



SmartGen
ideas for power

HAT820 SERIES

**DUAL POWER ATS CONTROLLER
COMMUNICATION PROTOCOL**

SmartGen

SMARTGEN (ZHENGZHOU) TECHNOLOGY CO., LTD.



Chinese trademark

SmartGen English trademark

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Table 1 - Software Version

Date	Version	Note
2019-06-13	1.0	Original release.
2020-05-20	1.1	Added PT open circuit alarm mark.



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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 etc.), and DCS or third-party monitoring system which is compatible with MODBUS. The monitoring system can be set up if a central PC (or IPC)-based communication master software is added (such as Kingview, Intouch, FIX, Synall etc.).

2. MODBUS BASIC RULES

- All communication loops should follow the master-slave mode. In this way, 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 master or slave receives information frame with unknown command, no response will be given.

3. DATA FRAME FORMAT

Communication is asynchronously transferred by the unit of byte (data frame). Each data frame is a serial data stream of 10 bits (stop bit: 1) or 11 bits (stop bit: 2) between master and slave.

Table 2 - Data Frame Format

Item	Description
Start bit	1-bit
Data bit	8-bit
Parity bit	Odd/Even/No parity
Stop bit	1-bit, 2-bit can be set.
Baud rate	2400bps/4800bps/9600bps/19200bps

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, and removes the address code to read information. If nothing goes wrong, it shall conduct the task, and then send implementation result to the sender. The returned information includes address code, function code of implemented action, data after implemented action, and CRC. If an error occurs, then nothing shall be sent.

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 (from 0-255). Single device address range is 1–247, which means that slave device whose address code is defined by users will receive the information sent by the master. Each slave has a unique address code, and each response begins with its 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

Function code is the second data of each communication transmission. ModBus communication protocol defines function code as 1-255 (01H-0FFH). HAT820 controller uses a part of it. By master request master can tell slave to conduct certain action. 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 > 127), it means slave does not respond, or response has an error.

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

Table 4 - ModBus Partial Function Codes

Function code	Definition	Operation
03H	Read Holding Registers	Reads single or multiple register data;
05H	Preset Single Coil	Forces a single coil;
06H	Write Single Register	Write a 16-bit binary number to register;

4.4.2 03H READ REGISTERS

With communication command of function code 03H, master can read the numerical registers (all kinds of collected analogue data and pre-set parameter values are stored in the register) inside the instrument. Input register value of 03H mapping data field is 16-bit (2 bytes). So register values read from the instrument are all 2 bytes. For each time maximum readable register values are 125.

Command format of slave response is address code, function code, data field, and CRC code. Data in data field are dual bytes in a group of 2 bytes and high byte is in the front.

4.4.3 05H PRESET SINGLE COIL

With this command master can store single coil data to bit registers (e.g. ATS transfer control). Slave also can respond information to the master with this command.

4.4.4 06H WRITE SINGLE REGISTER

With this command master can store single data to bit registers in the instrument. Register in ModBus communication protocol refers to 16-bit (2 bytes) and high byte is in the front. In this way all points in the device are 2 bytes. Command format 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 FUNCTION 03H DATA FIELD FORMAT

Table 5 - Master Request

Data Sequence	Data Signification	Byte Count
1	Starting address	2
2	Read register numbers	2

Table 6 - Slave Response

Data Sequence	Data Signification	Byte Count
1	Loopback byte count	1
2	N register data	N

4.5.3 FUNCTION 05H DATA FIELD FORMAT

Table 7 - Master Request

Data Sequence	Data Signification	Byte Count
1	Coil address	2
2	Force 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 FUNCTION 06H DATA FIELD FORMAT

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)

Master or slave can detect whether the received information is wrong or not with CRC. Sometimes due to electric noise or other interference, information will have small change in the transmission process. CRC ensures master or slave does not respond to the wrong information in the transmission process. In this way system safety and efficiency are guaranteed. 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 format are same: address code, function code, data area 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 count the received information is the same as the information again. 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 of data 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 CALCULATION PROCEDURE:

- Place a 16-bit register as FFFF hex;
- Make the first 8-bit data Exclusive OR with the low 8-bit of the CRC register, and put the result in the CRC register;
- Shift the CRC register one bit to the right, and fill MSB with 0. Examine the moved-out bit.
- If LSB was 0: repeat Step 3 (another shift).

If LSB was 1: Exclusive OR the CRC register with A001 hex;

- Repeat Step 3 and 4 until 8 shifts have been performed. When this is done, a complete 8-bit data are processed.
- Repeat Step 2 to 5 for the next 8-bit data of the message.
- The final CRC register value is the CRC code. Least Significant Byte is transmitted first and Most Significant Byte is at the last.

NOTE: The calculation of CRC code starts from <slave address> for all bytes, excluding <CRC code>.

4.7 EXAMPLES OF INFORMATION FRAME FORMAT

4.7.1 FUNCTION CODE 03H

Slave address is 01 and start address is 0026H of 3 data (each data is 2 bytes).

Table 11 - Data Address Example

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

Table 12 - Function Code 03H Master Request Example

Request	Bytes	Example (Hex)
Slave address	1	01 Send to slave 01
Function code	1	03 Read holding registers
Starting address	2	00 Starting address is 0026H 26
Count 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 slave address 01
Function code	1	03 Read register
Read count	1	06 3 data (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

Slave address is 01 and starting address is 0002H of 1 coil. Place 0002H unit 1.

Table 14 - Coil Data Address Example

Address	Data(Hex)
0000	0
0001	1
0002	0

NOTE: FF00 hex coil value is forced to 1 and 000H is forced to 0. Other values are illegal and will not affect the coil.

Table 15 - Function Code 05H Master Request Example

Request	Bytes	Example (Hex)
Slave address	1	01 Send slave address 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 PC. 3A

Table 16 - Function Code 05H Slave Response Example

Slave Response	Bytes	For Example (Hex)
Slave address	1	01 Respond slave address 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 place starting address of 00E3H of 1 point as 0002H.

Table 17 - Function Code 06H Master Request Example

Request	Bytes	Example (Hex)
Slave address	1	01 Send slave address 01
Function code	1	06 Write single register
Starting address	2	00 Starting address is 0026H 26
Data	2	00 Place 1 point data (2 bytes in total) 14
CRC code	2	68 CRC code which calculated by PC. 0E

Table 18 - Function Code 06H Slave Response Example

Slave Response	Bytes	For Example (Hex)
Slave address	1	01 Respond slave address 01
Function code	1	06 Force single register
Starting address	2	00 Starting address is 0026H 26
Data	2	00 Place 1 point data (2 bytes in total) 14
CRC code	2	68 CRC code which calculated by slave. 0E

4.8 ERROR HANDLING

When device detects 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 sent by the master. The following codes show that unexpected errors have occurred.

If CRC error occurs for the information received by the slave, then the device will ignore.

Table 19 - Error Code Format of Slave Response (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. ATTACHMENT: ADDRESS AND DATA

5.1 FUNCTION CODE 03H MAPPING DATA FIELD

Table 20 - Function Code 03H Mapping Data Field

Address (decimal)	Item	Description	Byte
0500	Common Alarm	1 for active(LSB)	1bit
	Common Shutdown Alarm	1 for active	1bit
	Common Warning 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 Master	1 for active	1bit
	S2 Master	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for manual	1bit
	Reserved	1 for active	1bit
	Genset Start Output	1 for active(MSB)	1bit
0501	S1 Voltage Normal	1 for active	1bit
	S1 Voltage Abnormal	1 for active	1bit
	S1 Voltage Transient 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 Genset Start Output	1 for active	1bit
	S1 Voltage None	1 for active	1bit
	S1 Voltage High	1 for active	1bit
	S1 Voltage Low	1 for active	1bit
	S1 Frequency High	1 for active	1bit
	S1 Frequency Low	1 for active	1bit
	S1 Loss of Phase	1 for active	1bit
	S1 Reverse Phase Sequence	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 Transient 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
	S2 Genset Start Output	1 for active	1bit
	S2 Voltage None	1 for active	1bit
	S2 Voltage High	1 for active	1bit
	S2 Voltage Low	1 for active	1bit
	S2 Frequency High	1 for active	1bit
	S2 Frequency Low	1 for active	1bit
	S2 Loss of Phase	1 for active	1bit
	S2 Reverse Phase Sequence	1 for active	1bit
	Reserved	1 for active (MSB)	1bit
0503	Switch Transfer 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
	S1 Load End Dead	1 for active	1bit
	S2 Load End Dead	1 for active	1bit
	S1 Load Overcurrent Trip	1 for active	1bit
	S2 Load Overcurrent Trip	1 for active	1bit
	Force to Break Fault Alarm	1 for active	1bit
	S1 Genset Fault	1 for active	1bit
	S2 Genset Fault	1 for active	1bit
	S1 Breaker Tripping Alarm	1 for active	1bit
	Synchronizing Failure Fault	1 for active	1bit
	S2 Breaker Trip Alarm	1 for active	1bit
0504	S1 Overcurrent Warning	1 for active	1bit
	S2 Overcurrent Warning	1 for active	1bit
	Force to Break Warning	1 for active	1bit
	Battery Voltage Low Warning	1 for active	1bit
	Battery Voltage High Warning	1 for active	1bit
	Synchronizing Failure Warning	1 for active	1bit
	Reserved	1 for active	1bit
	Temp. Sensor Open Warning	1 for active	1bit
	S1 PT Wire Broken Warning	1 for active	1bit
	S2 PT Wire Broken Warning	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



	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	Digital Input 1 Status	1 for active (LSB)	1bit
	Digital Input 2 Status	1 for active	1bit
	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
0507	QS1 Close Control Output	1 for active (LSB)	1bit
	QS1 Open Control Output	1 for active	1bit
	QS2 Close Control Output	1 for active	1bit
	QS2 Open Control Output	1 for active	1bit
	S1 Close Status	1 for active	1bit
	S2 Close Status	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	1bit
	Reserved	1 for active	1bit
	Remote Start On Load	1 for active	1bit
	Remote Start Off Load	1 for active	1bit
	Mains Abnormal Start	1 for active	1bit



	Scheduled Start	1 for active (MSB)	1bit
0508	Cycle Mode Start	1 for active (LSB)	1bit
	Balanced Running Mode Start	1 for active	1bit
	Master 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 Inhibit	1 for active	1bit
	Reserved	1 for active	1bit
	S1 Close Inhibit	1 for active	1bit
	S2 Close Inhibit	1 for active	1bit
	Waiting S1 PF	1 for active	1bit
	Waiting S2 PF	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
	Fan Control Output	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Auto Transfer/Restore	1 for active	1bit
	Remote Inhibit Input	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active	1bit
	Reserved	1 for active (MSB)	1bit
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	Frequency 1	Signed(*100)	2Bytes



1010	Reserved		2Bytes
1011	Reserved		2Bytes
1012	Reserved		2Bytes
1013	Reserved		2Bytes
1014	Reserved		2Bytes
1015	Reserved		2Bytes
1016	Reserved		2Bytes
1017	Reserved		2Bytes
1018	Reserved		2Bytes
1019	Reserved		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	Frequency 2	Signed(*100)	2Bytes
1030	S1S2 Voltage Difference		2Bytes
1031	S1S2 Frequency Difference		2Bytes
1032	S1S2 Phase Difference		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 Position	Signed (*10)	2Bytes
1045	B Phase Current Phase Position	Signed (*10)	2Bytes
1046	C Phase Current Phase Position	Signed (*10)	2Bytes
1047	N Wire Current Phase Position	Signed (*10)	2Bytes
1048	A Phase Active Power	Signed (*10)	4Bytes
1049			
1050	B Phase Active Power	Signed (*10)	4Bytes
1051			
1052	C Phase Active Power	Signed (*10)	4Bytes
1053			
1054	Total Active Power	Signed(*10)	4Bytes



1055			
1056	A Phase Inactive Power	Signed(*10)	4Bytes
1057			
1058	B Phase Inactive Power	Signed(*10)	4Bytes
1059			
1060	C Phase Inactive Power	Signed(*10)	4Bytes
1061			
1062	Total Inactive Power	Signed(*10)	4Bytes
1063			
1064	A Phase Apparent Power	Signed(*10)	4Bytes
1065			
1066	B Phase Apparent Power	Signed(*10)	4Bytes
1067			
1068	C Phase Apparent Power	Signed(*10)	4Bytes
1069			
1070	Total Apparent Power	Signed(*10)	4Bytes
1071			
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	Temperature Resistance Value		2Bytes
1079	Temperature		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	Please see voltage status description.	2Bytes
1089	S1 Voltage Status Delay		2Bytes
1090	S2 Voltage Status	Please see voltage status description.	2Bytes
1091	S2 Voltage Status Delay		2Bytes
1092	Genset Status	Please see genset status description.	2Bytes
1093	Genset Status Delay		2Bytes
1094	ATS Status	Please see ATS status description.	2Bytes
1095	ATS Status Delay		2Bytes
1096	Reserved		2Bytes
1097	Reserved		2Bytes
1098	Reserved		2Bytes
1099	Reserved		2Bytes



1100	Controller Current Time (Year)	Unsigned	2Bytes
1101	Controller Current Time (Month)	Unsigned	2Bytes
1102	Controller Current Time (Day)	Unsigned	2Bytes
1103	Controller Current Time (Week)	Unsigned	2Bytes
1104	Controller Current Time (Hour)	Unsigned	2Bytes
1105	Controller Current Time (Minute)	Unsigned	2Bytes
1106	Controller Current Time (Second)	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	2Bytes
1117	S1 Total Power Supply Hours(LSB)	Unsigned	4Bytes
1118	S1 Total Power Supply Hours(MSB)		
1119	S1 Total Power Supply Minutes	Unsigned	2Bytes
1120	S1 Total Power Supply Seconds	Unsigned	2Bytes
1121	S2 Total Power Supply Hours(LSB)	Unsigned	4Bytes
1122	S2 Total Power Supply Hours(MSB)		
1123	S2 Total Power Supply Minutes	Unsigned	2Bytes
1124	S2 Total Power Supply Seconds	Unsigned	2Bytes
1125	S1 Total Active Power kwh (LSB)	Signed(*10)	4Bytes
1126	S1 Total Active Power kwh (MSB)		
1127	S1 Total Reactive Power kVarh (LSB)	Signed(*10)	4Bytes
1128	S1 Total Reactive Power kVarh (MSB)		
1129	S1 Total Close Times(LSB)	Unsigned	4Bytes
1130	S1 Total Close Times(MSB)		
1131	S2 Total Active Power kwh (LSB)	Signed(*10)	4Bytes
1132	S2 Total Active Power kwh (MSB)		
1133	S2 Total Reactive Power kVarh (LSB)	Signed(*10)	4Bytes
1134	S2 Total Reactive Power kVarh (MSB)		
1135	S2 Total Close Times(LSB)	Unsigned	4Bytes
1136	S2 Total Close Times(MSB)		
1137	Accumulated Auto Transfer Times (LSB)	Unsigned	4Bytes
1138	Accumulated Auto Transfer Times (MSB)		
1139	Mains Failure Transfer Times (LSB)	Unsigned	4Bytes
1140	Mains Failure Transfer Times (MSB)		
1141	Accumulated Auto Transfer Running Time Hour (LSB)	Unsigned	4Bytes
1142	Accumulated Auto Transfer Running Time Hour (MSB)		



1143	Accumulated Auto Transfer Running Minute	Unsigned	2Bytes
1144	Accumulated Auto Transfer Running Minute	Unsigned	2Bytes

5.2 FUNCTION CODE 05H MAPPING DATA FIELD

Table 21 Function Code 05H Mapping Data Field

Address	Item	Description
15000	Remote Close S1	1 for active
15001	Remote Open	1 for active
15002	Remote Close S2	1 for active
15003	Reserved	1 for active
15004	Auto/Manual	0: Manual 1: Auto
15005	S1 Master	0: Slave 1: Master
15006	S2 Master	0: Slave 1: Master
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

5.3 S1 VOLTAGE STATUS DESCRIPTION

Table 22 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

Table 23 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 GENSET STATUS DESCRIPTION

Table 24 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)	
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	

5.6 Switch Status Description

Table 25 Switch 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 to Synchronize	Delay (Unit:s)	
11	QS1 Synchronize to Close	Delay (Unit:s)	
12	QS2 Synchronize to 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	