

JYK-17 Digital Ammeter/Voltmeter

Communication Protocol MODBUS-RTU

A. Protocol Overview: Protocol Type: MODBUS-RTU

1. Physical Layer: Transmission: 485

Address Number: 1~255 ; Baud Rate: 4800, 9600 ;
(the default) communication medium: shielded twisted pair.

2. Link Layer: Transmission: Master-slave full duplex

A data frame format: 1 start bit, 8 data bits, even parity bit, 1 stop bit (default)
1 start bit, 8 data bits, odd parity bit, 1 stop bit
1 start bit, 8 data bits, no parity bit, 1 stop bit

A datagram format:

Address Code	Funcation Code	Data Code	Check Code
8-Bits	8-Bits	N*8-Bits	16-Bits

Note: The datagram transmissiton sequence is always the same, i.e.the address code, function code, data code and the corresponding check code. Each datagram must be a continuous bit stream, instrument response time is 0.1~0.5secs, typically 0.2 seconds.

When the data frame arrive at the terminal device, remove the front data from the searched device, read data, after check data is correct, to perform the requested task data, then return the data to the sender. Return the data contain: the address of the searched device, execute command, execute commands generate the requested data and two-byte check code.

2. 1 Address Code: the address field frame is start by a byte, indicating the address of terminal device by user's appointed. Each address of terminal device is unique. Only be searched the terminal devcie, could be change the data with host.

2.2 Function Code: it shows what the function to be executed from the searched terminal device. All function code of our instrument as below sheet, the meaning and the initial function.

Code	Meaning	Action
03H	Read Data	Obtain one or more registers of current data
06H	Preset Single Register	Write a set of binary data into a register
10H	Preset Multiple Registers	Write multiple sets of binary date into registers

2.3 Data Code: it contains the required data of terminal execute special function and the collected data of terminal response to the query. The contents of these data maybe numbers, reference address or limit value. For example: Function code tells terminal to read a resgister, the data code indicate how many data read from this register beginning.

2.4 Check Code: provide the transmission error basis of host and terminal examination. Error check can ensure the host and terminal not respond to errors during data transmission. Improves the safety and reliability of the system data. Error check using a 16-bit cyclic redundancy (CRC) method.

2.5 Cyclic redundancy check (CRC) calculation method: CRC occupies two bytes whose value is calculated by the transmitting device, Then attach to the last of data code for sending together, the receiving device after receiveing dats, recalculated the check data of all valid data except CRC code, then make a comparison with the received CRC check code. If these two values are not equal, it has errors of data transmission.

Generate a CRC check code's process:

1. Preset a 16bits register (0FFFFH), named CRC register.
2. Process XOR with the first byte data of datagram and CRC register low byte, then return to CRC register.
3. Move the CRC register to the right shift, fill 0 in the highest bit, remove and test the lowest bit.

4. If the lowest bit is 0, repeat the step 3 (the next shift). If the lowest bit is 1, process XOR with CRC register and 001H.
5. Repeat step3, step4, until shift 8times.
6. Repeat the step2 to step5 to handle the next byte data, until all data bytes be finished.
7. Change the high/low byte of CRC register (low byte front, high byte behind)
8. The final CRC value is the CRC register's value.

B. Application layer functions details

The section of protocol using the following format (hexadecimal number).

1. Read Data (function code 03H)

This function allow the users to get the instrument's operating parameters and set parameters on the host.

Read voltage value, the host sends message format:

The host sends	Bytes	Message sent	Information Description
Slave Address	1	01H	Send message to slave address 01
Function Code	1	03H	Read register
Starting Address	2	0012H	Parameter starting address 0012H
The number of variables	2	0001H	Read a register (total:2bytes)
CRC Code	2	240FH	Calculated by the host

Slave Response, return message format:

Slave Response	Bytes	Return message	Information Description
Slave Address	1	01H	From slave address 01
Function Code	1	03H	Read register
Read Bytes	1	02H	Read a register (total:2bytes)
Register 03	2	01F4H	Voltage Value: 500V
CRC Code	2	B853H	Calculated by the instrument

Read current value, the host sends message format:

The host sends	Bytes	Message sent	Information Description
Slave Address	1	01H	Send message to slave address 01
Function Code	1	03H	Read register
Starting Address	2	0013H	Parameter starting address 0012H
The number of variables	2	0001H	Read a register (total:2bytes)
CRC Code	2	75CFH	Calculated by the host

Slave Response, return message format:

Slave Response	Bytes	Return message	Information Description
Slave Address	1	01H	From slave address 01
Function Code	1	03H	Read register
Read Bytes	1	02H	Read a register (total:2bytes)
Register 03	2	0640H	Current Value: 1600/100=16.0A
CRC Code	2	BA14H	Calculated by the instrument

Note: Voltage value that is the value of voltage register read by the hexadecimal into the decimal, after the current register transfer, the actual value is the read value to divide by 100.