



# EIP-2000 EtherNet/IP Digital I/O Module User`s Manual

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# 1. Introduction

The EIP-2000 is an Industrial EtherNet/IP Remote I/O module series. It is equipped with the EtherNet/IP protocol, and allows daisy chain connections, making it possible to transfer data much faster during process control and other industrial automation applications. Daisy chain connectivity provides a more scalable system with fewer wires to help avoid interference common in factory settings. Otherwise, ICPDAS also provides Utility, It allows user to configure and test the ENIP module through Ethernet. The words “EIP-2000” and “EIP-2000 module” are stand for all kinds of EIP-2000 series modules, while the word “EIP-2\*\*\*\*” represents the specific module such as “EIP-2055”.

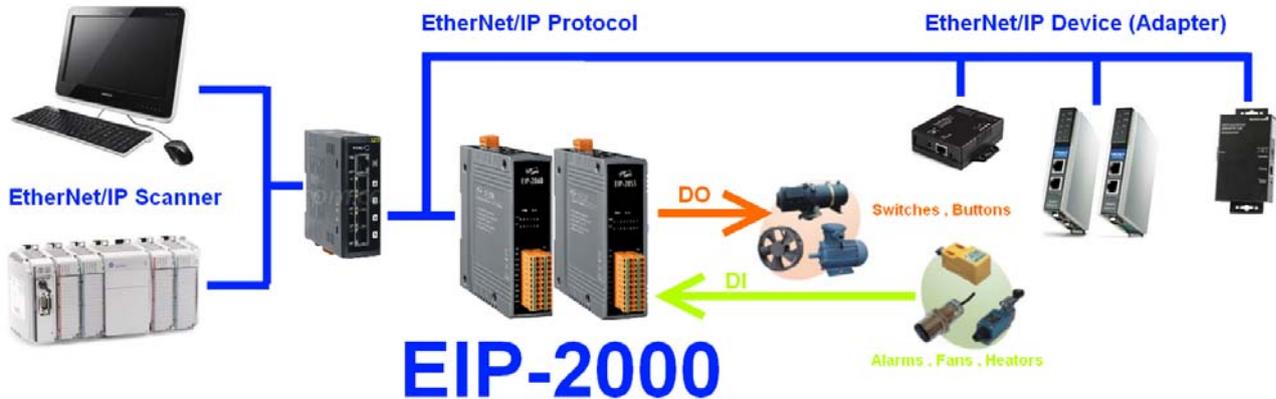


Figure1-1. EIP-2000 applications

## 1.1 Product Information

### 1.1.1 Features

#### General Features:

- Powerful 32-bit MCU handles efficient network traffic
- 10/100 Base-TX Ethernet, RJ-45 x 2
- (Auto-negotiating, auto MDI/MDIX, LED Indicators)
- Support ARP, TCP, UDP, ICMP, DHCP, BOOTP and TFTP protocols
- Support Daisy Chain connection
- Easy firmware update via Ethernet
- Removable terminal block connector
- RoHS compliant with Halogen-free

- LED display to indicate the I/O status
- Fire retardant materials (UL94-V0 Level)

**Built-in Multi-function I/O:**

- All Digital Output modules provide additional functions which can be configured by EIP-2000 Utility:

- ✚ **Power-On-Value. (EIP-2055 、 EIP-2060 、 EIP-2042)**

On boot up, DO status is set to the Power-On-Value for few seconds.

- ✚ **Safe-Value and Safe-Delay. (EIP-2055 、 EIP-2060 、 EIP-2042)**

If the EtherNet/IP connection disconnected, the DO status with remain the last status for certain seconds which is set by Safe Delay then set to Safe-Value.

- ✚ **All-in-one Module. (EIP-2055 、 EIP-2060)**

Various I/O components are mixed with multiple channels in a single module, which provides the most cost effective I/O usage and enhances performance of the I/O operations.

- All Digital Input modules provide additional functions:

- ✚ **DI counters. (EIP-2055 、 EIP-2060 、 EIP-2051)**

Every DI channels can be used as DI status and 32-bit low speed (5kHz) counters. The counts can be transferred or set zero by EtherNet/IP.

## 1.1.2 EIP-2000 Series Release Module

EIP-2000 series will provide a variety of digital and analog modules in the future. The module list is shown below.

Model	Description
EIP-2055	Isolated 8-channel Sink Type Open Collector Output and 8-channel DI EtherNet/IP Module
EIP-2060	Isolated 6-ch DI and 6-ch Relay Output EtherNet/IP module
EIP-2042	Isolated 16-channel Sink Type Open Collector Output EtherNet/IP module
EIP-2051	Isolated 16-channel DI EtherNet/IP Module

## 2. Hardware Information

### 2.1 System Specifications

#### 2.1.1 EIP-2055

<b>Digital Input</b>		
<b>Channels</b>	8	
<b>Input Type</b>	Dry Contact: Source, Wet Contact: Sink / Source	
<b>Dry Contact Level</b>	Off Voltage Level: Open On Voltage Level: Close to GND	
<b>Wet Contact Level</b>	Off Voltage Level: +4V max. On Voltage Level: +10 V ~ +50 V	
<b>Counters</b>	Channels	8
	Max. Counts	32-bit (4294967295)
	Max. Input Frequency	5KHz
<b>Photo-Isolation</b>	3750 VDC	
<b>Digital Output</b>		
<b>Channels</b>	8	
<b>Isolation Voltage</b>	3750 VDC	
<b>Type</b>	Open Collector	
<b>Sink/Source(NPN/PNP)</b>	Sink	
<b>Load Voltage</b>	+3.5 ~ +50 V	
<b>Max. Load Current</b>	700mA per channel	
<b>Communication Interface</b>		
<b>Connector</b>	10/100 Base-TX, 8-pin RJ-45 x 2 Support daisy chain connection.	
<b>Standard Supported</b>	IEEE 802.3 Ethernet/IP	
<b>Power</b>		
<b>Input Voltage Range</b>	10V ~ 30V	
<b>Power Consumption</b>	1.6W	
<b>Mechanism</b>		
<b>Installation</b>	DIN-Rail	
<b>Dimensions</b>	110mm x 90mm x 33mm (H x W x D)	
<b>Environment</b>		
<b>Operating Temperature</b>	-25°C ~ +75°C	
<b>Storage Temperature</b>	-30°C ~ +80°C	
<b>Humidity</b>	10% ~ 90%	

## 2.1.2 EIP-2060

<b>Digital Input</b>		
<b>Channels</b>	6	
<b>Input Type</b>	Dry Contact: Source, Wet Contact: Sink / Source	
<b>Dry Contact Level</b>	Off Voltage Level: Open On Voltage Level: Close to GND	
<b>Wet Contact Level</b>	Off Voltage Level: +4V max. On Voltage Level: +10 V ~ +50 V	
<b>Counters</b>	Channels	6
	Max. Counts	32-bit (4294967295)
	Max. Input Frequency	5KHz
<b>Photo-Isolation</b>	3750 VDC	
<b>Digital Output</b>		
<b>Channels</b>	6	
<b>Output Type</b>	Form A(SPST-NO)	
<b>Contact Rating(Resistive Load)</b>	5A 250VAC (47~63Hz)	
	5A 30 VDC	
<b>Operate Time</b>	10ms max.	
<b>Release Time</b>	5ms max.	
<b>Insulation Resistance</b>	1,000MΩs at 500 VDC	
<b>Dielectric Strength</b>	Between Contact and Open	1000VAC (1 min.)
	Between Coil and Contacts	3000VAC (1 min.)
<b>Endurance</b>	Mechanical	20,000,000 times min.
	Electrical	100,000 times min.
<b>Communication Interface</b>		
<b>Connector</b>	10/100 Base-TX, 8-pin RJ-45 x 2 Support daisy chain connection.	
<b>Standard Supported</b>	IEEE 802.3 Ethernet/IP	
<b>Power</b>		
<b>Input Voltage Range</b>	10V ~ 30V	
<b>Power Consumption</b>	1.6W	
<b>Mechanism</b>		
<b>Installation</b>	DIN-Rail	
<b>Dimensions</b>	110mm x 90mm x 33mm (H x W x D)	
<b>Environment</b>		
<b>Operating Temperature</b>	-25°C ~ +75°C	
<b>Storage Temperature</b>	-30°C ~ +80°C	
<b>Humidity</b>	10 ~ 90% RH, non-condensing	

## 2.1.3 EIP-2042

Digital Output	
Channels	16
Isolation Voltage	3750 VDC
Type	Open Collector
Sink/Source(NPN/PNP)	Sink
Load Voltage	+3.5 ~ +50 V
Max. Load Current	700mA per channel
Communication Interface	
Connector	10/100 Base-TX, 8-pin RJ-45 x 2 Support daisy chain connection.
Standard Supported	IEEE 802.3 Ethernet/IP
Power	
Input Voltage Range	10V ~ 30V
Power Consumption	1.6W
Mechanism	
Installation	DIN-Rail
Dimensions	110mm x 90mm x 33mm (H x W x D)
Environment	
Operating Temperature	-25°C ~ +75°C
Storage Temperature	-30°C ~ +80°C
Humidity	10% ~ 90%

## 2.1.4 EIP-2051

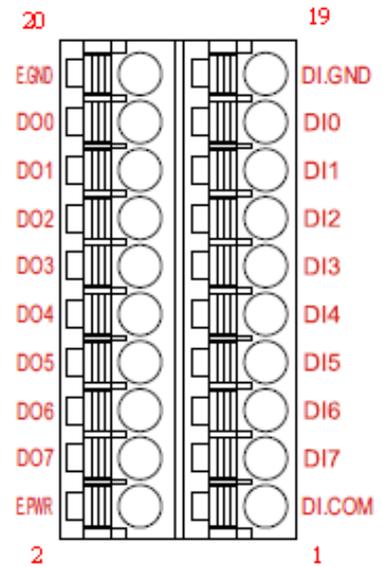
Digital Input		
Channels	16	
Input Type	Dry Contact: Source, Wet Contact: Sink / Source	
Dry Contact Level	Off Voltage Level: Open On Voltage Level: Close to GND	
Wet Contact Level	Off Voltage Level: +4V max. On Voltage Level: +10 V ~ +50 V	
Counters	Channels	16
	Max. Counts	32-bit (4294967295)
	Max. Input Freq.	5KHz
Photo-Isolation	3750 VDC	
Communication Interface		
Connector	10/100 Base-TX, 8-pin RJ-45 x 2 Support daisy chain connection.	
Standard Supported	IEEE 802.3 Ethernet/IP	
Power		
Input Voltage Range	10V ~ 30V	
Power Consumption	1.6W	

Mechanism	
Installation	DIN-Rail
Dimensions	110mm x 90mm x 33mm (H x W x D)
Environment	
Operating Temperature	-25°C ~ +75°C
Storage Temperature	-30°C ~ +80°C
Humidity	10% ~ 90%

## 2.2 I/O Specification

### 2.2.1 EIP-2055

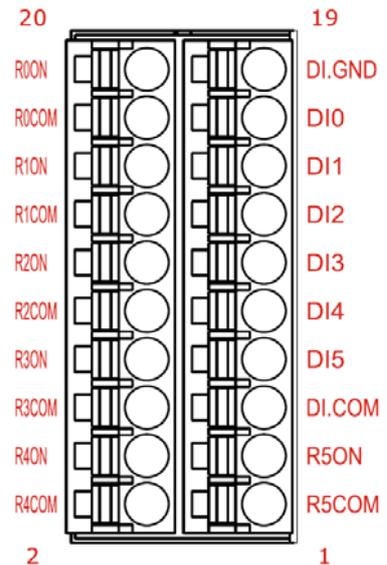
20-pin Spring-type terminal connector			
Pin	Description	Pin	Description
1	DI.COM	2	EXT.PWR
3	DI7	4	DO7
5	DI6	6	DO6
7	DI5	8	DO5
9	DI4	10	DO4
11	DI3	12	DO3
13	DI2	14	DO2
15	DI1	16	DO1
17	DI0	18	DO0
19	DI.GND	20	EXT.GND



Spring-type terminal connector

### 2.2.2 EIP-2060

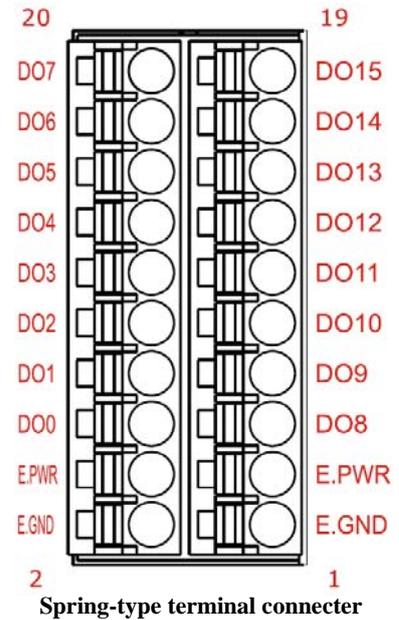
20-pin Spring-type terminal connector			
Pin	Description	Pin	Description
1	R5_COM	2	R4_COM
3	R5_ON	4	R4_ON
5	DI.COM	6	R3_COM
7	DI5	8	R3_ON
9	DI4	10	R2_COM
11	DI3	12	R2_ON
13	DI2	14	R1_COM
15	DI1	16	R1_ON
17	DI0	18	R0_COM
19	DI.GND	20	R0_ON



Spring-type terminal connector

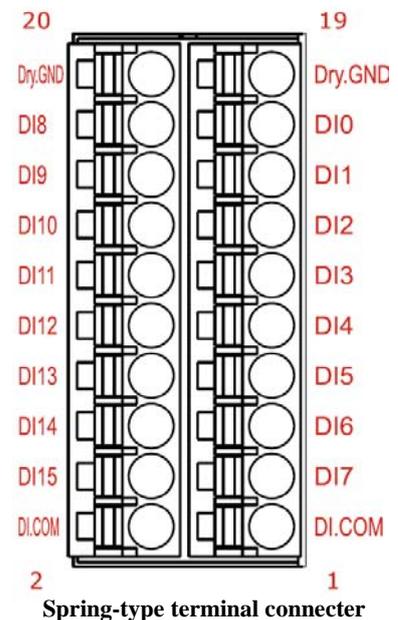
## 2.2.3 EIP-2042

20-pin Spring-type terminal connector			
Pin	Description	Pin	Description
1	EXT.GND	2	EXT.GND
3	EXT.PWR	4	EXT.PWR
5	DO8	6	DO0
7	DO9	8	DO1
9	DO10	10	DO2
11	DO11	12	DO3
13	DO12	14	DO4
15	DO13	16	DO5
17	DO14	18	DO6
19	DO15	20	DO7

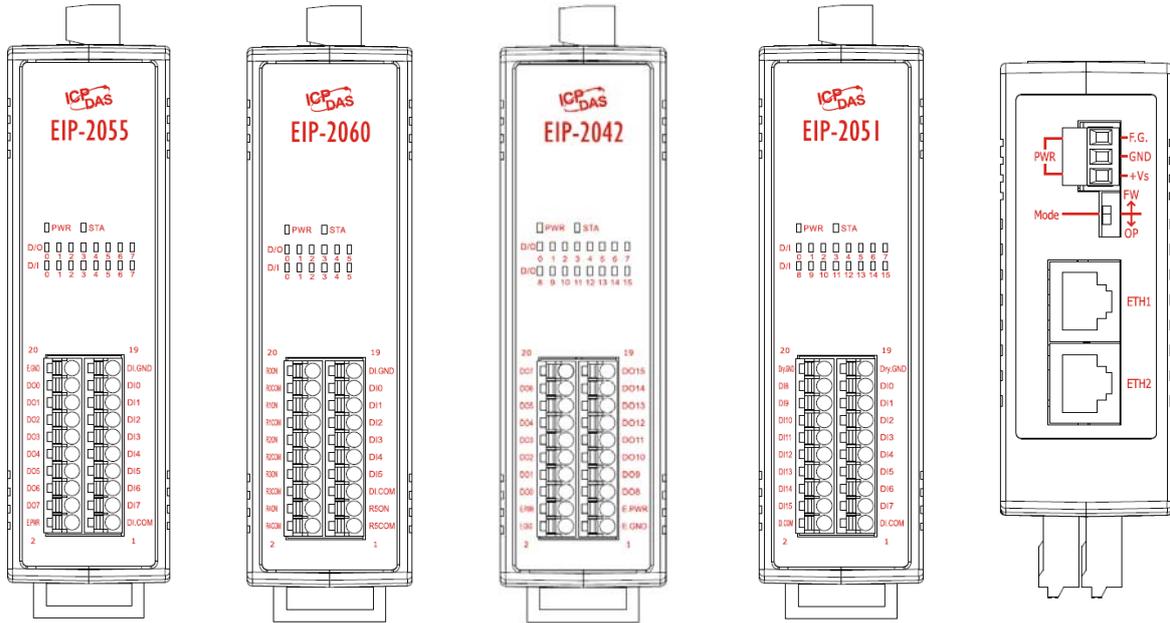


## 2.2.4 EIP-2051

20-pin Spring-type terminal connector			
Pin	Description	Pin	Description
1	DI.COM	2	DI.COM
3	DI7	4	DI15
5	DI6	6	DI14
7	DI5	8	DI13
9	DI4	10	DI12
11	DI3	12	DI11
13	DI2	14	DI10
15	DI1	16	DI9
17	DI0	18	DI8
19	Dry.GND	20	Dry.GND



# Front View



## Dual Ethernet RJ-45 Jack:

The EIP-2000 is equipped with two RJ-45 jacks for the 10/100 Base-TX Ethernet port and features networking capability. Two RJ-45 jacks of EIP-2000 have same functionality and designed to support “Daisy chain connection”. When the Ethernet link is detected and Ethernet packet is received, the Link/Act LED (Orange) indicator will be turned on.

## LED indicators:

There are three kinds of LED indicators on the EIP-2000. The behavior of LED indicators are shown below.

**Table2-1. EIP-2000 module LED indicator**

LED Indicator		
LED	LED Status	Description
Power LED	Always On	Module is in Run mode.
	Flashing	Module is in Init mode.
Status LED	Always On	EtherNet/IP connection is failed.
	Blink per second	EtherNet/IP connection is successful.
	Blink per 300 ms	EtherNet/IP disconnected during communication but still in Safe-Delay time.
	Blink per 100 ms	Module is about to reboot.
I/O status LED	On	The DI/DO is activated.
	Off	The DI/DO is inactivated.

For configuration of the **Power On Value**, **Safe Value**, **Safe Delay** for the EIP-2000. Please refer to section “4.2.2 Digital Settings”

## Operating Mode Selector:

FW Mode: Firmware update mode

OP Mode: Firmware running mode

Generally, the switch is always in the OP position while the EIP-2000 works. Only when updating the EIP-2000, the switch needs to be set to the FW position. Move the switch to the OP position and then re-power on the EIP-2000 after the update is completed.

**Table2-2. EIP-2000 module switch position**

Mode	Firmware Running	Flash Protection	Firmware Update	Configuration
FW	No	No	Yes	Not allowed
OP	Yse	Yes	No	Allowed

## 2.3 Wiring Connection

### 2.4.1 EIP-2055

Input	ON	OFF
Relay Contact (Dry)		
Open Collector (Dry)		
Relay Contact (Wet)		
NPN Output (Wet)		

Output	ON	OFF
Drive Relay		
Resistance Load		

## 2.4.2 EIP-2060

Input	ON	OFF
Relay Contact (Dry)		
Open Collector (Dry)		
Relay Contact (Wet)		
NPN Output (Wet)		

Output	ON	OFF
Relay		

## 2.4.3 EIP-2042

Output	ON	OFF
Drive Relay		
Resistance Load		

## 2.4.4 EIP-2051

Input	ON	OFF
Relay Contact (Dry)		
Open Collector (Dry)		
Relay Contact (Wet)		
NPN Output (Wet)		

## 2.4.5 Ethernet Connections

EIP-2000 can not only be directly connected to PC or EtherNet/IP scanner by Ethernet, but also be connected by daisy chain with other EIP-2000.

## 3. Setup and Test the EIP-2000 module

This chapter helps user to setup and test the EIP-2000 modules by EIP-2000 Utility, which is a supporting software used to configure and diagnose the EIP-2000 series modules.

### 3.1 Install the EIP-2000 Utility

The EIP-2000 Utility is supporting software designed for EIP-2000 Series. It can not only update or configure the EIP-2000 series modules, but also communicate with module by EtherNet/IP.

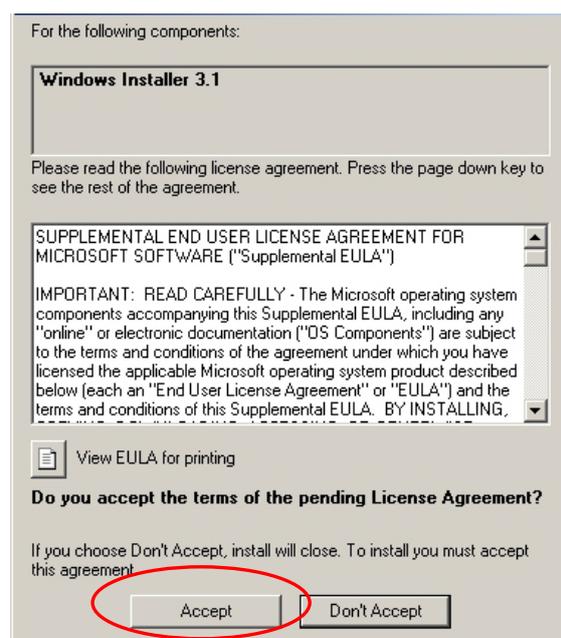
#### Step 1: Get the EIP-2000 Utility

The software is located at:

Fieldbus\_CD:\EtherNetIP\remote-io\EIP-2000\Utility

#### Step 2: Install .NET Framework 4 component

The EIP-2000 Utility tool requires the Windows Installer 3.1 and the .NET Framework 4 components. These components can be obtained from the web site.



### Step 3: Install Utility tool

After installing the “.Net Framework” components, please run the EIP-2000 Utility setup file.

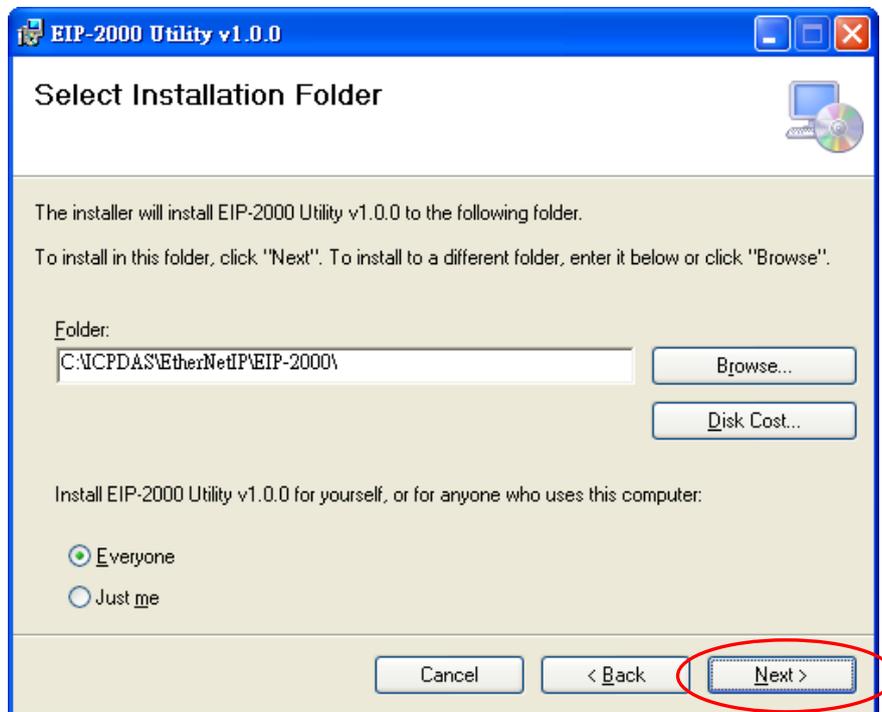


Figure3-1. To Select the installation path of the EIP-2000 Utility and click the “Next” button.

## 3.2 Setup the EIP-2000 module

### Step 1: Connect the power and host PC

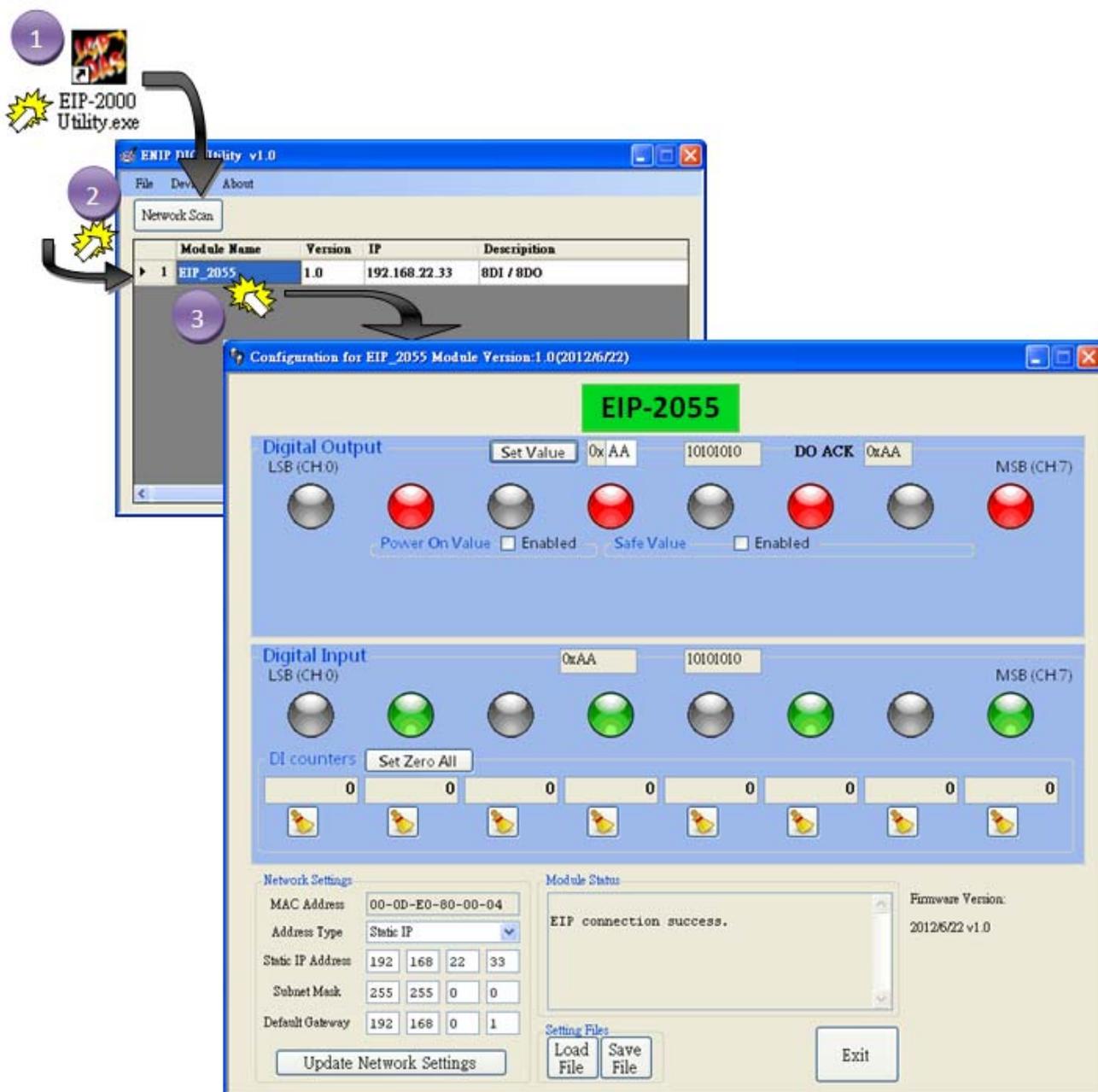
- (1) Make sure your PC is under the workable network configuration and environment.
- (2) First, disable or correctly configure the firewall of the Windows system and any anti-virus software. Or, some function of the EIP-2000 Utility may not work. (Contact your system administrator for more details about how to do this.)
- (3) Check **FW/OP switch** is on **OP position**. The **OP Mode** of EIP-2000 series modules support all of the functions except firmware update. Make sure the **Power LED** is always on.

## Step 2: Search and configure the EIP-2000 modules

- (1) Double click the EIP-2000 Utility shortcut on the desktop.
- (2) Click the “**Network Scan**” button to search your EIP-2000.
- (3) Select the item of the EIP-2000 and open the **Configuration Dialog** of the selected module.

EX: Click on the **EIP-2055** on the list can open the Configuration Dialog of **EIP-2055**.

If the module connects with PC properly, the EIP-2000 Utility will build the connection with the module through EtherNet/IP when opening the **Configuration Dialog**. In configuration dialog, user can modify the Network Setting and Digital output setting in this dialog.



### Figure3-2. the steps to configure EIP-2000 Utility

If the “Network Scan” cannot find the EIP-2000 module, switch the **FW/OP switch** to **FW position** and reboot the module.

In FW mode, the EIP-2000 is forced to the network configuration as following table. Connect the EIP-2000 with your computer at the same sub network or by using the same Ethernet switch. Afterwards, you can use the command “ping 192.168.255.1” in the Command Prompt window to test if the connection between the EIP-2000 and your computer is OK.

**Table3-1. EIP-2000 module default Ethernet settings**

Item	Settings
IP	192.168.255.1
Gateway	192.168.0.1
Mask	255.255.0.0

### Step 3: Test the EIP-2000

- (1) Double click the EIP-2000 Utility shortcut on the desktop.
- (2) Click the “**Network Scan**” button to search your EIP-2000.
- (3) Select the item of the EIP-2000 and open the **Configuration Dialog** of the selected module.
- (4) Click on the dark LED(●) or red led(●) icons inside the Digital Output panel to switch on/off the Digital Outputs of module. The dark green or light green icons inside the Digital Input panel indicate the status of the Digital inputs of the module. Make sure the System LED indicator is flashing.

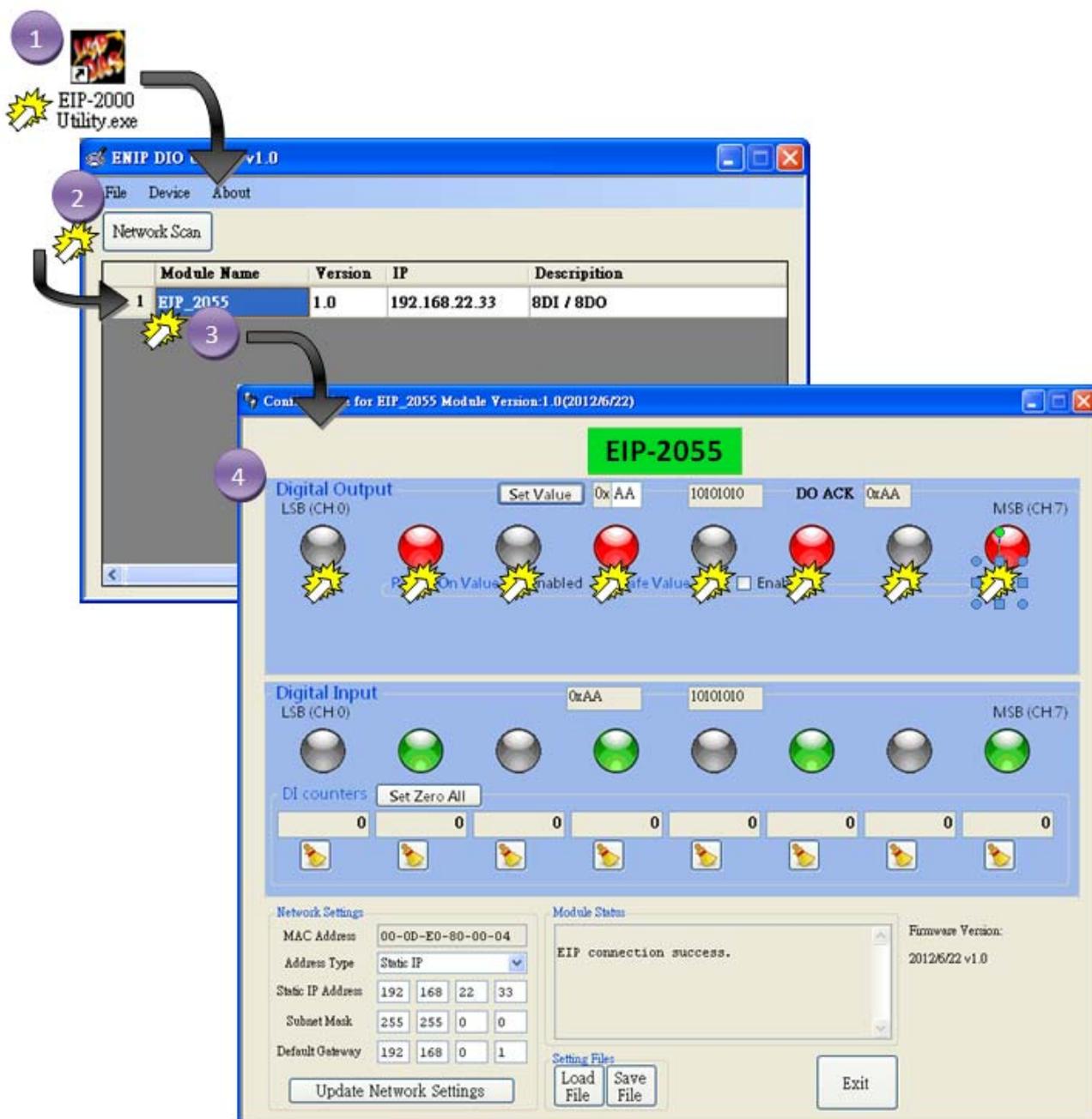


Figure3-3. the steps to test EIP-2000 Utility

## 4. EIP-2000 Utility Functionalities

### 4.1 Network Scan

- (1) Double click the EIP-2000 Utility shortcut on the desktop.
- (2) Click the “**Network Scan**” button to search your EIP-2000. Afterwards, you can see all of the EIP-2000 on the same network of your PC.

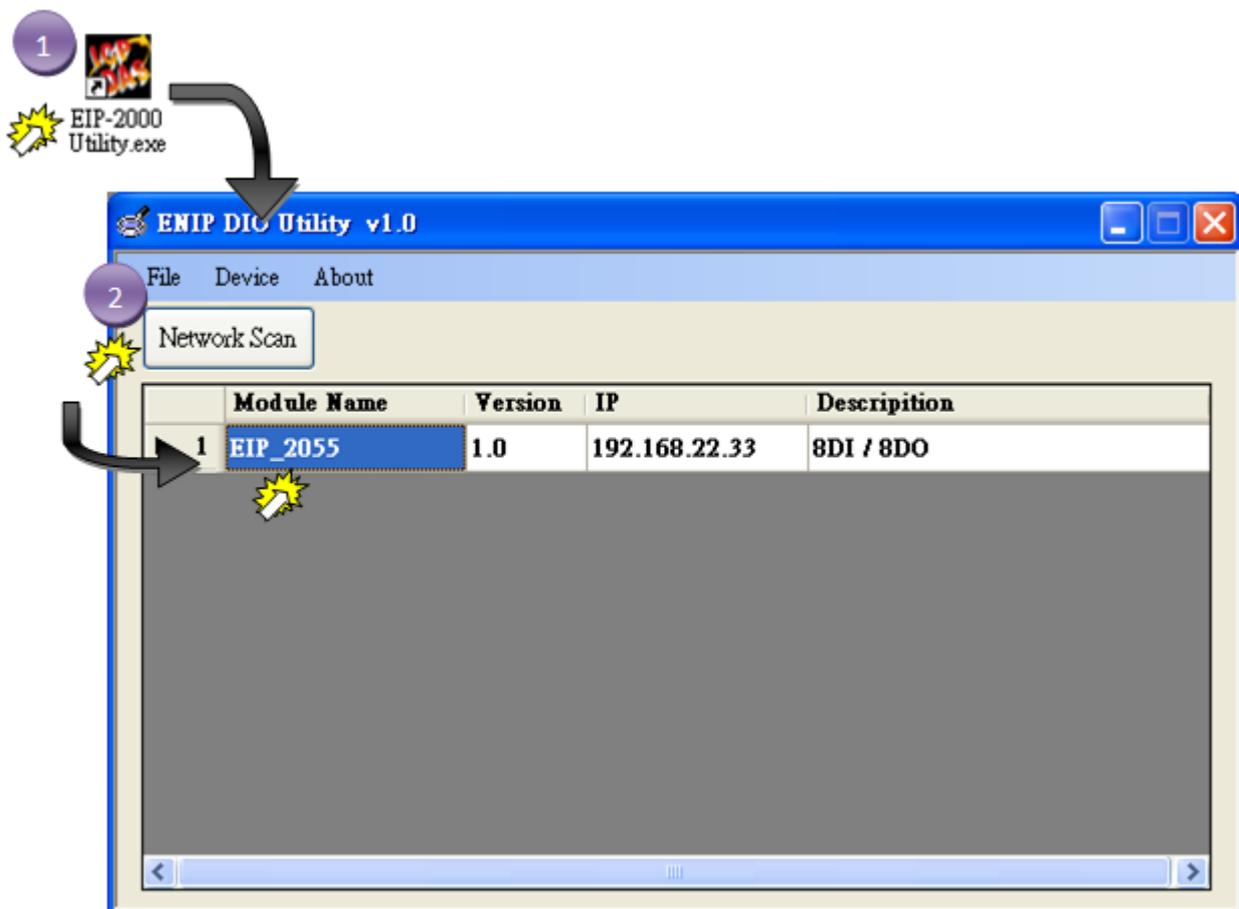


Figure4-1. the steps to scan EIP-2000 Utility

## 4.2 Module Configuration and Control

- (1) Double click the EIP-2000 Utility shortcut on the desktop.
- (2) Click the “**Network Scan**” button to search your EIP-2000.
- (3) Click the list item of the EIP-2000 to open the Configuration dialog.

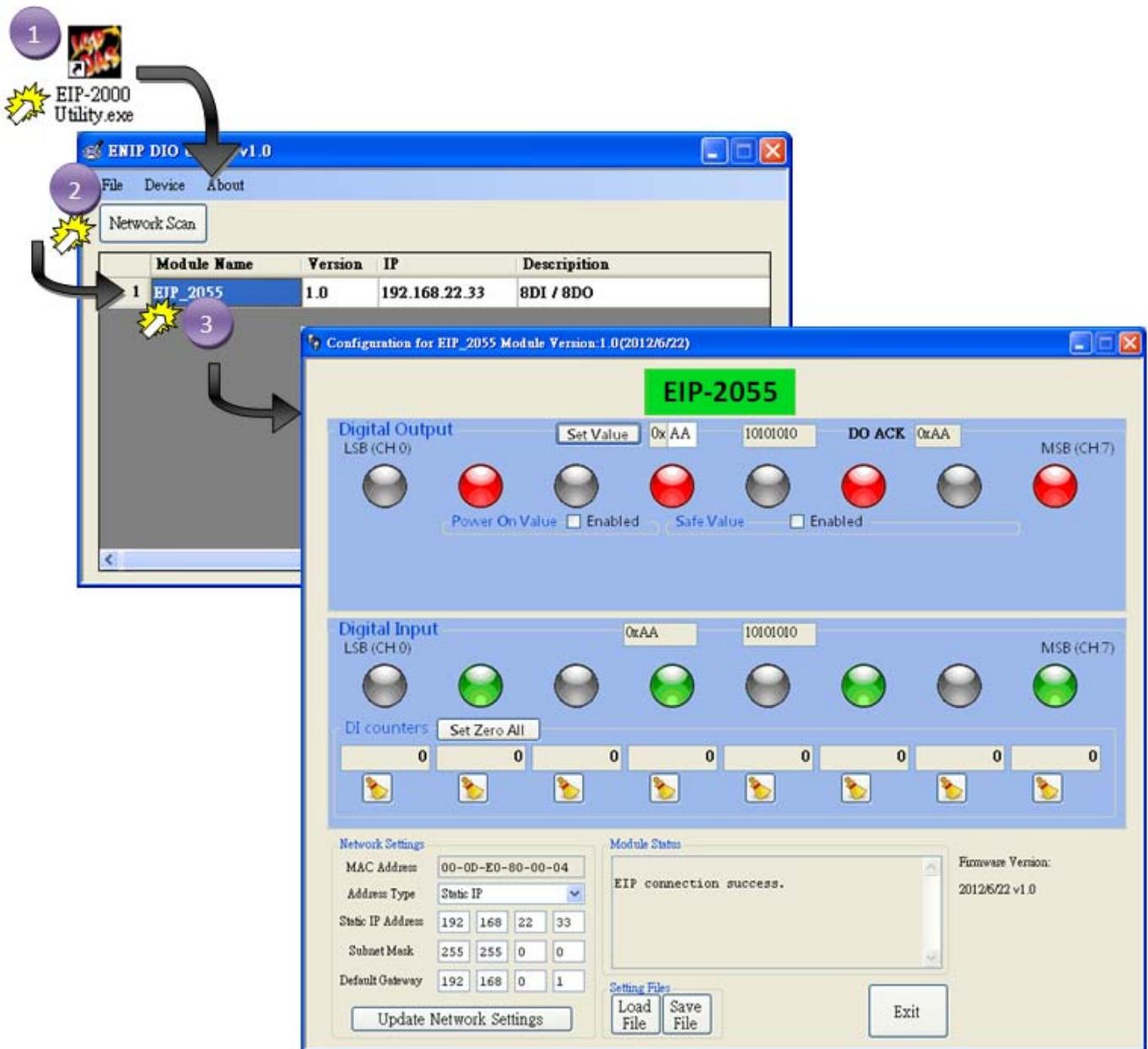


Figure4-2. the steps to open EIP-2000 Utility

**Table4-1. EIP-2000 Utility item descriptions**

<b>Item</b>	<b>Description</b>
<b>Network Settings</b>	For configuration of the Address Type, Static IP Address, Subnet Mask and Default Gateway of the EIP-2000 Please refer to section “ <b>4.2.1 Network Settings</b> ”
<b>Digital Output Settings</b>	For configuration of the <b>Power On Value</b> , <b>Safe Value</b> , and <b>Safe Delay</b> , of the EIP-2000. Please refer to section “4.2.2 Digital Output Settings”
<b>Digital Input Counters</b>	To calculate the DI status.
<b>Setting File Management</b>	For the setting files management of EIP-2000. Please refer to section “4.2.3 Setting File Management”

**Note!!**

**Network Setting will take effected after rebooting the system of the EIP-2000 module.**

## 4.2.1 Network Settings

The **Address Type**, **Static IP Address**, **Subnet Mask** and **Default Gateway** items are the most important network configuration and should always match the LAN definition of your PC. Or, the connection between the EIP-2000 and your PC may have problem. Contact your network administrator to obtain a proper network configuration for the EIP-2000.

**Table4-2.” Network Settings” item descriptions**

Item	Description
Address Type	<b>Static IP:</b> If you don't have a DHCP server in your network, configure the network settings manually. Please refer to the section “ <b>4.2.1.1 Manually Configuration</b> ”
	<b>DHCP:</b> Dynamic Host Configuration Protocol (DHCP) is a network application protocol that automatically assigns IP address to devices by the DHCP server. If there is no DHCP server in the network, the static IP must be used. Please refer to the section “ <b>4.2.1.2 Dynamic Configuration</b> ”
Static IP Address	Each EIP-2000 on the network must have a unique IP address. This field is used to assign an IP address for the EIP-2000.
Subnet Mask	The subnet mask defines which IP addresses of the network device are in the same sub-network.
Default Gateway	A gateway (or router) is a device that is used to build a connection between two sub-networks.
MAC Address	The MAC address of the EIP-2000.
Update Settings	Click this button to save the new settings to the EIP-2000.

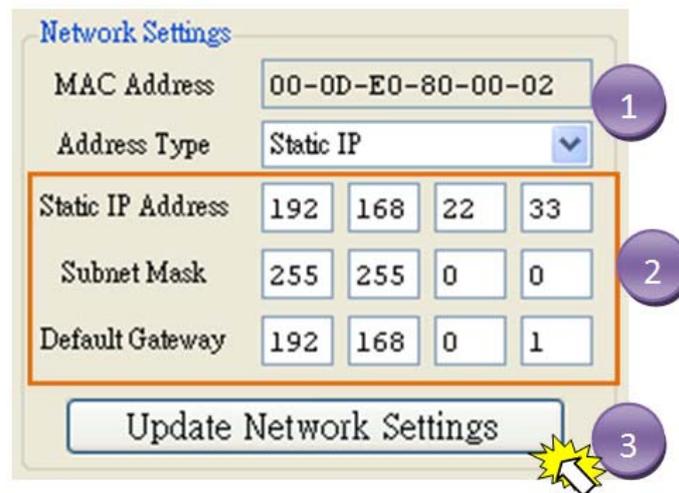
## Manually Configuration

In manually configuration, you have to assign all the network settings by yourself. The steps are shown below:

Step1: Select the “**Static IP**”.

Step2: Enter the **network settings**.

Step3: Click the “**Update Settings**” button to finish the configuration.



The screenshot shows a 'Network Settings' dialog box. The 'Address Type' dropdown is set to 'Static IP'. The 'Static IP Address' field is highlighted with a red box and contains the values 192, 168, 22, and 33. The 'Subnet Mask' field contains 255, 255, 0, and 0. The 'Default Gateway' field contains 192, 168, 0, and 1. The 'Update Network Settings' button is highlighted with a yellow starburst and a mouse cursor. Three numbered callouts (1, 2, 3) are present: 1 points to the 'Static IP' dropdown, 2 points to the IP address and subnet mask fields, and 3 points to the 'Update Network Settings' button.

MAC Address	00-0D-E0-80-00-02			
Address Type	Static IP			
Static IP Address	192	168	22	33
Subnet Mask	255	255	0	0
Default Gateway	192	168	0	1

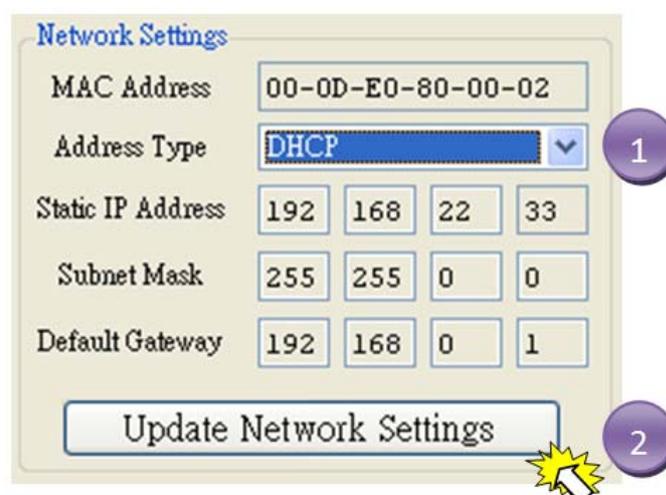
Update Network Settings

## Dynamic Configuration

The procedure of the dynamic configuration is very easy. If you have a DHCP server, network address can be configured dynamically by the following steps:

Step1: Select the “**DHCP**”.

Step2: Click the “**Update Settings**” button to finish the configuration.



The screenshot shows a 'Network Settings' dialog box. The 'Address Type' dropdown is set to 'DHCP'. The 'Static IP Address' field contains 192, 168, 22, and 33. The 'Subnet Mask' field contains 255, 255, 0, and 0. The 'Default Gateway' field contains 192, 168, 0, and 1. The 'Update Network Settings' button is highlighted with a yellow starburst and a mouse cursor. Two numbered callouts (1, 2) are present: 1 points to the 'DHCP' dropdown and 2 points to the 'Update Network Settings' button.

MAC Address	00-0D-E0-80-00-02			
Address Type	DHCP			
Static IP Address	192	168	22	33
Subnet Mask	255	255	0	0
Default Gateway	192	168	0	1

Update Network Settings

## 4.2.2 Digital Output Settings

There are three parameters in the Digital Output Settings dialog.

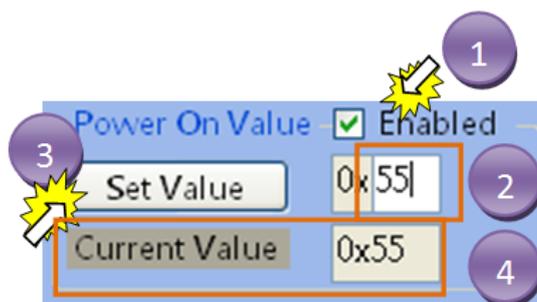


Table4-3. DIO settings item descriptions

Item	Description	Default
<b>Power On Value</b>	Set the Power On Value of EIP-2000.	0x00
<b>Safe Value</b>	Set the Safe Value of EIP-2000.	0x00
<b>Safe Delay</b>	Set the Safe Delay of EIP-2000.	3 second

### Power On Value

- Step1: Click the **Power On Value checkbox** to enable the Power On Value setting panel.
- Step2: Enter the “Power On Value” in the textbox. (0x00~0xFF)
- Step3: Click “**Set Value**” button to modify the “Power On Value” of the EIP-2000.
- Step4: Check if the “**Current Value**” shown below is correct.



### Note!!

If user clicks the checkbox to disable the Power On Value panel, the Power On Value will be set to 0x00.

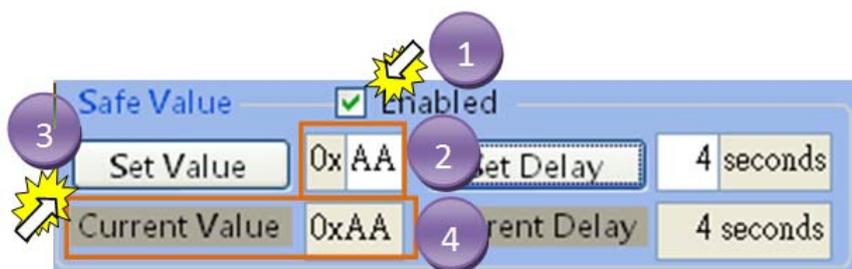
## Safe Value

Step1: Click the **Safe Value checkbox** to enable the Safe Value setting panel.

Step2: Enter the “Safe Value” in the textbox. (0x00~0xFF)

Step3: Click “**Set Value**” button to modify the “Safe Value” of the EIP-2000.

Step4: Check if the “**Current Value**” shown below is correct.



### Note!!

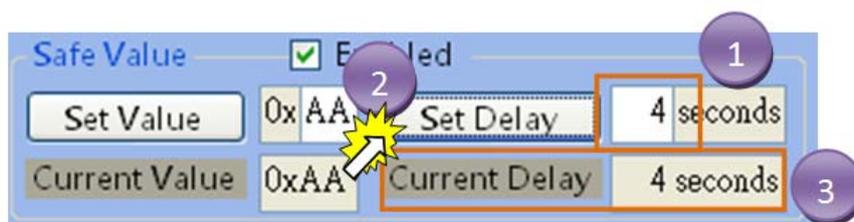
If user clicks the checkbox to disable the Power On Value panel, the Safe Value will be set to 0x00.

## Safe Delay

Step1: Enter the “Safe Delay” in the textbox. (3~255 second)

Step2: Click “**Set Value**” button to modify the “Safe Delay” of the EIP-2000.

Step3: Check if the “**Current Delay**” shown below is correct.



## Setting File Management



Table4-4. “Setting Files” item descriptions

Item	Description
<b>Load File</b>	Load the setting file to configure the parameters of EIP-2000.
<b>Save File</b>	Save the setting file of the current configuration of EIP-2000.

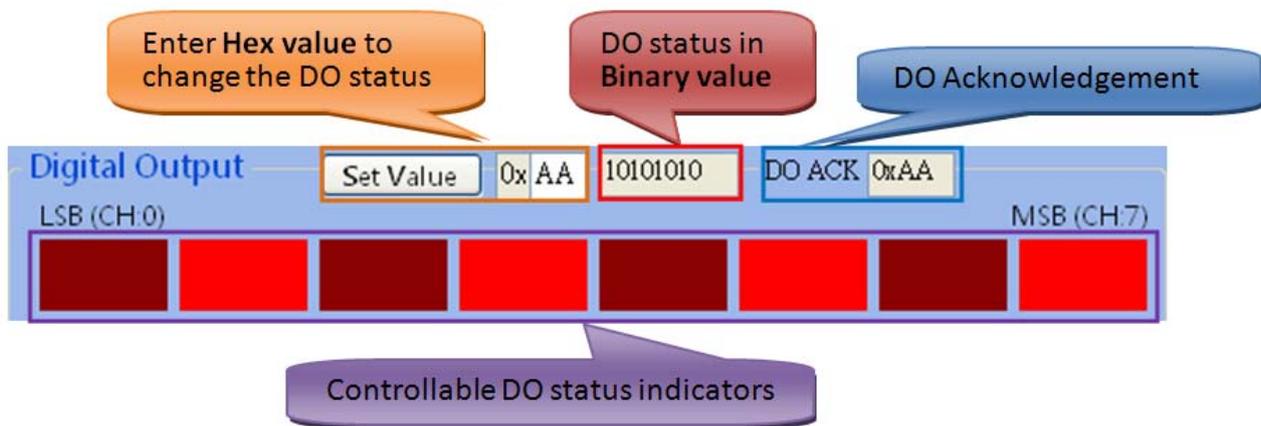
**Note!!**

Only setting files output from EIP-2000 Utility and matching dialog of the specific module can be loaded to configure the specific module.

Ex: The EIP-2055 can only configured by the setting files produced by EIP-2055 configuration dialog.

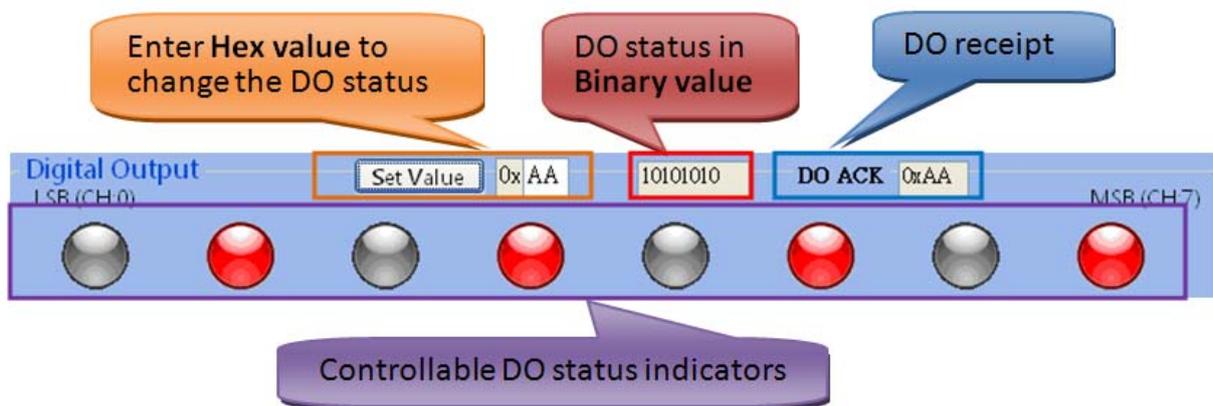
### 4.2.3 Digital Output

User can observe and control the DO status on the Digital Output Panel. Click on the green icons to change the status of the DO. The  icon indicates this digital output is at **low status**. Otherwise the  icons indicates the **high status** of digital output. User can also enter the total value of 8 DOs to control all the Dos at one time.



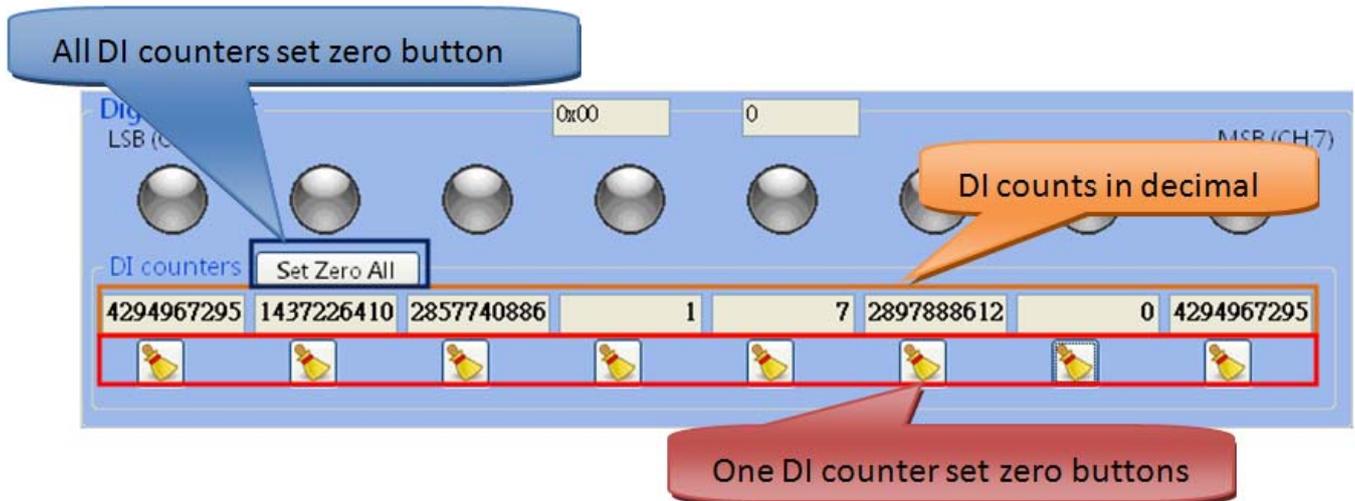
### 4.2.4 Digital Input

User can observe the DI status on the Digital Input Panel. The  icon indicates this digital input is at **low status**. Otherwise the  icons indicates the **high status**.



## 4.2.5 Digital Input Counters (If module support DI counter)

The labels under each DI led icons are their counters which indicate the count of the DI counters. The “Set Zero All” button can reset all of the DI counters at the same time, while the  button under each DI counter can reset just one DI counter.



## 4.3 Firmware Update

The EIP-2000 module supports firmware update through the Ethernet network with the BOOTP/TFTP protocol. Generally, the firmware is not necessary to update when it works well. If there are some bugs in the firmware of your EIP-2000 module or you need new released functions which did not support by your EIP-2000, the firmware update is necessary. If the firmware update procedure is broken unfortunately, please try it again.

Before updating the firmware, you have to set the “**FWSwitch**” to “**FW**” position and then re-power on the EIP-2000 module. Since the flash becomes writable, we can update the firmware through the Ethernet network.

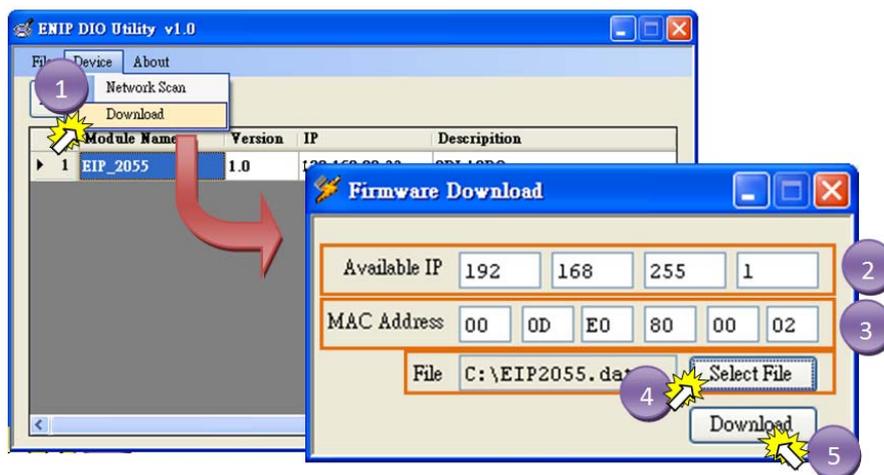


Mode	Firmware Running	Flash Protection	Firmware Update	Configuration
FW	No	No	Yes	Factory
OP	Yes	Yes	No	User-Defined

## Note!!

1. We'll configure the network settings of your PC. Or the update procedures through the Ethernet network may not work correctly.
2. The program (TFTP server) may not run correctly if there is another TFTP server running on the same PC.
3. The BOOTP and TFTP protocols use the Ethernet UDP port 67, 68 and 69. Please confirm that the firewall of the Windows system or anti-virus software can pass these UDP ports.

- Step1: Click the “**Download**” item to open the “Firmware Download” dialog.
- Step2: Enter an available IP address which will be temporarily assigned to the EIP-2000 module via the BOOTP protocol. After finishing the firmware update, this IP address is useless.
- Step3: The MAC address of the EIP-2000 module shall be filled in itself.
- Step4: Select the firmware which will be updated.
- Step5: Click the “**Download**” button to start the update procedure.



### Available IP:

This parameter is an available IP address on the Ethernet network. During the update procedure, the EIP-2000 will use this IP address. You can also assign the IP address which is used in the OP mode of the EIP-2000. Contact your network administrator for more information about an available IP address.

### MAC Address:

This parameter is the MAC address of the EIP-2000. You can get it from the Utility tool or use “ARP” after “ping” the module. The MAC Address shall be filled in itself when opening the “Firmware Download” dialog.

Please refer to section “4.2.1 Network Settings”

**Select File:**

The folder path of the new firmware can't include the character " "(the space character). Or the update procedure may be broken.

**Note!!**

**The folder path should not include Chinese or other unrecognizable characters. And we suggest user to use short folder path to make the update procedure working properly.**

## 5. R/W I/O data from EtherNet/IP

Since the EIP-2000 provides the functions of an EtherNet/IP adapter with digital I/O data information, there are some mechanisms for data-exchanging between EtherNet/IP objects and the digital I/O data registers. This section describes some parameters for users to setup their EtherNet/IP scanners to connect with EIP-2000 via EtherNet/IP.

### 5.1 Communication

We suggest users using Implicit Message communicate with EIP-2000. Implicit Messages are applied only for accessing the Input Instance 65<sub>hex</sub> (101) and Output Instance 66<sub>hex</sub> (102) of the Assembly Object in the object model. Before using Implicit Messages, you must use the Forward Open service with correct “Instance ID” and “Data length” settings of the Connection Manager Object to build a connection between the EtherNet/IP scanner and the EIP-2000. Afterwards, the Implicit Message can be used. The “Instance ID” of EIP-2000 modules are shown below, but the “Data length” is different from modules.

**Table 5-1. Instance ID table of EIP-2000**

Implicit Message Information of EIP-2000		
Instance	Instance ID	Data length
<b>Input(T-&gt;O)</b>	65 <sub>hex</sub> (101)	Depends on modules.
<b>Out(O-&gt;T)</b>	66 <sub>hex</sub> (102)	Depends on modules.
<b>Configuration</b>	64 <sub>hex</sub> (100)	

### 5.2 Data Assembly

If the connection built successfully, the EtherNet/IP scanner will communicate the I/O data with the EIP-2000 continuously. The input data get from the EIP-2000 are the digital input received by the EIP-2000, and the output data send to the EIP-2000 can control the digital output of the EIP-2000. Each module of the EIP-2000 has some difference of the data assembly.

## 5.2.1 EIP-2055

**Table 5-2. Data Assembly of EIP-2055**

Data Assembly	Byte count	Description
<b>Input Assembly</b>	34	1 <sup>st</sup> Byte: DI status
		2 <sup>nd</sup> Byte: DO status read back
		3 <sup>rd</sup> ~34 <sup>th</sup> Byte: DI counters
<b>Output Assembly</b>	2	1 <sup>st</sup> Byte: DO status
		2 <sup>nd</sup> Byte: to set DI counters zero

### Input Assembly

Input data is the data collected from the EIP-2055.

- The 1<sup>st</sup> byte of input data indicates the status of DI0~DI7. For example, the value 0x11 means DI0 and DI4 are activated while the others are not.
- The 2<sup>nd</sup> byte of input data is the **Receipt** of the DO. The **DO Receipt** indicates the DO status set by EtherNet/IP scanner. User can confirm if their control is success. Note that it cannot be regarded as the DO status actually output by the EIP-2055 if there is some unexpected problem of hardware.
- The 3<sup>rd</sup> ~ 34<sup>th</sup> bytes indicate the counters of 8 DIs. Each DI counter have 4 bytes to transmit the count. That means the maximum number the count is 4,294,967,295. The byte order of the counters are low to high in default.
- User can can the byte order in the EIP-2000 Utility.

For example:

Byte No.	2	3	4	5
<b>Data</b>	0x30	0x40	0x50	0x60
<b>Represent</b>				
<b>DI0 counter = 60504030<sub>hex</sub> = 1615872048<sub>dec</sub></b>				

Byte No.	14	15	16	17
<b>Data</b>	0x01	0x02	0x00	0x00
<b>Represent</b>				
<b>DI3 counter = 201<sub>hex</sub> = 513<sub>dec</sub></b>				

The relationship between byte number and the DI counters are shown below:

DI Counter	Byte Number
0	5,4,3,2
1	9,8,7,6
2	13,12,11,10
3	17,16,15,14
4	21,20,19,18
5	25,24,23,22
6	29,28,27,26
7	33,32,31,30

## Output Assembly

Output data is the data sent to the EIP-2055.

- The 1<sup>st</sup> byte of output data is DO status. DO status indicates the status of DO0~DO7. For example, the value 0x11 means DO0 and DO4 are activated while the others are not.
- The 2<sup>nd</sup> byte of output data is DI counter zero controller. User can zero the specific DI counter by enable the relative bit.

For example:

DI counter data	Description
<b>0xff=11111111<sub>bin</sub></b>	All DI counter set zero.
<b>0x55=1010101<sub>bin</sub></b>	DI0, DI2,DI4,DI6 counters set zero.
<b>0xAA=10101010<sub>bin</sub></b>	DI1, DI3,DI5,DI7 counters set zero.

## 5.2.2 EIP-2060

**Table 5-3. Data Assembly of EIP-2060**

Data Assembly	Byte count	Description
<b>Input Assembly</b>	26	1 <sup>st</sup> Byte: DI status
		2 <sup>nd</sup> Byte: DO status read back
		3 <sup>rd</sup> ~26 <sup>th</sup> Byte: DI counters
<b>Output Assembly</b>	2	1 <sup>st</sup> Byte: DO status
		2 <sup>nd</sup> Byte: to set DI counters zero

### Input Assembly

Input data is the data collected from the EIP-2060.

- The 1<sup>st</sup> byte of input data indicates the status of DI0~DI5. For example, the value 0x11 means DI0 and DI4 are activated while the others are not.
- The 2<sup>nd</sup> byte of input data is the **Receipt** of the DO. The **DO Receipt** indicates the DO status set by EtherNet/IP scanner. User can confirm if their control is success. Note that it cannot be regarded as the DO status actually output by the EIP-2055 if there is some unexpected problem of hardware.
- The 3<sup>rd</sup> ~ 26<sup>th</sup> bytes indicate the counters of 6 DIs. Each DI counter have 4 bytes to transmit the count. That means the maximum number the count is 4,294,967,295. The byte order of the counter is low to high.
- User can can the byte order in the EIP-2000 Utility.

For example: If the Byte order is low to high.

Byte No.	2	3	4	5
<b>Data</b>	0x30	0x40	0x50	0x60
<b>Represent</b>				
<b>DI0 counter = 60504030<sub>hex</sub> = 1615872048<sub>dec</sub></b>				

Byte No.	14	15	16	17
<b>Data</b>	0x01	0x02	0x00	0x00
<b>Represent</b>				
<b>DI3 counter = 201<sub>hex</sub> = 513<sub>dec</sub></b>				

The relationship between byte number and the DI counters are shown below:

DI Counter	Byte Number
0	5,4,3,2
1	9,8,7,6
2	13,12,11,10
3	17,16,15,14
4	21,20,19,18
5	25,24,23,22

## Output Assembly

Output data is the data sent to the EIP-2060.

- The 1<sup>st</sup> byte of output data is DO status. DO status indicates the status of DO0~DO5. For example, the value 0x11 means DO0 and DO4 are activated while the others are not.
- The 2<sup>nd</sup> byte of output data is DI counter zero controller. User can zero the specific DI counter by enable the relative bit.

## 5.2.5 EIP-2042

**Table 5-4. Data Assembly of EIP-2042**

Data Assembly	Byte count	Description
<b>Input Assembly</b>	2	1 <sup>st</sup> Byte: DO status read back (DO0~DO7).
		2 <sup>nd</sup> Byte: DO status read back (DO8~DO15).
<b>Output Assembly</b>	2	1 <sup>st</sup> Byte: DO status(DO0~DO7).
		2 <sup>nd</sup> Byte:DO status(DO8~DO15).

## Input Assembly

Input data is the data collected from the EIP-2042.

- The 1<sup>st</sup> ~2<sup>nd</sup> byte of input data is the **Receipt** of the DO. The **DO Receipt** indicates the DO status set by EtherNet/IP scanner. User can confirm if their control is success. Note that it cannot be regarded as the DO status actually output by the EIP-2042 if there is some unexpected problem of hardware.

## Output Assembly

Output data is the data sent to the EIP-2042.

- The 1<sup>st</sup> byte of output data is DO status. DO status indicates the status of DO0~DO7. For example, the value 0x11 means DO0 and DO4 are activated while the others are not.
- The 2<sup>nd</sup> byte of output data is DO status. DO status indicates the status of DO8~DO15.

## 5.2.6 EIP-2051

**Table 5-5. Data Assembly of EIP-2051**

Data Assembly	Byte count	Description
Input Assembly	66	1 <sup>st</sup> Byte: DI status(DI0~DI7).
		2 <sup>nd</sup> Byte: DI status(DI8~DI15).
		3 <sup>rd</sup> ~65 <sup>th</sup> Byte: DI counters.
Output Assembly	2	1 <sup>st</sup> Byte: to set DI counters zero (DI0~DI7).
		2 <sup>nd</sup> Byte: to set DI counters zero (DI8~DI15).

## Input Assembly

Input data is the data collected from the EIP-2051.

- The 1<sup>st</sup> byte of input data indicates the status of DI0~DI7. For example, the value 0x11 means DI0 and DI4 are activated while the others are not.
- The 2<sup>nd</sup> byte of input data indicates the status of DI8~DI15.
- The 3<sup>rd</sup> ~ 65<sup>th</sup> bytes indicate the counters of 16 DIs. Each DI counter have 4 bytes to transmit the count. That means the maximum number the count is 4,294,967,295. The byte order of the counters are low to high in default.
- User can can the byte order in the EIP-2000 Utility.

For example:

Byte No.	2	3	4	5
Data	0x30	0x40	0x50	0x60
<b>Represent</b>				
<b>DI0 counter = 60504030<sub>hex</sub> = 1615872048<sub>dec</sub></b>				

<b>Byte No.</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>
<b>Data</b>	0x01	0x02	0x00	0x00
<b>Represent</b>				
<b>DI3 counter = 201<sub>hex</sub> = 513<sub>dec</sub></b>				

The relationship between byte number and the DI counters are shown below:

<b>DI Counter</b>	<b>Byte Number</b>
<b>0</b>	5,4,3,2
<b>1</b>	9,8,7,6
<b>2</b>	13,12,11,10
<b>3</b>	17,16,15,14
<b>4</b>	21,20,19,18
<b>5</b>	25,24,23,22
<b>6</b>	29,28,27,26
<b>7</b>	33,32,31,30

## Output Assembly

Output data is the data sent to the EIP-2051.

- The 1<sup>st</sup> byte of output data is DI counter zero controller(DI8~DI15). User can zero the specific DI counter by enable the relative bit.
- The 2<sup>nd</sup> byte of output data is DI counter zero controller(DI0~DI7). User can zero the specific DI counter by enable the relative bit.

For example:

<b>DI counter data</b>	<b>Description</b>
<b>0xff=11111111<sub>bin</sub></b>	All DI counter set zero.
<b>0x55=1010101<sub>bin</sub></b>	DI0, DI2,DI4,DI6 counters set zero.
<b>0xAA=10101010<sub>bin</sub></b>	DI1, DI3,DI5,DI7 counters set zero.

### Note!!

**If the DI counter zero control stay 1, the DI counter is always 0. So user has to set zero the DI counter zero control after zero the DI counters.**

## 6. Appendix A: Glossary

### ARP (Address Resolution Protocol)

Consider two machines A and B that share a physical network. Each has an assigned IP address  $IP_A$  and  $IP_B$ , and a MAC address the  $MAC_A$  and  $MAC_B$ . The goal is to devise low-level software that hides MAC addresses and allows higher-level programs to work only with the IP addresses. Ultimately, however, communication must be carried out by the physical networks using whatever MAC address scheme the hardware supplies.

Suppose machine A wants to send a packet to machine B across a physical network to which they are both attached, but A only has the Internet address for B,  $IP_B$ . The question arises: how does A map that address to the MAC address for B,  $MAC_B$ ?

ARP provides a method of dynamically mapping 32-bit IP address to the corresponding 48-bit MAC address. The term dynamic is used since it happens automatically and is normally not a concern for either the application user or the system administrator.

### Clients and Servers

The client-server paradigm uses the direction of initiation to categorize whether a program is a client or server. In general, an application program that initiates peer to peer communication is called a client. End users usually invoke client programs when they use network services.

Most client programs consist of conventional application program develop tools. Each time a client program is executed; it contacts a server, sends a request and waits for a response. When the response arrives, the client program continues processing. Client programs are often easier to develop than servers, and usually require no special system privileges to operate.

By comparison, a server is any program that waits for incoming requests from a client program. The server receives a request from a client, performs the necessary computation and returns the result to the client.

## **Ethernet**

The term Ethernet generally refers to a standard published in 1982 by Digital Equipment Corp., Intel Corp. and Xerox Corp. Ethernet is the most popular physical layer local area network (LAN) technology today. Ethernet is a best-effort delivery system that uses CSMA/CD technology. It recognizes hosts using 48-bit MAC address.

## **Firmware**

Firmware is an alterable program located or stored in the semi-permanent storage area, e.g., ROM, EEPROM, or Flash memory.

## **ICMP (Internet Control Messages Protocol)**

No system works correctly all the time. ICMP provides a method of communicating between the Internet Protocol software on one machine and the Internet Protocol software on another. It allows gateways to send error or control messages to other gateways or allows a host to know what is wrong with the network communication.

## **Internet**

Physically, the Internet is a collection of packet switching networks interconnected by gateways along with TCP/IP protocol that allows them to perform logically as a single, large and virtual network. The Internet recognizes hosts using 32-bit IP address.

## **IP (Internet Protocol) address**

Every interface on an Internet must have a unique IP address (also called an Internet address). These addresses are 32-bit numbers. They are normally written as four decimal numbers, one for each byte of the address such as “192.168.41.1”. This is called dotted-decimal notation.

## MAC (Media Access Control) address

To allow a computer to determine which packets are meant for it, each computer attached to an Ethernet is assigned a 48-bit integer known as its MAC address (also called an Ethernet address, hardware address or physical address). They are normally written as eight hexadecimal numbers such as “00:71:88:af:12:3e:0f:01”. Ethernet hardware manufacturers purchase blocks of MAC addresses and assign them in sequence as they manufacture the Ethernet interface hardware. Thus, no two hardware interfaces have the same MAC address.

## Packet

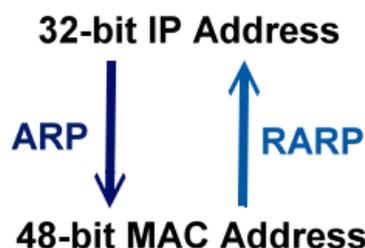
A packet is the unit of data sent across a physical network. It consists of a series of bits containing data and control information, including the source and the destination node (host) address, and is formatted for transmission from one node to another.

## Ping

Ping sends an ICMP echo request message to a host, expecting an ICMP echo reply to be returned. Normally, if a host cannot be pinged, you won't be able to use Telnet or FTP to connect to the host. Conversely, if Telnet or FTP cannot be used to connect to a host, Ping is often the starting point to determine what the problem is.

## RARP (Reverse Address Resolution Protocol)

RARP provides a method of dynamically mapping 48-bit MAC address to the corresponding 32-bit IP address.



## Socket

Each TCP segment contains the source and destination port number that can be used to identify the sending and receiving application. These two values, along with the source and destination IP address in the IP header, uniquely identify each connection.

The combination of an IP address and a port number is called a socket.

## **Subnet Mask**

Subnet mask is often simply called the mask. Given its own IP address and its subnet mask, a host can determine if a TCP/IP packet is destined for a host that is (1) on its own subnet, or (2) on a different network. If (1), the packet will be delivered directly; otherwise if, will be delivered via gateways or routers.

## **TCP (Transmission Control Protocol)**

TCP provides a reliable flow of data between two hosts. It is associated with tasks such as dividing the data passed to it from applications into appropriately sized chunks for the network layer below, acknowledging received packets, setting timeouts to make certain that the other end acknowledges packets that are sent, and so on.

## **TCP/IP**

The transmission Control Protocol (TCP) and the Internet Protocol (IP) are the standard network protocols. They are almost always implemented and used together and called TCP/IP. TCP/IP can be used to communicate across any set of interconnected networks.

## **UDP (User Datagram Protocol)**

UDP provides a much simpler service to the application layer. It just sends packets of data from one host to the other. But there is no guarantee that the packets will reach the destination host.

## 7. Appendix B: FAQ

### How to connect with Allen-Bradley PLC?

1. Open RSLogix 5000 and create a new project.



Figure7-1. Create a new project.

2. Select the PLC type and give the project a name.

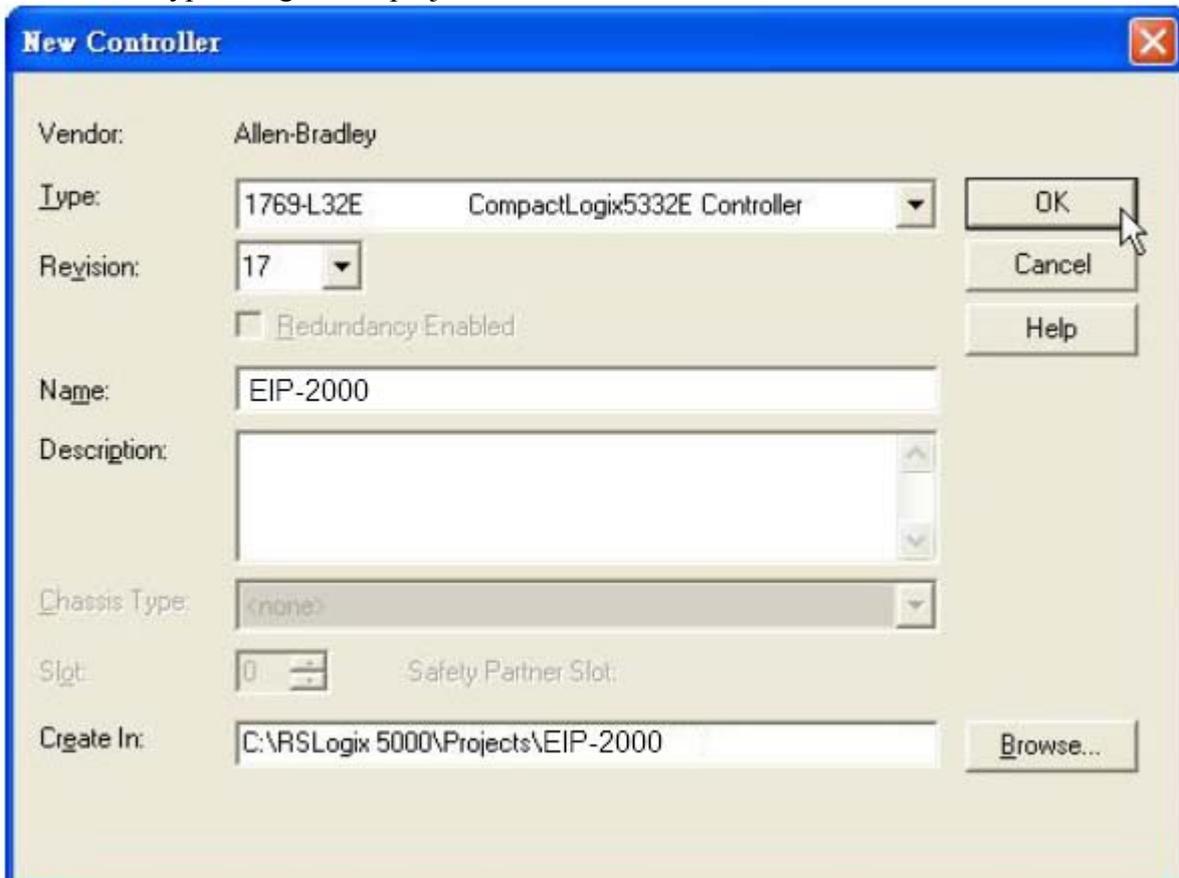


Figure7-2. Set the PLC type and project name.

3. Create a new module in the “Ethernet” item.

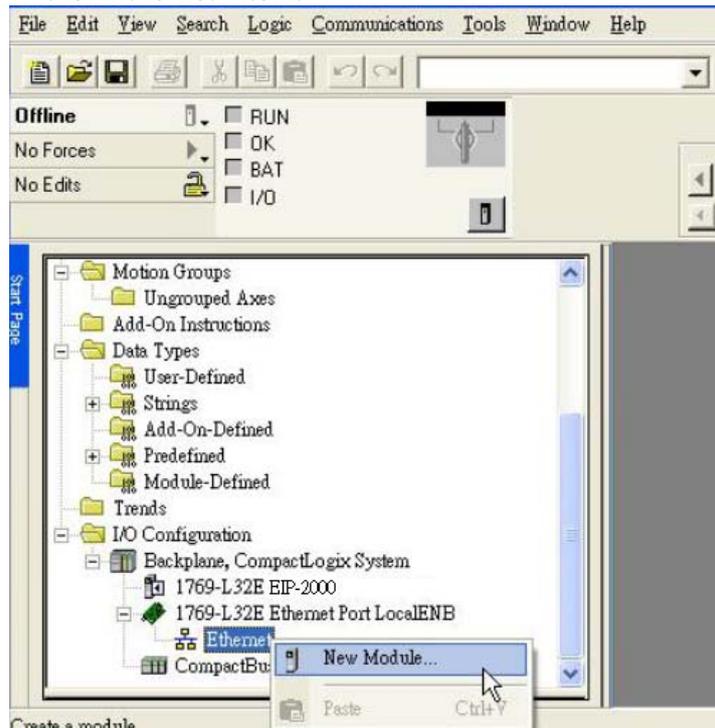


Figure 7-3. Create a new module.

4. Select the “ETHERNET-MODULE” below “Communications” in the Select Module window.

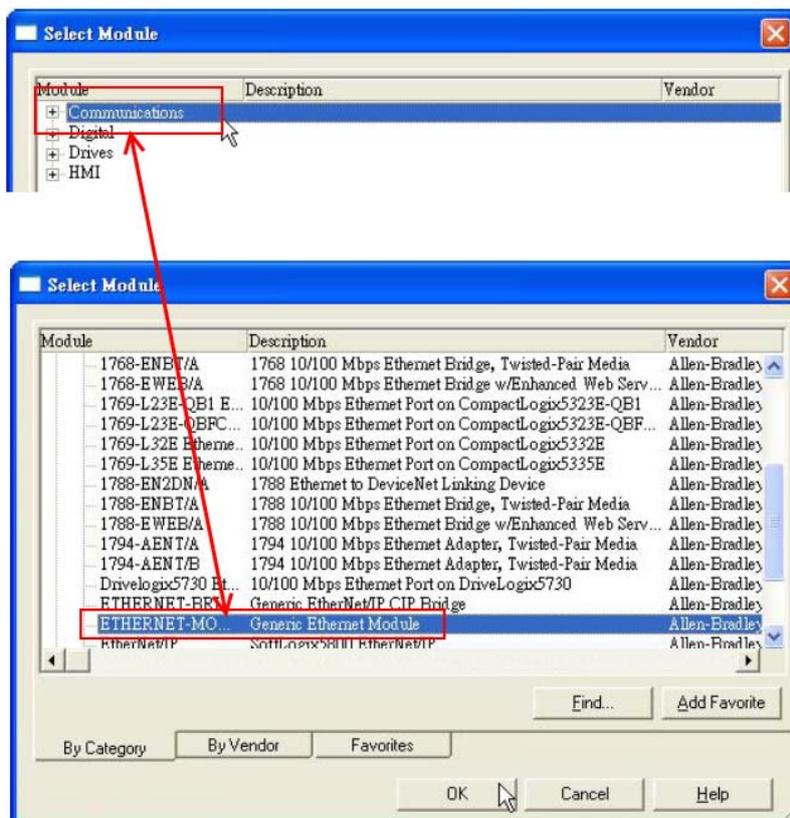
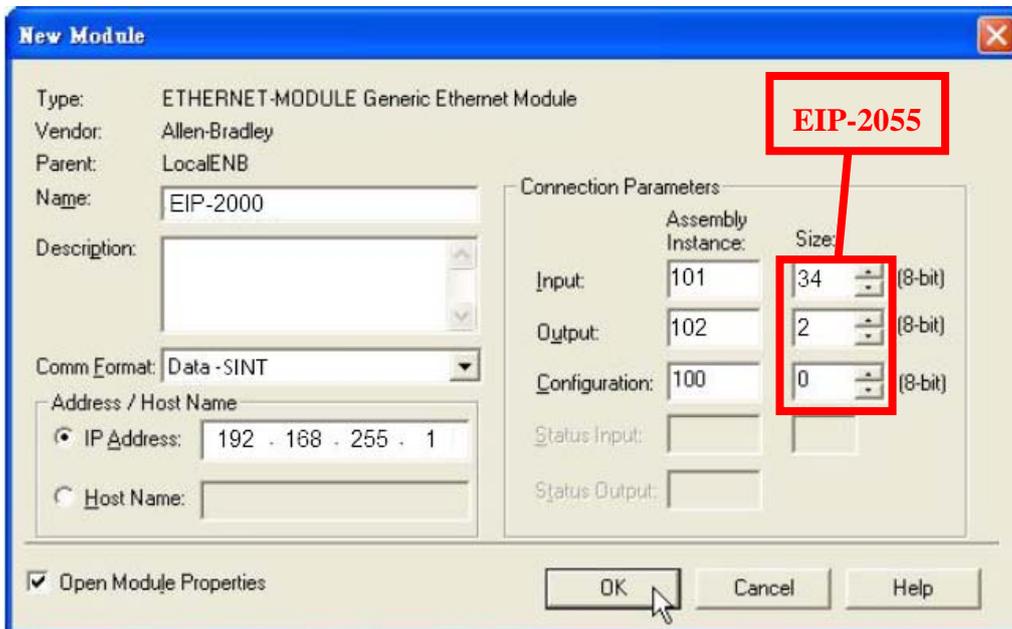
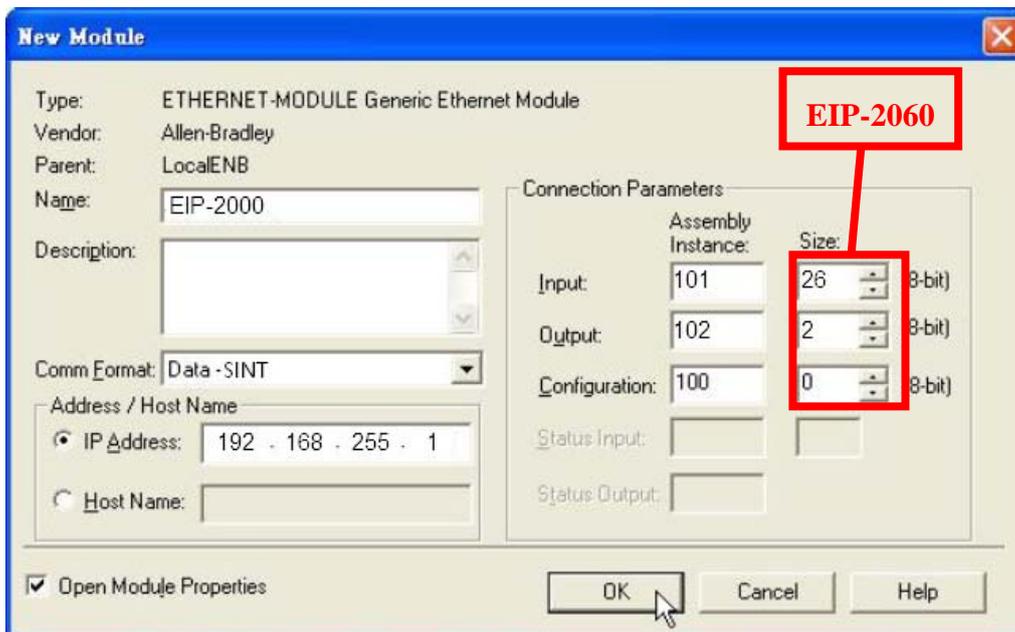


Figure7-4. Select “ETHERNET-MODULE”.

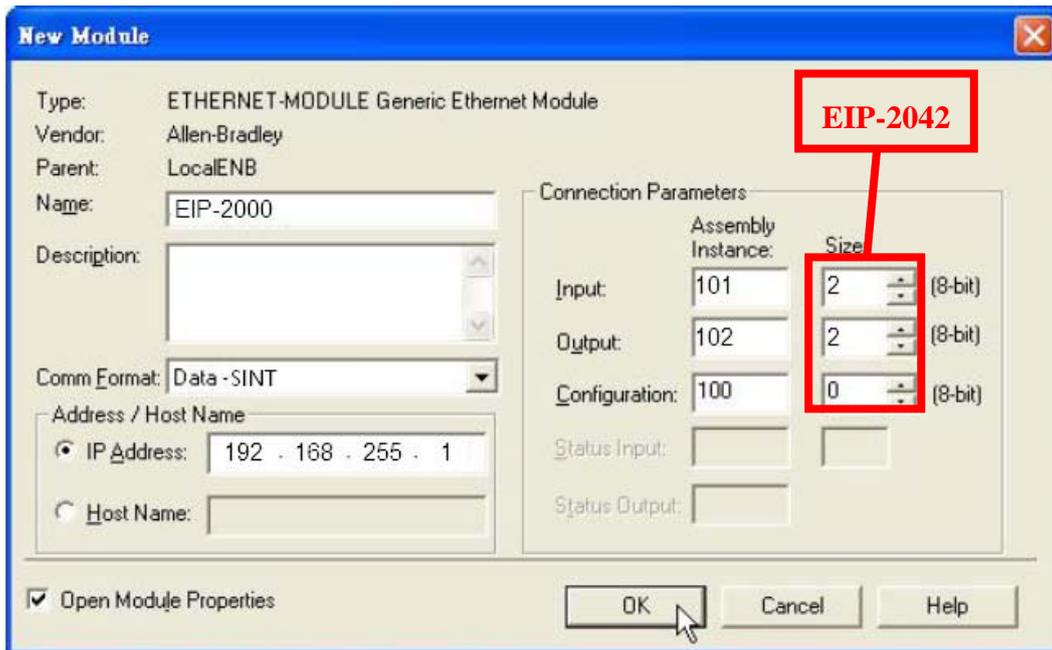
- Configure the new module parameters. The I/O length of new module must be the same with the length of EIP-2000 I/O data. The data assembly please refer to Table 5-1 and the instance ID please refer to Table 5-2.



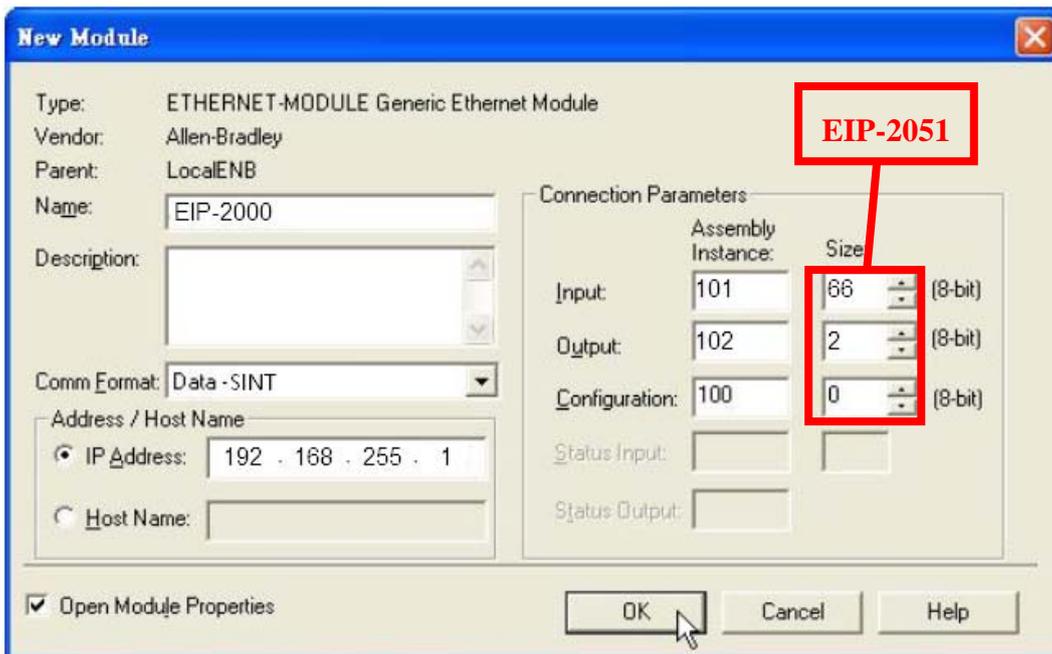
**Figure7-5. The settings of EIP-2055**



**Figure7-6. The settings of EIP-2060**



**Figure7-7. The settings of EIP-2042**



**Figure7-8. The settings of EIP-2051**

**Table 7-1. Data Assembly of EIP-2000**

	Data Assembly	Byte count	Description
EIP-2055	Input Assembly	34	1 <sup>st</sup> Byte: DI status
			2 <sup>nd</sup> Byte: DO status read back
			3 <sup>rd</sup> ~34 <sup>th</sup> Byte: DI counters
	Output Assembly	2	1 <sup>st</sup> Byte: DO status
			2 <sup>nd</sup> Byte: to set DI counters zero
EIP-2060	Input Assembly	26	1 <sup>st</sup> Byte: DI status
			2 <sup>nd</sup> Byte: DO status read back
			3 <sup>rd</sup> ~26 <sup>th</sup> Byte: DI counters
	Output Assembly	2	1 <sup>st</sup> Byte: DO status
			2 <sup>nd</sup> Byte: to set DI counters zero
EIP-2042	Input Assembly	2	1 <sup>st</sup> Byte: DO status read back (DO0~DO7).
			2 <sup>nd</sup> Byte: DO status read back (DO8~DO15).
	Output Assembly	2	1 <sup>st</sup> Byte: DO status (DO0~DO7).
			2 <sup>nd</sup> Byte: DO status (DO8~DO15).
EIP-2051	Input Assembly	66	1 <sup>st</sup> Byte: DI status(DI0~DI7).
			2 <sup>nd</sup> Byte: DI status(DI8~DI15).
			3 <sup>rd</sup> ~65 <sup>th</sup> Byte: DI counters.
	Output Assembly	2	1 <sup>st</sup> Byte: to set DI counters zero (DI0~DI7).
			2 <sup>nd</sup> Byte: to set DI counters zero (DI8~DI15).

**Table 7-2. Instance ID table of EIP-2000**

Implicit Message Information of EIP-2000		
Instance	Instance ID	Data length
<b>Input(T-&gt;O)</b>	65 <sub>hex</sub> (101)	Depends on modules. e.g.34
<b>Out(O-&gt;T)</b>	66 <sub>hex</sub> (102)	Depends on modules. e.g.2
<b>Configuration</b>	64 <sub>hex</sub> (100)	



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