for active	1bit
0007	Gen On-load	1 for active	1bit
0008	Emergency Stop	1 for active	1bit
0009	Overspeed Alarm Shutdown	1 for active	1bit
0010	Underspeed Alarm Shutdown	1 for active	1bit
0011	Speed Signal Loss Shutdown	1 for active	1bit
0012	Overfrequency Alarm Shutdown	1 for active	1bit
0013	Underfrequency Alarm Shutdown	1 for active	1bit
0014	Overvoltage Alarm Shutdown	1 for active	1bit
0015	Undervoltage Alarm Shutdown	1 for active (MSB)	1bit
0016	Gen Overcurrent Shutdown	1 for active	1bit
0017	Crank Failure	1 for active	1bit
0018	High Temperature Alarm Shutdown	1 for active	1bit
0019	Low Oil Pressure Alarm Shutdown	1 for active	1bit
0020	Frequency Loss Alarm	1 for active	1bit
0021	Input Port Shutdown Alarm	1 for active	1bit
0022	Low Fuel Level Shutdown Alarm	1 for active	1bit
0023	Low Coolant Level Shutdown Alarm	1 for active	1bit
0024	High Temperature Warning Alarm	1 for active	1bit
0025	Low Oil Pressure Warning Alarm	1 for active	1bit
0026	Gen Overcurrent Warning Alarm	1 for active	1bit
0027	Stop Failure Warning Alarm	1 for active	1bit
0028	Low Oil Level Warning	1 for active	1bit
0029	Charge Failure Warning	1 for active	1bit
0030	Battery Undervoltage Warning Alarm	1 for active	1bit
0031	Battery Overvoltage Warning Alarm	1 for active	1bit
0032	Input Port Warning Alarm	1 for active	1bit
0033	Speed Signal Loss Alarm	1 for active	1bit
0034	Low Coolant Level Warning	1 for active	1bit
0035	Temperature Sensor Open Warning	1 for active	1bit

Address	Item	Description	Bit
0036	Oil Pressure Sensor Open Warning	1 for active	1bit
0037	Maintenance Due Warning	1 for active	1bit
0038	Fail to Charge Warning	1 for active	1bit
0039	Overpower Warning	1 for active	1bit
0040	In Test Mode	1 for active	1bit
0041	In Auto Mode	1 for active	1bit
0042	In Manual Mode	1 for active	1bit
0043	In Stop Mode	1 for active	1bit
0044	Temperature Sensor Open Shutdown	1 for active	1bit
0045	Oil Pressure Sensor Open Shutdown	1 for active	1bit
0046	Maintenance Due Shutdown Alarm	1 for active	1bit
0047	Overpower Shutdown Alarm	1 for active	1bit
0048	Emergency Stop Input	1 for active	1bit
0049	Aux. Input 1	1 for active	1bit
0050	Aux. Input 2	1 for active	1bit
0051	Aux. Input 3	1 for active	1bit
0052	Aux. Input 4	1 for active	1bit
0053	Aux. Input 5	1 for active	1bit
0054	Reserved	1 for active	1bit
0055	Reserved	1 for active	1bit
0056	Crank Relay Output	1 for active	1bit
0057	Fuel Relay Output	1 for active	1bit
0058	Aux. Output 1	1 for active	1bit
0059	Aux. Output 2	1 for active	1bit
0060	Aux. Output 3	1 for active	1bit
0061	Aux. Output 4	1 for active	1bit
0062	Overcurrent Fault Shutdown Alarm	1 for active	1bit
0063	Overspeed Shutdown IN Alarm	1 for active	1bit
0064	Mains Failure	1 for active	1bit
0065	Mains OK	1 for active	1bit
0066	Mains Overvoltage	1 for active	1bit
0067	Mains Undervoltage	1 for active	1bit
0068	Mains Loss of Phase	1 for active	1bit
0069	Reserved	1 for active	1bit
0070	Reserved	1 for active	1bit
0071	Reserved	1 for active	1bit
0072	Gen OK	1 for active	1bit
0073	Gen Overvoltage	1 for active	1bit
0074	Gen Undervoltage	1 for active	1bit
0075	Gen Overfrequency	1 for active	1bit
0076	Gen Underfrequency	1 for active	1bit
0077	Gen Overcurrent Warning	1 for active	1bit
0078	In Scheduled Not Run	1 for active	1bit
0079	Reserved	1 for active	1bit

Address	Item	Description	Bit
0080	ECU Shutdown	1 for active	1bit
0081	ECU Communication Failure Alarm Shutdown	1 for active	1bit
0082	Gen Overvoltage Warning	1 for active	1bit
0083	Gen Undervoltage Warning	1 for active	1bit
0084	Gen Overfrequency Warning	1 for active	1bit
0085	Gen Underfrequency Warning	1 for active	1bit
0086	Gen Overcurrent Warning	1 for active	1bit
0087	Reserved	1 for active	1bit
0088	ECU Warning	1 for active	1bit
0089	GSM Communication Failure Warning	1 for active	1bit
0090	Reserved	1 for active	1bit
0091	Reserved	1 for active	1bit
0092	Reserved	1 for active	1bit
0093	Reserved	1 for active	1bit
0094	Reserved	1 for active	1bit
0095	Reserved	1 for active	1bit
0096	Reserved	1 for active	1bit
0097	Reserved	1 for active	1bit
0098	Reserved	1 for active	1bit
0099	Reserved	1 for active	1bit
00100	Reserved	1 for active	1bit
00101	Reserved	1 for active	1bit
00102	Reserved	1 for active	1bit
00103	Reserved	1 for active	1bit
00104	Reserved	1 for active	1bit
00105	Reserved	1 for active	1bit
00106	Reserved	1 for active	1bit
00107	Reserved	1 for active	1bit
00108	Reserved	1 for active	1bit
00109	Reserved	1 for active	1bit
00110	Reserved	1 for active	1bit
00111	Reserved	1 for active	1bit
00112	High Room Temperature Warning Alarm	1 for active	1bit
00113	Low Fuel Level IN Warning	1 for active	1bit
00114	Low Battery Pack Voltage Warning	1 for active	1bit
00115	Access Control IN Warning	1 for active	1bit
00116	1#ATS Transfer Failure Warning	1 for active	1bit
00117	2#ATS Transfer Failure Warning	1 for active	1bit
00118	Reserved	1 for active	1bit
00119	Reserved	1 for active	1bit
00120			

5.2 FUNCTION CODE 05H CORRESPONDING REMOTE COIL FIELD

Table 21 Function Code 05H Corresponding Remote Coil Field

Address	Item	Description
0000H	Remote Oil Engine in Start Status	1 for active (e.g. 0x00FF for active)
0001H	Remote Oil Engine in Stop Status	1 for active (e.g. 0x00FF for active)
0002H	Remote Oil Engine in Test Status	1 for active (e.g. 0x00FF for active)
0003H	Remote Oil Engine in Auto Status	1 for active (e.g. 0x00FF for active)
0004H	Remote Oil Engine in Manual Status	1 for active (e.g. 0x00FF for active)
0005H	Remote 1# ATS Gen C/O Key	1 for active (e.g. 0x00FF for active)
0006H	Remote 1# ATS Mains C/O Key	1 for active (e.g. 0x00FF for active)
0007H	Remote 2# ATS Gen C/O Key	1 for active (e.g. 0x00FF for active)
0008H	Remote 2# ATS Mains C/O Key	1 for active (e.g. 0x00FF for active)
0009H	Remote Door Output Control	Output (e.g. 0xFF00 for active)

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

Example:

Remotely control controller in auto mode, firstly get its remote address is 03H by checking the table.

Assume the slave address is 01, the mast request command is as the following:

Table 22 Master Request Command

Slave Address	Function Code	Remote Address (03H)		Remote Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**00**	**03**	**00**	**FF**	**7D**	**8A**

Slave response command is as the following:

Table 23 Slave Response Command

Slave Address	Function Code	Remote Address (03H)		Remote Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**00**	**03**	**00**	**FF**	**7D**	**8A**

5.3 FUNCTION CODE 03, 06 CORRESPONDING ADDRESS TABLE

Table 24 Function Code 03, 06 Corresponding Address

Address	Item	Description	Bytes
0000	Mains UA	Unsigned	2Bytes
0001	Mains UB	Unsigned	2Bytes
0002	Mains UC	Unsigned	2Bytes
0003	Mains UAB	Unsigned	2Bytes
0004	Mains UBC	Unsigned	2Bytes
0005	Mains UCA	Unsigned	2Bytes
0006	Mains Frequency	Unsigned (*10)	2Bytes
0007	Gen UA	Unsigned	2Bytes
0008	Gen UB	Unsigned	2Bytes
0009	Gen UC	Unsigned	2Bytes
0010	Gen UAB	Unsigned	2Bytes
0011	Gen UBC	Unsigned	2Bytes
0012	Gen UCA	Unsigned	2Bytes
0013	Gen Frequency	Unsigned (*10)	2Bytes
0014	A Phase Current	Unsigned	2Bytes
0015	B Phase Current	Unsigned	2Bytes
0016	C Phase Current	Unsigned	2Bytes
0017	Water Temperature Value	Unsigned	2Bytes
0018	Water Temperature Resistance Value	Unsigned (*10)	2Bytes
0019	Oil Pressure Value	Unsigned	2Bytes
0020	Oil Pressure Resistance Value	Unsigned (*10)	2Bytes
0021	Level Value	Unsigned	2Bytes
0022	Level Resistance Value	Unsigned (*10)	2Bytes
0023	Speed	Unsigned (*10)	2Bytes
0024	Battery Voltage	Unsigned (*10)	2Bytes
0025	D+ Voltage	Unsigned (*10)	2Bytes
0026	Active Power	Unsigned	2Bytes
0027	Reactive Power	Unsigned	2Bytes
0028	Apparent Power	Unsigned	2Bytes
0029	Power Factor	Unsigned (*100)	2Bytes
0030	Maintenance Countdown (h)	Unsigned	2Bytes
0031	Maintenance Countdown (min)	Unsigned	2Bytes
0032	Battery Pack Voltage	Unsigned	2Bytes
0033	Reserved	Unsigned	2Bytes
0034	Controller Running Status: Generator Status Table	Unsigned	2Bytes
0035	Delay	Unsigned	2Bytes
0036	Auto Running Status 0 Start 1 Stop 2 No Delay	Unsigned	2Bytes
0037	Delay	Unsigned	2Bytes

Address	Item	Description	Bytes
0038	ATS Running Status 0 No Delay 1 Transfer Rest	Unsigned	2Bytes
0039	Delay	Unsigned	2Bytes
0040	Mains Status 0 Normal 1 Abnormal 2 No Delay	Unsigned	2Bytes
0041	Delay	Unsigned	2Bytes
0042	Oil Engine Total Running Time (h) MSB	Unsigned (0-9999)	2Bytes
0043	Oil Engine Total Running Time (h) LSB	Unsigned (0-9999)	2Bytes
0044	Oil Engine Total Running Time (min)	Unsigned (0-9999)	2Bytes
0045	Oil Engine Total Running Time (s)	Unsigned (0-9999)	2Bytes
0046	Total Start Times MSB	Unsigned (0-9999)	2Bytes
0047	Total Start Times LSB	Unsigned (0-9999)	2Bytes
0048	Total Energy MSB	Unsigned (0-9999)	2Bytes
0049	Total Energy LSB	Unsigned (0-9999)	2Bytes
0050	Software Version	Unsigned (*10)	2Bytes
0051	Hardware Version (newly added)	Signed (*10)	2Bytes
0052	A Phase Active Power	Unsigned	2Bytes
0053	B Phase Active Power	Unsigned	2Bytes
0054	C Phase Active Power	Unsigned	2Bytes
0055	Load Output Percentage	Unsigned %	2Bytes
0056	Reserved	Unsigned	2Bytes
0057	Reserved	Unsigned	2Bytes
0058	Coolant Level	Unsigned	2Bytes
0059	Oil Temperature	Unsigned	2Bytes
0060	Coolant Pressure	Unsigned	2Bytes
0061	Fuel Pressure	Unsigned	2Bytes
0062	Fuel Temperature	Unsigned	2Bytes
0063	Inlet Temperature	Unsigned	2Bytes
0064	Outlet Temperature	Unsigned	2Bytes
0065	Turbo Pressure	Unsigned	2Bytes
0066	Fuel Consumption	Unsigned	2Bytes
0067	Reserved	Unsigned	2Bytes
0068 0069	Total Fuel Consumption	Unsigned	4Bytes
0070	SCM Internal Temperature	Unsigned (*10)	
0071	Controller Model	Unsigned	
0072	Controller Time: Year	Unsigned	2Bytes
0073	Controller Time: Month	Unsigned	2Bytes
0074	Controller Time: Day	Unsigned	2Bytes
0075	Controller Time: Week	Unsigned	
0076	Controller Time: Hour	Unsigned	
0077	Controller Time: Minute	Unsigned	
0078	Controller Time: Second	Unsigned	
0079	Release Year	Unsigned	

Address	Item	Description	Bytes
0080	Release Month	Unsigned	
0081	Release Day	Unsigned	
0082	Reserved	Unsigned	
0083	Reserved	Unsigned	
0084	Reserved	Unsigned	
0085	Reserved	Unsigned	
0086 0087	ECU Running Time		
0088	Reserved		
0089	Reserved		
0090	Reserved		
0091	Reserved		
0092	Reserved		
0093	Reserved		
0094	Reserved		
0095	Reserved		
0096	Reserved		
0097	Reserved		
0098 0099	GPS Longitude	Signed (*1000000)	4Bytes
00100 00101	GPS Latitude	Signed (*1000000)	4Bytes
00102 00103	GPS Altitude	Signed (*1000000)	4Bytes
00104	GPS Numbers	Unsigned	2Bytes
00105	GSM Energy	Unsigned	2Bytes
00106 00107	MCUID_H1	Unsigned	4Bytes
00108 00109	MCUID_H2	Unsigned	4Bytes
00110 00111	MCUID_L	Unsigned	4Bytes
00112	Reserved		
00113	Reserved		
00114	Reserved		
00115	Reserved		
00116	Reserved		
00117			
00118	Room Temperature		
00119	Room Temperature Resistance		
00120	2#ATS Running Status		
00121	Delay		
00122	1#ATS Running Status		
00123	Delay		

5.4 COMMON SOLUTIONS OF COMMUNICATION FAILURE

1) Check whether the positive and negative of RS485 is correctly connected;
2) Check whether the communication parameter setting in parameter setting is correct;
3) Check whether the RS485 converter (if configured) is normal;
4) 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.