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# EtherNet/IP Operation Manual



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# EtherNet/IP Operation Manual

## Revision History

Version	Revision	Date
1 <sup>st</sup>	The first version was published.	2016/05/20
2 <sup>nd</sup>	<ol style="list-style-type: none"><li>1.Information concerning AHCPU5X1-EN is added in section 1.3.1.</li><li>2.Information concerning AHCPU5X1-EN is added in section 2.1.</li><li>3.Information concerning AHCPU5X1-EN and AHCPU-ETHN-5A is added in chapter 3.</li><li>4.Information concerning AH-RTU series is added in section 4.4 and 4.6.</li><li>5.Information concerning TAG is added in section 5.1 and 5.2.</li><li>6.Information concerning AHCPU5X1-EN and AHCPU-ETHN-5A is added in chapter 8.</li><li>7.New product information is added in section 9.2.</li></ol>	2017/03/31
3 <sup>rd</sup>	<ol style="list-style-type: none"><li>1.Updates on ISPSOft version, information concerning AHCPU501-EN, AHRTU-ETHN-5A and AHCPU560-EN2 is added in chapter 1.</li><li>2.Information concerning AHCPU501-EN, AHRTU-ETHN-5A and AHCPU560-EN2 is added in chapter 2.</li><li>3.Information on Ethernet specifications of AHCPU501-EN and AHCPU560-EN2 is added in chapter 3. New content regarding maximum transmission speed of Delta products and calculating CIP connection is added in section 3.2.4 and 3.2.5</li><li>4.Information on ISPSOft version is updated and descriptions concerning AHCPU501-EN and AHCPU560-EN2 is added in chapter 4.</li><li>5.Notes for error code classification is added in section 6.1 and correct all error code 'H' to '16#'.</li><li>6.New EIP product information and updated content are added in chapter 9.</li></ol>	2019/05/13

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## Chapter 1 Product Introduction

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## 1.1 Introduction

### 1.1.1 EtherNet/IP

EtherNet/IP (“IP” stands for “Industrial Protocol”) is an industrial Ethernet network managed by ODVA, Inc. (formerly Open DeviceNet Vendors Association, Inc.), a global trade and standards development organization.

EtherNet/IP works on a TCP/UDP/IP based Ethernet network and uses most widely deployed collections of Ethernet standards to provide a broad range of applications in different industries that require high-speed and stability including Factory Automation (FA), Building Automation (BA), Process Automation (PA) and many more.

Delta covers a full range of controller and drive products supported by EtherNet/IP, including Programmable Logic Controllers (PLC), inverters, Human Machine Interfaces (HMI) and so on. Refer to section 9.1 for a full product list supported by EtherNet/IP. In addition, users can also use the EDS file to connect to the EtherNet/IP devices of other brands. Delta EtherNet/IP software, the EIP Builder, can be called or run independently through the ISPSOft v3.06.

## 1.2 Definition

Term	Definition
ODVA	Open DeviceNet Vendor Association for EtherNet/IP
EIP	EtherNet/IP, an industrial Ethernet network, provides interoperability for system providers. IP stands for Industrial Protocol. The term “EIP” (EtherNet/IP) will be used throughout this manual.
I/O Connection	Via the I/O connection to connect to EtherNet/IP and to exchange data cyclically.
Explicit Message	Connect to EtherNet/IP and to exchange data non-cyclically. Data will be exchanged piece by piece via instructions.
RPI	Requested Packet Interval, via the I/O connection to connect to EtherNet/IP to exchange data at regular time intervals.
ACD	Address Conflict Detection to detect IP address duplications.
Produced/Consumed TAG (P/C TAG)	<ul style="list-style-type: none"> <li>● TAGs are the methods used for assigning and referencing memory locations for Rockwell PLCs, the same as the registers for Delta PLCs.</li> <li>● Produced TAG: A TAG that a controller makes available for other controllers. Multiple controllers can simultaneously consume (receive) the data. A produced TAG sends its data to consumed TAGs (consumers) without using logic.</li> <li>● Consumed TAG: A TAG that receives the data of a produced TAG. The data type of the consumed TAG and the produced TAG must be matched (including any array dimensions).</li> <li>● The data is transferred over Ethernet/IP, for example, PLC-A needs data from PLC-B, so PLC-B sends the data to PLC-A. Therefore, PLC-A is the producer and PLC-B is the consumer.</li> </ul>



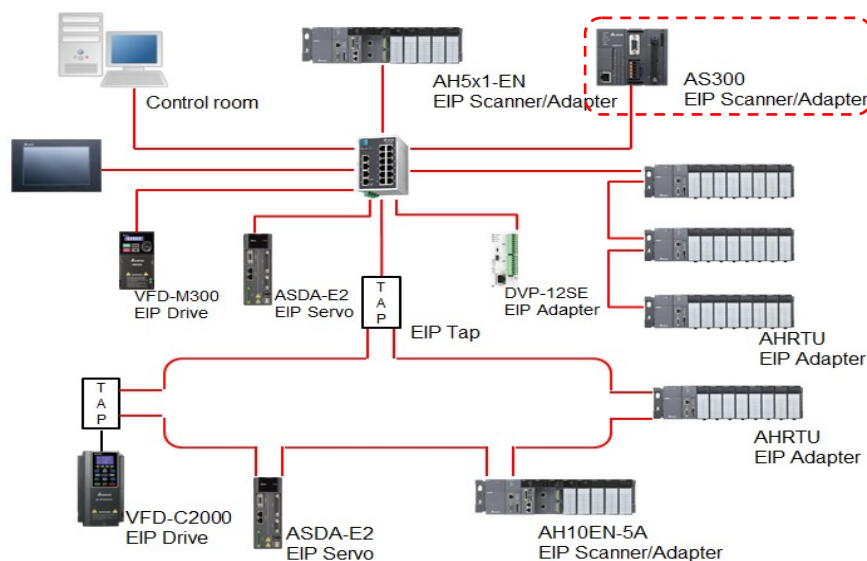
EDS	Electronic Data Sheets; EDS files are simple text files used by EtherNet/IP network configuration tools to help you identify EtherNet/IP products and easily commission them on a network.
Data Mapping	Exchange data between devices
EIP Scanner	The master station is called EIP Scanner in EtherNet/IP.
EIP Adapter	The slave station is called EIP Adapter in EtherNet/IP.
DLR	Device Level Ring (DLR) provides fault-tolerant network design for daisy-chain and linear topology. The DLR protocol provides high network availability in a ring topology and was intended primarily for implementation in EtherNet/IP end-devices that have two Ethernet ports and embedded switch technology, providing fast network fault detection and reconfiguration to support the most demanding control applications.

## 1.3 Features

### 1.3.1 Delta EIP Architecture

This typical Delta EIP architecture includes EIP Scanner and Adapter; data mapping can be achieved between devices via an I/O connection and explicit message.

- The AHCPU5X1-EN series which includes AHCPU501-EN, AHCPU511-EN, AHCPU521-EN and AHCPU531-EN support Ethernet single port communication and for network installation, it is required to employ EtherNet/IP devices.
- The AHCPU560-EN2, AH10EN-5A and AHRTU-ETHN-5A series support Ethernet dual port and DLR function; thus it can install, configure, and maintain linear as well as device-level ring (DLR) networks by using EtherNet/IP devices with embedded switch technology.



## 1.3.2 Product Features

**1**

- **Flexibility**

- Flexible topology: EIP devices may include an Ethernet single port as well as Ethernet dual port, and provide applicable networks such as linear topology, ring topology and ring topology for faster expansion and easier management.
- EtherNet/IP works on a TCP/UDP/IP based Ethernet network, uses most widely deployed collections of Ethernet standards and supports Wifi connection. Even for personnel with no IT background, the network can still be built up easily.
- Applicable networks include linear topology, ring topology, star topology, Ethernet, EtherNet/IP, one or more LANs, etc. Configuration can be set via a USB device or an interface.

- **Simplicity**

- Via a connector: Delta provides a full range of product line, including human machine interfaces (HMI), programmable logic controllers (PLC) and inverter drives, for application in an industrial operation. Simply via a RJ-45 connector, a network can be built up, saving costs on cables and other connecting tools.
- Single network: In replace with the 3-tier industrial architecture, single network architecture provides 100Mbps high-speed cyclical and non-cyclical data mapping function, ensuring a complete network diagnosis and effectively shortening debugging time.
- Graphical user interface designed software: The EIP Builder is graphical user interface designed for intuitive operation.

- **Integration**

- Data mapping: The EIP Builder provides a consistent setting interface, allowing users to reduce the time to learn and set up configurations easily.
- Listed device parameters: The EIP Builder presents a parameter list of Delta devices. Instead of looking up in the user manual, users can quickly check on the parameters from the list.
- EDS file: Users can connect to Delta and other brand EtherNet/IP products via the EDS files.

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# Chapter 2. Network Installation

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## 2.1 EtherNet/IP Device

A Delta EtherNet/IP (EIP) device allows users to build a linear topology, ring topology, and star topology. A Delta EIP device includes the EIP Builder software, EIP Scanner, EIP Adapter, EIP Tap, and Ethernet switch. EIP Scanner and EIP Adapter, each of them can be further divided to a single port and dual port.

- Ethernet single port: the AHCPU5X1-EN series including AHCPU501-EN, AHCPU511-EN, AHCPU521-EN and AHCPU531-EN.
- Ethernet dual port: the AHCPU560-EN2, AH10EN-5A and AHRTU-ETHN-5A series

## 2

## 2.2 Network Installation

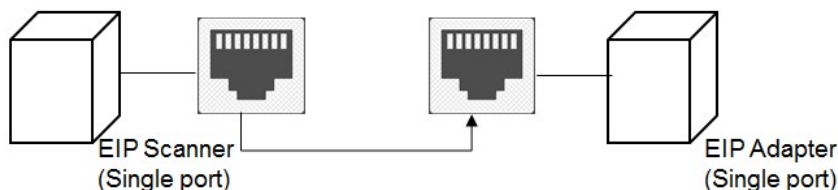
Each EtherNet/IP device is connected to an Ethernet switch via a CAT 5e cable. Please use Delta standard cables and the DVS series industrial switches. Refer to Delta PLC/HMI Cable Selection Guide for more information.

### 2.2.1 Single Port Device

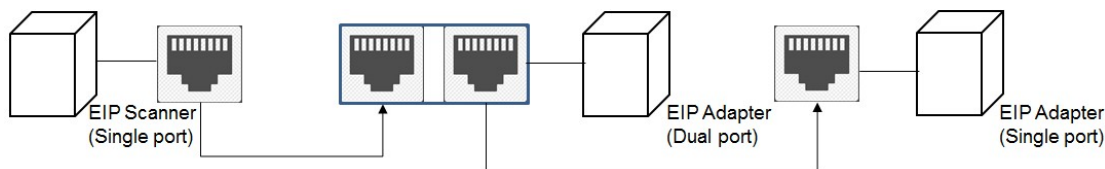
A single port device can build up a linear and a star topology. An Ethernet switch is required to create a star topology and a ring topology, and additionally an EtherNet/IP Tap is also needed.

#### Linear Topology

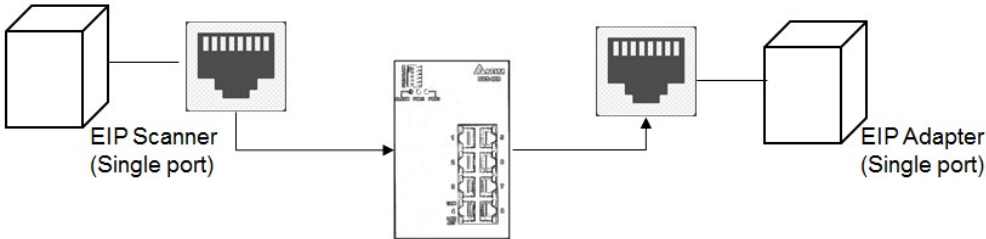
- **Linear Topology 1**



- **Linear Topology 2**



- **Star Topology**

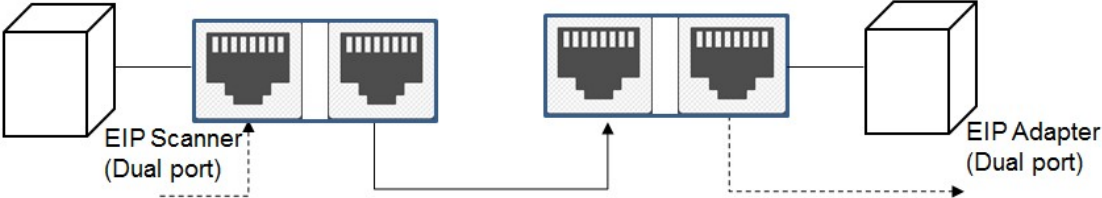


### 2.2.2 Dual Port Device

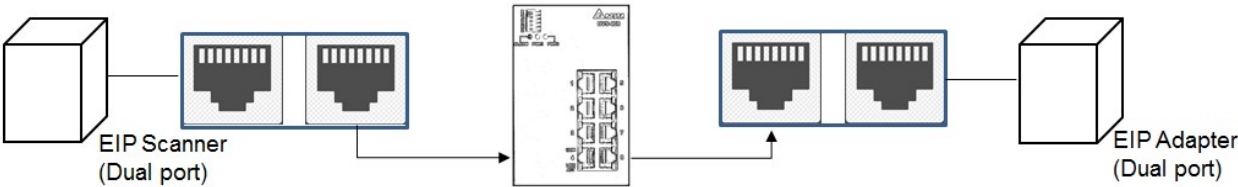
A dual port device can build up a linear, star and ring topology. A DLR function is required to create a ring topology. Refer to section 9.2 for DLR supported series.

2

- **Linear Topology**

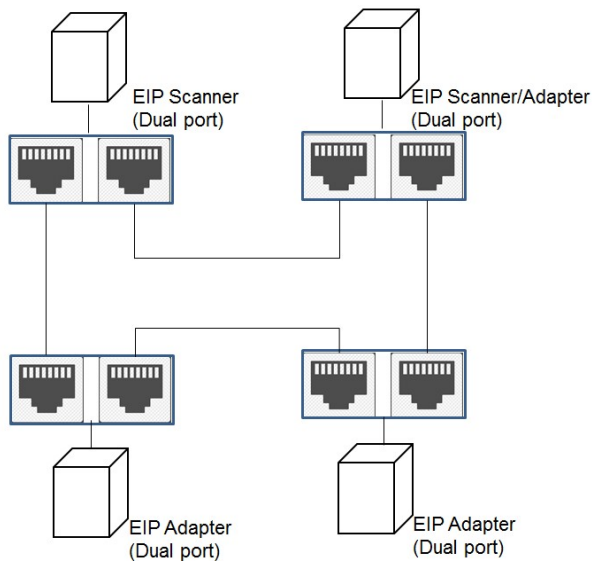


- **Star Topology**

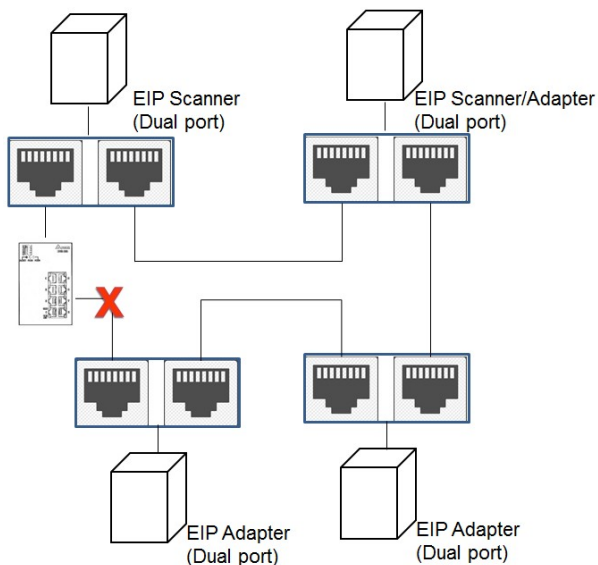


- **Ring Topology**

A DLR function is required to create a ring topology. Refer to section 9.2 for DLR supported series.



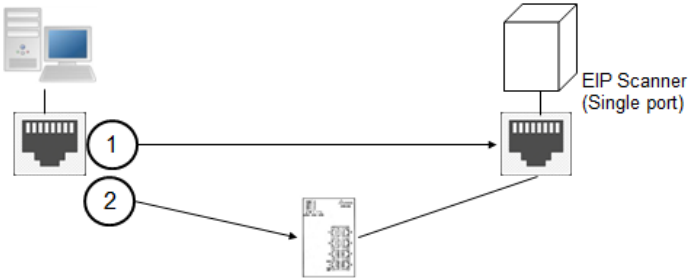
When a switch is needed for topology, the switch should support the DLR function. If not, the connection might fail.



### 2.2.3 PC Software

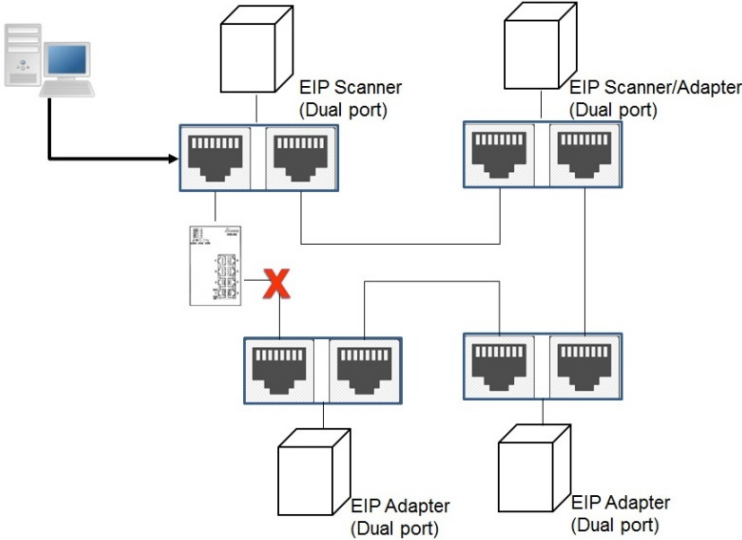
- **Linear and star topology**

Install the EIP Builder on your PC to monitor and configure the EIP devices. Users can also connect an EIP device to their PCs directly or use a switch to connect to the PCs.

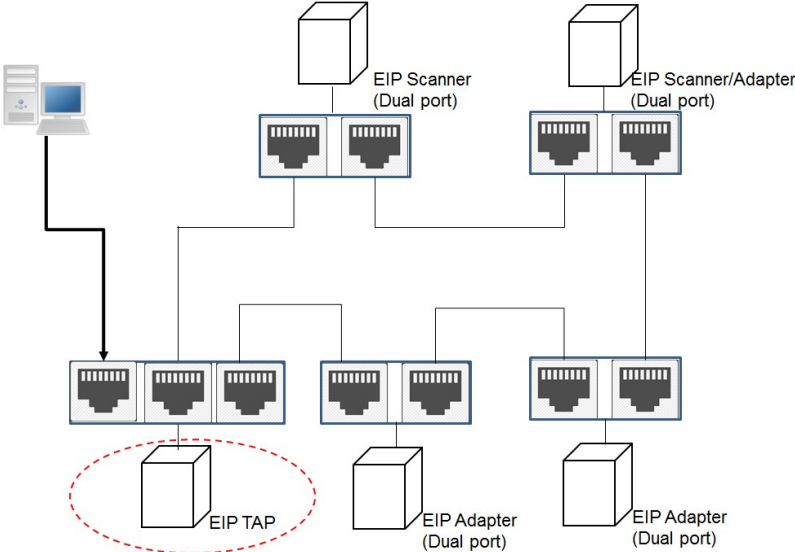


● Ring topology

Install the EIP Builder on your PC to monitor and configure the EIP devices. Be sure to save a network connection for your PC to connect to the EIP device.



Or you can use an EIP tap to connect your PC so that the ring topology can stay intact.



**MEMO**

**2**



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## Chapter 3 Product Specifications

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## 3.1 Ethernet Specifications

### 3.1.1 AHCPU5x1-EN/ AHCPU560-EN2

<b>Communication Protocols</b>	EtherNet/IP, MODBUS TCP
<b>Protocols</b>	BOOTP, DHCP, SNMP, NTP
<b>Communication Speed</b>	10/100 Mbps Auto-Detection
<b>Communication Interface</b>	RJ-45 with Auto MDI/MDIX
<b>Numbers of the Ethernet Communication Port</b>	AHCPU5x1-EN : 1 AHCPU560-EN2 : 2

### 3.1.2 AH10EN-5A

<b>Communication Protocols</b>	EtherNet/IP, MODBUS TCP
<b>Protocols</b>	BOOTP, DHCP, SMTP, SNMP, NTP
<b>Communication Speed</b>	10/100 Mbps Auto-Detection
<b>Communication Interface</b>	RJ-45 with Auto MDI/MDIX
<b>Numbers of the Ethernet Communication Port</b>	2

### 3.1.3 AHRTU-ETHN-5A

<b>Communication Protocols</b>	EtherNet/IP, MODBUS TCP
<b>Protocols</b>	BOOTP, DHCP, NTP
<b>Communication Speed</b>	10/100 Mbps Auto-Detection
<b>Communication Interface</b>	RJ-45 with Auto MDI/MDIX
<b>Numbers of the Ethernet Communication Port</b>	2

## 3.2 Ethernet/IP Specifications

### 3.2.1 AHCPU5x1-EN/ AHCPU560-EN2

Item		Specification
<b>General</b>	Category	Scanner / Adapter
	Topology	Star
<b>CIP Network I/O Connection</b>	Max. Number of the CIP Connections	AHCPU501-EN: 32 (Clients + Servers) AHCPU511-EN: 64 (Clients + Servers) AHCPU521-EN: 128 (Clients + Servers) AHCPU531-EN: 256 (Clients + Servers) AHCPU560-EN2: 256 (Clients + Servers)
	Max. Number of the TCP Connections	AHCPU501-EN: 16 (Clients + Servers) AHCPU511-EN: 32 (Clients + Servers) AHCPU521-EN: 64 (Clients + Servers) AHCPU531-EN: 128 (Clients + Servers) AHCPU560-EN2: 128 (Clients + Servers)
	Requested Packet Interval (RPI)	1 ms~1000 ms
	Max. Transmission Speed	10000 pps
	Max. Data Length	500 bytes
	<b>CIP Network Explicit Message</b>	Class 3 (Connected Type)
UCMM (Non-Connected Type)		Total 32 (Clients + Servers) , including the clients + servers from the Class 3 (for V2.1 or later version)
CIP Objects		Identity Object (16#01) Message Router Object (16#02) Assembly Object (16#04) Connection Manager Object (16#06) Port Object (16#F4) TCP/IP Interface Object (16#F5) Ethernet Link Object (16#F6)
<b>CIP Network Produced Tag</b>	Max. Number of the CIP Connections	32 (Clients + Servers) (for V2.1 or later version)
	Max. Data Length	500 bytes
	Requested Packet Interval (RPI)	1 ms~1000 ms
<b>CIP Network Consumed Tag</b>	Max. Number of the CIP Connections	32 (Clients + Servers) (for V2.1 or later version)
	Max. Data Length	500 bytes
	Requested Packet Interval (RPI)	1 ms~1000ms

### 3.2.2 AH10EN-5A

Item		Specification
<b>General</b>	Category	Scanner /Adapter
	Topology	Star, Linear, Ring
<b>CIP Network I/O Connection</b>	Max. Number of the CIP Connections	64 (Clients + Servers)
	Max. Number of the TCP Connections	64 (Clients + Servers)
	Requested Packet Interval (RPI)	1 ms~1000 ms
	Max. Transmission Speed	6400 pps
	Max. Data Length	500 bytes
<b>CIP Network Explicit Message</b>	Class 3 (Connected Type)	Total 32 (Clients + Servers), including the clients + servers from the UCMM type
	UCMM (Non-Connected Type)	Total 32 (Clients + Servers), including the clients + servers from the Class 3
	CIP Objects	Identity Object ( 16#01 ) Message Router Object ( 16#02 ) Assembly Object ( 16#04 ) Connection Manager Object ( 16#06 ) DLR Object ( 16#47 ) QoS Object ( 16#48 ) Port Object ( 16#F4 ) TCP/IP Interface Object ( 16#F5 ) Ethernet Link Object ( 16#F6 )  Vendor specific object : X Register ( 16#350 ) Y Register ( 16#351 ) D Register ( 16#352 ) M Register ( 16#353 ) S Register ( 16#354 ) T Register ( 16#355 ) C Register ( 16#356 ) HC Register ( 16#357 ) SM Register ( 16#358 ) SR Register ( 16#359 ) Control Register ( 16#370 ) Input Register ( 16#371 ) Output Register ( 16#372 )

### 3.2.3 AHRTU-ETHN-5A

Item		Specification
<b>General</b>	Category	Adapter
	Topology	Star, Linear, Ring
<b>CIP Network I/O Connection</b>	Max. Number of the CIP Connections	96
	Max. Number of the TCP Connections	48



Item		Specification
	Requested Packet Interval (RPI)	1 ms~1000 ms
	Max. Transmission Speed	10000 pps
	Max. Data Length	500 bytes
<b>CIP Network Explicit Message</b>	Class 3 (Connected Type)	Total 48 (Clients + Servers), including the clients + servers from the UCMM type
	UCMM (Non-Connected Type)	Total 48 (Clients + Servers) , including the clients + servers from the Class 3
	CIP Objects	Identity Object ( 16#01 ) Message Router Object ( 16#02 ) Assembly Object ( 16#04 ) Connection Manager Object ( 16#06 ) DLR Object ( 16#47 ) QoS Object ( 16#48 ) Port Object ( 16#F4 ) TCP/IP Interface Object ( 16#F5 ) Ethernet Link Object ( 16#F6 )  Vendor specification object : Status Register ( 16#370 ) Input Register ( 16#371 ) RTU AI Register ( 16#373 ) RTU AO Register ( 16#374 ) RTU DI Register ( 16#375 ) RTU DO Register ( 16#376 )

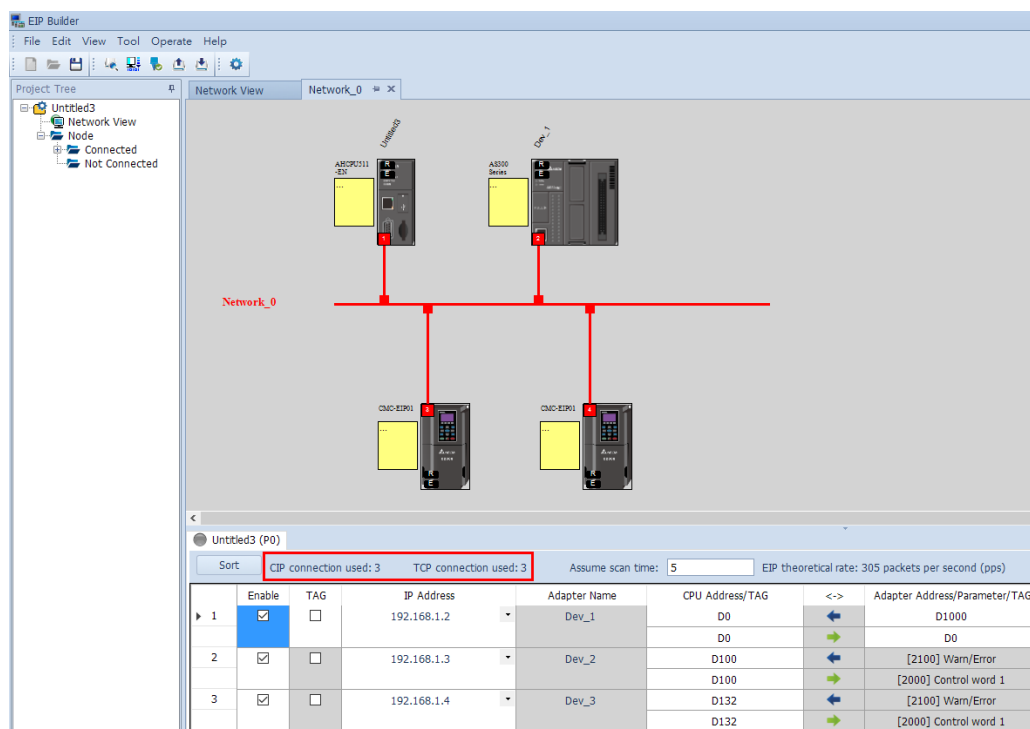
### 3.2.4 Maximum Transmission Speed of Delta Products

The EtherNet/IP transmission speed is expressed in terms of packets per second (pps). In addition, the actual transmission speed is affected by the requested packet interval (RPI) and the scan time of the CPU as an EIP scanner. Below is a list regarding the maximum transmission speed of Delta EIP products for your reference.

Category	Product	Max. Transmission Speed (pps)
Mid-range PLC	AHCPU5X1-EN Series, AHCPU560-EN2	10,000
	AH10EN-5A	6,400
	AHRTU-ETHN-5A	10,000
	AH10EMC-5A	6,400
	AS300 Series, AS200 Series	3,000
	AS-FEN02 communication card	10,000
Small PLC	DVPES2-E Series	16,00
	DVP26SE	1,600
AC Motor Drive	VFD-MS300 Series (CMM-EIP01 communication card)	800
	VFD-C2000 Series (CMC-EIP01 communication card)	800

### 3.2.5 Calculating CIP Connection

Users can refer to the EIP Builder data exchange page (see below) to find out the number of CIP and TCP connections. The method for calculating the number of CIP connection is also listed below.



Series	Model	Method to Calculate CIP Connection	
		Adapter	Scanner
AH	AHRTU-ETHN-5A	Limited to AHCPU and third-party host 1) RTU + DIO uses 1 connection 2) Each AIO or NIO module uses 1 connection	Do not support
	AH10EN-5A	Each data exchange group uses 1 connection	
	AHCPU5x1-EN	1) Each data exchange group uses 1 connection	
	AHCPU560-EN2	2) Execute instruction API2208 EIPRW uses 1 connection	
AS	AS-FEN02	1) If using AS series or a third-party as the host CPU, RTU + DIO + AIO use 1 connection 2) If using AH series as the host CPU, RTU + DIO use 1 connection, each AIO module uses 1 connection	Do not support
	AS300	1) Each data exchange group uses 1 connection	
	AS200	2) Execute instruction API2208 EIPRW uses 1 connection	
DVP	DVPES2-E	Each data exchange group uses 1 connection	Do not support
	DVP26SE	Each data exchange group uses 1 connection	Do not support
VFD	CMC-EIP01	Each VFD uses 1 connection	Do not support
	CMM-EIP01	Each VFD uses 1 connection	Do not support

※ AH Series Host – Example of Calculating the number of CIP Connection:

**AH Series Host  
(Scanner)**



Calculating CIP Connections:

1. Long Range Communication Station A: 1 (RTU+DIO) + 3 (AI/O) + 2 (SCM) = 6
  2. Long Range Communication Station B: 1 (RTU+DIO) + 3 (AI/O) = 4
  3. AS Series Host: 5 (Connection Used for Data Exchange)
- => Total of CIP Connection Used: 6+4=10

**Long Range Communication  
Station A  
(AHRTU-ETHN-5A)**



Module	AH16AM10N-5A	X2
Configuration:	AH16AN01T-5A	X2
	AH06XA-5A	X3
	AH10SCM-5A	X2



**Long Range Communication  
Station B  
(AHRTU-ETHN-5A)**



Module	AH16AM10N-5A	X2
Configuration :	AH16AP11T-5A	X4
	AH08DA-5A	X2
	AH08AD-5A	X1



**AS Series Host**



CIP Connection Used  
for Data Exchange: 5

**MEMO**

**3**



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## Chapter 4 EIP Builder

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Delta EtherNet/IP software, EIP Builder, is embedded in the ISPSOft. It can be called or run independently through the ISPSOft software (applicable with version 3.06 and later versions).

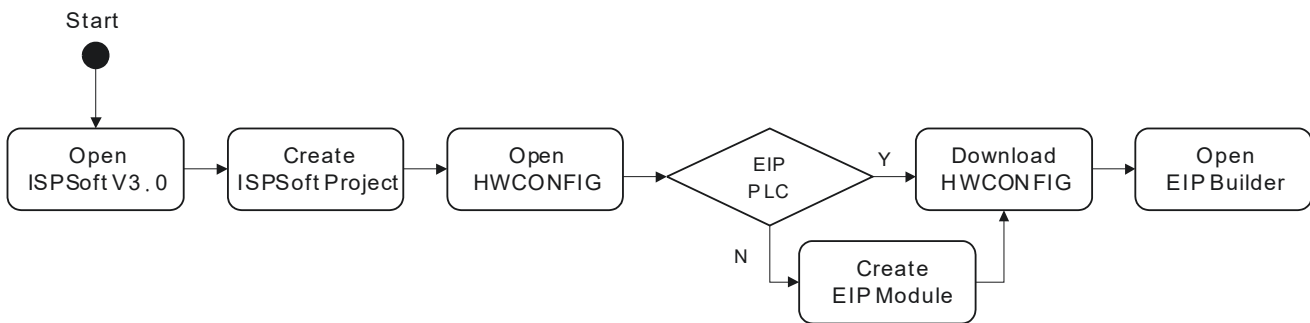
## 4.1 Access EIP Builder

The EIP Builder can be called from Delta EIP Scanner's HWCONFIG in the ISPSOft. It can also be called independently to set up parameters for the Adapter. Delta EIP Scanner is equipped with the EtherNet/IP communication PLC and the EtherNet/IP module. Refer to chapter 9.3 for a list of Delta EIP Scanner products supported by the EIP Builder.

### 4.1.1 Setting Up EIP Scanner

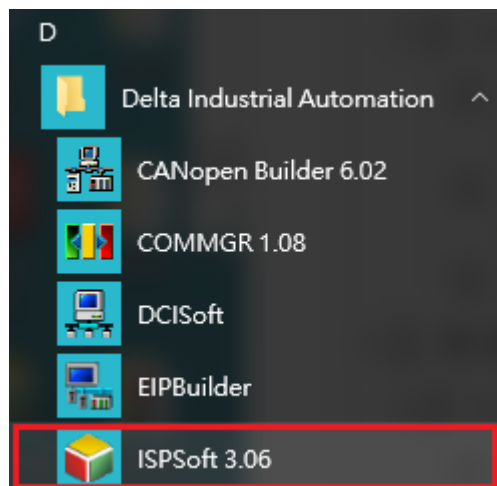
- **Running Process**

Run the EIP Builder via an EIP Scanner (see below). When using a Delta EIP Scanner, users need to set up an EIP module through the HWCONFIG in the ISPSOft.

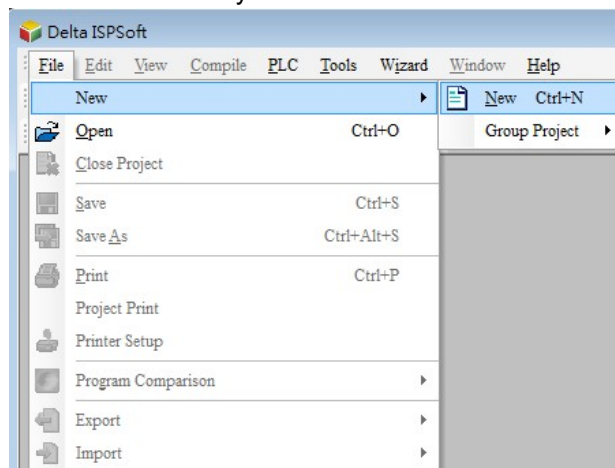


- **Operation Steps**

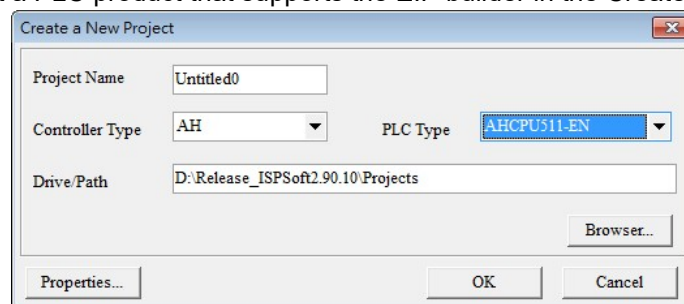
1. Open ISPSOft : Find ISPSOft 3.06 from the start menu in Windows. Click the start menu and go to *All programs > Delta Industrial Automation > ISPSOft 3.06*



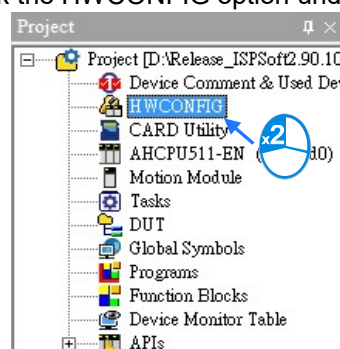
2. Create a new project: Click **File > New** and you will see the Create a New Project window.



3. Select a PLC: Select a PLC product that supports the EIP builder in the Create a New Project window.

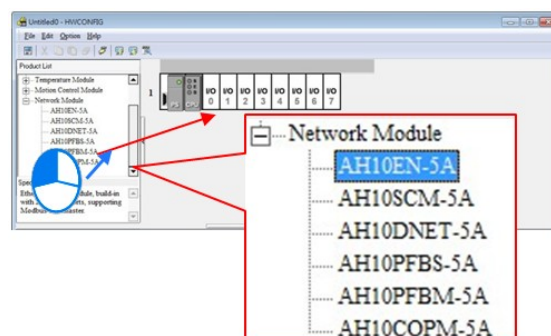



4. Open the HWCONFIG: Double click the HWCONFIG option under the Project.



5. Create an EIP module (AH10EN-5A):

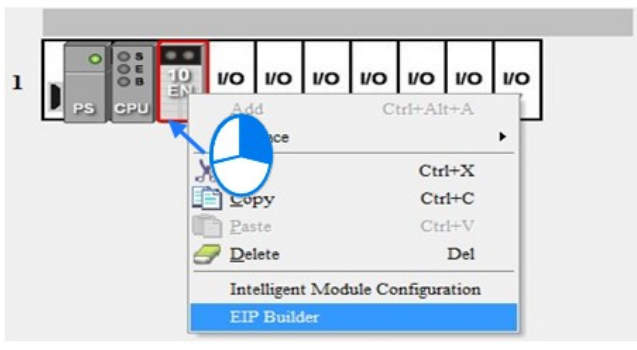
- ◆ Select the AH10EN-5A from the Network Module in the Product List.
- ◆ Drag the selected AH10EN-5A to the CPU's main backplane.



- 6. Save and download the HWCONFIG : Click Save to save the HWCONFIG settings and then click  Download to PLC to download the file to PLC.

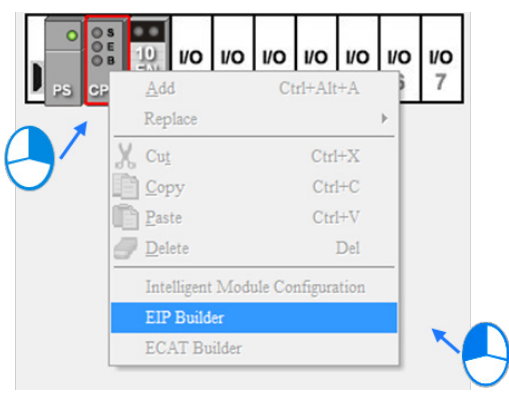


- 7. Open the EIP Builder:
  - 7.1 Right-click the AH10EN-5A on the CPU's main backplane and you will see the EIP Builder. Double click it to open the EIP Builder.



4

- 7.2 Right-click the AHCPU5x1-EN on the CPU's main backplane and you will see the EIP Builder. Double click it to open the EIP Builder.



## 4.2 Set up the IP Address

This section will provide an overview of how to set up the IP address for AH10EN-5A IP and AHCPU5x1-EN/AHCPU560-EN2. The IP address should be set up before configuring EIP related parameters or data mapping settings.

### 4.2.1 IP Address Types

The AH10EN-5A series and AHCPU5x1-EN/AHCPU560-EN2 series supports 3 types of IP addressing, BOOTP, DHCP and static IP address.

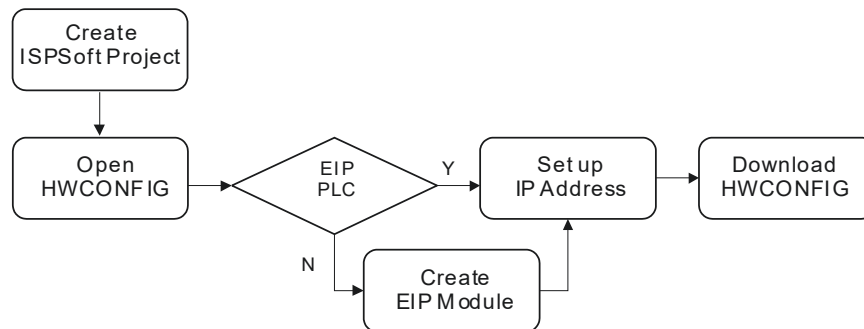
Type of IP Address	Definition
BOOTP	Via the TCP/IP Bootstrap Protocol (BOOTP) to set up the IP address, netmask and gateway. BOOTP server may require some configuration. The Bootp protocol is designed for a network in which each host has a permanent network connection.
DHCP	Via the Dynamic Host Configuration Protocol (DHCP) to obtain IP address, netmask, gateway, main computer name and the WINS server automatically.



## 4.2.2 Set up the IP Address (Static IP)

### ● Operation Steps:

When using an EIP product with a static IP address, users need to set up the IP address through the HWCONFIG in the ISPSOft.

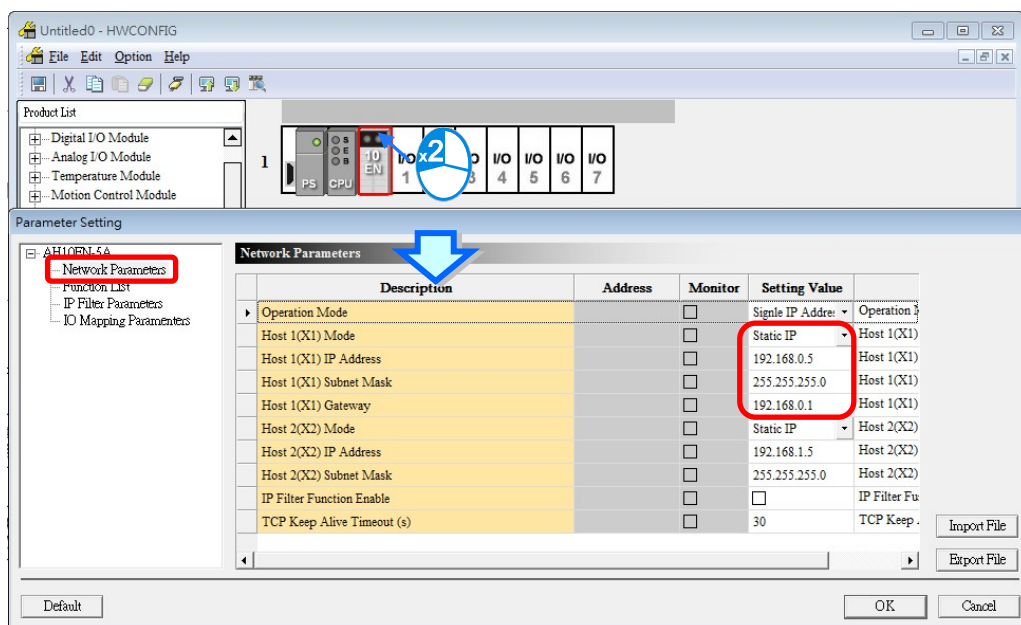


Refer to section 4.1.1 for how to set up an EIP module through the HWCONFIG in the ISPSOft.

### 1. Configure the network parameters

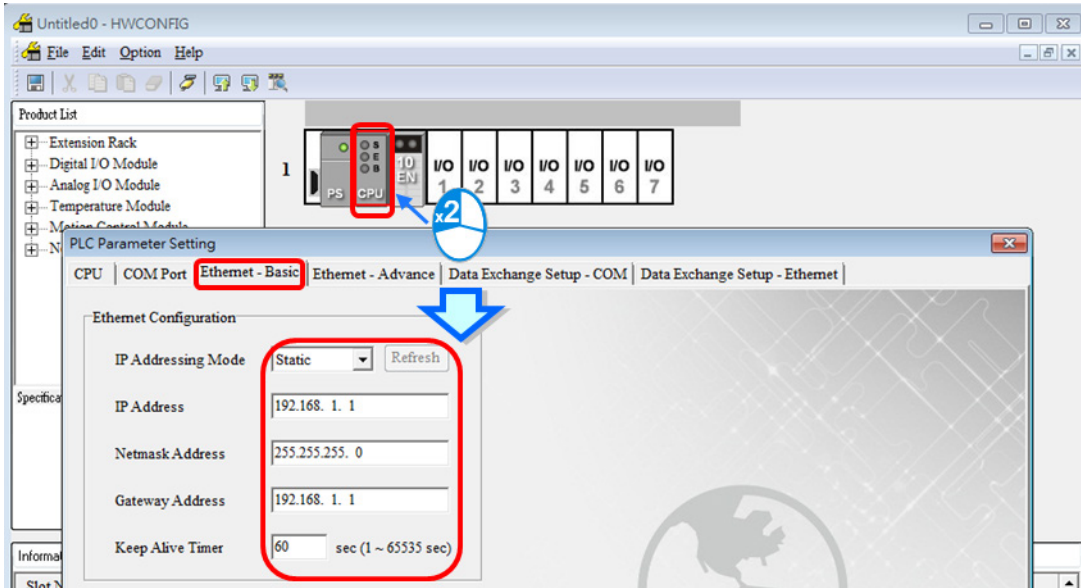
#### 1.1 AH10EN-5A

- ◆ Double-click the AH10EN-5A in the HWCONFIG to open the Parameter Setting page.
- ◆ Set up the IP address under the Network Parameters node. Once the setup is done, click OK to leave this page.



### 1.2 AHCPU5x1-EN

- ◆ Double-click the AHCPU5x1-EN in the HWCONFIG to open the Parameter Setting page.
- ◆ Set up the IP address under the Ethernet Basic tab. Once the setup is done, click OK to leave this page.



4

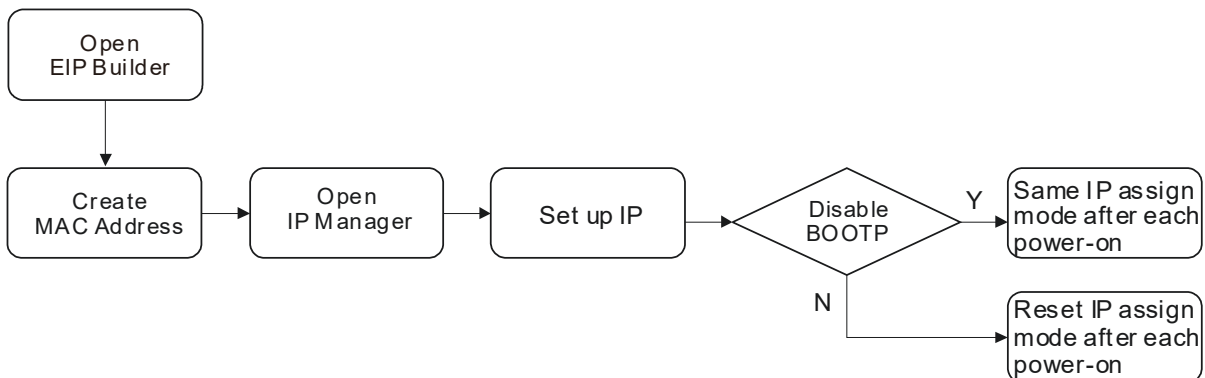
- ◆ Save and download the HWCONFIG: Click Save to save the HWCONFIG settings and then click Download.



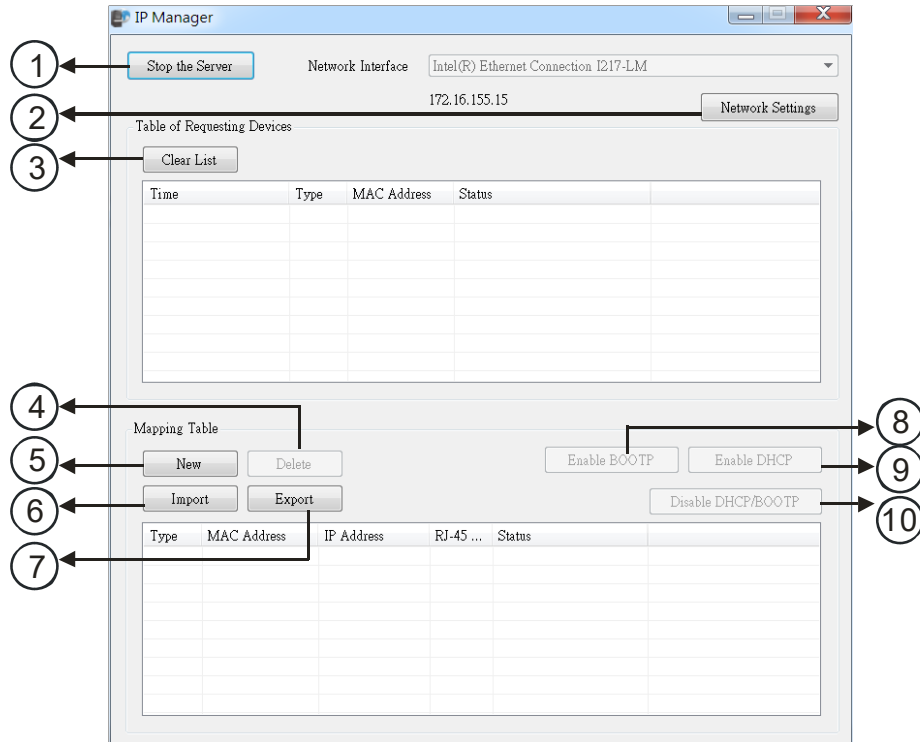
### 4.2.3 Set up the IP Address (BOOTP/DHCP)

● Operation Steps:

When using an EIP product with a BOOTP/DHCP IP address, users can set up the IP address through the IP Manager in the EIP Builder.



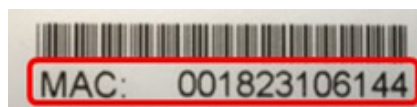
**Descriptions for the IP Manager:**



	Item	Definition
①	Stop the Server	Stop the BOOTP/DHCP server; the IP manager will not request for IP addresses from the BOOTP/DHCP server.
②	Network Settings	Set up the subnet mask, gateway, primary DNS, secondary DNS, and domain name.
③	Clear List	Clear all the contents on the list.
④	New	Add new IP/MAC address.
⑤	Delete	Delete the selected item on the list.
⑥	Import	Import the IP/MAC address list; the file format is .CSV.
⑦	Export	Export the IP/MAC address list; the file format is .CSV.
⑧	Enable BOOTP	Enable the BOOTP to assign an IP address for the selected item.
⑨	Enable DHCP	Enable the DHCP to assign an IP address for the selected item.
⑩	Disable BOOTP/DHCP	Disable the BOOTP/DHCP on the device; the device will not request for IP addresses from the server.

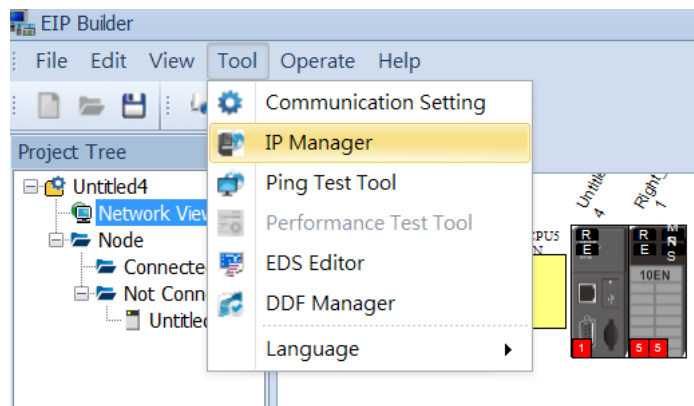
● **Operation Steps:**

1. MAC address: find the MAC address on the EIP device as its unique identity.



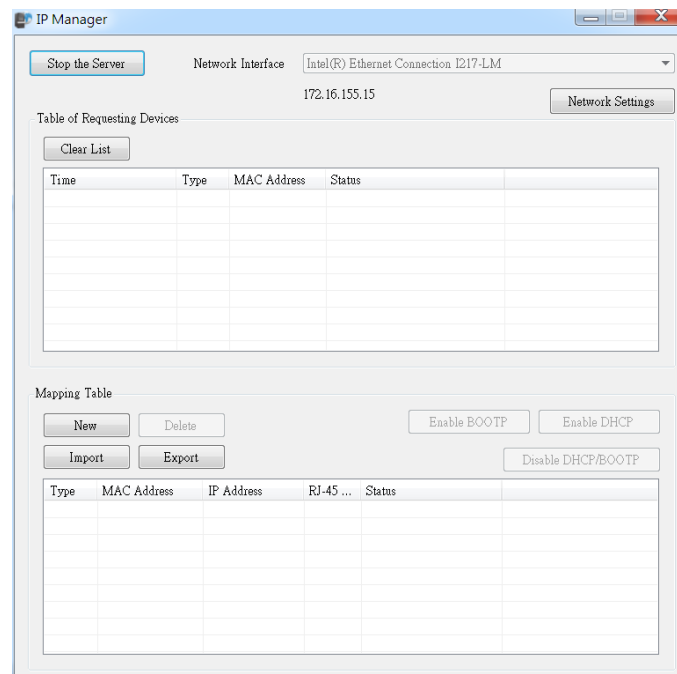
2. Open the IP Manager

- ◆ Click the Tool tab of the EIP Builder and click to open the IP Manager setup page.



- ◆ The IP Manager can be the BOOTP/DHCP Server, receiving IP address requests from devices.

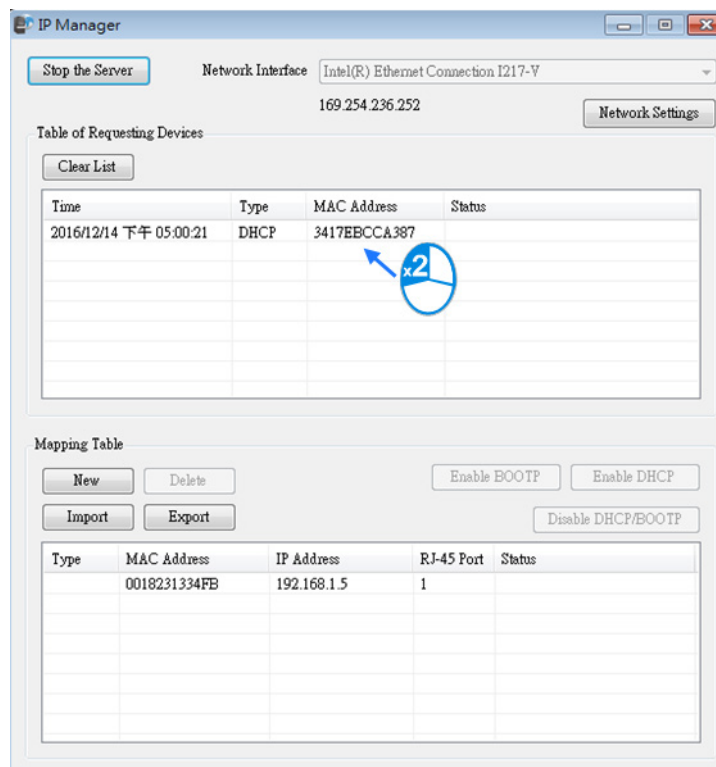
4



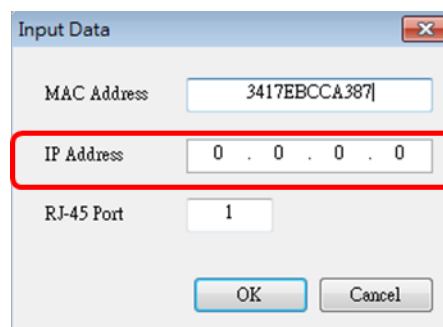


## 3. Set up the IP address

- ◆ Select and double-click the listed address to open the IP setup page.

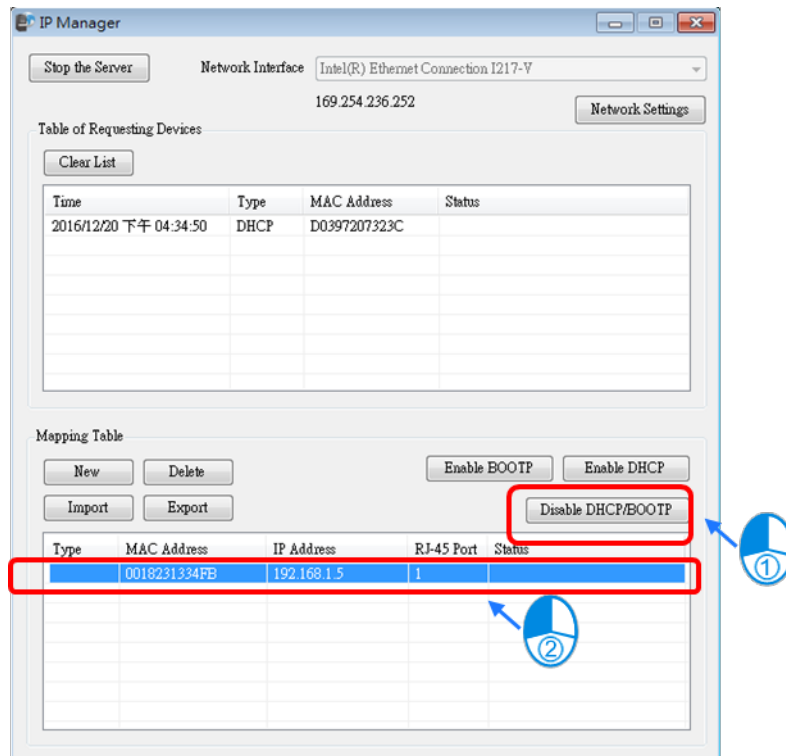


- ◆ Type the IP address.



## 4. Disable DHCP/BOOTP

- ◆ Click to select the device in the Mapping Table that you'd like to disable its DHCP/BOOTP function and then click the Disable DHCP/BOOTP button. After that the selected device will not send DHCP/BOOTP requests. For the modification on the IP address receiving mode, refer to section 4.2.4 for more information.



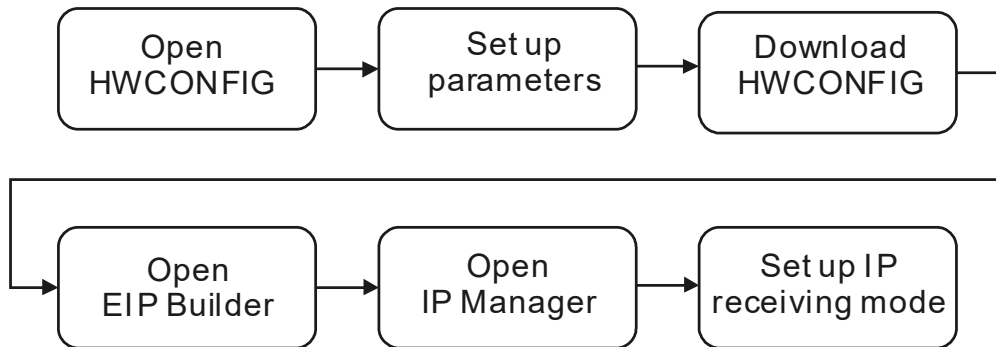
4

● **Note**

1. Enable BOOTP: When the IP address receiving mode is in BOOTP (BOOTP is enabled), the IP address is assigned, and the device will send out BOOTP requests for IP addresses during each power-on.
2. Enable DHCP: When the IP address receiving mode is in DHCP (DHCP is enabled), the IP address is assigned, and the device will send out DHCP requests for IP addresses during each power-on.
3. Disable DHCP/BOOTP: When the IP address receiving mode is in BOOTP (BOOTP is enabled), the IP address is assigned; once the Disable DHCP/BOOTP button is clicked, the device will not send out DHCP/BOOTP requests for IP addresses during each power-on.

#### 4.2.4 IP Modification (BOOTP/DHCP)

To enable the DHCP or BOOTP function again, users will need to use the device software to make that change. Take the AH10EN-5A series as an example, you will need to go to *ISPSoft > HWCONFIG > IP Manager*. Open the IP Manager and set up the IP address receiving mode.

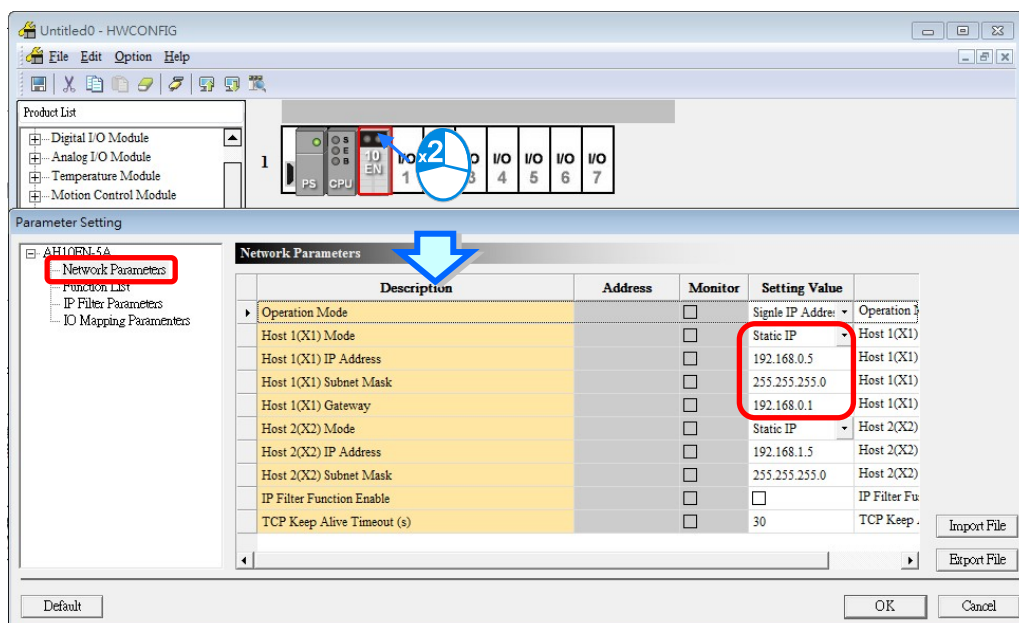


- **Operation Steps:**

1. Refer to section 4.1.1 for how to open the HWCONFIG.
2. Set up the parameters: Enable the IP address receiving mode to BOOTP/DHCP.

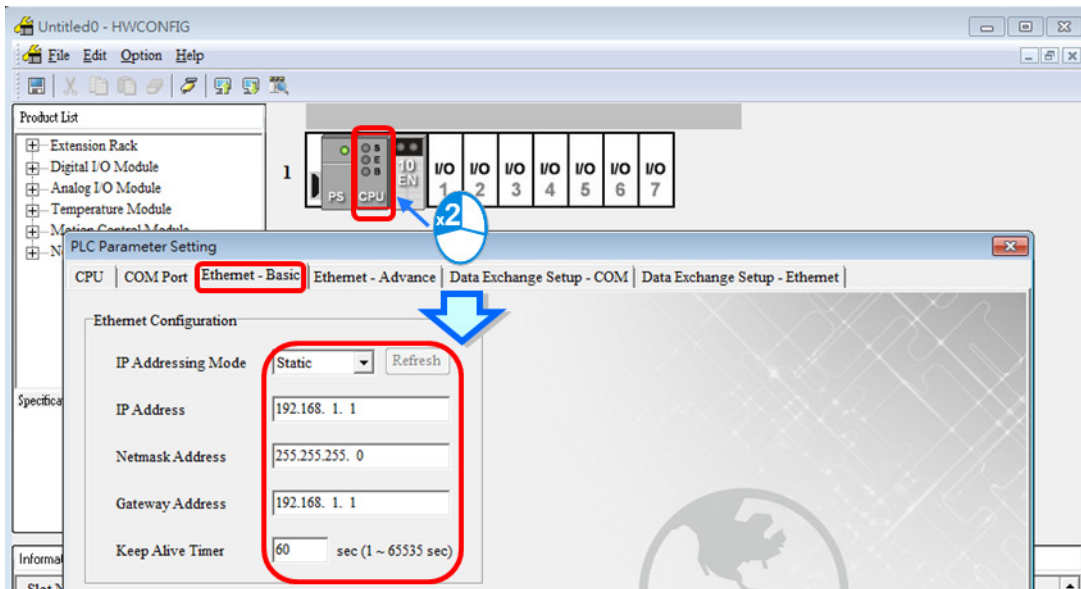
#### 2.1 AH10EN-5A

- ◆ Double-click the device you'd like to change its IP address receiving mode.
- ◆ You will see the option Network Parameters. Click this option to see the Network Parameters setup page.
- ◆ Make changes on the items that you'd like to change their IP address receiving modes and click OK to confirm the settings.



## 2.1 AHCPU5x1-EN

- ◆ Double-click the device you'd like to change its IP address receiving mode.
- ◆ Set up the IP address under the Ethernet Basic tab.
- ◆ Make changes on the items that you'd like to change their IP address receiving modes and click OK to confirm the settings.



### 3. Download the HWCONFIG

- ◆ Refer to section 4.1.1 for the related information.

### 4. Open the EIP Builder

- ◆ Refer to section 4.1.1 for the related information.

### 5. Open the IP Manager

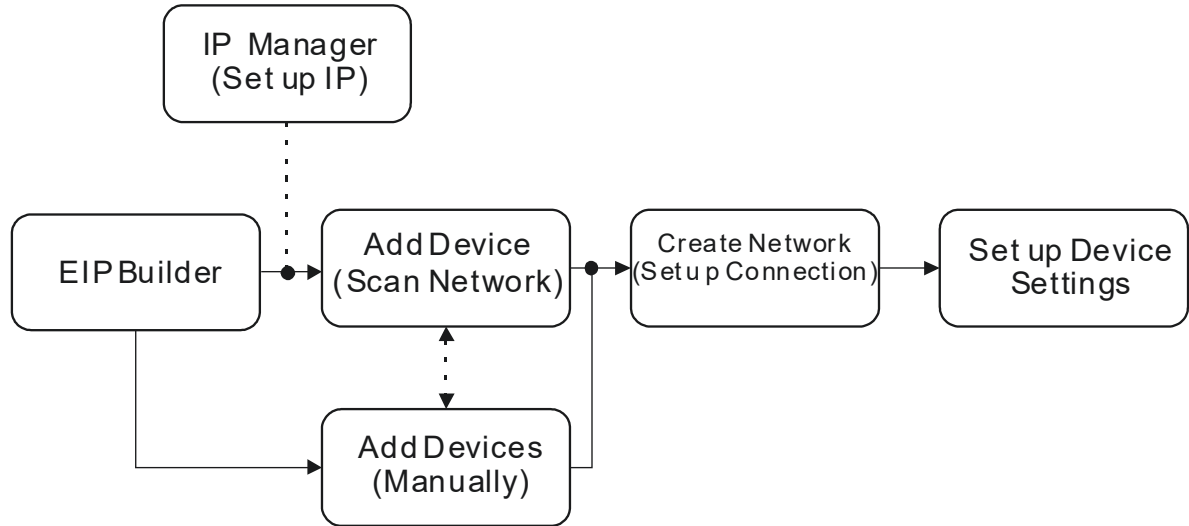
- ◆ Refer to section 4.2.2 for the related information.

### 6. Open the IP setup page

- ◆ Refer to section 4.2.2 for the related information.

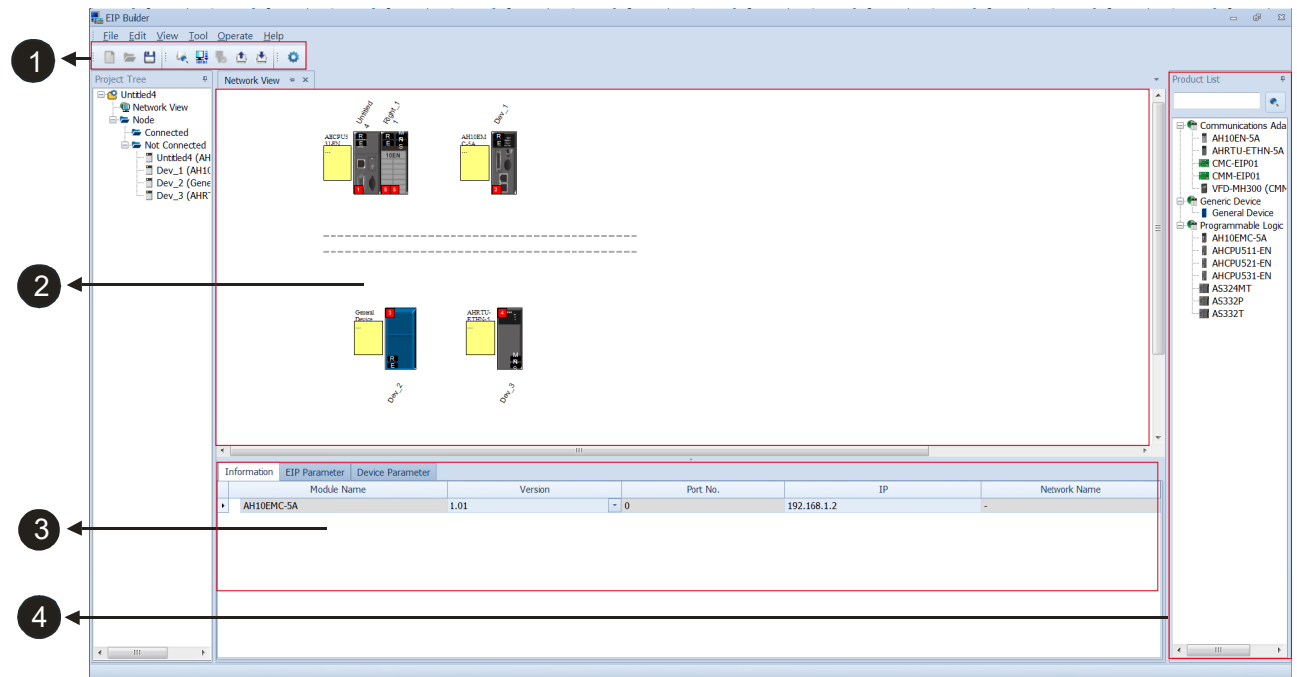
### 4.3 Network

The EIP Builder provides a graphical user interface; users can see the devices and their EtherNet/IP connections in the Network View. This section will provide an overview of how to add your devices in and build up the network connections. The procedure of the process is stated below.



4

#### Descriptions for the EIP Builder:



	Item	Definition
❶	Toolbar	Toolbar buttons
❷	Network View	Display the connected devices and their connection status
❸	Configuration Area	Set the parameters and display the configurations
❹	Product List	Display the available devices to be connected to EtherNet/IP

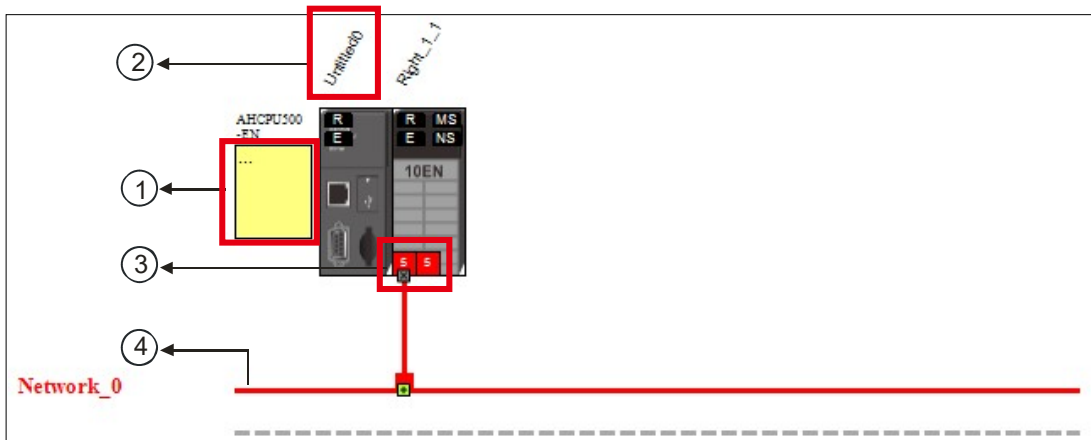
1 Toolbar



Icon	Name	Definition
	New	Create a new EIP Builder project
	Open	Open an existing project
	Save	Save the project
	Scan Network	Scan the network for device availability
	Check	Check if the project is planed nicely
	On-line Mode	Switch to on-line mode
	Uploader	Upload
	Downloader	Download
	Setup Button	Open the communication setting; set up the path connecting the PC to the EIP Scanner

4

2 Network View

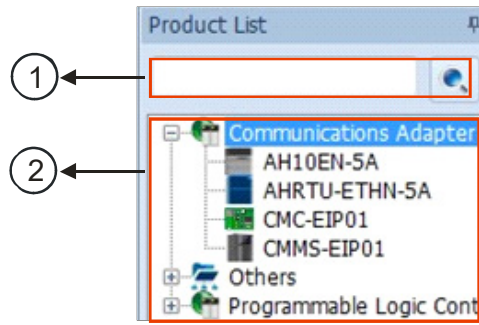


	Name	Definition
①	Station Name	Name for the station
②	Device Name	Name for the device
③	Ethernet COM Port	Display the number of devices with Ethernet communication ports. The last digit of the IP address will be shown on the COM port.
④	Network_0	Display connection status; devices on the same line indicate they are in the same network.

3 Configuration Area

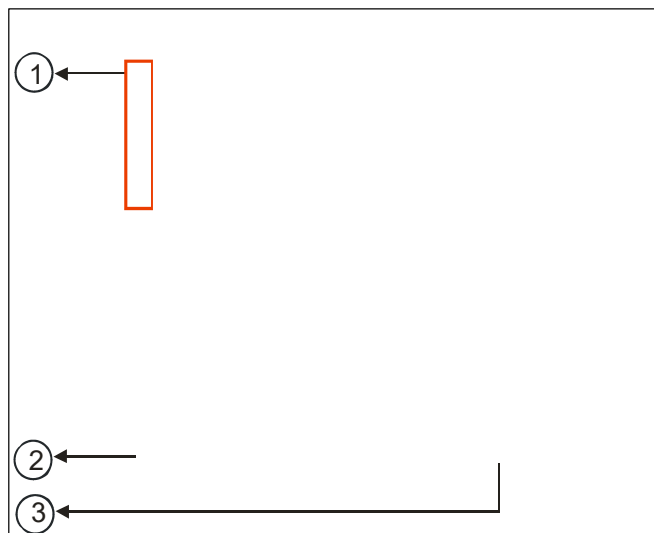
Refer to section 4.3.3 for more information.

④ Product List



	Name	Definition
①	Search Bar	Type the module name to search; when nothing found, that means there is no EDS file in the system.
②	Product List	Categorize the devices according to the definition of the EtherNet/IP; for devices from the 3 <sup>rd</sup> party will be put in the Others folder.

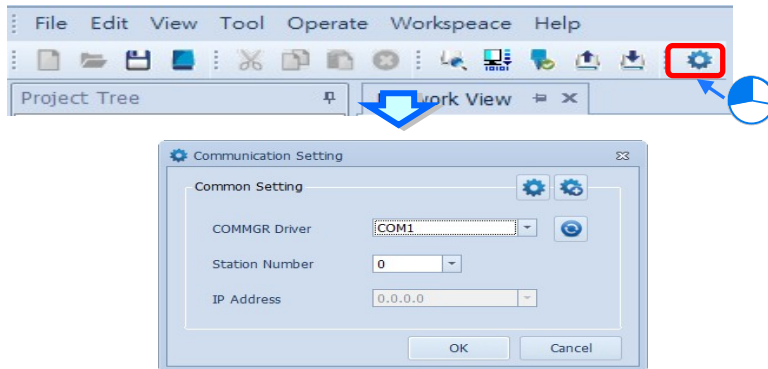
Scan Network



	Name	Definition
①	Selection checkboxes	Tick to select the devices you'd like to add to the network view
②	Refresh	Refresh to scan the network again
③	Join	Add the selected device to the network view

● **Operation Steps:**

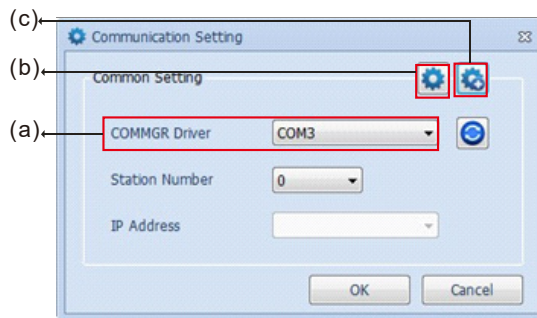
1. **Add new devices in (scan the network):** Click the setup button to bring out the communication set up page.



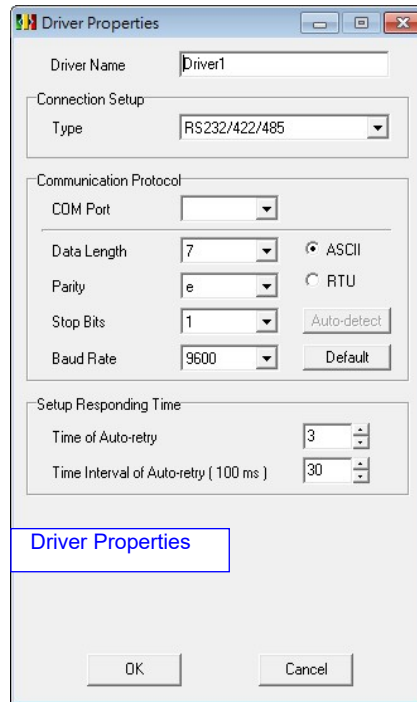
- ◆ Once your PC is connected to the EIP Scanner, there are 3 ways to set up the network communication.

4

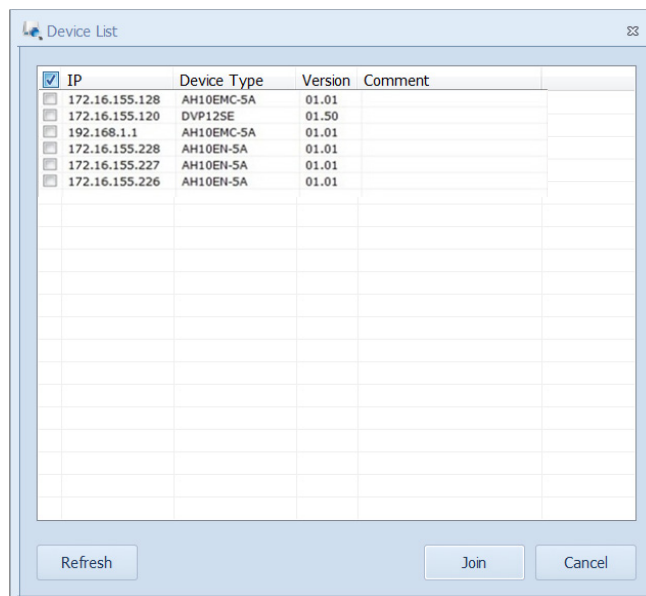
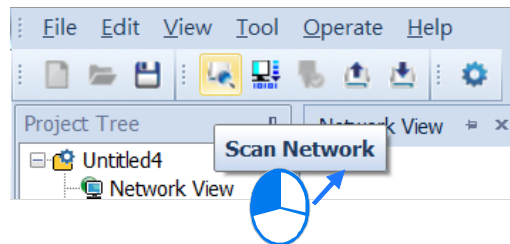
- (a) Select the created Driver: Select the created driver from the COMMGR Driver drop down list.
- (b) Edit the created Driver: Click the setup button in the Common Setting section to bring out the Driver Properties to edit.
- (c) Add a new Driver: Click the setup button+ in the Common Setting section to bring out the Driver Properties to add new Driver.



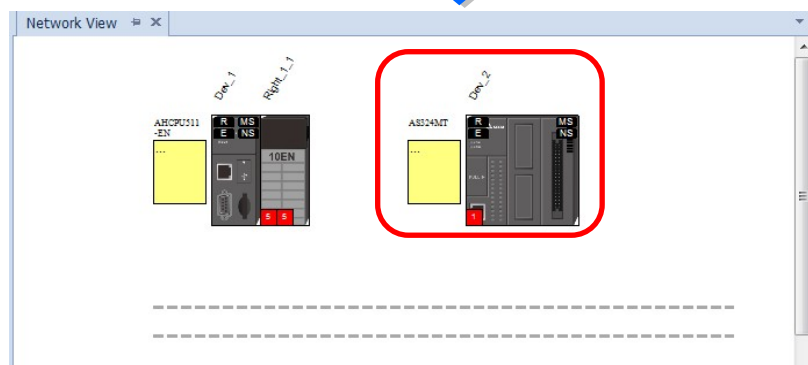
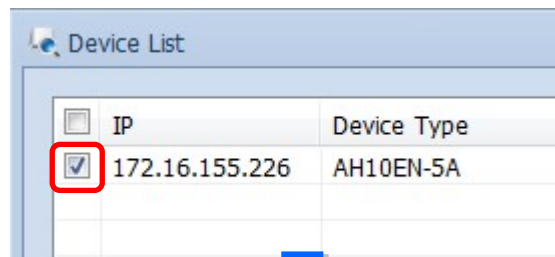




- ◆ Click the Scan Network button, the EIP Builder will scan the network and list the scanned devices in the Device List.

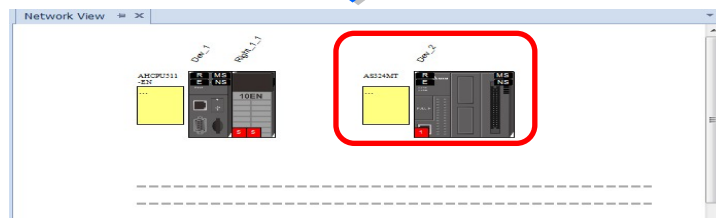
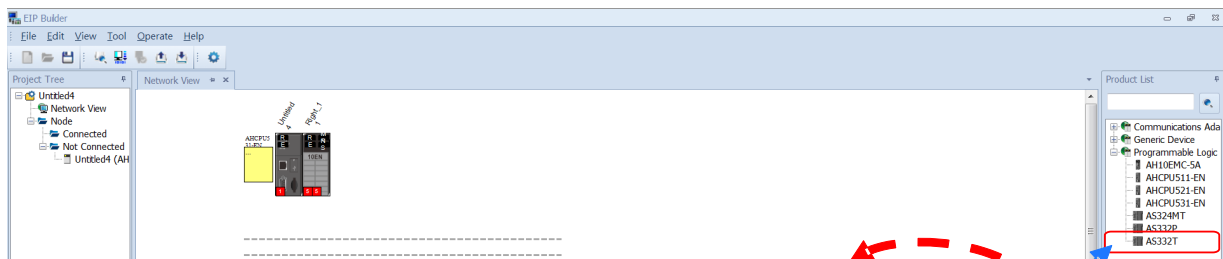


- ◆ Tick to select the devices you'd like to add to the Network. After that, click Join to add the selected devices.



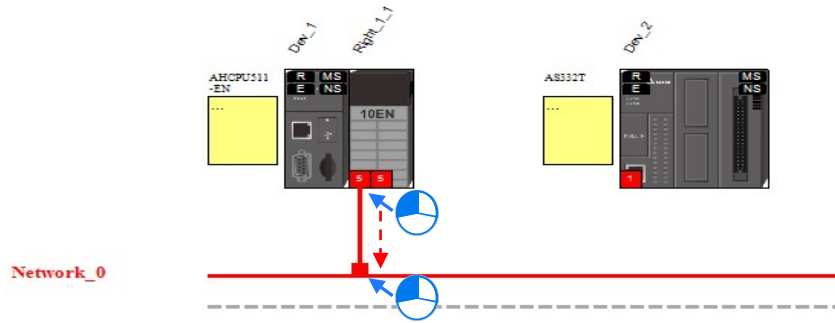
4

2. Add devices (Manually) : Select the devices you'd like to add from the Device List; you can also type in the module name in the search bar. After that drag the device you'd like to add to the network view.

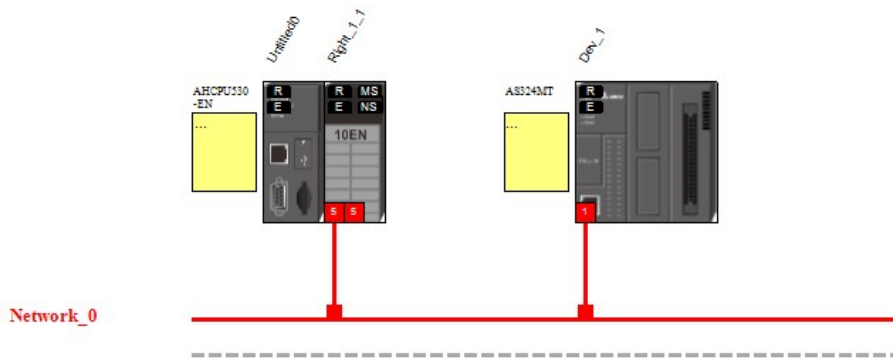


### 3. Create Network

- ◆ Drag the Ethernet communication port of the device to the network to create connection.



- ◆ Create network connections for the devices.

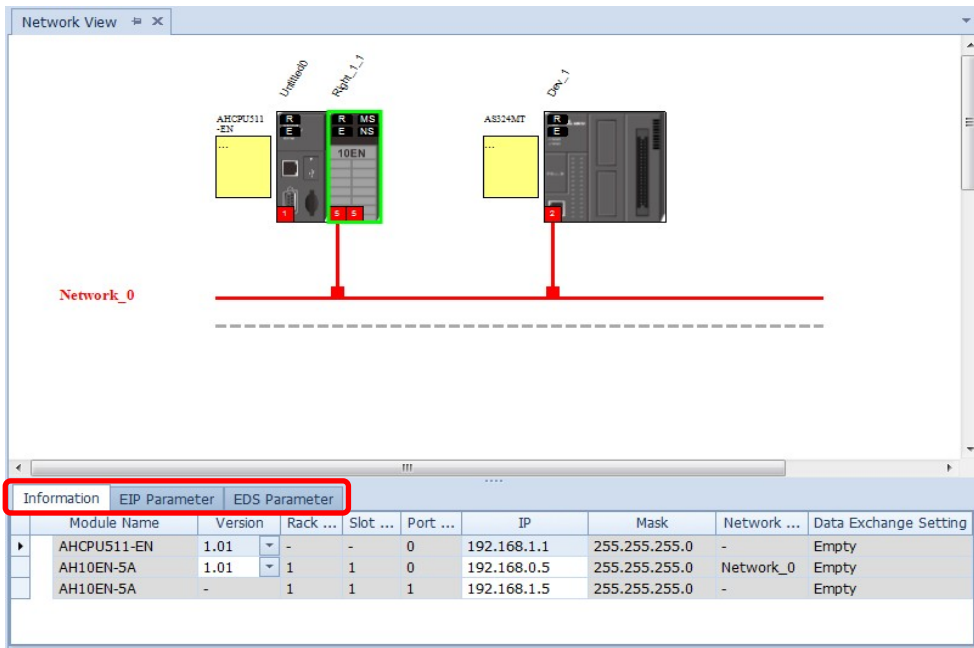


- ◆ Once the connection is established, click the network line “Network\_0”, you will see all the connected devices in this network.

User Define Name	Module Name	Port No.	IP	Data Exchange Setting
Right_1_1	AH10EN-5A	0	192.168.0.5	Empty
Dev_1	AS324MT	0	192.168.1.2	Empty

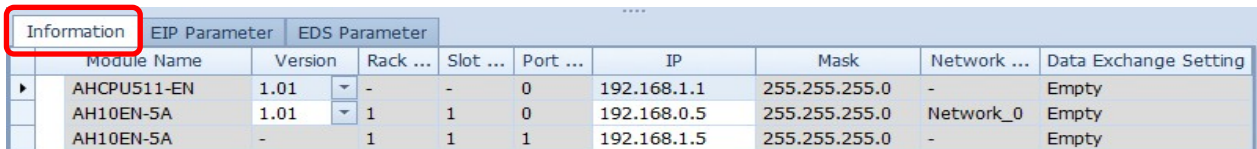
4. Set up the parameters

- ◆ Click tabs of the Information, EIP parameter and the EDS Parameter to see and edit the parameters respectively.



(a) Information Tab

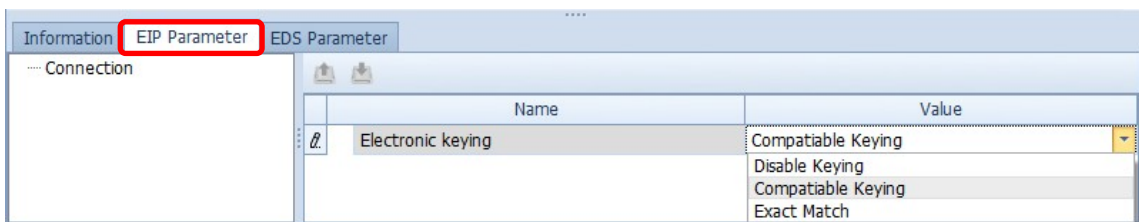
This tab contains information regarding Module Name, Version, Rack, Slot, Slot, IP address, Mask, Network and Data mapping Setting.



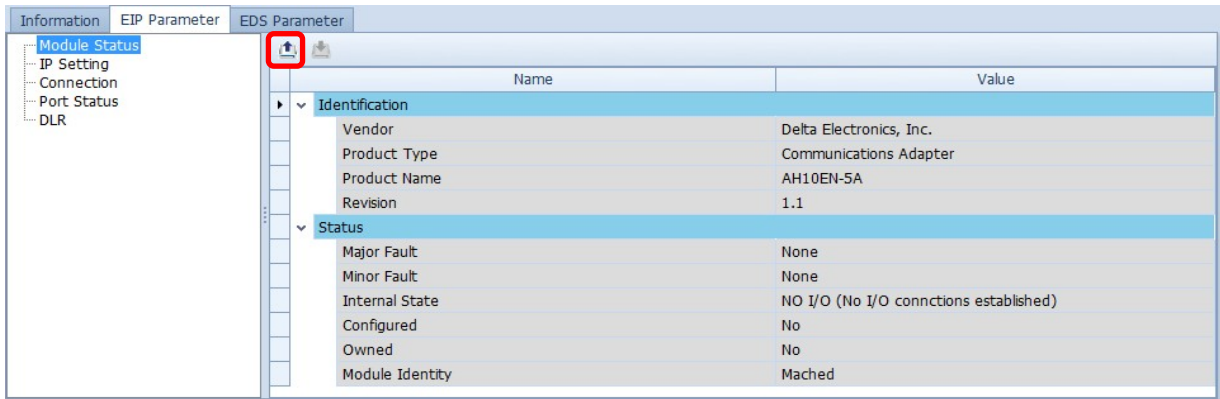
(b) EIP Parameter Tab

This tab contains information regarding parameters in the EDS file. When Off-line, users can only check the connection parameters for setting up the EDS filtering rules.

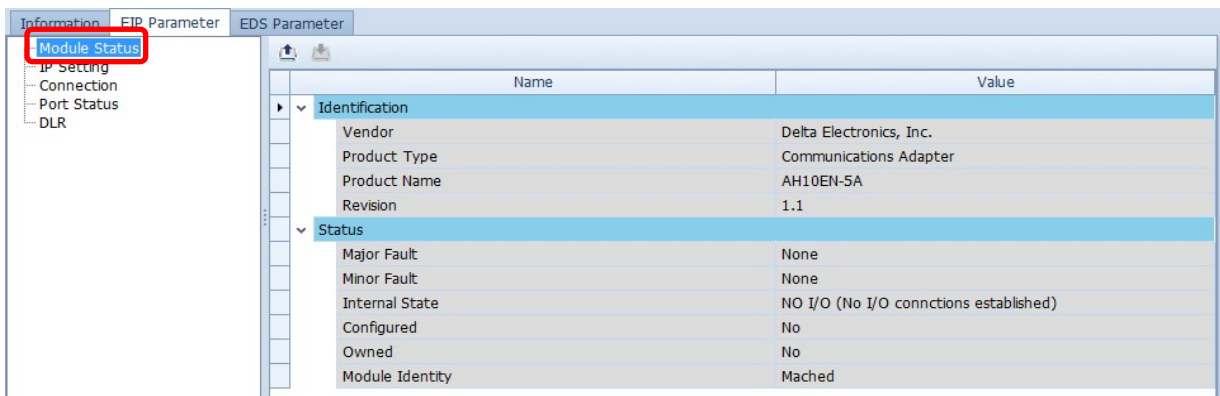
- ◆ **Disable Keying:** Disable checking on the product information and its versions.
- ◆ **Compatible Keying:** Checking if the product information and its master version are matched; as for the minor version, check for its compatibility.
- ◆ **Exact Match:** Checking if the product information, its master version and minor version are matched.



While the device is connected, you can click the upload button to upload the related parameters back to the device.



	Name	Definition
①	Module Status	(c) Identification: Display information regarding Vendor, Product Type, Product Name, Revision, etc. (d) Status: Display connection status, including Major Fault, Minor Fault, Internal State, Configuration Status, and Module Identity.
②	IP Setting	<ul style="list-style-type: none"> <li>Port1: Indicating port 1 of the device, for editing configurations of the IP Address, Subnet Mask, Gateway Address, and Host Name.</li> </ul> Remark: When there is a Port2, that means there are 2 Ethernet communication ports.
③	Connection	<ul style="list-style-type: none"> <li>EDS parameters filtering rules include Disable Keying, Compatible Keying, and Exact Match.</li> </ul>
④	Port Status	<ul style="list-style-type: none"> <li>Display Link Status, Speed, Duplex, Negotiation Status and Hardware Fault.</li> </ul>
⑤	Device Level Ring (DLR)	<ul style="list-style-type: none"> <li>Display DLR information includes Network Topology, Network Status, Ring Supervisor, and Active Supervisor Precedence.</li> </ul>



The screenshot shows the EDS Parameter Tab with 'IP Setting' selected in the left-hand tree. The main area displays a table of parameters for two ports.

Name	Value
<b>Port 1</b>	
IP Configured	Static
IP Address	172.16.155.226
Subnet Mask	255.255.255.0
Gateway Address	172.16.155.1
Host Name	AH10EN-5A
<b>Port 2</b>	
IP Configured	Static
IP Address	172.16.155.226
Subnet Mask	255.255.255.0
Gateway Address	172.16.155.1
Host Name	AH10EN-5A

The screenshot shows the EDS Parameter Tab with 'Connection' selected in the left-hand tree. The main area displays a table of parameters.

Name	Value
Electronic keying	Compatible Keying

The screenshot shows the EDS Parameter Tab with 'Port Status' selected in the left-hand tree. The main area displays a table of port status information.

Port	Link status	Speed	Duplex	Negotiation Status	Hardware Fault
1	Active	100 Mbps	Full	Success	No detected
2	Inactive	-	-	-	-

The screenshot shows the EDS Parameter Tab with 'DLR' selected in the left-hand tree. The main area displays a table of DLR information parameters.

Name	Value
<b>DLR Information</b>	
Network Topology	Linear
Network Status	Normal
Ring Supervisor	IP: 0.0.0.0 MAC: 00:00:00:00:00:00
Active Supervisor Precedence	0

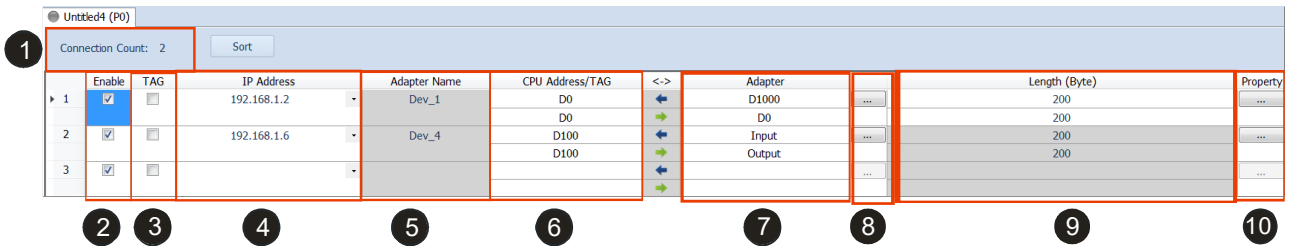
(c) **EDS Parameter Tab:** this is not supported on the AH10EN-5A series.

## 4.4 Data Mapping

When the connection between devices is established, users can use the data mapping function to exchange data between devices. This section will provide an overview of how to create a data mapping table.



### Descriptions for the Data Mapping:



	Name	Definition
❶	Connection Count	Data mapping connection count; each row represents one independent EtherNet/IP connection. The number of connections cannot exceed the maximum connection number that the Scanner supports. For the AH10EN-5A series, the maximum connection number is 64.
❷	Enable	Enable / Disable the data mapping function
❸	TAG	Use TAGs created to execute data mapping; after selected, this function is enabled and <ul style="list-style-type: none"> <li>● read only (←)</li> <li>● registers are not available for the row selected</li> <li>● the length cannot be modified</li> <li>● consumed TAG should be created in ISPSOft global symbols beforehand</li> </ul>
❹	IP Address	The IP address of the Adapter that you'd like to connect to. After the data mapping connection is established, the system will load the connected device's IP address. Users can also use the drop down list to select the device's IP address to add and edit the connection.
❺	Adapter Name	Once the IP address is selected, its name will be displayed but cannot be modified here. Refer to section 4.3 ❷ for more information on how to change the device name.
❻	CPU Address	Start address of the data mapping's register
	Scanner's register address + address offset (EtherNet/IP modules)	Actual represented register = starting register address + address offset; starting register address can be set on the HWCONFIG setup page.
	If TAG ❸ is selected	Consumed TAG can be selected from the drop-down list
❼	Adapter Address/Parameter	Target adapter's register address / parameters
	If TAG ❸ is selected	Input the Produced TAG of the EIP to be connected; the default name is the same as TAG in ❸.
❽	I/O Mapping Table	Set up the IN/OUT parameters; when there is no I/O representative table presented for the Adapter, they cannot be opened, for example some PLCs.

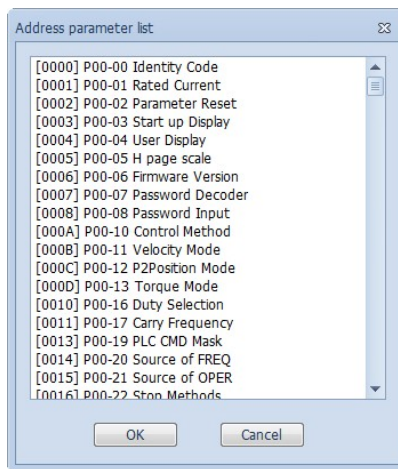
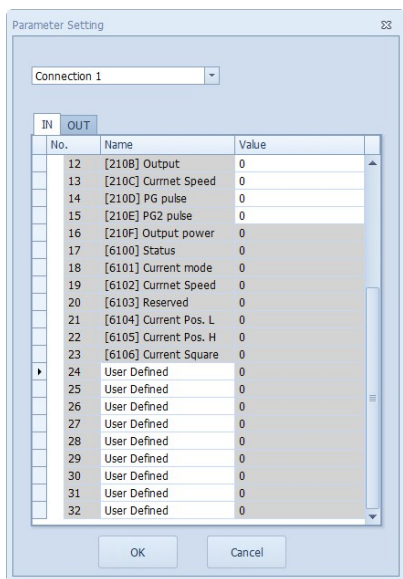
	Name	Definition
⑨	Length	Set up the data mapping length; unit: byte, the maximum is 500 byte.
⑩	Property	Set up the advanced data mapping parameters.

⑨ I/O Mapping Table

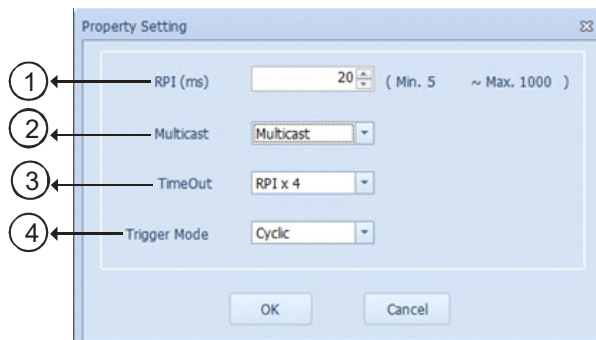
Delta EIP devices provide I/O mapping table. If needed, users can use the table to edit the parameters.

	Name	Definition
①	Connection	Select the connection from the drop down list. Different connection might have different mapping parameters.
②	In	Input the mapping parameters. The column No. states the maximum number of mapping parameters to input. Double-click the column Name to open the mapping table to edit.
③	Out	Output the mapping parameters. The column No. states the maximum number of mapping parameters to output. Double-click the column Name to open the mapping table to edit.
④	Name	The parameter name; double-click the column Name to open the mapping table to edit.
⑤	Value	Values; after editing and downloading the values will be stored in the Scanner. When the connection is established, the values will be written to the Adapter.

4



⑩ Property



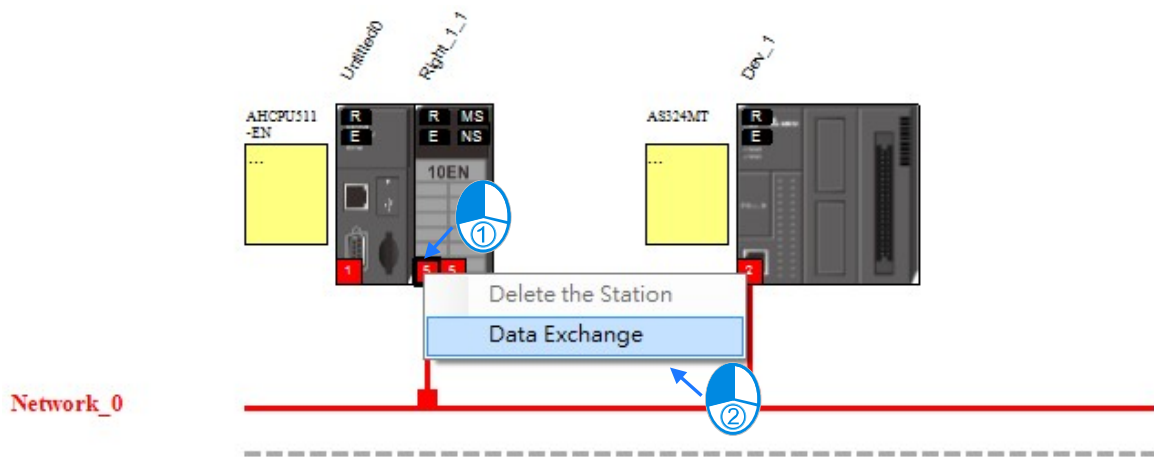


	Name	Definition
①	Requested Packet Interval (RPI)	RPI setup: via the I/O connection to connect to EtherNet/IP to exchange data at regular time intervals, unit: ms
②	Multicast	Communication mode setup: Multicast or Point-to-Point
③	Timeout	Timeout setup; set up the timeout time according to the RPI or the multiple of RPI (RPI*X).
④	Trigger Mode	Trigger Mode: Cyclic, Change of State, and Application Cyclic: renew data cyclically Change of State: renew data once there is any change Application: renew data according to the product setup

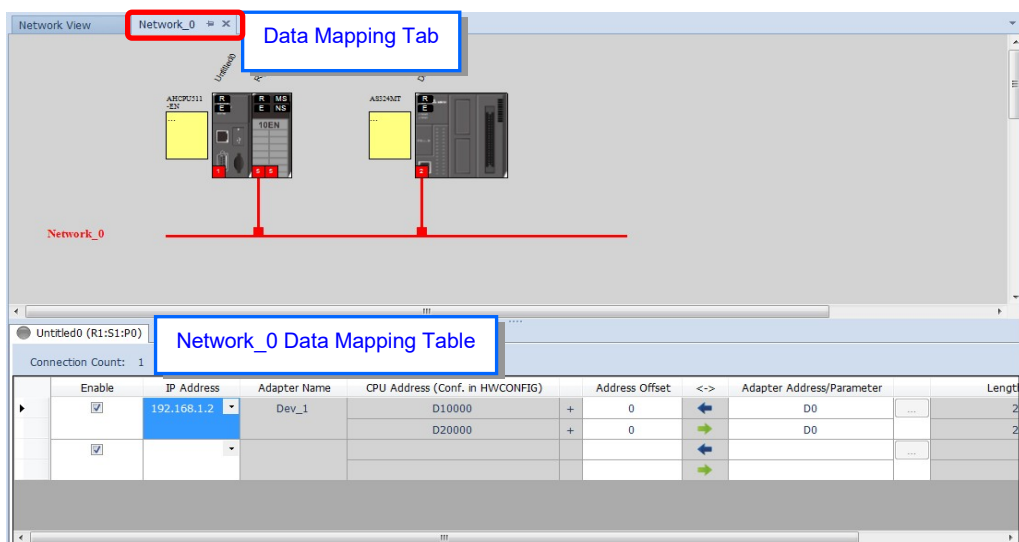
● **Operation Steps:**

1. Create a data mapping table (※):

- ◆ Click to select the Scanner Ethernet COM port that you'd like to perform the data mapping and then right-click to see the options. Click Data Exchange to open the Data Mapping Table.



- ◆ After the selection is made, the system will create a Data Mapping Tab, shown as Network\_0.



2. Set up the Data Mapping Parameters

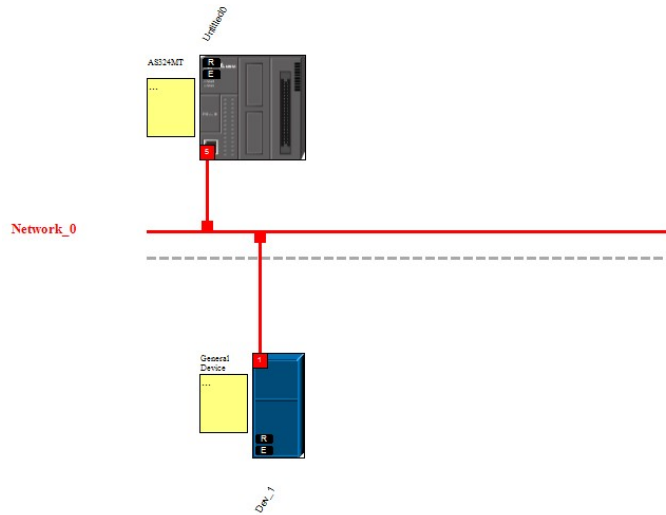
◆ Type the parameters in the data mapping table

- a) See the example of reading the D500~D599 of the Adapter with the IP address 192.168.1.2 to the D10000~D10099 of the Scanner below.
- b) See the example of writing the D20200~D20299 of the Scanner to the D100~D199 of the Adapter with the IP address 192.168.1.1

Enable	TAG	IP Address	Adapter Name	CPU Address/TAG	<->	Adapter	Length (Byte)	Property
<input checked="" type="checkbox"/>	<input type="checkbox"/>	192.168.1.2	Dev_1	D0	←	D1000	200	...
<input checked="" type="checkbox"/>	<input type="checkbox"/>	192.168.1.6	Dev_4	D0	→	D0	200	...
<input checked="" type="checkbox"/>	<input type="checkbox"/>			D100	→	Input	200	...
<input checked="" type="checkbox"/>	<input type="checkbox"/>			D100	→	Output	200	...

◆ Use TAG in data mapping

- a) Add a General Device in the network and select the IP address of the Produced TAG of the device to be connected. For adding devices in the network, please refer to section 4.3 for more information.



- b) The data mapping page

Enable	TAG	IP Address	Adapter Name	CPU Address/TAG	<->	Adapter	Length (Byte)	Property
<input checked="" type="checkbox"/>	<input type="checkbox"/>	192.168.1.2	Dev_1	D0	←	D1000	200	...
<input checked="" type="checkbox"/>	<input type="checkbox"/>	192.168.1.6	Dev_4	D0	→	D0	200	...
<input checked="" type="checkbox"/>	<input type="checkbox"/>			D100	→	Input	200	...
<input checked="" type="checkbox"/>	<input type="checkbox"/>			D100	→	Output	200	...

- c) Select TAG to have this function enabled. And after this function is enabled, the attributes is read only (←).

	Enable	TAG	IP Address
▶ 1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	192.168.1.2



CPU Address/TAG	<->	Adapter
	←	Input

- ※ Users can also select TAG and then input the IP address directly to connect to TAGs from other devices. In this case, there is no need to create a connection to Gerneal Device.

- d) Users can use the drop-down list of the CPU Address /TAG to select the already created Consumed TAG.

CPU Address/TAG	<->	Adapter
Freq	←	Input

- e) After the TAG function is selected, the system will input data in the columns of Adapter register address, parameter, and address of the TAG with the same name. Users can also edit the data in the columns. Make sure the TAG name is the same as the Produced TAG of the EIP to be connected.

◆ Set up property

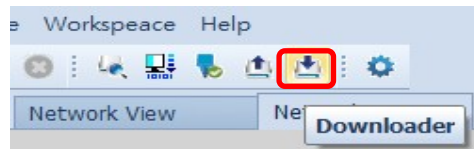
- a) Click the Property to set up.

Length (Byte)	Property
200	...
200	

- b) Type the data mapping parameters  
Set the Requested Packet Interval (RPI) to renew the data between the Scanner and Adapter cyclically, for example every 20ms.

3. Download

- ◆ Click Downloader on the tool bar to open the download window.



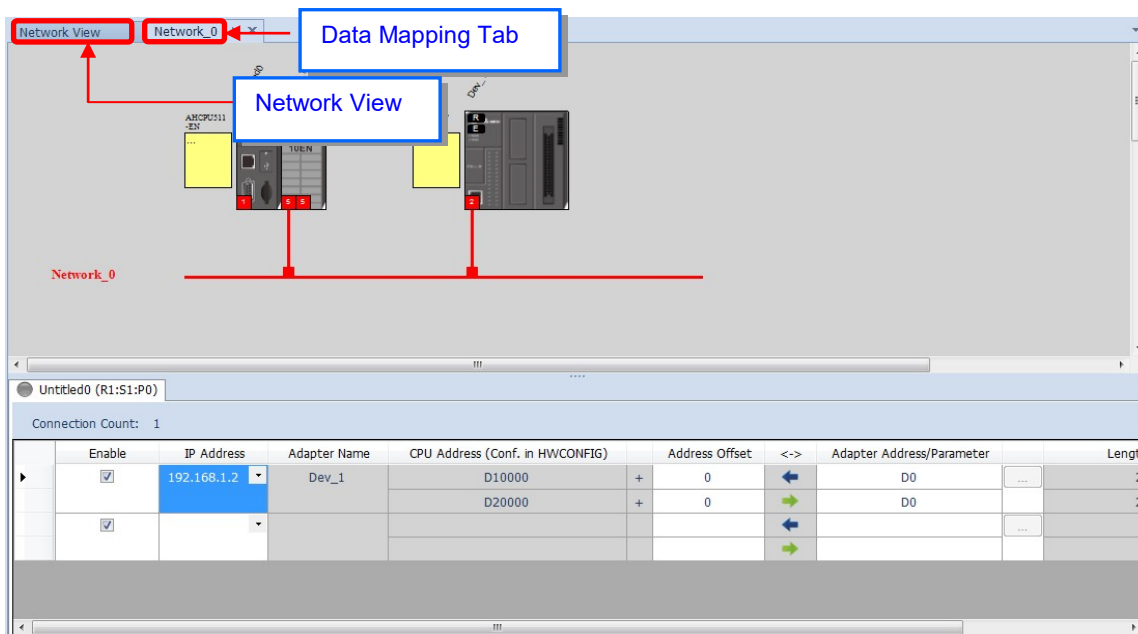
- ◆ Selecting the Scanner communication port of the EIP Builder; every communication port can download a data mapping table.

Name	Status
▼ <input checked="" type="checkbox"/> Untitled0	
▼ <input type="checkbox"/> EDS Parameters	
<input type="checkbox"/> AH10EN-5A (Right_1_1)	
<input type="checkbox"/> AS324MT (Dev_1)	
▼ <input checked="" type="checkbox"/> Network Data Exchange Table	
<input type="checkbox"/> Untitled0 (P0)	
<input checked="" type="checkbox"/> Untitled0 (R1:S1:P0)	
<input type="checkbox"/> Untitled0 (R1:S1:P1)	

4

### 4.5 Diagnosis

The EIP Builder can provide the diagnosis on the connection and data mapping status. For the connection status, refer to Adapter connection status and indicator in the Network View tab and for data mapping status and error codes, refer to Network\_0, the data mapping tab.



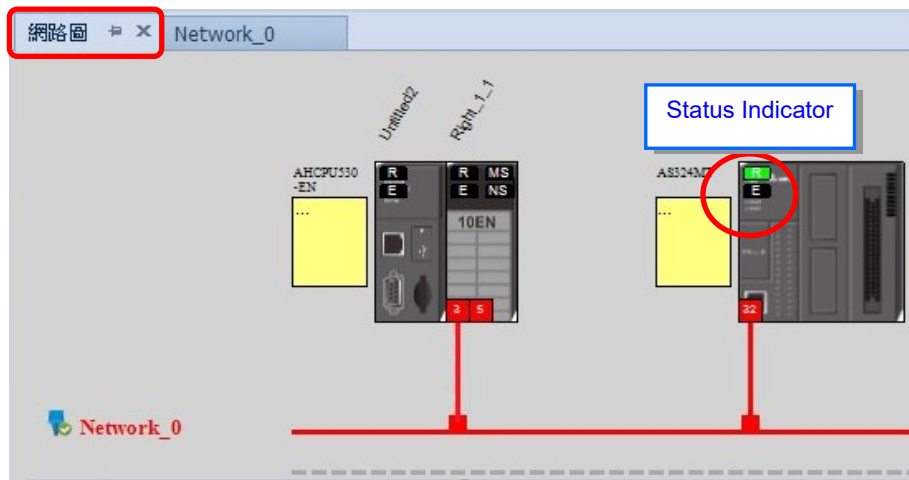
● **Operation Step**

1. Click the On-line Mode on the toolbar.

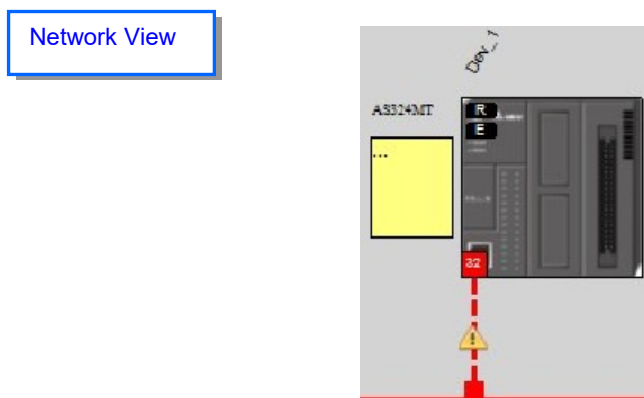


2. Network View (Connection Status):

- a) Click the Network View tab to check the device status from the indicators, for example RUN / STOP and Error indicators on the PLC.



- b) The dotted line and the warning sign indicate connection error, as the image shown below.

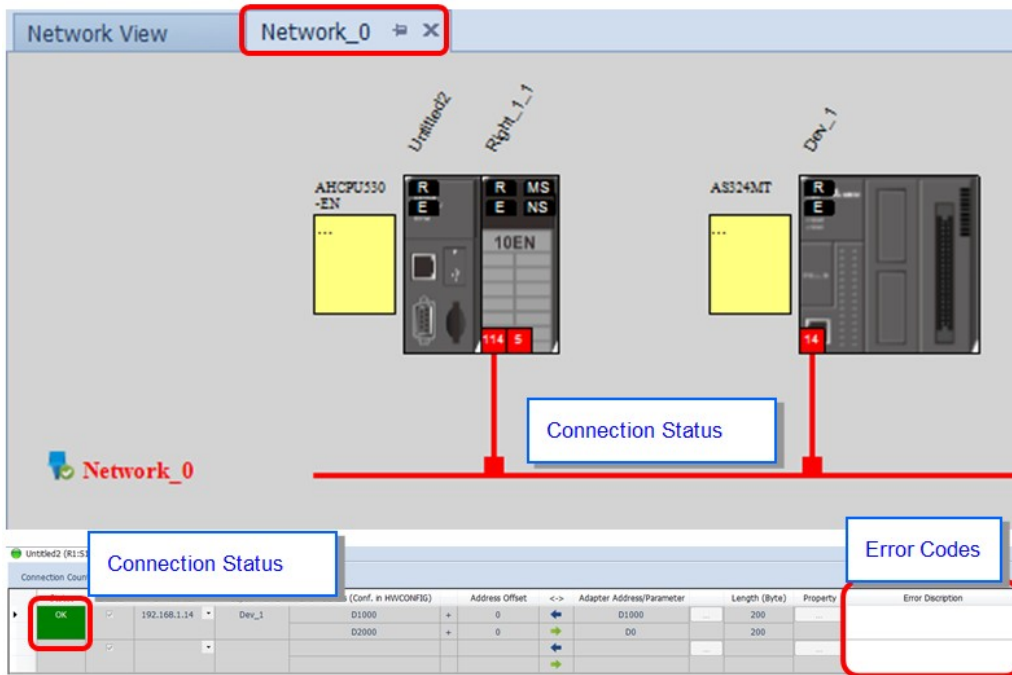


◆ **Network\_0 (Data Mapping):**

- a) Click the On-line Mode on the toolbar.



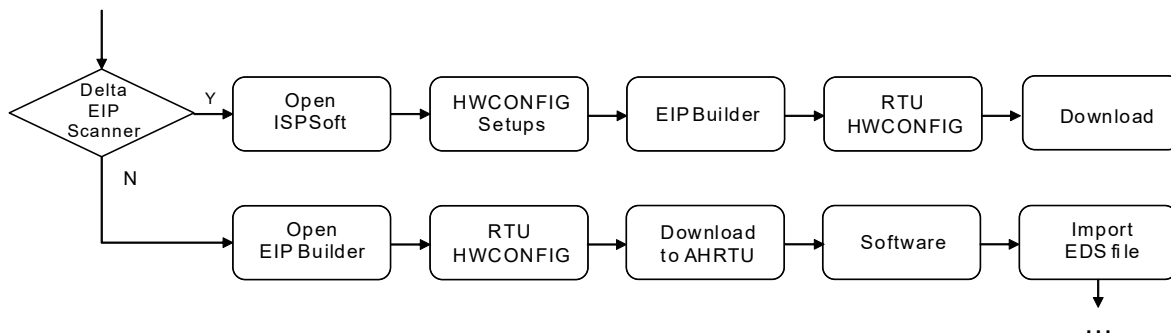
- b) Click the Network\_0 to check the data mapping status and the error codes. For error code definition, refer to section 6.2.



4

## 4.6 AH Series – Connect to a RTU module

This section will provide an overview of how to connect the Delta AH series EtherNet/IP RTU modules such as AHRTU-ETHN-5A to Delta EIP Scanner and EIP Scanner from other brands. See the operation steps below.

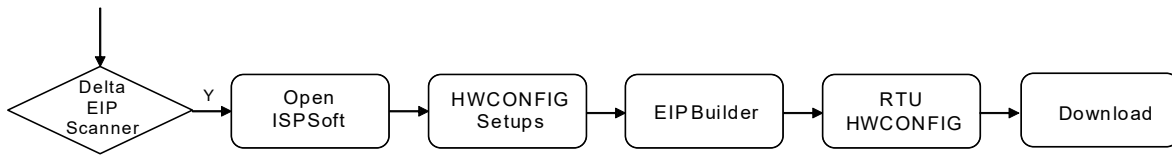


### 4.6.1 AHCPU5x1-EN Series/AHCPU560-EN2

AHCPU5x1-EN series with firmware version later than V2.00 and AHCPU560-EN2 supports EtherNet/IP. Users can connect to Delta AHRTU-ETHN-5A modules via EtherNet/IP. Once the settings are done, users can use the devices X, Y and D in AHCPU5x1-EN series and AHCPU560-EN2 to control digital and analog I/O modules connected to AHRTU-ETHN-5A.

- **Running Process:**

Open EIP Builder and add the module AHRTU-ETHN-5A in the Network View. Open HWCONFIG to set up digital and analog I/O modules of AHRTU-ETHN-5A.

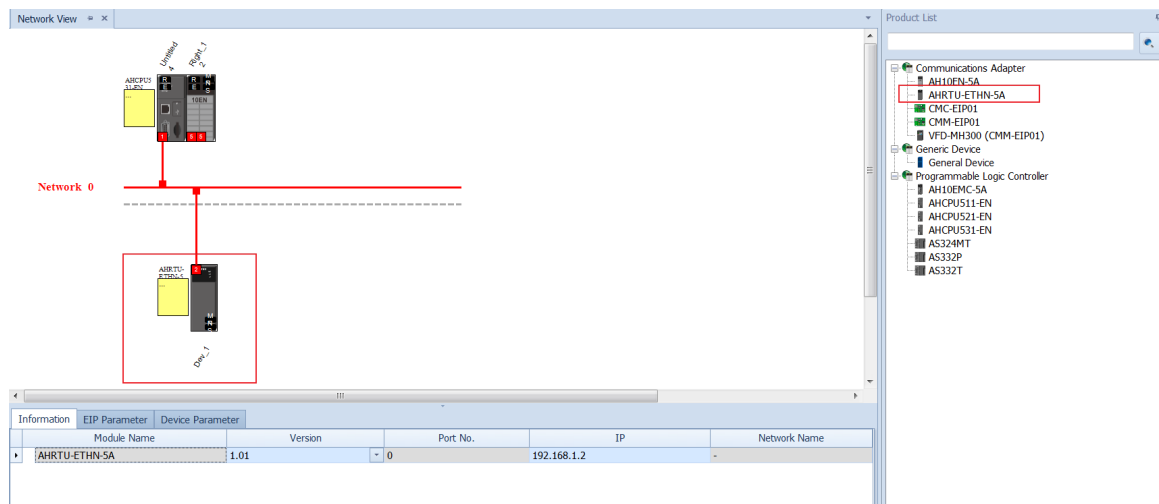


● **Operation Steps:**

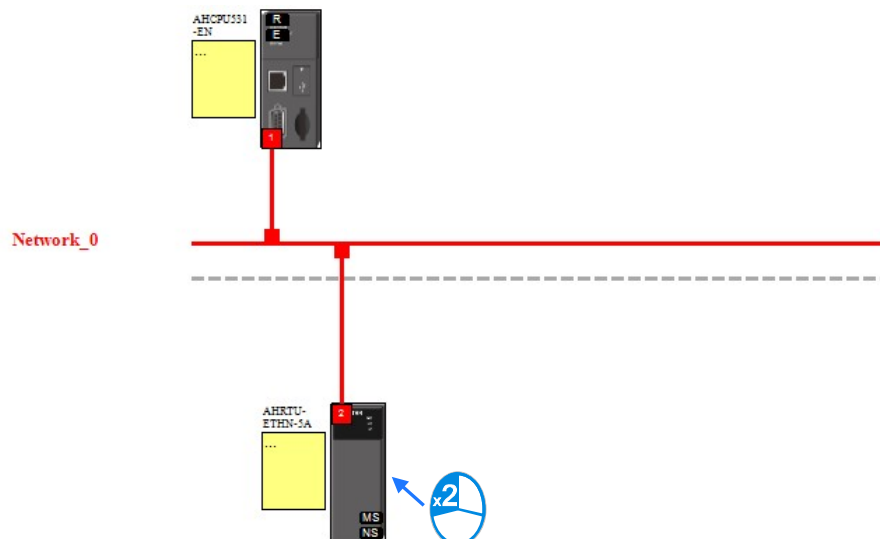
1. Refer to section 4.1 for more information on HWCONFIG in ISPSOft and EIO Builder.

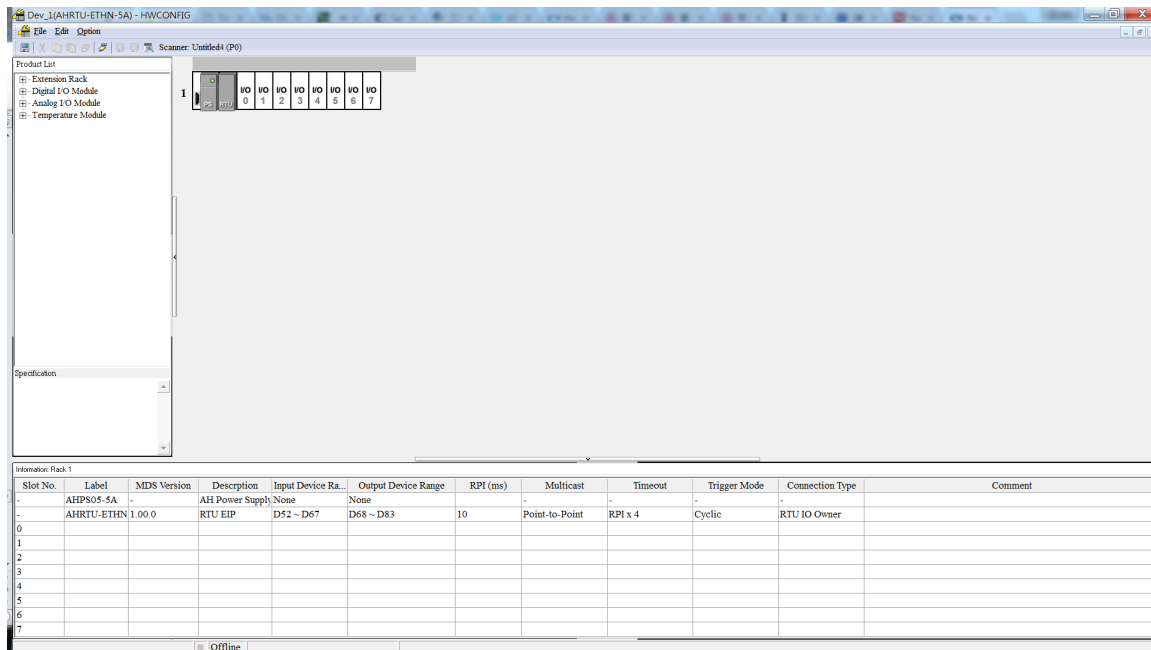
◆ **EIP Builder**

Add the module AHRTU-ETHN-5A in the Network View and create a connection to the CPU for data mapping.



2. Double-click the AHRTU-ETHN-5A module to open HWCONFIG.





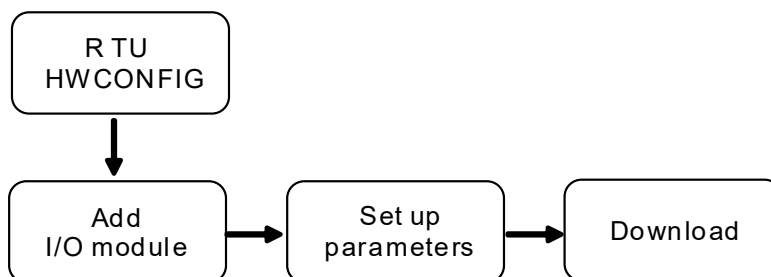
4

● **Descriptions for the EIP Builder:**

Slot No.	Label	MDS Version	Description	Input Device Range	Output Device Range	RPI (ms)	Multicast	Timeout	Trigger Mode	Connection Type
-	AHPS05-5A	-	AH Power Supply	None	None	-	-	-	-	-
-	AHRTU-ETHN	1.00.0	RTU EIP	D52 ~ D67	D68 ~ D83	10	Point-to-Point	RPI x 4	Cyclic	RTU IO Owner
0										

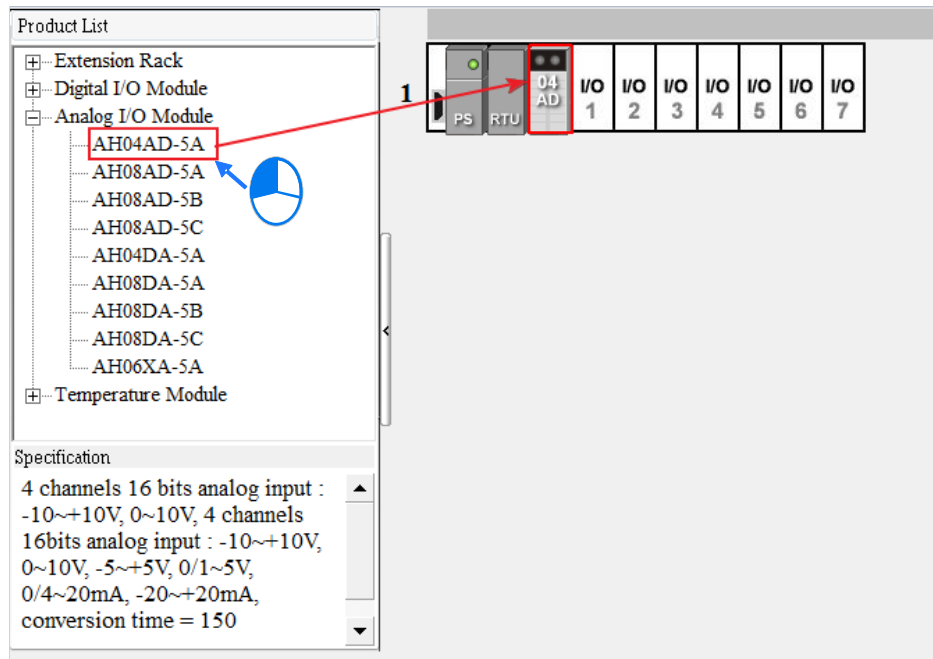
	Name	Description
1	Information: Rack 1	Information of the rack 1
2	Slot number	Slot number of rack 1 (power module and AHRTU module are excluded)
3	Label	Module Name
4	MDS Version	Device firmware version
5	Description	Device description
6	Input Device Range	The input devices assigned to a module are displayed here
7	Output Device Range	The output devices assigned to a module are displayed here
8	Requested Packet Interval (RPI)	RPI setting value; unit: ms Only analog I/O modules and special modules need to set the RPI time to renew data; for other digital I/O modules, data can be renewed according to the RPI time set for the AHRTU-ETHN-5A.
9	Multicast	Communication mode setup: Multicast or Point-to-Point
10	Timeout	Timeout setup; set up the timeout time according to the RPI or the multiple of RPI (RPI*X).
11	Trigger mode	Renew data according to the set RPI time
12	Connection type	Owner or Listen only

● **Operation Steps:**





1. Add an I/O module



Add the I/O modules according to the real placement by dragging the modules on the left hand side to the right side of the RTU module. Make sure the slot assignment is the same as the real placement.

2. Setting parameters

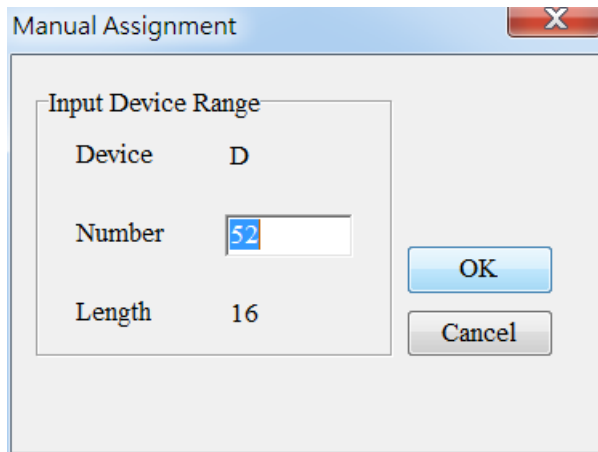
- ◆ The system automatically assigns devices to a module so that the data in the module can be stored. The devices assigned to a module are displayed in the Input Device Range cell and the Output Device Range cell.

Information: Rack 1

Slot No.	Label	MDS Version	Description	Input Device Range	Output Device Range
-	AHPS05-5A	-	AH Power Supply	None	None
-	AHRTU-ETHN	1.00.0	RTU EIP	D52 ~ D67	D68 ~ D83
0	AH04AD-5A	1.00	4 x AI 16bit	D84 ~ D91	
1					

- ◆ Click the ... in the "Input Device Range" and "Output Device Range" column to edit the ranges.





- ◆ RPI setting value; unit: mm  
 Only analog I/O modules and special modules (for example AH04AD-5A) need to set the RPI time to renew data. For other digital I/O modules, data can be renewed according to the RPI time set for the AHRTU-ETHN-5A and values in this column cannot be modified in Network\_0 tab.

4

Information: Rack 1

Slot No.	Label	MDS Version	Description	Input Device Range	Output Device Range	RPI (ms)
-	AHPS05-5A	-	AH Power Supply	None	None	
-	AHRTU-ETHN	1.00.0	RTU EIP	D52 ~ D67	D68 ~ D83	10
0	AH04AD-5A	1.00	4 x AI 16bit	D84 ~ D91		20

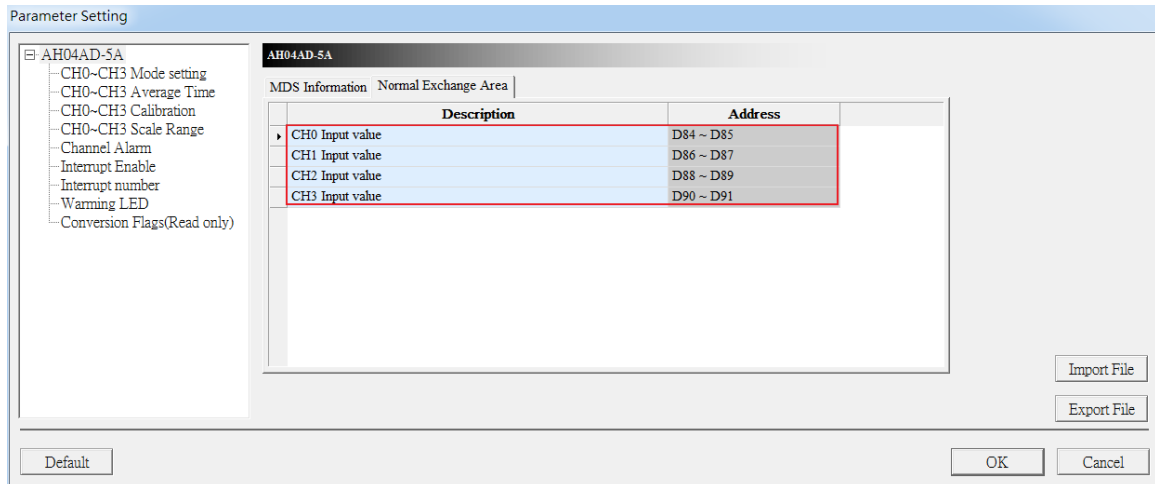
- ◆ After the setup is done, the detailed connection information of the ARTU-ETHN-5A modules will be added in the data mapping table. Data in the table cannot be modified here.

Untitled4 (P0)

Connection Count: 2    Sort

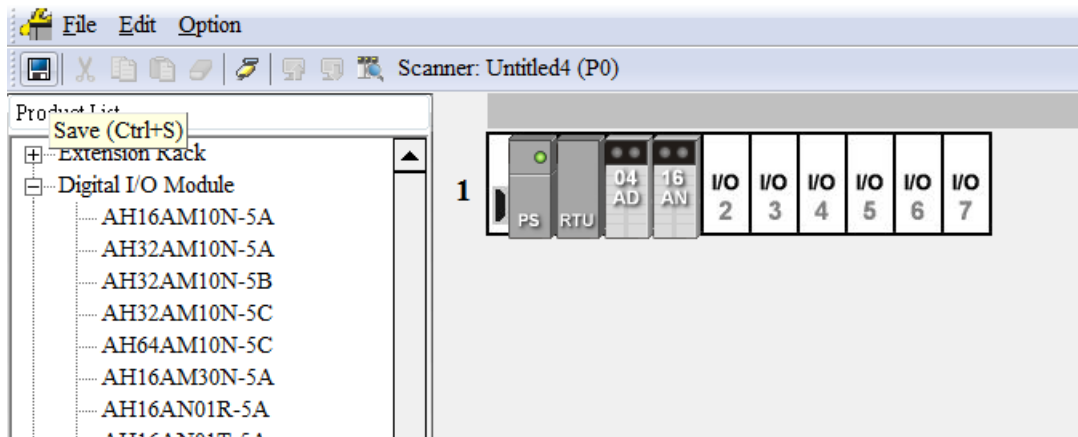
	Enable	TAG	IP Address	Adapter Name	CPU Address/TAG	<->	Adapter	Length	Property
1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	192.168.1.2	AHRTU-ETHN-5A(Dev_1)	D52	←		32	...
					D68	→		32	...
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	192.168.1.2	AHRTU-ETHN-5A (R:1 S:1)	D84	←	Input	16	...
						→	Output	0	...
3	<input checked="" type="checkbox"/>	<input type="checkbox"/>				←		...	...
						→		...	...

- ◆ Parameters for special modules can be seen in the RTU HWCONFIG. Double-click the module in the Network View tab to open the RTU HWCONFIG and check the corresponding device address in the Normal Exchange Area tab.

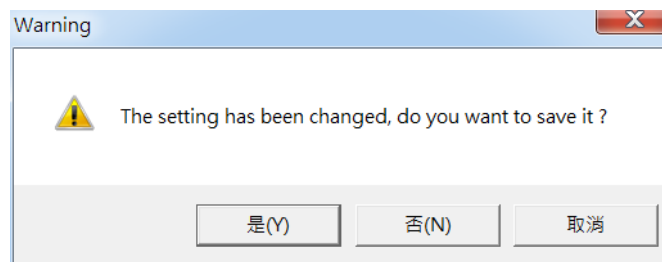


### 3. Download

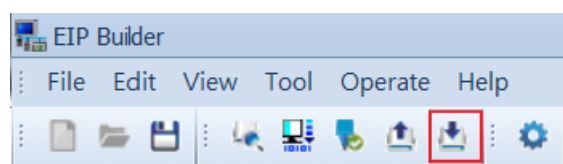
- ◆ Save: after the parameters are set, click the Save button to save the parameters.



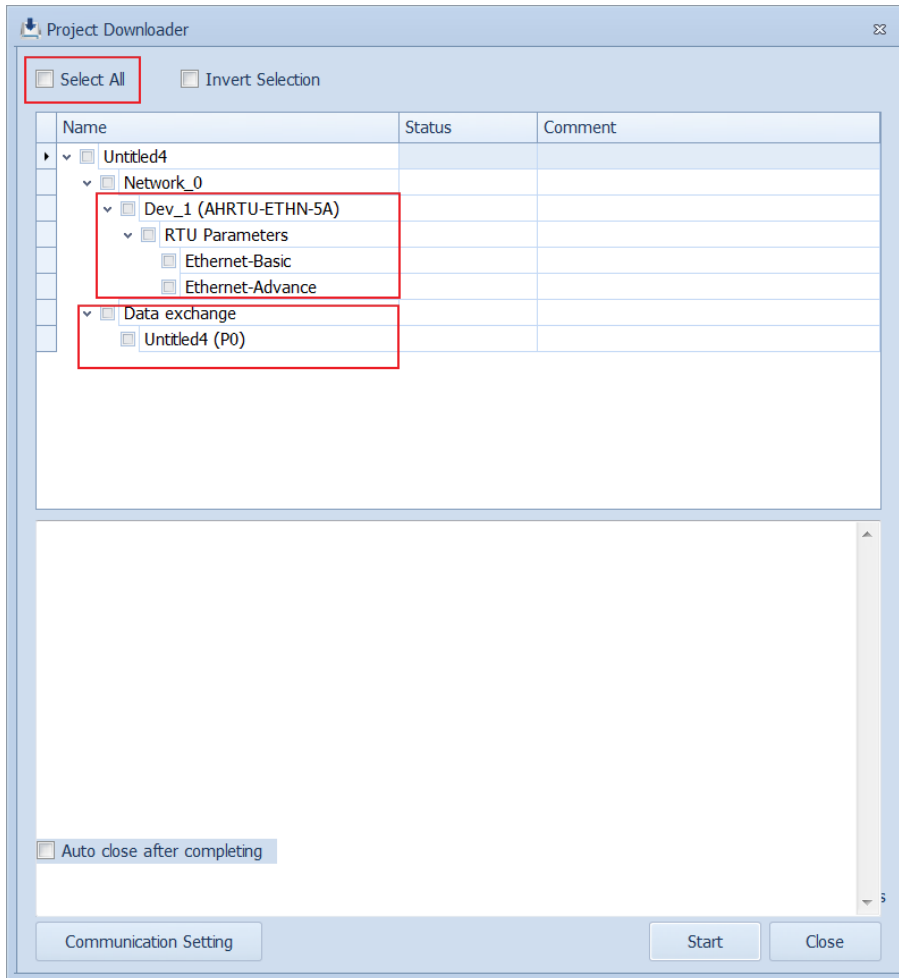
- ◆ A warning window will appear if the changed settings have not been saved.



- ◆ Download: Click the download icon to download.



- ◆ Tick the Sectl All option or select the module one by one to download the data mapping table.



4

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## Chapter 5 Programming

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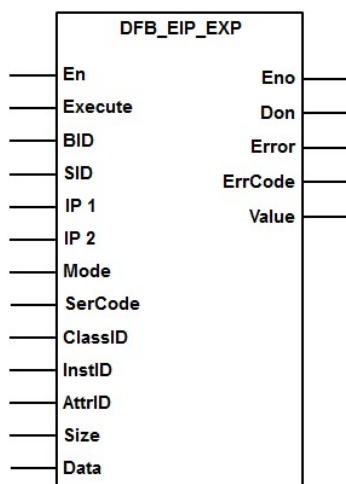
- 5.1. DFB\_EIP\_EXP Function Block .....5-2**
  - 5.1.1 Parameters ..... 5-2
- 5.2. TAG Function .....5-7**
  - 5.2.1 Produced TAG..... 5-7
  - 5.2.2 Consumed TAG..... 5-9

All connections in EtherNet/IP can be divided into explicit messaging connections and implicit (or I/O) messaging connections. Explicit messaging uses TCP/IP and request/response communications procedure or client/server connection, requiring that the memory location of the information to be sent to the client be defined in the instruction itself. Implicit messaging uses UDP/IP and is when a server sends information from predefined memory locations to a client at a given interval, using a requested packet interval (RPI) parameter to specify the rate at which data updates.

### 5.1. DFB\_EIP\_EXP Function Block

See the DFB\_EIP\_EXP function block below. Refer to the section 9.8 for objects that are supported by AH10EN-5A. For using slaves via the AH10EN-5A, refer to the slave manual for related information on Objects.

When the AH10EN-5A acts as scanners for EtherNet/IP, users can use the function block DFB\_EIP\_EXP to read/write the objects of the adapters. When the EIP builder uses Objects as its parameters, every Object has various parameters. The parameter unit is Attribute and the read/write path is Class→Instance→Attribute.



#### 5.1.1 Parameters

The meaning of each parameter in the function blocks are stated below.

Name	Description	Data Type
Execute (Execution Bit)	When the execution bit turns from Off to On, the function block will be executed and will send out an explicit message. When the operation is complete, the Done bit will be On. While an error occurs, an Error bit will be On, and an error code will be shown in the ERRCode.	BOOL
BID (Backplane number)	The backplane number of the scanner module: 1	WORD
SID (Slot number)	The slot number of the scanner module:0-11	WORD
PID (Port number)	Assigned Ethernet Port for the scanner module	WORD
IP1 (IP address 1)	This parameter is used to assign the first two IP addresses of the adapter for the assigned scanner to read/write. Example: IP = 192.168.1.5, IP1 will be written as 16#C0A8.	WORD
IP2 (IP address 2)	This parameter is used to assign the last two IP addresses of the adapter for the assigned scanner to read/write. Example: IP = 192.168.1.5, IP2 will be written as 16#0105.	WORD

Mode	<p>Setups for the explicit message connection:</p> <p>0: UCMM: do not create a CIP connection.</p> <p>1: Connected then close conn; after the transmission is done, close the connection.</p> <p>2: Connected then keep conn; after the transmission is done, keep the connection.</p>	WORD
SerCode (Service Code)	<p>EtherNet/IP standard service code is similar to the function code. The service codes specify the actions going to take. Delta products support the following service codes.</p> <p>0x01 – read every Attribute;</p> <p>0x0E – read a single one Attribute;</p> <p>0x05 – reset from the adapter ;</p> <p>0x10 – write a single one Attribute</p>	WORD
ClassId (Class number)	Attribute is the basics of the EtherNet/IP, used for identifying configurable parameters (Class) within a device.	WORD
InstId (Instance number)	Attribute is the basics of the EtherNet/IP, used for identifying configurable parameters (Instance) within a device.	WORD
AttrId (Attribute number)	Attribute is the basics of the EtherNet/IP, used for identifying configurable parameters (Attribute) within a device.	WORD
Size (Parameter type)	If the scanner wants to write a parameter data to the adapter, the parameter type should be also written in. The unit for this parameter is byte. When the Size is 1, it means the parameter type is BYTE. When the Size is 2, it means the parameter type is WORD. When the Size is 4, it means the parameter type is DWORD.	WORD
Data (Starting value)	If the scanner wants to write a parameter data to the adapter, the parameter to be written can be typed or can use the starting register address. The scanner will send the values in the Data to the adapter. The Data length is determined by the Size. The storing order of the values in the Data will be little-endian first and then big-endian. If Data=D0, Size=4, the D0 little-endian will be stored first and then the D0 big-endian, D1 little-endian and then D1 big-endian.	WORD
Don (Completion bit )	When the operation is complete, the Don bit will be On.	BOOL
Error (Error bit )	While an error occurs, an Error bit will be On, and an error code will be shown in the ERRCode.	BOOL
ErrCode (Error code)	<p>Error codes (refer to the following table)</p> <p>16#00 indicates a successful communication.</p>	WORD
Value (Return Data)	After the function blocks are executed successfully, the AH10EN-5A will put the read value to the parameter assigned registers, low bytes first and the high bytes.	WORD

**Errors**

The meaning of each error code in the function blocks are stated below.

<b>Error Code</b>	<b>Error</b>	<b>Description</b>
16#01	Connection failure	A connection related service failed along the connection path.
16#02	Resource unavailable	Resources needed for the object to perform the requested service were unavailable
16#03	Invalid parameter value	The typed value is not in the parameter service range.
16#04	Path segment error	The path segment identifier or the segment syntax was not understood by the processing node.
16#05	Path destination unknown	The path is referencing an object class, instance or structure element that is not known or is not contained in the processing node.
16#07	Connection lost	The messaging connection was lost.
16#08	Service not supported	The requested service was not implemented or was not defined for this Object Class/Instance.
16#09	Invalid attribute value	Invalid attribute data detected
16#0E	Attribute not settable	A request to modify a non-modifiable attribute was received.
16#10	Device state conflict	The device's current mode/state prohibits the execution of the requested service.
16#11	Reply data too large	The data to be transmitted in the response buffer is large
16#13	Not enough data	The service did not supply enough data to perform the specified operation
16#14	Attribute not supported	The attribute specified in the request is not supported
16#15	Too much data	The service supplied more data than was expected
16#16	Object does not exist	The object specified does not exist in the device.

Example 1: using UCMM to read the manufacturer code of the IP address 192.168.1.10

Manufacturer code: ClassId=1, InstId=1, AttrId=1

The parameters in the function blocks are as below:

<b>Input</b>		
<b>Parameter</b>	<b>Value</b>	<b>Description</b>
BID	16#01	Backplane 1
SID	16#01	Slot 1
PID	16#01	
IP1	16#C0A8	IP address: 192.168.1.10



IP2	16#010A	
Mode	16#00	UCMM
SerCode	16#0E	Read/write a single one attribute service code
ClassId	1	Class ID = 1
InstId	1	Instance ID = 1
AttrId	1	Attribute ID =1
Size	No need to set up	No need to set up
Data	No need to set up	No need to set up

When the function blocks are executed successfully, the output parameters will be stated as below.

Output		
Parameter	Settings	Description
Don	ON (16#01)	Complete
Error	No output	No error
ErrCode	16#00	No error
Value	16#031F	Delta's manufacturers code

When the function blocks are not executed successfully, the output parameters will be stated as below.

Output		
Parameter	Settings	Description
Don	No output	No output
Error	ON (16#01)	Error
ErrCode	16#07	Connection lost
Value	No output	No output

Example 2: Create a CIP connection and change the parameter value of the node 192.168.1.10 to 16#01. Close the connection after the transmission is done.

Parameters: ClassId= 16#9D, InstId= 2, AttrId= 1

The parameters in the function blocks are as below:

Input		
Parameter	Settings	Description
BID	16#01	Backplane 1
SID	16#01	Slot 1
PID	16#01	

IP1	16#C0A8	IP address: 192.168.1.10
IP2	16#010A	
Mode	16#01	Create a CIP connection and close the connection after the transmission is done.
SerCode	16#10	Write a single one Attribute
ClassId	16#9D	Class ID = 9D
InstId	16#02	Instance ID = 2
AttrId	16#01	Attribute ID =1
Size	16#02	Target parameter type: 2Bytes
Data	16#01	Parameter value: 16#01

When the function blocks are executed successfully, the output parameters will be stated as below.

Output		
Parameter	Settings	Description
Don	ON (16#01)	Complete
Error	No output	No error
ErrCode	16#00	No error
Value	No output	No output

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When the function blocks are not executed successfully, the output parameters will be stated as below.

Output		
Parameter	Settings	Description
Don	No output	No output
Error	ON (16#01)	Error
ErrCode	16#0E	Cannot write the attribute
Value	No output	No output

The Error bit is On and the ErrCode=16#1401 (The I/O module appears to have a read/write error.)

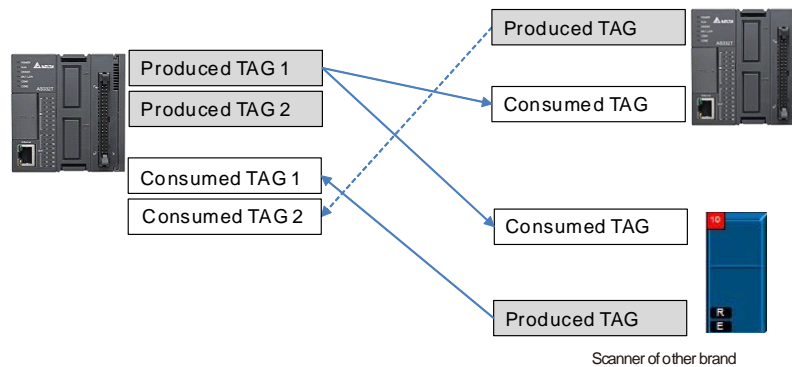
Don and Value are shown with no output. No other FBs are used.

## 5.2. TAG Function

Users can use TAG function to transmit data among different controllers. Controllers can share TAGs while they are attached to the same network, such as EtherNet/IP. TAG can be further defined as Produced TAG and Consumed TAG.

1. Produced TAG: a tag that a controller makes available for other controller. Multiple controllers (EIP scanner devices) can simultaneously consume (receive) the data. A produced tag sends its data to consumed tags (consumers) without using logic.
2. Consumed TAG: a tag that receives the data of a produced tag. The data type of the consumed tag and the produced tag must be matched (including any array dimensions).

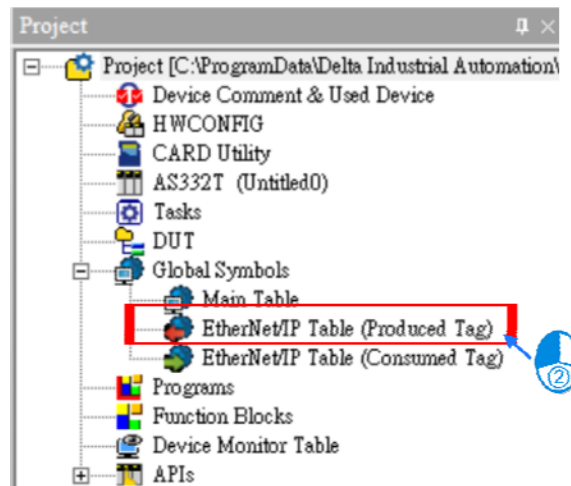
Before connecting to a Produced TAG, users should check the IP address and the names of the TAGs (Produced TAG and Consumed TAG). One controller can have multiple TAGs created, including produced TAG and consumed TAG. See the example below:



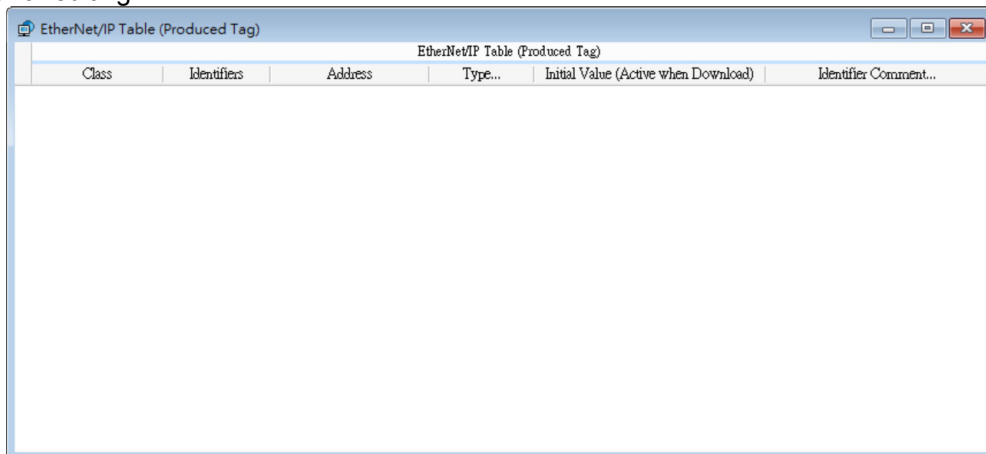
### 5.2.1 Produced TAG

How to create a Produced TAG:

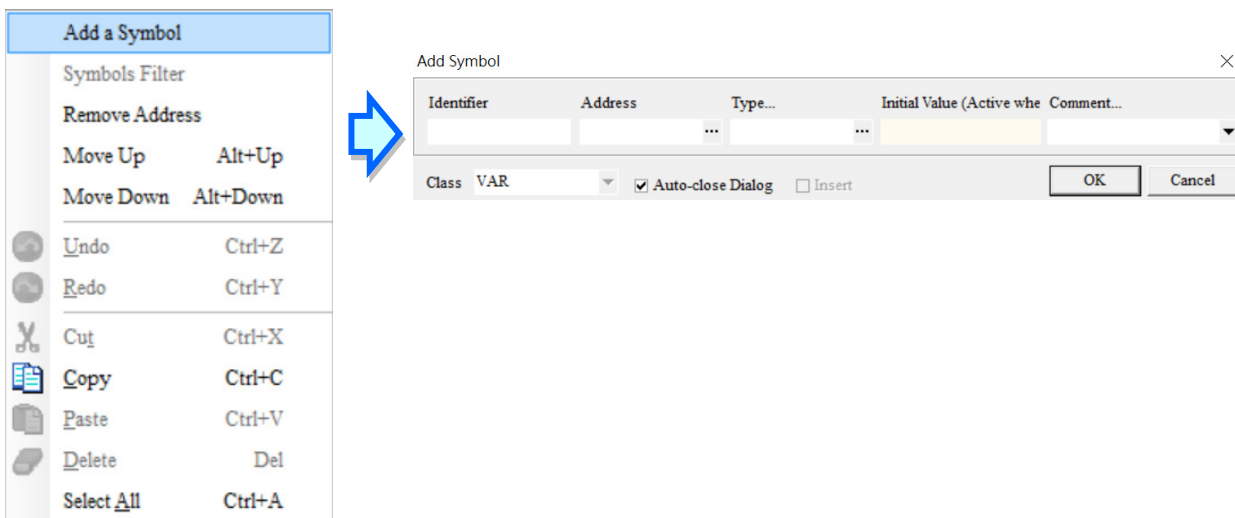
1. Open the ISPSOFT software and unfold the Global Symbols item to see the EtherNet/IP Table (Produced TAG) and EtherNet/IP Table (Consumed TAG). Double click the EtherNet/IP Table (Produced TAG).



- After double clicking the EtherNet/IP (Produced TAG) option, the EtherNet/IP Table (Produced TAG) will show up for editing.



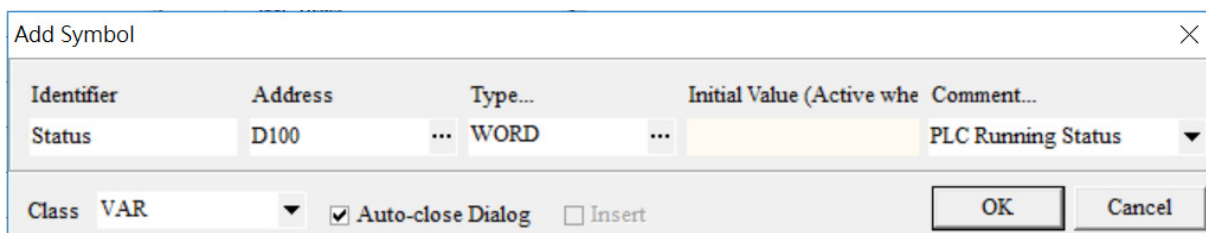
- Right click on the EtherNet/IP Table (Produced TAG) to see the context menu and select the option "Add a Symbol". And then an Add Symbol window will appear.



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- Set up the Produced TAG: as the example shown below.

Identifier	Status
Address	D100
Type	WORD
Initial Value	--
Comment	PLC Running Status

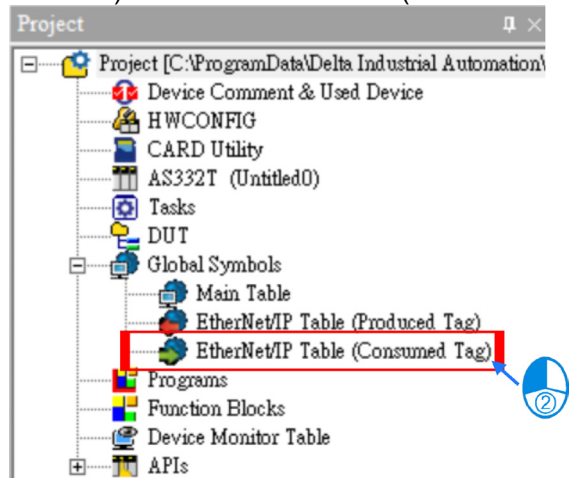


After the setups are complete, download the parameters to the PLC. Other controllers can receive the data of a produced tag via the consumed tag. For the creation of a consumed TAG, refer to the manual from the controller to be used for data transmsion.

## 5.2.2 Consumed TAG

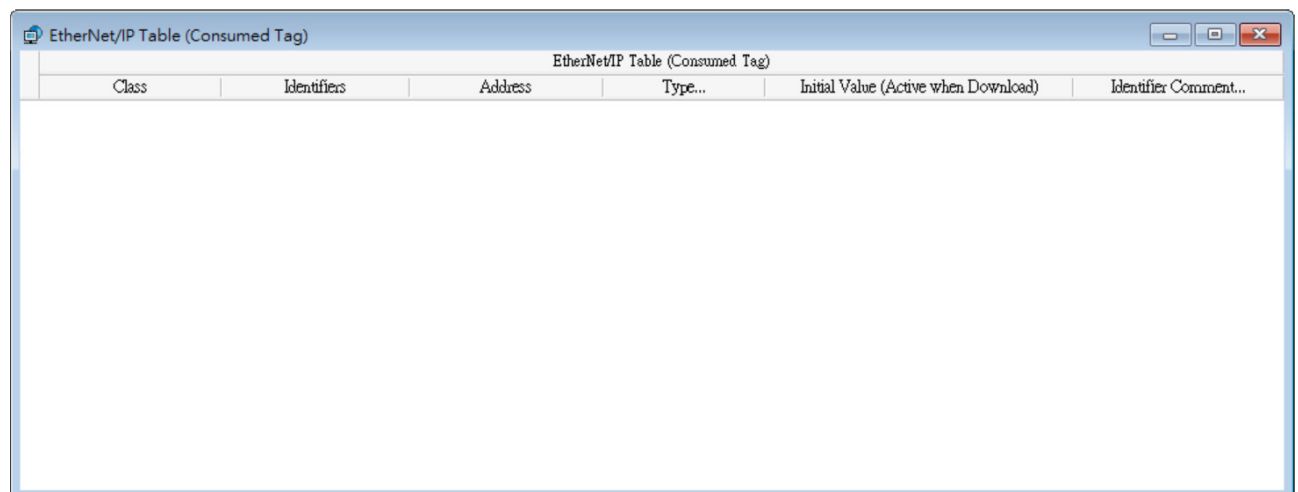
How to create a Produced TAG:

1. Open the ISPSOFT software and unfold the Global Symbols item to see the EtherNet/IP Table (Produced TAG) and EtherNet/IP Table (Consumed TAG). Double click the EtherNet/IP Table (Consumed TAG).

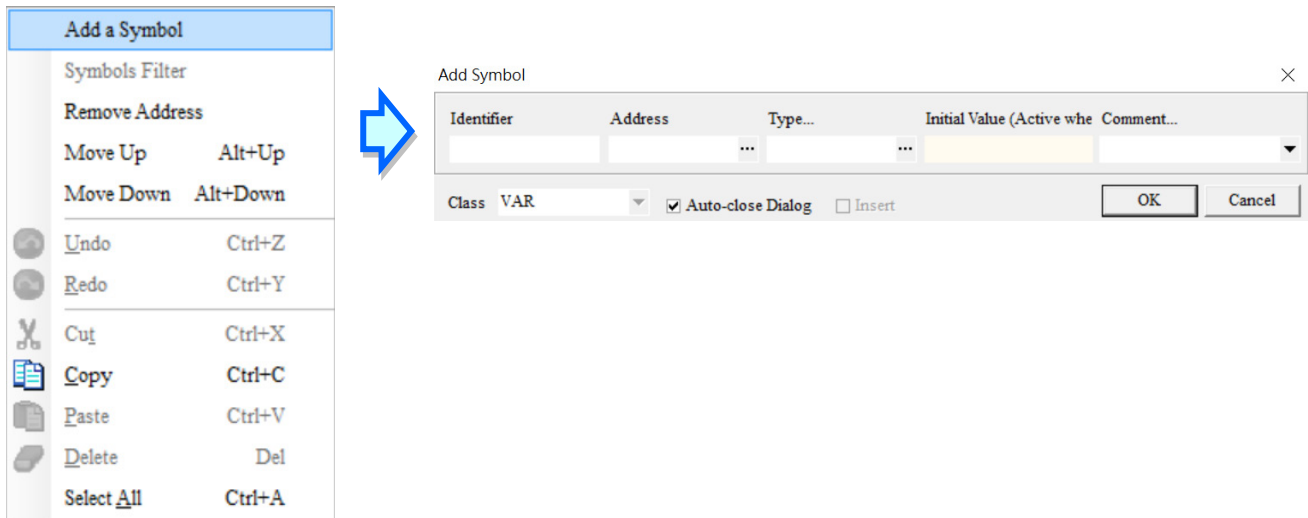


※ It is only available for PLC with the EtherNet/IP TAG function. Refer to chapter 3 for EtherNet/IP specifications to learn the supported models and number of TAGs supported.

2. After double clicking the EtherNet/IP (Consumed TAG) option, the EtherNet/IP Table (Produced TAG) will show up for editing.

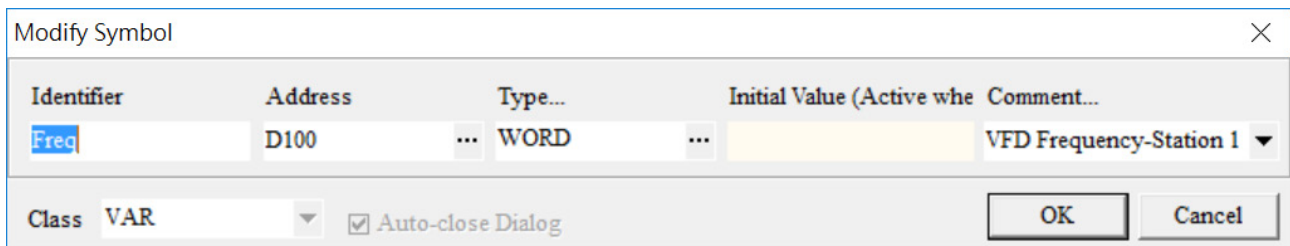


- Right click on the EtherNet/IP Table (Produced TAG) to see the context menu and select the option “Add a Symbol”. And then an Add Symbol window will appear.



- Set up the Consumed TAG: as the example shown below.

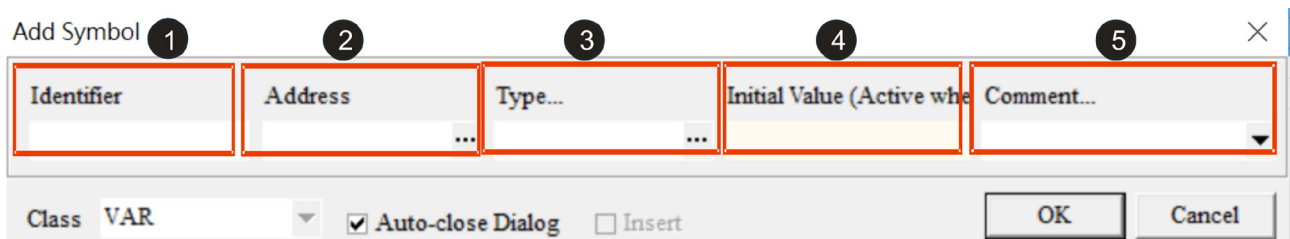
Identifier	Freq	Status
Address	D100	D100
Type	WORD	WORD
Initial Value	--	--
Comment	VFD Frequency - Station 1	PLC Running S



- TAGs can be used in the data mapping table. Refer to section 4.4 for more information on data mapping.

	Enable	TAG	IP Address	Adapter Name	CPU Address/TAG	<->	Adapter Address/Parameter/TAG	Length (Byte)	Property
1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	192.168.1.1	Dev_1	Freq	←	Freq	2	...
2	<input checked="" type="checkbox"/>	<input type="checkbox"/>				←			...

- Add Symbol window



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Number	Name	Description
①	Identifier	User can create a name for the Consumed TAG in the PLC; up to 40 characters can be used.
②	Address	The address is corresponding to the registers or bits in the PLC; selections are data register and M bits.
③	Type	The data type BOOL, WORD, DWORD, INT, DINT, REAL, and ARRAY are supported. One-dimensional array is supported; up to 512 byte can be used.
④	Initial Value	None
⑤	Comment	Descriptions can be added to describe the TAG; up to 128 characters are supported.

**MEMO**



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## Chapter 6 Troubleshooting

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This section will provide an overview of EtherNet/IP error codes and troubleshooting.

## 6.1 Troubleshooting

There are 3 error code categories, including Hardware Error, Configuration Error, and Application Error. These error codes are defined by the ODVA for the EtherNet/IP errors. Refer to the following table for self-defined error codes.

Error Code Classification		Description
1 <sup>st</sup> Phase	2 <sup>nd</sup> Phase	
Category	Item	
Hardware Error	Product Error	Hardware error detected after power-on
	Ethernet Connection Error	No Ethernet connection
Configuration Error	IP Setup Error	IP address setup error
	*EDS Files Mismatched	Mismatched EDS files lead to I/O connection failure.
	*Data Exchange Setup Error	Data exchange setup error lead to I/O connection failure.
Application Error	*EtherNet/IP Error	EtherNet/IP Communication Failure

Note: \* Read EtherNet/IP errors of AHCPU5x1-EN/ AHCPU560-EN2 host series through special registers (SR2048~SR2303). The special register will only display the last 2 bytes of the error codes. For example, the error code is 16#1101011C, but only 16#011C is displayed.

## 6.2 Error Code & How to fix them

### 6.2.1 Hardware Error

Category	Error Code	Description	How to fix them
Product Error	16#00000000	CPU Hardware Error	<ol style="list-style-type: none"> <li>1. Reconfigure your module.</li> <li>2. Replace the module.</li> <li>3. Contact your local distributor.</li> </ol>
	16#00010000	Memory Hardware Error	<ol style="list-style-type: none"> <li>1. Reconfigure your module and power on again.</li> <li>2. Replace the module.</li> <li>3. Contact your local distributor.</li> </ol>
	16#00020000	Ethernet Hardware Error	<ol style="list-style-type: none"> <li>1. Reconnect your cables or switch.</li> <li>2. Replace the cable or switch.</li> <li>3. Contact your local distributor.</li> </ol>
Link Error	16#01000000	Network Connection Error	<ol style="list-style-type: none"> <li>1. Check if the network wiring installation is correctly done.</li> <li>2. Check if the Link LED is a solid green.</li> </ol>

## 6.2.2 Configuration Error

Category	Error Code	Description	How to fix them
IP Setup Error	16#10000000	IP address setup error	Check if the IP address is valid.
	16#10010000	IP address conflict error	<ol style="list-style-type: none"> <li>1. Check if the same IP address has been assigned to more than one device.</li> <li>2. Reset the IP address.</li> </ol>
	16#10020000	Network server connection error	<ol style="list-style-type: none"> <li>1. Check the server connection settings.</li> <li>2. Check if the system server exists.</li> <li>3. Check if all the cables are properly connected to the server.</li> </ol>
	16#10030000	Change IP address during operation	Set up the correct IP address and turn your device on again.
EDS Files Mismatched	16#1101011C	The Transport Class field values of the Transport Class and Trigger in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010114	The Vender ID or the Product Code in the EDS file is mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010115	The Device type parameters in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010116	The Revision parameters in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#1101011E	The Direction parameters in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#1101011F	The output fixed / variable flag in the EDS file is mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010120	The input fixed / variable flag in the EDS file is mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010121	The output priority in the EDS file is mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010122	The input priority in the EDS file is mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>

Category	Error Code	Description	How to fix them
	16#11010123	The output connection type parameters in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010124	The input connection type parameters in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010125	The output redundant ownership parameters in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010126	The configuration size parameters in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010129	The configuration path parameters in the EDS file are mismatched.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
	16#11010132	The EDS file does not support the Null forward open.	<ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file are matched.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol>
Data Exchange Setup Error	16#12010100	I/O Connections Duplicated	<ol style="list-style-type: none"> <li>1. Check if the system has created the I/O connections.</li> <li>2. Change the connection type to Listen Only.</li> </ol>
	16#12010106	Ownership Conflict	<ol style="list-style-type: none"> <li>1. Check the scanner owner.</li> <li>2. Reconfigure the invalid scanner.</li> <li>3. Change the connection to multicast.</li> </ol>
	16#12010110	Target for Connection not Configured	<ol style="list-style-type: none"> <li>1. Check the I/O connection status.</li> <li>2. Activate the I/O connections again.</li> </ol>
	16#12010111	Adapter RPI Not Supported	Check the RPI for the adapter.
	16#12010113	Out of Connections	<ol style="list-style-type: none"> <li>1. Check if the connection exceeds the limit.</li> <li>2. Reduce the number of the product connection.</li> </ol>
	16#12010119	Non-Listen Only Not Opened	<ol style="list-style-type: none"> <li>1. Check if the system has created the I/O connections.</li> <li>2. Check the scanner I/O connection status.</li> </ol>
	16#12010127	Invalid Originator to Target Size	Check the module number and the product setup file to see if they are matched.
	16#12010128	Invalid Target to Originator Size	Check the output size in the connection parameters.
	16#1201012D	Consumed Tag does not exist.	Check if the parameters in the consumed tag are correctly set.
	16#1201012E	Produced Tag does not exist.	Check if the parameters in the produced tag are correctly set.
16#12010204	Unconnected Request Timeout	No response from the adapter; check if the power and the network connection of the adapter are working properly.	

6



Category	Error Code	Description	How to fix them
	16#12010302	Network Bandwidth NOT Available for Data	<ol style="list-style-type: none"> <li>1. Check the I/O connection limit between the scanner and the adapter.</li> <li>2. Increase the RPI value or reduce the number of the connections.</li> </ol>
	16#12010315	Invalid Segment in Connection Path	Check the module number and the product setup file to see if they are matched.

### 6.2.3 Application Error

Category	Error Code	Description	How to fix them
EtherNet/ IP Error	16#00010203	I/O Connection Timeout	<ol style="list-style-type: none"> <li>1. Check the network connection status.</li> <li>2. Check if the module is working fine.</li> <li>3. Increase the RPI value.</li> </ol>
	16#30020000	The Device Level Ring (DLR) detects lost connection.	Check the network connection status in the Ring topology.
	16#00010319	Secondary Resources Unavailable	<ol style="list-style-type: none"> <li>1. Check the module number and the product setup file to see if they are matched.</li> <li>2. Reduce the number of the connections.</li> </ol>

**MEMO**

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## Chapter 7 Studio 5000 Software Operation

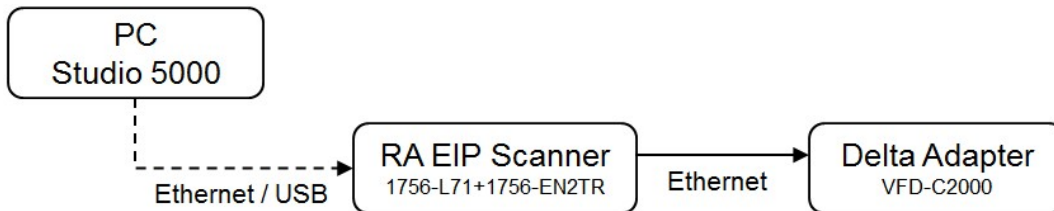
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This section will provide an overview of how to use EtherNet/IP to connect to a Delta EtherNet/IP Adapter via the 3rd party software. Here we take Rockwell's Software Studio 5000 as an example.

## 7.1 Architecture

RA EIP Scanner use Ethernet to connect a Delta Adapter; as for the PC, it can connect to the RA Scanner via the Ethernet/USB.



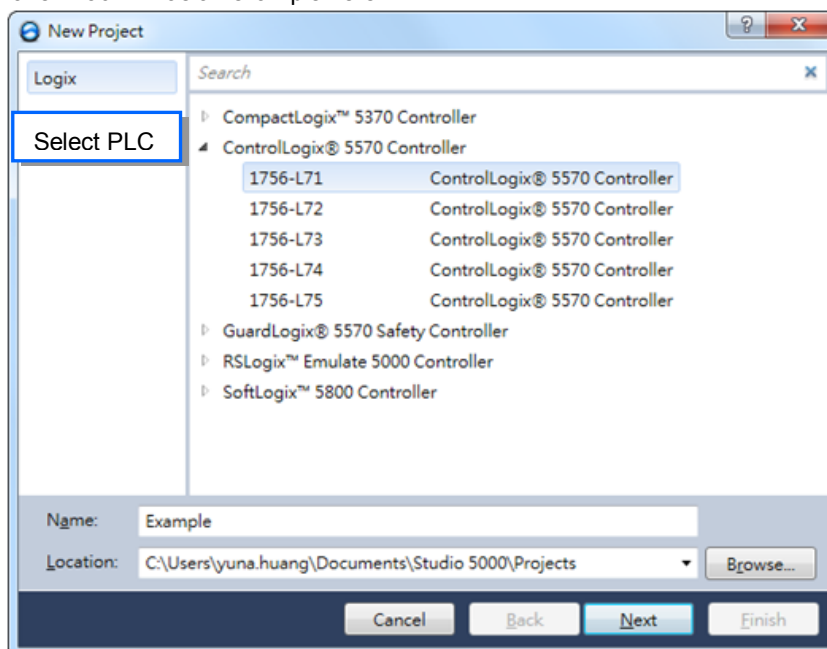
※ Rockwell Software Studio 5000, ControlLogix, RSLogix are registered trademarks of Rockwell Automation, Inc.

## 7.2 Create a New Project

- Open the Studio 5000 and click the “New Project” under the “Create” section.

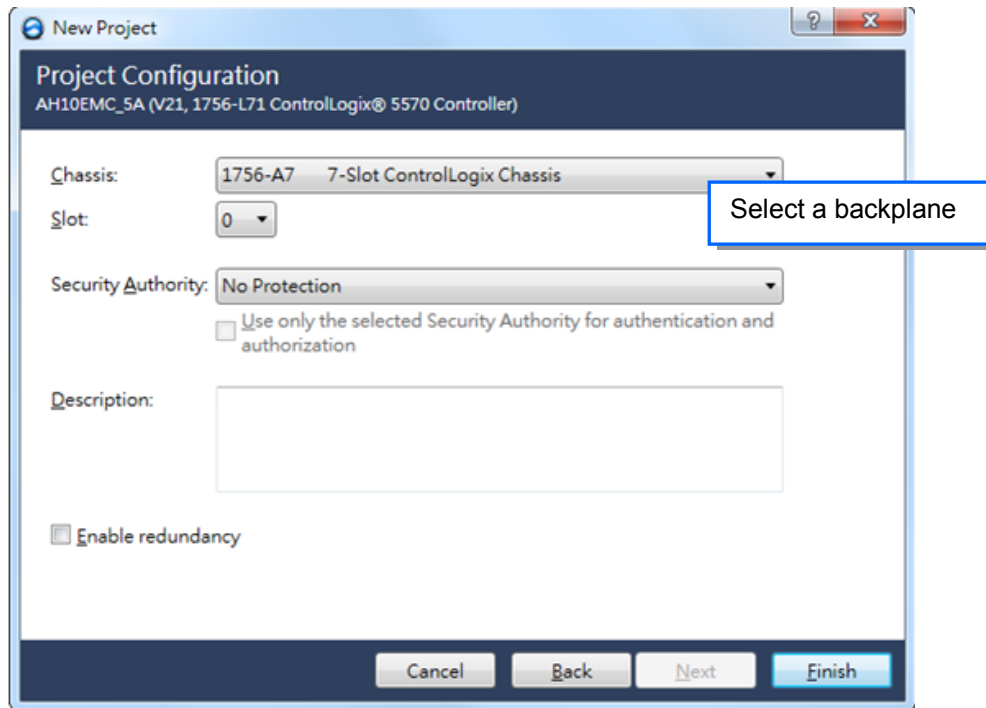


- Select a PLC. Take 1756-L71 as an example here.

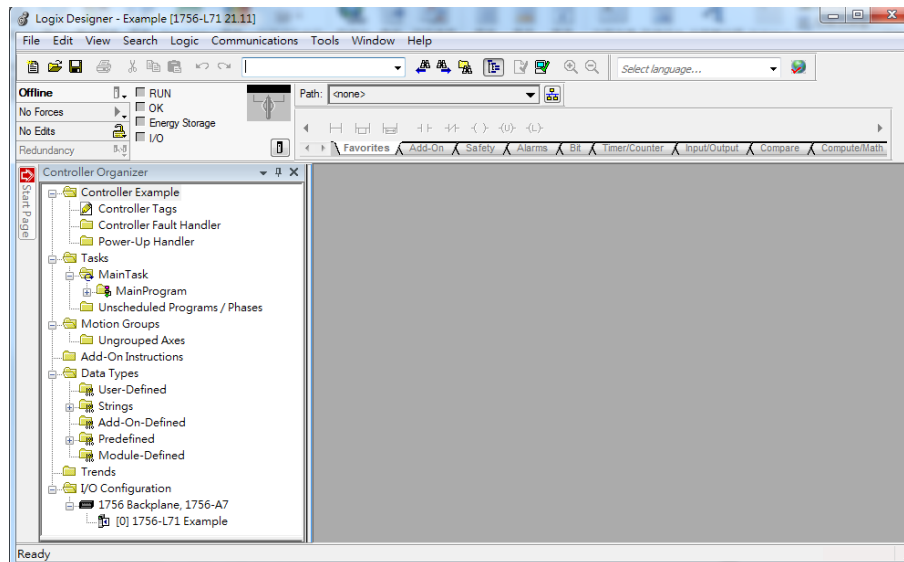




- Click “Finish” to complete the creation of a new project.



- Once the project is created, the setup page will be presented.

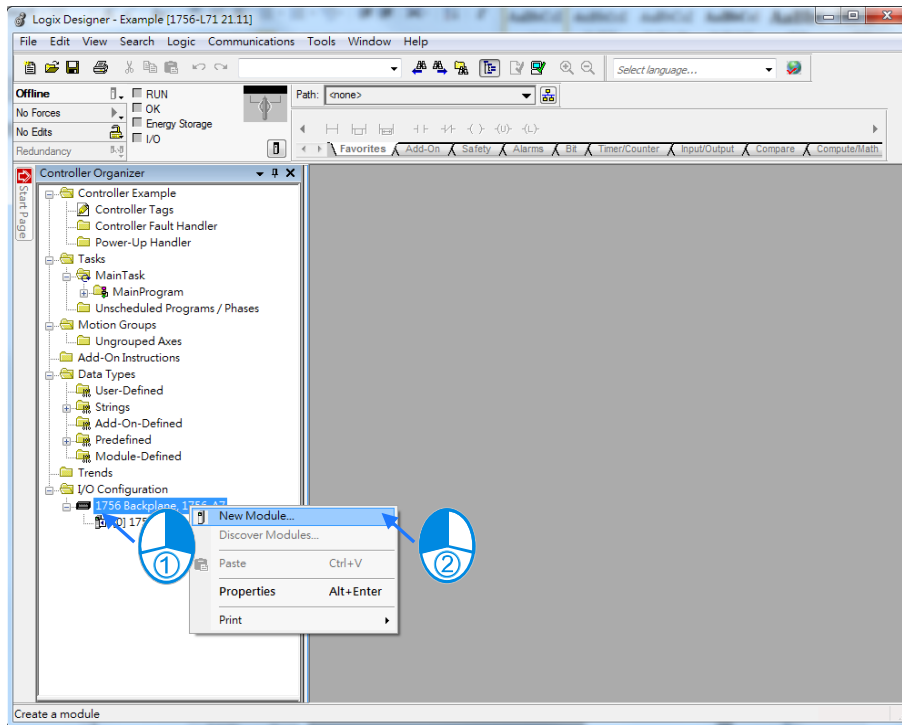


## 7.3 Create a Scanner

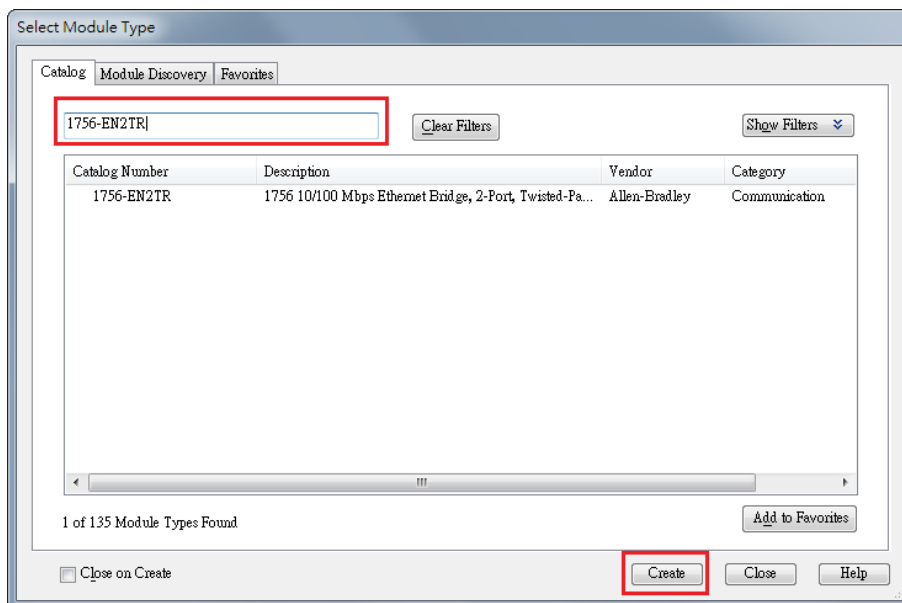
After the project creation is done, users can create the EtherNet/IP module, 1756-EN2TR, and then connect to the EtherNet/IP devices via the EtherNet/IP module.

### 7.3.1 Create a New Module

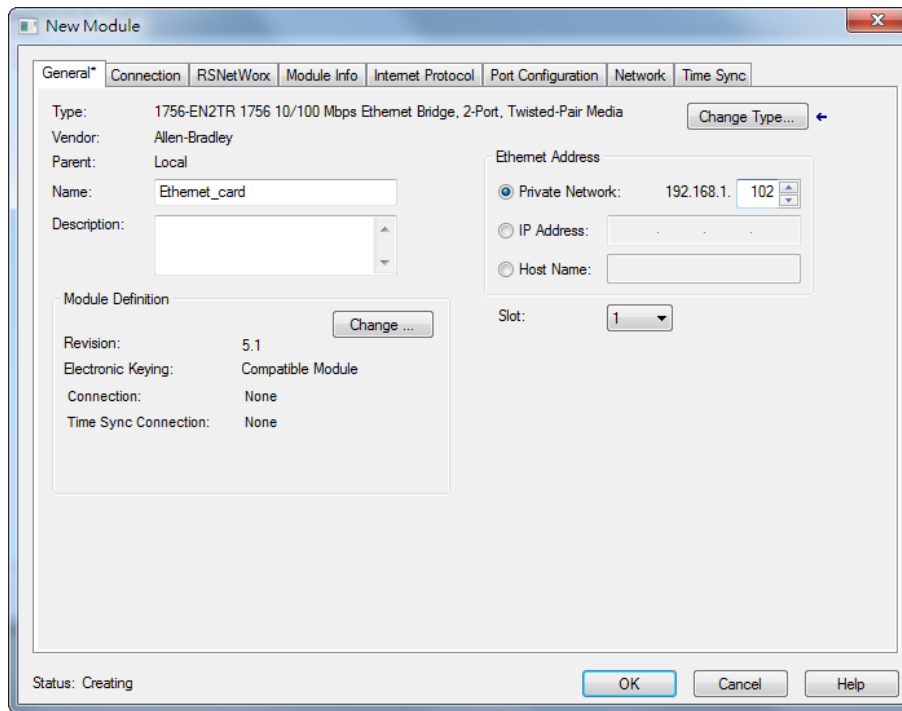
- Right-click the 1756 Backplane 1756-A7 and then click the option “New Module”.



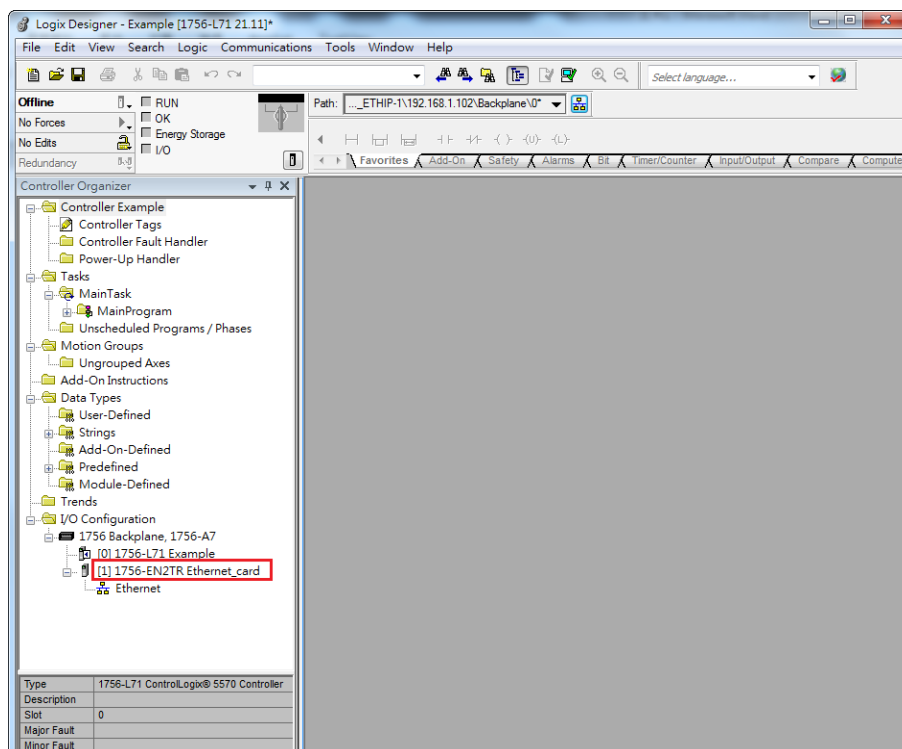
- Type the 1756-EN2TR in the filter field and then click “Create”.



- Type the Name, IP address and other required information. After that click “OK” to complete the creation of an EtherNet/IP module.



- You will see the newly created module 1756-EN2TR in the node.

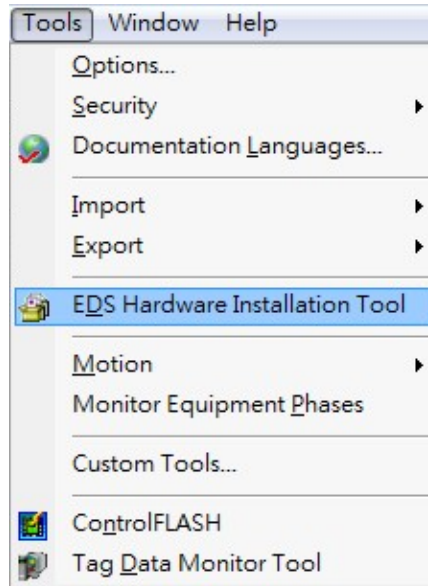


## 7.4 Connect to a Delta Adapter

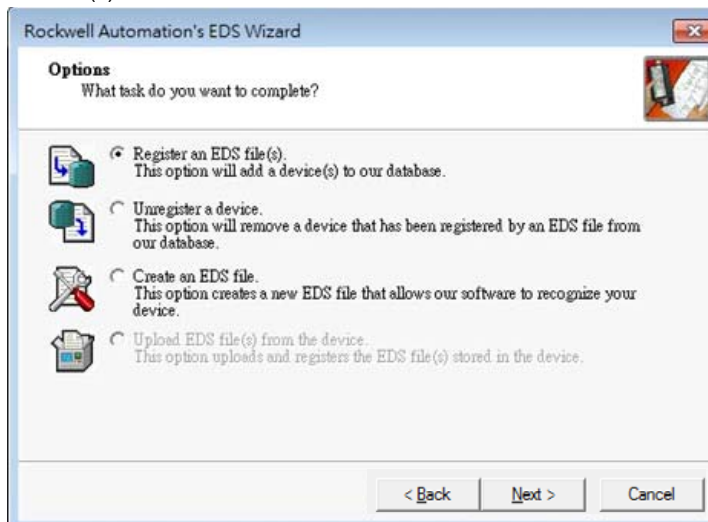
This section will provide an overview of how to connect to a Delta EtherNet/IP Adapter via Rockwell's Software Studio 5000.

### 7.4.1 Import an EDS file

- Go to Tools > EDS Hardware Installation Tool.

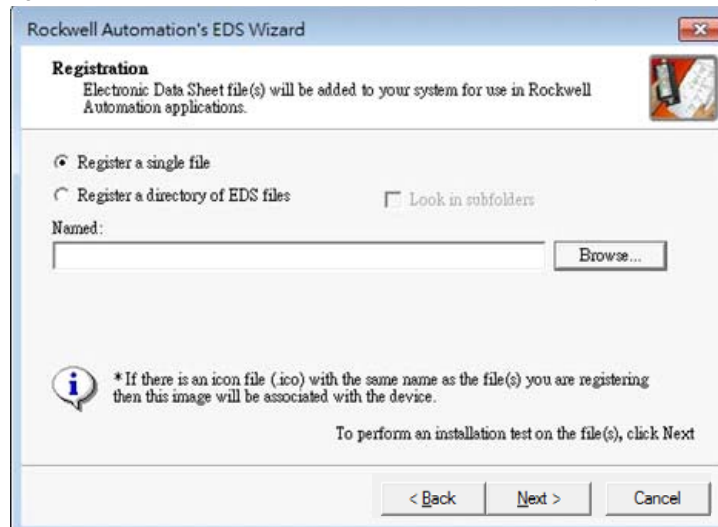


- Select "Register an EDS file(s)".

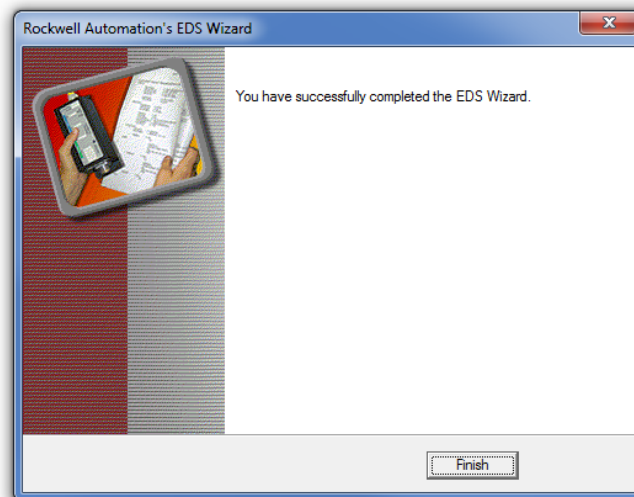


7

- Select “Register a single file” and use the “Browse” to find the EDS file that you’d like to import.

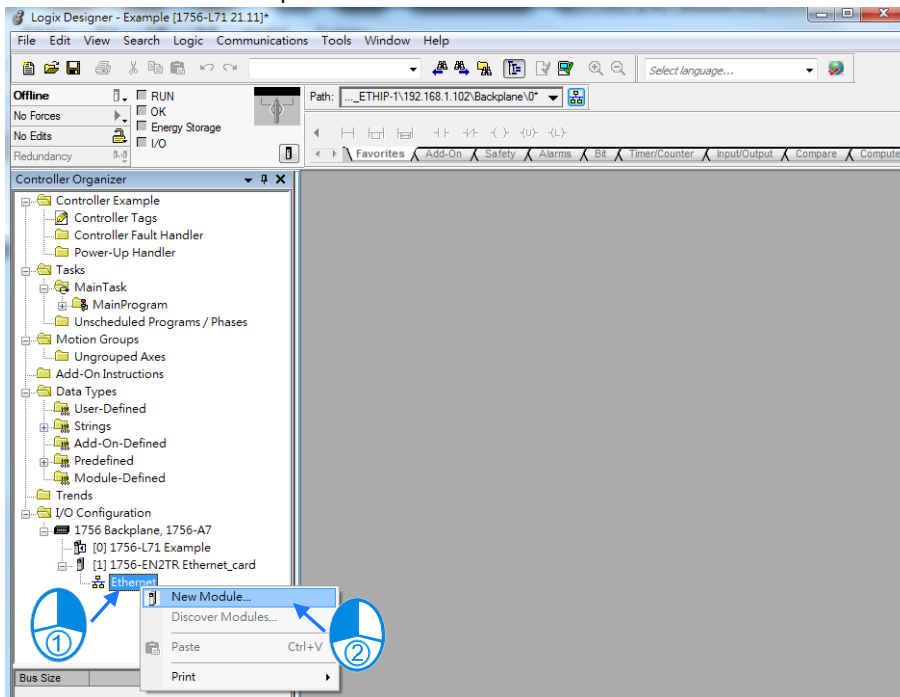


- Follow the instructions from the wizard and then click “Finish” to complete the setup.

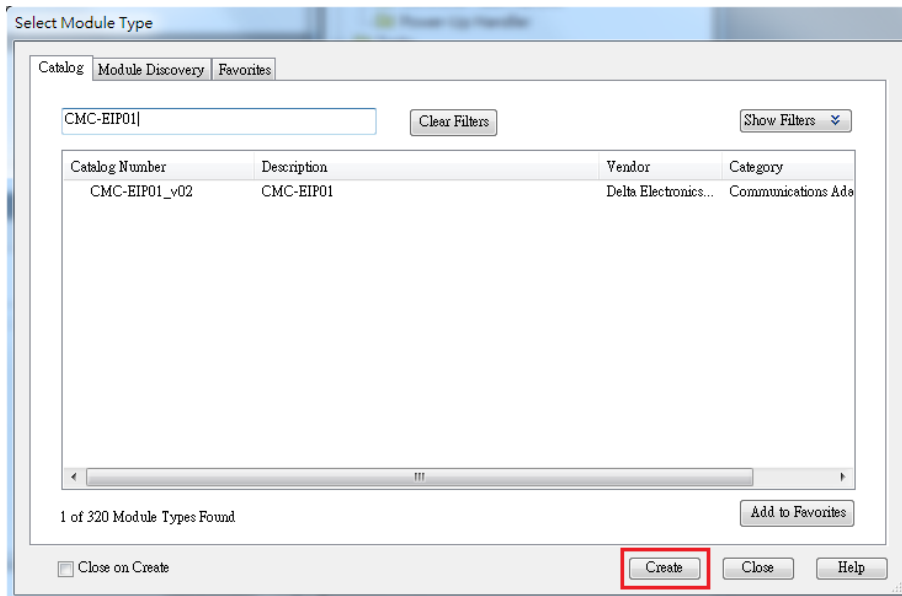


## 7.4.2 Create an Adapter

- Right click “Ethernet” and select the option “New Module” under the node of 1756-EN2TR.

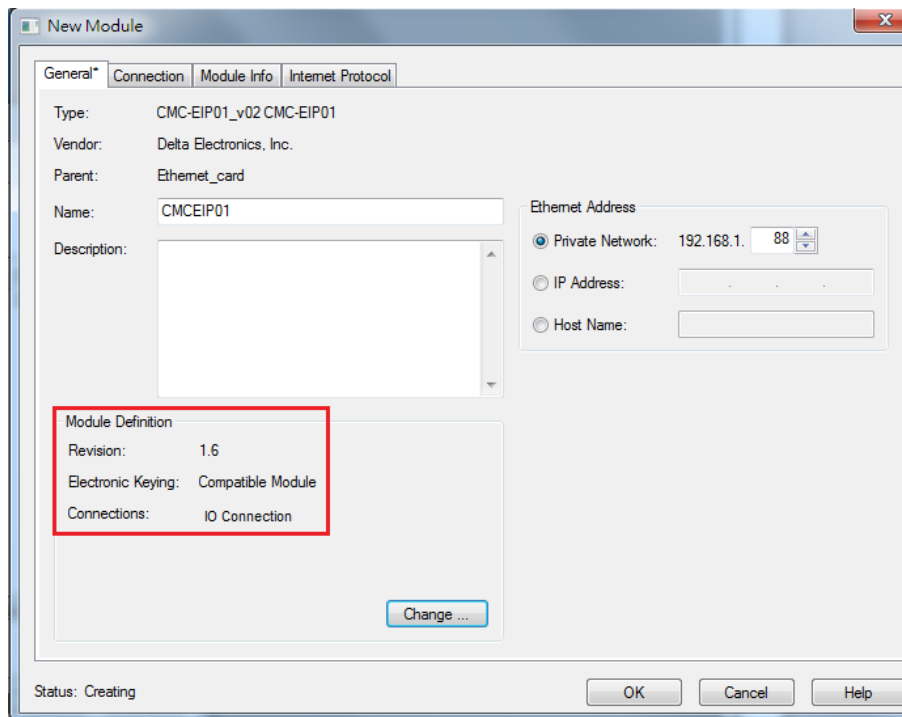


- Type the Delta module number of the imported EDS file in the filter field and you will see the number shown in the Catalog Number list. After that click “Create”.

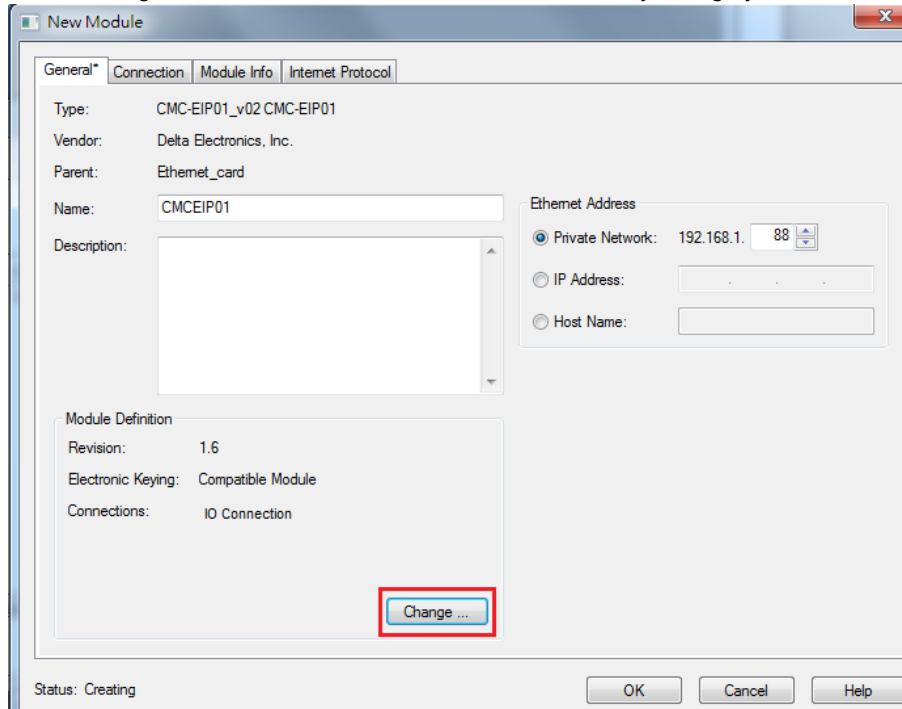


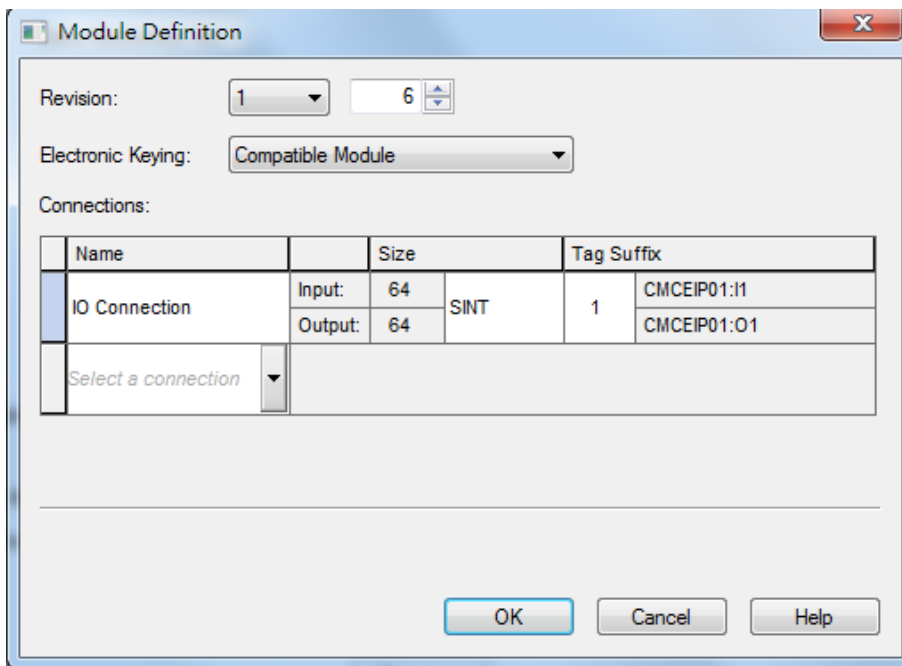
7

- Check if the product name and the IP address are the same as the information shown in the Module Definition section.



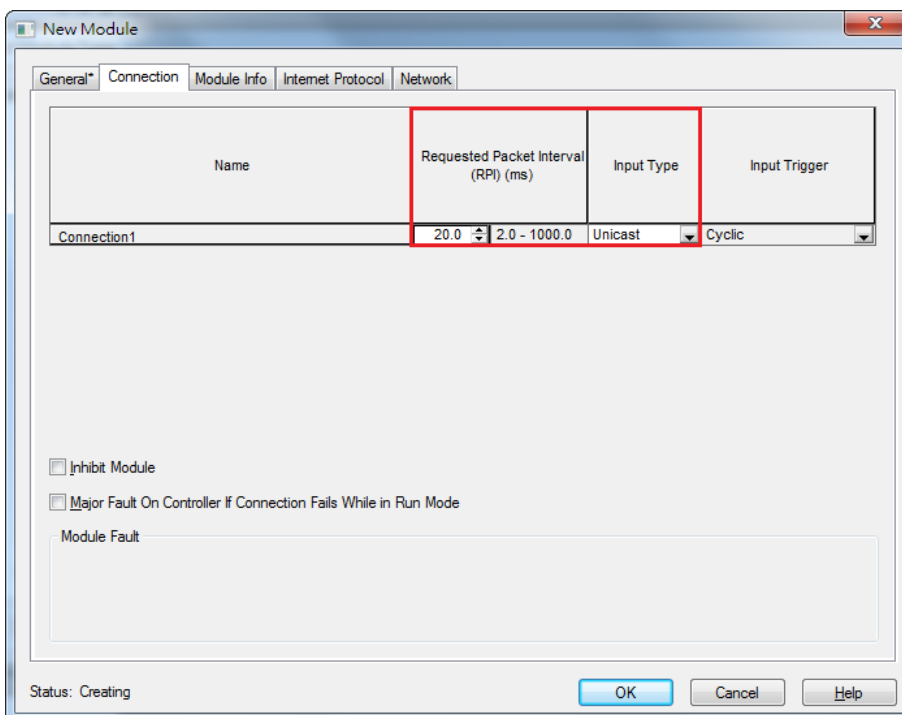
- You can click the “Change” button in the Module Definition if there is any change you’d like to make.





※ For general purposes, there is no need to change the parameters from the imported EDS files which often can be used directly for connection.

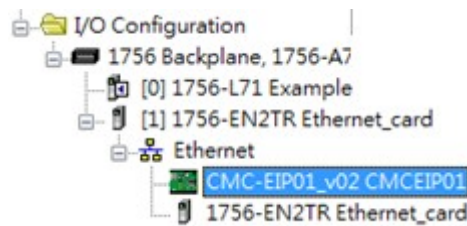
- Select the Connection tab to modify the RPI and Input Type settings. Requested Packet Interval, via the I/O connection to connect to a Scanner to exchange data at regular time intervals, in the unit of mini-second. Options for input type are Unicast and Multicast; select one from the dropdown list. (Selections from the dropdown list may vary according to different products.)



7



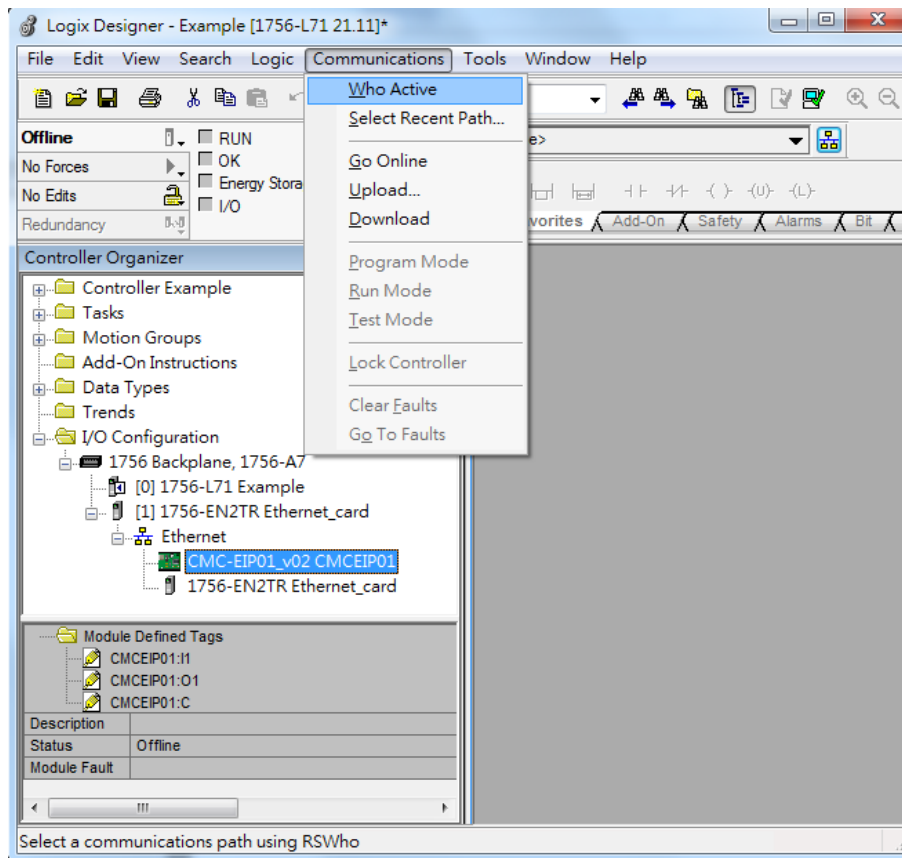
- After the setup is done, click OK to complete the creation of an adapter. After that you will see a Delta Adapter that you have created in the node.



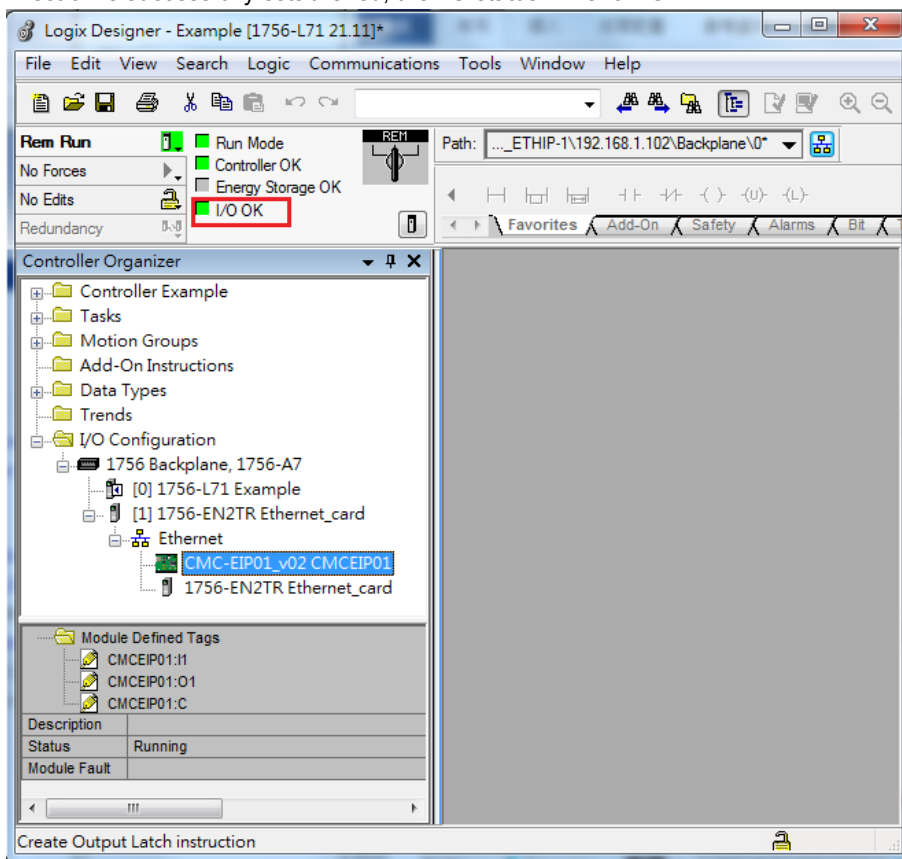
## 7.5 Download

After the creation of the Delta Adapter device is done, download the project to the PLC and go online.

- Click the “Communications” tab to and then select the option “ Who Active”. For establishing a connection, select the PC connected Scanner model number and then go to Communications > Download.



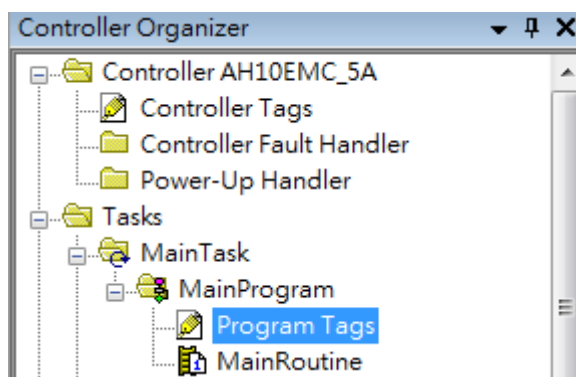
- After the connection is successfully established, the I/O status will show OK.



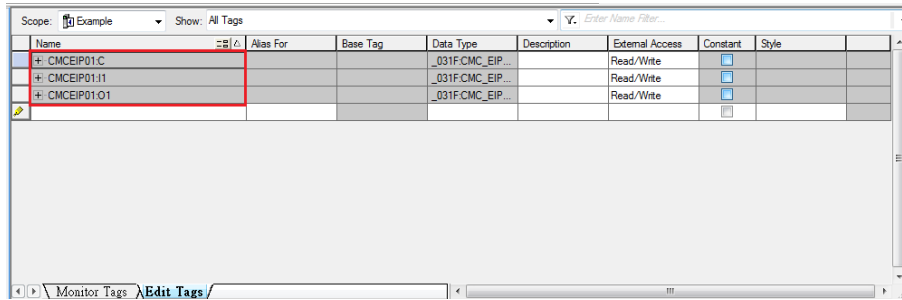
## 7.6 Data Mapping

Click the “Program TAGs” under the “Tasks” node for data mapping setups, including Configure, Input and Output. After the device is created in the I/O Configuration, the TAG will be added automatically.

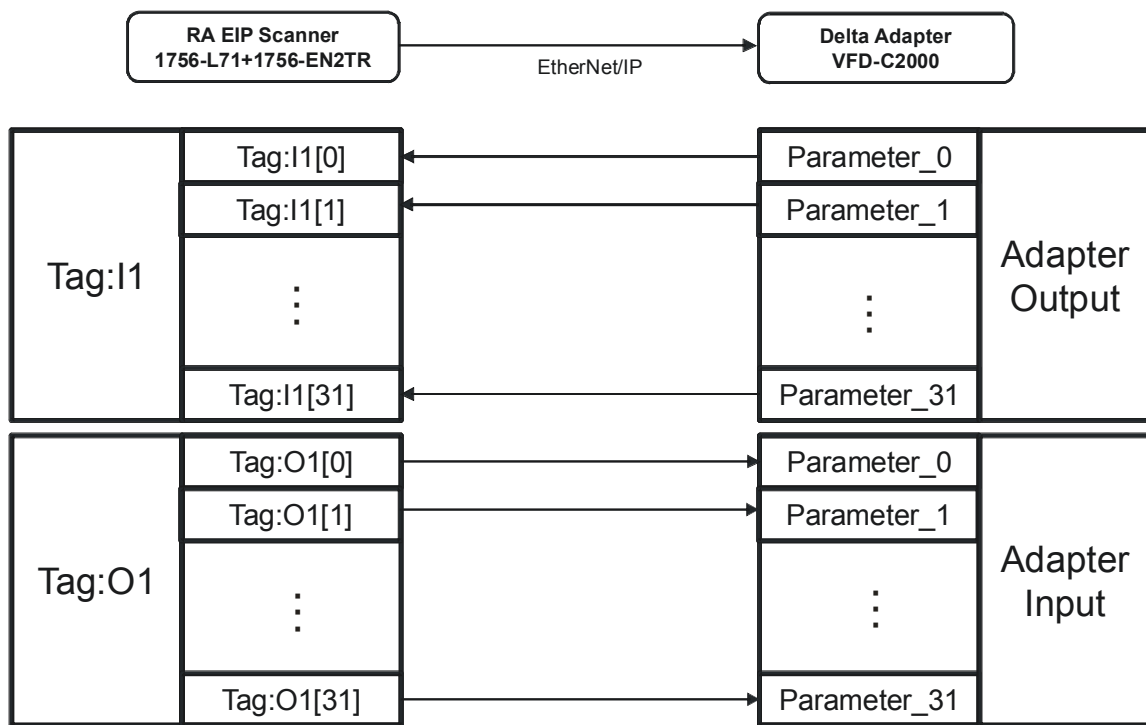
- Click the “Program TAGs”.



- You will see the TAGs listed under the Name section. TAGs will be shown with a product name in the front and a C/I1/O1 in the back, separated by a colon (:), for example CMCEIP01:C, CMCEIP01:I1, and CMCEIP01:O1.



- TAG : C contains information from Adapter EDS file, including Input and Output parameters. Users can edit the parameters of Input and Output here.
- TAG : I1, the mapping starts from TAG : I1[0], and will be mapped to the first parameters of the Adapter Output. The length is the output length provided by the Adapter.
- TAG : O1, the mapping starts from TAG : O1[0], and will be mapped to the first parameters of the Adapter Input. The length is the input length provided by the Adapter.



**MEMO**

## Chapter 8 CIP Object

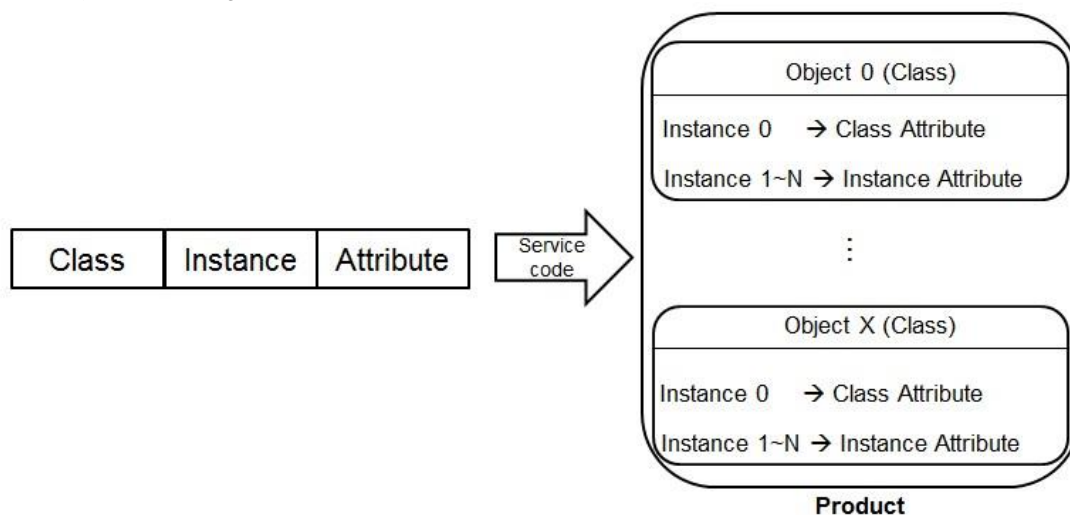
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## 8.1 Object List

In EtherNet/IP, object is referred to as a set of parameter that is structured accordingly by Class, Instance and Attribute. For example, Instance 0 contains basic information of every object, e.g. version and length. While Instance 1~N creates connection or status of required parameters for each product. Users can obtain product parameters from the supported service code via objects (see diagram below).



The supported EtherNet/IP objects are listed below. Refer to the section 8.2 for the data type definition. Refer to the section 8.3~8.12 for object contents. Refer to chapter 5 for object reading/writing.

Object Name	Function	Class ID	Available for
Identity Object	Provides information including manufacturer, device types and versions.	1 (16#01)	All series
Message Router Object	Provides messaging connection status and the number of connections supported.	2 (16#02)	All series
Assembly Object	Defines parameter of I/O connection data exchange.	4 (16#04)	All series
Connection Manager Object	Provides CIP connection function.	6 (16#06)	All series
Device Level Ring Object	Provides DLR configuration and connection status.	71 (16#47)	AH10EN-5A AHRTU-ETHN-5A
Quality of Service (QoS) Object	When the device supports DLR function, the DLR packet is dealt first compare to other packets (considering recovery time) via QoS traffic prioritization.	72 (16#48)	AH10EN-5A AHRTU-ETHN-5A
Port Object	The setting is used to execute interfaces to CIP including USB and EtherNet/IP.	244 (16#F4)	AHCPU5X1-EN AH10EN-5A AHRTU-ETHN-5A
TCP/IP Interface Object	Displays methods of IP configuration and interface.	245 (16#F5)	All series
Ethernet Link Object	Shows the connection status of each Ethernet port on the device.	246 (16#F6)	All series
X Register	Bit/Word Register	848 (16#350)	AH10EN-5A
Y Register	Bit/Word Register	849 (16#351)	AH10EN-5A
D Register	Bit/Word Register	850 (16#352)	AH10EN-5A
M Register	Bit Register	851 (16#353)	AH10EN-5A
S Register	Bit Register	852 (16#354)	AH10EN-5A

Object Name	Function	Class ID	Available for
T Register	Bit/Word Register	853 (16#355)	AH10EN-5A
C Register	Bit/Word Register	854 (16#356)	AH10EN-5A
HC Register	Bit/Word Register	855 (16#357)	AH10EN-5A
SM Register	Bit Register	856 (16#358)	AH10EN-5A
SR Register	Word Register	857 (16#359)	AH10EN-5A
Control Register	AH10EN-5A communication related parameters	858 (16#370)	AH10EN-5A
Status Register	AHRTU-ETHN-5A device and the communication status		AHRTU-ETHN-5A
Input Register	Read the device status	859 (16#371)	AH10EN-5A AHRTU-ETHN-5A
Output Register	Triggering device function	882 (16#372)	AH10EN-5A
RTU AI Register	Analog input module value of AHRTU-ETHN-5A	883 (16#373)	AHRTU-ETHN-5A
RTU AO Register	Analog output module value of AHRTU-ETHN-5A	884 (16#374)	AHRTU-ETHN-5A
RTU DI Register	Digital input module value of AHRTU-ETHN-5A	885 (16#375)	AHRTU-ETHN-5A
RTU DO Register	Digital output module value of AHRTU-ETHN-5A	886 (16#376)	AHRTU-ETHN-5A



## 8.2 Data Type

This section will provide an overview of the supported data types by objects.

Data Type	Description																																																							
BOOL	False(16#00) or True(16#01)																																																							
SIGNED INTEGER	<p>SINT(1 byte), INT(2 bytes), DINT(4 bytes), LINT(8 bytes)</p> <table border="1"> <thead> <tr> <th>Number</th> <th>1st</th> <th>2nd</th> <th>3rd</th> <th>4th</th> <th>5th</th> <th>6th</th> <th>7th</th> <th>8th</th> </tr> </thead> <tbody> <tr> <td>SINT</td> <td>0LSB</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>INT</td> <td>0LSB</td> <td>1LSB</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>DINT</td> <td>0LSB</td> <td>1LSB</td> <td>2LSB</td> <td>3LSB</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>LINT</td> <td>0LSB</td> <td>1LSB</td> <td>2LSB</td> <td>3LSB</td> <td>4LSB</td> <td>5LSB</td> <td>6LSB</td> <td>7LSB</td> </tr> </tbody> </table> <p>Ex: DINT value = 16#12345678</p> <table border="1"> <thead> <tr> <th>Number</th> <th>1st</th> <th>2nd</th> <th>3rd</th> <th>4th</th> </tr> </thead> <tbody> <tr> <td>DINT</td> <td>78</td> <td>56</td> <td>34</td> <td>12</td> </tr> </tbody> </table>	Number	1st	2nd	3rd	4th	5th	6th	7th	8th	SINT	0LSB								INT	0LSB	1LSB							DINT	0LSB	1LSB	2LSB	3LSB					LINT	0LSB	1LSB	2LSB	3LSB	4LSB	5LSB	6LSB	7LSB	Number	1st	2nd	3rd	4th	DINT	78	56	34	12
Number	1st	2nd	3rd	4th	5th	6th	7th	8th																																																
SINT	0LSB																																																							
INT	0LSB	1LSB																																																						
DINT	0LSB	1LSB	2LSB	3LSB																																																				
LINT	0LSB	1LSB	2LSB	3LSB	4LSB	5LSB	6LSB	7LSB																																																
Number	1st	2nd	3rd	4th																																																				
DINT	78	56	34	12																																																				
UNSIGNED INTEGER	<p>USINT(1 byte), UINT(2 bytes), UDINT(4 bytes), ULINT(8 bytes)</p> <p>Ex: UDINT value = 16#AABBCCDD</p> <table border="1"> <thead> <tr> <th>Number</th> <th>1st</th> <th>2nd</th> <th>3rd</th> <th>4th</th> </tr> </thead> <tbody> <tr> <td>UDINT</td> <td>DD</td> <td>CC</td> <td>BB</td> <td>AA</td> </tr> </tbody> </table>	Number	1st	2nd	3rd	4th	UDINT	DD	CC	BB	AA																																													
Number	1st	2nd	3rd	4th																																																				
UDINT	DD	CC	BB	AA																																																				
STRING	<p>ASCII CODES, 1 or 2 bytes/words</p> <p>STRING: 2 bytes character count + 1 byte character</p> <table border="1"> <thead> <tr> <th></th> <th colspan="2">Contents (Charcount)</th> <th colspan="4">Contents (String contents)</th> </tr> </thead> <tbody> <tr> <td>STRING</td> <td>04</td> <td>00</td> <td>4D</td> <td>69</td> <td>6C</td> <td>6C</td> </tr> </tbody> </table> <p>STRING2: 2 bytes character count + 2 byte character</p> <table border="1"> <thead> <tr> <th></th> <th colspan="2">Contents (Charcount)</th> <th colspan="8">Contents (String contents)</th> </tr> </thead> <tbody> <tr> <td>STRING2</td> <td>04</td> <td>00</td> <td>4D</td> <td>00</td> <td>69</td> <td>00</td> <td>6C</td> <td>00</td> <td>6C</td> <td>00</td> </tr> </tbody> </table> <p>SHORT_STRING: 1 bytes character count + 1 byte character</p> <table border="1"> <thead> <tr> <th></th> <th colspan="2">Contents (Charcount)</th> <th colspan="4">Contents (String contents)</th> </tr> </thead> <tbody> <tr> <td>STRING</td> <td colspan="2">04</td> <td>4D</td> <td>69</td> <td>6C</td> <td>6C</td> </tr> </tbody> </table>		Contents (Charcount)		Contents (String contents)				STRING	04	00	4D	69	6C	6C		Contents (Charcount)		Contents (String contents)								STRING2	04	00	4D	00	69	00	6C	00	6C	00		Contents (Charcount)		Contents (String contents)				STRING	04		4D	69	6C	6C					
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STRING	04		4D	69	6C	6C																																																		
Fixed LENGTH BIT STRING	<p>BYTE (1 byte), WORD (2 bytes), DWORD (4 bytes), LWORD (8 bytes)</p> <table border="1"> <thead> <tr> <th></th> <th>1st</th> <th>2nd</th> <th>3rd</th> <th>4th</th> <th>5th</th> <th>6th</th> <th>7th</th> <th>8th</th> </tr> </thead> <tbody> <tr> <td>Byte</td> <td>7...0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>WORD</td> <td>7...0</td> <td>15...8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>DWORD</td> <td>7...0</td> <td>15...8</td> <td>23...16</td> <td>31...24</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>LWORD</td> <td>7...0</td> <td>15...8</td> <td>23...16</td> <td>31...24</td> <td>39...32</td> <td>47...40</td> <td>55...48</td> <td>63...56</td> </tr> </tbody> </table>		1st	2nd	3rd	4th	5th	6th	7th	8th	Byte	7...0								WORD	7...0	15...8							DWORD	7...0	15...8	23...16	31...24					LWORD	7...0	15...8	23...16	31...24	39...32	47...40	55...48	63...56										
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LWORD	7...0	15...8	23...16	31...24	39...32	47...40	55...48	63...56																																																

Data Type	Description							
STRINGI	A single string consists multiple language representation							
	Name		Data Type		Meaning			
	Number		USINT		The number of internationalized character strings			
	Strings		Array of: Struct of:		Array of individual internationalized character strings			
	LanguageChar1		USINT		The first ASCII character of the ISO 639-2/T language			
	LanguageChar2		USINT		The second ASCII character of the ISO 639-2/T language			
	LanguageChar3		USINT		The third ASCII character of the ISO 639-2/T language			
	CharStringStruct		USINT		The structure of the character string, limited to the Elementary Data type value 16#D0 (STRING), 16#D5 (STRING2), 16#D9 (STRINGN) and 16#DA (SHORT_STRING)			
	CharSet		UINT		The character set which the character string is based on which comes from IANA MIB Printer Code (RFC 1759).			
	InternationalString		Defined in CharStringStruct		An array of 8-bit octet elements which is the actual international character string			
ISO 639-2/T language:								
Language		First Character		Second Character		Third Character		
English		e		n		G		
French		f		r		e		
Spanish		s		p		a		
Italian		i		t		a		
STRUCT	STRUCT of: Any Data Type composes the structure.							
	Ex.: STRUCT of { BOOL, UINT, DINT } = { TRUE, 16#1234, 16#56789ABC }							
			1st	2nd	3rd	4th	5th	6th
Byte		01	34	12	BC	9A	78	56
ARRAY	Array of: Any Data Type composes the array.							
	Ex.: ARRAY of UINTs = { 1 · 2 · 3 }							
	Number	1st	2nd	3rd	4th	5th	6th	
Array	01	00	02	00	03	00		
EPATH	It's a path that consists of multiple segments and references the class, instance and attribute of another object.							
	Ex. : Identity Object, Instance attribute 5 = " 20 01 24 01 30 05 "							

### 8.3 Identity Object (Class ID: 16#01)

Identity information is stored in the Identity Object and consists of the Vendor ID, Device Type, Product Code and Major Revision for your device.

- Service Code

Service code	Service Name	Attribute		Description
		Class Attribute	Instance Attribute	
16#01	Get_Attributes_All	X	V	Read all attributes
16#05	Reset	X	V	Resets the drive to the start-up state.
16#0E	Get_Attribute_Single	V	V	Read one attribute

- Class

- Class ID: 16#01

- Instance

- 16#00: Class Attribute
- 16#01: Instance Attribute
- When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	16#1	Revision of this object
16#02	Max Instance	Get	UINT	16#1	Maximum instance number of this object
16#03	Number of Instance	Get	UINT	16#1	Number of object instances currently created at this class level of the device

- When Instance = 0, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Vendor ID	Get	UINT	16#31F	Delta Electronics, inc.
16#02	Device Type	Get	UINT	16#0C	Data type: AH10EN-5A/AHRTU-ETHN-5A: 16#0C (Communication Adatper) AHCPU5X1-EN: 16#0E (Programmable Logic Controller)
16#03	Product Code	Get	UINT	16#4000	Product Code: AH10EN-5A: 16#4000 AHRTU-ETHN-5A: 16#4001 AHCPU511-EN: 16#0101 AHCPU521-EN: 16#0102 AHCPU531-EN: 16#0103
16#04	Revision	Get	STRUCT	--	Revision of this device: Major / Minor
	Major Revision		USINT	16#01	Major Revision Range: 16#01~16#7F
	Minor Revision		USINT	16#01	Minor Revision Range: 16#01~16#FF
16#05	Status	Get	WORD	16#00	Status, refer to the following ※1
16#06	Serial Number	Get	UDINT	16#abcd	The last 4 characters of the MAC address, ab:cd

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#07	Product Name	Get	STRING	"AH10EN-5A"	The maximum number of a product name is 32 words. AH10EN-5A: "AH10EN-5A" AHRTU-ETHN-5A: "AHRTU-ETHN-5A" AHCPU511-EN: "AHCPU511-EN" AHCPU521-EN: "AHCPU521-EN" AHCPU531-EN: "AHCPU531-EN"

※1 Status Description (16#05)

Bit (s)	Name	Description
0	Owned	Display if the device has an owner connection or not. 0: No 1: Yes
1	Reserved	0 · Always OFF
2	Configured	Display if the device is configured or not. 0: No 1: Yes
3	Reserved	0 · Always OFF
4-7	Extended Device Status	0: Self-Testing 1: Firmware Update 2: At least one faulted I/O connection 3: No I/O connections established 4: Non-Volatile Configuration bad 5: Major Fault 6: At least one I/O connection in run mode 7: At least one I/O connection established, all in idle mode. 8-15: Reserved
8	Minor Recoverable Fault	0: No minor recoverable fault detected 1: Minor recoverable fault detected
9	Minor Unrecoverable Fault	0: No minor unrecoverable fault detected 1: Minor unrecoverable fault detected
10	Major Recoverable Fault	0: No major recoverable fault detected 1: Major recoverable fault detected
11	Major Unrecoverable Fault	0: No major unrecoverable fault detected 1: Major unrecoverable fault detected

## 8.4 Message Router Object (Class ID: 16#02)

It provides a messaging connection point through which a Client may address a service to any object class or instance residing in the physical device.

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	V	V	Read a single attribute

- Class
  - Class ID: 16#02
- Instance
  - 16#00: Class Attribute
  - 16#01: Instance Attribute
  - When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	16#01	Revision of this object

- When Instance = 0, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#02	Number Available	Get	UINT	16#0	The maximum number of connections
16#03	Number Active	Get	UINT	16#0	The number of connected connections

## 8.5 Assembly Object (Class ID: 16#04)

### 8.5.1 AHCPU5x1-EN and AH10EN-5A

It binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection and can be used to bind input data or output data.

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	V	V	Read a single attribute
16#10	Set_Attribute_Single	X	V	Edit a single attribute

- Class
  - Class ID : 16#04
- Instance
  - 16#00 : Class Attribute
  - 16#64 : I/O Connection Output 1
  - 16#65 : I/O Connection Input 1
  - 16#66 : I/O Connection Output 2
  - 16#67 : I/O Connection Input 2
  - 16#72 : I/O Connection Output 8
  - 16#73 : I/O Connection Input 8
  - 16#74~16#7A Reserved
  - 16#80 : Configuration 1
  - 16#81 : Configuration 2
  - 16#87 : Configuration 8

- When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	16#2	Revision of this object
16#02	Max Instance	Get	UINT	16#C7	The max. number of Instances

- When Instance = 64~87, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#03	Data	Get/Set	ARRAY of BYTE	--	IO Connection Data
16#04	Size	Get	UINT	--	Instance 16#03 Data Size

- When Instance = 64~87, the length for Instance Attributes 16#04 are listed below.

I/O Message Connection			
Connection No.	Function	Instance	Length
Connection 1	Input	16#65	100 words
	Output	16#64	100 words
	Configuration	16#80	6 words
Connection 2	Input	16#67	100 words
	Output	16#66	100 words
	Configuration	16#81	6 words
Connection 3	Input	16#69	100 words
	Output	16#68	100 words
	Configuration	16#82	6 words
Connection 4	Input	16#6B	100 words
	Output	16#6A	100 words
	Configuration	16#83	6 words
Connection 5	Input	16#6D	100 words
	Output	16#6C	100 words
	Configuration	16#84	6 words
Connection 6	Input	16#6F	100 words
	Output	16#6E	100 words
	Configuration	16#85	6 words
Connection 7	Input	16#71	100 words
	Output	16#70	100 words
	Configuration	16#86	6 words
Connection 8	Input	16#73	100 words
	Output	16#72	100 words
	Configuration	16#87	6 words

## 8.5.2 AHRTU-ETHN-5A

It binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection and can be used to bind input data or output data.

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	V	V	Read a single attribute
16#10	Set_Attribute_Single	X	V	Edit a single attribute

- Class
  - Class ID : 16#04
- Instance
  - 16#00 : Class Attribute
  - 16#64 : RTU IO Owner Output
  - 16#65 : RTU IO Owner Input, RTU IO Listen only Input
  - 16#80 : RTU IO Owner Configuration
  - 16#C7 : RTU IO Listen only Output
  - 
  - When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	16#2	Revision of this object
16#02	Max Instance	Get	UINT	16#C7	The max. number of Instances

- When Instance = 16#64, 16#65, 16#80, the Instance Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#03	Data	Get/Set	ARRAY of BYTE	--	IO Connection Data
16#04	Size	Get	UINT	--	Instance 16#03 Data Size

- I/O Message Connection

I/O Message Connection			
Connection No.	Function	Instance	Length
RTU IO Owner	Input	16#65	32~500 bytes
	Output	16#64	32~500 bytes
	Configuration	16#80	168 bytes
RTU IO Listen only	Input	16#65	32~500 bytes
	Output	16#C7	0 bytes

## 8.6 Connection Manager Object (Class ID: 16#06)

Use this object for connection and connectionless communications, including establishing connections across multiple subnets.

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	V	X	Read a single attribute
16#4E	Forward_Close	V	V	Close a connection
16#54	Forward_Open	X	V	Open a connection; the maximum data size is 511 bytes.
16#5B	Large_Forward_Open	X	V	Open a connection; the maximum data size is 65535 bytes

- Class

- Class ID : 16#06

- Instance

- 16#00 : Class Attribute
- 16#01 : Instance Attribute
- When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	1	Revision of this object
16#02	Max Instance	Get	UINT	1	Maximum instance number of this object

- When Instance = 1, the Instance Attributes are listed below.

Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Open Requests	Get	UINT	16#0	Number of Forward Open service requests received.
16#02	Open Format Rejects	Get	UINT	16#0	Number of Forward Open service requests which were rejected due to bad format.
16#03	Open Resources Rejects	Get	UINT	16#0	Number of Forward Open service requests which were rejected due to lack of resources.
16#04	Open Other Rejects	Get	STRUCT	16#0	Number of Forward Open service requests which were rejected for reasons other than bad format or lack of resources.
16#05	Close Requests	Get	WORD	16#0	Number of Forward Close service requests received.
16#06	Close Format Rejects	Get	UDINT	16#0	Number of Forward Close service requests which were rejected due to bad format.
16#07	Close Other Rejects	Get	STRING	16#0	Number of Forward Close service requests which were rejected for reasons other than bad format.



Attribute	Name	Access Rule	Data Type	Values	Description
16#08	Connection Timeouts	Get	UINT	16#0	Total number of connection timeouts that have occurred in connections controlled by this Connection Manager

## 8.7 Device Level Ring Object (Class ID: 16#47)

DLR provides the configuration and status information interface for the DLR protocol.

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#01	Get_Attributes_All	X	V	Read all attributes
16#0E	Get_Attribute_Single	V	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute
16#18	Get_Memeber	X	V	IP address list of the Ring
16#4B	Verify_Fault_Location	X	V	Send the instruction, Locate_Fault to obtain the addresses of the starting and ending points.
16#4C	Clear_Rapid_Faults	X	V	Send the instruction, Rapid Fault/Restore Cycle Detected for the supervisor to resume the normal operation.
16#4D	Restart_Sign_On	X	V	Send the instruction to refresh the ring participant list.

- Class
  - Class ID : 16#47
- Instance
  - 16#00 : Class Attribute
  - 16#01 : Instance Attribute
  - When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	3	Revision of this object

- When Instance = 1, the Instance Attributes are listed below.
- Devices of DLR Supervisor support Instance Attribute 16#04, 16#05, 16#06, 16#07, 16#08 and 16#09

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Network Topology	Get	USINT	1	Current Network Topology 0 : "Linear" 1 : "Ring"
16#02	Network Status	Get/Set	USINT	2	Current Network Status, refer to the following ※1

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#03	Ring Supervisor Status	Set	USINT	0	Ring Supervisor Active Status Flag, refer to the following ※2
16#04	Ring Supervisor Config	Set	STRUCT of		Ring supervisor parameters
	Ring Supervisor Enable		BOOL	0	Ring supervisor flag 0 : Disable 1 : Enable
	Ring Supervisor Precedence		USINT	0	Ring supervisor precedence number
	Beacon Interval		UDINT	400	Ring Beacon interval time (us)
	Beacon Timeout		UDINT	1960	Ring Beacon timeout (us)
	DLR VLAN ID		UINT	0	VLAN ID Range: 0~4094.
16#05	Ring Faults	Set	UINT	0	Ring fault counter
16#06	Last Active Node on Port1	Get	STRUCT of		Port 1 Ring fault IP and MAC addresses of the last active node
	Device IP Address		UDINT	0	IP address of the device
	Device MAC Address		ARRAY of 6 USINTs	0	MAC address of the device
16#07	Last Active Node on Port2	Get	STRUCT of		Port 2 Ring fault IP and MAC addresses of the last active node
	Device IP Address		UDINT	0	IP address of the device
	Device MAC Address		ARRAY of 6 USINTs	0	MAC address of the device
16#08	Ring Protocol Participants Count	Get	UINT	0	Quantity of the devices in the Ring
16#09	Ring Protocol Participants List	Get	ARRAY of STRUCT of		IP and MAC addresses of the devices in the Ring
	Device IP Address		UDINT	0	IP address of the device
	Device MAC Address		ARRAY of 6 USINTs	0	MAC address of the device
16#10	Active Supervisor Address	Get	STRUCT of :	--	Ring supervisor IP and MAC address
	Supervisor IP Address		UDINT	0	Supervisor Device IP address
	Supervisor MAC address		ARRAY of 6 USINTs	0	Supervisor MAC address
16#11	Active Supervisor Precedence	Get	USINT	0	Ring supervisor Precedence value
16#12	Capability Flags	Get	DWORD	1	refer to the following ※3

## ※1 Network Status

Current Status of the Network	Description
0	Normal
1	Ring Fault (when in the Ring network topology mode)
2	Unexpected Loop Detected (when in the Linear network topology mode)
3	Partial Network Fault (when in the Ring network topology mode and ring supervisor is enabled.)
4	Rapid Fault/Restore Cycle (use the instruction Clear_Rapid_Faults to clear)

## ※2 Ring Supervisor Status

Ring Supervisor Active Status	Description
0	Node is functioning as a backup.
1	Node is functioning as the active ring supervisor.
2	Node is functioning as a normal ring node. (ring supervisor not enabled)
3	Node is operating in a non-DLR topology. (supervisor not enabled and no other supervisors in the network)
4	Node cannot support the currently operating ring parameters, that is, Beacon Interval and/or Beacon Timeout

## ※3 Capability Flags

Bit(s)	Name	Description
0	Announce-based Ring Node	1: When the device is capable of operating as a supervisor and sending announce frame ring nodes.
1	Beacon-based Ring Node	1: When the device is capable of operating as a supervisor and sending beacon frame ring nodes.
2-4	Reserved	0
5	Supervisor Capable	1: The device supports ring supervisor.
6	Redundant Gateway Capable	1: The device supports redundant gateway.
7	Flush_Table frame Capable	1: The device supports flush tables frame.
8-31	Reserved	0

## 8.8 QoS Object (Class ID: 16#48)

It provides a means to configure certain QoS-related behaviours in EtherNet/IP devices to treat traffic streams with different relative priorities or other delivery characteristics.

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	V	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute

- Class

- Class ID : 16#48

- Instance

- 16#00 : Class Attribute
- 16#01 : Instance Attribute
- When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	1	Revision of this object

- When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#01	802.1Q Tag Enable	Get/Set	USINT	0	Enable 802.1Q tag to send frames 0: disable (Default) 1: enable
16#04	DSCP Urgent	Get/Set	USINT	55	DSCP Urgent Value (CIP transport class 0/1)
16#05	DSCP Scheduled	Get/Set	USINT	47	DSCP Schedule Value (CIP transport class 0/1)
16#06	DSCP High	Get/Set	USINT	43	DSCP High Priority Value (CIP transport class 0/1)
16#07	DSCP Low	Get/Set	USINT	31	DSCP Low Priority Value (CIP transport class 0/1)
16#08	DSCP Explicit	Get/Set	USINT	27	DSCP Value (CIP explicit transport class 2/3 and UCMM)

## 8.9 Port Object (Class ID: 16#F4)

It describes the communication interfaces that are present on the device and visible to CIP, including USB, EtherNet/IP and more.

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#01	Get_Attributes_All	X	V	Returns a predefined listing of this objects attributes
16#0E	Set_Attribute_Single	V	V	Returns the contents of the specified attribute.

- Class

- Class ID : 16#F4

- Instance

- 16#00 : Class Attribute
- 16#01 : Instance Attribute
- 16#N : Instance #N Attribute
- When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	1	Revision of this object
16#02	Max Instance	Get	UINT	2	Maximum instance number of this object
16#03	Number of Instance	Get	UINT	2	Number of object instances currently created at this class level of the device
16#08	Entry Port	Get	UINT	1	Communication port for EtherNet/IP
16#09	Port Instance Info	Get	ARRAY of STRUCT of	--	Port Instance information: Port Type + Port Number
	Port Type		UINT	16#01 16#04	Port1: Blackplane Type: 16#01 Number: 16#01
	Port Number		UINT	16#01 16#02	Port2: Ethernet Port Type: 16#04 Number: 16#02

- When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Port Type	Get	UINT	16#04	EtherNet/IP, refer to the following ※ 1
16#02	Port Number	Get	UINT	16#01	Identify each communication port
16#03	Link Object	Get	STRUCT of	--	Identify Object attached to this port. Path length + Link Path
	Path Length		UINT	16#02	Path length
	Link Path		EPATH	20 65 24 01	Path segment: 16#

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#04	Port Name	Get	SHORT_STRING	Backplane EIP1	Name of the communication port Instance1: "Backplane" 09 42 61 63 6B 70 6C 61 6E 65 Instance2: EIP1
16#07	Port Number and Node Address	Get	EPATH	01 01	Communication port number and node number of this device on port.

- When Instance = 2, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Port Type	Get	UINT	16#04	EtherNet/IP, refer to the following ※1
16#02	Port Number	Get	UINT	16#01	Identify each communication port
16#03	Link Object	Get	STRUCT of	--	Identify Object attached to this port. Path length + Link Path
	Path Length		UINT	16#02	Path length
	Link Path		EPATH	20 F5 24 01	Path segment:
16#04	Port Name	Get	SHORT_STRING	EIP1	Name of the communication port Instance1: Maximum 64 characters
16#07	Port Number and Node Address	Get	EPATH	Ex. "192.16 8.1.3" 12 0C 31 39 32 2E 31 36 38 2E 31 2E 33 00	Communication port number and node number of this device on port.

※1 Communication Port Type

Communication Port Type	Description
1	Self-defined
2	ControlNet
3	ControlNet Redundant
4	EtherNet/IP
5	DeviceNet
201	MODBUS/TCP
203	SERCOS III

## 8.10 TCP/IP Interface Object (Class ID: 16#F5)

It provides the mechanism to configure a device's TCP/IP network interface. Examples of configurable items include the device's IP Address, Network Mask, and Gateway Address.

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#01	Get_Attributes_All	X	V	Read all attributes
16#0E	Get_Attribute_Single	V	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute



- Class
  - Class ID = 16#F5
- Instance
  - 16#00 : Class Attribute
  - 16#01 : Instance Attribute
  - When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	16#2	Revision of this object AH10EN-5A: 16#03 AHRTU-ETHN-5A: 16#03 AHCPU5X1-EN: 16#03
16#02	Max Instance	Get	UINT	16#2	Maximum instance number of this object AH10EN-5A: 16#02 AHRTU-ETHN-5A: 16#01 AHCPU5X1-EN: 16#01
16#03	Number of Instance	Get	UINT	16#2	Number of object instances currently created at this class level of the device AH10EN-5A: 16#02 AHRTU-ETHN-5A: 16#01 AHCPU5X1-EN: 16#01

- When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Status	Get	DWORD	16#2	IP status, refer to the following ※1
16#02	Configuration Capability	Get	DWORD	16#15	Configuration capability, refer to the following ※2
16#03	Configuration Control	Get/Set	DWORD	16#0	Configuration Control, refer to the following ※3
16#04	Physical Link Object :	Get	STRUCT of	--	Path to physical link object
	Path Size		UINT	16#0	Size of Path
	Path		EPATH	--	Logical segments identifying the physical link object
16#05	Interface Configuration :	Get/Set	STRUCT of	--	TCP/IP network interface configuration.
	IP Address		UDINT	16#C0A80005	The device's IP address; 192.168.1.5
	Network Mask		UDINT	16#FFFFFFF0 0	The device's network mask: 255.255.255.0
	Gateway Address		UDINT	16#C0A80001	Default gateway address: 192.168.0.1
	Name Server		UDINT	0	Primary name server
	Name Server 2		UDINT	0	Secondary name server
	Domain Name		STRING	00 00	Default domain name

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#06	Host Name	Get/Set	STRING	AH10EN-5A	Device name AH10EN-5A: "AH10EN-5A" AHRTU-ETHN-5A: "AHRTU-ETHN-5A" AHCPU511-EN: "AHCPU511-EN" AHCPU521-EN: "AHCPU521-EN" AHCPU531-EN: "AHCPU531-EN"

※1 Interface Status

Status	Description
0	The Interface Configuration attribute has not been configured.
1	The Interface Configuration attribute contains valid configuration obtained from BOOTP, DHCP or non-volatile memory.
2	The Interface Configuration attribute contains valid configuration obtained from hardware.

※2 Interface Capability Flags

Bit	Description
0	BOOTP Client
1	DNS Client
2	DHCP Client
3	DHCP-DNS Update
4	Configuration Settable
5	Hardware Configurable
6	Interface Configuration Change Requires Reset

※3 Interface Configuration Control

Status	Description
0	The device shall use the interface configuration values previously stored (for example, in non-volatile memory or via hardware switches).
1	The device shall obtain its interface configuration values via BOOTP.
2	The device shall obtain its interface configuration values via DHCP upon start-up.

## 8.11 Ethernet Link Object (Class ID: 16#F6)

It maintains link-specific counters and status information for an IEEE 802.3 communications interface.

● Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#01	Get_Attributes_All	X	V	Returns a predefined listing of this objects attributes
16#0E	Set_Attribute_Single	V	V	Write one attribute
16#4C	Get_and_Clear	X	V	Clear the contents of the attribute Once the attribute is read. For devices that support Instance Attribute 4 or 5, this service code Get and Clear will be available.



- Class
  - Class ID: 16#F6
- Instance
  - 16#00: Class Attribute
  - 16#01: Instance Attribute
  - 16#N: Instance #N Attribute, the number of the Ethernet port
  - When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Revision	Get	UINT	16#03	Revision of this object
16#02	Max Instance	Get	UINT	16#02	Maximum instance number of this object AH10EN-5A: 16#02 AHCPU5X1-EN: 16#01 AHRU-ETHN-5A: 16#02
16#03	Number of Instance	Get	UINT	16#02	Number of object instances currently created at this class level of the device AH10EN-5A: 16#02 AHCPU5X1-EN: 16#01 AHRU-ETHN-5A: 16#02

- When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Interface Speed	Get	DWORD	16#64	Interface speed currently in use 10(16#0A), 100(16#64), 1000(16#3E8) Mbps
16#02	Interface Flags	Get	DWORD	16#F	Ethernet port status, refer to the following ※1
16#03	Physical Address	Get	ARRAY of 6 USINTs	By Product	MAC address
16#04	Interface Counters	Get	STRUCT of :		Ethernet interface counter; only available for AHRU-ETHN-5A
	In Octets		UDINT	16#0	Number of the interface bits received
	In Ucast Packets		UDINT	16#0	Number of the interface unicast packets received
	In NUcast Packets		UDINT	16#0	Number of the interface non-unicast packets received
	In Discards		UDINT	16#0	Number of the interface packets received and then dropped
	In Errors		UDINT	16#0	Number of the interface error packets received
	In Inknown Protos		UDINT	16#0	Number of the interface unknown communication protocol packets received
	Out Octets		UDINT	16#0	Number of the interface bits sent
	Out Ucast Packets		UDINT	16#0	Number of the interface unicast packets sent
	Out NUcast Packets		UDINT	16#0	Number of the interface non-unicast packets sent
Out Discards	UDINT	16#0	Number of the interface packets		

Instance Attribute	Name	Access Rule	Data Type	Values	Description
					received and then dropped
	Out Errors		UDINT	16#0	Number of the interface packets sent but errors occurred
16#05	Media Counters	Get	STRUCT of :	16#0	Ethernet interface error counter; only available for AHRTU-ETHN-5A
	Alignment Errors		UDINT	16#0	The number of times when the length of the received packet is not a bit integral
	FCS Errors		UDINT	16#0	The number of times when the FCS error check runs during packet receiving period
	Single Collisions		UDINT	16#0	The number of times when the packet is sent successfully but with one collision
	Multiple Collisions		UDINT	16#0	The number of times when the packet is sent successfully but with multiple collisions
	SQE Test Errors		UDINT	16#0	The number of times an error message appears when SQE test runs
	Deferred Transmissions		UDINT	16#0	The number of times when the transmission is deferred due to busy interface
	Late Collisions		UDINT	16#0	The number of times an collision occurs during packet sending
	Excessive Collisions		UDINT	16#0	The number of times when the packet cannot be sent due to carrier sense and excessive collisions occur
	MAC Transmit Errors		UDINT	16#0	The number of times when the packet cannot be sent due to MAC layer errors
	Carrier Sense Errors		UDINT	16#0	The number of times when no response on the carrier sense or no resent during the sending of the packets.
	Frame Too Long		UDINT	16#0	The number of times when the length of the received packet exceeds the upper limit.
	MAC Receive Errors		UDINT	16#0	The number of times when an error occurs on the packet receiving due to MAC layer error
16#0A	Interface Label	Get	SHORT_S TRING	NA	Define the Ethernet port name For example: AH10EN-5A When Ethernet port is x1, the expression will be 02 78 31. For port 1, the definition of the name in string is 01 31.
	Length		USINT	NA	The maximum length of the name is 16 characters.
	Interface name		SHORT_S TRING	NA	Use ASCII characters to name the Ethernet port name.

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- When Instance = 2, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#01	Interface Speed	Get	DWORD	16#64	Interface speed currently in use 10(16#0A), 100(16#64), 1000(16#3E8) Mbps
16#02	Interface Flags	Get	DWORD	16#F	Ethernet port status, refer to the following ※1
16#03	Physical Address	Get	ARRAY of 6 USINTs	By Product	MAC address
16#04	Interface Counters	Get	STRUCT of :		Enthernet interface counter; only available for AHRTU-ETHN-5A
	In Octets		UDINT	16#0	Number of the interface bits received
	In Ucast Packets		UDINT	16#0	Number of the interface unicast packets received
	In NUcast Packets		UDINT	16#0	Number of the interface non-unicast packets received
	In Discards		UDINT	16#0	Number of the interface packets received and then dropped
	In Errors		UDINT	16#0	Number of the interface error packets received
	In Inknown Protos		UDINT	16#0	Number of the interface unknown communication protocol packets received
	Out Octets		UDINT	16#0	Number of the interface bits sent
	Out Ucast Packets		UDINT	16#0	Number of the interface unicast packets sent
	Out NUcast Packets		UDINT	16#0	Number of the interface non-unicast packets sent
	Out Discards		UDINT	16#0	Number of the interface packets received and then dropped
	Out Errors		UDINT	16#0	Number of the interface packets received and then dropped
16#05	Media Counters	Get	STRUCT of :	16#0	Enthernet interface error counter; only available for AHRTU-ETHN-5A
	Alignment Errors		UDINT	16#0	The number of times when the length of the received packet is not a bit integral
	FCS Errors		UDINT	16#0	The number of times when the FCS error check runs during packet receiving period
	Single Collisions		UDINT	16#0	The number of times when the packet is sent successfully but with one collision
	Multiple Collisions		UDINT	16#0	The number of times when the packet is sent successfully but with multiple collisions
	SQE Test Errors		UDINT	16#0	The number of times an error message appears when SQE test runs
	Deferred Transmissions		UDINT	16#0	The number of times when the transmission is deferred due to busy interface
	Late Collisions		UDINT	16#0	The number of times an collision occurs during packet sending
Excessive Collisions	UDINT	16#0	The number of times when the packet cannot be sent due to carrier sense and excessive collisions occur		

Instance Attribute	Name	Access Rule	Data Type	Values	Description
	MAC Transmit Errors		UDINT	16#0	The number of times when the packet cannot be sent due to MAC layer errors
	Carrier Sense Errors		UDINT	16#0	The number of times when no response on the carrier sense or no resent during the sending of the packets.
	Frame Too Long		UDINT	16#0	The number of times when the length of the received packet exceeds the upper limit.
	MAC Receive Errors		UDINT	16#0	The number of times when an error occurs on the packet receiving due to MAC layer error
16#0A	Interface Label	Get	SHORT_STRING	NA	Define the Ethernet port name For example: AH10EN-5A When Ethernet port is x2, the expression will be 02 78 32.
	Length		USINT	NA	The maximum length of the name is 16 characters.
	Interface name		SHORT_STRING	NA	Use ASCII characters to name the Ethernet port name.

※1 Interface Flag Table

Bit (s)	Name	Description
0	Link Status	0 indicates an inactive link 1 indicates an active link
1	Half/Full Duplex	0 indicates half duplex 1 indicates full duplex
2-4	Negotiation Status	0 : Auto-negotiation in progress 1 : Auto-negotiation and speed detection failed 2 : Auto negotiation failed but detected speed 3 : Successfully negotiated speed and duplex 4 : Auto-negotiation not attempted. Forced speed and duplex.
5	Manual Setting Requires Reset	shall be set to zero
6	Local Hardware Fault	0 indicates the interface detects no local hardware fault 1 indicates a local hardware fault is detected
7-31	Reserved	0

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## 8.12 Vendor Specific Objects

### 8.12.1 X Register (Class ID: 16#350)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#32	Read_Parameter	X	V	Read Parameter

- Class
  - Class ID : 16#350
- Instance
  - 16#01 : Instance Attribute, Bit Register
  - 16#02 : Instance Attribute, Word Register
  - When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	X0.0	Get	BOOL	16#00	X0.0 bit register
16#01	X0.1	Get	BOOL	16#00	X0.1 bit register
16#02~16#03FE	X0.2~X63.14	Get	BOOL	16#00	X0.2 ~X63.14 bit register
16# Max	XMax.15	Get	BOOL	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

- When Instance = 2, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	X0	Get	INT	16#00	X0 word register
16#01	X1	Get	INT	16#00	X1 word register
16#02~16#03E	X2~X62	Get	INT	16#00	X2~X62 word register
16# Max	XMax	Get	INT	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.2 Y Register (Class ID: 16#351)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter
16#33	Write_Parameter	X	V	Write Parameter

- Class
  - Class ID : 16#351
- Instance
  - 16#01 : Instance Attribute, Bit Register
  - 16#02 : Instance Attribute, Word Register

- When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	X0.0	Get	BOOL	16#00	X0.0 bit register
16#01	X0.1	Get	BOOL	16#00	X0.1 bit register
16#02~16#03FE	X0.2~X63.14	Get	BOOL	16#00	X0.2 ~X63.14 bit register
16# Max	XMax.15	Get	BOOL	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

- When Instance = 2, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	X0	Get	INT	16#00	X0 word register
16#01	X1	Get	INT	16#00	X1 word register
16#02~16#03E	X2~X62	Get	INT	16#00	X2~X62 word register
16# Max	XMax	Get	INT	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.3 D Register (Class ID: 16#352)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter
16#33	Write_Parameter	X	V	Write Parameter

- Class

- Class ID : 16#352

- Instance

- 16#01 : Instance Attribute, Bit Register
- 16#02 : Instance Attribute, Word Register

- When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	D0.0	Set	INT	16#00	D0.0 bit register
16#01	D0.1	Set	INT	16#00	D0.1 bit register
16#02~16#03FFFE	D0.2~ D4096.14	Set	INT	16#00	D0.2~D4096.14 bit register
16#FFFF	D4096.15	Set	INT	16#00	D4096.15 bit register

- When Instance = 2, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	D0	Set	INT	16#00	D0 word register
16#01	D1	Set	INT	16#00	D1 word register
16#02~16#752E	D2~D29998	Set	INT	16#00	D2~D29998 word register
16# Max	DMax	Set	INT	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.4 M Register (Class ID: 16#353)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter
16#33	Write_Parameter	X	V	Write Parameter

- Class
  - Class ID : 16#353
- Instance
  - 16#01 : Instance Attribute, Bit Register
  - When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	M0	Set	BOOL	16#00	M0 word register
16#01	M1	Set	BOOL	16#00	M1 word register
16#02~16#1FFE	M2~M8190	Set	BOOL	16#00	M2~M8190 word register
16# Max	MMax	Set	BOOL	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.5 S Register (Class ID: 16#354)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter
16#33	Write_Parameter	X	V	Write Parameter

- Class
  - Class ID : 16#354
- Instance
  - 16#01 : Instance Attribute, Bit Register
  - When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	S0	Set	BOOL	16#00	S0 word register
16#01	S1	Set	BOOL	16#00	S1 word register
16#02~16#7FE	S2~S2046	Set	BOOL	16#00	S2~S2046 word register
16# Max	SMax	Set	BOOL	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.6 T Register (Class ID: 16#355)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter
16#33	Write_Parameter	X	V	Write Parameter

- Class
  - Class ID : 16#355
- Instance
  - 16#01 : Instance Attribute, Bit Register
  - 16#02 : Instance Attribute, Word Register
  - When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	T0	Set	BOOL	16#00	T0 bit register
16#01	T1	Set	BOOL	16#00	T1 bit register
16#02~16#1FE	T2~T510	Set	BOOL	16#00	T2~T510 bit register
16# Max	TMax	Set	BOOL	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.



- When Instance = 2, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	T0	Set	INT	16#00	T0 word register
16#01	T1	Set	INT	16#00	T1 word register
16#02~16#1FE	T2~T510	Set	INT	16#00	T2~T510 word register
16# Max	TMax	Set	INT	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.7 C Register (Class ID: 16#356)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter
16#33	Write_Parameter	X	V	Write Parameter

- Class
  - Class ID : 16#356
- Instance
  - 16#01 : Instance Attribute, Bit Register
  - 16#02 : Instance Attribute, Word Register
  - When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	C0	Set	BOOL	16#00	C0 bit register
16#01	C1	Set	BOOL	16#00	C1 bit register
16#02~16#1FE	C2~C510	Set	BOOL	16#00	C2~C510 bit register
16# Max	CMax	Set	BOOL	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

- When Instance = 2, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	C0	Set	INT	16#00	C0 word register
16#01	C1	Set	INT	16#00	C1 word register
16#02~16#1FE	C2~C510	Set	INT	16#00	C2~C510 word register
16# Max	CMax	Set	INT	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.8 HC Register (Class ID: 16#357)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter
16#33	Write_Parameter	X	V	Write Parameter

- Class

- Class ID : 16#357

- Instance

- 16#01 : Instance Attribute, Bit Register
- 16#02 : Instance Attribute, Word Register

- When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	HC0	Set	BOOL	16#00	HC0 bit register
16#01	HC1	Set	BOOL	16#00	HC1 bit register
16#02~16#FE	HC2~HC254	Set	BOOL	16#00	HC2~HC254 bit register
16# Max	HCMMax	Set	BOOL	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

- When Instance = 2, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	HC0	Set	DINT	16#00	HC0 word register
16#01	HC1	Set	DINT	16#00	HC1 word register
16#02~16#FE	HC2~HC254	Set	DINT	16#00	HC2~HC254 word register
16# Max	HCMMax	Set	INT	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.9 SM Register (Class ID: 16#358)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#32	Read_Parameter	X	V	Read Parameter

- Class

- Class ID : 16#358

- Instance
  - 16#01 : Instance Attribute, Bit Register
  - When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	SM0	Set	BOOL	16#00	SM0 bit register
16#01	SM1	Set	BOOL	16#00	SM1 bit register
16#02~16#FFE	SM2~SM4094	Set	BOOL	16#00	SM2~SM4094 bit register
16# Max	SMax	Set	BOOL	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.10 SR Register (Class ID: 16#359)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#32	Read_Parameter	X	V	Read Parameter

- Class
  - Class ID : 16#359
- Instance
  - 16#01 : Instance Attribute, Word Register
  - When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	SR0	Set	INT	16#00	SR0 word register
16#01	SR1	Set	INT	16#00	SR1 word register
16#02~16#7FE	SR2~SR2046	Set	INT	16#00	SR2~SR2046 word register
16# Max	SMax	Set	INT	16#00	The maximum number of the instance attribute is determined by the sepecification of the connected AH series PLC.

### 8.12.11 Control Register (Class ID: 16#370)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#10	Set_Attribute_Single	X	V	Write one attribute

16#32	Read_Parameter	X	V	Read Parameter
16#33	Write_Parameter	X	V	Write Parameter

- Class
  - Class ID : 16#370
- Instance
  - 16#01 : Instance Attribute, Word Register
  - When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	Model Name	Get	UINT	16#5881	System defined; AH10EN-5A module
16#01	System Version	Get	UINT	--	System version is shown using hexadecimal notation; for example, 16#1020 = V1.02.
16#02	Reserved		UINT	--	
16#03	Mode	Get	UINT	--	0: Single IP, network switch mode 1: Double IP, 2 independent port mode
16#04	Port X1 IP Address	Set	UINT	--	Port X1 IP address
16#05	Port X1 IP Address	Set	UINT	--	
16#06	Port X1 Mask	Set	UINT	--	Port X1 Subnet mask
16#07	Port X1 Mask	Set	UINT	--	
16#08	Port X1 Gateway Address	Set	UINT	--	Port X1 Gateway IP address
16#09	Port X1 Gateway Address	Set	UINT	--	
16#0A	Port X1 DHCP Enable	Set	UINT	16#0	0: Static 1: DHCP 2: BOOTP
16#0B	Port X1 IP Config Trigger Setup	Set	UINT	16#0	0: IP configuration is done. 1: Port X1 IP trigger parameter setup
16#0C	Port X1 IP Config Status	Set	UINT	--	0: IP configuration is done. 1: IP configuration is in process. 2: DHCP configuration is not complete. 3: IP parameter setting error
16#0D	Reserved		UINT	--	
16#0E	Port X2 IP Address	Set	UINT	--	Port X2 IP Address
16#0F	Port X2 IP Address	Set	UINT	--	
16#10	Port X2 Mask	Set	UINT	--	Port X2 Subnet mask
16#11	Port X2 Mask	Set	UINT	--	
16#12~13	Reserved		UINT	--	
16#14	Port X2 DHCP Enable	Set	UINT	16#0	0: Static 1: DHCP 2: BOOTP
16#15	Port X2 IP Config Trigger Setup	Set	UINT	16#0	0: IP configuration is done. 1: Port X2IP trigger parameter setup

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#16	Port X2 IP Config Status	Set	UINT	--	0: IP configuration is done. 1: IP configuration is in process. 2: DHCP configuration is not complete. 3: IP parameter setting error
16#17~16#2F	Reserved		UINT	--	
16#30	E-mail 1 Status Register	Set	UINT	--	0: sending
16#31	E-mail 2 Status Register	Set	UINT	--	1: in process
16#32	E-mail 3 Status Register	Set	UINT	--	2: E-Mail sent successfully
16#33	E-mail 4 Status Register	Set	UINT	--	3~9: Reserved
16#34	E-mail 5 Status Register	Set	UINT	--	10: cannot connect to SMTP-Server
16#35	E-mail 6 Status Register	Set	UINT	--	11: Wrong E-Mail recipient address
16#36	E-mail 7 Status Register	Set	UINT	--	12: SMTP-Server communication error
16#37	E-mail 8 Status Register	Set	UINT	--	

### 8.12.12 Status Register (Class ID: 16#370)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Get_Attribute_Single	X	V	Read one attribute
16#33	Write_Parameter	X	V	Write Parameter

- Class

- Class ID : 16#370

- Instance

- 16#01 : Instance Attribute, Word Register

- When Instance = 1, the Class Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	Model Name	Get	UINT	16#68C1	System defined; AHRTU-ETHN-5A module
16#01	System Version	Get	UINT	--	System version is shown using hexadecimal notation; for example, 16#1020 = V1.02.
16#02	Subversion	Get	UINT	--	System subversion
16#03	Number of successful TCP connections	Get	UINT	16#0	Number of successful TCP connections
16#04	Number of successful CIP connections	Get	UINT	16#0	Number of successful CIP connections
16#05	Number of successful connections via MODBUS TCP Server	Get	UINT	16#0	Number of successful connections via MODBUS TCP Server
16#06	Scan Time (0.1ms)	Get	UINT	--	

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#07	RTU Status	Get	UINT	16#0	bit0~1 00: normal 01: alarm 10: error 11: error; the system keeps running
16#08	Backplane Status	Get	UINT	16#0	bit0~7 = backplane 1~8 0: setting parameters in the software cannot be matched with the device configurations 1: setting parameters in the software can be matched with the device configurations
16#09~16#14	Status of the backplane I/O modules 0~11	Get	UINT	16#0	B0 00: normal; 01: alarm 10: error
					B1 0: stop 1: run
					B2 0: module not existed 1: existing module
					B3 0: the device configurations cannot be matched with the setting parameters 1: the device configurations can be matched with the setting parameters
16#15~16#4C	Status of the I/O modules 0~7 from the extension backplane 1~7	Get	UINT	16#0	B0 00: normal; 01: alarm 10: error
					B1 0: stop 1: run
					B2
16#4D	RTU Error Codes	Get	UINT	16#0	Refer to AHRTU-ETHN-5A manual
16#4E~16#59	Error Code of the backplane I/O modules	Get	UINT	16#0	Error codes of I/O modules 0~11
16#5A~16#91	Error codes of the I/O modules from the extension backplane	Get	UINT	16#0	Error codes of the I/O modules 0~7 from the extension backplane 1~7

### 8.12.13 Input Register (Class ID: 16#371)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter

- Class
  - Class ID : 16#371
- Instance
  - 16#01 : Instance Attribute, Word Register
  - When Instance = 16#1, the AH10EN-5A Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	System Status	Get	UINT	16#0	Display the system status; 0 = Normal
16#01	System Version	Get	UINT	--	System version is shown using hexadecimal notation; for example, 16#1020 = V1.02.
16#02	Port X1 Status	Get	UINT	--	Display the status of Port X1 0: Link Up 1: Link Down
16#03	Port X2 Status	Get	UINT	--	Display the status of Port X2 0: Link Up 1: Link Down
16#04~16#05	Reserved	Get	UINT	--	
16#06	MODBUS TCP Client Connection Status	Get	UINT	--	The connection number of the MODBUS TCP Client.
16#07	MODBUS TCP Client Connection Status	Get	UINT	--	The connection number of the MODBUS TCP Server.
16#08~16#0A	Reserved	Get	UINT	--	
16#0B	TCP Connection Status	Get	UINT	16#0	The number of the TCP connections
16#0C	Status of Data Mapping 1~16	Get	UINT	--	One bit represents one remote device; 0 = success, 1 = failure
16#0D	Status of Data Mapping 17~32	Get	UINT	--	
16#0E	Status of Data Mapping 33~48	Get	UINT	--	
16#0F	Status of Data Mapping 49~64	Get	UINT	--	
16#10	Input Area Update Time (ms)	Get	UINT	--	The time to complete an update for input areas.
16#11	Output Area Update Time (ms)	Get	UINT	--	The time to complete an update for output areas.
16#12	Normal Exchange Area Update Time (ms)	Get	UINT	--	The time to complete an update for both input and output areas.
16#13	System Scan Time (ms)	Get	UINT	--	AH10EN-5A scan time (ms) The scan time is the cycle of which the PLC gathers the inputs, runs your PLC program and then updates the outputs.

- When Instance = 16#1, the AHRTU-ETHN-5A Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00	RTU System Status	Get	UINT	16#0	0 = Normal 1 = Alarm 2: Error
16#01~02	RTU Error Code	Get	UINT	--	0 = Normal Others = Error
16#03~16#0A	Reserved	Get	UINT	--	
16#0B~16#0F	Module Status	Get	UINT	--	0 = Normal 1 = Not Normal Attribute ID 16#0B, bit 0: I/O module 0 of the main backplane

Instance Attribute	Name	Access Rule	Data Type	Values	Description
					bit 1 : I/O module 1 of the main backplane bit 11: I/O module 11 of the main backplane bit 12: I/O module 0 of the extension backplane

### 8.12.14 Output Register (Class ID: 16#372)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Instance Attribute	
16#0E	Set_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter

- Class

- Class ID : 16#372

- Instance

- 16#01 : Instance Attribute, Word Register
- When Instance = 16#1, the AH10EN-5A Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00~16#09	Reserved	Get	UINT	--	
16#0A	Register used for email triggering	Get	UINT	--	1 bit represents one trigger option; 1: sending email Bit [0~7]: represents email triggering number 1~8.
16#0B	Data mapping mode	Get	UINT	--	0: Stop 1: Stop after one execution 2: Continuous execution
16#0C	Register used to store data mapping 1~16	Get	UINT	--	1 bit represents one remote device; 0: not executing 1: executing Bit [0~15]: represents data mapping number 1~16.
16#0D	Register used to store data mapping 17~32	Get	UINT	--	
16#0E	Register used to store data mapping 33~48	Get	UINT	--	
16#0F	Register used to store data mapping 49~63	Get	UINT	--	
16#10~16#13	Reserved	Get	UINT	--	

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### 8.12.15 RTU AI Register (Class ID : 16#373)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Class Attribute	
16#0E	Get_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter



- Class
  - Class ID : 16#373
- Instance
  - 16#01 : Instance Attribute · Word Register
  - When Instance = 16#1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#000~16#43F	Input value of the analog I/O module	Get	UINT	--	Input voltage / current values of the analog I/O modules or the temperature values of the temperature modules; stated by the order of the module channels

### 8.12.16 RTU AO Register (Class ID : 16#374)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Class Attribute	
16#0E	Get_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter

- Class
  - Class ID : 16#373
- Instance
  - 16#01 : Instance Attribute · Word Register
  - When Instance = 16#1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#000~16#43F	Output value of the analog I/O module	Get	UINT	--	Output voltage / current values of the analog I/O modules or the temperature values of the temperature modules; stated by the order of the module channels

### 8.12.17 RTU DI Register (Class ID : 16#375)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Class Attribute	
16#0E	Get_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter

- Class
  - Class ID : 16#375
- Instance
  - 16#01 : Instance 1 Attribute · Coil Register
  - 16#02 : Instance 2 Attribute · Word Register

- When Instance = 16#1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#000~16#E9F	Input value of the digital I/O module	Get	UINT	--	X0.0 ~ X233.15

- When Instance = 16#2, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00~16#E9	Input value of the digital I/O module	Get	UINT	--	X0 ~ X233

### 8.12.18 RTU DO Register (Class ID : 16#376)

- Service Code

Service Code	Service Name	Support		Description
		Class Attribute	Class Attribute	
16#0E	Get_Attribute_Single	X	V	Write one attribute
16#32	Read_Parameter	X	V	Read Parameter

- Class
  - Class ID : 16#375
- Instance
  - 16#01 : Instance 1 Attribute · Coil Register
  - 16#02 : Instance 2 Attribute · Word Register

- When Instance = 16#1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#000~16#E9F	Input value of the digital I/O module	Get	UINT	--	Y0.0 ~ Y233.15

- When Instance = 16#2, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
16#00~16#E9	Input value of the digital I/O module	Get	UINT	--	Y0 ~ Y233

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## Chapter 9 Delta EIP Product List

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## 9.1 Delta EIP Products

Positioning	Product	Version
Mid-range PLC	AHCPU501-EN, AHCPU511-EN, AHCPU521-EN, AHCPU531-EN	V2.00
	AHCPU560-EN2	V1.00
	AH10EN-5A	V2.00
	AHRTU-ETHN-5A	V1.00
	AH10EMC-5A	V1.00
	AS300 Series	V1.00
	AS200 Series	V1.00
	AS300 Series (AS-FEN02 Communication Card)	V1.06 ( V1.00 )
	AS00SCM-A (AS-FEN02 Communication Card)	V2.02 ( V1.00 )
Small PLC	DVPES2-E Series	V3.60
	DVP26SE	V1.00
Inverter	VFD-MS300 Series (CMM-EIP01 Communication Card)	V1.00
	VFD-C2000 Series (CMC-EIP01 Communication Card)	V1.06

## 9.2 Delta EIP Products, DLR (Device Level Ring) supported

Positioning	Product	Version
Mid-range PLC	AHCPU560-EN2	V1.00
	AH10EN-5A	V2.00
	AHRTU-ETHN-5A	V1.00
	AS-FEN02	V1.04

## 9.3 Delta EIP Products, Scanner supported

Positioning	Product	Version
Mid-range PLC	AHCPU501-EN, AHCPU511-EN, AHCPU521-EN, AHCPU531-EN	V2.00
	AHCPU560-EN2	V1.00
	AH10EN-5A	V2.00
	AS300 Series, AS200 Series	V1.00