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|  Shenzhen teplice technology co. LTD  |
| MODBUS Communication protocol |
| This article is suitable for PDU for Yespeed 485 |

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| --- |
|  [typing author's name] 2017/5/20 |

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# 1、Overview

 **In this paper, the standard of communication regulation of PDU MODBUS is described**.

# 2、Range of application

 **This agreement is applicable to the Yespeed PDU MODBUS protocol**.

# 3、Reference

 **Nothing.**

# 4、Physical interface

 String mouth：RS485

 Message frame transfer mode：RTU model

 Frame format：1 bit start, 8 data bits, no code bits, 1 stop bits, CRC code

 Baud rate：9600, 19200, etc. Can be set.

# 5、MODBUS Function code

## 5.1 MODBUS Partial function code

The following table lists the parts of the function code supported by the MODBUS: in decimal representation。

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **code** | **Chinese name** | **Register address** | **Bit operation/Operations on** | **Number of operations** |
| **01** | Read the coil state | 00001-09999 | Bit operation | Single or multiple |
| **02** | Read (switch) input state | 10001-19999 | Bit operation | Single or multiple |
| **03** | Reading retention register | 40001-49999 | Operations on | Single or multiple |
| **04** | Read input register | 30001-39999 | Operations on | Single or multiple |
| **05** | Write a single coil | 00001-09999 | Bit operation | Single |
| **06** | Write a single retention register | 40001-49999 | Operations on | Single |
| **15** | Write multiple coil | 00001-09999 | Bit operation | multiple |
| **16** | Write multiple retention register | 40001-49999 | Operations on | multiple |

Function code instructions：

 Function code can be divided into Bit operation and Operations on。

 The Bit operation package instruction includes reading coil status 01, read (switch) input status 02, write a single coil 06 and write multiple coils 15.

 Operations on (2 bytes) instructions include: read to keep register03, write a single register06, and write multiple register16.

## 5.2 Modbus Register address allocation

|  |  |  |  |
| --- | --- | --- | --- |
| **Register information address(PLC address)** | **For function code****(decimal)** | **register species** | **Read and write state** |
| **00001-09999** | 01 05 15 | coil state | Can read but write |
| **10001-19999** | 02 | (switch) input state | Can be read |
| **30001-39999** | 04 | Input register | Can be read |
| **40001-49999** | 03 06 16 | retention register | Can read but write |

## 5.3 Register type description

|  |  |  |  |
| --- | --- | --- | --- |
| **Register species** | **instructions** | **PLC analogy** | **illustrate** |
| **coil state** | The output port of the output port, by Bit operation, can set the output state of the port, or read the output state of that Bit. | DO | Electromagnetic valve output，MOSFET output，LED display etc. |
| **switch****State of the input** | The output port of the output port, by Bit operation, can set the output state of the port, or read the output state of that Bit. | DI | Dial switch, close switch, mechanical switch, etc |
| **retention****register** | The output parameter or the parameters that are set when the controller is running. Can read but write. | AO | The output of the analog output is set, the PID operation parameter, the conversion sampling frequency of the AD. |
| **input****register** | Input parameters. The parameters obtained from the external device when the controller is running | AI | Analog input |

## 5.4 Special instructions：

Register address information（PLC address）

 The register information address refers to the address in the controller that can be a PLC or a touch screen, or a text display. For example, 40001, 30002, etc., these addresses are typically used in a decimal description.

Register addressing address（Protocol address）

 Register addressing address is the Register address used by the communication. For example, the information address 40001 corresponds to address 0x0000, 40002 corresponds to address 0x0001, and the register addressing address is generally used in the 16-way description. Again, such as, information register40003 corresponding addressing address 0002, corresponding addressing information register30003 address 0002, although the two information register communication when using the same address, but you need to use different command can access, when visit so there is no conflict.

## 5.5 This agreement opens the public function code

Table 3 this protocol opens the public function code

|  |  |  |  |
| --- | --- | --- | --- |
| **code** | **Chinese name** | **Bit operation/Operations on** | **Number of operations** |
| **0x01** | Read the coil state | Bit operation | Single or multiple |
| **0x03** | Reading retention register  | Operations on | Single or multiple |
| **0x04** | Read input register | Operations on | Single or multiple |
| **0x05** | Write a single coil | Bit operation | Single |
| **0x06** | Write a single retention register | Operations on | Single |
| **0x0F** | Write multiple coil | Bit operation | multiple |
| **0x10** | Write multiple retention register | Operations on | multiple |

# 6、Message format

## 6.1 Read the coil state READ COIL READ COIL (0x01)

Instructions

 Read ON/OFF state of export from machine discrete quantity. The discrete output can be exported for the relay or the MOSFET output interface, which is essentially a Bit operation.

query

 The query information specifies the starting and winding number of the coil to be accessed.

 0x01 command format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **Register number** | **CRC code** |
| **data** | ADDR | 01H | Start REG | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

0x01 response format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| define | address | function code | Return data bytes | Return data | CRC code |
| **data** | ADDR | 01H | X | DATA | CRC16 |
| **number of bytes** | 1 | 1 | 1 | X | 2 |

## 6.2 Read the input bit state READ DISCRETE INPUTS (0x02)

Instructions

 Read ON/OFF state from the discrete input signal.

Query

 The query information specifies the input starting address to be read and the number of input signals.

 0x02 command format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **Register number** | **CRC code** |
| **data** | ADDR | 02H | Start REG | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

 0x02 response format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **Return data bytes** | **Return data** | **CRC code** |
| **data** | ADDR | 02H | X | DATA | CRC16 |
| **number of bytes** | 1 | 1 | 1 | X | 2 |

## 6.3 Reading retention register READ HOLDING REGISTERS (0x03)

Instructions

 Read binary data from the machine holding register.

Query

 The query information specifies the number of register starting address and register.

 0x03 command format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **Register number** | **CRC code** |
| **data** | ADDR | 03H | Start REG | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

 0x03 response format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **Return data bytes** | **Return data** | **CRC code** |
| **data** | ADDR | 03H | X | DATA | CRC16 |
| **number of bytes** | 1 | 1 | 1 | X | 2 |

## 6.4 Read input register READ INPUT REGISTERS (0x04)

Instructions

 Read binary data from the machine input register (type 3XXXX).

Query

 he query information specifies the number of register's starting address and register to be read, and the corresponding address for register30001-30016 is 0-15.

 0x04 command format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **Register number** | **CRC code** |
| **data** | ADDR | 04H | Start REG | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

 0x03 response format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **Return data bytes** | **Return data** | **CRC code** |
| **data** | ADDR | 04H | X | DATA | CRC16 |
| **number of bytes** | 1 | 1 | 1 | X | 2 |

## 6.5 Forced single coil WRITE SINGLE COIL (0x05)

Instructions

 Force individual coils (0XXXX type) to be ON or OFF state.

Query

 The query information specifies the type of coil that needs to be forced.

 A constant in the querydata area. In the case of the ON/OFF state of the requested coil, the FF00H value request coil is ON state, and the 0000H value request coil is OFF state. 05 instruction set the state of a single coil, 15 instruction can set up multiple state of the coil, although is set coil ON/OFF state, but different ON/OFF of the expression.

 0x5 command format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **register values** | **CRC code** |
| **data** | ADDR | 05H | Start REG | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

 0x05 response format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **register values** | **CRC code** |
| **data** | ADDR | 05H | Start REG | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

## 6.6 Preset a single holding register WRITE SINGLE REGISTER (0x06)

Instructions

 Preset a value to a 4XXXX type to keep register. Note that the 06 instruction can only operate on a single hold register, and the 16 instructions can set up a single or multiple retention register.

 0x6 command format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **register values** | **CRC code** |
| **data** | ADDR | 06H | Start REG | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

 0x05 response format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **register values** | **CRC code** |
| **data** | ADDR | 06H | Start REG | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

## 6.7 Forced coil Write Multiple coil registers(0x0F)

Instructions

 The coil (type 0XXXXX type) is forced to be ON or OFF in the order of the coil.

Query

 The query information specifies the type of the forced coil.

 The querydata section specifies the ON/OFF state of the requested coil, such as the "1" in the data section, which indicates the corresponding coil state of the request is ON, and the value is "0", which is OFF state.

 0x0F command format：

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **Register number** | **number of bytes** | **register values** | **CRC code** |
| **data** | ADDR | 0FH | Start REG | Quantity | Byte Cnt | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 1 | X | 2 |

 0x0F response format：

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **Register number** | **bytes** | **CRC code** |
| **data** | ADDR | 0FH | Start REG | Quantity | Byte Cnt | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 1 | 2 |

## 6.8 Preset multiple holding registers Write Multiple registers (0x10)

Instructions

 Preset data in the various (4XXXX type) register.

 0x10 command format：

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **Register number** | **number of bytes** | **register values** | **CRC code** |
| **data** | ADDR | 10H | Start REG | Quantity | Byte Cnt | N REG | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 1 | X | 2 |

 0x10 response format：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **define** | **address** | **function code** | **register** | **Register number** | **CRC code** |
| **data** | ADDR | 10H | Start REG | Quantity | CRC16 |
| **number of bytes** | 1 | 1 | 2 | 2 | 2 |

# 7、Example

## 7.1 Read relay condition

 Use 01H function code：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **Register number** | **CRC16code** |
| **send** | 01 | 01 | 00 | 00 | 00 | 01 | 31 | CA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **number of bytes** | **register values** | **CRC16code** |
| **return** | 01 | 01 | 01 | 01 | 90 | 48 |

 Relays 1 switch status: 01 is closed

## 7.2 Switch relay（address is 01）：

 Use 05H function code：（Operate only one relay at a time）

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **register values** | **CRC16code** |
| **Open the second** | 01 | 05 | 00 | 01 | FF | 00 | DD | FA |
| **Close the second** | 01 | 05 | 00 | 01 | 00 | 00 | 9C | 0A |

 Use 0FH function code：（Multiple relays can be operated at one time）This operation eight

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **Register number** | **number of bytes** | **Register values** | **CRC16code** |
| **Fully open** | 01 | 0F | 00 | 00 | 00 | 08 | 01 | FF | BE | D5 |
| **All-OFF** | 01 | 0F | 00 | 00 | 00 | 08 | 01 | 00 | FE | 95 |
| **On the third** | 01 | 0F | 00 | 02 | 00 | 01 | 01 | 01 | 96 | 97 |
| **Close the third** | 01 | 0F | 00 | 02 | 00 | 01 | 01 | 00 | 57 | 57 |

## 7.3 Reading temperature and humidity, voltage current power（address is 01）：

 Use 04H function code:

Read the temperature：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **Register number** | **CRC16code** |
| **send** | 01 | 04 | 00 | 00 | 00 | 01 | 31 | CA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **number of bytes** | **register values（temperature）** | **CRC16code** |
| **return** | 01 | 04 | 02 | 00 | DC | B8 | A9 |

Temperature calculation：

 hexadecimal->decimal：00DCH ->220D-> (220/10 )22.0℃

Read the humidity：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **register number** | **CRC16code** |
| **send** | 01 | 04 | 00 | 01 | 00 | 01 | 60 | 0A |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **number of bytes** | **register values（humidity）** | **CRC16code** |
| **return** | 01 | 04 | 02 | 02 | 59 | 78 | 6A |

humidity calculation：

 hexadecimal->decimal：0259H ->601D-> (601/10 )60.1%H

Read the voltage：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **Register number** | **CRC16code** |
| **send** | 01 | 04 | 00 | 02 | 00 | 01 | 90 | 0A |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **number of bytes** | **register values（voltage）** | **CRC16code** |
| **return** | 01 | 04 | 02 | 08 | 9B | FF | 5B |

voltage calculation：

 ->decimal：089BH ->2203D-> (2203/10 )220.3V

Read the current：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **register number** | **CRC16code** |
| **send** | 01 | 04 | 00 | 03 | 00 | 01 | C1 | CA |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **number of bytes** | **register values（ current）** | **CRC16code** |
| **return** | 01 | 04 | 02 | 02 | DA | 39 | CB |

 current calculation：

 hexadecimal->decimal：02DAH ->730D-> (730/100 )7.3A

Read the power：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **Register number** | **CRC16code** |
| **send** | 01 | 04 | 00 | 04 | 00 | 01 | 70 | 0B |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **number of bytes** | **register values（power）** | **CRC16code** |
| **return** | 01 | 04 | 02 | 06 | 2D | 7A | 8D |

power calculation：

 hexadecimal->decimal：062DH -> 1581D->1581W

Read together：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **Register number** | **CRC16 code** |
| **send** | 01 | 04 | 00 | 00 | 00 | 05 | 30 | 09 |

return：

 01 04 0A 00 DD 02 71 08 98 02 D5 06 3B 86 51

 temperature：00 DDH->22.1℃

 humidity：02 71 H->62.5%H

 voltage：08 98 H->220V

 current：02 D5 H->7.25A

 power：06 3B H->1595W

## 7.4 Read hyper pressure and overflows（address is 01）：

 Use 03H function code:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **Register number** | **CRC16code** |
| **send** | 01 | 03 | 00 | 00 | 00 | 03 | 05 | CB |

return：

 01 03 06 09 C4 07 D0 06 40 D2 E0

 Overvoltage (upper limit)：09C4H->2500D->(2500/10)250V

 Overpressure value：07D0H->2000D->(2000/10)200V

 Superfluid value：0640H->1600D->(1600/100)16A

## 7.5 Set overpressure, overflows（address为01）：

 Ceiling voltage> lower voltage

 Ceiling voltage>1800(180V)

 lower voltage<2800(280V)

 2000（20A）> Ceiling current>500（5A）

 Use06Hfunction code:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **address** | **function code** | **Register address** | **register values** | **CRC16code** |
| **Ceiling voltage** | 01 | 06 | 00 | 00 | 0A | 28 | 8F | 74 |
| **lower voltage** | 01 | 06 | 00 | 01 | 06 | 40 | DA | 5A |
| **Ceiling current** | 01 | 06 | 00 | 02 | 02 | BC | 28 | DB |

 Use10Hfunction code:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **address** | **function code** | **Register address** | **Register number** | **number of bytes** | **Register** **values** | **CRC16 code** |
| **01** | 10 | 00 | 00 | 00 | 03 | 06 | 0A | 28 | 06 | 40 | 02 | BC | 87 | A1 |

 0A28H->2600->260V

 0640H->1600->160V

 02BCH->700->7A