**Modbus communication protocol\_Ver 1.38\_C**

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# 一、Introduction

## 1.1、Protocol Introduction

Modbus Protocol is a common language used in UPS controller. MODBUS Serial Line protocol is a Master-Slave protocol; the master send request to an individual slave. After receiving and processing the request, the slave returns a message (a 'reply') to the master. Each slave must have an unique address (from 0x01~0xFF), so that it can be addressed independently from other nodes.

## 1.2、Interface

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

Data length: RTU mode 8bit、ASCII mode 7bit

Parity: None

Stop bit: 1bit

### 1.2.1 RS\_485 port definition

The RS\_485 definition is shown in Fig 1.

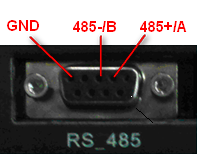


Fig1. RS\_485 port definition

pin2--- 485+/A

pin3--- 485-/B

pin5 --- GND

### 1.2.2 RS\_232 port definition

Male type pins definition of RS\_232 Port is shown in Fig 2.

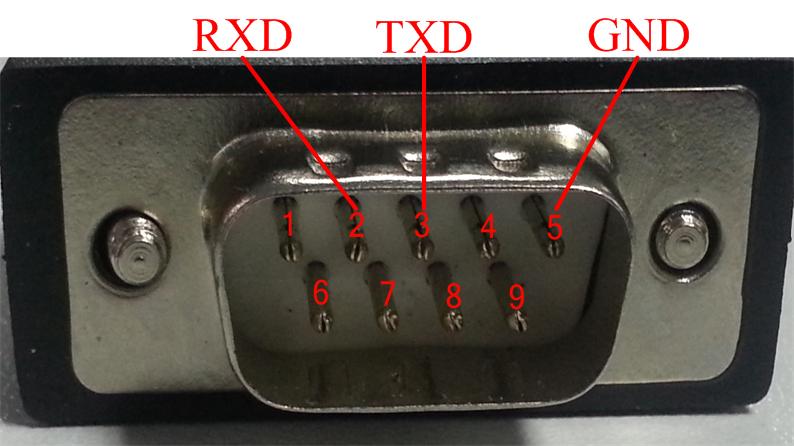


Fig2. Male type pins definition of RS\_232 Port

pin2--- RXD

pin3--- TXD

pin5--- GND

Female type holes definition of RS\_232 Port is shown in Fig 3.

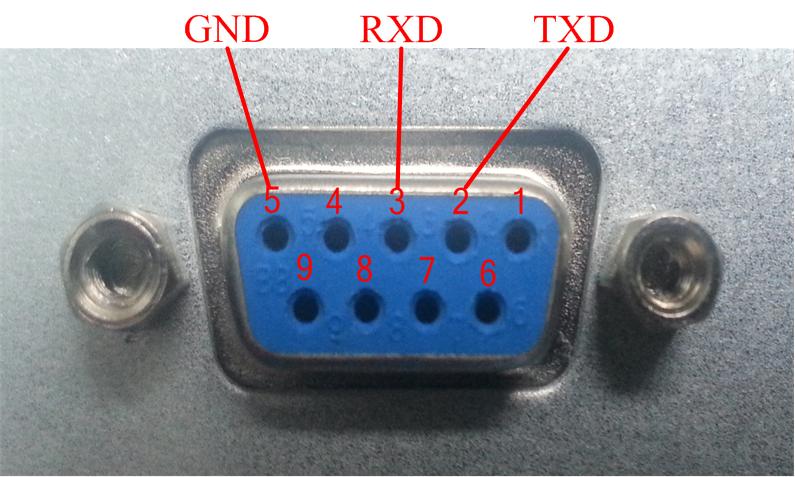


Fig3. Female type holes definition of RS\_232 Port

pin2--- TXD

pin3--- RXD

pin5--- GND

## 1.3、Protocol format

This protocol supports RTU mode and ASCII mode.

### 1.3.1 Format of the RTU mode

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. Each message must be transmitted in a continuous stream of characters.

The format for each byte in the RTU mode is:

Coding system: 8-bit binary;

Bits per Byte: 1 sart bit

8 data bits, least significant bit sent first

1 bit for parity completion, if not, this is stop bit

1 stop bit

Error check area: Cyclic Redundancy Check (CRC)

Remark: the use of no parity requires 2 stop bits.

RTU Mode Request frame format:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Start | Address | Function | Register  Starting address | Register  number | CRC  Low bit | CRC  High bit | End |
| ≥3.5 character times | 8 bits | 8 bits | 16 bits | 16 bits | 8 bits | 8 bits | ≥3.5 character times |

Bit Sequence in RTU mode:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Start | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Stop/Par | Stop |

RTU Mode Response frame format:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Start | Address | Function | Date | CRC  Low bit | CRC  High bit | End |
| ≥3.5 character times | 8 bits | 8 bits | N\*8 bits | 8 bits | 8 bits | ≥3.5 character times |

A MODBUS message is placed by the transmitting device into a frame that has a known beginning and ending point. This allows devices that receive a new frame to begin at the start of the message, and to know when the message is completed. Partial messages must be detected and errors must be set as a result. In RTU mode, message frames are separated by a silent interval of at least 3.5 character times.

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. 1.5 character times and 3.5 character times are relative to the baud rate, for example, baud rate is 9600:

1.5 character times =（1/9600）×11×1.5×1000 = 1.72 ms

3.5 character times =（1/9600）×11×3.5×1000 = 4.01 ms

For a complete 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 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.

The format for each byte in ASCII mode is:

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

Bits per Byte: 1 start bit

7 data bits, least significant bit sent first

1 bit for parity completion, if not, this is stop bit

1 stop bit

Error check area: Longitudinal Redundancy Checking (LRC)

Remark: the use of no parity requires 2 stop bits.

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)** |

Bit Sequence in ASCII mode:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Start | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Stop/Par | 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)** |

In ASCII mode, a message is delimited by specific characters as Start-of-frames (0x3A) and End-of-frames (0x0D). The maximum interval between the characters is 1s, if more than 1s, the receiving device considers an error has occurred. The allowable characters transmitted for all other fields are hexadecimal 0–9, A–F (ASCII coded), **highest 4-bit sent first, then least 4-bit**. For example, the byte 0x01 is encoded as two characters: 0x30 and 0x31.

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 |

# 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 | HT11、HT31 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 | HT11、HT31 series just have phase A, the registers of phase B and C be reserved. |
| 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 | HT11、HT31 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 | HT11、HT31 series just have phase A, the registers of phase B and C be reserved. |
| 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 | ℃ |  |
| 50 | Battery voltage positive | Unsigned int | 0.1 | V | HT11、HT31 series just have phase A, the registers of phase B and C be reserved.  Battery current:  Charge>0,Discharge<0 |
| 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 | ℃ |  |
| 55 | Battery remain time | Unsigned int | 0.1 | min |  |
| 56 | Battery capacity | Unsigned int | 0.1 | % |  |
| 57 | Reserved |  |  |  |  |
| 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 |  |  |
| 71 | No. of currently available unit | Unsigned int | 1 |  | RMX、HTX series:  Bit0-Bit3: Adjustment enable bits  (0: disable, 1: enable)  Bit0: Invertor Adjust  Bit1: Bypass Adjust  Bit2: Input Adjust  Bit3: Battery Adjust  Other series(except HT11(1-3KVA), it no this function)：  Bit0-Bit3: The number of currently online module(1-10). If it is 0, it means adjustment conditions is not OK.  Bit4-Bit15: Reserved |
| 72 | Unit N Inv voltage A | Unsigned int | 0.1 | V | HT11、HT31 series just have phase A, the registers of phase B and C be reserved.  HT11(1-3KVA) no this function  (Internal use only) |
| 73 | Unit N Inv voltage B | Unsigned int | 0.1 | V |
| 74 | Unit N Inv voltage C | Unsigned int | 0.1 | V |
| 75 | Unit N bypass voltage A | Unsigned int | 0.1 | V |
| 76 | Unit N bypass voltage B | Unsigned int | 0.1 | V |
| 77 | Unit N bypass voltage C | Unsigned int | 0.1 | V |
| 78 | UPS series number | Unsigned int | 1 |  | Bit0-Bit5: UPS series  1:RMX(20-600KVA)  2:RM(10-200 KVA)  3:HT33(40-200 KVA)  4:HTX33(10-40 KVA)  5:HT33(10-30 KVA)  6:HT31(10-20 KVA)  7:HT11(6-20 KVA)  8:HT11(1-3 KVA)  Bit6-Bit15:Reserved |
| 79 | Reserved |  |  |  |  |
| 80 | MTR\_IP\_PORT | Unsigned int | 1 |  | (Used by tooling test)  Monitoring board input port state defined as follows:  Bit0:MaintCb  Bit1:LcdPenIrq  Bit2:DryBCBClosed  Bit3:DryBCBOnline  Bit4:BCBGenOnline  Bit5:KeyMute  Bit6:KeyTxByp  Bit7:KeyTxInv  Bit8:Epo  Bit9:BypFanFail  Bit10: ServiceMod  Bit11: ModConnectOk  Bit12: CabConnectOk  Bit13: AsRemoteSd  Bit14: RemoteEpo  Bit15: Reserved |
| The follows are module data, currently only supported by RMX(20-600KVA) and RM(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 RMX(20-600KVA) 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 | ℃ |  |
| 2098 | Outlet Temperature | Unsigned int | 0.1 | ℃ |  |
| 2099 | Rectifier IGBT Temperature Phase A | Unsigned int | 0.1 | ℃ |  |
| 2100 | Rectifier IGBT Temperature Phase B | Unsigned int | 0.1 | ℃ |  |
| 2101 | Rectifier IGBT Temperature Phase C | Unsigned int | 0.1 | ℃ |  |
| 2102 | Invertor IGBT Temperature Phase A | Unsigned int | 0.1 | ℃ |  |
| 2103 | Invertor IGBT Temperature Phase B | Unsigned int | 0.1 | ℃ |  |
| 2104 | Invertor IGBT Temperature Phase C | Unsigned int | 0.1 | ℃ |  |
| 2105 | Reserved | Unsigned int |  |  |  |
| 2106 | Reserved | Unsigned int |  |  |  |
| 2107 | Reserved | Unsigned int |  |  |  |
| 2108 | Reserved | Unsigned int |  |  |  |
| 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 RMX(20-600KVA) and RM(10-200KVA) series. | | | | | |
| 2145 | Rectifier Identifer | 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 Identifer | 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 |  |  |

**For example:**

Assuming UPS device address is 0x12, start address of the register is 0x0005, No. of the register is 2, to inquiry “Bypass current ph\_B”and“Bypass current ph\_C”, if“Bypass current ph\_B” is 50.2A，“Bypass current ph\_C”is 50.2A，coefficient is 0.1，so:

Register 0x0005 value is：(502)D = (01F6)H

Register 0x0006 value is：(502)D = (01F6)H

Return number of the register is: 4

RTU mode，request and response frame information as follow：

Request frame：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Device address | Function code | Start address of register | Register number | CRC |
| data | 0x12 | 0x03 | 0x0005 | 0x0002 | 0xAD96 |

Response frame：

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Device address | Function code | Data Length(byte) | Data content | | CRC |
| data | 0x12 | 0x03 | 0x04 | 0x01F6 | 0x01F6 | 0x EAB8 |

ASCII mode，request and response frame information as follow：

Request frame：

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | start | Device address | Function code | Start address of register | | Register number | | LRC | Stop |
|  | ： | 0x12 | 0x03 | 0x0005 | | 0x0002 | | 0xE4 | CRLF |
| ASCII | 0x3A | 0x3132 | 0x3033 | 0x3030 | 0x3035 | 0x3030 | 0x3032 | 0x4534 | 0x0D0A |

Response frame：：

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Start | Device address | Function code | Data Length  (byte) | Data content | | | | LRC | Stop |
|  | ： | 0x12 | 0x03 | 0x04 | 01F6 | | 01F6 | | 0xF3 | CRLF |
| ASCII | 0x3A | 0x3132 | 0x3033 | 0x3034 | 0x3031 | 0x4636 | 0x3031 | 0x4636 | 0x4633 | 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：Connect |
| 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 HT11(1-3k) have this function |
| 115 | Reserved |  |  |
| 116 | Reserved |  |  |
| 117 | Reserved |  |  |
| 118 | Reserved |  |  |
| 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 RMX(20-600KVA)and RM(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 RMX(20-600KVA)and RM(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 RMX(20-600KVA) and RM(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 RMX(20-600KVA) and RM(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 |
| (Not use in 20K module)  Line Synchronization Signal | Unsigned int | Bit8-Bit11:  0000 : Normal  0001 : Fault |
| (Not use in 20K module)  PWM Synchronization Signal | Unsigned int | Bit4-Bit7:  0000 : Normal  0001 : Fault |
| (Not use in 20K module)  Input Current Unbalance | 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 RMX(20-600KVA) and RM(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 RMX(20-600KVA)  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 | 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 |
| RMX(20-600KVA) most have 30 modules, RM(10-200KVA) most have 10 modules, the follows only be supported by RMX(20-600KVA). | | | |
| 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:**

**HT serial below 30K treat as one module**

**For example:**

Assuming UPS device address is 0x12, start address of the register is 0x006C, No. of the register is 1, to inquiry “Battery Reverse”, if“Battery Reverse” is 0x0000.

RTU mode，request and response frame information as follow：

Request frame：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Device address | Function code | Start address of register | Register number | CRC |
| data | 0x12 | 0x04 | 0x006C | 0x0001 | 0x74F3 |

Response frame：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Device address | Function code | Data Length(byte) | Data content | CRC |
| data | 0x12 | 0x04 | 0x02 | 0x0000 | 0xF33C |

ASCII mode，request and response frame information as follow：

Request frame：

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Start | Device address | Function code | Start address of register | | Register number | | LRC | Stop |
|  | ： | 0x12 | 0x04 | 0x006C | | 0x0001 | | 0x7D | CRLF |
| ASCII | 0x3A | 0x3132 | 0x3034 | 0x3030 | 0x3643 | 0x3030 | 0x3031 | 0x3744 | 0x0D0A |

Response frame：

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Start | Device address | Function code | Data Length  (byte) | Data content | | LRC | Stop |
|  | ： | 0x12 | 0x04 | 0x02 | 0x0000 | | 0xE8 | CRLF |
| ASCII | 0x3A | 0x3132 | 0x3034 | 0x3032 | 0x3030 | 0x3030 | 0x4538 | 0x0D0A |

## 2.3、Write Single Register(Function 0x06)

Only used by insider

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.**  **(Register)** | **Name** | **Data type**  **(Hi-Lo)** | **Coefficient** | **Remark** |
| 391 | Reserved | Unsigned int |  |  |
| 392 | Reserved | Unsigned int |  |  |
| 393 | Reserved | Unsigned int |  |  |
| 394 | Reserved | Unsigned int |  |  |
| 395 | Reserved | Unsigned int |  |  |
| 396 | Reserved | Unsigned int |  |  |
| 397 | Reserved | Unsigned int |  |  |
| 398 | Reserved | Unsigned int |  |  |
| 399 | Reserved | Unsigned int |  |  |
| 400 | Set module ID | Unsigned int |  | Used by query module data  RMX(20-600KVA): 1-30  RM(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 Anolog 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 RMX(20-600KVA) and RM(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 RMX(20-600KVA) and RM(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 B CRC table

High\_ byte table

/\* Table of CRC values for high–order byte \*/

static unsigned Unsigned int auchCRCHi[] = {

0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,

0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,

0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,

0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,

0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81,

0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,

0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,

0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,

0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,

0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,

0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01,

0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,

0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,

0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,

0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,

0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,

0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,

0x40 } ；

Low\_ byte table

/\* Table of CRC values for low–order byte \*/

static Unsigned int auchCRCLo[] = {

0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05, 0xC5, 0xC4,

0x04, 0xCC, 0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,

0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD,

0x1D, 0x1C, 0xDC, 0x14, 0xD4, 0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,

0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7,

0x37, 0xF5, 0x35, 0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,

0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA, 0xEE,

0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,

0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60, 0x61, 0xA1, 0x63, 0xA3, 0xA2,

0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,

0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB,

0x7B, 0x7A, 0xBA, 0xBE, 0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,

0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91,

0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,

0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99, 0x59, 0x58, 0x98, 0x88,

0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,

0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80,0x40 }；