

Hybrid Inverter EMS Protocol

Version 00.03.02

Date 2022

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1. General Info

hybrid inverter set up the COM with external control device based on RS485 MODBUS (RTU). Inverter works as slave while external control device works as master.

2. Protocol Description

The MODBUS protocol consists of hardware layer, data layer and application layer.

2.1 Hardware Layer

- Communication by serial port with standard 2 cables(pins) RS485 connection.
- Default baud rate 9600.
- RTU data transfer based on asynchronous mode.
- 1 start bit
- 8 data bits
- No checkout code
- 1 stop bit

2.2 Data Layer

2.2.1 Addressing Mode

The protocol supports both unicasting and multicasting broad approaches with below addressing rules:

| Master Address | Slave Address | Reserved |
|----------------|---------------|----------|
| 0 | 1~247 | 248~255 |

2.2.2 Data Frames Structure

| Address | Function Code | Data | CRC Checkout Code |
|---------|---------------|-----------|-------------------|
| 1 byte | 1 byte | 2*N bytes | 2 bytes |

Note:

- No more than 256 bytes for each data frame.
- CRC Check-out code, low byte+high byte
- All data frames in this protocol only consists of function code and data.

2.2.3 Data Coding

MODBUS use one 'big-Endian' to show address and data value, which mean when sending multi bytes, most significant bit will be delivered firstly, e.g., as below:

| Register | Value |
|----------|--------|
| 16 bits | 0xABCD |

When sending first byte as 0xAB, the second byte will be 0xCD

2.2.4 Data exchange procedure

- All the communication request shall always be and can only be activated by Master node.
- Under unicast broadcasting, it shall follow “request →reply” from master node to slave node, and the reply from slave node shall be within 5s, or master node will take it as time-out.
- Under multicast broadcasting, slave nodes only receive master request, but not reply.

2.2.5 CRC

```
const INT8U auchCRChi[256] = { 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,
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,
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,
};

const INT8U auchCRCLo[256] = { 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, 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
};

```

```

INT16U CRC16(INT8U *puchMsg, INT16U usDataLen)
{
    INT8U uchCRCHi = 0xFF ;
    INT8U uchCRCLo = 0xFF ;
    INT8U uIndex=0 ;
    while (usDataLen--)
    {
        uIndex = uchCRCLo ^ *puchMsg++;
        uchCRCLo = uchCRCHi ^ auchCRCHi[uIndex];
        uchCRCHi = auchCRCLo[uIndex];
    }
    return (((INT16U)uchCRCHi << 8) | (INT16U)uchCRCLo) ;
}

```

2.3 Application Layer

Function Code

| Function Code | Description |
|---------------|-----------------------|
| 03 (0x03) | Read Register |
| 06 (0x06) | Write Single Register |
| 16 (0x10) | Write Multi Registers |

Items and Definitions

| Items | Definition |
|------------------|----------------------------------|
| Register/Address | One Register store 2 bytes value |
| U16 | Unsigned 16 bits int Data |
| U32 | Unsigned 32 bits int Data |
| I16 | Signed 16 bits int Data |
| I32 | Signed 32 bits int Data |
| STR | String |
| N/A | None |
| RO | Read only |
| WO | Write only |
| RW | Read and write |

2.3.1 Function Code 03(0x03)

Master Node Request Data Frame:

| Data Field | Byte(s) | Description |
|------------------------|---------|---------------|
| Slave Node Address | 1 | 1~247 |
| Function Code | 1 | 0x03 |
| Register Start Address | 2 | 0x0000~0xFFFF |
| Register Numbers | 2 | 1~125 |
| CRC | 2 | N/A |

Slave Node Normal Reply Data Frame

| Data Field | Byte(s) | Description |
|--------------------|---------|-------------|
| Slave Node Address | 1 | 1~247 |
| Function Code | 1 | 0x03 |
| Bytes | 1 | 2*N |
| Register Value | 2*N | N/A |
| CRC | 2 | N/A |

Slave Node Abnormal Reply Data Frame

| Data Field | Bytes(s) | Description |
|--------------------|----------|-------------|
| Slave Node Address | 1 | 1~247 |
| Function Code | 1 | 0x83 |
| Abnormal Code | 1 | 1/2/3 |
| CRC | 2 | N/A |

2.3.2 Function Code 06(0x06)

Master Node Normal Request Data Frame

| Data Field | Byte(s) | Description |
|--------------------|---------|---------------|
| Slave Node Address | 1 | 1~247 |
| Function Code | 1 | 0x06 |
| Register Address | 2 | 0x0000~0xFFFF |
| Register Value | 2 | 0x0000~0xFFFF |
| CRC | 2 | N/A |

Slave Node Normal Reply Data Frame

| Data Field | Byte(s) | Description |
|--------------------|---------|---------------|
| Slave Node Address | 1 | 1~247 |
| Function Code | 1 | 0x06 |
| Register Address | 2 | 0x0000~0xFFFF |
| Register Value | 2 | 0x0000~0xFFFF |
| CRC | 2 | N/A |

Slave Node Abnormal Reply Data Frame

| Data Field | Byte(s) | Description |
|--------------------|---------|-------------|
| Slave Node Address | 1 | 1~247 |
| Function Code | 1 | 0x86 |
| Abnormal Code | 1 | 1/2/3 |
| CRC | 2 | N/A |

2.3.3 Function Code 16(0x10)

Master Normal Request Data Frame:

| Data Field | Byte(s) | Description |
|--------------------|---------|---------------|
| Slave Node Address | 1 | 0~247 |
| Function Code | 1 | 0x10 |
| Register Address | 2 | 0x0000~0xFFFF |
| Register Numbers | 2 | 0x0000~0x007b |
| Byte(s) | 1 | 2*N |
| Register Value | 2*N | Value |
| CRC | 2 | N/A |

Note: N is register numbers (0x0000~0x007b)

Slave Node Normal Reply Data Frame

| Data Field | Byte(s) | Description |
|--------------------|---------|---------------|
| Slave Node Address | 1 | 1~247 |
| Function Code | 1 | 0x10 |
| Register Address | 2 | 0x0000~0xFFFF |
| Register Numbers | 2 | 0x0000~0x007b |
| CRC | 2 | N/A |

Slave Node Abnormal Reply Data Frame

| Data Field | Byte(s) | Description |
|--------------------|---------|-------------|
| Slave Node Address | 1 | 1~247 |
| Function Code | 1 | 0x90 |
| Abnormal Code | 1 | 1/2/3 |
| CRC | 2 | N/A |

三、Registers Table

Table 3.1 Hybrid Inverter RO Registers Table

| ID | Register | Bytes | Description | R/W | Data Type | Unit | Accuracy | Note |
|----|----------|-------|--------------------------------------|-----|-----------|------|----------|---|
| 1 | 10000 | 8 | Inverter SN | RO | STR | N/A | 1 | Read Bytes to string |
| | | | | | | | | |
| 2 | 10008 | 1 | Equipment Info | RO | U16 | N/A | 1 | Please refer to table 3.2 |
| 3 | 10011 | 2 | Firmware Version | RO | U32 | N/A | 1 | Read Bytes |
| | 10012 | | | | | | | |
| 4 | 10100 | 1 | Date: Y/M | RO | U16 | N/A | 1 | |
| 5 | 10101 | 1 | Time: D/H | RO | U16 | N/A | 1 | |
| 6 | 10102 | 1 | Time: M/S | RO | U16 | N/A | 1 | |
| 7 | 10104 | 1 | Grid Regulation | RO | U16 | N/A | 1 | |
| 8 | 10105 | 1 | Inverter Running Status | RO | U16 | N/A | 1 | 0:wait, wait for on-grid 1:check, self-check 2:On Grid 3:fault 4:flash, firmware update 5.Off Grid |
| 9 | 10112 | 2 | Fault FLAG1 | RO | U32 | N/A | 1 | Please refer to table 3.3 |
| | 10113 | | | | | | | |
| 10 | 10114 | 2 | Fault FLAG2 | RO | U32 | N/A | 1 | |
| | 10115 | | | | | | | |
| 11 | 10120 | 2 | Fault FLAG3 | RO | U32 | N/A | 1 | |
| | 10121 | | | | | | | |
| 12 | 10994 | 2 | Phase A Power on Meter | RO | I32 | kW | 1000 | |
| | 10995 | | | | | | | |
| 13 | 10996 | 2 | Phase B Power on Meter | RO | I32 | kW | 1000 | |
| | 10997 | | | | | | | |
| 14 | 10998 | 2 | Phase C Power on Meter | RO | I32 | kW | 1000 | |
| | 10999 | | | | | | | |
| 15 | 11000 | 2 | Total Power on Meter | RO | I32 | kW | 1000 | |
| | 11001 | | | | | | | |
| 16 | 11002 | 2 | Total Grid-Injection Energy on Meter | RO | U32 | kWh | 100 | |

| | | | | | | | | |
|----|-------|---|--|----|-----|-----|------|--|
| | 11003 | | | | | | | |
| 17 | 11004 | 2 | Total Purchasing Energy from Grid on Meter | RO | U32 | kWh | 100 | |
| | 11005 | | | | | | | |
| 18 | 11006 | 1 | Grid Lines A/B Voltage | RO | U16 | V | 10 | |
| 19 | 11007 | 1 | Grid Lines B/C Voltage | RO | U16 | V | 10 | |
| 20 | 11008 | 1 | Grid Lines C/A Voltage | RO | U16 | V | 10 | |
| 21 | 11009 | 1 | Grid Phase A Voltage | RO | U16 | V | 10 | |
| 22 | 11010 | 1 | Grid Phase A Current | RO | U16 | A | 10 | |
| 23 | 11011 | 1 | Grid Phase B Voltage | RO | U16 | V | 10 | |
| 24 | 11012 | 1 | Grid Phase B Current | RO | U16 | A | 10 | |
| 25 | 11013 | 1 | Grid Phase C Voltage | RO | U16 | V | 10 | |
| 22 | 11014 | 1 | Grid Phase C Current | RO | U16 | A | 10 | |
| 23 | 11015 | 1 | Grid Frequency | RO | U16 | Hz | 100 | |
| 24 | 11016 | 2 | P_AC | RO | I32 | kW | 1000 | |
| | 11017 | | | | | | | |
| 25 | 11018 | 2 | Total PV Generation on that day | RO | U32 | kWh | 10 | |
| | 11019 | | | | | | | |
| 26 | 11020 | 2 | Total PV Generation from Installation | RO | U32 | kWh | 10 | |
| | 11021 | | | | | | | |
| 27 | 11022 | 2 | Total PV Generation Time from Installation | RO | U32 | H | 1 | |
| | 11023 | | | | | | | |
| 28 | 11028 | 2 | PV Input Total Power | RO | U32 | kW | 1000 | |
| | 11029 | | | | | | | |
| 29 | 11032 | 1 | Temperature Sensor 1 | RO | I16 | °C | 10 | |

| | | | | | | | | |
|----|-------|---|----------------------|----|-----|-----|------|---------------------------|
| 30 | 11033 | 1 | Temperature Sensor 2 | RO | I16 | °C | 10 | |
| 31 | 11034 | 1 | Temperature Sensor 3 | RO | I16 | °C | 10 | |
| 32 | 11035 | 1 | Temperature Sensor 4 | RO | I16 | °C | 10 | |
| 33 | 11038 | 1 | PV1 Voltage | RO | U16 | V | 10 | |
| 34 | 11039 | 1 | PV1 Current | RO | U16 | A | 10 | |
| 35 | 11040 | 1 | PV2 Voltage | RO | U16 | V | 10 | |
| 36 | 11041 | 1 | PV2 Current | RO | U16 | A | 10 | |
| 37 | 11062 | 2 | PV1 Input Power | RO | U32 | kW | 1000 | |
| | 11063 | | | | | | | |
| 38 | 11064 | 2 | PV2 Input Power | RO | U32 | kW | 1000 | |
| | 11065 | | | | | | | |
| 39 | 18000 | 2 | ARM Fault FLAG1 | RO | U32 | N/A | 1 | Please refer to table 3.3 |
| | 18001 | | | | | | | |
| | | | | | | | | |
| 40 | 40200 | 1 | Backup_A_V | RO | U16 | V | 10 | AC Voltage |
| 41 | 40201 | 1 | Backup_A_I | RO | U16 | A | 10 | AC Current |
| 42 | 40202 | 1 | Backup_A_F | RO | U16 | Hz | 100 | Frequency |
| 43 | 40204 | 2 | Backup_A_P | RO | I32 | kW | 1000 | AC Active Power |
| | 40205 | | | | | | | |
| 44 | 40210 | 1 | Backup_B_V | RO | U16 | V | 10 | AC Voltage |
| 45 | 40211 | 1 | Backup_B_I | RO | U16 | A | 10 | AC Current |
| 46 | 40212 | 1 | Backup_B_F | RO | U16 | Hz | 100 | Frequency |
| 47 | 40214 | 2 | Backup_B_P | RO | I32 | kW | 1000 | AC Active Power |
| | 40215 | | | | | | | |
| 48 | 40220 | 1 | Backup_C_V | RO | U16 | V | 10 | AC Voltage |
| 49 | 40221 | 1 | Backup_C_I | RO | U16 | A | 10 | AC Current |
| 50 | 40222 | 1 | Backup_C_F | RO | U16 | Hz | 100 | Frequency |
| 51 | 40224 | 2 | Backup_C_P | RO | I32 | kW | 1000 | AC Active Power |
| | 40225 | | | | | | | |
| 52 | 40230 | 2 | Total_Backup_P | RO | I32 | kW | 1000 | AC Active Power |
| | 40231 | | | | | | | |
| 53 | 40236 | 2 | Invt_A_P | RO | I32 | kW | 1000 | Phase A Active Power |
| | 40237 | | | | | | | |
| 54 | 40242 | 2 | Invt_B_P | RO | I32 | kW | 1000 | Phase B Active Power |
| | 40243 | | | | | | | |
| 55 | 40248 | 2 | Invt_C_P | RO | I32 | kW | 1000 | Phase C Active Power |
| | 40249 | | | | | | | |
| 56 | 40254 | 1 | Battery_V | RO | U16 | V | 10 | DC Voltage |
| 57 | 40255 | 1 | Battery_I | RO | I16 | A | 10 | DC Current |
| 58 | 40256 | 1 | Battery_Mode | RO | U16 | N/A | 1 | 0:discharge;1:charge |

| | | | | | | | | |
|----|-------|---|---|----|-----|-----|------|---------------|
| 59 | 40258 | 2 | Battery_P | RO | I32 | kW | 1000 | Battery Power |
| | 40259 | | | | | | | |
| 60 | 41000 | 1 | Grid Injection Energy on that day[Meter] | RO | U16 | kWh | 10 | |
| 61 | 41001 | 1 | Grid Purchasing Energy on that day[Meter] | RO | U16 | kWh | 10 | |
| 62 | 41002 | 1 | Backup Output Energy on that day | RO | U16 | kWh | 10 | |
| 63 | 41003 | 1 | Battery Charge Energy on that day | RO | U16 | kWh | 10 | |
| 64 | 41004 | 1 | Battery Discharge Energy on that day | RO | U16 | kWh | 10 | |
| 65 | 41005 | 1 | PV Generation Energy on that day | RO | U16 | kWh | 10 | |
| 66 | 41006 | 1 | Loading Energy on that day | RO | U16 | kWh | 10 | |
| 67 | 41008 | 1 | Energy Purchased from Grid on that day | RO | U16 | kWh | 10 | |
| 68 | 41102 | 2 | Total Energy injected to grid | RO | U32 | kWh | 10 | |
| | 41103 | | | | | | | |
| 69 | 41104 | 2 | Total Energy Purchased from Grid from Meter | RO | U32 | kWh | 10 | |
| | 41105 | | | | | | | |
| 70 | 41106 | 2 | Total Output Energy on backup port | RO | U32 | kWh | 10 | |
| | 41107 | | | | | | | |
| 71 | 41108 | 2 | Total Energy Charged to Battery | RO | U32 | kWh | 10 | |
| | 41109 | | | | | | | |
| 72 | 41110 | 2 | Total Energy Discharged from Battery | RO | U32 | kWh | 10 | |
| | 41111 | | | | | | | |

| | | | | | | | | |
|----|-------|---|---|----|-----|-----|------|--|
| 73 | 41112 | 2 | Total PV Generation | RO | U32 | kWh | 10 | |
| | 41113 | | | | | | | |
| 74 | 41114 | 2 | Total Loading Energy consumed at grid side | RO | U32 | kWh | 10 | |
| | 41115 | | | | | | | |
| 75 | 41118 | 2 | Total Energy Purchased from Grid at inverter side | RO | U32 | kWh | 10 | |
| | 41119 | | | | | | | |
| | ... | | | | | | | |
| 76 | 42000 | 1 | Battery Types | RO | U16 | N/A | 1 | |
| 77 | 42001 | 1 | Battery strings | RO | U16 | N/A | 1 | |
| 78 | 42002 | 1 | Battery protocol | RO | U16 | N/A | 1 | |
| 79 | 42003 | 1 | Software Version | RO | U16 | N/A | 1 | |
| 80 | 42004 | 1 | Hardware Version | RO | U16 | N/A | 1 | |
| 81 | 42005 | 1 | BMS Charge I _{max} | RO | U16 | A | 10 | |
| 82 | 42006 | 1 | BMS Discharge I _{max} | RO | U16 | A | 10 | |
| 82 | 43000 | 1 | SOC | RO | U16 | % | 100 | |
| 83 | 43001 | 1 | SOH | RO | U16 | % | 100 | |
| 84 | 43002 | 1 | BMS Status | RO | U16 | N/A | 1 | |
| 85 | 43003 | 1 | BMS Pack Temperature | RO | U16 | °C | 10 | |
| 86 | 43008 | 1 | Max Cell Temperature ID | RO | U16 | N/A | 1 | |
| 87 | 43009 | 1 | Max Cell Temperature | RO | U16 | °C | 10 | |
| 88 | 43010 | 1 | Min Cell Temperature ID | RO | U16 | N/A | 1 | |
| 89 | 43011 | 1 | Min Cell Temperature | RO | U16 | °C | 10 | |
| 90 | 43012 | 1 | Max Cell Voltage ID | RO | U16 | N/A | 1 | |
| 91 | 43013 | 1 | Max Cell Voltage | RO | U16 | V | 1000 | |
| 92 | 43014 | 1 | Min Cell Voltage ID | RO | U16 | N/A | 1 | |
| 93 | 43015 | 1 | Min Cell Voltage | RO | U16 | V | 1000 | |
| 94 | 43016 | 2 | BMS ERROR CODE | RO | U32 | N/A | 1 | |
| | 43017 | | | | | | | |
| 95 | 43018 | 2 | BMS WARN CODE | RO | U32 | N/A | 1 | |

| | | | | | | | |
|--|-------|--|--|--|--|--|--|
| | 43019 | | | | | | |
|--|-------|--|--|--|--|--|--|

Table 3.2 Equipment Info

| Inverter Type (10008 high bit) | | Three Phase Hybrid | Single Phase Hybrid |
|-----------------------------------|---|--------------------|---------------------|
| | | 30 | 31 |
| Model Info (10008 low bit) | 0 | WTS-4KW-3P | N/A |
| | 1 | WTS-5KW-3P | N/A |
| | 2 | WTS-6KW-3P | WTS-4.2KW-1P |
| | 3 | WTS-8KW-3P | WTS-4.6KW-1P |
| | 4 | WTS-10KW-3P | WTS-5KW-1P |
| | 5 | WTS-12KW-3P | WTS-6KW-1P |
| | 6 | N/A | WTS-7KW-1P |
| | 7 | N/A | WTS-8KW-1P |
| | 8 | N/A | WTS-3KW-1P |
| | 9 | N/A | WTS-3.6KW-1P |

Table 3.3 Fault Registers Map

| Fault Code | Registers | BIT | HEX | DEC | Fault Description |
|------------|-------------------------------|------|------------|-----|------------------------------|
| 1 | 10112 (Fault FLAG1) | BIT0 | 0x00000001 | 1 | Mains Lost |
| 2 | | BIT1 | 0x00000002 | 2 | Grid Voltage Fault |
| 3 | | BIT2 | 0x00000004 | 4 | Grid Frequency Fault |
| 4 | | BIT3 | 0x00000008 | 8 | DCI Fault |
| 5 | | BIT4 | 0x00000010 | 16 | ISO Over Limitation |
| 6 | | BIT5 | 0x00000020 | 32 | GFCI Fault |
| 7 | | BIT6 | 0x00000040 | 64 | PV Over Voltage |
| 8 | | BIT7 | 0x00000080 | 128 | Bus Voltage Fault |
| 9 | | BIT8 | 0x00000100 | 256 | Inverter Over Temperature |
| 34 | 10112 (Fault FLAG2) | BIT1 | 0x00000002 | 2 | SPI Fault |
| 35 | | BIT2 | 0x00000004 | 4 | E2 Fault |
| 36 | | BIT3 | 0x00000008 | 8 | GFCI Device Fault |
| 37 | | BIT4 | 0x00000010 | 16 | AC Transducer Fault |
| 38 | | BIT5 | 0x00000020 | 32 | Relay Check Fail |
| 39 | | BIT6 | 0x00000040 | 64 | Internal Fan Fault |
| 40 | | BIT7 | 0x00000080 | 128 | External Fan Fault |
| 10001 | 18000 (ARM Fault FLAG1) | BIT0 | 0x00000001 | 1 | SCI Fault |
| 10002 | | BIT1 | 0x00000002 | 2 | FLASH Fault |
| 10003 | | BIT2 | 0x00000004 | 4 | Meter Comm Fault |

Table 3.4 Hybrid Inverter RW Registers Map

| NO. | Register | Bytes | Function | R/W | Type | Unit | Accuracy | Note |
|-----|----------|-------|--|-----|------|------|----------|---|
| 1 | 20000 | 1 | Inverter RTC date and time | RW | RW | U16 | N/A | High Bit Year [19-99] Low Bit Month [1-12] |
| 2 | 20001 | 1 | | RW | RW | U16 | N/A | High Bit Day [1-31] Low Bit Hour [0-23] |
| 3 | 20002 | 1 | | RW | RW | U16 | N/A | High Bit Minute [0-59] Low Bit Second [0-59] |
| 4 | 25100 | 1 | Grid Injection Power Limit Switch | RW | U16 | N/A | 1 | 0:Off; 1:ON |
| 5 | 25103 | 1 | Grid Injection Power Limit Setting | RW | U16 | N/A | 1000 | [0.0%-100.0%] |
| 6 | 25104 | 1 | Smart Meter COM. Status | WO | U16 | N/A | 1 | 0:Meter COM. Abnormal 1:Meter COM. Normal |
| 7 | 25105 | 2 | Phase A Power On Meter | WO | I32 | W | 1 | |
| 8 | 25107 | 2 | Phase B Power On Meter | WO | I32 | W | 1 | |
| 9 | 25109 | 2 | Phase C Power On Meter | WO | I32 | W | 1 | |
| | ... | | | | | | | |
| 10 | 50000 | 1 | Hybrid Inverter Working Mode Setting | RW | U16 | N/A | 1 | Please refer to table 3.6 |
| 11 | 50001 | 1 | EPS/UPS function Switch | RW | U16 | N/A | 1 | 0:OFF; 1:ON |
| 12 | 50004 | 1 | Off-grid Voltage Setting | RW | U16 | V | 10 | |
| 13 | 50005 | 1 | Off-grid Frequency Setting | RW | U16 | Hz | 100 | [45.00-65.00]Hz |
| 14 | 50006 | 1 | Off-grid asymmetric output function switch | RW | U16 | N/A | 1 | 0:OFF; 1:ON |
| 15 | 50007 | 1 | Peak Load Shifting Switch | RW | U16 | N/A | 1 | 0:OFF; 1:ON |
| 16 | 50009 | 1 | Max. Grid Power Value Setting | RW | U16 | kVA | 10 | |
| | ... | | | | | | | |
| 17 | 50202 | 1 | Inverter AC Power Setting | RW | U16 | N/A | 1 | 0:Off |

| | | | | | | | | |
|----|-------|---|--|----|-----|-----|------|---|
| | | | | | | | | 1: Total Power Setting, Register: 50203 2: Power on each Phase Setting, Registers: 50204- 50206 |
| 18 | 50203 | 1 | Total AC Power Setting | RW | I16 | kW | 100 | 总功率调度设置 |
| 19 | 50204 | 1 | Phase A Power Setting | RW | I16 | kW | 100 | A 相功率调度设置 |
| 20 | 50205 | 1 | Phase B Power Setting | RW | I16 | kW | 100 | B 相功率调度设置 |
| 21 | 50206 | 1 | Power C Power Setting | RW | I16 | kW | 100 | C 相功率调度设置 |
| 22 | 50207 | 1 | Battery Power Setting | RW | I16 | kW | 100 | |
| 23 | 50208 | 1 | Max. AC Power Limit Setting | RW | I16 | kW | 100 | |
| 24 | 50209 | 1 | Min. AC Power Limit Setting | RW | I16 | kW | 100 | |
| 25 | 50210 | 1 | Priority Power Output Setting | RW | U16 | NA | 1 | 0: PV Output Priority 1: Battery Output Priority |
| 26 | 50211 | 1 | PV Power Setting | RW | U16 | kW | 100 | |
| | ... | | | | | | | |
| 27 | 52500 | 1 | Battery Configuration | RW | U16 | N/A | 1 | Please Refer to Table 3.7 |
| 28 | N/A | | | | | | | |
| 29 | 52502 | 1 | On-grid Battery SOC Protection Switch | RW | U16 | N/A | 1 | 0:OFF, 1:ON |
| 30 | 52503 | 1 | On-grid Battery DOD | RW | U16 | N/A | 1000 | [0.0%-100.0%] |
| 31 | 52504 | 1 | Off-grid Battery SOC Protection Switch | RW | U16 | N/A | 1 | 0:OFF, 1:ON |
| 32 | 52505 | 1 | Off-grid Battery DOD | RW | U16 | N/A | 1000 | [0.0%-100.0%] |
| | ... | | | | | | | |
| 33 | N/A | | | | | | | |
| 34 | 53006 | 1 | Scheduled Charge&Discharge | RW | U16 | N/A | 1 | bit0- bit5 stands for period1-period6, bit7-bit15 Reserved; 0: disable 1: enable |

| | | | | | | | | |
|----|-------|---|--------------------------|-----|-----|-----|------|---|
| 35 | 53007 | 1 | Charge/Discharge Setting | RW | U16 | N/A | 1 | Period1: 0:NONE 1:charge 2:discharge |
| 36 | 53008 | 1 | Battery Charge By | | U16 | N/A | 1 | Period1: 0:PV 1:PV+GRID |
| 37 | 53009 | 1 | rsved | | U16 | N/A | 1 | Period1: Reserved: 0xFF |
| 38 | 53010 | 1 | Power Limit | | U16 | N/A | 1000 | Period1: [0.0-100.0%] |
| 39 | 53011 | 1 | rsved | | U16 | N/A | 1 | Period1: Reserved: 0xFF |
| 40 | 53012 | 1 | Start Time | | U16 | N/A | 1 | Period1: |
| 41 | 53013 | 1 | Stop Time | | U16 | N/A | 1 | High 8bits(Hour):[0,23] Low 8bits(Mins):[0,59] |
| 42 | 53014 | 1 | Charge/Discharge | RW | U16 | N/A | 1 | Period2 Same Period1 |
| 43 | 53015 | 1 | Battery Charge By | | U16 | N/A | 1 | |
| 44 | 53016 | 1 | rsved | | U16 | N/A | 1 | |
| 45 | 53017 | 1 | Power Limit | | U16 | N/A | 1000 | |
| 46 | 53018 | 1 | rsved | | U16 | N/A | 1 | |
| 47 | 53019 | 1 | Start Time | | U16 | N/A | 1 | |
| 48 | 53020 | 1 | Stop Time | U16 | N/A | 1 | | |
| 49 | 53021 | 1 | Charge/Discharge | RW | U16 | N/A | 1 | Period3 Same as Period1 |
| 50 | 53022 | 1 | Battery Charge By | | U16 | N/A | 1 | |
| 51 | 53023 | 1 | rsved | | U16 | N/A | 1 | |
| 52 | 53024 | 1 | Power Limit | | U16 | N/A | 1000 | |
| 53 | 53025 | 1 | rsved | | U16 | N/A | 1 | |
| 54 | 53026 | 1 | Start Time | | U16 | N/A | 1 | |
| 55 | 53027 | 1 | Stop Time | U16 | N/A | 1 | | |
| 56 | 53028 | 1 | Charge/Discharge | RW | U16 | N/A | 1 | Period4 Same as Period1 |
| 57 | 53029 | 1 | Battery Charge By | | U16 | N/A | 1 | |
| 58 | 53030 | 1 | rsved | | U16 | N/A | 1 | |
| 59 | 53031 | 1 | Power Limit | | U16 | N/A | 1000 | |
| 60 | 53032 | 1 | rsved | | U16 | N/A | 1 | |
| 61 | 53033 | 1 | Start Time | | U16 | N/A | 1 | |
| 62 | 53034 | 1 | Stop Time | U16 | N/A | 1 | | |
| 63 | 53035 | 1 | Charge/Discharge | RW | U16 | N/A | 1 | Period5 Same as Period1 |
| 64 | 53036 | 1 | Battery Charge By | | U16 | N/A | 1 | |
| 65 | 53037 | 1 | rsved | | U16 | N/A | 1 | |
| 66 | 53038 | 1 | Power Limit | | U16 | N/A | 1000 | |
| 67 | 53039 | 1 | rsved | | U16 | N/A | 1 | |
| 68 | 53040 | 1 | Start Time | | U16 | N/A | 1 | |

| | | | | | | | | |
|----|-------|---|---------------------------|----|-----|-----|------|--|
| 69 | 53041 | 1 | Stop Time | | U16 | N/A | 1 | |
| 70 | 53042 | 1 | Charge/Discharge | RW | U16 | N/A | 1 | Period6 Same as Period1 |
| 71 | 53043 | 1 | Battery Charge By | | U16 | N/A | 1 | |
| 72 | 53044 | 1 | rsved | | U16 | N/A | 1 | |
| 73 | 53045 | 1 | Power Limit | | U16 | N/A | 1000 | |
| 74 | 53046 | 1 | rsved | | U16 | N/A | 1 | |
| 75 | 53047 | 1 | Start Time | | U16 | N/A | 1 | |
| 76 | 53048 | 1 | Stop Time | | U16 | N/A | 1 | |
| | ... | | | | | | | |
| 77 | 53500 | 8 | BMSVersion | WO | STR | N/A | 1 | Only for EMS |
| 78 | 53508 | 1 | BMS Status | | U16 | N/A | 1 | Please refer to Table 3.8, only for EMS |
| 79 | 53509 | 2 | BMS ErrorCode | | U32 | N/A | 1 | Please refer to Table 3.9, only for EMS |
| 80 | 53511 | 2 | BMS ProtectionCode | | U32 | N/A | 1 | |
| 81 | 53513 | 2 | BMS WarnCode | | U32 | N/A | 1 | |
| 82 | 53515 | 1 | BMSChargeVoltLi mit | | U16 | V | 10 | Only for EMS |
| 83 | 53516 | 1 | BMSChargeCurrM ax | | U16 | A | 10 | |
| 84 | 53517 | 1 | BMSDischargeVoltL imit | | U16 | V | 10 | Only for EMS |
| 85 | 53518 | 1 | BMSDischargeCurr Max | | U16 | A | 10 | |
| 86 | 53519 | 1 | BMSBatSOC | | U16 | % | 100 | |
| 87 | 53520 | 1 | BMSBatSOH | | U16 | % | 100 | |
| 88 | 53521 | 1 | BMSBatVoltage | | U16 | V | 10 | |
| 89 | 53522 | 1 | BMSBatCurrent | | I16 | A | 10 | |
| 90 | 53523 | 1 | BMSBatTemp | | I16 | °C | 10 | |

Table 3.5 Hybrid Inverter WO Registers Map

| NO. | Registers | Bytes | Function | R/W | Type | Unit | Accuracy | Note |
|-----|-----------|-------|---|-----|------|------|----------|------------------|
| 1 | 50200 | 1 | Off-grid function Switch | WO | U16 | N/A | 1 | 0:OFF; 1:ON |
| 2 | 50201 | 1 | Clear Off-grid Over-loading Protection Flag | WO | U16 | N/A | 1 | Write 1 to clear |

Table 3.6

| NO. | Hybrid Inverter Working Mode | | Description | Note |
|-----|------------------------------|-----------------|------------------|---------------------------------|
| | 50000 high 8bits | 50000 low 8bits | | |
| 1 | 01 | 01 | General Mode | |
| 2 | | 02 | Economic Mode | |
| 3 | | 03 | UPS Mode | |
| 4 | 02 | N/A | Off Grid Mode | |
| 5 | 03 | 01 | EMS_ACtrlMode | Valid Registers: 50202-50206 |
| 6 | | 02 | EMS_GeneralMode | |
| 7 | | 03 | EMS_BattCtrlMode | Valid Registers: 50207-50211 |
| 8 | | 04 | EMS_OffGridMode | |

Table 3.7 Battery Configuration (52500)

| Battery Brand(52500) | | Protocol Configuration (52501) | Note |
|----------------------|-------|--------------------------------|--------------|
| 2 | EMS | N/A | Only for EMS |
| 10 | Li-HV | | |
| 14— | Rsvd | | |

Table 3.8

| Registers(53508) | Bits | Function | Description |
|--------------------------------|-----------|--|---|
| High 8 bits BMS Control Status | Bit15 | Rsvd | |
| | Bit14 | | |
| | Bit13 | | |
| | Bit12 | | |
| | Bit11 | ForceCharge | 1: ForceCharge Command (ChargeCommand Bit10 must write 1) 0: Invalid(Null) |
| | Bit10 | ChargeCommand | 1:Enable 0:Disable |
| | Bit9 | Off-grid DischargeCommand | 1:Enable 0:Disable |
| | Bit8 | On-grid DischargeCommand | 1:Enable 0:Disable |
| Low 8bits BMS Running Status | Bit0~Bit7 | 0:Sleep 1:Charge 2:Discharge 3:Standby 4:Fault | |

Table 3.9

| Registers | Bits | Hex | Dec | Fault Description | Note |
|--------------------------------------|------------|------------|-------------------------------|---|------|
| 53509 (BMS Error Code) | BIT0 | 0x00000001 | 1 | Internal COM Fault | |
| | BIT1 | 0x00000002 | 2 | Voltage Sensor Fault | |
| | BIT2 | 0x00000004 | 4 | Temperature Sensor Fault | |
| | BIT3 | 0x00000008 | 8 | Relay Fault | |
| | BIT4 | 0x00000010 | 16 | Cells Damage Fault | |
| 53511 (BMS Protection Code) | BIT0 | 0x00000001 | 1 | Cells Low Voltage Protection | |
| | BIT1 | 0x00000002 | 2 | Cells High Voltage Protection | |
| | BIT2 | 0x00000004 | 4 | Battery Module Discharge Low Voltage Protection | |
| | BIT3 | 0x00000008 | 8 | Battery Module Charge Over Voltage Protection | |
| | BIT4 | 0x00000010 | 16 | Charge Low Temperature Protection | |
| | BIT5 | 0x00000020 | 32 | Charge High Temperature Protection | |
| | BIT6 | 0x00000040 | 64 | Discharge Low Temperature Protection | |
| | BIT7 | 0x00000080 | 128 | Discharge High Temperature Protection | |
| | BIT8 | 0x00000100 | 256 | Battery Module Charge Over-current Protection | |
| | BIT9 | 0x00000200 | 512 | Battery Module Discharge Over-current Protection | |
| | BIT10 | 0x00000400 | 1024 | Battery Module Low Voltage Protection | |
| | BIT11 | 0x00000800 | 2048 | Battery Module Over Voltage Protection | |
| | BIT12 | 0x00001000 | 4096 | Power Terminal Over Temperature Protection | |
| | BIT13 | 0x00002000 | 8192 | Ambient Low Temperature Protection | |
| | BIT14 | 0x00004000 | 16384 | Ambient High Temperature Protection | |
| BIT15 | 0x00008000 | 32768 | Leakage Current Protection | | |
| 53513 (BMS Alarm Code) | BIT0 | 0x00000001 | 1 | Cells Low Voltage Warning | |
| | BIT1 | 0x00000002 | 2 | Cells High Voltage Warning | |
| | BIT2 | 0x00000004 | 4 | Battery Module Discharge | |

| | | | | | |
|--|-------|------------|-------|---|--|
| | | | | Low Voltage Warning | |
| | BIT3 | 0x00000008 | 8 | Battery Module Charge Over Voltage Warning | |
| | BIT4 | 0x00000010 | 16 | Charge Low Temperature Warning | |
| | BIT5 | 0x00000020 | 32 | Charge Over Temperature Warning | |
| | BIT6 | 0x00000040 | 64 | Discharge Low Temperature Warning | |
| | BIT7 | 0x00000080 | 128 | Discharge Over Temperature Warning | |
| | BIT8 | 0x00000100 | 256 | Battery Module Charge Over-current Warning | |
| | BIT9 | 0x00000200 | 512 | Battery Module Discharge Over Current Warning | |
| | BIT10 | 0x00000400 | 1024 | Battery Module Low Voltage Warning | |
| | BIT11 | 0x00000800 | 2048 | Battery Module Over Voltage Warning | |
| | BIT12 | 0x00001000 | 4096 | Power Terminal Over Temperature Warning | |
| | BIT13 | 0x00002000 | 8192 | Ambient Low Temperature Warning | |
| | BIT14 | 0x00004000 | 16384 | Ambient Over Temperature Warning | |

Annex-1 (EMS Applications)

Application #1: AC Power Control

| EMS_ACCtrlMode | | | | | | |
|-------------------------------------|---|----------------------------|-------------------------------|-------------------------------|-------------------------------|---|
| AC Power Setting | Registers | | | | | Note |
| | Power Mode Seeting(50202) | Total Power Setting(50203) | Phase A Power Setting (50204) | Power B Power Setting (50204) | Phase C Power Setting (50204) | |
| AC Total Power Setting | 1 | Set Power | -- | -- | -- | Note: Set Power is to set the total input/output power of inverter $P_{inv}^{(1)} = \text{Set Power Set}; \text{PowerA} = \text{PowerB} = \text{PowerC} = \text{Set Power} / 3$ |
| AC Three Phases Independent Setting | 2 | -- | Set PowerA | Set PowerB | Set PowerC | |
| | Note: Set PowerA, Set PowerB, Set PowerC is to set PhaseA/B/C power independently, which shall follow the rule as below $P_{inv} = \text{Set PowerA} + \text{Set PowerB} + \text{Set PowerC}$ | | | | | |

Application #2: General Mode

| EMS_GeneralMode | | | | | | |
|-----------------|---|----|----|----|----|------|
| Control Mode | Registers | | | | | Note |
| | -- | -- | -- | -- | -- | |
| General Mode | Note: For maximum PV Self-consumption, shall follow the rule as below: $P_{load}^{(2)} = P_{pv}^{(3)} + P_{bat}^{(4)} - P_{meter}^{(5)}$ | | | | | |

Application #3: Battery Charge/Discharge Control

| EMS_BattCtrlMode | | | | | |
|---------------------------------------|---|-----------------------------|--------------------------------|-------------------------------|--|
| Battery charge/discharge control mode | Registers | | | | Note: |
| | Battery Power Setting(50207) | AC Top Limit Setting(50208) | AC Bottom Limit Setting(50209) | Supply Power Priority (50210) | |
| Battery Charge | Set Pbat | Set PupLimit | Set PloverLimit | 0: PV Supply Priority | 1. Pbat<0, battery charging; 2. Pbat>0, battery discharging; 3. Pinv<0, purchasing power from grid; 4. Pinv>0, power injection to grid; 5. Set PupLimit is setting the top limit of Pin, Set PloverLimit is setting the bottom limit of Pinv, please make sure Set PupLimit >= Set PloverLimit 6. According to inverter power balance formula: Pinv = Pbat + Ppv, when Pbat confirmed, as well as the Pinv limits set(Set PupLimit and Set PloverLimit) and Ppv priority, EMS can confirm the inverter running logic with much flexibility. |
| | E.g. Setting Map: Set Pbat = -1000W; Set PupLimit = 10000W; Set PloverLimit = -500W; PV Supply with Priority; Target: Battery Charge: 1000W, Maximum Grid Injection: 10000W, Maximum Grid Purchasing: 500W 1. E.g. Ppv = 0W, battery charge power is 500W(Pbat = -500W), Inverter Grid Purchasing 500W(Pinv = -500W); 2. E.g. Ppv = 200W, battery charge power is 700W(Pbat = -700W), Inverter Grid Purchasing is 500W(Pinv = -500W); 3. E.g. Ppv = 2000W, battery charge power is 1000W(Pbat = -1000W), Inverter Grid Injection Power is 1000W (Pinv = 1000W) | | | | |
| Battery Discharge | Set Pbat | Set PupLimit | Set PloverLimit | 0: PV Supply with Priority | |
| | E.g. Setting Map: Set Pbat = 1000W; Set PupLimit = 2000W; Set PloverLimit = -10000W; PV Supply with Priority Target: Battery Discharge: 1000W, Max. Grid Injection Power: 2000W, Max. Grid Purchasing Power: 10000W; 1. E.g. Ppv = 0W, Battery Discharge Power: 1000W(Pbat = 1000W), Inverter Grid Injection Power: 1000W(Pinv = 1000W) 2. E.g. Ppv = 500W, Battery Discharge Power: 1000W(Pbat = 1000W), Inverter Grid Injection Power: 1500W(Pinv = 1500W) 3. E.g. Ppv = 1500W, Battery Discharge Power: 500W(Pbat = 500W), Inverter Grid Injection Power 2000W(Pinv = 2000W); | | | | |
| Battery Force Charge | Set Pbat | Set PupLimit | Set PloverLimit | 0: PV Supply with Priority | |
| | E.g. Setting Map: Set Pbat = -1000W; Set PupLimit = 10000W; Set PloverLimit = -500W; PV Supply with Priority Target: Battery Charge Power:1000W, Max. Grid Injection Power: 10000W, release inverter grid purchasing power limit and Set PloverLimit = -Pn; | | | | |

| | | | | |
|-------------------------|--|--------------|-----------------|---------------------------------|
| | <ol style="list-style-type: none"> 1. E.g. Ppv = 0W, battery charge power is 1000W(Pbat =-1000W), Inverter Grid Purchasing Power: 1000W(Pinv =-1000W); 2. E.g. Ppv = 200W, battery charge power is 1000W(Pbat = -1000W), Inverter Grid Purchasing Power: 800W(Pinv =-800W); 3. E.g. Ppv = 2000W, battery charge power is 1000W(Pbat = -1000W), Inverter Grid Injection Power:1000W(Pinv =-1000W) | | | |
| Battery Force Discharge | Set Pbat | Set PupLimit | Set PlowerLimit | 1: Battery Supply with Priority |
| | <p>E.g. Setting Map: Set Pbat = 1000; Set PupLimit = 2000; Set PlowerLimit =-10000; Battery Supply with Priority; Target: Battery Discharge Power:1000W, Max. Inverter Grid Injection Power: 2000W, Max. Grid Purchasing Power: 10000W;</p> <ol style="list-style-type: none"> 1. E.g. Ppv=0W, Battery Discharge Power: 1000W(Pbat=1000W), Inverter Grid Injection Power:1000W(Pinv = 1000W); 2. E.g. Ppv=500W, Battery Discharge Power:1000W(Pbat=1000W), Inverter Grid Injection Power:1500W(Pinv =1500W); 3. E.g. Ppv =1500W(Limit Ppv<=1000W, battery supply with priority), Battery Discharge Power: 1000W(Pbat = 1000W), Inverter Grid Injection Power: 2000W(Pinv = 2000W); | | | |

Application #4: Off-grid Mode

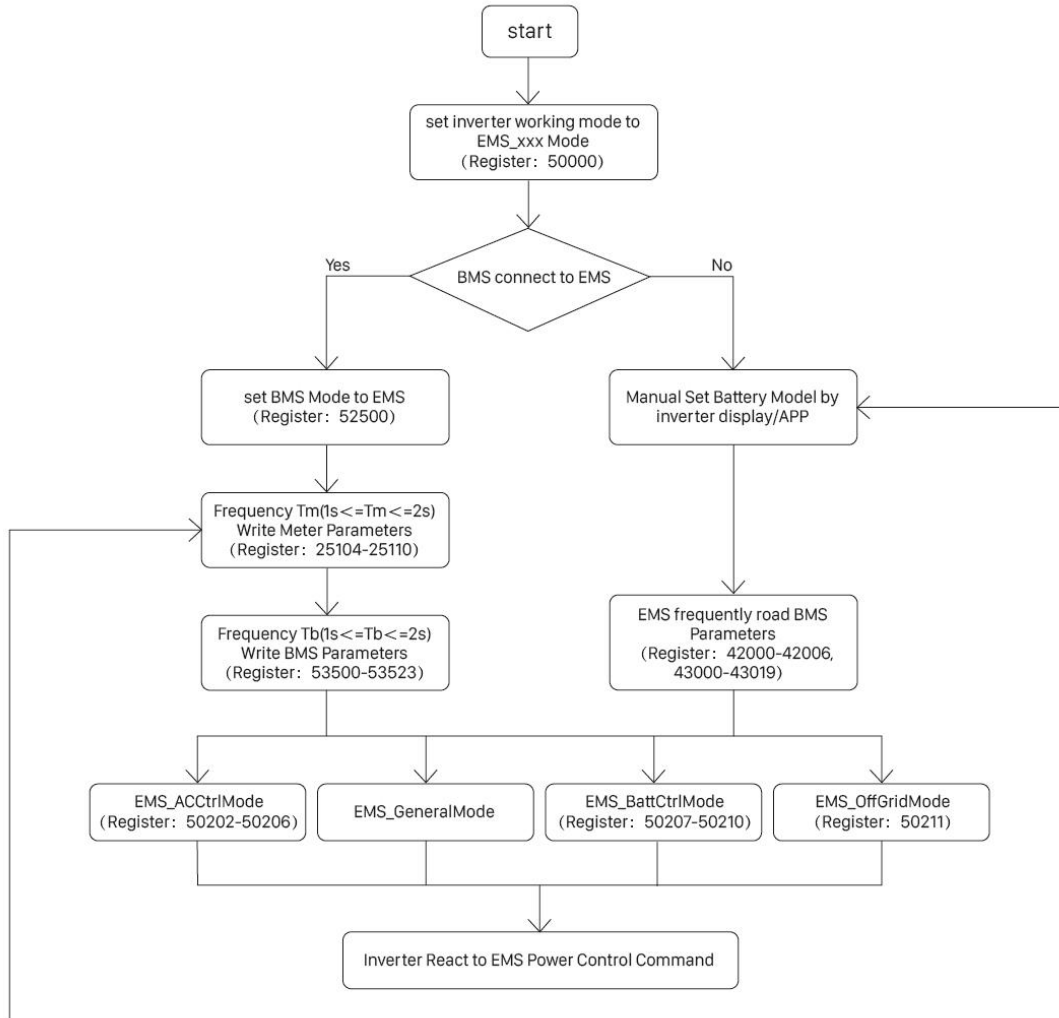
| EMS_OffGridMode | | | | | | |
|-----------------|--|----|----|----|----|------|
| Control Mode | Registers | | | | | Note |
| | PV Power Setting(50211) | -- | -- | -- | -- | |
| Set Ppv | | | | | | |
| Off-grid Mode | Ppv = Set Ppv Note: Pbackup ⁽⁶⁾ = Pbat + Ppv | | | | | |

Note:

1. Hybrid Inverter AC Power
2. Total Loading Power(grid loading+backup loading)
3. PV Output Power
4. Battery Charge/Discharge Power
5. Grid Injection/Purchasing Power
6. Hybrid inverter backup loading Power

Annex-2 (EMS Control Procedure)

Procedure: EMS Control Procedure



Note: When BMS Connect to EMS, if EMS failed to write meter values (registers: 25104~25110)and BMS parameter(53500~53523) within certain period, inverter will fall into protection mode.