

# DPS5020CNC power communication protocol

## V1.2

### A, protocol overview

RS232、RS485 Or Bluetooth serial interface, communication protocols MODBUS-RTU Agreement, this product only supports a function code 0x03、0x06、0x10。

### II. Communication protocol described

Message transmission is asynchronous, Modbus-RTU Mode to 11 Bits bytes

|                      |           |
|----------------------|-----------|
| Word format (serial) | 10 Binary |
| Start bit            | 1         |
| Data bits            | 8         |
| Parity bit           | No        |
| Stop bit             | 1         |

#### Data frame structure:

| Data-frame interval | Address code | Function code | Data area | CRC Check |
|---------------------|--------------|---------------|-----------|-----------|
| 3.5 Bytes more      | 1 Bytes      | 1 Bytes       | N Bytes   | 2 Bytes   |

Before sending data request resting time is, no data sent to the data bus time is greater than the 3.5 (For example: a baud rate of 9600 When 5ms ) Sends a message to at least 3.5 Byte time pause interval start, the entire message must be a continuous data stream, if in the frame before the completion of more than 3.5 Byte time pause time, the receiving device will refresh complete message and not assume that the next byte is the address fields of a new message. Similarly, if a new message is less than 3.5 characters before time then started receiving device thinks it is a continuation of previous messages.

#### 1.1 Address code

Code is the first byte of each communication information frames (8), From 1 to 255。 This byte indicates that the address set by the user from the machine will receive the information that is sent by the host. Each machine must have a unique address code, and the only address from machine code to respond to an echo information. When the echo from the machine information, echo data start with the individual address codes. Send from machine address code that will be sent to the address, and returned from the machine address code that echo the slave address. Code shows that the corresponding address where the information came from.

#### 1.2 Function code:

Function code to frame each time the address information of the second byte transmitted, ModBus Communication protocol defines the function code for 1 to 127。 As a host sends the request, and told what action should be performed by function code. As a response, function returned from the machine code as with the function code that is sent from the host, and has responded to the host machine and related operations. This machine supports only 0x03 and the 0x06, and 0x10 function code.

| Function code | Define             | Operations (binary)                 |
|---------------|--------------------|-------------------------------------|
| 0x03          | Read register data | Read one or more registers the data |

|      |                          |  |
|------|--------------------------|--|
| 0x06 | Write single register    | Writes binary data to a single set of registers        |
| 0x10 | Write multiple registers | Binary data is written to multiple groups of registers |

### 1.3 Data area

Area includes require from data sent back information or perform an action, such information can be data (such as switching input/Output, analog input/Output, registers, and so on), with reference to the address, and so on. For example, the host through the function code 03 tell from the return value of the register (including the starting address and register to read read register length), then the returned data includes the data length and data content of the register.

#### 0x03 Read the host format

| Address code | Function code | Register the starting address | Number of register address n (1 ~ 32) | CRC Check code |
|--------------|---------------|-------------------------------|---------------------------------------|----------------|
| 1 Bytes      | 1 Bytes       | 2 Bytes                       | 2 Bytes                               | 2 Bytes        |

#### 0x03 Read function returns the format from

| Address code | Function code | Returns the number of bytes 2*n | Register data | CRC Check code |
|--------------|---------------|---------------------------------|---------------|----------------|
| 1 Bytes      | 1 Bytes       | 1 Bytes                         | 2*n Bytes     | 2 Bytes        |

#### 0x06 Write individual registers host format

| Address code | Function code | Register address | Register data | CRC Check code |
|--------------|---------------|------------------|---------------|----------------|
| 1 Bytes      | 1 Bytes       | 2 Bytes          | 2 Bytes       | 2 Bytes        |

#### 0x06 Write single register function returns the format from

| Address code | Function code | Register address | Register data | CRC Check code |
|--------------|---------------|------------------|---------------|----------------|
| 1 Bytes      | 1 Bytes       | 2 Bytes          | 2 Bytes       | 2 Bytes        |

#### 0x10 Write the host format

| Address code | Function code | Register the starting address | Number of register address n (1 ~ 32) | Number of bytes written 2*n | Register data | CRC Check code |
|--------------|---------------|-------------------------------|---------------------------------------|-----------------------------|---------------|----------------|
| 1 Bytes      | 1 Bytes       | 2 Bytes                       | 2 Bytes                               | 1 Bytes                     | 2*n Bytes     | 2 Bytes        |

#### 0x10 Function: Returns the format from

| Address code | Function code | Register the starting address | Number of register address n (1 ~ 32) | CRC Check code |
|--------------|---------------|-------------------------------|---------------------------------------|----------------|
| 1 Bytes      | 1 Bytes       | 2 Bytes                       | 2 Bytes                               | 2 Bytes        |

**Agreement register introduction (Within a single register address data for double byte data)**

| The name  | Introductions                                | Number of bytes | The decimal point | Work unit | Read and write | Register address |
|-----------|--|-----------------|-------------------|-----------|----------------|------------------|
| U-SET     | Voltage settings                             | 2               | 2                 | V         | R/W            | 0000H            |
| I-SET     | Current setting                              | 2               | 2                 | A         | R/W            | 0001H            |
| UOUT      | Output voltage display values                | 2               | 2                 | V         | R              | 0002H            |
| IOUT      | Output current display value                 | 2               | 2                 | A         | R              | 0003H            |
| POWER     | Output display values                        | 2               | 2                 | W         | R              | 0004H            |
| UIN       | Input voltage display value                  | 2               | 2                 | V         | R              | 0005H            |
| LOCK      | Key lock                                     | 2               | 0                 | -         | R/W            | 0006H            |
| PROTECT   | Protection status                            | 2               | 0                 | -         | R              | 0007H            |
| CVCC      | Constant voltage and constant current status | 2               | 0                 | -         | R              | 0008H            |
| ONOFF     | Switching output                             | 2               | 0                 | -         | R/W            | 0009H            |
| B_LED     | Backlight brightness levels                  | 2               | 0                 | -         | R/W            | 000AH            |
| MODEL     | Product model                                | 2               | 0                 | -         | R              | 000BH            |
| VERSON    | Firmware version number                      | 2               | 0                 | -         | R              | 000CH            |
| EXTRACT_M | Shortcut to bring up the data set            | 2               | 0                 | -         | W              | 0023H            |
| U-SET     | Voltage settings                             | 2               | 2                 | V         | R/W            | 0050H            |
| I-SET     | Current setting                              | 2               | 3                 | A         | R/W            | 0051H            |
| S-OVP     | Over-voltage protection value                | 2               | 2                 | V         | R/W            | 0052H            |
| S-OC      | Over-current protection value                | 2               | 3                 | A         | R/W            | 0053H            |
| S-OPP     | Over power protection                        | 2               | 1、2               | W         | R/W            | 0054H            |
| B-LED     | Backlight brightness levels                  | 2               | 0                 | -         | R/W            | 0055H            |
| M-PRE     | Data brings up updates output                | 2               | 0                 | -         | R/W            | 0056H            |
| S-INI     | Power output switch                          | 2               | 2                 | -         | R/W            | 0057H            |

**1:** This product design M0-M9 A total of 10 Set of stored data sets, each set by serial 10-17 A total of 8 The data, which M0 Data group called power-on default data for product groups, M1、M2 Shortcut to bring up the data set for panel data set, M3-M9 For general storage array data sets the start address is calculated by: 0050H+ Data group number \*0010H, For example, M3 Data sets the starting address as follows: 0050H+3\*0010H=0080H。

**2:** Key lock function to read and write values 0 1, 0 For non-locking 1 As locked.

**3:** Protection status reads the value for the 0-3 , 0 For normal operation, 1 OVP, 2 OCP , 3 OPP 。

**4:** Reads a value of constant voltage and constant current 0 1 , 0 CV State, 1 CC State.

**5:** Switch output functions to read and write values for 0 1 , 0 Is turned off, 1 To open.

**6:** Backlight brightness level read/write range 0-5 , 0 Grade is the most dark, 5 Brightest star level.

**5:** Shortcut to bring up function writes a value to the data set 0-9 Writing will automatically call up the corresponding data set after the data.

#### **1.4 Error-checking code (CRC Parity):**

Master or slave can check code out to receive information is correct. Due to electronic noise or other disturbance, errors sometimes occur during transmission of information, error check code (CRC) can test host machine or in the address information during data transmission for errors, incorrect data may be waived (both sent and received), increasing the safety and efficiency of the system. MODBUS communication protocol of CRC(cyclic code redundancy) contains 2 byte, that is, 16-bit binary number. CRC codes sent by the device (host), sending information placed in the rear of the frame. Receiving device (slave) recalculate the received information the CRC, compared the calculated CRC and receive consistent, if the two do not match, then the error. CRC checksum sent low in front, high in the back.

#### **CRC Calculation method of the code:**

- (1) Preset 16 Register as a hexadecimal FFFF (That is, all 1) ; Refer to this register as CRC Register;
- (2) The first 8 Binary data (both communication and information the first byte of the frame) 16 CRC Low register 8 Different from, and in the results CRC Register;
- (3) CRC Register contents of the one to the right (low) 0 Fill the top and check the right removed after;
- (4) If you are removing bits 0 : Repeat 3 (Again a bit to the right) ; If you are removing bits 1 : CRC Register and polynomial A001 ( 1010 0000 0000 0001 ) XOR;
- (5) Repeat steps 3 4 Until the right 8 Time, so that the entire 8 All data are processed;
- (6) Repeat steps 2 To step 5 And communicate information frames the next byte;
- (7) The communication frames all the bytes as described above when the calculation is complete, get the 16 CRC Swap the high and low bytes of the register;
- (8) Finally got the CRC Register contents CRC Code.

### **Three instances, communications**

#### **1 : Host reads the output voltage and output current display value**

The message format hosts send:

| Host sends                    | Number of bytes | Information sent | Notes                                   |
|-------------------------------|-----------------|------------------|---|
| Slave address                 | 1               | 01               | Sent to the address 01 From the machine |
| Function code                 | 1               | 03               | Read register                           |
| Register the starting address | 2               | 0002H            | Register the starting address           |
| Number of register address    | 2               | 0002H            | A total of 2 Bytes                      |
| CRC Code:                     | 2               | 65CBH            | Calculated by the host CRC Code:        |

For example if the currently displayed value is 05.00V, 15.00 A, Then returns a response message format:

| From machine responses                       | Number of bytes | The information returned | Notes                           |
|--|-----------------|--------------------------|---------------------------------|
| Slave address                                | 1               | 01                       | From machine 01                 |
| Function code                                | 1               | 03                       | Read register                   |
| Number of bytes to read                      | 1               | 04                       | A total of 1 Bytes              |
| Address for 0002H The contents of a register | 2               | 01F4H                    | Output voltage display values   |
| Address for 0003H The contents of a register | 2               | 05DCH                    | Output current display value    |
| CRC Code:                                    | 2               | B8F4H                    | Obtained from machine CRC Code: |

## 2 : Host to set the voltage to 24.00V

The message format hosts send:

| Host sends                                   | Number of bytes | Information sent | Notes                            |
|--|-----------------|------------------|----------------------------------|
| Slave address                                | 1               | 01H              | From machine 01                  |
| Function code                                | 1               | 06H              | Write single register            |
| Register address                             | 2               | 0000H            | Register address                 |
| Address for 0000H The contents of a register | 2               | 0960H            | Set the output voltage           |
| CRC Code:                                    | 2               | 8FB2H            | Calculated by the host CRC Code: |

Messages returned from the machine after receiving the response format:

| From machine responses                       | Number of bytes | The information returned | Notes                                   |
|--|-----------------|--------------------------|---|
| Slave address                                | 1               | 01H                      | Sent to the address 01 From the machine |
| Function code                                | 1               | 06H                      | Write single register                   |
| Register address                             | 2               | 0000H                    | Register the starting address           |
| Address for 0000H The contents of a register | 2               | 0960H                    | Set the output voltage                  |
| CRC Code:                                    | 2               | 8FB2H                    | Obtained from machine CRC Code:         |

**3 : Host to set the voltage to 24.00V, The current 15.00A .**

The message format hosts send:

| Host sends                                   | Number of bytes | Information sent | Notes                               |
|--|-----------------|------------------|-------------------------------------|
| Slave address                                | 1               | 01H              | From machine 01                     |
| Function code                                | 1               | 10H              | Write register                      |
| Register the starting address                | 2               | 0000H            | Register the starting address       |
| Number of register address                   | 2               | 0002H            | A total of 2 Bytes                  |
| Number of bytes written                      | 1               | 04H              | A total of 1 Bytes                  |
| Address for 0000H The contents of a register | 2               | 0960H            | Set the output voltage              |
| Address for 0001H The contents of a register | 2               | 05DCH            | Setting the output current value    |
| CRC Code:                                    | 2               | F2E4H            | Calculated by the host<br>CRC Code: |

Messages returned from the machine after receiving the response format:

| From machine responses        | Number of bytes | The information returned | Notes                                   |
|-------------------------------|-----------------|--------------------------|---|
| Slave address                 | 1               | 01H                      | Sent to the address 01 From the machine |
| Function code                 | 1               | 10H                      | Write register                          |
| Register the starting address | 2               | 0000H                    | Register the starting address           |
| Number of register address    | 2               | 0002H                    | A total of 2 Bytes                      |
| CRC Code:                     | 2               | 41C8H                    | Obtained from machine CRC Code:         |