

Modbus communication protocol_Ver 1.50_C

UPS Model ZY120, SHIELD, NS3000, NOVA, Must400, Must900, MMust

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1、 Introduction

1.1 Protocol Introduction

Modbus protocol is a general language applied to the controller. Through this protocol, the controller can communicate with other UPS equipment via the network. This communication adopts the response mode. The host initiates the request (sends telemetry and remote signaling information), and the slave executes the request and responds. The slaves need to be distinguished by address setting, and the address range that can be set for the slaves is 0x01 ~ 0xFF.

1.2 Interface

Baud rate: 1200bps, 2400 bps, 4800 bps, 9600 bps, 14400 bps, 19200 bps

Data length: 8bit

Parity: None

Stop bit: 1bit

1.2.1 RS_485 port definition

The RS_485 definition is shown in Fig 1.

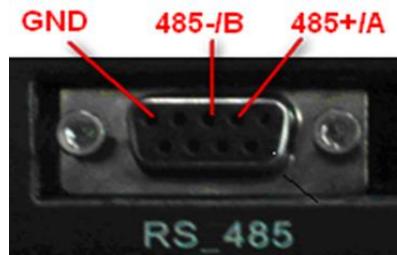


Fig 1. RS_485 port definition

pin2--- 485+/A

pin3--- 485-/B

pin5 --- GND

The RS_485 phoenix termina definition is shown in Fig 2.

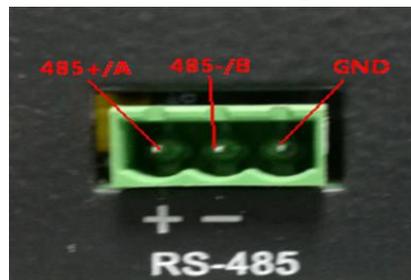


Fig 2. RS_485 port definition

Pin1--- 485+/A

Pin2--- 485-/B

Pin3 --- GND

1.2.2 RS_232 port definition

Male type pins definition of RS_232 Port is shown in Fig 3.

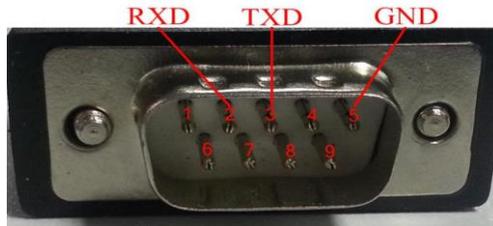


Fig 3. Male type pins definition of RS_232 Port

- pin2--- RXD
- pin3--- TXD
- pin5--- GND

Female type holes definition of RS_232 Port is shown in Fig 4.

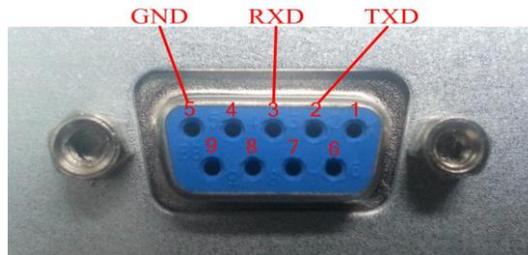


Fig 4. Female type holes definition of RS_232 Port

- pin2--- TXD
- pin3--- RXD
- pin5--- GND

1.2.3 USB port

The USB interface adopts the standard USB B-type, and the user can connect the UPS and the computer with standard USB B-type cable. After wiring, the corresponding driver should be installed in the computer. The driver can be found in the incidental CD.



Fig 5.USB B-type cable

1.3 Protocol format

This protocol supports RTU mode and ASCII mode.

1.3.1 Format of the RTU mode

The controller communicate through Modbus by RTU mode, each information byte (8 bits) consists of 2 parts of 4-bit hexadecimal characters. The format of the information byte is as below.

Coding system: 8-bit binary

Starting bit: one bit

Data bit: 8 bits of data, lower bits first send

Parity check: odd or even check as one bit, no check as 1 stop bit

Stop bit: 1 bit

Error check: cycle redundancy check (CRC)

Request-to-send format in RTU mode

Start	Device address	Functional code	Register start address	Register digit	CRC Lower byte	CRC High byte	End
Free time for 3.5 characters at least	8 bit	8 bit	16 bit	16 bit	8 bit	8 bit	Free time for 3.5 characters at least

In RTU mode, the characters are transmitted with 11-bit format, as following

Start bit	1	2	3	4	5	6	7	8	Stop bit (Parity check)	Stop bit
-----------	---	---	---	---	---	---	---	---	-------------------------	----------

The RTU mode response frame format:

Start	Device address	Functional Code	Data	CRC Lower byte	CRC High byte	End
Free time for 3.5 characters at least	8 bit	8 bit	$8n \uparrow$ bit	8 bit	8 bit	Free time for 3.5 characters at least

Message transmission requires a pause interval of at least 3.5 characters. After the last transmitted character, a pause of at least 3.5 character time is required to mark the end of the message. A new message can start after this pause.

The entire message frame must be transmitted as a continuous stream. If there is more than 1.5 characters of idle time between two characters before the frame is completed, the frame is regarded as an error, the reception is stopped, and the reception is restarted. That is to ensure that the interval between the two frames is at least greater than 3.5 character time, 1.5 character time and 3.5 character time are related to the specific communication baud rate, the calculation method is as follows: If the

communication baud rate is 9600, then

$$1.5 \text{ character interval} = (1/9600) \times 11 \times 1.5 \times 1000 = 1.72 \text{ ms}$$

$$3.5 \text{ character interval} = (1/9600) \times 11 \times 3.5 \times 1000 = 4.01 \text{ ms}$$

【Example】 ***

Request frame format: request date of unit 1, register start address: 0002, only 1 register.

	Address	Function	Register Starting address		Register number		CRC	
Date	0x01	0x03	0x00	0x02	0x00	0x01	0x25	0xCA
Bit	1	1	2		2		2	

Response frame format: unit 1 Response frame.

	Address	Function	Return data bytes	Date		CRC	
Date	0x01	0x03	0x02	0x12	0x22	0xE9	0x5C
Bit	1	1	1	2		2	

1.3.2 Format of the ASCII mode

When the controller communicates on the Modbus bus in ASCII mode, each 8-bit byte in a message is transmitted as 2 ASCII characters, and the format of each byte of the ASCII code is:

- Coding System: Hexadecimal, ASCII characters '0'-'9', 'A'-'F'
- Start bit: 1bit
- Data bit: 7 data bits, least significant bit sent first
- Parity check: 1 bit for parity completion, if not, this is stop bit
- Stop bit: 1bit
- Error check area: Longitudinal Redundancy Checking (LRC)

ASCII Mode Request frame format:

Start	Address	Function	Register Starting address	Register number	LRC	End
: (0x3A)	16 bits	16 bits	32 bits	32 bits	16 bits	CRLF (0x0D0A)

The ASCII mode character transmission format uses 10-bit transmission, including 7 data bits, and the bit sequence is:

Start	1	2	3	4	5	6	7	Stop (Parity)	Stop
-------	---	---	---	---	---	---	---	---------------	------

ASCII Response frame format:

Start	Address	Function	Return data number	Date	LRC	End
: (0x3A)	16 bits	16 bits	16 bits	N*32bits	16 bits	CRLF (0x0D0A)

The frame header of the ASCII mode frame format is "0x3A", and the frame end is "0x0D" and "0x0A". The maximum interval between characters is 1s. If it is greater than 1s, the receiving device considers that an error has occurred. In ASCII mode, all data bytes are sent in ASCII code, the first 4 bits are sent, and then the lower 4 bits. For example: 0x01, two ASCII characters 0x30 and 0x31 will be transmitted.

At this time, the data adopts LRC verification, and the verification covers the information part from the slave address to the data. The checksum is equal to the complement of all the characters participating in the checksum (discard the carry bit) + 1.

【Example】 ***

Request frame format: request date of unit 1, register start address: 0002, only 1 register.

	Start	Address	Function	Register Starting address		Register number		LRC	End
Byte	:	0x01	0x03	0x00	0x02	0x00	0x01	F9	CRLF
ASCII	0x3A	0x3031	0x3033	0x3030	0x3032	0x3030	0x3031	0x4639	0x0D0A

Response frame format: write 4000 (0x0FA0) to register 0002 of slave unit 1:

	Start	Address	Function	Return Date number	Date		LRC	End
Byte	:	0x01	0x06	0x02	0x0F	0xA0	0x48	CRLF
ASCII	0x3A	0x3031	0x3036	0x3032	0x3046	0x4130	0x3438	0x0D0A

1.4 Response information classification

The host sends a check to the slave device and hopes for a normal response, There may be 4 types of events in the host query:

(1) The slave receives the query, there is no communication error, and the information is processed normally, then a normal response event is returned.

(2) Due to communication error, the slave cannot receive the query data, so no response is returned. At this time, the host depends on the processing program to determine that the query has timed out.

(3) If the slave receives an inquiry and finds a communication error (LRC or CRC), it does not return a response. At this time, the master processor determines that the inquiry timed out.

(4) When the slave receives an inquiry, there is no communication error, but it cannot be handled (such as reading a non-existent register address or the wrong number of registers), and reports the nature of the error to the master.

The response information to report an error to the host has 2 areas that are different from the normal response:

Function code area: When responding normally, the response function code area of the slave, with the function code of the original query. The MSB of all function codes is 0 (the value is lower than 80H). When responding abnormally, the slave sets the MSB of the function code to 1, so that the function code value is greater than 80H, which is higher than the normal response value. In this way, the host

application can identify abnormal response events and can check the data area of abnormal codes.

Data area: In the normal response, the data area contains (given the query requirements) data or statistical values. In the abnormal response, the data area is an abnormal code, which explains the conditions and causes of the abnormal response from the slave.

Abnormal codes and meanings are shown in the table below:

Code	Name	Meanings
0x01	Illegal function code	The slave receives a function code that cannot be executed. After issuing the query command, the code indicates no program function.
0x02	Illegal data address	The received data address is an address that is not allowed by the slave; for example: the starting address of the register is wrong, and the number of the queried registers is wrong.

【Example】 ***

RTU mode: (ASC mode is similar)

Command information: request the data of No. 1 machine, the location is: register start address 0066, the number of registers is 2

	Address	Function	Register Starting address		Register number		CRC	
Data	0x01	0x03	0x00	0x66	0x00	0x02	0x24	0x14

Response message: The response frame of No. 1 machine, because the register start address is wrong, the returned message is an illegal data address.

	Address	Function	Data content	CRC	
Data	0x01	0x83	0x02	0xC0	0xF1

1.5 Function Code

Function code	Name	Function
0x03	Read holding register	Obtain the current binary value in one or more holding registers (can be used to obtain analog function code)
0x04	Read input register	Read binary data in slave input register(Can be used as a function code for obtaining alarms and status quantities)
0x06	Preset single register	Load the specific binary value into a holding register (can be used as writing

		tool setting data)
0x6D	Query module telemetry	
0x6E	Query module remote volume	

2. Communication content

2.1 Telemetry (Function code: 0x03)

No. (Register)	Name	Data type (Hi-Lo)	Coefficient	Unit	Remark
0	Bypass voltage Phase A	Unsigned int	0.1	V	Used for compatibility
1	Bypass voltage Phase A	Unsigned int	0.1	V	ZY120 and SHIELD series just have phase A, the registers of phase B and C be reserved.
2	Bypass voltage Phase B	Unsigned int	0.1	V	
3	Bypass voltage Phase C	Unsigned int	0.1	V	
4	Bypass current Phase A	Unsigned int	0.1	A	
5	Bypass current Phase B	Unsigned int	0.1	A	
6	Bypass current Phase C	Unsigned int	0.1	A	
7	Bypass frequency Phase A	Unsigned int	0.01	Hz	
8	Bypass frequency Phase B	Unsigned int	0.01	Hz	
9	Bypass frequency Phase C	Unsigned int	0.01	Hz	
10	Bypass PF_A	Unsigned int	0.01		
11	Bypass PF_B	Unsigned int	0.01		
12	Bypass PF_C	Unsigned int	0.01		
13	Input voltage Phase A	Unsigned int	0.1	V	
14	Input voltage Phase B	Unsigned int	0.1	V	
15	Input voltage Phase C	Unsigned int	0.1	V	
16	Input current Phase A	Unsigned int	0.1	A	
17	Input current Phase B	Unsigned int	0.1	A	
18	Input current Phase C	Unsigned int	0.1	A	
19	Input frequency Phase A	Unsigned int	0.01	Hz	
20	Input frequency Phase B	Unsigned int	0.01	Hz	
21	Input frequency Phase C	Unsigned int	0.01	Hz	
22	Input PF_A	Unsigned int	0.01		
23	Input PF_B	Unsigned int	0.01		
24	Input PF_C	Unsigned int	0.01		
25	Output voltage Phase A	Unsigned int	0.1	V	ZY120 and SHIELD series just have phase A, the registers of phase B and C be reserved.
26	Output voltage Phase B	Unsigned int	0.1	V	
27	Output voltage Phase C	Unsigned int	0.1	V	
28	Output current Phase A	Unsigned int	0.1	A	
29	Output current Phase B	Unsigned int	0.1	A	
30	Output current Phase C	Unsigned int	0.1	A	
31	Output frequency Phase A	Unsigned int	0.01	Hz	
32	Output frequency Phase B	Unsigned int	0.01	Hz	
33	Output frequency Phase C	Unsigned int	0.01	Hz	
34	Output PF_A	Unsigned int	0.01		
35	Output PF_B	Unsigned int	0.01		
36	Output PF_C	Unsigned int	0.01		

37	Output kVA Phase A	Unsigned int	0.1/1	kVA/VA	ZY120 and SHIELD series just have phase A, the registers of phase B and C be reserved. The coefficient of 1-3K is 1, unit is VA, other series coefficient is 0.1, unit is kVA
38	Output kVA Phase B	Unsigned int	0.1	kVA	
39	Output kVA Phase C	Unsigned int	0.1	kVA	
40	Output kW Phase A	Unsigned int	0.1/1	kW/W	
41	Output kW Phase B	Unsigned int	0.1	kW	
42	Output kW Phase C	Unsigned int	0.1	kW	
43	Output kVar Phase A	Unsigned int	0.1/1	kVar/Var	
44	Output kVar Phase B	Unsigned int	0.1	kVar	
45	Output kVar Phase C	Unsigned int	0.1	kVar	
46	Load percent Phase A	Unsigned int	0.1	%	
47	Load percent Phase B	Unsigned int	0.1	%	
48	Load percent Phase C	Unsigned int	0.1	%	
49	Environment temperature	Unsigned int	0.1	°C	
50	Battery voltage positive	Unsigned int	0.1	V	
51	Battery voltage negative	Unsigned int	0.1	V	
52	Battery current positive	int	0.1	A	
53	Battery current negative	int	0.1	A	
54	Battery temperature	Unsigned int	0.1	°C	
55	Battery remain time	Unsigned int	0.1	min	
56	Battery capacity	Unsigned int	0.1	%	
57	Bypass fan running time	Unsigned int	1	H	
58	Reserved				
59	Reserved				
60	Reserved				
61	Reserved				
62	Reserved				
63	Reserved				
64	Reserved				
65	Reserved				
66	Reserved				
67	Reserved				
68	Monitor series number	Unsigned int	1		
69	First monitor version number	Unsigned int	1		
70	Second monitor version number	Unsigned int	1		
78	UPS series number	Unsigned int	1		Bit0-Bit5: UPS series

					1:Modular (10-600K) 2:Modular(10-200 K) 3:(40-200 KVA) 4:NOVA(10-40 KVA) 5:NS3000 (10-30 KVA) 6:ZY120 3/1(10-20) 7:ZY120 (6-20 KVA) 8:ZY120 (1-3 KVA) 9: SHIELD 1/1 + 3/1 (6-20 KVA) Bit6-Bit15:Reserved
79	UPS Type	Unsigned int			Bit0-Bit2: Input and output phase 1: 3in-3out 2: 3in -1out 3: 1in -1out 4: 1in -3out 5: 2in -2out Bit3-Bit15:Reserved
The follows are module data, currently only supported by Modular (10-600KVA) and (10-200KVA) series.					
2000	Current Module Number	Unsigned int	1		Record the module data from which module
2001	Main Input Voltage Phase A	Unsigned int	0.1	V	
2002	Main Input Voltage Phase B	Unsigned int	0.1	V	
2003	Main Input Voltage Phase C	Unsigned int	0.1	V	
2004	Main Input Current Phase A	Unsigned int	0.1	A	
2005	Main Input Current Phase B	Unsigned int	0.1	A	
2006	Main Input Current Phase C	Unsigned int	0.1	A	
2007	Main Input Frequency Phase A	Unsigned int	0.01	Hz	
2008	Main Input Frequency Phase B	Unsigned int	0.01	Hz	
2009	Main Input Frequency Phase C	Unsigned int	0.01	Hz	
2010	Input PF Phase A	Unsigned int	0.01		
2011	Input PF Phase B	Unsigned int	0.01		
2012	Input PF Phase C	Unsigned int	0.01		
2013	Postive DC Bus Voltage	Unsigned int	0.1	V	
2014	Negative DC Bus Voltage	Unsigned int	0.1	V	

2015	Postive Battery String Voltage	Unsigned int	0.1	V	
2016	Negative Battery String Voltage	Unsigned int	0.1	V	
2017	Postive Charger Voltage	Unsigned int	0.1	V	
2018	Negative Charger Voltage	Unsigned int	0.1	V	
2019	Postive Charger Current	Unsigned int	0.1	A	
2020	Negative Charger Current	Unsigned int	0.1	A	
2021	Postive Discharge Current	Unsigned int	0.1	A	
2022	Negative Discharge Current	Unsigned int	0.1	A	
2023	Invertor Voltage Phase A	Unsigned int	0.1	V	
2024	Invertor Voltage Phase B	Unsigned int	0.1	V	
2025	Invertor Voltage Phase C	Unsigned int	0.1	V	
2026	Output Current Phase A	Unsigned int	0.1	V	
2027	Output Current Phase B	Unsigned int	0.1	V	
2028	Output Current Phase C	Unsigned int	0.1	V	
2029	Output Frequency Phase A	Unsigned int	0.01	A	
2030	Output Frequency Phase B	Unsigned int	0.01	A	
2031	Output Frequency Phase C	Unsigned int	0.01	A	
2032	Output PF Phase A	Unsigned int	0.01		
2033	Output PF Phase B	Unsigned int	0.01		
2034	Output PF Phase C	Unsigned int	0.01		
2035	Output Voltage Phase A	Unsigned int	0.1	V	
2036	Output Voltage Phase B	Unsigned int	0.1	V	
2037	Output Voltage Phase C	Unsigned int	0.1	V	
2038	Bypass Voltage Phase A	Unsigned int	0.1	V	
2039	Bypass Voltage Phase B	Unsigned int	0.1	V	
2040	Bypass Voltage Phase C	Unsigned int	0.1	V	
2041	Output Apparent Power Phase A	Unsigned int	0.1	kVA/VA	
2042	Output Apparent Power Phase B	Unsigned int	0.1	kVA	
2043	Output Apparent Power Phase C	Unsigned int	0.1	kVA	
2044	Output Active Power Phase A	Unsigned int	0.1	kW/W	
2045	Output Active Power Phase B	Unsigned int	0.1	kW	
2046	Output Active Power Phase C	Unsigned int	0.1	kW	
2047	Output Reactive Power Phase A	Unsigned int	0.1	kVar/Var	
2048	Output Reactive Power Phase B	Unsigned int	0.1	kVar	

2049	Output Reactive Power Phase C	Unsigned int	0.1	kVar	
2050	Output Load Percentage Phase A	Unsigned int	0.1	%	
2051	Output Load Percentage Phase B	Unsigned int	0.1	%	
2052	Output Load Percentage Phase C	Unsigned int	0.1	%	
2053	Reserved	Unsigned int			
2054	Reserved	Unsigned int			
2055	Reserved	Unsigned int			
2056	Reserved	Unsigned int			
2057	Reserved	Unsigned int			
2058	Reserved	Unsigned int			
2059	Reserved	Unsigned int			
2060	Reserved	Unsigned int			
2061	Reserved	Unsigned int			
2062	Reserved	Unsigned int			
2063	Reserved	Unsigned int			
2064	Reserved	Unsigned int			
2065	Reserved	Unsigned int			
2066	Reserved	Unsigned int			
2067	Reserved	Unsigned int			
2068	Reserved	Unsigned int			
2069	Reserved	Unsigned int			
2070	Reserved	Unsigned int			
2071	Reserved	Unsigned int			
2072	Reserved	Unsigned int			
The follows are module expanding data, currently only supported by Modular (10-600KVA) series.					
2073	Fan Running Time (hour)	Unsigned int	1	h	
2074	DC Bus Capacitor Running Time (hour)	Unsigned int	1	h	
2075	Reserved	Unsigned int			
2076	Reserved	Unsigned int			
2077	Forbid Rectifier Power On Sign Integration	Unsigned int	1		
2078	Utility Power And Battery Sign Integration	Unsigned int	1		
2079	Reserved	Unsigned int			
2080	Reserved	Unsigned int			
2081	Rectifier DSP Input Port	Unsigned int	1		
2082	Rectifier DSP Output Port	Unsigned int	1		
2083	Invertor DSP Input Port	Unsigned int	1		
2084	Invertor DSP Output	Unsigned int	1		

2085	Allow Invertor On Sign Integration	Unsigned int	1		
2086	Allow Transfer to Invert Sign Integration	Unsigned int	1		
2087	Transfer to Bypass Locked Sign Integration	Unsigned int	1		
2088	Invertor Power Off Locked Sign Integration	Unsigned int	1		
2089	Reserved	Unsigned int			
2090	Invertor IO CAN	Unsigned int	1		
2091	Invertor DATA CAN	Unsigned int	1		
2092	Parallel Signal	Unsigned int	1		
2093	Read Rectifier Variate	Unsigned int	1		
2094	Write Rectifier Variate	Unsigned int	1		
2095	Read Invertor Variate	Unsigned int	1		
2096	Write Invertor Variate	Unsigned int	1		
2097	Inlet Temperature	Unsigned int	0.1	°C	
2098	Outlet Temperature	Unsigned int	0.1	°C	
2099	Rectifier IGBT Temperature Phase A	Unsigned int	0.1	°C	
2100	Rectifier IGBT Temperature Phase B	Unsigned int	0.1	°C	
2101	Rectifier IGBT Temperature Phase C	Unsigned int	0.1	°C	
2102	Invertor IGBT Temperature Phase A	Unsigned int	0.1	°C	
2103	Invertor IGBT Temperature Phase B	Unsigned int	0.1	°C	
2104	Invertor IGBT Temperature Phase C	Unsigned int	0.1	°C	
2105	Reserved	Unsigned int			
2106	Reserved	Unsigned int			
2107	Reserved	Unsigned int			
2108	Input SCR Temperature	Unsigned int	0.1	°C	
2109	Reserved	Unsigned int			
2110	Reserved	Unsigned int			
2111	Reserved	Unsigned int			
2112	Reserved	Unsigned int			
2113	Reserved	Unsigned int			
2114	Reserved	Unsigned int			
2115	Reserved	Unsigned int			
2116	Reserved	Unsigned int			
2117	Reserved	Unsigned int			
2118	Reserved	Unsigned int			

2119	Reserved	Unsigned int			
2120	Reserved	Unsigned int			
2121	Reserved	Unsigned int			
2122	Reserved	Unsigned int			
2123	Reserved	Unsigned int			
2124	Reserved	Unsigned int			
2125	Reserved	Unsigned int			
2126	Reserved	Unsigned int			
2127	Reserved	Unsigned int			
2128	Reserved	Unsigned int			
2129	Reserved	Unsigned int			
2130	Reserved	Unsigned int			
2131	Reserved	Unsigned int			
2132	Reserved	Unsigned int			
2133	Reserved	Unsigned int			
2134	Reserved	Unsigned int			
2135	Reserved	Unsigned int			
2136	Reserved	Unsigned int			
2137	Reserved	Unsigned int			
2138	Reserved	Unsigned int			
2139	Reserved	Unsigned int			
2140	Reserved	Unsigned int			
2141	Reserved	Unsigned int			
2142	Reserved	Unsigned int			
2143	Reserved	Unsigned int			
2144	Reserved	Unsigned int			

The follows are module version informations, currently only supported by Modular(10-600KVA) and (10-200KVA) series.

2145	Rectifier Identifier	Unsigned int	1		
2146	Rectifier Series Number	Unsigned int	1		
2147	Rectifier First Version Number	Unsigned int	1		
2148	Rectifier Second Version Number	Unsigned int	1		
2149	Invertor Identifier	Unsigned int	1		
2150	Invertor Series Number	Unsigned int	1		
2151	Invertor First Version Number	Unsigned int	1		
2152	Invertor Second Version Number	Unsigned int	1		

Note:

unsigned int : Unsigned 16bit integer.

int : Signed 16bit integer.

For example:

Assuming UPS device address is 0x01, start address of the register is 0x0001, No. of the register is 1, to inquiry "Bypass voltage Phase A"

RTU mode, request and response frame information as follow:

Request frame:

	Device address	Function code	Start address of register	Register number	CRC
Data	0x01	0x03	0x0001	0x0001	0xD5CA

Response frame:

	Device address	Function code	Data Length(byte)	Data content	CRC
Data	0x01	0x03	0x02	0x****	0x****

ASCII mode, request and response frame information as follow:

Request frame:

	start	Device address	Function code	Start address of register		Register number		LRC	Stop
	:	0x01	0x03	0x0001		0x0001		0xFA	CRLF
ASCII	0x3A	0x3031	0x3033	0x3030	0x3031	0x3030	0x3031	0x4641	0x0D0A

Response frame:

	Start	Device address	Function code	Data Length (byte)	Data content		LRC	Stop
	:	0x01	0x03	0x02	0x****		0x**	CRLF
ASCII	0x3A	0x3031	0x3033	0x3032	0x****	0x****	0x****	0x0D0A

2.2 Telesignalization (Function code: 0x04)

No. (Register)	Name	Data type (Hi-Lo)	Remark
81	Load On Source	Unsigned int	0: None 1: UPS Supply 2: Bypass Supply
82	Battery Status	Unsigned int	0: Not Work 1: Float Charge 2: Boost Charge 3: Discharge

83	Battery Connect Status	Unsigned int	0: Not Connect 1: Connect
84	Maintain Cb Status	Unsigned int	0: Open 1: Close
85	EPO	Unsigned int	0: None 1: EPO
86	Invertor Ready Capacity	Unsigned int	0: Enough 1: Not Enough
87	Generator Input	Unsigned int	0: Disconnect 1: Connected
88	Input Fail	Unsigned int	0: Normal 1: Abnormal
89	Bypass Sequence Fail	Unsigned int	0: Normal 1: Abnormal
90	Bypass Voltage Fail	Unsigned int	0: Normal 1: Abnormal
91	Bypass Fail	Unsigned int	0: Normal 1: Abnormal
92	Bypass Over Load	Unsigned int	0: No 1: Yes
93	Bypass Over Load Timeout	Unsigned int	0: No 1: Yes
94	Bypass Untrack	Unsigned int	0: No 1: Yes
95	Tx Time Limit	Unsigned int	0: No 1: Yes
96	Output Shorted	Unsigned int	0: No 1: Yes
97	Battery EOD	Unsigned int	0: No 1: Yes
98	Battery Test Begin (Reserved)	Unsigned int	0: No 1: Yes
99	Battery Test Result	Unsigned int	0: No Test 1: Test Success 2: Test Fail 3: Testing
100	Battery Manual Test (Reserved)	Unsigned int	0: No 1: Yes
101	Battery Maintain Result	Unsigned int	0: No Maintain 1: Maintain success 2: Maintain Fail 3: Maintaining
102	Stop Test (Reserved)	Unsigned int	
103	Fault Clear (Reserved)	Unsigned int	

104	Hislog Clear (Reserved)	Unsigned int	
105	On Ups Inhibited	Unsigned int	0: Invertor On Enable 1: Invertor On Disable
106	Manual Tx Bypass	Unsigned int	0: No 1: Yes
107	Battery Volt Low	Unsigned int	0: No 1: Yes
108	Battery Reverse	Unsigned int	0: No 1: Yes
109	REC Status	Unsigned int	0:OFF 1:Soft Start 2:Normal Work
110	Input Neutral Lost	Unsigned int	0: No Lost 1: Lost
111	Bypass Fan Fail	Unsigned int	0: Normal 1: Fail
112	Lost N+X Redundant	Unsigned int	0: No Lost 1: Lost
113	EOD System Inhibited	Unsigned int	0: No 1: Inhibited
114	CT Weld Reverse	Unsigned int	0: Normal 1: Reverse Just ZY120(1-3k) have this function
115	Electrolyte Leakage	Unsigned int	0: Normal 1: Leakage
116	Sensor status	Unsigned int	Corresponding bit is 1 indicate the sensor is disconnected, 0 means it is connected. Bit0: Battery temperature sensor Bit1: Environment temperature sensor Bit2-Bit15: Reserve
117	Reserved		
118	Integrated Alarm	Unsigned int	Bit0: 1 Alarm, 0 Normal Bit1: 1 Fault, 0 Normal Bit2-Bit15: Reserve
119	First Module Online Flag Bit	Unsigned int	Bit15: Module 32 Bit14: Module 31 Bit0: Module 17 Corresponding bit is 1 means the module on, 0 means the module off Just Modular(10-600KVA) and (10-200KVA) have this function
120	Second Module Online Flag Bit	Unsigned int	Bit15: Module 16 Bit14: Module 15 Bit0: Module 1

			Corresponding bit is 1 means the module on, 0 means the module off Just Modular(10-600KVA) and (10-200KVA) have this function
121	Unit 1 Pull	Unsigned int	0: Pull Out 1: Join In
122	Unit 1 REC Fail	Unsigned int	0: Normal 1: Abnormal
123	Unit 1 INV Fail	Unsigned int	0: Normal 1: Abnormal
124	Unit 1 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
125	Unit 1 Fan Fail	Unsigned int	0: Normal 1: Abnormal
126	Unit 1 INV Over Load	Unsigned int	0: Normal 1: Abnormal
127	Unit 1 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
128	Unit 1 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
129	Unit 1 INV Protect	Unsigned int	0: Normal 1: Abnormal
130	Unit 1 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
131	Reserved		
132	Reserved		
133	Unit 2 Pull	Unsigned int	0: Pull Out 1: Join In
134	Unit 2 REC Fail	Unsigned int	0: Normal 1: Abnormal
135	Unit 2 INV Fail	Unsigned int	0: Normal 1: Abnormal
136	Unit 2 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
137	Unit 2 Fan Fail	Unsigned int	0: Normal 1: Abnormal
138	Unit 2 INV Over Load	Unsigned int	0: Normal 1: Abnormal
139	Unit 2 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
140	Unit 2 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
141	Unit 2 INV Protect	Unsigned int	0: Normal 1: Abnormal
142	Unit 2 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
143	Reserved		
144	Reserved		
145	Unit 3 Pull	Unsigned int	0: Pull Out 1: Join In
146	Unit 3 REC Fail	Unsigned int	0: Normal 1: Abnormal
147	Unit 3 INV Fail	Unsigned int	0: Normal 1: Abnormal
148	Unit 3 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
149	Unit 3 Fan Fail	Unsigned int	0: Normal 1: Abnormal
150	Unit 3 INV Over Load	Unsigned int	0: Normal 1: Abnormal
151	Unit 3 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
152	Unit 3 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
153	Unit 3 INV Protect	Unsigned int	0: Normal 1: Abnormal
154	Unit 3 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
155	Reserved		
156	Reserved		
157	Unit 4 Pull	Unsigned int	0: Pull Out 1: Join In
158	Unit 4 REC Fail	Unsigned int	0: Normal 1: Abnormal

159	Unit 4 INV Fail	Unsigned int	0: Normal 1: Abnormal
160	Unit 4 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
161	Unit 4 Fan Fail	Unsigned int	0: Normal 1: Abnormal
162	Unit 4 INV Over Load	Unsigned int	0: Normal 1: Abnormal
163	Unit 4 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
164	Unit 4 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
165	Unit 4 INV Protect	Unsigned int	0: Normal 1: Abnormal
166	Unit 4 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
167	Reserved		
168	Reserved		
169	Unit 5 Pull	Unsigned int	0: Pull Out 1: Join In
170	Unit 5 REC Fail	Unsigned int	0: Normal 1: Abnormal
171	Unit 5 INV Fail	Unsigned int	0: Normal 1: Abnormal
172	Unit 5 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
173	Unit 5 Fan Fail	Unsigned int	0: Normal 1: Abnormal
174	Unit 5 INV Over Load	Unsigned int	0: Normal 1: Abnormal
175	Unit 5 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
176	Unit 5 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
177	Unit 5 INV Protect	Unsigned int	0: Normal 1: Abnormal
178	Unit 5 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
179	Reserved		
180	Reserved		
181	Unit 6 Pull	Unsigned int	0: Pull Out 1: Join In
182	Unit 6 REC Fail	Unsigned int	0: Normal 1: Abnormal
183	Unit 6 INV Fail	Unsigned int	0: Normal 1: Abnormal
184	Unit 6 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
185	Unit 6 Fan Fail	Unsigned int	0: Normal 1: Abnormal
186	Unit 6 INV Over Load	Unsigned int	0: Normal 1: Abnormal
187	Unit 6 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
188	Unit 6 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
189	Unit 6 INV Protect	Unsigned int	0: Normal 1: Abnormal
190	Unit 6 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
191	Reserved		
192	Reserved		
193	Unit 7 Pull	Unsigned int	0: Pull Out 1: Join In
194	Unit 7 REC Fail	Unsigned int	0: Normal 1: Abnormal
195	Unit 7 INV Fail	Unsigned int	0: Normal 1: Abnormal
196	Unit 7 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
197	Unit 7 Fan Fail	Unsigned int	0: Normal 1: Abnormal
198	Unit 7 INV Over Load	Unsigned int	0: Normal 1: Abnormal
199	Unit 7 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
200	Unit 7 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
201	Unit 7 INV Protect	Unsigned int	0: Normal 1: Abnormal

202	Unit 7 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
203	Reserved		
204	Reserved		
205	Unit 8 Pull	Unsigned int	0: Pull Out 1: Join In
206	Unit 8 REC Fail	Unsigned int	0: Normal 1: Abnormal
207	Unit 8 INV Fail	Unsigned int	0: Normal 1: Abnormal
208	Unit 8 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
209	Unit 8 Fan Fail	Unsigned int	0: Normal 1: Abnormal
210	Unit 8 INV Over Load	Unsigned int	0: Normal 1: Abnormal
211	Unit 8 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
212	Unit 8 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
213	Unit 8 INV Protect	Unsigned int	0: Normal 1: Abnormal
214	Unit 8 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
215	Reserved		
216	Reserved		
217	Unit 9 Pull	Unsigned int	0: Pull Out 1: Join In
218	Unit 9 REC Fail	Unsigned int	0: Normal 1: Abnormal
219	Unit 9 INV Fail	Unsigned int	0: Normal 1: Abnormal
220	Unit 9 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
221	Unit 9 Fan Fail	Unsigned int	0: Normal 1: Abnormal
222	Unit 9 INV Over Load	Unsigned int	0: Normal 1: Abnormal
223	Unit 9 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
224	Unit 9 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
225	Unit 9 INV Protect	Unsigned int	0: Normal 1: Abnormal
226	Unit 9 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
227	Reserved		
228	Reserved		
229	Unit 10 Pull	Unsigned int	0: Pull Out 1: Join In
230	Unit 10 REC Fail	Unsigned int	0: Normal 1: Abnormal
231	Unit 10 INV Fail	Unsigned int	0: Normal 1: Abnormal
232	Unit 10 REC Over Temperature	Unsigned int	0: Normal 1: Abnormal
233	Unit 10 Fan Fail	Unsigned int	0: Normal 1: Abnormal
234	Unit 10 INV Over Load	Unsigned int	0: Normal 1: Abnormal
235	Unit 10 INV Over Load Timeout	Unsigned int	0: Normal 1: Abnormal
236	Unit 10 INV Over Temperature	Unsigned int	0: Normal 1: Abnormal
237	Unit 10 INV Protect	Unsigned int	0: Normal 1: Abnormal
238	Unit 10 Manual Shutdown	Unsigned int	0: Normal 1: Shutdown
239	Reserved		
240	Reserved		
The follows are module status data, currently only supported by Modular(10-600KVA) and (10-200KVA) series.			
3000	Current Module Number	Unsigned int	Record the module data from which module, you can set this register by function code 0x06.

3001	Load On Source	Unsigned int	Bit12-Bit15: 0000 : None 0001 : UPS 0010 : Bypass 0100 : Other Unit
	Rectifier Status	Unsigned int	Bit8-Bit11: 0000 : OFF 0001 : Soft Start 0010 : Normal Work
	Invertor Status	Unsigned int	Bit4-Bit7: 0000 : OFF 0001 : Soft Start 0010 : Normal Work
	Bypass Status	Unsigned int	Bit0-Bit3: 0000 : Abnormal 0001 : Normal
3002	Battery Status	Unsigned int	Bit12-Bit15: 0000 : Disconnect 0001 : Boost Charging 0010 : Float Charging 0100 : Discharging 1000 : Not Working
	Input CB Status	Unsigned int	Bit8-Bit11: 0000 : Open 0001 : Close
	Bypass CB Status	Unsigned int	Bit4-Bit7: 0000 : Open 0001 : Close
	Output CB Status	Unsigned int	Bit0-Bit3: 0000 : Open 0001 : Close
3003	Maintenance CB Status	Unsigned int	Bit12-Bit15: 0000 : Open 0001 : Close
	Postive Battery String CB Status	Unsigned int	Bit8-Bit11: 0000 : Open 0001 : Close
	Negative Battery String CB Status	Unsigned int	Bit4-Bit7: 0000 : Open 0001 : Close
	Postive Battery String Connect Status	Unsigned int	Bit0-Bit3: 0000 : Disconnect 0001 : Connect
3004	Negative Battery String Connect Status	Unsigned int	Bit12-Bit15: 0000 : Disconnect

			0001 : Connect
	Invertor On Allow Status	Unsigned int	Bit8-Bit11: 0000 : Disable 0001 : Enable
	Invertor Working Status	Unsigned int	Bit4-Bit7: 0000 : Not Ready 0001 : Ready 0010 : Supplying
	Generator Connect Status	Unsigned int	Bit0-Bit3: 0000 : Disconnect 0001 : Connect
3005	Service Mode	Unsigned int	Bit12-Bit15: 0000 : No 0001 : Yes
	Invertor Ready Capacity	Unsigned int	Bit8-Bit11: 0000 : Enough 0001 : Less
	Load Capacity VS Invertor Capacity	Unsigned int	Bit4-Bit7: 0000 : Invertor Capacity More 0001 : Load Capacity More
	BCB Shunt Trip Status	Unsigned int	Bit0-Bit3: 0000 : No Action 0001 : Trip
3006	BCB Connect Status	Unsigned int	Bit12-Bit15: 0000 : Disconnect 0001 : Connect
	BCB Status	Unsigned int	Bit8-Bit11: 0000 : Open 0001 : Close
	EPO Status	Unsigned int	Bit4-Bit7: 0000 : No Action 0001 : EPO
	Module Pull Status	Unsigned int	Bit0-Bit3: 0000 : Inset 0001 : Pull Out
3007	Invertor Available Status	Unsigned int	Bit12-Bit15: 0000 : Unavailable 0001 : Available
	Power On End Flag	Unsigned int	Bit8-Bit11: 0000 : Not End 0001 : End
	LBS Available Status	Unsigned int	Bit4-Bit7: 0000 : Unavailable 0001 : Available
	Synchronization Source	Unsigned int	Bit0-Bit3:

			0000 : Reserved 0001 : Local Oscillator 0010 : Synchronize Bypass 0100 : Reserved 1000 : Synchronize LBS
3008	Interrupt Transfer to Inverter	Unsigned int	Bit12-Bit15: 0000 : Disable 0001 : Enable
	Dormancy Status	Unsigned int	Bit8-Bit11: 0000 : No 0001 : Yes
	Small LCD Function Key Status	Unsigned int	Bit4-Bit7: 0000 : OFF 0001 : ON
	Small LCD Current Page	Unsigned int	Bit0-Bit3: 0~7 means the number of page index after turn page
3009	If wave exist in XROM	Unsigned int	Bit12-Bit15: 0000 : No 0001 : Yes
	If the wave is triggering	Unsigned int	Bit8-Bit11: 0000 : No 0001 : Yes
	Reserved	Unsigned int	
	Reserved	Unsigned int	
3010	Reserved	Unsigned int	
3011	Reserved	Unsigned int	
3012	Reserved	Unsigned int	
3013	Reserved	Unsigned int	
3014	Reserved	Unsigned int	
3015	Reserved	Unsigned int	
3016	Reserved	Unsigned int	
The follows are module alarm data, currently only supported by Modular(10-600KVA) and (10-200KVA) series.			
3017	Synchronization Status	Unsigned int	Bit12-Bit15: 0000 : Asynchronize 0001 : Synchronized
	Utility Power	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Rectifier	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Inverter	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault

3018	Bypass Power	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Postive Battery String Voltage	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Low 0010 : High
	Negative Battery String Voltage	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Low 0010 : High
	Postive Battery String Temperature	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3019	Negative Battery String Temperature	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Input Voltage Phase A	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Low 0010 : High
	Input Voltage Phase B	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Low 0010 : High
	Input Voltage Phase C	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Low 0010 : High
3020	Input Current Phase A	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Input Current Phase B	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Input Current Phase C	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Output Voltage Phase A	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Low 0010 : High
3021	Output Voltage Phase B	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Low

			0010 : High
	Output Voltage Phase C	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Low 0010 : High
	Output Current Phase A	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Output Current Phase B	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3022	Output Current Phase C	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Line Synchronization Signal (Not use in 20K module)	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	PWM Synchronization Signal (Not use in 20K module)	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Input Current Unbalance (Not use in 20K module)	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3023	Utility Voltage Status	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Utility Frequency Status	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Main Input Sequence Status	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	REC Soft Start Status	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3024	REC IGBT Over Current	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Input Inductance Over Temperature	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Rectifier Over Temperature	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Postive DC Bus Over Voltage	Unsigned int	Bit0-Bit3:

			0000 : Normal 0001 : Fault
3025	Negative DC Bus Over Voltage	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Fan Fail(All)	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Main BackFeed Protect	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	DC Bus Unbalance	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3026	Postive DC Bus Low Voltage	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Negative DC Bus Low Voltage	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Postive Battery String Reverse	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Negative Battery String Reverse	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3027	Battery Leakage	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Battery Cool Start	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Postive Charger Over Voltage	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Low 0010 : High
	Negative Charger Over Voltage	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Low 0010 : High
3028	Postive Charger Over Temperature	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Negative Charger Over Temperature	Unsigned int	Bit8-Bit11: 0000 : Normal

			0001 : Fault
	Postive Charger Status	Unsigned int	Bit4-Bit7: 0000: Normal 0001 : Fault
	Negative Charger Status	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3029	Postive Battery String Low Voltage	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Negative Battery String Low Voltage	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Postive Battery String EOD	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Negative Battery String EOD	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3030	Input Neutral Lost	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Bypass Sequence Status	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Bypass Voltage Status	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Bypass SCR Status	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3031	Bypass Overload	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Bypass Overload Time Out	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Bypass Freqence Over Track	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Bypass BackFeed Protect	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3032	Pulse Load to Bypass	Unsigned int	Bit12-Bit15: 0000 : Normal

			0001 : Fault
	Overload Time Out	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Bypass Fail and Shutdown	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Auxiliary Power Lost	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3033	Manual Shutdown	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Invertor Protect	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Exceed Tx Times Limit(Per hour)	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Output Power BackFeed	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3034	Input Fuse Breakdown	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Bypass Over Current Lock	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Invertor Inductance Over Temperature	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Invertor Over Temperature	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3035	Invertor IGBT Over Current	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Output Fuse Breakdown	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Output Overload	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Invertor Relay Status	Unsigned int	Bit0-Bit3: 0000 : Normal

			0001 : Fault
3036	Invertor Communication Status	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Manual Starting Action	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Parallel Cable Status	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Parallel Share Status	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3037	User Operation Error	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Output Shorted Circuit	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Battery Test	Unsigned int	Bit4-Bit7: 0000 : Not Define 0001 : Test OK 0010 : Test Fail 0100 : Testing
	Battery Maintenance	Unsigned int	Bit0-Bit3: 0000 : Not Define 0001 : Test OK 0010 : Test Fail 0100 : Testing
3038	System Test	Unsigned int	Bit12-Bit15: 0000 : Not Define 0001 : Test OK 0010 : Test Fail
	Invertor Bridge Open	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Inveter Relay Open	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Inveter Relay Shorted	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3039	Outlet Temperature Abnormal	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault

	Input Over Current Time Out	Unsigned int	Bit8-Bit11: 0000 : Normal 0001 : Fault
	Inlet Time Sensor Connect Status	Unsigned int	Bit4-Bit7: 0000 : Normal 0001 : Fault
	Outlet Time Sensor Connect Status	Unsigned int	Bit0-Bit3: 0000 : Normal 0001 : Fault
3040	Fan Fail Over Temperature	Unsigned int	Bit12-Bit15: 0000 : Normal 0001 : Fault
	Reserved		
	Reserved		
	Reserved		
3041-3070 reserved for module alarm			
3071-3190 are comprehensive module alarm, set by bits, corresponding bit is 1 means alarm occurred, 0 means alarm not happen. Every module possess 4 registers, total of 120. Currently, only Modular(10-600KVA) and (10-200KVA) have this function.			
3071	Module 1 Comprehensive Alarm	Unsigned int	Bit0: Rectifier Fail Bit1: Invertor Fail Bit2: Rectifier Over Temperature Bit3: Fan Fail Bit4: Over Load Bit5: Over Load Timeout Bit6: Invertor Over Temperature Bit7: Invertor Protect Bit8: Manual Shutdown The follows comprehensive alarm only supported by Modular(10-600KVA) Bit9: Battery or Charger Fail Bit10: Power Share Fail Bit11: Synchron Pulse Fail Bit12: Input Voltage Detect Fail Bit13: Battery Voltage Detect Fail Bit14: Output Voltage Fail Bit15: Bypass Voltage Detect Fail
3072	Module 1 Comprehensive Alarm	Unsigned int	Bit0: Invertor Bridge Fail Bit1: Outlet Temperature Error Bit2: Input Current Unbalance Bit3: DC Bus Over Voltage Bit4: Rectifier Soft Start Fail Bit5: Invertor Relay Connect Fail

			Bit6: Invertor Relay Short Circuit Bit7: PWM Synchron Fail Bit8: Intelligent Sleep Bit9: Input Over Current Timeout Bit10: No Inlet Temperature Sensor Bit11: No Outlet Temperature Sensor Bit12: Capacitor Expired Bit13: Fan Expired Bit14: Module Connector Error Bit15: Firmware Error
3073	Module 1 Comprehensive Alarm	Unsigned int	Bit0: Module ID Duplicate Bit1: No Input SCR temperature Sensor Bit2: Input SCR Over temperature Bit3: Rated capacity setting overrange Bit4- Bit15:Reserved
3074	Module 1 Comprehensive Alarm	Unsigned int	Reserved
3075-3078	Module 2 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3079-3082	Module 3 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3083-3086	Module 4 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3087-3090	Module 5 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3091-3094	Module 6 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3095-3098	Module 7 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3099-3102	Module 8 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3103-3106	Module 9 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3107-3110	Module 10 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
Modular (10-600KVA) most have 30 modules, Modualr (10-200KVA) most have 10 modules, the follows only be supported by Modular(10-600KVA).			
3111-3114	Module 11 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3115-3118	Module 12 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3119-3122	Module 13 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3123-3126	Module 14 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3127-3130	Module 15 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3131-3134	Module 16 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3135-3138	Module 17 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3139-3142	Module 18 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3143-3146	Module 19 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3147-3150	Module 20 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3151-3154	Module 21 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3155-3158	Module 22 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3159-3162	Module 23 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3163-3166	Module 24 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3167-3170	Module 25 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3171-3174	Module 26 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3175-3178	Module 27 Comprehensive Alarm	Unsigned int	Refer to 3071-3074

3179-3172	Module 28 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3183-3186	Module 29 Comprehensive Alarm	Unsigned int	Refer to 3071-3074
3187-3190	Module 30 Comprehensive Alarm	Unsigned int	Refer to 3071-3074

Note:

Unsigned int: Unsigned integer.

NS3000 series models below 30K are equivalent to be treated as a module.

【例如】 ***

Assuming that the UPS device address is set to 0x01, the starting address of the query register is 81, that is, 0x0051, and the number of registers is 1.

Then the number of bytes of returned data is 2. In RTU mode, the request frame information and response frame information for status query are:

Request frame:

	Device address	Function code	Start address of register	Register number	CRC
data	0x01	0x04	0x0051	0x0001	0x601B

Response frame:

	Device address	Function code	Data Length(byte)	Data content	CRC
data	0x01	0x04	0x02	0x****	0x****

ASCII mode, request and response frame information as follow:

Request frame:

	Start	Device address	Function code	Start address of register		Register number		LRC	Stop
	:	0x01	0x04	0x0051		0x0001		0xA9	CRLF
ASCII	0x3A	0x3031	0x3034	0x3030	0x3531	0x3030	0x3031	0x4139	0x0D0A

Response frame:

	Start	Device address	Function code	Data Length (byte)	Data content		LRC	Stop
	:	0x01	0x04	0x02	0x****		0xE8	CRLF
ASCII	0x3A	0x3031	0x3034	0x3032	0x****	0x****	0x****	0x3A

2.3、 Write Single Register(Function 0x06)

Only used by insider

No. (Register)	Name	Data type (Hi-Lo)	Coefficient	Remark
393	232 port communication	Unsigned int		0x00: ModBus Mode

	protocol setting			0x01: SNT Mode Available for 1-3K models;
400	Set module ID	Unsigned int		Used by query module data Modular (10-600KVA): 1-30 (10-200KVA): 1-10 Other series reserved.

RTU mode, request and response frame information as follow:

Request frame:

	Device address	Function code	Address of register	Register value	CRC
Data	0x**	0x06	0x0*** (2 Bytes)	0x0*** (2 Bytes)	0x****

Response frame:

	Device address	Function code	Data Length(byte)	Register value	CRC
Data	0x**	0x06	0x0*** (2 Bytes)	0x0*** (2 Bytes)	0x****

ASCII mode, request and response frame information as follow:

Request frame:

	start	Device address	Function code	Address of register	Register value	LRC	Stop
	:	0x**	0x06	0x0*** (2 Bytes)	0x0*** (2 Bytes)	0x**	CRLF
ASCII	0x3A	0x****	0x3036	0x30**,0x****	0x30**,0x****	0x****	0x0D0A

Response frame:

	Start	Device address	Function code	Data Length (byte)	Data content	LRC	Stop
	:	0x**	0x06	0x0*** (2 Bytes)	0x0*** (2 Bytes)	0xF3	CRLF
ASCII	0x3A	0x****	0x3036	0x30**,0x****	0x30**,0x****	0x4633	0x0D0A

2.4 Query Module Analog Data(Function 0x6D)

Only used by insider.

Note: This function be used for getting module telemetry, address range 2000-2152, other address is illegal.

Only Modular(10-600KVA) and (10-200KVA) series have this function.

RTU mode, request and response frame information as follow:

Request frame:

	Device address	Function code	Start address of register	Register number	Bytes number	Module ID	CRC
Data	0x**	0x6D	0x**** (2 Bytes)	N(2 Bytes)	N*2 (1 Byte)	1-30 (2 Bytes)	0x****

Response frame:

	Device address	Function code	Data bytes number	Data content	CRC
Data	0x**	0x6D	N*2 (1 Byte)	0x****, ..., 0x****	0x****

ASCII mode, request and response frame information as follow:

Request frame:

	start	Device address	Function code	Start address of register	Register number	Bytes Number	Module ID	LRC	Stop
data	:	0x**	0x6D	0x**** (2 Bytes)	N (2 Bytes)	N*2 (1)	1-30 (2 Bytes)	0x**	CRLF
ASCII	0x3A	0x****	0x3644	0x****, 0x****	0x****, 0x****	0x****	0x****, 0x****	0x****	0x0D0A

Response frame:

	Start	Device address	Function code	Data bytes number	Data content	LRC	Stop
data	:	0x**	0x6D	0x** (1 Byte)	0x****, ..., 0x****	0x**	CRLF
ASCII	0x3A	0x****	0x3644	0x****	0x****, 0x****, ..., 0x****, 0x****	0x****	0x0D0A

2.5 Query Module Signal Data(Function 0x6E)

Only used by insider.

Note: This function be used for getting module telesignalization, address range 3000-3070, other address is illegal.
Only Modular(10-600KVA) and (10-200KVA) series have this function.

RTU mode, request and response frame information as follow:

Request frame:

	Device address	Function code	Start address of register	Register number	Bytes number	Module ID	CRC
data	0x**	0x6E	0x**** (2 Bytes)	N(2 Bytes)	N*2 (1 Byte)	1-30 (2 Bytes)	0x****

Response frame:

	Device address	Function code	Data bytes number	Data content	CRC
data	0x**	0x6E	N*2 (1 Byte)	0x****,...,0x****	0x****

ASCII mode, request and response frame information as follow:

Request frame:

	start	Device address	Function code	Start address of register	Register number	Bytes Number	Module ID	LRC	Stop
Data	:	0x**	0x6E	0x**** (2 Bytes)	N (2 Bytes)	N*2 (1)	1-30 (2 Bytes)	0x**	CRLF
ASCII	0x3A	0x****	0x3645	0x****, 0x****	0x****, 0x****	0x****	0x****, 0x****	0x****	0x0D0A

Response frame:

	Start	Device address	Function code	Data bytes number	Data content	LRC	Stop
Data	:	0x**	0x6E	0x** (1 Byte)	0x****,...,0x****	0x**	CRLF
ASCII	0x3A	0x****	0x3645	0x****	0x****,0x****,..., 0x****,0x****	0x****	0x0D0A

Appendix A □ □ LRC/CRC

- LRC Check
- CRC Check

LRC longitudinal redundancy check

The LRC field is a byte containing an 8-bit binary value. The LRC value is calculated by the transmitting device and placed in the message frame. The receiving device calculates the LRC during the process of receiving the message and compares it with the value in the LRC field of the received message. If the two values are not equal, there is an error.

The LRC check is relatively simple. It is used in the ASCII protocol and detects the contents of the message field except for the beginning colon and the end carriage return and line feed number. It simply adds 1 to each data that needs to be transmitted by superimposing it in bytes.

CRC cyclic redundancy check

The cyclic redundancy check CRC area is 2 bytes and contains a 16-bit binary data. The sending device calculates the CRC value and appends the calculated value to the message. When receiving the message, the receiving device recalculates the CRC value and compares the calculated value with the actual value received in the CRC area. If the two are not the same, An error is generated.

When the CRC starts, first set all 16 bits of the register to "1", and then put the data of two adjacent 8-bit bytes into the current register. Only the 8-bit data of each character is used to generate the CRC , Stop bit and parity bit are not added to CRC.

During the CRC generation, every 8-bit data is XORed with the value in the register, and the result is shifted to the right by one bit (toward the LSB), and the MSB is filled with "0" to detect the LSB. XOR of the fixed value set, if the LSB is "0", no XOR operation will be performed.

Repeat the above process until the shift is 8 times. After the 8th shift is completed, the next 8-bit data is XOR with the current value of the register. After all the information is processed, the final value in the register is the CRC value.

