

# Three-phase Inverter Rs485 Communication protocol

## 1. Communication configuration

The communication mode adopts the master-slave reply mode.

- 1) Physical interface RS-485
- 2) Serial communication interface
- 3) Baud rate: 9600 bps
- 4) On start bit, 8 data bits, no parity check, one stop bit
- 5) Minimum query period: 1s

## 2. Communication Frame

- 1) Communication data frames are large end sequences.

- 2) Frame format

Table 1 Message format

0x02	Address	Timestamp	Data	CRC	0x03
1byte	2byte	2byte	nbyte	2byte	1byte

- 3) The data frame contains a byte start flag 0x02, two byte addresses, two byte timestamps, n byte data, two byte CRC checks, and an end flag 0x03.
- 4) Sending frames and receiving frames have the same structure.
- 5) If a byte is equal to frame head, frame tail, or 0x1B between the frame head and the frame tail, it needs to be converted to two bytes upon transmission

Source code	Escape code
0x02	0x1B 0xE7
0x03	0x1B 0xE8
0x1B	0x1B 0x00

- 6) The verification is 2 bytes. The calculation scope includes address, time stamp and data. See appendix 1 for the algorithm.
- 7) Address  
Refers to the address of the inverter to be accessed, which is 1-65535; When =0, represents group sending, the inverter only needs to be executed, but no feedback.
- 8) The time stamp  
The timestamp is generated by the communication host with a value range of 1-65535. When the slave machine is answered, the timestamp must equal the host sending value.
- 9) Direction of data transmission  
Transmission is always initiated by the upper computer. Return, always feedback by inverter.
- 10) Inverter data query command

## 3. Get the inverter data command description

### 3.1 Polling(0x00)

Send: 0x00

Returns: 0x00

For example:

Tx: 02 00 01 00 01 00 45 85 03

Rx: 02 00 01 00 01 00 45 85 03

\*this command is used to determine whether the inverter is online; If there is no response, the address device does not exist.

### 3.2. Read version information(0x01)

Property: read only Definition:

VerInfo

Rx:02 00 01 00 01 00 64 00 CA 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 26 3D

**Definition:**

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Name	Size	Unit	Note
EnergyToday	4 byte integer	WH	day generation

PowerMax	4 byte integer	W	day peak power
PowerCurrent	4 byte integer	W	current generation power
RunTime	4 byte integer	second	the cumulative generation time of the day
EnergySum	4 byte integer	WH	current cumulative power generation

### 3.3.3 Get the state information of the inverter

Name: InterverState

Property: read only

Definition: InterverState 12Byte

Address	Offset	Note
Byte0	Bit7~Bit0	reserved
Byte1	Bit7	reserved
	Bit6	reserved
	Bit5	TempSensorErr
	Bit4	PVBrkerOpen
	Bit3	EepromErr
	Bit2	SPICommErr
	Bit1	IntFanErr
	Bit0	ExtFanErr
Byte2	Bit7	IntProtectA
	Bit6	TempOver
	Bit5	IntProtectB
	Bit4	GridV.OutLim
	Bit3	GridF.OutLim
	Bit2	GridF.OutLim
	Bit1	IntProtectC
	Bit0	GridV.OutLim
Byte3	Bit7	GridV.OutLim
	Bit6	IntProtectD
	Bit5	PVVoltOver
	Bit4	IntProtectE
	Bit3	IntProtectF
	Bit2	IntProtectG
	Bit1	IntProtectH
	Bit0	IntProtectI
Byte4	Bit7	IntProtectJ
	Bit6	IntProtectK
	Bit5	AC.ConErr
	Bit4	IntProtectL
	Bit3	IntProtectM
	Bit2	EmergencyStp
	Bit1	GridV.OutLim
	Bit0	IntProtectN
Byte5	Bit7	IntProtectO
	Bit6	PV.Reverse
	Bit5	IntpProtectP
	Bit4	GFCI.Err
	Bit3	IsolationErr
	Bit2	IntProtectQ
	Bit1	IntProtectR
	Bit0	IntProtectS

Byte6	Bit7~Bit0	reserved
Byte7	Bit7	reserved
	Bit6	reserved
	Bit5	reserved
	Bit4	reserved
	Bit3	reserved
	Bit2	reserved
	Bit1	IntProtectU
	Bit0	IntProtectT
Byte8	Bit7	reserved
	Bit6	reserved
	Bit5	IntFaultN
	Bit4	IntFaultA
	Bit3	IntFaultB
	Bit2	IntFaultC
	Bit1	IntFaultD
	Bit0	IntFaultE
Byte9	Bit7	reserved
	Bit6	IntfaultG
	Bit5	reserved
	Bit4	reserved
	Bit3	IntFaultJ
	Bit2	IntFaultK
	Bit1	IntFaultL
	Bit0	IntFaultM
Byte10	Bit7~Bit0	reserved
Byte11	Bit7	Start Or Normal
	Bit6	reserved
	Bit5	Inverter Run or Stop
	Bit4	reserved
	Bit3	reserved
	Bit2	grid is normal (normal is 1, otherwise 0)
	Bit1	grid-connected generation (generation is 1 and vice versa)
	Bit0	Inverter starts to work (work 1 and vice versa)

Property: read only

Send: 0x10

Returns: 0x10

InterverState (3.3.1)

RunInfo (3.3.2)

FurnishPowerInfo (3.3.3)

For example:

Tx:02 00 01 00 01 10 57 B4 03

Rx:02 00 01 00 01 10 00 00 80 00 00 1B E7 00 00 00 00 00 05 00 00 00 00 00 00 07 0D 38 82 24 E1 00 00  
00 0B DE  
F6 8B 92 03

### 3.4 Read PV information

Name: PVinfo

Property: read only

Definition:

Name	Size	Unit	Note
Upv3	2 byte integer	0.1V	PV3 voltage
Ipv3	2 byte integer	0.1A	PV3 electric current
Rsv1	2 byte integer	/	/
Rsv2	2 byte integer	/	/
Rsv3	2 byte integer	/	/
Rsv4	2 byte integer	/	/
Rsv5	2 byte integer	/	/
Rsv6	2 byte integer	/	/

Send:0x05  
Returns: 0x05  
PVinfo

For example:  
Tx:02 00 01 00 01 05 15 20 03  
Rx:02 00 01 00 01 05 00 00 00 00 00 00 00 00 00 00 00 00 00 00 96 E8 03

### 3.5 Read the remote shutdown status

Property: read only  
Send:0x12  
Returns:0x12  
Status (1 byte, 0 is stop, 1 is boot)

For example:  
Tx:02 00 01 00 01 12 77 F6 03  
Rx:02 0001 0001 12 01 E8 51 03

### 3.6 Set remote control to stop starting

Attribute: write only  
Send:0x09  
Reply:0x09  
result (1 byte, 0 is stop, 1 is boot)

For example:  
Tx:02 00 01 00 01 09 00 27 F9 03  
Rx:02 00 01 00 01 09 00 27 F9 03

## [appendix 1] calculation of verification

CRC-16 verification is used for verification.The calculation method is as follows:

```
u16 crc_table[256] =
{
    0x0000, 0x1021, 0x2042, 0x3063, 0x4084, 0x50A5, 0x60C6, 0x70E7,
    0x8108, 0x9129, 0xA14A, 0xB16B, 0xC18C, 0xD1AD, 0xE1CE, 0xF1EF,
    0x1231, 0x0210, 0x3273, 0x2252, 0x52B5, 0x4294, 0x72F7, 0x62D6,
```

0x9339, 0x8318, 0xB37B, 0xA35A, 0xD3BD, 0xC39C, 0xF3FF, 0xE3DE,  
0x2462, 0x3443, 0x0420, 0x1401, 0x64E6, 0x74C7, 0x44A4, 0x5485,  
0xA56A, 0xB54B, 0x8528, 0x9509, 0xE5EE, 0xF5CF, 0xC5AC, 0xD58D,  
0x3653, 0x2672, 0x1611, 0x0630, 0x76D7, 0x66F6, 0x5695, 0x46B4,  
0xB75B, 0xA77A, 0x9719, 0x8738, 0xF7DF, 0xE7FE, 0xD79D, 0xC7BC,  
0x48C4, 0x58E5, 0x6886, 0x78A7, 0x0840, 0x1861, 0x2802, 0x3823,  
0xC9CC, 0xD9ED, 0xE98E, 0xF9AF, 0x8948, 0x9969, 0xA90A, 0xB92B,  
0x5AF5, 0x4AD4, 0x7AB7, 0x6A96, 0x1A71, 0x0A50, 0x3A33, 0x2A12,  
0xDBFD, 0xCBDC, 0xFBBF, 0xEB9E, 0x9B79, 0x8B58, 0xBB3B, 0xAB1A,  
0x6CA6, 0x7C87, 0x4CE4, 0x5CC5, 0x2C22, 0x3C03, 0x0C60, 0x1C41,  
0xEDAE, 0xFD8F, 0xCDEC, 0xDDCD, 0xAD2A, 0xBD0B, 0x8D68, 0x9D49,  
0x7E97, 0x6EB6, 0x5ED5, 0x4EF4, 0x3E13, 0x2E32, 0x1E51, 0x0E70,  
0xFF9F, 0xEFBE, 0xDFDD, 0xCFFC, 0xBF1B, 0xAF3A, 0x9F59, 0x8F78,  
0x9188, 0x81A9, 0xB1CA, 0xA1EB, 0xD10C, 0xC12D, 0xF14E, 0xE16F,  
0x1080, 0x00A1, 0x30C2, 0x20E3, 0x5004, 0x4025, 0x7046, 0x6067,  
0x83B9, 0x9398, 0xA3FB, 0xB3DA, 0xC33D, 0xD31C, 0xE37F, 0xF35E,  
0x02B1, 0x1290, 0x22F3, 0x32D2, 0x4235, 0x5214, 0x6277, 0x7256,  
0xB5EA, 0xA5CB, 0x95A8, 0x8589, 0xF56E, 0xE54F, 0xD52C, 0xC50D,  
0x34E2, 0x24C3, 0x14A0, 0x0481, 0x7466, 0x6447, 0x5424, 0x4405,  
0xA7DB, 0xB7FA, 0x8799, 0x97B8, 0xE75F, 0xF77E, 0xC71D, 0xD73C,  
0x26D3, 0x36F2, 0x0691, 0x16B0, 0x6657, 0x7676, 0x4615, 0x5634,  
0xD94C, 0xC96D, 0xF90E, 0xE92F, 0x99C8, 0x89E9, 0xB98A, 0xA9AB,  
0x5844, 0x4865, 0x7806, 0x6827, 0x18C0, 0x08E1, 0x3882, 0x28A3,  
0xCB7D, 0xDB5C, 0xEB3F, 0xFB1E, 0x8BF9, 0x9BD8, 0xABBB, 0xBB9A,  
0x4A75, 0x5A54, 0x6A37, 0x7A16, 0x0AF1, 0x1AD0, 0x2AB3, 0x3A92,  
0xFD2E, 0xED0F, 0xDD6C, 0xCD4D, 0xBDAA, 0xAD8B, 0x9DE8, 0x8DC9,  
0x7C26, 0x6C07, 0x5C64, 0x4C45, 0x3CA2, 0x2C83, 0x1CE0, 0x0CC1,  
0xEF1F, 0xFF3E, 0xCF5D, 0xDF7C, 0xAF9B, 0xBFBA, 0x8FD9, 0x9FF8,  
0x6E17, 0x7E36, 0x4E55, 0x5E74, 0x2E93, 0x3EB2, 0x0ED1, 0x1EF0

};

```
u16 Crc16(u8 *buffer,u16 buffer_length)
{
    u16 i;
    u16 crc;
    crc=0;
    for(i=0;i<buffer_length;i++)
        crc=crc_table[((crc>>8) ^ buffer[i]) & 0xff] ^ (crc<<8);
    return crc;
}
```