



Shenzhen Hi-Link Electronic Co., Ltd.

HLK-DIO16

16 Channel Digital Input Output Controller

USER MANUAL

Modbus Protocol Specification

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1 Introduction

This product supports the standard Modbus RTU protocol. The controller as a slave can support the master's real-time control of the output, read the current value and version number of the input and output, and read and write the device parameters. The supported function codes are 0x03 and 0x10.

2 Function Code

2.1 0x03: Read save register value

The mater reads the device time, jog time, delay time, cycle time, input and output status, and version number of the device.

Main station message:

Device Address	1 byte, Content is 0-0xff
Function Code	1 byte, Content is 0x3
Start Register Address	2 byte, High byte first (0x0-0x35)
Number of Register	2 byte, High byte first (1-0x10)

Slave station reply message:

Device Address	1 byte, Content is 0-0xff
Function Code	1 byte, Content is 0x3
Digital Length	1 byte, Content is Number of registers×2
Data	The number of registers × 2 bytes, each data high byte in the different functions corresponding to the different registers, refer 5.2 register list

2.2 0x10: Write multiple register values

The mater sets the output action, device time, jog time, delay time, and cycle time of the device.

Main station message:

Device Address	1 byte, Content is 0-0xff
Function Code	1 byte, Content is 0x06
Start Register Address	2 byte, High byte first (0x0-0x35)
Number of Register	2 byte, High byte first (0x2-0x10)
Digital Length	1 byte 0x2-0x20)
Data	Specific data, different functions corresponding to different registers, refer 5.2 Register List for details.

Slave station reply message:

Device Address	1 byte, Content is 0-0xff
Function Code	1 byte, Content is 0x06
Start Register Address	2 byte, High byte first
Number of Register	2 byte, High byte first

3 Registers List

Function	Register address	Register number	Register function	Register description	Register definition	Notes
Output control command	0x00	2	Output Action	Low byte valid, high byte reserved	Action type (low 4 bits): 0x00 off, 0x01 on, 0x02 flip, 0x03 jog; Execution mode (optional): Whether bit7 is executed cyclically, whether bit6 is delayed or not;	what action is performed by the device, whether it is delayed or executed cyclically
			Output channel selection	High byte/ low byte	bit0 ~ bit15 corresponding to relay 1 ~ 16 0: Unchecked, 1: selected	Control which output
Device Time	0x02	3	Year	High Byte	0 ~ 255, 0 represents 2018	Readable writable
			Month	Low Byte	1 ~ 12	Readable writable
			Day	High Byte	1 ~ 31	Readable writable
			Hour	Low Byte	00 ~ 23	Readable writable
			Minute	High Byte	00 ~ 59	Readable writable
			Second	Low Byte	00 ~ 59	Readable writable
Point Time	0x05	16	Inching time	High byte/ low byte	One register per channel (2 bytes), which in turn corresponds to the inching time of output channels 1 to 16, in units of 10ms	Readable writable
Delay time	0x15	16	Delayed execution time	High byte/ low byte	One register per channel (2 bytes), which corresponds to the delay time of output channels 1~16, in units of 10ms	Readable writable
Output relay state	0x25	1	Output relay status flag	High byte/ low byte	Bit0~bit15 correspond to the status of output relays 1~16, 0: off, 1: close	Readable
Digital input state	0x26	1	Digital input status flag	High byte/ low byte	Bit0~bit15 correspond to the state of digital input 1~16, 0: on or low level, 1: off or high level	Readable
Recycle time	0x27	16	Cycle time during loop execution	High byte/ low byte	One register per channel (2 bytes), which in turn corresponds to the cycle time of output channels 1 to 16, in units of 10ms	Readable writable
Software version	0x37	2	Software version number	High byte/ low byte	8 bit BCD code	Readable

4 Use example

4.1 Simultaneously read 16 digital input states

Take the 16-channel digital input status and the device address as 0x01 as an example. The command is as follows:

Output Control Command 0x00 2 Output Action Low byte valid, high byte reserved Action type (low 4 bits):

0x00 off, 0x01 on,

0x02 flip, 0x03 jog;

Execution mode (optional):

Whether bit7 is executed cyclically, whether bit6 is delayed or not, what action is performed by the device, whether it is delayed or executed cyclically just write

Output channel selection High byte/low byte bit0~bit15 Corresponding to relay 1~16

0: unchecked, 1: selected to control which output

0x01030026000165c1

Command parsing:

01	03	0026	0001	65c1
Device address	Function code	Register initial address	Register number	Verify code
1 byte, 0x01	1 byte, 03, read register	2 bytes, The register to start reading address (check register list available)	2 bytes, Number of registers that need to be read	CRC verify code

Description:

- (1) Device address: the serial port link or the other remote terminal identifier;
- (2) Function code: read the value of DI, using 0x03 function code;
- (3) Register start address: the address of the first register when reading multiple registers;
- (4) Number of registers: the number of registers that need to be read at one time;

Assume that the input channel DI0-DI1 of the device is high, the other channel inputs are low, and the command returned by the device is:

0x0103020003b844

01	03	02	0003	a40b
Device address	Function code	Digital length	Data	Verify code
1 Byte, 0x01	1 Byte, 03, read register	Number of registers x2	DI0-DI1 input is high, other channel input is low, the data is 0x0003	CRC verify code

4.2 Simultaneously set 16 relay loops to flip

Take the example of setting 1~8 relay loops and the device address is 0x01 as an example.

The command is as follows:

0x01100000000204008200FF13c7

Command parsing:

01	10	0000	0002	04	008200FF	13c7
Device address	Function code	Register initial address	Register number	Digital length	Data	Verify code
1 byte 0x01	1 byte 0x10 write register	2 byte The register to start reading address (check register list available)	2 byte Number of registers that need to be read	The digital length to be read	The register value corresponding to the specific register address, 0x0082 is the register value of register address 0x00, 0x00FF is the register value of register address 0x01	CRC verify code

Description:

- (1) Device address: the serial port link or the other remote terminal identifier;
- (2) Function code: read the value of DI, using 0x10 function code;
- (3) Register start address: the address of the first register when reading multiple registers;
- (4) Number of registers: the number of registers that need to be read at one time;
- (5) Digital length : the length of the digital to be read;
- (6) Data: The specific data to be read, as defined in the register list;

When the device responds normally and the cycle time setting is valid, the relays 1-8 are cyclically flipped at the same time according to the cycle time. The command returned by the device is:

0x01100000000241c8

01	10	0000	0002	41c8
Device address	Function code	Register initial address	Register number	Verify code
1 byte 0x01	1 byte 0x10, write register	2 bytes The register to start reading address (check register list available)	2 bytes Number of register that need to be read	CRC verify code

5 Revision Record

Date	Version	Modify Content
2018-9-29	1.0	Original Version
2018-10-25	1.1	Add output action execution options, complete instructions and icons

6 technical support and contact information



Shenzhen Hi-Link Electronic Co., Ltd.

Add: Caiyue Mansion, No.24 Liuxian Blvd, Longhua District, Shenzhen, Guangdong, China

Tel: 0755-23152658/83575155;

Web: www.hlktech.com