**MACON EVI DC Inverter Water to Water Heat Pump Communication Protocol**

**V1.3**

1. Communication Rules   
   Communication method: Half-duplex asynchronous serial communication  
   Baud rate: 2400BPS  
   Data bit: 8BIT, low bit first  
   Parity(oden-even) check: Even check  
   Start bit: 1BIT (low level)

Stop bit: 1BIT (high level)

Data transmission format per byte:

2. Communication Protocol: MODBUS RTU Protocol

**2.1 Overview**

Master / slave communication: master: upper computer; slave: communication board.

Data transmission format per frame:

|  |  |  |  |
| --- | --- | --- | --- |
| Device address | Function code | Data | CRC check |
| 8bits | 8bits | N\*8bits | 16bits |

Device address: slave device address, ranging from 1 to 255 (the slave address of this project is defined as 1)

Function code: read or write function

Data: Communication data in read and write functions

**2.2 Function code and data definition**

**2.2.1 Function code definition**

The detailed description of the function code can be found in the MODBUS protocol. This protocol uses three function codes, as detailed in the following description:

Function code = 03: Read multiple save registers. The master requests to read multiple 8-bit binary data from the slave. The data structure is defined in the following table:

Master (request) Slave (response)

|  |  |
| --- | --- |
| Device address | Device address |
| Function code (03) | Function code (03) |
| Register start address high order | Data length (8Bit) |
| Register start address low order | Data 1 high |
| Register number high | Data 1 low |
| Register number low | ： |
| CRC check low | ： |
| CRC check high | Data N high |
|  | Data N low |
|  | CRC check low |
|  | CRC check high |

Function code = 06H:

The function of presetting (writing) a single register, the master sends two 8-bit binary data to the slave. The data structure is defined in the following table:

Master (request) Slave (response)

|  |  |
| --- | --- |
| Device address | Device address |
| Function code (06) | Function code (06) |
| Register start address high order | Register start address high order |
| Register start address low order | Register start address low order |
| Data high | Data high |
| Data low | Data low |
| CRC check low | CRC check low |
| CRC check high | CRC check high |

Function code = 16: (not recommended)

Preset (write) multiple register functions. The master sends multiple 8-bit binary data to the slave. The data structure is defined in the following table:

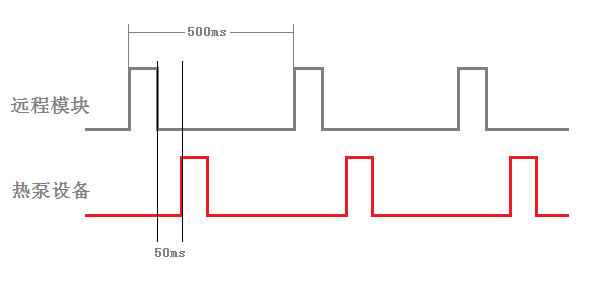
Master (request) Slave (response)

|  |  |
| --- | --- |
| Device address | Device address |
| Function code (16) | Function code (16) |
| Register start address high order | Register start address high order |
| Register start address low order | Register start address low order |
| Register number high | Register number high |
| Register number low | Register number low |
| Data length (8Bit) | CRC check low |
| Data 1 high | CRC check high |
| Data 1 low |  |
| ： |  |
| ： |  |
| Data N high |  |
| Data N low |  |
| CRC check low |  |
| CRC check high |  |

**2.4 Communication process**

After power-on reset, the master sends the relevant function code data frame to the slave every 500ms according to the function requirements. After the slave receives correctly, it sends the corresponding data to the master with a delay of 50ms according to the received function code. If the master does not receive the slave signal within 200ms after sending the data, the frame data is resent. When the slave device does not receive the master signal for more than 10s, it is regarded as a communication error.

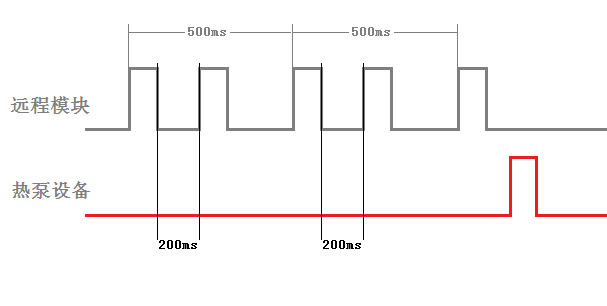
Communication diagram:



Heat pump

Remote module

Normal Communication



Heat pump

Remote module

Abnormal communication

## Read-write register data

**2.2.2.1 Read-write register**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Code | Function | Content | Byte | Descriptoin | Remarks |
| 2000 | 06/16/03 | Unit ON/OFF setting | Unicode/double byte | 0~1 | 0 OFF 1 ON |
| 2001 | 06/16/03 | Working mode setting | Unicode/double byte | 0~6 | 1. Cooling 2. Underfloor heating 3. Fan coil heating 4. Hot water 5. Auto |
| 2002 | 06/16/03 | Cooling temperature setting | Unicode/double byte |  |  |
| 2003 | 06/16/03 | Heating temperature setting | Unicode/double byte |  |
| 2004 | 06/16/03 | Hot water temperature setting | Unicode/double byte |  |
| 2005 | 06/16/03 | Fan coil cooling △T | Unicode/double byte |  |  |
| 2006 | 06/16/03 | Underfloor heating △T | Unicode/double byte |  |  |
| 2007 | 06/16/03 | Hot water tank △T | Unicode/double byte |  |  |
| 2008 | 06/16/03 | Fan coil heating △T | Unicode/double byte |  |  |
| 2009 | 06/16/03 | (Parameter 1) Main EEV initial opening setting | Unicode/double byte | 0~500 |  |
| 2010 | 06/16/03 | (Parameter 2) | Unicode/double byte |  |  |
| 2011 |  | (Parameter 3) | Unicode/double byte |  |  |
| 2012 |  | (Parameter 4) | Unicode/double byte |  |  |
| 2013 |  | (Parameter 5) Sterilizing time setting | Unicode/double byte |  |  |
| 2014 |  | (Parameter 6) | Unicode/double byte |  |  |
| 2015 |  | (Parameter 7) | Unicode/double byte |  |  |
| 2016 |  | (Parameter 8) | Unicode/double byte |  |  |
| 2017 |  | (Parameter 9) | Unicode/double byte |  |  |
| 2018 |  | (Parameter 10) | Unicode/double byte |  |  |
| 2019 |  | (Parameter 11) | Unicode/double byte |  |  |
| 2020 |  | (Parameter 12) | Unicode/double byte |  |  |
| 2021 |  | (Parameter 13) Maximum setting temperature | Unicode/double byte |  |  |
| 2022 |  | (Parameter 14) | Unicode/double byte |  |  |
| 2023 |  | (Parameter 15) | Unicode/double byte |  |  |
| 2024 |  | (Parameter 16) | Unicode/double byte |  |  |
| 2025 |  | (Parameter 17) | Unicode/double byte |  |  |
| 2026 |  | (Parameter 18) | Unicode/double byte |  |  |
| 2027 |  | (Parameter 19) | Unicode/double byte |  |  |
| 2028 |  | (Parameter 20) | Unicode/double byte |  |  |
| 2029 |  | (Parameter 21) | Unicode/double byte |  |  |
| 2030 |  | (Parameter 22) | Unicode/double byte |  |  |
| 2031 |  | (Parameter 24) Cooling ambient temperature setting for auto mode | Unicode/double byte |  |  |
| 2032 |  | (Parameter 24) Heating ambient temperature setting for auto mode | Unicode/double byte |  |  |
| 2033 |  | (Parameter 25) | Unicode/double byte |  |  |
| 2034 |  | (Parameter 26) | Unicode/double byte |  |  |
| 2035 |  | (Parameter 27) | Unicode/double byte |  |  |
| 2036 |  | (Parameter 28) Mode switch delay under auto mode | Unicode/double byte |  |  |
| 2037 |  | (Parameter 29) Defrost cycle | Unicode/double byte |  |  |
| 2038 |  | (Parameter 30) Coil temperature setting to enter defrost mode | Unicode/double byte |  |  |
| 2039 |  | (Parameter 31) Ambient temperature setting to extend the defrost time | Unicode/double byte |  |  |
| 2040 |  | (Parameter 32) Temperature difference between ambient and coil temperature to enter defrost mode | Unicode/double byte |  |  |
| 2041 |  | ( Parameter 33) Setting to extend the defrost cycle time | Unicode/double byte |  |  |
| 2042 |  | (Parameter 34) Maximum defrost time | Unicode/double byte |  |  |
| 2043 |  | (Parameter 35) Coil temperature setting to exit defrost mode | Unicode/double byte |  |  |
| 2044 |  | (Parameter 36) Temperature setting to allow user for water return cycle | Unicode/double byte |  |  |
| 2045 |  | (Parameter 37) Water return cycle time setting | Unicode/double byte |  |  |
| 2046 |  | (Parameter 38) Low ambient temperature protection setting | Unicode/double byte |  |  |
| 2047 |  | (Parameter 39) Whether using frequency reduction function when approaching the setting temperature | Unicode/double byte |  |  |
| 2048 |  | (Parameter 40) Cooling low ambient temperature protection setting | Unicode/double byte |  |  |
| 2049 |  | ( Parameter 41) Main EEV superheat degree control selection | Unicode/double byte |  | 0: Superheat degree adjustment  1: Fixed-point adjustment |
| 2050 |  | (Parameter 42) Main EEV target superheat degree | Unicode/double byte |  |  |
| 2051 |  | (Parameter 43) 3-way valve 2 switching time | Unicode/double byte |  |  |
| 2052 |  | (Parameter 44) Water pump working mode after reaching the setting temperature under heating/cooling mode | Unicode/double byte |  | 0: ON and OFF according to Para. 45  1: Keep OFF  2: Keep ON |
| 2053 |  | (Parameter 45) Water pump running interval | Unicode/double byte |  |  |
| 2054 |  | (Parameter 46) Low ambient temperature setting to turn on water pump under standby mode | Unicode/double byte |  |  |
| 2055 |  | (Parameter 47) Waterway cleaning function selection | Unicode/double byte |  | 0: OFF  1: Water pump ON  2: Water pump & 3-way valve 1 ON  3: Water pump & 3-way valve 1 & 2 ON |
| 2056 |  | Whether accept the frequency control of the host unit | Unicode/double byte | 0~1 | 0-NO 1-YES |
| 2057 |  | Host unit compressor frequency setting value | Unicode/double byte | 0~120 |  |
| 2058~2099 |  |  |  |  |  |

**Read-only register data**

**2.2.2.2 Read-only mode register**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 2100 | 03 | Water tank temperature | Unicode/double byte |  |  |
| 2101 | 03 | Reserved | Unicode/double byte |  |  |
| 2102 | 03 | Outlet water temperature | Unicode/double byte |  |  |
| 2103 | 03 | Inlet water temperature | Unicode/double byte |  |  |
| 2104 | 03 | Discharge temperature | Unicode/double byte |  |  |
| 2105 | 03 | Suction temperature | Unicode/double byte |  |  |
| 2106 | 03 | Reserved (EVI suction temperature) | Unicode/double byte |  |  |
| 2107 | 03 | External coil temperature | Unicode/double byte |  |  |
| 2108 | 03 | Cooling coil temperature | Unicode/double byte |  |  |
| 2109 | 03 | Reserved (Indoor temperature) | Unicode/double byte |  |  |
| 2110 | 03 | Outdoor ambient temperature | Unicode/double byte |  |  |
| 2111 | 03 | Reserved (High pressure saturation temperature) | Unicode/double byte |  |  |
| 2112 | 03 | Reserved (Primary circuit low pressure saturation temperature) | Unicode/double byte |  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2113 | 03 | Reserved (secondary low pressure saturation temperature | Unicode/double byte |  |  | | |
| 2114 | 03 | IPM temperature | Unicode/double byte |  |  | | |
| 2115 | 03 | Brine side inlet water temperature | Unicode/double byte |  |  | | |
| 2116 | 03 | Brine side outlet water temperature | Unicode/double byte |  |  | | |
| 2117 | 03 | Reserved temperature 3 | Unicode/double byte |  |  | | |
| 2118 | 03 | Compressor running frequency | Unicode/double byte |  |  | | |
| 2119 | 03 | DC fan motor speed | Unicode/double byte |  |  | | |
| 2120 | 03 | AC voltage | Unicode/double byte |  |  | | |
| 2121 | 03 | AC current | Unicode/double byte |  |  | | |
| 2122 | 03 | DC voltage | Unicode/double byte |  |  | | |
| 2123 | 03 | Compressor phase current | Unicode/double byte |  |  | | |
| 2124 | 03 | Primary EEV opening | Unicode/double byte |  |  | | |
| 2125 | 03 | Secondary EEV opening | Unicode/double byte |  |  | | |
| 2126 | 03 | (Reserved) High pressure | Unicode/double byte |  |  | | |
| 2127 | 03 | (Reserved) Low pressure | Unicode/double byte |  |  | | |
| 2128 | 03 | EE coding | Unicode/double byte |  |  | | |
| 2129 | 03 | Reserved | Unicode/double byte |  |  | | |
| 2130 | 03 | Reserved | Unicode/double byte |  |  | | |
| 2131 | 03 | Reserved | Unicode/double byte |  |  | | |
| 2132 | 03 | Reserved | Unicode/double byte |  |  | | |
| 2133 | 03 | System working status | Unicode/double byte | Bit0 | Frequency reaches upper limit | | |
| Bit1 | Frequency reaches lower limit | | |
| Bit2 |  | | |
| Bit3 |  | | |
| Bit4 |  | | |
| Bit5 |  | | |
| Bit6 |  | | |
| Bit7 |  | | |
| Bit8 |  | | |
| Bit9 |  | | |
| Bit10 |  | | |
| Bit11 |  | | |
| Bit12 |  | | |
| Bit13 |  | | |
| Bit14 |  | | |
| Bit15 |  | | |
| 2134 | 03 | Error code | Unicode/double byte | Bit0 | Brine side inlet water temperature sensor error | | |  |
| Bit1 | Brine side outlet water temperature sensor error |  |
| Bit2 | Brine side water flow protection |  |
| Bit3 | Water tank temperature sensor error |  |
| Bit4 |  |  |
| Bit5 |  |  |
| Bit6 |  |  |
| Bit7 |  |  |
| Bit8 |  |  |
| Bit9 |  |  |
| Bit10 |  |  |
| Bit11 |  |  |
| Bit12 |  |  |
| Bit13 |  |  |
| Bit14 |  |  |
| Bit15 |  |  |
| 2135 | 03 | System working status | Unicode/double byte | Bit0 | Unit ON/OFF status |  |
| Bit1 | Compressor status |
| Bit2 | High wind speed (fan motor output sign) (the control only have 1 speed, when the signal of fan motor output, this will change to 1) |
| Bit3 | Medium wind speed |
| Bit4 | Low wind speed |
| Bit5 | Water pump |
| Bit6 | 4-way valve |
| Bit7 | Electric heater |
| Bit8 | Water flow switch |
| Bit9 | High pressure switch |
| Bit10 | Low pressure switch |
| Bit11 | Remote ON/OFF switch for all modes |
| Bit12 | Mode switch |
| Bit13 | 3-way valve 1 |
| Bit14 | 3-way valve 2 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | Bit15 | Brine side water flow switch |  |
| 2136 | 03 | System working status | Unicode/double byte | Bit0 | Solenoid valve |  |
| Bit1 | Unloading valve |
| Bit2 | Oil return valve |
| Bit3 | Brine side water pump |
| Bit4 | Brine side antifreeze |
| Bit5 | Defrost |
| Bit6 | Refrigerant recovery |
| Bit7 | Oil return |
| Bit8 | Wired controller connecting status |
| Bit9 | Energy-saving operation |
| Bit10 | Primary antifreeze protection |
| Bit11 | Secondary antifreeze protection |
| Bit12 | High temperature sterilizing |
| Bit13 | Secondary water pump |
| Bit14 | Remote On/OFF switch for heating/cooling mode |
| Bit15 | Reserved |
| 2137 | 03 | Error code | Unicode/double byte | Bit0 | Indoor EE error |  |
| Bit1 | Outdoor EE error |
| Bit2 | Inlet water temp. sensor error |
| Bit3 | Outlet water temp. sensor error |
| Bit4 | Cooling coil antifreeze protection |
| Bit5 | External coil temp. sensor error |
| Bit6 | Discharge temperature sensor error |
| Bit7 | Suction temperature sensor error |
| Bit8 | Ambient temperature sensor error |
| Bit9 | Communication error between drive board and main board |
| Bit10 | Wired controller communication error |
| Bit11 | Compressor abnormal start |
| Bit12 | Communication error between indoor and outdoor unit |
| Bit13 | IPM error |
| Bit14 | High outlet water temperature protection |
| Bit15 | AC voltage protect |
| 2138 | 03 | Error code | Unicode/double byte | Bit0 | AC current protection |  |
| Bit1 | Compressor current protection |
| Bit2 | DC fan motor protection |
| Bit3 | Bus voltage protection |
| Bit4 | IPM temperature protection |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | Bit5 | High discharge temperature protection |  |
| Bit6 | High pressure switch protection |
| Bit7 | Low pressure switch protection |
| Bit8 | Water flow switch protection |
| Bit9 | Cooling external coil overheat protection |
| Bit10 | Low ambient temperature protection |
| Bit11 | Primary circuit low pressure protection |
| Bit12 | Secondary circuit low pressure protection |
| Bit13 | Large inlet/outlet temperature difference protection |
| Bit14 | Low outlet water temperature protection |
| Bit15 | Compressor running differential pressure protection |