

# **DAM-E3016**

## **User's Manual**



**Beijing ART Technology Development Co., Ltd.**

## DAM-E3016 Module

### Introduction

#### Features

#### 12-ch Isolated Digital Input/ 4-ch Open-collector Output

##### General

- Power Consumption:  $2W@24V_{DC}$
- Power Supply: unregulated  $10\sim30V_{DC}$
- Support dual watchdogs
- Support 10/100Mbps Ethernet
- Provide default web page or custom-built web page

##### Digital Input

- Channels: 12
- Input Level
  - Dry Contact: Grounding or open circuit
  - Wet Contact: Logic Level 0: +1V max
  - Logic Level 1:  $4V\sim30V$
- Isolated Voltage: 3750V
- Input channel can be used as a 500Hz counter

##### Digital Output

- Channels: 4
- Maximum load: 30V, 200mA
- Isolated Voltage: 3750V
- Output channels can be used as 500Hz pulse output

### Easy to operate

DAM-E3016 utility software can help you to select input configuration, set the operating parameter for your process control needed.

#### Industrial Design

DAM-E3016 was designed to use in industrial environment. It can be installed in standard DIN rail inside the cabinet. And it can be powered by unregulated  $10\sim30V_{DC}$  to meet the various power supplied source in field. It also withstands ambient temperature up to  $60^{\circ}C$  and resists the effects of vibration and mechanical shock.

### Wiring & Installation

Power supply requirements: unregulated  $+10 V_{DC} \sim +30 V_{DC}$ . "+Vs" is a positive, and "GND" is ground. The Ethernet interface is connected to a computer switch directly via network cable. If the wiring and power is ok, then the power indicator should be stop flash and keep on. The module initialization is completed. The indicator flashes according to the transmitted data when the module is working.

## DAM-E3016

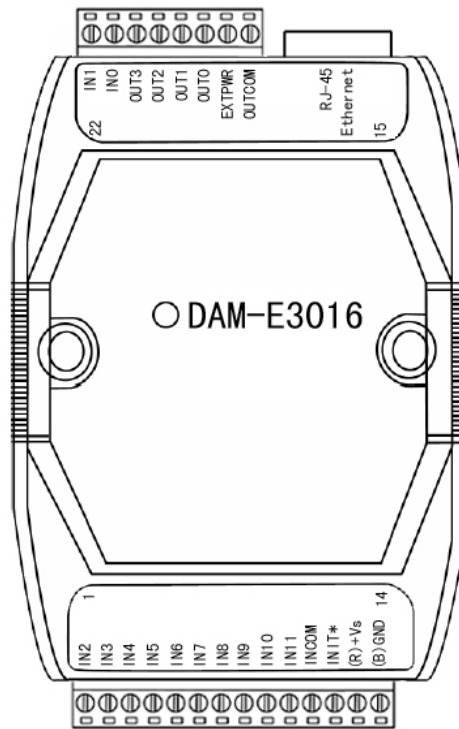


Fig.1 DAM-E3016 Drawing

DAM-E3016 can be installed in standard DIN rail inside the cabinet; it also can be installed by stacking mode.

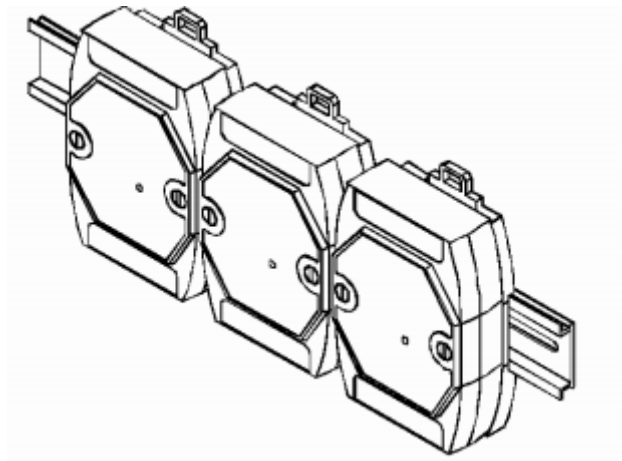


Fig.2 DAM-E3016 standard DIN installation

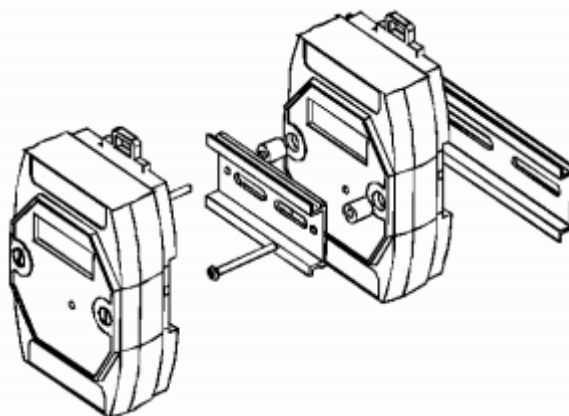


Fig.3 DAM-E3016 stack installation

## Application Wiring

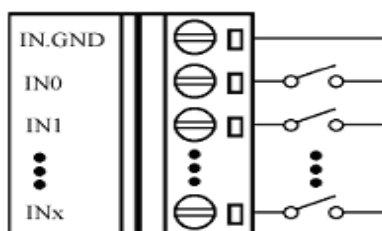


Fig.4 Dry contact signal input

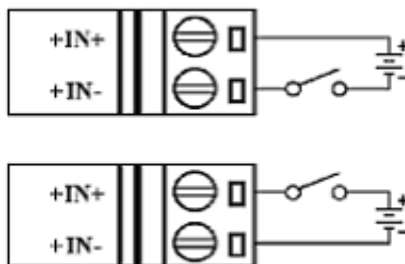


Fig.5 Wet contact signal input

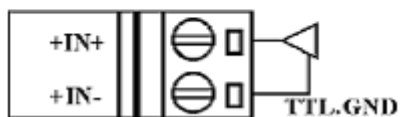
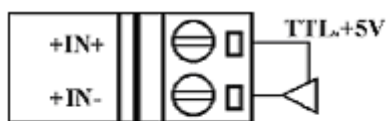


Fig.6 TTL/CMOS signal input

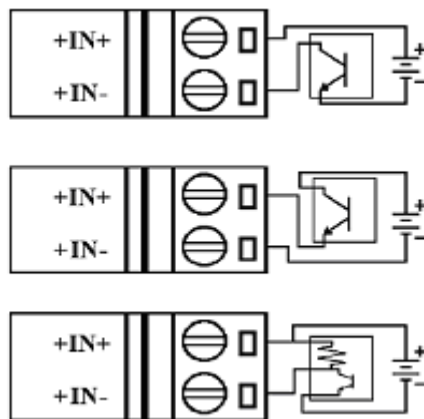


Fig.7 Open-collector signal input

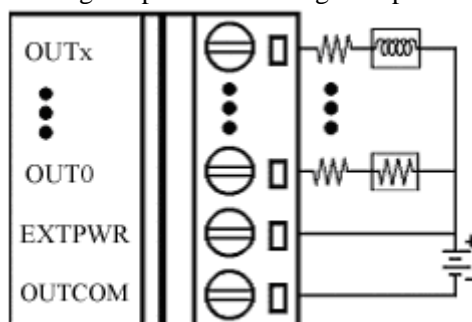


Fig.8 Open-collector signal output

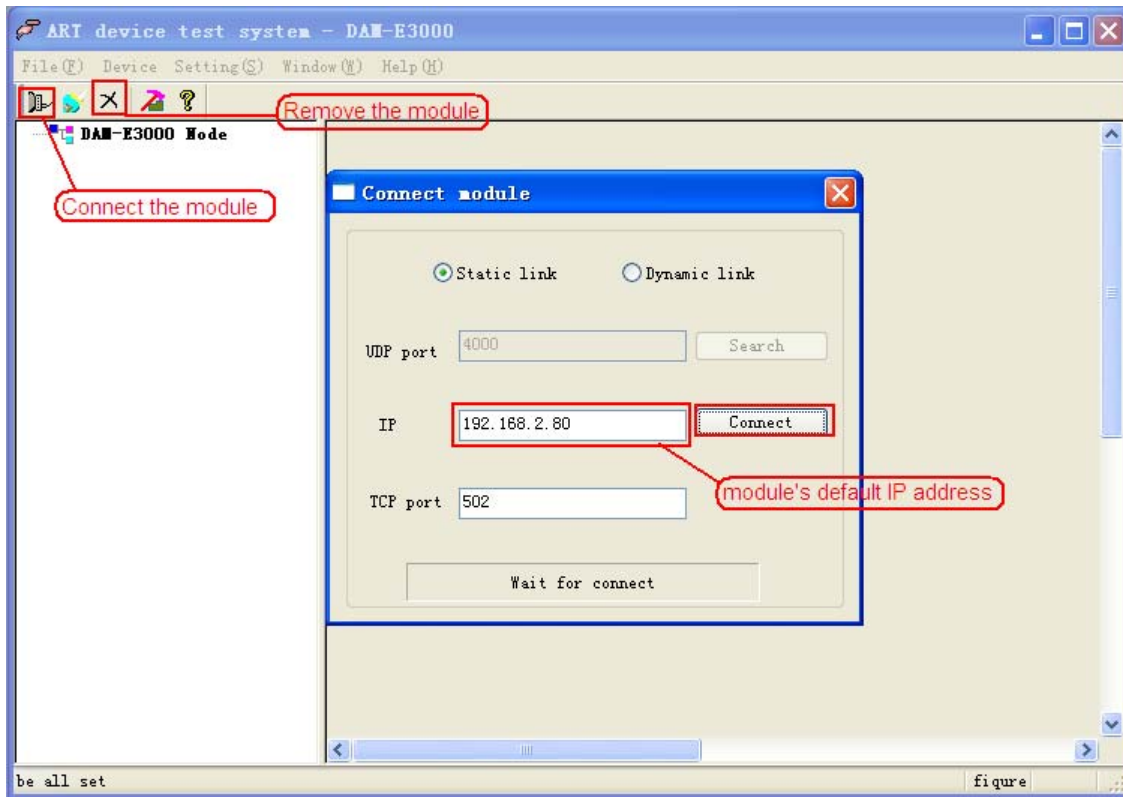
## Default Setting

If the module's network configuration is wrong, or forget the last modified value, the module can be reverted to default settings. Steps: short-circuit the "INIT\*" and "GND" when there is no power; power-on for 3 seconds, power off, disconnect "INIT\*" and "GND". The module is reverted to the default settings.

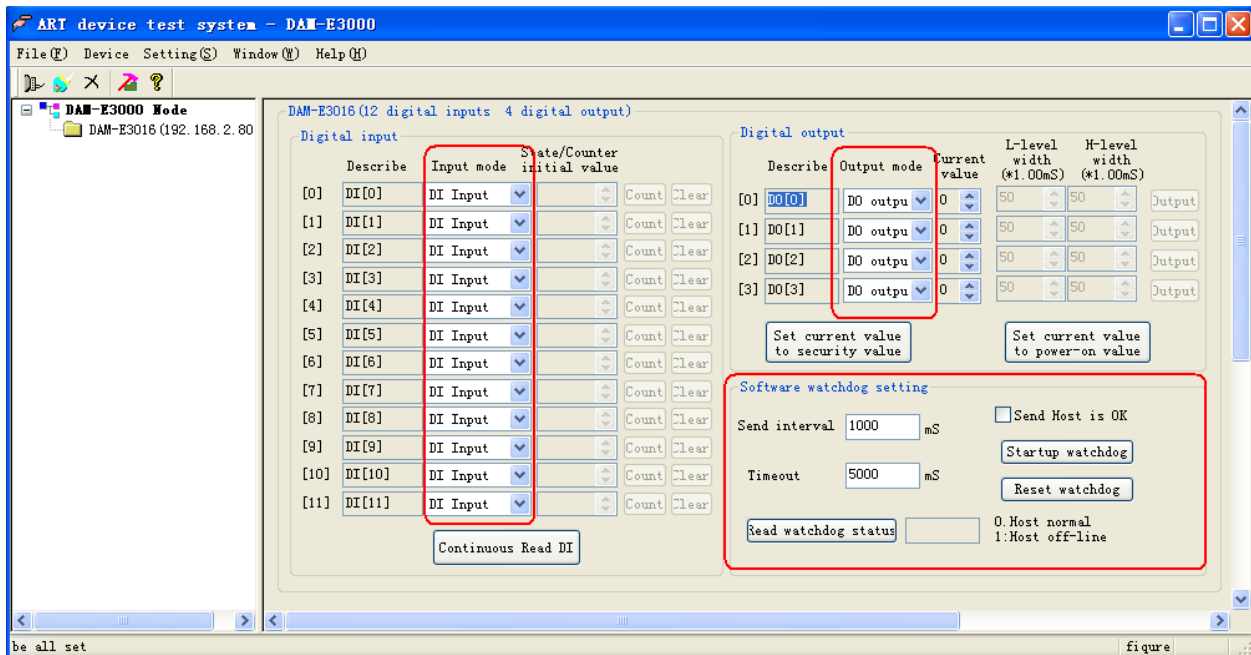
1. IP Address: 192.168.2.80
2. Subnet Mask: 255.255.255.0
3. Default Gateway: 192.168.2.1
4. TCP Port: 502
5. HTTP Port: 80

## Operation Interface

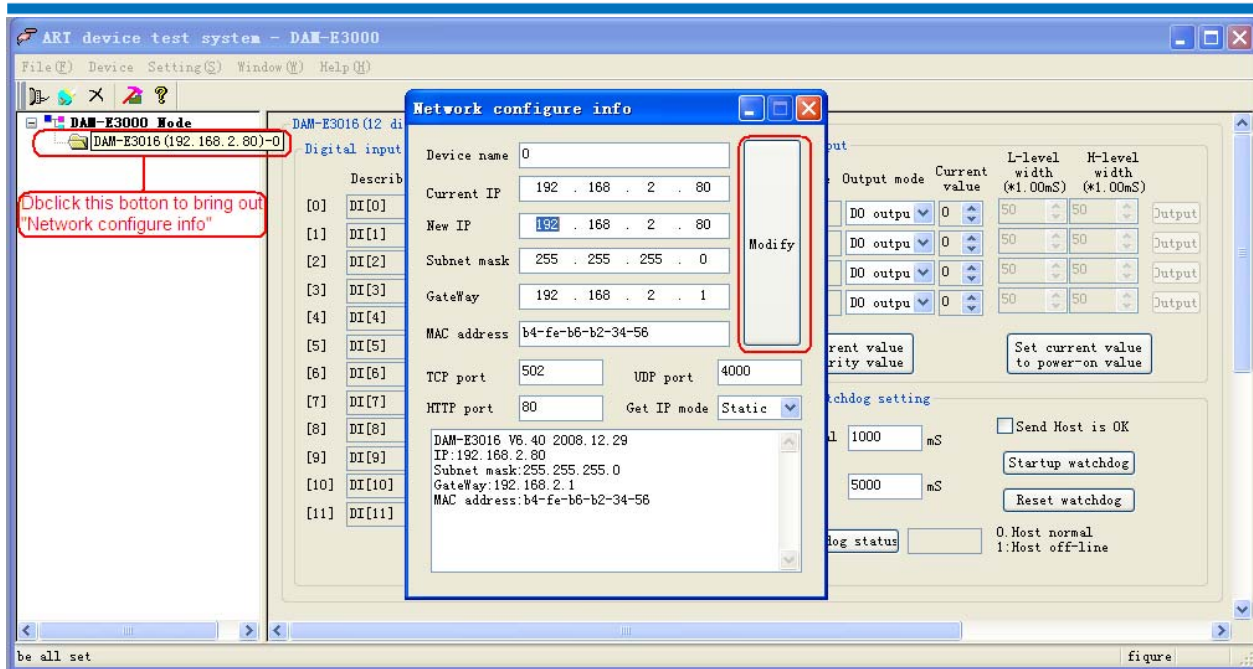
Click the “DAME3000” in “ART Data Acquisition Measurement Suite” to open the device test system of DAM-E3000 Modules.



Users can configure the parameters such as input mode, output mode, software watchdog and so on.



Double-clicking the “DAM-E3016: 192.168.2.80-0” in the system tree of left dialog block to get “Network configure info” box, in this box, we can set “IP” and “Device name” and “TCP port”.



## Communication Protocol

At present, Ethernet Distributed Acquisition Modules of our company use MODBUS TCP mode. Supported function code includes the following categories:

- 01 READ COIL STATUS
- 02 READ INPUT STATUS
- 03 READ HOLDING REGISTERS
- 04 READ INPUT REGISTERS
- 05 FORCE SINGLE COIL
- 06 PRESET SINGLE REGISTER
- 15 FORCE MULTIPLE COILS
- 16 FORCE MULTIPLE REGISTERS
- 20 READ FILE RECORD
- 21 WRITE FILE RECORD

## Address Mapping Table

### Read Relay Status

Function Code: 01

Description: Read the status of the output relay

**Data Description:**

Address	Description	Note
00001-00004	For Switch Output Current Status	4 Channels, 1 for H Level,0 for L level
Reservation		
00033-00036	For Switch Output Power-on Status	4 Channels, 1 for H Level,0 for L level
Reservation		
00065-00068	For Switch Output Safe Status	4 Channels, 1 for H Level,0 for L level
Reservation		

**Request**

Domain Name	Byte	Value
Function Code	1 byte	0×01
Start Address	2 bytes	0×0000 to 0×FFFF
Read Amount	2 bytes	1 to 2000(0×7D0)

**Response**

Domain Name	Byte	Value
Function Code	1 byte	0×01
Byte Count	1 bytes	N= (Read Amount+7)/8
Coil Status	n bytes	

**Exception**

Domain Name	Byte	Value
Function Code	1 byte	0×01+0×80
Error Code	1 byte	0×1 or 0×2

**Example**

Request		Response	
Domain Name	Data (hex)	Domain Name	Data (hex)
Function Code	01	Function Code	01
Start Address H (byte)	00	Byte Count	03
Start Address L (byte)	13	27(h)~05 status	CD
Read Amount H (byte)	00	35(h)~28 status	6B
Read Amount L (byte)	13	38(h)~36 status	05

**Read Switch Input**

Function Code: 02

Description : Read input switch status

**Data Description**

Address	Description	Note
10001-10012	For Switch Input Status	12 Channels, 0 for no power, 1 for power on
Reservation		
10033-10044	For Rising Edge Latched Status	12Channels, 0 for No Latch, 1 for Latch
Reservation		
10065-10076	For Falling Edge Latched Status	12Channels, 0 for No Latch, 1 for Latch
Reservation		

**Request**

Domain Name	Byte	Value
Function Code	1 byte	0×02
Start Address	2 bytes	0×0000 to 0×FFFF
Read Amount	2 bytes	1 to 2000 (0×7D0)

**Response**

Domain Name	Byte	Value
Function Code	1 byte	0×02
Byte Count	1 byte	N= (Read Amount+7)/8



Input Status	n bytes	
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**Exception**

Domain Name	Byte	Value
Function Code	1 byte	0×02+0×80
Error Code	1 byte	0×1 or 0×2

**Example**

Request		Response	
Domain Name	Data (hex)	Domain Name	Data (hex)
Function Code	02	Function Code	02
Start Address H (byte)	00	Byte Count	03
Start Address L (byte)	C4	204(h)~197 status	AC
Read Amount H (byte)	00	212(h)~205 status	DB
Read Amount L (byte)	16	218(h)~213 status	35

**Read Holding Register**

Function Code: 03

Note: Read the holding register value

**Data Description:**

Address	Description	Note
40001	For Ch01 Pulse Output L Level	16 bits
40002	For Ch01 Pulse Output H level	16 bits
40003	For Ch02 Pulse Output L Level	16 bits
40004	For Ch02 Pulse Output H level	16 bits
40005	For Ch03 Pulse Output L Level	16 bits
40006	For Ch03 Pulse Output H level	16 bits
40007	For Ch04 Pulse Output L Level	16 bits
40008	For Ch04 Pulse Output H level	16 bits
Reservation		
40065	For Ch01 Switch Pulse Count L	16 bits
40066	For Ch01 Switch Pulse Count H	16 bits
40067	For Ch02 Switch Pulse Count L	16 bits
40068	For Ch02 Switch Pulse Count H	16 bits
40069	For Ch03 Switch Pulse Count L	16 bits
40070	For Ch03 Switch Pulse Count H	16 bits
40071	For Ch04 Switch Pulse Count L	16 bits
40072	For Ch04 Switch Pulse Count H	16 bits
40073	For Ch05 Switch Pulse Count L	16 bits
40074	For Ch05 Switch Pulse Count H	16 bits
40075	For Ch06 Switch Pulse Count L	16 bits
40076	For Ch06 Switch Pulse Count H	16 bits
40077	For Ch07 Switch Pulse Count L	16 bits
40078	For Ch07 Switch Pulse Count H	16 bits
40079	For Ch08 Switch Pulse Count L	16 bits
40080	For Ch08 Switch Pulse Count H	16 bits

40081	For Ch09Switch Pulse Count L	16 bits
40082	For Ch09Switch Pulse Count H	16 bits
40083	For Ch10 Switch Pulse Count L	16 bits
40084	For Ch10 Switch Pulse Count H	16 bits
40085	For Ch11 Switch Pulse Count L	16 bits
40086	For Ch11 Switch Pulse Count H	16 bits
40087	For Ch12 Switch Pulse Count L	16 bits
40088	For Ch12 Switch Pulse Count H	16 bits
Reservation		
40129	For Pulse Output Enable Register	Set bit: Enabled; Space: Disabled
40130	For Input Latch Enable Register	Set bit: Enabled; Space: Disabled
40131	For Input Count Enable Register	Set bit: Enabled; Space: Disabled
40132	For Input Count Mode Register	Set bit: Rise; Space: Fall
Reservation		
40513	For Watchdog Control Register	bit0: 0 disabled, 1 enabled bit1: 0 normal, 1 overflow bit2: 0 normal, 1 reset
40514	For Watchdog Overflow Register	Watchdog Overtime Constant
40515	For Watchdog Reset Register	0x55AA
Reservation		

**Request**

Domain Name	Byte	Value
Function Code	1 byte	0×03
Start Address	2 bytes	0×0000 to 0×FFFF
Read Amount	2 bytes	1 to 125 (0×7D)

**Response**

Domain Name	Byte	Value
Function Code	1 byte	0×03
Byte Count	1 byte	2n
Input State	2n bytes	

**Exception**

Domain Name	Byte	Value
Function Code	1 byte	0×03+0×80
Error Code	1 byte	0×1 or 0×2

**Example**

Request		Response	
Domain Name	Data (hex)	Domain Name	Data (hex)
Function Code	03	Function Code	03
Start Address H (byte)	00	Byte Count	02
Start Address L (byte)	08	Holding Registers High	00
Read Amount H (byte)	00	Holding Register Low	0A
Read Amount L (byte)	01		

Note 1: The unit of the pulse output level width: millisecond

The unit of the watchdog timer length: millisecond

Note 2: When power on, the highest bit of the watchdog control register is 1, can be done to do determine whether the module is rested or not.

## Write Single Relay

Function Code: 05

### Request

Domain Name	Byte	Value
Function Code	1 byte	0×05
Set Address	2 bytes	0×0000 to 0×FFFF
Set Content	2 bytes	0x0000 or 0xFF00 0x0000 release relay 0xFF00 engage relay

### Response

Domain Name	Byte	Value
Function Code	1 byte	0x05
Set Address	2 bytes	0x0000 to 0xFFFF
Set Content	2 bytes	0x0000 or 0xFF00

### Exception

Domain Name	Byte	Value
Function Code	1 byte	0x05+0x80
Error Code	1 byte	0x1 or 0x2

### Example

Request		Response	
Domain Name	Data (hex)	Domain Name	Data (hex)
Function Code	05	Function Code	05
Set Address H (byte)	00	Set Address H (byte)	00
Set Address L (byte)	05	Set Address L (byte)	05
Set Content H (byte)	FF	Set Content H (byte)	FF
Set Content L (byte)	00	Set Content L (byte)	00

## Set Single Holding Register

Function Code: 06

### MODBUS Request

Domain Name	Byte	Value
Function Code	1 byte	0×06
Address Setting	2 bytes	0×0000 to 0×FFFF
Content Setting	2 bytes	0×0000 to 0×FFFF

### MODBUS Response

Domain Name	Byte	Value
Function Code	1 byte	0×06

Address Setting	2 bytes	0×0000 to 0×FFFF
Content Setting	2 bytes	0×0000 to 0×FFFF

**Exception**

Domain Name	Byte	Value
Function Code	1 byte	0×06+0×80
Error Code	1 byte	0×1 or 0×2

**Example**

Request		Response	
Domain Name	Data(hex)	Domain Name	Data(hex)
Function Code	06	Function Code	06
Set Address High (byte)	00	Set Address High (byte)	00
Set Address Low (byte)	08	Set Address Low (byte)	08
Set Content High (byte)	00	Set Content High (byte)	00
Set Content Low (byte)	19	Set Content Low (byte)	19

**Multiple Relay Setting**

Function Code: 0F

**Request**

Domain Name	Byte	Value
Function Code	1 byte	0×0F
Start Address Setting	2 bytes	0×0000 to 0×FFFF
Length Setting	2 bytes	0×0000 to 0×07B0
Byte count	1 byte	n
Set content	n bytes	

**Response**

Domain Name	Byte	Value
Function Code	1 byte	0×0F
Start Address Setting	2 bytes	0×0000 to 0×FFFF
Length Setting	2 bytes	0×0000 to 0×07B0

**Exception**

Domain Name	Byte	Value
Function Code	1 byte	0×0F+0×80
Error Code	1 byte	0×1 or 0×2

**Example**

Request		Response	
Domain Name	Data(hex)	Domain Name	Data(hex)
Function Code	0F	Function Code	0F
Set Address High (byte)	00	Set Address High (byte)	00
Set Address Low (byte)	13	Set Address Low (byte)	13
Set Amount High (byte)	00	Set Amount High (byte)	00
Set Amount Low (byte)	0A	Set Amount Low (byte)	0A
Byte count	02		

Set Content High (byte)	CD
Set Content Low (byte)	01

## Set Multiple Holding Registers

Function Code: 10

### Request

Domain Name	Byte	Value
Function Code	1 byte	0×10
Start Address Setting	2 bytes	0×0000 to 0×FFFF
Length Setting	2 bytes	0×0000 to 0×07B0
Byte count	1 byte	2n
Set content	2n bytes	

### Response

Domain Name	Byte	Value
Function Code	1 byte	0×10
Start Address Setting	2 bytes	0×0000 to 0×FFFF
Length Setting	2 bytes	0×0000 to 0×07B0

### Exception

Domain Name	Byte	Value
Function Code	1 byte	0×10+ 0×80
Error Code	1 byte	0×1 or 0×2

### Example

Request		Response	
Domain Name	Data(hex)	Domain Name	Data(hex)
Function Code	10	Function Code	10
Set Address High (byte)	00	Set Address High (byte)	00
Set Address Low (byte)	01	Set Address Low (byte)	01
Set Amount High(byte)	00	Set Amount High(byte)	00
Set Amount Low (byte)	02	Set Amount Low (byte)	02
Byte count	04		
Set Content High (byte)	00		
Set Content Low (byte)	0A		
Set Content High (byte)	01		
Set Content Low (byte)	02		

## Read File Record

Function Code: 14/06

Read file record: in MODBUS, file is considered to be 16-bit array, addressing according to address. Read file: set the start address and read length and change the Start Address and Read Length can traverse the entire file. The file does not have a name, it has number only. You can only read and write one file at one time.

### Request

Domain Name	Byte	Value
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Function Code	1 byte	0x14
Byte Count	1 byte	0x07 to 0xF5
Sub Function Code	1 byte	0x06
File Number	2 bytes	0x0000 to 0xFFFF
Record Number	2 bytes	0x0000 to 0x270F
Read Length	2 bytes	n
Sub Function Code	1 byte	0x06
.....	.....	

**Response**

Domain Name	Byte	Value
Function Code	1 byte	0x14
Byte Count	1 byte	0x07 to 0xF5
Sub Function Byte Count	1 byte	0x07 to 0xF5
Sub Function Code	1 byte	0x06
Data	2n bytes	

**Exception**

Domain Name	Byte	Value
Function Code	1 byte	0x14+ 0x80
Error Code	1 byte	0x1 or 0x2

**Example**

Request		Response	
Domain Name	Data(hex)	Domain Name	Data(hex)
Function Code	14	Function Code	14
Byte Count	07	Byte Count	06
Sub Function Code	06	Respond Count	05
File Number High (byte)	00	Sub Function Code	06
File Number Low(byte)	04	Record Data High(byte)	0D
Record Number High(byte)	00	Record Date Low(byte)	FE
Record Number Low(byte)	01	Record Data High(byte)	00
Read Length High(byte)	00	Record Date Low(byte)	20
Read Length Low(byte)	02		

**Write File Record**

Function Code: 15/06

**Request**

Domain Name	Byte	Value
Function Code	1 byte	0x15
Byte Count	1 byte	0x07 to 0xF5
Sub Function Code	1 byte	0x06
File Number	2 bytes	0x0000 to 0xFFFF
Record Number	2 bytes	0x0000 to 0x270F
Read Length	2 bytes	n

Data	2n bytes	
.....	.....	

**Response**

Domain Name	Byte	Value
Function Code	1 byte	0x15
Byte Count	1 byte	0x07 to 0xF5
Sub Function Code	1 byte	0x06
File Number	2 bytes	0x0000 to 0xFFFF
Record Number	2 bytes	0x0000 to 0x270F
Write Length	2 bytes	n
Data	2n bytes	

**Exception**

Domain Name	Byte	Value
Function Code	1 byte	0x15+ 0x80
Error Code	1 byte	0x1 or 0x2

**Example**

Request		Response	
Domain Name	Data(hex)	Domain Name	Data(hex)
Function Code	15	Function Code	15
Byte Count	0B	Byte Count	0B
Sub Function Code	06	Sub Function Code	06
File Number High (byte)	00	File Number High (byte)	00
File Number Low(byte)	04	File Number Low (byte)	04
Record Number High(byte)	00	Record Number High(byte)	00
Record Number Low(byte)	01	Record Number Low(byte)	01
Read Length High(byte)	00	Write Length High(byte)	00
Read Length Low(byte)	02	Write Length Low(byte)	02
Write Data	4 bytes	Write Data	4 bytes

**EEPROM Assignment**

```
//file 0
#define MODULE_NET_ADDR          0x0000
#define MODULE_VER_ADDR          0x0020
//file 1
#define NET_CONFIG_ADDR          0x0000
//file 2
#define DIG_POWER_ADDR           0x0000
#define DIG_SAFE_ADDR            0x0004
//file3 to file 7
.....
```

**Note:**

EEPROM is 8kbyte capacity, divide to 8 file blocks, every block 1kbyte.

1. MODULE\_NET\_ADDR

Restore to factory defaults network configuration parameter.

Byte	4	4	4	6
Content	IP Address	Default Gateway	Subnet Mask	MAC Address

2. MODULE\_VER\_ADDR

Module Version Information:

Byte	42byte		
Content	DAM-E3016	V6.20 2006.09.01	ID:DAME123456

3. NET\_CONFIG\_ADDR

Network configuration parameter, call table 1 for structures.

4. DIG\_POWER\_ADDR

Digital output power-on value, 2 bytes.

5. DIG\_SAFE\_ADDR

Digital output safe value, 2 bytes.