

UPS MODBUS PTOTOCOL

Version:V1.1

Date:2010-10-20

1. Introduction

The Text describe UPS Modbus Protocol,it is the same with (three phase of input and output)UPS and Modularization UPS.

The Prorocol Reference Modbus Application Protocol_v1_1.

2. MODBUS Protocol description

2.1 Modbus Address Rules

The MODBUS Serial Line protocol is a Master-Slaves protocol. Only one master (at the same time) is connected to the bus, and one or several (247 maximum number) slaves nodes are also connected to the same serial bus.

The MODBUS Master node has no specific address, only the slave nodes must have an address., the slave nodes addresses are in in the range of 1 ... 247 decimal;The Address 0 is reserved as the broadcast address. This address must be unique on a MODBUS serial bus.

2.2 Modbus Protocol frame

Modbus Protocol frame is maked up of Additional address, Function code, Data and Error check.

Table 2.1.1 General MODBUS frame

Additional address	Function code	Data	Error check
--------------------	---------------	------	-------------

Two different serial transmission modes are defined : The RTU mode and the ASCII mode.

2.3 RTU Transmission Mode

2.3.1 Frame description

When devices communicate on a MODBUS serial line using the RTU (Remote Terminal Unit) mode, each 8-bit byte in a message contains two 4-bit hexadecimal characters. The main advantage of this mode is that its greater character density allows better data throughput than ASCII mode for the same baud rate. Each message must be transmitted in a continuous stream of characters. Each character or byte is sent in this order (left to right):Least Significant Bit (LSB) . . . Most Significant Bit (MSB)

The format for each byte (11 bits) in RTU mode is :

Coding System: 8-bit binary

Bits per Byte: 1 start bit

8 data bits, least significant bit sent first

1 bit for parity completion

1 stop bit

Tabel 2.3.1 Bit Sequence in RTU mode (specific case of No Parity)

start bit	data bit								stop bit	stop bit
1	1	2	3	4	5	6	7	8	1	1

2.3.2 RTU Frame

RTU frame is made up of Additional address, Function code, Data and CRC check.

The maximum size of a MODBUS RTU frame is 256 bytes. The maximum size of a data is 252 bytes.

Tabel 2.3.2a RTU Frame

format	Slave Address	Function Code	Data	CRC	
Byte	1 bytes	1 bytes	0~252 bytes	2 bytes	
				CRC Low	CRC Hi

In RTU mode, message frames are separated by a silent interval of at least 3.5 character times. In the following sections, this time interval is called t_{3,5}.

The entire message frame must be transmitted as a continuous stream of characters.

If a silent interval of more than 1.5 character times occurs between two characters, the message frame is declared incomplete and should be discarded by the receiver.

Tabel 2.3.2b RTU frame send sequence

	Modbus frame				
start	Slave address	Function Code	Data	CRC	over
≥3.5	8bit	8bit	N*8bit	168bit	≥3.5

dddd

2.3.3 CRC Checking

The CRC field contains a 16-bit value implemented as two 8-bit bytes.

The CRC field is appended to the message as the last field in the message. When this is done, the low-order byte of the field is appended first, followed by the high-order byte. The CRC high-order byte is the last byte to be sent in the message.

The CRC value is calculated by the sending 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 it received in the CRC field. If the two values are not equal, an error results.

The CRC calculation is started by first pre-loading 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 and the parity bit, 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 (eight) 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 content of the register, after all the bytes of the message have been applied, is the CRC value.

When the CRC is appended to the message, the low-order byte is appended first, followed by the high-order byte. A detailed example of CRC generation is contained in Appendix B.

2.4 ASCII Transmission Mode

2.4.1 Frame description

When devices are setup to communicate on a MODBUS serial line using ASCII (American Standard Code for Information Interchange) mode, each 8-bit byte in a message is sent as two ASCII characters. This mode is used when the physical communication link or the capabilities of the device does not allow the conformance with RTU mode requirements regarding timers management.

The format for each byte (10 bits) in ASCII mode is :

Coding System: Hexadecimal, ASCII characters 0-9, A-F

One hexadecimal character contains 4-bits of data within each ASCII character of the message

Bits per Byte: 1 start bit

7 data bits, least significant bit sent first

1 bit for parity completion;

1 stop bit

Each character or byte is sent in this order (left to right):Least Significant Bit (LSB) . . . Most Significant Bit (MSB)

Tabel 2.4.1 Bit Sequence in ASCII mode

Start	data							stop	stop
1	1	2	3	4	5	6	7	1	1

2.4.2 ASCII Frame

RTU frame is made up of Additional address, Function code, Data,LRC check.and Over Character.

The maximum size of a MODBUS ASCII frame is 513 bytes. The maximum size of a data is 2*252 bytes.

Tabel 2.4.2 ASCII Frame

start	Address	Function	Data	LRC	End
1 char	2 char	2 char	0~2x252 char	2 char	2 char
:					CR,LF

2.4.3 LRC Checking

The LRC field is one byte, containing an 8-bit binary value. The LRC value is calculated by the device that emits, which appends the LRC to the message. The device that receives calculates an LRC during receipt of the message, and compares the calculated value to the actual value it received in the LRC field. If the two values are not equal, an error results.

The LRC is calculated by adding together successive 8-bit bytes of the message, discarding any carries, and then two's complementing the result. It is performed on the ASCII message field contents excluding the 'colon' character that begins the message, and excluding the CRLF pair at the end of the message. In ASCII mode, the resulting LRC is ASCII encoded into two bytes and placed at the end of ASCII mode frame prior to the CRLF.

A detailed example of LRC generation is contained in Appendix B.

2.4.4 Data

DATAB:Value type is one byte char.the message is sent two ASCII characters.,the data range:

Sign Char type:-128 ~ +127

No Sign Char type:0 ~ 255

DATAI:Value type is two bytes int.the message is sent four ASCII characters.,the data range:

Sign int type: -32768 ~ +32767

No Sign int type: 0 ~ +65535

2.5 Function Code

Table 2.5.1The function code is using in the protocol

Tabel 2.5.1 code			
No	code	Definition	remark
1	01H	Read Coils	
2	02H	Read Discrete Inputs	
3	03H	Read Holding Registers	
4	04H	Read Input Register	
5	05H	Write Single Coil	
6	06H	Write Single Register	
7	0FH	Write Multiple Coils	
8	10H	Write Multiple Registers	
9	14H	Read File record	
10	2BH	Read devicedentification	

2.4 exception-function_code

Tabel 2.4.1 exception-function_code

Code	Definition	remark
01H	ILLEGAL FUNCTION	The function of request is wrong
02H	ILLEGAL DATA ADDRESS	The address of request is wrong
03H	ILLEGAL DATA VALUE	Wrong value is requested
06H	SLAVE DEVICE BUSY	
08H	Memory parity error	

2.5 Memory Sign

The Protocol grouping the memory,there are some singn,they are 0XXXX,1XXXX,2XXXX,3XXXX and 4XXXX,the rule is inTabel named '2.5.1'.

Tabel 2.5.1 the rule of grouping the memory

Memory Sign	name	type	Read/Write	Memory address	Function Code
0XXXX	Coils	Bit	Read/Write	00001 ~ 0XXXX	01H,05H,0FH
1XXXX	Discretes Input	Bit	Read-Only	10001 ~ 1XXXX	02H
2XXXX	output Registers	Word	Write-Only	20001 ~ 2XXXX	06H,10H
3XXXX	Input Registers	word	Read-Only	30001 ~ 3XXXX	04H
4XXXX	Holding Registers	word	Read/Write	40001 ~ 4XXXX	03H,06H,10H

2.6 MODBUS Commucation

2.6.1 Read Coils (Function Code 0x01)

Request

Function Code	1byte	0x01
Starting Address	2bytes	0x0000~0xFFFF
Quantity of coils	2bytes	1~2000(0x7D0)

Response

Function Code	1byte	0x01
Byte count	1byte	N *
Coil Status	N *byte	
*N = Quantity of Outputs / 8, if the remainder is different of 0 $\Rightarrow$ N = N+1		

Error

Function Code	1byte	0x81
Exception code	1byte	01 or 02 or 03 or 04

Here is an example of a request to read discrete outputs 20–38:

Read Coils

request		response	
Field	(Hex)	Field	(Hex)
Function Code	01	Function Code	01
Starting AddressHi	00	Byte count	03
Starting AddressLo	13	Outputs status 20~27	CD
Quantity of Outputs Hi	00	Outputs status 28~35	6B
Quantity of Outputs Lo	13	Outputs status 36~38	05

Note:

1. Outputs status 1 is the value of address of 0x0000;
2. Outputs status 20 is the value of address of 0x0013.

	Outputs status 20~27								Outputs status 28~35								Outputs status 36~38							
Hex	CD								6B								05							
binary	b0	b1	b2	b3	b4	b5	b6	b7	b0	b1	b2	b3	b4	b5	b6	b7	b0	b1	b2	b3	b4	b5	b6	b7
	1	0	1	1	0	0	1	1	1	1	0	1	0	1	1	0	1	0	1	0	0	0	0	0
Outputs status	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	-	-	-	-	-

2.6.2 Read Discrete Inputs (Function Code 0x02)

Request

Function Code	1byte	0x02
Starting Address	2bytes	0x0000~0xFFFF
Quantity of Inputs	2bytes	1~2000(0x7D0)

Response

Function Code	1byte	0x02
Byte count	1byte	N *
Input Status	N *byte	
*N = Quantity of Inputs / 8 if the remainder is different of 0 $\Rightarrow$ N = N+1		

Error

Function Code	1byte	0x82
Exception code	1byte	01 or 02 or 03 or 04

Here is an example of a request to read discrete inputs 197 – 218:

Read Discrete Inputs

Request		Response	
Field	(Hex)	Field	(Hex)
Function Code	02	Function Code	02
Starting Address Hi	00	Byte count	03
Starting Address Lo	C4	Inputs Status 197~204	AC
Quantity of Inputs Hi	00	Inputs Status 205~212	DB
Quantity of Inputs Lo	16	Inputs Status 218~213	35

	Inputs Status 197~204								Inputs Status 205~212								Inputs Status 218~213							
Hex	AC								DB								35							
binary	b0	b1	b2	b3	b4	b5	b6	b7	b0	b1	b2	b3	b4	b5	b6	b7	b0	b1	b2	b3	b4	b5	b6	b7
	0	0	1	1	0	1	0	1	1	1	0	1	1	0	1	1	1	0	1	0	1	1	0	0
Inputs Status	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	-	-

2.6.3 Read Holding Registers (Function Code 0x03)

Request

Function Code	1byte	0x03
Starting Address	2bytes	0x0000~0xFFFF
Quantity of Registers	2bytes	1~125(0x7D)

Response

Function Code	1byte	0x03
Byte count	1byte	2 × N *
Register value	N * × 2bytes	
*N = Quantity of Registers		

Error

Function Code	1byte	0x83
Exception code	1byte	01 or 02 or 03 or 04

Here is an example of a request to read registers 108 – 110:

Read Holding Registers

Request		Response	
Field	Hex	Field	Hex
Function Code	03	Function Code	03
Starting Address Hi	00	byte count	06
Starting Address Lo	6B	Register value Hi (108)	02
No.of Registers Hi	00	Register value Lo (108)	2B
No.of Registers Lo	03	Register value Hi (109)	00
		Register value Lo (109)	00
		Register value Hi (110)	00
		Register value Lo (110)	64

Note:

- 1.The 0x0000 is the address of Register[1];
- 2.The 0x006B is the address of Register[108];

2.6.4 Read Input Registers (Function Code 0x04)

Request

Function Code	1byte	0x04
Starting Address	2bytes	0x0000~0xFFFF
Quantity of Registers	2bytes	1~125(0x7D)

Response

Function Code	1byte	0x04
byte count	1byte	$2 \times N$ *
Quantity of Registers	$N * \times 2$ bytes	
*N = Quantity of Input Registers		

Error

Function Code	1byte	0x84
Exception code	1byte	01 or 02 or 03 or 04

Here is an example of a request to read input register 9:

Read Input Registers

Request		Response	
Field	Hex	Field	Hex
Function	04	Function	04
Starting AddressHi	00	byte count	02
Starting AddressLo	08	Input Reg. 9 Hi	00
Quantity of Input Reg. Hi	00	Input Reg. 9 Lo	0A
Quantity of Input Reg. Lo	01		

Note:

- 1.The 0x0000 is the address of Register[1];
- 2.The 0x0008 is the address of Register[9];

2.6.5 Write Single Coil (Function Code 0x05)

Request

Function Code	1byte	0x05
Output Address	2bytes	0x0000~0xFFFF
Output Value	2bytes	0x0000 or 0xFF00

Response

Function Code	1byte	0x05
Output Address	2bytes	0x0000~0xFFFF
Output Value	2bytes	0x0000 or 0xFF00

Error

Function Code	1byte	0x85
Exception code	1byte	01 or 02 or 03 or 04

Here is an example of a request to write Coil 173 ON:

Write Single Coil

Request		Response	
Field	Hex	Field	Hex
Function Code	05	Function Code	05
Output Address Hi	00	Output Address Hi	00
Output Address Lo	AC	Output Address Lo	AC
Output Value Hi	FF	Output Value Hi	FF
Output Value Lo	00	Output Value Lo	00

2.6.6 Write Single Register (Function Code 0x06)

Request

Function Code	1byte	0x06
Register Address	2bytes	0x0000~0xFFFF
Register Value	2bytes	0x0000~0xFFFF

Response

Function Code	1byte	0x06
Register Address	2bytes	0x0000~0xFFFF
Register Value	2bytes	0x0000~0xFFFF

Error

Function Code	1byte	0x86
Exception code	1byte	01 or 02 or 03 or 04

Here is an example of a request to write register 2 to 00 03 hex:

Write Single Register

Request		Response	
Field	Hex	Field	Hex
Function	06	Function	06
Register Address Hi	00	Register Address Hi	00
Register Address Lo	01	Register Address Lo	01
Register Value Hi	00	Register Value Hi	00
Register Value Lo	03	Register Value Lo	03

2.6.7 Write Multiple Coils (Function Code 0x0F)

Request

Function Code	1byte	0x0F
Starting Address	2bytes	0x0000~0xFFFF
Quantity of Outputs	2bytes	0x0001~0x07B0
byte count	1byte	N
Outputs Value	$N \times 1\text{byte}$	
*N = Quantity of Outputs / 8, if the remainder is different of 0 $\Rightarrow N = N+1$		

Response

Function Code	1byte	0x0F
Starting Address	2bytes	0x0000~0xFFFF
Quantity of Outputs	2bytes	0x0001~0x07B0

Error

Function Code	1byte	0x8F
Exception code	1byte	01 or 02 or 03 or 04

Here is an example of a request to write a series of 10 coils starting at coil 20:

Write Multiple Coils

Request				Response			
Field		Hex		Field		Hex	
Function Code		0F		Function Code		0F	
Starting AddressHi		00		Starting AddressHi		00	
Starting AddressLo		13		Starting AddressLo		13	
Quantity of Outputs Hi		00		Quantity of Outputs Hi		00	
Quantity of Outputs Lo		0A		Quantity of Outputs Lo		0A	
byte count		02					
Outputs Value Hi		CD					
Outputs Value Lo		01					

	Outputs Status 20~27								Outputs Status 28~29							
Hex	CD								01							
binary	b0	b1	b2	b3	b4	b5	b6	b7	b0	b1	b2	b3	b4	b5	b6	b7
	1	0	1	1	0	0	1	1	1	0	0	0	0	0	0	0
Outputs Status	20	21	22	23	24	25	26	27	28	29	-	-	-	-	-	-

2.6.8 Write Multiple registers (Function Code 0x10)

Request

Function Code	1byte	0x10
Starting Address	2bytes	0x0000~0xFFFF
Quantity of Registers	2bytes	1~123(0x7B)
byte count	1byte	$2 \times N$
Registers Value	$N \times 2\text{bytes}$	
*N = Quantity of Registers		

Response

Function Code	1byte	0x10
Starting Address	2bytes	0x0000~0xFFFF
Quantity of Registers	2bytes	1~123(0x7B)

Error

Function Code	1byte	0x90
Exception code	1byte	01 or 02 or 03 or 04

Here is an example of a request to write two registers starting at 2 to 00 0A and 01 02 hex.

Write Multiple registers

Request		Response	
Field	Hex	Field	Hex
Function Code	10	Function Code	10
Starting AddressHi	00	Starting AddressHi	00
Starting AddressLo	01	Starting AddressLo	01
Quantity of Registers Hi	00	Quantity of Registers Hi	00
Quantity of Registers Lo	02	Quantity of Registers Lo	02
byte count	04		
Registers Value Hi	00		
Registers Value Lo	0A		
Registers Value Hi	01		
Registers Value Lo	02		

2.6.9 Read File Record (Function Code 0x14)**Request**

Function Code	1byte	0x14
byte count	1byte	0x07~0xF5byte
Sub-Req. x, Reference Type	1byte	0x06
Sub-Req. x, File Number	2bytes	0x0001~0xFFFF
Sub-Req. x, Record Number	2bytes	0x0000~0x270F
Sub-Req. x, Register Length	2bytes	N
Sub-Req. x+1, ...	...	...

Response

Function Code	1byte	0x14
Resp. data Length	1byte	0x07~0xF5
Sub-Req. x, File Resp. length	1byte	0x05~0xF5(RUDY)
Sub-Req. x, Reference Type	1byte	06
Sub-Req. x, Record Data	N×2bytes	...
Sub-Req. x+1, ...	...	...

Error

Function Code	1byte	0x94
Exception code	1byte	01 or 02 or 03 or 04 or 08

Here is an example of a request to read two groups of references from remote device:

- _ Group 1 consists of two registers from file 4, starting at register 1 (address 0001).
- _ Group 2 consists of two registers from file 3, starting at register 9 (address 0009).

Read File Record

Request	Response
---------	----------

Field	Hex	Field	Hex
Function Code	14	Function Code	14
byte count	0E	Resp. Data length	0C
Sub-Req. 1, Ref. Type	06	Sub-Req. 1, File resp. length	05
Sub-Req. 1, File Number Hi	00	Sub-Req. 1, Ref. Type	06
Sub-Req. 1, File Number Lo	04	Sub-Req. 1, Record. Data Hi	0D
Sub-Req. 1, Record number Hi	00	Sub-Req. 1, Record. Data Lo	FE
Sub-Req. 1, Record number Lo	01	Sub-Req. 1, Record. Data Hi	00
Sub-Req. 1, Record Length Hi	00	Sub-Req. 1, Record. Data Lo	20
Sub-Req. 1, Record Length Lo	02	Sub-Req. 2, File resp. length	05
Sub-Req. 2, Ref. Type	06	Sub-Req. 2, Ref. Type	06
Sub-Req. 2, File Number Hi	00	Sub-Req.2, Record. Data Hi	33
Sub-Req. 2, File Number Lo	03	Sub-Req. 2, Record. Data Lo	CD
Sub-Req. 2, Record number Hi	00	Sub-Req. 2, Record. Data Hi	00
Sub-Req. 2, Record number Lo	09	Sub-Req. 2, Record. Data Lo	40
Sub-Req. 2, Record Length Hi	00		
Sub-Req. 2, Record Length Lo	02		

2.6.10 Read Device Identification (Function Code 0x2B)

Request

Function Code	1byte	0x2B
MEI Type*	1byte	0x0E
Read Device ID code	1byte	01/02/03/04
Object Id	1byte	0x00~0xFF

Response

Function Code	1byte	0x2B
MEI Type*	1byte	0x0E
Read Device ID code	1byte	01/02/03/04
Conformity level	1byte	0x01 or 0x02 or 0x03 or 0x81 or 0x82 or 0x83
More Folows	1byte	00/FF
Next Object Id	1byte	Object Id
Number of objects	1byte	...
List Of		
Object ID	1byte	...
Object length	1byte	...
Object Value	Object length	Depending on the object ID

Error

Function Code	1byte	0xAB
Exception code	1byte	01 or 02 or 03 or 04

Definition:

1. Read Device ID code(ReadDevId)

Read Device ID code	Definition
01	request to get the basic device identification (stream access)
02	request to get the regular device identification (stream access)
03	request to get the extended device identification (stream access)
04	request to get one specific identification object (individual access)

2. Object Id

Object Id	Object Name / Description	Type	M/O	category
0x00	VendorName	ASCII String	Mandatory	Basic
0x01	ProductCode	ASCII String	Mandatory	
0x02	MajorMinorRevision	ASCII String	Mandatory	
0x03	VendorUrl	ASCII String	Optional	Regular
0x04	ProductName	ASCII String	Optional	
0x05	ModelName	ASCII String	Optional	
0x06	UserApplicationName	ASCII String	Optional	
0x07 ... 0x7F	Reserved			
0x80 ... 0xFF	Private objects may be optionally defined The range [0x80 – 0xFF] is Product dependant	Relate to Equip	device dependant	Extended

2. Conformity Level

Conformity Level	Definition
0x01	basic identification (stream access only)
0x02	regular identification (stream access only)
0x03	extended identification (stream access only)
0x81	basic identification (stream access and individual access)
0x82	regular identification (stream access and individual access)
0x83	extended identification (stream access and individual access)

In case of ReadDevId codes 01, 02 or 03 (stream access), If the identification data doesn't fit into a single response, several request/response transactions may be required. 00 : no more Object are available FF : other identification Object are available and further Modbus transactions are required In case of ReadDevId code 04 (individual access), this field must be set to 00.

Example of a Read Device Identification request for "Basic device identification" : In this example all information are sent in one response PDU.

request for "Basic device identification"

Request		Response	
Field	Hex	Field	Hex
Function Code	2B	Function Code	2B

MEI Type	0E	MEI Type*	0E
Read Dev Id code	01	Read Device ID code	01
Object Id	00	Conformity level	01
		More Folows	00
		Next Object Id	00
		Number of objects	03
		Object ID	00
		Object length	16
		Object Value	“Company identification”
		Object ID	01
		Object length	0D
		Object Value	“product code XX”
		Object ID	02
		Object length	05
		Object Value	“V2.11”

Example 2:

First transaction :

Request		Response	
Field	Hex	Field	Hex
Function Code	2B	Function Code	2B
MEI Type	0E	MEI Type*	0E
Read Dev Id code	01	Read Device ID code	01
Object Id	00	Conformity level	01
		More Folows	00
		Next Object Id	00
		Number of objects	03
		Object ID	00
		Object length	16
		Object Value	“Company identification”
		Object ID	01
		Object length	0D
		Object Value	“Product code XXXXXXXXXXXXXXXXXX”

Example 3:

Second transaction :

Request		Response	
Field	Hex	Field	Hex
Function Code	2B	Function Code	2B
MEI Type	0E	MEI Type*	0E
Read Dev Id code	01	Read Device ID code	01
Object Id	02	Conformity level	01
		More Folows	00
		Next Object Id	00
		Number of objects	03
		Object ID	02
		Object length	05
		Object Value	“V2.11”

3. Protocol Application

Equip can implement Physical interface with RS232 or RS485.

Data Signaling Rates is 2400bps or 9600bps. The premission rate is 9600bps.

Function Code Application				
Application Content	type	Function Code	operation	Memory Address
Control Status	bit	01H	Read	0XXXX
		05H	Write	
Control Command	word	06H	Write	2XXXX
Status information	bit	02H	Read	1XXXX
Simulation information	word	04H	Read	3XXXX
Software version		2BH	Read	
History record		14H	Read	
User setting	word	03H	Read	4XXXX
		06H	Write	
System date	word	03H	Read	4XXXX
		10H	Write	
System self-testing time	word	03H	Read	4XXXX
		10H	Write	
History record count	word	03H	Read	4XXXX
		10H	Write	
Correct data	word	03H	Read	4XXXX
		10H	Write	

3.1 Coils(Address:0XXXX)Data Content

Table 3.1.1 Control Command information

Outputs StatusAddress	Content	Type	Definition	remark
00002	Buzzer Mute	bit	1: Buzzer Mute	

3.2 Inputs Status(Address:1XXXX)Data Content

Table 3.2.1 UPS Status information

Inputs Status Address	Content	Type	Definition	remark
10001	Input Switch	bit	1:opened;0:closed	Switch Staus
10002	Output Switch	bit	1: opened;0:closed	
10003	Manu-Bypass Switch	bit	1: opened;0:closed	
10004	ByPass Switch	bit	1:opened;0:closed	
10005	Ext. bypass Switch	bit	1:opened;0:closed	
10006	OutSide-Output Switch	bit	1:opened;0:closed	
10007	Change Master	bit	1:Efficient Status	Work Mode
10008	ECO	bit	1:Efficient Status	
10009	LBS Active	bit	1:Efficient Status	
10010	Battery Test	bit	1: Battery Test	
10011	Battery charge	bit	1 Battery charge	
10012	P-Battery Boost Charging	bit	1: Boost Charging	
10013	N-Battery Boost Charging	bit	1: Boost Charging	Work Staus
10014	Rectifier Staus	bit	1:Work;0:Stop	
10015	Rectifier Over Current	bit	1: Rectifier Over Current Statud	
10016	Input Supply Power Status	bit	1: Work;0: Stop	
10017	Input Supply Power Mode	bit	1: Input Supply Power,0: Battery Supply Power	

10018	Inverter on/off Status1	bit	00:shutdown;01: Soft start; 10: Inv work on ,but No Output; 11: Normal Output	
10019	Inverter on/off Status2	bit		
10020	UPS Supply Power Status1	bit		
10021	UPS Supply Power Status2	bit		
10022	Coming to Interval transfer	bit	1:Efficient Status	Hint
10023	INV. Off coming to PowerOff	bit	1:Efficient Status	
10024	INV. Off coming to Overload	bit	1:Efficient Status	
10025	Dynamotor	bit	1:Efficient Status	
10026	Inverter invalid due to over load	bit	1:Efficient Status	Protect Status
10027	UPS In shutdown Due To Overload.	bit	1:Efficient Status	
10028	UPS In Bypass Due To Overload	bit	1:Efficient Status	
10029	Parallel in Bypass	bit	1:Efficient Status	
10030	ShutDown Due To Batt. Low	bit	1:Efficient Status	
10031	Transfer Times-out	bit	1:Efficient Status	

Tabel 3.2.2 UPS Alarm Status information

Inputs Status Address	Content	Type	Definition	remark
10065	Rectifier fault	bit		Level 1Alarm (serious Alarm)
10066	Inverter fault	bit		
10067	Auxiliary power fault	bit		
10068	Fan fault	bit		
10069	Input Thyristor failed	bit		
10070	Invert Thyristor failed	bit		
10071	bypass Thyristor failed	bit		
10072	Fuse broken	bit		
10073	DC BUS volt. abnormal	bit		
10074	Initializtion fault	bit		
10075	Battery Thyristor failed	bit		
10076	Charger fault	bit		
10077	Parallel fault	bit		Level 2 Alarm (common Alarm)
10078	Parallel on invalid	bit		
10079	DC component over limit	bit		
10080	Mains Site Wiring Fault	bit		
10081	Input Neutral line missing	bit		
10082	Bypass Site Wiring Fault	bit		
10083	Battery Reverse	bit		
10084	No Battery	bit		
10085	Feedback protection	bit		
10086	Battery Fault	bit		
10087	Battery temperature over	bit		

10088	Overload	bit		Level 3 Alarm (Hint Alarm)
10089	Parallel Overload	bit		
10090	Battery under voltage	bit		
10091	Battery over voltage	bit		
10092	Battery low pre-warning	bit		
10093	Mains freq. abnormal	bit		
10094	Mains volt. abnormal	bit		
10095	Bypass unable to trace	bit		
10096	Bypass Not Available	bit		
10097	Bypass over current	bit		
10098	LBS Not SYNC	bit		
10099	System Not Synchronized	bit		
10100	Ext. Fire Alarm	bit		
10101	Ext. Smog Alarm	bit		

Note:the status what value is 1 is effective

Tabel 3.2.3 Node Status information

Inputs Status Address	Content	Type	Definition	remark
10201	Mains Abnormal	bit		
10202	Battery under voltage	bit		
10203	Bypass Output	bit		
10204	UPS fault	bit		
10205	Invert Output	bit		
10206	UPS Power Integration Fault alarm	bit		
10207	over temperature	bit		

Note:the status what value is 1 is effective

3.3 Output Registers(Address:2XXXX)Data Content

Tabel 3.3.1 Control Command

Output Registers Address	Content	Size	Range	Unit	remark
20001	Inverter on	2bytes		second	If this Address was writed ,the UPS Will make Inverter on;the data is the value of delay time.
20002	Inverter Off	2bytes		second	If this Address was writed,the UPS Will make Inverter off;the data is the value of delay time.
20003	Battery Test	2bytes		second	If this Address was writed,the UPS Will make Battery test;the data is the value of test time.if the value is 0,the test will stop.
20010	Battery Resist Test	2bytes			If this Address was writed,the UPS Will test Battery Resist;the data can be any numerical value.

20020	Resume pretermis- sion rating parameter	2bytes			this Address was writed, the UPS Will Resume pretermis- sionrating parameter,the data can be any numerical value.
-------	---	--------	--	--	--

3.4 Input Registers(Address:3XXXX)Data Content

Tabel 3.4.1 UPS Data

Input RegistersAddress	Content	Size	Range	Unit	remark
30001	input A Phase voltage	2bytes	0~3000	0.1V	
30002	input B Phase voltage	2bytes	0~3000	0.1V	
30003	input C Phase voltage	2bytes	0~3000	0.1V	
30004	input frequency	2bytes	0~700	0.1Hz	
30005	Input A Phase current	2bytes	0~20000	0.1A	
30006	Input B Phase current	2bytes	0~20000	0.1A	
30007	Input C Phase current	2bytes	0~20000	0.1A	
30008	Input A Phase Power Factor	2bytes	0~100	0.01	
30009	Input B Phase Power Factor	2bytes	0~100	0.01	
30010	Input C Phase Power Factor	2bytes	0~100	0.01	
30011	Output A Phase voltage	2bytes	0~3000	0.1A	
30012	Output B Phase voltage	2bytes	0~3000	0.1A	
30013	Output C Phase voltage	2bytes	0~3000	0.1A	
30014	Output frequency	2bytes	0~700	0.1Hz	
30015	Output A Phase current	2bytes	0~20000	0.1A	
30016	Output B Phase current	2bytes	0~20000	0.1A	
30017	Output C Phase current	2bytes	0~20000	0.1A	
30018	Output A Phase active power	2bytes	0~4000	0.1kW	
30019	Output B Phase active power	2bytes	0~4000	0.1kW	
30020	Output C Phase active power	2bytes	0~4000	0.1kW	
30021	Output A Phase load percent	2bytes	0~200	0.01	
30022	Output B Phase load percent	2bytes	0~200	0.01	
30023	Output C Phase load percent	2bytes	0~200	0.01	
30024	Output A Phase load peak rate	2bytes	0~1000	0.01	
30025	Output B Phase load peak rate	2bytes	0~1000	0.01	
30026	Output C Phase load peak rate	2bytes	0~1000	0.01	
30027	Bypass A Phase voltage	2bytes	0~3000	0.1V	
30028	Bypass B Phase voltage	2bytes	0~3000	0.1V	
30029	Bypass C Phase voltage	2bytes	0~3000	0.1V	

30030	Bypass frequency	2bytes	0~7000	0.1Hz	
30031	Positive Battery Voltage	2bytes	0~5000	0.1V	
30032	Negative Battery Voltage	2bytes	0~5000	0.1V	
30033	Positive Battery Discharge current	2bytes	0~20000	0.1V	
30034	Negative Battery Discharge current	2bytes	0~20000	0.1A	
30035	Positive Battery charge current	2bytes	0~20000	0.1A	
30036	Negative Battery charge current	2bytes	0~20000	0.1A	
30037	Battery Capability	2bytes	0~100	%	
30038	Battery Support	2bytes	0~999	minute	
30039	Battery Temperature	2bytes	0~2000	0.1℃	
30040	Environment Temperature	2bytes	0~2000	0.1℃	
30041	Battery Lasting	2bytes		minute	

Tabel 3.4.2 Parallel Data

Input RegistersAddress	Content	Size	Range	Unit	remark
30061	Parallel Link Number	2bytes			
30062	Parallel Invert Output Number	2bytes			
30063	Parallel Output A phase Apparent Power	2bytes		0.1kVA	
30064	Parallel Output B phase Apparent Power	2bytes		0.1kVA	
30065	Parallel Output C phase Apparent Power	2bytes		0.1kVA	
30066	Parallel Output A phase Active Power	2bytes		0.1KW	
30067	Parallel Output A phase Active Power	2bytes		0.1KW	
30068	Parallel Output A phase Active Power	2bytes		0.1KW	

Tabel 3.4.3 UPS Status information

Input RegistersAddress	Content	Size	Format	remark
30081	operational status	2bytes	numerical value	Tabel 4.4.1
30082	UPS Status information 1	2bytes	16bit,(high-order byte is front)	Tabel 4.3.1
30083	UPS Status information 2	2bytes	16bit,(high - order byte is front)	
30084	UPS Status information 3	2bytes	16bit,(high - order byte is front)	
30085	UPS Status information 4	2bytes	16bit,(high - order byte is front)	
30086	UPS Alarm information 1	2bytes	16bit,(high - order byte is front)	Tabel 4.3.2
30087	UPS Alarm information 2	2bytes	16bit,(high - order byte is front)	
30088	UPS Alarm information 3	2bytes	16bit,(high - order byte is front)	
30089	UPS Alarm information 4	2bytes	16bit,(high - order byte is front)	
30090	Monitor System Status information	2bytes	16bit,(high - order byte is front)	Tabel 4.3.3
30091	Monitor System Alarm	2bytes	16bit,(high - order byte is front)	Tabel 4.3.4

	information			
--	-------------	--	--	--

Tabel 3.4.4 Module n Data

Input RegistersAddress	Content	Size	Range	Unit	remark
MBARn+01	Positive BUS Voltage	2bytes	0~5000	0.1V	
MBARn+02	Negative BUS Voltage	2bytes	0~5000	0.1V	
MBARn+03	Invert A Phase voltage	2bytes	0~3000	0.1V	
MBARn+04	Invert B Phase voltage	2bytes	0~3000	0.1V	
MBARn+05	Invert C Phase voltage	2bytes	0~3000	0.1V	
MBARn+06	Invert A Phase current	2bytes	0~20000	0.1A	
MBARn+07	Invert B Phase current	2bytes	0~20000	0.1A	
MBARn+08	Invert C Phase current	2bytes	0~20000	0.1A	
MBARn+09	Invert frequency	2bytes	0~700	0.1Hz	
MBARn+10	Rectifier temperature	2bytes	0~2000	0.1℃	
MBARn+11	Invert temperature	2bytes	0~2000	0.1℃	
MBARn+12	Rectifier Status information 1	2bytes	16bit,(high - order byte is front)		Tabel 4.3.5
MBARn+13	Rectifier Status information 2	2bytes	16bit,(high - order byte is front)		
MBARn+14	Invert Status information 1	2bytes	16bit,(high - order byte is front)		Tabel 4.3.6
MBARn+15	Invert Status information 2	2bytes	16bit,(high - order byte is front)		
MBARn+16	Rectifier Alarm information 1	2bytes	16bit,(high - order byte is front)		Tabel 4.3.7
MBARn+17	Rectifier Alarm information 2	2bytes	16bit,(high - order byte is front)		
MBARn+18	Invert Alarm information 1	2bytes	16bit,(high - order byte is front)		Tabel 4.3.8
MBARn+19	Invert Alarm information 2	2bytes	16bit,(high - order byte is front)		
MBARn is the base address of Module what number is n Module 1:MBAR01=30100; Module 2:MBAR02=30150; Module 3:MBAR03=30200; Module 4:MBAR04=30250; Module 5:MBAR05=30300; Module 6:MBAR06=30350; Module 7:MBAR07=30400; Module 8:MBAR08=30450; Module 9:MBAR09=30500; Module 10:MBAR10=30550					

Tabel 3.4.5 Battery information

Registers Address	Content	Size	Unit	remark
BBARn+01	Battery Voltage	2bytes	0.01V	
BBARn+02	Battery temperature	2bytes	0.1℃	
BBARn+03	Battery Resist	2bytes	0.01mΩ	
BBARn+04	Battery Status	2bytes		
BBARn is the base address of: Battery monitor data and the number of battery is n. Number n:BBARn=32000+4*n				

3.5 Holding Registers(Address:4XXXX)Data Content

Tabel 3.5.1 User setting

Holding RegistersAddress	Content	Size	Range	Unit	remark
40001	UPS Rating Capability	2bytes	100~4000	0.1kVA	

40002	Parallel ID	2bytes	1~15		
40003	Module Number	2bytes	1~10		
40004	Work Mode	2bytes			Tabel 4.4.2
40005	System Voltage Level	2bytes	110~240	V	
40006	Output frequency Level	2bytes	50,60	Hz	
40007	Parallel Amount	2bytes	1~15		
40008	Parallel Redundancy	2bytes	0~14		
40009	Switch Bypass times	2bytes	3~10		
40010	M/S Alternate Cyc	2bytes	1~6	month	
40011	Bypass Frequence Range	2bytes	1,2,4,5,10	%	1%,2%,4%,5%,10%
40012	Bypass Volt Upper Limit	2bytes	5,10,15,25	%	5%,10%,15%,25%
40013	Bypass Volt lower Limit	2bytes	-45,-30,-20	%	-45%,-30%,-20%
40014	Invert-Volt fine	2bytes	-50~+50	‰	
40015	Battery Number	2bytes	13~20	node	
40016	Single Battery Volt	2bytes	2,4,6,12	V	
40017	Battery Group	2bytes	1~8	group	
40018	Boost upper limit Volt	2bytes	230~240	0.01V/Cell	
40019	Float base Volt	2bytes	220~229	0.01V/Cell	
40020	EOD Volt	2bytes	120~190	0.01V/Cell	
40021	Single Battery Capability	2bytes	1~2000	AH	
40022	Battery low PreAlarm Time	2bytes	1~100	minute	
40023	Max Charge current	2bytes	1~25	A	
40024	Power walk in	2bytes	0~20	second	
40025	Boost Last Time	2bytes	0~999	minute	
40026	LBS Setting	2bytes	0,1,2		0:LBS Disable; 1:LBS Master; 2:LBS Slave
40027	Status control information	2bytes			Tabel 4.3.9
40028	Float Volt temperature Repair Parameter	2bytes	1~6	0.001V/Cell/℃	

Tabel 3.5.2 System Date

Holding RegistersAddress	Content	Size	Range	Unit	remark
40031	year	1Byte	0~99	year	
	month	1Byte	1~12	month	
40032	day	1Byte	1~31	day	
	hour	1Byte	0~23	hour	
40033	minute	1Byte	0~59	minute	
	second	1Byte	0~59	second	

Tabel 3.5.3 System Self-testing time

Holding RegistersAddress	Content	Size	Range	Unit	remark
40041	control	1Byte	0,1,2		0:time to self-test disabled ; 1:time by day; 2:time by week;
	day(week)	1Byte	1~31(0~6)	day(week)	
40042	hour	1Byte	0~23	hour	
	minute		0~59	minute	
40043	Self-Test Time	2bytes	1~99	minute	

Tabel 3.5.4 History Record

Holding	Content	Size	Range	Unit	remark
---------	---------	------	-------	------	--------

RegistersAddress					
40051	Rating Record total(high)	2bytes			
40052	Rating Record total (low)	2bytes			
40053	Record total(high)	2bytes			If the value is 0,it means that there no record
40054	Record total (low)	2bytes			
40055	currently Record Pointer(high)	2bytes			
40056	currently Record Pointer(low)	2bytes			

Tabel 3.5.5 System Timing of ON/OFF

Holding Registers Address	Content	Size	Range	Unit	remark
40061	(high - order byte)Group number	1Byte	0~255		Default value is 0
	(low - order byte):control	1Byte	0,1,2		0:time to self-test disabled ; 1:time by day; 2:time by week;
40062	(high - order byte) Reserved	1Byte	0		
	(low - order byte):start day(week)	1Byte	1~31(0~6)	day(week)	
40063	(high - order byte):Start hour	1Byte	0~23	hour	
	(low - order byte): Start minute	1Byte	0~59	minute	
40064	(high - order byte): Reserved	1Byte	0		
	(low - order byte): shutdown day(week)	1Byte	1~31(0~6)	day(week)	
40065	(high - order byte): shutdown hour	1Byte	0~23	hour	
	(low - order byte): shutdown minute	1Byte	0~59	minute	

Tabel 3.5.6 Preventive Maintenance Date

Holding Registers Address	Content	Size	Range	Unit	remark
40071	year	2bytes			
40072	(high - order byte):month	1Byte	1~12		
	(low - order byte):day	1Byte	1~28(31)		date

Tabel 3.5.7 Status and Alarm information

Holding Registers Address	Content	Size	Format	remark
40081	operational status	2bytes		1: allowable 0:forbidden The details is in the Tabel

			16bit,(high - order byte is front)	3.5.7a
40082	UPS Status information 1	2bytes	16bit,(high - order byte is front)	1: allowable 0:forbidden The details is in the Tabel 4.3.1
40083	UPS Status information 2	2bytes	16bit,(high - order byte is front)	
40084	UPS Status information 3	2bytes	16bit,(high - order byte is front)	
40085	UPS Status information 4	2bytes	16bit,(high - order byte is front)	
40086	UPS Alarm information 1	2bytes	16bit,(high - order byte is front)	1: allowable 0:forbidden The details is in the Tabel 4.3.2
40087	UPS Alarm information 2	2bytes	16bit,(high - order byte is front)	
40088	UPS Alarm information 3	2bytes	16bit,(high - order byte is front)	
40089	UPS Alarm information 4	2bytes	16bit,(high - order byte is front)	
40090	Monitor System Status information	2bytes	16bit,(high - order byte is front)	1: allowable 0:forbidden The details is in the Tabel 4.3.3
40091	Monitor System Alarm information	2bytes	16bit,(high - order byte is front)	1: allowable 0:forbidden The details is in the Tabel 4.3.4

Tabel 3.5.7a Operational status information

No	D15~D0bit	Content	remark
1	D15	Initializing	1: allowable 0:forbidden (Default value is 1)
2	D14	Standby	
3	D13	Non-Output	
4	D12	On Bypass	
5	D11	On-Line	
6	D10	Battery	
7	D09	Battery Testing	
8	D08	INV Starting	
9	D07	Economy MODE	
10	D06	EPO	
11	D05	Manu Bypass	
12	D04	Fault	
13	D03~D0	(Reserved)	

Tabel 3.5.8 Rect Correct Data

Holding RegistersAddress	Content	Size	Range	Unit	remark
40101	input A Phase voltage Correct Data	2bytes			
40102	input B Phase voltage Correct Data	2bytes			
40103	input C Phase voltage Correct Data	2bytes			
40104	Positive Battery Voltage Correct Data	2bytes			
40105	Negative Battery Voltage Correct Data	2bytes			
40106	Positive BUS Voltage Correct Data	2bytes			
40107	Negative BUS Voltage Correct Data	2bytes			
40108	Positive Battery Voltage	2bytes			

	current Correct Data				
40109	Negative Battery Voltage current Correct Data	2bytes			
40110	Rect Variable Address	2bytes			
40111	Rect Variable Value	2bytes			

Tabel 3.5.9 Imv Correct Data

Holding RegistersAddress	Content	Size	Range	Unit	remark
40121	Invert A Phase voltage Correct Data	2bytes			
40122	Invert B Phase voltage Correct Data	2bytes			
40123	Invert C Phase voltage Correct Data	2bytes			
40124	Invert Bypass A Phase voltage Correct Data	2bytes			
40125	Invert Bypass B Phase voltage Correct Data	2bytes			
40126	Invert Bypass C Phase voltage Correct Data	2bytes			
40127	Output A Phase voltage Correct Data	2bytes			
40128	Output B Phase voltage Correct Data	2bytes			
40129	Output C Phase voltage Correct Data	2bytes			
40130	Positive BUS Voltage Correct Data	2bytes			
40131	Negative BUS Voltage Correct Data	2bytes			
40132	Invert Variable Address	2bytes			
40133	Invert Variable Value	2bytes			
40134	Invert A Phase DC component Correct Data	2bytes			
40135	Invert B Phase DC component Correct Data	2bytes			
40136	Invert C Phase DC component Correct Data	2bytes			

Tabel 3.5.10 Communication Setting Parameter

Holding RegistersAddress	Content	Size	Range	Unit	remark
40201	Port1 Communication Parameter	2bytes			
40202	Port2 Communication Parameter	2bytes			
40203	Port3 Communication Parameter	2bytes			
40204	Port4 Communication Parameter	2bytes			

Definition:

Communication Setting Parameter is built by two bytes.the high-order byte is the Communication Protocol, the

low-order byte is the Bound Rate.

Select Communication Protocol: the default value is 0.

Select Bound Rate: the default value is 0. its range is in 0..2.

0:2400bps;1:4800bps;2:9600bps.

Tabel 3.5.11 Self-Wasting Parameter

Holding RegistersAddress	Content	Size	Range	Unit	remark
40211	Self-Wasting (B)	2bytes		W	
40212	Self-Wasting (K)	2bytes			
40213	The Resist what value is same with Single Battery	2bytes			

Definition: this part is relate to Battery Support.

3.5 Query History Record

Request

Function Code	1byte	0x14
byte count	1byte	0x07
Reference Type	1byte	0x06
Request File Number	2bytes	1,10
Request Record Number	2bytes	1~max
Register Length	2bytes	66

Response

Function Code	1byte	0x14
Resp. data Length	1byte	68
File Resp. length	1byte	66
Reference Type	1byte	0x06
Record Data	66byte	History record

Definition:

1. File number is 1, it record the event what sequence number is reverse number; File number is 10, it record the event record what sequence number is accumulate number..

3.6 Read Device Identification

Request

Function Code	1byte	0x2B
MEI Type*	1byte	0x0E
Read Device ID code	1byte	0x01
Object Id	1byte	Tabel 3.6.1

Response

Function Code	1byte	0x2B
MEI Type*	1byte	0x0E
Read Device ID code	1byte	0x01
Conformity level	1byte	0x01
More Follows	1byte	0x00
Next Object Id	1byte	0x00

Number of objects	1byte	0x01
Object ID	1byte	Tabel 3.6.1
Object length	1byte	N
Object Value	Nbyte	Tabel 4.1.1

Tabel 3.6.1 Object Id

Object Id	Content Description	Object Length (Byte)	remark
0x00	Vendor Name	15	
0x01	Product Code	6	Tabel 4.1.1
0x02	MajorMinorRevision	10	
0x03	VendorUrl	10	
0x05	ModelName	10	
0x81	Version1	10	
0x82	Version2	10	

4. Information Definition

4.1 Read Device ID code

4.1.1 Machine Type Code Data Structure

Tabel 4.1.1 Machine Type Code Data Structure

No	Content	Size	remark
1	Machine Type Code	1Byte	ASCII Code, “U”:UPS “O”:Outside UPS “I”: Invert “E”:EPS “M”: Modularization UPS
2	Product Type	1Byte	ASCII Code, “H”: High Frequency “G”:Power Frequency “B”:Back up “I”:On-line
3	Work Mode	1 Byte	ASCII Code, “S”:one phase input and output “D”: three phase input and one phase output “T”: three phase input and output
4	(Reserved)	1 Byte	ASCII Code,,30H
5	Rated Power	2bytes	Hex value,Unit:0.1kVA

4.2 History Record information

The details of one history record is in tabel 4.2.1.

Tabel 4.2.1 History Record information

No	Content	Size	remark
1	Record number	2bytes	
2	Year month	2bytes	BCD Code
3	Day hour	2bytes	BCD Code
4	minute second	2bytes	BCD Code
5	operational status	2bytes	The value of High-order byte is the operational status

	Module ID		The value of low-order byte is module id.
6	Currently event code	2bytes	The value of High-order byte is the currently event code.
	Currently Alarm code		The value of low-order byte is the currently alarm code.
7	UPS Status information 1	2bytes	Tabel 4.3.1
8	UPS Status information 2	2bytes	
9	UPS Status information 3	2bytes	
10	UPS Status information 4	2bytes	
11	UPS Alarm information 1	2bytes	Tabel 4.3.2
12	UPS Alarm information 2	2bytes	
13	UPS Alarm information 3	2bytes	
14	UPS Alarm information 4	2bytes	
15	Monitor System Status information	2bytes	Tabel 4.3.3
16	Monitor System Alarm information	2bytes	Tabel 4.3.4
17	input A Phase voltage	2bytes	
18	input B Phase voltage	2bytes	
19	input C Phase voltage	2bytes	
20	input frequency	2bytes	
21	Output A Phase voltage	2bytes	
22	Output B Phase voltage	2bytes	
23	Output C Phase voltage	2bytes	
24	Output A Phase current	2bytes	
25	Output B Phase current	2bytes	
26	Output C Phase current	2bytes	
27	Output frequency	2bytes	
28	Positive Battery Voltage	2bytes	
29	Negative Battery Voltage	2bytes	
30	Positive Battery current	2bytes	
31	Negative Battery current	2bytes	
32	Inside Temperature	2bytes	
33	(Reserved)	2bytes	

Tabel 4.2.2 UPS Event information

Event Code	UPS Event information
00	(no new event)
01	Initializing
02	Standby
03	Non-Output
04	On Bypass
05	On-Line
06	Battery
07	Economy MODE
08	Automatic Self Test
09	Inverter in soft starting
10	Fault

11	Manu Bypass
12	EPO Activated
13~19	(Reserved)
20	Int. Input Switch closed
21	Int. Input Switch opened
22	Rectifier Deactivated
23	Rectifier Activated
24	Rectifier Over Current
25	Battery charge deactivated
26	Positive Battery Boost Charging
27	Positive Battery Float Charging
28	Negative Battery Boost Charging
29	Negative Battery Float Charging
30	Int. bypass Switch Opened
31	Int.bypass Switch Closed
32	Int.output Switch Opened
33	Int. output Switch Closed
34	Ext.bypass Switch Opened
35	Ext. bypass Switch Closed
36	Ext. output Switch Opened
37	Ext. output Switch Closed
38	Coming to Interval transfer
39	Coming to over load due to inverter off
40	Coming to Interval transfer due to inverter off
41	Inverter invalid due to over load
42	Change Master
43	Transfer Times-out
44	UPS In shutdown Due To Overload.
45	UPS In Bypass Due To Overload.
46	Parallel in Bypass
47	LBS Activated
48	Thunder Protect
49	ShutDown Due To Batt. Low
50	Time to turn on
51	Time to turn off
52	Time to Battery Testing
53	Testing Stopped
54	Manu turn off
55	Remote turn off
56	Module online
57	Module takeoff

Tabel 4.2.3 UPS Alarm information

Event Code	UPS Alarm information
00	(no new Alarm information)
01	Rectifier Fault
02	Rectifier Over Temperature
03	Inverter Over temperature
04	Rectifier Over current
05	Auxiliary power 1 fault
06	Auxiliary power 2 fault
07	Input Thyristor failed
08	Discharge Thyristor failed
09	Charge Thyristor failed
10	Fan fault
11	Fan Power fault
12	DC Bus over voltage
13	DC Bus below voltage
14	DC bus unbalance
15	Mains Site Wiring Fault
16	Soft start failed
17	Input Neutral line missing
18	Battery reverse
19	No battery
20	P-Battery Charger fault
21	N-battery charger fault
22	Battery under voltage
23	Battery over voltage
24	Battery low pre-warning
25	Mains freq. abnormal
26	Mains volt. abnormal
27	Inverter fault
28	Inv. IGBT bridge shorted
29	Inverter Thyristor short
30	Inverter Thyristor broken
31	Bypass Thyristor short
32	Bypass Thyristor broken
33	CAN comm. Fault
34	Parallel load sharing fault
35	Bypass Site Wiring Fault
36	System Not Sync. To Bypass
37	Bypass unable to trace
38	Bypass Not Available
39	IGBT over current
40	Fuse broken

41	Cable connection error
42	Parallel relay fault
43	LBS Not SYNC
44	Initializtion fault
45	Inverter on invalid
46	Overload
47	Parallel Overload
48	DC component over limit
49	Bypass over current
50	Feedback protection
51	Firt Alarm
52	Smog Alarm
53	Battery Fault
54	Battery temperature over
55	(Reserved)
56	Machine Type Setting fault

4.3 UPS Information

Tabel 4.3.1 UPS Status information

No	D63~D0bit		remark
1	D63	Input Switch	1:opened;0:closed
2	D62	Rectifier	1:work ;0:stop
3	D61	EPO Activated	1: EPO Status
4	D60	Rectifier current Limt	1: Rectifier current Limt
5	D59	Input Supply Power Status	1: work;0:stop
6	D58	Input Supply Power Mode	1: Input Supply Power,0: Battery Supply Power
7	D57	Battery Test	1: Battery Test
8	D56	Battery charge	1: Battery charge
9	D55	P-Battery Boost/ Float Charging	1: Boost Charging
10	D54	N-Battery Boost/ Float Charging	1: Boost Charging
11	D53~D32	0(Reserved)	
12	D31	ByPass Switch	1:opened;0:closed
13	D30	Output Switch	1:opened;0:closed
14	D29	Manu-Bypass Switch	1:opened;0:closed
15	D28	Ext. bypass Switch	1:opened;0:closed
16	D27	OutSide-Output Switch	1:opened;0:closed
17	D26	Inverter on/off Status	00:shutdown;01: Soft start; 10: Inv work on ,but No Output; 11: Normal Output
18	D25		
19	D24	UPS Supply Power Status	00:no Supply Power;01:Bypass Supply Power; 10: Inverter Supply Power
20	D23		
21	D22	Coming to Interval transfer	1:Efficient Status;0: invalid
22	D21	INV. Off coming to PowerOff	1:Efficient Status;0: invalid
23	D20	INV. Off coming to Overload	1:Efficient Status;0: invalid

24	D19	EPO	1:Efficient Status;0:invalid
25	D18	Inverter invalid due to over load	Output by Bypass coming to Overload in Single Mode or INV.invalid due to Overload in Parallel Mode
26	D17	Change Master	1:Efficient Status;0:invalid
27	D16	Transfer Times-out	1:Efficient Status;0:invalid
28	D15	UPS In shutdown Due To Overload.	1:Efficient Status;0:invalid
29	D14	UPS In Bypass Due To Overload.	1:Efficient Status;0:invalid
30	D13	Parallel in Bypass	1:Efficient Status;0:invalid
31	D12	LBS Activated	1:Efficient Status;0:invalid
32	D11	ECO	1:Efficient Status;0:invalid
33	D10~D0	0(Reserved)	

Tabel 4.3.2 UPS Alarm information

No	D63~D0bit		remark
1	D63	Rectifier Fault	1:Efficient Status;0:invalid
2	D62	Rectifier Over Temperature	
3	D61	Inverter Over temperature	
4	D60	Rectifier Over current	
5	D59	Auxiliary power 1 fault	
6	D58	Auxiliary power 2 fault	
7	D57	Input Thyristor failed	
8	D56	Discharge Thyristor failed	
9	D55	Charge Thyristor failed	
10	D54	Fan fault	
11	D53	Fan Power fault	
12	D52	DC Bus over voltage	
13	D51	DC Bus below voltage	
14	D50	DC bus unbalance	
15	D49	Mains Site Wiring Fault	
16	D48	Soft start failed	
17	D47	Input Neutral line missing	
18	D46	Battery reverse	
19	D45	No battery	
20	D44	P-Battery Charger fault	
21	D43	N-battery charger fault	
22	D42	Battery under voltage	
23	D41	Battery over voltage	
24	D40	Battery low pre-warning	
25	D39	Mains freq. abnormal	
26	D38	Mains volt. abnormal	
27	D37	0(Reserved)	
28	D36	0(Reserved)	
29	D35	0(Reserved)	
30	D34	0(Reserved)	
31	D33	0(Reserved)	
32	D32	0(Reserved)	
33	D31	Inverter fault	1:Efficient Status;0:invalid
34	D30	Inv. IGBT bridge shorted	
35	D29	Inverter Thyristor short	
36	D28	Inverter Thyristor broken	
37	D27	Bypass Thyristor short	

38	D26	Bypass Thyristor broken	
39	D25	CAN comm. Fault	
40	D24	Parallel load sharing fault	
41	D23	Bypass Site Wiring Fault	
42	D22	System Not Sync. To Bypass	
43	D21	Bypass unable to trace	
44	D20	Bypass Not Available	
45	D19	IGBT over current	
46	D18	Fuse broken	
47	D17	Cable connection error	
48	D16	Parallel relay fault	
49	D15	LBS Not SYNC	
50	D14	Initializtion fault	
51	D13	Inverter on invalid	
52	D12	Overload	
53	D11	Parallel Overload	
54	D10	DC component over limit	
55	D9	Bypass over current	
56	D8	Feedback protection	
57	D7	BUS volt. abnormal	
58	D6	0(Reserved)	
59	D5	0(Reserved)	
60	D4	0(Reserved)	
61	D3	0(Reserved)	
62	D2	0(Reserved)	
63	D1	0(Reserved)	
64	D0	0(Reserved)	

Tabel 4.3.3 Monitor System Status Information

No	D15~D0bit		remark
1	D15	Dynamotor	1:Efficient Status
2	D14	ShutDown Due To Batt. Low	1:Efficient Status
3	D13	Time to turn on	1:Efficient Status
4	D12	Time to turn off	1:Efficient Status
5	D11	Time to Battery Testing	1:Efficient Status
6	D10	Thunder Protect	1:Efficient Status
7	D9	Battery monitor system connect	1: connected;0: disconnect
8	D8	Sequence Code register	1: unregistered 0: registered
9	D7	Calculate charge rate	1:calculated;0:uncalculated
10	D6	Calculate Support	1:calculated;0:uncalculated
11	D5	0(Reserved)	
12	D4	0(Reserved)	
13	D3	0(Reserved)	
14	D2	0(Reserved)	
15	D1	0(Reserved)	
16	D0	0(Reserved)	

Tabel 4.3.4 Monitor System Alarm Information

No	D15~D0bit		remark
1	D15	Battery Fault	1:Efficient Status
2	D14	Battery temperature over	1:Efficient Status

3	D13	Battery over voltage	1:Efficient Status
4	D12	Battery under voltage	1:Efficient Status
5	D11	Fire Alarm	1:Efficient Status
6	D10	Smog Alarm	1:Efficient Status
7	D9	Machine Type Setting fault	1:Efficient Status
8	D8	Over Preventive Maintenance Time	1:Efficient Status
9	D7	0(Reserved)	
10	D6	0(Reserved)	
11	D5	0(Reserved)	
12	D4	0(Reserved)	
13	D3	0(Reserved)	
14	D2	0(Reserved)	
15	D1	0(Reserved)	
16	D0	0(Reserved)	

Tabel 4.3.5 Rect Status Information

No	D31~D0bit		remark
1	D31	Input Switch	1:opened;0:closed
2	D30	Rectifier	1:work ;0:stop
3	D29	EPO Activated	1: EPO Status
4	D28	Rectifier current Limt	1: Rectifier current Limt
5	D27	Input Supply Power Status	1: work;0:stop
6	D26	Input Supply Power Mode	1: Input Supply Power,0: Battery Supply Power
7	D25	Battery Test	1: Battery Test
8	D24	Battery charge	1: Battery charge
9	D23	P-Battery Boost/ Float Charging	1: Boost Charging
10	D22	N-Battery Boost/ Float Charging	1: Boost Charging
11	D21	0(Reserved)	
12	D20	0(Reserved)	
13	D19	0(Reserved)	
14	D18	0(Reserved)	
15	D17	0(Reserved)	
16	D16	0(Reserved)	
17	D15	Communication connected	It is only good for module, its value is 0. 1:Communication connected;0: Communication lost
18	D14	0(Reserved)	
19	D13	0(Reserved)	
20	D12	0(Reserved)	
21	D11	0(Reserved)	
22	D10	0(Reserved)	
23	D9	0(Reserved)	
24	D8	0(Reserved)	
25	D7	0(Reserved)	
26	D6	0(Reserved)	

27	D5	0(Reserved)	
28	D4	0(Reserved)	
29	D3	0(Reserved)	
30	D2	0(Reserved)	
31	D1	0(Reserved)	
32	D0	0(Reserved)	

Tabel 4.3.6 Inv Status Information

No	D31~D0bit		remark
1	D31	ByPass Switch	1:opened;0:closed
2	D30	Output Switch	1:opened;0:closed
3	D29	Manu-Bypass Switch	1:opened;0:closed
4	D28	Ext. bypass Switch	1:opened;0:closed
5	D27	OutSide-Output Switch	1:opened;0:closed
6	D26	Inverter on/off Status	00:shutdown;01: Soft start; 10: Inv work on ,but No Output; 11: Normal Output
7	D25		
8	D24	UPS Supply Power Status	00:no Supply Power;01:Bypass Supply Power; 10:Inverter Supply Power
9	D23		
10	D22	Coming to Interval transfer	1:Efficient Status;0:invalid
11	D21	INV. Off coming to PowerOff	1:Efficient Status;0:invalid
12	D20	INV. Off coming to Overload	1:Efficient Status;0:invalid
13	D19	EPO	1:Efficient Status;0:invalid
14	D18	Inverter invalid due to over load	Output by Bypass coming to Overload in Single Mode or INV.invalid due to Overload in Parallel Mode
15	D17	Change Master	1:Efficient Status;0:invalid
16	D16	Transfer Times-out	1:Efficient Status;0:invalid
17	D15	UPS In shutdown Due To Overload.	1:Efficient Status;0:invalid
18	D14	UPS In Bypass Due To Overload.	1:Efficient Status;0:invalid
19	D13	Parallel in Bypass	1:Efficient Status;0:invalid
20	D12	LBS Activated	1:Efficient Status;0:invalid
21	D11	ECO	1:Efficient Status;0:invalid
22	D10	0(Reserved)	
23	D9	0(Reserved)	
24	D8	0(Reserved)	
25	D7	0(Reserved)	
26	D6	0(Reserved)	
27	D5	0(Reserved)	
28	D4	0(Reserved)	
29	D3	0(Reserved)	
30	D2	0(Reserved)	
31	D1	0(Reserved)	
32	D0	0(Reserved)	

Tabel 4.3.7 Rect Alarm Information

No	D31~D0bit		remark
1	D31	Rectifier Fault	1:Efficient Status;0:invalid
2	D30	Rectifier Over Temperature	

3	D29	Inverter Over temperature	
4	D28	Rectifier Over current	
5	D27	Auxiliary power 1 fault	
6	D26	Auxiliary power 2 fault	
7	D25	Input Thyristor failed	
8	D24	Discharge Thyristor failed	
9	D23	Charge Thyristor failed	
10	D22	Fan fault	
11	D21	Fan Power fault	
12	D20	DC Bus over voltage	
13	D19	DC Bus below voltage	
14	D18	DC bus unbalance	
15	D17	Mains Site Wiring Fault	
16	D16	Soft start failed	
17	D15	Input Neutral line missing	
18	D14	Battery reverse	
19	D13	No battery	
20	D12	P-Battery Charger fault	
21	D11	N-battery charger fault	
22	D10	Battery under voltage	
23	D9	Battery over voltage	
24	D8	Battery low pre-warning	
25	D7	Mains freq. abnormal	
26	D6	Mains volt. abnormal	
27	D5	0(Reserved)	
28	D4	0(Reserved)	
29	D3	0(Reserved)	
30	D2	0(Reserved)	
31	D1	0(Reserved)	
32	D0	0(Reserved)	

Tabel 4.3.8 Inv Alarm Information

No	D31~D0bit		remark
1	D31	Inverter fault	1:Efficient Status;0:invalid
2	D30	Inv. IGBT bridge shorted	
3	D29	Inverter Thyristor short	
4	D28	Inverter Thyristor broken	
5	D27	Bypass Thyristor short	
6	D26	Bypass Thyristor broken	
7	D25	CAN comm. Fault	
8	D24	Parallel load sharing fault	
9	D23	Bypass Site Wiring Fault	
10	D22	System Not Sync. To Bypass	
11	D21	Bypass unable to trace	
12	D20	Bypass Not Available	
13	D19	IGBT over current	
14	D18	Fuse broken	
15	D17	Cable connection error	
16	D16	Parallel relay fault	
17	D15	LBS Not SYNC	
18	D14	Initializtion fault	
19	D13	Inverter on invalid	
20	D12	Overload	
21	D11	Parallel Overload	
22	D10	DC component over limit	

23	D9	Bypass over current	
24	D8	Feedback protection	
25	D7	BUS volt. abnormal	
26	D6	0(Reserved)	
27	D5	0(Reserved)	
28	D4	0(Reserved)	
29	D3	0(Reserved)	
30	D2	0(Reserved)	
31	D1	0(Reserved)	
32	D0	0(Reserved)	

Tabel 4.3.9 User Setting Status information

No	D15~D0bit		remark
1	D15	Output Disable	0: output is allowable ;1: output is forbidden
2	D14	Auto Turn-on Disable	0: allowable;1: forbidden
3	D13	Boost Charging Disable	0: allowable;1: forbidden
4	D12	Buzzer Mute	0: hint voice in Battery Mode;1:Mute
5	D11	0(Reserved)	
6	D10	0(Reserved)	
7	D9	0(Reserved)	
8	D8	0(Reserved)	
9	D7	0(Reserved)	
10	D6	0(Reserved)	
11	D5	0(Reserved)	
12	D4	0(Reserved)	
13	D3	0(Reserved)	
14	D2	0(Reserved)	
15	D1	0(Reserved)	
16	D0	0(Reserved)	

4.4 UPS Data Information Definition

Tabel 4.4.1 UPS operational status

No	Hex		remark
1	0x0000	Initializing	
2	0x0001	Standby	
3	0x0002	Non-Output	
4	0x0003	On Bypass	
5	0x0004	On-Line	
6	0x0005	Battery	
7	0x0006	Battery Testing	
8	0x0007	INV Starting	
9	0x0008	Economy MODE	
10	0x0009	EPO	
11	0x000A	Manu Bypass	
12	0x000B	Fault	

Tabel 4.4.2 Work Mode Setting

No	Hex		remark
1	0x0000	Single	
2	0x0001	ECO	
3	0x0002	Master	
4	0x0003	Slave	
5	0x0004	Paralle	
6	0x0005	Test	
7	0x0006	Maintain	
8	0x0007	Aging	