**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 | RegisterStarting address | Registernumber | CRCLow bit | CRCHigh 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 | CRCLow bit | CRCHigh 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 AdjustOther 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 series1: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:MaintCbBit1:LcdPenIrqBit2:DryBCBClosedBit3:DryBCBOnlineBit4:BCBGenOnlineBit5:KeyMuteBit6:KeyTxBypBit7:KeyTxInvBit8:EpoBit9:BypFanFailBit10: ServiceModBit11: ModConnectOkBit12: CabConnectOkBit13: AsRemoteSdBit14: RemoteEpoBit15: 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：None1：UPS Supply2：Bypass Supply |
| 82 | Battery Status | Unsigned int | 0：Not Work1：Float Charge2：Boost Charge3：Discharge |
| 83 | Battery Connect Status | Unsigned int | 0：Not Connect1：Connect |
| 84 | Maintain Cb Status | Unsigned int | 0：Open1：Close  |
| 85 | EPO | Unsigned int | 0：None1：EPO |
| 86 | Invertor Ready Capacity | Unsigned int | 0：Enough1：Not Enough |
| 87 | Generator Input | Unsigned int | 0：Disconnect1：Connect |
| 88 | Input Fail | Unsigned int | 0：Normal1：Abnormal |
| 89 | Bypass Sequence Fail | Unsigned int | 0：Normal1：Abnormal |
| 90 | Bypass Voltage Fail | Unsigned int | 0：Normal1：Abnormal |
| 91 | Bypass Fail | Unsigned int | 0：Normal1：Abnormal |
| 92 | Bypass Over Load | Unsigned int | 0：No1：Yes |
| 93 | Bypass Over Load Timeout | Unsigned int | 0：No1：Yes |
| 94 | Bypass Untrack | Unsigned int | 0：No1：Yes |
| 95 | Tx Time Limit | Unsigned int | 0：No1：Yes |
| 96 | Output Shorted | Unsigned int | 0：No1：Yes |
| 97 | Battery EOD | Unsigned int | 0：No1：Yes |
| 98 | Battery Test Begin (Reserved) | Unsigned int | 0：No1：Yes |
| 99 | Battery Test Result | Unsigned int | 0: No Test1:Test Success2:Test Fail3:Testing |
| 100 | Battery Manual Test (Reserved) | Unsigned int | 0：No1：Yes |
| 101 | Battery Maintain Result | Unsigned int | 0:No Maintain1:Maintain success2: Maintain Fail3: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 Enable1: Invertor On Disable |
| 106 | Manual Tx Bypass | Unsigned int | 0: No1: Yes |
| 107 | Battery Volt Low | Unsigned int | 0: No1: Yes |
| 108 | Battery Reverse | Unsigned int | 0: No1: Yes |
| 109 | REC Status | Unsigned int | 0:OFF1:Soft Start2:Normal Work |
| 110 | Input Neutral Lost | Unsigned int | 0: No Lost1: Lost |
| 111 | Bypass Fan Fail | Unsigned int | 0: Normal1: Fail |
| 112 | Lost N+X Redundant | Unsigned int | 0: No Lost1: Lost |
| 113 | EOD System Inhibited | Unsigned int | 0: No1: Inhibited |
| 114 | CT Weld Reverse | Unsigned int | 0: Normal1: ReverseJust HT11(1-3k) have this function |
| 115 | Reserved |  |  |
| 116 | Reserved |  |  |
| 117 | Reserved |  |  |
| 118 | Reserved |  |  |
| 119 | First Module Online Flag Bit  | Unsigned int | Bit15: Module 32Bit14: Module 31…Bit0: Module 17Corresponding bit is 1 means the module on, 0 means the module offJust RMX(20-600KVA)and RM(10-200KVA) have this function |
| 120 | Second Module Online Flag Bit | Unsigned int | Bit15: Module 16Bit14: Module 15…Bit0: Module 1Corresponding bit is 1 means the module on, 0 means the module offJust 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 : None0001 : UPS0010 : Bypass0100 : Other Unit |
| Rectifier Status | Unsigned int | Bit8-Bit11:0000 : OFF0001 : Soft Start0010 : Normal Work |
| Invertor Status | Unsigned int | Bit4-Bit7:0000 : OFF0001 : Soft Start0010 : Normal Work |
| Bypass Status | Unsigned int | Bit0-Bit3:0000 : Abnormal0001 : Normal |
| 3002 | Battery Status | Unsigned int | Bit12-Bit15:0000 : Disconnect0001 : Boost Charging0010 : Float Charging0100 : Discharging1000 : Not Working |
| Input CB Status | Unsigned int | Bit8-Bit11:0000 : Open0001 : Close |
| Bypass CB Status | Unsigned int | Bit4-Bit7:0000 : Open0001 : Close |
| Output CB Status | Unsigned int | Bit0-Bit3:0000 : Open0001 : Close |
| 3003 | Maintenance CB Status | Unsigned int | Bit12-Bit15:0000 : Open0001 : Close |
| Postive Battery String CB Status | Unsigned int | Bit8-Bit11:0000 : Open0001 : Close |
| Negative Battery String CB Status | Unsigned int | Bit4-Bit7:0000 : Open0001 : Close |
| Postive Battery String Connect Status | Unsigned int | Bit0-Bit3:0000 : Disconnect0001 : Connect |
| 3004 | Negative Battery String Connect Status | Unsigned int | Bit12-Bit15:0000 : Disconnect0001 : Connect |
| Invertor On Allow Status | Unsigned int | Bit8-Bit11:0000 : Disable0001 : Enable |
| Invertor Working Status | Unsigned int | Bit4-Bit7:0000 : Not Ready0001 : Ready0010 : Supplying |
| Generator Connect Status | Unsigned int | Bit0-Bit3:0000 : Disconnect0001 : Connect |
| 3005 | Service Mode | Unsigned int | Bit12-Bit15:0000 : No0001 : Yes |
| Invertor Ready Capacity | Unsigned int | Bit8-Bit11:0000 : Enough0001 : Less |
| Load Capacity VS Invertor Capacity | Unsigned int | Bit4-Bit7:0000 : Invertor Capacity More0001 : Load Capacity More |
| BCB Shunt Trip Status | Unsigned int | Bit0-Bit3:0000 : No Action0001 : Trip |
| 3006 | BCB Connect Status | Unsigned int | Bit12-Bit15:0000 : Disconnect0001 : Connect |
| BCB Status | Unsigned int | Bit8-Bit11:0000 : Open0001 : Close |
| EPO Status | Unsigned int | Bit4-Bit7:0000 : No Action0001 : EPO |
| Module Pull Status | Unsigned int | Bit0-Bit3:0000 : Inset0001 : Pull Out |
| 3007 | Invertor Available Status | Unsigned int | Bit12-Bit15:0000 : Unavailable0001 : Available |
| Power On End Flag | Unsigned int | Bit8-Bit11:0000 : Not End0001 : End |
| LBS Available Status | Unsigned int | Bit4-Bit7:0000 : Unavailable0001 : Available |
| Synchronization Source | Unsigned int | Bit0-Bit3:0000 : Reserved0001 : Local Oscillator0010 : Synchronize Bypass0100 : Reserved1000 : Synchronize LBS |
| 3008 | Interrupt Transfer to Inverter | Unsigned int | Bit12-Bit15:0000 : Disable0001 : Enable |
| Dormancy Status | Unsigned int | Bit8-Bit11:0000 : No0001 : Yes |
| Small LCD Function Key Status | Unsigned int | Bit4-Bit7:0000 : OFF0001 : 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 : No0001 : Yes |
| If the wave is triggering | Unsigned int | Bit8-Bit11:0000 : No0001 : 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 : Asynchronize0001 : Synchronized |
| Utility Power | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Rectifier | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Inverter | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3018 | Bypass Power | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Postive Battery String Voltage | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Low0010 : High |
| Negative Battery String Voltage | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Low0010 : High |
| Postive Battery String Temperature | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3019 | Negative Battery String Temperature | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Input Voltage Phase A | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Low0010 : High |
| Input Voltage Phase B | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Low0010 : High |
| Input Voltage Phase C | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Low0010 : High |
| 3020 | Input Current Phase A | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Input Current Phase B | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Input Current Phase C | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Output Voltage Phase A | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Low0010 : High |
| 3021 | Output Voltage Phase B | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Low0010 : High |
| Output Voltage Phase C | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Low0010 : High |
| Output Current Phase A | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Output Current Phase B | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3022 | Output Current Phase C | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| (Not use in 20K module) Line Synchronization Signal | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| (Not use in 20K module)PWM Synchronization Signal | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| (Not use in 20K module)Input Current Unbalance | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3023 | Utility Voltage Status | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Utility Frequency Status | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Main Input Sequence Status | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| REC Soft Start Status | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3024 | REC IGBT Over Current | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Input Inductance Over Temperature | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Rectifier Over Temperature | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Postive DC Bus Over Voltage | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3025 | Negative DC Bus Over Voltage | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Fan Fail(All) | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Main BackFeed Protect | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| DC Bus Unbalance | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3026 | Postive DC Bus Low Voltage | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Negative DC Bus Low Voltage | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Postive Battery String Reverse | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Negative Battery String Reverse | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3027 | Battery Leakage | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Battery Cool Start | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Postive Charger Over Voltage | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Low0010 : High |
| Negative Charger Over Voltage | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Low0010 : High |
| 3028 | Postive Charger Over Temperature | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Negative Charger Over Temperature | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Postive Charger Status | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Negative Charger Status | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3029 | Postive Battery String Low Voltage | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Negative Battery String Low Voltage | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Postive Battery String EOD | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Negative Battery String EOD | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3030 | Input Neutral Lost | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Bypass Sequence Status | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Bypass Voltage Status | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Bypass SCR Status | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3031 | Bypass Overload | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Bypass Overload Time Out | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Bypass Freqence Over Track | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Bypass BackFeed Protect | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3032 | Pulse Load to Bypass | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Overload Time Out | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Bypass Fail and Shutdown | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Auxiliary Power Lost | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3033 | Manual Shutdown | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Invertor Protect | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Exceed Tx Times Limit(Per hour) | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Output Power BackFeed | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3034 | Input Fuse Breakdown | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Bypass Over Current Lock | Unsigned int | Bit8-Bit11: 0000 : Normal0001 : Fault |
| Invertor Inductance Over Temperature | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Invertor Over Temperature | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3035 | Invertor IGBT Over Current | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Output Fuse Breakdown | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Output Overload | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Invertor Relay Status | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3036 | Invertor Communication Status | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Manual Starting Action | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Parallel Cable Status | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Parallel Share Status | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3037 | User Operation Error | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Output Shorted Circuit | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Battery Test | Unsigned int | Bit4-Bit7:0000 : Not Define0001 : Test OK0010 : Test Fail0100 : Testing |
| Battery Maintenance | Unsigned int | Bit0-Bit3:0000 : Not Define0001 : Test OK0010 : Test Fail0100 : Testing |
| 3038 | System Test | Unsigned int | Bit12-Bit15:0000 : Not Define0001 : Test OK0010 : Test Fail |
| Invertor Bridge Open | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Inveter Relay Open | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Inveter Relay Shorted | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3039 | Outlet Temperature Abnormal | Unsigned int | Bit12-Bit15:0000 : Normal0001 : Fault |
| Input Over Current Time Out | Unsigned int | Bit8-Bit11:0000 : Normal0001 : Fault |
| Inlet Time Sensor Connect Status | Unsigned int | Bit4-Bit7:0000 : Normal0001 : Fault |
| Outlet Time Sensor Connect Status | Unsigned int | Bit0-Bit3:0000 : Normal0001 : Fault |
| 3040 | Fan Fail Over Temperature | Unsigned int | Bit12-Bit15:0000 : Normal0001 : 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 FailBit1: Invertor FailBit2: Rectifier Over TemperatureBit3: Fan Fail Bit4: Over LoadBit5: Over Load TimeoutBit6: Invertor Over TemperatureBit7: Invertor ProtectBit8: Manual ShutdownThe follows comprehensive alarm only supported by RMX(20-600KVA)Bit9: Battery or Charger FailBit10: Power Share FailBit11: Synchron Pulse FailBit12: Input Voltage Detect FailBit13: Battery Voltage Detect FailBit14: Output Voltage FailBit15: Bypass Voltage Detect Fail |
| 3072 | Module 1 Comprehensive Alarm | Unsigned int | Bit0: Invertor Bridge FailBit1: Outlet Temperature ErrorBit2: Input Current UnbalanceBit3: DC Bus Over VoltageBit4: Rectifier Soft Start FailBit5: Invertor Relay Connect FailBit6: Invertor Relay Short CircuitBit7: PWM Synchron FailBit8: Intelligent SleepBit9: Input Over Current TimeoutBit10: No Inlet Temperature SensorBit11: No Outlet Temperature SensorBit12: Capacitor ExpiredBit13: Fan ExpiredBit14: Module Connector ErrorBit15: 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 dataRMX(20-600KVA): 1-30RM(10-200KVA): 1-10Other 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 }；