HAT833

THREE POWER ATS CONTROLLER

COMMUNICATION PROTOCOL

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO.,LTD.

Chinese trademark

English trademark

SmartGen — make your generator ***smart***
SMARTGEN TECHNOLOGY CO., LTD.
No.28 Jinsuo Road
Zhengzhou
Henan Province
P. R. China
Tel: 0086-371-67988888/67981888
0086-371-67991553/67992951
0086-371-67981000(overseas)
Fax: 0086-371-67992952
Web: www.smartgen.com.cn
www.smartgen.cn
Email: sales@smartgen.cn

Table 1 - Software Version

Date	Version	Note
2018-09-04	1.0	Original release.

CONTENT

1 OVERVIEW

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, there is no response.

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	Description
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 INTRODUCTION

When communication command is sent to the slave, corresponding slave 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 master. Response information includes address code, function code, data and error check code (CRC). If an error occurred 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’ time)	1 byte 8-bit	1 byte 8-bit	N bytes N*8-bit	2 bytes 16-bit	Delay (equivalent to 4 bytes’ time)

4.3 ADDRESS CODE

Address code is the first data frame (8-bit) in each transmitted information frame, 0-255. Single device address range is 1–247, this byte shows that the slave defined by users will recieve the information sent by the master. Each slave has a unique address code, and responses begin with the address code. A master addresses a slave by placing the slave address in the address field of the message. When the slave sends its response, it places its own address in this address field of the response to let the master know which slave is responding.

4.4 FUNCTION CODE

4.4.1 INSTRUCTION

This is the second byte of each transmission. ModBus communication protocol defined function code as 1-255 (01H-0FFH). HAT833 ATS controller uses part of them. Master sends the request and the slave executes actions accoding to the fuction code. If the function code sent by slave is same as that sent by master, it means the response is active. But if the function code MSB is 1 (function code range>127), it means there is no respose or respose 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 Holding Registers	Reads the contents of holding registers.
05H	Force Single Coil	Forces a single coil to either ON or OFF.
06H	Preset Single Register	Write a 16-bit value into a single holding register.

4.4.2 03H READ HOLDING REGISTERS

With fuction code 03H command, the master can read the numerical registers inside the device (numerical registers contains various 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 FORCE 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 foldback information to the master.

4.4.4 06H PRESET SINGLE REGISTER

Master uses this command to save a single register data into registers in the device. The register data in the ModBus communication is 16-bit (2 bytes) and the first byte contains the high order bits and the second contains the low order bits. Thus all the points of device are all 2 bytes. Command format is slave address, function code, data field and the CRC code.

4.5 DATA FIELD

4.5.1 INSTRUCTION

Data fields are varies with different function codes.

4.5.2 FUNCTION CODE (03H) –READ HOLDING REGISTERS.

Request:

Data sequence	Data signification	Byte count
1	Starting address	2
2	Read registers	2

Response:

Data sequence	Data signification	Byte count
1	Loopback byte count	1
2	N - register data	N

4.5.3 FUNCTION CODE (05H) –FORCE SINGLE COIL

Request:

Data sequence	Data signification	Byte count
1	Coil address	2
2	Forced single coil value	2

Response:

Data sequence	Data signification	Byte count
1	Coil address	2
2	Single coil value	2

4.5.4 FUNCTION CODE (06H) –PRESET SINGLE REGISTER

Request:

Data sequence	Data signification	Byte count
1	Register address	2
2	Register value (2-byte)	2

Response:

Data sequence	Data signification	Byte count
1	Register address	2
2	Register value (2-byte)	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 ensure the error information does not work to increase the system's safety and efficiency.

When the CRC is appended to the message, the low-order byte is appended first, followed by the high-order byte.

Note: All information frame format are same: address code, function code, data area and CRC code.

The CRC field is two bytes, containing a 16-bit binary value. The CRC value is calculated by the transmitting device, which appends the CRC to the message. The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value that received in the CRC field. If the two values are not equal, an error results.

The CRC is started by first preloading a 16–bit register to all 1's. Then a process begins of applying successive 8–bit bytes of the message to the current contents of the register. Only the eight bits of data in each character are used for generating the CRC. Start and stop bits do not apply to the CRC.

During generation of the CRC, each 8–bit character is exclusive ORed with the register contents. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB was a 1, the register is then exclusive ORed with a preset, fixed value. If the LSB was a 0, no exclusive OR takes place.

This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next 8–bit byte is exclusive ORed with the register's current value, and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value.

A procedure for generating a CRC-16 is:

- Load a 16–bit register with FFFF hex (all 1's). Call this the CRC register.
- Exclusive OR the first 8–bit byte of the message with the low–order byte of the 16–bit CRC register, putting the result in the CRC register.
- Shift the CRC register one bit to the right (toward the LSB), zero–filling the MSB. Extract and examine the LSB.
- (If the LSB was 0): Repeat Step 3 (another shift).
- (If the LSB was 1): Exclusive OR the CRC register with the polynomial value A001 hex (1010 0000 0000 0001).
- Repeat Steps 3 and 4 until 8 shifts have been performed. When this is done, a complete 8–bit byte will have been processed.
- Repeat Steps 2 through 5 for the next 8–bit byte of the message. Continue doing this until all bytes have been processed.
- The final contents of the CRC register are the CRC value. Least Significant Byte first. When the 16–bit CRC (two 8–bit bytes) is transmitted in the message, the low-order byte will be transmitted first, followed by the high-order byte.

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 and starting address is 3 registers of 0026H (each data is 2 bytes).

Data Address

Address	Data(Hex)
0026	0014
0028	0014
002A	0005

Request

Request	Bytes	Example (Hex)
Slave address	1	01 Send to the slave 01
Function code	1	03 Read Holding Registers
Starting address	2	00 Starting address is 0026H 26
No. of Points	2	00 Read 3 registers (total 6 bytes) 03
CRC code	2	E4 CRC code which calculated by PC. 00

Response

Response	Bytes	Example (Hex)
Slave address	1	01 Respond to the slave 01
Function code	1	03 Read register
Read count	1	06 3 registers (total 6 bytes)
Data 1	2	00 The content of address 0026H 14
Data 2	2	00 The content of address 0027H 14
Data 3	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

Read coil for slave address is 01 and starting address is 0002H. 0002H is addressed as 1.

Coil Data Address

Address	Data(Hex)
0000	0
0001	1
0002	0

Note: A value of FF 00 hex requests the coil to be ON. A value of 00 00H requests it to be OFF. All other values are illegal and will not affect the coil.

Request

Request	Bytes	For example (Hex)
Slave address	1	01 Send to the slave 01
Function code	1	05 Force single coil
Starting address	2	00 Starting address for 0000H 00
Data	2	FF Set coil as 1 00
CRC code	2	04 CRC code which calculated by PC. 3A

Slave Response

Slave response	Bytes	For example (Hex)
Slave address	1	01 Respond to the slave 01
Function code	1	05 Force single coil
Starting address	2	00 Starting address is 0000H 00
Data	2	FF Set coil as 1 00
CRC code	2	04 CRC code which calculated by slave. 3A

4.7.3 FUNCTION CODE 06H

Slave address is 01 and starting address is one register of 00E3H(content is 0002H).

Request	Bytes	Example (Hex)
Slave address	1	01 Send to the slave 01
Function code	1	06 Preset Single Register
Starting address	2	00 Starting address is 0026H 26
Data	2	00 Preset Register Data (2 bytes) 14
CRC code	2	68 CRC code which calculated by PC. 0E

Slave response	Bytes	For example (Hex)
Slave address	1	01 Respond to the slave 01
Function code	1	06 Preset Single Register
Starting address	2	00 Starting address is 0026H 26
Data	2	00 Preset Register Data (2 bytes) 14
CRC code	2	68 CRC code which calculated by PC. 0E

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 5 - Error Code Format Responded By Slave(CRC excluded)

Type	Byte
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 ADDRESS AND DATA

5.1 FUNCTION CODE 03H MAP DATA FIELD

Address(decimal)	Item	Description	Bytes Count
0500	Common Alarm	1 for active(LSB)	1bit
	Common Warn Alarm	1 for active	1bit
	Common Fault Alarm	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Audible Alarm	1 for active	1bit
	Reserved	1 for active	1bit
	Auto Mode	1 for active	1bit
	Reserved	1 for active	1bit
	S1 Priority	1 for active	1bit
	S2 Priority	1 for active	1bit
	S3 Priority	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Genset Start Output	1 for active(MSB)	1bit
0501	S1 Voltage Normal	1 for active(LSB)	1bit
	S1 Voltage Abnormal	1 for active	1bit
	S1 Voltage Instant Abnormal	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	S1 Start Output	1 for active	1bit
	S1 No Volt	1 for active	1bit
	S1 Over Volt	1 for active	1bit
	S1 Under Volt	1 for active	1bit
	S1 Over Freq	1 for active	1bit
	S1 Under Freq	1 for active	1bit
	S1 Loss of Phase	1 for active	1bit
	S1 Phase Sequence Wrong	1 for active	1bit
	Reserved	1 for active(MSB)	1bit
0502	S2 Voltage Normal	1 for active(LSB)	1bit
	S2 Voltage Abnormal	1 for active	1bit
	S2 Voltage Instant Abnormal	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit

Address(decimal)	Item	Description	Bytes Count
	S2 Start Output	1 for active	1bit
	S2 No Volt	1 for active	1bit
	S2 Over Volt	1 for active	1bit
	S2 Under Volt	1 for active	1bit
	S2 Over Freq	1 for active	1bit
	S2 Under Freq	1 for active	1bit
	S2 Loss of Phase	1 for active	1bit
	S2 Phase Sequence Wrong	1 for active	1bit
	Reserved	1 for active(MSB)	1bit
0503	Breaker Failure	1 for active(LSB)	1bit
	S1 Close Failure	1 for active	1bit
	S1 Open Failure	1 for active	1bit
	Reserved	1 for active	1bit
	S2 Close Failure	1 for active	1bit
	S2 Open Failure	1 for active	1bit
	S3 Close Failure	1 for active	1bit
	S3 Open Failure	1 for active	1bit
	S1 Load Over Current Trip	1 for active	1bit
	S2 Load Over Current Trip	1 for active	1bit
	Forced Open Failure Alarm	1 for active	1bit
	S1 Genset Fault	1 for active	1bit
	S2 Genset Fault	1 for active	1bit
	Trip Alarm	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active(MSB)	1bit
0504	S1 Load Over Current Warn	1 for active(LSB)	1bit
	S2 Load Over Current Warn	1 for active	1bit
	Forced Open Warn	1 for active	1bit
	Battery Under Volt Warn	1 for active	1bit
	Battery Over Volt Warn	1 for active	1bit
	Reserved	1 for active	1bit
	S3 Load Over Current Warn	1 for active	1bit
	Reserved	1 for active	1bit
	S3 Load Over Current Trip	1 for active	1bit
	S3 Genset Fault	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active(MSB)	1bit
0505	Digital Input 1 Status	1 for active(LSB)	1bit
	Digital Input 2 Status	1 for active	1bit

Address(decimal)	Item	Description	Bytes Count
	Digital Input 3 Status	1 for active	1bit
	Digital Input 4 Status	1 for active	1bit
	Digital Input 5 Status	1 for active	1bit
	Digital Input 6 Status	1 for active	1bit
	Digital Input 7 Status	1 for active	1bit
	Digital Input 8 Status	1 for active	1bit
	Digital Input 9 Status	1 for active	1bit
	Digital Input 10 Status	1 for active	1bit
	Digital Input 11 Status	1 for active	1bit
	Digital Input 12 Status	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active(MSB)	1bit
0506	Relay Output 1 Status	1 for active(LSB)	1bit
	Relay Output 2 Status	1 for active	1bit
	Relay Output 3 Status	1 for active	1bit
	Relay Output 4 Status	1 for active	1bit
	Relay Output 5 Status	1 for active	1bit
	Relay Output 6 Status	1 for active	1bit
	Relay Output 7 Status	1 for active	1bit
	Relay Output 8 Status	1 for active	1bit
	Relay Output 9 Status	1 for active	1bit
	Relay Output 10 Status	1 for active	1bit
	Relay Output 11 Status	1 for active	1bit
	Relay Output 12 Status	1 for active	1bit
	L Power Output Status	1 for active	1bit
	N Power Output Status	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active(MSB)	1bit
0507	S1 Close Control Output	1 for active(LSB)	1bit
	S1 Open Control Output	1 for active	1bit
	S2 Close Control Output	1 for active	1bit
	S2 Open Control Output	1 for active	1bit
	S1 Breaker Close Status	1 for active	1bit
	S2 Breaker Close Status	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Manual Test S1	1 for active	1bit
	Manual Test S2	1 for active	1bit
	Manual Test S3	1 for active	1bit
	Reserved	1 for active	1bit
	Remote Start Load	1 for active	1bit

Address(decimal)	Item	Description	Bytes Count
	Remote Start Off Load	1 for active	1bit
	Mains Start Abnormal	1 for active	1bit
	Scheduled Run	1 for active(MSB)	1bit
0508	Cycle Start	1 for active(LSB)	1bit
	Balance Start	1 for active	1bit
	Priority Start	1 for active	1bit
	Reserved	1 for active	1bit
	Scheduled Not Run	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Start Inhibited	1 for active	1bit
	Reserved	1 for active	1bit
	S1 Close Inhibited	1 for active	1bit
	S2 Close Inhibited	1 for active	1bit
	Wait for S1 to Prepare Close PF Input	1 for active	1bit
	Wait for S2 to Prepare Close PF Input	1 for active(MSB)	1bit
0509	NEL1 Trip Control	1 for active(LSB)	1bit
	NEL2 Trip Control	1 for active	1bit
	NEL3 Trip Control	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Elevator Control	1 for active	1bit
	Reserved	1 for active	1bit
	S3 Close Inhibited	1 for active	1bit
	Reserved	1 for active	1bit
	Wait for S3 to Prepare Close PF Input	1 for active	1bit
	Reserved	1 for active	1bit
	Auto Trans./Restore	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active(MSB)	1bit
0510	QS3 Close Control Output	1 for active (LSB)	1bit
	QS3 Open Control Output		
	Reserved		
	Reserved		
	Reserved		
	Reserved		
	QS3 Breaker Close Status		
	Reserved		

Address(decimal)	Item	Description	Bytes Count
	Reserved		
	Reserved		
	Reserved		
	Reserved		
	Reserved		
	Reserved		
	Reserved		
	Reserved		
0511	S3 Volt Normal		
	S3 Volt Abnormal		
	S3 Volt Instant Abnormal		
	Reserved		
	Reserved		
	Reserved		
	Reserved		
	S3 Genset Start Output		
	S3 No Volt		
	S3 Over Volt		
	S3 Under Volt		
	S3 Over Frequency		
	S3 Under Frequency		
	S3 Loss of Phase		
	S3 Phase Sequence Wrong		
	Reserved		
1000	UAB1	Unsigned	2Bytes
1001	UBC1	Unsigned	2Bytes
1002	UCA1	Unsigned	2Bytes
1003	UA1	Unsigned	2Bytes
1004	UB1	Unsigned	2Bytes
1005	UC1	Unsigned	2Bytes
1006	UA1 Phase	Signed(*10)	2Bytes
1007	UB1 Phase	Signed(*10)	2Bytes
1008	UC1 Phase	Signed(*10)	2Bytes
1009	Freq 1	Signed(*100)	2Bytes
1010	UAB3		2Bytes
1011	UBC3		2Bytes
1012	UCA3		2Bytes
1013	UA3		2Bytes
1014	UB3		2Bytes
1015	UC3		2Bytes
1016	UA3 Phase		2Bytes
1017	UB3 Phase		2Bytes
1018	UC3 Phase		2Bytes

Address(decimal)	Item	Description	Bytes Count
1019	Frequency 3		2Bytes
1020	UAB2	Unsigned	2Bytes
1021	UBC2	Unsigned	2Bytes
1022	UCA2	Unsigned	2Bytes
1023	UA2	Unsigned	2Bytes
1024	UB2	Unsigned	2Bytes
1025	UC2	Unsigned	2Bytes
1026	UA2 Phase	Signed(*10)	2Bytes
1027	UB2 Phase	Signed(*10)	2Bytes
1028	UC2 Phase	Signed(*10)	2Bytes
1029	Freq2	Signed(*100)	2Bytes
1030	Reserved		2Bytes
1031	Reserved		2Bytes
1032	Reserved		2Bytes
1033	Reserved		2Bytes
1034	Reserved		2Bytes
1035	Reserved		2Bytes
1036	Reserved		2Bytes
1037	Reserved		2Bytes
1038	Reserved		2Bytes
1039	Reserved		2Bytes
1040	A-Phase Current	Unsigned(*10)	2Bytes
1041	B-Phase Current	Unsigned(*10)	2Bytes
1042	C-Phase Current	Unsigned(*10)	2Bytes
1043	Reserved	Unsigned(*10)	2Bytes
1044	A-Phase Current Phase	Signed(*10)	2Bytes
1045	B-Phase Current Phase	Signed(*10)	2Bytes
1046	C-Phase Current Phase	Signed(*10)	2Bytes
1047	N-Wire Current Phase	Signed(*10)	2Bytes
1048 1049	A-phase Active Power	Signed(*10)	4Bytes
1050 1051	B-phase Active Power	Signed(*10)	4Bytes
1052 1053	C-phase Active Power	Signed(*10)	4Bytes
1054 1055	Total Active Power	Signed(*10)	4Bytes
1056 1057	A-phase Reactive Power	Signed(*10)	4Bytes
1058 1059	B-phase Reactive Power	Signed(*10)	4Bytes
1060 1061	C-phase Reactive Power	Signed(*10)	4Bytes

Address(decimal)	Item	Description	Bytes Count
1062 1063	Total Reactive Power	Signed(*10)	4Bytes
1064 1065	A-phase Apparent Power	Signed(*10)	4Bytes
1066 1067	B-phase Apparent Power	Signed(*10)	4Bytes
1068 1069	C-phase Apparent Power	Signed(*10)	4Bytes
1070 1071	Total Apparent Power	Signed(*10)	4Bytes
1072	A-phase Power Factor	Signed(*100)	2Bytes
1073	B-phase Power Factor	Signed(*100)	2Bytes
1074	C-phase Power Factor	Signed(*100)	2Bytes
1075	Average Power Factor	Signed(*100)	2Bytes
1076	Reserved		2Bytes
1077	Reserved		2Bytes
1078	Reserved		2Bytes
1079	Reserved		2Bytes
1080	Battery Voltage	Signed(*10)	2Bytes
1081	Reserved		2Bytes
1082	Reserved		2Bytes
1083	Reserved		2Bytes
1084	Reserved		2Bytes
1085	Reserved		2Bytes
1086	Reserved		2Bytes
1087	Reserved		2Bytes
1088	S1 Voltage Status	See Voltage Status Description	2Bytes
1089	S1 Voltage Status Delay		2Bytes
1090	S2 Voltage Status	See Voltage Status Description	2Bytes
1091	S2 Voltage Status Delay		2Bytes
1092	Genset Status	See Genset Status Description	2Bytes
1093	Genset Status Delay		2Bytes
1094	ATS Status	See ATS Status Description	2Bytes
1095	ATS Status Delay		2Bytes
1096	S3 Volt Status	See Voltage Status Description	2Bytes
1097	S3 Volt Status Delay		2Bytes
1098	Transfer Priority	0: S1>S2>S3 1: S2>S1>S3 2: S3>S1>S2 3: S1>S3>S2 4: S2>S3>S1 5: S3>S2>S1	2Bytes
1099	Reserved		2Bytes

Address(decimal)	Item	Description	Bytes Count
1100	Controller Current Time (YY)	Unsigned	2Bytes
1101	Controller Current Time (MM)	Unsigned	2Bytes
1102	Controller Current Time (DD)	Unsigned	2Bytes
1103	Controller Current Time (Week)	Unsigned	2Bytes
1104	Controller Current Time (HH)	Unsigned	2Bytes
1105	Controller Current Time (MM)	Unsigned	2Bytes
1106	Controller Current Time (SS)	Unsigned	2Bytes
1107	Reserved		2Bytes
1108	Reserved		2Bytes
1109	Reserved		2Bytes
1110	Reserved		2Bytes
1111	Continue Power Supply Hours	Unsigned	2Bytes
1112	Continue Power Supply Minutes	Unsigned	2Bytes
1113	Continue Power Supply Seconds	Unsigned	2Bytes
1114	Last Continue Power Supply Hours	Unsigned	2Bytes
1115	Last Continue Power Supply Minutes	Unsigned	2Bytes
1116	Last Continue Power Supply Seconds	Unsigned	4Bytes
1117	S1 Total Power Supply Hours(LSB)	Unsigned	2Bytes
1118	S1 Total Power Supply Hours(MSB)		2Bytes
1119	S1 Total Power Supply Minutes	Unsigned	2Bytes
1120	S1 Total Power Supply Seconds	Unsigned	2Bytes
1121	S2 Total Power Supply Hours(LSB)	Unsigned	2Bytes
1122	S2 Total Power Supply Hours(MSB)		2Bytes
1123	S2 Total Power Supply Minutes	Unsigned	2Bytes
1124	S2 Total Power Supply Seconds	Unsigned	2Bytes
1125	S1 Total Active Power kwh(LSB)	Unsigned	2Bytes
1126	S1 Total Active Power kwh(MSB)		2Bytes
1127	S1 Total Reactive Power kVarh(LSB)	Unsigned	2Bytes
1128	S1 Total Reactive Power kVarh(MSB)		2Bytes
1129	S1 Total Close Times(LSB)	Unsigned	2Bytes
1130	S1 Total Close Times(MSB)	Unsigned	2Bytes
1131	S2 Total Active Power kwh(LSB)	Unsigned	2Bytes
1132	S2 Total Active Power kwh(MSB)		2Bytes
1133	S2 Total Reactive Power kVarh(LSB)	Unsigned	2Bytes
1134	S2 Total Reactive Power kVarh(MSB)		2Bytes
1135	S2 Total Close Times (LSB)	Unsigned	2Bytes
1136	S2 Total Close Times (MSB)	Unsigned	2Bytes
1137	Reserved		
1138	Reserved		
1139	S3 Total Power Supply Hours(LSB)	Unsigned	4Bytes
1140	S3 Total Power Supply Hours(MSB)		
1141	S3 Total Power Supply Minutes	Unsigned	2Bytes
1142	S3 Total Power Supply Seconds	Unsigned	2Bytes

Address(decimal)	Item	Description	Bytes Count
1143	S3 Total Active Power kwh(LSB)	Unsigned	4Bytes
1144	S3 Total Active Power kwh(MSB)		
1145	S3 Total Reactive Power kVarh(LSB)	Unsigned	4Bytes
1146	S3 Total Reactive Power kVarh(MSB)		
1147	S3 Total Close Times(LSB)	Unsigned	4Bytes
1148	S3 Total Close Times(MSB)		
1149	Reserved	Unsigned	4Bytes
1150	Reserved		2Bytes

5.2 FUNCTION CODE 05H MAP DATA FIELD

Address	Item	Description
15000	Reserved	
15001	Reserved	
15002	Reserved	
15003	Reserved	
15004	Auto/Manual	0: Manual 1: Auto
15005	Reserved	
15006	Reserved	
15007	Alarm Reset	1 for active
15008	Remote Start Genset 1	1 for active
15009	Remote Stop Genset 1	1 for active
15010	Remote Start Genset 2	1 for active
15011	Remote Stop Genset 2	1 for active
15012	Remote Output 1 Output	1 for active
15013	Remote Output 2 Output	1 for active
15014	Remote Output 3 Output	1 for active
15015	Remote Output 4 Output	1 for active
15016	Remote Output 5 Output	1 for active
15017	Remote Output 6 Output	1 for active
15018	Remote Output 7 Output	1 for active
15019	Remote Output 8 Output	1 for active
15020	Remote Output 9 Output	1 for active
15021	Remote Output 10 Output	1 for active
15022	Remote Output 11 Output	1 for active
15023	Remote Output 12 Output	1 for active
15024	Remote Start Genset 3	1 for active
15025	Remote Stop Genset 3	1 for active
15026	Reserved	1 for active
15027	Reserved	1 for active
15028	Reserved	1 for active
15029	Reserved	1 for active
15030	Remote Switch Transfer 000	
15031	Reserved	
15032	Reserved	
15033	Reserved	1 for active
15034	Remote Switch Transfer 100	1 for active
15035	Remote Switch Transfer 001	1 for active
15036	Remote Switch Transfer 010	1 for active

5.3 S1 VOLTAGE STATUS DESCRIPTION

Count	Status	Delay	Note
0	S1 Normal Identify	Delay (Unit:s)	
1	S1 Abnormal Identify	Delay (Unit:s)	
2	S1 Volt Normal	No Delay	
3	S1 No Volt	No Delay	
4	S1 Over Volt	No Delay	
5	S1 Under Volt	No Delay	
6	S1 Over Freq	No Delay	
7	S1 Low Freq	No Delay	
8	S1 Loss of Phase	No Delay	
9	S1 Phase Sequence Wrong	No Delay	

5.4 S2 VOLTAGE STATUS DESCRIPTION

Count	Status	Delay	Note
0	S2 Normal Identify	Delay (Unit:s)	
1	S2 Abnormal Identify	Delay (Unit:s)	
2	S2 Volt Normal	No Delay	
3	S2 No Volt	No Delay	
4	S2 Over Volt	No Delay	
5	S2 Under Volt	No Delay	
6	S2 Over Freq	No Delay	
7	S2 Under Freq	No Delay	
8	S2 Loss of Phase	No Delay	
9	S2 Phase Sequence Wrong	No Delay	

5.5 S3 VOLTAGE STATUS DESCRIPTION

Count	Status	Delay	Note
0	S3 Normal Identify	Delay (Unit:s)	
1	S3 Abnormal Identify	Delay (Unit:s)	
2	S3 Volt Normal	No Delay	
3	S3 No Volt	No Delay	
4	S3 Over Volt	No Delay	
5	S3 Under Volt	No Delay	
6	S3 Over Freq	No Delay	
7	S3 Under Freq	No Delay	
8	S3 Loss of Phase	No Delay	
9	S3 Phase Sequence Wrong	No Delay	

5.6 GENSET STATUS DESCRIPTION

Count	Status	Delay	Note
0	Start Delay	Delay (Unit:s)	
1	Stop Delay	Delay (Unit:s)	
2	Scheduled No Run	Delay (Unit:s)	
3	Scheduled Run	Delay (Unit:s)	
4	S1 Cycle Running	Delay (Unit:s)	

Count	Status	Delay	Note
5	S2 Cycle Running	Delay (Unit:s)	
6	S1 Genset Start	No Delay	
7	S2 Genset Start	No Delay	
8	Genset Start	No Delay	
9	Genset Standby	No Delay	
10	S3 Cycle Running	Delay (Unit:s)	
11	S3 Genset Start	No Delay	

5.7 BREAKER STATUS DESCRIPTION

Count	Status	Delay	Note
0	Ready to Transfer	No Delay	
1	QS1 Closing	Delay (Unit:s)	
2	QS1 Opening	Delay (Unit:s)	
3	QS2 Closing	Delay (Unit:s)	
4	QS2 Opening	Delay (Unit:s)	
5	Transfer Rest Time	Delay (Unit:s)	
6	QS1 Again Close	Delay (Unit:s)	
7	QS1 Again Open	Delay (Unit:s)	
8	QS2 Again Close	Delay (Unit:s)	
9	QS2 Again Open	Delay (Unit:s)	
10	Wait for Sync	Delay (Unit:s)	
11	QS1 Sync Close	Delay (Unit:s)	
12	QS2 Sync Close	Delay (Unit:s)	
13	Wait for QS1 PF Input	Delay (Unit:s)	
14	Wait for QS2 PF Input	Delay (Unit:s)	
15	Elevator Control Delay	Delay (Unit:s)	
16	QS1 Load Supply	No Delay	
17	QS2 Load Supply	No Delay	
18	Load disconnect	No Delay	
19	Reserved	Delay (Unit:s)	
20	Reserved	Delay (Unit:s)	
21	Reserved	Delay (Unit:s)	
22	Reserved		
23	Reserved		
24	Reserved		
25	Reserved		
26	Wait for QS3 PF Input	Delay (Unit:s)	
27	QS3 Closing	Delay (Unit:s)	
28	QS3 Opening	Delay (Unit:s)	
29	QS3 Again Close	Delay (Unit:s)	
30	QS3 Again Open	Delay (Unit:s)	
31	Reserved		
32	QS3 Load Supply	No Delay	