

# **INNOVA Modbus**

**Modbus Protocol**

**For All DC Inverter PAC**

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# Preface

PAC Modbus. This protocol specifies the communication format and data format for the Modbus communication of All DC Inverter PAC.

PAC This protocol is applicable to All DC Inverter PAC.

BMS : Please pay attention to the following 3 points before developing the BMS software:

1. MODBUS ; Controllers for the IDUs of this series have been integrated with MODBUS interface, so there is no need to connect communication modules. In this context, communication module indicates the module that is integrated by the controllers. Please be noted.
2. BMS 5.1.2 PAC BMS Make sure you have read the precautions before developing the BMS interface of each unit, e.g. section 5.1.2 –Precautions before the Development of the BMS Interface for All DC Inverter PACI.
3. BMS Please contact INNOVA to confirm the compatibility of the BMS system.

Notice:

This product is subject to change without prior notice.

## I. Terms and Definitions

### 1.1 Modbus Modbus communication

Modbus Modbus Modbus is a protocol used for industrial communication and a distributed control system. Modbus network is a master-slave network, which allows the communication between one master unit and one or multiple slave units to realize data interchange. The Modbus communication is realized in a request-response way, that is, each request sent by the master unit is corresponding to a response replied by the slave unit.

### 1.2 ASCII ASCII Mode

Modbus 2 ASCII Under this mode, as for the communication via the Modbus, eight bits in one piece of information can be transmitted as two ASCII characters.

### 1.3 RTU RTU Mode

ASCII Under this mode, eight bits can be divided into two 4-bit hexadecimal characters. The advantage of the RTU mode is that, with the same baud rate the transmitted character density is higher than that in the ASCII mode. Each piece of information should be transmitted continuously.

### 1.4 Master Unit

It indicates the device which sends out the request to

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Modbus, like a PC.

#### 1.5 Slave Unit

Modbus It indicates the device which needs Modbus communication interface and is capable of responding to the request sent by the master unit, like a communication module, which is taken as an example in this protocol.

#### 1.6 Coil

##### 1 Bit Modbus 1 Bit

Bool、 It is expressed by one bit, like the switch bit, failure bit, etc. The coil is a universal expression of the Modbus protocol and actually it is a one-bit data value, namely Boolean, switching value.

#### 1.7 Register

2 (16 Bit)。 Modbus Word (16 Bit) 、 It is expressed by two bytes (16 bits), like temperature, mode, etc. The register is a universal expression of the Modbus protocol and actually it is a word (16 bits), or an analog value.

#### 1.8 Device Address

Modbus : 1~255, 0 It indicates the address of the Modbus communication module, through which the master unit can identify each communication module in the network. Address range: 1~255. Address 0 is the address of broadcast (it can be received by all communication modules).

#### 1.9 Broadcast

When the master unit sends out a control frame, then all slave units in the network can receive it and then all performs this control action (but no reply is given). The device address for the broadcast frame is 0.

#### 1.10 Function Code

: It is used to identify the function of the communication frame. See the following table for the function codes covered in this protocol.

1 Table 1 Function Code

| Description                            | Fucntion Code |
|----------------------------------------|---------------|
| (Bit) Read coils<br>(read bit)         | 0x01          |
| (Word) Read registers<br>(read word)   | 0x03          |
| (Bit) Write coils<br>(write bit)       | 0x0f          |
| (Word) Write registers<br>(write word) | 0x10          |

#### 1.11 Starting Address

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( : Bit : Word) 8, 8 It indicates the starting address of the register (coil: bit address; register: word address). The data translation starts from the high-order eight bits to the low-order eight bits.

#### 1.12 Data Size

(Bit : Word) 8, 8 It indicates the counting number of to-be-operated data starting from the starting address (coil: bit count; register: word count). The data translation starts from the high-order eighth bits to the low-order eight bits.

#### 1.13 Byte Count

, It indicates the count number of effective bytes during the data transmission.

#### 1.14 Effective Data

It indicates the control data, status data, etc.

#### 1.15 Alarm Code

It indicates the error type which is detected by the communication module when the master unit is sending the request frame.

#### 1.16 CRC

2, 8, 8, A It indicates the cyclic redundancy code consisting of two bytes. The data translation starts from the low-order eight bits to the high-order eight bits. See Annex A for more details about its calculation.

#### 1.17 Request Frame

It is the request sent by the master unit to the communication module.

#### 1.18 Response Frame

It is the response replied by the communication module to the request frame sent by the master unit.

#### 1.19 Communication Frame

It is the collection of continuously transmitted bytes during the communication.

#### 1.20 BMS

Building management system

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# BMS

## II. Brief Introduction of the BMS System

PAC MODBUS, 255 The Modbus monitoring system of All DC Inverter PAC is capable of controlling up to 255 sets of units at the same time.

Modbus RS485 255

The interface RS485 of Modbus communication protocol, provided by the long-distance monitoring system, can be directly connected with the BMS or INNOVA monitoring system, that is, can control up to 255 units and display their running status at the same time. The control function of the BMS/PC is equal to that of the unit itself. In other words, BMS/PC and units can both control the functions of units at the same time. However, the command sent later takes the priority.

## III. Network Topology

### 3.1. General

MODBUS As shown in Fig.1, the whole network consists of two parts: units' network and Modbus network. The IDUs are with MODBUS interface and have to be selected by setting address mode through the wired controller so that the communication data of the two networks can be interchanged. See the corresponding section in unit's service manual for the detailed setting method.

There are at most 255 communication modules in one monitoring system, that is, only 255 indoor units can be connected.

When there are more than 255 units, a new network can be established through another port which is also capable of connecting 255 communication modules.

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# MODBUS IV. Modbus Protocol Format

## 4.1. General

Modbus has actually become an industrial communication standard because it is not only fully opened and used widely but also simple and can be debugged flexibly. Besides, as for the communication of multiple units, Modbus can be developed fast and also can be conveniently connected with devices which support this protocol. There are two communication modes: RTU and ASCII. The former one is adopted for the BMS interface.

## 4.2. Protocol Interface

The protocol interface is the Modbus RTU protocol.

## 4.3. Hardware Interface

1) Communication Interface: RS485

2) Communication

Mode: baud rate: 9600 bit/s (In some special case, other baud rate can be selected but the communication mechanism should be in accord with this protocol.)

Start Bit : 1

Data Bit : 8

Check Bit : None

Stop Bit : 1

## 4.4. Modbus RTU Universal Communication

### Frame Format of Modbus under RTU Mode

| Start Time Interval | Addr. Code | Function Code | Data Area | CRC     | Stop Time Interval |
|---------------------|------------|---------------|-----------|---------|--------------------|
| T1-T2-T3-T4         | 1 Byte     | 1 Byte        | n Bytes   | 2 Bytes | T1-T2-T3-T4        |

Under the RTU mode, there is at least 3.5ms dead time before the data transmission, which can be figured through the adopted baud rate (like T1-T2-T3-T4 in the table above) and there is another 3.5ms dead time after the transmission of the last character. After that, another set of data can be transmitted.

The whole set of data should be transmitted continuously. If there is a pause more than 1.5ms during the transmission, the receiver will jump to the transmission of the next set of data.

If the dead time is less than 3.5ms, the transmission would fail as the CRC for the information combination is ineffective.

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## 4.5. MODBUS MODBUS Standard Protocol Format

### 4.5.1. Coil (Bit)

Table 2: Coil Data

| Addr.  | Byte<br>Corresponding Byte | Values |
|--------|----------------------------|--------|
| Bit 0  | Byte0.0                    | 1      |
| Bit 1  | Byte0.1                    | 0      |
| Bit 2  | Byte0.2                    | 1      |
| Bit 3  | Byte0.3                    | 0      |
| Bit 4  | Byte0.4                    | 1      |
| Bit 5  | Byte0.5                    | 0      |
| Bit 6  | Byte0.6                    | 1      |
| Bit 7  | Byte0.7                    | 0      |
| Bit 8  | Byte1.0                    | 1      |
| Bit 9  | Byte1.1                    | 0      |
| Bit 10 | Byte1.2                    | 1      |
| Bit 11 | Byte1.3                    | 0      |
| Bit 12 | Byte1.4                    | 1      |
| Bit 13 | Byte1.5                    | 0      |
| Bit 14 | Byte1.6                    | 1      |
| Bit 15 | Byte1.7                    | 0      |
| .....  | .....                      | .....  |

1. -Coillndicates the data of some flag bit or failure bit, etc.
2. The unit of data is bit and each bit has a corresponding address.
3. The data bit exists in the byte of the communication frame and each byte is composed of eight bits. The high-order byte is corresponding to the high-order bit whereas the low-order byte is corresponding to the low-order bit. See table 2 for more details.
4. The master unit can operate one bit among the communication data or multiple bits at the same time.

master unit can read or transmit is less than Byte×8. The ineffective data bit of the last byte should be cleared when the effective data of the communication frame is transmitted or read. For instance, when nine bits (the value of each is 1) are read or transmitted, then two bytes are needed. The first one is —1111 1111 and the second one is —0000 0001. For the last byte, the ineffective bits —0 should be cleared.

#### 4.5.2. (Word, 16 Bit) Register (Word, 16 bit)

Table 3: Registers Data

| 地址 Addr. | Corresponding Byte | Values |
|----------|--------------------|--------|
| Word 0   | Byte 0             | AA 55  |
|          | Byte 1             |        |
| Word 1   | Byte 2             | AA 55  |
|          | Byte 3             |        |
| Word 2   | Byte 4             | 55 AA  |
|          | Byte 5             |        |
| .....    | .....              | .....  |
|          | .....              |        |

- unit of the register is —word which has a corresponding address starting from 0.
- When the master unit reads a word, it needs to read two bytes from the high-order eight bits to the low-order eight bits.
- When the master unit transmits or reads the request frame, it can transmit or read one or multiple continuous words in the data list.

#### 4.5.3. Read Coils (Read bit)

Note: It can read the coil data but not support the broadcast.

: 0x01

Function Code: 0x01

Table 4: Request Frame

| Device Addr. | Function Code | Starting Addr. | Data Size | CRC     |
|--------------|---------------|----------------|-----------|---------|
| 1 Byte       | 1 Byte        | 2 Bytes        | 2 Bytes   | 2 Bytes |

Table 5: Corresponding Frame

| Device Addr. | Function Code | Byte Count | Effective Data | CRC     |
|--------------|---------------|------------|----------------|---------|
| 1 Byte       | 1 Byte        | 1 Byte     | n Bytes        | 2 Bytes |

Starting Address: It is the starting place where to read a series of bits.

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Data Size: it indicates the count number of bits.

For example: Read ten bits from

the coil 5 of the device 10 (see table 2 for the coil data), as follows:

Request frame: 0A (device address) 01 (function code) 00 05 (starting address) 00 0A (data size) AD 77 (CRC)

Response Frame: 0A (device address) 01 (function code) 02 (byte count) AA 02 (effective data) E3 5C (CRC)

The last byte is —0000 0010||, among which the ineffective bits —0|| should be cleared.

#### 4.5.4. ) Write Coils (Write bit)

Note: The master unit writes coil data into the communication module and also supports the broadcast.

Function Code: 0x0F

Table 6: Request Frame

| Device Addr. | Function Code | Starting Addr. | Data Size | Byte Count | Effective Data | CRC     |
|--------------|---------------|----------------|-----------|------------|----------------|---------|
| 1 Byte       | 1 Byte        | 2 Bytes        | 2 Bytes   | 1 Byte     | n Bytes        | 2 Bytes |

Table 7: Response Frame

| Device Addr. | Function Code | Starting Addr. | Data Size | CRC     |
|--------------|---------------|----------------|-----------|---------|
| 1 Byte       | 1 Byte        | 2 Bytes        | 2 Bytes   | 2 Bytes |

Note: The response frame has the same device address, function code, starting address and data size as the request frame.

Forexample: Set eleven consecutive bits to —1|| from the device 10 and starting at the address 6, as follows:

Request Frame: 0A (device address) 0F (function code) 00 06 (starting address) 00 0B (data size) 02 (byte count) FF 07 (effective data) 97 A0 (CRC)

Response Frame: 0A (device address) 0F (function code) 00 06 (starting address) 00 0B (data size) F5 76 (CRC)

The last byte is —0000 0111||, among which the ineffective bits —0|| should be cleared.

#### 4.5.5. Read Registers (Read word)

Note: Read the register data but do not support the broadcast.

Function Code: 0x03

Table 8: Request Frame

| Device Addr. | Function Code | Starting Addr. | Data Size | CRC     |
|--------------|---------------|----------------|-----------|---------|
| 1 Byte       | 1 Byte        | 2 Bytes        | 2 Bytes   | 2 Bytes |

Table 9: Response Frame

| Device Addr. | Function Code | Byte Count | Effective Data | CRC     |
|--------------|---------------|------------|----------------|---------|
| 1 Byte       | 1 Byte        | 1 Byte     | n Bytes        | 2 Bytes |

Starting address: It indicates the starting address to read the data block. Data size: It indicates the count number of words with the maximum of 127 each time.

For example: Read two continuous

words (see table 3 for the registers data) from the device 10 and starting at the address 1, as follow:

Request Frame: 0A (device address) 03 (function code) 00 01 (starting address) 00 02 (data size) 94 B0 (CRC)  
) Response Frame: 0A (device address) 03 (function code) 04 (byte count) AA 55 55 AA (effective data) CE 14 (CRC)

#### 4.5.6. Write Registers (Write word)

Write control data from the master unit into the register and support broadcast.

Function Code: 0x10

Table 10: Request Frame

| Device Addr. | Function Code | Starting Addr. | Data Size | Byte Count | Effective Data | CRC     |
|--------------|---------------|----------------|-----------|------------|----------------|---------|
| 1 Byte       | 1 Byte        | 2 Bytes        | 2 Bytes   | 1 Byte     | n Bytes        | 2 Bytes |

Table 11: Response Frame

| Device Addr.                                                                                                              | Function Code | Starting Addr. | Data Size | CRC     |
|---------------------------------------------------------------------------------------------------------------------------|---------------|----------------|-----------|---------|
| 1 Byte                                                                                                                    | 1 Byte        | 2 Bytes        | 2 Bytes   | 2 Bytes |
| Note: The response frame has the same device address, function code, starting address and data size as the request frame. |               |                |           |         |

for example: write three words (0x12,

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0x23, 0x34) from the device 10 and starting at the address 2, as follow:

Request Frame: 0A (device address) 10 (function code) 00 02 (starting address) 00 03 (data size) 06 (byte count)  
00 12 00 23 00 34 (effective data) 15 DF (CRC)

Response Frame: 0A (device address) 10 (function code) 00 02 (starting address) 00 03 (data size) 20 B3 (CRC)

### 4.5.7. Alarm Response

Note: The master unit sends out a request frame in order to receive a normal response, but when the communication module detects a failure, an alarm response will be sent back.

Function code: Set the highest-order bit to 1, which is the value figured through the operation of the request frame's function code and 0x80 (The function code of normal response will be back as it is).

Communication format of the alarm response frame:

Table12: Alarm Response Frame

| Device Addr. | Function Code | Alarm Code | CRC     |
|--------------|---------------|------------|---------|
| 1 Byte       | 1 Byte        | 1 Bytes    | 2 Bytes |

Description of the alarm codes:

Table 13: Alarm Codes

| Alarm Code | Name                 | Description                                                                                    |
|------------|----------------------|------------------------------------------------------------------------------------------------|
| 0x03       | Illegal data         | The transmitted data is incorrect or beyond the data range.                                    |
| 0x04       | Salve device failure | There is communication failure between the communication module and the air conditioning unit. |

For example: The master unit is to read 128 words from the device 10 and starting at the address 0. If it is out of the readable range of Modbus, alarm frame will be sent back as follows:

Request frame: 0A (device address) 03 (function code) 00 00 (starting address) 00 80 (data size) 45 11 (CRC)

Response frame: 0A (device address) 83 (device address) 03 (alarm code) 70 F3 (CRC)

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## V. Communication Protocol for All DC Inverter PAC

### 5.1. PAC General

All DC Inverter PAC has integrated BMS interface into the indoor units. As Modbus protocol interface is provided, there is no need to connect communication modules. However, it's necessary to do some settings through wired controllers. Please refer to the relevant service manual for the setting methods. The long-distance monitoring system for All DC Inverter PAC can be used to monitor INNOVA's All DC Inverter PAC or be incorporated into user's BMS system. By monitoring the PC or BMS system, user can realize a centralized management and control on up to 255 sets of All DC Inverter PAC. It is a highly efficient tool for the management of an intelligent air conditioning system in modern buildings. Through this interface, it can not only realize the long-distance monitoring to units, including units' running temperature, compressor status and error status, but also can enable units' settings remotely, like temperature setting, mode setting, on/off setting, mode shield setting, on/off shield setting, etc.

In the protocol, —Rl indicates —read onlyl  
and —W/Rl indicates —write and readl.

### 5.2. BMS Precautions before the Development of the BMS Interface for All DC

#### Inverter PAC

★(1) : Cooling Only Unit: Heating instruction is invalid. It is recommended that the monitoring software can tell this operation is invalid.

★(2) : When the format of the alarm response frame received by the BMS system is 0x04, it indicates that there is communication failure between units and the communication module.

★(3) : Energy Saving Solution:  
Cooling mode: When the setting for energy saving under cooling is active, the temperature set by long-distance monitoring must be higher than the temperature lower limit for energy saving, otherwise units will not response to the command. It is suggested that the BMS software can tell

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the setting fails.

Heating mode: When the setting for energy saving under heating is active, the temperature set by long-distance monitoring must be lower than the temperature upper limit for energy saving, otherwise units will not response to the command. It is suggested that the BMS software can tell the setting fails.

★(4) : When the BMS system needs to cancel or set one of the two flag bits of energy saving, When the BMS system needs to cancel or set one of the two flag bits of energy saving, the two flag bits need to be cancelled or set simultaneously.

★(5) : When unit is in fan mode or auto mode, sleep setting will be invalid.

★(6) : When unit is in auto mode, the setting of long-distance temperature shield will be invalid.

★(7) : Under power-off status, when X-fan function is energized, fan motor will run for 2min.

★(8) : BMS All data sent by the BMS system to the communication module should be verified if it is effective.

★(9) : 。 After the communication module is powered on again and before receiving any effective data, the alarm code 04 will be reported.

### **5.3. PAC Definition of Effective Data**

The data for the Modbus communication protocol can be divided into two types: switching value and register. The register indicates the values of temperature, valves and other continuous or multi-mode values. Switching value indicates the value which has only two status, like the temperature sensor error (with only two status: abnormal or normal).

# 1. (Word 0~Word X)

## Data and Address Distribution of the Analog Values: (Word 0~Word X)

| Addr   | Acess Type (R-read only, W/R-write/read) | Data Meaning | Range                                                                                                          | Accuracy | Unit | Data Type (actual value) | Pay special attention before development (to the data marked with ★) | Remarks        |
|--------|------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------|----------|------|--------------------------|----------------------------------------------------------------------|----------------|
| Word 0 | R                                        | Reserved     | /                                                                                                              | /        | /    | /                        |                                                                      |                |
| Word 1 | R                                        | Reserved     | /                                                                                                              | /        | /    | /                        |                                                                      |                |
| Word 2 | W/R                                      | Unit On/Off  | 0xAA : Unit on ; 0x55 : Unit off                                                                               | /        | /    | Unsigned, integer type   |                                                                      |                |
| Word 3 | R                                        | Reserved     | /                                                                                                              | /        | /    | /                        |                                                                      | Broadcast data |
| Word 4 | R                                        | Ambient temp | ×10<br>Transmission value=actual value,<br>actual value:<br>transmission value=temp value×10                   | 0.1      | °C   | Signed, interger type    |                                                                      |                |
| Word 5 | R                                        | IDU Addr.    | Transmission value=actual value,<br>actual value: If connected with central controller, address range is 1-16; | 1        | /    | Unsigned, integer type   |                                                                      |                |

|            |     |                  |                                                                                                                                      |   |   |                           |       |
|------------|-----|------------------|--------------------------------------------------------------------------------------------------------------------------------------|---|---|---------------------------|-------|
|            |     |                  | if connected with PC<br>address mode,<br>address range is 1-255                                                                      |   |   |                           |       |
| Word<br>6  | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>7  | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>8  | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>9  | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>10 | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>11 | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>12 | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>13 | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>14 | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>15 | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>16 | R   | Reserved         | /                                                                                                                                    | / | / | /                         |       |
| Word<br>17 | W/R | Set mode         | Transmission<br>value=actual value,<br>actual value: 001:<br>cooling; 010: heating;<br>011: drying; 100: fan<br>only; 101: auto mode | / | / | Unsigned,<br>integer type | ★ (1) |
| Word<br>18 | R   | Reserved         | /                                                                                                                                    | / | / |                           |       |
| Word<br>19 | W/R | Set fan<br>speed | Transmission<br>value=actual value,                                                                                                  | / | / | Unsigned,<br>integer type |       |

|            |     |                       |                                                                                                                                                                                                                                                                                      |   |    |                           |  |
|------------|-----|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|---------------------------|--|
|            |     |                       | actual value: 0: auto<br>1: speed 1; 2: speed<br>2; 3: speed 3; 4:<br>speed 4; 5: speed 5;<br>6: turbo                                                                                                                                                                               |   |    |                           |  |
| Word<br>20 | W/R | Set temp              | Transmission<br>value=actual value,<br>actual value:16-30,<br>under low-temp<br>drying, it is 12°C,<br>under absence mode, it<br>is 8°C.                                                                                                                                             | 1 | °C | Unsigned,<br>integer type |  |
| Word<br>21 | R   | Reserved              | /                                                                                                                                                                                                                                                                                    | / | /  |                           |  |
| Word<br>22 | W/R | Up &<br>down<br>swing | Transmission<br>value=actual value,<br>actual value:<br>0000---off,<br>0001---15 air swing,<br>0010--- 1 position,<br>0011--- 2 position,<br>0100--- 3 position,<br>0101---4 position,<br>0110---5 position,<br>0111---35 air swing,<br>1000---25 air swing,<br>1001---24 air swing, | / | /  | Unsigned,<br>integer type |  |

|            |     |                              |                                                                                                                                                                                                                                                                                                                                  |   |   |                           |       |
|------------|-----|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---------------------------|-------|
|            |     |                              | 1010---14 air swing,<br>1011---13 air swing                                                                                                                                                                                                                                                                                      |   |   |                           |       |
| Word<br>23 | W/R | Left &<br>right<br>swing     | Transmission<br>value=actual value,<br>actual value:<br>0000---off (default<br>value after power on),<br>0001---air swing at<br>same direction<br>0010---1 position,<br>0011---2 position,<br>0100---3 position,<br>0101---4 position,<br>0110---5 position,<br>1100---15 position,<br>1101---air swing at<br>opposite direction | / | / | Unsigned,<br>integer type |       |
| Word<br>24 | W/R | Fresh air<br>valve<br>status | Transmission<br>value=actual value,<br>actual value: 0~10, 0:<br>indicates fresh air<br>valve, 10 modes of<br>fresh air                                                                                                                                                                                                          | / | / | Unsigned,<br>integer type |       |
| Word<br>25 | W/R | Sleep<br>mode                | Transmission                                                                                                                                                                                                                                                                                                                     | / | / | Unsigned,<br>integer type | ★ (5) |

|            |     |                                                                    |                                                                                                                  |   |    |                           |      |
|------------|-----|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|---|----|---------------------------|------|
|            |     |                                                                    | value=actual value,<br>actual value:0: no<br>sleep mode; 1: sleep<br>mode 1; 2: sleep mode<br>2; 3: sleep mode 3 |   |    |                           |      |
| Word<br>26 | W/R | Reserved                                                           | /                                                                                                                | / | /  | /                         |      |
| Word<br>27 | W/R | Reserved                                                           | /                                                                                                                | / | /  | /                         |      |
| Word<br>28 | W/R | Reserved                                                           | /                                                                                                                | / | /  | /                         |      |
| Word<br>29 | W/R | Reserved                                                           | /                                                                                                                | / | /  | /                         |      |
| Word<br>30 | W/R | Reserved                                                           | /                                                                                                                | / | /  | /                         |      |
| Word<br>31 | W/R | Reserved                                                           | /                                                                                                                | / | /  | /                         |      |
| Word<br>32 | W/R | Reserved                                                           | /                                                                                                                | / | /  | /                         |      |
| Word<br>33 | W/R | Reserved                                                           | /                                                                                                                | / | /  | /                         |      |
| Word<br>34 | W/R | Clean<br>function                                                  | Transmission<br>value=actual value,<br>actual value: 00: no<br>clean function; 10-39:<br>contamination grade     | / | /  | Unsigned,<br>integer type |      |
| Word<br>35 | W/R | Temp<br>lower<br>limit for<br>energy<br>saving<br>under<br>cooling | Transmission<br>value=actual value,<br>actual value: 16~30                                                       | 1 | °C | Unsigned,<br>integer type | ★(3) |
| Word<br>36 | W/R | Temp<br>upper<br>limit for<br>energy                               | Transmission<br>value=actual value,<br>actual value: 16~30                                                       | 1 | °C | Unsigned,<br>integer type | ★(3) |

|            |   |                                           |                                                                                                                                                                                                                                                                                                                                 |   |   |                           |  |
|------------|---|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---------------------------|--|
|            |   | saving<br>under<br>heating                |                                                                                                                                                                                                                                                                                                                                 |   |   |                           |  |
| Word<br>37 | R | Reserved                                  | /                                                                                                                                                                                                                                                                                                                               | / | / | /                         |  |
| Word<br>38 | R | Reserved                                  | /                                                                                                                                                                                                                                                                                                                               | / | / | /                         |  |
| Word<br>39 | R | Selection<br>of ambient<br>temp<br>sensor | Transmission<br>value=actual value,<br>actual value:<br>01: air return temp<br>sensor for indoor<br>ambient temp<br>10: wired controller<br>temp sensor for indoor<br>ambient temp<br>11: air return temp<br>sensor for cooling,<br>drying and fan mode,<br>select wired controller<br>temp sensor for<br>heating and auto mode | / | / | Unsigned,<br>integer type |  |
| Word<br>40 | R | Reserved                                  | /                                                                                                                                                                                                                                                                                                                               | / | / | /                         |  |
| Word<br>41 | R | Reserved                                  | /                                                                                                                                                                                                                                                                                                                               | / | / | /                         |  |
| Word<br>42 | R | Reserved                                  | /                                                                                                                                                                                                                                                                                                                               | / | / | /                         |  |
| Word<br>43 | R | Reserved                                  | /                                                                                                                                                                                                                                                                                                                               | / | / | /                         |  |
| Word<br>44 | R | Reserved                                  | /                                                                                                                                                                                                                                                                                                                               | / | / | /                         |  |
| Word<br>45 | R | Reserved                                  | /                                                                                                                                                                                                                                                                                                                               | / | / | /                         |  |

|         |   |                      |                                                          |   |    |                       |  |  |
|---------|---|----------------------|----------------------------------------------------------|---|----|-----------------------|--|--|
| Word 46 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 47 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 48 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 49 | R | Outdoor ambient temp | Transmission value=actual value, actual value: -100--155 | 1 | °C | Signed, interger type |  |  |
| Word 50 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 51 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 52 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 53 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 54 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 55 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 56 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 57 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 58 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 59 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 60 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 61 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 62 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 63 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 64 | R | Reserved             | /                                                        | / | /  | /                     |  |  |
| Word 65 | R | Reserved             | /                                                        | / | /  | /                     |  |  |

ODU  
response  
data

|         |   |                                        |                                                                         |     |    |                        |                         |
|---------|---|----------------------------------------|-------------------------------------------------------------------------|-----|----|------------------------|-------------------------|
| Word 66 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 67 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 68 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 69 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 70 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 71 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 72 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 73 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 74 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 75 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 76 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 77 | R | DRED function                          | 0: no DRED function;<br>1:DRED1 mode;<br>2:DRED2 mode;<br>3:DRED3 mode. | /   | /  | Unsigned, integer type |                         |
| Word 78 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 79 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 80 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 81 | R | Reserved                               | /                                                                       | /   | /  | /                      |                         |
| Word 82 | R | Ambient temp at the port of air return | Transmission value=actual value, actual value:                          | 0.1 | °C | Signed, interger type  | IDU identification data |

|         |   |                             |                                                                             |     |    |                       |  |
|---------|---|-----------------------------|-----------------------------------------------------------------------------|-----|----|-----------------------|--|
|         |   |                             | transmission=(temp value)×10                                                |     |    |                       |  |
| Word 83 | R | Ambient temp of light board | Transmission value=actual value, actual value: transmission=(temp value)×10 | 0.1 | °C | Signed, interger type |  |
| Word 84 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |
| Word 85 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |
| Word 86 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |
| Word 87 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |
| Word 88 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |
| Word 89 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |
| Word 90 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |
| Word 91 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |
| Word 92 | R | Reserved                    | /                                                                           | /   | /  | /                     |  |

## 2. Bit 0～Bit 1495)

### Data and Address Distribution of Switching Values: (Bit 0～Bit 1495)

| Addr. | Access Type<br>(R-read only,<br>W/R-write/read) | Addr.<br>Bit | Data Meaning | Range | Parameter<br>Type | Pay<br>special<br>attention<br>before<br>development<br>(to the data<br>marked<br>with ★) | Remarks |
|-------|-------------------------------------------------|--------------|--------------|-------|-------------------|-------------------------------------------------------------------------------------------|---------|
| Byte0 | R                                               | Bit0         | 预 留 Reserved | /     | /                 |                                                                                           |         |
|       | R                                               | Bit1         | 预 留 Reserved | /     | /                 |                                                                                           |         |
|       | R                                               | Bit2         | 预 留 Reserved | /     | /                 |                                                                                           |         |

|       |     |       |                                                          |                                                                                                                                   |                  |       |                |
|-------|-----|-------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------|-------|----------------|
|       | R   | Bit3  | 预 留 Reserved                                             | /                                                                                                                                 | /                |       |                |
|       | R   | Bit4  | 预 留 Reserved                                             | /                                                                                                                                 | /                |       |                |
|       | R   | Bit5  | 预 留 Reserved                                             | /                                                                                                                                 | /                |       |                |
|       | R   | Bit6  | 预 留 Reserved                                             | /                                                                                                                                 | /                |       |                |
|       | R   | Bit7  | 预 留 Reserved                                             | /                                                                                                                                 | /                |       |                |
| Byte1 | R   | Bit8  | Whether or not ODU has flag bit?                         | 0: no, 1: yes                                                                                                                     | Status parameter |       | Broadcast data |
|       | R   | Bit9  | Whether or not the master wired controller has flag bit? | 0: no, 1: yes                                                                                                                     | Status parameter |       |                |
|       | R   | Bit10 | Reserved                                                 | 0: no, 1: yes                                                                                                                     | Status parameter |       |                |
|       | R   | Bit11 | Reserved                                                 | 0: no, 1: yes                                                                                                                     | Status parameter |       |                |
|       | R   | Bit12 | Reserved                                                 | 0: no, 1: yes                                                                                                                     | Status parameter |       |                |
|       | R   | Bit13 | Whether or not the slave wired controller has flag bit?  | 0: no, 1: yes                                                                                                                     | Status parameter |       |                |
|       | R   | Bit14 | Reserved                                                 | /                                                                                                                                 | /                |       |                |
|       | R   | Bit15 | Reserved                                                 | /                                                                                                                                 | /                |       |                |
|       | R   | Bit16 | Reserved                                                 |                                                                                                                                   |                  |       |                |
| Byte2 | W/R | Bit17 | Remote lock                                              | 1 (current status is locked by long-distance monitoring or the household charging system),<br>0 (no above lock or it is unlocked) | Status parameter |       |                |
|       | W/R | Bit18 |                                                          |                                                                                                                                   |                  | ★ (6) |                |
|       |     |       |                                                          |                                                                                                                                   |                  |       |                |

|       |     |       |                                         |                                                    |                  |       |
|-------|-----|-------|-----------------------------------------|----------------------------------------------------|------------------|-------|
|       |     |       | Remote temp shield                      | 1: with shield, 0: without shield                  | Status parameter |       |
|       | W/R | Bit19 | Remote mode shield                      | 1: with shield, 0: without shield                  | Status parameter |       |
|       | W/R | Bit20 | Remote On/Off shield                    | 1: with shield, 0: without shield                  | Status parameter |       |
|       | W/R | Bit21 | Remote energy saving shield             | 1: with shield, 0: without shield                  | Status parameter |       |
|       | R   | Bit22 | Reserved                                | /                                                  | /                |       |
|       | R   | Bit23 | Reserved                                | /                                                  | /                |       |
| Byte3 | W/R | Bit24 | Absence mode                            | 0: off; 1: on                                      | Status parameter |       |
|       | W/R | Bit25 | Healthy function                        | 0: off; 1: on                                      | Status parameter |       |
|       | W/R | Bit26 | Comfortable and energy saving: I-Demand | 0: off; 1: on                                      | Status parameter |       |
|       | W/R | Bit27 | Turbo                                   | 0: off; 1: on                                      | Status parameter |       |
|       | W/R | Bit28 | E-heating permission mark               | 0: permit e-heating on; 1: not permit e-heating on | Status parameter |       |
|       | W/R | Bit29 | X-fan                                   | 0: off; 1: on                                      | Status parameter | ★ (7) |
|       | W/R | Bit30 | Silent                                  | 0: off; 1: on                                      | Status parameter |       |
|       | W/R | Bit31 | Low temp drying mode                    | 0: off; 1: on                                      | Status parameter |       |
| Byte4 | W/R | Bit32 | Energy saving under                     | 0: off; 1: on                                      | Status parameter | ★(4)  |

|       |     |       |                                                     |                                 |                  |      |
|-------|-----|-------|-----------------------------------------------------|---------------------------------|------------------|------|
|       |     |       | cooling is active                                   |                                 |                  |      |
|       | W/R | Bit33 | Energy saving under heating is active               | 0: off; 1: on                   | Status parameter | ★(4) |
|       | W/R | Bit34 | Buttons lock (childlock) status                     | 1: on; 0: off                   | Status parameter |      |
|       | W/R | Bit35 | On/Off memorizing status                            | 0: memorize, 1: not memorize    | Status parameter |      |
|       | W/R | Bit36 | °C/°F flag bit                                      | 1: °F; 0: °C                    | Status parameter |      |
|       | R   | Bit37 | Reserved                                            | /                               | /                |      |
|       | R   | Bit38 | Reserved                                            | /                               | /                |      |
|       | R   | Bit39 | Reserved                                            | /                               | /                |      |
| Byte5 | R   | Bit40 | Timer status                                        | 1: with timer; 0: without timer | Status parameter |      |
|       | R   | Bit41 | Reserved                                            | /                               | /                |      |
|       | R   | Bit42 | Reserved                                            | /                               | /                |      |
|       | R   | Bit43 | Reserved                                            | /                               | /                |      |
|       | R   | Bit44 | Reserved                                            | /                               | /                |      |
|       | R   | Bit45 | Reserved                                            | /                               | /                |      |
|       | R   | Bit46 | Gate control system is provided or not?             | 1: yes; 0: no                   | Status parameter |      |
|       | R   | Bit47 | Human body sensing check module is provided or not? | 1: yes; 0: no                   | Status parameter |      |

|       |   |       |                                                             |                                                                                                                                             |                   |  |
|-------|---|-------|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--|
| Byte6 | R | Bit48 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit49 | Timer On flag                                               | 1: active; 0: not active                                                                                                                    | Status parameter  |  |
|       | R | Bit50 | Timer Off flag                                              | 1: active; 0: not active                                                                                                                    | Status parameter  |  |
|       | R | Bit51 | Indoor ambient temperature in current mode                  | 0: indoor ambient temperature is the air return ambient temperature<br>1: indoor ambient temperature is the temperature at wired controller | Status parameter  |  |
|       | R | Bit52 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit53 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit54 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit55 | Low standby power consumption control function (1W standby) | 1: mode 2; 0: mode 1                                                                                                                        | Status parameter  |  |
| Byte7 | R | Bit56 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit57 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit58 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit59 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit60 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit61 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit62 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit63 | Reserved                                                    | /                                                                                                                                           | /                 |  |
| Byte8 | R | Bit64 | Reserved                                                    | /                                                                                                                                           | /                 |  |
|       | R | Bit65 | Wired controller temp sensor error                          | 1: yes; 0: no                                                                                                                               | Failure parameter |  |
|       | R | Bit66 | Reserved                                                    | /                                                                                                                                           | /                 |  |

|        |     |       |                                    |                                                                                      |                   |  |
|--------|-----|-------|------------------------------------|--------------------------------------------------------------------------------------|-------------------|--|
|        | R   | Bit67 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit68 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit69 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit70 | Wired controller memory chip error | 1: yes; 0: no                                                                        | Failure parameter |  |
|        | R   | Bit71 | Reserved                           | /                                                                                    | /                 |  |
|        |     |       |                                    |                                                                                      |                   |  |
| Byte9  | W/R | Bit72 | Cancel timer                       | 0: do not cancel, 1: cancel                                                          | Status parameter  |  |
|        | R   | Bit73 | Reserved                           | /                                                                                    | /                 |  |
|        | W/R | Bit74 | Up & down swing mode               | 0: mode 1-simple air swing; 1: mode 2-fixed angle air swing and small area air swing | Status parameter  |  |
|        | R   | Bit75 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit76 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit77 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit78 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit79 | Reserved                           | /                                                                                    | /                 |  |
|        |     |       |                                    |                                                                                      |                   |  |
| Byte10 | R   | Bit80 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit81 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit82 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit83 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit84 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit85 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit86 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit87 | Reserved                           | /                                                                                    | /                 |  |
| Byte11 | R   | Bit88 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit89 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit90 | Reserved                           | /                                                                                    | /                 |  |
|        | R   | Bit91 | Electric heating                   | 1: yes 0: no                                                                         | Status parameter  |  |
|        | R   | Bit92 | Water pump                         | 1: on; 0: off                                                                        | Status parameter  |  |
|        | R   | Bit93 | Fresh air valve switch             | 1: turn on; 0: turn off                                                              | Status parameter  |  |

IDU board  
identification

|        |   |        |                                       |                         |                   |  |
|--------|---|--------|---------------------------------------|-------------------------|-------------------|--|
|        | R | Bit94  | vCold plasma generator                | 1: turn on; 0: turn off | Status parameter  |  |
|        | R | Bit95  | Error output status                   | 1: yes 0: no            | Status parameter  |  |
| Byte12 | R | Bit96  | Reserved                              | /                       | /                 |  |
|        | R | Bit97  | Indoor evaporator temp sensor error   | 1: yes 0: no            | Failure parameter |  |
|        | R | Bit98  | Indoor air return temp sensor error   | 1: yes 0: no            | Failure parameter |  |
|        | R | Bit99  | Light board ambient temp sensor error | 1: yes 0: no            | Failure parameter |  |
|        | R | Bit100 | Reserved                              | 1: yes 0: no            | Failure parameter |  |
|        | R | Bit101 | Water overflow protection             | 1: yes 0: no            | Failure parameter |  |
|        | R | Bit102 | Flag bit of IDU memory ship error     | 1: yes 0: no            | Failure parameter |  |
|        | R | Bit103 | Reserved                              | /                       | /                 |  |
| Byte13 | R | Bit104 | Jumper cap error                      | 1 error, 0 normal       | Failure parameter |  |
|        | R | Bit105 | Indoor fan error                      | 1: yes 0: no            | Failure parameter |  |
|        | R | Bit106 | Reserved                              | /                       | /                 |  |
|        | R | Bit107 | Reserved                              | /                       | /                 |  |

|        |   |        |                                                    |                                                 |                   |  |
|--------|---|--------|----------------------------------------------------|-------------------------------------------------|-------------------|--|
|        | R | Bit108 | Unit needs cleaning                                | 1: yes 0: no                                    | Status parameter  |  |
|        | R | Bit109 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit110 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit111 | Reserved                                           | /                                               | /                 |  |
| Byte14 | R | Bit112 | Card in/out status                                 | 0: card out, 1: card in                         | Status parameter  |  |
|        | R | Bit113 | Is there people in the room?                       | 0: no, 1: yes                                   | Status parameter  |  |
|        | R | Bit114 | Static pressure type                               | 0: low static pressure; 1: high static pressure | Status parameters |  |
|        | R | Bit115 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit116 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit117 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit118 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit119 | Reserved                                           | /                                               | /                 |  |
| Byte15 | R | Bit120 | Communication failure with master wired controller | 1: yes 0: no                                    | Failure parameter |  |
|        | R | Bit121 | Communication failure with slave wired controller  | 1: yes 0: no                                    | Failure parameter |  |
|        | R | Bit122 | Communication failure with ODU                     | 1: yes 0: no                                    | Failure parameter |  |
|        | R | Bit123 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit124 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit125 |                                                    | /                                               | /                 |  |
|        | R | Bit126 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit127 | Reserved                                           | /                                               | /                 |  |
| Byte16 | R | Bit128 | Reserved                                           | /                                               | /                 |  |
|        | R | Bit129 | Reserved                                           | /                                               | /                 |  |

|        |   |        |                                             |              |                   |  |
|--------|---|--------|---------------------------------------------|--------------|-------------------|--|
|        | R | Bit130 | Reserved                                    | /            | /                 |  |
|        | R | Bit131 | Reserved                                    | /            | /                 |  |
|        | R | Bit132 | Reserved                                    | /            | /                 |  |
|        | R | Bit133 | Reserved                                    | /            | /                 |  |
|        | R | Bit134 | Reserved                                    | /            | /                 |  |
|        | R | Bit135 | Reserved                                    | /            | /                 |  |
| Byte17 | R | Bit136 | Reserved                                    | /            | /                 |  |
|        | R | Bit137 | Reserved                                    | /            | /                 |  |
|        | R | Bit138 | Reserved                                    | /            | /                 |  |
|        | R | Bit139 | Reserved                                    | /            | /                 |  |
|        | R | Bit140 | Reserved                                    | /            | /                 |  |
|        | R | Bit141 | Reserved                                    | /            | /                 |  |
|        | R | Bit142 | Reserved                                    | /            | /                 |  |
|        | R | Bit143 | Reserved                                    | /            | /                 |  |
| Byte18 | R | Bit144 | Reserved                                    | /            | /                 |  |
|        | R | Bit145 | Reserved                                    | /            | /                 |  |
|        | R | Bit146 | Reserved                                    | /            | /                 |  |
|        | R | Bit147 | Outdoor fan status                          | 1: on 0: off | Status parameter  |  |
|        | R | Bit148 | Reserved                                    | /            | /                 |  |
|        | R | Bit149 | Reserved                                    | /            | /                 |  |
|        | R | Bit150 | 4-way valve status                          | 1: on 0: off | Status parameter  |  |
|        | R | Bit151 | Compressor status                           | 1: on 0: off | Status parameter  |  |
| Byte19 | R | Bit152 | Compressor discharge temperature protection | 1: yes 0: no | Failure parameter |  |
|        | R | Bit153 | Fluorine shortage protection                | 1: yes 0: on | Failure parameter |  |
|        | R | Bit154 | DC fan motor protection                     | 1: yes 0: on | Failure parameter |  |
|        | R | Bit155 |                                             | 1: yes 0: on | Failure           |  |

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response  
information

|        |   |        |                                                                 |              |                                        |  |
|--------|---|--------|-----------------------------------------------------------------|--------------|----------------------------------------|--|
|        |   |        | 4-way valve reverse error protection                            |              | parameter                              |  |
|        | R | Bit156 | Over power protection                                           | 1: yes 0: on | Failure parameter                      |  |
|        | R | Bit157 | Over load protection                                            | 1: yes 0: on | Failure parameter                      |  |
|        | R | Bit158 | Low pressure protection                                         | 1: yes 0: on | Failure parameter                      |  |
|        | R | Bit159 | High pressure protection                                        | 1: yes 0: on | Failure parameter<br>Failure parameter |  |
| Byte20 | R | Bit160 | Evaporator anti-freezing protection                             | 1: yes 0: on | Failure parameter                      |  |
|        | R | Bit161 | Outdoor ambient temp sensor error                               | 1: yes 0: on | Failure parameter                      |  |
|        | R | Bit162 | Discharge temp sensor error                                     | 1: yes 0: on | Failure parameter                      |  |
|        | R | Bit163 | Condenser temp sensor error                                     | 1: yes 0: on | Failure parameter                      |  |
|        | R | Bit164 | Error of copper pipe temp sensor for the outdoor heat exchanger | 1: yes 0: on | Failure parameter                      |  |

|        |   |        |                                    |                               |                   |      |
|--------|---|--------|------------------------------------|-------------------------------|-------------------|------|
|        | R | Bit165 | Jumper cap error                   | 1: yes 0: on                  | Failure parameter |      |
|        | R | Bit166 | ODU memory chip error              | 1: yes 0: on                  | Failure parameter |      |
|        | R | Bit167 | Reserved                           | /                             | /                 |      |
| Byte21 | R | Bit168 | Reserved                           | /                             | /                 |      |
|        | R | Bit169 | Reserved                           | /                             | /                 |      |
|        | R | Bit170 | Reserved                           | /                             | /                 |      |
|        | R | Bit171 | Reserved                           | /                             | /                 |      |
|        | R | Bit172 | Reserved                           | /                             | /                 |      |
|        | R | Bit173 | Reserved                           | /                             | /                 |      |
|        | R | Bit174 | Drive communication failure        | 1: yes 0: on                  | /                 |      |
|        | R | Bit175 | Reserved                           | /                             | /                 |      |
| Byte22 | R | Bit176 | SAVE status                        | 1: yes 0: on                  | Status parameter  |      |
|        | R | Bit177 | Cooling only heat pump flag bit    | 0: cool and heat 1: cool only | Status parameter  | ★(1) |
|        | R | Bit178 | Reserved                           | /                             | /                 |      |
|        | R | Bit179 | System defrosting                  | 1: yes 0: on                  | Status parameter  |      |
|        | R | Bit180 | Reserved                           | /                             | /                 |      |
|        | R | Bit181 | Reserved                           | /                             | /                 |      |
|        | R | Bit182 | Low power consumption status       | 1: ready 0: not               | Status parameter  |      |
|        | R | Bit183 | AC input phase sequence protection | 1: 是 0: 否<br>1: yes 0: no     | Failure parameter |      |

|        |   |        |                                                                                           |                     |                   |  |
|--------|---|--------|-------------------------------------------------------------------------------------------|---------------------|-------------------|--|
|        |   |        | (phase loss or reverse)                                                                   |                     |                   |  |
| Byte23 | R | Bit184 | Inverter compressor drive DC busbar voltage overflow protection or voltage drop off error | 1 failure, 0 normal | Failure parameter |  |
|        | R | Bit185 | Inverter compressor drive DC busbar voltage overhigh protection                           | 1 failure, 0 normal | Failure parameter |  |
|        | R | Bit186 | Inverter compressor drive alternate current protection (input side)                       | 1 failure, 0 normal | Failure parameter |  |
|        | R | Bit187 | Inverter compressor drive IPM protection                                                  | 1 failure, 0 normal | Failure parameter |  |
|        | R | Bit188 | Inverter compressor drive PFC protection                                                  | 1 failure, 0 normal | Failure parameter |  |

|        |   |        |                                                                     |                     |                      |  |
|--------|---|--------|---------------------------------------------------------------------|---------------------|----------------------|--|
|        | R | Bit189 | Inverter<br>compressor<br>startup failure                           | 1 failure, 0 normal | Failure<br>parameter |  |
|        | R | Bit190 | Inverter<br>compressor<br>phase loss<br>protection                  | 1 failure, 0 normal | Failure<br>parameter |  |
|        | R | Bit191 | Inverter<br>compressor<br>drive module<br>reset                     | 1 failure, 0 normal | Failure<br>parameter |  |
| Byte24 | R | Bit192 | Inverter<br>compressor<br>over-current<br>protection                | 1 failure, 0 normal | Failure<br>parameter |  |
|        | R | Bit193 | Inverter<br>compressor<br>power<br>protection                       | 1 failure, 0 normal | Failure<br>parameter |  |
|        | R | Bit194 | Inverter<br>compressor<br>drive current<br>check circuit<br>failure | 1 failure, 0 normal | Failure<br>parameter |  |
|        | R | Bit195 | Inverter<br>compressor<br>out-of-step<br>protection                 | 1 failure, 0 normal | Failure<br>parameter |  |
|        | R | Bit196 |                                                                     |                     |                      |  |

|        |   |        |                                                              |                     |                   |  |
|--------|---|--------|--------------------------------------------------------------|---------------------|-------------------|--|
|        |   |        | Compressor stalling                                          | 1 failure, 0 normal | Failure parameter |  |
|        | R | Bit197 | Reserved                                                     | /                   | /                 |  |
|        | R | Bit198 | Inverter compressor drive module high temperature protection | 1 failure, 0 normal | Failure parameter |  |
|        | R | Bit199 | Inverter compressor drive module temperature sensor failure  | 1 failure, 0 normal | Failure parameter |  |
| Byte25 | R | Bit200 | Reserved                                                     | /                   | /                 |  |
|        | R | Bit201 | Inverter compressor low intensity field                      |                     | Status parameter  |  |
|        | R | Bit202 | Inverter compressor drive frequency limit                    |                     | Status parameter  |  |
|        | R | Bit203 | Inverter compressor drive frequency demultiply               |                     | Status parameter  |  |
|        | R | Bit204 | Inverter compressor drive AC input low voltage               |                     | Status parameter  |  |

|        |   |        |                                                                |                           |                   |       |
|--------|---|--------|----------------------------------------------------------------|---------------------------|-------------------|-------|
|        |   |        | frequency limit                                                |                           |                   |       |
|        | R | Bit205 | Inverter compressor drive under charge                         | 1 under charge, 0 charged | Status parameter  |       |
|        | R | Bit206 | Reserved                                                       | /                         | /                 |       |
|        | R | Bit207 | Power type of inverter compressor drive AC input               |                           | Status parameter  |       |
| Byte26 | R | Bit208 | Inverter compressor drive storage chip failure                 | 1 failure, 0 normal       | Failure parameter | ★ (1) |
|        | R | Bit209 | Reserved                                                       | /                         | /                 |       |
|        | R | Bit210 | Inverter compressor drive charged circuit failure              | 1 failure, 0 normal       | Failure parameter |       |
|        | R | Bit211 | Inverter compressor drive AC input voltage abnormal protection | 1 failure, 0 normal       | Failure parameter |       |
|        | R | Bit212 | sensor failure of inverter compressor                          | 1 failure, 0 normal       | Failure parameter |       |

|        |   |        |                                                                                                                 |                     |                   |  |
|--------|---|--------|-----------------------------------------------------------------------------------------------------------------|---------------------|-------------------|--|
|        |   |        | drive electric box                                                                                              |                     |                   |  |
|        | R | Bit213 | Inverter compressor drive AC input zero cross protection                                                        | 1 failure, 0 normal | Failure parameter |  |
|        | R | Bit214 | Temperature drift protection                                                                                    | 1 failure, 0 normal | Failure parameter |  |
|        | R | Bit215 | Sensor connection protection (electric current sensor is not connected to the corresponding U phase or V phase) | 1 failure, 0 normal | Failure parameter |  |
| Byte27 | R | Bit216 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit217 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit218 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit219 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit220 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit221 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit222 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit223 |                                                                                                                 | /                   | /                 |  |
| Byte28 | R | Bit224 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit225 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit226 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit227 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit228 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit229 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit230 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit231 |                                                                                                                 | /                   | /                 |  |
| Byte29 | R | Bit232 |                                                                                                                 | /                   | /                 |  |
|        | R | Bit233 |                                                                                                                 | /                   | /                 |  |

|        |   |        |  |   |   |  |
|--------|---|--------|--|---|---|--|
|        | R | Bit234 |  | / | / |  |
|        | R | Bit235 |  | / | / |  |
|        | R | Bit236 |  | / | / |  |
|        | R | Bit237 |  | / | / |  |
|        | R | Bit238 |  | / | / |  |
|        | R | Bit239 |  | / | / |  |
| Byte30 | R | Bit240 |  | / | / |  |
|        | R | Bit241 |  | / | / |  |
|        | R | Bit242 |  | / | / |  |
|        | R | Bit243 |  | / | / |  |
|        | R | Bit244 |  | / | / |  |
|        | R | Bit245 |  | / | / |  |
|        | R | Bit246 |  | / | / |  |
|        | R | Bit247 |  | / | / |  |

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## VI. Common Failures of BMS System

| Failures                                                                                                                                                      | Possible Causes                                                         | Corrective Actions                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-----------------------------------------|
| Based on the provided protocol BMS shows there is communication error and it fails to display any operation status for all or some units and fails to control | Some communication cord is not twisted pair                             | Replace the cord with the twisted pair. |
|                                                                                                                                                               | The crystal head of the communication cord is not pressed down properly | Press down the crystal head properly    |

|                                                                                                                                                    |                                                                                                                                                 |                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| all or some units                                                                                                                                  | The communication cord between indoor and outdoor units is disconnected                                                                         | Solder the disconnected communication cord                                                                         |
|                                                                                                                                                    | The communication cord is broken                                                                                                                | Solder the broken communication cord                                                                               |
|                                                                                                                                                    | It is not the two cords in the middle of the crystal head that are wired                                                                        | Wired the two cords in the middle of the crystal head                                                              |
|                                                                                                                                                    | The communication cord is short-circuit                                                                                                         | Repair the short-circuit communication cord                                                                        |
|                                                                                                                                                    | The twisted pairs are too close with the power cord (less than 15cm), resulting in too much interference which causes the communication failure | Separate the twisted pairs and the power cord. If impossible, it is recommended to shield them with the steel pipe |
|                                                                                                                                                    | Some communication interfaces are connected improperly                                                                                          | Reconnect the communication interface                                                                              |
| The wiring is in good condition, but there is no information displayed for all or some units and the software shows there is communication failure | After the replacement of the chip of the outdoor unit or resetting of the DIP switch, the unit is not re-energized                              | Re-energize the unit                                                                                               |
|                                                                                                                                                    | The serial port of the communication software fails to match with that of the PC                                                                | Replace the serial port or modify the setting of the serial port of the software                                   |
|                                                                                                                                                    | The unit address of the software does not match with the actual unit address                                                                    | Modify the set unit address of the software                                                                        |
|                                                                                                                                                    | The unit is not energized                                                                                                                       | Energize the unit                                                                                                  |
|                                                                                                                                                    | No chip is plugged in the indoor or outdoor unit, or it is plugged reversely                                                                    | Replug the chip and power on the unit again                                                                        |
|                                                                                                                                                    | The unit address is wrong or repeated                                                                                                           | Modify the improperly set unit address                                                                             |
| The wiring and other devices are in good condition, but there is no information displayed for some device                                          | A repeater may be is needed or the repeater is connected improperly                                                                             | Install the repeater correctly                                                                                     |
| No information is displayed and there is a alarm indicating the communication failure. Besides the TX lamp on the converter lights all the time    | The communication A and B are connected reversely or incorrectly                                                                                | Check the wiring and follow the principle of line A-to-line A and line B-to-line B                                 |
| Although the communication cord, devices and the installation are in good condition, there is still communication failure on the software          | Incompatible display or controller is used                                                                                                      | Check the model of the wireless remote controller and the wired controller, If not, make a replacement             |

## A Annex A

(Normative Annex)

CRC Calculation Method

### A.1 CRC Calculation Method

Calculation Method of CRC: The CRC is first preloading a 16-bit register to all 1's. Then successively transact each 8-bit bytes of the message. During calculating the CRC, each 8-bit character is exclusive ORed with the register contents. Then the result is shifted in the direction of the least significant bit (LSB), with a zero filled into the most significant bit (MSB) position. The LSB is extracted and examined. If the LSB is a 1, the register is then exclusive ORed with a preset, fixed value. If the LSB was a 0, no exclusive OR takes place. This process is repeated until eight shifts have been

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performed. After the last (eighth) shift, the next 8-bit character is exclusive ORed with the register's current value, and the process repeats for eight shifts as described above. The final contents of the register, after all the characters of the message have been applied, is the CRC value. During transmission and reception of data in CRC, low order byte is in the front.

## A.2 CRC

- 1) Preload a 16-bit register with FFFF hex (all 1's). Call this the CRC register.
- 2) Exclusive OR the first 8-bit byte of the message with the low-order byte of the 16-bit CRC register, putting the result in the CRC registers.
- 3) Shift the CRC register one bit to the right (toward the LSB), zero-filling the MSB. Extract and examine the LSB.
- 4) (If the LSB was 0): Repeat Step 3 (another shift). (If the LSB was 1): Exclusive OR the CRC register with the polynomial value A001 (1010 0000 0000 0001).
- 5) Repeat Steps 3 and 4 until 8 shifts have been performed. When this is done, a complete 8-bit byte will have been processed.
- 6) Repeat Steps 2 and 5 to process the next 8-bit data.
- 7) The final obtained CRC register is CRC.

---

## A.3 CRC CRC Example (Only for Reference)

**Parameters :** Data (Starting address of the block data), Data Size (Byte count of the block data)

**Return:** CRC Calculating Result

```
uint16 CRC_Calculate(uint8 *data, uint16 dataSize)
{
    uint8 i;
    uint8 temp;
    uint16 j;
    uint16 CRCCode;
    CRCCode=0xffff;
    for(j=0;j<dataSize;j++){
        CRCCode = CRCCode^data[j];
        for( i = 0; i < 8; i++ ){
            temp = CRCCode & 0x0001;
            CRCCode = (CRCCode >> 1);
            if(temp ==1){
                CRCCode = (CRCCode^0xA001);// 0xA001 0xA001 is a preset multinomial, a constant value
            }
        }
    }
    return CRCCode;
}
```