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AS Series Operation Manual

AS **Series Operation Manual**

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AS Series Operation Manual

Revision History

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1st	The first version was published.	2016/11/30

AS Series Operation Manual

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Chapter 1 Introduction

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1.1 Introduction

This manual introduces functions of CPUs, devices, module tables, troubleshooting, and etc.

1.1.1 Related Manuals

The related manuals of the AS series programmable logic controllers are composed of the following

- AS series Quick Start

  It guides users to use the system before they read the related manuals.

- AS series Programming Manual

  It introduces the programming of the AS series programmable logic controllers, the basic instructions, and the applied instructions.

- ISPSoft User Manual

  It introduces the use of ISPSoft, the programming language (Ladder, SFC, FBD, and ST), the concept of POUs, and the concept of tasks.

- AS series Hardware Manual

  It introduces electrical specifications, appearances, dimensions, and etc.

- AS series Operation Manual

  It introduces functions of CPUs, devices, module tables, troubleshooting, and etc.

- AS series Module Manual

  It introduces the use of special I/O modules. For example, network modules, analog I/O modules, temperature measurement modules, motion control modules, and etc.

1.1.2 Description of Models

Classification	Model Name	Description
Power supply module	AS-PS02	Input: 100~240 VAC, 50/60 Hz Output: 24VDC/2A, 48W (for PLC internal use)
	AS-PS02A	Input: 100~240 VAC, 50/60 Hz Output: 24VDC/1.5A, 36W (for PLC internal use) Output: 24VDC/0.5A, 12W (for external use)
CPU module	AS332P-A	CPU module, PNP output, 2x RS-485 ports, 1x USB port, 1x Micro SD interface, 2x function cards (optional), supporting 32 I/Os (16DI+16DO) and up to 1024 I/Os, the program capacity:128K steps
	AS332T-A	CPU module, NPN output, 1x Ethernet port, 2x RS-485 ports, 1x USB port, 1x Micro SD interface, 2x function cards (optional), supporting 32 I/Os (16DI+16DO) and up to 1024 I/Os, the program capacity:128K steps

Classification	Model Name	Description
	AS324MT-A	CPU module, NPN differential output, 1x Ethernet port, 2x RS-485 ports, 1x USB port, 1x Micro SD interface, 2x function cards (optional), supporting 24 I/Os (12DI+12DO) and up to 1016 I/Os, the program capacity:128K steps
Digital input/output module	AS08AM10N-A	24VDC 5mA 8 inputs Spring-clamp terminal block
	AS08AN01P-A	5 ~ 30VDC 0.5A 8 outputs Sourcing output Spring-clamp terminal block
	AS08AN01R-A	240VAC/24VDC 2A 8 outputs Relay Spring-clamp terminal block
	AS08AN01T-A	5 ~ 30VDC 0.5A 8 outputs Sinking output Spring-clamp terminal block
	AS16AM10N-A	24VDC 5mA 16 inputs Spring-clamp terminal block
	AS16AN01P-A	5 ~ 30VDC 0.5A 16 outputs Sourcing output Spring-clamp terminal block

Classification	Model Name	Description
	AS16AN01R-A	240VAC/24VDC 2A 16 outputs Relay Spring-clamp terminal block
	AS16AN01T-A	5 ~ 30VDC 0.5A 16 outputs Sinking output Spring-clamp terminal block
	AS16AP11P-A	24VDC 5mA 8 inputs 5 ~ 30VDC 0.5A 8 outputs Sourcing output Spring-clamp terminal block
	AS16AP11R-A	24VDC 5mA 8 inputs 240VAC/24VDC 2A 8 outputs Relay Spring-clamp terminal block
	AS16AP11T-A	24VDC 5mA 8 inputs 5 ~ 30VDC 0.5A 8 outputs

Classification	Model Name	Description
		Sinking output Spring-clamp terminal block
	AS32AM10N-A	24VDC 3.2mA 32 inputs MIL connector
	AS32AN02T-A	5 ~ 30VDC 0.1A 32 outputs Sinking output MIL connector
	AS64AM10N-A	24VDC 3.2mA 64 inputs MIL connector
	AS64AN02T-A	5 ~ 30VDC 0.1A 64 outputs Sinking output MIL connector
Analog input/output module	AS04AD-A	4-channel analog input module Hardware resolution: 16 bits 0~10V, 0/1~5V, -5~+5V, -10~+10V, 0/4~20mA, -20~+20mA Conversion time: 2ms/channel
	AS04DA-A	4-channel analog input module Hardware resolution: 12 bits -10~+10V, 0~20mA, 4~20mA Conversion time: 2ms/channel
	AS06XA-A	4-channel analog input module Hardware resolution: 16 bits 0~10V, 0/1~5V, -5~+5V, -10~+10V, 0/4~20mA, -20~+20mA Conversion time: 2 ms/channel

Classification	Model Name	Description
		2-channel analog input module Hardware resolution: 12 bits -10~+10V, 0~20mA, 4~20mA Conversion time: 2ms/channel
Temperature measurement module	AS04RTD-A	4-channe, 2-wire/3-wire RTD Sensor type: Pt100 / Ni100 / Pt1000 / Ni1000 / JPt100 / LG-Ni1000 / Cu50 / Cu100 / 0~300Ω / 0~3000Ω input impedance Resolution: 0.1°C/0.1°F (16 bits) Conversion time: 200ms/channel
	AS04TC-A	4-channe thermocouple Sensor type: J, K, R, S, T, E, N, B and -100~+100 mV Resolution: 0.1°C/0.1°F (24 bits) Conversion time: 200ms/channel
Load cell module	AS02LC-A	2-channel, 4-wire/6-wire load cell sensor Eigenvalue applicable to a load cell: 1, 2, 4, 6, 20, 40, 80 mV/V Highest precision 1/10000 @ 50ms of the conversion time ADC Resolution : 24 bits Conversion time: 2.5 ~ 400ms (9 options to choose from)
Network module	AS00SCM-A	Serial communication module, 2x communication ports, applicable to communication cards, supporting MODBUS protocols
Remote I/O module	AS00SCM-A + AS-FCOPM	Applicable to AS-FCOPM function cards
Function cards	AS-F232	Serial communication port, RS232, functioning as a master or slave
	AS-F422	Serial communication port, RS422, functioning as a master or slave
	AS-F485	Serial communication port, RS485, functioning as a master or slave
	AS-FCOPM	CANopen communication port, supporting DS301, AS series remote modules and Delta servo systems
	AS-F2AD	2-channel analog input 0~10V (12 bits), 4~20mA (11 bits) Conversion time: 3ms/channel

Classification	Model Name	Description
	AS-F2DA	2-channel analog input 0~10V, 4~20mA (12 bits) Conversion time: 2ms/channel
Programming cable	UC-PRG015-01A (1.5M)	Used for the connection between a PLC and a PC via a mini USB port, applicable for AS332T-A, AS332P-A, and AS324MT-A
	UC-PRG030-01A (3M)	Used for the connection between a PLC and a PC via a mini USB port, applicable for AS332T-A, AS332P-A, AS324MT-A
	UC-PRG030-20A (3M)	Used for the connection between a PLC and a PC via a RJ45 port, applicable for AS332T-A, AS332P-A, AS324MT-A
I/O extension cable	UC-ET010-24B (1M) UC-ET020-24B (2M) UC-ET030-24B (3M)	MIL connector, 40Pin ↔ 40Pin, shielded, applicable for AS32AM10N-A, AS32AN02T-A, AS64AM10N-A, AS64AN02T-A
	UC-ET010-24D (1M) UC-ET020-24D (2M) UC-ET030-24D (3M)	MIL connector, 40Pin↔ 2x 20Pin, shielded, applicable for AS332T-A, AS332P-A, AS324MT-A, AS32AM10N-A, AS32AN02T-A, AS64AM10N-A, AS64AN02T-A
External terminal module	UB-10-ID16A	16 inputs/outputs, 20-Pin MIL connector, applicable for AS332T-A, AS332P-A, AS324MT-A, AS32AM10N-A, AS32AN02T-A, AS64AM10N-A, AS64AN02T-A
	UB-10-ID32A	32 inputs, 40-Pin MIL connector, applicable for AS32AM10N-A, AS64AM10N-A
	UB-10-OR16A	16 relay outputs, 20-Pin MIL connector, NPN, applicable for AS332T-A, AS32AN02T-A, AS64AN02T-A
	UB-10-OR16B	16 relay outputs, 20-Pin MIL connector, PNP, applicable for AS332P-A
	UB-10-OT32A	32 transistor outputs, 40-Pin MIL connector, NPN, applicable for AS32AN02T-A, AS64AN02T-A
Network cables	UC-CMC003-01A (0.3M)	CANopen communication cable, applicable for AS-FCOPM series

Classification	Model Name	Description
	UC-CMC005-01A (0.5M)	CANopen communication cable, applicable for AS-FCOPM series
	UC-CMC010-01A (1M)	CANopen communication cable, applicable for AS-FCOPM series
	UC-CMC015-01A (1.5M)	CANopen communication cable, applicable for AS-FCOPM series
	UC-CMC020-01A (2M)	CANopen communication cable, applicable for AS-FCOPM series
	UC-CMC030-01A (3M)	CANopen communication cable, applicable for AS-FCOPM series
	UC-CMC050-01A (5M)	CANopen communication cable, applicable for AS-FCOPM series
	UC-CMC100-01A (10M)	CANopen communication cable, applicable for AS-FCOPM series
	UC-CMC200-01A (20M)	CANopen communication cable, applicable for AS-FCOPM series

1.2 Overview

An AS series CPU module is an advanced controller with built-in 6 high speed counters for inputs, 6-axis (pulse), and can optionally work with a total of 8-axis (CANopen) position outputs. It provides a strong network function for users, and users can create connection among devices on the network through software. An AS series CPU module also provides structured programming. Users can assign programs to different tasks, and write a program which is frequently executed in a function block. Besides, users can choose different programming languages ladder diagrams (LD), structured texts (ST), sequential function charts (SFC), and continuous function chart (CFC) dealt with by IEC 61131-3 according to their needs when writing programs. They can create the AS series hardware configuration by means of hardware configuration software. They can also restore or back up a system rapidly through the built-in SD interface in an AS series series CPU module. This manual introduces the basic operation of an AS series system, and help users familiarize themselves with the AS series system.

1.3 Characteristics

The characteristics of the AS series CPU module are as follows.

1. High efficiency

- The AS300 series CPU module adopts a 32-bit high-speed processor. Basic instructions can be executed at 25ns each and the moving instructions at 150ns each. The instructions are executed at a speed of 40k

steps/ms (40% of the instructions are basic instructions, and 60% of the instructions are applied instructions.)

- The CPU of the AS300 series is Soc architecture designed; built with 6 high speed counters, the maximum frequency is 200kHz for each counter (differential output models can reach 4mHz); 6-axis high speed position output at 200kHz (differential output models can reach 4mHz).

2. Supporting more inputs and outputs

- The AS series CPU module supports up to 1024 digital I/Os or 32 I/O modules (any type) or 16 analog I/O modules.
- The AS series can work with SCM communication modules (AS-FCOPM included) to create a remote connection and up to 15 remote modules can be connected.

  Note: For the connected unit of the CPU modues and the connected remoted modules, the I/O points cannot exceed 1024 I/Os or 32 I/O modules (any type) or 16 analog I/O modules.

3. Multiple I/O modules

- The I/O modules supported by the AS series CPU module are digital input/output modules, analog input/output modules, temperature measurement modules, network modules, and function cards.

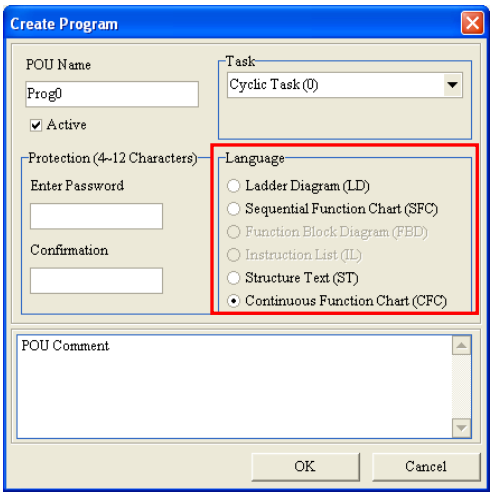
Module	Description
Digital input/output module	AS08AM10N-A, AS08AN01T-A, AS08AN01P-A, AS08AN01R-A, AS16AM10N-A, AS16AN01T-A, AS16AN01P-A, AS16AN01R-A, AS16AP11T-A, AS16AP11P-A, AS16AP11R-A, AS32AM10N-A, AS32AN02T-A, AS64AM10N-A, AS64AN02T-A
Analog input/output module (Temperature measurement module)	AS04AD-A, AS04DA-A, AS06XA-A, AS04RTD-A, AS04TC-A
Network module	AS00SCM-A
Communication card	AS-F232, AS-F422, AS-F485, AS-FCOPM
Function card	AS-F2AD, AS-F2DA

4. Larger program capacity and memory

- The AS series advanced CPU modules (AS332/AS324) have 128k steps of program capacity. 60000 general registers (30000 for specific use and 30000 for programming editing), and 64k words of memory (can be used for storing parameters).

5. Supporting IEC 61131-3

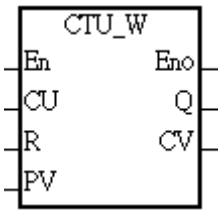
- The AS series CPU module supports IEC 61131-3.
- The programming languages which are supported are ladder diagrams (LD), sequential function charts (SFC), structured texts (ST), and continuous function chart (CFC).



- Users can select a programming language according to their preference and the convenience. The programming languages support one another so that the programs written by different users are related.

6. Strong function block

- Not only the standard IEC61131-3 function blocks are supported, but also the convenient function blocks provided by Delta Electronics, Inc. are supported. Users can write the program frequently executed in a function block so that the program becomes more structured and can be executed more conveniently.
- The symbol for a function block in a ladder diagram is like an Integrated circuit (IC) in a circuit diagram. Owing to the fact that the ladder diagram is based on the traditional circuit diagram, the operation of a function block is quite similar to the function of an integrated circuit. Users only need to send the signal to the corresponding input of the function block, and they can receive the signal or state which is required. During the whole process, users do not need to consider the processing procedure inside the function block.

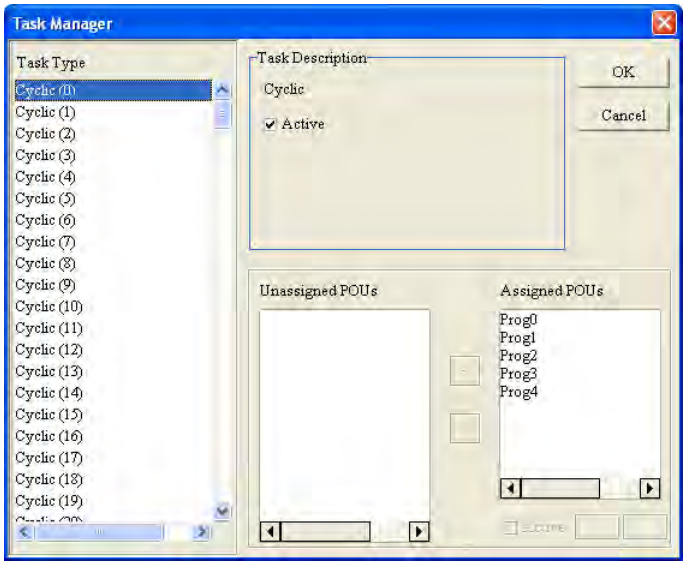


- A function block is a program element equipped with the operation function. It is similar to a subroutine, and is a type of POU (Program Organization Unit). It can not operate by itself, and has to be called through the program POU. After the related parameters are transmitted, the function defined by a function block is

executed. Besides, the final operation result can be sent to the device or variable used in the superior POU after the execution of the function block is complete.

- The setting of passwords by means of ISPSoft provides the secrecy of function blocks for special businesses. The program inside a function block can not be learned, and the patent of a business will not be infringed.

7. Task



- The programs can be assigned to 283 tasks at most. Among the 288 tasks, 32 tasks are cyclic tasks, 32 tasks are I/O interrupts, 4 tasks are timer interrupts, 2 tasks are communication interrupts, 1 task is an external 24 V low-voltage interrupt, and 212 tasks are user-defined tasks.

- Users can enable and disable a task during the execution of a program by means of TKON and TKOFF.

8. Increasing the efficiency of configuring the hardware through an USB cable and ISPSoft

- The AS300 series CPU module provides a standard USB 2.0 interface. USB 2.0 increases the data transfer rate, and decreases the time it takes to download the program, monitor the program and configure the hardware. Besides, users do not need to buy a communication cable for the CPU module. They can use a general USB cable to connect to the AS series CPU module.

9. Serial control interface with multiple functions

- AS300 series CPU modules provide two RS-485 serial control interfaces, i.e. COM1 and COM2 and can be set as a master or slave.

- Users can use the communication cards to work with 2 extension serial communication ports and to set the port as a master or slave.

10. High-speed Ethernet communication interface

- AS300 series is equipped with a 10/100 M Ethernet communication interface, and supports emails, webs, and socket services.
- The error message related to the system is sent to users' email boxes immediately. Users do not need to be on the spot to understand the problem.

11. Memory card

- The memory card has the following functions.

  System backup: The user program, the CPU parameters, the module table, the setting value in the device

  System recovery: The user program, the CPU parameters, the module table, and the setting value in the device

  Parameter storage: The value in the device

  Log storage: The system error log and the system status log

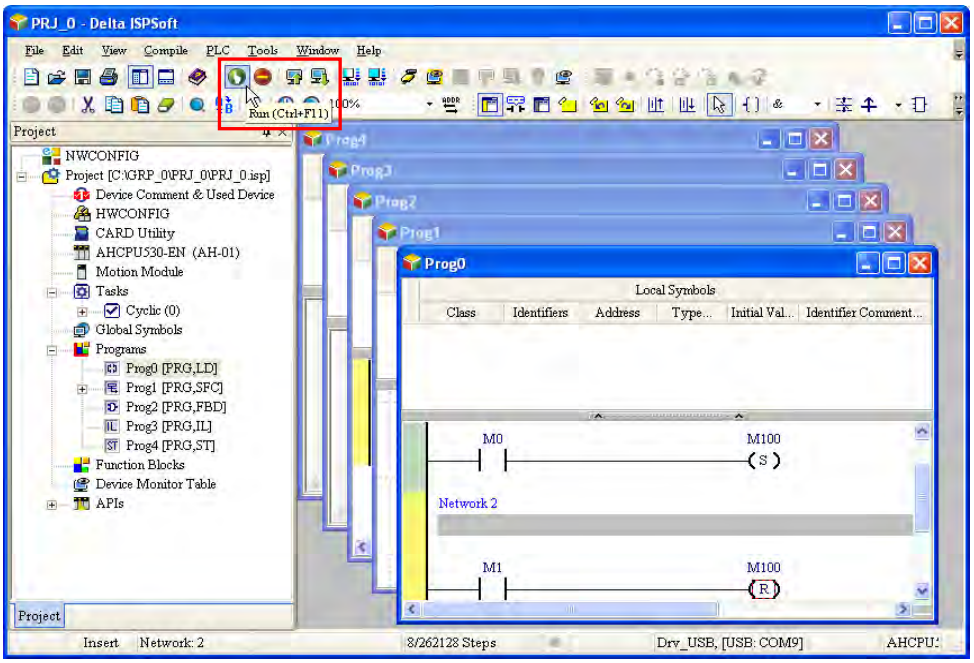
12. Hot swap

- The AS series I/O modules support the on-line uninterruptible hot swap. When the system runs, users can replace the module which breaks down without disconnecting the module. After the module is replaced, the new module runs normally. Users do not need to set the module manually or switch the state.

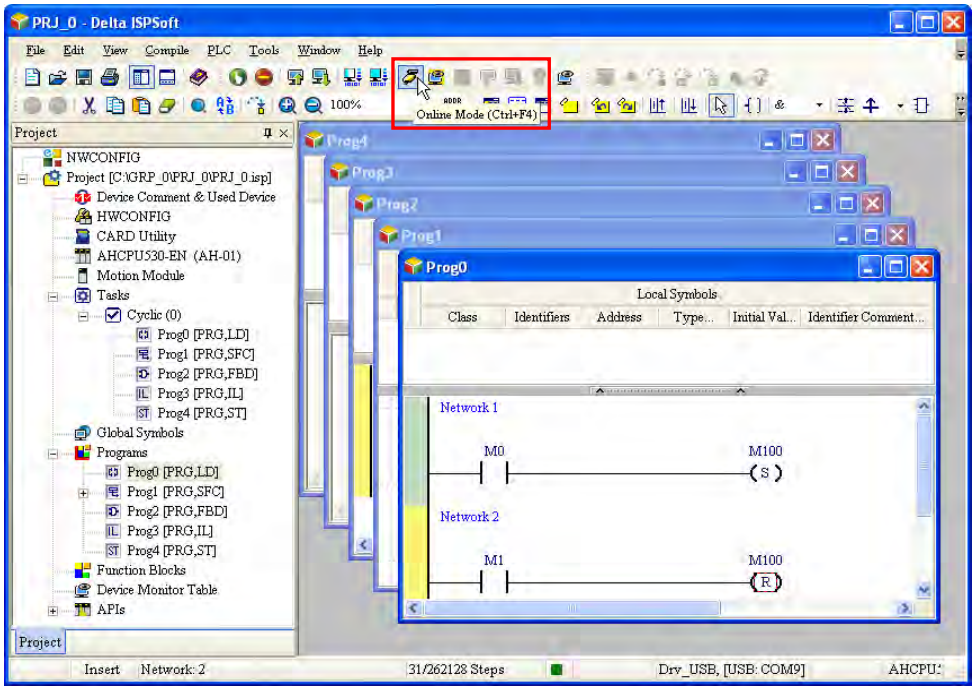
13. Supporting the on-line debugging mode

- After a single instruction step has been complete, or after a breakpoint is specified, users can easily find the bug in the program by means of the on-line debugging mode supported by the AS series CPU module.
- If users want to enter the debugging mode, the CPU module must run. After users enable the on-line monitoring function, they have to click  . The debugging screen varies from programming language to programming language, but the same operation applies to these programming languages. For the AS series PLC, structured texts do not support the debugging mode, and sequential function charts support the debugging mode during the action and the transition.

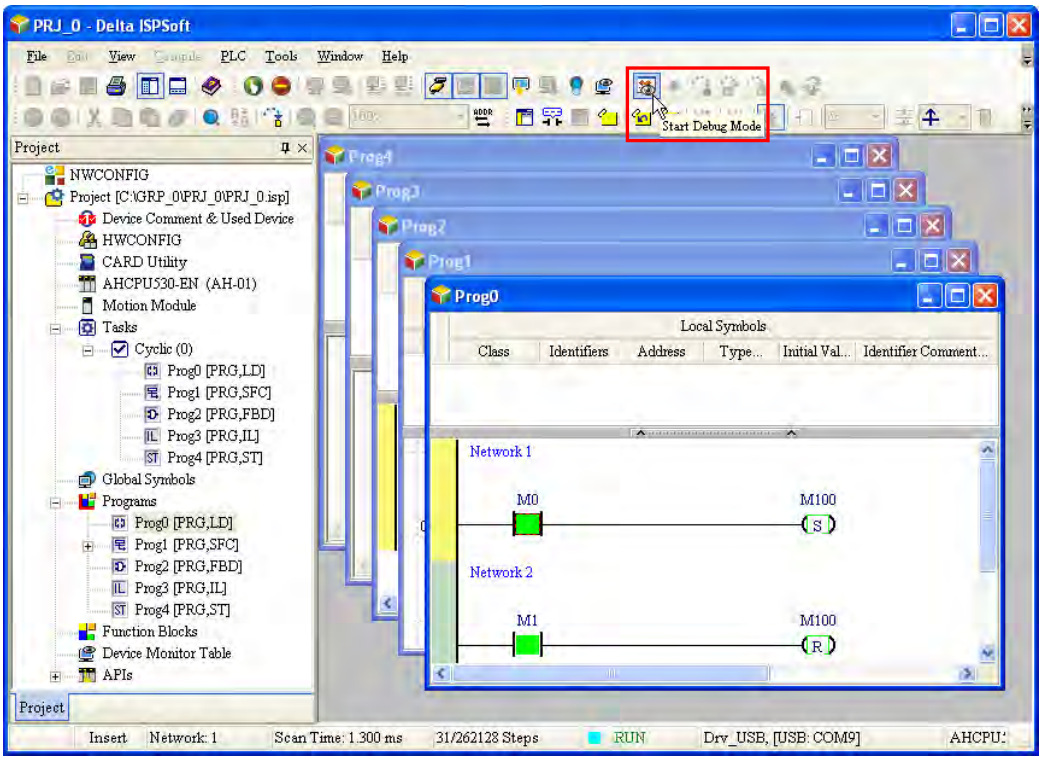
Step 1: Setting the PLC to RUN



Step 2: Entering the on-line mode

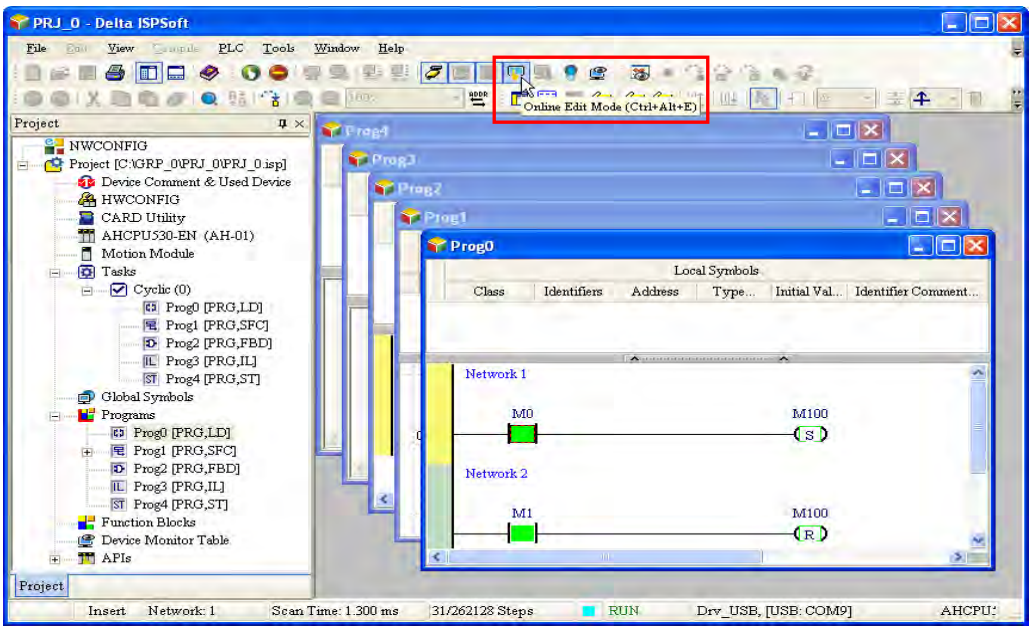


Step 3: Entering the debugging mode

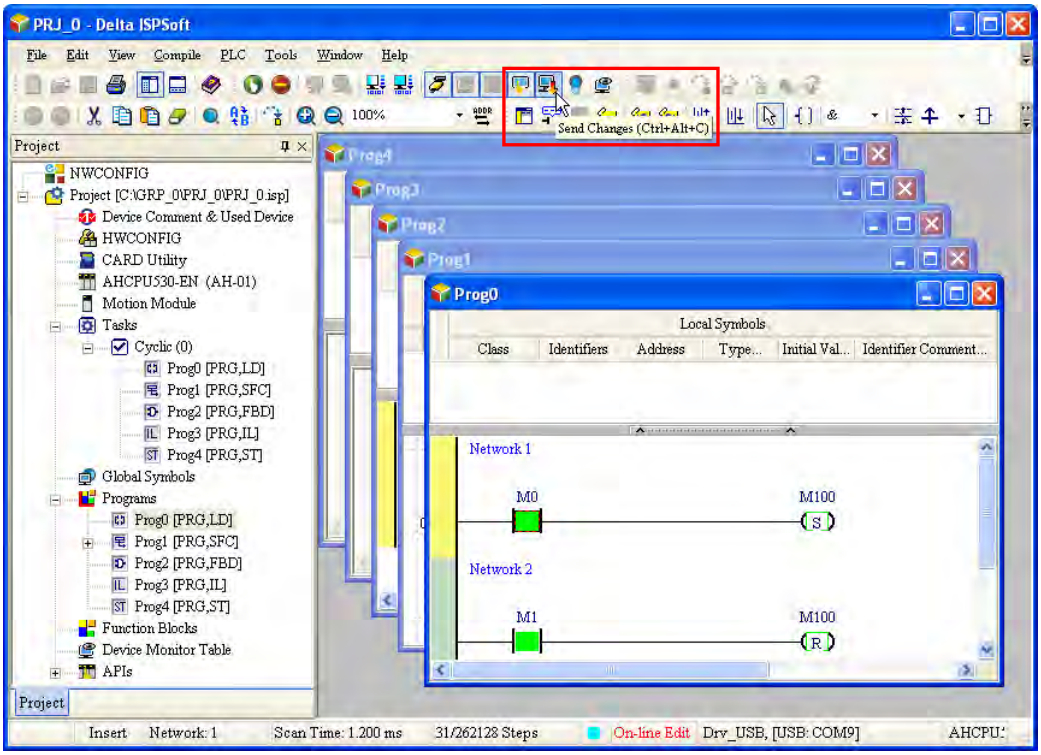


14. Supporting the on-line editing mode

- When the system runs, users can make use of the on-line editing mode to update the program without affecting the operation of the system.
- When the system is in the on-line monitoring mode, users can enter the on-line editing mode by clicking  .



- After the program is modified and compiled, users can update the program in the CPU module by clicking  .



MEMO

2

Chapter 2 Specifications and System Configuration

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2.1 General Specifications

Item	Specifications
Operating temperature	-20~60°C
Storage temperature	-40~80°C
Operating humidity	5~95% No condensation
Storage humidity	5~95% No condensation
Work environment	No corrosive gas exists.
Installation location	In a control box
Pollution degree	2
EMC (electromagnetic compatibility)	Refer to AS Hardware Manual chapter 7 for more information.
Vibration resistance	Tested with: 5 Hz ≦ f ≦ 8.4 Hz, constant amplitude 3.5 mm; 8.4 Hz ≦ f ≦ 150 Hz, constant acceleration 1g Duration of oscillation: 10 sweep cycles per axis on each direction of the 3 mutually perpendicular axes International Standard IEC 61131-2 & IEC 60068-2-6 (TEST Fc)
Shock resistance	Tested with: Half-sine wave: Strength of shock 15 g peak value, 11 ms duration; Shock direction: The shocks in each in direction per axis, on 3 mutually perpendicular axes (total of 18 shocks) International Standard IEC 61131-2 & IEC 60068-2-27 (TEST Ea)
Safety	Conforms to IEC 61131-2, UL508

2.2 Specifications for CPU Modules

2.2.1 Functional specifications

Item	AS324MT-A/AS332T-A/AS332P-A	Remark
Execution	The program is executed cyclically.	
Input/Output control	Regenerated inputs/outputs Direct inputs/outputs	The inputs and outputs can be controlled through the derivative operators DX and DY.
Programming language	IEC 61131-3	
	Ladder diagrams, structured texts, function block diagrams, sequential function charts, instruction lists, and continuous function charts	
Instruction execution speed	40K steps/ms	
Number of instructions	Approximately 666 instructions	
Constant scan cycle (ms)	1-32000 (The scan cycle can be increased by one millisecond.)	Setting the parameter
Program capacity (step)	128K steps	
Installation	DIN rails or screws	

Item	AS324MT-A/AS332T-A/AS332P-A	Remark
Installation of a module	No backplane installation; only module after module	
Maximum number of modules which can be installed	32 modules	
Number of tasks	283 tasks (32 cyclic tasks; 16 I/O interrupts; 4 timed interrupts, etc.)	Refert to operation manual for more information
Number of inputs/outputs	1024	Number of inputs/outputs accessible to an actual input/output module
Input relays [X]	1024	
Output relays [Y]	1024	
Internal relays [M]	8192 (M0~M8191)	
Timers [T]	512 (T0~T511)	
Counters [C]	512 (C0~C511)	
32-bit counter [HC]	256 (HC0~HC255)	
Data register [D]	3000 (D0~D29999)	
Data register [W]	3000 (W0~W29999)	
Stepping relay [S]	2048 (S0~S2047)	
Index register [E]	10 (E0~E9)	
Special auxiliary relay [SM]	2048 (SM0~SM2047)	
Special data register [SR]	2048 (SR0~SR2047)	
Serial communication port	2x RS-485	
Ethernet port	10/100 M	
USB port	Mini USB	
Storage interface	SD Card (Micro SD); maximum storage: 32G	
Real-time clock	Years, months, days, hours, minutes, seconds, and weeks	*Batteries (CR1620) are not included.
Function card interface	2x function cards, supporting communication card, AD/DA analog function cards	
CANopen DS301 (Master)	Maximum nodeL 64; maximum bytes: 2000	*A function card AS-FCOPM is required.
CANopen DS301 (Slave)	Maximum PDO: 8; maximum bytes: 8	

2.2.2 Electrical specifications

Item \ Model	AS332T-A	AS332P-A	AS324MT-A
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)		
Power consumption	3.6W		

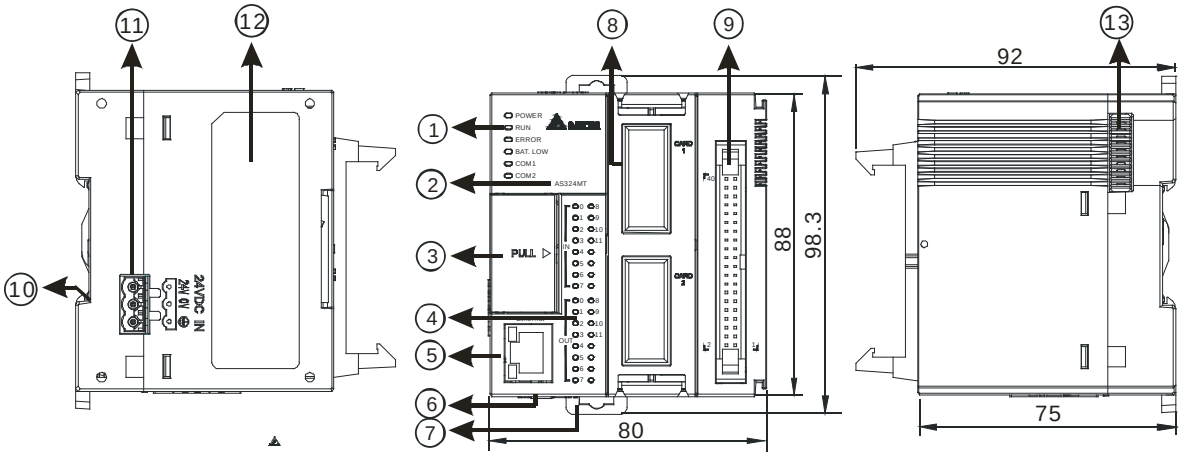
- **Electrical specifications for the inputs on digital input/output modules (The signals passing through the inputs are 24 VDC signals.)**

Item \ Model		AS332T-A	AS332P-A	AS324MT-A
Number of inputs		16		12
Connector type		ML connector		
Input type		Digital input		
Input form		Direct current (sinking or sourcing)		X0.0+~X0.3+/X0.0-~X0.3-: differential input X0.4~X0.11: Direct current (sinking or sourcing)
Input voltage/ current		24 VDC 5 mA		X0.0+~X0.3+/X0.0-~X0.3-: 5 VDC, 5 mA X0.4~X0.11: 24 VDC, 5 mA
Action level	**OFF→ON**	>15 VDC		X0.0+~X0.3+/X0.0-~X0.3-: >0.2VDC X0.4~X0.11: >15VDC
	ON→OFF	<5 VDC		X0.0+~X0.3+/X0.0-~X0.3-: <-0.2VDC X0.4~X0.11: <5VDC
Response time	**OFF→ON**	X0.0~X0.11：< 2.5μs X0.12~X0.15：< 50μs		X0.0+~X0.3+/X0.0-~X0.3-：< 0.125μs X0.4~X0.11：< 2.5μs
	ON→OFF	X0.0~X0.11：< 2.5μs X0.12~X0.15：< 50μs		X0.0+~X0.3+/X0.0-~X0.3-：< 0.125μs X0.4~X0.11：< 2.5μs
Maximum input frequency		X0.0~X0.11：200KHz X0.12~X0.15：10KHz		X0.0+~X0.3+/X0.0-~X0.3-：< 4MHz X0.4~X0.11：< 200KHz
Input impedance		5.6 kΩ		
Input signal		Voltage input Sinking: The inputs are NPN transistors whose collectors are open collectors. Sourcing: The inputs are PNP transistors whose collectors are open collectors.		
Electrical isolation		Optocoupler		
Input display		When the optocoupler is driven, the input LED indicator is ON.		

- **Electrical specifications for the outputs on a digital input/output module**

Item \ Model		AS332T-A	AS332P-A	AS324MT-A
Number of inputs		16		12
Connector type		ML connector		
Output form		Transistor-T (sinking)	Transistor-P (sourcing)	Y0.0+~Y0.3+/Y0.0-~Y0.3-: differential input Y0.4~Y0.11 : Transistor-T (sinking)
Output current		5~30VDC, 0.1A		Y0.0+~Y0.3+/Y0.0-~Y0.3- : 5VDC, 20mA Y0.4~Y0.11 : 5-30VDC, 0.1A
Maximum load	**Resistance**	0.1A		Y0.0+~Y0.3+/Y0.0-~Y0.3- : 20mA Y0.4~Y0.11 : 0.1A
	Inductance	N/A		
	Bulb	N/A		
Maximum output frequency[*1]	**Resistance**	Y0.0~Y0.11 : 200KHz Y0.12~Y0.15 : 100Hz		Y0.0+~Y0.3+/Y0.0-~Y0.3- : 4MHz Y0.4~Y0.11: 200KHz
	Inductance	N/A		
	Bulb	N/A		
Maximum Response time	**OFF→ON**	Y0.0~Y0.11: 2.5μs Y0.12~Y0.15: 0.5ms		Y0.0+~Y0.3+/Y0.0-~Y0.3-: 0.125μs Y0.4~Y0.11: 2.5μs

2.2.3 Profiles

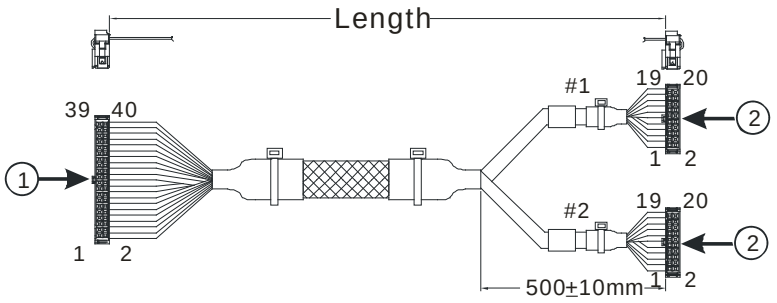


Number	Name	Description
1	Power LED indicator	Indicating the power status of the CPU module
	Run LED indicator	Operating status of the module ON: The module is running. OFF: The module stops running. Blinking: The module is in the detection mode.

Number	Name	Description
	Error LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
	BAT.LOW LED indicator	Indicating the battery status of the CPU module (Enable/Disable this display by HWCONFIG in ISPSoft)
	COM1 LED COM2 LED	Indicating the communication status of the COM port OFF: no commumnication over the COM port Blinking: a communication is taking place in the COM port
2	Model name	Showing the model name of the CPU module
3	Run/Stop	RUN: execute the programs STOP: stop the programs
	USB port	Mini USB communication port
	SD card slot	Providing an interface for a SD card
	VR0/VR1	VR0: use the flag SM166 to activate the values in SR166 VR1: use the flag SM167 to activate the values in SR167
4	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
5	Ethernet port	Providing an interface for a n Ethernet communication
6	COM1/COM2	Providing an interface for RS-485 communication
7	DIN rail clip	Securing the DIN rail
8	Extension card slot	Providing an interface for an extension card
9	ML connector	Connecting the module and the wiring module
10	Grounding clip	For grounding
11	Power supply	For power supply
12	Label	Nameplate
13	External module port	Connecting the modules

- **ML connector, extension cable, and wiring modules**

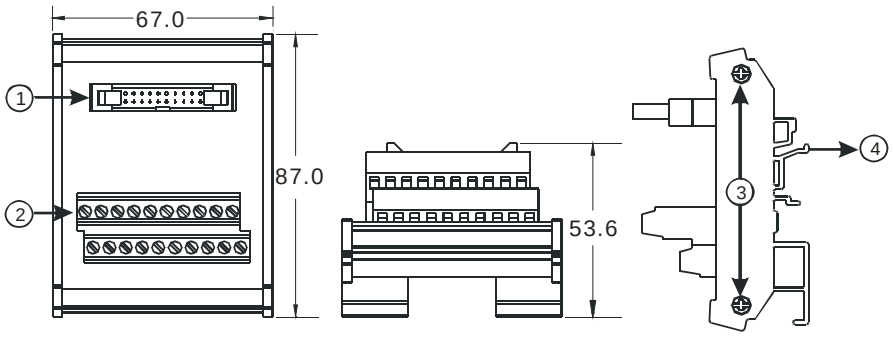
1. Extension Cable UC-ET010-24D (1M) / UC-ET020-24D (2M) / UC-ET030-24D (3M)



Unit: mm

Number	Name	Description
1	IDC 40-pin terminal	Connecting a digital input/output module and an external terminal module.
2	IDC 20-pin terminal	Connecting the external terminal modules UB-10-ID16A/UB-10-OR16A/UB-10-OR16B

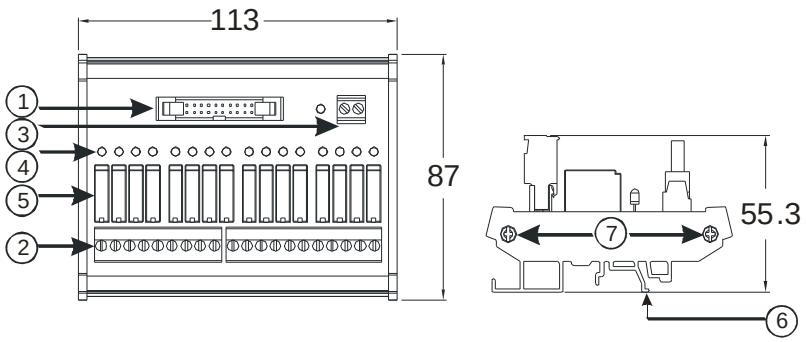
2. AS332T-A/AS332P-A/AS324MT-A and the external terminal module UB-10-ID16A



Unit: mm

Number	Name	Description
1	20-pin ML connector	Connecting the external terminal module and a wiring module
2	Terminals	Input/Output terminals for wiring
3	Set screw	Fixing the base
4	Clip	Hanging the external terminal module on a DIN rail

3. AS332T-A and the external terminal module UB-10-OR16A/AS332P-A, and UB-10-OR16B

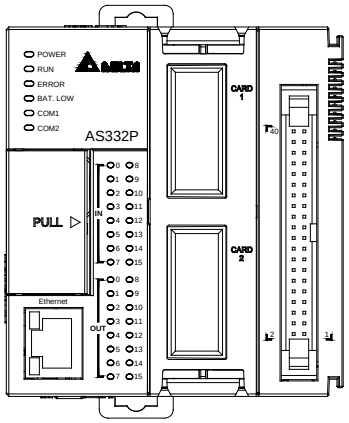


Unit: mm

Number	Name	Description
1	20-pin ML connector	Connecting the external terminal module and a wiring module
2	Terminals	Input/Output terminals for wiring
3	2-pin power input terminal	Power input terminal for wiring
4	Output LED indicator	If there is an output signal, the output LED indicator is ON.
5	Relay output	Relay output
6	Clip	Hanging the external terminal module on a DIN rail
7	Set screw	Fixing the base

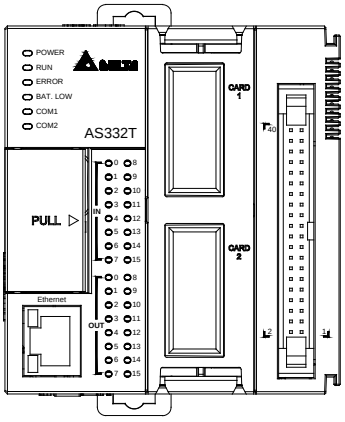
2.2.4 Arrangement of Input/Output Terminals

AS332P-A



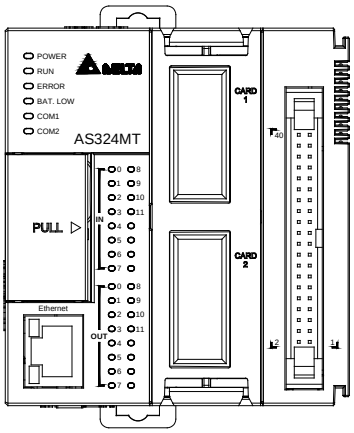
-	-
S/S	S/S
X0.15	X0.14
X0.13	X0.12
X0.11	X0.10
X0.9	X0.8
X0.7	X0.6
X0.5	X0.4
X0.3	X0.2
X0.1	X0.0
C0	C0
-	-
Y0.15	Y0.14
Y0.13	Y0.12
Y0.11	Y0.10
Y0.9	Y0.8
Y0.7	Y0.6
Y0.5	Y0.4
Y0.3	Y0.2
Y0.1	Y0.0

AS332T-A



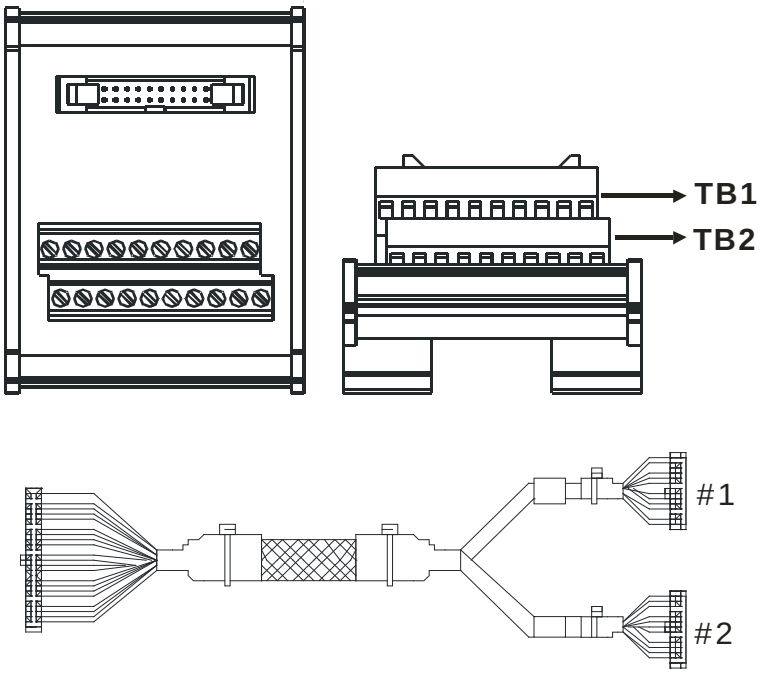
-	-
S/S	S/S
X0.15	X0.14
X0.13	X0.12
X0.11	X0.10
X0.9	X0.8
X0.7	X0.6
X0.5	X0.4
X0.3	X0.2
X0.1	X0.0
-	-
C0	C0
Y0.15	Y0.14
Y0.13	Y0.12
Y0.11	Y0.10
Y0.9	Y0.8
Y0.7	Y0.6
Y0.5	Y0.4
Y0.3	Y0.2
Y0.1	Y0.0

AS324MT-A



S/S	S/S
X0.11	X0.10
X0.9	X0.8
X0.7	X0.6
X0.5	X0.4
SG0	SG0
X0.3-	X0.3+
X0.2-	X0.2+
X0.1-	X0.1+
X0.0-	X0.0+
C0	C0
Y0.11	Y0.10
Y0.9	Y0.8
Y0.7	Y0.6
Y0.5	Y0.4
SG1	SG1
Y0.3-	Y0.3+
Y0.2-	Y0.2+
Y0.1-	Y0.1+
Y0.0-	Y0.0+

- **ML connector and the external terminal module UB-10-ID16A**



AS332T-A											
#1	TB1	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	C0	-
	TB2	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	C0	-
#2	TB1	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	S/S	-
	TB2	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	S/S	-

AS332P-A											
#1	TB1	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	-	C0
	TB2	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	-	C0
#2	TB1	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	S/S	-
	TB2	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	S/S	-

AS324MT-A											
#1	TB1	Y0.0+	Y0.1+	Y0.2+	Y0.3+	SG1	Y0.4	Y0.6	Y0.8	Y0.10	C0
	TB2	Y0.0-	Y0.1-	Y0.2-	Y0.3-	SG1	Y0.5	Y0.7	Y0.9	Y0.11	C0
#2	TB1	X0.0+	X0.1+	X0.2+	X0.3+	SG0	X0.4	X0.6	X0.8	X0.10	S/S
	TB2	X0.0-	X0.1-	X0.2-	X0.3-	SG0	X0.5	X0.7	X0.9	X0.11	S/S

2.3 Specifications for Digital Input/Output Modules

2.3.1 General Specifications

- **Electrical specifications for the inputs on digital input/output modules**
  (The signals passing through the inputs are 24 VDC signals.)

Module name		08AM10N-A	16AM10N-A	32AM10N-A	64AM10N-A	16AP11RA	16AP11T-A	16AP11P-A
Number of inputs		8	16	32	64	8	8	8
Connector type		Removable terminal block		ML connector		Removable terminal block		
Input type		Digital input						
Input form		Direct current (sinking or sourcing)						
Input voltage/ current		24VDC · 5mA			24VDC 3.2mA	24VDC · 5mA		
Action level	OFF→ON	>15 VDC						
	ON→OFF	<5 VDC						
Response time	OFF→ON	10 ms±10%						
	ON→OFF	15 ms±10%						
Maximum input frequency		50 Hz						
Input impedance		4.7kΩ			7.5kΩ	4.7kΩ		
Input signal		Voltage input Sinking: The inputs are NPN transistors whose collectors are open collectors. Sourcing: The inputs are PNP transistors whose collectors are open collectors.						
Electrical isolation		Optocoupler						
Input display		When the optocoupler is driven, the input LED indicator is ON.						

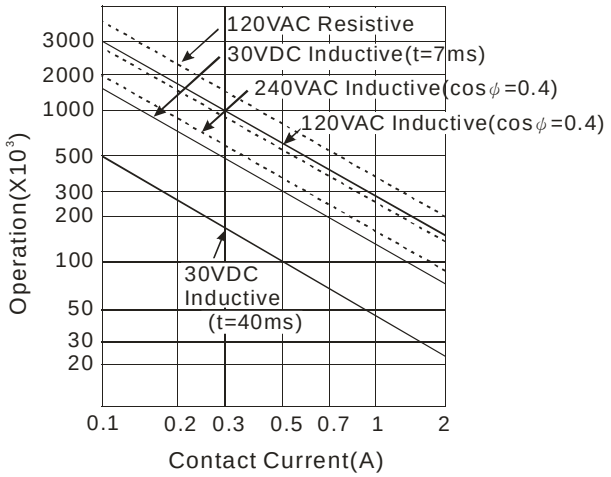
- **Electrical specifications for the outputs on a digital input/output module**

Item \ Model		08AN01R-A	16AN01R-A	16AP11R-A	08AN01T-A	16AN01T-A	16AP11T-A	08AN01P-A	16AN01P-A	16AP11P-A
Number of inputs		8	16	8	8	16	8	8	16	8
Connector type		Removable terminal block								
Output type		Digital output								
Output form		Relay-R			Transistor-T (sinking)			Transistor-P (sourcing)		
Output voltage/ current		240VAC/24VDC			5~30VDC *2			5~30VDC *2		
Maximum load	Resistance	2A/output, 8A/COM			0.5A			0.5A		
	Inductance	Life cycle curve*2			12W（24VDC）			12W（24VDC）		
	Bulb	20W（24VDC） 100W（230VAC）			2W（24VDC）			2W（24VDC）		
Maximum output frequency*1	Resistance	1Hz			100Hz			100Hz		
	Inductance	0.5Hz			0.5Hz			0.5Hz		
	Bulb	1Hz			10Hz			10Hz		
Maximum Response time	OFF→ON	10ms			0.5ms			0.5ms		
	ON→OFF									

Item \ Model		32AN02T-A	64AN02T-A
Number of inputs		32	64
Connector type		ML connector	
Output type		Digital output	
Output form		Transistor-T (sinking)	
Output voltage/ current		5~30VDC	
Maximum load	**Resistance**	0.1A	
	Inductance	N/A	
	Bulb	N/A	
Maximum output frequency[*1]	**Resistance**	100Hz	
	Inductance	N/A	
	Bulb	N/A	
Maximum Response time	**OFF→ON**	0.5ms	
	ON→OFF		

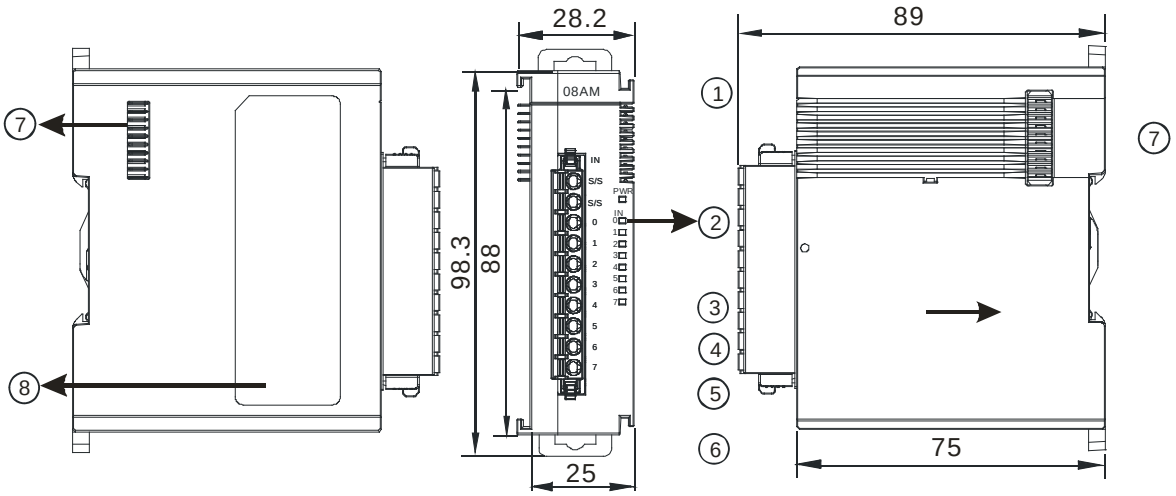
*1: The scan cycle affects the frequency.

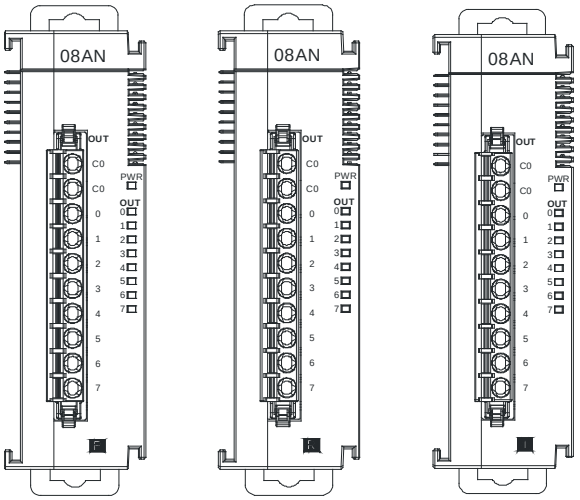
*2: The life cycle curve is shown below.



2.3.2 Profiles

- **AS08AM10N-A/AS08AN01P-A/AS08AN01R-A/AS08AN01T-A**

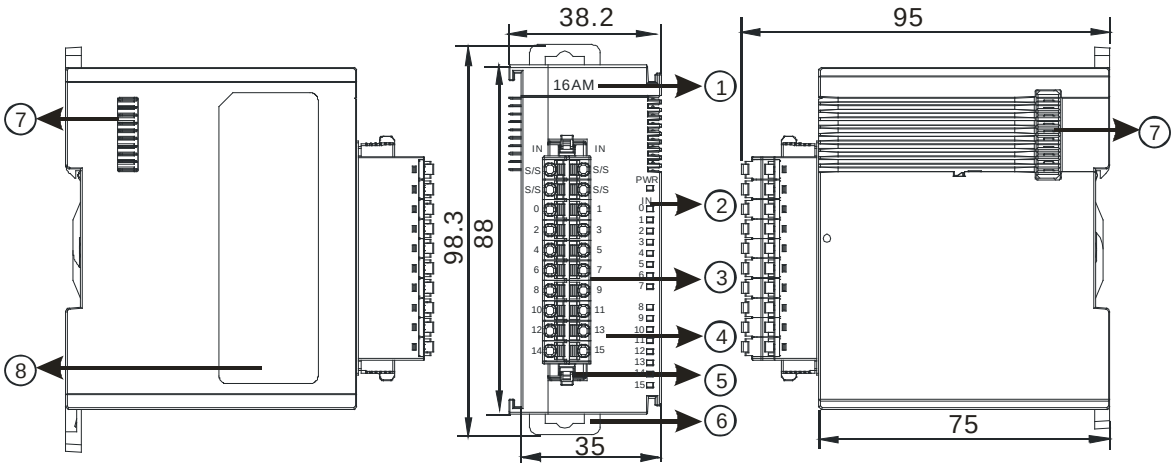


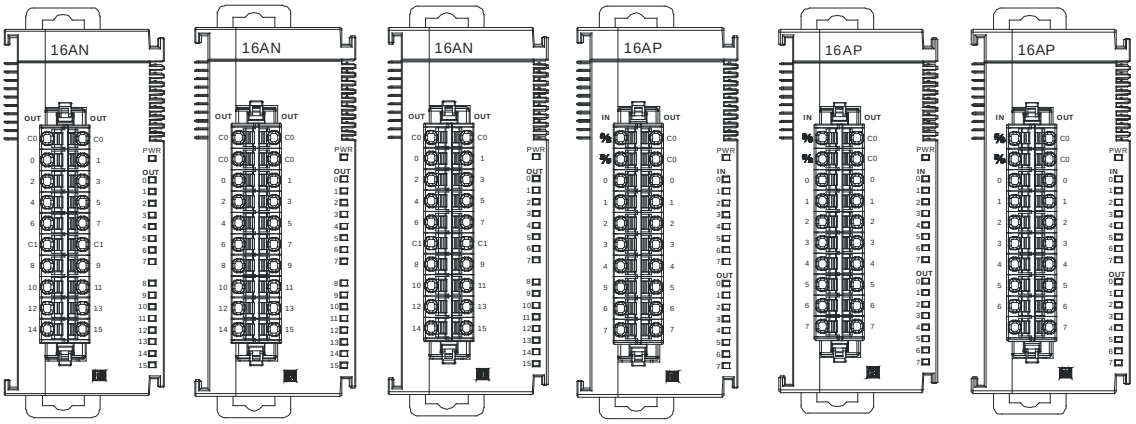


Unit: mm

Number	Name	Description
1	Model name	Model name of the module
2	Input/output LED indicator	While inputting, the input LED indicator lights up. While outputting, the output LED indicator lights up.
3	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads which will be driven.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Terminal block clip	Securing the terminal block
6	DIN rail clip	Securing the DIN rail
7	External module port	Connecting the modules
8	Label	Nameplate

- **AS16AM10N-A/AS16AN01P-A/AS16AN01R-A/AS16AN01T-A/AS16AP11P-A/AS16AP11R-A/ AS16AP11T-A**

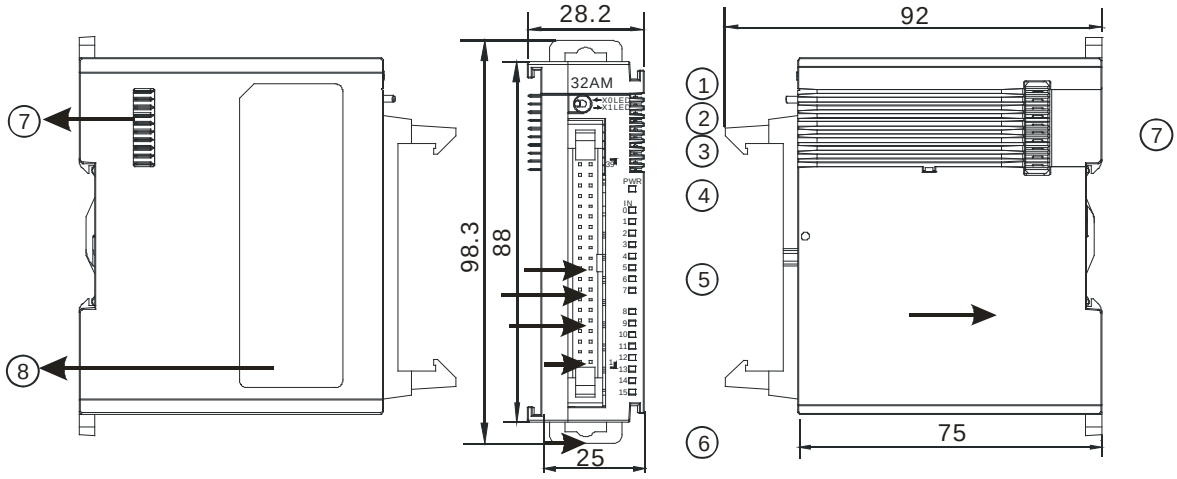




Unit: mm

Number	Name	Description
1	Model name	Model name of the module
2	Input/Output LED indicator	If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON.
3	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads which will be driven.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Terminal block clip	Securing the terminal block
6	DIN rail clip	Securing the DIN rail
7	External module port	Connecting the modules
8	Label	Nameplate

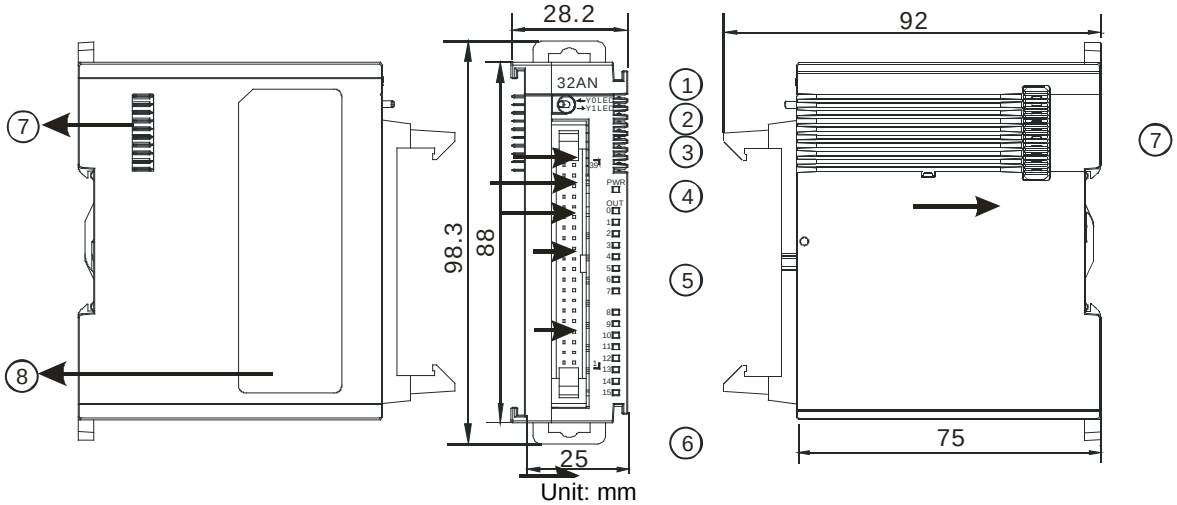
- **AS32AM10N-A**



Unit: mm

Number	Name	Description
1	Model name	Model name of the module
2	X0/X1 LED Indicator switch	Switch the LED indicators of their represented inputs.
3	ML connector	For the external I/O connecting cables UC-ET010-24B, UC-ET020-24B, UC-ET030-24B
4	Power LED indicator	Indicating the power status of the module
5	Input LED indicator	If there is an input signal, the input LED indicator is ON.
6	DIN rail clip	Securing the DIN rail
7	External module port	Connecting the modules
8	Label	Nameplate

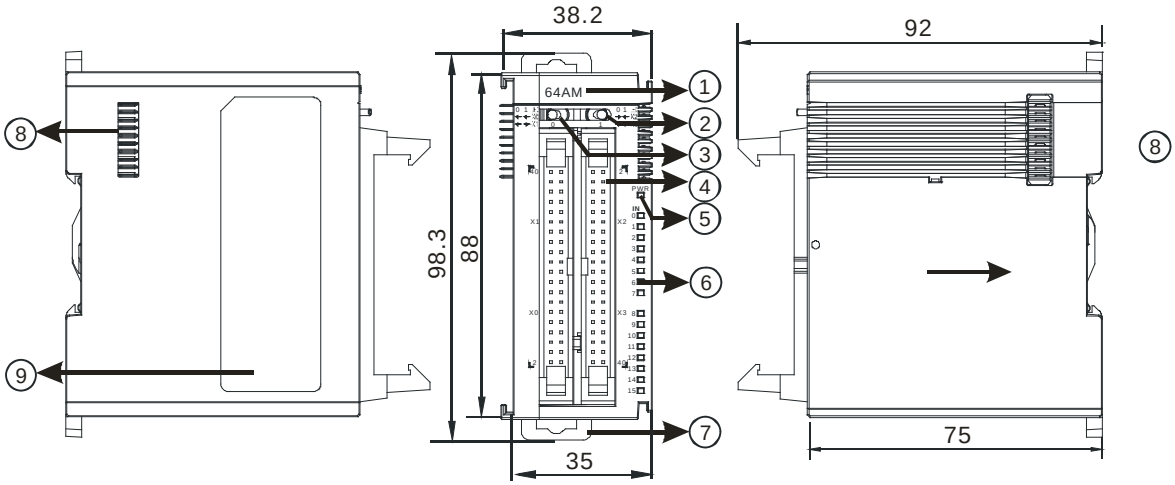
- **AS32AN02T-A**



Unit: mm

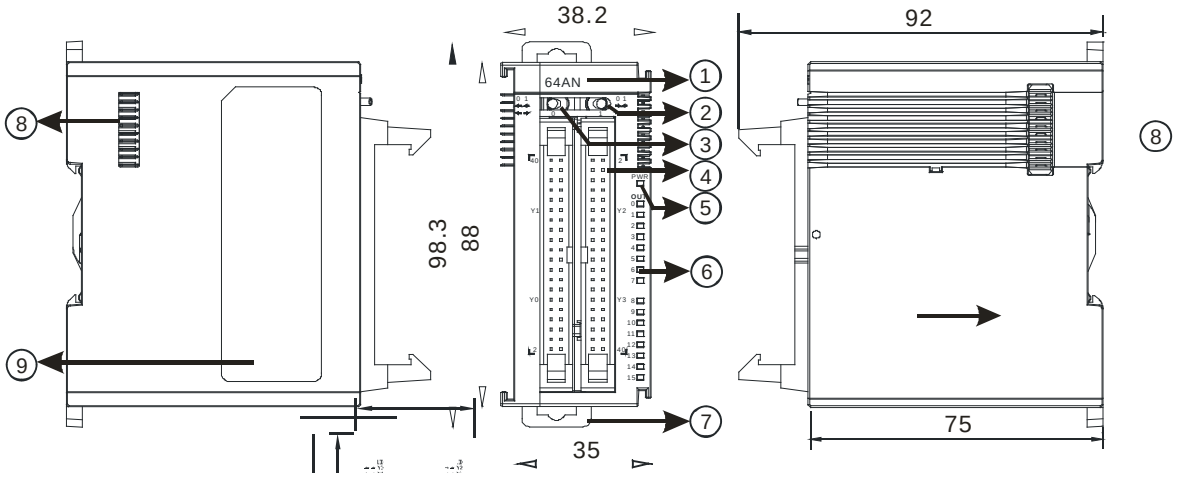
Number	Name	Description
1	Model name	Model name of the module
2	Y0/Y1 LED indicator switch	Switch the LED indicators of their represented outputs.
3	ML connector	For the external I/O connecting cables UC-ET010-24D, UC-ET020-24D, UC-ET030-24D
4	Power LED indicator	Indicating the power status of the module
5	Output LED indicator	If there is an output signal, the output LED indicator is ON.
6	DIN rail clip	Securing the DIN rail
7	External module port	Connecting the modules
8	Label	Nameplate

- **AS64AM10N-A**



Number	Name	Description
1	Model name	Model name of the module
2	LED indicator switch 1	Switch the LED indicators of their represented inputs.
3	LED indicator switch 2	Switch the LED indicators of their represented inputs.
4	ML connector	For the external I/O connecting cables UC-ET010-24B, UC-ET020-24B, UC-ET030-24B
5	Power LED indicator	Indicating the power status of the module
6	Input LED indicator	If there is an input signal, the input LED indicator is ON.
7	DIN rail clip	Securing the DIN rail
8	External module port	Connecting the modules
9	Label	Nameplate

- **AS64AN02T-A**

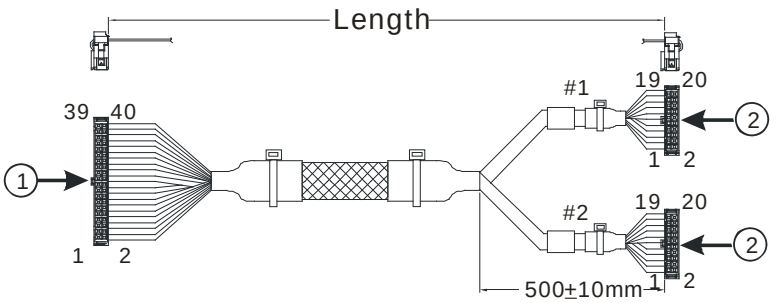


Unit: mm

Number	Name	Description
1	Model name	Model name of the module
2	LED indicator switch 1	Switch the LED indicators of their represented outputs.
3	LED indicator switch 2	Switch the LED indicators of their represented outputs.
4	ML connector	For the external I/O connecting cables UC-ET010-24D, UC-ET020-24D, UC-ET030-24D
5	Power LED indicator	Indicating the power status of the module
6	Output LED indicator	If there is an output signal, the output LED indicator is ON.
7	DIN rail clip	Securing the DIN rail
8	External module port	Connecting the modules
9	Label	Nameplate

- **ML connector, extension cable, and wiring modules**

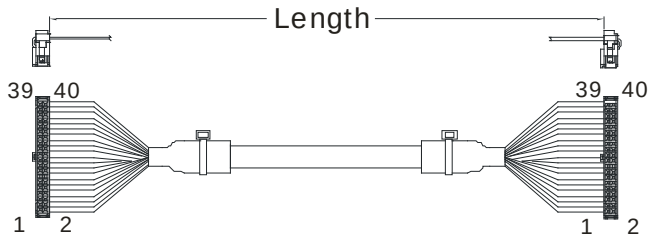
1. Extension Cable UC-ET010-24D (1M) / UC-ET020-24D (2M) / UC-ET030-24D (3M)



Unit: mm

Number	Name	Description
1	IDC 40-pin terminal	Connecting a digital input/output module and an external terminal module.
2	IDC 20-pin terminal	Connecting the external terminal modules UB-10-ID16A/UB-10-OR16A/UB-10-OR16B

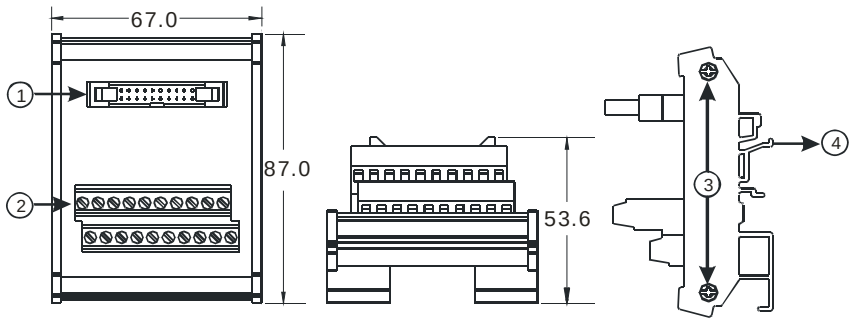
2. I/O connecting cables UC-ET010-24B (1M) / UC-ET020-24B (2M) / UC-ET030-24B (3M)



Number	Name	Description
1	IDC 40-pin terminal	Connecting an external terminal module and an wiring module UB-10-ID32A, and UB-10-OT32A

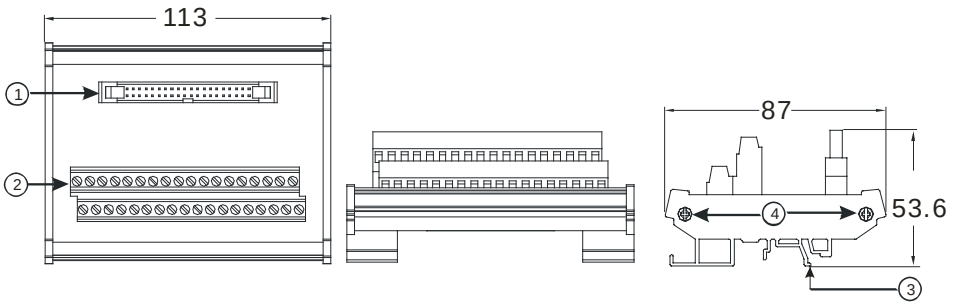
3. AS32AM10N-A/AS64AM10N-A and the external terminal modules UB-10-ID16A, UB-10-ID32A

◆ UB-10-ID16A



Unit: mm

◆ UB-10-ID32A

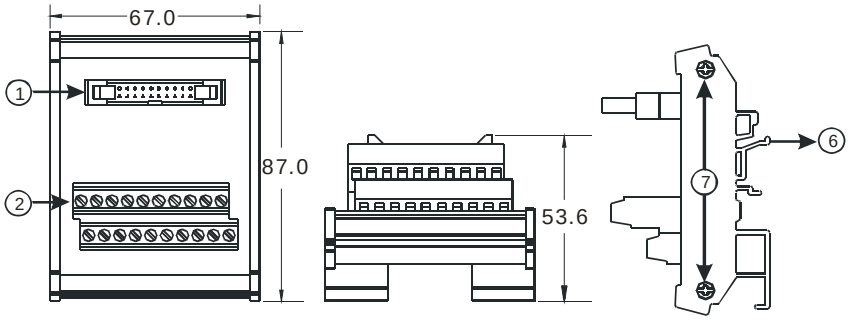


Unit: mm

Number	Name	Description
1	UB-10-ID16A: 20-pin ML connector UB-10-ID32A: 40-pin ML connector	Connecting the external terminal module and a wiring module
2	Terminals	Input/Output terminals for wiring
3	Clip	Hanging the external terminal module on a DIN rail
4	Set screw	Fixing the base

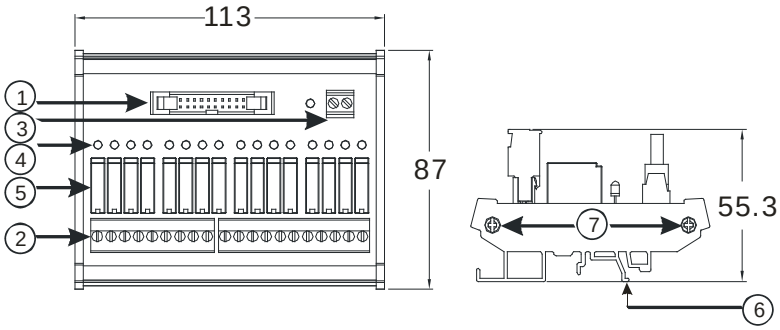
4. AS332T-A/AS64AN02T-A and the external terminal modules UB-10-ID16A, UB-10-OR16A, and UB-10-OT32A.

◆ UB-10-ID16A



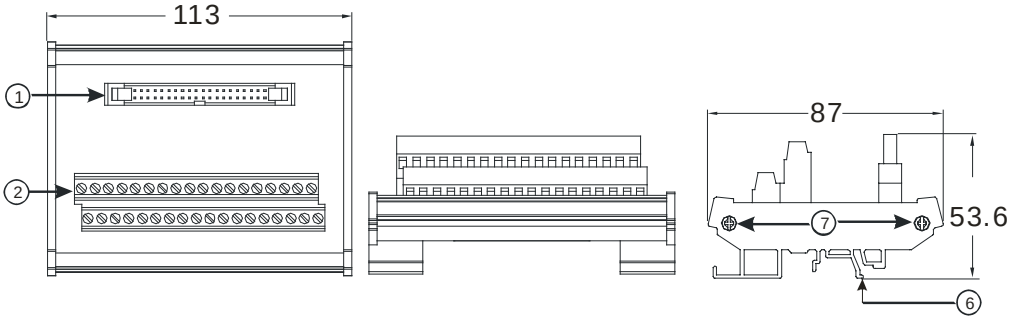
Unit: mm

◆ UB-10-OR16A



Unit: mm

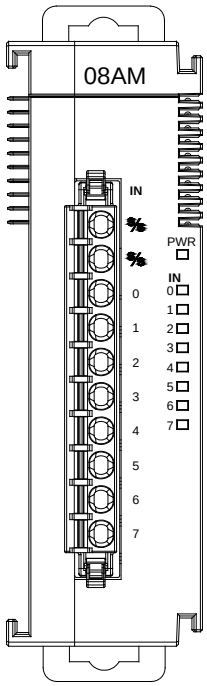
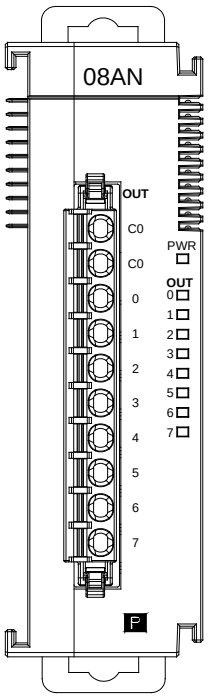
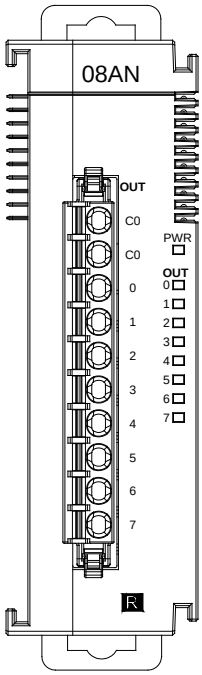
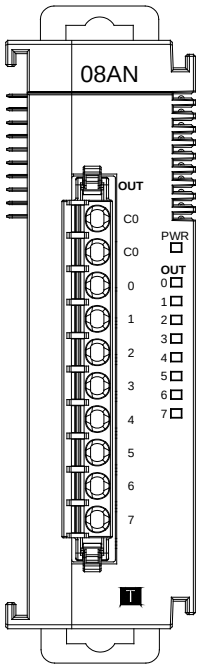
◆ UB-10-OT32A

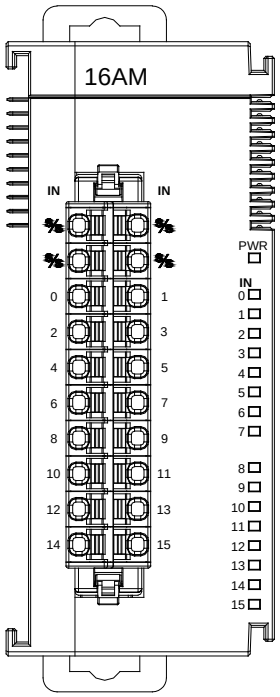
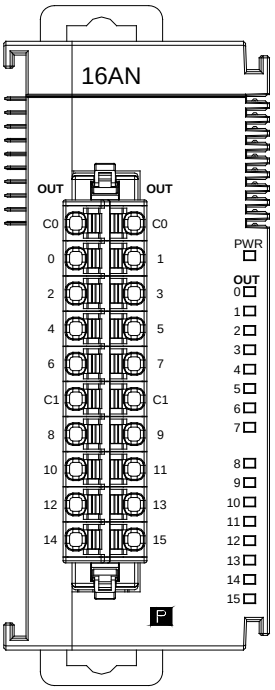


Unit: mm

Number	Name	Description
1	UB-10- ID16A /OR16A: 20-pin ML connector UB-10-OT32A: 40-pin ML connector	Connecting the external terminal module and a wiring module
2	Terminals	Input/Output terminals for wiring
3	2-pin power input terminal	Power input terminal for wiring
4	Output LED indicator	If there is an output signal, the output LED indicator is ON.
5	Relay output	Relay output
6	Clip	Hanging the external terminal module on a DIN rail
7	Set screw	Fixing the base

2.3.3 Arrangement of Input/Output Terminals

AS08AM10N-A	AS08AN01P-A
	
AS08AN01R-A	**AS08AN01T-A**
	

AS16AM10N-A	AS16AN01P-A
	
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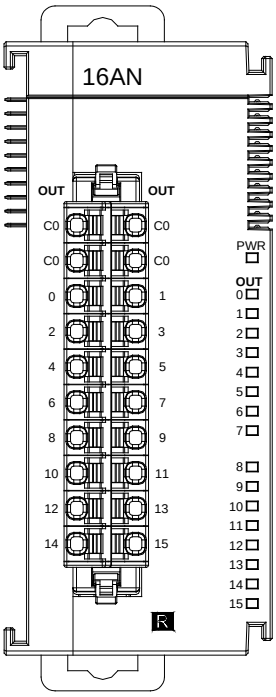
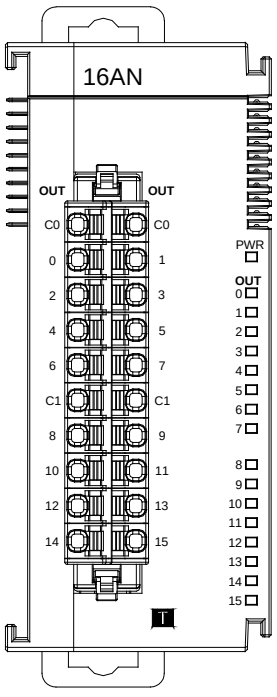
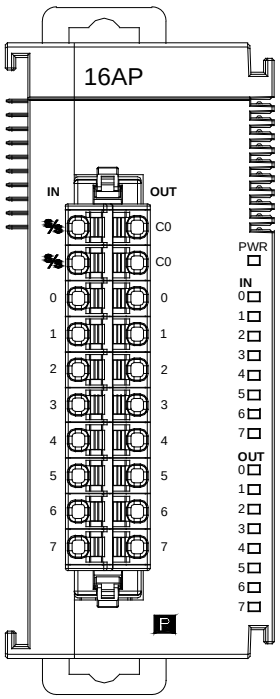
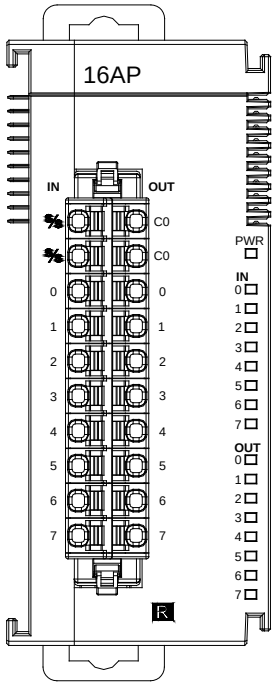
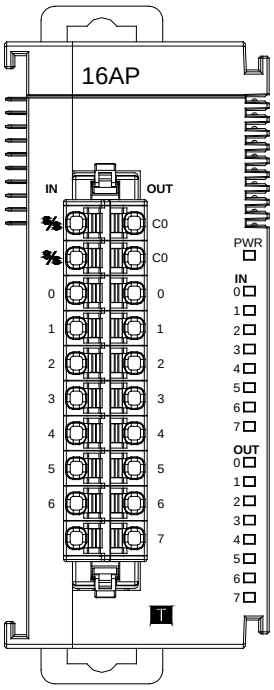
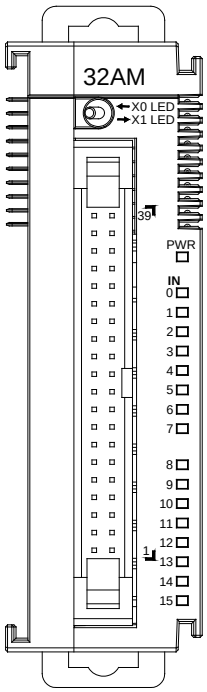
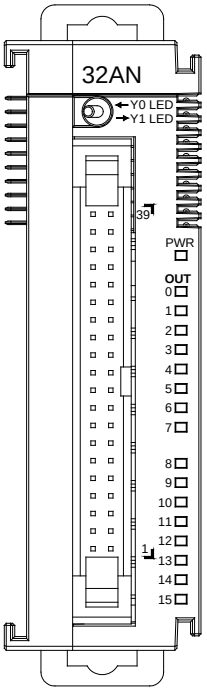
	

AS16AP11P-A	AS16AP11R-A
	

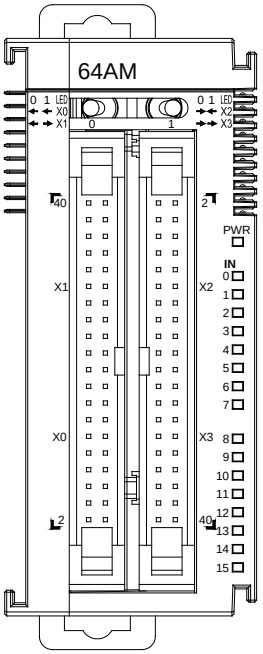
AS16AP11T-A	AS32AM10N-A		
		-	-
		S/S	S/S
		1.15	1.14
		1.13	1.12
		1.11	1.10
		1.9	1.8
		1.7	1.6
		1.5	1.4
		1.3	1.2
		1.1	1.0
		-	-
		S/S	S/S
		0.15	0.14
		0.13	0.12
		0.11	0.10
		0.9	0.8
		0.7	0.6
		0.5	0.4
		0.3	0.2
		0.1	0.0

AS32AN02T-A



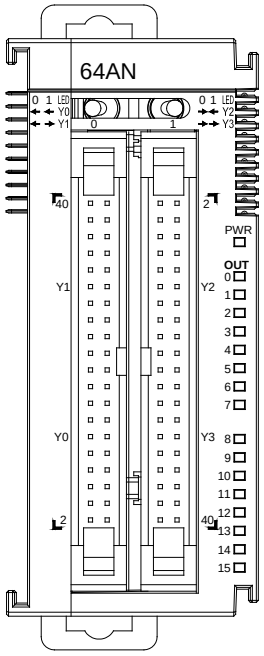
-	-
C0	C0
1.15	1.14
1.13	1.12
1.11	1.10
1.9	1.8
1.7	1.6
1.5	1.4
1.3	1.2
1.1	1.0
-	-
C0	C0
0.15	0.14
0.13	0.12
0.11	0.10
0.9	0.8
0.7	0.6
0.5	0.4
0.3	0.2
0.1	0.0

AS64AM10N-A



-	-	2.0	2.1
S/S	S/S	2.2	2.3
1.15	1.14	2.4	2.5
1.13	1.12	2.6	2.7
1.11	1.10	2.8	2.9
1.9	1.8	2.10	2.11
1.7	1.6	2.12	2.13
1.5	1.4	2.14	2.15
1.3	1.2	S/S	S/S
1.1	1.0	-	-
-	-	3.0	3.1
S/S	S/S	3.2	3.3
0.15	0.14	3.4	3.5
0.13	0.12	3.6	3.7
0.11	0.10	3.8	3.9
0.9	0.8	3.10	3.11
0.7	0.6	3.12	3.13
0.5	0.4	3.14	3.15
0.3	0.2	S/S	S/S
0.1	0.0	-	-

AS64AN02T-A

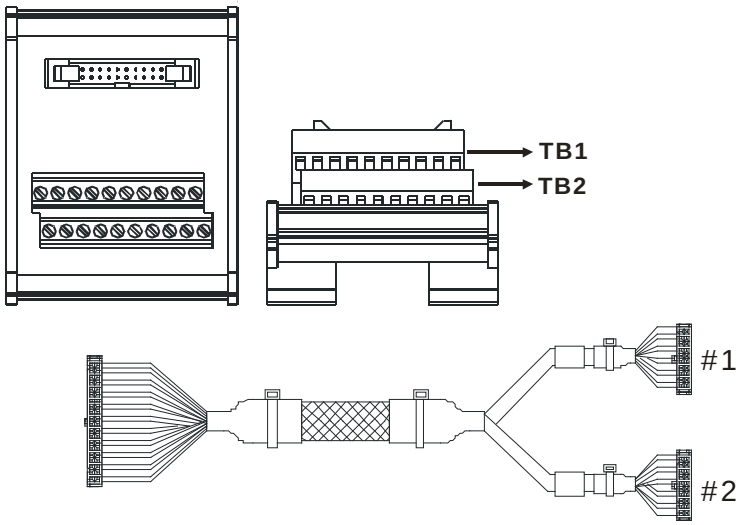


-	-	2.0	2.1
C0	C0	2.2	2.3
1.15	1.14	2.4	2.5
1.13	1.12	2.6	2.7
1.11	1.10	2.8	2.9
1.9	1.8	2.10	2.11
1.7	1.6	2.12	2.13
1.5	1.4	2.14	2.15
1.3	1.2	C1	C1
1.1	1.0	-	-
-	-	3.0	3.1
C0	C0	3.2	3.3
0.15	0.14	3.4	3.5
0.13	0.12	3.6	3.7
0.11	0.10	3.8	3.9
0.9	0.8	3.10	3.11
0.7	0.6	3.12	3.13
0.5	0.4	3.14	3.15
0.3	0.2	C1	C1
0.1	0.0	-	-

- **ML connector and the wiring module**

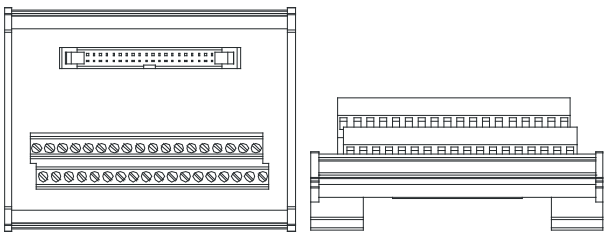
1. AS32AM10N-A/AS64AM10N-A

   - The wiring module: UB-10-ID16A



AS32AM10N-A/ AS64AM10N-A											
#2	TB1	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	S/S	-
	TB2	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	S/S	-

   - The wiring module: UB-10-ID32A



Terminals:

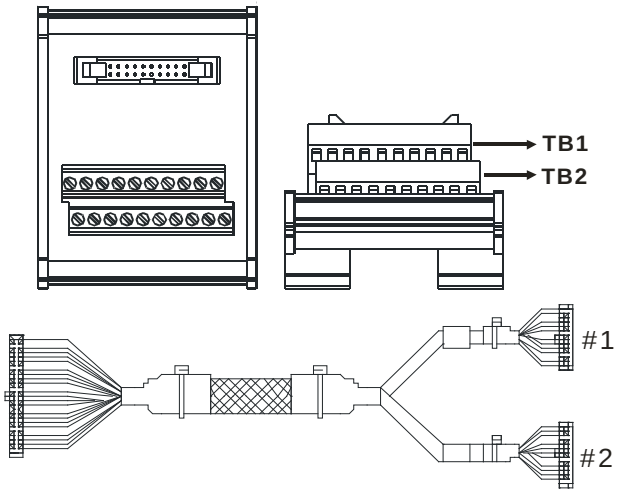
Upper row	S/S	S/S	X0	X2	X4	X6	X10	X12	X14	X16	X20	X22	X24	X26	X30	X32	X34	X36
Lower row	S/S	S/S	X1	X3	X5	X7	X11	X13	X15	X17	X21	X23	X25	X27	X31	X33	X35	X37

AS series terminals:

Upper row	X0.0	X0.2	X0.4	X0.6	X0.8	X0.10	X0.12	X0.14	X1.0	X1.2	X1.4	X1.6	X1.8	X1.10	X1.12	X1.14	S/S	S/S
Lower row	X0.1	X0.3	X0.5	X0.7	X0.9	X0.11	X0.13	X0.15	X1.1	X1.3	X1.5	X1.7	X1.9	X1.11	X1.13	X1.15	S/S	S/S

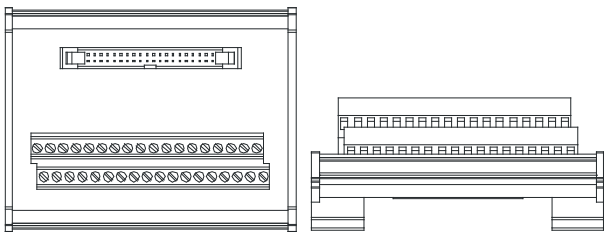
2. AS32AN02T-A/AS64AN02T-A and the wiring modules:

◆ UB-10-ID16A



AS332T-A											
#1	TB1	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	C0	-
	TB2	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	C0	-

◆ UB-10-OT32A



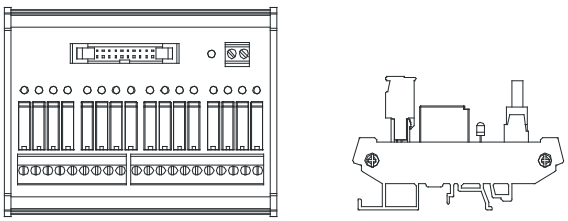
Terminals:

Upper row	Y0	Y2	Y4	Y6	Y10	Y12	Y14	Y16	Y20	Y22	Y24	Y26	Y30	Y32	Y34	Y36	+24V	+24V
Lower row	Y1	Y3	Y5	Y7	Y11	Y13	Y15	Y17	Y21	Y23	Y25	Y27	Y31	Y33	Y35	Y37	GND	GND

AS series terminals:

Upper row	Y0.0	Y0.2	Y0.4	Y0.6	Y0.8	Y0.10	Y0.12	Y0.14	Y1.0	Y1.2	Y1.4	Y1.6	Y1.8	Y1.10	Y1.12	Y1.14	•	•
Lower row	Y0.1	Y0.3	Y0.5	Y0.7	Y0.9	Y0.11	Y0.13	Y0.15	Y1.1	Y1.3	Y1.5	Y1.7	Y1.9	Y1.11	Y1.13	Y1.15	C0	C0

◆ UB-10-OR16A



Terminals:

																		GND	+24 V
C0	Y0	Y1	Y2	Y3	C1	Y4	Y5	Y6	Y7	C2	Y10	Y11	Y12	Y13	C3	Y14	Y15	Y16	Y17

AS series terminals:

																		GND	+24V
C0	Y0.0	Y0.1	Y0.2	Y0.3	C1	Y0.4	Y0.5	Y0.6	Y0.7	C2	Y0.8	Y0.9	Y0.10	Y0.11	C3	Y0.12	Y0.13	Y0.14	Y0.15

2.4 Specifications for Analog Input/Output Modules

2.4.1 General Specifications

- **AS04AD-A**

Electrical specifications

Module name	**AS04AD-A**
Number of inputs	4
Analog-to-digital conversion	Voltage input/Current input
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Conversion time	2ms/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC

Functional specifications

Analog-to-digital conversion	**Voltage input**				
Rated input range	-10 V~10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware input range	-10.1 V~10.1 V	-0.1 V~10.1 V	-5.05 V~5.05 V	-0.05 V~5.05 V	0.95 V~5.05 V
Fiducial error (Room temperature) (The umber of input voltages which are averaged is 100.)	±0.2%				
Fiducial error (Full temperature range) (The number of input voltages which are averaged is 100.)	±0. 5%				
Linearity error (Room temperature)	±0.02%				

Analog-to-digital conversion	Voltage input
Linearity error (Full temperature range)	±0.06%
Hardware resolution	16 bits
Input impedance	2MΩ
Absolute input range	±15 V

Analog-to-digital conversion	Current input		
Rated input range	±20 mA	0 mA~20 mA	4 mA~20 mA
Hardware input range	-20.2 mA~20.2 mA	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Fiducial error (Room temperature) (The number of input currents which are averaged is 100.)	±0.2%		
Fiducial error (Full temperature range) (The number of input currents which are averaged is 100.)	±0.5%		
Linearity error (Room temperature) (Full temperature range)	±0.04%		
Linearity error	±0.10%		
Hardware resolution	16 bits		
Input impedance	250 Ω		
Absolute input range	±32 mA		

- **AS04DA-A**

Electrical specifications

Module name	AS04DA-A
Number of inputs	4
Analog-to-digital conversion	Voltage input/Current input
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Conversion time	2ms/channel

Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC

Functional specifications

Analog-to-digital conversion	**Voltage input**				
Rated input range	±10 V	0 V~10 V	±5 V	0 V~5 V	1 V~5 V
Hardware input range	-10.1V~10.1V	-0.1V~10.1V	-5.05V~5.05V	-0.05V~5.05V	0.95V~5.05V
Fiducial error (Room temperature) (The umber of input voltages which are averaged is 100.)	±0.2%				
Fiducial error (Full temperature range) (The number of input voltages which are averaged is 100.)	±0. 5%				
Linearity error (Room temperature)	±0.05%				
Linearity error (Full temperature range)	±0.05%				
Hardware resolution	12 bits				
Input impedance	1kΩ~2MΩ at ±10V and 0V~10V				
Absolute input range	≧500Ω at 1V~5V				

Analog-to-digital conversion	**Current input**	
Rated input range	0 mA~20 mA	4 mA~20 mA
Hardware input range	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Fiducial error (Room temperature) (The number of input currents which are averaged is 100.)	±0.2%	

Analog-to-digital conversion	Current input
Fiducial error (Full temperature range) (The number of input currents which are averaged is 100.)	±0.5%
Linearity error (Room temperature) (Full temperature range)	±0.03%
Linearity error	±0.03%
Hardware resolution	12 bits
Input impedance	≦550 Ω

- **AS06XA-A**

Electrical specifications

Module name	AS06XA-A
Number of inputs/outputs	Inputs: 4; Outputs: 2
Analog-to-digital conversion	Voltage input/Current input; Voltage output/Current output;
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Conversion time	2ms/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC

A/D Functional specifications

Analog-to-digital conversion	Voltage input				
Rated input range	-10V~10V	0V~10V	±5V	0V~5V	1V~5V
Hardware input range	-10.1V~10.1V	-0.1V~10.1V	-5.05V~5.05V	-0.05 V~5.05 V	0.95V~5.05V
Fiducial error (Room temperature) (The umber of input voltages which are averaged is 100.)	±0.2%				

Analog-to-digital conversion	Voltage input
Fiducial error (Full temperature range) (The number of input voltages which are averaged is 100.)	±0. 5%
Linearity error (Room temperature)	±0.02%
Linearity error (Full temperature range)	±0.06%
Hardware resolution	16 bits
Input impedance	2MΩ
Absolute input range	±15 V

Analog-to-digital conversion	Current input		
Rated input range	±20 mA	0 mA~20 mA	4 mA~20 mA
Hardware input range	-20.2 mA~20.2 mA	-0.2 mA~20.2 mA	3.8 mA~20.2 mA
Fiducial error (Room temperature) (The number of input currents which are averaged is 100.)	±0.2%		
Fiducial error (Full temperature range) (The number of input currents which are averaged is 100.)	±0.5%		
Linearity error (Room temperature) (Full temperature range)	±0.04%		
Linearity error	±0.10%		
Hardware resolution	16 bits		
Input impedance	250 Ω		
Absolute input range	±32 mA		

D/A Functional specifications

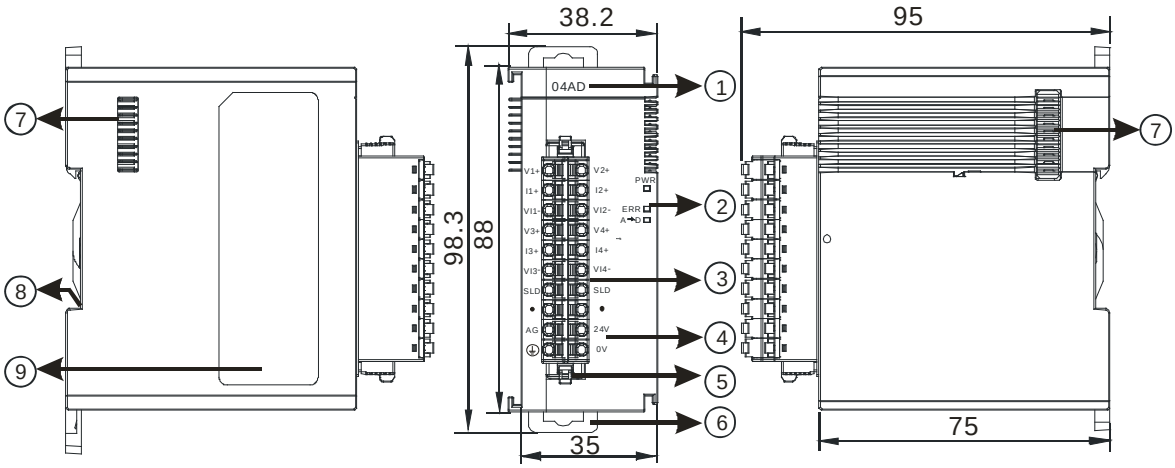
Digital-to-analog conversion	Voltage input				
Rated input range	±10V	0V~10V	±5V	0V~5V	1V~5V
Hardware input range	-10.1V~10.1V	-0.1V~10.1V	-5.05V~5.05V	-0.05 V~5.05 V	0.95V~5.05V
Fiducial error (Room temperature) (The umber of input voltages which are averaged is 100.)	±0.2%				
Fiducial error (Full temperature range) (The number of input voltages which are averaged is 100.)	±0. 5%				
Linearity error (Room temperature)	±0.05%				
Linearity error (Full temperature range)	±0.05%				
Hardware resolution	12 bits				
Input impedance	1kΩ~2MΩ at ±10V and 0V~10V				
Absolute input range	≧500Ω at 1V~5V				

Analog-to-digital conversion	Current input	
Rated input range	0mA~20mA	4mA~20mA
Hardware input range	-0.2mA~20.2mA	3.8mA~20.2mA
Fiducial error (Room temperature) (The number of input currents which are averaged is 100.)	±0.2%	
Fiducial error (Full temperature range) (The number of input currents which are averaged is 100.)	±0.5%	

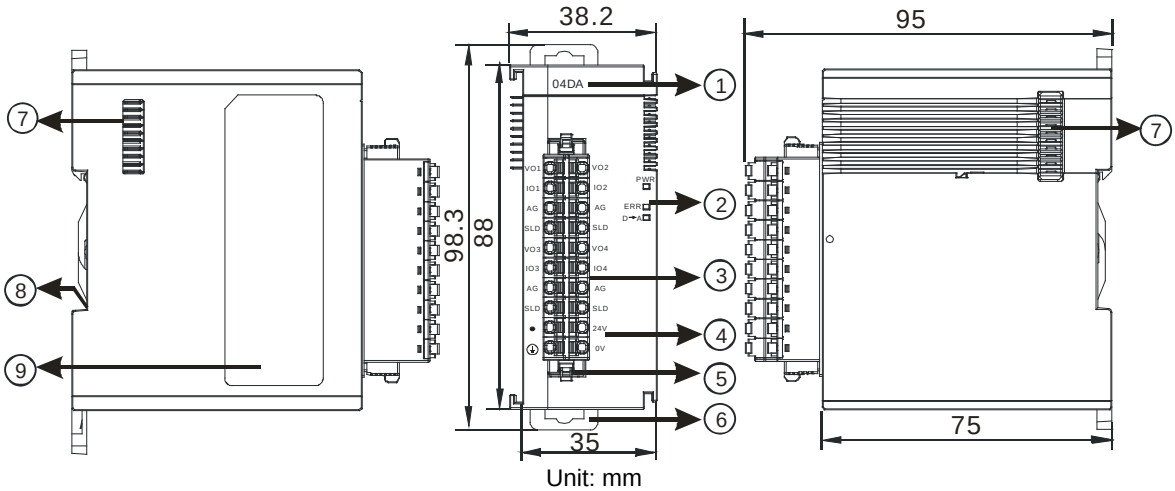
Analog-to-digital conversion	Current input
Linearity error (Room temperature) (Full temperature range)	±0.03%
Linearity error	±0.10%
Hardware resolution	12 bits
Input impedance	≦550 Ω

2.4.2 Profiles

- **AS04AD-A**

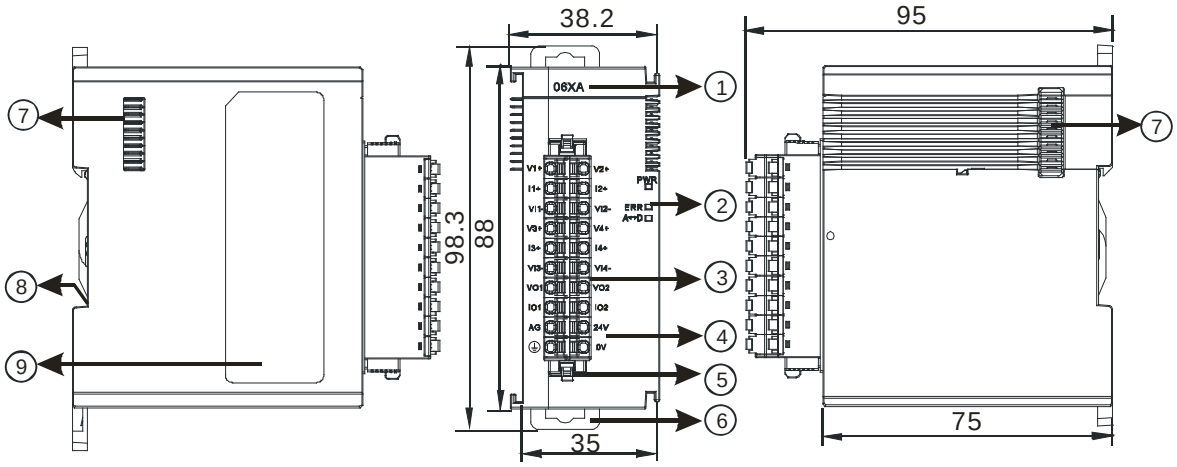


- **AS04DA-A**



Unit: mm

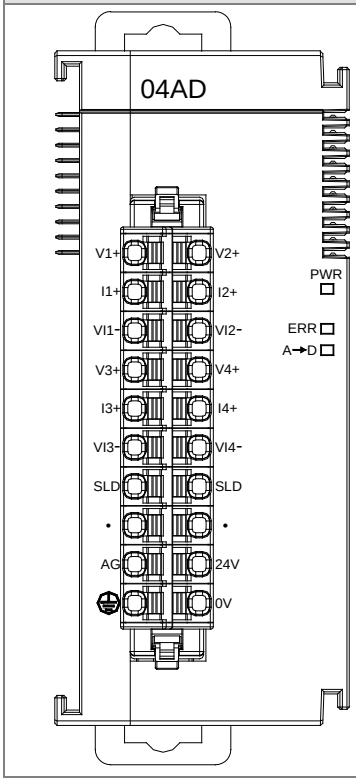
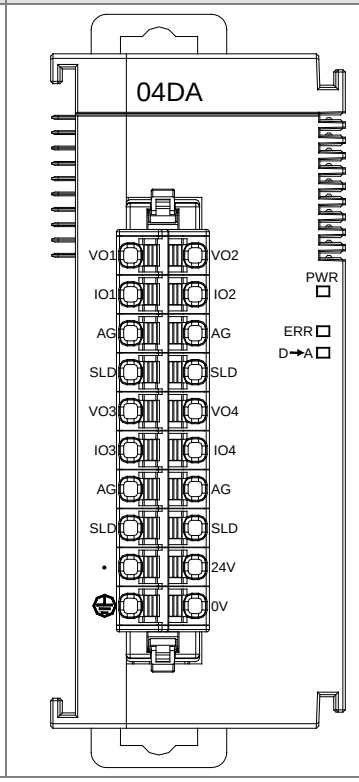
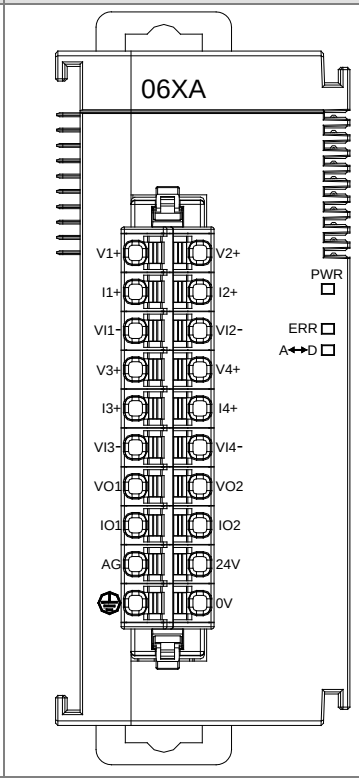
- **AS06XA-A**



Unit: mm

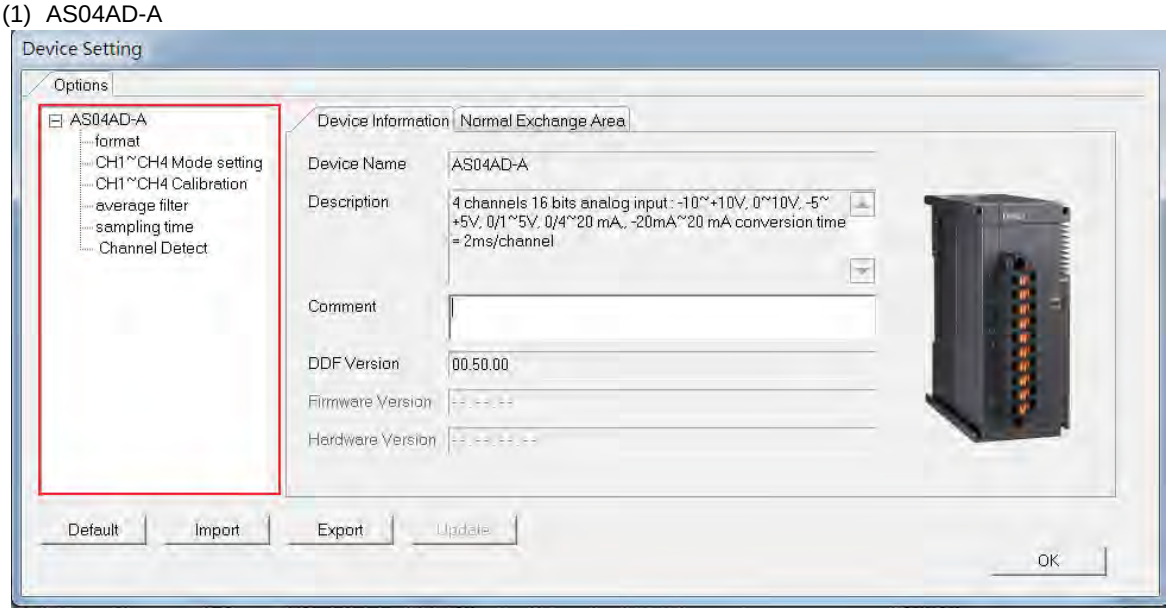
Number	Name	Description
1	Model name	Model name of the module
2	POWER LED indicator	Indicating the status of the power supply ON: the power is on OFF: no power
	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
	Analog to digital conversion indicator	Indicating the analog to digital conversion status Blinking: conversion is taking place OFF: stop conversion
3	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads which will be driven.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Termainal block clip	Removing the terminal block
6	DIN rail clip	Securing the module onto the DIN rail
7	Module connecting set	Connecting the modules
8	Ground clip	
9	Label	Nameplate

2.4.3 Arrangement of Input/Output Terminals

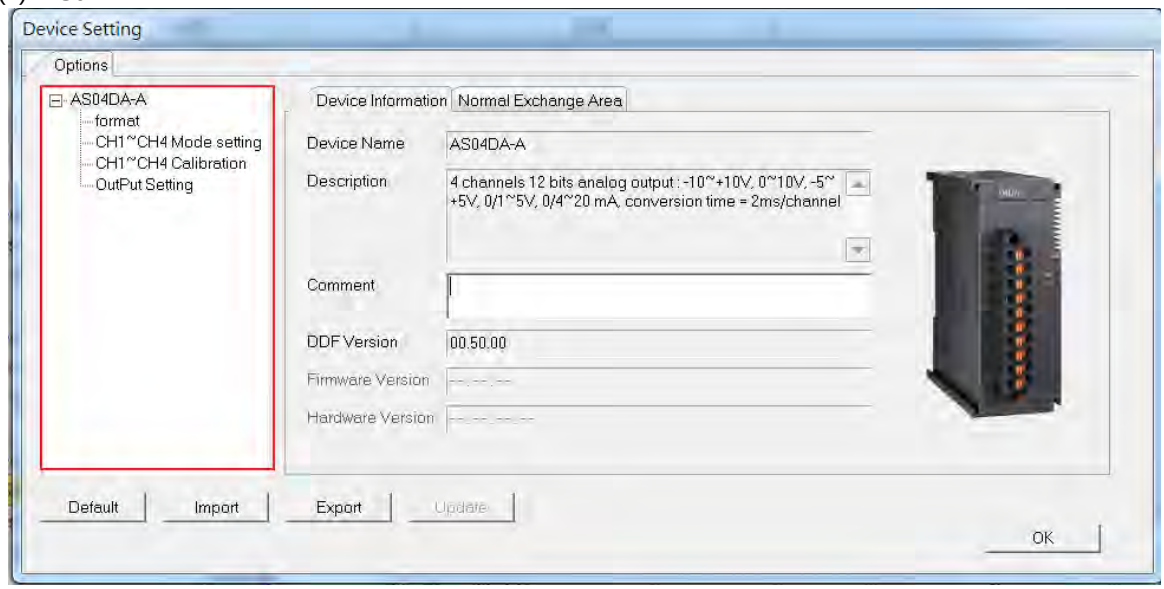
AS04AD-A	AS04DA-A	AS06XA-A
		

2.4.4 Device Settings

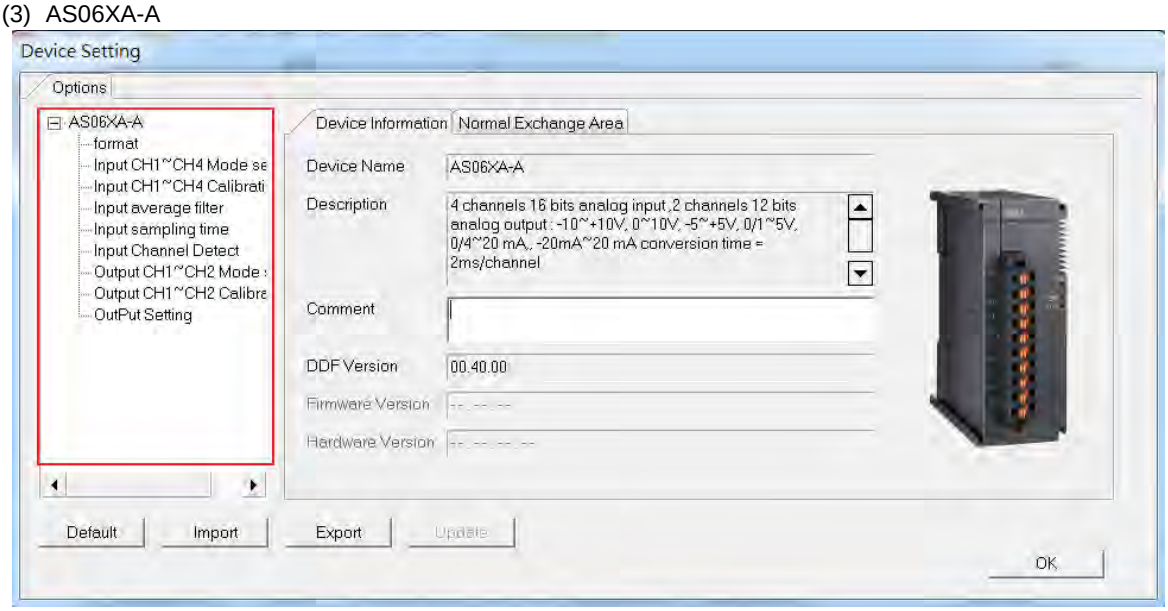
(1) AS04AD-A



(2) AS04DA-A



(3) AS06XA-A



Please refer to AS Series Module Manual for further information on device settings.

2.5 Specifications for Temperature Measurement Modules

2.5.1 General Specifications

- **AS04RTD-A**

Electrical specifications

Number of analog inputs	4	
Applicable sensor	2-WIRE & 3-WIRE Pt100/Ni100/Pt1000/Ni1000/ JPt100/LG-Ni1000/Cu50/Cu100/0~300Ω/0~3000Ω Pt100：DIN 43760-1980 JIS C1604-1989；100Ω 3850 PPM/°C Pt1000：DIN EN60751；1 kΩ 3850 PPM/°C Ni100/Ni1000：DIN 43760 JPt100：JIS C1604-1989 LG-Ni1000 Cu50/Cu100	
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)	
Connector type	Removable terminal block	
Overall accuracy	Pt100/Ni100/Pt1000/Ni1000/JPt100/LG-Ni1000	25°C/77°F: The error is ±0.1% of the input within the range. -20~60°C/-4~140°F: The error is ±0.5% of the input within the range.
	Cu50	25°C/77°F: The error is ±4°C of the input within the range.
	Cu100	25°C/77°F: The error is ±2°C of the input within the range.
Conversion time	2-wire/3-wire configuration: 200 ms/channel	
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit/an optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC	

Functional specifications

Analog-to-digital conversion	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Rated input range	Pt100: -180°C~800°C Ni100: -80°C~170°C Pt1000: -180°C~800°C Ni1000: -80°C~170°C JPt100: -180°C~500°C LG-Ni100: -50°C~180°C Cu50: -50°C~150°C Cu100: -50°C~150°C	Pt100: -292°F~1,472°F Ni100: -112°F~338°F Pt1000: -292°F~1,472°F Ni1000: -112°F~338°F JPt100: -112°F~338°F LG-Ni100: -58°F~356°F Cu50: -58°F~302°F Cu100: -58°F~302°F	0~300Ω 0~3000Ω
Average function	Range: 1~100		
Self-diagnosis	Disconnection detection		

- **AS04TC-A**

Electrical specifications

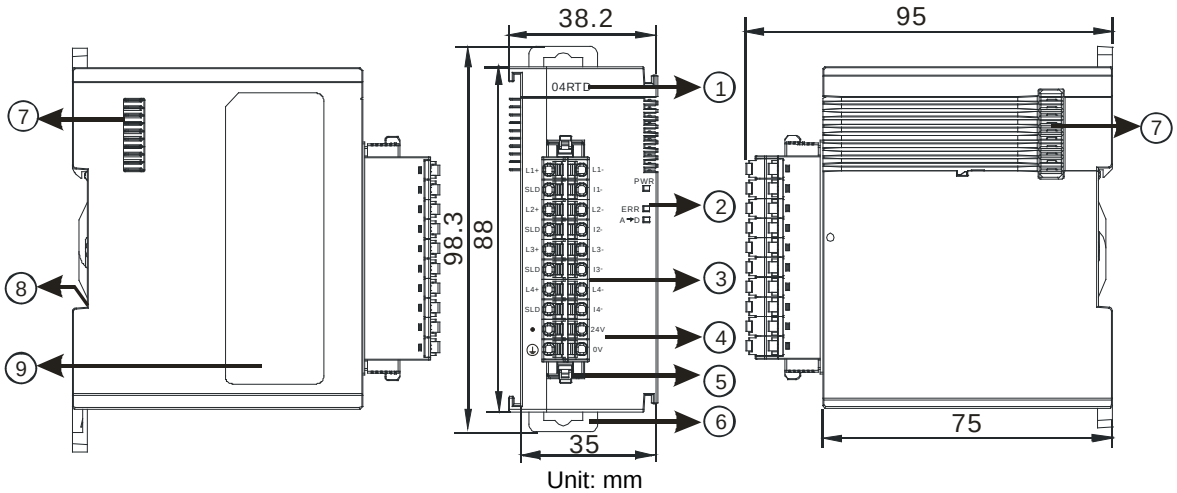
Number of analog inputs	4
Applicable sensor	Type J, K, R, S, T, E, N and B thermocouple; input impedance: ±100mV
Supply voltage	24 VDC (20.4 VDC~28.8 VDC) (-15%~+20%)
Connector type	Removable terminal block
Overall accuracy	25°C/77°F: The error is ±0.5% of the input within the range. -20~60°C/-4~140°F: The error is ±1% of the input within the range.
Conversion time	200 ms/channel
Isolation	An analog circuit is isolated from a digital circuit by a digital integrated circuit, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between two group circuits: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC Isolation between the analog channels: 120VAC

Functional specifications

Analog-to-digital conversion	Centigrade (°C)	Fahrenheit (°F)	Input impedance
Rated input range	Type J: -100°C~1200°C Type K: -100°C~1,350°C Type R: 0°C~1,750°C Type S: 0°C~1,750°C Type T: -150°C~400°C Type E: -150°C~980°C Type N: -150°C~1,300°C Type B: 200°C~1,800°C	Type J: -148°F~2,192°F Type K: -148°F~2,462°F Type R: 32°F~3,182°F Type S: 32°F~3,182°F Type T: -238°F~752°F Type E: -238°F~1,796°F Type N: -238°F~2,372°F Type B: 32°F~3,182°F	±100mV
Average function	Range: 1~100		
Self-diagnosis	Disconnection detection		

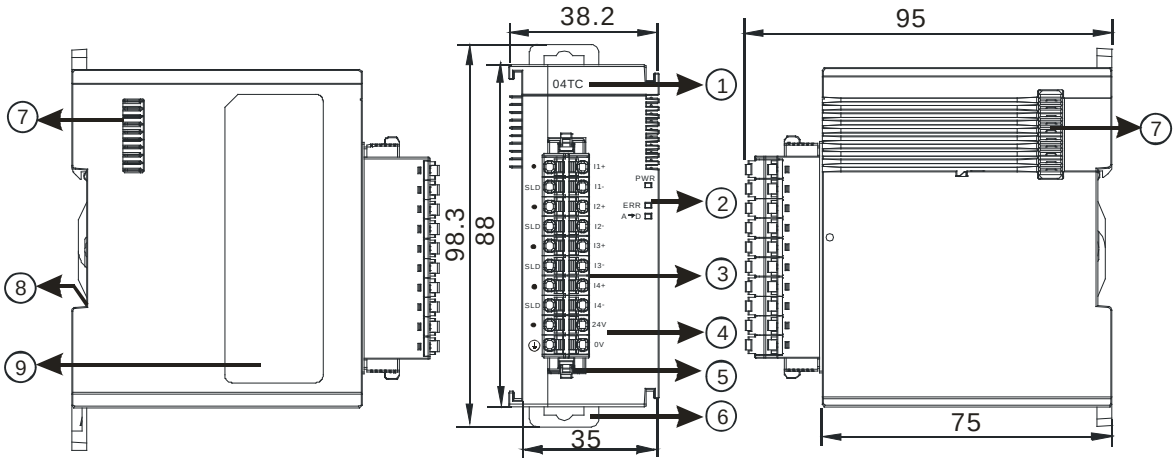
2.5.2 Profiles

- **AS04RTD-A**



Number	Name	Description
1	Model name	Model name of the module
2	POWER LED indicator	Indicating the status of the power supply ON: the power is on OFF: no power
	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
	Analog to digital conversion indicator	Indicating the analog to digital conversion status Blinking: conversion is taking place OFF: stop conversion
3	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads which will be driven.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Termainal block clip	Removing the terminal block
6	DIN rail clip	Securing the module onto the DIN rail
7	Module connecting set	Connecting the modules
8	Ground clip	
9	Label	Nameplate

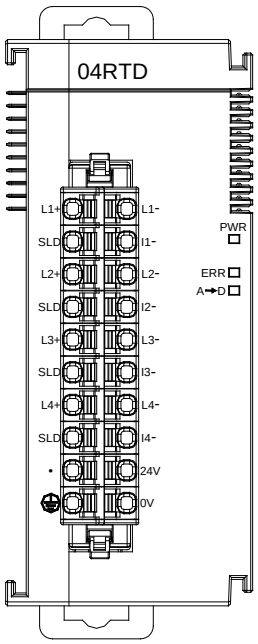
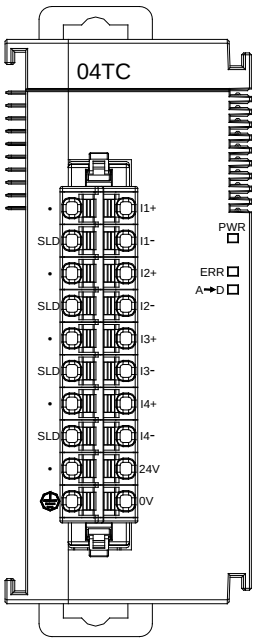
- **AS04TC-A**



Number	Name	Description
1	Model name	Model name of the module
2	POWER LED indicator	Indicating the status of the power supply ON: the power is on OFF: no power
	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
	Analog to digital conversion indicator	Indicating the analog to digital conversion status Blinking: conversion is taking place OFF: stop conversion

Number	Name	Description
3	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads which will be driven.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Termainal block clip	Removing the terminal block
6	DIN rail clip	Securing the module onto the DIN rail
7	Module connecting set	Connecting the modules
8	Ground clip	
9	Label	Nameplate

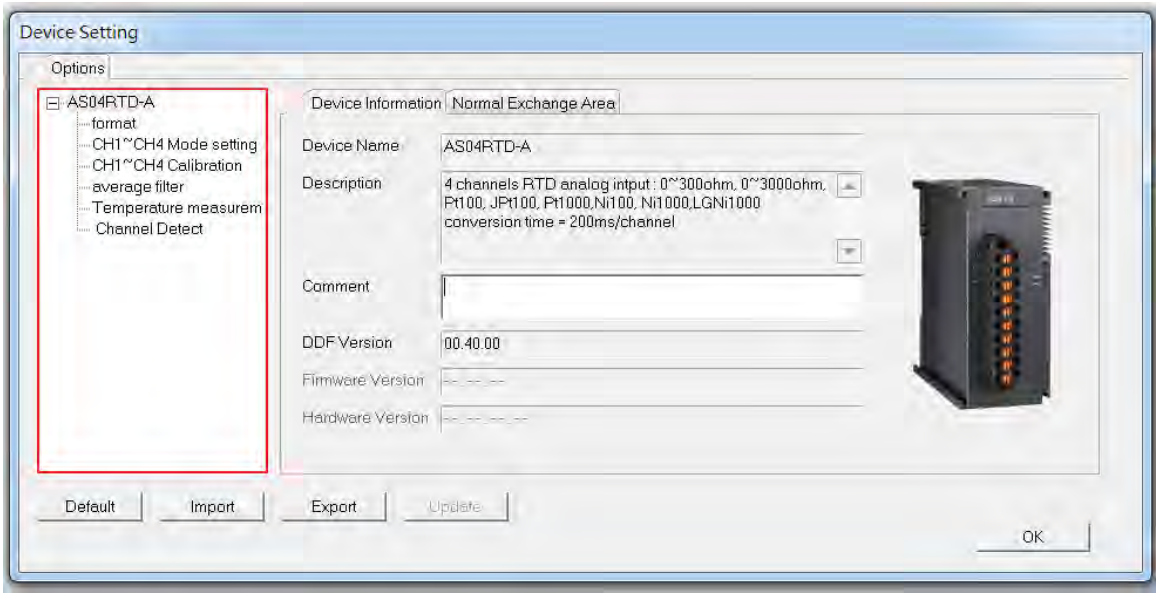
2.5.3 Dimensions

AS04RTD-A	AS04TC-A
	

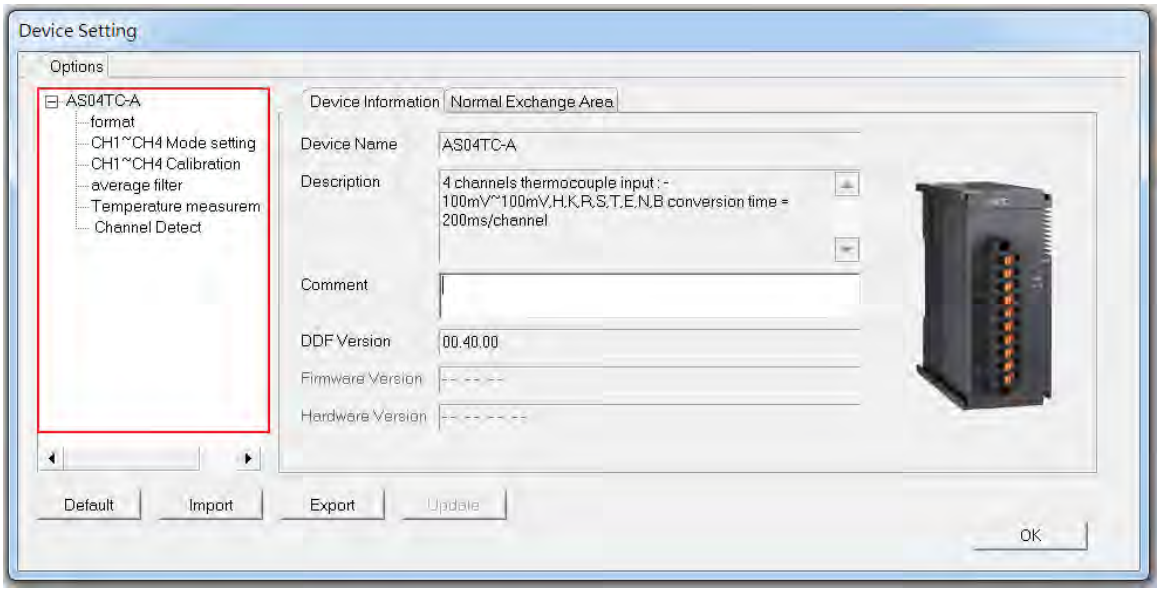
Unit: mm

2.5.4 Device Setting

(1) AS04RTD-A



(2) AS04TC-A



Please refer to AS Series Module Manual for further information on device settings.

2.6 Specifications for Network Modules

2.6.1 General Specifications

RS-485/RS-422/RS-232 communication interface

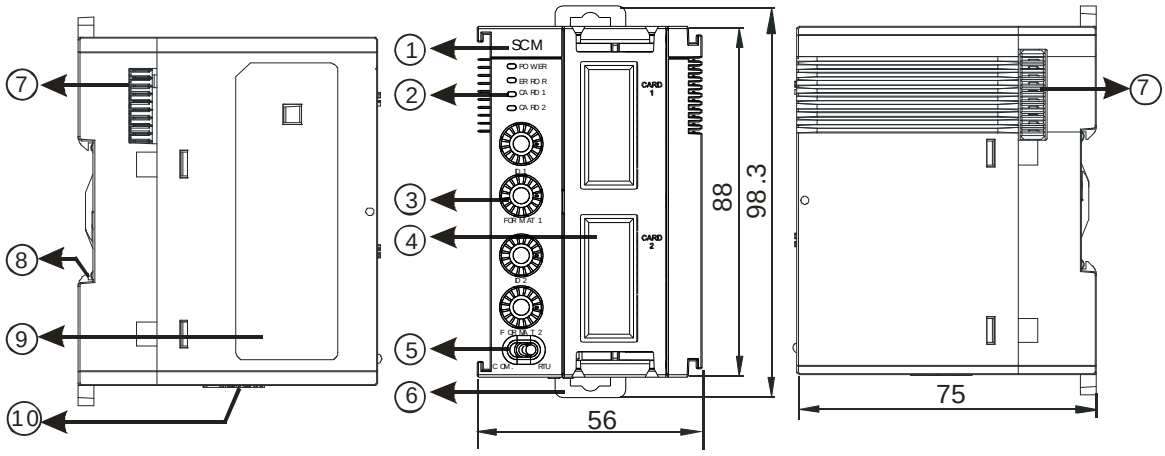
Item	Specifications
Connector type	European-style terminal block, spring-clamp termainal block
Transmission speed	300、600、1,200、2,400、4,800、9,600、19,200、38,400、57,600、76,800、115,200、230,400bps
Communication format	Stop bit: 1 stop bit or 2 stop bits Parity bit: none, an odd parity bit, or an even parity bit Data bit: 7 data bits or 8 data bits
Communication protocol	Modbus ASCII/RTU UD Link

Electrical specifications

Item	Specifications
Supply voltage	24 VDC
Electric energy consumption	0.6 W
Weight	Approximately 169 g

2.6.2 Profiles

- **AS00SCM-A**

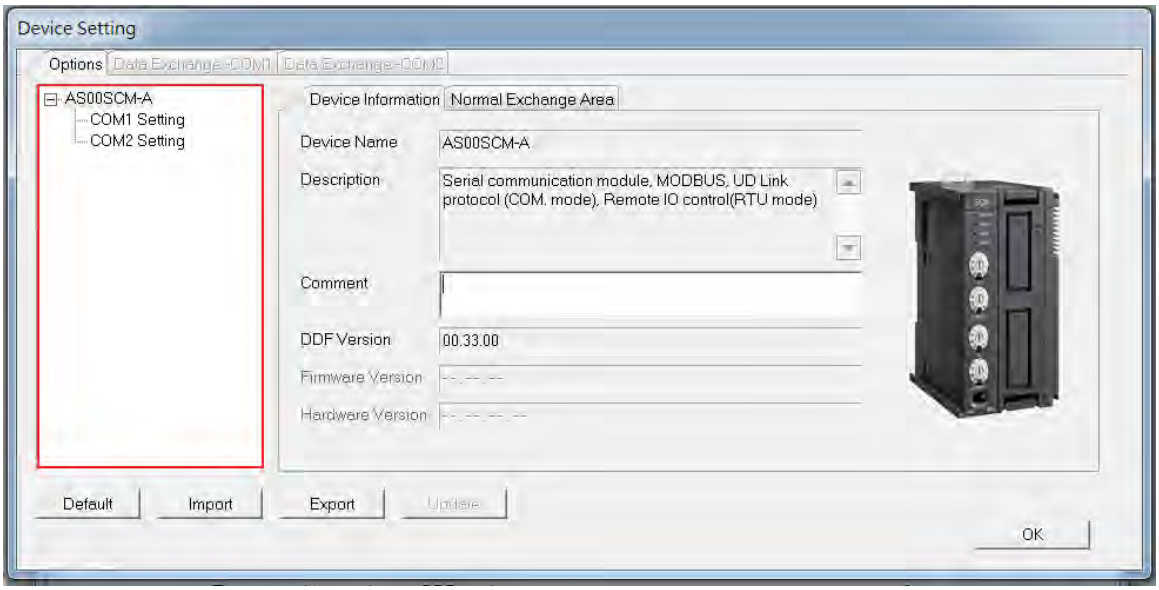


Unit: mm

Number	Name	Description
1	Model name	Model name of the module
2	POWER LED indicator	Indicating the status of the power supply ON: the power is on OFF: no power or the power is low
	ERROR LED indicator	Error status of the module OFF: The module is normal. Blinking: ● Module setting or communication error (blinks every 1 second) ● Hardware or low power error (blinks every 0.2 second)

Number	Name	Description
	Extension card 1 indicator (orange)	Blinking: communication is taking place in card 1 OFF: No communication in card 1
	Extension card 2 indicator (orange)	Blinking: communication is taking place in card 2 OFF: No communication in card 2
3	Address and function setting knobs	2 sets for setting up the address and function in card 1 and 2
4	Slot for function card 1	Available for AS-F232/AS-F422/AS-F485
	Slot for function card 2	Available for AS-F232/AS-F422/AS-F485/AS-FCOPM
5	Mode switch	COM: communication mode ; RTU: remote control mode
6	DIN rail clip	Securing the module onto the DIN rail
7	Module connecting set	Connecting the modules
8	Ground clip	
9	Label	Nameplate
10	Input for supplying power to remote modules	Power supply for the remote module

2.6.3 Device Setting



Please refer to AS Series Module Manual for further information on device settings.

2.7 Specifications for Load Cell Modules

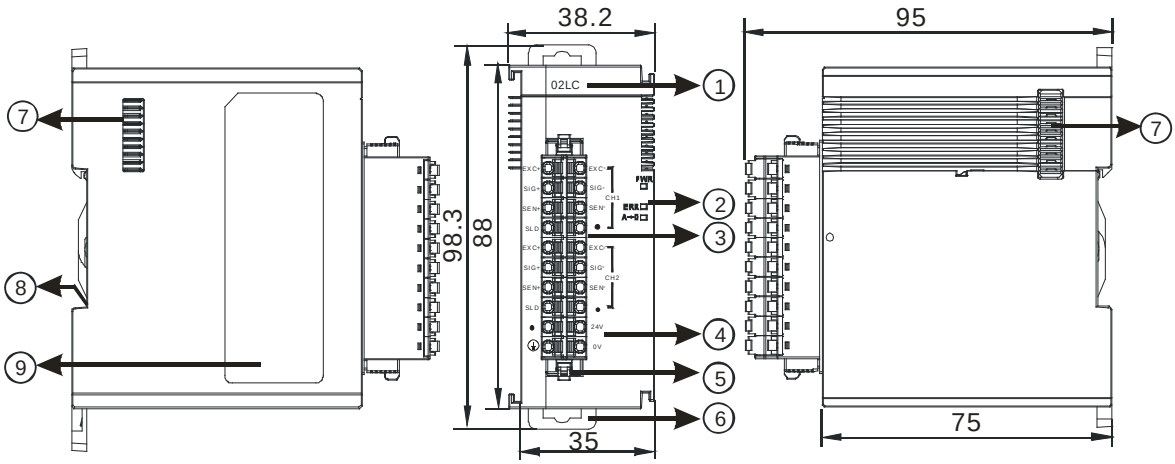
2.7.1 General Specifications

- **AS02LC-A**

Load cell module	Voltage output
Rated supply voltage/Power consumption	24 VDC (-15 to +20%) / 5W
Minimum/maximum voltage	18~31.2VDC
Maximum current consumption	150 mA
Input signal range	±40mVDC
Sensibility	+5 VDC +/-10%
ADC resolution	24 bits
Highest precision	0.04%
Applicable sensor type	4-wire or 6-wire load cell
Expanding a temperature coefficient	≤ ± 50 ppm/K v. E
Reducing a temperature coefficient to zero	≤ ± 0.4 μV/K
Linearity error	≤ 0.02%
Response time	2.5, 10, 16, 20, 50, 60, 100, 200, and 400ms
Eigenvalue applicable to a load cell	0~1, 0~2, 0~4, 0~6, 0~20, 0~40 and 0~80 mV/V
Maximum distance for connecting a load cell	100 meters
Maximum output current	5 VDC * 160 mA
Allowable load	40~4,010 Ω
Averaging weights	100
Common-mode rejection ratio (CMRR @50/60 Hz)	≥100 dB
Dynamic range	K1~K5
Averaging weights	K1~K100
Isolation	Between a digital circuit and the ground: 500 VAC Between an analog circuit and the ground: 500 VAC Between an analog circuit and a digital circuit: 500 VAC

2.7.2 Profiles

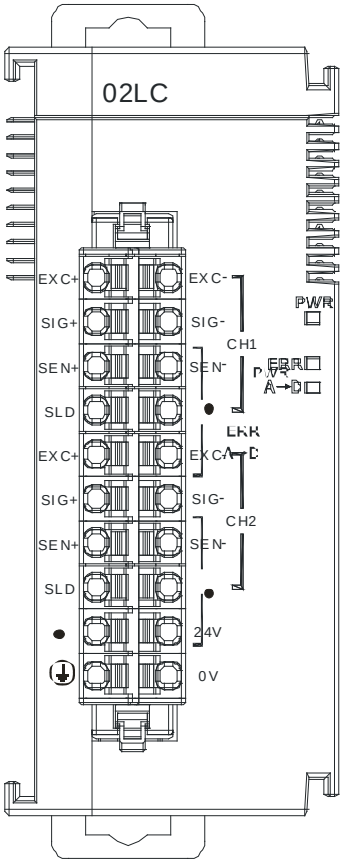
- **AS02LC-A**



Number	Name	Description
1	Model name	Model name of the module
2	POWER LED indicator	Indicating the status of the power supply ON: the power is on OFF: no power
	ERROR LED indicator	Error status of the module ON: A serious error occurs in the module. OFF: The module is normal. Blinking: A slight error occurs in the module.
	Analog to digital conversion indicator	Indicating the analog to digital conversion status Blinking: conversion is taking place OFF: stop conversion
3	Removable terminal block	The inputs are connected to sensors. The outputs are connected to loads which will be driven.
4	Arrangement of the input/output terminals	Arrangement of the terminals
5	Termainal block clip	Removing the terminal block
6	DIN rail clip	Securing the module onto the DIN rail
7	Module connecting set	Connecting the modules
8	Ground clip	
9	Label	Nameplate

2.7.3 Dimensions

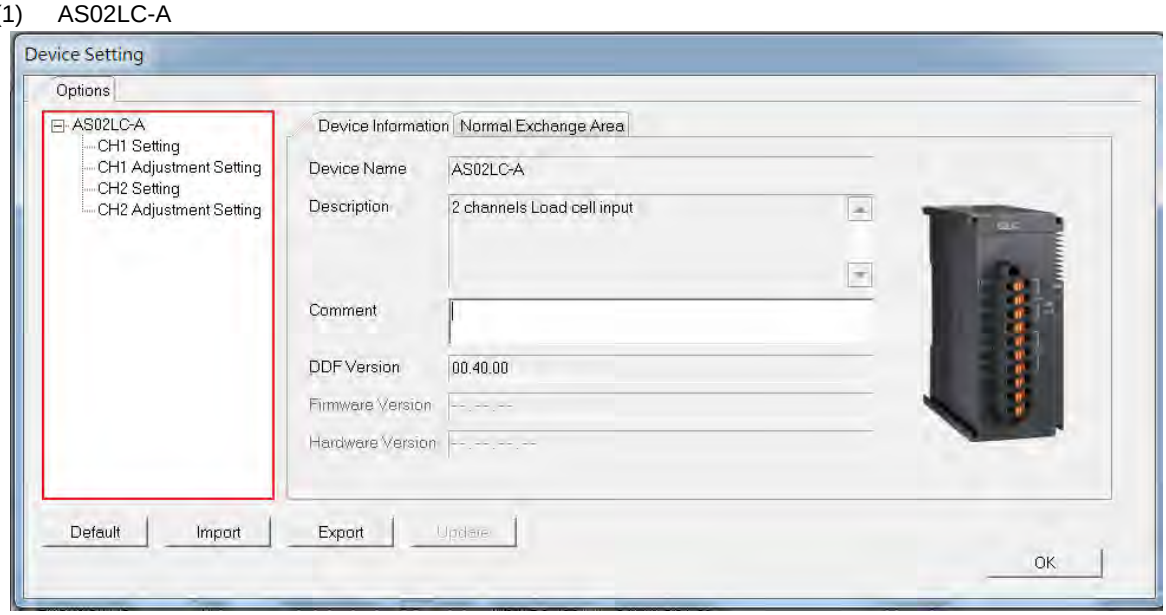
- **AS02LC-A**



Unit: mm

2.7.4 Device Setting

(1) AS02LC-A



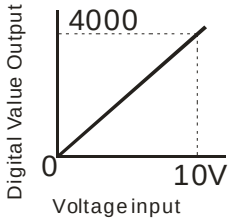
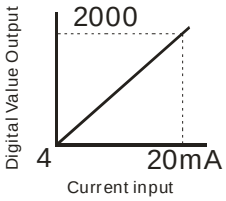
Please refer to AS Series Module Manual for further information on device settings.

2.8 Specifications for the Extension Card

2.8.1 General Specifications

- **AS-F2AD**

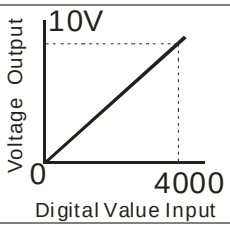
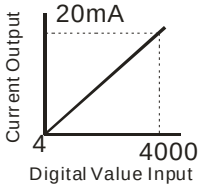
2 analog signal input channels:

Item	Voltage Input		Current input
Analog Signal	DC 0~+10V		DC 4~20mA
Resolution	12-bit		11-bit
Input impedance	2MΩ		250Ω
Conversion time	3ms / CH		
Characteristic curve			
Digital value output	Card1	SR168 (CH1)	SR169 (CH2)
	Card2	SR170 (CH1)	SR171 (CH2)

Users can use the program to read the values in SR to obtain the corresponding A/D conversion value for the channel.

- **AS-F2DA**

2 analog signal output channels:

Item	Voltage output		Current output
Analog Signal	DC 0~+10V		DC 4~20mA
Resolution	12-bit		12-bit
Input impedance	≥1kΩ		≤500Ω
Conversion time	2ms / CH		
Characteristic curve			
Digital value output	Card1	SR172 (CH1)	SR173 (CH2)
	Card2	SR174 (CH1)	SR175 (CH2)

Users can use the instruction MOV to move the value to the SR to obtain the corresponding voltage output value.

- **AS-F232**

AS series PLC is built with COM1 (RS-485), and COM2 (RS-485). Users can use this extension card for communication via different interface such as RS-232, PC and so on. Other than the different communication interface, the communication functions including are the same as the built-in ones; the communication port can be set as a Slave or a Master node. After installing the extension card, go to the HWCONFIG in the ISPSoft for communication setups.

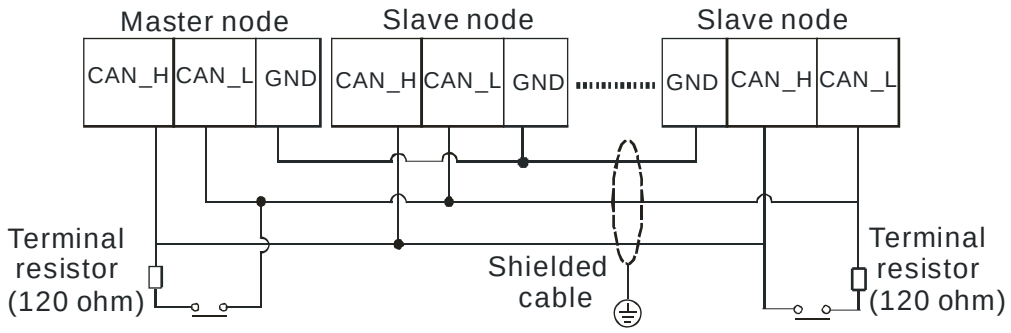
■ Wiring example

DB9 male to DB9 female (standard cable)

- **AS-FCOPM**

With its own standalone communication port, it can work independently and can be set as a Slave or a Master node. After installing the extension card, go to the HWCONFIG in the ISPSoft for communication setups.

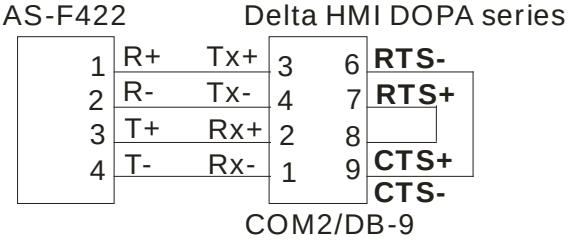
■ Wiring example



- **AS-F422**

Users can use this extension card for communication with Delta HMI series or other devices via RS-422 communication port. Other than the different communication interface, the communication functions including are the same as the built-in ones; the communication port can be set as a Slave or a Master node. After installing the extension card, go to the HWCONFIG in the ISPSoft for communication setups.

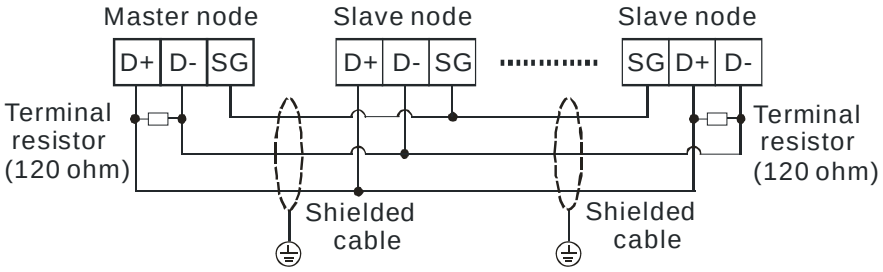
■ Wiring example of the communication with Delta HMI DOPA series via COM2



- **AS-F485**

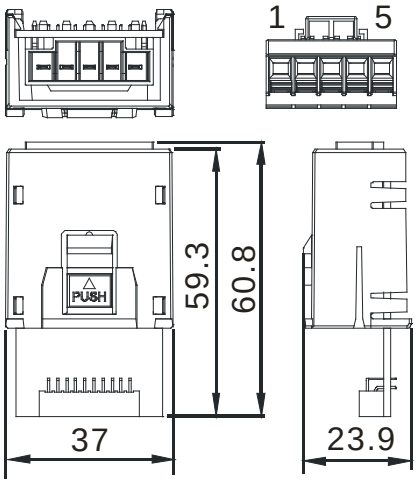
With its own standalone communication port, it can work independently and can be set as a Slave or a Master node. After installing the extension card, go to the HWCONFIG in the ISPSoft for communication setups.

■ Wiring example



2.8.2 Profiles

- **AS-F2AD/AS-F2DA/AS-F422/AS-F485**

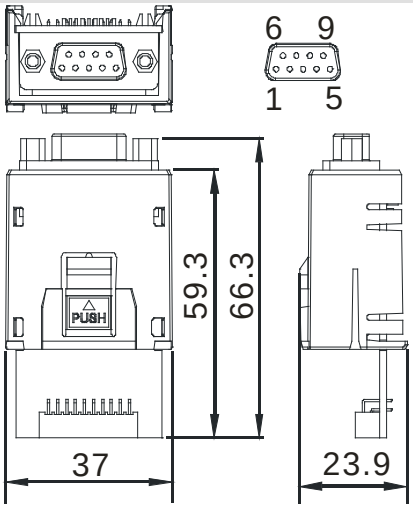


Unit: mm

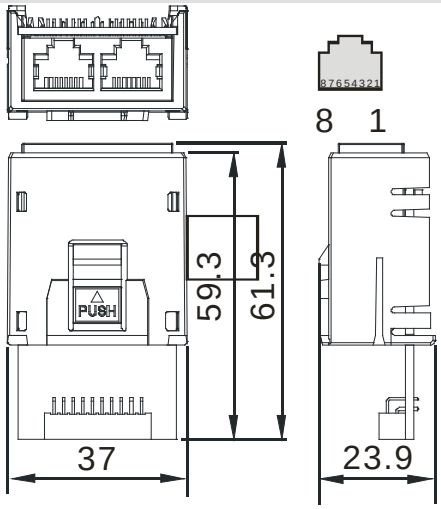
Pin no.	AS-F2AD	AS-F2DA	AS-F422	AS-F485
1	V1+	VO1	R+	-
2	I1+	IO1	R-	-
3	V2+	VO2	T+	D+
4	I2+	IO2	T-	D-
5	COM	COM	SG	SG

- **AS-F232/AS-FCOPM**

AS-F232



AS-FCOPM



Unit: mm

Pin no.	AS-F232	AS-FCOPM
1	-	CAN_H
2	TX	CAN_L
3	RX	GND
4	-	-
5	GND	-
6-9	-	-

2.9 Specifications for Power Supply Modules

2.9.1 General Specifications

- **AS-PS02**

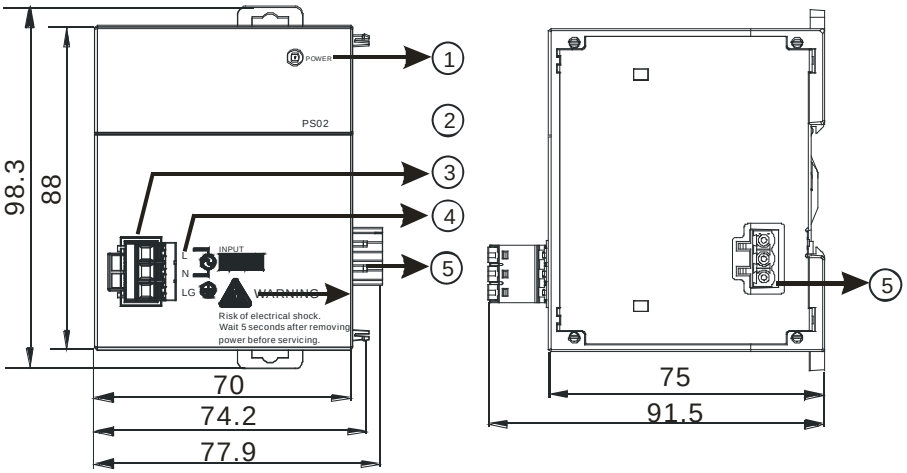
Item	Specifications
Supply voltage	100~240 VAC (-15%~10%) 50/60 Hz±5%
Action specifications	If the input power supply is larger than 85 VAC, the power supply module can function normally.
Allowable instantaneous power failure time	If the instantaneous power failure time is within ten milliseconds, the power supply module keeps running.
Fuse	2.5A/250VAC
Inrush current	＜70A@115VAC
24 VDC output	The maximum current is 2A. It is only for internal use: the CPU and the modules.
Power protection	The 24 VDC output is equipped with the short circuit protection and the overcurrent protection.
Surge voltage withstand level	1,500 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)
Insulation voltage	Above 5 MΩ (The voltage between all inputs/outputs and the ground is 500 VDC.)
Ground	The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.

- **AS-PS02A**

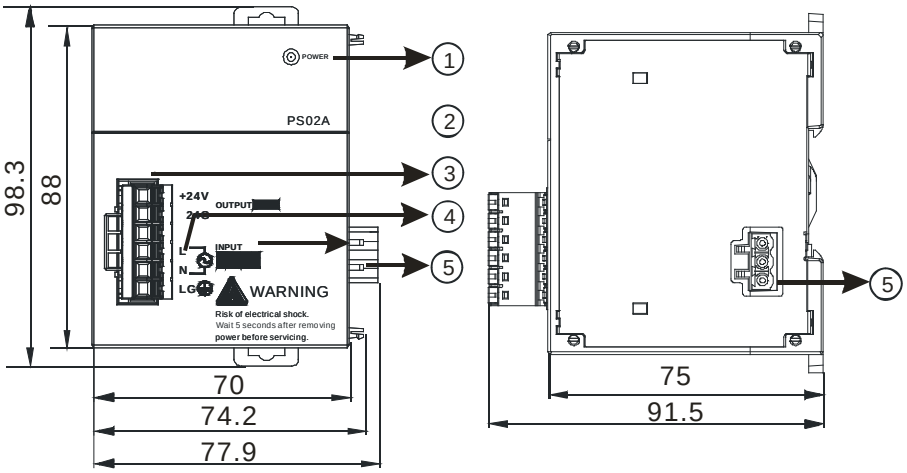
Item	Specifications
Supply voltage	100~240 VAC (-15%~10%) 50/60 Hz±5%
Action specifications	If the input power supply is larger than 85 VAC, the power supply module can function normally.
Allowable instantaneous power failure time	If the instantaneous power failure time is within ten milliseconds, the power supply module keeps running.
Fuse	2.5A/250VAC
Inrush current	＜70A@115VAC
24 VDC output	1.5A for internal use: the CPU and the modules 0.5A for external use
Power protection	The 24 VDC output is equipped with the short circuit protection and the overcurrent protection.
Surge voltage withstand level	1,500 VAC (Primary-secondary), 1,500 VAC (Primary-PE), 500 VAC (Secondary-PE)
Insulation voltage	Above 5 MΩ (The voltage between all inputs/outputs and the ground is 500 VDC.)
Ground	The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.

2.9.2 Profiles

- **AS-PS02**



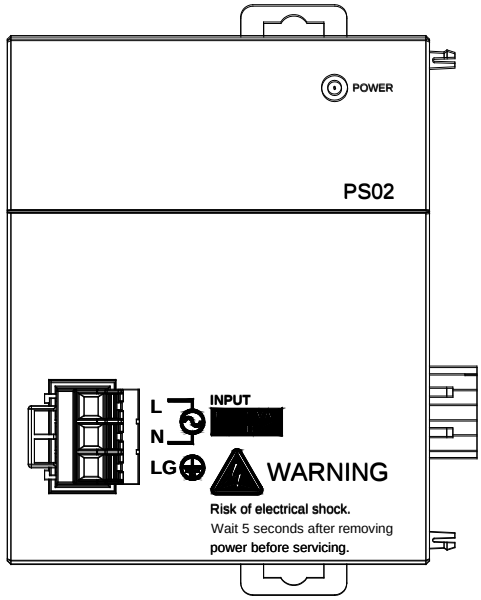
- **AS-PS02A**



Number	Name	Description
1	POWER LED indicator (green)	Indicating the status of the power supply
2	Model name	Model name of the power supply module
3	Terminal	Terminal for wiring
4	Arrangement of the terminals	24G/+24V: DC power input LG: Line ground L/N: AC power input
5	Power output	Connected with AS series

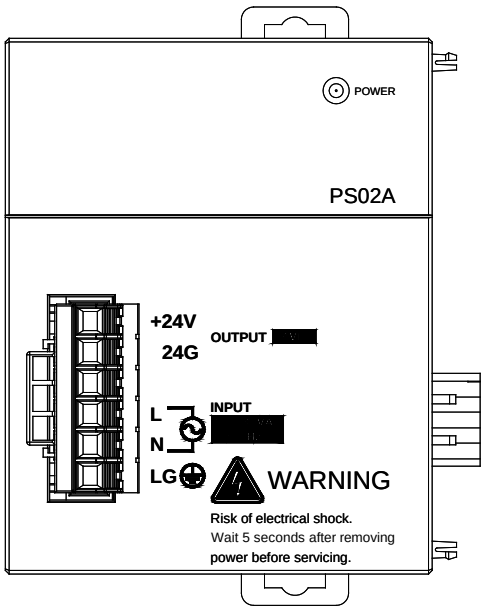
2.9.3 Arrangement of Power Module Terminals

- **AS-PS02**



- L/N: AC power input
- LG: Line ground

- **AS-PS02A**



- 24G/+24V: DC power input
- L/N: AC power input
- LG: Line ground

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Chapter 3 Installing Software

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Before developing an AS Series system, users need to install ISPSoft and COMMGR, which are basic software. ISPSoft is a platform for integrating the program development of a whole system, hardware configuration, and network configuration. COMMGR functions as middleware between a computer and devices. For example, it functions as a communication management interface between ISPSoft and AS series hardware.

3.1 Installing and Uninstalling ISPSoft

- System requirements

Item	System requirement	
Operating system	Windows XP / VISTA / 7 / 8 / 10	
CPU	Pentium 1.5 G or above	
Memory	256 MB or above (A memory having a capacity of 512 MB or above is recommended.)	
Hard disk drive	Capacity : 500 MB or above	
CD-ROM drive	For installing ISPSoft It is optionally required.	
Monitor	Resolution: 800×600 or above (Setting which is suggested: 1024x768/96 dpi)	
Keyboard/Mouse	A general keyboard/mouse, or devices compatible with Windows	
Printer	A printer with a driver for Windows (It is used to print a project, and is optionally required.)	
RS-232 port	For connecting to a PLC	One of them is used, but a PLC which is connected must have a corresponding port. (*1)
USB port	For connecting to a PLC	
Ethernet port	For connecting to a PLC	
Communication software	COMMGR, a communication manager, must be installed on a computer. (*2)	
Models which are supported	AH500 series PLCs/DVP series PLCs (exclusive of DVP-PM series PLCs)/ AS series, AC motor drives: VFD with PLC built-in series, and Text panel HMI with PLC built-in series.	

*1. ISPSoft supports several ways in which a computer is connected to a PLC. Users have to make sure of the port and the mode supported by a PLC before a computer is connected to the PLC.

*2. Please refer to section 3.2 for more information about COMMGR.

*3. The functions and specifications mentioned above are only applicable to ISPSoft version 3.00 or above. The older versions are not equipped with the complete functions.

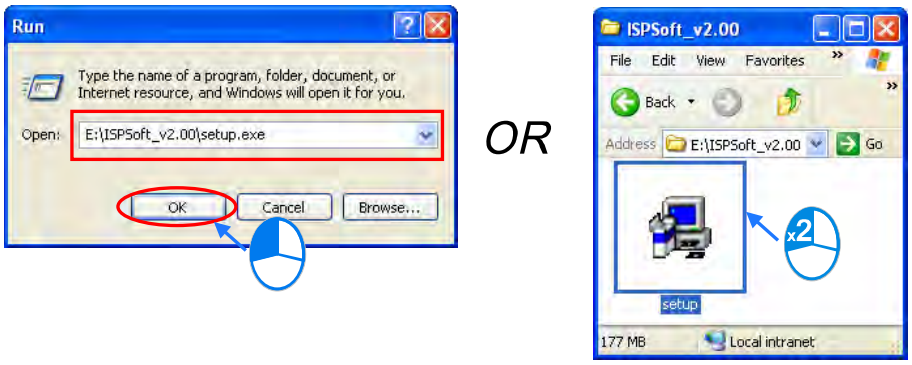
3.1.1 Installing ISPSoft

If an older version of ISPSoft has been installed on a computer, users have to uninstall it before install ISPSoft. Pleases refer to section 3.1.2 for more information about uninstalling ISPSoft. The following are the steps of installing ISPSoft.

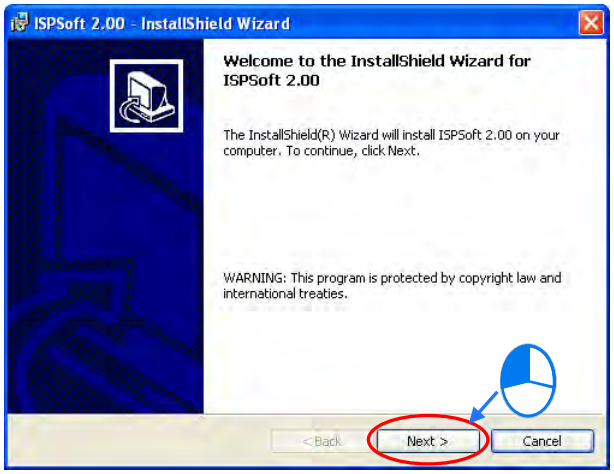
(1) Start the Windows operating system and then install ISPSoft. (It may require users to have the administrative privileges to perform software installation.)

(2) Put the ISPSoft CD in the CD-ROM drive, or download the installation program from http://www.delta.com.tw/ch/index.asp. (Before the installation program downloaded from the website is installed, it has to be decompressed.)

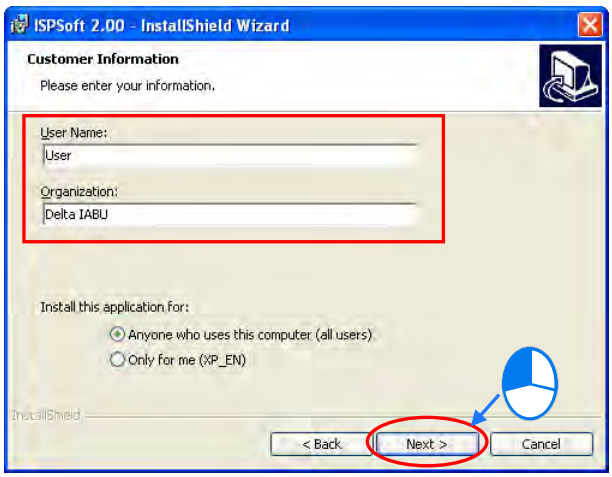
(3) Click **Start**, and then click **Run…** to open the **Run** window. Specify a path which denotes a file called setup.exe in the **Open** box, and then click **OK**. Users can also double-click the **setup** icon to execute the installation program.



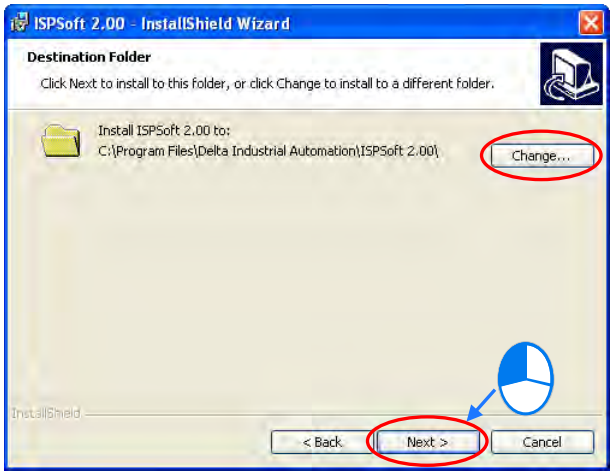
(4) After the ISPSoft x.xx – InstallShield Wizard window appears, click **Next**.



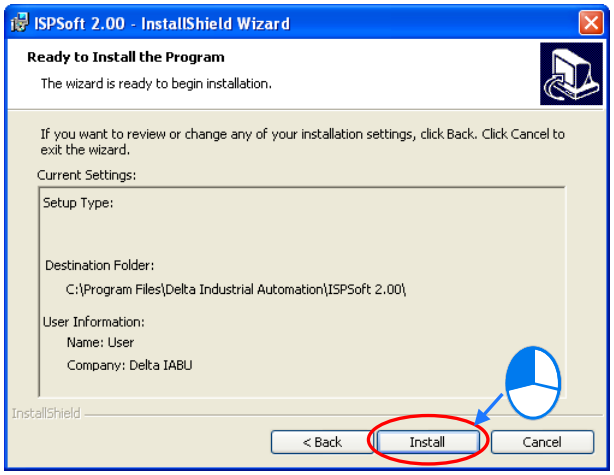
(5) Type related information in the **User Name** box and **Organization** box, and then click **Next**.



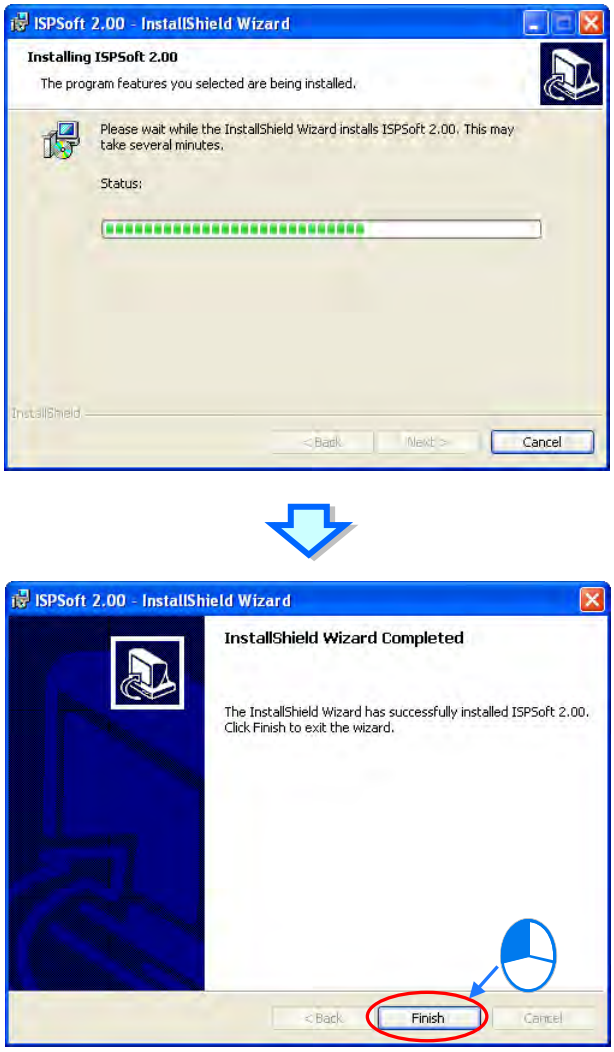
(6) Leave the default path unchanged, or click **Change**… to change the path. Click **Next** to proceed to the next step.



(7) Check the installation information, and then click **Install**.



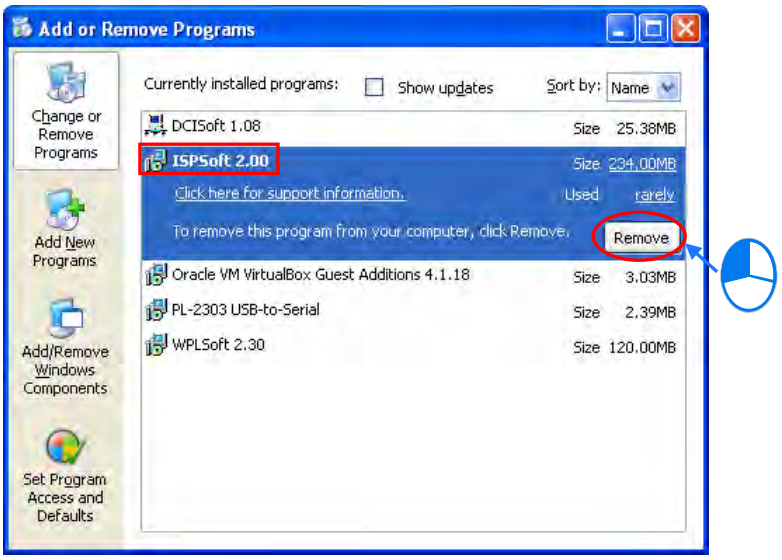
(8) After ISPSoft is installed, shortcuts to the program are created on the desktop and the **Start** menu. Click **Finish** to complete the installation.



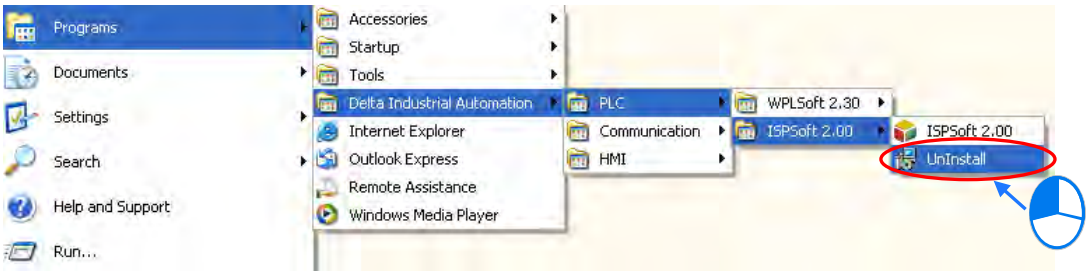
3.1.2 Uninstalling ISPSoft

(1) There are two methods of uninstalling ISPSoft.

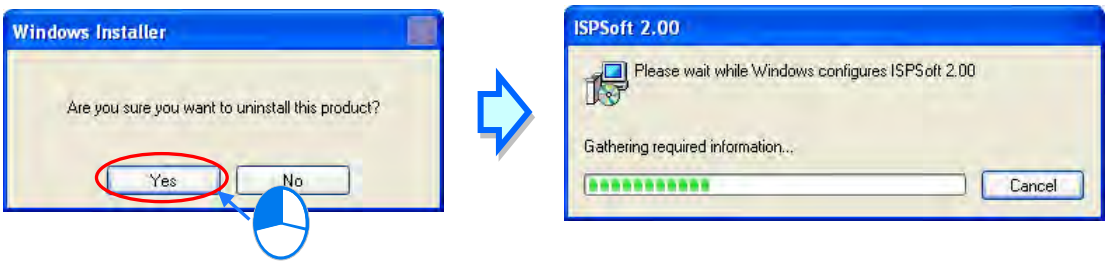
- Method 1: Open the **Control Panel** window, and click **Add or Remove Programs**. In the **Currently installed programs** box, click **ISPSoft x.xx**, and then click **Remove**.



- Method 2: **Start**>**Programs**>**Delta Industrial Automation**>**PLC**>**ISPSoft x.xx**>**Uninstall**



(2) After users click **Yes**, ISPSoft will be removed.



3.2 Installing and Uninstalling COMMGR

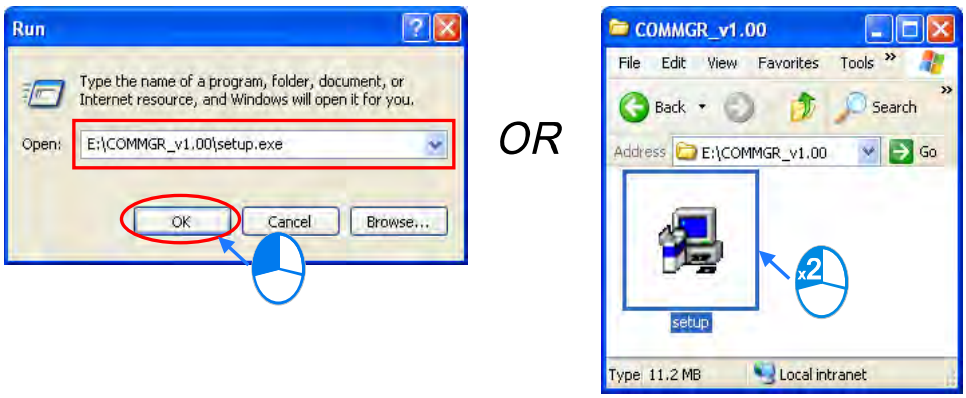
3.2.1 Installing COMMGR

If an older version of COMMGR has been installed on a computer, users have to uninstall it before install COMMGR. Pleases refer to section 3.2.2 for more information about uninstalling COMMGR. The following are the steps of installing COMMGR.

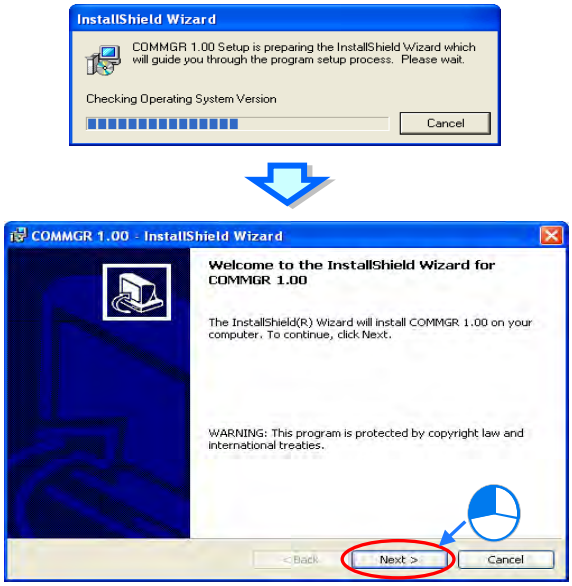
(1) Start the Windows operating system and then install ISPSoft. (It may require users to have the administrative privileges to perform software installation.)

(2) Put a COMMGR CD in the CD-ROM drive, or download the installation program from http://www.delta.com.tw/ch/index.asp. (Before the installation program downloaded from the website is installed, it has to be decompressed.)

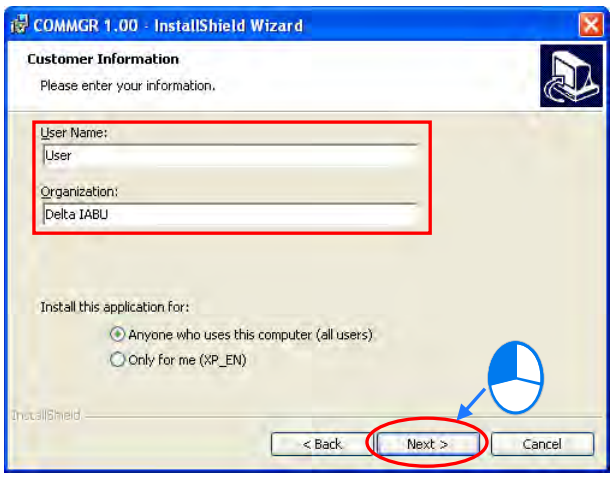
(3) Click **Start**, and then click **Run…** to open the **Run** window. Specify a path which denotes a file called setupComm.exe in the **Open** box, and then click **OK**. Users can also double-click the **setupComm** icon to execute the installation program.



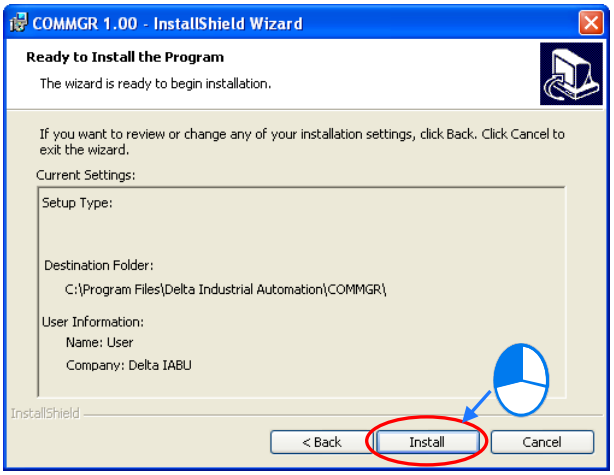
(4) After the **COMMGR x.xx – InstallShield Wizard** window appears, click **Next**.



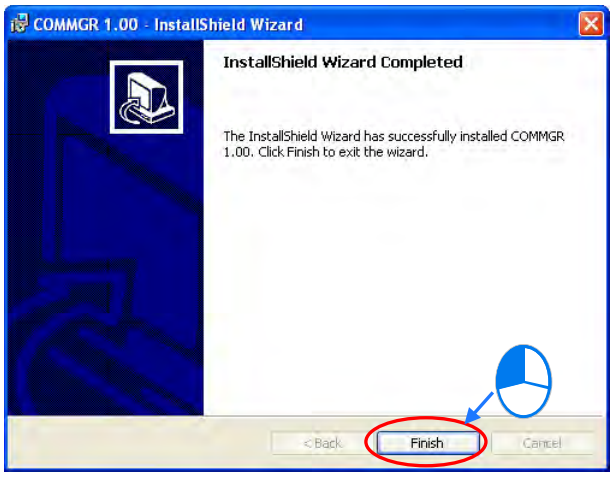
(5) Type information in the **User Name** box and the **Organization** box, and then click **Next**.



(6) Check the installation information, and then click **Install**.



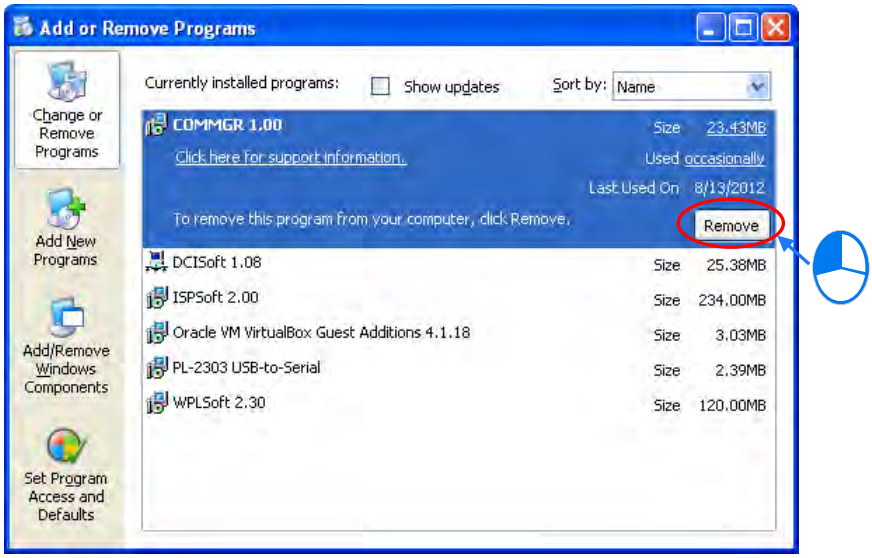
(7) After COMMGR is installed, a shortcut to the program is created on the **Start** menu. Click **Finish** to complete the installation.



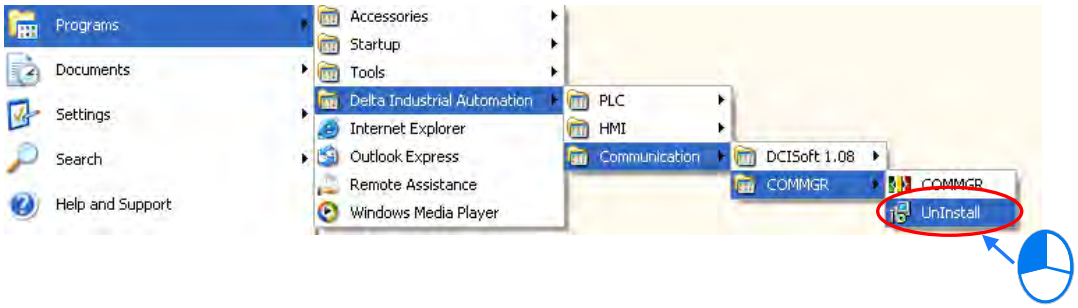
3.2.2 Uninstalling COMMGR

(1) There are two methods of uninstalling COMMGR.

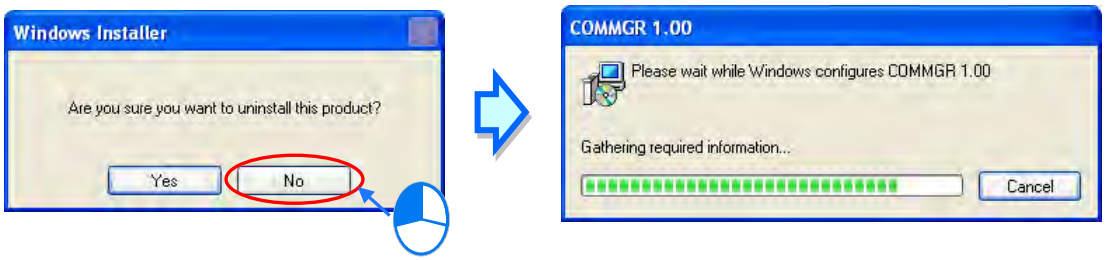
- Method 1: Open the **Control Panel** window, and click **Add or Remove Programs**. In the **Currently installed programs** box, click **COMMGR x.xx**, and then click **Remove**.



- Method 2: **Start**>**Programs**>**Delta Industrial Automation**>**Communication**>**COMMGR**>**Uninstall**



(2) After users click **Yes**, COMMGR will be removed.



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Chapter 4 Installing Hardware

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4.1 Installation

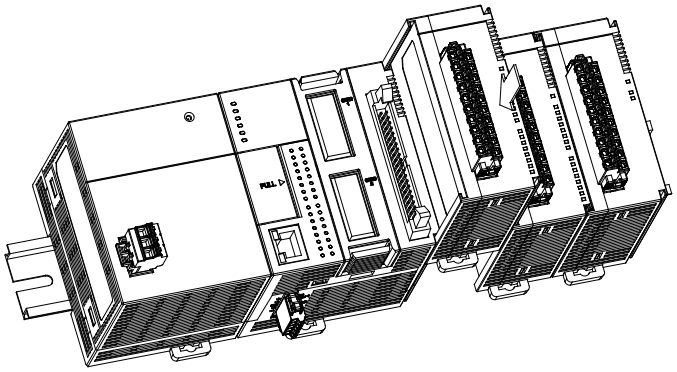
4.1.1 Installing a Module

Prepare modules which will be used, e.g. a power supply module, a CPU module, and digital I/O modules, and etc. Please follow the steps of installing a module illustrated in chapter 2 in AS Series Hardware Manual.

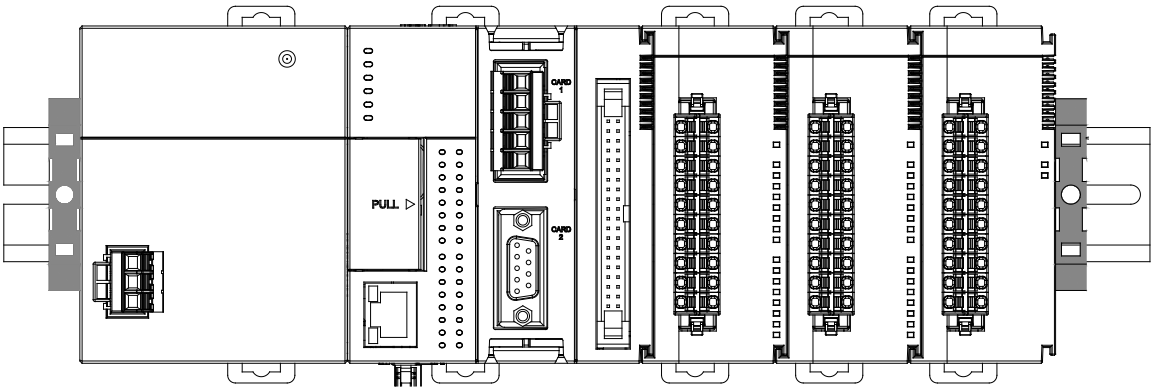
Insert a module into a slot, make sure that the module is installed on the backplane properly, and tighen the the screw, as illustrated below.

1. Please install the PLC onto the power supply module, and then insert the module hooks into the DIN rail mounting slot.

2. Link the I/O modules on the right side of the PLC and make sure they are hooked together, push the modules into the DIN rail until hearing a click. That means the module is on the DIN rail and is connected to the PLC as illustrated below.

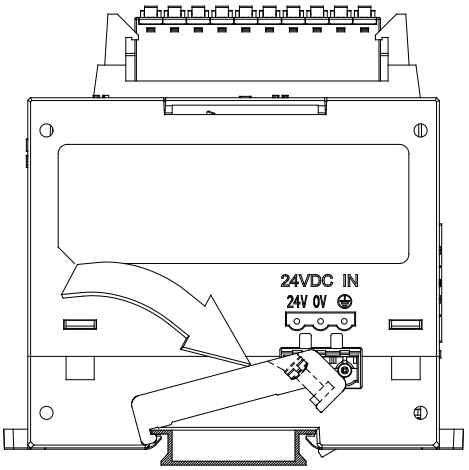


If there is a vibration source in the installation site, it is suggested to installed anti-vibration baffles on the sides of the AS series for better stabilization as the gray baffles illustrated below.

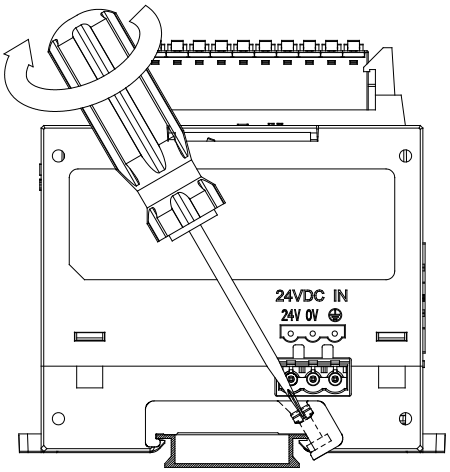


- **Install the baffles:**

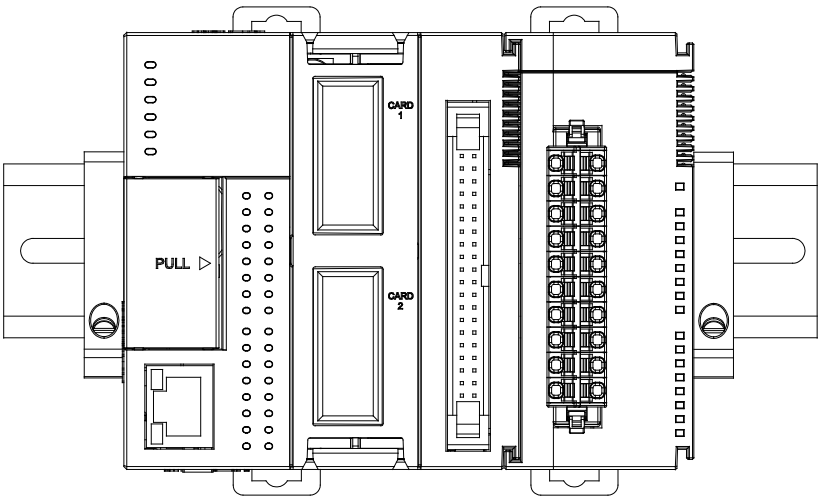
  - Hook the baffles onto the DIN rail and press it down as the directional arrow indicated below.



  - Use screws to secure the baffle.



  - The baffles installation is complete as the image shown below.

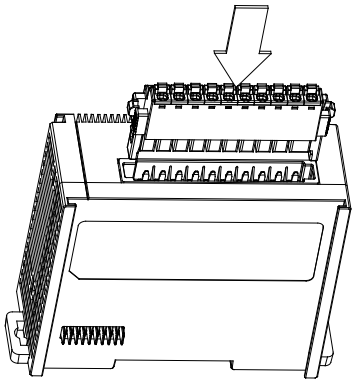


4.1.2 Installing a Removable Terminal Block

Please install the removable terminal block on the module, as illustrated below.

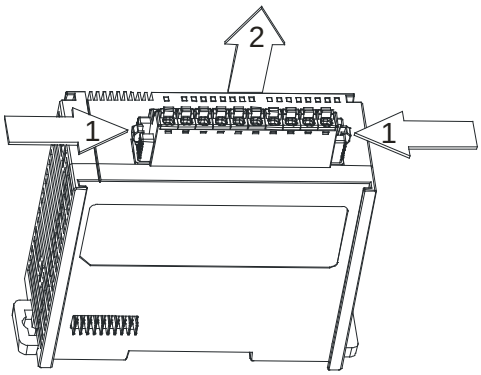
- **Installation**

1. Level the terminal block at the printed circuit board, and press it into the module.



- **Removal**

1. Pull down the clip in the direction indicated by the arrow and then pull the terminal block up as illustrated below.

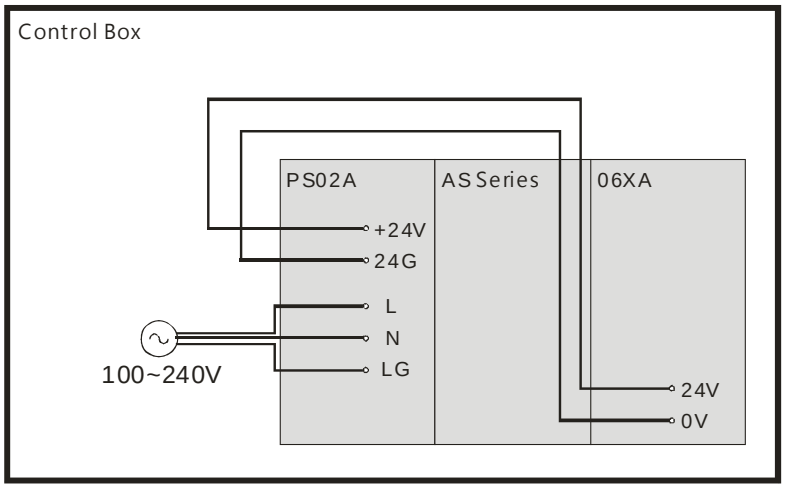


4.2 Wiring

4.2.1 Wiring a Power Supply Module

A power supply module supplies direct current to a CPU module and I/O modules.

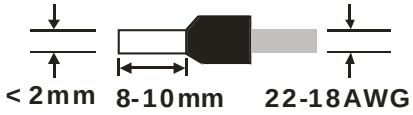
- **Connecting an AC power cable**



- The alternating-current input voltage is in the range of 100 VAC to 240 VAC. Please connect the power supply to the terminals L and N. If the 110 VAC or the 220 VAC power supply is connected to the input terminals +24V and 24G, the PLC will be damaged.

- If the power cut lasts for less than 10 milliseconds, the PLC keeps running without being affected. If the power cut lasts for long, or if the voltage of the power supply decreases, the PLC stops running, and there is no output. When the power supply returns to normal, the PLC resumes. (Users have to notice that there are latched auxiliary relays and registers in the PLC when they write the program.)

- Please use single-core cables or twin-core cables in a diameter of 22 AWG~18 AWG and with less than 2mm pin-typed terminals. Only use copper conducting wires with a temperature of 60/75°C.



4.2.2 Wiring I/O Modules

The I/O modules include digital input/output modules, analog input/output modules, and network module. Please follow the directions for the wiring of I/O modules in chapter 5 in AS Series Hardware Manual.

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Chapter 5 Devices

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5.1 Introduction of Devices

This section gives an account of values/strings processed by the PLC. It also describes the functions of devices which include input/output/auxiliary relays, timers, counters, and data registers.

5.1.1 Device Table

Type	Device name		Number of devices	Range
Bit device	Input relay	X	1024	X0.0~X63.15
	Output relay	Y	1024	Y0.0~Y63.15
	Data register	D	48,0000	D0.0~D29999.15
		W	48,0000	W0.0~W29999.15 *4
	Auxiliary relay	M	8192	M0~M8191
	Special auxiliary relay	SM	2048	SM0~SM2047
	Stepping relay	S	2048	S0~S2047
	Timer	T	512	T0~T511
	Counter	C	512	C0~C511
	32-bit counter	HC	256	HC0~HC255
Word device	Input relay	X	64	X0~X63
	Output relay	Y	64	Y0~Y63
	Data register	D	30000	D0~D29999
		W	30000	W0~W29999 *4
	Special auxiliary relay	SR	2048	SR0~SR2047
	File register	FR	65536	FR0~FR65535
	Timer	T	512	T0~T511
	Counter	C	512	C0~C511
	32-bit counter	HC	256（512 words）	HC0~HC255
	Index register	E	10	E0~E9
			5	E10~E14 *4
Constant*1	Decimal system	K	16 bits: -32768~32767 32 bits: -2147483648~2147483647	
Constant*2	Hexadecimal system	16#	16 bits: 16#0~16#FFFF 32 bits: 16#0~16#FFFFFFFF	

Type	Device name		Number of devices	Range
	Single-precision floating-point number	F	32 bits: $\pm1.17549435^{-38}$~$\pm3.40282347^{+38}$	
String*3	String	"$"	1~31 characters	

*1: The decimal forms are notated by K in the device lists in Chapter 5 and Chapter 6 in AS Series Programming Manual. For example a K50 in the AS programming manual, only the number 50 should be inputted in ISPSoft.

*2: The floating-point numbers are notated by F/DF in the device lists in Chapter 5 and Chapter 6 in AS Series Programming Manual, whereas they are represented by decimal points in ISPSoft; for the floating-point F500, one should input 500.0.

*3: The strings are notated by "$" in Chapter 5 and Chapter 6 in AS Series Programming Manual, whereas they are represented by " " in ISPSoft; for the string of 1234, one should input "1234"in ISPSoft.

*4: Used for editing in ISPSoft only.

5.1.2 Basic Structure of I/O Storages

Device	Function	Access of bits	Access of words	Modification by ISPSoft	Forcing the bit ON/OFF
X	Input relay	OK	OK	OK	OK
Y	Output relay	OK	OK	OK	OK
M	Auxiliary relay	OK	-	OK	-
SM	Special auxiliary relay	OK	-	OK	-
S	stepping relay	OK	-	OK	-
T	Timer	OK	OK	OK	-
C	Counter	OK	OK	OK	-
HC	32-bit counter	OK	OK	OK	-
D	Data register	OK	OK	OK	OK
SR	Special data register	-	OK	OK	-
FR	File register	-	OK*1	-	-
E	Index register	-	OK	OK	-

*1: An instruction should be used for the writing of a FR.

5.1.3 Relation Between the PLC Action and the Device Type

Device type / PLC action		Non-latched area		Latched area	
		Device Y	**Other devices**	**File register**	**Other devices**
Power: OFF→ON		Cleared	Cleared	Retained	Retained
Restore to defaults		Cleared	Cleared	Cleared	Cleared
STOP ↓ RUN*[1]	**The non-latched area is cleared.**	Cleared	Cleared	Retained	Retained
	The state of the non-latched area is retained.	Retained	Retained	Retained	Retained
RUN ↓ STOP*[1]	**The state of device Y is cleared.**	Cleared	Retained	Retained	Retained
	The state of device Y is retained.	Retained	Retained	Retained	Retained
SM204 is ON. (All non-latched areas are cleared.)		Cleared	Cleared	Retained	Retained
SM205 is ON. (All latched areas are cleared.)		Retained	Retained	Retained	Cleared

*1: For the setups of the states, please go to HWCONFIG in ISPSoft. The default of PLC STOP->RUN is "cleared not-latched area". The default of PLC RUN->STOP is "cleared the state of device Y".

5.1.4 Latched Areas in the Device Range

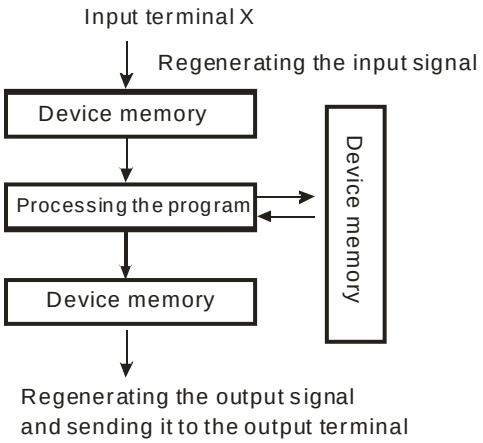
Device	Function	Device range	Latched area
X	Input relay	X0~X63	All devices are non-latched.
Y	Output relay	Y0~Y63	All devices are non-latched.
M*[1]	Auxiliary relay	M0~M8191	The default range is M6000~M8191.
SM	Special auxiliary relay	SM0~SM2047	Some devices are latched, and can not be changed. Please refer to the list of special auxiliary relays for more information.
S*[1]	Stepping relay	S0~S1023	The default range is S512~S1023
T	Timer	T0~T511	All devices are non-latched.
C*[1]	Counter	C0~C511	The default range is C448~C511
HC*[1]	32-bit counter	HC0~HC255	The default range is HC128~HC255
D*[1]	Data register	D0~D29999	The default range is D20000~D29999
		W0~W29999	*[2]
FR	File register	FR0~FR65535	All devices are latched.
SR	Special data register	SR0~SR2047	Some are latched, and can not be changed. Please refer to the list of special data registers for more information.
E	Index register	E0~E9	All devices are non-latched.
		E10~E14	*[2]

*1: For the setups of the latched area, please go to HWCONFIG in ISPSoft. Set the latched area and the other areas will be seen as non-latched areas. The range of latched areas can not exceed the device range. For example, set the M600~M7000 as the lated areas and that makes M0~M5999 and M7001~M8191 as the non-latched areas.

*2: Used for editing in ISPSoft only.

5.2. Functions of Devices

Procedure for processing the program in the PLC:



- Regenerating the input signal

  1. Before the program is executed, the state of the external input signal is read into the memory of the input signal.
  2. When program is executed, the state in the memory of the input signal does not change even if the input signal changes from ON to OFF or from OFF to ON. Not until the next scan begins will the input signal be refreshed.

- Processing the program

  After the input signal is refreshed, the instructions in the program are executed in order from the start address of the program, and the results are stored in the device memories.

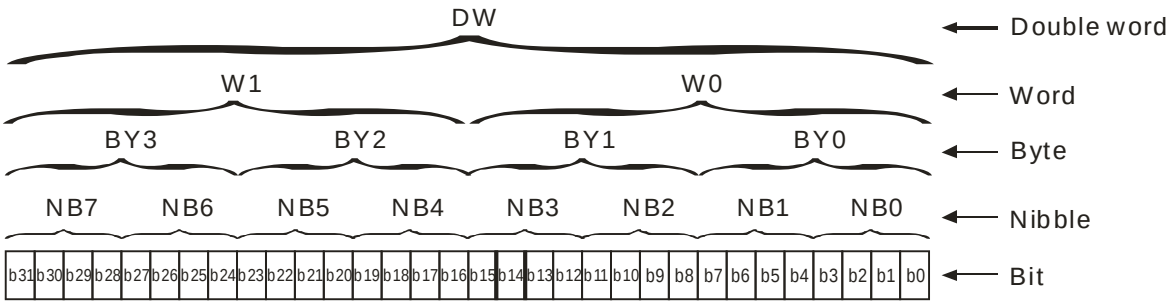
- Regenerating the state of the output

  After the instruction END is executed, the state in the device memory is sent to the specified output terminal.

5.2.1 Values and Constants

Name	Description
Bit	A bit is the basic unit in the binary system. Its state is either 1 or 0.
Nibble	A nibble is composed of four consecutive bits (e.g. b3~b0). Nibbles can be used to represent 0~9 in the decimal system, or 0~F in the hexadecimal system.
Byte	A byte is composed of two consecutive nibbles (i.e. 8 bits, b7~b0). Bytes can be used to represent 00~FF in the hexadecimal system.
Word	A word is composed of two consecutive bytes (i.e. 16 bits, b15~b0). Words can be used to represent 0000~FFFF in the hexadecimal system.
Double word	A double word is composed of two consecutive words (i.e. 32 bits, b31~b0). Double words can be used to represent 00000000~FFFFFFFF in the hexadecimal system.

The relation among bits, nibbles, bytes, words, and double words in the binary system is shown below.



The PLC uses four types of values to execute the operation according to different control purposes. The functions of these values are illustrated as follows:

1. Binary number (BIN)

   The PLC adopts the binary system to operate the values.

2. Decimal number (DEC)

   The decimal number in the PLC is used as;

   - the setting value of the timer (T) or the setting value of the counter (C/HC). For example, TMR C0 50 (**constant K**).
   - the device number. For example, M10 and T30 (device number)
   - the number before or after the decimal point. For example, X0.0, Y0.11, and D10.0 (device number).
   - **the constant K**: It is used as the operand in the applied instruction. For example, MOV 123 D0 **(constant K)**.

3. Binary-coded decimal (BCD)

   A decimal value is represented by a nibble or four bits, and therefore sixteen consecutive bits can represent a four-digit decimal value.

4. Hexadecimal number (HEX)

   The hexadecimal number in the PLC is used as;

   - **the constant 16#**: It is used as the operand in the applied instruction. For example, MOV 16#1A2B D0 (hexadecimal constant).

Corresponding values:

Binary Number (BIN)	**Decimal Number (DEC)**	**Binary Code Decimal (BCD)**	**Hexadecimal Number (HEX)**
PLC internal execution	**Constant** K, Device number	BCD related instruction	Onstant 16#, Device number
0000	0	0000	0
0001	1	0001	1
0010	2	0010	2
0011	3	0011	3
0100	4	0100	4
0101	5	0101	5
0110	6	0110	6
0111	7	0111	7
1000	8	1000	8
1001	9	1001	9
1010	10	-	A
1011	11	-	B
1100	12	-	C
1101	13	-	D
1110	14	-	E
1111	15	-	F
10000	16	0001 0000	10
10001	17	0001 0001	11

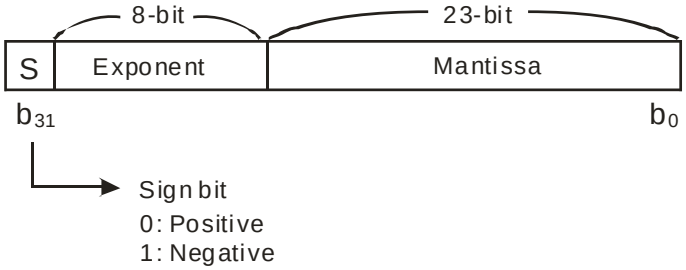
5.2.2 Floating-point Numbers

The floating-point numbers are represented by decimal points in ISPSoft. For example, the floating-point number of 500 is 500.0. Please refer to section 2.2.2 in AS Series Programming Manual for more information.

The floating-point numbers are represented by decimal points in ISPSoft. For example, the floating-point number of 500 is 500.0.

5.2.2.1 Single-precision Floating-point Numbers

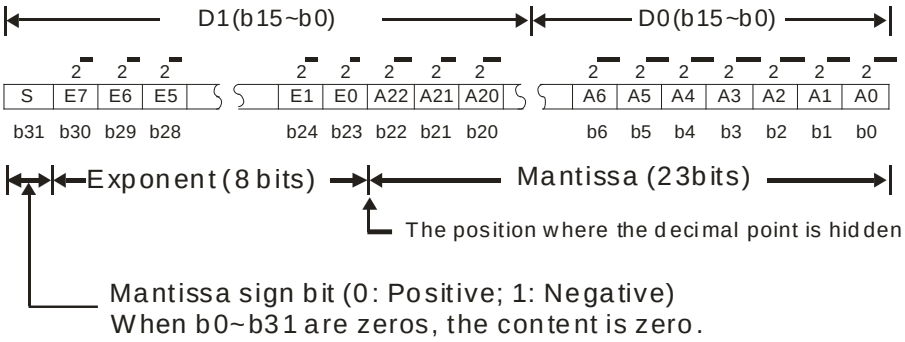
The floating-point number is represented by the 32-bit register. The representation adopts the IEEE754 standard, and the format is as follows.



Equation: $(-1)^S \times 2^{E-B} \times 1.M; B = 127$

The single-precision floating-point numbers range from ±2-126 to ±2+128, and correspond to the range from ±1.1755×10-38 to ±3.4028×10+38.

The AS series PLC uses two consecutive registers to form a 32-bit floating-point number. Take (D1, D0) for example.



Example 1:

23 is represented by the single-precision floating-point number.

Step 1: Convert 23 into the binary number, i.e. 23.0=10111.

Step 2: Normalize the binary number, i.e. 10111=1.0111 ×24 (0111 is the mantissa, and 4 is the exponent.).

Step 3: Get the value of the exponent.

∵ E-B=4→E-127=4 ∴ E=131=100000112

Step 4: Combine the sign bit, the exponent, and the mantissa to form the floating-point number.

0 100**0001**1 011**1000**0000**0000**0000**0000**$_2$=41B80000$_{16}$

Example 2:

-23 is represented by the single-precision floating-point number.

The steps of converting -23.0 into the floating-point number are the same as those of converting 23.0 into the floating-point number, except that the sign bit is 1.

1 100**0001**1 011**1000**0000**0000**0000**0000**$_2$=C1B80000$_{16}$

5.2.2.2 Decimal Floating-point Numbers

- Since single-precision floating-point numbers and double-precision floating-point numbers are not widely accepted by people, they can be converted into decimal floating-point numbers for people to make judgement. However, as to the operation of the decimal point, the PLC still uses single-precision floating-point numbers and double-precision floating-point numbers.
- A 32-bibt decimal floating-point number is represented by two consecutive registers. The constant is stored in the register whose number is smaller while the exponent is stored in the register whose number is bigger. Take (D1, D0) for example.

$$\text{Decimal floating-point number} = [\text{Constant } D0] * 10^{[\text{Exponent } D1]}$$

Base number D0=±1,000~±9,999

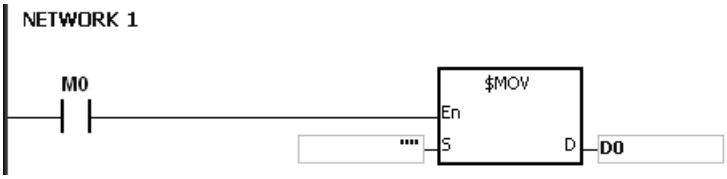
Exponent D1=-41~+35

The base number 100 does not exist in D0 because 100 is represented by $1,000\times10^{-1}$. In addition, 32-bit decimal floating-point numbers range from $\pm1175\times10^{-41}$ to $\pm402\times10^{+35}$.

5.2.3 Strings

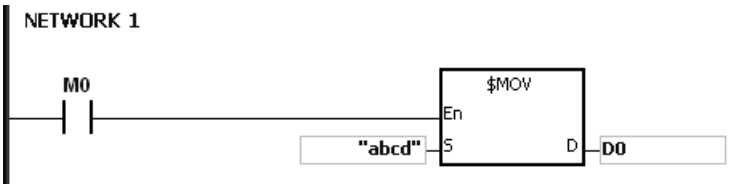
What strings can process are ASCII codes (*1). A complete string begins with a start character, and ends with an ending character (NULL code). If what you enter is a string, you can enter 31 characters at most, and the ending character 16#00 will be added automatically in ISPSoft.

1. No string (NULL code) is moved.



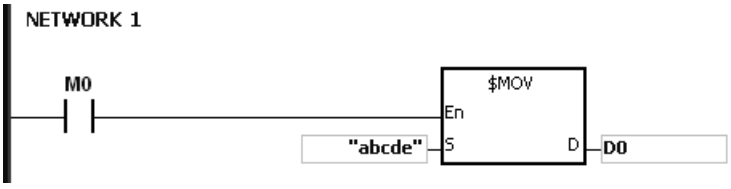
D0=0 (NULL)

2. The string is an even number.



D0	16#62 (b)	16#61 (a)
D1	16#64 (d)	16#63 (b)
D2	0 (NULL)	

3. The string is an odd number.



D0	16#62 (b)	16#61 (a)
D1	16#64 (d)	16#63 (b)
D2	0 (NULL)	16#65 (e)

*1: ASCII code chart

Hex	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
ASCII	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
Hex	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
ASCII	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
Hex	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
ASCII	SP	!	"	#	$	%	&	'	(	)	*	+	·	-	.	/
Hex	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
ASCII	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
Hex	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
ASCII	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Hex	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
ASCII	P	Q	R	S	T	U	V	W	X	Y	Z	☒	☒	☒	☒	☒
Hex	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
ASCII	`	a	b	C	d	e	f	g	h	i	j	k	l	M	n	o
Hex	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F
ASCII	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	☒

Note: ☒ represents an invisible character. Please do not use it.

5.2.4 Input Relays (X)

- Function of the input

  The input is connected to the input device (e.g. external devices such as button switches, rotary switches, number switches, and etc.), and the input signal is read into the PLC. Besides, contact A or contact B of the input can be used several times in the program, and the ON/OFF state of the input varies with the ON/OFF state of the input device.

- Input number (the decimal number):

  For the PLC, the input numbers start from X0.0. The number of inputs varies with the number of inputs on the digital input/output modules, and the inputs are numbered according to the order in which the digital input/output modules are connected to the CPU module. The maximum number of inputs on the PLC can reach up to 8192, and the range is between X0.0 and X511.15.

- Input type

  The inputs are classified into two types.

  1. Regenerated input: Before the program is executed, the data is fed into the PLC according to the

states of the inputs which are regenerated. For example, LD X0.0.

2. Direct input: During the execution of the instructions, the data is fed into the PLC according to the states of the inputs. For example, LD DX0.0.

5.2.5 Output Relays (Y)

- The function of the output

  The task of the output is sending the ON/OFF signal to drive the load connected to the output. The load can be an external signal lamp, a digital display, or an electromagnetic valve. There are four types of outputs. They are relays, transistors (NPN and PNP), and TRIACs (thyristors). Contact A or contact B of the output can be used several times in the program, but the output Y should be used only once in the program. Otherwise, according the program-scanning principle of the PLC, the state of the output depends on the circuit connected to the last output Y in the program.

- The output number (the decimal number)

  For the PLC, the input numbers start from Y0.0. The number of outputs varies with the number of outputs on the digital input/output modules, and the outputs are numbered according to the order in which the digital input/output modules are connected to the PLC. The maximum number of outputs on the PLC can reach up to 1024, and the range is between Y0.0 and Y63.15.

  The output which is not practically put to use can be used as a general device.

- The output type

  The outputs are classified into two types.

  1. Regenerated output: Not until the program executes the instruction END is the information fed out according to the states of the outputs. For example, OUT Y0.0.

  2. Direct output: When the instructions are executed, the information is fed out according to the states of the outputs. For example, OUT DY0.0.

5.2.6 Auxiliary Relays (M)

The auxiliary relay has contact A and contact B. It can be used several times in the program. Users can combine the control loops by means of the auxiliary relay, but can not drive the external load by means of the auxiliary relay. The auxiliary relays can be divided into two types according to their attributes.

1. For general use: If an electric power cut occurs when the PLC is running, the auxiliary relay for general use will be reset to OFF. When the power supply is restored, the auxiliary relay for general use is still OFF.

2. For latched use: If an electric power cut occurs when the PLC is running, the state of the auxiliary relay for latched use will be retained. When the power supply is restored, the state remains the same as that before the power electric cut.

5.2.7 Special Auxiliary Relays (SM)

Every special auxiliary relay has its specific function. Please refer to section 2.2.7 in AS Series Programming Manual for more information.

5.2.8 Stepping Relays (S)

Function of the stepping relay:

The stepping relay can be easily used in the industrial automation to set the procedure. It is the most basic device in the sequential function chart (SFC). Please refer to ISPSoft User Manual for more information related to sequential function charts.

There are 2048 stepping relays, i.e. S0~S2047. Every stepping relay is like an output relay in that it has an output coil, contact A, and contact B. It can be used several times in the program, but it can not directly drive the external load. Besides, the stepping relay can be used as a general auxiliary relay when it is not used in the sequential function chart.

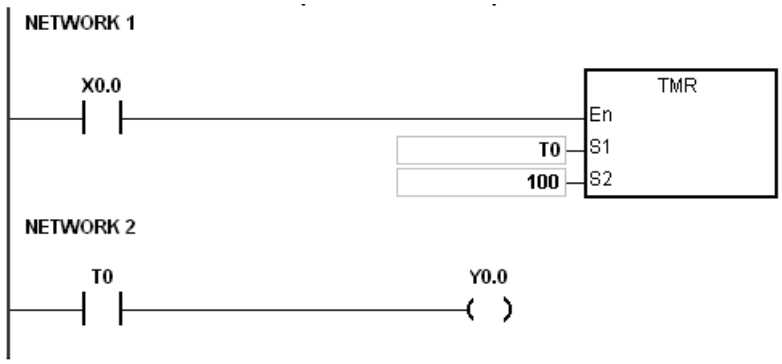
5.2.9 Timers (T)

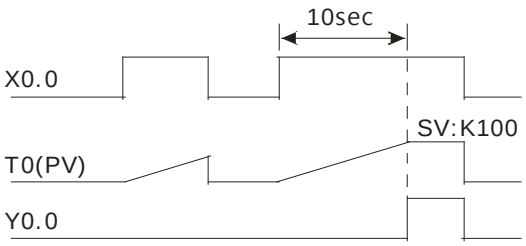
1. 100 millisecond timer: The timer specified by the instruction TMR takes 100 milliseconds as the timing unit.
2. 1 millisecond timer: The timer specified by the instruction TMRH takes 1 millisecond as the timing unit.
3. The accumulative timers are ST0~ST511. If users want to use the device-monitoring function, they can monitor T0~T511.
4. If the same timer is used repeatedly in the program, including in different instructions TMR and TMRH, the setting value is the one that the value of the timer matches first.
5. If the same timer is used repeatedly in the program, it is OFF when one of the conditional contacts is OFF.
6. If the same timer is used repeatedly in the program as the timer for the subroutine's exclusive use and the accumulative timer in the program, it is OFF when one of the conditional contacts is OFF.
7. When the timer is switched from ON to OFF and the conditional contact is ON, the timer is reset and counts again.
8. When the instruction TMR is executed, the specified timer coil is ON and the timer begins to count. As the value of the timer matches the setting value (value of the timer $\geqq$ setting value), the state of the contact is ON.

A. General-purpose timer

When the instruction TMR is executed, the general-purpose timer begins to count. As the value of the timer matches the setting value, the output coil is ON.

- When X0.0=ON and the timer takes 100ms as the timing unit, the output coil T0 will be ON, when the value of the timer = setting value100.
- When X0.0=OFF or the power is off, the value of the timer is 0 and the output coil T0 will be OFF.

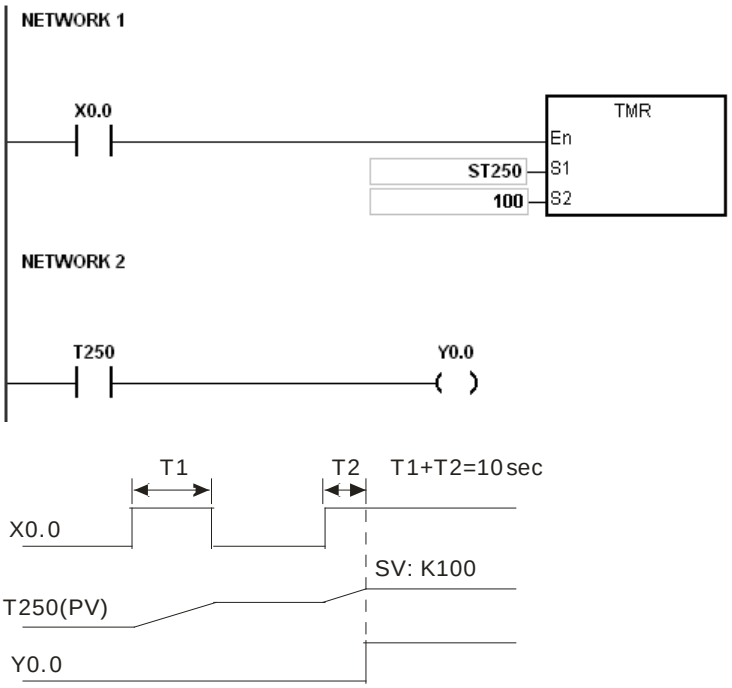




B. Accumulative timer

When the instruction TMR is executed, the accumulative timer begins to count. As the value of the timer matches the setting value, the output coil is ON. As long as users add the letter S in front of the letter T, the timer becomes the accumulative timer. When the conditional contact is OFF, the value of the accumulative timer is not reset. When the conditional contact is ON, the timer will count from the current value.

- When X0.0=ON and the timer T250 takes 100ms as the timing unit, the output coil T250 will be ON, when the value of the timer = setting value100.
- When X0.0=OFF or the power is off, the timer T250 stops counting, and the value of the timer stays the same. When X0.0=ON, the vaule of the timer will be accumulated and when the accumulated value = setting value 100, the output coil T250 will be ON.



C. Timer used in the function block

T412~T511 are the timers which users can use in the functional block or the interrupt.

When the instruction TMR or END is executed, the timer used in the functional block begins to count. As the value of the timer matches the setting value, the output coil is ON.

If the general-purpose timer is used in the functional block or the interrupt, and the functional is not executed, the timer can not count correctly.

5.2.10 Counters

- Characteristics of the 16-bit counter

Item	16-bit counter
Type	General type
Number	C0~C511
Direction	Counting up
Setting value	0~32,767
Specification of the setting value	The setting value can be either the constant or the value in the data register.
Change of the current value	The counter stops counting when the value of the counter matches the setting value.

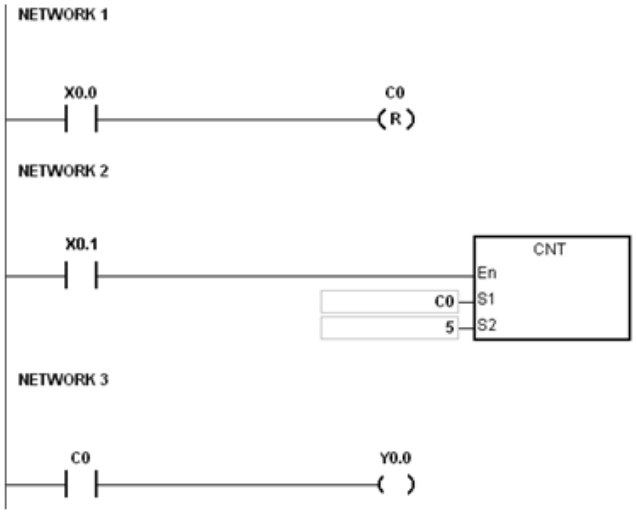
Item	16-bit counter
Output contact	The contact is ON when the value of the counter matches the setting value.
Reset	When the instruction RST is executed, the current value is cleared to zero, and the contact is reset of OFF.
Action of the contact	After the scan is complete, the contact acts.

- Function of the counter

  Each time the input switches from OFF to ON, the value of the counter is the same as the output coil. Users can use either the decimal constant or the value in the data register as the setting value.

16-bit counter:

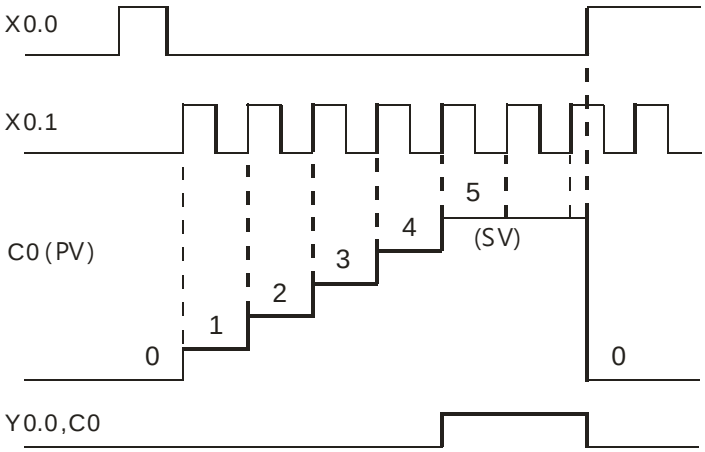
1. Setting range: 0~32,767 (The setting values 0 and 1 mean the same thing in that the output contact is ON when the counter counts for the first time.)
2. For the general-purpose counter, the current value of the counter is cleared when there is a power cut. If the counter is the latched one, the current value of the counter and the state of the contact before the power cut will be retained. The latched counter counts from the current value when the power supply is restored.
3. If users use the instruction MOV or ISPSoft to transmit a value bigger than the setting value to the current value register C0, the contact of the counter C0 will be ON and the current value will become the same as the setting value next time X0.1 is switched from OFF to ON.
4. Users can use either the constant or the value in the data register as the setting value of the counter.
5. The setting value of the counter can be a positive or a negative. If the counter counts up from 32,767, the next current value becomes 0.



1. When X0.0=ON, the instruction RST will be executed and the current value of C0 will be reset to zero and the output contact of the counter C0 will be FF.

2. When X0.1 is from OFF to ON, the value of the counter increases by one increment.

3. When the value of the the counter C0 reached the setting vaule 5, the contact of the counter C0 will be ON (the current value of C0 = the setting value = 5). After that the trigger from X0.1 will not be accepted by C0 and the current value of C0 will stay at the value 5.



5.2.11 32-bit Counters (HC)

- Characteristics of the 32-bit counter

Item	32-bit counter		
Type	Up/down counter	Up counter	High-speed counter
Number	HC0 ~ HC63	HC64 ~ HC199	HC200 ~ HC255
Direction	Counting up/down	Counting up	Counting up/down
Setting value	-2,147,483,648~+2,147,483,647		
Specification of the setting value	The setting value can be either the constant or the value occupying two data registers (32-bit).		
Change of the current value	The counter keeps counting even after the value of the counter matches the setting value.		
Output contact	The contact is ON when the value of the addition counter matches the setting value. The contact is reset to OFF when the value of the subtraction counter matches the setting value.		
Reset	When the instruction RST is executed, the current value is cleared to zero, and the contact is reset to OFF.		
Action of the contact	After the instruction DCNT scan is complete, the contact acts.		

- 32-bit general-purpose addition/subtraction counter

  1. Setting range: -2,147,483,648~2,147,483,647

  2. The switch between the 32-bit general-purpose addition counters and the 32-bit general-purpose subtraction counters depends on the states of the special auxiliary relays SM621~SM684. For example, the counter HC0 is the addition counter when SM621 is OFF, whereas HC0 is the subtraction counter when SM621 is ON.

  3. Users can use either the constant or the value in the data registers as the setting value of the counter, and the setting value can be a positive or a negative. If users use the value in the data registers as the setting value of the counter, the setting value occupies two consecutive registers.

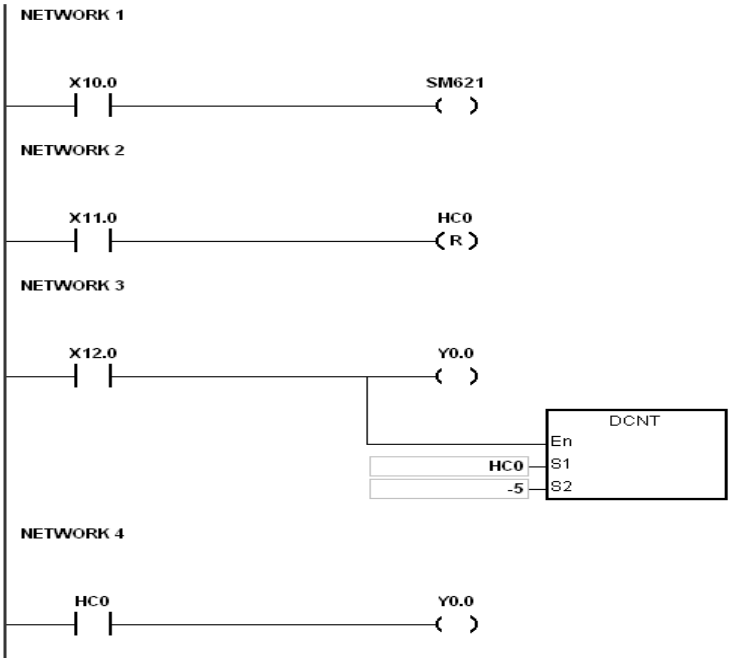
  4. For the general-purpose counter, the current value of the counter is cleared when there is a power cut. If the counter is the latched one, the current value of the counter and the state of the contact before the power cut will be retained. The latched counter counts from the current value when the power supply is restored.

  5. If the counter counts up from 2,147,483,647, the next current value becomes -2,147,483,648. If the counter counts down from -2,147,483,648, the next current value becomes 2,147,483,647.

- 32-bit high speed addition/subtraction counter

Please refer to the instruction description of API1004 DCNT in AS Series Programming Manual for more details.

Example:



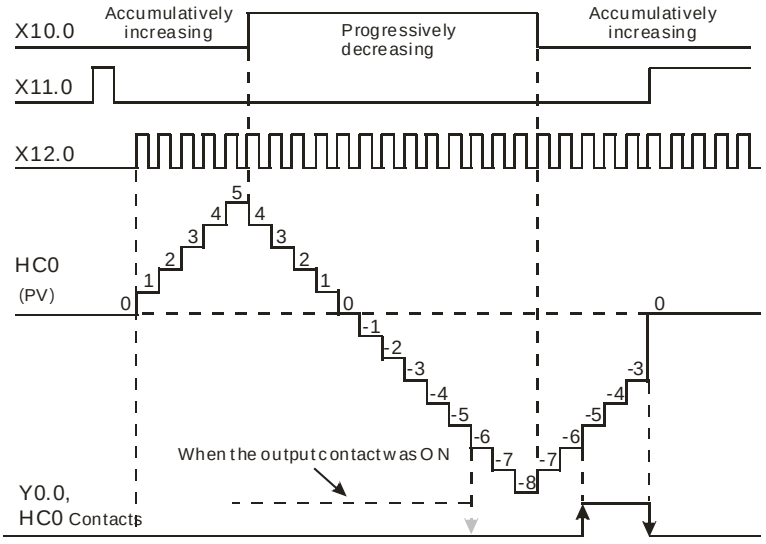
1. X10.0 drives SM621 to determine counting direction (up/down) of HC0.

2. When X11.0 goes from OFF to ON, RST instruction will be executed and the PV in HC0 will be cleared to 0 and its contact is OFF.

3. When X12.0 goes from OFF to ON, PV of HC0 will count up (plus 1) or count down (minus 1).

4. When PV in HC0 changes from -6 to -5, the contact HC0 will go from OFF to ON. When PV in HC0 changes from -5 to -6, the contact HC0 will go from ON to OFF.

5. If MOV instruction is applied through ISPSoft to designate a value bigger than SV to the PV register of HC0, next time when X12.0 goes from OFF to ON, the contact HC0 will be ON and PV of HC0 will equal SV.



5.2.12 Data Registers (D)

The data register stores the 16-bit data. The highest bit represents either a positive sign or a negative sign, and the values which can be stored in the data registers range from -32,768 to +32,767. Two 16-bit registers can be combined into a 32-bit register, i.e. (D+1, D) in which the register whose number is smaller represents the low 16 bits. The highest bit represents either a positive sign or a negative sign, and the values which can be stored in the data registers range from -2,147,483,648 to +2,147,483,647. Besides, four 16-bit registers can be combined into a 64-bit register, i.e. (D+3, D+2, D+1, D) in which the register whose number is smaller represents the lower 16 bits. The highest bit represents either a positive sign or a negative sign, and the values which can be stored in the data registers range from -9,223,372,036,854,776 to +9,223,372,036,854,775,807. The data registers can also be used to refresh the values in the control registers in the modules other than digital I/O modules. Please refer to ISPSoft User Manual for more information regarding refreshing the values in the control registers.

The registers can be classified into two types according to their properties.

1. General-purpose register: When the PLC begins to run, or is disconnected, the value in the register will be cleared to zero. If users want to retain the data when the PLC begins to RUN, they can refer to ISPSoft User Manual for more information. Please notice that the value will still be cleared to zero when the PLC is disconnected.

2. Latched register: If the PLC is disconnected, the data in the latched register will not be cleared. In other words, the value before the disconnection is still retained. If users want to clear the data in the latched area, they can use RST or ZRST.

5.2.13 Special Data Registers (SR)

Every special data register has its definition and specific function. Please refer to section 2.2.14 in AS Series Programming Manual for more information.

5.2.14 Index Register (E)

The index register is the 16-bit data register. It is like the general register in that the data can be read from it and written into it. However, it is mainly used as the index register. The range of index registers is E0~E9. Please refer to section 4.4 in AS Series Programming Manual for more information about the usage of index registers.

5.2.15 File Registers (FR)

AS series PLC provides users with File Registers for storing larger amount of parameters. Users can edit, upload, download the system parameters via ISPSoft. The values in FR can be read while operating the PLC. Please refer to API2303 MEMW in AS Series programming manual for more information about how to write in FR.

MEMO

6

Chapter 6 Writing a Program

Table of Contents

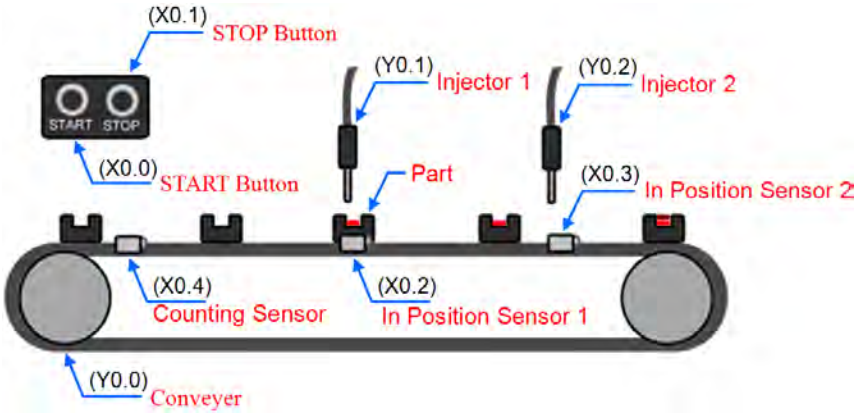
6.1 Quick Start

The chapter provides a simple example, and leads users to create a traditional ladder diagram in ISPSoft in a short time. However, in order to help users who are not familiar with IEC 61131-3 understand the functions provided by ISPSoft, and create a traditional ladder diagram, programming concepts related to IEC 61131-3 are not introduced in this chapter. For example, POUs, function blocks, variables, and etc. are not introduced.

6.1.1 Example

When the equipment operates, the parts on the conveyer are conveyed from left to right. If a sensor senses that a part is under an injector, the PLC will send a trigger signal to the injector, and the injector will injects the glue. How long the part will be injected is set externally, and is not controlled by the program in the PLC. However, the program in the PLC must be able to turn the trigger signal OFF so that the trigger signal can be sent next time. There are two injectors above the conveyer, and the two injectors inject glue in the same way.

Besides, there is a sensor at the left side of the conveyer. When a part passes the sensor, the sensor value increases by one increment. If the sensor value is 100, the internal completion flag will be set to ON. The state of the flag can be used by other procedures later. However, the use of the state of the flag is not introduced in this example.



6.1.2 Hardware

In this example, the AS series CPU module used is **AS332T-A**.

Type	ID	Description
Digital input	X0.0	START button
Digital input	X0.1	STOP button
Digital input	X0.2	In position sensor 1
Digital input	X0.3	In position sensor 2
Digital input	X0.4	Counting sensor
Digital output	Y0.0	Conveyer

Type	ID	Description
Digital output	Y0.1	Trigger signal for injector 1
Digital output	Y0.2	Trigger signal for injector 2

6.1.3 Program

(1) When the START button (X0.0) is turned from OFF to ON, the internal operation flag is set to ON, and the conveyer (Y0.0) starts to run. When the STOP button (X0.1) is turned from OFF to ON, an error occurs (the error flag is ON), the operation flag is reset to OFF, and the conveyer stops running.

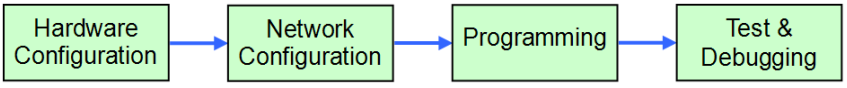
(2) When in position sensor 1 (X0.2) is ON, the trigger signal for injector 1 (Y0.1) is set to ON. When in position sensor 1 is OFF, the trigger signal for injector 1 is reset to OFF.

(3) When in position sensor 2 (X0.3) is ON, the trigger signal for injector 2 (Y0.2) is set to ON. When in position sensor 2 is OFF, the trigger signal for injector 2 is reset to OFF.

(4) When the counting sensor (X0.4) is turned from OFF to ON, the sensor value increases by one increment. If the sensor value is larger than or equal to 100, the internal completion flag will be set to ON.

6.2 Procedure for Creating a Project in ISPSoft

The procedure for creating a project in ISPSoft is as follow. Users can adjust the procedure according to the practical application and their habits.



- **Hardware configuration**

  Users can set the parameters such as a range of latched devices and a port number in a PLC. Besides, the users have to configure modules used with an AS300 series CPU module, and set the parameters in these modules.

- **Network configuration**

  If a system used adopts network architecture, or devices need to exchange data, users can use the network configuration tool **NWCONFIG** in ISPSoft to configure a network and exchange data via COM as well as Ethernet.

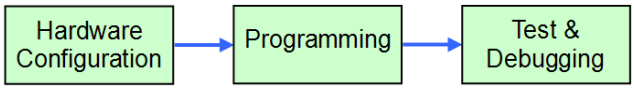
- **Programming**

  After users write a program in ISPSoft, they can compile the program. If the compiling of a program is unsuccessful, the messages in the **Compile Message** page can lead users to the places where errors occur to check the program code.

- **Test and debugging**

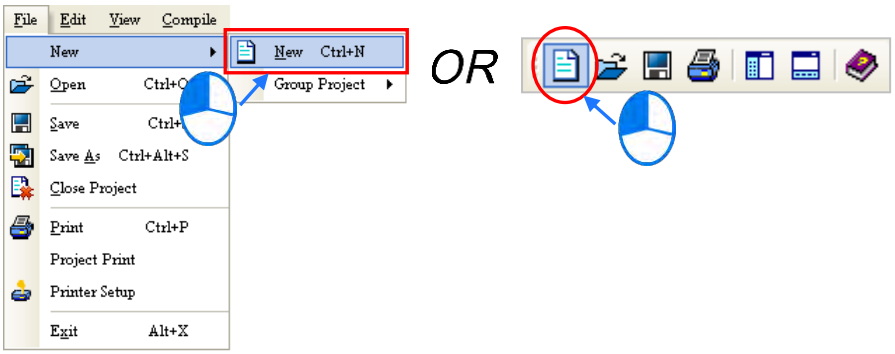
  Users can download a program which is compiled, a hardware configuration, and a network configuration to a PLC. Besides, the users can test and debug the program online by means of the functions provided by ISPSoft.

Owing to the fact that the example introduced in this chapter does not discuss a network configuration, only the following procedure is carried out. The procedure will be introduced in the following section.

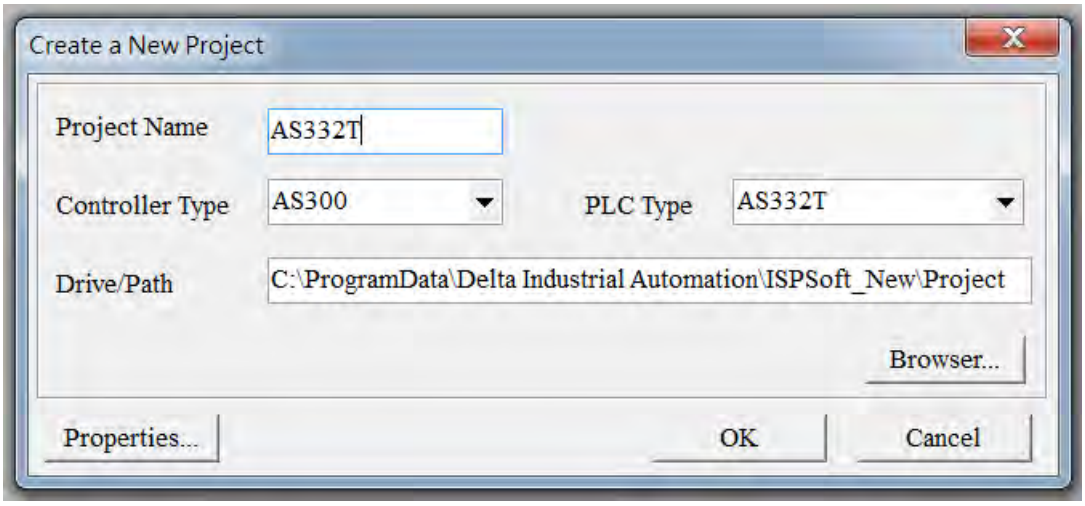


6.3 Creating a Project

After ISPSoft is started, users can click the **File** menu, point to **New**, and click **New** to create a new project. They can also create a new project by clicking on the toolbar after ISPSoft is started.

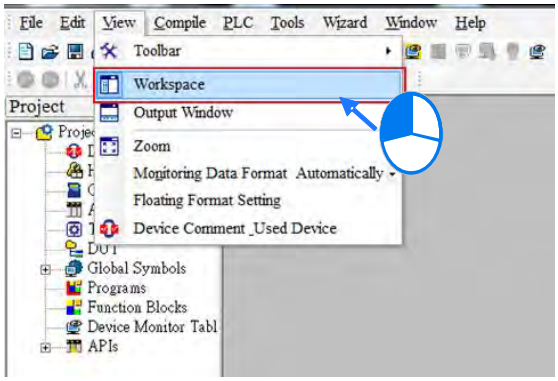


In the **Create a New Project** window, type a project name in the **Project Name** box and a path in the **Drive/Path** box, select a PLC in the **PLC Type** drop-down list box, and click **OK**. (The PLC used in this example is AS332T.)



After the project is created successfully, a project management area will appear at the left side of the main screen. The relation between the items listed in the project management area is represented by a hierarchical

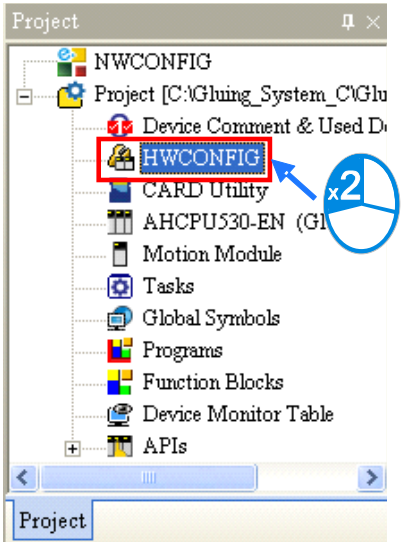
tree structure. If the project management area does not appear, the users can click **Workspace** on the **View** menu, or click  on the toolbar.



OR

6.4 Hardware Configuration

After users double-click **HWCONFIG** in the project management area, the **HWCONFIG** window will appear.

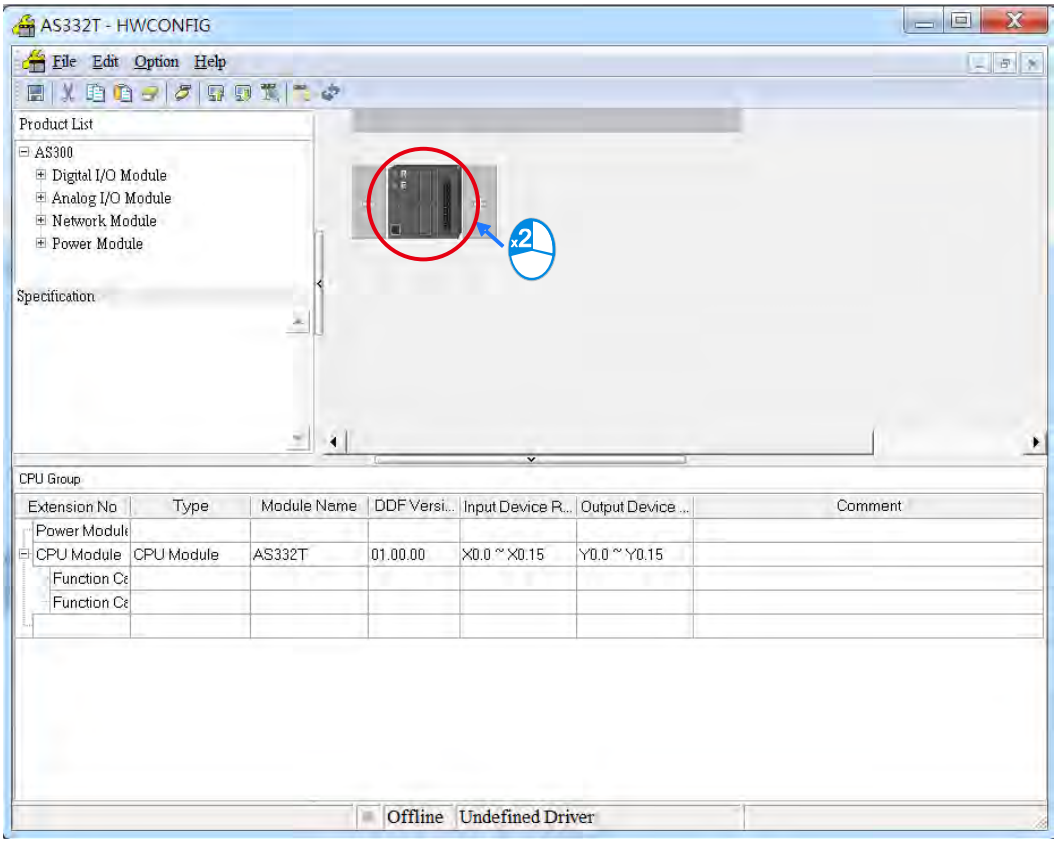


6.4.1 Configuring a Module

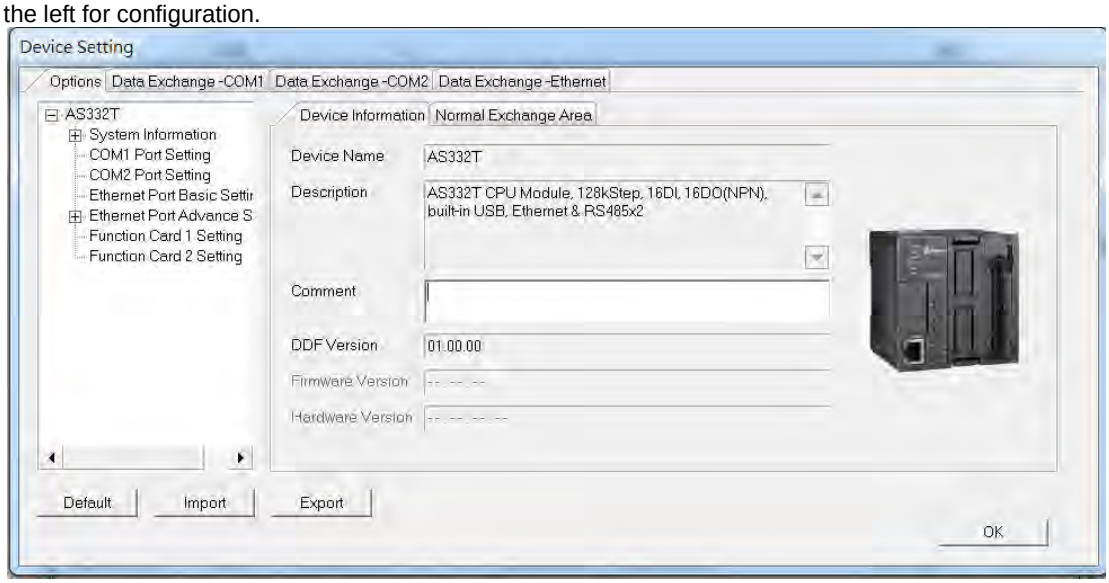
In the **HWCONFIG** window, the default setting is with a CPU module. For the additions of modules or setups, please refer to chapter 8 for more information.

6.4.2 Setting the Parameters

After the users double-click the CPU module or the extension module, the **Device Setting** window will appear with the information related to the module.



Users can select the setting tabs for specific setups at the top of the window and then select the setting items on the left for configuration.



The hardware configuration is complete. The configuration and the setting must be downloaded to the CPU module so that they can take effect. The configuration and the setting are saved here, and will be downloaded with the program in the project later.

If the users want to save the configuration and the setting, they can click **Save** on the **File** menu, or  on the toolbar. After the configuration and the setting are saved, the users can close the **HWCONFIG** window.

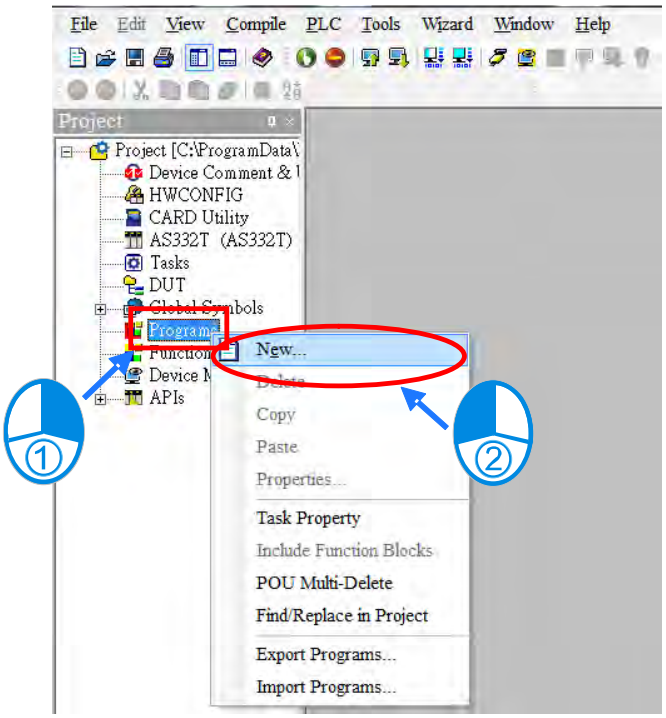
***. Please refer to chapter 8 for more information about HWCONFIG.**

6.5 Creating a Program

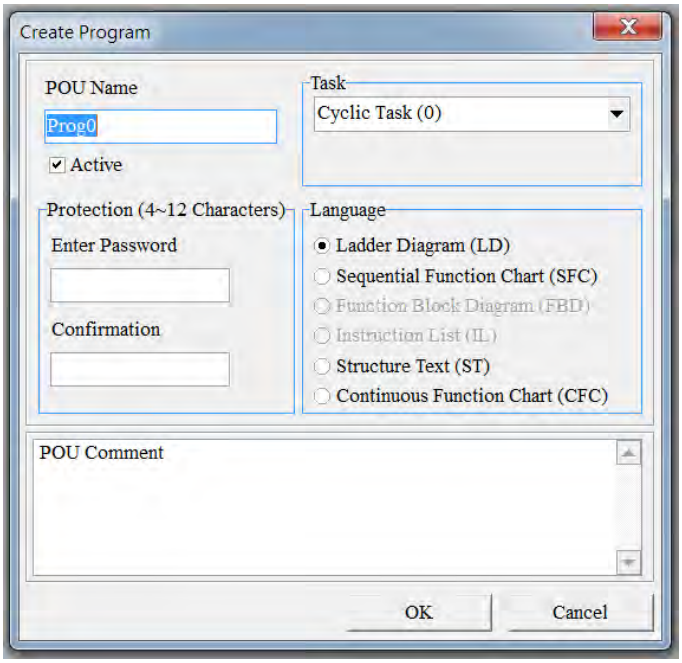
The following sections will show users how to create a traditional ladder diagram in ISPSoft. The contents of the following sections include creating a POU, editing a traditional diagram, and compiling a program. The users are expected to equip themselves with the basic abilities to create a traditional ladder diagram in a short time.

6.5.1 Adding a Ladder Diagram

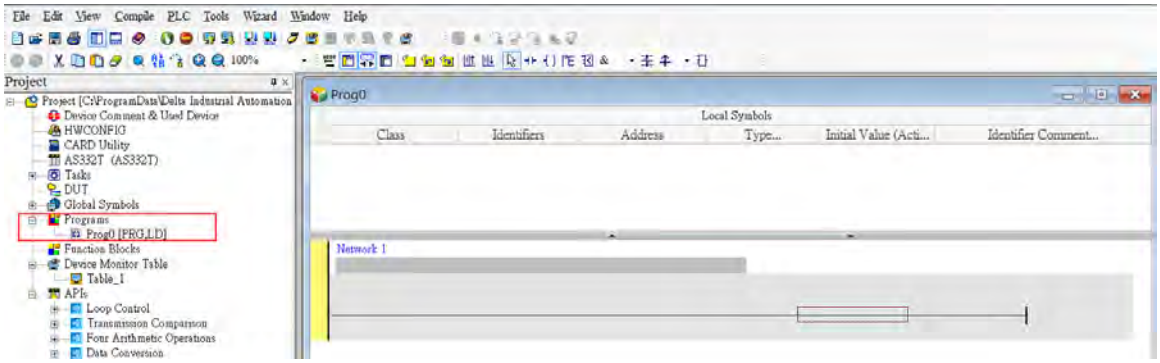
(1) Right-click **Programs** in the project management area, point to **POU** on the context menu, and click **New…**.

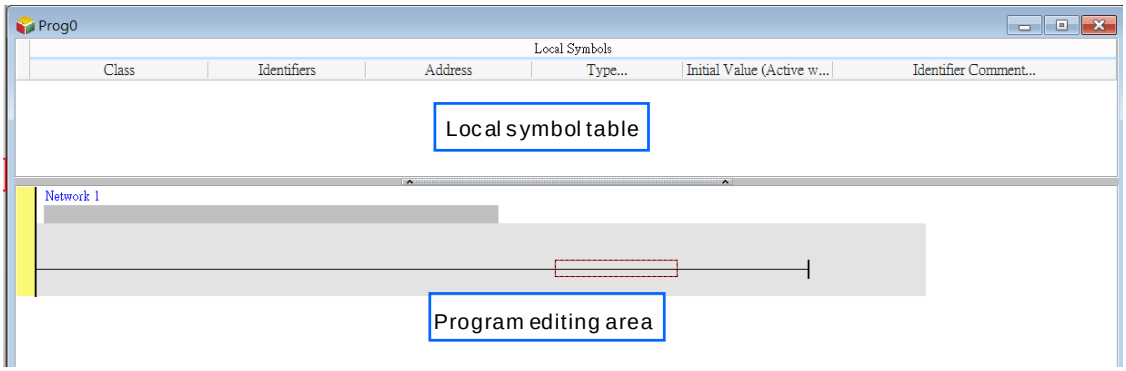


(2) Type a program name in the **POU Name** box, select the **Ladder Diagram (LD)** option button in the **Language** section, and retain the other default values. Click **OK** after the setting is complete. An item will be under **Programs** in the project management area. The item is a program organization unit (POU).



(3) After the POU is added, a program editing window will appear in the main working area.





After the program editing window is opened, the corresponding toolbar will appear in the window. The functions are described below.

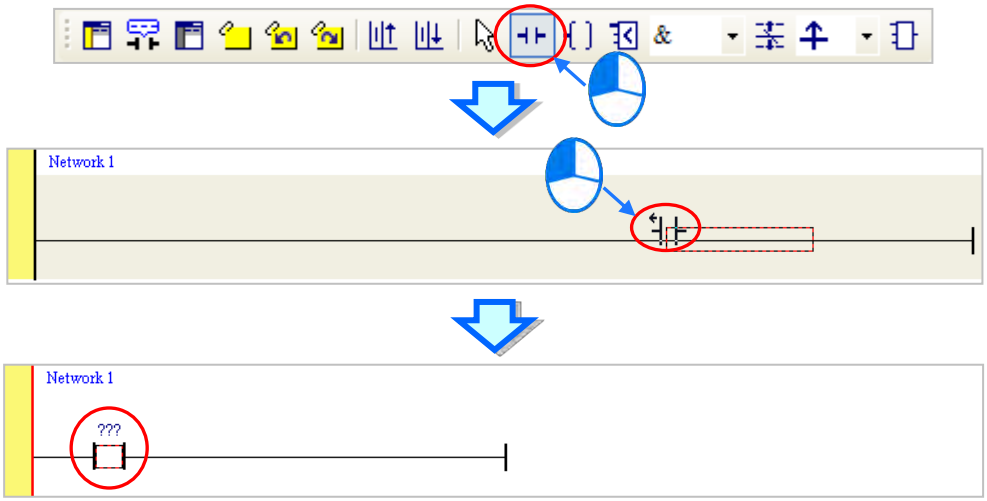
Icon	Keyboard shortcut	Function
	Shift+Ctrl+C	Displaying/Hiding the comments on the networks
	None	Displaying/Hiding the commands on the devices
	Shift+Ctrl+A	Activating/Inactivating the network selected
	Shift+Ctrl+B	Adding a bookmark to the network selected or deleting a bookmark from the network selected
	Shift+Ctrl+P	Going to the previous bookmarked position
	Shift+Ctrl+N	Going to the next bookmarked position
	Ctrl+I	Putting a network above the network selected
	Shift+Ctrl+I	Putting a network under the network selected
	ESC	Selection
	Typing an instruction	Inserting a contact
	Typing an instruction	Inserting a coil
	Typing an instruction	Inserting a comparison contact
&	Typing an instruction	Selecting a type of comparison contact
	Typing an instruction	Inserting a block logic instruction (NP/PN/INV/FB_NP/FB_PN)
	Typing an instruction	Selecting a type of block logic instruction (NP/PN/INV/FB_NP/FB_PN)
	Shift+Ctrl+U	Inserting an instruction or a function block

***. Please refer to section 6.5.3 for more information about typing an instruction.**

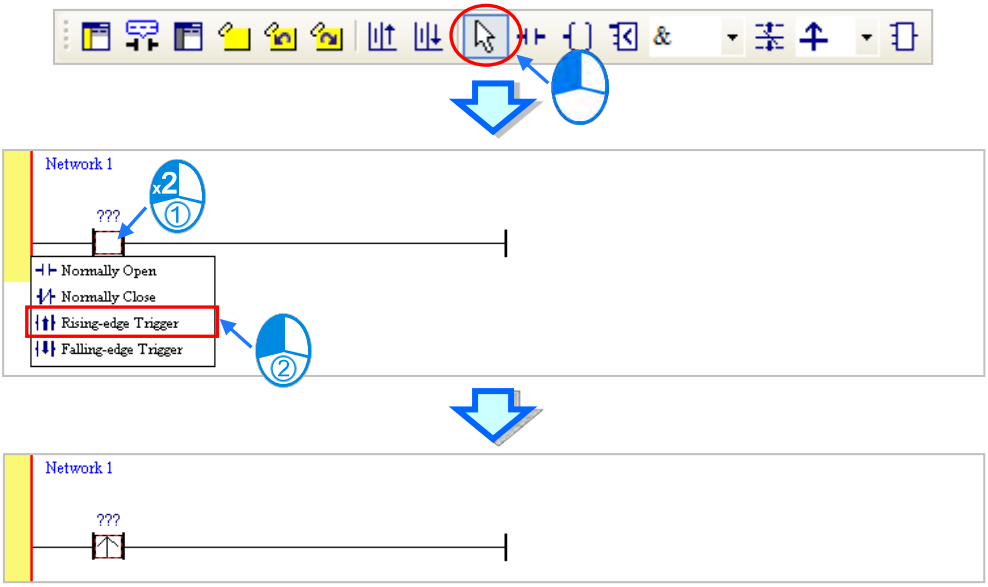
6.5.2 Basic Editing – Creating a Contact and a Coil

(1) Click on the toolbar, and then move the mouse cursor to the red frame in network 1. The mouse cursor appears as a contact when the mouse cursor is moved to the left side of the red frame, the right side of the red frame, or the bottom of the red frame. Users can decide where to insert a contact. If a ladder diagram is edited, the mouse cursor must be near a position which is edited. Besides, an object inserted is arranged by the system automatically. Users can not move the object at will.

In this example, users do not need to decide where to insert the contact. Therefore, the mouse cursor can be near the red frame, and the users can click the left mouse button.

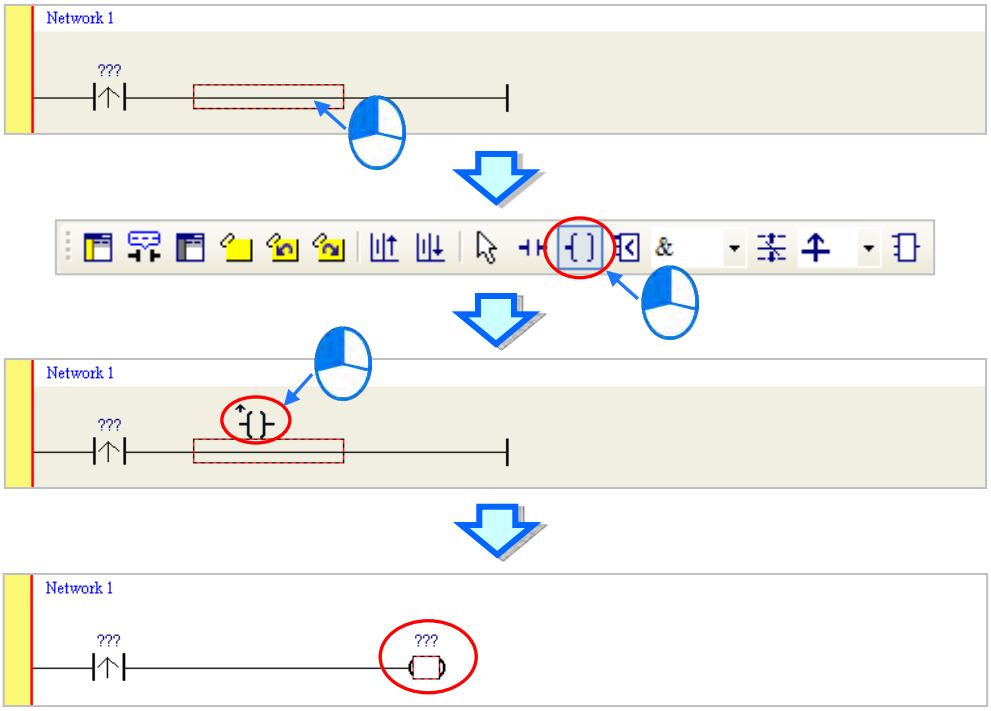


(2) Click  on the toolbar, or press Esc on the keyboard. After the contact is double-clicked, a drop-down list will appear. The items on the drop-down list are **Normally Open**, **Normally Close**, **Rising-edge Trigger**, and **Falling-edge Trigger**. In this example, **Rising-edge Trigger** is selected.

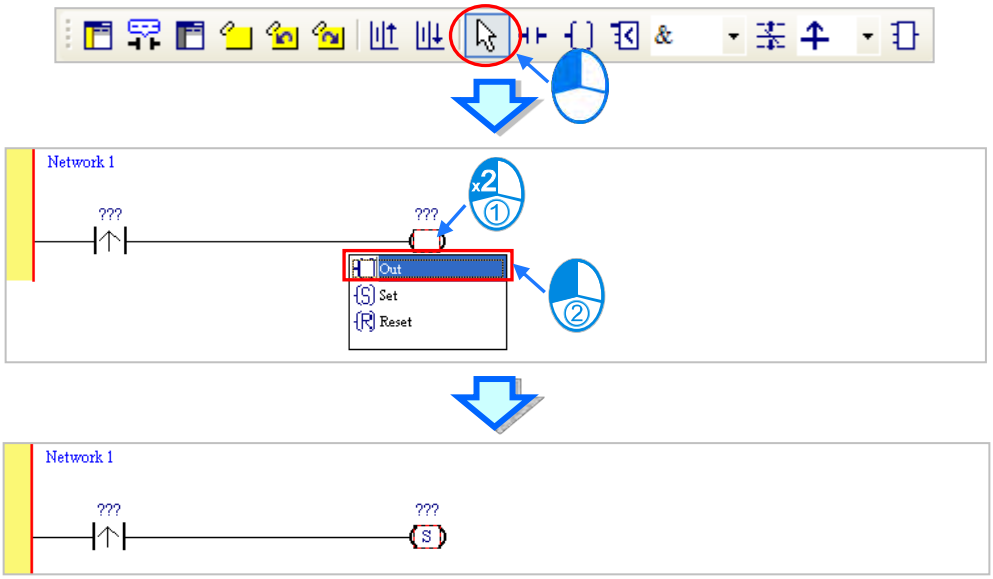


(3) Click the line at the right side of the contact, click  on the toolbar, and move the mouse cursor to the red frame. Likewise, the mouse cursor appears as a coil when the mouse cursor is above or under the red frame. Users can decide where to insert the coil.

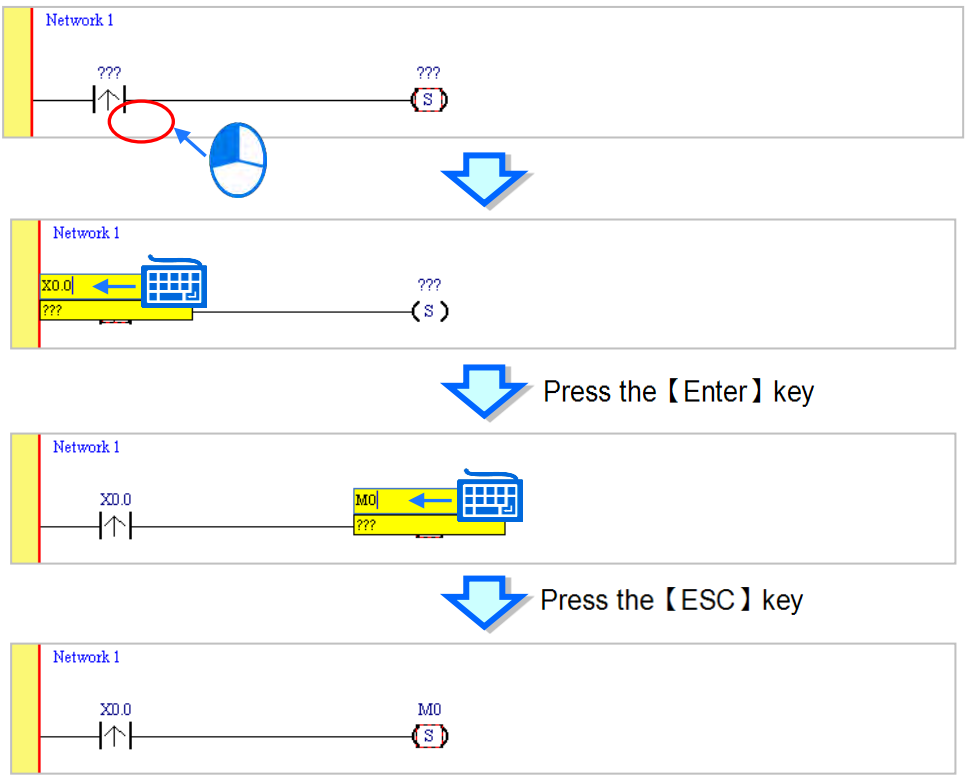
In this example, the users do not need to decide where to insert the coil. Therefore, the mouse cursor can be near the red frame, and the users can click the left mouse button.



(4) Click  on the toolbar, or press Esc on the keyboard. After the coil is double-clicked, a drop-down list will appear. The items on the drop-down list are **Out**, **Set**, and **Reset**. In this example, **Set** is selected.



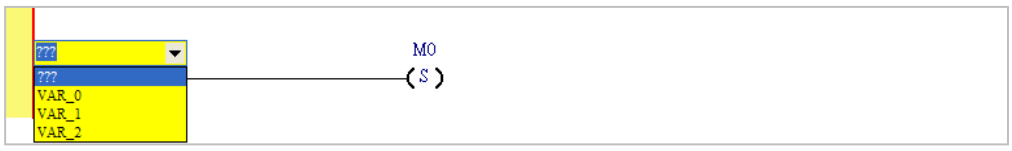
(5) Click ??? above the contact, type a device address in the box, and press Enter on the keyboard to jump to the next box in the network. After a device address is typed in the box, the users can press Esc on the keyboard to complete the editing. In this example, X0.0 is typed in the box for the contact, and M0 is typed in the box for the coil.



Additional remark

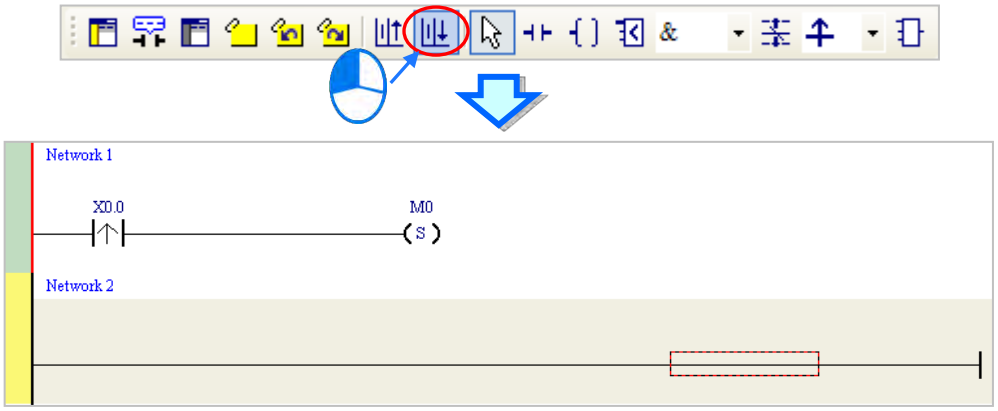
After users click a network and press Enter on the keyboard, they can edit a box. The users can edit the next box in the network after they press Enter on the keyboard. Besides, the next network is selected after the users press Tab on the keyboard. The users can edit a box with the keyboard. After the editing is complete, the users can press Enter on the keyboard to jump to the next box. If the users want to end the editing, they can press Esc on the keyboard.

If the users have declared symbols, they can click in a box, or press Page Down on the keyboard when they edit the box. The symbols on the drop-down list are the symbols which can be assigned to the object. The users can select a symbol by the mouse or the up/down key on the keyboard. Please refer to chapter 6 in ISPSoft User Manual for more information about symbols.



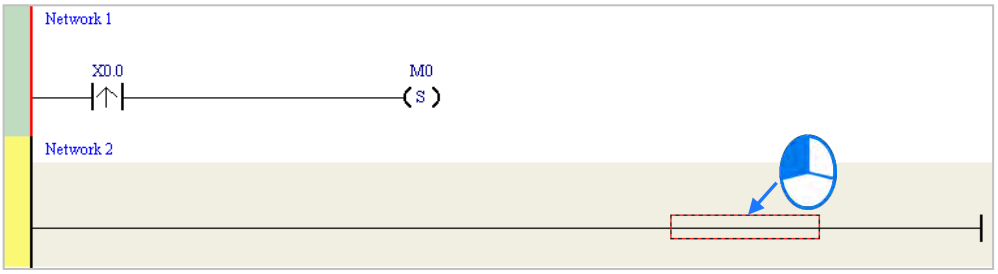
6.5.3 Basic Editing – Inserting a Network and Typing an Instruction

After on the toolbar is clicked, a network will be under the network selected. After on the toolbar is clicked, a network will be put above the network selected. In this example, a network is under network 1.

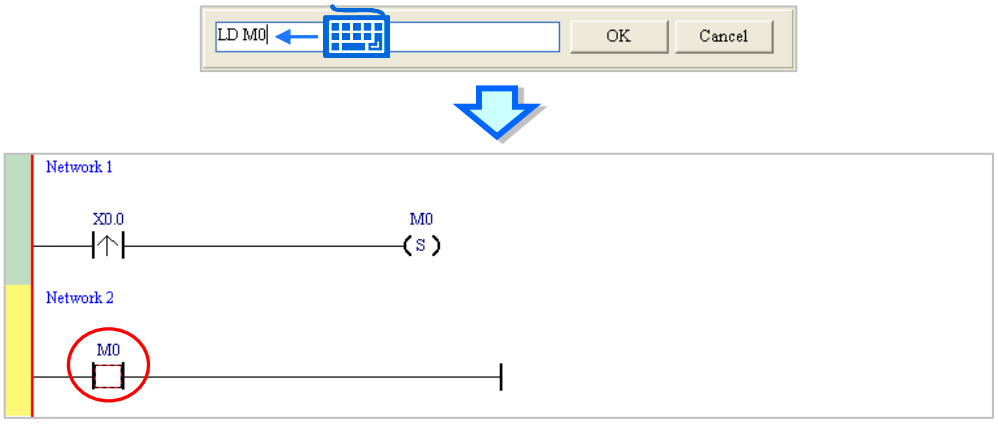


A contact and a coil can be created not only by clicking and on the toolbar, but also by typing instructions.

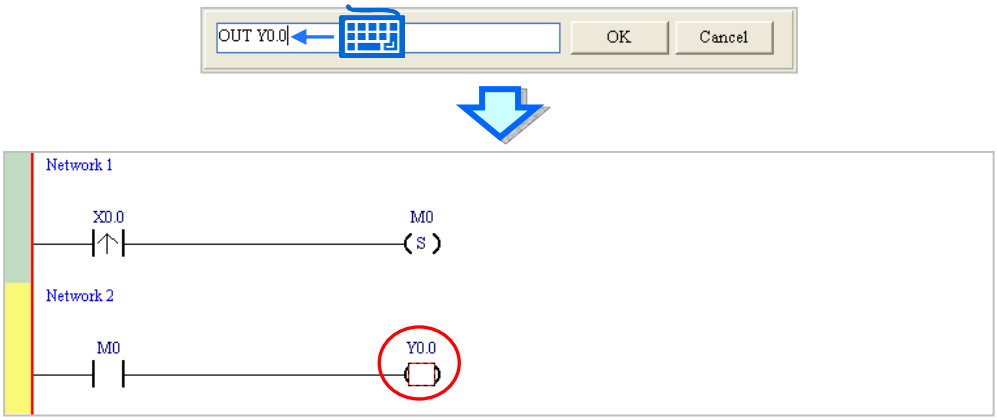
(1) Click the line in network 2.



(2) Type the IL instruction “LD M0”. (The instruction is case-insensitive.) As soon as the IL instruction is typed, a box which can be edited appears. After the typing of the IL instruction is complete, users can press Enter on the keyboard or click **OK** at the right side of the box.



(3) Type the IL instruction “OUT Y0.0”, and write the program shown below.

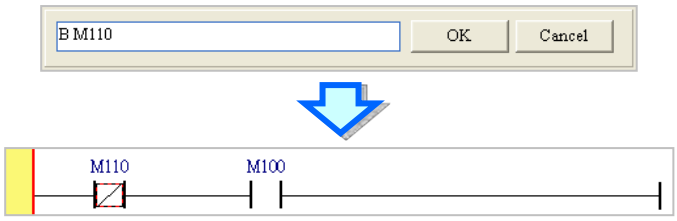


Additional remark

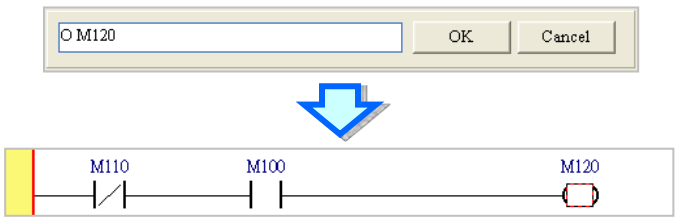
A contact and a coil can be created by typing simple instructions. Please refer to the description below. (The instructions typed are case-insensitive.)

- Inserting a normally-open contact (contact A): “A Device address”

- Inserting a normally-closed contact (contact B): “B Device address”

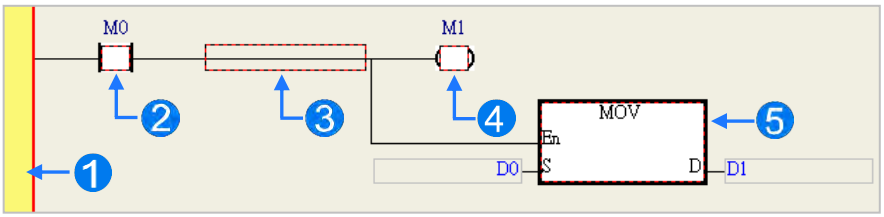


- Inserting an output coil (OUT): “O Device address”



6.5.4 Basic Editing – Selection of a Network and Operation

Before an object in a network is selected, users have to press Esc on the keyboard, or click  on the toolbar. After the cursor appears as a small arrow, the users can click the object in the network. The basic selection is shown below.



❶ Selecting the network

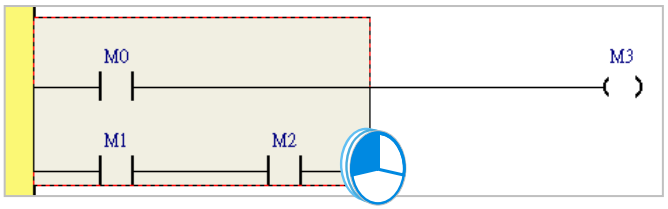
❷ Selecting the input contact

❸ Selecting the network

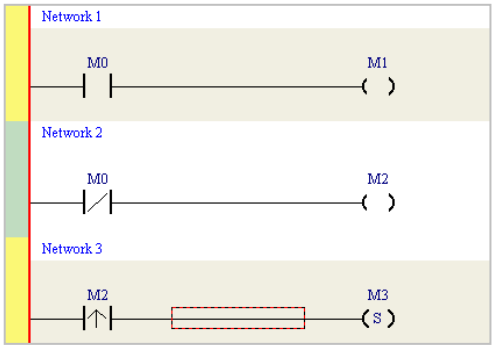
❹ Selecting the output coil

❺ Selecting the block

If users want to select a group of devices, they can click a device, and drag it to draw a frame round the group of devices. The users can also select the group of devices by clicking the first device, pressing Ctrl+B on the keyboard, clicking the last device, and pressing Ctrl+B on the keyboard. Users must draw a frame round devices which are in the same network, and the devices must be adjacent to one another. Besides, input devices and output devices can not be in the same frame.



If users want to select several networks, they can press Ctrl on the keyboard, and click the networks. The users can also select a range of networks by pressing Shift on the keyboard, clicking the first network within the range, and the last network within the range.

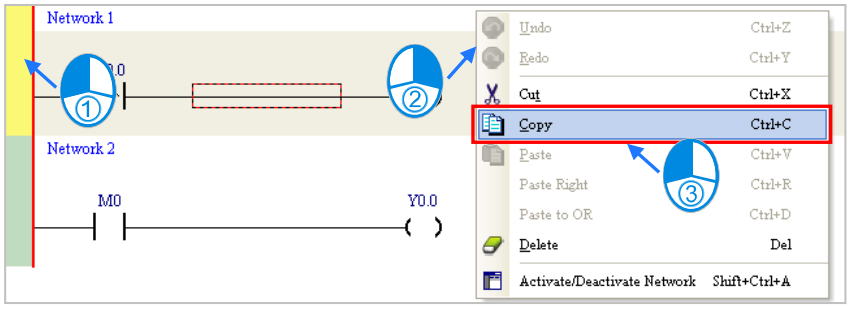


If users right-click an object after the object is clicked, they can click an item on the context menu.

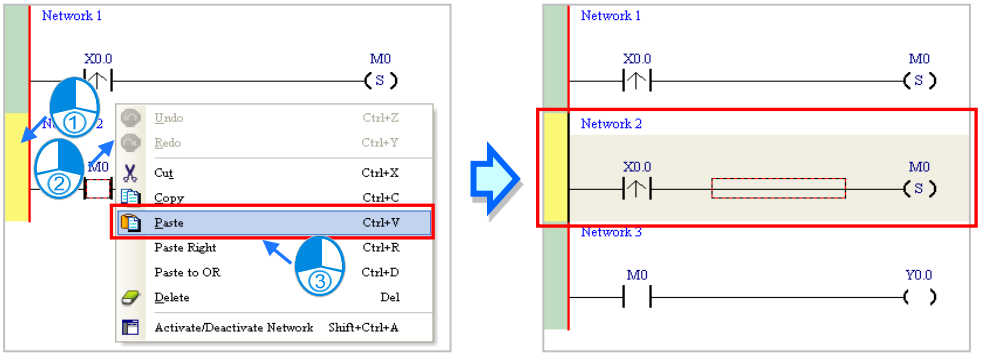
Item	Function
Undo	Undoing the last action (The number of previous actions that can be undone is 20.)
Redo	Redoing an action which has been undone
Cut	Cutting a device, a block, or a network
Copy	Copying a device, a block, or a network
Paste	Paste an object which has been copied or cut on the present position
Paste right	Pasting an object at the right side of the position selected (The object will be connected to the position selected in series.)
Paste under	Pasting an object under the position selected (The object will be connected to the position selected in parallel.)
Delete	Deleting a device, a block, or a network
Activate/Inactivate Network	Activating or Inactivating the network selected (The network which is inactivated is ignored when the program is compiled.)

Users can proceed with the operation in the example.

(1) Select network 1, right-click network 1, and click **Copy** on the context menu.

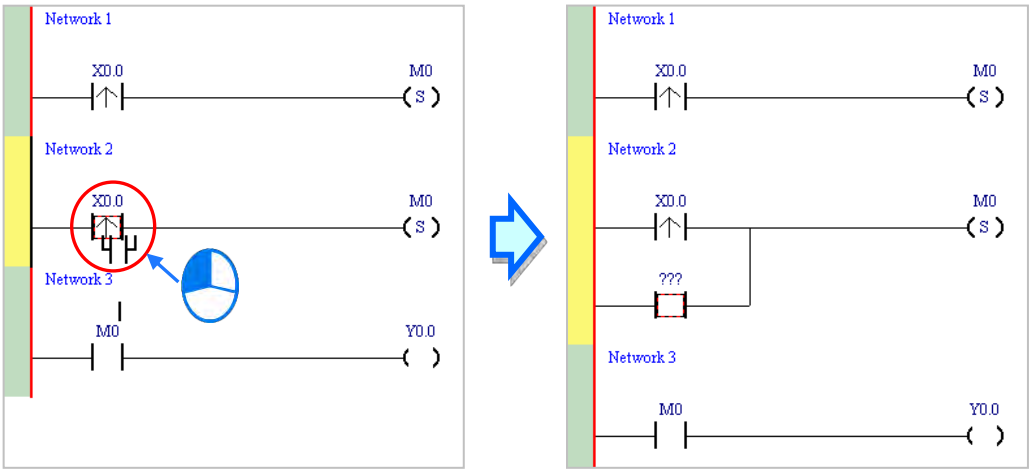


(2) Select network 2, right-click network 2, and click **Paste** on the context menu. A copy of network 1 will be put above network 2, and network 2 will become network 3.

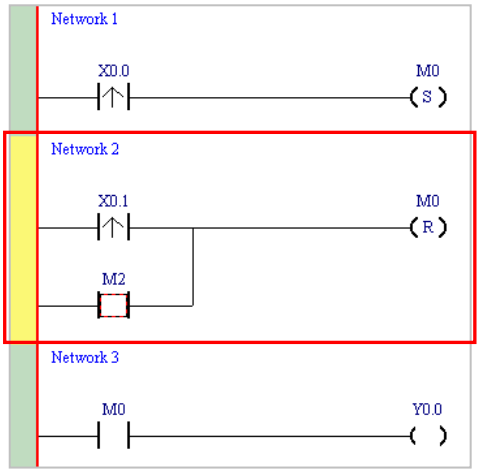


6.5.5 Basic Editing – Connecting a Contact in Parallel

(1) Click  on the toolbar, and then move the mouse cursor to the input contact in network 2. The mouse cursor will appear as a contact. Move the mouse cursor to the button of the input contact in network 2. After the mouse cursor appears as ┤├, users can click the left mouse button. A contact will be connected to the input contact in network 2 in parallel.

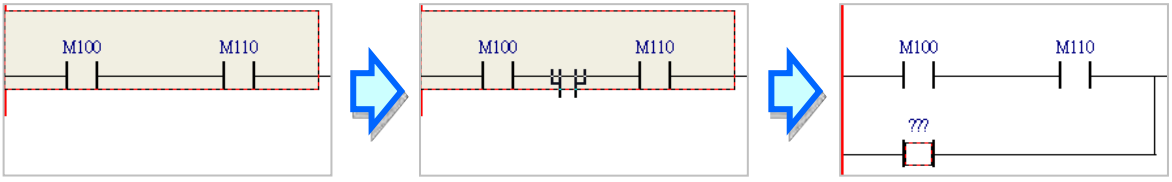


(2) Write the program in network 2 shown below in the way described above.



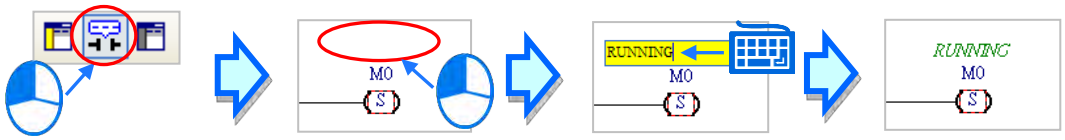
Additional remark

After users select a group of contacts, they can connect a contact to the group of contacts in the way described above.

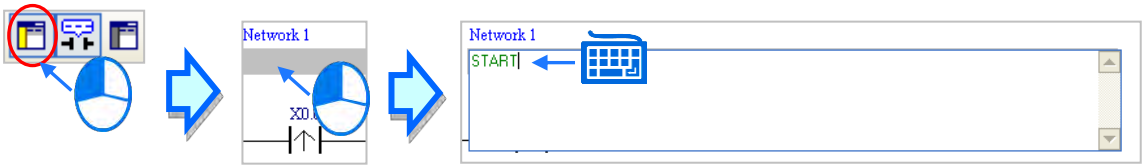


6.5.6 Basic Editing – Editing a Comment

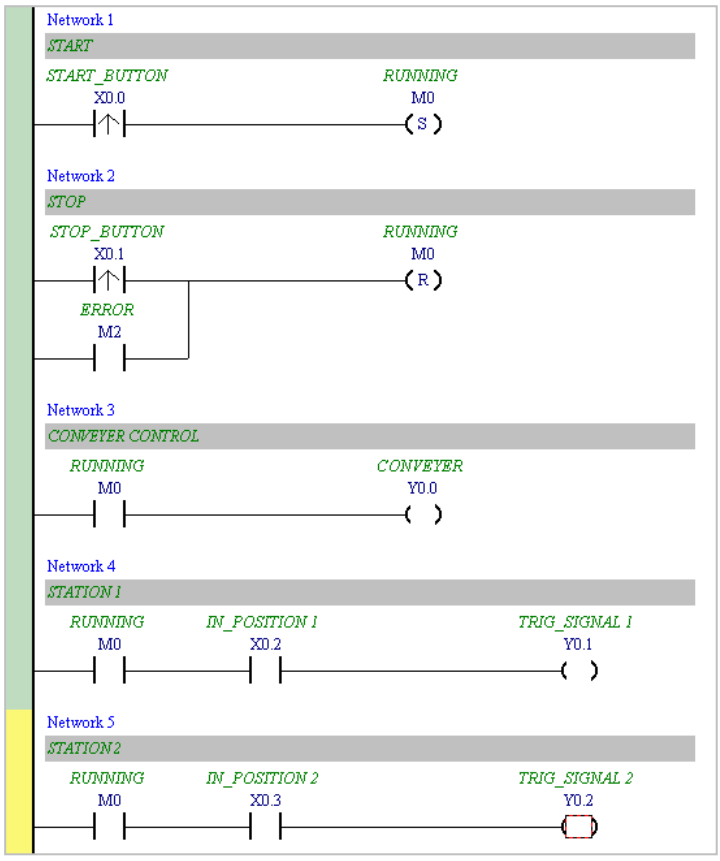
(1) Make sure that  on the toolbar is pressed. Click the position above a device name, type a comment in the box, and press Enter on the keyboard.



(2) Make sure that  on the toolbar is pressed. Click the position under a network number, and then type a comment in the box. If users want to start a new line of text at a specific point, they can press Shift+Enter on the keyboard. Press Enter on the keyboard after the editing is complete.

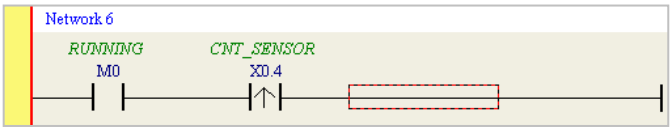


(3) Write the program shown below in the way described above.



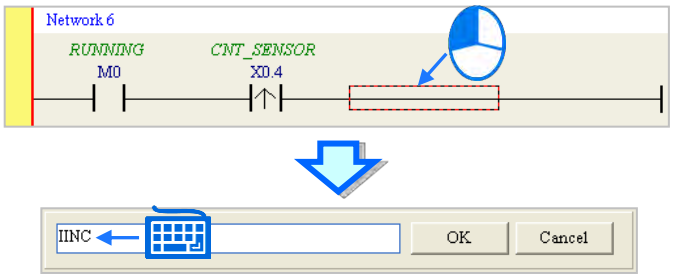
6.5.7 Basic Editing – Inserting an Applied Instruction

Put network 6 under network 5, and then write the program shown below. Users can insert an applied instruction in one of the three ways described below.



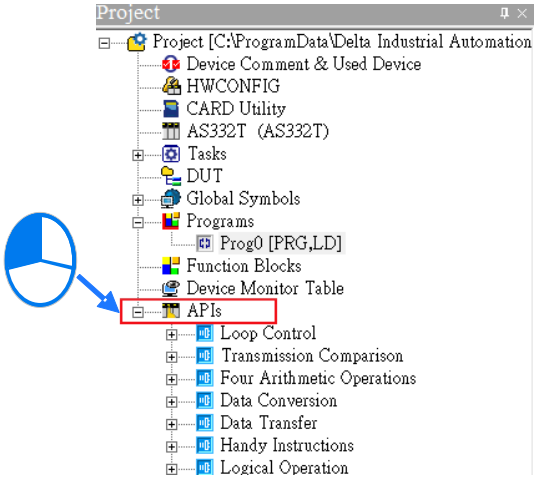
- Method 1

  Click the position where an instruction will be inserted, type the instruction (INC in this example), and press Enter on the keyboard.

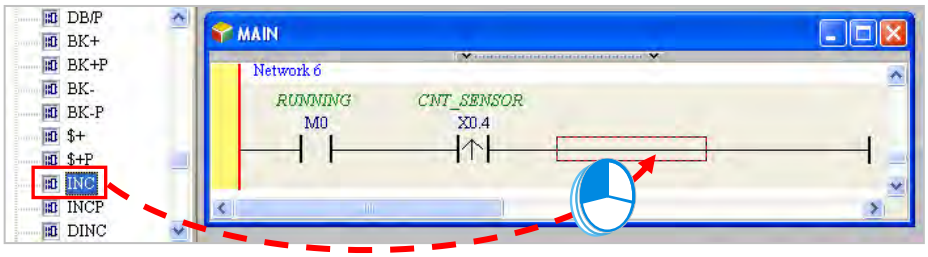


- Method 2

  Unfold the **APIs** section in the project management area, find the instruction type, and unfold the instruction type section.

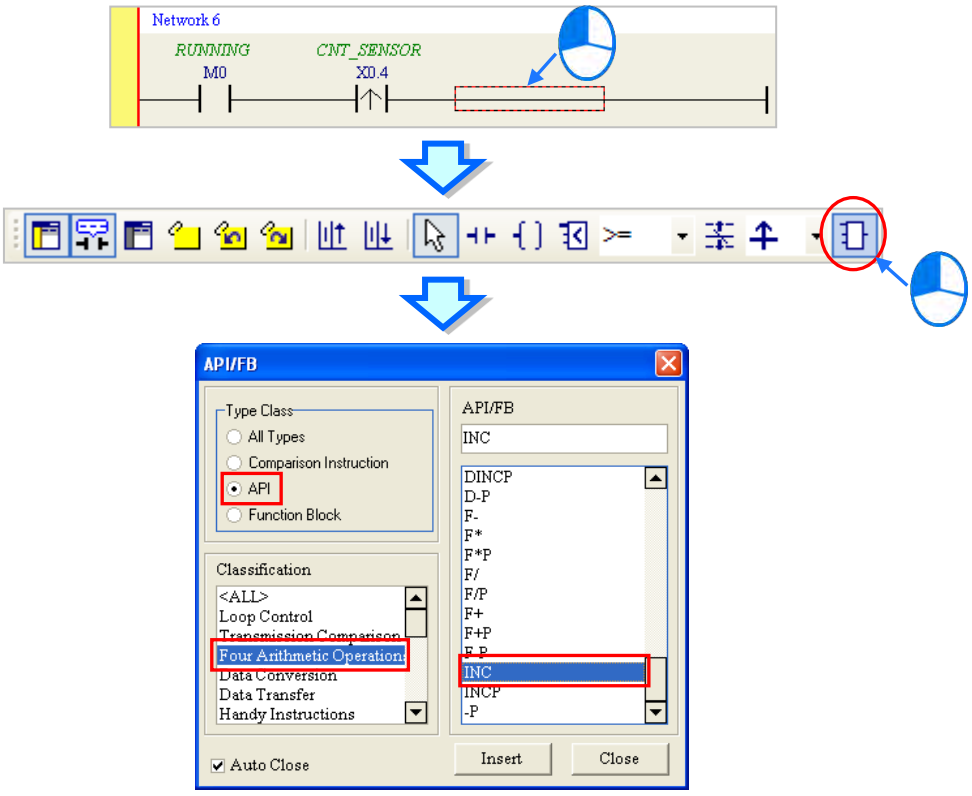


  Select the instruction (INC in this example) which will be inserted, and then drag it to the position where it will be inserted.

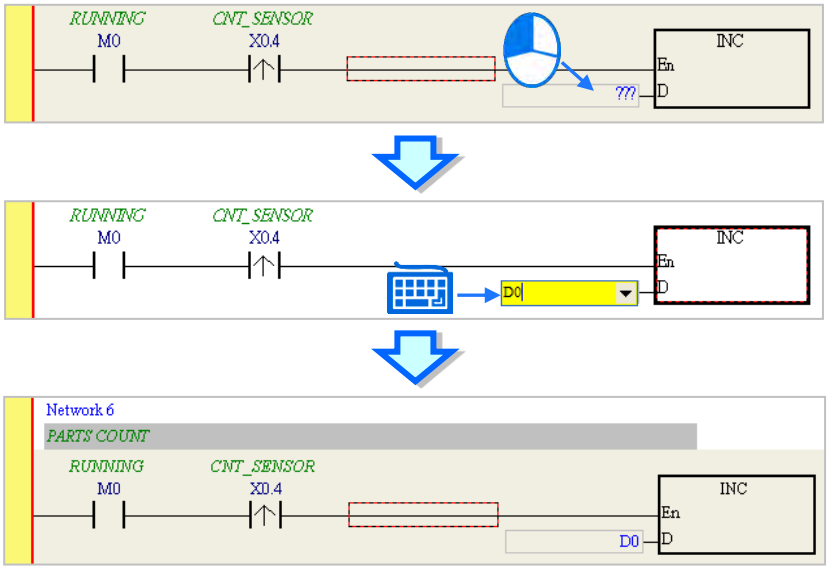


- Method 3

Click the position where an instruction will be inserted, click  on the toolbar, select the instruction (INC in this example) which will be inserted in the **API/FB** window, and click **Insert**.

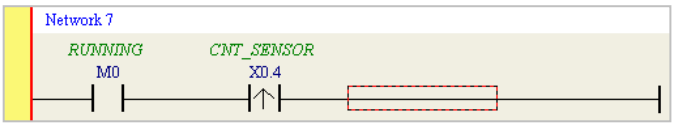


After the instruction is inserted successfully, the users can assign a device address to the operand, and write the program shown below.



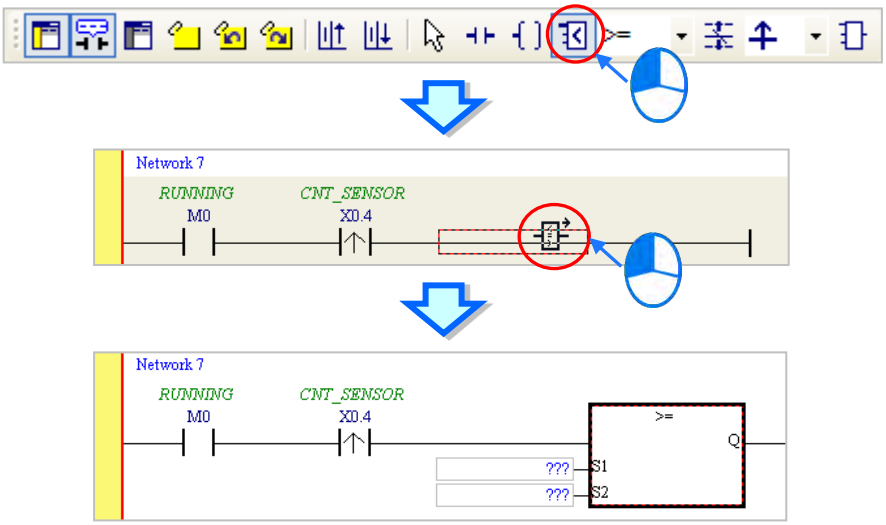
6.5.8 Basic Editing – Creating a Comparison Contact and Typing a Constant

A comparison contact can be inserted not only in one of the three ways described in section 6.5.7, but also by means of the following steps. Users need to put network 7 under network 6, and write the program shown below.

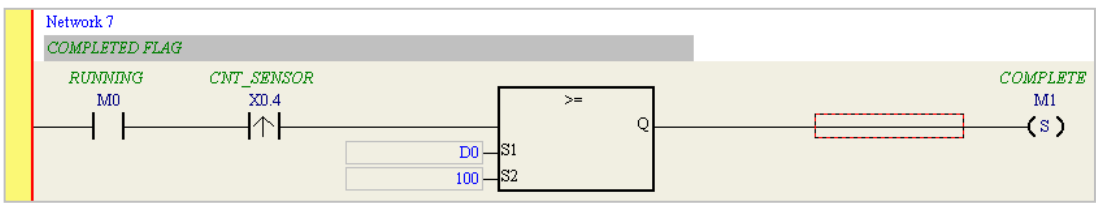


(1) Click & on the toolbar, and then select a type (>= in this example).

(2) Click on the toolbar, and then move the mouse cursor to the position where the comparison contact will be inserted. The mouse cursor appears as a comparison contact when the mosue is moved to the left side of the red frame, the right side of the red frame, or the bottom of the red frame. The users can decide where to insert the comparison contact. After the users decided on a position, they can click the left mouse button to insert the comparison contact.

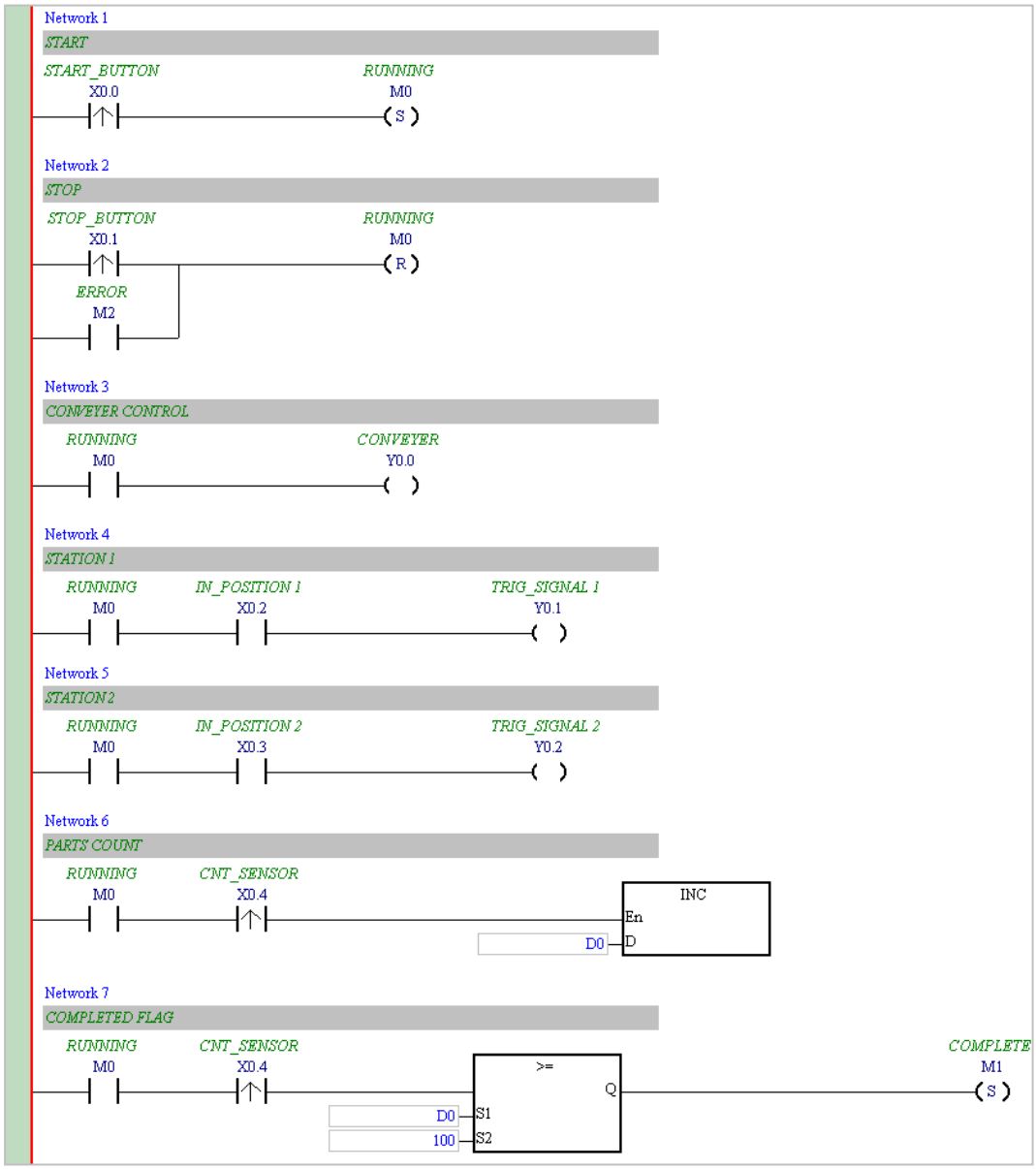


Write the program shown below in the way described above. In WPLSoft, a decimal value is preceded by K, and a hexadecimal value is preceded by H. If users want to type a decimal value in ISPSoft, they can type it directly. If users wan to type a hexadeicmal value in ISPSoft, they have to type “16#” and the hexadecimal value, e.g. 16#7FFF. In ISPSoft, an octal value is preceded by 8#, and a binary value is preceded by 2#.



6.5.9 Writing a Program

The creation of a traditional ladder diagram in ISPSoft has been introduced. Users can write the program shown below in the way described in the previous sections. Owning to the fact that the program has not been compiled, the mother line at the left side of the ladder diagram is red during the writing of the program. The following sections will introduce how to compile the program, and how to download the program which has been compiled to the CPU module to test the program.



***1. The program above is saved in the folder denoted by …\ISPSoft x.xx\Project\Example\Gluing_System_C.**

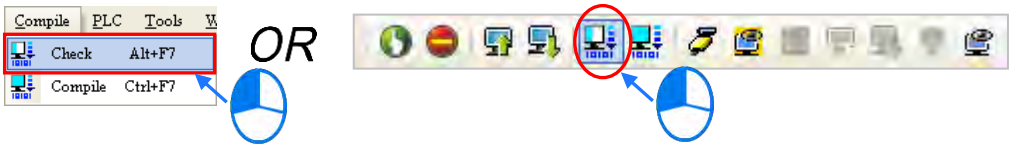
***2. Please refer to chapter 8 in ISPSoft User Manual for more information about creating a ladder diagram.**

6.5.10 Checking and Compiling a Program

After users write a program, they can check the syntax of the programming language or compile the program. The syntax and the structure in the present window will be checked after the **Check** function is enabled. The whole project will be checked after the **Compile** function is enabled. If there is no error in the project, an execution code will be generated automatically. After the program is compiled successfully, the mother line at the left side of the ladder diagram will become black.

- **Check**

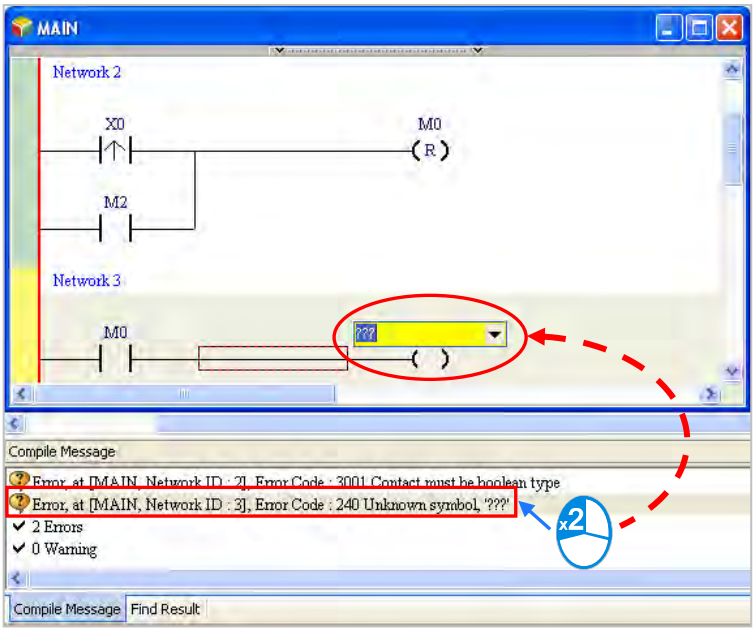
  Click **Check** on the **Compile** menu, or  on the toolbar.



- **Compile**

  Click **Compile** on the **Compile** menu, or  on the toolbar.

After the check is complete, the **Compile Message** page shows the result related to the check. If there is any error in the project, the **Compile Message** page will show the related message. After the message is clicked, the system will automatically lead users to the place where the error occurs. The users can enable the **Check** function or the **Compile** function after the error is eliminated.



6.6 Testing and Debugging a Program

6.6.1 Creating a Connection

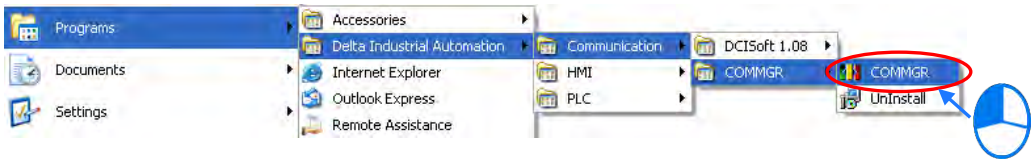
Before a program and parameters are downloaded to a PLC or monitored online, ISPSoft must be connected to the PLC. In this example, ISPSoft is connected to the CPU module AS332T-A through a USB cable. Please refer to section 2.4 in ISPSoft User Manual for more information about connecting ISPSoft to a PLC in other ways. Please refer to operation manuals for more information about wiring.

Those who have connected ISPSoft to a PLC successfully in accordance with the contents of section 2.4 in ISPSoft User Manual can skip this section.

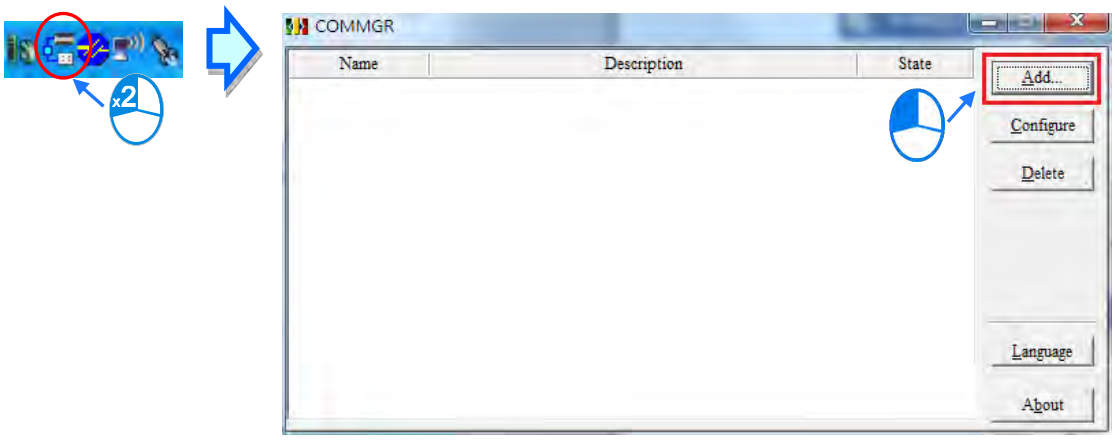
(1) Install the modules on the main backplane in accordance with the hardware configuration in HWCONFIG. Make sure that the wiring is correct, and then power the CPU module.

(2) Connect the CPU module to the computer through a USB cable. If the USB driver for the AS series CPU module has been installed on the computer, **Delta PLC** will appear in the **Device Manager** Window, and a port number will be assigned to **Delta PLC**. Please refer to appendix A for more information about installing a USB driver.

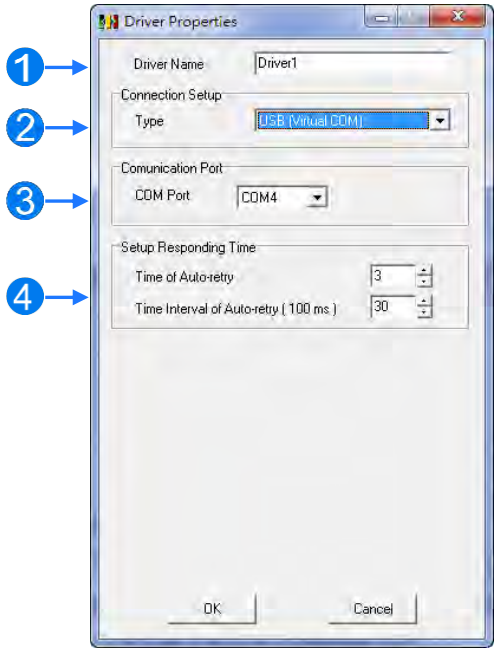
(3) Make sure that COMMGR is started, and the icon representing COMMGR is displayed on the system tray. If the icon representing COMMGR is not displayed on the system tray, users can start COMMGR by clicking the shortcut on the **Start** menu (**Start**>**Programs**>**Delta Industrial Automation**>**Communication**>**COMMGR)**.



(4) Double-click the icon representing COMMGR on the system tray to open the **COMMGR** window. Click **Add** in the **COMMGR** window to create a driver.



(5) Set the parameters in the **Driver Properties** window, and then click **OK**.



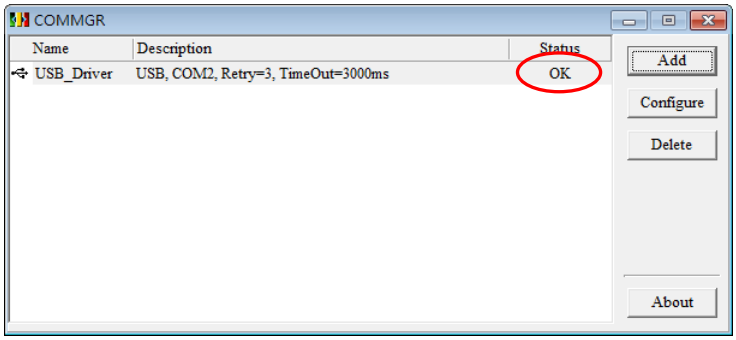
① Type a driver name in the **Driver Name** box.

② Select **USB (Virtual COM**) in the **Type** drop-down list box in the **Connection Setup** section.

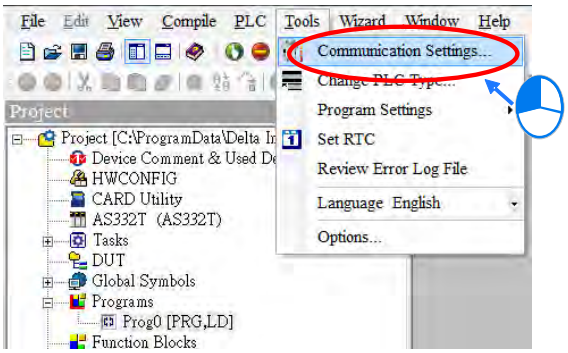
③ Select a communication port in the **COM Port** drop-down list box. If the first two steps are complete, the PLC which is connected and its communication port will be displayed in the **COM Port** drop-down list box.

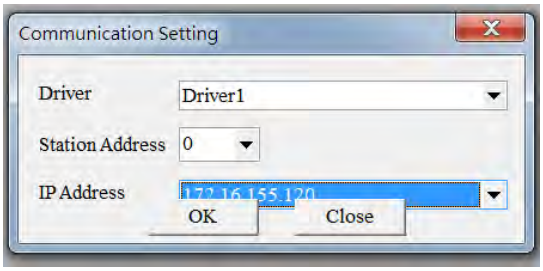
④ Users can select the number of times the sending of a command is retried if a connection error occurs in the **Time of Auto-retry** box, and select an interval of retrying the sending of a command in the **Time Interval of Auto-retry** box.

(6) After the setup is done, users can find a USB_Driver in the window. When the connection is normal, the OK will be shown in the column of Status.

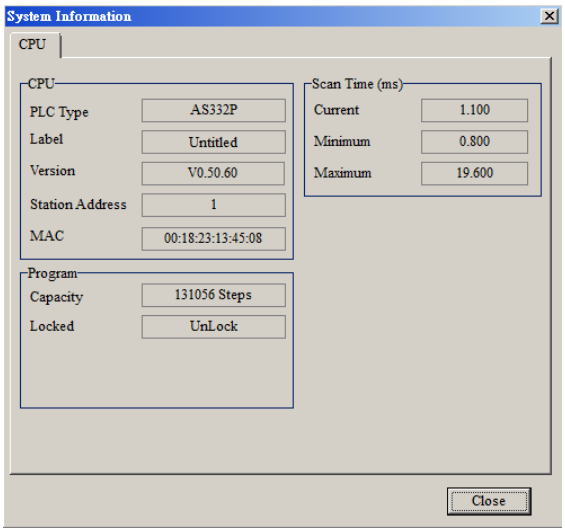


(7) Click the driver created in the **COMMGR** window, and then click **Start**. Start ISPSoft, and then click **Communication Settings…** on the **Tools** menu. In the **Communication Setting** window, select the driver which has been created in the **Driver** drop-down list box, appear, and select 0 in the **Station Address** drop-down list box, and click **OK**. The information about the driver will be displayed in the status bar in ISPSoft.





(8) Click **System Information** on the **PLC** menu. ISPSoft will retrieve related information from the PLC. If the computer communicates with the CPU module normally, the related information retrieved from the PLC will be displayed in the **System Information** window.

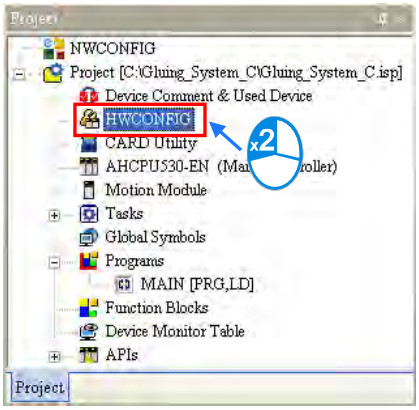


6.6.2 Downloading a Program and Parameters

If ISPSoft is connected to a PLC normally, the parameters and the program in the project can be downloaded to the PLC. First, start ISPSoft and open the project created in the previous sections. In this example, two types of parameters are downloaded to the CPU module. They are the hardware configuration and the program.

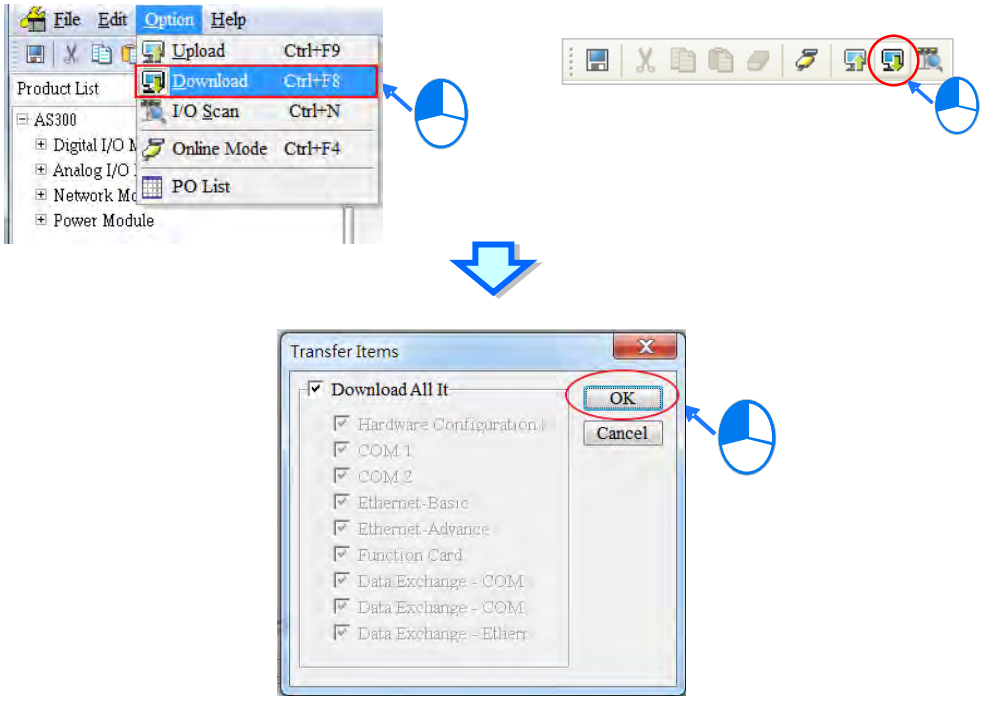
- **Downloading the hardware configuration**

(1) Double-click **HWCONFIG** in the project management area to open the **HWCONFIG** window.



(2) The hardware configuration is displayed in the window. Before the hardware configuration is downloaded to the CPU module, users have to make sure that the actual hardware configuration is the same as the hardware configuration in the window.

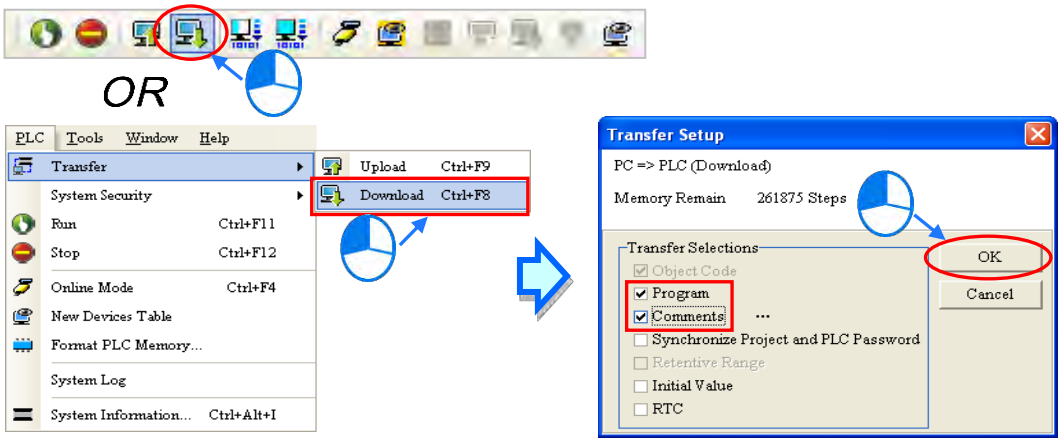
(3) After the users click **Download** on the **Option** menu, or  on the toolbar, the **Transfer Items** window will appear. The hardware configuration will be downloaded to the CPU module after **OK** is clicked.



(4) After the hardware configuration is downloaded to the CPU module successfully, the BUS FAULT LED indicator on the CPU module will be OFF. The users can close the **HWCONFIG** window. If the BUS FAULT LED indicator on the CPU module is still ON or blinking, the CPU module is in an abnormal state. Please make sure that the actual hardware configuration is the same as the hardware configuration in the **HWCONFIG** window again, or refer to the operation manual for more information about eliminating the error. Please refer to chapter 8 for more information about HWCONFIG.

- **Downloading the program**

After the program is compiled successfully, the users can click the **PLC** menu, point to **Transfer**, and click **Download**. The users can also click  on the toolbar after the program is compiled successfully. Select the **Program** checkbox and the **Comments** checkbox in the **Transfer Setup** window so that the program in the CPU module can be uploaded later, and then click **OK**.



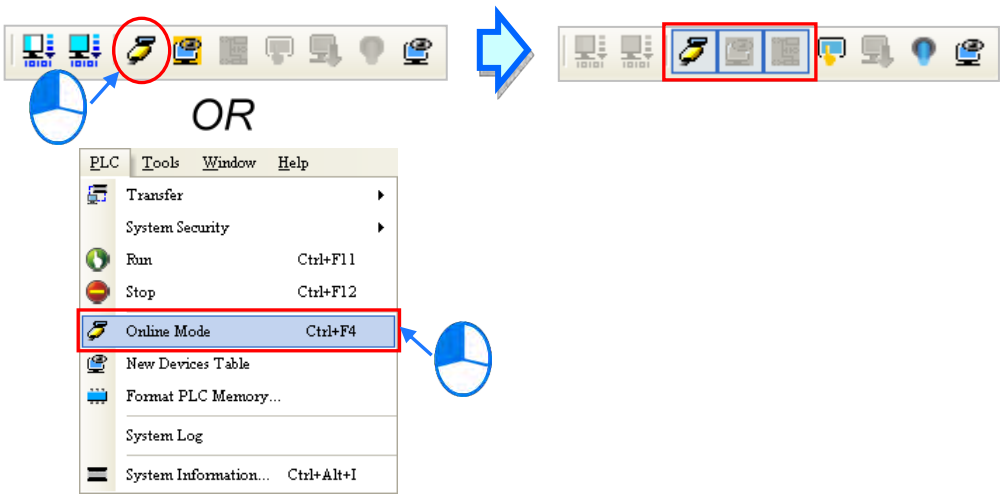
6.6.3 Connection Test

After a program is downloaded to a PLC, users can monitor the execution status of the PLC through ISPSoft. There are two monitoring modes that ISPSoft provide. One is the device monitoring mode, and the other is the program monitoring mode.

Monitoring mode	Description
 Device monitoring mode	Users can monitor the statuses of the devices in the PLC through the monitoring table. In this mode, ISPSoft only needs to update the statuses of the devices. The present program in ISPSoft does not need to be the same as the program in the PLC.
 Program monitoring mode	In this mode, the operating status of the program is displayed in the program editing window. As a result, the present program in ISPSoft must be the same as the program in the PLC.

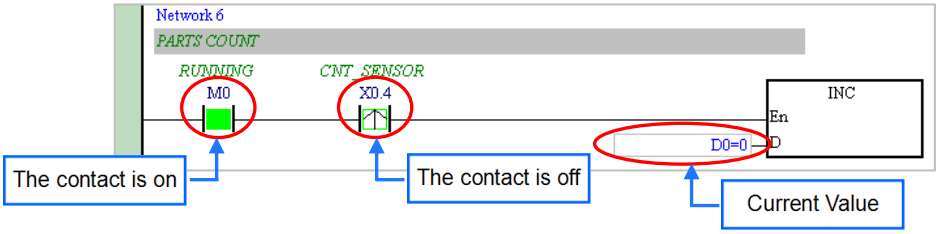
***. The device monitoring function can be enabled independently. However, if the program monitoring function is enabled, the device monitoring function is also enabled.**

After users click **Online Mode** on the **PLC** menu, or  on the toolbar, the online monitoring function will be enabled. The system will also enable the device monitoring mode and the program monitoring mode.

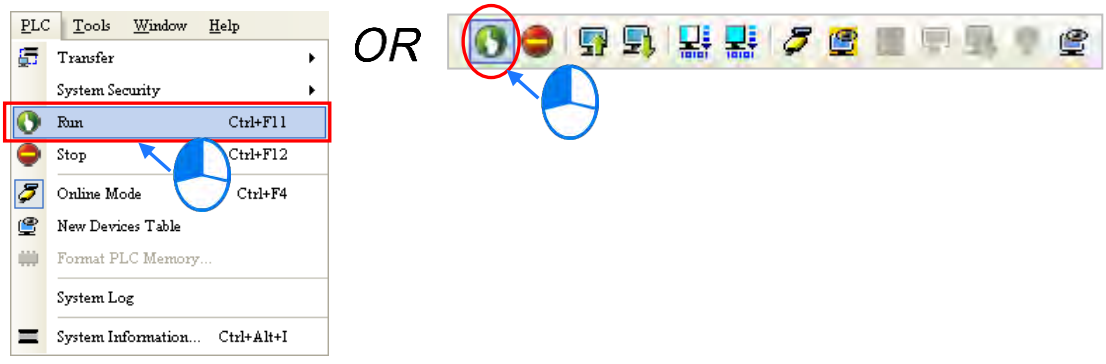


In the online monitoring mode, users can view the present scan time, the communication status, and the status of the PLC in the status bar in ISPSoft.

Besides, the present statuses of the devices will be displayed in the original program editing window after the program monitoring function is enabled.

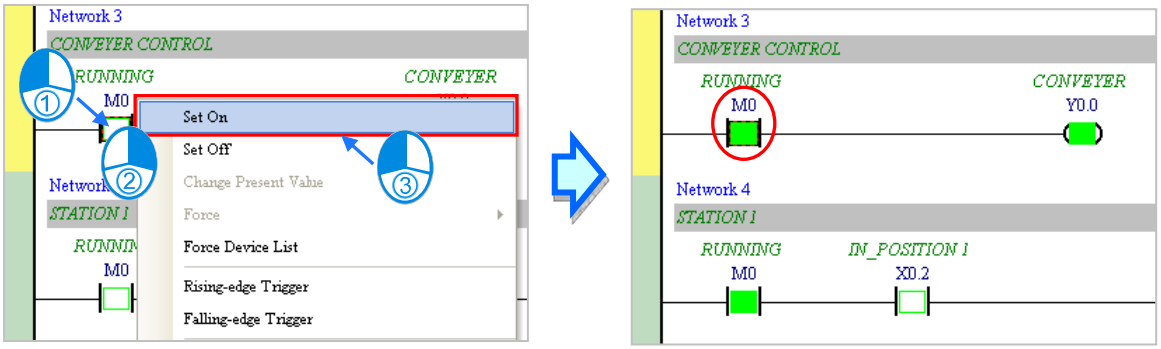


Users can change the operating status of a PLC by the RUN/STOP switch on the PLC. They can also change the operating status of the PLC through the functions provided by ISPSoft. After users click **Run** on the **PLC** menu or  on the toolbar, the PLC will begin to run. The PLC will stop running after **Stop** on the **PLC** menu or  on the toolbar is clicked.



In the online monitoring mode, users can select a device, right-click the device, and click an item on the context menu. During a test, users can change the status of a device or the value in a device by clicking an item on the context menu.

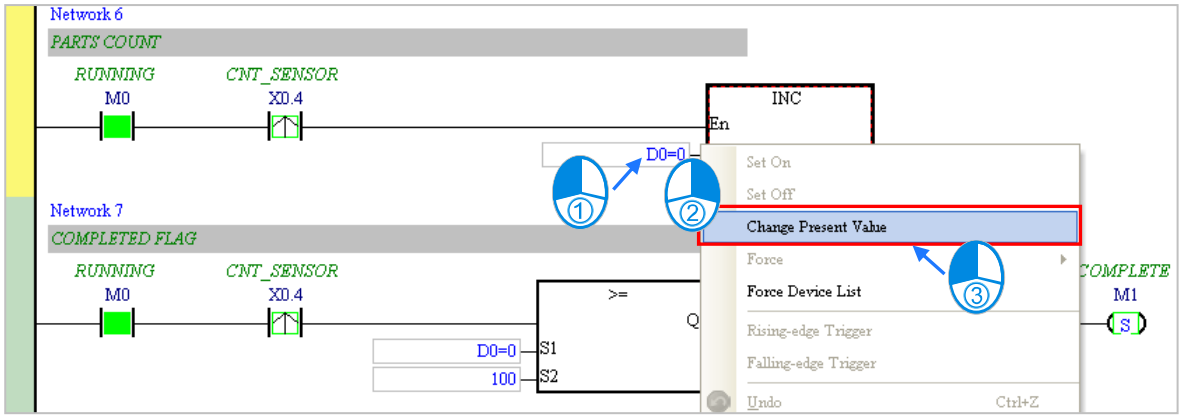
Before the status of a device is changed, users have to make sure that the operation does not cause damage to the system or staff.



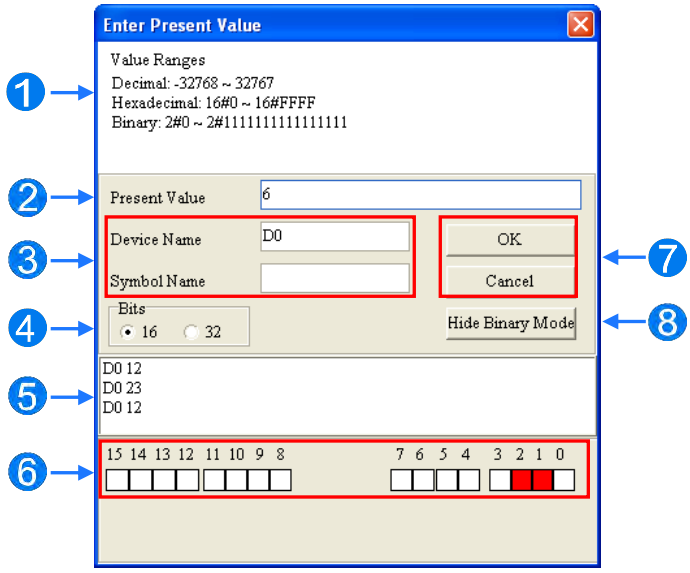
The items on the context menu are described below. **Force** on the context menu only applies to input contacts and output contacts.

Item	Description
Set On	Setting the contact selected to ON
Set Off	Setting the contact selected to OFF
Rising-edge Trigger	No matter what the state of the contact selected is, the system set the contact to OFF, and then set it to ON.
Falling-edge Trigger	No matter what the state of the contact selected is, the system set the contact to ON, and then set it to OFF.
Force	Forcing an input contact or output contact ON or OFF
Force Device List	Forcing several input contacts or output contacts in the tables ON or OFF

If users want to change the value in a device, they can click the device, right-click the device, click **Change Present Value** on the context menu, and set a present value in the **Enter Present Value** window.



The **Enter Present Value** window is described below.



❶ Message

❷ Users can type a value in the **Present Value** box.

❸ Name of a device or a symbol whose present value will be changed

❹ Users can type a 16-bit value or a 32-bit value.

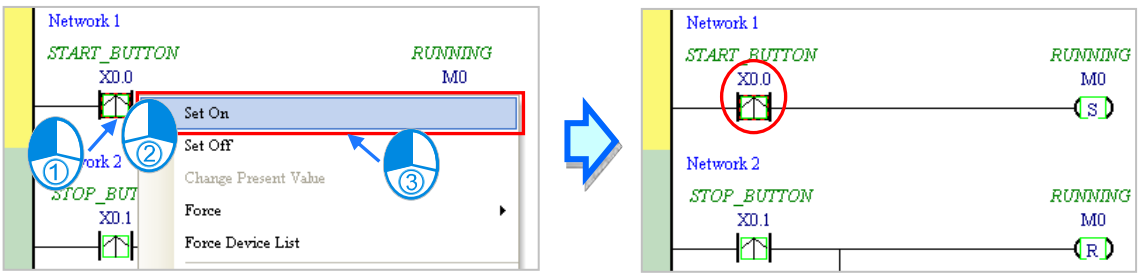
❺ Value change history (Format: Device name Value)

❻ In the binary mode, users can set the states of the bits through the mouse.

❼ The setting values will be applied after **OK** is clicked. The window will be closed after **Cancel** is clicked.

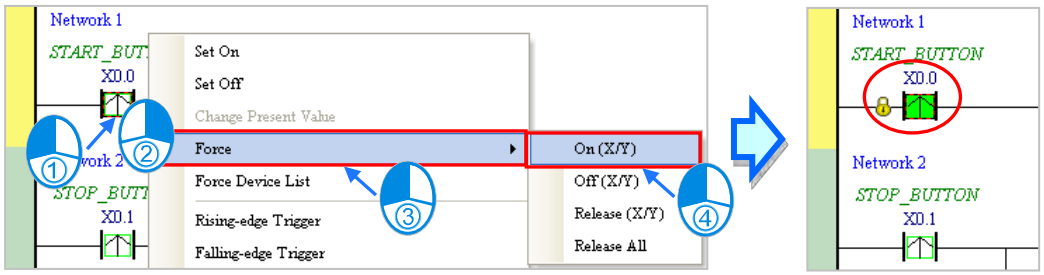
❽ Users can display or hide the binary mode.

In this example, X0.0~X0.15 and Y0.0~Y0.15 are input devices and output devices assigned to the digital I/O module AS332T-A. After the parameters in the hardware are downloaded to the CPU module, the states of X0.0~X0.15 will be the same as the states of the inputs on the actual module. Even if users set X0.0~X0.15 to ON or OFF in the program editing window, the states of X0.0~X0.15 will be updated by the actual input signals.



However, an input contact can be forced ON or OFF during a test. Users can click an input contact or output

contact which will be set, right-click the contact, point to **Force** on the context menu, and select **On (X/Y)**, **Off (X/Y)**, **Release (X/Y)**, or **Release All**. If an input contact or output contact is forced ON or OFF, a lock symbol will appear at the left side of the contact.



Force	Description
On (X/Y)	Forcing the input contact or output contact selected ON
Off (X/Y)	Forcing the input contact or output contact selected OFF
Release (X/Y)	Releasing the contact from the locked state
Release All	Releasing all the contacts from the locked states

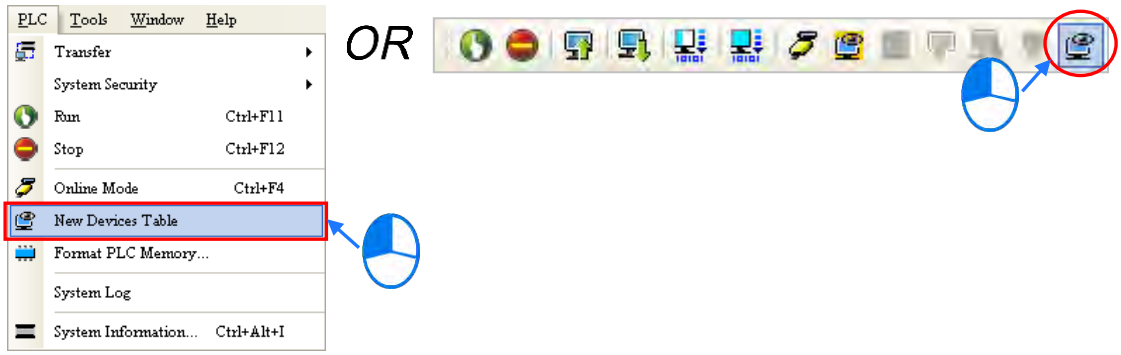
If an output contact in the program is forced ON or OFF, the output state of this contact will not be affected by the program execution result.

***. If the online monitoring function is disabled, the contacts will not be automatically released from the locked states. As a result, users have to check whether the contacts need to be released from the locked states after the test is complete.**

There are two ways to create a monitoring table. Users can create a monitoring table online or offline.

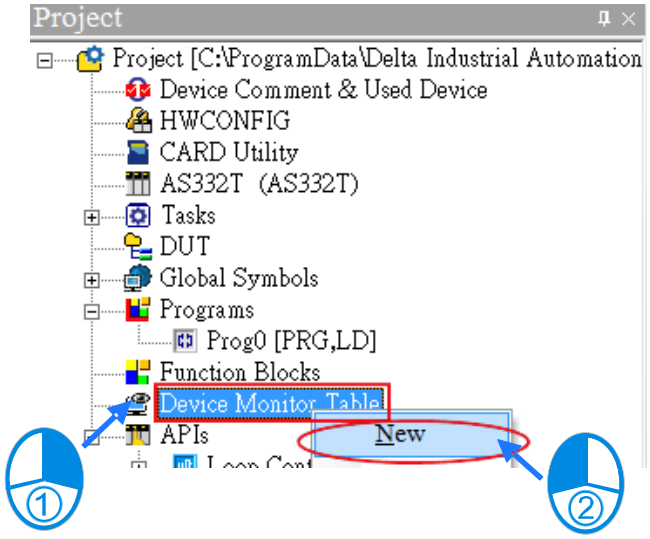
- **Method 1**

  Click **New Devices Table** on the **PLC** menu, or  on the toolbar.

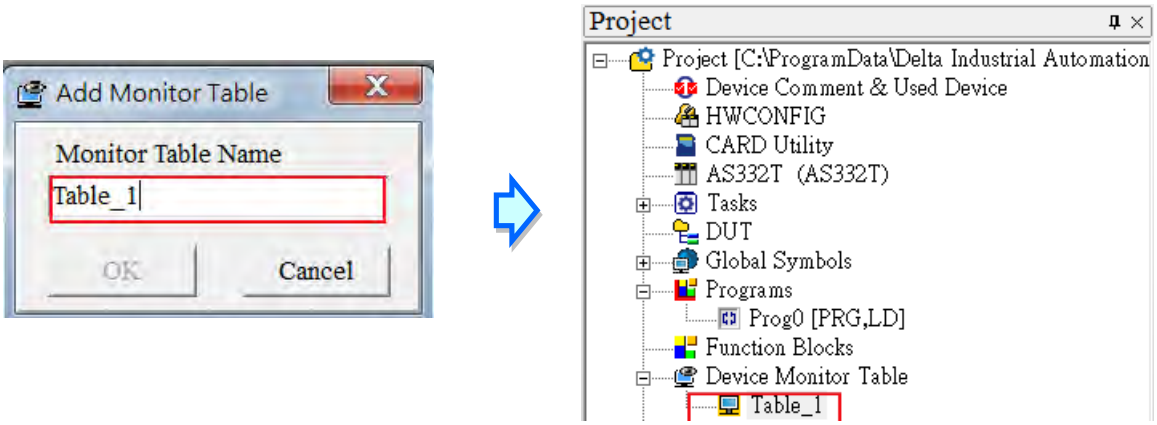


- **Method 2**

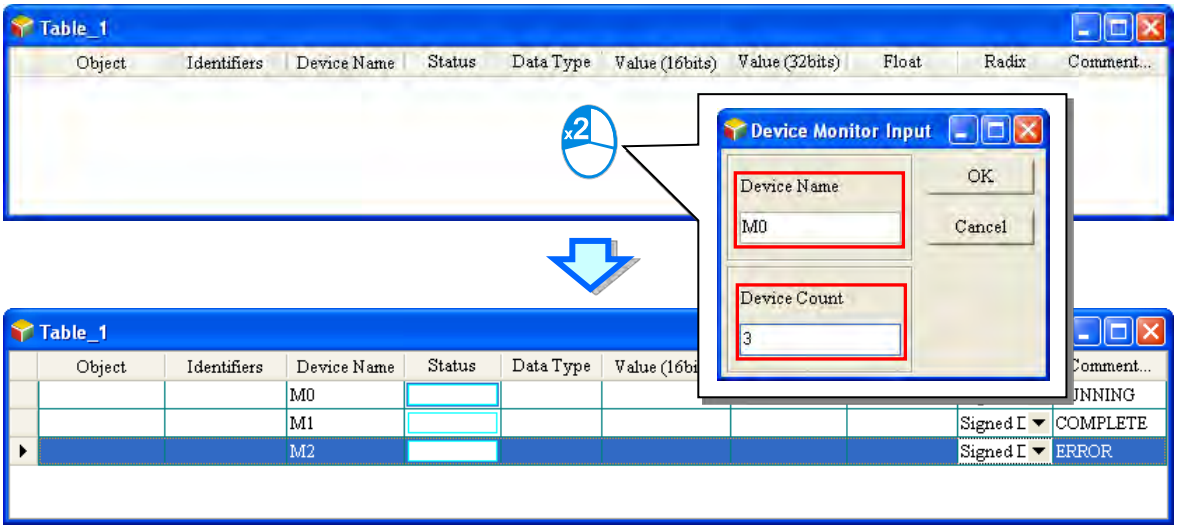
  Right-click **Device Monitoring Table** in the project management area, point to **Device Monitor** on the context menu, and click **New**.



Type a table name in the **Add Monitor Table** window, and then click **OK**. An item will be under **Device Monitor Table** in the project management area. If users want to open the monitoring table, they can double-click the item. Besides, the users can create several monitoring tables in the project, and the monitoring tables created will be saved with the project.



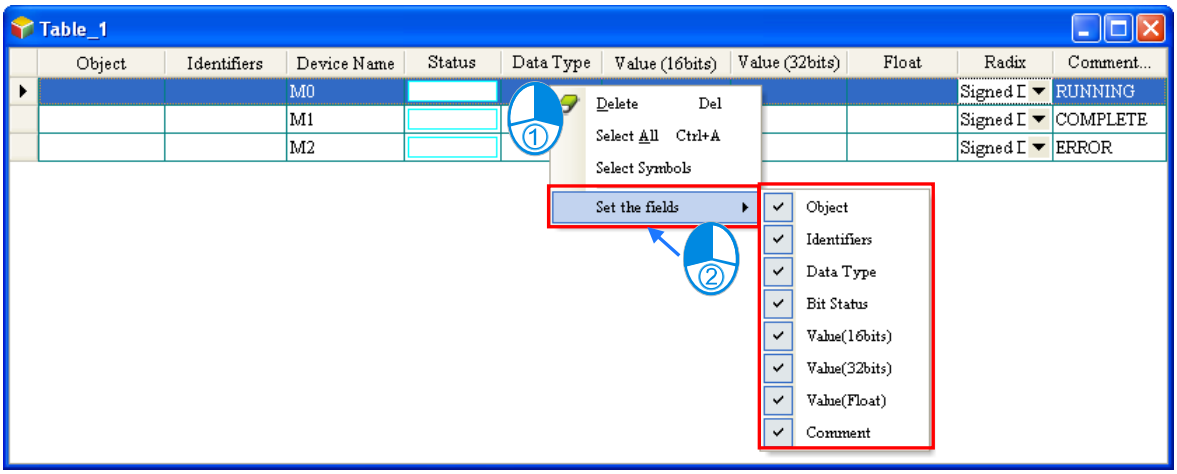
After the item is double-clicked, a window will appear. The users can add items which will be monitored to the window. If the users want to add an item to the window, they have to double-click the blank in the monitoring table, or type a device name directly, and type a start address and the number of devices which will be monitored in the **Device Monitor Input** window. Please notice that 100 items at most can be added to a monitoring table.



The users can press Insert on the keyboard to switch between inserting an item in the monitoring table and replacing an item in the monitoring table. The mode which is selected is displayed in the status bar in ISPSoft.

If the insertion mode is selected, the item added will be above the item selected in the monitoring table. If the replacement mode is selected, the item added will overwrite the item selected in the monitoring table.

If the users want to hide certain columns in the monitoring table, they can right-click the monitoring table, point to **Set the Fields**, and unselect certain items. After an item is unselected, the corresponding column will disappear.

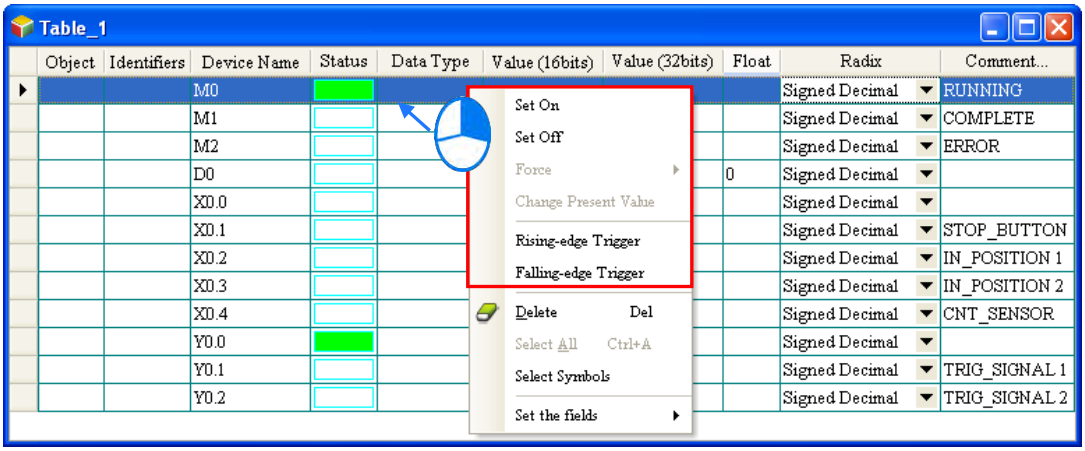


The description of the columns in the monitoring table is as follows.

Column	Description
Source	The source of a symbol
Identifier	The identifier of a symbol
Device name	The name of a device monitored

Column	Description
Status	If a bit device or a contact is monitored, the state will be ON or OFF.
Data type	If a symbol is monitored, the data type of the symbol will be displayed.
Value (16 bits)	In the online mode, a 16-bit value is displayed.
Value (32 bits)	In the online mode, a 32-bit value is displayed.
Float	In the online mode, a 32-bit floating-point number is displayed.
Radix	Users can select a format in which a value is represented.
Comment	The comments on a device or the comment on a symbol is displayed.

After the monitoring table is created, the users can monitor the items in the monitoring table in the online mode. Besides, after the users right-click an item in the monitoring table in the online mode, a context menu which is the same as the context menu which will after a device in the program editing window is clicked will appear. The users can change the state of the item or the value in the item by clicking an item on this context menu.

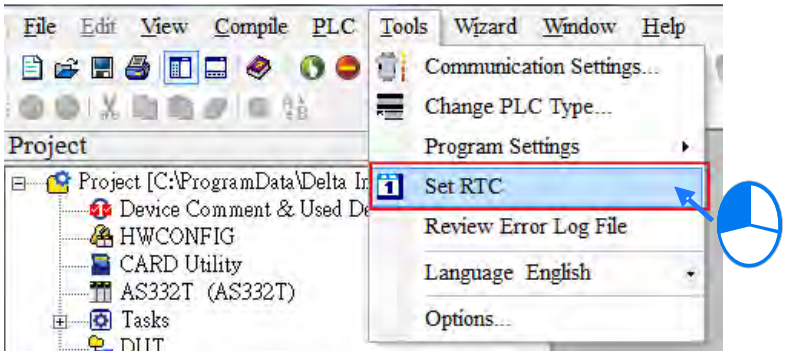


The program created in this chapter can be tested and debugged through the monitoring table created in this section. Please refer to chapter 17 in ISPSoft User Manual for more information about testing and debugging a program.

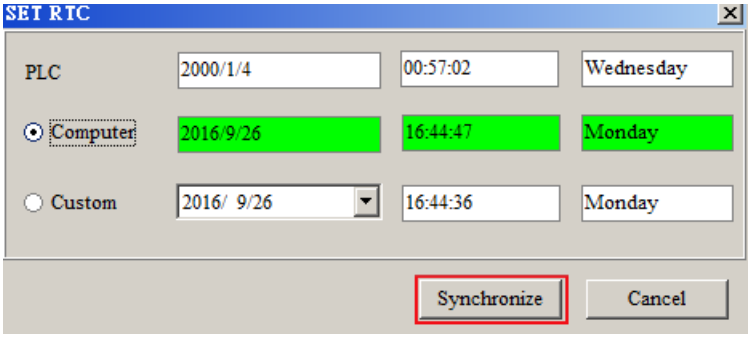
6.7 Setting a Real-time Clock

After an AS series CPU module is connected to a computer, users can set the real-time clock in the CPU module through ISPSoft.

(1) Click **Set RTC** on the **Tools** menu.



(2) Select **Computer**, and then click **Synchronize**.



(3) The setting of the real-time clock is complete.

Chapter 7 Memory Card

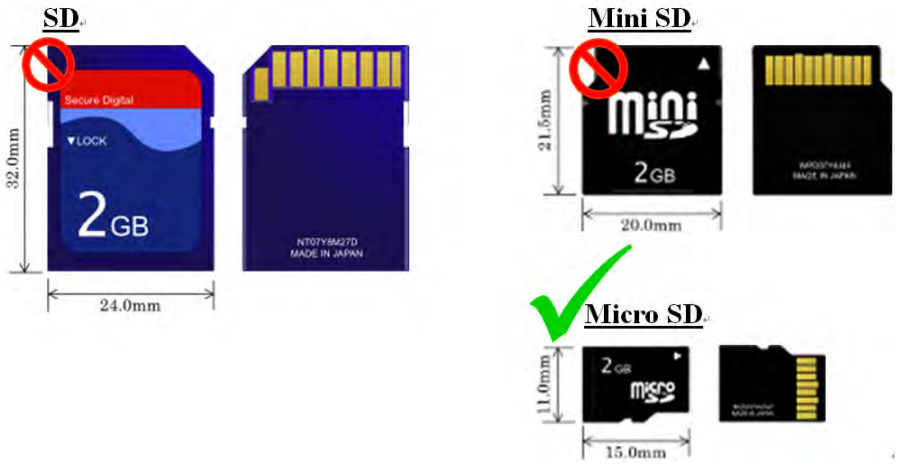
Table of Contents

7.1 Overview of Memory Cards

The AS series CPU modules support standard SD cards. Users can purchase products which meet specifications. The specifications for the SD cards supported by the AS series CPU modules, and the usage of the SD cards are described in this chapter.

7.1.1 Appearances of Memory Cards

SD cards are classified into three types according to size. They are SD cards, miniSD cards, and microSD cards. The AS series CPU modules support standard-sized SD cards.



7.1.2 Specifications for SD Cards

There are several specifications for SD cards on the market. SD cards not only can be classified according to size, but also can be classified into three types according to capacity. These types are SD cards, SDHC cards, and SDXC cards. The AS series now supports the maximum of 32GB in the FAT32 format. The following is the table of SD card families. The mini SDHC in the column of SDHC column indicates the specifications supported by the AS series. Be sure to purchase products which meet the specifications.

- SD card families

Type	SD		SDHC		SDXC	
Capacity	32MB~2GB		4GB~32GB		32GB~2TB	
File system	FAT16/FAT32		FAT32		exFAT (FAT64)	
Size	SD	SDHC	Mini SDHC	Micro SDHC	SDXC	Micro SDXC
Speed class rating	N/A		CLASS 2 (Min. 2MB/Sec.) CLASS 4 (Min. 4MB/Sec.) CLASS 6 (Min. 6MB/Sec.) CLASS 10 (Min. 10MB/Sec.)		CLASS 2 (Min. 2MB/Sec.) CLASS 4 (Min. 4MB/Sec.) CLASS 6 (Min. 6MB/Sec.) CLASS 10 (Min. 10MB/Sec.)	

7.2 Before using a Memory Card

7.2.1 Formatting a Memory Card

A SDHC memory card that users use for the first time may not be formatted. A SDHC memory card which is not formatted can not be used in an AS series CPU module. Therefore, users need to format the SDHC memory card. The file system with which the memory card is formatted is FAT32.

The following example introduces the most common way to format an SDHC card, formatting an SDHC card through a card reader. However, users still need to read the documents provided by the SDHC card manufacturer carefully.

⚠ If a memory card is formatted, all the data in the memory card will be deleted. Users have to check whether the data in a memory card needs to be backed up before they format the memory card.

(1) Insert the SDHC card into a card reader. The operating system detects a new storage device.

(2) Right-click the new storage device, and then click **Format**.

(3) The file system with which the memory card is formatted must be FAT32. The other default setting is retained. Click **Quick Format**, and then click **Start**.

(4) After **OK** in the warning window is clicked, the SDHC card is formatted.

7.3 Installing and Removing a Memory Card

7.3.1 Memory Card Slot in a CPU Module

As the image shown below, the memory card slot is in the front size of the AS series PLC.

7.3.2 Installing a Memory Card

Insert a memory card into the memory card slot in a CPU module, and push it downward until it clicks. After the memory card is installed, it is fixed firmly in the slot. If the memory card is loose, it is not installed correctly.

Besides, the memory card has anti-misinsertion design. If it is inserted in the wrong direction, it cannot be pushed downward. To prevent the CPU module from being damaged, users cannot force the memory card in. The correct way to insert the memory card is shown below.

7.3.3 Removing a Memory Card

After a memory card is pushed downward, it springs from the slot, and users can take it out.

7.4 Contents of a Memory Card

7.4.1 Initializing a Memory Card

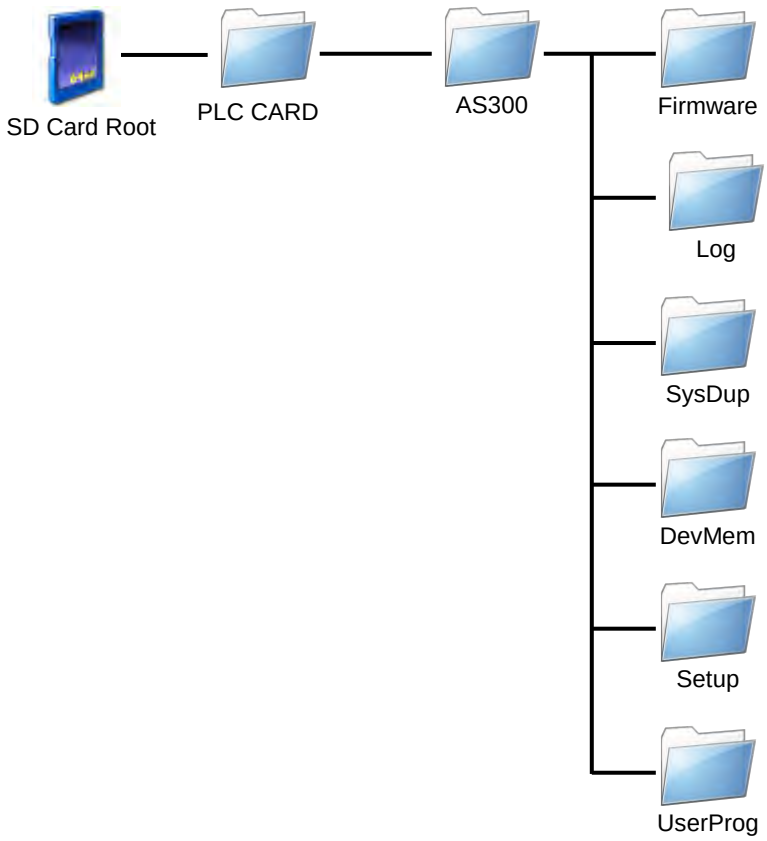
Whenever an SDHC card is inserted into a CPU module which is supplied with power, or power is supplied to a CPU module into which an SDHC card has been inserted, the system initializes the SDHC card, and a default folder created in the SDHC card is named according to the model of the CPU module.

During the initialization of a SDHC card, if a folder is missing from the default folder group, the system automatically adds the lost folder. However, if the initialization of a SDHC card fails, the SDHC card cannot be initialized again until it is formatted again.

When a memory card is initialized, the SYSTEM LED indicator blinks.

7.4.2 Folder Structure in a Memory Card

The default folder group created by an AS system is shown below. The folder name is AS300. Several subfolders are contained inside the AS300 folder. Related files created by users and the AS system are stored in the subfolders.



Folder	Description
Firmware	Used for storing firmware files (.mot)
Log	Used for storing Log files (.log)
SysDup	Used for storing backup files (.dup)
UserProg	Used for storing device memory files (.txt, .dmd, .csv)
DevMem, Setup	Reserved for the system

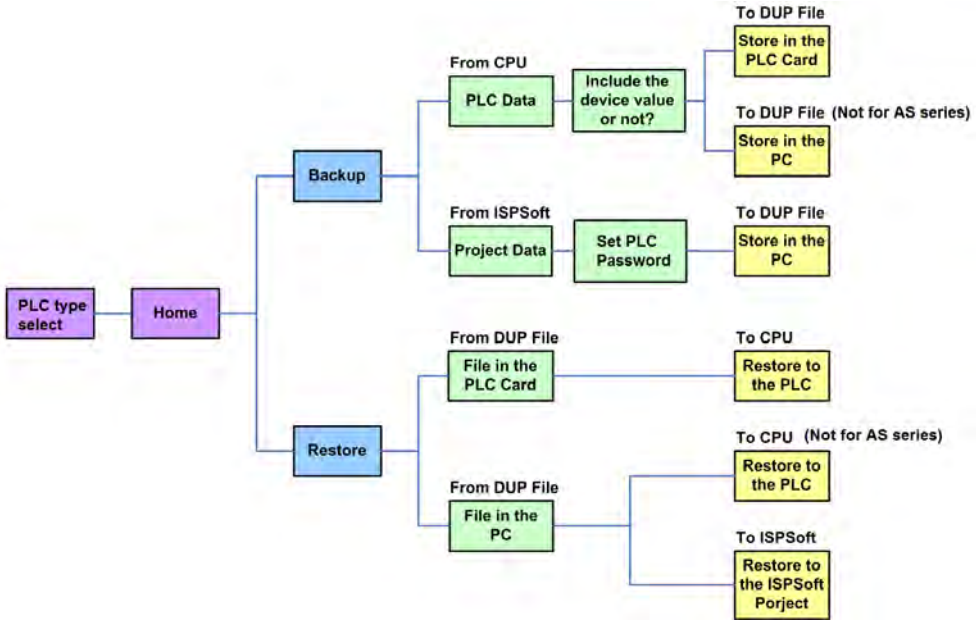
7.5 Introduction of CARD Utility

There are SDHC slots on AS series CPU modules. Users can back up/restore data in an AS series CPU module through the use of a memory card. Besides, ISPSoft provides CARD Utility for AS series CPU modules. The users can back up/restore data in an AS series CPU module or an ISPSoft project through a wizard. The program code, the parameter setting, the hardware configuration, and the network configuration in an AS series

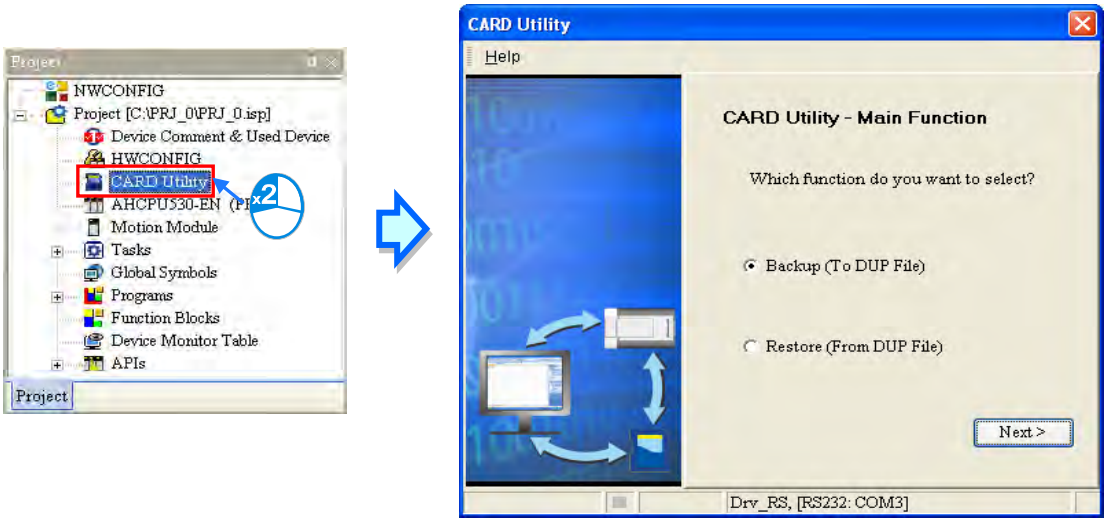
CPU module or an ISPSoft project can be backed up. The values in the devices in an AS series CPU module can also be backed up. Please refer to operation manuals or technical documents for more information about the specifications of the SDHC cards which can be inserted into AS series CPU modules, and the usage of the SDHC cards.

The functions supported by CARD Utility are described below. The diagram below is a flowchart.

- If users export data in an AS series CPU module as a backup file (*.dup), the data exported can be saved in the memory card inserted in the AS series CPU module, or a folder in the computer. The users can decide whether to back up the values in the devices in the AS series CPU module.
- If users export an ISPSoft project for an AS series CPU module as a backup file (*.dup), the ISPSoft project exported can only be saved in a folder in the computer. Data such as register editing (*.dvl), device status editing (*.dvb), file register editing (*.wft) of AS series can be seen as values in the device and can be backed up.
- Users can put the backup file saved in the memory card inserted in an AS series CPU module into the AS series CPU module.
- Users can put a backup file (*.dup) saved in a computer into the AS series CPU module connected to the computer, or restore the backup file to an ISPSoft project. If the users choose to restore the backup file to an ISPSoft project, the system will automatically skip the values in the devices and the hardware configuration in the backup file.
- If users restore the backup file (*.dup) from the PC to an ISPSoft project for an AS series CPU module, Data such as register editing (*.dvl), device status editing (*.dvb), file register editing (*.wft) of AS series can also be restored.



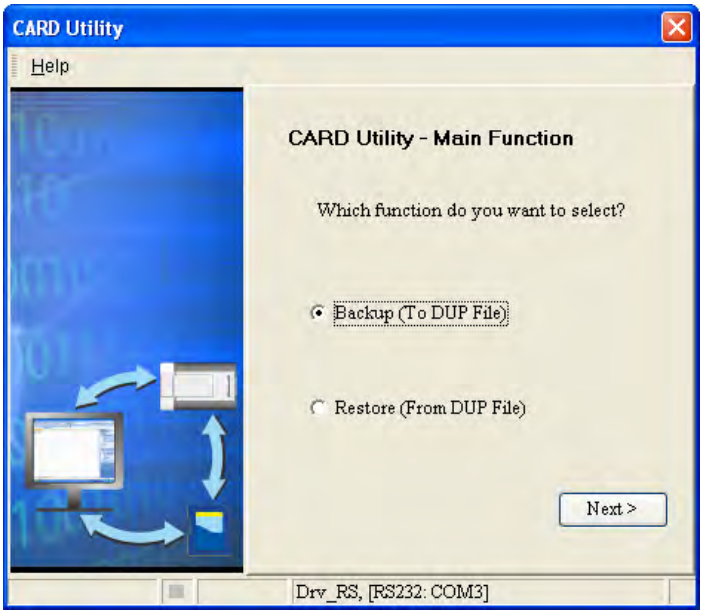
After users double-click **CARD Utility** in the project management area, the system will open the **CARD Utility** window.



7.6 Backup

If the backup source/backup destination is an AS series CPU module or the memory card inserted in an AS series CPU module, users have to make sure that ISPSoft is connected to the AS series CPU module normally. Please refer to section 2.4 in ISPSoft User Manual for more information.

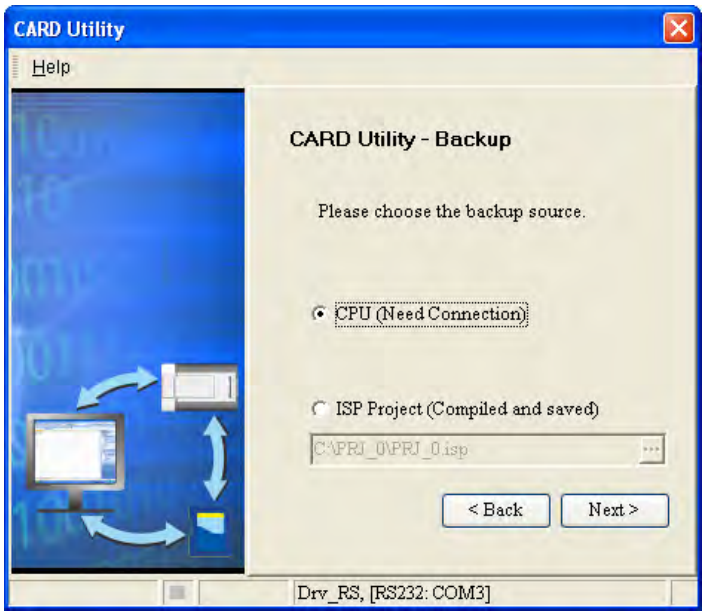
(1) Select the **Backup (To DUP File)** option button in the **CARD Utility** window, and then click **Next**.



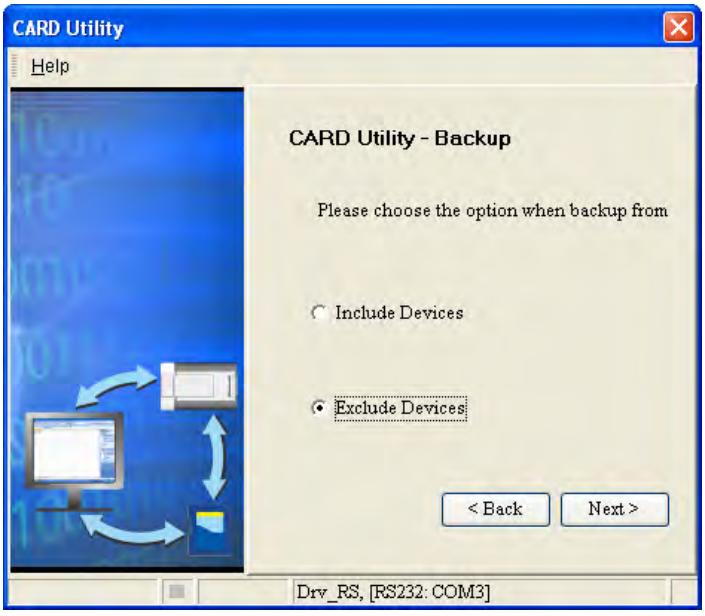
(2) Select a backup source, and then click **Next**.

After the users select the **ISP Project (Compiled and saved)** option button, they have to click ···, and select an isp file in the **Open** window. If the program in the isp file selected is not compiled, a message

appears when the isp file is backed up. Open the isp file with ISPSoft, compile the program in the isp file, and save the isp file. After the program in the isp file is compiled, the users can back up the isp file.



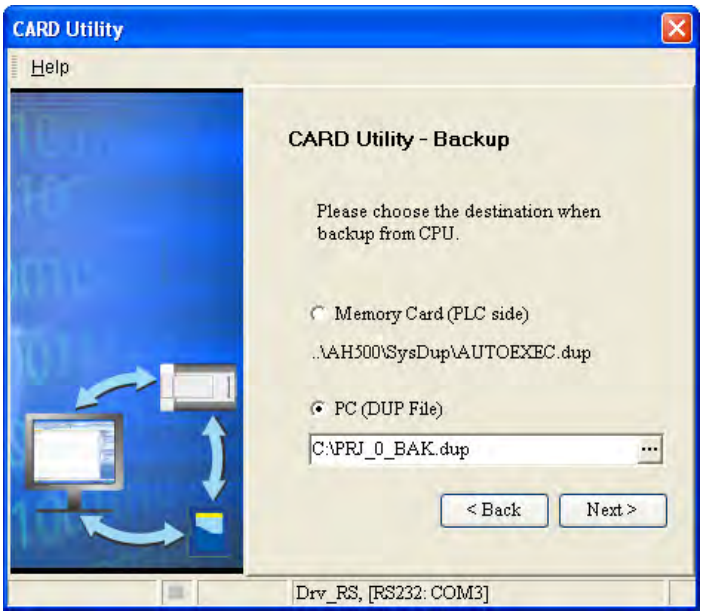
(3) After the users select the **CPU (Need Connection)** option button, they have to decide whether to back up the values in the devices in the AS series CPU module which is connected to ISPSoft.



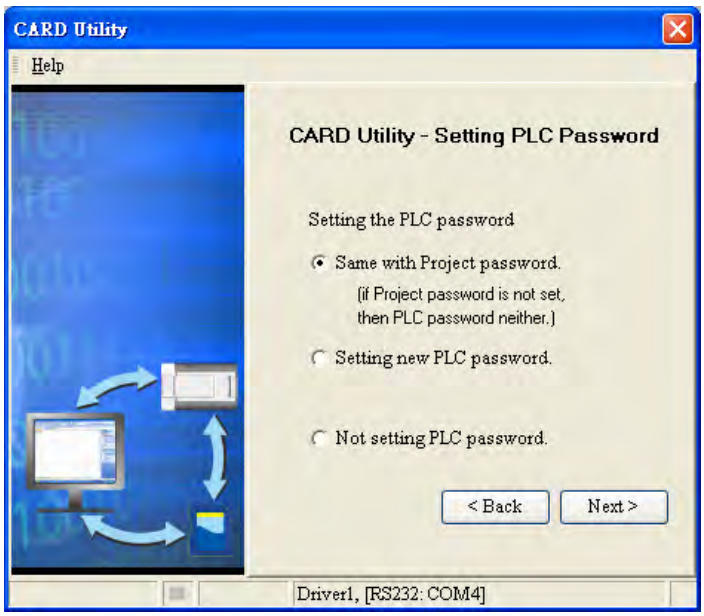
(4) Select a backup destination. If the backup source is an ISPSoft project, the backup destination must be a computer.

a. If the **Memory Card (PLC Side)** option button is selected, the filename of the backup file which will be produced will be **AUTOEXEC.dup**, and the path which points to the backup file will be **Root directory of the memory card\AS300\SysDup\AUTOEXEC.dup**.

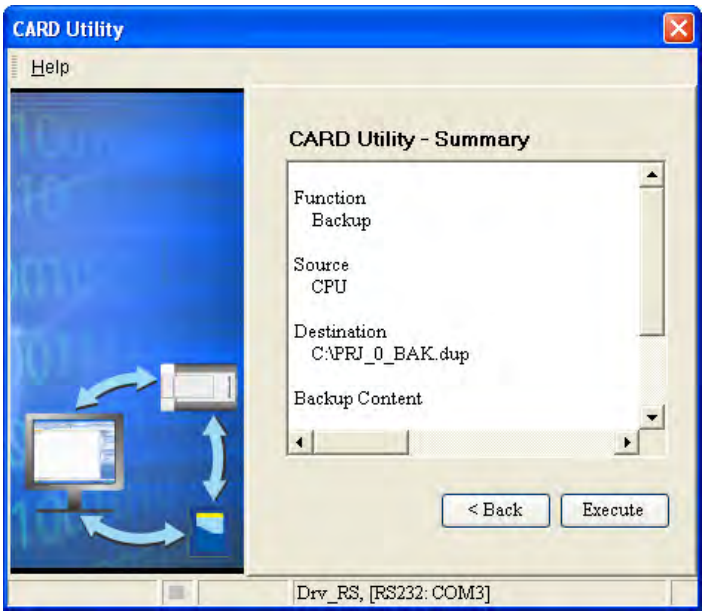
b. If the **PC (DUP File)** option button is selected, the users have to click ···, select a folder in the **Save in** drop-down list box in the **Save As** window, and type a filename in the **File name** box.



(5) When the backup source is selected to the ISPSoft Project, users can set up the PLC password. The options are to set the password the same as the Project (If the password for the Project is not set, the same goes to the PLC password.), set a new PLC password, and do not set a PLC password. When the option “Setting new PLC password” is selected, the setup window will show up.

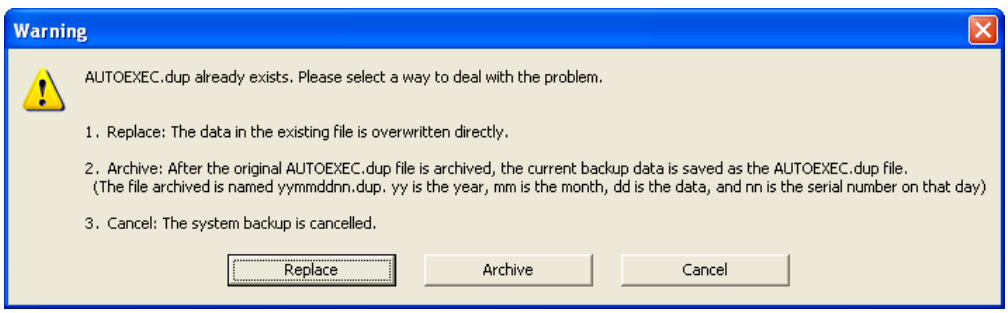


(6) After the users make sure that the summary in the **CARD Utility** window is consistent with the data backup which will be performed, they can click **Execute**.



Even if the users click **Cancel** to stop ISPSoft from performing the data backup in the process of backing up data in the AS series CPU module onto the memory card inserted in the AS series CPU module, the AS series CPU module will still performs the data backup. The users can turn off the AS series CPU module to stop the data backup from being performed. However, the backup file produced is not a complete backup file. As a result, the users have to delete the backup file from the memory card.

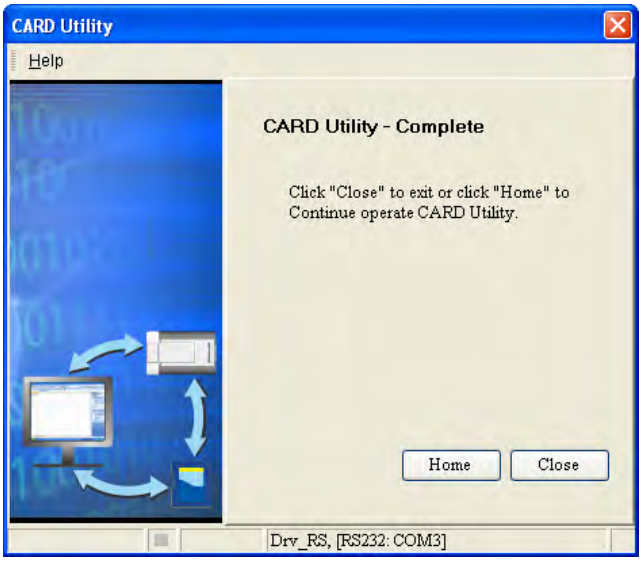
If the **Memory Card (PLC Side)** option button is selected, the filename of the backup file which will be produced will be **AUTOEXEC.dup**, and the path which points to the backup file will be **Root directory of the memory card\AS300\SysDup\AUTOEXEC.dup**. If there is an old backup file in the memory card inserted in the AS series CPU module which is connected to ISPSoft, the **Warning** window will appear. The users have to click **Replace**, Archive, or **Cancel** in the Warning window according to the message in the window.



If the data backed up is protected by passwords, these passwords will also be backed up.

Data backup	Description
CPU module→Memory card	The data backed up includes the PLC ID and the PLC password set in the CPU module.
ISPSoft project→Computer	The data backed up includes the program ID and the project password set in the ISPSoft project.

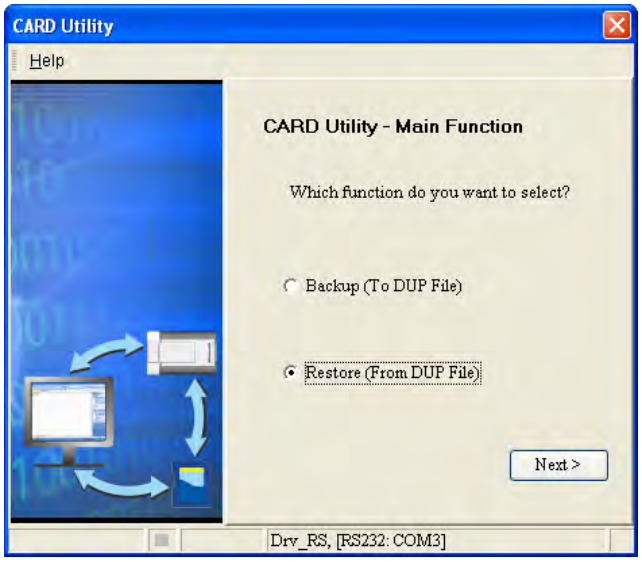
(7) After the data backup is performed, the users can click **Home** or **Close** in the **CARD Utility** window.



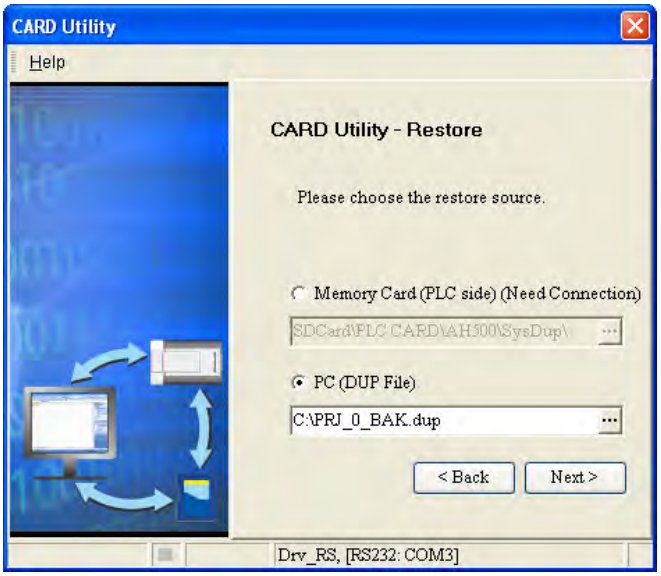
7.7 Restoration

If the restoration source/restoration destination is an AS series CPU module or the memory card inserted in an AS series CPU module, users have to make sure that ISPSoft is connected to the AS series CPU module normally. Please refer to section 2.4 in ISPSoft User Manual for more information.

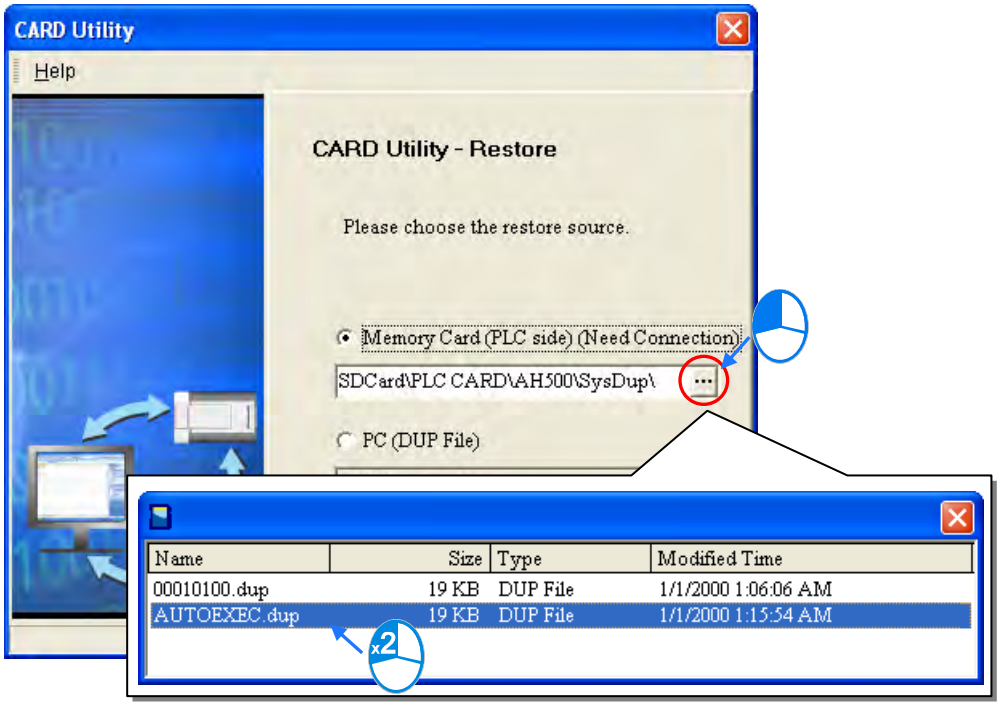
(1) Select the **Restore (From DUP File)** option button in the **CARD Utility** window, and then click **Next**.



(2) Select a restoration source, click ···, and select a backup file.



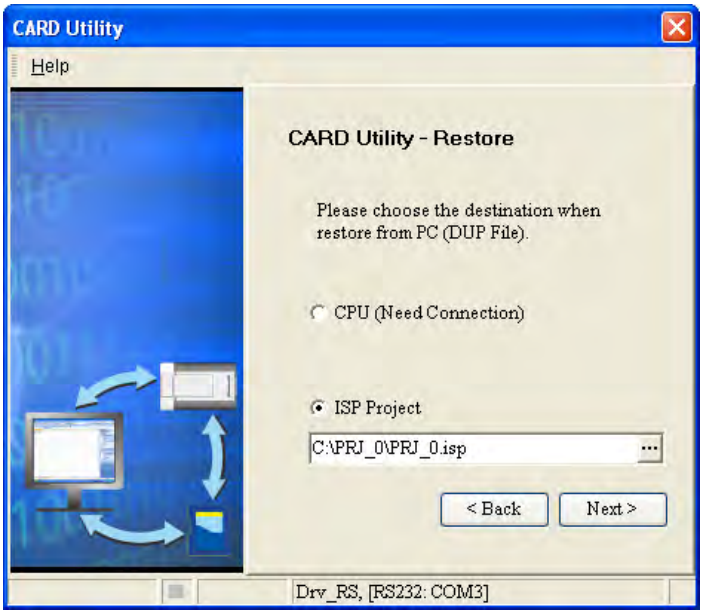
If the **Memory Card (PLC side) (Need Connection)** option button is selected, the backup files in the memory card inserted in the AS series connected to ISPSoft will be displayed in a window after ··· is clicked. The users have to double-click a backup file in the window.



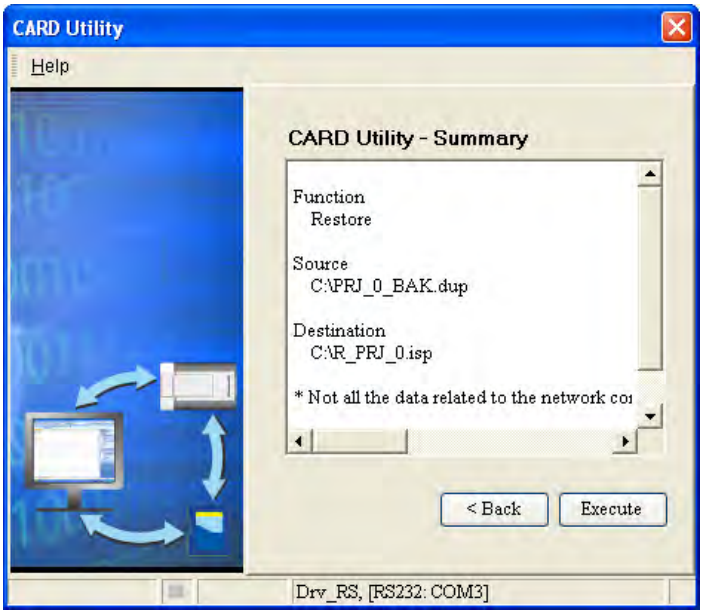
(3) Select a restoration destination, and then click **Next**.

a. If the users want to put the backup file selected into the AS series CPU module which is connected to ISPSoft, they have to select the **CPU (Need Connection)** option button. If the restoration source is the memory card inserted in the AS series CPU module connected to ISPSoft, the restoration destination must be the AS series CPU module.

b. If the **ISP Project** option button is selected, the users have to click ···. After the users click ···, they have to specify a filename and a path. If the path specified point to a file which exists in the computer, the file will be overwritten after the data restoration is performed.



(4) After the users make sure that the summary in the **CARD Utility** window is consistent with the data restoration which will be performed, they can click **Execute**.

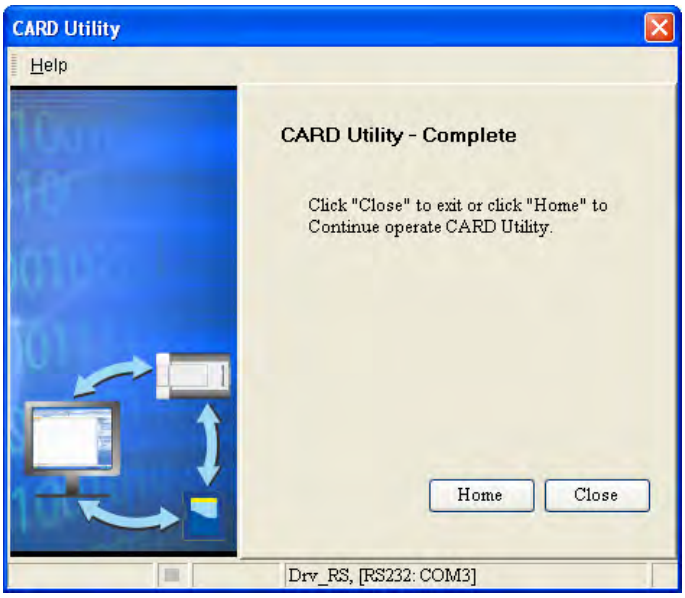


If the users click **Cancel** in the process of restoring data to the AS series CPU module, the data will not be completely restored. To prevent the AS series CPU module from operating incorrectly, the users have to restore the AS series CPU module to the factory setting if they do not perform the data restoration again. Besides, the AS series CPU module will still performs the data restoration even if the users click **Cancel** in the process of restoring a backup file in the memory card inserted in the AS series CPU module. The users can turn off the AS series CPU module to stop the data restoration from being performed.

If restoration source/restoration destination contains a password and an ID, the password and the ID will be processed.

Data restoration	Description
Memory card→CPU module	a. The ID in the backup file must be the same as the ID in the CPU module, otherwise the data restoration will not be performed. b. If there is a PLC password in the CPU module, the password in the backup file must be the same as the PLC password in the CPU module. Otherwise the data restoration will not be performed. c. If there is no PLC password in the CPU module, and there is a password in the backup file, the system will perform the data restoration, and the password in the backup file will become the PLC password in the CPU.
Computer→ ISPSoft project	The ID and the password in the backup file will become the program ID and the project password in an ISPSoft project.

(5) After the data restoration is performed, the users can click **Home** or **Close** in the **CARD Utility** window.



8

Chapter 8 Hardware Configuration and Data Exchange Setups

Table of Contents

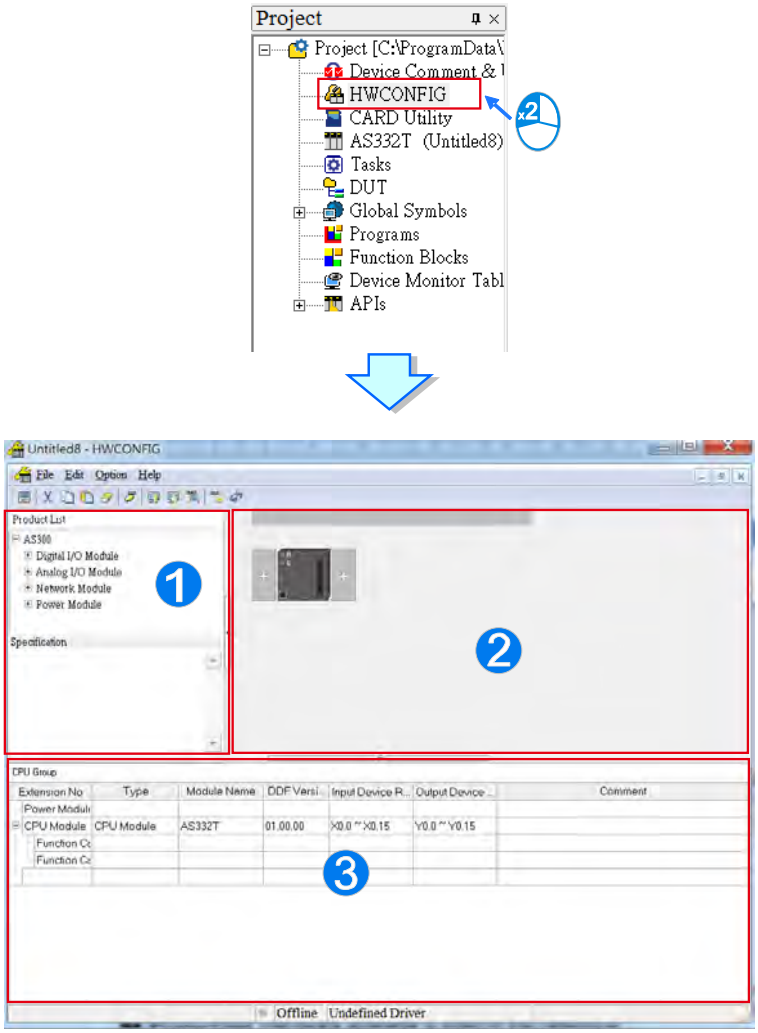
8.1 Hardware Configuration Tool for AS Series Modules - HWCONFIG

HWCONFIG is a built-in hardware configuration tool in ISPSoft. Users can configure racks, set CPU parameters, set module parameters, download/upload parameters, detect a hardware configuration online, and make a diagnosis through HWCONFIG.

All parameters set in HWCONFIG must be downloaded to the CPU module so that they can take effect.

8.1.1 Introduction of the Environment of HWCONFIG

After users double-click **HWCONFIG** in the project management area, the **HWCONFIG** window will appear.

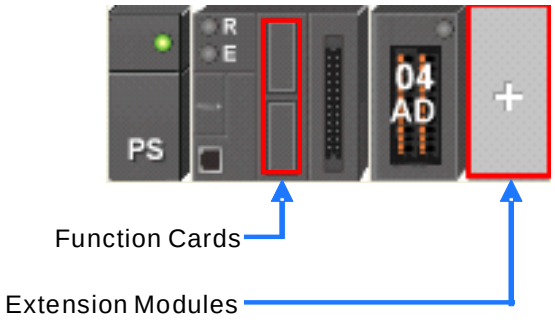


❶ **Product list**: Hardware available is listed in the catalogue.

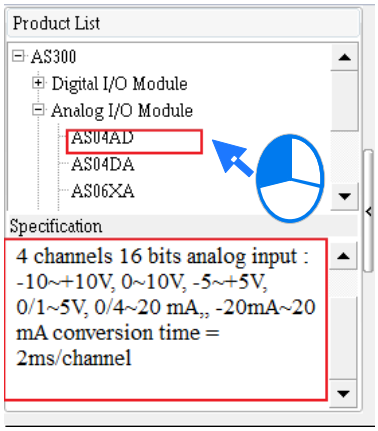
❷ **System configuration area:** It is the main working area. Users can configure and set a whole system in this area.

❸ **Information list:** The information about the present system configuration is listed in the list.

The present system configuration is displayed in the system configuration area. With no backplane design, the extension modules can be added on the right side of the AS series CPU module and the CPU module is built with function card slots for a versatile solution. Users can configure and set the modules in this area. For the settings of the function cards, users will need to go to the CPU module for setups. Refer to section 8.2 for configurations on the function cards. When the configuration in the system configuration area is modified, the information on the information list will be updated.

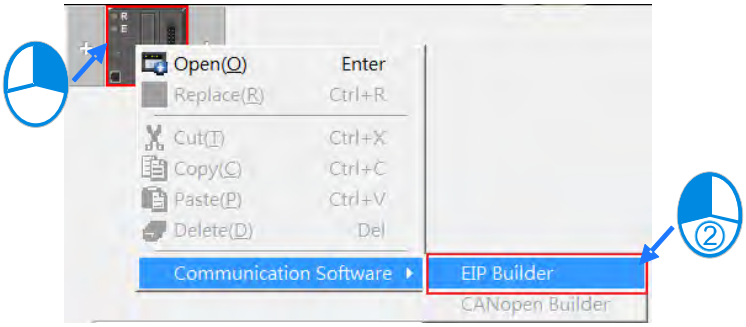


All hardware available is listed in the product list. After a section is unfolded, all devices belongs to the section are listed under the section. If users click a device, the specifications for the device will be under the product list.



Delta Electronics provides users with specific configuration tools for some CPU modules. Users can open the tools such as Ethernet/IP or EtherCAT to set advanced parameters for network assignments for the modules.

For the advanced setups, right-click the CPU module in the system configuration area to see and click the option “communication software” and then click to select the tools, such as EIP Builder for the setups of the Ethernet/IP configurations. It is required to save the configurations done in HWCONFIG before opening the tools. And while editing in the tools, it is not allowed to work in HWCONFIG. Some tools require an independent installation and a reminder will be shown when the independent installation of the tool has not been installed before.



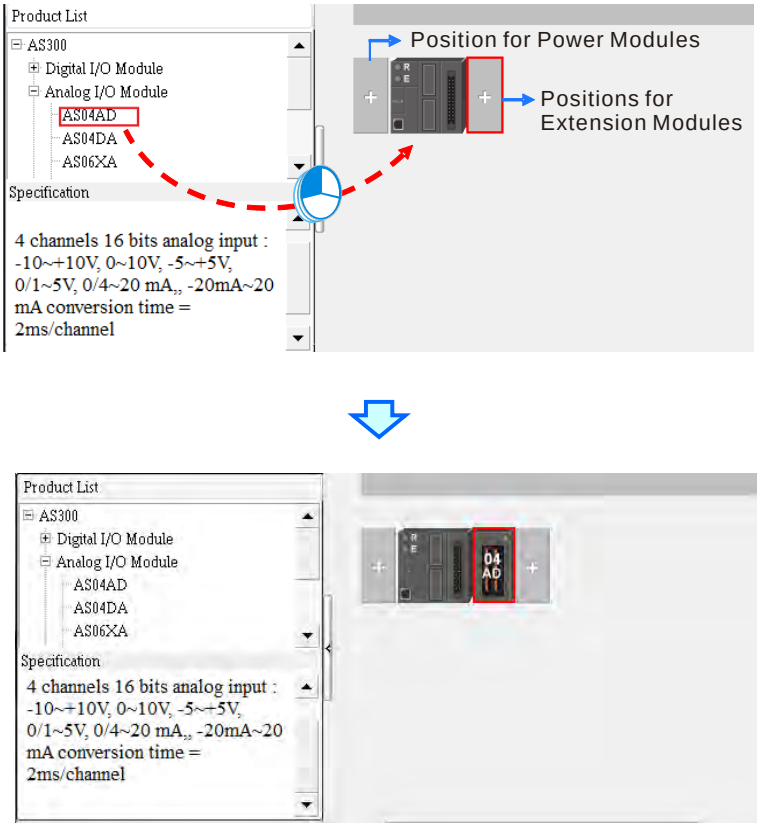
Refer to their specific manuals for the detailed setups of the communication software tools.

8.1.2 Configuring a Module

8.1.2.1 Adding a Module

- **Method 1**

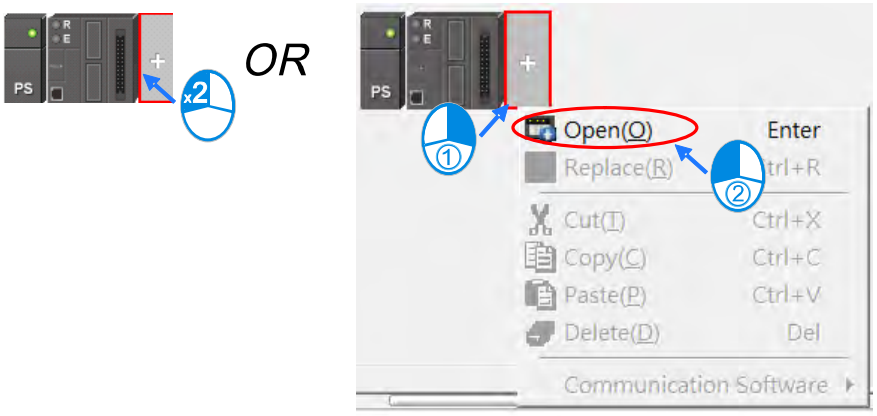
  Users can select a module from the product list and drag it to a vacant slot. AS Series is no backplane designed and for extensions, modules can be placed on the right side of the CPU module. As for the power module, it can only be placed on the left side of the CPU module and only ONE power module can be installed.



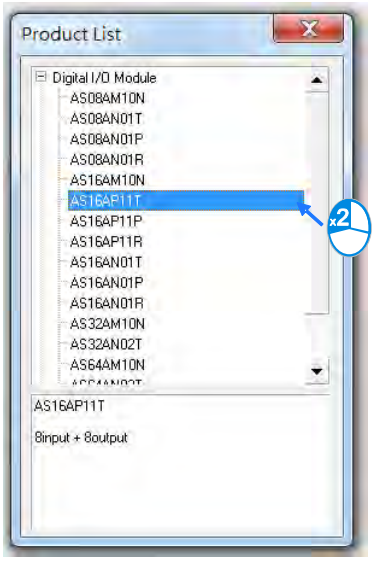
***. If users want to drag a module on the product list to the system configuration area, the module can only be put on a vacant slot. If the module is dragged to an occupied slot, the system will prohibit this operation.**

- **Method 2**

Double-click the vacant slot with a plus sign, and the Product List window will appear. Or users can also right-click the vacant slot with a plus sign, and click Open on the context menu to open the Product List window.



Double-click on the module you'd like to add from the Product List.

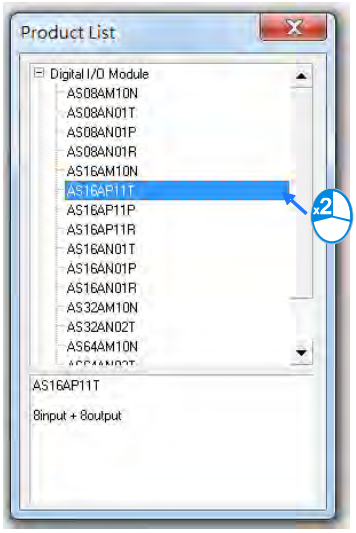


- **Method 3**

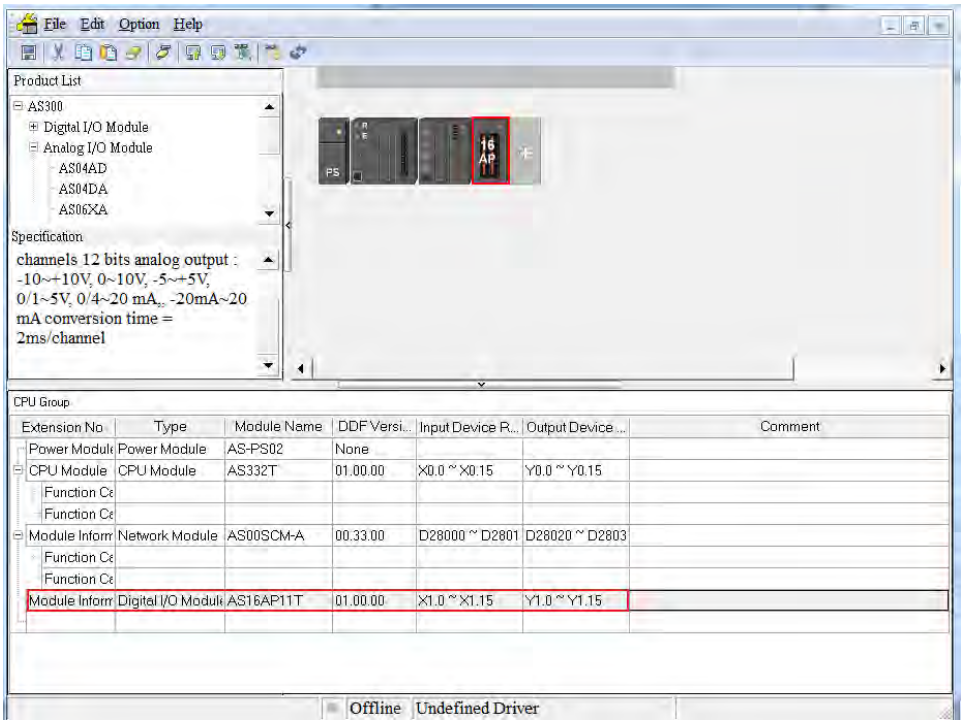
Double-click the empty space for module on the Information List, and the Product List window will appear.

Extension No	Type	Module Name	DDF Version	Input Device Range	Output Device Range
Power Module	Power Module	AS-PS02	None		
CPU Module	CPU Module	AS332T	01.00.00	X0.0 ~ X0.15	Y0.0 ~ Y0.15
Function Card1					
Function Card2					
Module Information1	Network Module	AS00SCM-A	00.33.00	D28000 ~ D28019	D28020 ~ D28039
Function Card1					
Function Card2					
Module Information2	Digital I/O Module	AS16AP11T	01.00.00	X1.0 ~ X1.15	Y1.0 ~ Y1.15

Double-click on the module you'd like to add from the Product List.



No matter which method is used to add a module, the configuration in the system configuration area and the information on the information list will be updated after a module is added.

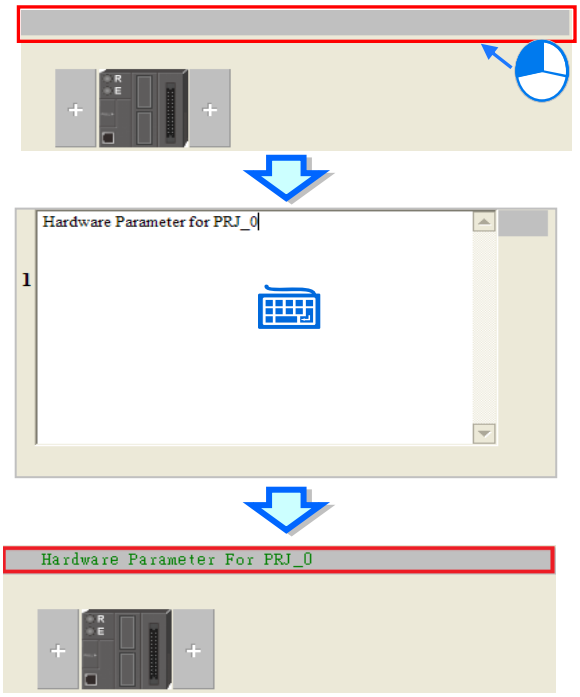


8.1.2.2 Assigning I/O Addresses

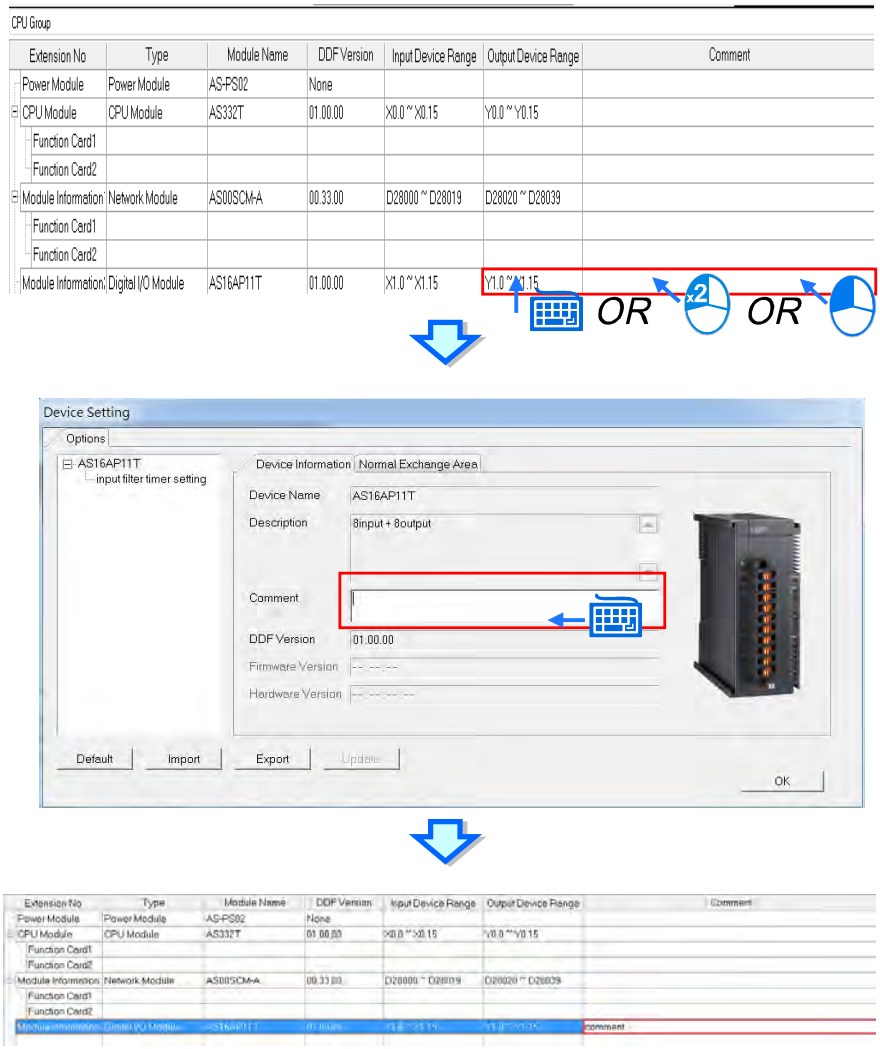
AS series does not support assign addresses manually. Addresses are automatically assigned to an input/output module through HWCONFIG in ISPSoft. Users can assign a start address to the first remote module installed on the right side of the I/O module slot (SCM module). And the following I/O module will be assigned with an address followed by the assigned address automatically. For remote module configuration, please refer to section 8.2.3 for more details.

8.1.2.3 Editing a Comment

After users click the gray area at the top of the system configuration area, they can type a comment about the hardware configuration in the drop-down box that appears. If users want to start a new line of text at a specific point, they can press Shift+Enter on the keyboard. After the comment is typed, users can press Enter on the keyboard.



After users click the Comment cell for a module on the information list, they can press a key on the keyboard, or click ··· to open the Comment window. The users can type a comment about the module in the Comment window.

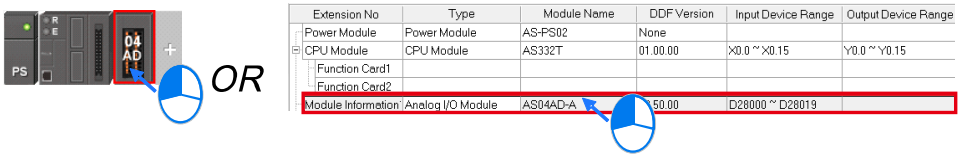


8.1.2.4 Deleting a Module

There are two ways to delete a module which has been configured. (The CPU module cannot be deleted.)

- **Method 1**

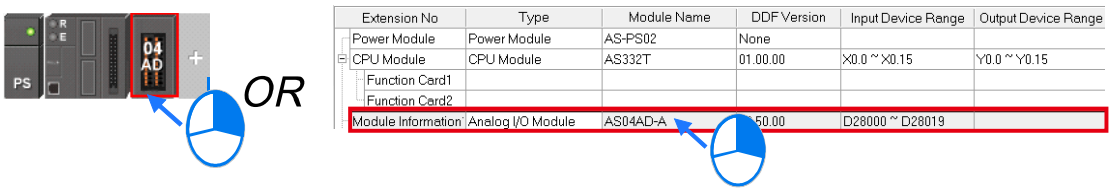
(1) Select a module which will be deleted from the system configuration area or information list.



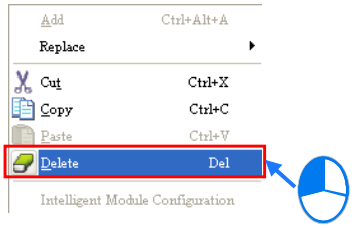
(2) Click **Delete** on the **Edit** menu, click  on the toolbar, or press Delete on the keyboard.

- **Method 2**

(1) Right-click a module which will be deleted from the system configuration area or information list.



(2) Click **Delete** on the context menu.

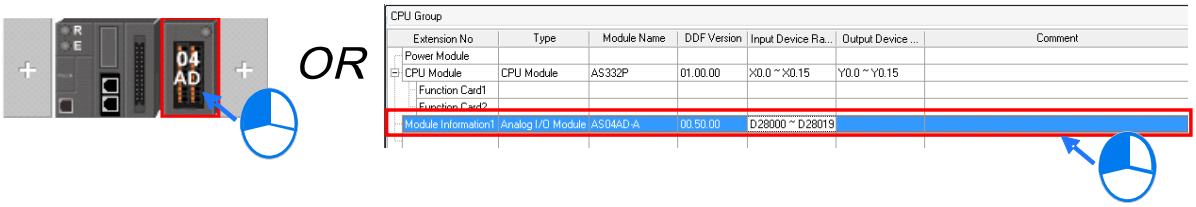


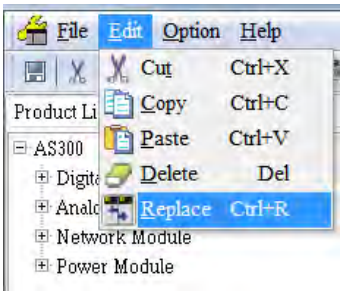
8.1.2.5 Replacing a Module

There are two ways to replace a module which has been added. (The CPU module and power module cannot be deleted.)

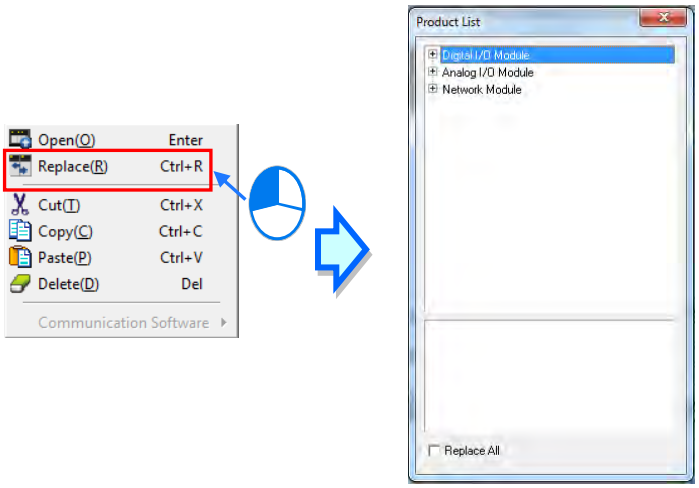
- **Method 1**

(1) Click a module which will be replaced in the system configuration area or on the information list, and then click **Edit** on the tool bar.

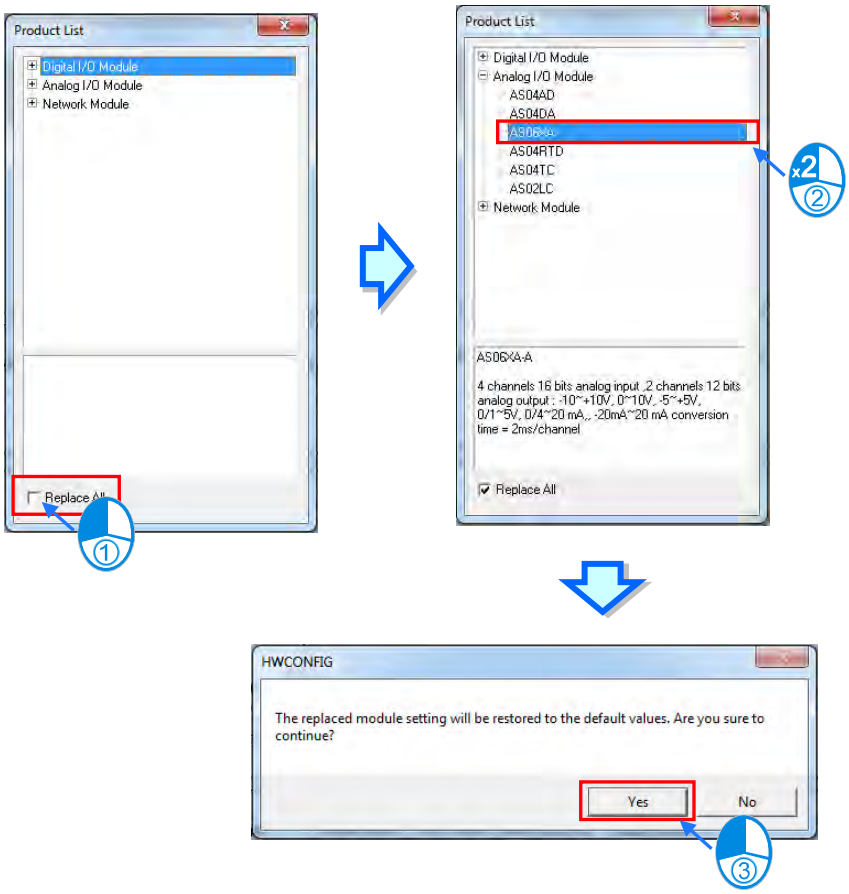




(2) Click **Replace** on the context menu and then a Product List window will show up.

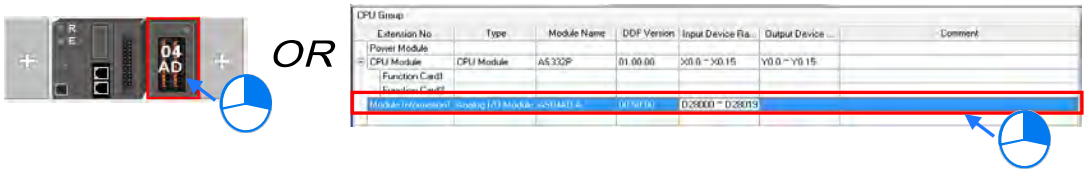


(3) Check the **Replace All** box when changing the same modules altogether at the same time. Select and double-click the new module (module to be replaced with) and after that a question will ask “The replaced module setting will be restored to the default values. Are you sure to continue?” Click **Yes** if the selected module needs to be replaced with the specific module.

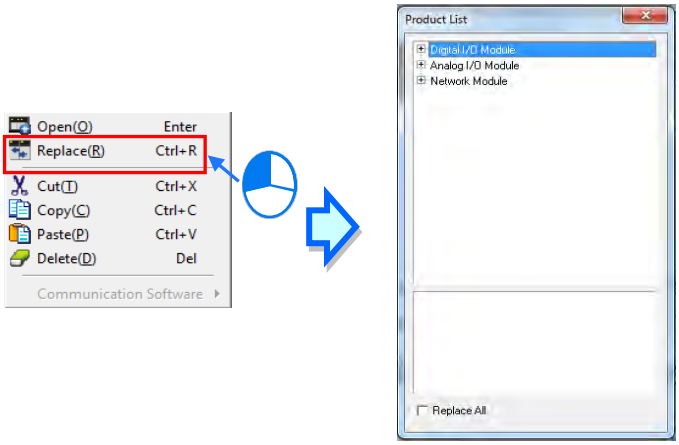


- **Method 2**

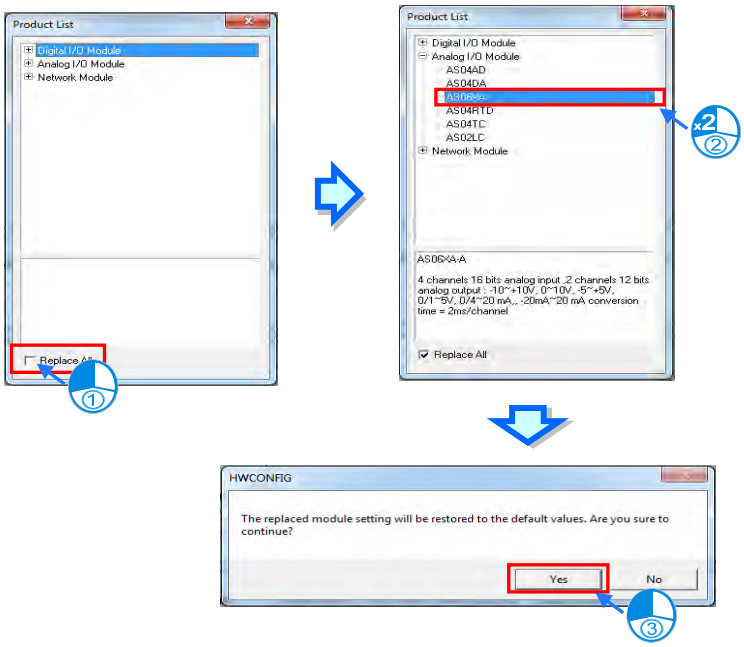
(1) Right-click a module which will be replaced in the system configuration area or on the information list, and then click **Replace** on the context menu.



(2) Click **Replace** on the context menu and then a Product List window will show up.



(3) Check the **Replace All** box when changing the same modules altogether at the same time. Select and double-click the new module (module to be replaced with) and after that a question will ask “The replaced module setting will be restored to the default values. Are you sure to continue?” Click **Yes** if the selected module needs to be replaced with the specific module.

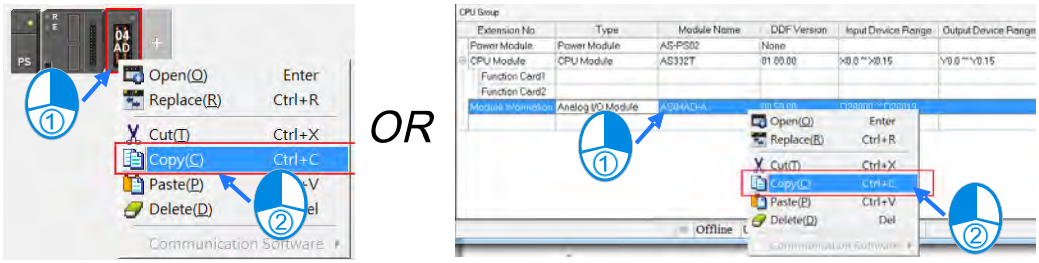


8.1.2.6 Copying/Pasting a Module

There are two ways to copy a module. (The CPU module and the power supply module can not be copied/pasted.)

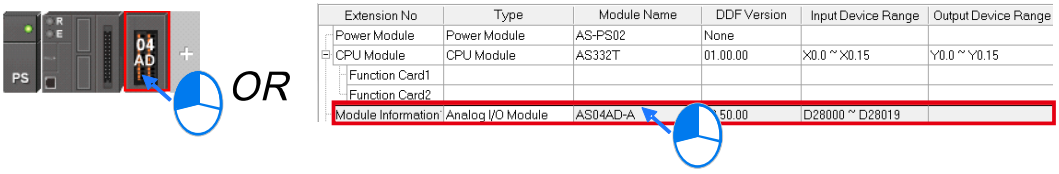
- **Method 1**

  Right-click a module which will be copied in the system configuration area or on the information list, and then click **Copy** on the context menu.

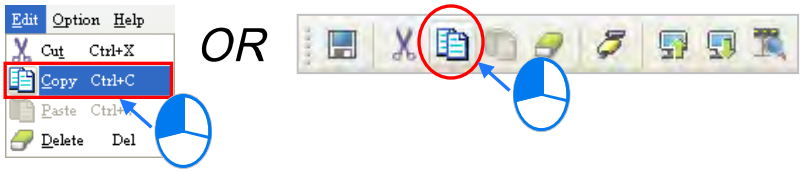


- **Method 2**

  (1) Click a module which will be copied in the system configuration area or on the information list.



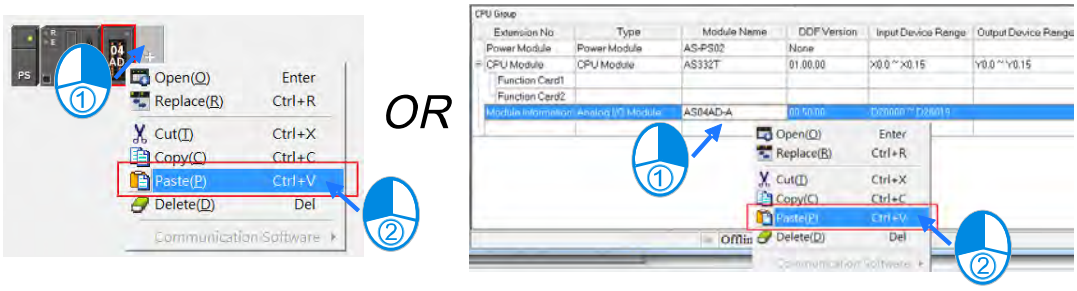
  (2) Click **Copy** on the **Edit** menu, or  on the toolbar.



There are two ways to paste a module.

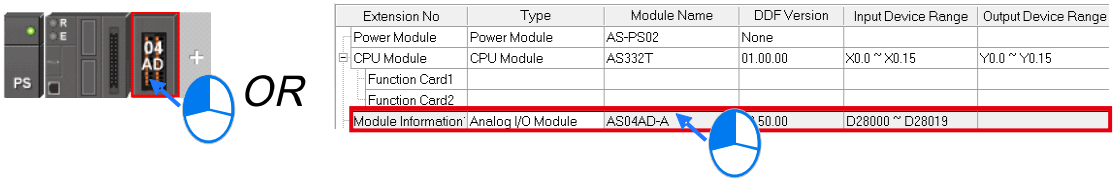
- **Method 1**

  Right-click a slot on which a module will be pasted in the system configuration area or on the information list, and then click **Paste** on the context menu.



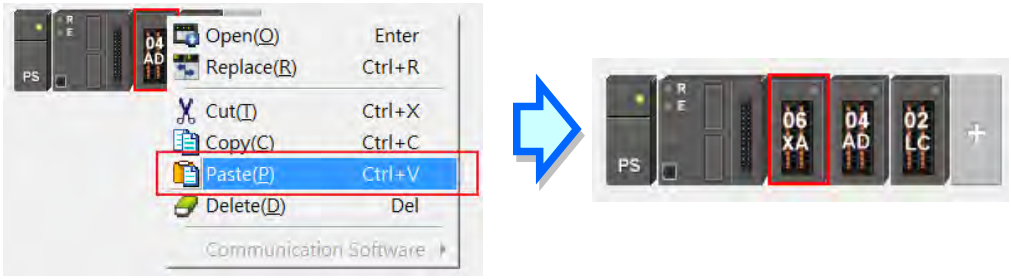
- **Method 2**

(1) Click a slot on which a module will be pasted in the system configuration area or on the information list.



(2) Click **Paste** on the **Edit** menu, or  on the toolbar.

If the position that you'd like to paste a module is already with a module, the pasted module will be added in front of the position where a module has already taken its place. As the example shown below, adding the module 06XA in the position of the module 04AD will have the module 06XA be positioned in front of the module 04AD.

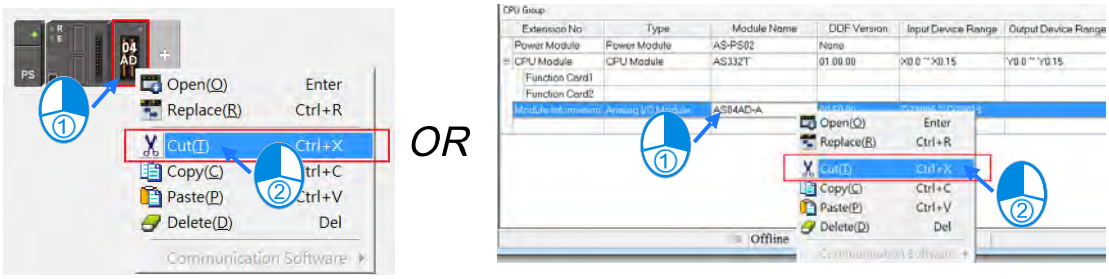


8.1.2.7 Cutting/Pasting a Module

There are two ways to cut a module. (The CPU module and the power supply module can not be cut/pasted.)

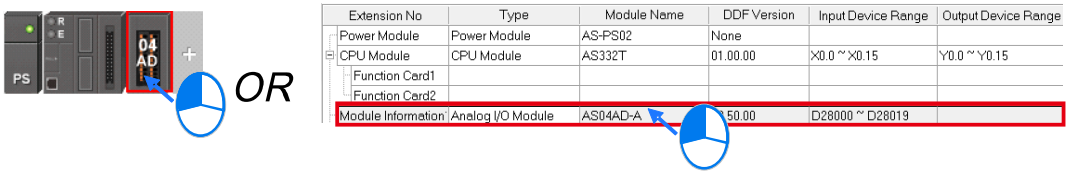
- **Method 1**

  Right-click a module which will be cut in the system configuration area or on the information list, and then click **Cut** on the context menu.

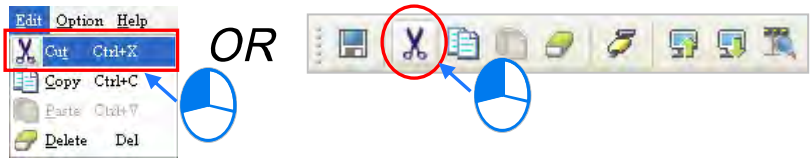


- **Method 2**

(1) Click a module which will be cut in the system configuration area or on the information list.



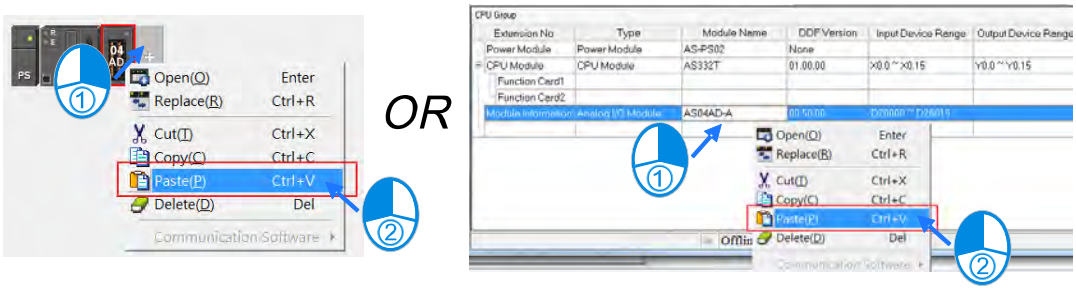
(2) Click **Cut** on the **Edit** menu, or  on the toolbar.



There are two ways to paste a module.

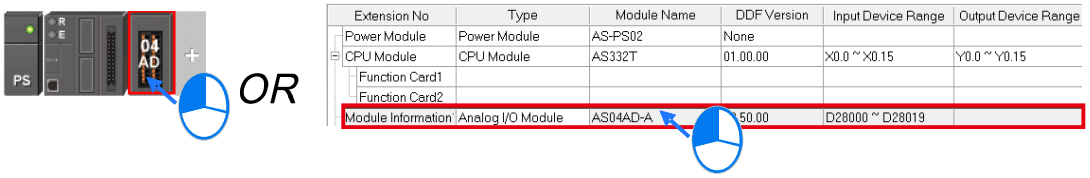
- **Method 1**

Right-click a slot on which a module will be pasted in the system configuration area or on the information list, and then click **Paste** on the context menu.



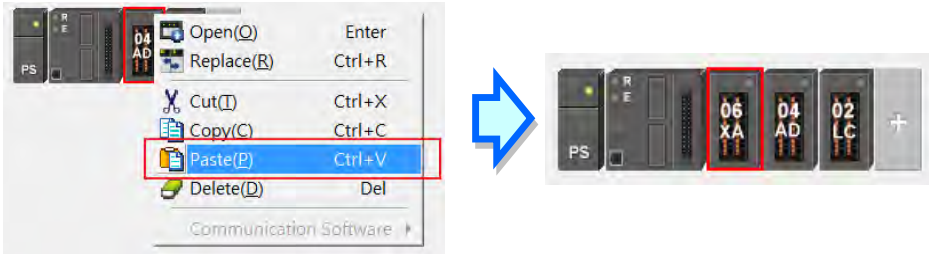
- **Method 2**

(1) Click a slot on which a module will be pasted in the system configuration area or on the information list.



(2) Click **Paste** on the **Edit** menu, or  on the toolbar.

If the position that you'd like to paste a module is already with a module, the pasted module will be added in front of the position where a module has already taken its place. As the example shown below, adding the module 06XA in the position of the module 04AD will have the module 06XA be positioned in front of the module 04AD.



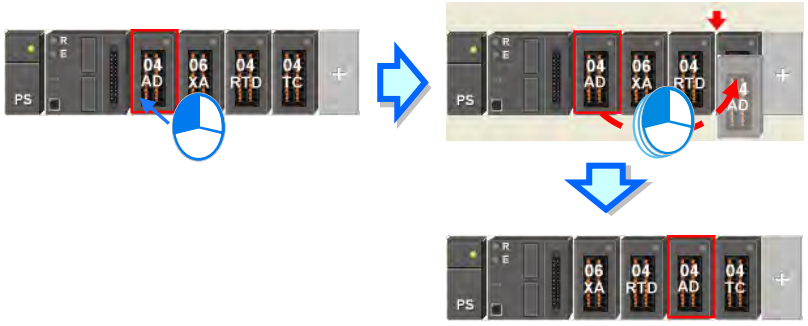
Additional remark

A module which is cut can only be pasted once. When a module is cut/pasted, the parameters in the module are processed as follows.

- **Input/Output device range**: The input/output devices assigned to the module cut are automatically assigned to the module pasted.

8.1.2.8 Dragging a Module

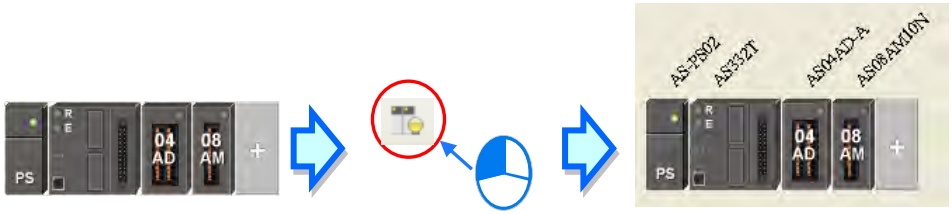
All modules in the system configuration area can be dragged by the mouse except the CPU module and the power supply module. And when dragging a module from one positon to another position in the System Configuration Area, a red arrow will show along with the direction of your mouse cursor.



*** When a module is dragged, the input/output devices assigned to the module, the comment about the module, the parameters in the module, the data registers assigned to the module, and the parameters in the intelligent module are also dragged.**

8.1.2.9 Show/Hide Device Name

Module names can be shown or hidden in the System Configuration Area by click the icon  on the tool bar.



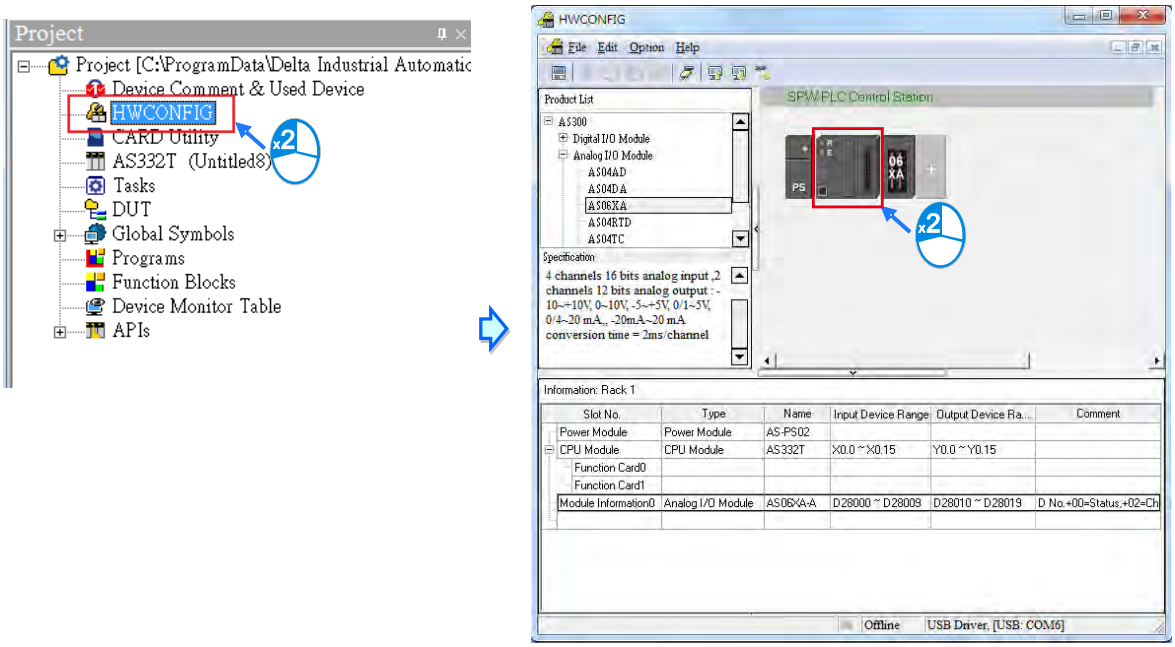
8.2 Setting the Parameters in an AS Series CPU Module

8.2.1 Opening the PLC Parameter Setting Window

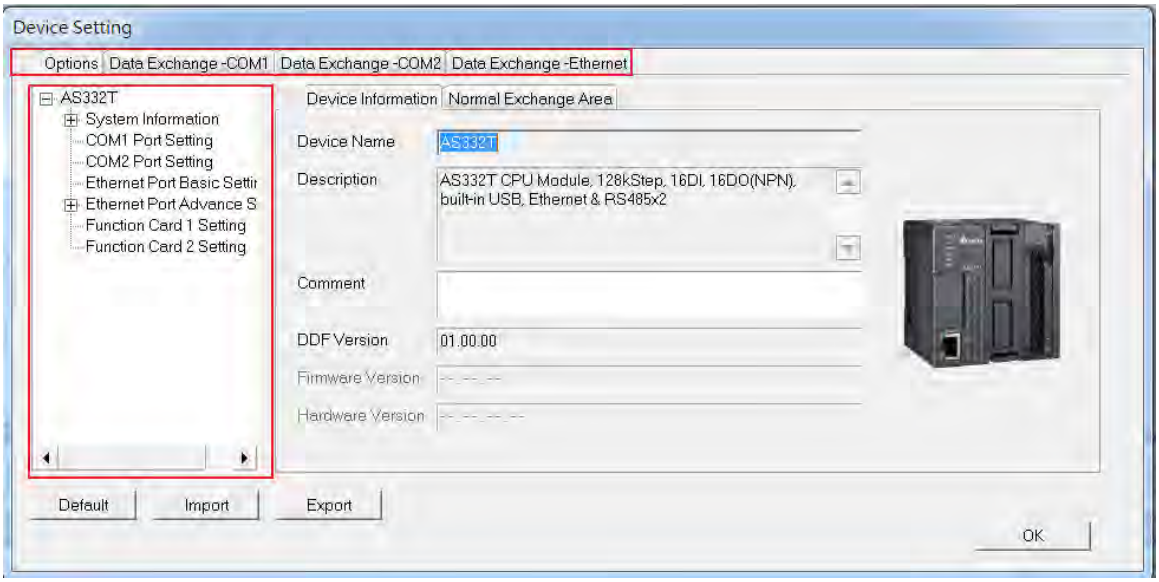
After users double-click the CPU module in the system configuration area, the **PLC Parameter Setting** window will appear. The parameters which can be set vary with the models of the CPU modules.

⚠ **Before the parameters in a CPU module are set, users have to refer to the operation manual for the CPU module. To prevent damage to the system or staff, the users have to make sure of the effect that the parameters which are set have on the CPU module and the whole system.**

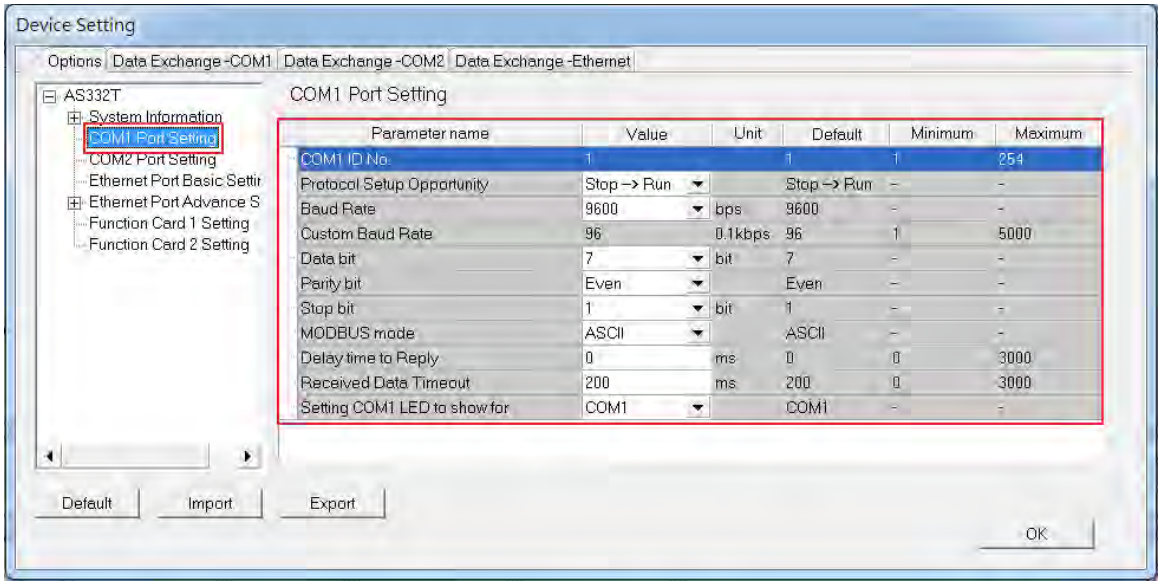
***. The set parameters should be downloaded to the CPU module to take effect.**



The parameters are classified into several types. The users can click the primary tabs at the top of the window, and the setting options on the left.



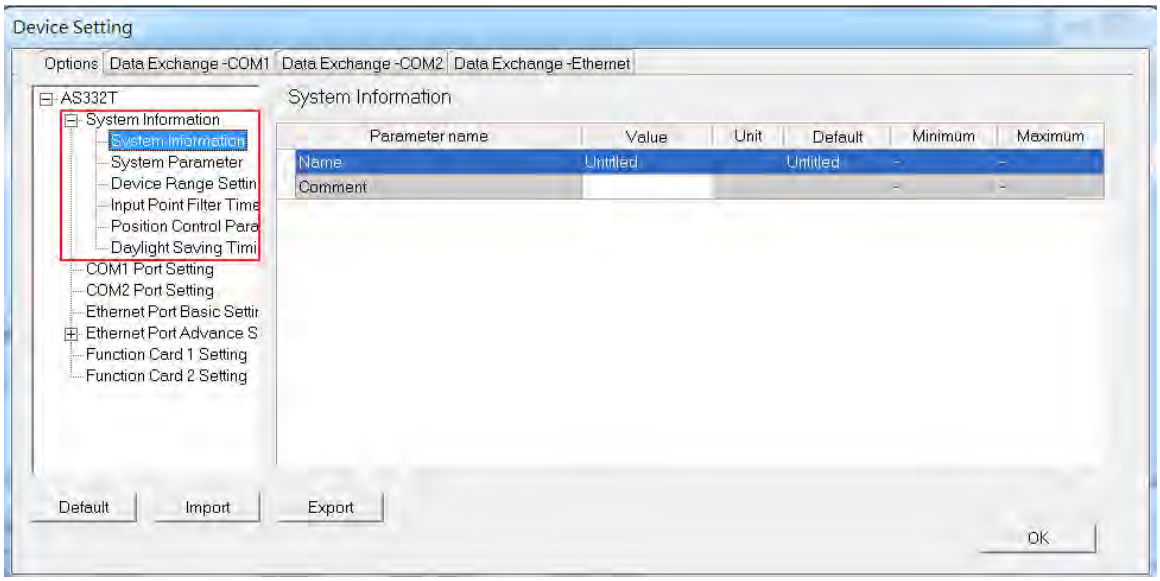
Once you have selected the setting option, the details of the setting parameters for the selected setting option will appear on the right. Users can set up the Parameter name, Value, Unit, Default, Minimum and Maximum in the setup area.



8.2.2 Setting the Basic CPU Parameters

8.2.2.1 Options - System Information

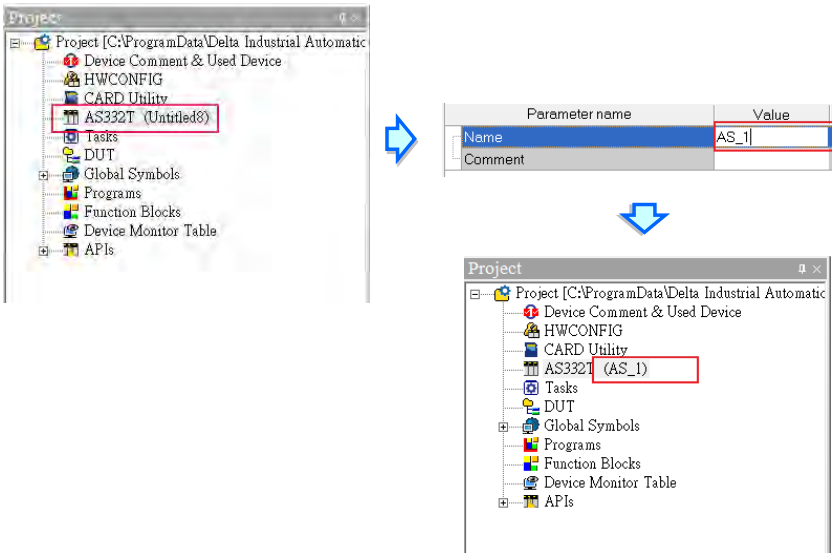
After users click the Options tab at the top of the window, users can find the system information option. Unfold the system information, users can find the System Information, System Parameter, Device Range Setting, Input Point Filter Time, Positon Control Para, and Daylight Saving Timing.



System Information:

On the System Information page, there are 2 sections for users to edit, Name and Comment. Up to 15 characters can be inputted in the Name section, and up to 31 characters can be inputted in the Comment section. Spaces and special characters can be used in these 2 sections but please be noted, a Chinese character occupies two characters.

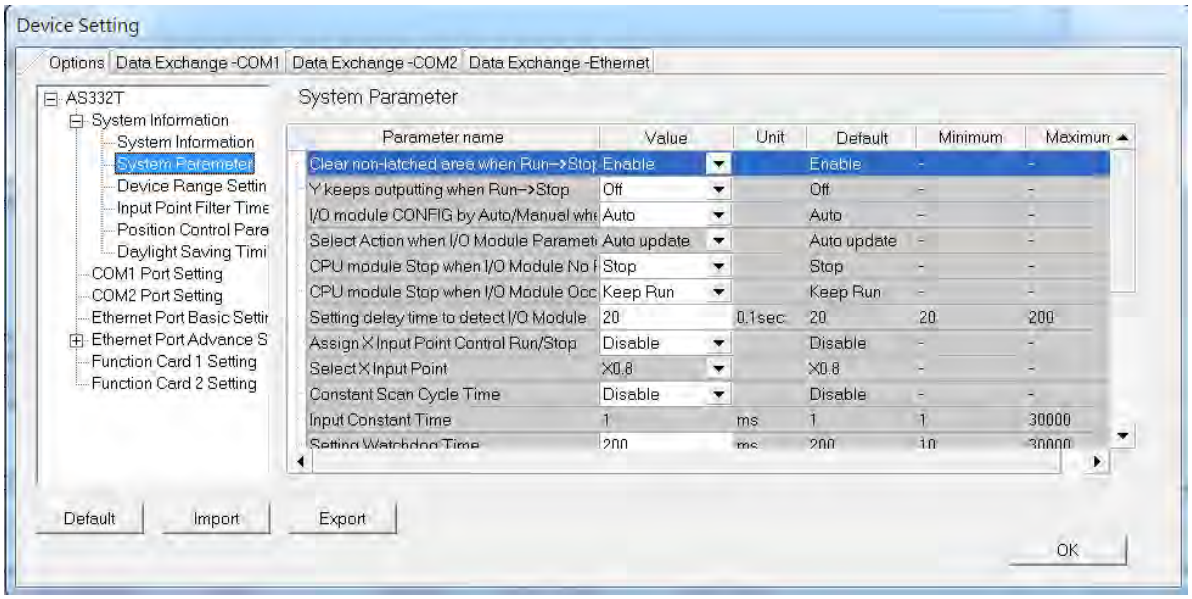
After an ISPSoft project is created, the project name will be taken as the default name of the CPU module, and the default name of the CPU module will be attached to the model in the project management area. Users can change the default name of the CPU module in the Name box later.



Users can identify a device by means of the name of the device. When several devices are connected on a network, users can check whether a device connected to the computer is the device they expect by means of the name of the device. To prevent unexpected effect on other CPU modules, if users want to download/upload the program, but the name of the CPU module is different from the name attached to the model in the project management area, the system will remind the users to check the name of the CPU module and the name attached to the model in the project management area.

System Parameter

On the System Parameter page, parameters can be set by inputting appropriate values and by selecting from the drop-down list.



- **Clear Non-latched area when Run → Stop**

  When setting the PLC state from Run to Stop, will the states of the non-latched devices, and the values in the non-latched devices are cleared?

  - **Disable:** All the state and value in the non-latched devices keep the same.
  - **Enable:** All the state and value in the non-latched devices will be cleared and restore to defaults.

- **Y keeps outputting when RUN→Stop**

  What the states of the Y devices are when the CPU module begins to run or stop.

  - **Off:** All Y devices are set to OFF.
  - **Retain:** The states of the Y devices are retained.

- **I/O module CONFIG by Auto/Manual when Power On**

  When power-on, the CPU module will be configured automatically or users configure the parameters in HWCONFIG.

  - **Auto:** The CPU module will be configured automatically.
  - **Manual:** Users configure the parameters in HWCONFIG.

- **Select Action when I/O Module parameter with manual CONFIG Different**

  When the previous setting option is set as Manual, which action to be taken when the actual settings are not the same as the parameters set manually.

  - **Auto update:** The CPU module will be configured as the actual settings automatically.
  - **Show error:** The CPU module shows error.

- **CPU module Stop when I/O Module No Response**

  When a module from the connected extension modules is not responding, how should the CPU module and other module react?

  - **Stop:** The CPU module stops running and sends error
  - **Keep Run:** The CPU module and I/O modules keep running.

- **CPU module Stop when I/O Module Occurred Error**

  When a slight error occurred from a module, how should the CPU module react?

  - Stop: The CPU module stops running and sends error
  - Keep Run: The CPU module keeps running and sends error.

- **Setting delay time to detect I/O Module**

  Set up the time to detect an I/O module after powering on the CPU module.

- **Assign X Input Point Control Run/Stop**

  Assign an input point to have the CPU module run/stop

  - Disable: Run/stop the CPU module to via the dip switch of the CPU module.
  - Enable: Run/stop the CPU module via the assigned input point and the dip switch of the CPU module can still control the run/stop of the CPU module.

- **Select X Input Point**

  If the previous option has selected “Enable”, users can select one input point to control the Run/Stop of the CPU module from the dropdown list.

- **Constant Scan Cycle Time**

  Set the scan cycle time up

  - Disable: Disable this function

- Enable: When the actual scan cycle time is less than the setup time, the CPU module will wait till the setup time is met and then start the next scan. While the actual scan time is larger than the setup time, the CPU module will start the next scan after the actual scan time is complete.

- **Input Constant Time**

  If the previous option has selected “Enable”, users can set the scan cycle time. If the actual scan time is less than setting value, the CPU module will not carry out the next scan until the setting value is reached. If the actual scan time is larger than the setting value, the CPU module will ignore the setting value, and operate according to the actual scan time. Besides, if the scan time set is larger than the watchdog timeout set, a watchdog timeout occurs when the CPU module operates.

- **Setting Watchdog Time**

  The parameter sets a timeout during which the program is scanned. The CPU module will send an error if the program execution exceeds the time.

- **Show Battery Low Voltage Error**

  The parameter sets whether the alarm is shown when the lithium battery for the real-time clock is of low voltage or is not installed in AS300.

  - Disable: Disable this function

  - Enable: There is an alarm when the lithium battery is of low voltage or not installed

- **Save Error History Info**

  Set up where to store the error log. The parameter sets the location to store error logs.

  - PLC: Store in the PLC. Twenty error logs at most can be stored in an AS series CPU module. If there are more than twenty error logs, the oldest error log will be overwritten by the latest error log.

  - PLC & SD Card: When there are more than twenty error logs, the oldest error log will be backed up in the memory card before the oldest error log is overwritten.

- **Select Action when 24Vdc Input Unstable**

  - Continue running when power stable: When the power is unstable, the AS series will pause and after the power is stable, it will continue running.

  - Into Error Status: When the power is unstable, the error LED will blink and the AS series will stop running.

- **Communication Module Refreshed Priority**

  - Scan Time First: When there is an update, the AS series will be refreshed in batch automatically to save scan time.

  - Synchronous Data First: When there is an update, the AS series will be refreshed completely and automatically to ensure the data integrity. However when the quantity of the data is too large, the scan time will be affected.

- **COM Communication Error Record**

  The parameter sets whether to enable the error record when there is an error at COM port.

  - Disable: Disable this function

  - Enable: Enable this function and start record error log.

- **I601 Timer interrupt Setting Time Base**

  Users can set the interval of triggering 1601 timer interrupt. The function is used with Timer Interrupt 0 in the work management together.

- **I602 Timer interrupt Setting Time Base**

  Users can set the interval of triggering 1602 timer interrupt. The function is used with Timer Interrupt 1 in the work management together.

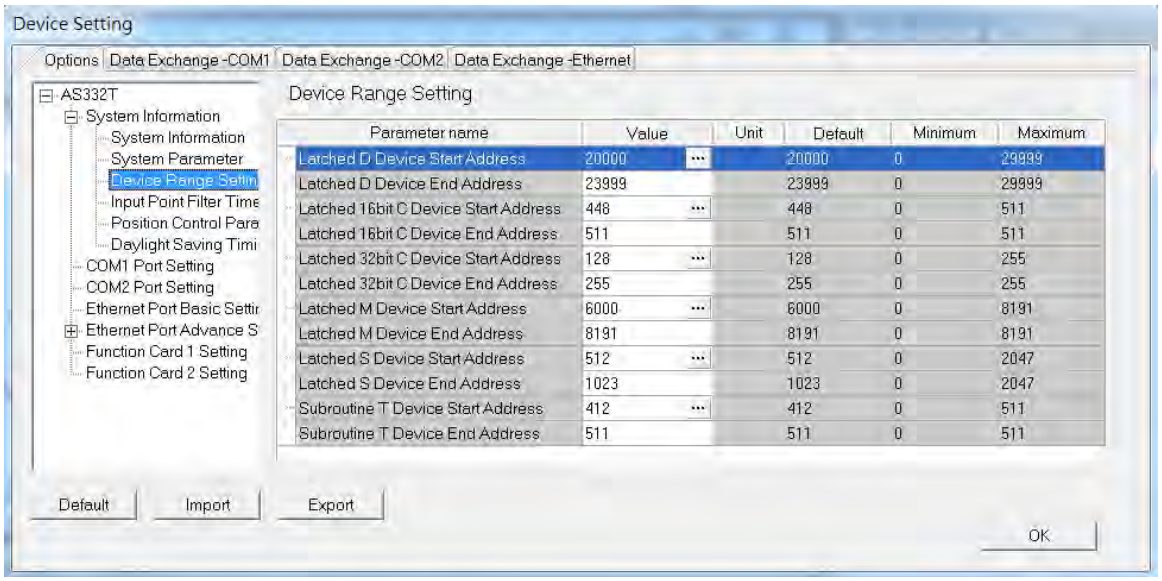
- **I603 Timer interrupt Setting Time Base**

  Users can set the interval of triggering 1603 timer interrupt. The function is used with Timer Interrupt 2 in the work management together.

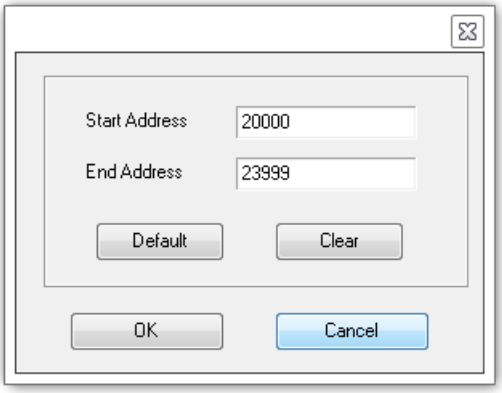
- **I6014 Timer interrupt Setting Time Base**

  Users can set the interval of triggering 1604 timer interrupt. The function is used with Timer Interrupt 3 in the work management together.

Device Range Setting

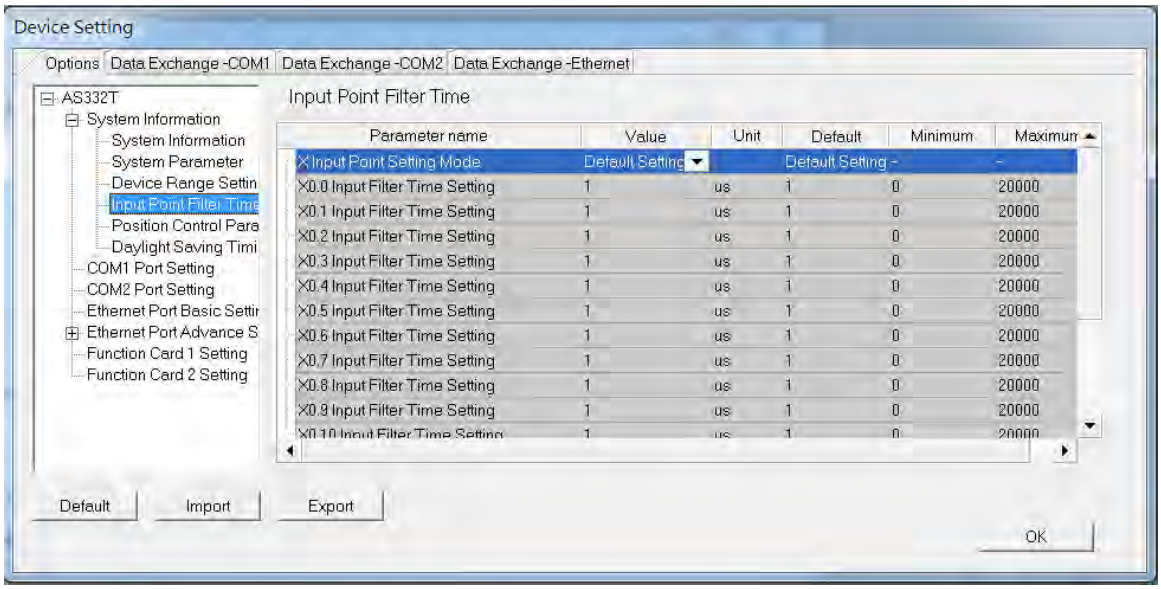


Click ··· to open the setup window, to set the start and end address. Click **Default** if the users want to restore the setting to the default values. Click **Clear** to clear the set values. Click **OK** to save and confirm the setting; click **Cancel** to discard the setting and leave the setup page.



Input Point Filter Time

On the Input Point Filter Time page, users can set the input point filter time for each input. If the duration of the received signal time is less than the set filter time, it will be regarded as noises and will be filtered out. Users can select an appropriate filter time according to their actual needs.

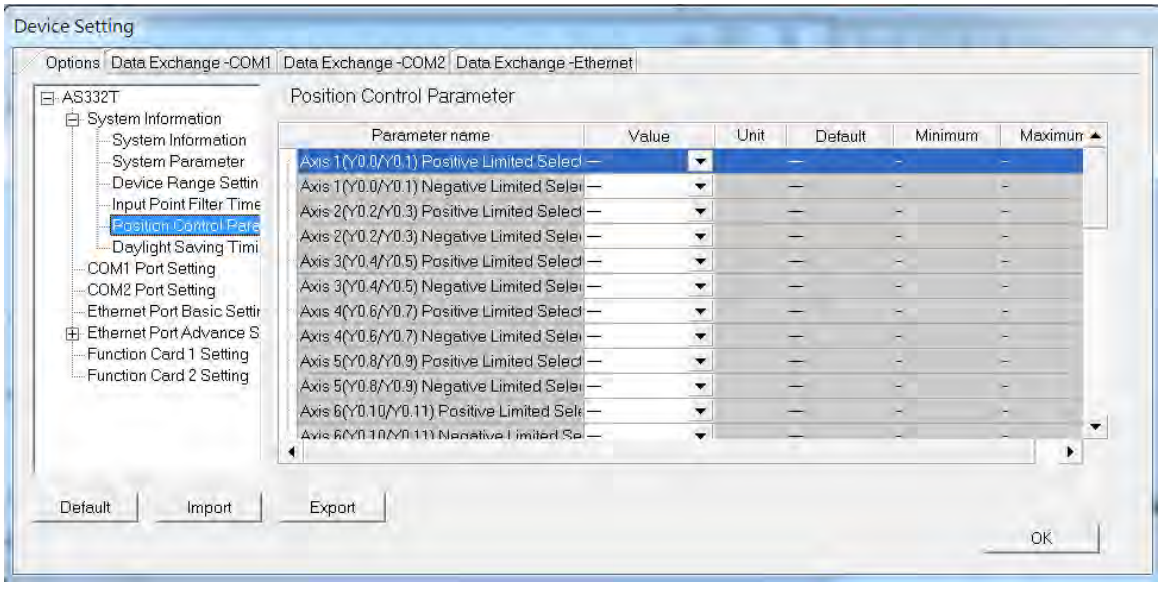


- X Input Point Filter for CPU module
  - Default Setting: use the defaults in the input point filter
  - Manual Setting: set up the filter time for each X input point
- X0.0~X0.15 Input Point Filter Time

  Once the Manual Setting is select, users can set up the filter time individually for X0.0~X0.15.

Positive Control Parameter

On the Positive Control Parameter page, users can set the Positive/Negative Controls for axis 1~6, and make it a total of 12 controls.

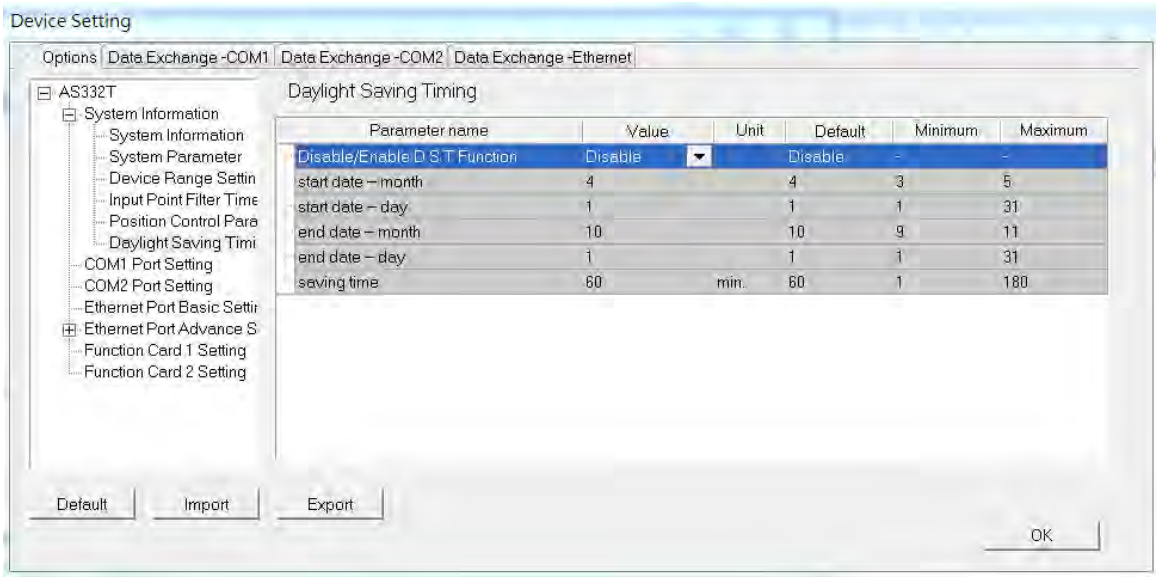


- Axis 1 (Y0.0/Y0.1) positive control ~ axis 6 (Y0.10/Y0.11) positive control

  Select the raising and falling edges for the input X from the dropdown list.

Daylight Saving Timing

On the daylight saving timing page, users can enable or disable this function. Set up the daylight saving time and the set up the time zones to perform the daylight saving, and the system will act accordingly.



- Disable/Enable D.S.T Function

  Users can set to use this function or not.

- Start Date – Month

  Set the month to start the day light saving

- Start Date – Day

  Set the day to start the day light saving

- End Date – Month

  Set the month to end the day light saving

- Start Date – Day

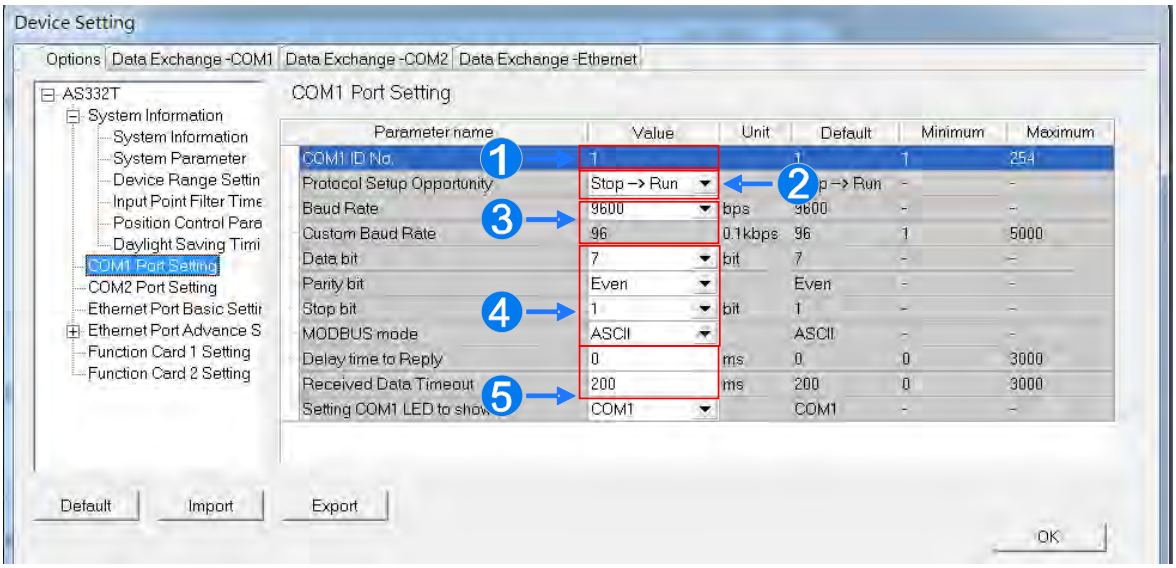
  Set the day to end the day light saving

- Saving time

  Set the daylight saving time by minutes

8.2.2.2 Options - COM1 & COM2 Port Setting

The AS CPU module is equipped with two communication ports, there are two setting areas for the two communication ports, and the two communication ports are set individually.



❶ Users can set a station address. A device on a network can be identified by means of the station address of the device. The station address of a device on a network cannot be the same as the station address of another device on the same network. If the communication port functions as a slave, and there are other slaves, the station address of the communication port cannot be 0. Station address 0 has the meaning of broadcasting to all slaves in a communication protocol. If a master specifies in a data packet that data must be sent to station address 0, the data will be sent to all slaves. No matter what station address of these slaves are, these slaves will receive the data packet.

❷ Set up when the communication port will take effect. Selecting **Stop --> Run** the communication can work while the state of the CPU module is from Stop to Run. Or selecting Power-on, the communication will start working when Power-on.

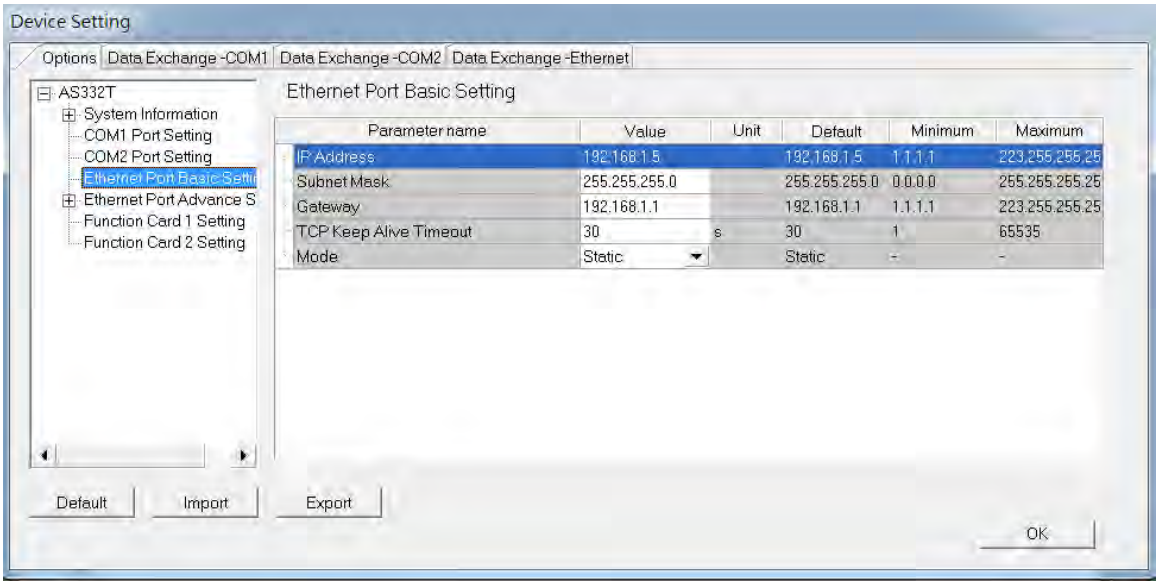
❸ Users can select a communication speed in the **Baud Rate** drop-down list box. Or select Custom and input a new rate.

❹ Set up the communication protocol for the port.

❺ Set up the “Delay Time to Reply” is when AS series CPU module receives the communication and how long it will hold before responding to the remote modules. Received Data Timeout is when AS series CPU module acting as a server and sends out communications and how long it will wait before regarding the deceived data is timeout.

8.2.2.3 Options - Ethernet Port Basic Setting

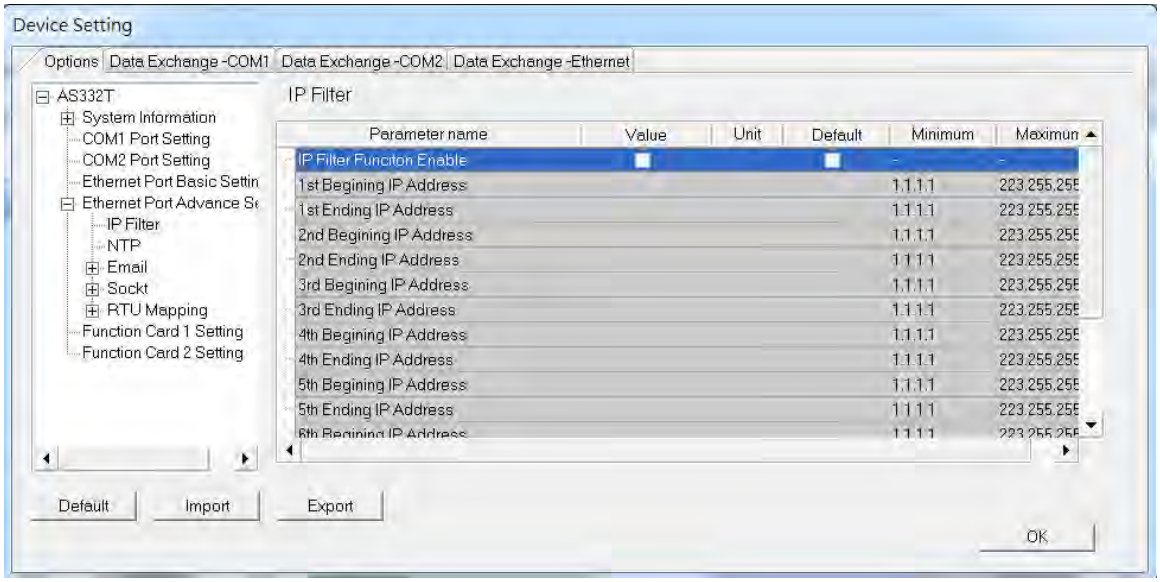
Click the Ethernet Port Basic Setting to see the setup page. The users can set the communication parameters for the Ethernet port in the CPU module in this page.



If users select **Static** in the **IP Addressing** Mode drop-down list box, they can specify an IP address. If **Dynamic** or **BOOTP** is selected in the **IP Addressing Mode** drop-down list box, an IP address is assigned by a DHCP/BOOTP server.

8.2.2.4 Options - Ethernet Port Advanced Setting

Click the Ethernet Port Basic Setting to see the setup page. There are setups for IP Filter, NTP, Email, Socket, and RTU mapping.



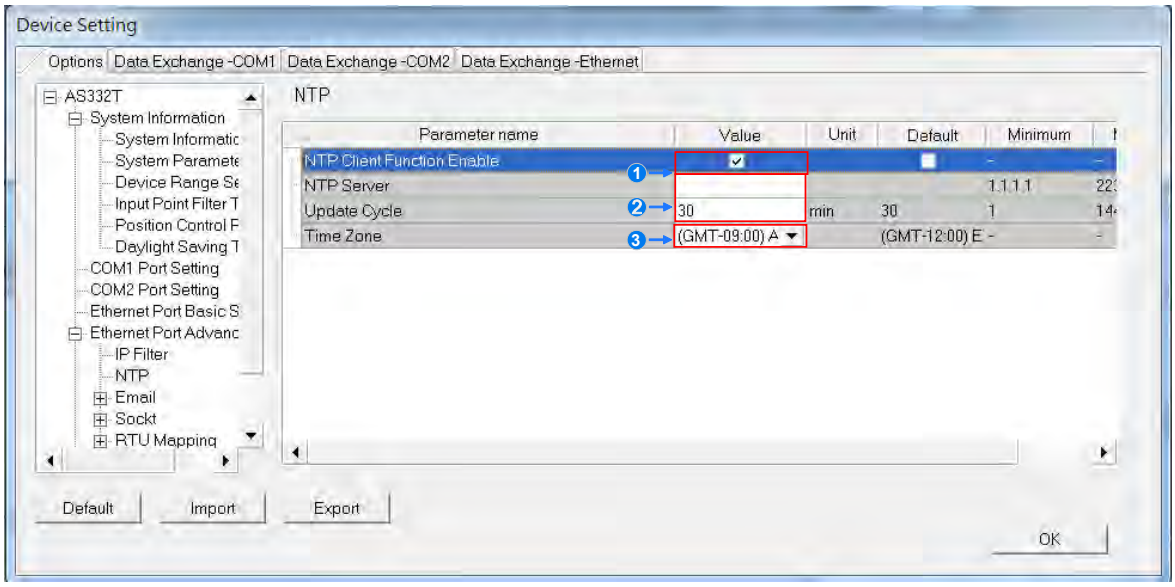
IP Filter

Devices whose IP addresses are listed in the table will be allowed to communicate with the CPU module, and the CPU module will discard data packets sent from devices whose IP addresses are not listed in the table. Devices on a network are filtered. The setting here ensures that objects communicating with the CPU module are devices which are allowed. Up to 8 address ranges can be set.

NTP

NTP is the function of synchronizing the real-time clock in the CPU module to an NTP server, and carry out the related setting. Please refer to related documents or manuals for more information about NTP.

Select the **Enable NTP Client Service** checkbox, and then set the related parameters.

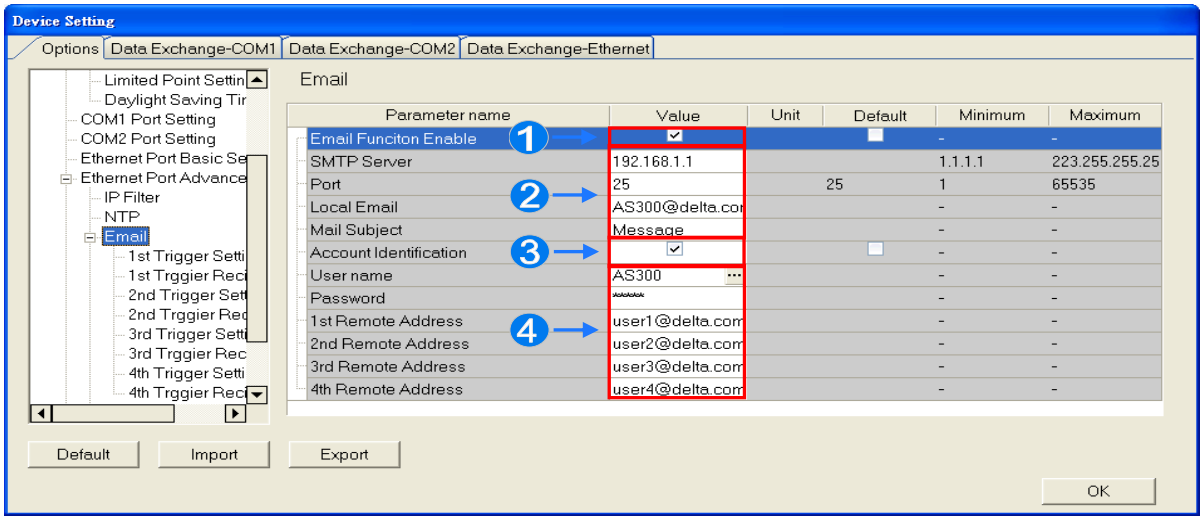


❶ Users can set the IP address of an NTP server. The CPU module corrects the time inside itself by connecting to the server periodically.

❷ Users can set an interval of correcting the time in the CPU module. If the interval is thirty minutes, the CPU module will connect to the NTP server every thirty minutes.

❸ Users can select a time zone in the **Time Zone** drop-down list box.

Email table is for users to set the email-related functions. The email will be sent to the set email address after the email function is enabled. Total four groups of email sending conditions and four groups of email addresses can be set.



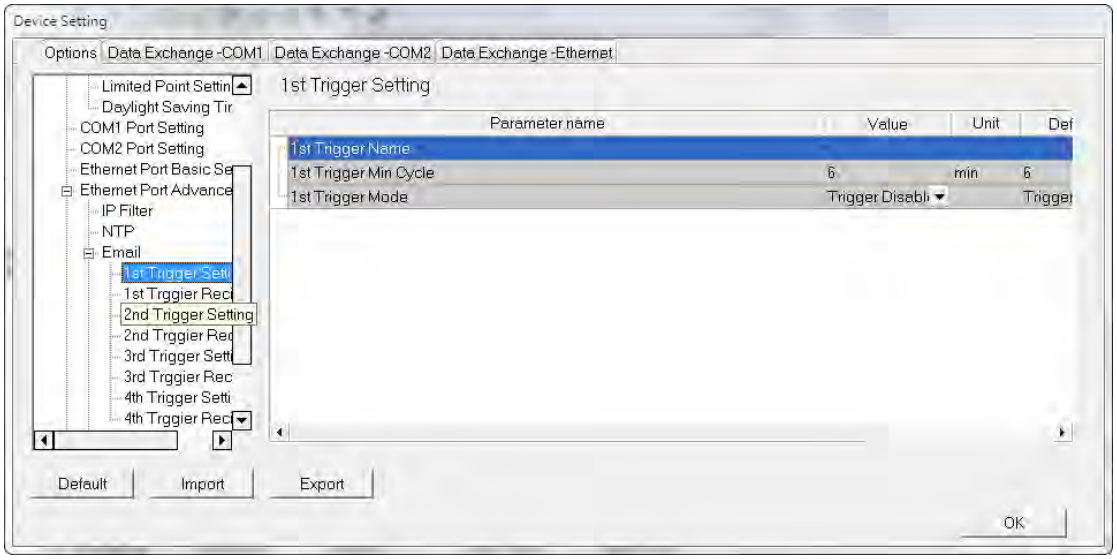
❶ Select **Email Function Enable** to enable the function and then start setting the following parameters.

❷ Set an IP address of SMTP server. Set the COM port of SMTP server at the COM port and set the sender's email box at local email address. Type a mail subject as the start of the subject of every email.

❸ Select **Account identification** checkbox to enable the function. Users can set to authenticate themselves with a user name and a password before logging in to an SMTP server.

❹ Type the target email address of a receiver.

Type a trigger name in **Trigger Name box** and a minimum interval in **Trigger Min Cycle** in the **Trigger Setting** table. And then select a trigger condition on the drop-down list. When the sending condition is met, the system will send an email every a period of time. But the same email will not be sent again within the set interval.



Trigger modes can be set as follows.

- **CPU Error**

If an error occurs in the CPU module, the condition of triggering the sending of an email is met. Please refer to operation manuals for more information about errors occurring in CPU modules. After users select the **CPU Error** option button, they have to select **Fatal Error Only** or **All Errors** in the drop-down list at the right side of the option button.

a) **Fatal Error Only**: If a fatal error occurs in the CPU module, the condition of triggering the sending of an email is met and an email will be sent.

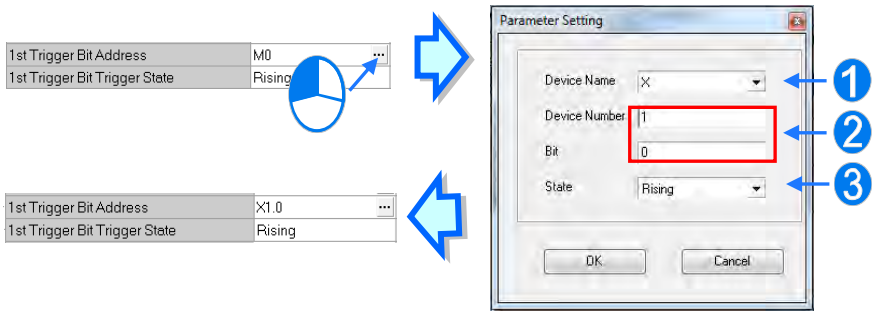
b) **All Errors**: If an error occurs in the CPU module, the condition of triggering the sending of an email is met and an email will be sent.

- **CPU (RUN<=>STOP)**

When the CPU module begins to run, or when the CPU module stops running, the condition of triggering the sending of an email is met and an email will be sent.

- **Bit Status Change**

If the state of a bit device specified meets a condition set, the sending of an email will be triggered and an email will be sent. For example, if X0.0 is turned from OFF to ON, the condition of triggering the sending of an email will be met. If users want to set a condition, they can click ··· button in the following window.



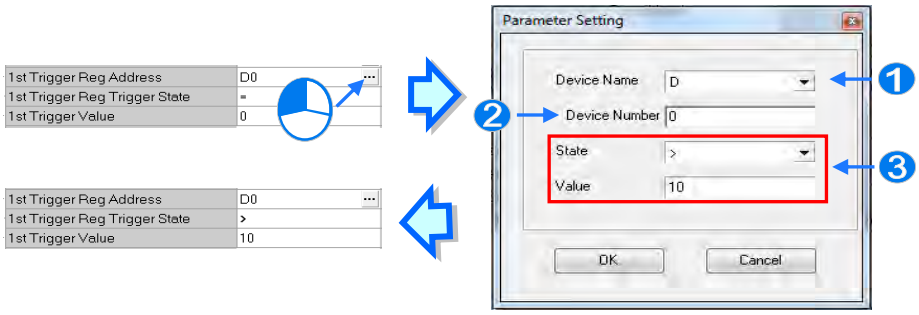
❶ **Device Name**: Users can select a device type in the **Device Name** drop-down list box.

❷ **Device Number & Bit**: Users can type a device address in the **Device Number** box. If the device type selected is X/Y, the users have to specify a bit number.

❸ **State**: Users can select **Rising** or **Falling** in the **State** drop-down list.

- **Register Value Change**

If the value in a device specified meets a set condition, the sending of an email will be triggered and an email will be sent. For example, if the value in D0 is larger than 10, the condition of triggering the sending of an email will be met and an email will be sent. If users want to set a condition, they can they can click ··· button in the following window.



❶ **Device Name**: Users can select a device type in the **Device Name** drop-down list.

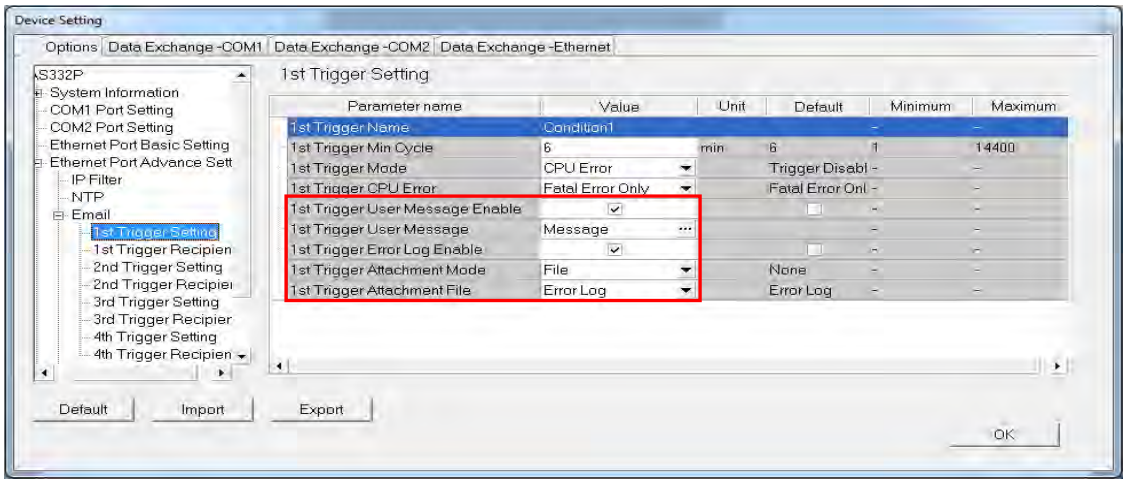
❷ **Device Number**: Users can type a device address in the **Device Number** field.

❸ **State & Value**: Users can set s condition of triggering the sending of an email here.

- **Periodic Timer**

An email is sent periodically. How often an email is sent depends on the interval typed in the **Trigger Min Cycle** box in the **Trigger Setting** section.

Where any trigger mode is set, the user message and error log related parameters will show up.



Select the **Trigger User Message Enable** box and then click ··· button to the right side of **Trigger User Message**. Type some content as the email text in the pop-up window.

If users select the **Error Log Enable** checkbox in the **Trigger Setting** table, the error log will be added to the email content automatically.

The options on the drop-down menu of **Trigger Attachment Mode** decide whether to add an attachment to the email. Please make sure the maximum size of the email file allowed before setting an attachment. For more information, refer to relevant operation manuals.

- **None**

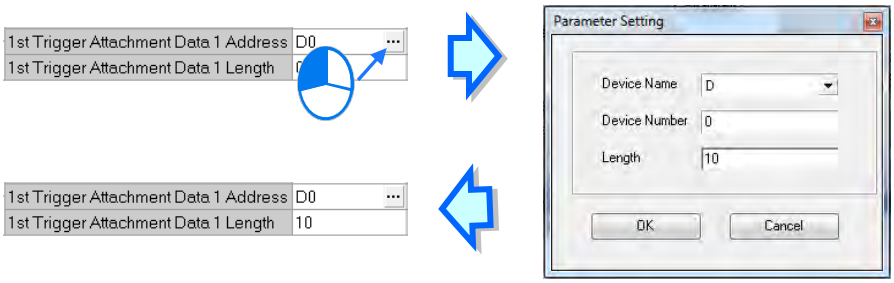
If this option button is selected, no attachment will be inserted.

- **File**

Users can select an error log in the memory card, or the system backup file in the memory card as the attachment of the email.

- **PLC Device**

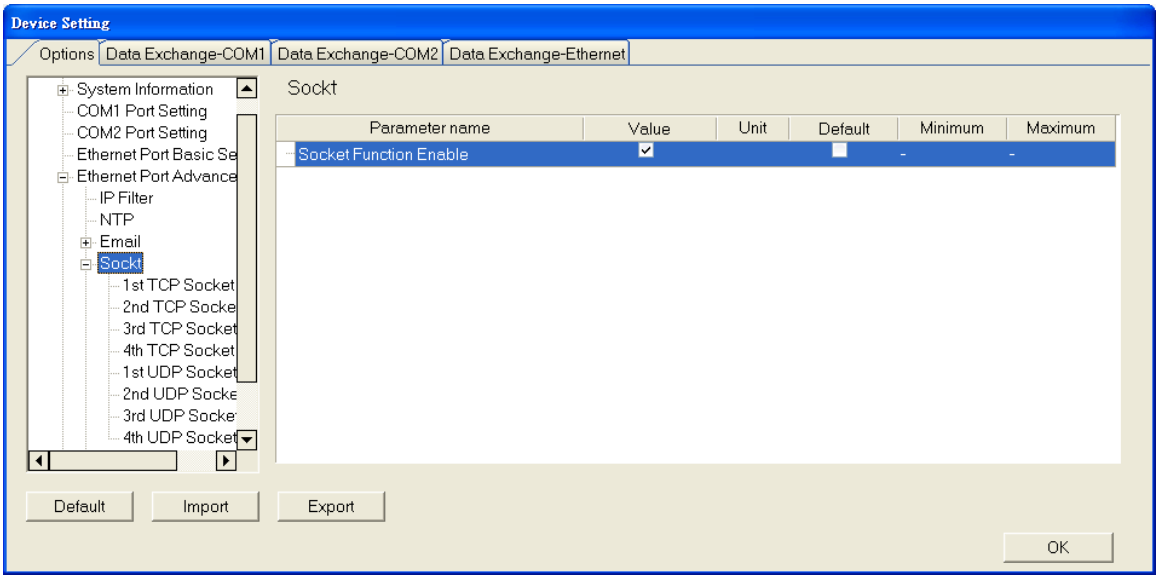
If this option button is selected, the system automatically retrieves the states of the devices, or the values in the devices listed in the table as the attachment when the email is sent. After this option button is selected, users can click ··· button in the following window to open the **Attachment** window. Two groups of devices at most can be set. For example, if the condition is met, the values in D0~D9 will be sent as an attachment.



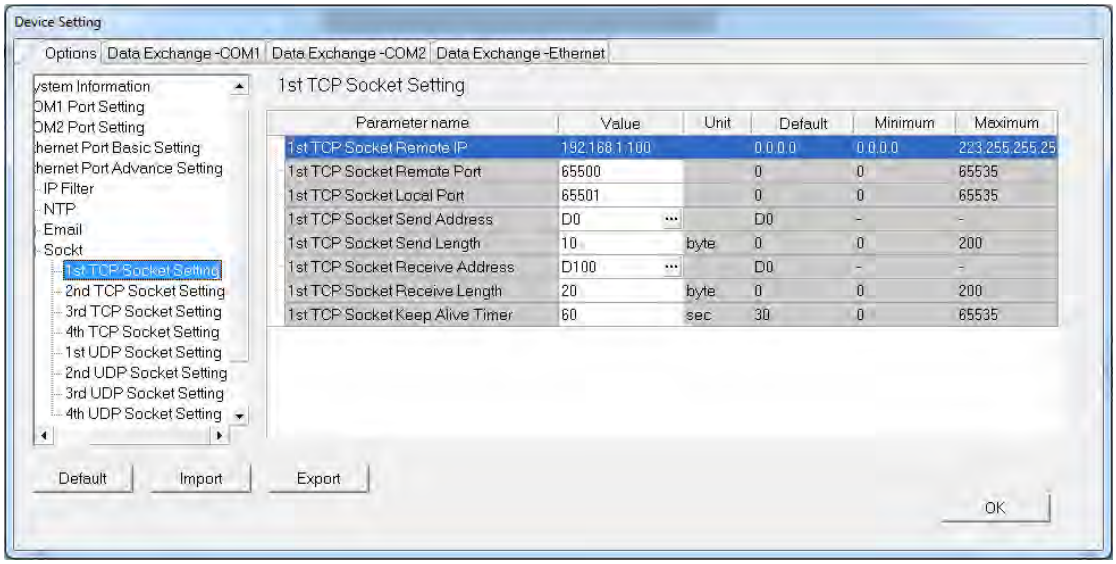
Select the target email address of a receiver when the condition of sending an email is met in **Trigger Receiving** table. And the specific email box is set in the **Email** section.

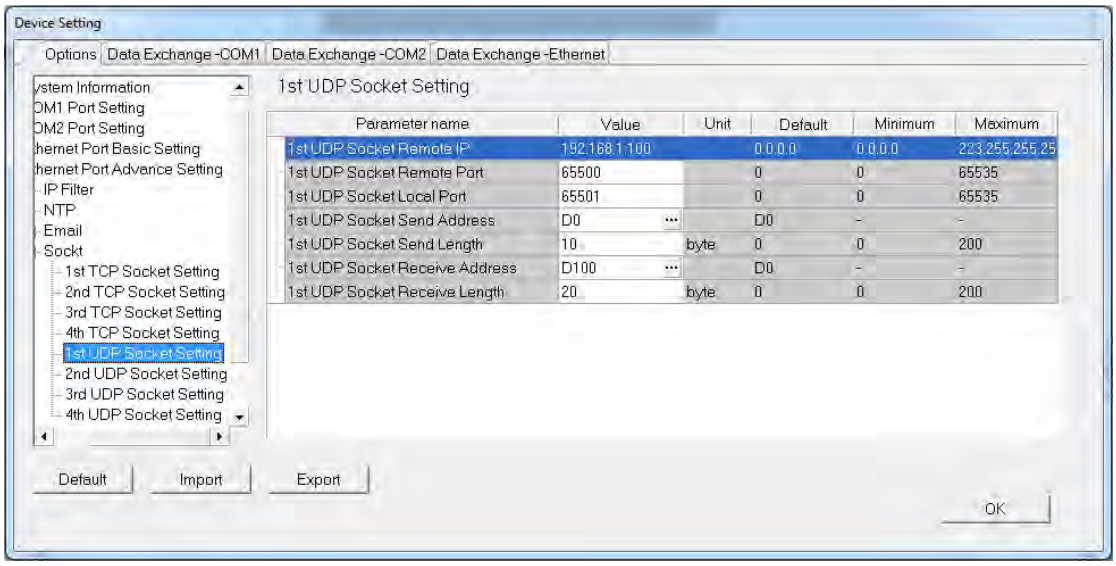
Users can set the parameters for sockets through which data is transmitted. This function has to be used with specific applied instructions. Please refer to AS Series Programming Manual for more information. Sockets will not be introduced here. Please refer to related documents or manuals for more information about sockets.

In the **Socket** table, users can set COM port parameters for data transmission via Ethernet. However, the function should be applied with specific API instructions. For relevant details, refer to AS series programming manual. And for the information on the socket, refer to relevant literature.



The system for AS series modules supports the data transmission between the CPU module and other CPU module or device via a socket as well as TCP and UDP protocols in each of which four groups of connections can be set. Users should select **Socket Function Enable** checkbox before any setup and then do other setting in TCP and UDP setting pages respectively.





The parameters in the **TCP Socket Setting** are the same as the parameters in the **UDP Socket Setting** except that there is no **Keep Alive Timer** parameter in the UDP Socket Setting. The parameters in the TCP and UDP Socket Setting are described below.

- **Remote IP**: Users can set a remote IP address.
- **Remote Port**: Users can set a communication port used by the remote device for this TCP connection. The port number must be within the range between 0 and 65535.
- **Local Port**: Users can set a communication port used by the local CPU module for this connection. The port number must be within the range between 0 and 65535.
- **Send Address**: Users can set the length of data which will be sent by the local CPU module. The length must be within the range between 0 words and 500 words.
- **Send Length**: Uses can set an initial device in the CPU module where data which will be sent is stored.

●**Receive Address**: Users can set the length of data which will be received by the local CPU module. The length must be within the range between 0 words and 500 words.

●**Receive Length**: Uses can set an initial device in the CPU module where data which will be received is stored.

●**Keep Alive Timer**: Users can set a maximum keep alive time for the connection. If no data is transmitted, and the keep alive period has elapsed, the CPU module will terminate the connection automatically.

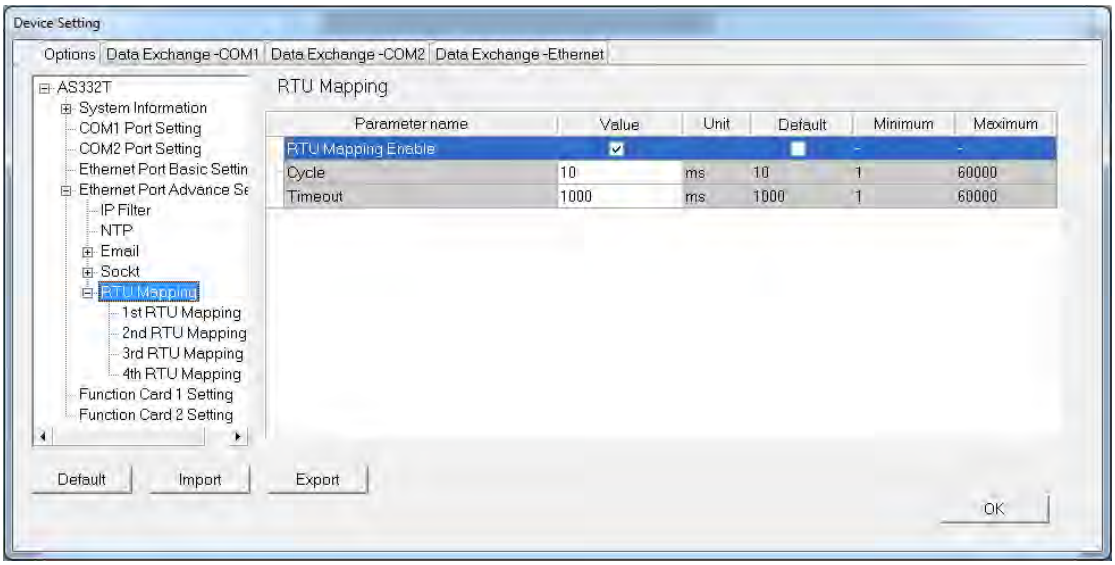
The port number used by the local CPU module and the port number used by the remote device can not be the same, and the devices where data which will be sent is stored cannot overlap the devices where data which will be received is stored. If the IP address of the remote device is 192.168.1.100, the port number used by the remote device is 65500, and the port number used by the local CPU module is 65501, the remote device and the local CPU module can transmit data through this TCP connection.

If the local CPU module wants to send 10-word data to the remote device, the data will be stored in D0~D9 before the data is sent. If the local CPU module receives 20-word data from the remote device, the data will be stored in D100~D119.

If the length of data received is larger than the length set, the first 20-word data will be stored in D100~D119, and the data after the first 20-word data will be discarded. Likewise, if the length of data received is less than the length set, the data will be stored in the devices starting from D100, and the values in devices where no new data is stored will be retained.

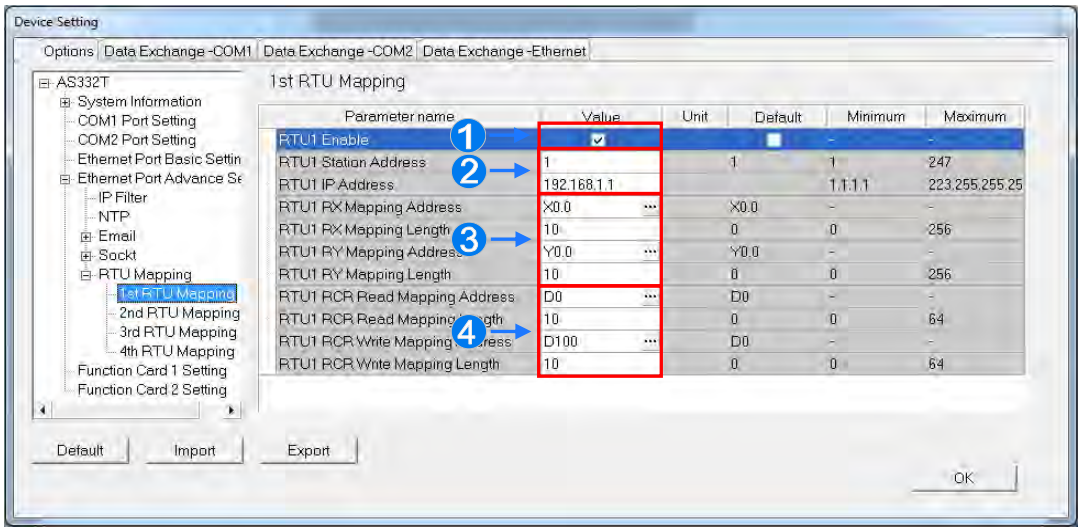
If no data is transmitted, and 60 seconds have elapsed, the CPU module will close the socket, and terminate the connection.

In the **RTU Mapping** table, users can set Delta RTU-EN01 slave in connection with AS series module. The remote device can be controlled via Ethernet and 4 groups of RTU-EN01 are connectable in the network. For the setting and operation of RTU-EN01, refer to the operation manual.



Select RTU Mapping Enable checkbox to enable the function of connection between RTU module and AS series module. Set the update cycle in **Cycle** box and a timeout in **Timeout** box. It means a timeout when RTU does not give a reply within the timeout set.

The data mapping between each group of RTU-EN01 and AS series module is set in the **RTU Mapping** section. RTU-EN01 and I/O module connected to it are set via DCISoft. For more information on DCISoft, refer to the operation manual.



❶ Users can select RTU1 Enable to enable this RTU function. Each RTU can be set individually.

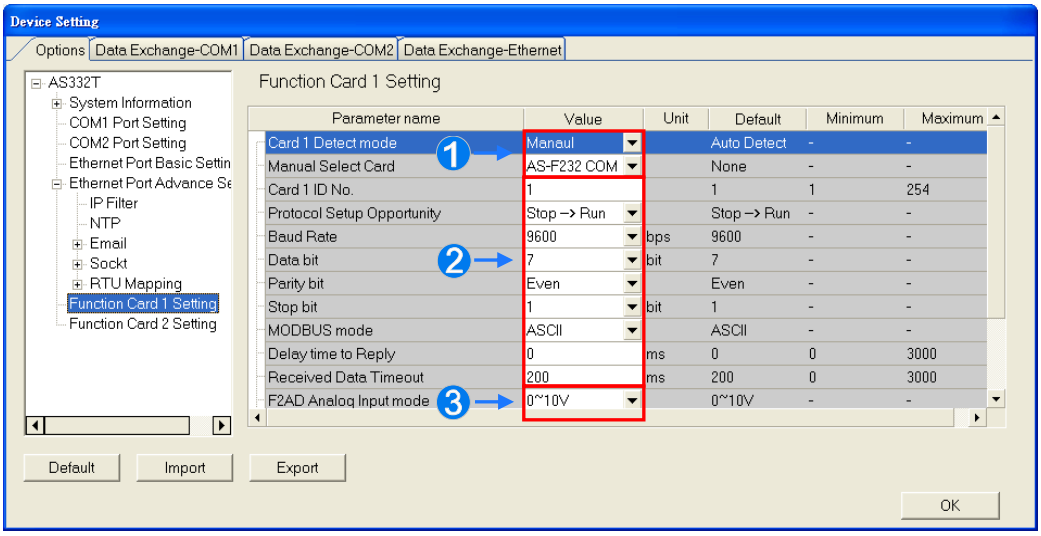
❷ Users can set a station address and IP address.

❸ Users can set RX mapping address and RX mapping length to make the digital input points of DI module connected to RTU mapped to X/M devices and length of AS series module. While, the RY mapping address and length set is used for making the digital output points of DO module mapped to Y/M devices and length of AS300 series module.

❹ Users can set RCR Read mapping address and RCR Read mapping length to make the analog input points of AI module connected to RTU mapped to D/SR devices and length of AS300 series module. While, the RCR Write mapping address and length set is used for making the analog output points of AO module mapped to D/SR devices and length of AS300 series module.

8.2.2.5 Options - Function Card 1 Setting

The **Function Card 1 Setting** table is used for setting parameters of function card 1 in AS300 series CPU module, which is installed by inserting to the slot.



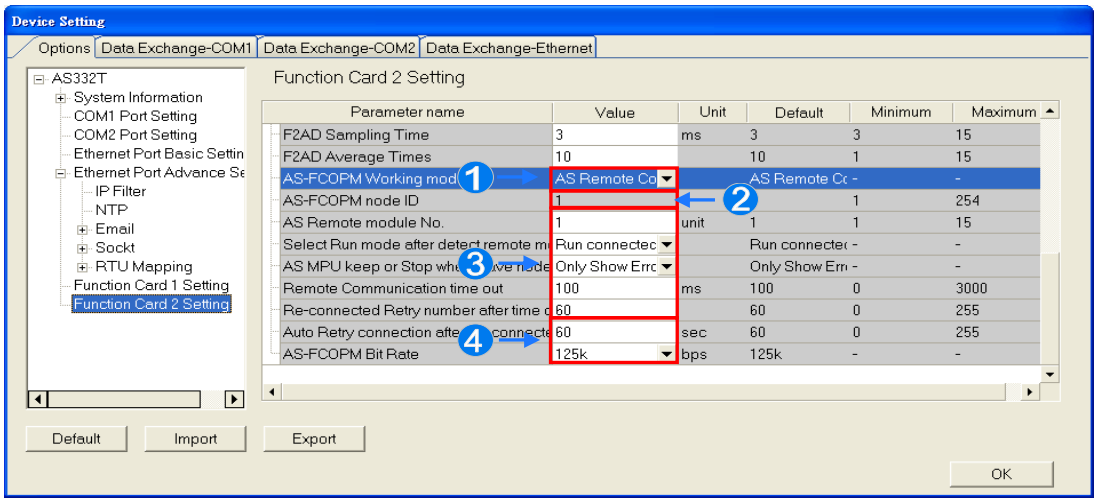
❶ Users can select **Auto** in **Card1 Detect mode** box to detect the actual card model and setting or **Manual** to select the AS--F232/ F422/ F485/F2AD/F2DA function card which need be configured in the **Manual Select Card** box.

❷ For the setting of parameters in AS--F232/ F422/ F485, refer to COM port setting in section 3.5.2.2.

❸ At the bottom of the table in the window above, users can set F2AD to receive the signal of 0~10V or 4~20mA in **F2AD Analog Input Mode** box and set F2AD to send the signal of 0~10V or 4~20mA in **F2DA Analog Output Mode** box. The interval of F2AD sampling and average times are set in **F2AD Sampling Time** and **Average Times** boxes respectively.

8.2.2.6 Options - Function Card 2 Setting

The Function Card 2 Setting table is used for setting parameters of function card 2 in AS series CPU module, which is installed by inserting to the slot. For function card 2, AS-FCOPM in **Manual Select Card** box is one additional option which does not exist for function card 1. If users select AS-FCOPM card, the parameters can be set in the following window.



❶ Users can select AS Remote Control/Delta ASD-A2 Control/CANopen DS301 in the **AS-FCOPM working mode** box. AS Remote Control is used for connecting AS series remote I/O. Delta ASD-A2 control is applied to the communication protocol exclusive to Delta servo products. CANopen DS301 is for the application of DS301 standard protocol.

❷ Users can set the address of the station when CANopen DS301 is selected in the **AS-FCOPM working mode** box.

❸ The remote I/O parameters can be set if Delta ASD-A2 Control is selected as AS-FCOPM working mode. AS remote module No. sets the number of remote I/O modules and each one can connect an extension module. For operation of AS remote module, refer to section 3.5.3. **Select Run mode after detect remote module** sets the actual connected remote module works normally or all remote modules stop running if the number of actual connected modules are inconsistent with the set number of modules.

AS CPU keep or Stop when slave node dis-connected sets to only show errors or stop running and send an alarm when the remote I/O module is disconnected during operation.

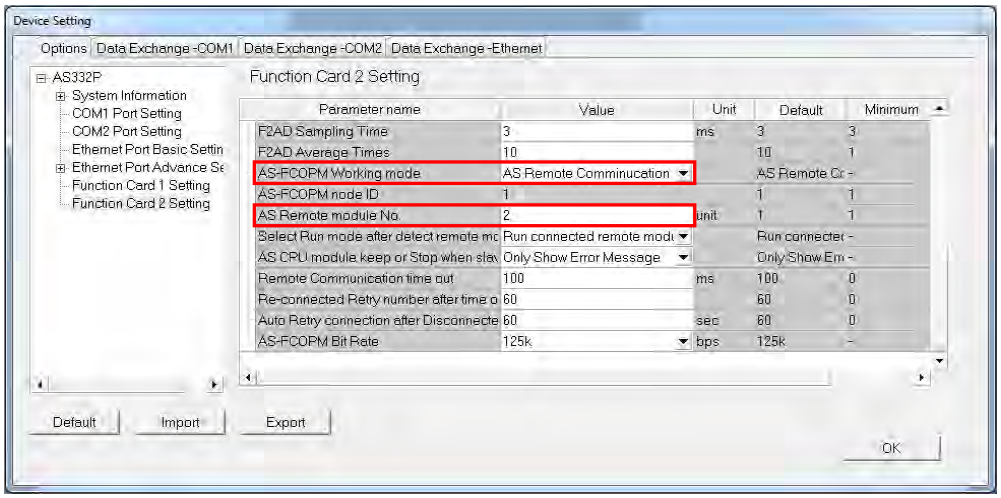
Remote Communication Timeout sets the timeout during which the remote I/O module does not give a reply.

Auto Retry connection after Disconnected sets the times of retrying to make a connection after a timeout occurs.

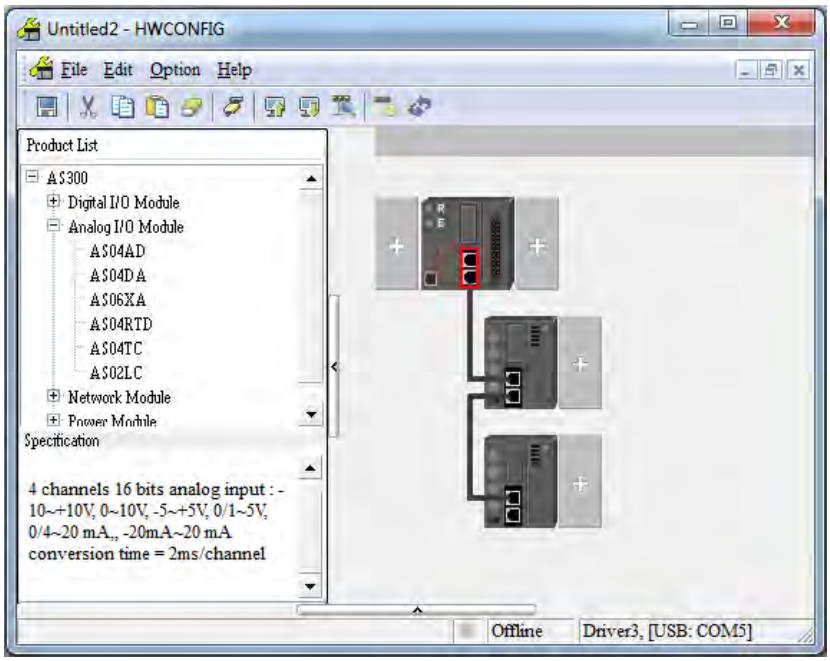
❹ Users can set the parameters **Auto Retry connection after Disconnected** and **AS-FCOPM Bit Rate** under the three AS-FCOPM working modes.

8.2.3 Configuring AS - Series Remote Modules

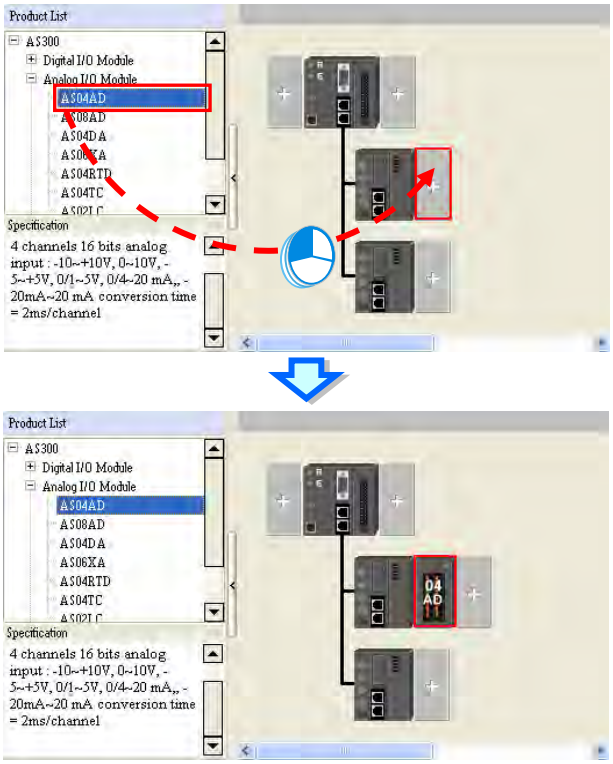
AS series CPU module can connect remote IO modules so as to save the wiring between a device in the remote place and the controller. AS Remote Control can be selected in **AS-FCOPM Working mode** box and the number of AS remote module can be set in **AS Remote module No.** box after users select Manual in **Card2 Detect Mode** box and AS-FCOMPM in **Manual Select Card** box in **Function Card 2 Setting** table under **Options** tab.



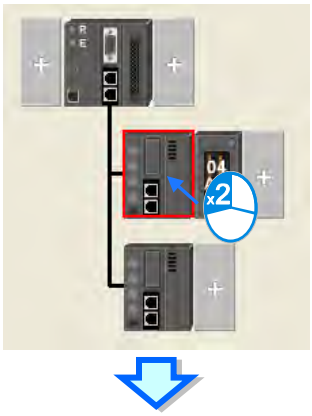
If users set 2 units in **AS Remote module No.** box, there will be 2 remote modules in the system configuration area after clicking the **OK** button.

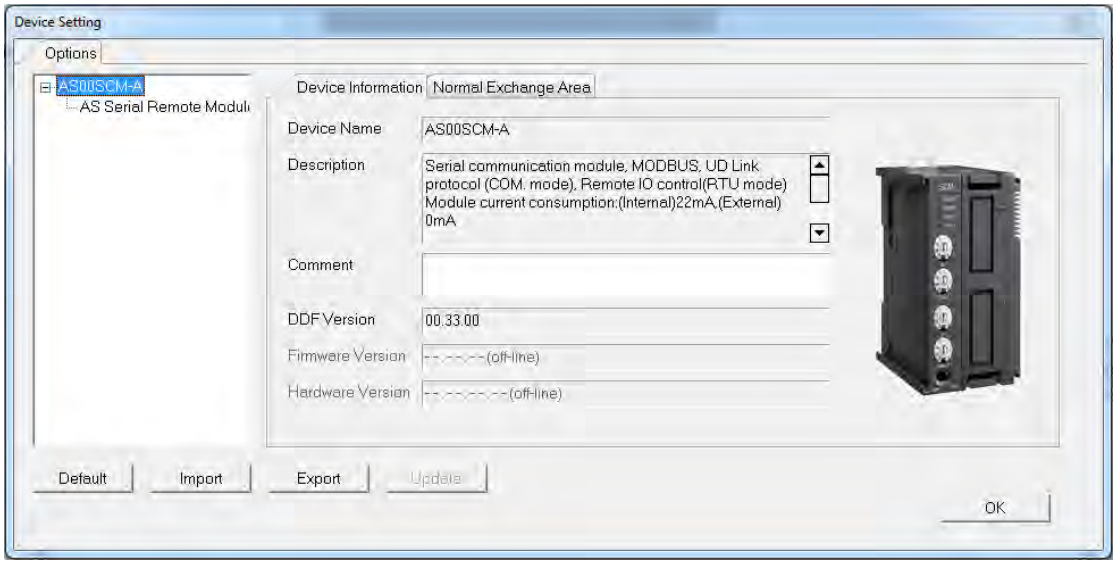


Users can set the remote module in the system configuration area according to the introduction such as adding, deleting, copying and moving an extension module in section 8.1.2. The actions of clicking with the mouse or dragging as well as right-clicking and selecting context menu options are the same as that for a general controller as follows. All extension modules except network modules can be configured.

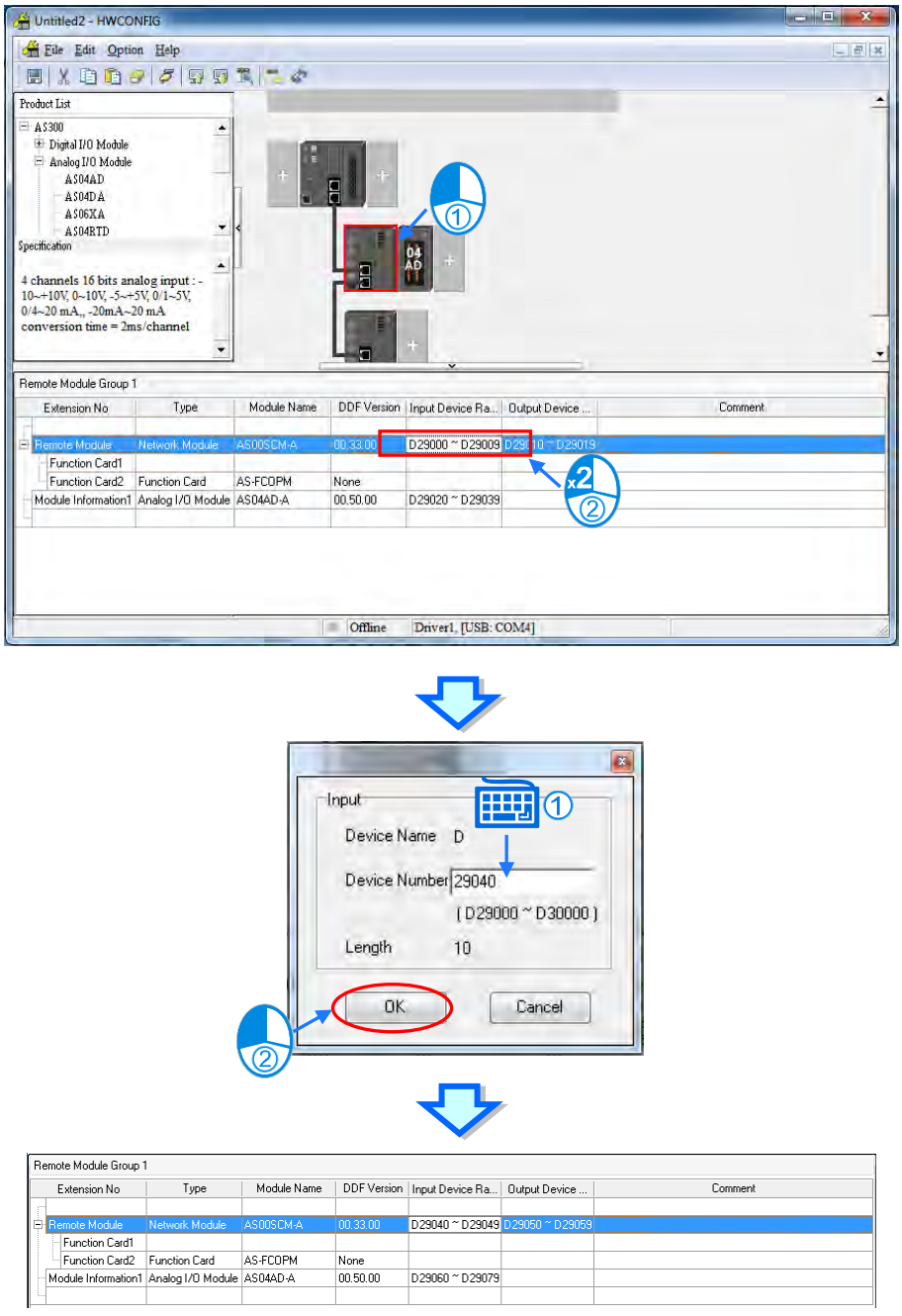


Likewise, users can double click to open the parameter setting window of a remote module and the extension modules connected to it.

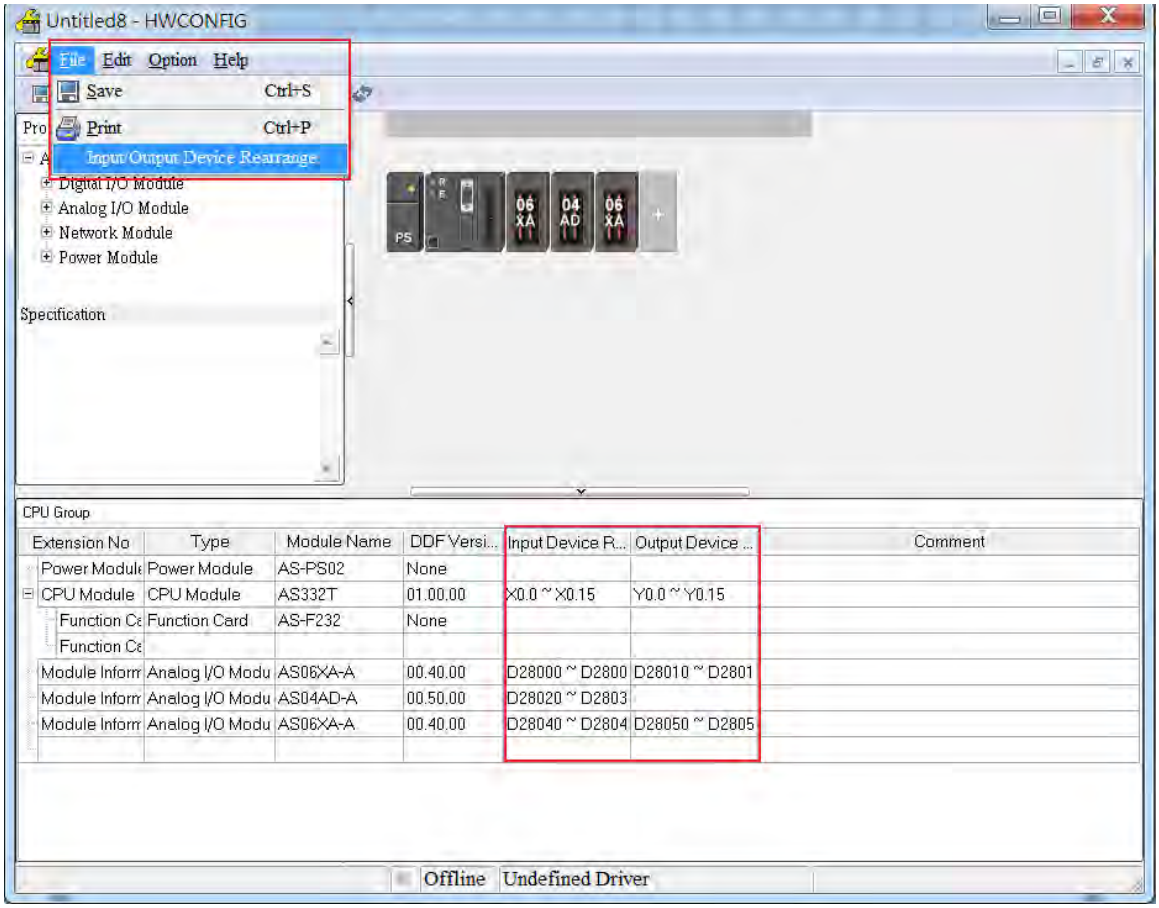




For the remote module, the start of input device range can be set as follows. Click one remote module, double click Input Device Range box in Remote Module Group 1 table and then type the **device No.** in the pop-up window. After the **OK** button is clicked, the input and output device range of the remote device will be updated and that of extension modules connected to it will be configured automatically.


Untitled2 - HWCONFIG
File Edit Option Help
Product List
AS300
Digital I/O Module
Analog I/O Module
AS04AD
AS04DA
AS06XA
AS04RTD
Specification
4 channels 16 bits analog input : -10~+10V, 0~10V, -5~+5V, 0/1~5V, 0/4~20 mA,, -20mA~20 mA
conversion time = 2ms/channel
Remote Module Group 1
Extension No
Type
Module Name
DDF Version
Input Device Ra...
Output Device ...
Comment
Remote Module
Network Module
AS00SCM-A
00.33.00
D29000 ~ D29009
Function Card1
Function Card2
Function Card
AS-FCOPM
None
Module Information1
Analog I/O Module
AS04AD-A
00.50.00
D29020 ~ D29039
Offline
Driver1, [USB: COM4]
Input
Device Name D
Device Number 29040
(D29000 ~ D30000)
Length 10
OK
Cancel
Remote Module Group 1
Extension No
Type
Module Name
DDF Version
Input Device Ra...
Output Device ...
Comment
Remote Module
Network Module
AS00SCM-A
00.33.00
D29040 ~ D29049
D29050 ~ D29059
Function Card1
Function Card2
Function Card
AS-FCOPM
None
Module Information1
Analog I/O Module
AS04AD-A
00.50.00
D29060 ~ D29079

Since the module arrangements may affect the input / output device range, and the device range may be not in order. The input/output device range can be rearranged to an orderly sequence; click the File > Input / Output device rearrange. And after that all the sequence of the device range will be orderly.



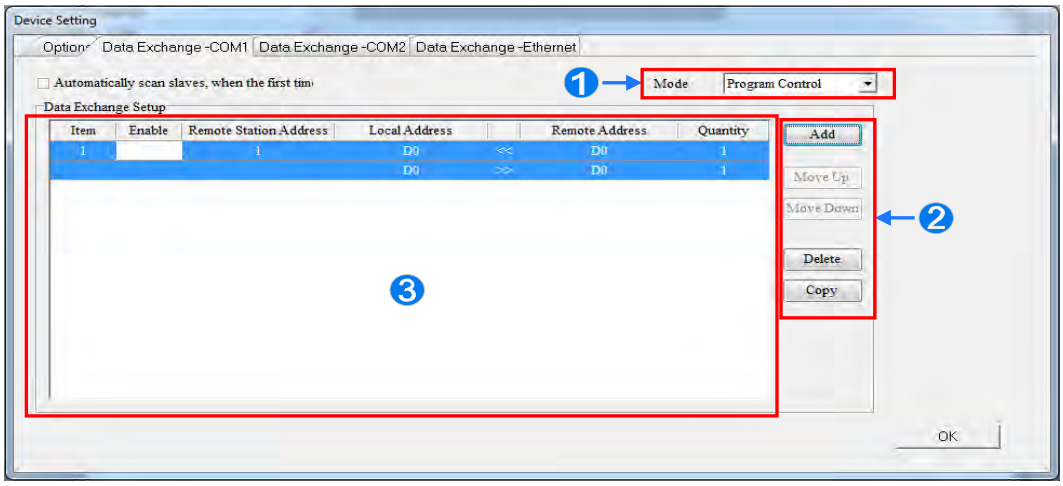
8.3 Data Exchange - COM1, Data Exchange - COM2 and Data Exchange – Ethernet

8.3.1 Descriptions of the setting window

After users click the tab Data Exchange-COM1, Data Exchange-COM2 or Data Exchange-Ethernet, the parameters for making the data exchange table of the communication port built in AS series can be set.

AS series module can be the master and exchanges data with the slave remote devices via COM1 and COM2 based on MODBUS protocol or via Ethernet port based on MODBUS TCP protocol.

Their setting windows are the same as below.



❶ When setting the start mode to **Program Control,** the program in the PLC decides whether the set data exchange is performed. **PLC Run** means that the set data exchange will be performed automatically when PLC is in a RUN state. **Always Enable** means that the data exchange will be performed constantly when the PLC is powered on.

❷ A new data exchange table will be added in area ❸ by clicking **Add**. The present data exchange table selected will be moved up or down by clicking **Move Up** and **Move Down**. The present data exchange table selected will be deleted by clicking **Delete**. The present data exchange table selected will be copied by clicking **Copy** and then can be pasted to the last row.

❸ The data exchange table is explained as below.

Name	Description
Item	The number of the block for data exchange
Enable	To select whether to enable the data exchange table when the data exchange is performed.
Station Address/ IP Address	The slave station address of the data exchange table, one address can be set for multiple data exchange tables. It is a station address under COM1and COM2 tabs and IP under Ethernet tab.
Local Address	The device address range used by the master in the data exchange table
<< / >>	「<<」: Input; the data block where the master read a slave 「>>」: Output; the data block where the master write to a slave
Remote Address	The device address range used by a slave in the data exchange table The device range will be in hexadecimal display, if the slave in the data exchange table is a user-defined MODBUS Device.
Quantity	The size of the data exchange table, which is basically consistent with the result calculated from the device range.

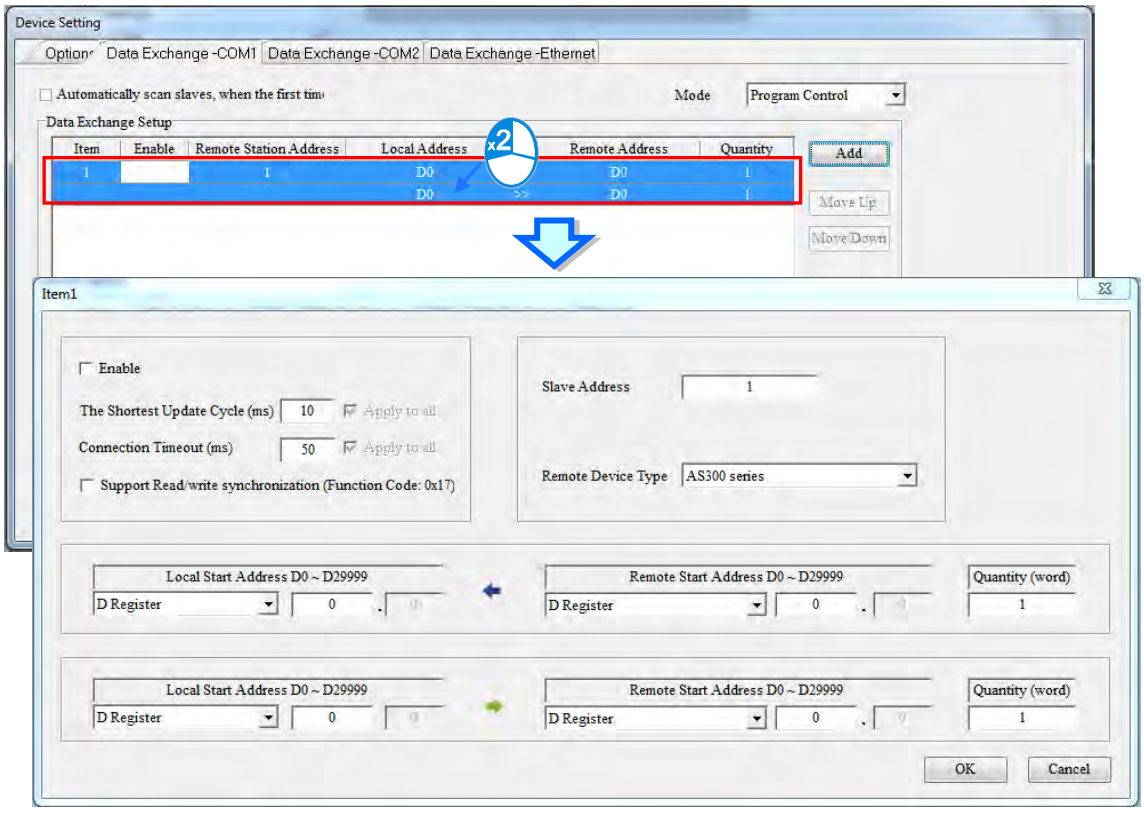
8.3.1.1 Data Exchange - COM1 and Data Exchange - COM2

On the page of tab **Data Exchange-COM1** or **Data Exchange-COM2**, double click a data exchange table which is to be set to open **Item** window as below. Select the checkbox of **Enable** to enable the data exchange table in the mode mentioned above. **Remote Address** is the address of the target slave for data exchange. The **Shortest Update Cycle** is the period for data exchange of the data exchange table. If the target device does not make any response within the time specified by **Connection Timeout**, that is timeout.

The master can complete the read and write in a command to improve the efficiency of data exchange by selecting **Support Read/write synchronization (Function code 0x17)** in which the specific MODBUS function code is used.

Please make sure that all devices in data exchange support MODBUS function code for read and write synchronization. Otherwise, the read and write will fail on account of the failure to identify function codes after the command from the master is received.

Device Type is the model of a target slave including Delta PLC and standard MODBUS devices.



●Input

AS series module reads data from a remote device.

Local Start Address: Device type and start address of devices where AS series store data;

Remote Start Address: Device type and start address of the remote device to be read;

Quantity: Data length of input

●Output

AS series module writes data to a remote device.

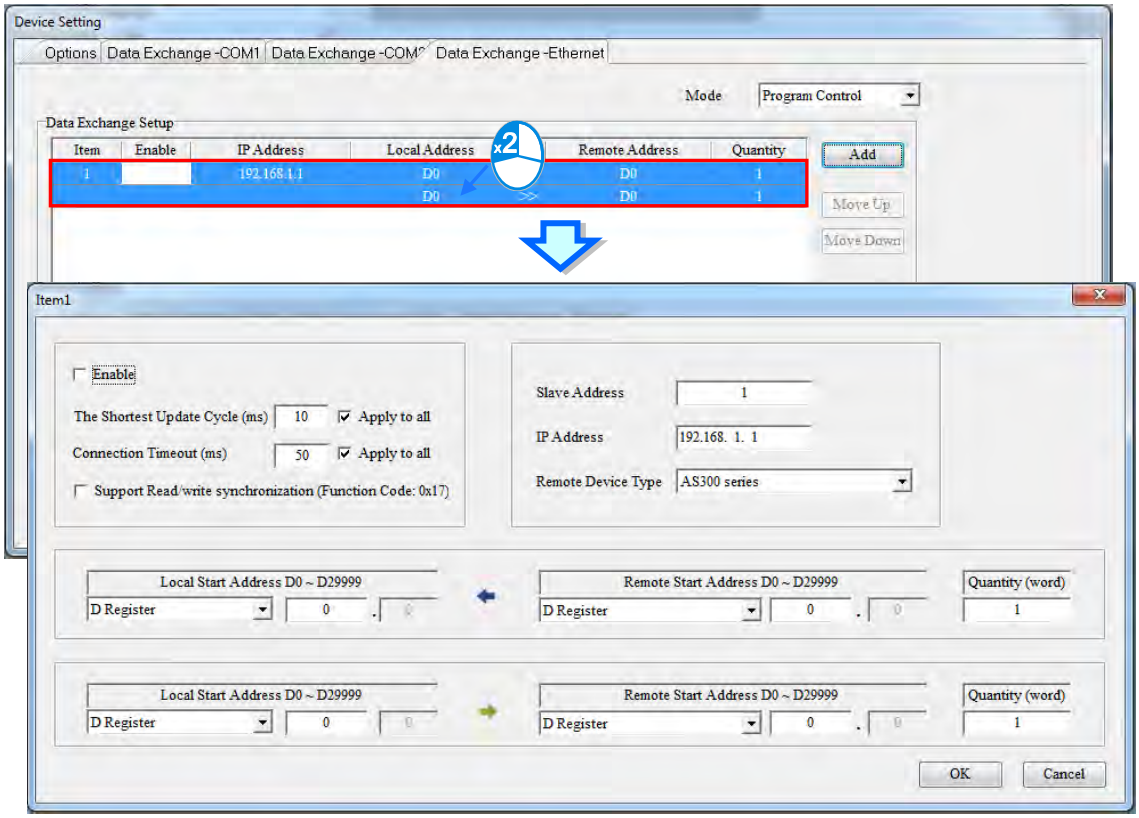
Local Start Address: Device type and start address of the source data of AS series;

Remote Start Address: Device type and start address of the remote device where data are to be written;

Quantity: Data length of output

8.3.1.2 Data Exchange - Ethernet

On the page of tab **Data Exchange - Ethernet**, double click the data exchange table to be set so as to open the **Item** window as below. The settings are almost the same as that for **Data Exchange - COM1** and **Data Exchange - COM2** except the target slave model option in Device Type which contains Delta PLC and standard MODBUS TCP equipment as well as IP address for typing the IP of remote slaves. For other settings, refer to the content of Data Exchange - COM1 and Data Exchange - COM2.

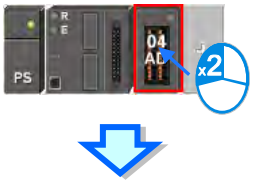


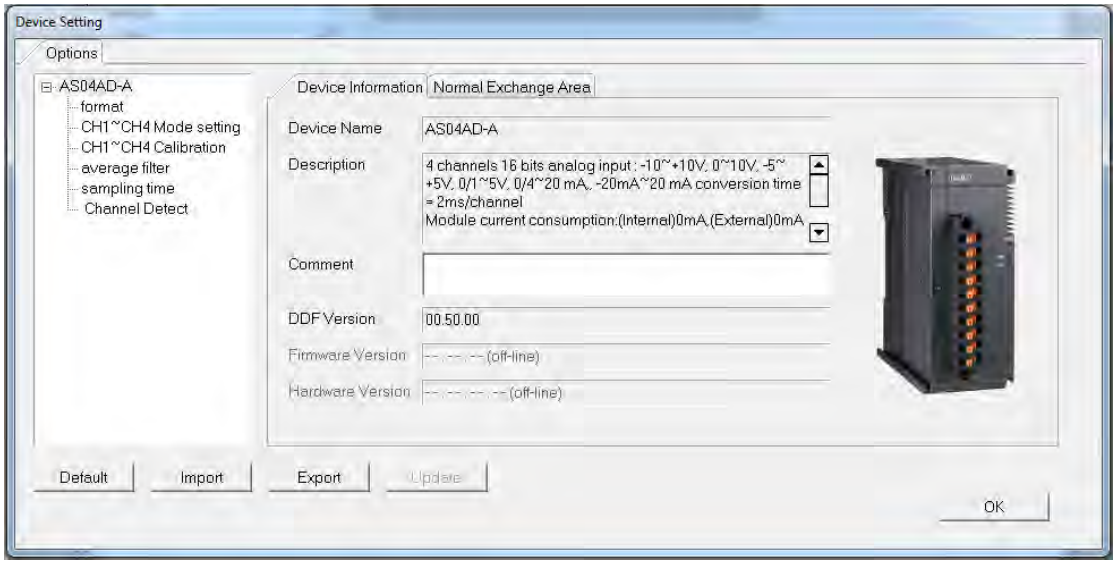
Select the check box of **Apply to all** on the right side of **The Shortest Update Cycle** and **Connection Timeout** and then click **OK**. The settings for **The Shortest Update Cycle** and **Connection Timeout** will be written to other data tables on the tab **Data Exchange - Ethernet**. Users could set data exchange tables separately without selecting the check box of **Apply to all**.

8.4 Setting Parameters in a Module

8.4.1 Parameters in a Module

Users can set the parameters in every module configured in HWCONFIG. The functions and characters of every module depend on the setting of the parameters. If users want to set the parameters in a module, they can double-click the module in the system configuration area. The system will automatically open the **Parameter Setting** window. The setting windows of various models are a bit different.

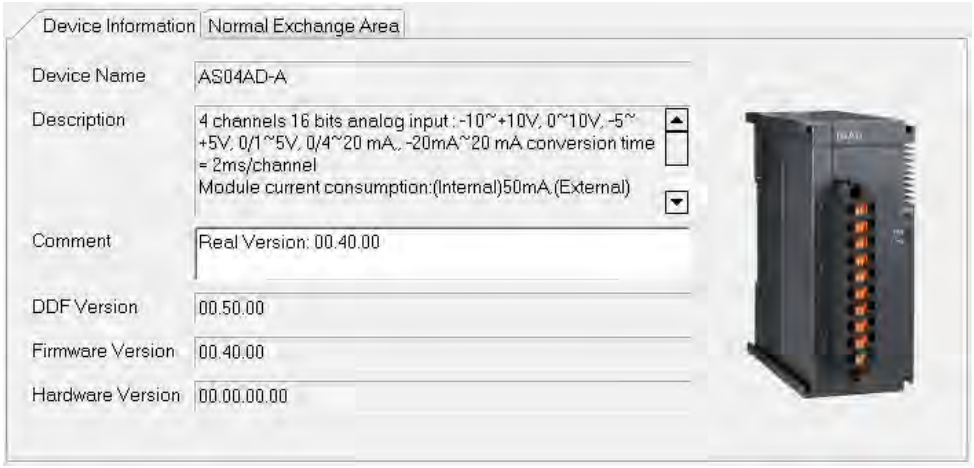




⚠The parameters are set according to the functions supported by the module. Before users set the parameters, they have to refer to Operation Manual for more information. To prevent damage to the system or staff, the users have to make sure of the effect that the parameters which are set have on the module and the whole system.

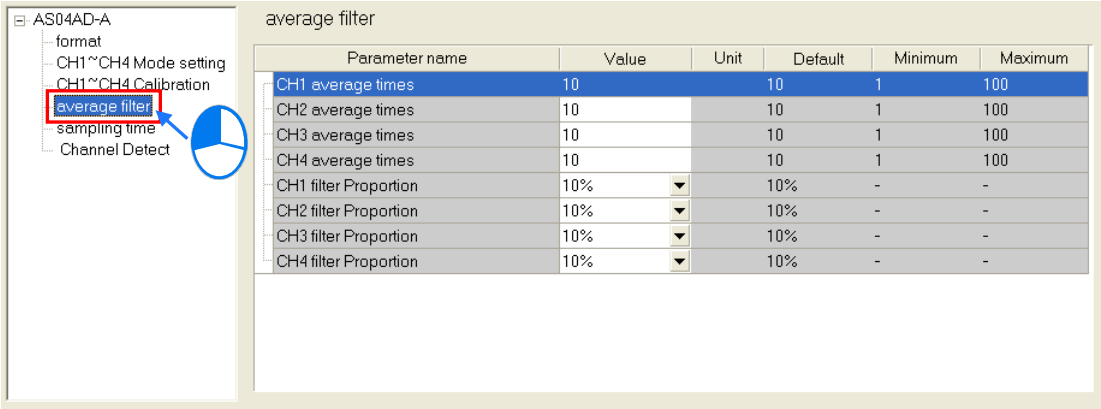
There are two tabs in the setting window of AS series modules. They are the **Device Information** tab and the **Normal Exchange Area** tab. If users click the **Device Information** tab, the module information, appearance and present DDF document version will be displayed.

The number of parameters which can be set in the module and the range of setting values depend on the version of the DDF document. Besides, the firmware version and hardware version of the CPU module will be displayed as well when all modules are connected online.



If users click the **Normal Exchange Area** tab, the functions to which the input/output devices assigned to the module correspond will be displayed.

Users can select a parameter type at the left side of the window, and then set the parameters in the table at the right side of the window. The formats of the tables for the parameter types are the same, but the contents of the tables are different. Besides, the number of parameters which can be set and the range of setting values depend on the firmware version of the module which is set.



The descriptions of the columns in the table are as follows. If the color of a table cell is grayed out, the cell cannot be edited.

Parameter name

The parameter names or descriptions are shown in this column.

Parameter name	Value	Unit	Default	Minimum	Maximum
CH1 average times	10		10	1	100
CH2 average times	10		10	1	100
CH3 average times	10		10	1	100
CH4 average times	10		10	1	100

Value

Users can set initial values in this column. When the parameters in HWCONFIG are downloaded, the initial values set are written into the module. Users may type initial values for some parameter types, or select initial values on a drop-down menu for other parameter types in the **Value** column. Please refer to the instructions of the module for more information about the range of values which can be set, and the processing mechanism after the initial values are downloaded.

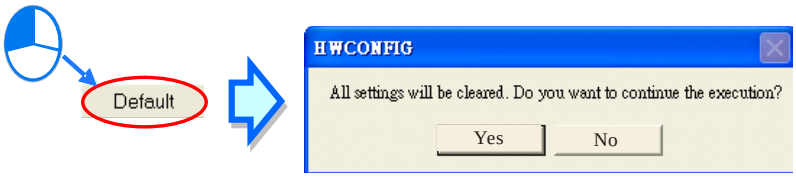
Parameter name	Value	Unit	Default	Minimum	Maximum
CH1 average times	10		10	1	100
CH2 average times	10		10	1	100
CH3 average times	10		10	1	100
CH4 average times	10		10	1	100

Unit, Default, Minimum and Maximum

Users can refer to the unit, default, the minimum and maximum of the parameters in the following window when setting them.

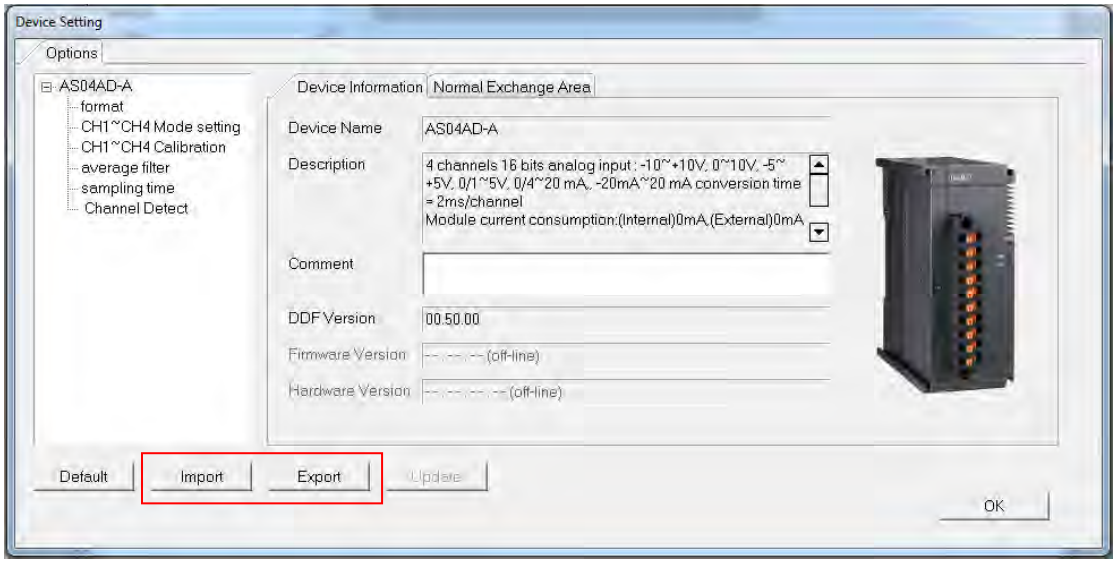
Parameter name	Value	Unit	Default	Minimum	Maximum
CH1 average times	10		10	1	100
CH2 average times	10		10	1	100
CH3 average times	10		10	1	100
CH4 average times	10		10	1	100

After **Default** button in the lower left corner of the Parameter Setting window is clicked, the values of the parameters in the module will be restored to the default values.



8.4.2 Exporting and Importing the Parameters in a Module

After **Export File** in the **Parameter Setting** window is clicked, the parameters in the module will be saved as a CSV file. A file which was exported previously can also be imported.



- **Exporting the parameters in a module**

  Click **Export File** in the **Parameter Setting** window, select a folder in the **Save in** drop-down list box in the **Save As** window, type a filename in the **File name** box, and click **Save**.

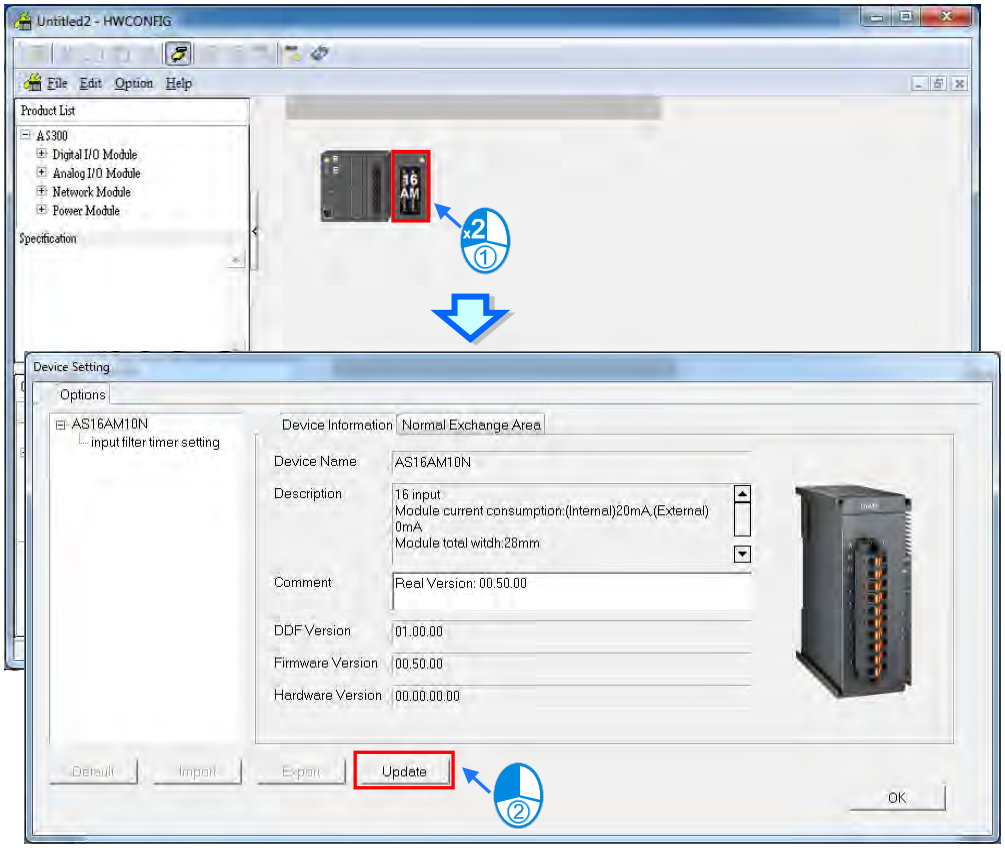
- **Importing the parameters in a module**

  Click **Import File** in the **Parameter Setting** window, select a file which will be imported in the **Save As** window, and click **Open**. The windows for importing and exporting parameters of various modules are a bit different as follows.

  Before the parameters are imported, the system will check the file format and the module model. If the file format or the module model is not correct, the system will stop the import of the parameters. If the data registers specified in the original file exported have been used in the present configuration, different data registers will be specified in the file after the file is imported.

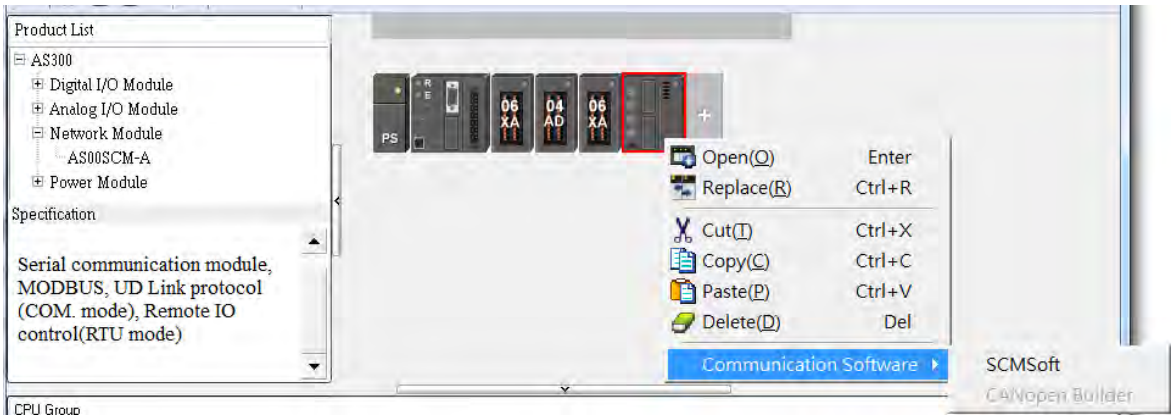
8.4.3 Updating Parameters in a Module

Parameters in a module can be updated. Make sure it is in the Online mode and double click the module you'd wish to have its parameters updated and then its information page will show up. Click the **Update** button to have parameters of the selected module updated.



8.4.4 Setting Parameters in a SCM

Delta Electronics, Inc. provides users with specific configuration tools for some CPU modules. Users can open the tools such as CANopen network planning and SCM (Serial Communication Module) to set advanced parameters for network assignments for the modules. For the advanced setups, right-click the CPU module in the system configuration area to see and click the option "communication software" and then click to select the tools, SCMSoft. It is required to save the configurations done in HWCONFIG before opening the tool. And while editing in the tools, it is not allowed to work in HWCONFIG. Some tools require an independent installation and a reminder will be shown when the independent installation of the tool has not been installed before.



Refer to their specific manuals for the detailed setups of the communication software tools.

9

Chapter 9. EtherNet/IP

Table of Contents

9.1 Introduction

9.1.1 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 9.9 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 software. Download the ISPSoft software at:

http://www.deltaww.com/services/DownloadCenter2.aspx?secID=8&pid=2&tid=0&CID=06&itemID=060301&typeID=1&downloadID=,&title=--%20Select%20Product%20Series%20--&dataType=8;&check=1&hl=en-US

9.1.2 Definition

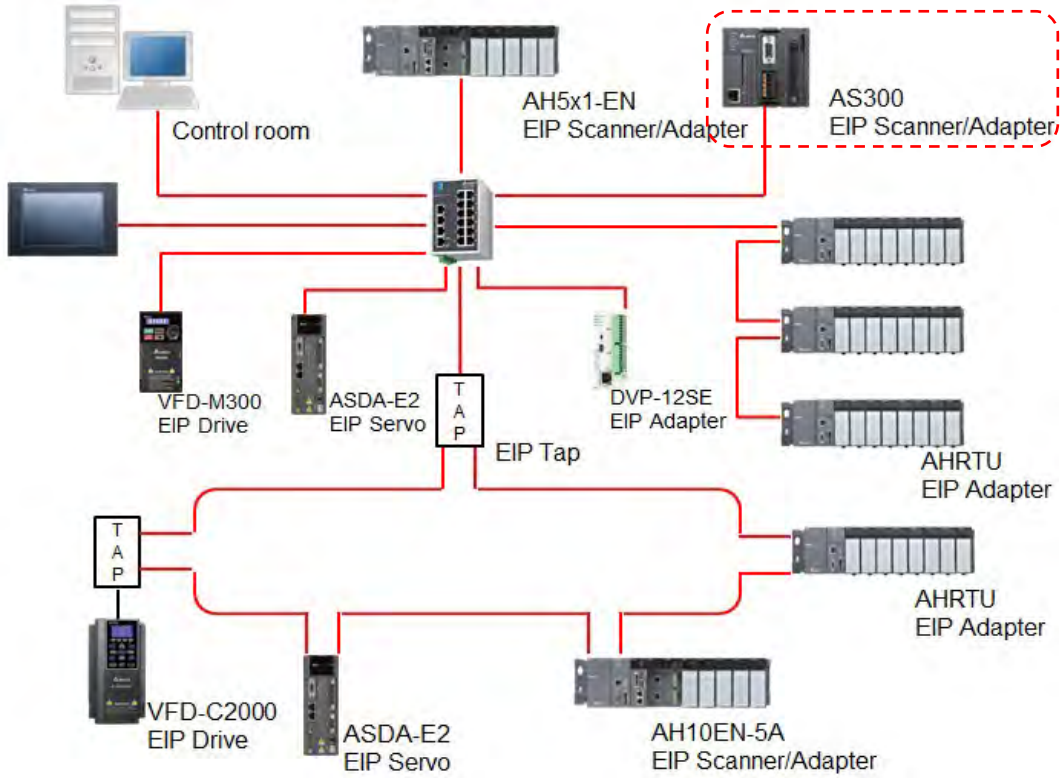
Term	Definition
ODVA	Open DeviceNet Vendor Association for EtherNet/IP
EIP	EtherNet/IP, an industrial Ethernet network, provides interoperability for system providers. IP stands for Industrial Protocol. The term “EIP” (EtherNet/IP) will be used throughout this manual.
I/O Connection	Via the I/O connection 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)	● TAGs are the methods used for assigning and referencing memory locations for Rockwell PLCs, the same as the registers for Delta PLCs. ● 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. ● 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).

	● 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.
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 call**ed** 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.

9.1.3 Features

9.1.3.1 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 AS series supports Ethernet single port; thus it can install and configure by using EtherNet/IP devices with embedded switch technology.



9.1.3.2 Product Features

- **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 100MB/bits 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 the device parameters in a list. Instead of looking up in the user manual, users can quickly check on the parameters in the list.

  - EDS file: Users can connect to Delta and other brand EtherNet/IP products via the EDS files.

9.2 Network Installation

9.2.1 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. The AS series is a single port device. Refer to section 9.2.2.1 for the single port setup and refer to section 9.2.2.3 for the software installation.

9.2.2 Network Installation

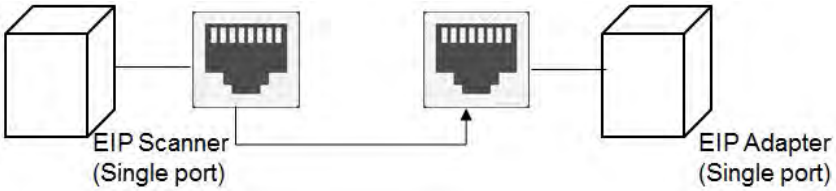
Each EtherNet/IP device is connected to an Ethernet switch via a CAT 5e cable. Please use Delta standard cables and the DVS series industrial switches. Refer to Delta PLC/HMI Cable Selection Guide for more information.

9.2.2.1. Single Port Device

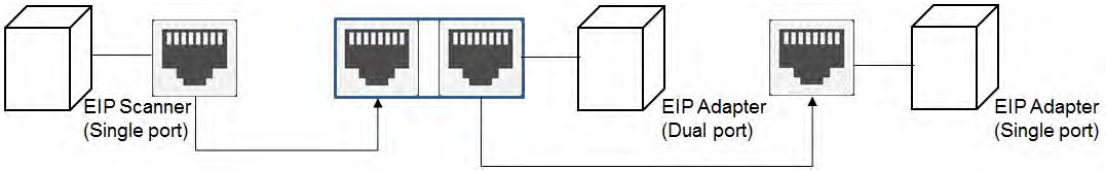
A single port device can build up a linear and a star topology. An Ethernet switch is required to create a star topology and a ring topology, and additionally an EtherNet/IP Tap is also needed.

Linear Topology

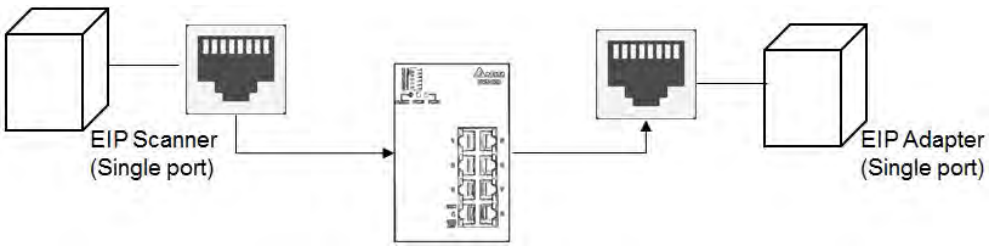
- **Linear Topology** 1



- **Linear Topology** 2



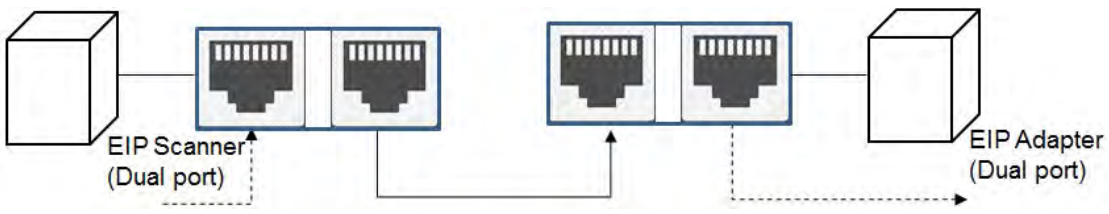
Star Topology



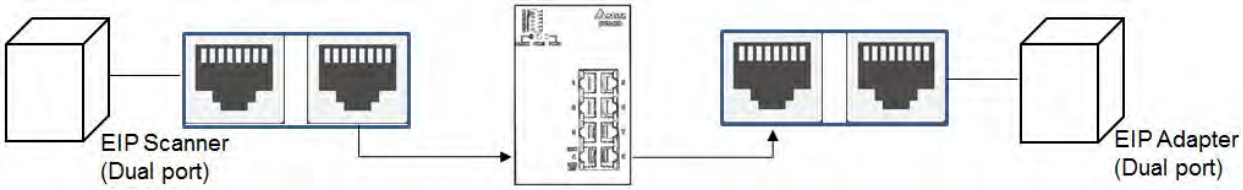
9.2.2.2. Dual Port Device

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 9.9.2 for DLR supported series.

Linear Topology

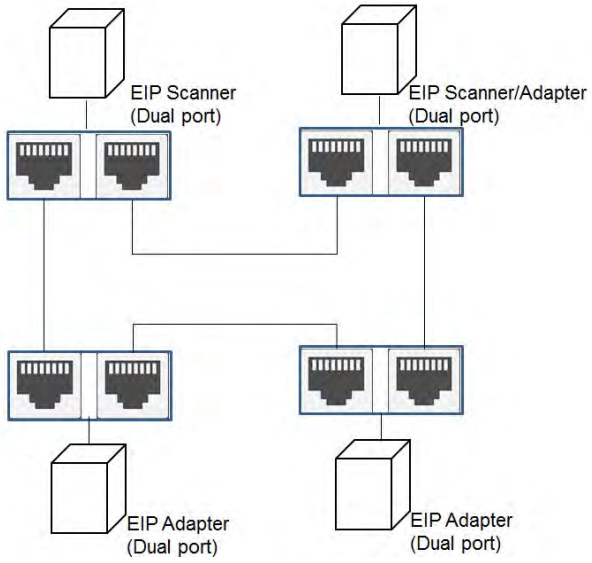


Star Topology

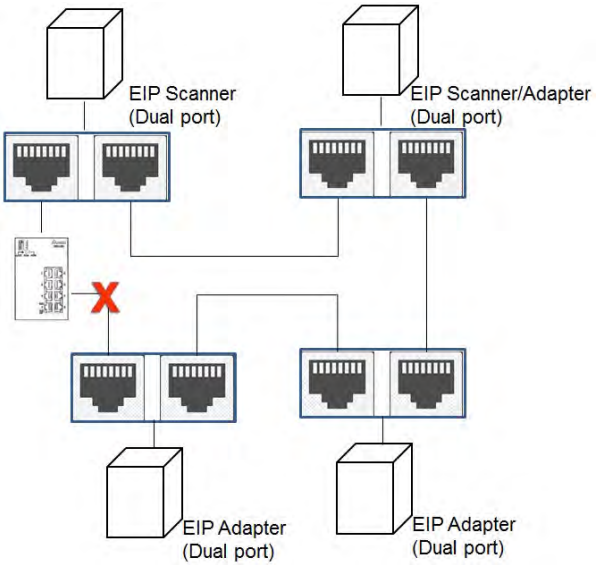


Ring Topology

A DLR function is required to create a ring topology. Refer to section 9.9.2 for DLR supported series.



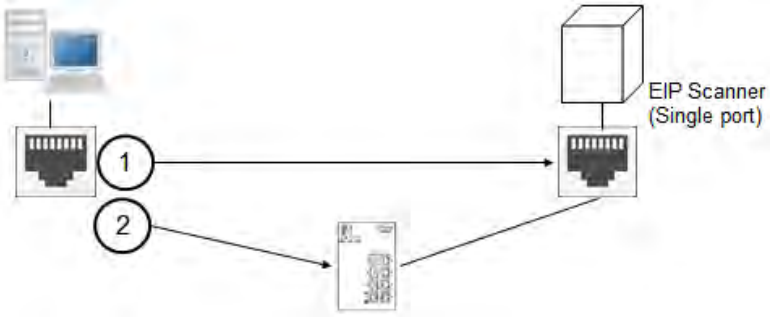
When a switch is needed for topology, the switch should support the DLR function. If not, the connection might fail.



9.2.2.3 EIP Builder Software

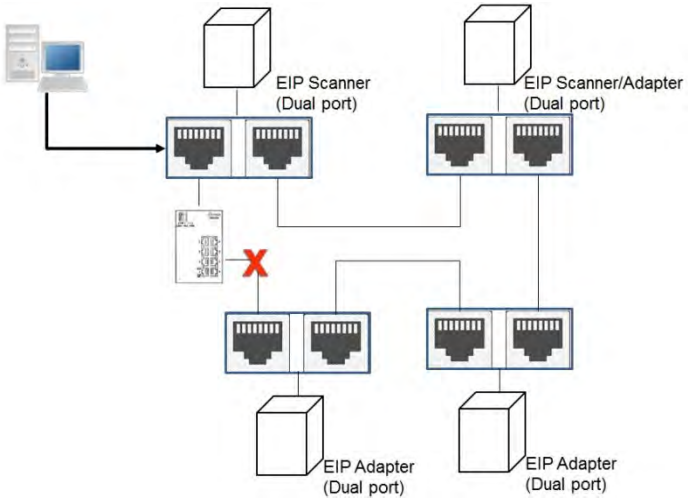
Linear and star topology

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.

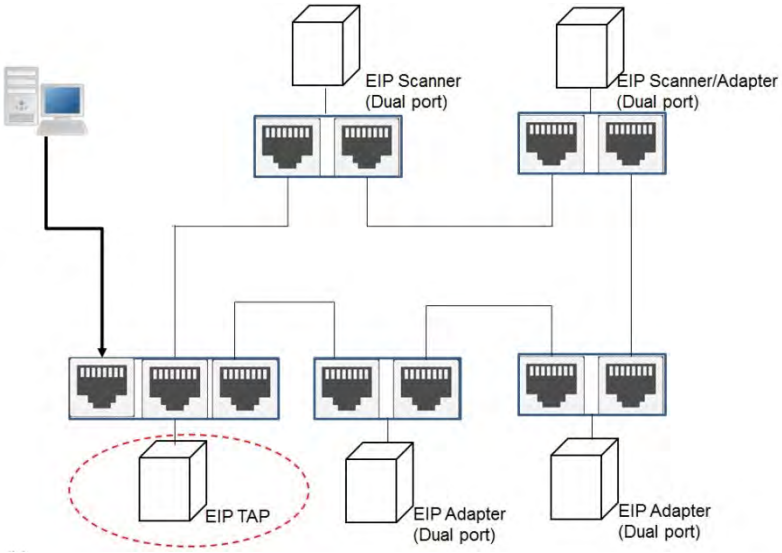


Ring topology

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.



9.3 Specifications

9.3.1 Ethernet Specification

Communication Protocols	EtherNet/IP, MODBUS TCP
Protocols	BOOTP, SNMP, NTP
Communication Speed	10/100 Mbps Auto-Detection
Communication Interface	RJ-45 with Auto MDI/MDIX
Numbers of the Ethernet Communication Port	1

9.3.2 EtherNet/IP Specification

Item		**Specification**
General	Category	Scanner / Adapter
	Topology	Star
CIP Network I/O Connection	Max. Number of the CIP Connections	32 (Clients + Servers)
	Max. Number of the TCP Connections	16 (Clients + Servers)
	Requested Packet Interval (RPI)	5 ms~1000ms
	Max. Transmission Speed/Per Transmission	3000 pps
	Max. Data Length	500 bytes
CIP Network Explicit Message	Class 3 (Connected Type)	Total 32 (Servers), including the ones from the UCMM type
	UCMM (Non-Connected Type)	Total 32 (Clients + Servers) , including the ones from the Class 3
	CIP Objects	Identity, Message Router, Assembly, Connection Manager, Port, TCP/IP interface, Ethernet link, Vendor specific
CIP Network Produced TAG	Max. Number of the CIP Connections	32 (Clients + Servers)
	Max. Data Length	500 bytes (I/O Connections) 400 bytes (Explicit Message)
	Requested Packet Interval (RPI)	5 ms~1000ms

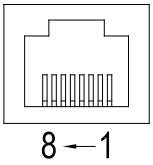
Item		Specification
CIP Network Consumed TAG	Max. Number of the CIP Connections	32 (Clients + Servers)
	Max. Data Length	500 bytes (I/O Connections) 400 bytes (Explicit Message)
	Requested Packet Interval (RPI)	5 ms~1000ms

9.3.3 EtherNet

9.3.3.1 Pin Assignment

Delta EtherNet/IP devices are with CAT5e industrial Ethernet cables and can be connected via the communication port RJ-45.

Pin	Signal	Description	Pin	Signal	Description
1	Tx+	Transmit plus	5	--	N/C
2	Tx-	Transmit negative	6	Rx-	Receive negative
3	Rx+	Receive plus	7	--	N/C
4	--	N/C	8	--	N/C



9.3.3.2 LED Indicator

LED Indicator		LED Status	Description
LINK	Green	ON	● Communication port is connected. ● Connected to Ethernet
		OFF	● Communication port is not connected. ● Not Connected to Ethernet
ACK	Yellow	Blinking	● Packets Transmitting/Receiving ● Packets Transmitting/Receiving via Ethernet
		OFF	● No Packets Transmitting/Receiving ● No Packets Transmitting/Receiving via Ethernet

9.4 EIP Builder

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 3.0 and above). Download the ISPSoft software at:

http://www.deltaww.com/services/DownloadCenter2.aspx?secID=8&pid=2&tid=0&CID=06&itemID=060301&typeID=1&downloadID=,&title=--%20Select%20Product%20Series%20--&dataType=8;&check=1&hl=en-US

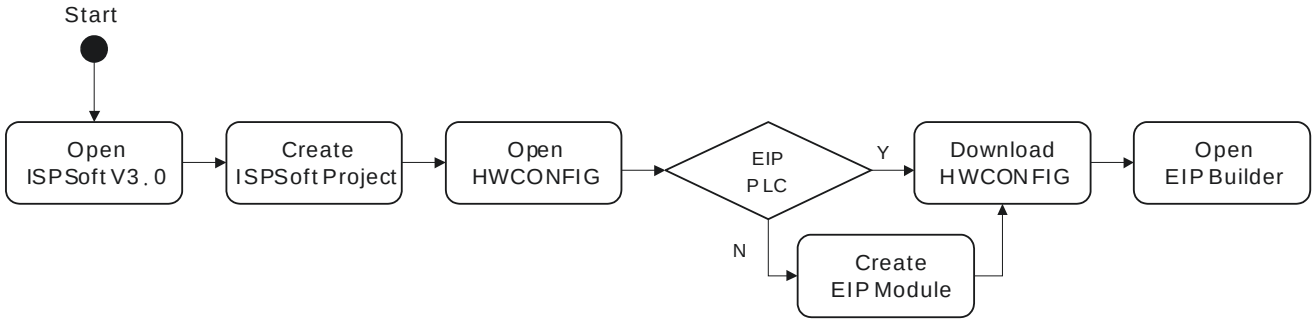
9.4.1 Run the EIP Builder

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 section 9.9.3 for a list of Delta EIP Scanner products supported by the EIP Builder.

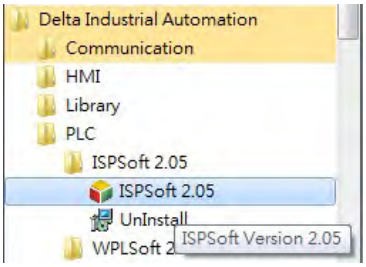
9.4.1.1 Run the EIP Builder via an EIP Scanner

- **Operation Steps**

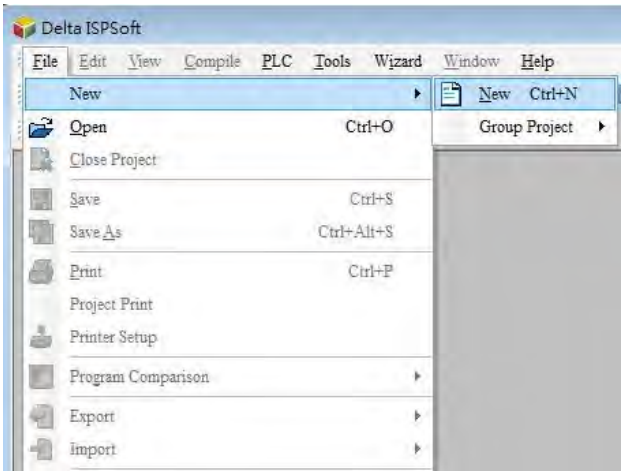
Run the EIP Builder via an EIP Scanner product. When using a Delta EIP Scanner, users need to set up an EIP module through the HWCONFIG in the ISPSoft.



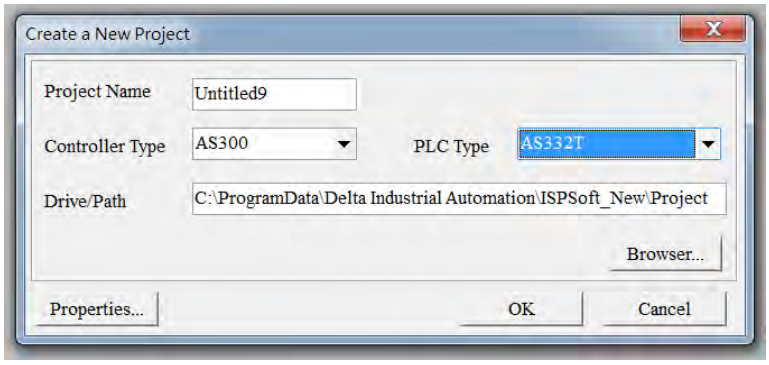
1. Open ISPSoft V3.0: Find ISPSoft 3.00 from the start menu in Windows. Click the start menu and go to All programs > Delta Industrial Automation > PLC > ISPSoft 3.00 > ISPSoft 3.00.



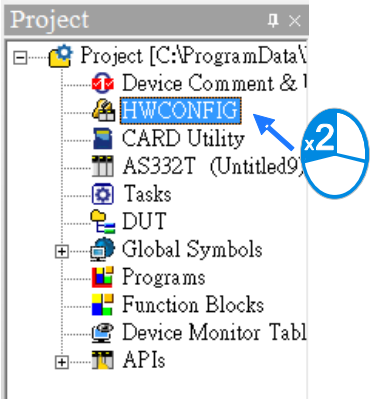
2. Create a new project: *Click File > New* and you will see the Create a New Project window.



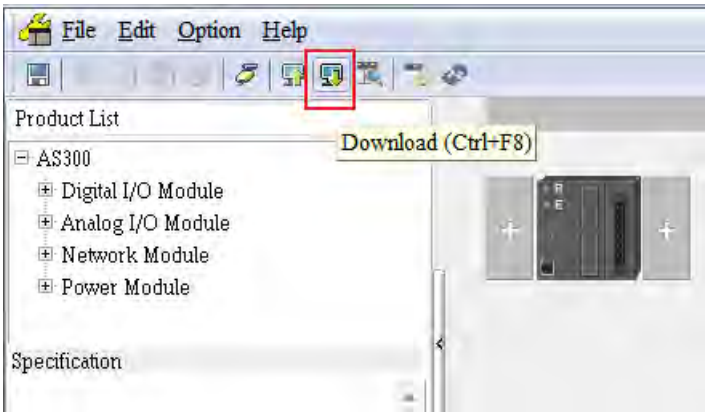
3. Select a PLC: Select a PLC product that supports the EIP builder in the Create a New Project window.



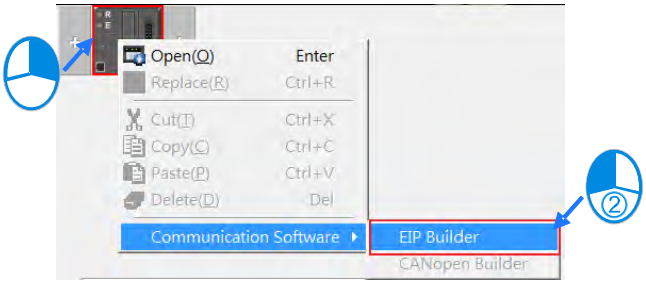
4. Open the HWCONFIG: Double click the HWCONFIG option under the Project.



5. Save and download the HWCONFIG：Click Save to save the HWCONFIG settings and then click  Download to PLC to download the file to PLC. It is required to save the configurations done in HWCONFIG before opening the tools. And while editing in the tools, it is not allowed to work in HWCONFIG.



6. Open the EIP Builder: Right-click the CPU module in the system configuration area to see and click the option “communication software” and then click to select EIP Builder.



9.4.2 Set up the IP Address

This section will provide an overview of how to set up the IP address for AS series. The IP address should be set up before configuring EIP related parameters or data mapping settings.

9.4.2.1 IP Address Types

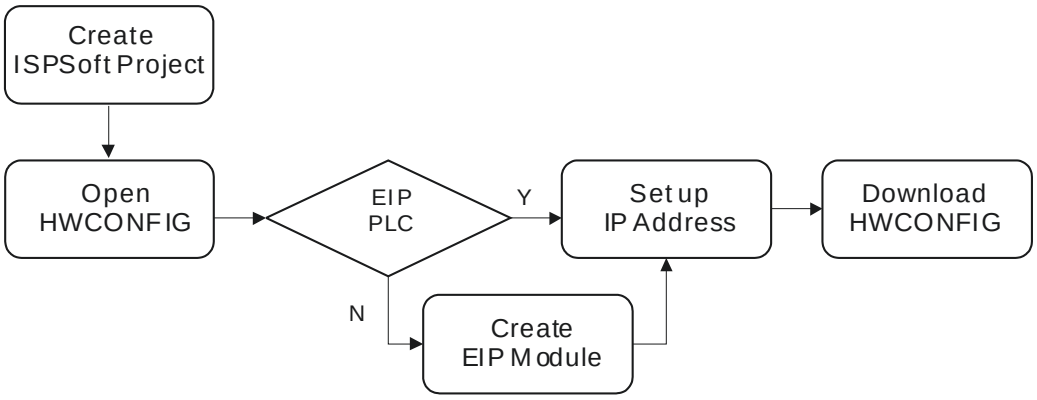
AS series supports 3 types of IP addressing, BOOTP, DHCP and static IP address.

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.
Static IP	For no IP setup control series: Users set up their IP address, netmask and gateway manually.

9.4.2.2 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. The example of AS seriesis listed below.

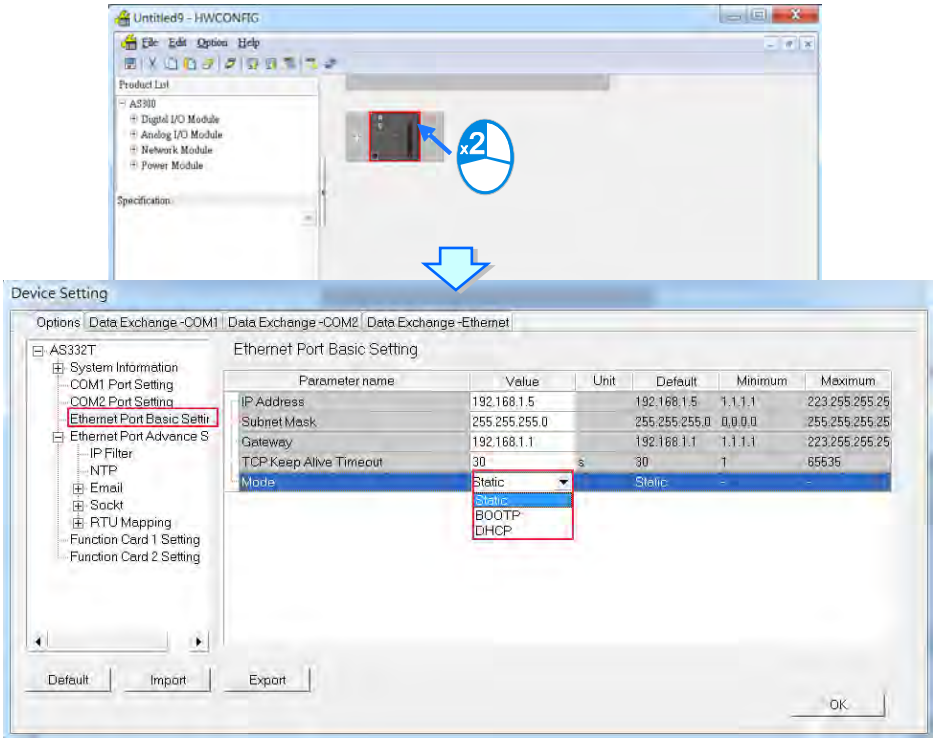


Refer to section 9.4.1.1 for how to set up an EIP module through the HWCONFIG in the ISPSoft.

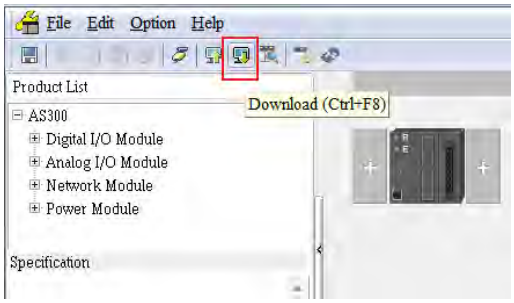
1. Configure the network parameters

◆ Double-click the AS series 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.



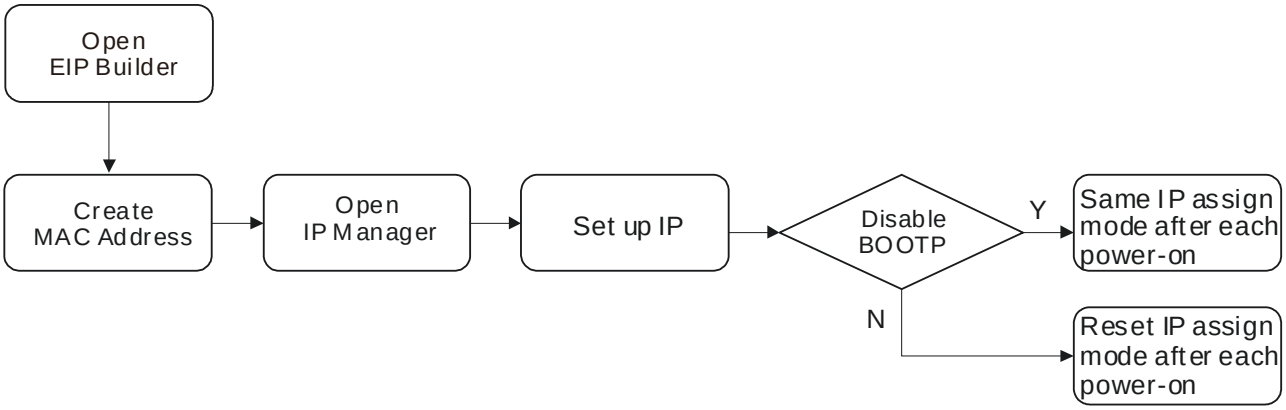
2. Save and download the HWCONFIG: Click Save to save the HWCONFIG settings and then click Download.



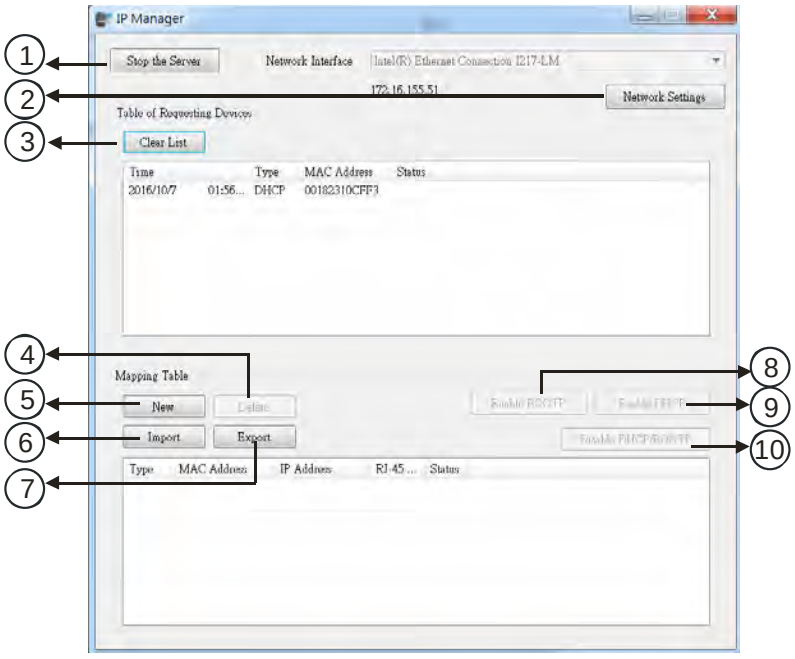
9.4.2.3 Set up the IP Address (BOOTP/DHCP)

- **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:



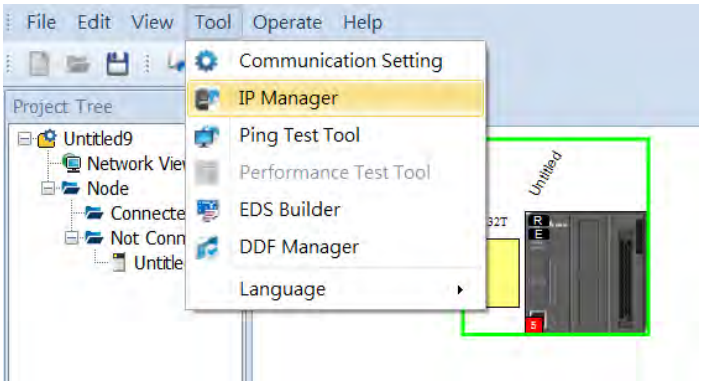
	Item	Definition
①	Stop the Server	Stop the BOOTP/DHCP server; the IP manager will not request for IP addresses from the BOOTP/DHCP server.
②	Network Settings	Set up the subnet mask, gateway, primary DNS, secondary DNS, and domain name.
③	Clear List	Clear all the contents on the list.
④	New	Add new IP/MAC 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:**

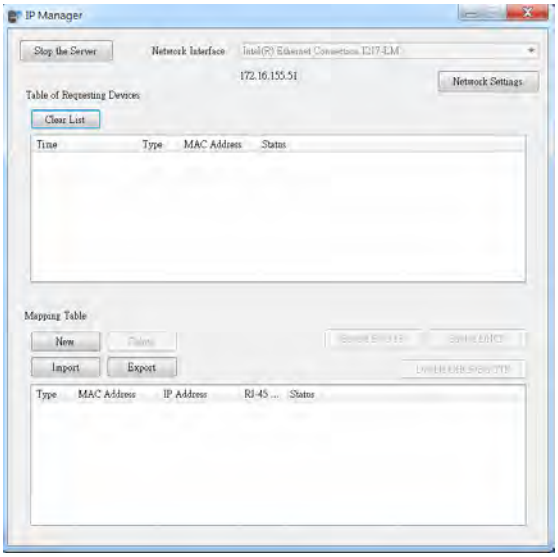
1. MAC address: find the MAC address on the EIP device as its unique identity.

2. Open the IP Manager

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

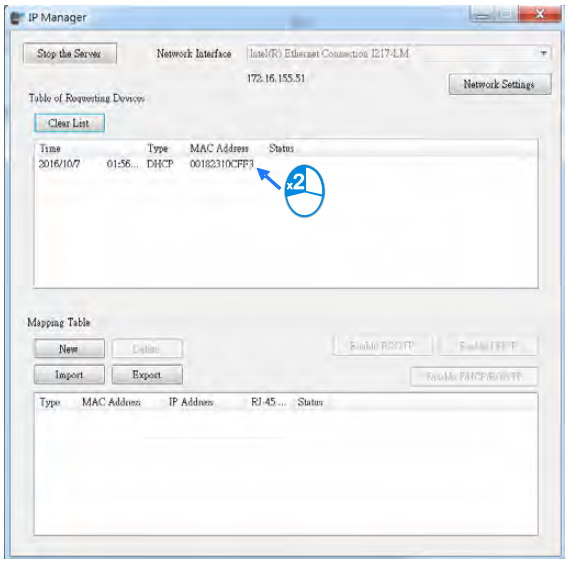


◆ The IP Manager can be the BOOTP/DHCP Server, receiving IP address requests from devices.

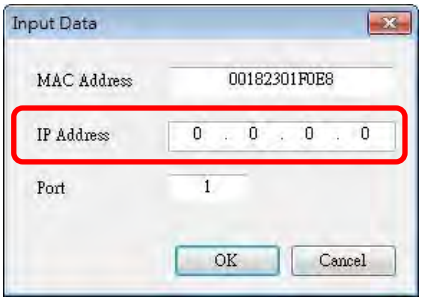


3. Set up the IP address

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

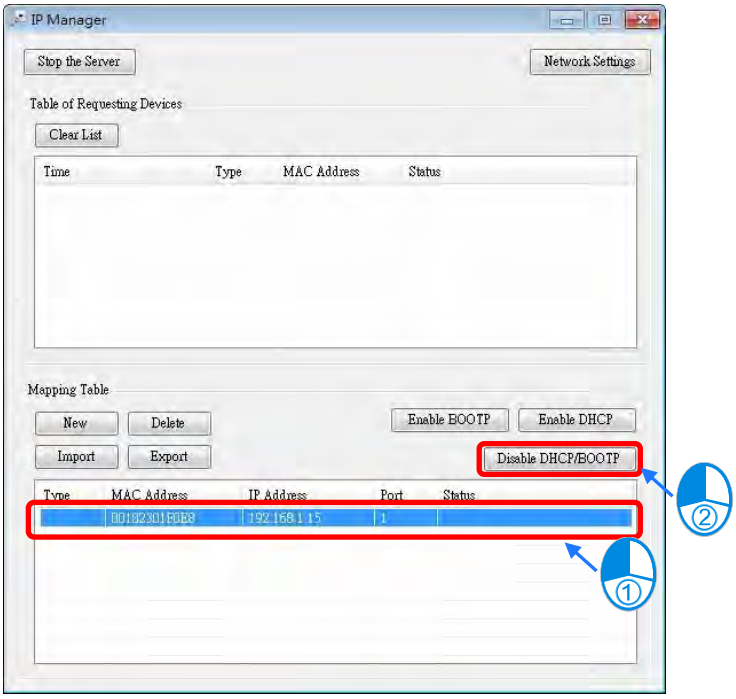


◆ Type the IP address.



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 9.4.2.4 for more information.



- **Note**

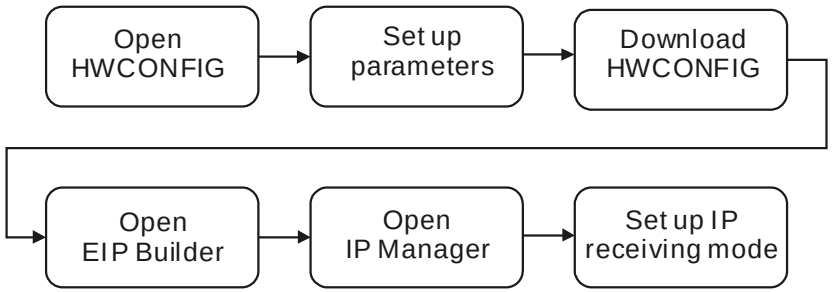
1. Enable BOOTP: When the IP address receiving mode is in BOOTP (BOOTP is enabled), the IP address is assigned, and the device will send out BOOTP requests for IP addresses during each power-on.

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.

9.4.2.4 Enable the BOOTP/DHCP Again

To enable the DHCP or BOOTP function again, users will need to use the device software to make that change. Take the AS 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.

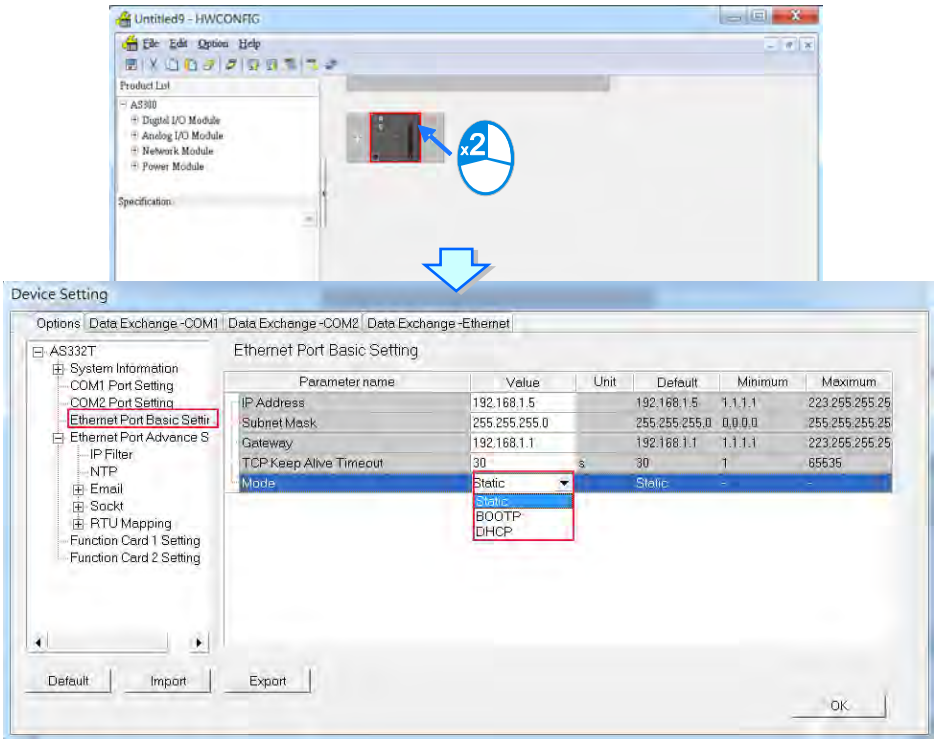


- **Operation Steps:**

1. Refer to section 9.4.1.1 for how to open the HWCONFIG.

2. Set up the parameters: Enable the IP address receiving mode to BOOTP/DHCP.

   - ◆ 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.



3. Download the HWCONFIG

   - ◆ Refer to section 9.4.1.1 for the related information.

4. Open the EIP Builder

   - ◆ Refer to section 9.4.1.1 for the related information.

5. Open the IP Manager

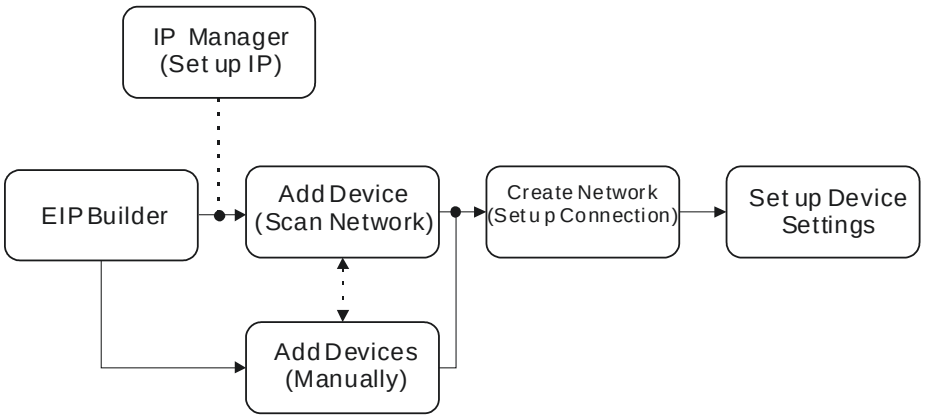
   ◆ Refer to section 9.4.2.2 for the related information.

6. Open the IP setup page

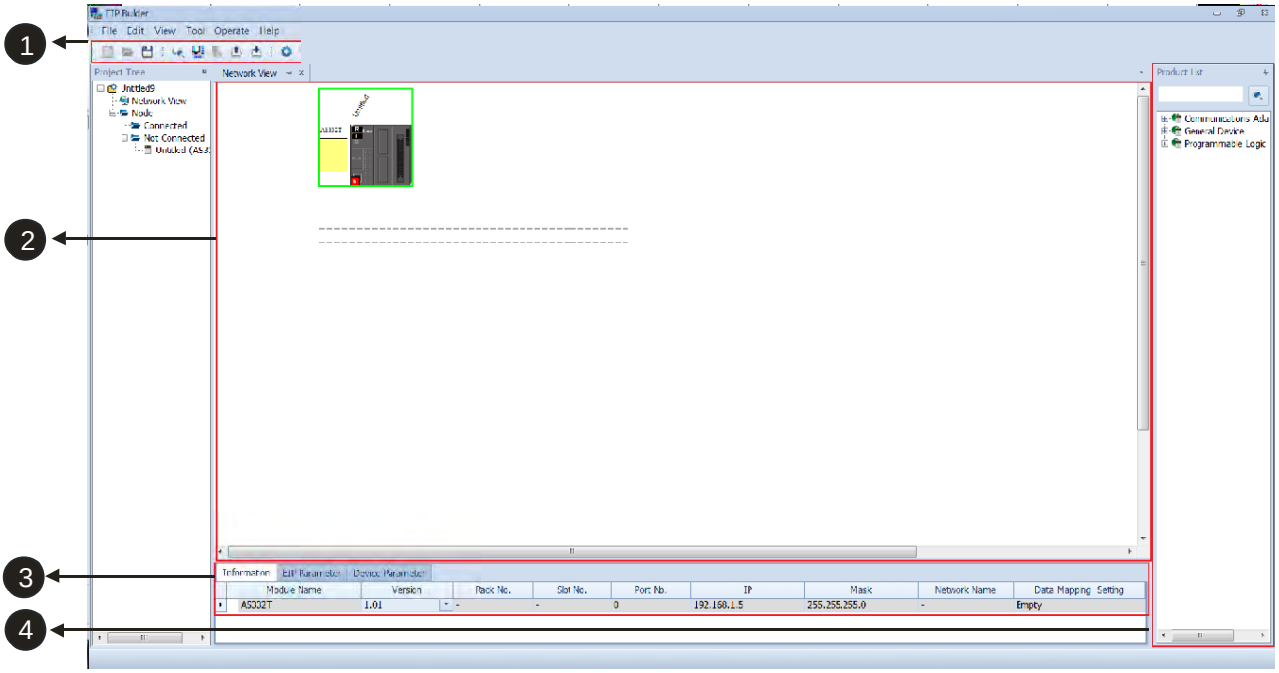
   ◆ Refer to section 9.4.2.2 for the related information.

9.4.3 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.



Descriptions for the EIP Builder:



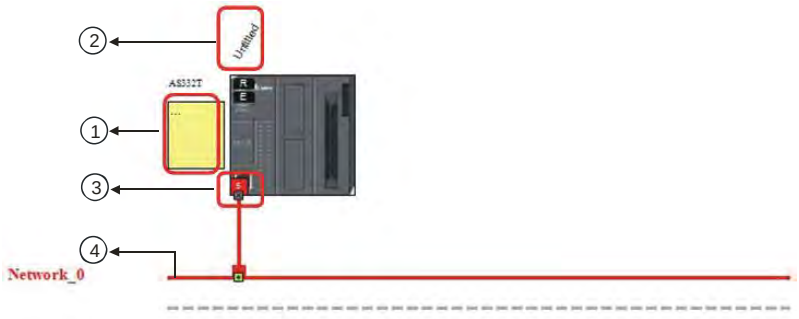
	Item	Definition
❶	Toolbar	Toolbar buttons
❷	Network View	Display the connected devices and their connection status
❸	Configuration Area	Set the parameters and display the configurations
❹	Product List	Display the available devices to be connected to EtherNet/IP

❶ Toolbar

Icon	Name	Definition
	New	Create a new EIP Builder project
	Open	Open an existing project
	Save	Save the project
	Help	Open the help file
	Cut	Cut the selected item
	Copy	Copy the selected item
	Paste	Paste the selected item
	Delete	Delete the selected item
	Scan Network	Scan the network for device availability
	Check	Check if the project is planed nicely
	On-line Mode	Switch to on-line mode

Icon	Name	Definition
	Uploader	Upload
	Downloader	Download
	Setup Button	Open the communication setting; set up the path connecting the PC to the EIP Scanner

❷ Network View

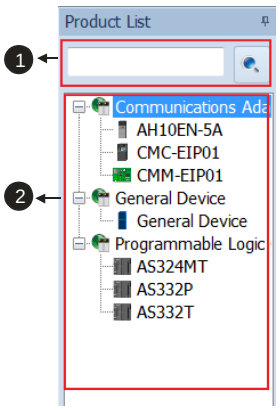


	Name	Definition
①	Station Name	Name for the station
②	Device Name	Name for the device
③	Ethernet COM Port	Display the number of devices with Ethernet communication ports. The last digit of the IP address will be shown on the COM port.
④	Network_0	Display connection status; devices on the same line indicate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

❸ Configuration Area

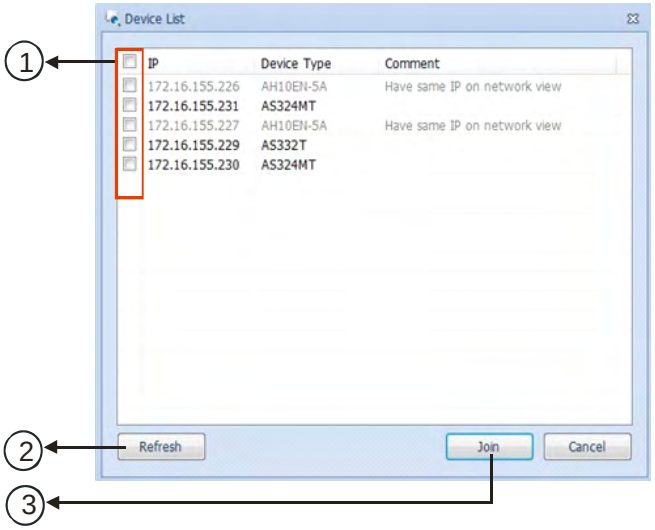
Refer to section 9.4.3.3 for more information.

❹ 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 3rd party will be put in the Others folder.

9.4.3.1 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: Add new devices in (scan the network)**

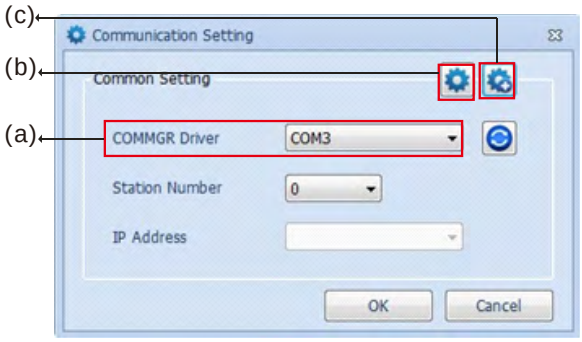
1. Click the setup button to bring out the communication set up page.

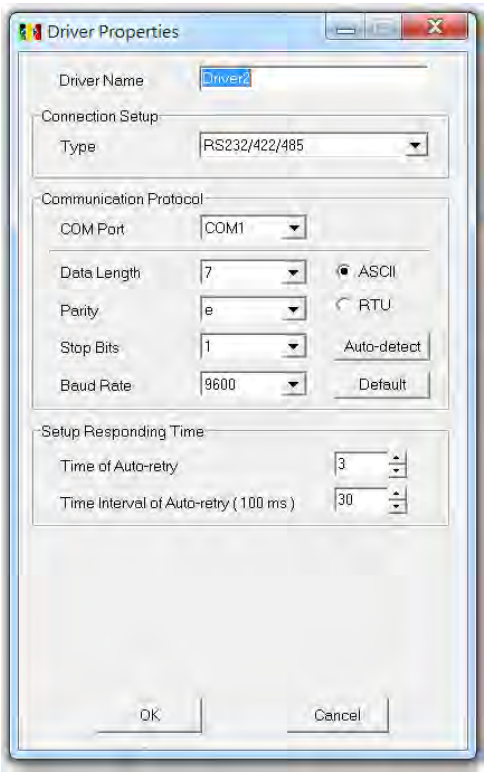
2. Once your PC is connected to the EIP Scanner, there are 3 ways to set up the network communication.

   (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.

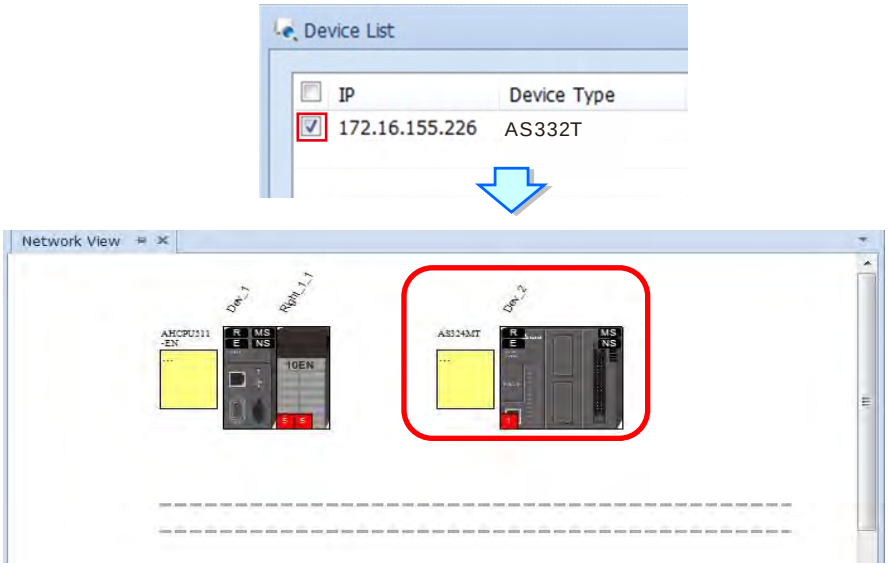
   (c) Add a new Driver: Click the setup button+ in the Common Setting section to bring out the Driver Properties to add new Driver.





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

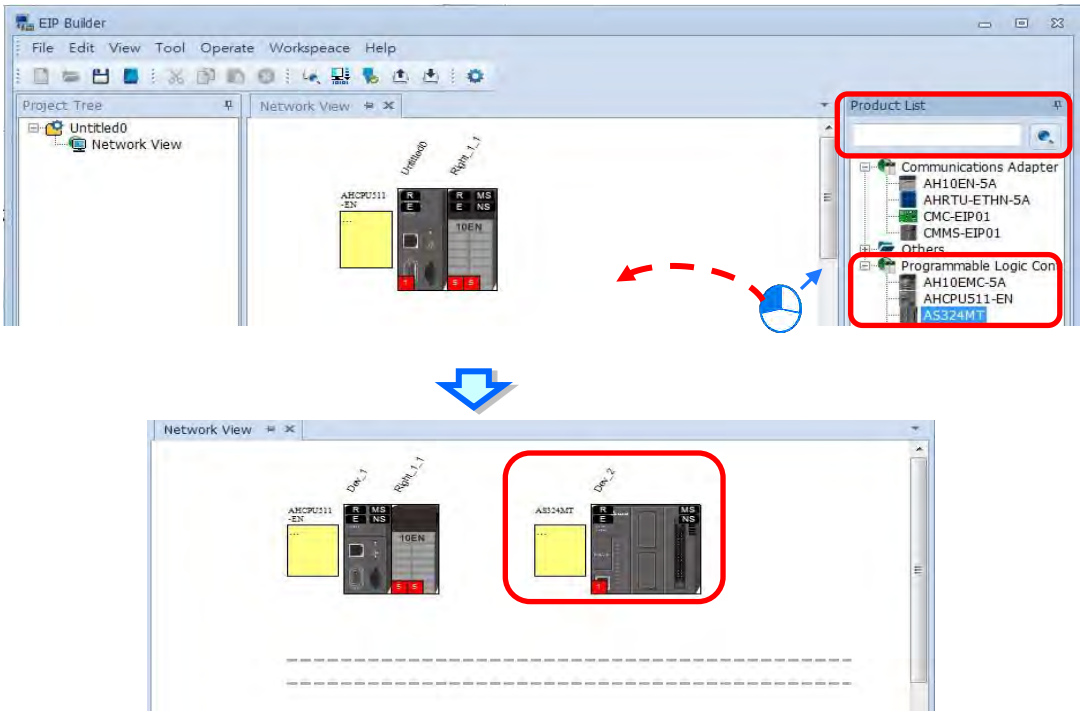
4. Tick to select the devices you'd like to add to the Network. After that, click Join to add the selected devices in.



9.4.3.2 Add devices (Manually)

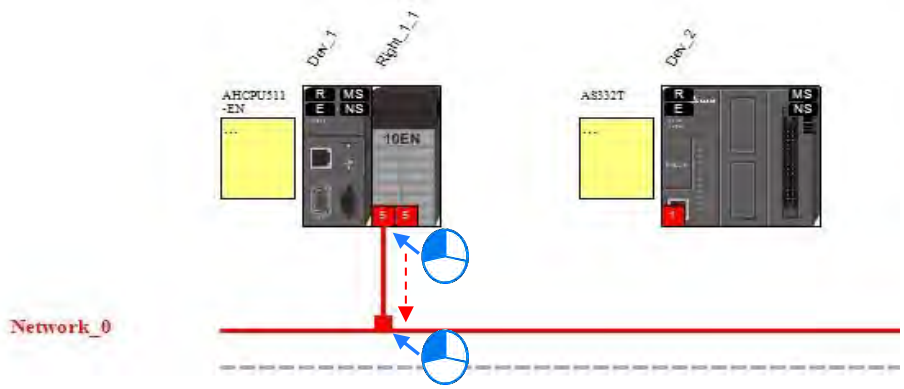
- **Operation Steps: Add new devices in (manually)**

1. 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.

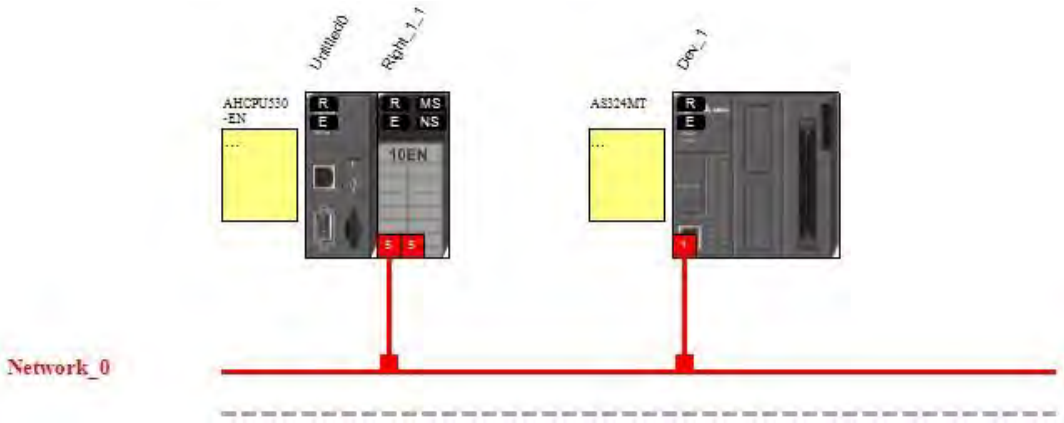


2. Create Network

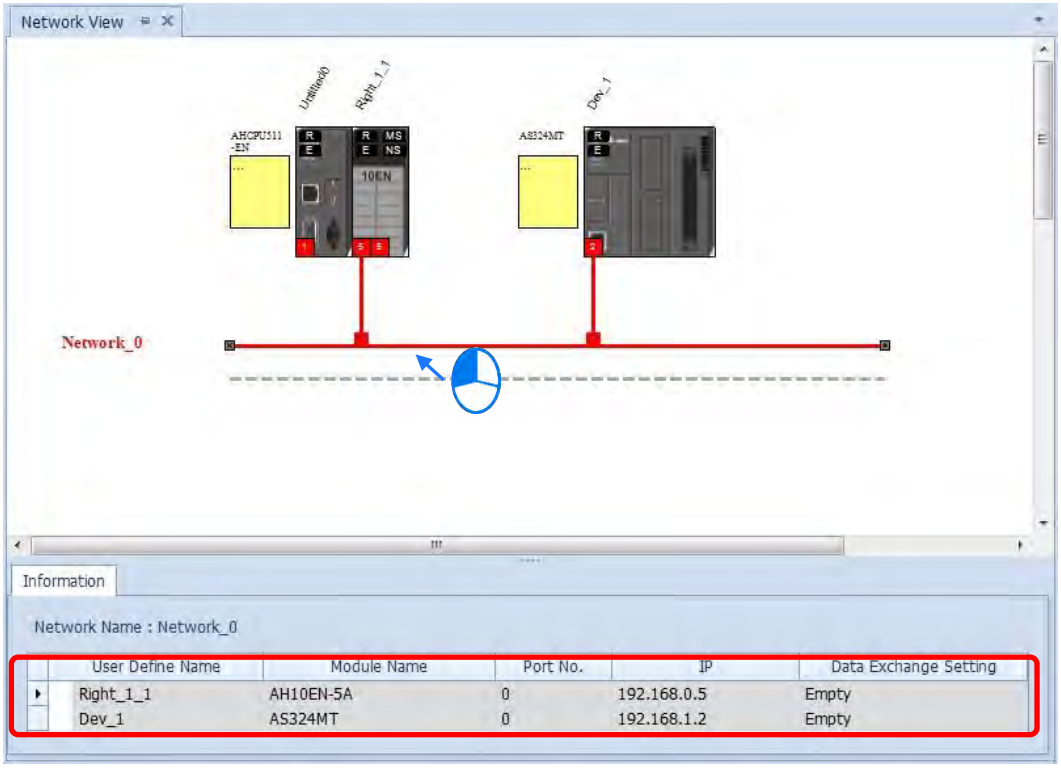
(a) Drag the Ethernet communication port of the device to the network to create connection.



Create network connections for the devices.

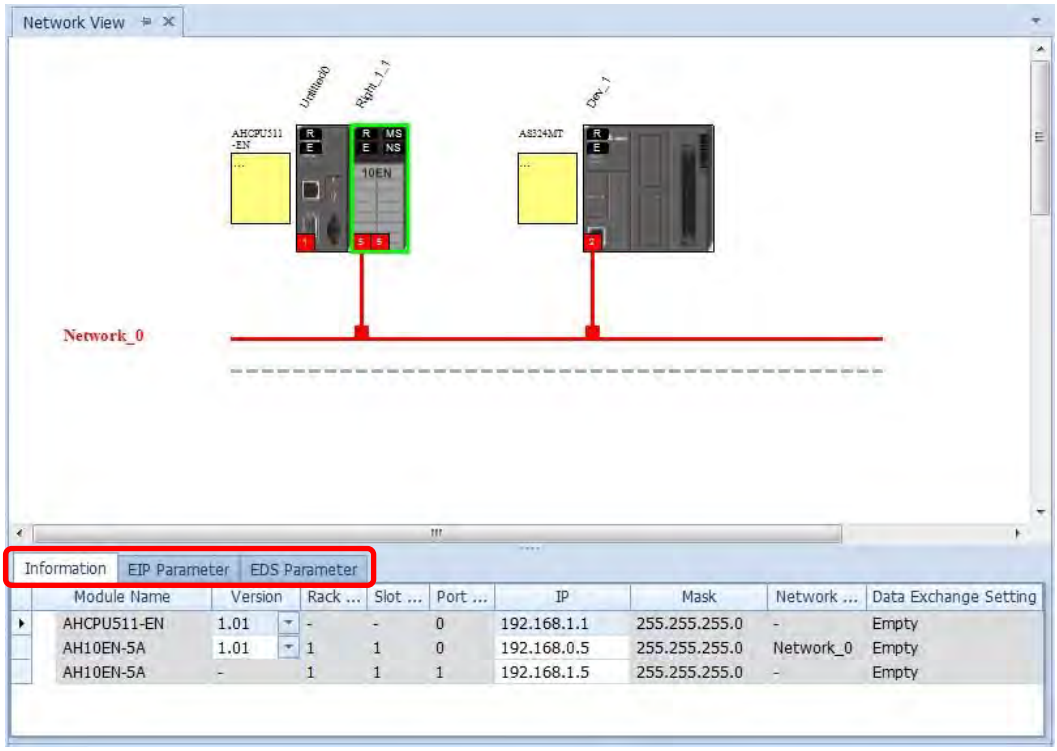


(b) Once the connection is established, click the network line “Network_0”, you will see all the connected devices in this network.



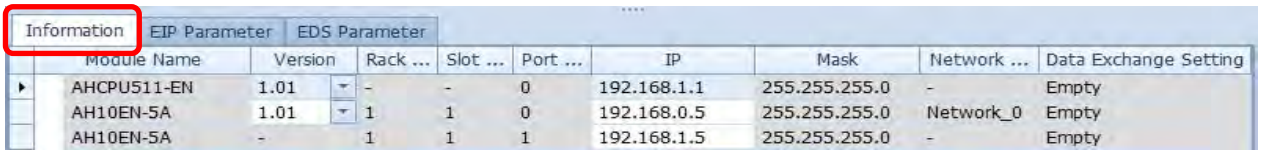
9.4.3.3 Set up the parameters

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



- **Information Tab**

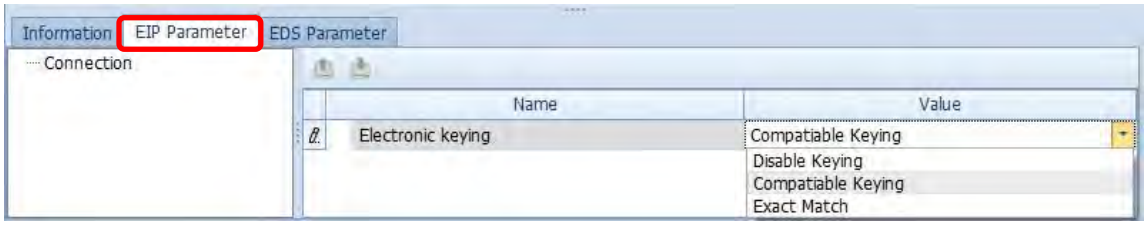
This tab contains information regarding Module Name, Version, Rack, Slot, Slot, IP address, Mask, Network and Data mapping Setting.



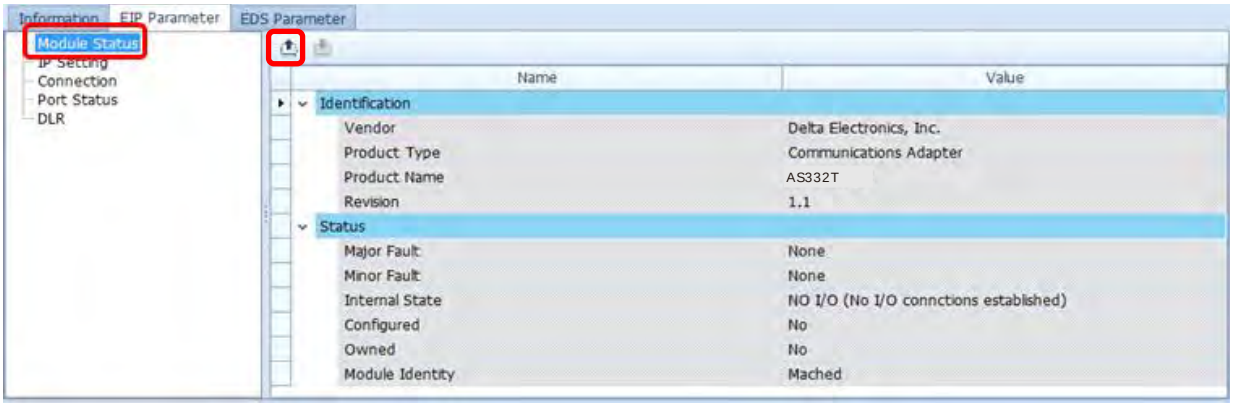
- **EIP Parameter Tab**

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.

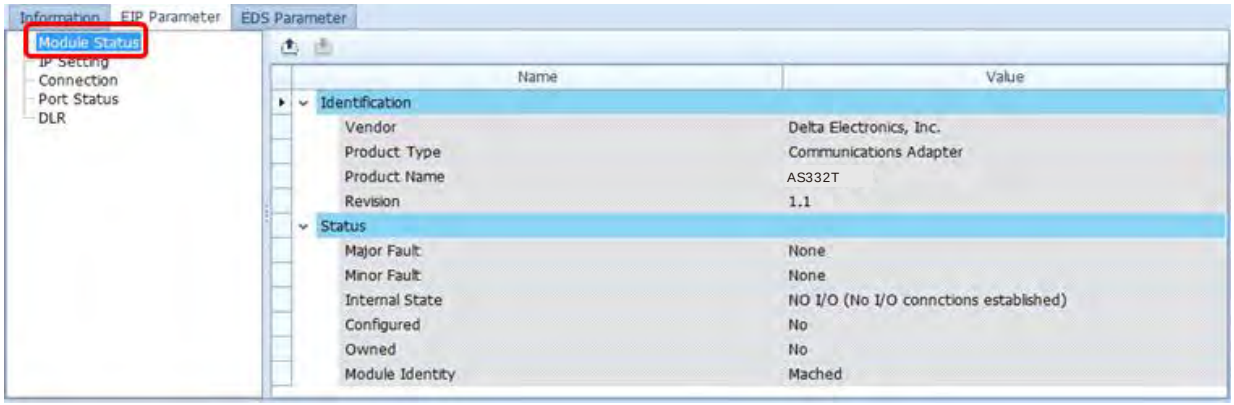
- **Disable Keying:** Disable checking on the product information and its versions.
- **Compatible Keying:** Checking if the product information and its master version are matched; as for the minor version, check for its compatibility.
- **Exact Match:** Checking if the product information, its master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

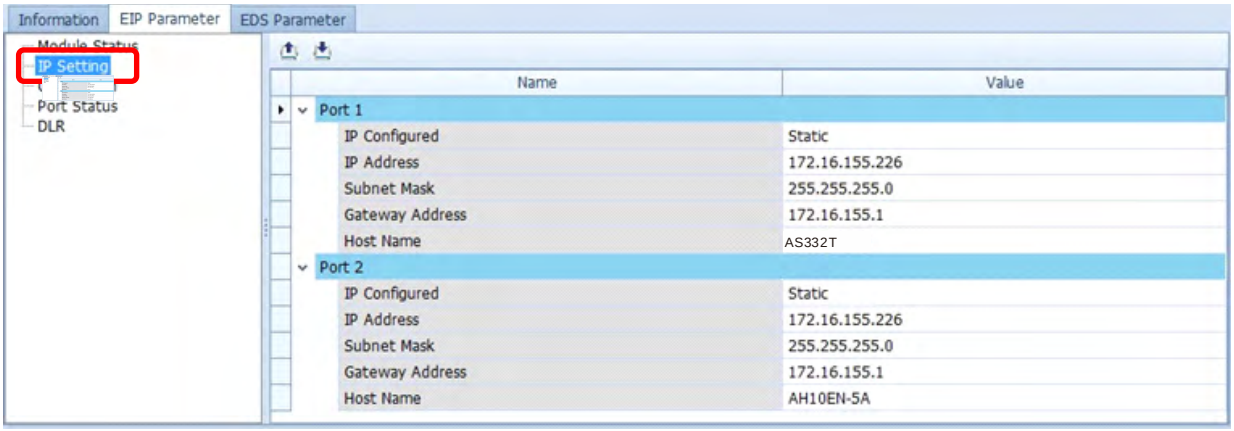


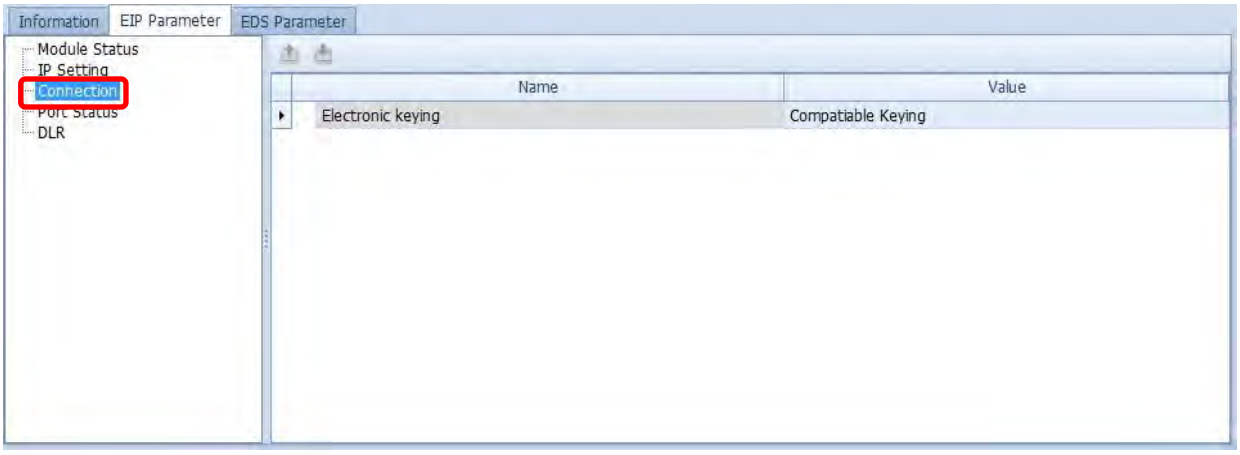
While the device is connected, you can click the upload button to upload the related parameters back to the device.

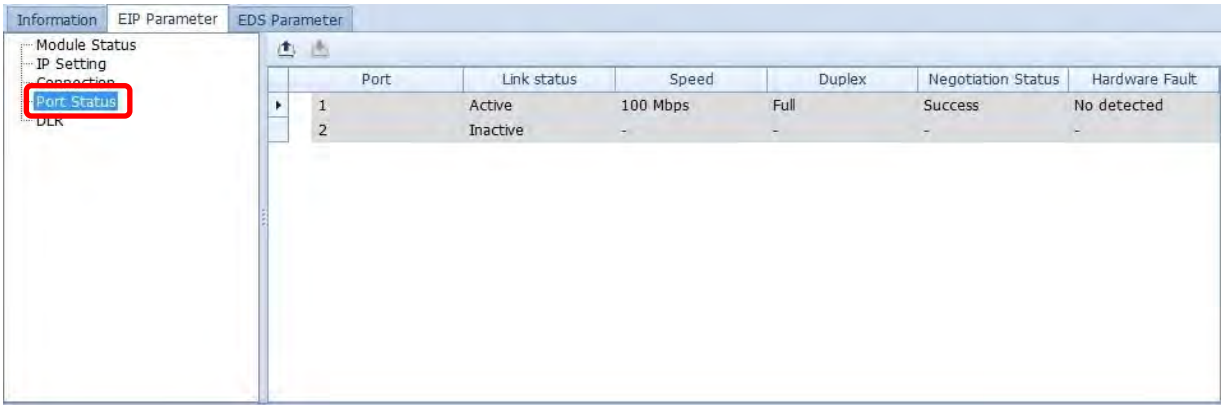


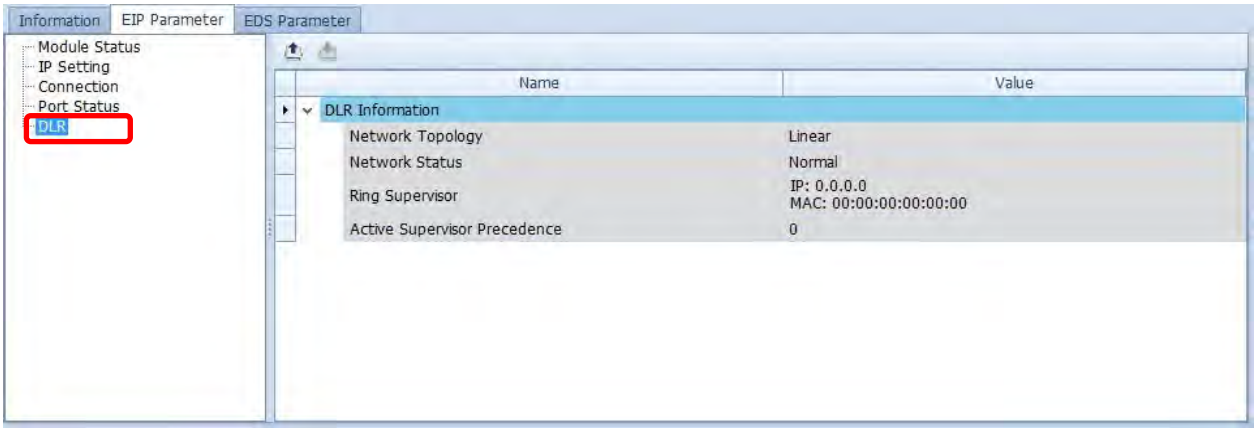
	Name	Definition
①	Module Status	● Identification: Display information regarding Vendor, Product Type, Product Name, Revision, etc. ● Status: Display connection status, including Major Fault, Minor Fault, Internal State, Configuration Status, and Module Identity.
②	IP Setting	● Port1: Indicating port 1 of the device, for editing configurations of the IP Address, Subnet Mask, Gateway Address, and Host Name. Remark: When there is a Port2, that means there are 2 Ethernet communication ports.
③	Connection	● EDS parameters filtering rules include Disable Keying, Compatible Keying, and Exact Match.
④	Port Status	● Display Link Status, Speed, Duplex, Negotiation Status and Hardware Fault.


Information
EIP Parameter
EDS Parameter
Module Status
IP Setting
Connection
Port Status
DLR
Name
Value
Identification
Vendor
Delta Electronics, Inc.
Product Type
Communications Adapter
Product Name
AS332T
Revision
1.1
Status
Major Fault
None
Minor Fault
None
Internal State
NO I/O (No I/O connctions established)
Configured
No
Owned
No
Module Identity
Mached


Information
EIP Parameter
EDS Parameter
IP Setting
Port Status
DLR
Name
Value
Port 1
IP Configured
Static
IP Address
172.16.155.226
Subnet Mask
255.255.255.0
Gateway Address
172.16.155.1
Host Name
AS332T
Port 2
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


Information
EIP Parameter
EDS Parameter
Module Status
IP Setting
Connection
DLR
Name
Value
Electronic keying
Compatiable Keying


Information
EIP Parameter
EDS Parameter
Module Status
IP Setting
Port Status
DLR
Port
Link status
Speed
Duplex
Negotiation Status
Hardware Fault
1
Active
100 Mbps
Full
Success
No detected
2
Inactive
-
-
-
-

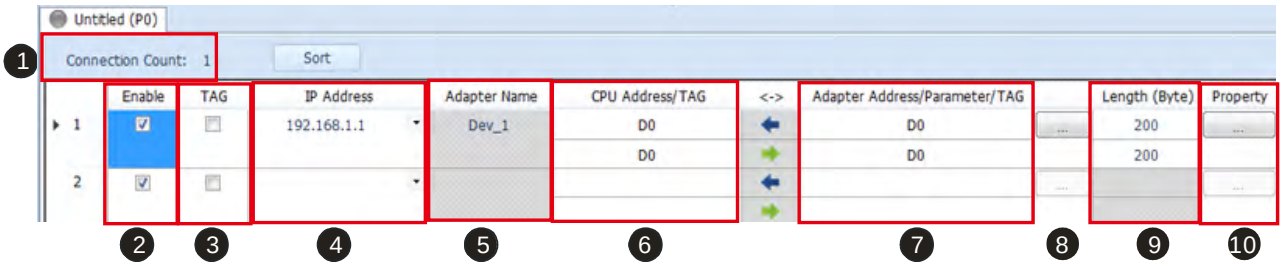


- **EDS Parameter Tab:** this is not supported on the AS300 series.

9.4.4 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 AS series, the maximum connection number is 32.
❷	Enable	Enable / Disable the data mapping function
❸	TAG	Use TAG to perform data mapping with adapters. After ticking this box, ● The directional arrow will be left with (←) (READ only) ● Registers cannot be used in this row. ● The length format is followed by the data format in the Global Symbols; the length format cannot be changed here.

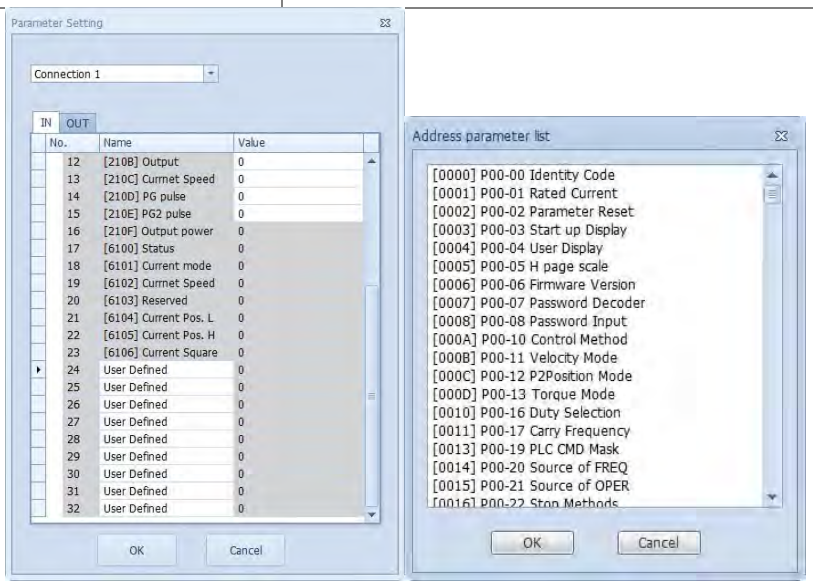
	Name	Definition
		● Users need to create a Consumed TAG in the Global Symbol from ISPSoft before using this function.
❹	IP Address	The IP address of the Adapter that you'd like to connect to. After the data mapping connection is established, the system will load the connected device's IP address. Users 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 9.4.3 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.
	Tick the TAG box❸.	Select the Consumed TAG name from the drop-down list.
❼	Adapter Address/Parameter	Target adapter's register address / parameters
	Tick the TAG box❸.	Input the name of the Produced TAG for other going to be connected EIP devices. Default name is the same as the name shown in ❻.
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.
❾	Length	Set up the data mapping length; unit: byte, the maximum is 500 byte. The length format cannot be changed here when using TAG.
❿	Property	Set up the advanced data mapping parameters.

❼ I/O Mapping Table

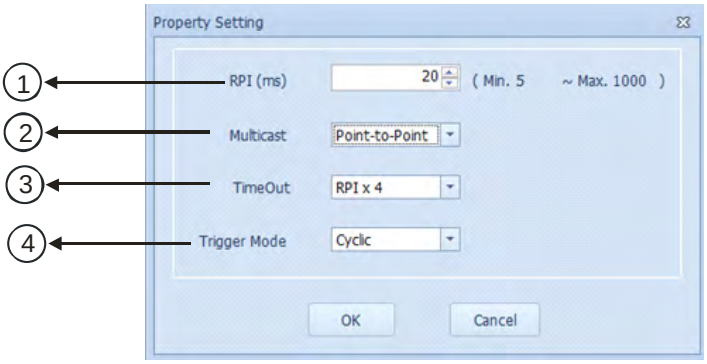
Delta EIP devices provide I/O mapping table. If needed, users can use the table to edit the parameters.

	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.

	Name	Definition
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.



❾ Property



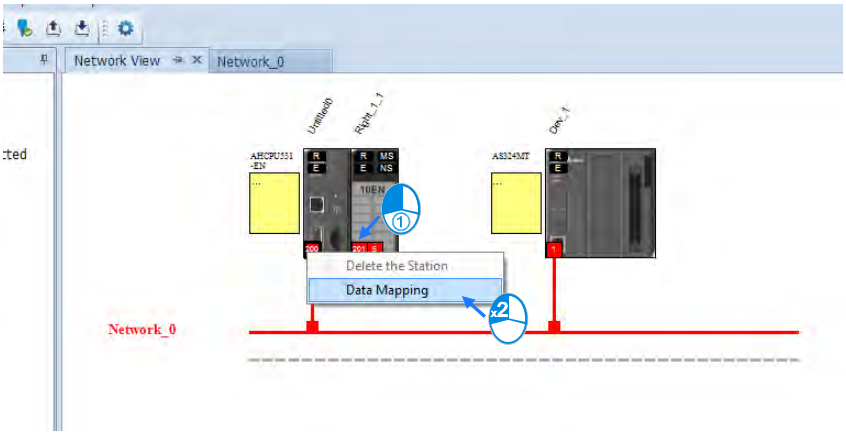
	Name	Definition
①	Requested Packet Interval (RPI)	RPI setup: via the I/O connection to connect to EtherNet/IP to exchange data at regular time intervals, unit: ms
②	Multicast	Communication mode setup: Multicast or Point-to-Point

	Name	Definition
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

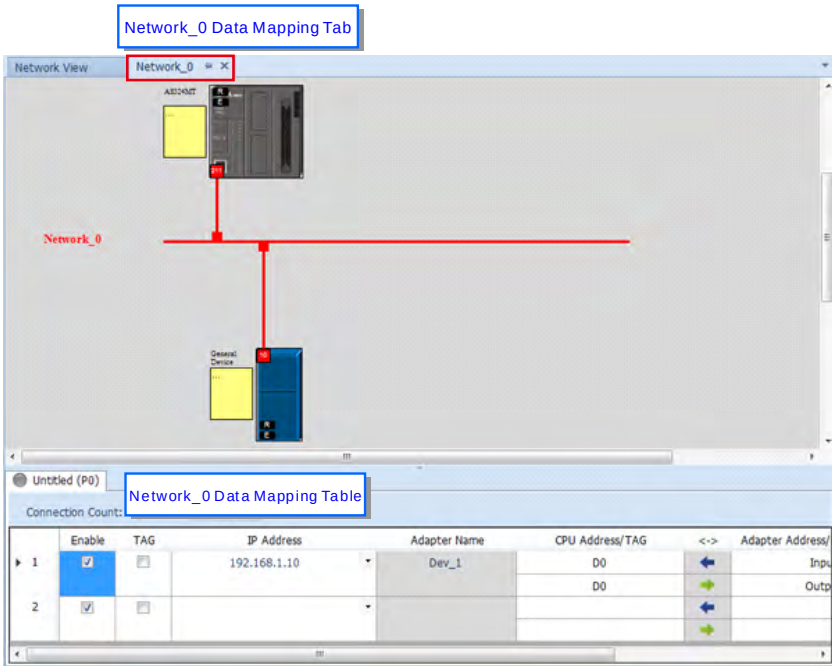
- **Operation Steps:**

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

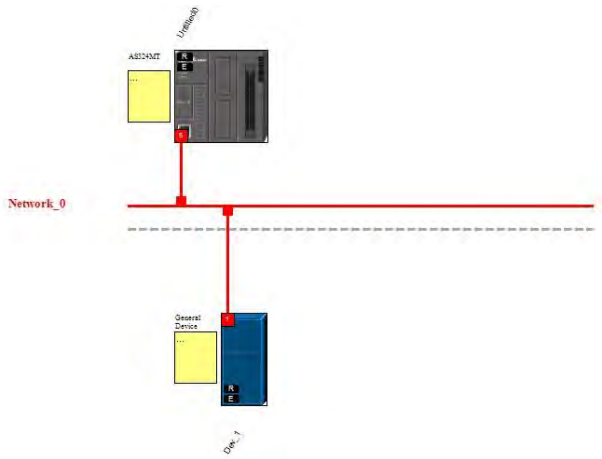
a) See the example of reading the D500~D599 of the Adapter with the IP address 192.168.1.2 to the D10000~D10099 of the Scanner below.

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

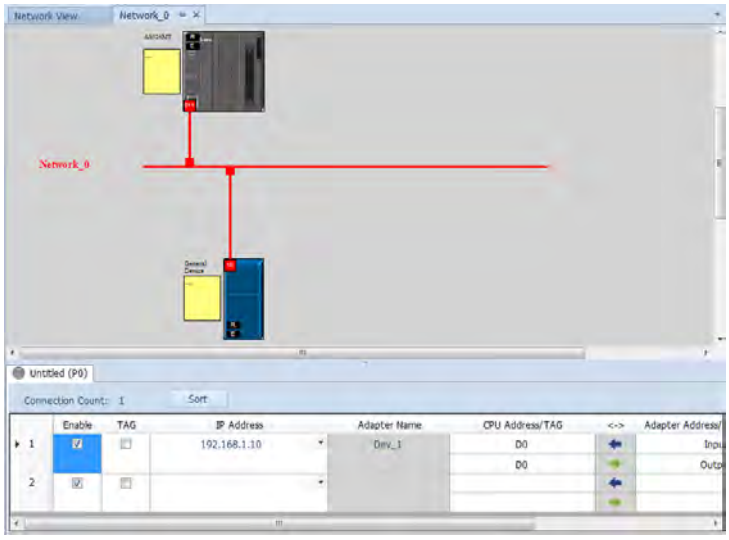
	Enable	TAG	IP Address	Adapter Name	CPU Address/TAG	<->	Adapter Address/Parameter/TAG		Length (Byte)	Property
1	☑	☐	192.168.1.1	Dev_1	D0	←	D500	...	200	...
					D200	→	D100		200	
2	☑	☐				←		...		...
						→				

◆ Use TAG function in data mapping

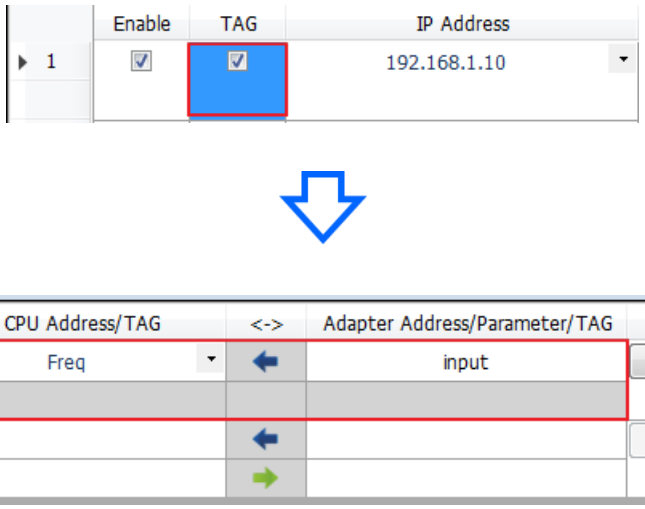
a) Create a General Device in the network view as the image shown below and then appointed the IP address to be used as a Produced TAG. For a device addition, please refer to section 9.4.3.



b) Start or switch to the data mapping page.



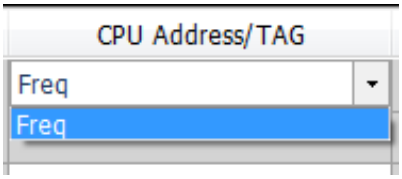
c) Once the TAG box is ticked, the directional arrow will be left with (←) (READ only)



※Users can also input the IP address to be connected to other TAGs and then the creation of a General Device is not necessary.

d) Selecting the Consumed TAG

Select the created Consumed TAG from the CPU register address /TAG column.

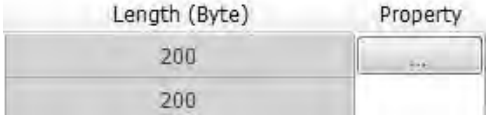


e) Input the name for the to-be-connected Produced TAG.

After selecting the TAG, the software will show the same TAG name in the register address / parameters / address of the Adapter. Users can modify the TAG name to have the same name as the Produced TAG name.

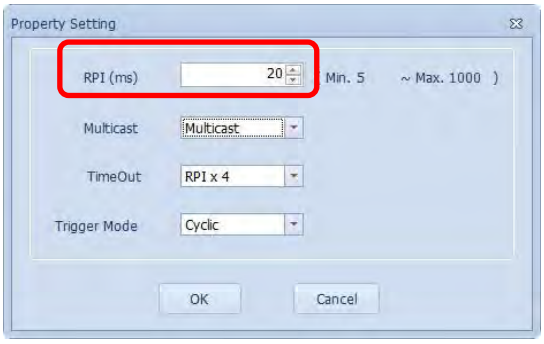
◆ Set up property

a) Click the Property to set up.



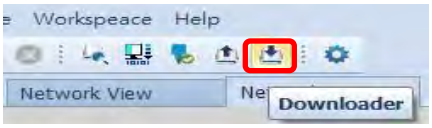
b) Type the data mapping parameters

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

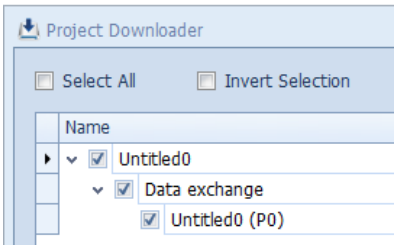


3. Download

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

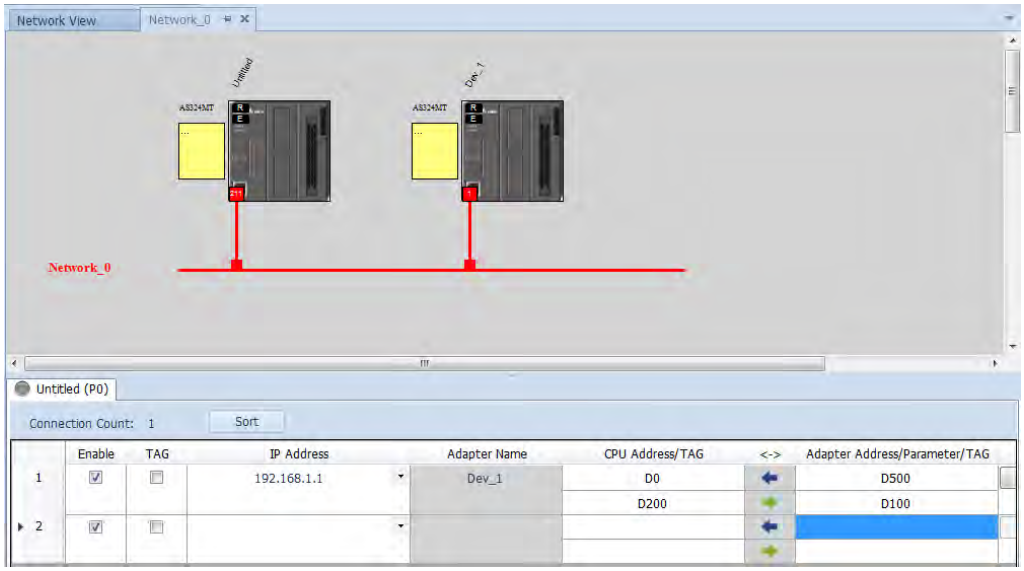


- Selecting the Scanner communication port of the EIP Builder; every communication port can download a data mapping table.



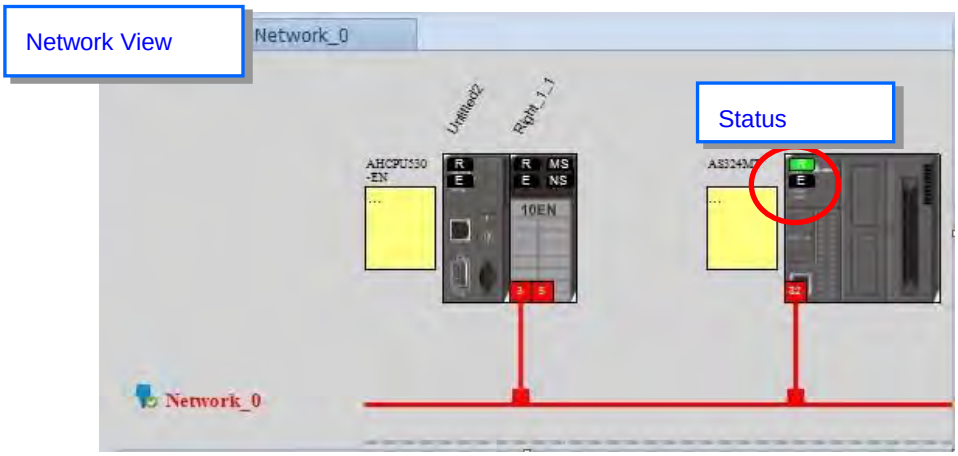
9.4.5 Diagnosis

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**
  - ◆ 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.

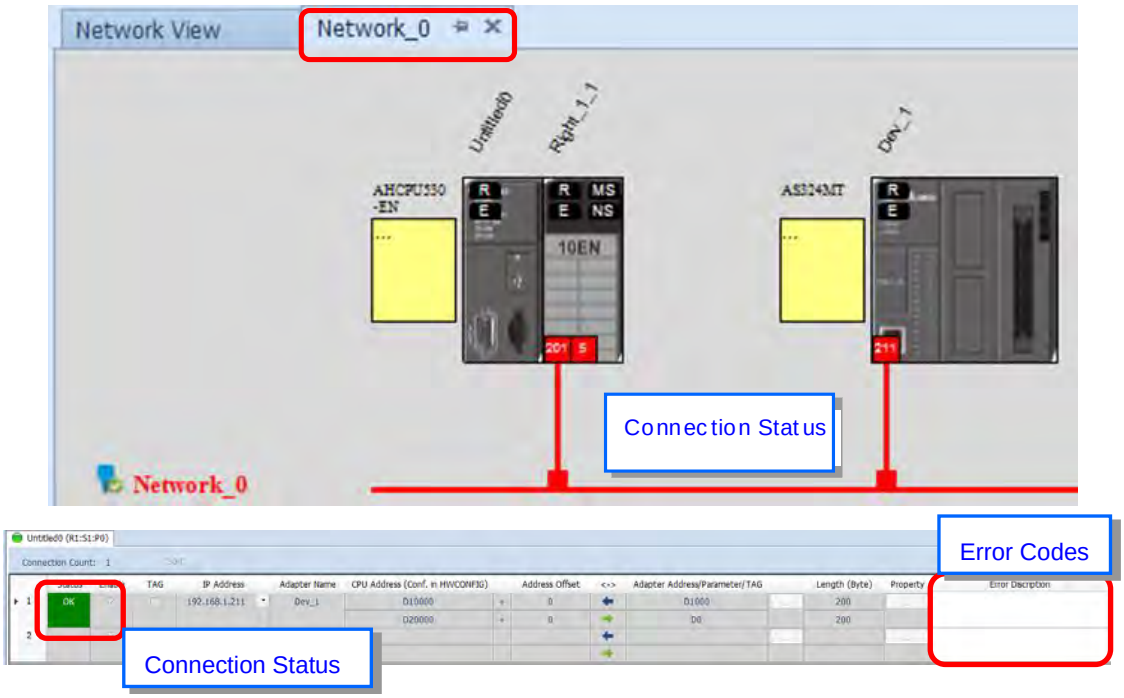


The dotted line and the warning sign indicate connection error, as the image shown below.

  - ◆ 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 9.6.2.



9.5 Programming

9.5.1 Explicit Message

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. For details on using implicit messages, please refer to section 9.4.4. This section will provide an overview of how AS Series uses explicit messaging instructions.

When the AS series acts a Scanner, users can use the API2208 EIPRW instruction to read/write Object. When the EIP builder uses Objects as its parameters, each Object includes various parameters. For the details on the instruction API2208 EIPRW, please refer to AS Programming Manual. For details on Objects that are supported by AS series, please refer to section 9.8.

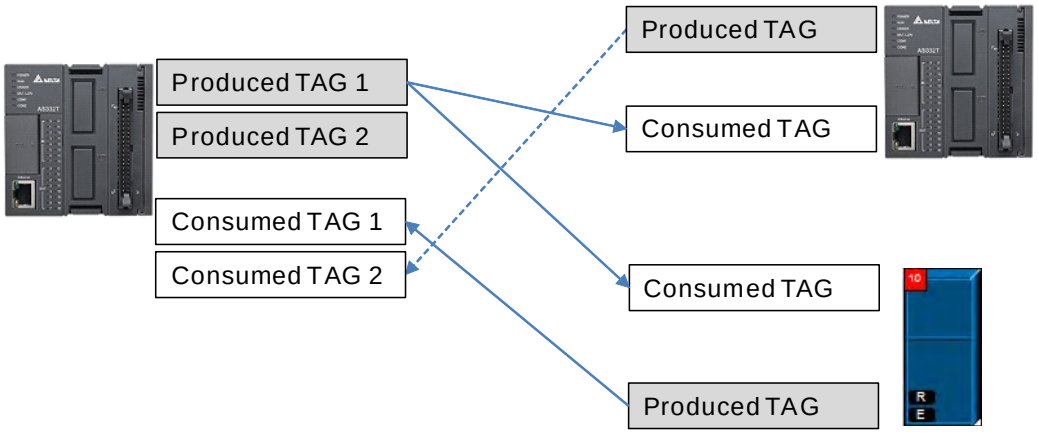
9.5.12 TAG

EtherNet/IP can use TAG to exchange data. Delta PLC can use Global Symbols to define TAG, and the TAG can be used for Delta HMI and the 3rd party devices. There are 2 types of EIP TAGs, Produced TAG and Consumed TAG.

1. Produced TAG: A PLC can make produced tags to send data to consumed tags made by other EIP Scanners for data mapping with other EIP devices.

2. Consumed TAG: EIP Scanners make consumed tags to receive data of produced tags for data mapping with other EIP devices.

Tags can be used for connecting other EIP devices. Before connecting the Consumed TAG, please check the IP address of the device to be connected and the Produced TAG name. One device can have more than one Produced TAG and Consumed TAG. See the example for reference.

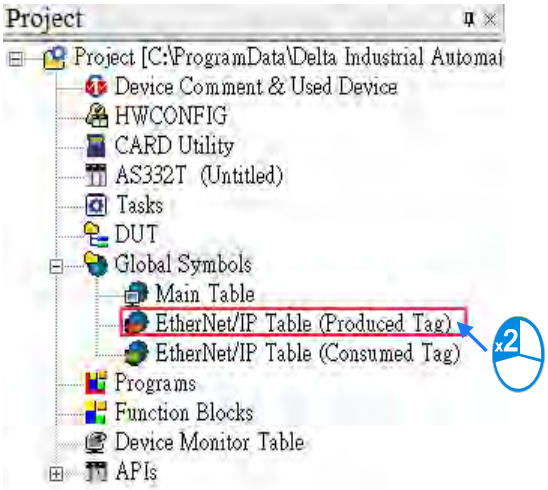


Other EIP devices

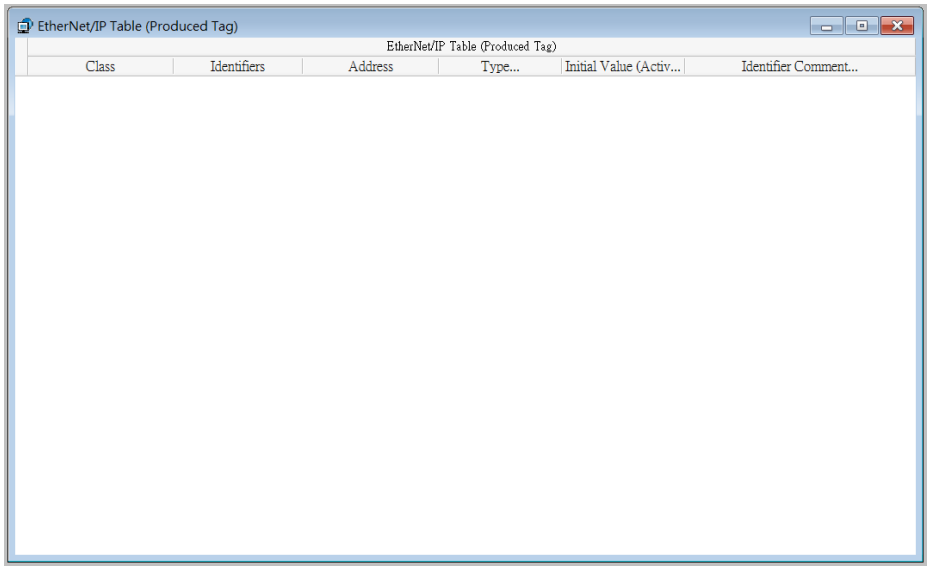
9.5.1.1 Produced TAG

Creating a Produced TAG

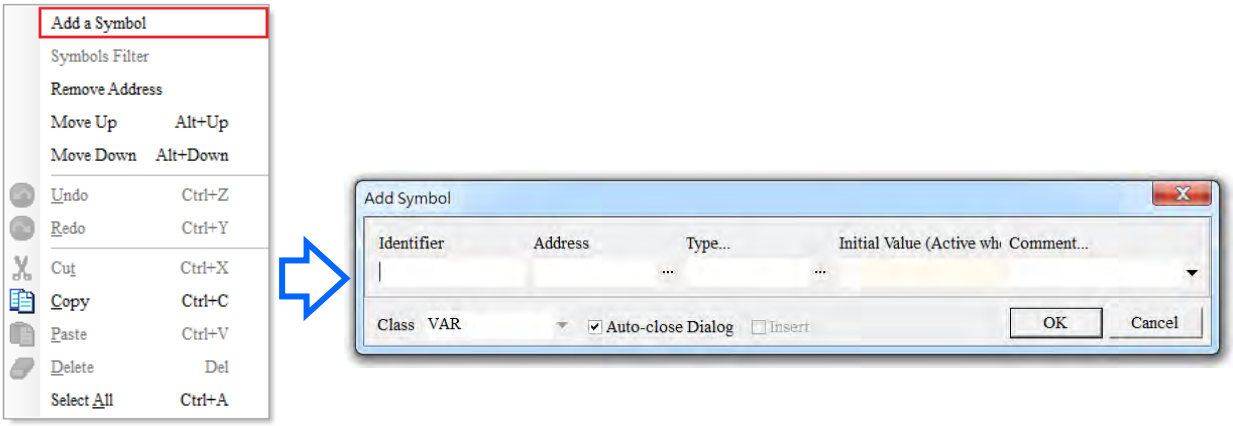
1. Unfold the option Global Symbols and then users can see the EtherNet/IP Table (Produced TAG) in ISPSoft.



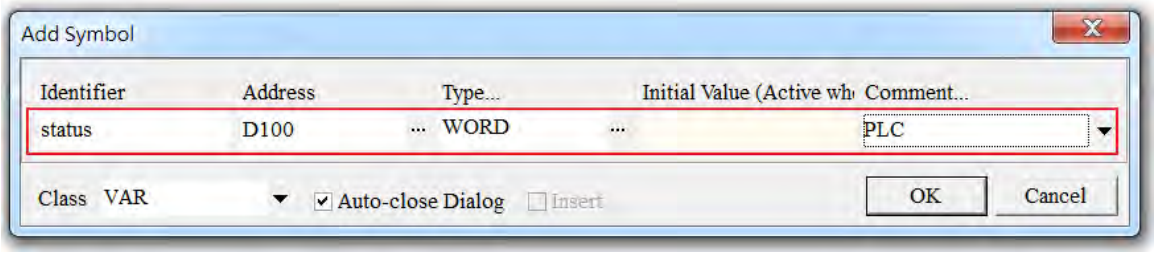
2. Double click the option “EtherNet/IP Table (Produced TAG)” to create a Produced TAG



3. Right click on the EtherNet/IP Table (Produced Tag) page and select “Add a Symbol ” to see the Add Symbol window.



4. Input the required information in the table to complete the creation of a produced tag.



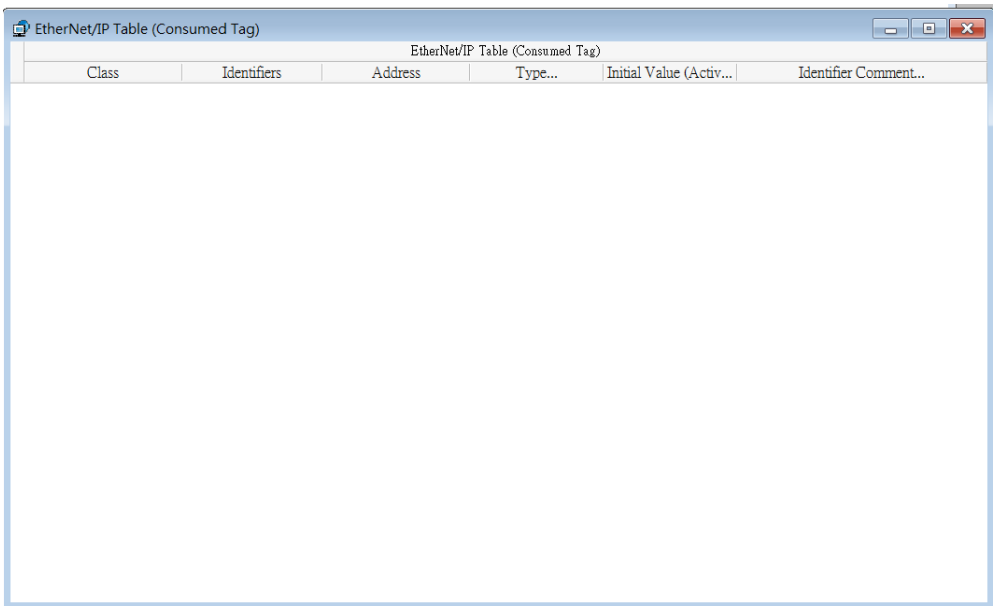
After the settings are complete, download it to the PLC. And then other EIP devices can access to this Produced TAG via their created Consumed TAG. The creation of a Consumed TAG varies among brands; please refer to the manuals of the EIP devices for specific instructions.

9.5.1.2 Consumed TAG

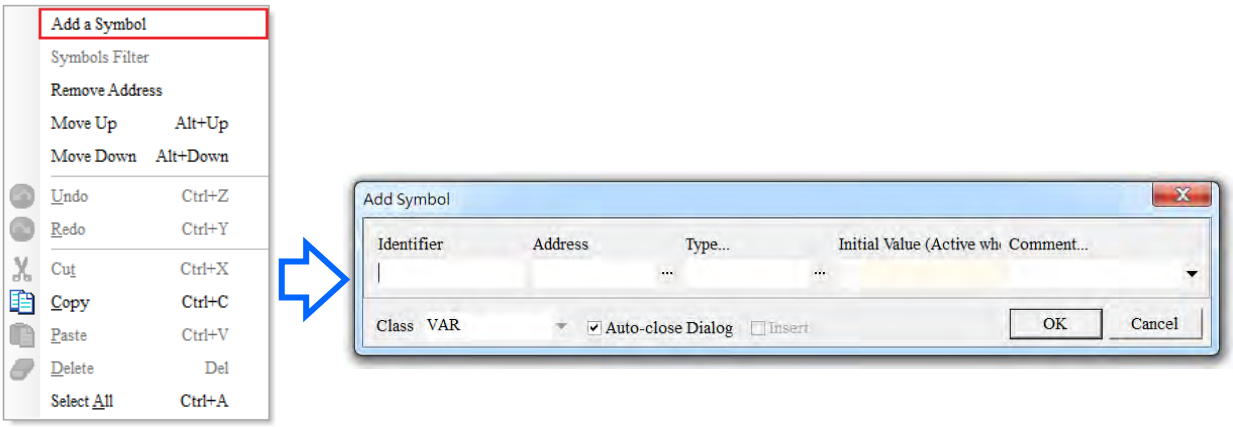
Creating a Consumed TAG

1. Unfold the option Global Symbols and then users can see the EtherNet/IP Table (Consumed TAG) in ISPSoft.

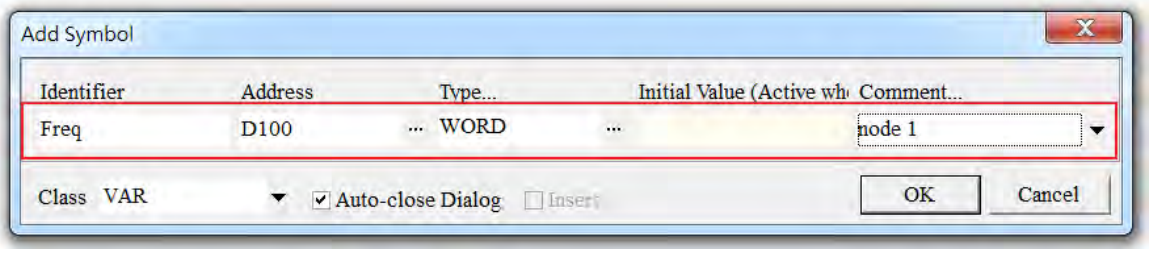
2. Double click the option “EtherNet/IP Table (Consumed TAG)” to create a Consumed TAG



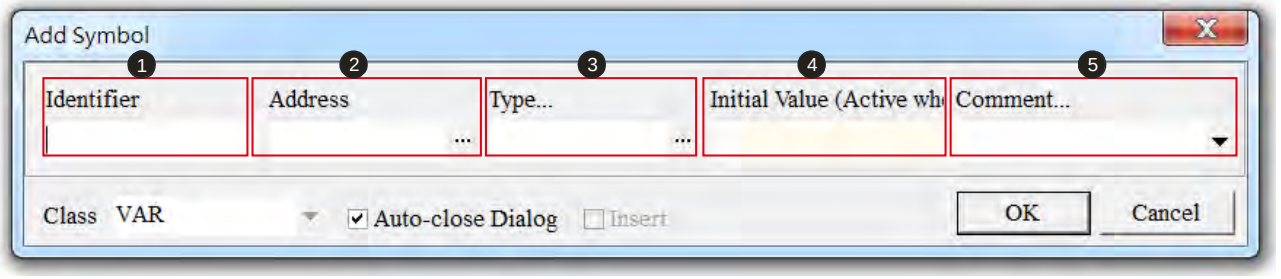
3. Right click on the EtherNet/IP Table (Consumed Tag) page and select “Add a Symbol ” to see the Add Symbol window.



4. Input the required information in the table to complete the creation of a consumed tag.



- Descriptions for the Add Symbol window



Number	Name	Description
①	Identifier	Create Tags of a PLC; up to 40 characters can be inputted.
②	Address	Correspond to registers or bytes of a PLC; data register or M bit device can be used.
③	Type	Support data types such as BOOL, WORD, DWORD, INT, DINT, REAL, and ARRAY (one-dimensional array linear array, up to 512 byte supported).
④	Initial Value	Not supported
⑤	Comment	Description for the TAG; up to 128 word can be inputted.

5. Tags can be used in the data mapping. Please refer to section 9.4.4 for more information.

9.6 Troubleshooting

This section will provide an overview of error codes and troubleshooting for AS series.

9.6.1 Error Code Classification

There are 2 error code categories, including Configuration Error, and Application Error for AS series. These error codes are defined by the ODVA for the EtherNet/IP errors. Refer to the following table for self-defined error codes of AS series.

Error Code Classification		**Description**
1st Phase	2nd Phase	
Category	Item	
Configuration 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 ※
※ Only the last 2 bytes of the error code will be shown; for example, only 011C will appear to represent the error code H'1101011C.		

9.6.2 Error Code & How to fix them

9.6.2.1 Configuration Error

Category	**Error Code**	**Description**	**How to fix them**
EDS Files Mismatched	H'1101011C	The Transport Class field values of the Transport Class and Trigger in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010114	The Vender ID or the Product Code in the EDS file is mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010115	The Device type parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010116	The Revision parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file.

Category	Error Code	Description	How to fix them
			3. Ask the vendor of the device for the EDS file.
	H'1101011E	The Direction parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'1101011F	The output fixed / variable flag in the EDS file is mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010120	The input fixed / variable flag in the EDS file is mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010121	The output priority in the EDS file is mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010122	The input priority in the EDS file is mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010123	The output connection type parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010124	The input connection type parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H'11010125	The output redundant ownership parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file.

Category	Error Code	Description	How to fix them
			3. Ask the vendor of the device for the EDS file.
	H’11010126	The configuration size parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H’11010129	The configuration path parameters in the EDS file are mismatched.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
	H’11010132	The EDS file does not support the Null forward open.	1. Check if the product information and the EDS file are matched. 2. Reload the EDS file. 3. Ask the vendor of the device for the EDS file.
Data Exchange Setup Error	H’12010100	I/O Connections Duplicated	1. Check if the system has created the I/O connections. 2. Change the connection type to Listen Only.
	H’12010106	Ownership Conflict	1. Check the scanner owner. 2. Reconfigure the invalid scanner. 3. Change the connection to multicast.
	H’12010110	Target for Connection not Configured	1. Check the I/O connection status. 2. Activate the I/O connections again.
	H’12010111	Adapter RPI Not Supported	Check the RPI for the adapter.
	H’12010113	Out of Connections	1. Check if the connection exceeds the limit. 2. Reduce the number of the product connection.
	H'12010119	Non-Listen Only Not Opened	1. Check if the system has created the I/O connections. 2. Check the scanner I/O connection status.
	H’12010127	Invalid Originator to Target Size	Check the module number and the product setup file to see if they are matched.
	H’12010128	Invalid Target to Originator Size	Check the output size in the connection parameters.
	H’1201012D	Consumed TAG does not	Check if the parameters in the consumed tag are

Category	Error Code	Description	How to fix them
		exist.	correctly set.
	H'1201012E	Produced TAG does not exist.	Check if the parameters in the produced tag are correctly set.
	H'12010204	Unconnected Request Timeout	No response from the adapter; check if the power and the network connection of the adapter are working properly.
	H'12010302	Network Bandwidth NOT Available for Data	1. Check the I/O connection limit between the scanner and the adapter. 2. Increase the RPI value or reduce the number of the connections.
	H'12010315	Invalid Segment in Connection Path	Check the module number and the product setup file to see if they are matched.

9.6.2.2 Application Error

Category	Error Code	Description	How to fix them
EtherNet/ IP Error	H'00010203	I/O Connection Timeout	1. Check the network connection status. 2. Check if the module is working fine. 3. Increase the RPI value.

9.7 Studio 5000 Software Operation

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.

9.7.1 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.

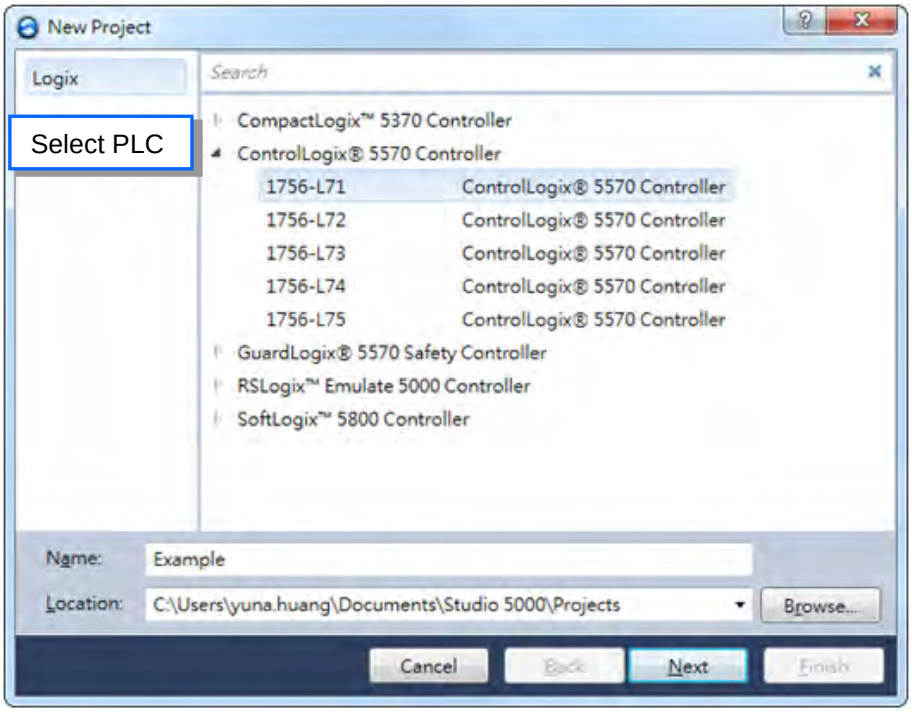
※ Rockwell Software Studio 5000, ControlLogix, RSLogix are registered trademarks of Rockwell Automation, Inc.

- **Operation Steps:**

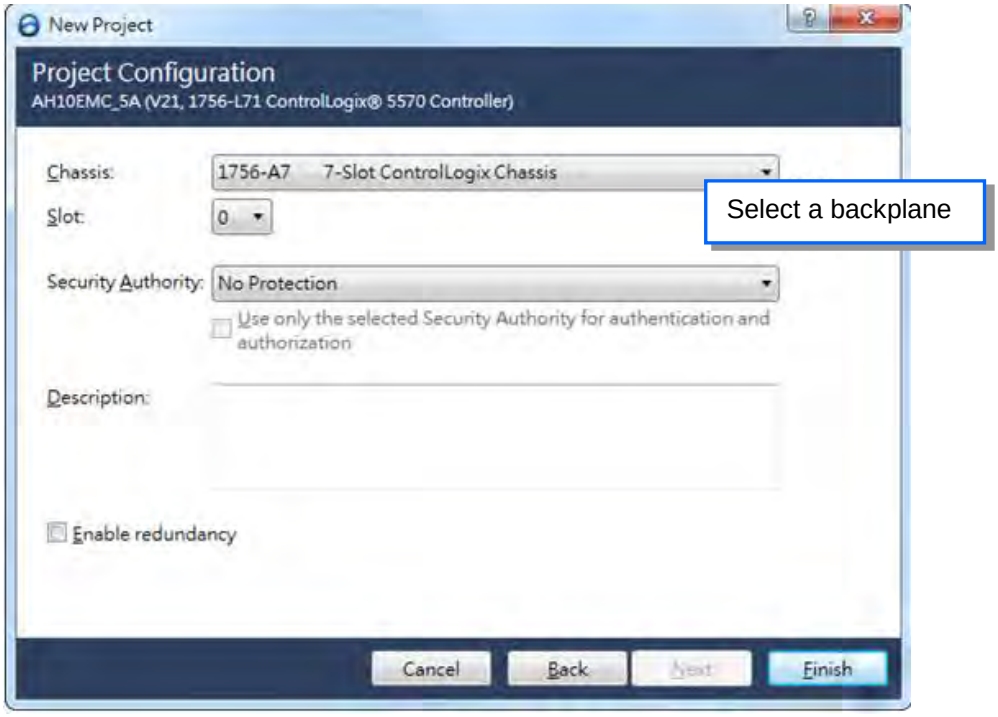
9.7.2 Create a New Project

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

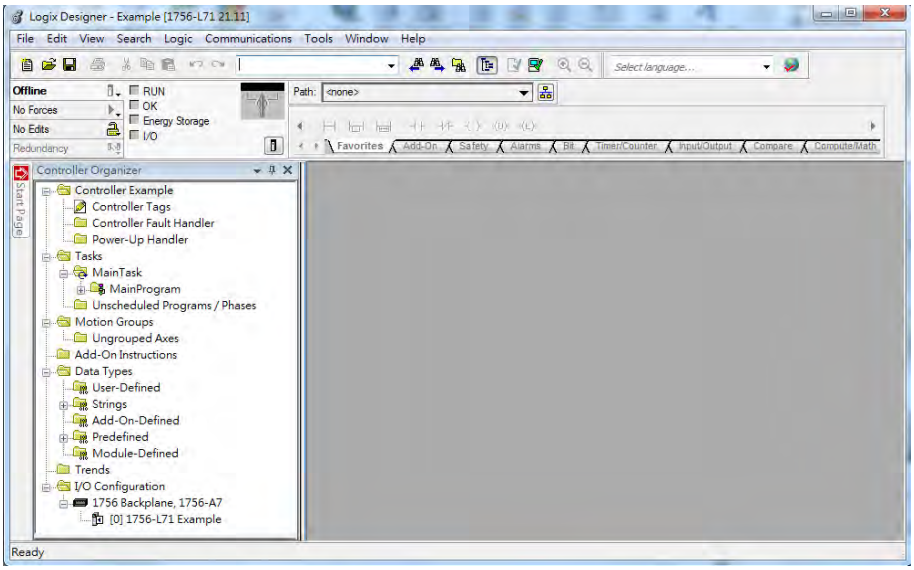
- Select a PLC. Take 1756-L71 as an example here.



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



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

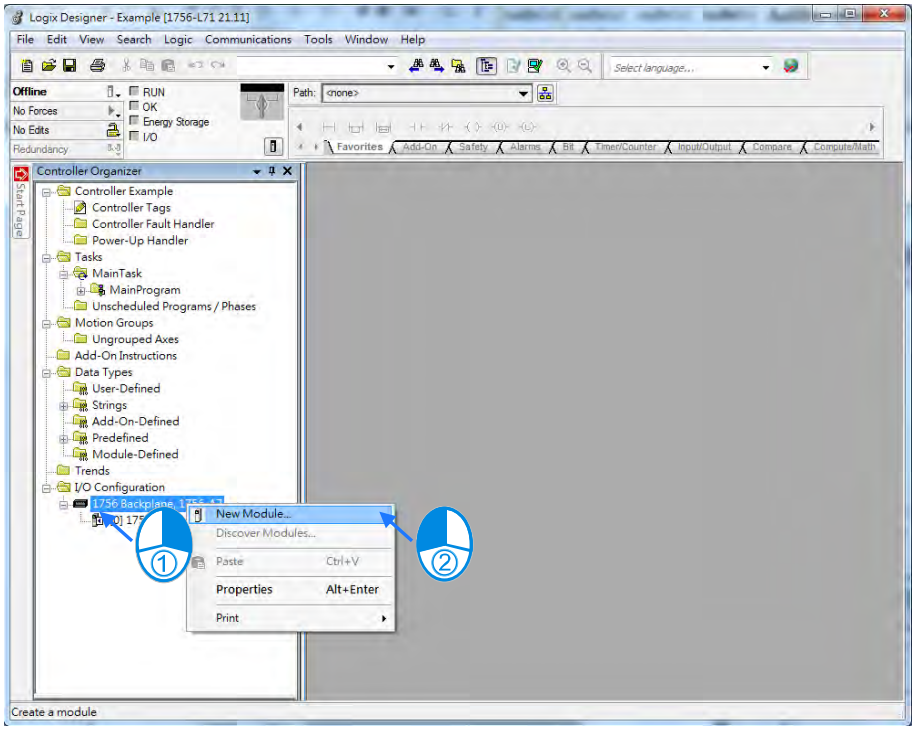


9.7.3 Create a Scanner

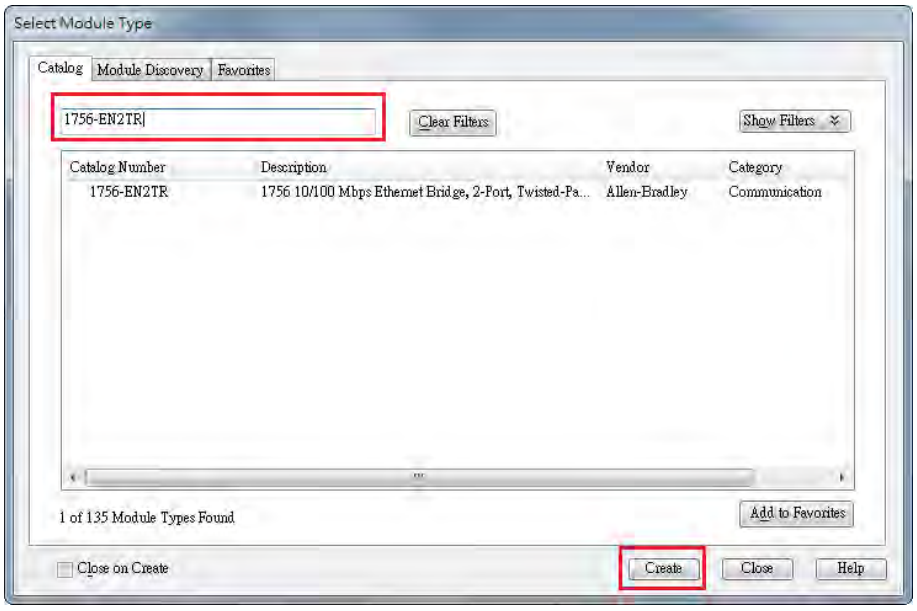
After the project creation is done, users can create the EtherNet/IP module, 1756-EN2TR, and then connect to the EtherNet/IP devices via the EtherNet/IP module.

9.7.3.1 Create a New Module

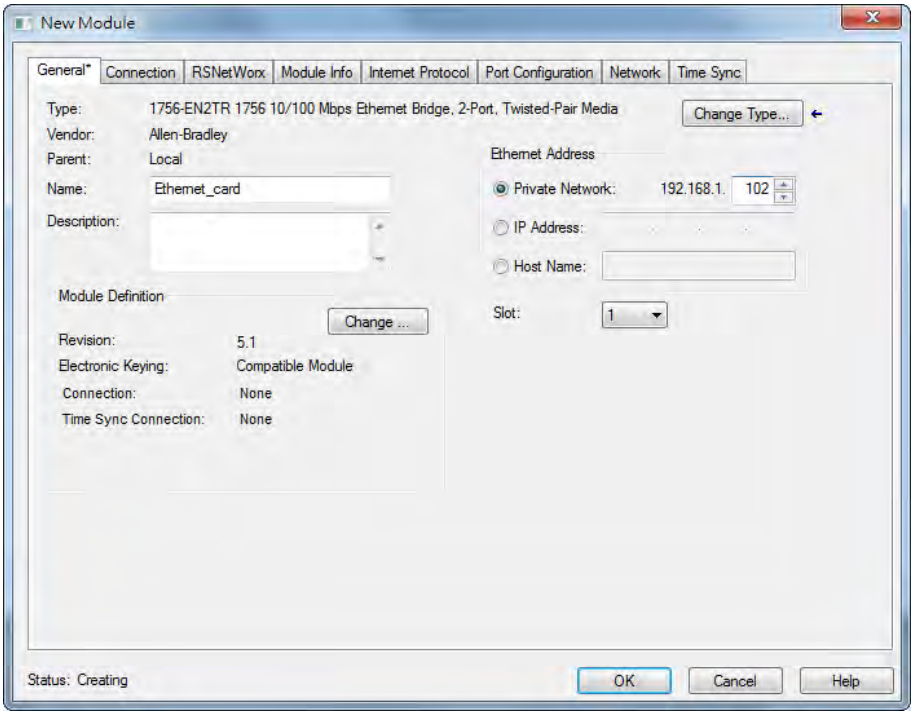
- Right-click the 1756 Backplane 1756-A7 and then click the option “New Module”.



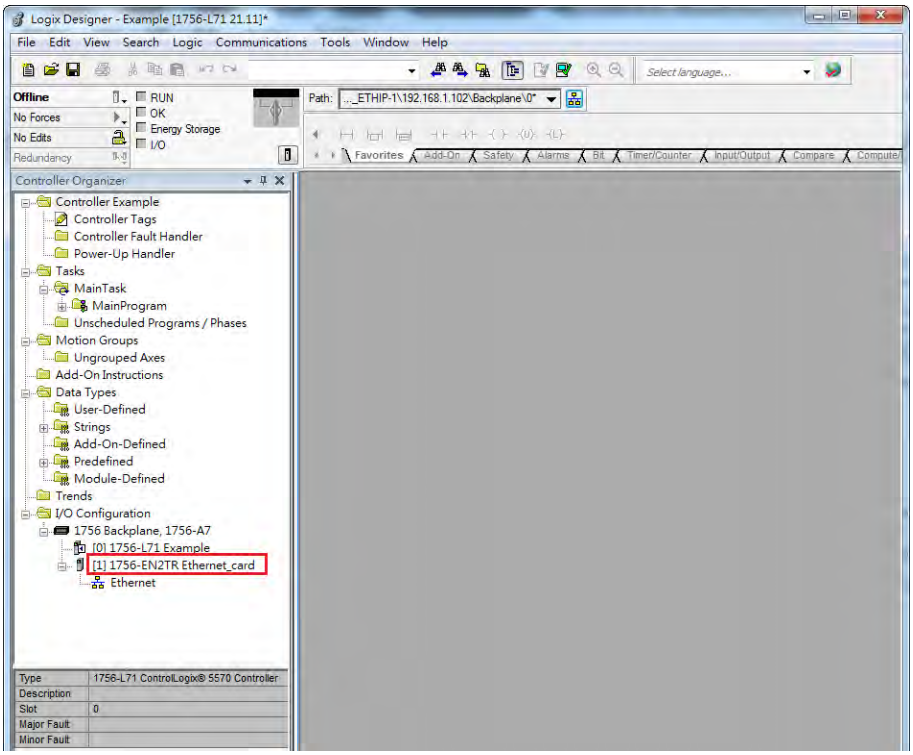
- Type the 1756-EN2TR in the filter field and then click “Create”.



- 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.



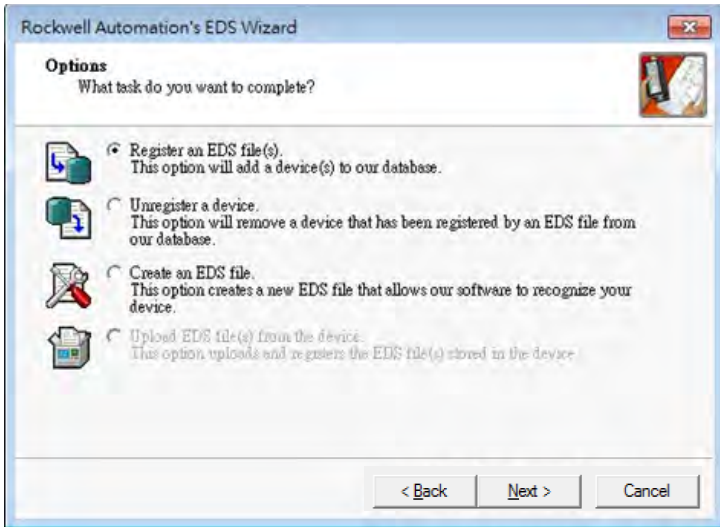
9.7.4 Connect to a Delta Adapter

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

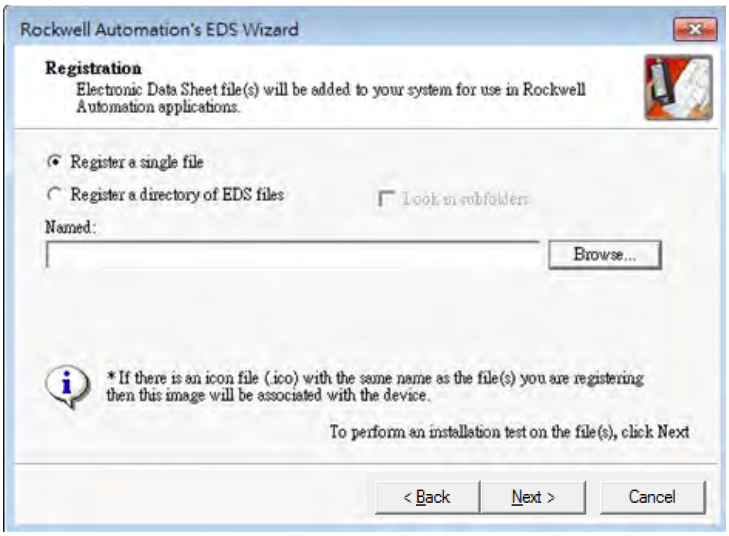
9.7.4.1 Import an EDS file

- Go to Tools > EDS Hardware Installation Tool.

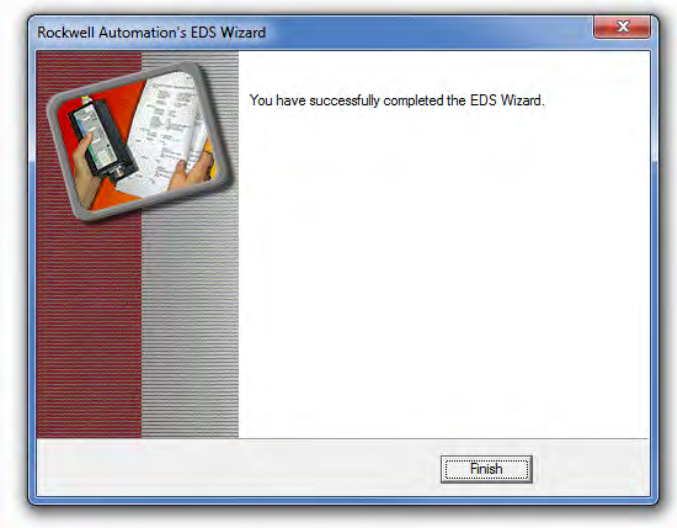
- Select "Register an EDS file(s)".



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

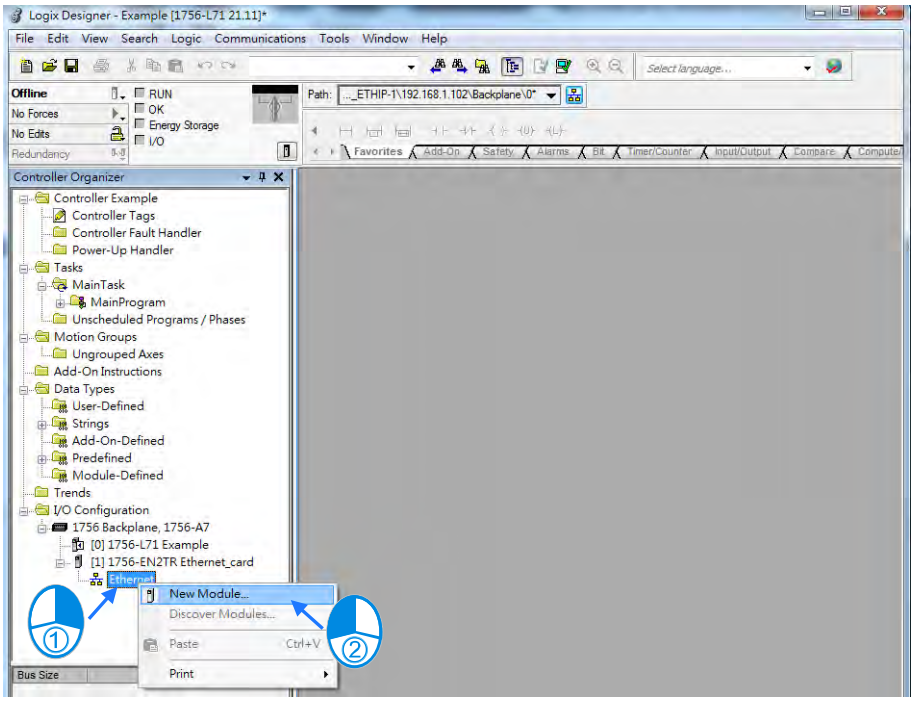


- Follow the instructions from the wizard and then click “Finish” to complete the setup.

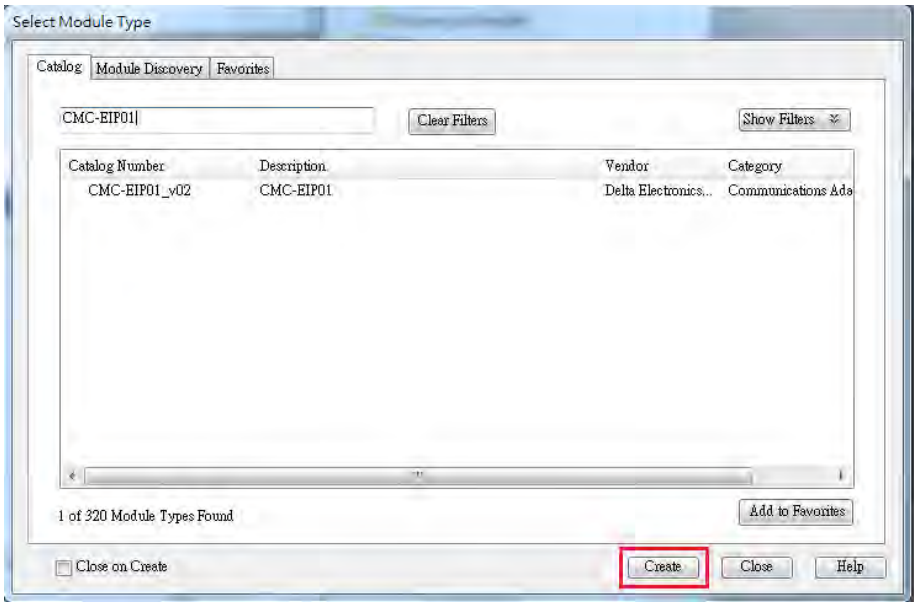


9.7.4.2 Create an Adapter

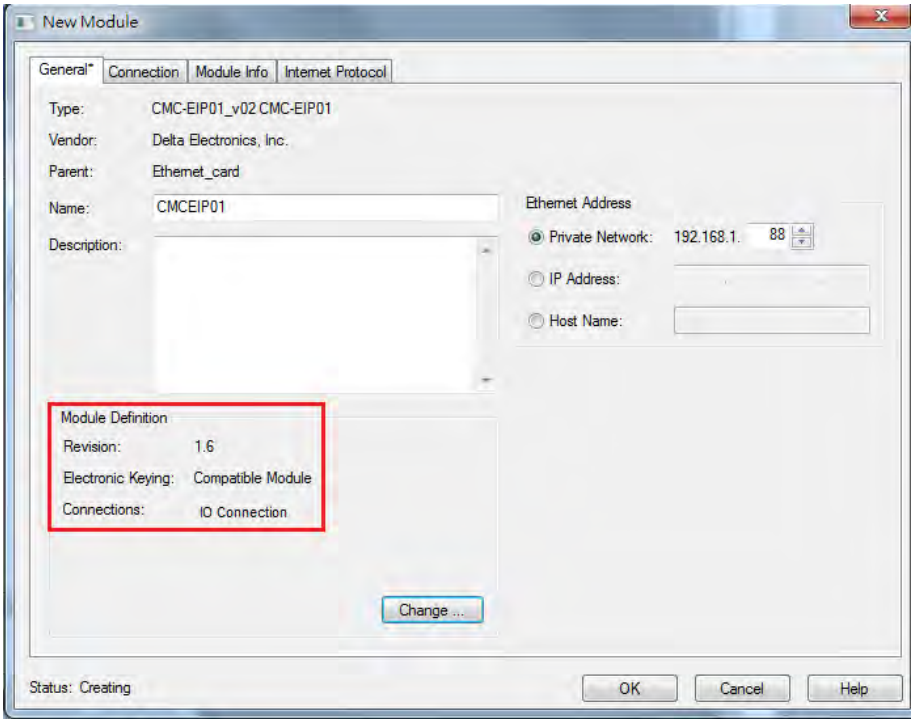
- Right click “Ethernet” and select the option “New Module” under the node of 1756-EN2TR.



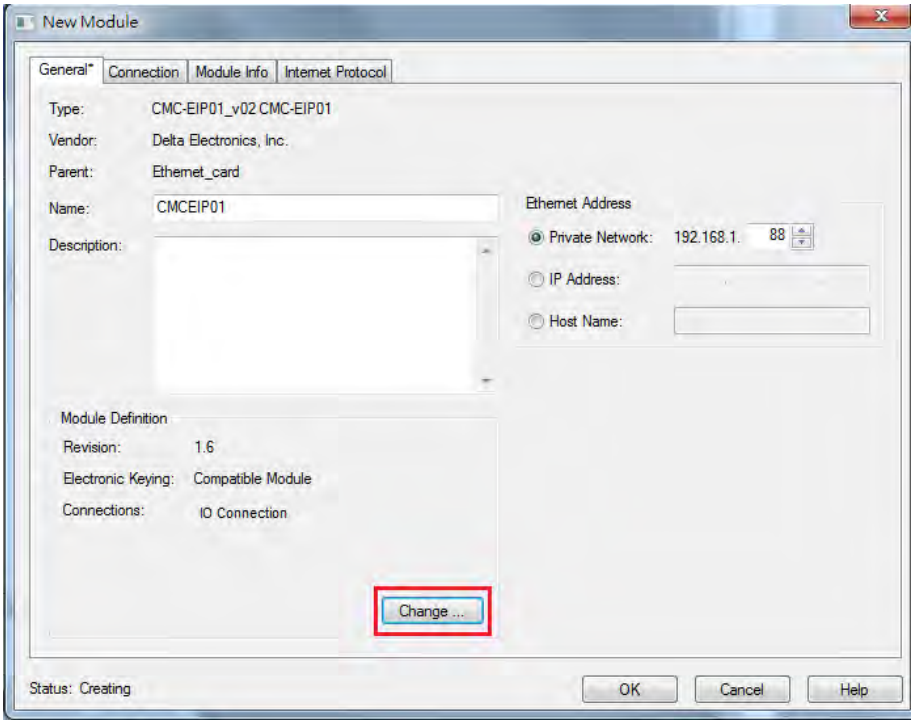
- Type the Delta module number of the imported EDS file in the filter field and you will see the number shown in the Catalog Number list. After that click “Create”.

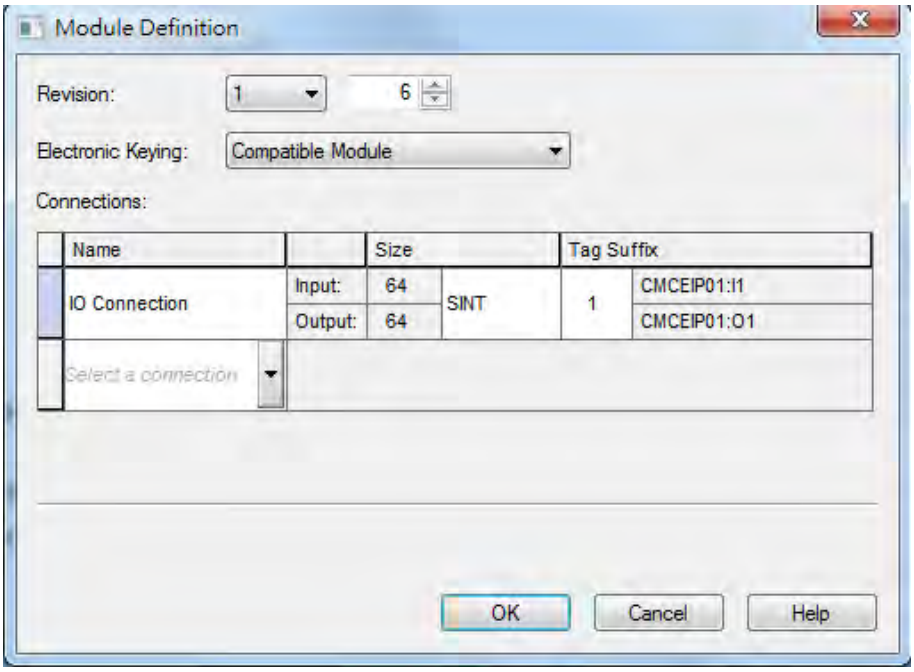


- Check if the product name and the IP address are the same as the information shown in the Module Definition section.



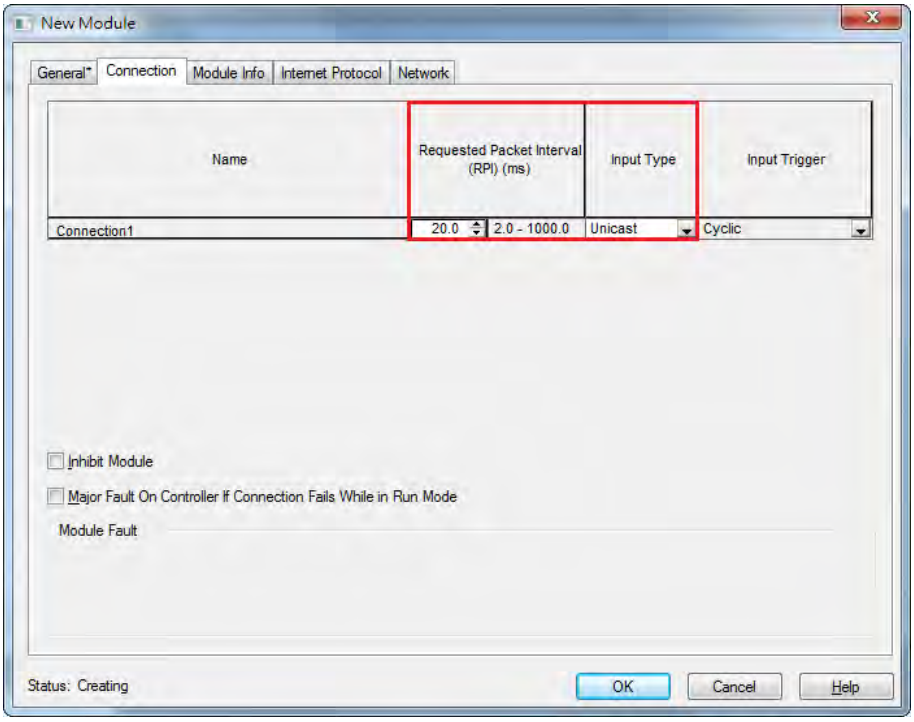
- You can click the “Change” button in the Module Definition if there is any change you’d like to make.



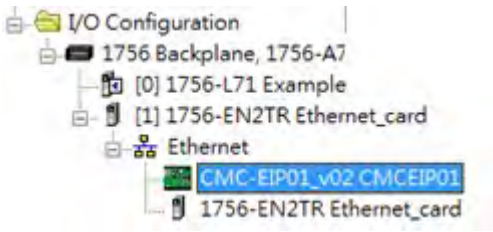


※ For general purposes, there is no need to change the parameters from the imported EDS files which often can be used directly for connection.

- 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.)



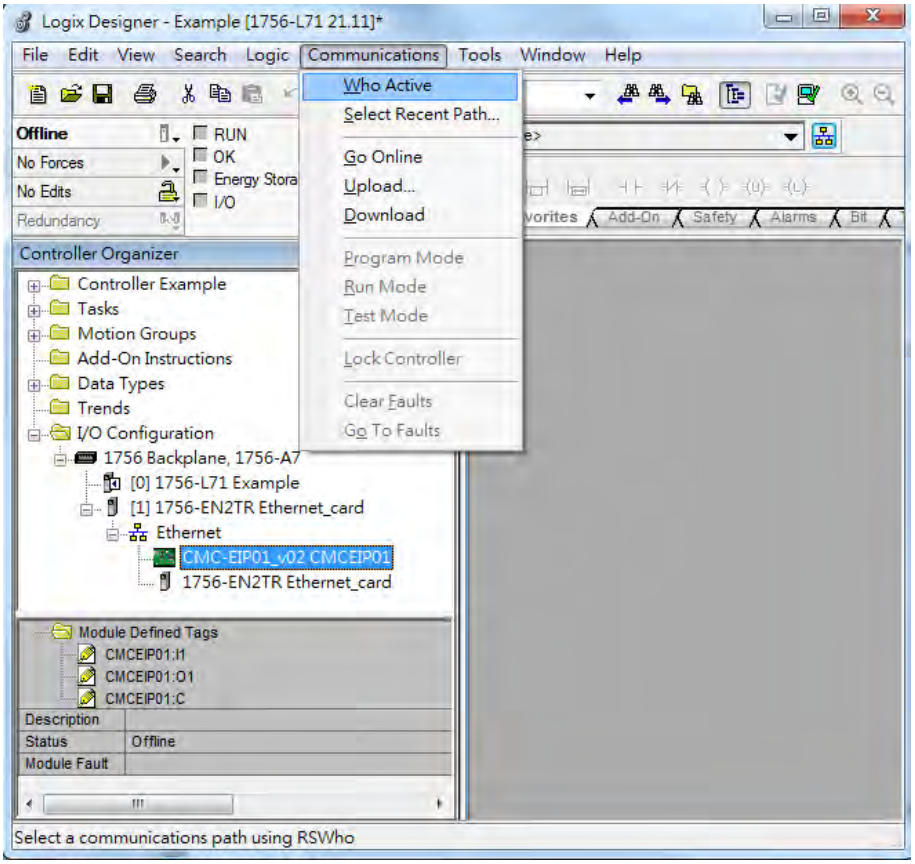
- After the setup is done, click OK to complete the creation of an adapter. After that you will see a Delta Adapter that you have created in the node.



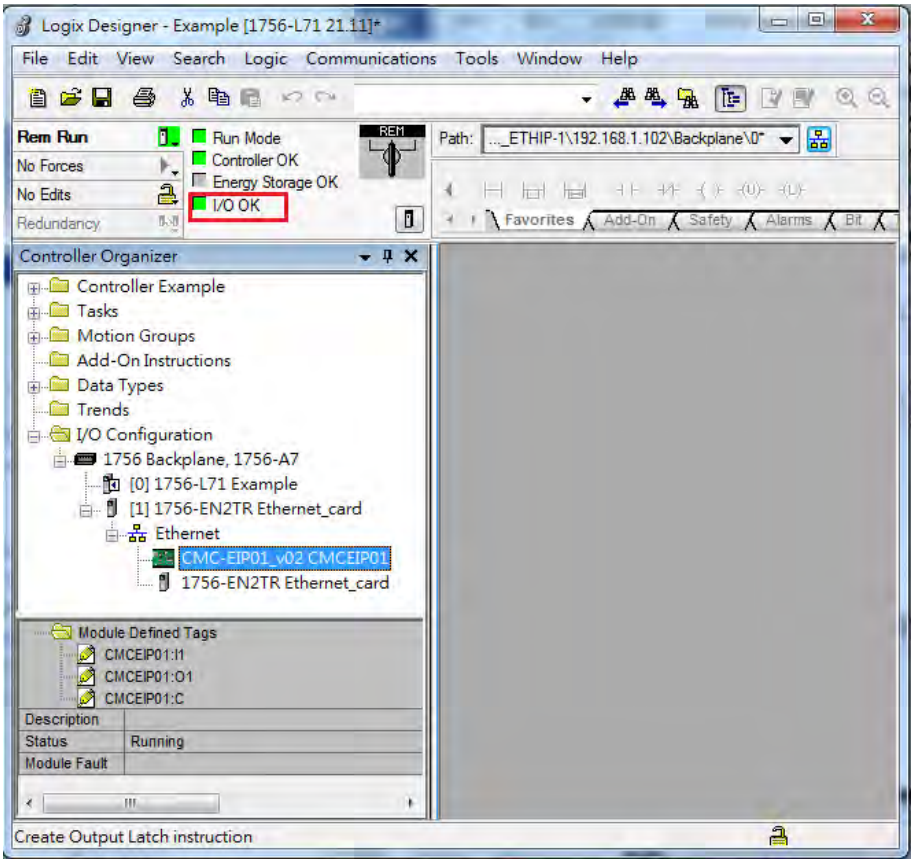
9.7.5 Download

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.



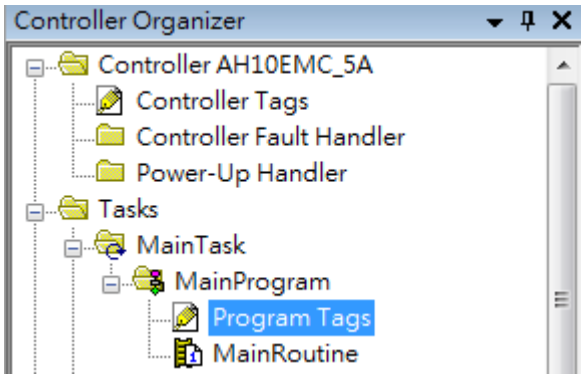
- After the connection is successfully established, the I/O status will show OK.



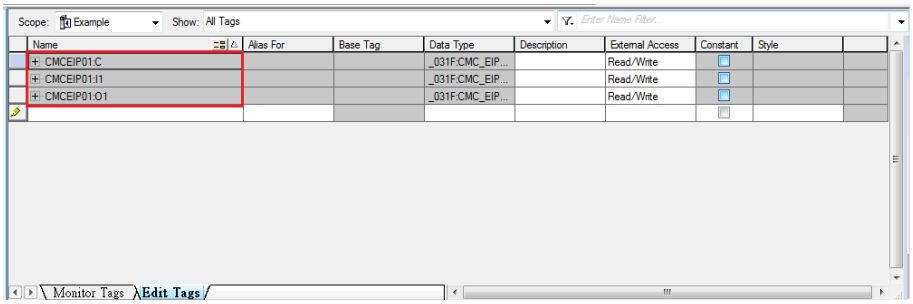
9.7.6 Data Mapping

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”.



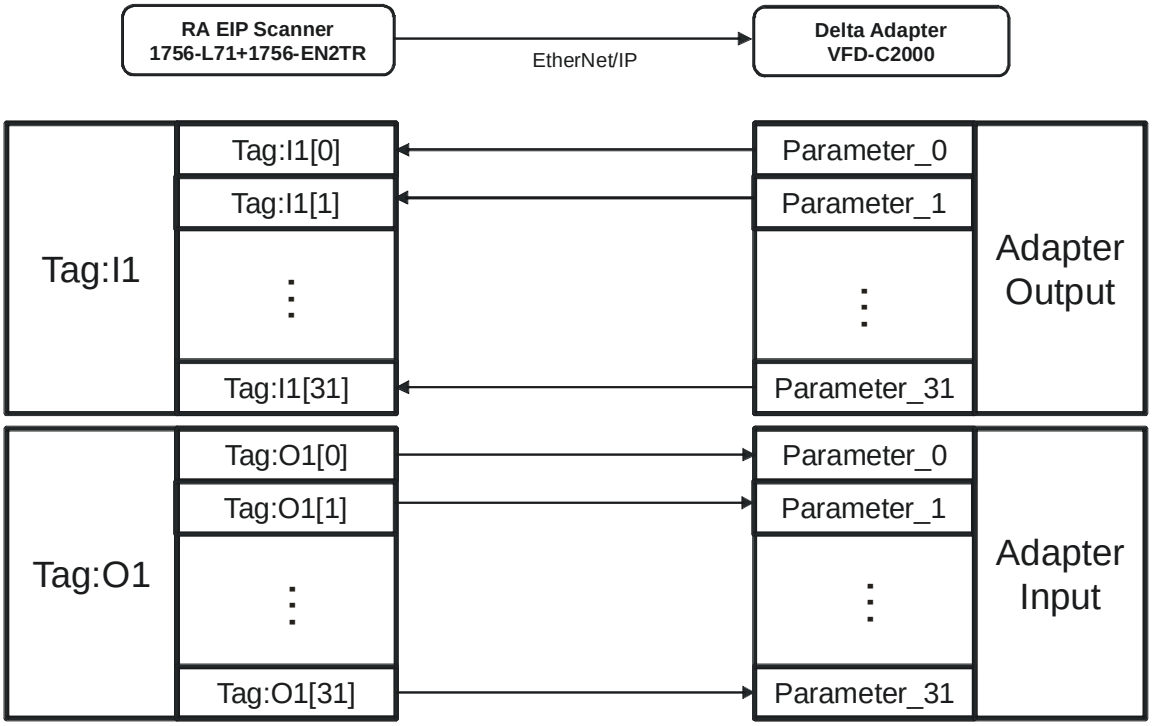
- You will see the TAGs listed under the Name section. TAGs will be shown with a product name in the front and a C/I1/O1 in the back, separated by a colon (:), for example CMCEIP01:C, CMCEIP01:I1, and CMCEIP01:O1.



- 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.

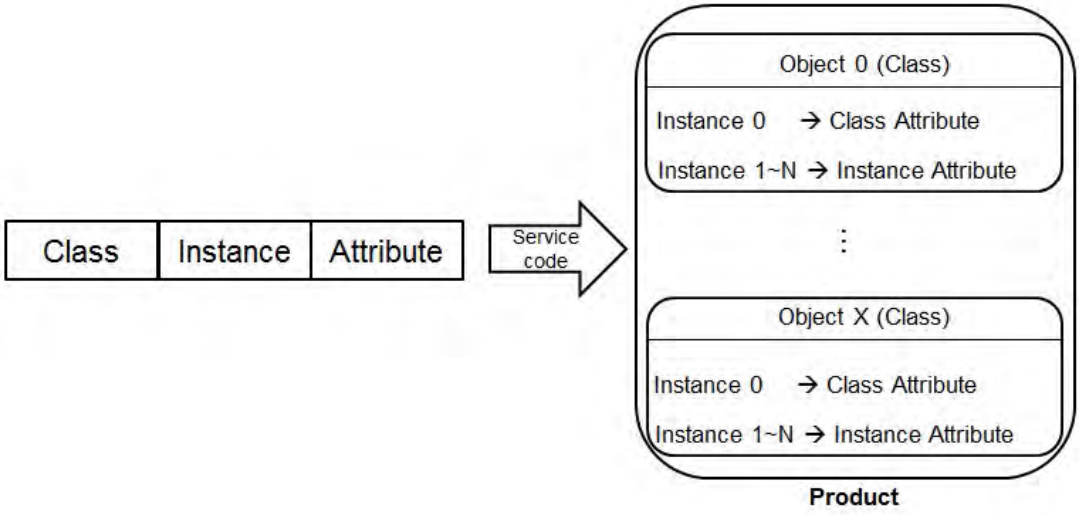
- TAG：O1, the mapping starts from TAG：O1[0], and will be mapped to the first parameters of the Adapter Input. The length is the input length provided by the Adapter.



9.8 CIP Object

9.8.1 Object List

CIP requires objects (groups of related data and behavior associated with this data) to describe a device, how it functions, communicates and its unique identity. Objects can be further defined to Class (a set of objects representing the same type of system), Instance ('copy' of an object) and Attribute (data values). An object instance/class has attributes, providing services and implementing behavior. Instance 0 contains basic information of every object, e.g. version and length. Instance 1~N contains parameters for creating connections. Users can obtain product parameters from the supported service code via objects.



The supported EtherNet/IP objects are listed below. Refer to the section 9.8.2 for the data type definition. Refer to the section 9.8.3 for object contents. Refer to the section 9.5 for object reading/writing.

Object Name	Function	Class ID
Identity Object	It provides identification of general information about the device.	1 (H'01)
Message Router Object	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.	2 (H'02)
Assembly Object	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.	4 (H'04)
Connection Manager Object	Use this object for connection and connectionless communications, including establishing connections across multiple subnets.	6 (H'06)
Port Object	It describes the communication interfaces that are present on the device and visible to CIP, including USB, EtherNet/IP and more.	244 (H'F4)

Object Name	Function	Class ID
TCP/IP Interface Object	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.	245 (H'F5)
Ethernet Link Object	It maintains link-specific counters and status information for an IEEE 802.3 communications interface.	246 (H'F6)
X Register	Bit/Word Register	848 (H'350)
Y Register	Bit/Word Register	849 (H'351)
D Register	Bit/Word Register	850 (H'352)
M Register	Bit Register	851 (H'353)
S Register	Bit Register	852 (H'354)
T Register	Bit/Word Register	853 (H'355)
C Register	Bit/Word Register	854 (H'356)
HC Register	Bit/Word Register	855 (H'357)
SM Register	Bit Register	856 (H'358)
SR Register	Word Register	857 (H'359)

9.8.2 Data Type

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

<table>
<tr><th>Data Type</th><th>Description</th></tr>
<tr><td>BOOL</td><td>False(H'00) or True(H'01)</td></tr>
<tr><td>SIGNED INTEGER</td><td>SINT(1 byte), INT(2 bytes), DINT(4 bytes), LINT(8 bytes)
<table>
<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>
<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>
</table>
Ex: DINT value = H'12345678
<table>
<tr><th>Number</th><th>1st</th><th>2nd</th><th>3rd</th><th>4th</th></tr>
<tr><td>DINT</td><td>78</td><td>56</td><td>34</td><td>12</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Data Type</th><th>Description</th></tr>
<tr><td>UNSIGNED INTEGER</td><td>USINT(1 byte), UINT(2 bytes), UDINT(4 bytes), ULINT(8 bytes)
Ex: UDINT value = H'AABBCCDD
<table>
<tr><th>Number</th><th>1st</th><th>2nd</th><th>3rd</th><th>4th</th></tr>
<tr><td>UDINT</td><td>DD</td><td>CC</td><td>BB</td><td>AA</td></tr>
</table></td></tr>
<tr><td>STRING</td><td>ASCII CODES, 1 or 2 bytes/words
STRING: 2 bytes character count + 1 byte character
<table>
<tr><th></th><th colspan="2">Contents (Charcount)</th><th colspan="4">Contents (String contents)</th></tr>
<tr><td>STRING</td><td>04</td><td>00</td><td>4D</td><td>69</td><td>6C</td><td>6C</td></tr>
</table>
STRING2: 2 bytes character count + 2 byte character
<table>
<tr><th></th><th colspan="2">Contents (Charcount)</th><th colspan="6">Contents (String contents)</th></tr>
<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>
</table>
SHORT_STRING: 1 bytes character count + 1 byte character
<table>
<tr><th></th><th>Contents (Charcount)</th><th colspan="4">Contents (String contents)</th></tr>
<tr><td>STRING</td><td>04</td><td>4D</td><td>69</td><td>6C</td><td>6C</td></tr>
</table></td></tr>
<tr><td>Fixed LENGTH BIT STRING</td><td>BYTE (1 byte), WORD (2 bytes), DWORD (4 bytes), LWORD (8 bytes)
<table>
<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>
<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>
</table></td></tr>
<tr><td>STRINGI</td><td>A single string consists multiple language representation
<table>
<tr><th>Name</th><th>Data Type</th><th>Meaning</th></tr>
<tr><td>Number</td><td>USINT</td><td>The number of internationalized character strings</td></tr>
<tr><td>Strings</td><td>Array of:
Struct of:</td><td>Array of individual internationalized character strings</td></tr>
<tr><td>LanguageChar1</td><td>USINT</td><td>The first ASCII character of the ISO 639-2/T language</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Data Type</th><th>Description</th></tr>
<tr><td></td><td>
<table>
<tr><td>LanguageChar2</td><td>USINT</td><td>The second ASCII character of the ISO 639-2/T language</td></tr>
<tr><td>LanguageChar3</td><td>USINT</td><td>The third ASCII character of the ISO 639-2/T language</td></tr>
<tr><td>CharStringStruct</td><td>USINT</td><td>The structure of the character string, limited to the Elementary Data type value 0xD0 (STRING), 0xD5 (STRING2), 0xD9 (STRINGN) and 0xDA (SHORT_STRING)</td></tr>
<tr><td>CharSet</td><td>UINT</td><td>The character set which the character string is based on which comes from IANA MIB Printer Code (RFC 1759).</td></tr>
<tr><td>InternationalString</td><td>Defined in CharStringStruct</td><td>An array of 8-bit octet elements which is the actual international character string</td></tr>
</table>
ISO 639-2/T language:
<table>
<tr><th>Language</th><th>First Character</th><th>Second Character</th><th>Third Character</th></tr>
<tr><td>English</td><td>e</td><td>n</td><td>G</td></tr>
<tr><td>French</td><td>f</td><td>r</td><td>e</td></tr>
<tr><td>Spanish</td><td>s</td><td>p</td><td>a</td></tr>
<tr><td>Italian</td><td>i</td><td>t</td><td>a</td></tr>
</table>
</td></tr>
<tr><td>STRUCT</td><td>STRUCT of: Any Data Type composes the structure.
Ex.: STRUCT of { BOOL, UINT, DINT } = { TRUE, H’1234, H’56789ABC }
<table>
<tr><td></td><td>1st</td><td>2nd</td><td>3rd</td><td>4th</td><td>5th</td><td>6th</td><td>7th</td></tr>
<tr><td>Byte</td><td>01</td><td>34</td><td>12</td><td>BC</td><td>9A</td><td>78</td><td>56</td></tr>
</table>
</td></tr>
<tr><td>ARRAY</td><td>Array of: Any Data Type composes the array.
Ex.: ARRAY of UINTs = { 1 · 2 · 3 }
<table>
<tr><td>Number</td><td>1st</td><td>2nd</td><td>3rd</td><td>4th</td><td>5th</td><td>6th</td></tr>
<tr><td>Array</td><td>01</td><td>00</td><td>02</td><td>00</td><td>03</td><td>00</td></tr>
</table>
</td></tr>
<tr><td>EPATH</td><td>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 “</td></tr>
</table>

9.8.3 Identity Object (Class ID: 01 Hex)

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	
H'01	Get_Attributes_All	X	V	Read all attributes
H'05	Reset	X	V	Resets the drive to the start-up state.
H'0E	Get_Attribute_Single	V	V	Read one attribute

- Class
  - Class ID: H'01

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

Class Attribute	Name	Access Rule	Data Type	Values	Description
H'01	Revision	Get	UINT	H'1	Revision of this object
H'02	Max Instance	Get	UINT	H'1	Maximum instance number of this object
H'03	Number of Instance	Get	UINT	H'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
H'01	Vendor ID	Get	UINT	H'31F	Delta Electronics, Inc.
H'02	Device Type	Get	UINT	H'0C	Communication Adapter

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'03	Product Code	Get	UINT	H'4000	Product Code
H'04	Revision	Get	STRUCT	--	Revision of this device: Major / Minor
	Major Revision		USINT	H'01	Major Revision Range: H'01~H'7F
	Minor Revision		USINT	H'01	Minor Revision Range: H'01~H'FF
H'05	Status	Get	WORD	H'00	Status, refer to the following ※1
H'06	Serial Number	Get	UDINT	H'abcd	The last 4 characters of the MAC address, ab:cd
H'07	Product Name	Get	STRING	"AS300T"	The maximum number of a product name is 32 words.

※1 Status Description (H'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

Bit (s)	Name	Description
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

9.8.4 Message Router Object (Class ID: 02 Hex)

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	
H'0E	Get_Attribute_Single	V	V	Read a single attribute

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

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

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'02	Number Available	Get	UINT	H'0	The maximum number of connections

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'03	Number Active	Get	UINT	H'0	The number of connected connections

9.8.5 Assembly Object (Class ID: 04 Hex)

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	
H'0E	Get_Attribute_Single	V	V	Read a single attribute
H'10	Set_Attribute_Single	X	V	Edit a single attribute

- Class
  - Class ID：H'04

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

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

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

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

I/O Message Connection			
Connection No.	**Function**	**Instance Attribute**	**Length**
Connection 1	Input	0x65	100 words
	Output	0x64	100 words
	Configuration	0x80	8 words
Connection 2	Input	0x67	100 words
	Output	0x66	100 words
	Configuration	0x81	8 words
Connection 3	Input	0x69	100 words
	Output	0x68	100 words
	Configuration	0x82	8 words
Connection 4	Input	0x6B	100 words
	Output	0x6A	100 words
	Configuration	0x83	8 words
Connection 5	Input	0x6D	100 words
	Output	0x6C	100 words
	Configuration	0x84	8 words
Connection 6	Input	0x6F	100 words
	Output	0x6E	100 words
	Configuration	0x85	8 words
Connection 7	Input	0x71	100 words
	Output	0x70	100 words
	Configuration	0x86	8 words

Connection 8	Input	0x73	100 words
	Output	0x72	100 words
	Configuration	0x87	8 words

9.8.6 Connection Manager Object (Class ID: 06 Hex)

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	
H'0E	Get_Attribute_Single	V	X	Read a single attribute
H'4E	Forward_Close	X	V	Close a connection
H'54	Forward_Open	X	V	Open a connection; the maximum data size is 511 bytes.

- Class
  - Class ID：H'06

- Instance
  - H'00：Class Attribute
  - H'01：Instance Attribute

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

Class Attribute	Name	Access Rule	Data Type	Values	Description
H'01	Revision	Get	UINT	1	Revision of this object
H'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
H'01	Open Requests	Get	UINT	H'0	Number of Forward Open service requests received.
H'02	Open Format Rejects	Get	UINT	H'0	Number of Forward Open service requests which were rejected due to bad format.
H'03	Open Resources Rejects	Get	UINT	H'0	Number of Forward Open service requests which were rejected due to lack of resources.
H'04	Open Other Rejects	Get	STRUCT	H'0	Number of Forward Open service requests which were rejected for reasons other than bad format or lack of resources.
H'05	Close Requests	Get	WORD	H'0	Number of Forward Close service requests received.
H'06	Close Format Rejects	Get	UDINT	H'0	Number of Forward Close service requests which were rejected due to bad format.
H'07	Close Other Rejects	Get	STRING	H'0	Number of Forward Close service requests which were rejected for reasons other than bad format.
H'08	Connection Timeouts	Get	UINT	H'0	Total number of connection timeouts that have occurred in connections controlled by this Connection Manager

9.8.7 Port Object (Class ID: F4 Hex)

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	
H'01	Get_Attributes_All	X	V	Returns a predefined listing of this objects attributes
H'0E	Set_Attribute_Single	V	V	Returns the contents of the specified attribute.

- Class
  - Class ID：H'F4

- Instance
  - H'00：Class Attribute
  - H'01：Instance Attribute
  - H'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
H'01	Revision	Get	UINT	1	Revision of this object
H'02	Max Instance	Get	UINT	1	Maximum instance number of this object
H'03	Number of Instance	Get	UINT	1	Number of object instances currently created at this class level of the device
H'08	Entry Port	Get	UINT	1	Communication port for EtherNet/IP
H'09	Port Instance Info	Get	ARRAY of STRUCT of	--	Port Instance information: Port Type + Port Number

Class Attribute	Name	Access Rule	Data Type	Values	Description
	Port Type		UINT	H'04	EtherNet/IP, refer to the following ※1
	Port Number		UINT	H'01	Identify each communication port

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'01	Port Type	Get	UINT	H'04	EtherNet/IP, refer to the following ※1
H'02	Port Number	Get	UINT	H'01	Identify each communication port
H'03	Link Object	Get	STRUCT of	--	Identify Object attached to this port. Path length + Link Path
	Path Length		UINT	--	Path length
	Link Path		EPATH	--	Path segment
H'04	Port Name	Get	SHORT_ STRING	EIP1	Name of the communication port
H'07	Port Number and Node Address	Get	EPATH	01 01	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

9.8.8 TCP/IP Interface Object (Class ID: F5 Hex)

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	
H'01	Get_Attributes_All	X	V	Read all attributes
H'0E	Get_Attribute_Single	V	V	Read one attribute
H'10	Set_Attribute_Single	X	V	Write one attribute

- Class
  - Class ID = H'F5
- Instance
  - H'00：Class Attribute
  - H'01：Instance Attribute
  - H'N: Instance #N Attribute, number of IP addresses that the device supported
  - When Instance = 0, the Class Attributes are listed below.

Class Attribute	Name	Access Rule	Data Type	Values	Description
H'01	Revision	Get	UINT	H'2	Revision of this object
H'02	Max Instance	Get	UINT	H'2	Maximum instance number of this object
H'03	Number of Instance	Get	UINT	H'2	Number of object instances currently created at this class level of the device

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'01	Status	Get	DWORD	H'2	IP status, refer to the following ※1
H'02	Configuration Capability	Get	DWORD	H'15	Configuration capability, refer to the following ※2
H'03	Configuration Control	Get/Set	DWORD	H'0	Configuration Control, refer to the following ※3
H'04	Physical Link Object：	Get	STRUCT of	--	Path to physical link object
	Path Size		UINT	H'0	Size of Path
	Path		EPATH	--	Logical segments identifying the physical link object
H'05	Interface Configuration：	Get/Set	STRUCT of	--	TCP/IP network interface configuration.
	IP Address		UDINT	H'C0A80005	The device's IP address; 192.168.1.5
	Network Mask		UDINT	H'FFFFFF00	The device's network mask: 255.255.255.0
	Gateway Address		UDINT	H'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
H'06	Host Name	Get/Set	STRING	AS300T	Device name

※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 witches).
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.

9.8.9 Ethernet Link Object (Class ID: F6 Hex)

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	
H'01	Get_Attributes_All	X	V	Read all attributes
H'0E	Get_Attributes_Single	V	V	Read one attribute

- Class
  - Class ID: H'F6

- Instance
  - H'00: Class Attribute

- H’01: Instance Attribute
- H’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
H’01	Revision	Get	UINT	H’03	Revision of this object
H’02	Max Instance	Get	UINT	H’021	Maximum instance number of this object
H’03	Number of Instance	Get	UINT	H’01	Number of object instances currently created at this class level of the device

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H’01	Interface Speed	Get	DWORD	H’64	Interface speed currently in use 10(H’0A), 100(H’64), 1000(H’3E8) Mbps
H’02	Interface Flags	Get	DWORD	H’F	Ethernet port status, refer to the following ※1
H’03	Physical Address	Get	ARRAY of 6 USINTs	By Product	MAC address
H’0A	Interface Label	Get	SHORT_STRING	NA	Define the name of the Ethernet port For example: for port 1, the definition of the name in string is 01 31.
	Length		USINT	NA	The maximum length of the name is 16 words.
	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

9.8.10 X Register (Class ID: 350 Hex)

- Service Code

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

- Class
  - Class ID：H'350

- Instance
  - H'01：Instance Attribute, Bit Register
  - H'02：Instance Attribute, Word Register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	X0.0	Get	BOOL	H'00	X0.0 bit register
H'01	X0.1	Get	BOOL	H'00	X0.1 bit register
H'02~H'03FE	X0.2~X63.14	Get	BOOL	H'00	X0.2 ~X63.14 bit register
H'3FF	X63.15	Get	BOOL	H'00	X63.15 bit register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	X0	Get	INT	H'00	X0 word register
H'01	X1	Get	INT	H'00	X1 word register
H'02~H'3E	X2~X62	Get	INT	H'00	X2~X62 word register
H'3F	X63	Get	INT	H'00	X63 word register

9.8.11 Y Register (Class ID: 351 Hex)

- Service Code

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

- Class
  - Class ID：H'351

- Instance
  - H'01：Instance Attribute, Bit Register

- H’02：Instance Attribute, Word Register
- When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H’00	Y0.0	Set	BOOL	H’00	Y0.0 bit register
H’01	Y0.1	Set	BOOL	H’00	Y0.1 bit register
H’02~H’03FE	Y0.2~Y63.14	Set	BOOL	H’00	Y0.2~Y63.14 bit register
H’3FF	Y63.15	Set	BOOL	H’00	Y63.15 bit register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H’00	Y0	Set	INT	H’00	Y0 word register
H’01	Y1	Set	INT	H’00	Y1 word register
H’02~H’3E	Y2~Y62	Set	INT	H’00	Y2~Y62 word register
H’3F	Y63	Set	INT	H’00	Y63 word register

9.8.12 D Register (Class ID: 352 Hex)

- Service Code

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

- Class
  - Class ID：H’352
- Instance
  - H’01：Instance Attribute, Bit Register
  - H’02：Instance Attribute, Word Register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	D0.0	Set	INT	H'00	D0.0 bit register
H'01	D0.1	Set	INT	H'00	D0.1 bit register
H'02~H'752FE	D0.2~D29999.14	Set	INT	H'00	D0.2~D29999.14 bit register
H'752FF	D29999.15	Set	INT	H'00	D29999.15 bit register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	D0	Set	INT	H'00	D0 word register
H'01	D1	Set	INT	H'00	D1 word register
H'02~H'752E	D2~D29998	Set	INT	H'00	D2~D29998 word register
H'752F	D29999	Set	INT	H'00	D29999 word register

9.8.13 M Register (Class ID: 353 Hex)

- Service Code

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

- Class
  - Class ID：H'353

- Instance
  - H'01：Instance Attribute, Bit Register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	M0	Set	BOOL	H'00	M0 bit register
H'01	M1	Set	BOOL	H'00	M1 bit register
H'02~H'1FFE	M2~M8190	Set	BOOL	H'00	M2~M8190 bit register
H'1FFF	M8191	Set	BOOL	H'00	M8191 bit register

9.8.14 S Register (Class ID: 354 Hex)

- Service Code

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

- Class

  - Class ID：H'354

- Instance

  - H'01：Instance Attribute, Bit Register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	S0	Set	BOOL	H'00	S0 bit register
H'01	S1	Set	BOOL	H'00	S1 bit register
H'02~H'7FE	S2~S2046	Set	BOOL	H'00	S2~S2046 bit register
H'7FF	S2047	Set	BOOL	H'00	S2047 bit register

9.8.15 T Register (Class ID: 355 Hex)

- Service Code

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

- Class
  - Class ID：H'355

- Instance
  - H'01：Instance Attribute, Bit Register
  - H'02：Instance Attribute, Word Register
  - When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	T0	Set	BOOL	H'00	T0 bit register
H'01	T1	Set	BOOL	H'00	T1 bit register
H'02~H'1FE	T2~T510	Set	BOOL	H'00	T2~T510 bit register
H'1FF	T511	Set	BOOL	H'00	T511 bit register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	T0	Set	INT	H'00	T0 word register
H'01	T1	Set	INT	H'00	T1 word register
H'02~H'1FE	T2~T510	Set	INT	H'00	T2~T510 word register
H'1FF	T511	Set	INT	H'00	T511 word register

9.8.16 C Register (Class ID: 356 Hex)

- Service Code

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

- Class
  - Class ID：H'356

- Instance
  - H'01：Instance Attribute, Bit Register
  - H'02：Instance Attribute, Word Register
  - When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	C0	Set	BOOL	H'00	C0 bit register
H'01	C1	Set	BOOL	H'00	C1 bit register
H'02~H'1FE	C2~C510	Set	BOOL	H'00	C2~C510 bit register
H'1FF	C511	Set	BOOL	H'00	C511 bit register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	C0	Set	INT	H'00	C0 word register
H'01	C1	Set	INT	H'00	C1 word register
H'02~H'1FE	C2~C510	Set	INT	H'00	C2~C510 word register
H'1FF	C511	Set	INT	H'00	C511 word register

9.8.17 HC Register (Class ID: 357 Hex)

- Service Code

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

- Class
  - Class ID：H'357

- Instance
  - H'01：Instance Attribute, Bit Register
  - H'02：Instance Attribute, Word Register
  - When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	HC0	Set	BOOL	H'00	HC0 bit register
H'01	HC1	Set	BOOL	H'00	HC1 bit register
H'02~H'FE	HC2~HC254	Set	BOOL	H'00	HC2~HC254 bit register
H'FF	HC255	Set	BOOL	H'00	HC255 bit register

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

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	HC0	Set	DINT	H'00	HC0 word register
H'01	HC1	Set	DINT	H'00	HC1 word register
H'02~H'FE	HC2~HC254	Set	DINT	H'00	HC2~HC254 word register
H'FF	HC255	Set	DINT	H'00	HC255 word register

9.8.18 SM Register (Class ID: 358 Hex)

- Service Code

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

- Class
  - Class ID：H'358

- Instance
  - H'01：Instance Attribute, Bit Register
  - When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	SM0	Set	BOOL	H'00	SM0 bit register
H'01	SM1	Set	BOOL	H'00	SM1 bit register
H'02~H'FFE	SM2~SM4094	Set	BOOL	H'00	SM2~SM4094 bit register
H'FFF	SM4095	Set	BOOL	H'00	SM4095 bit register

9.8.19 SR Register (Class ID: 359 Hex)

- Service Code

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

- Class
  - Class ID：H'359

- Instance
  - H'01：Instance Attribute, Bit Register
  - When Instance = 1, the Instance Attributes are listed below.

Instance Attribute	Name	Access Rule	Data Type	Values	Description
H'00	SR0	Set	INT	H'00	SR0 word register
H'01	SR1	Set	INT	H'00	SR1 word register
H'02~H'7FE	SR2~SR2046	Set	INT	H'00	SR2~SR2046 word register
H'7FF	SR2047	Set	INT	H'00	SR2047 word register

9.9 Delta EIP Product List

9.9.1 Delta EIP Products

Positioning	Product	Version
Mid-range PLC	AHCPU511-EN、AHCPU521-EN、AHCPU531-EN	V2.0
	AH10EN-5A	V2.0
	AHRTU-ETHN-5A	V1.0
	AH10EMC-5A	V1.0
Small PLC	AS300 Series	V1.0
Inverter	VFD-MS300 Series (CMM-EIP01 Communication Card)	V1.0
	VFD-C2000 Series (CMC-EIP01 Communication Card)	V1.06

9.9.2 Delta EIP Products, DLR (Device Level Ring) supported

Positioning	Product	Version
Mid-range PLC	AH10EN-5A	V2.0
	AHRTU-ETHN-5A	V1.0

9.9.3 Delta EIP Products, Scanner supported

Positioning	Product	Version
Mid-range PLC	AHCPU511-EN、AHCPU521-EN、AHCPU531-EN	V2.0
	AH10EN-5A	V2.0
Small PLC	AS300 Series	V1.0

10

Chapter 10 CANopen Function and Operation

Table of Contents

10.1 The Introduction of CANopen

1. Due to the simple wiring, immediate communication, strong debugging ability, stable communication, and low cost, the CANopen network is widely used in fields such as industrial automation, automotive industry, medical equipment industry, and building trade.
2. Accessable for AS300 Series PLC when works with the AS-FCOPM function card, the CAN port, which conforms to the basic communication protocol of CANopen DS301, can work in a master mode or a slave mode.
3. This chapter explains the functions of CANopen. In a master mode, the CANopen functions can support slave 1~ 64.
4. The CANopen network configuration software for AS series is CANopen Builder. The CANopen station address and the communication rate are set by means of this software. The programming software for AS series is ISPSoft.
5. This chapter mainly focuses on the CANopen functions. If users do not understand the professional terms mentioned in the introduction of the functions, they can refer to section 10.3 for more information.

10.1.1 The Description of the CANopen Functions

If the CAN port functions as a master, it has the following functions.

1. It support the standard CANopen protocol DS301 V4.02.
2. It supports the NMT (network management object) service.
   - It supports the NMT state control.

     The NMT state control can be used to control the state of a slave in the CANopen network.
   - It supports the NMT error control.

     The NMT error control is used to detect the disconnection of a slave. The NMT error control can be classified into two types, i.e. Heartbeat and Node Guarding. The PLC supports Heartbeat, but do not support Node Guarding.
3. It supports the PDO (process data object) service.
   - The PDO message is used to transmit the immediate input data and output data.
   - It supports 128 RxPDO at most, and 390 bytes at most.
   - It supports 128 TxPDO at most, and 390 bytes at most.
   - The PDO transmission type: The synchronous mode, and the asynchronous mode
4. It supports the SDO (Service Data Object) service.
   - The SDO can be used to read the parameter from a slave, write the parameter into a slave, or configure the parameter for a slave.
   - It supports the standard SDO transmission mode.
   - It supports the automatic SDO functions. 20 pieces of data at most can be written into a slave.
   - It supports the use of the SDO service in a PLC ladder diagram to read the data from a slave or write the data into a slave.
5. It supports the service of reading the emergency from a slave.

- The service of reading the emergency from a slave can be used to read an error or an alarm from a slave.
- 5 emergencies can be stored in a slave.
- The emergency can be read through a PLC ladder diagram.

6. It supports the SYNC object (synchronous object) service.

   Several devices can operate synchronously through the synchronous object service

7. The CANopen communication rates which are supported are 20K, 50K, 125K, 250K, 500K, 1Mbps.
8. The mapping data types which are supported:

Storage	Data type
8-bit	SINT USINT BYTE
16-bit	INT UINT WORD
32-bit	DINT UDINT REAL DWORD
64-bit	LINT ULINT LREAL LWORD

If the CAN port functions as a slave, it has the following functions.

- It supports the standard CANopen protocol DS301 V4.02.
- It supports the NMT (network management object) service.
  - It supports the NMT state control.

    The state of AS series in the CANopen network is controlled by a master.
  - It supports the NMT error control.

    Heartbeat is supported, but Node Guarding is not supported.
- It supports the PDO (process data object) service.
  - The PDO message is used to transmit the immediate input data and output data.
  - It supports 8 TxPDO at most, and 8 RxPDO at most.
  - The PDO transmission type: The synchronous mode, and the asynchronous mode
- It supports the emergency service.

  If an error or an alarm occurs in AS series, the master is notified through the emergency.

10.1.2 The Input/Output Mapping Areas

CANopen DS301 specifications for the AS series PLC:

Type	Item	Description
Master	Maximun slave nodes	Up to 64 nodes
	Maximum transfer size of a PDO (Read + Write)	Up to 2000 Bytes (including some system configuraitons)
Slave	Maximum transfer size of a PDO (Read + Write)	Up to 8 PDOs; each PDO with up to 8 bytes can be transferred at a time

The output mapping areas are D25000-D25999, and the input mapping areas are D24000-D24999.

Device in the PLC	Mapping area	Mapping length
D25000~D25031	SDO request information, NMT service information, and Emergency request information	64 bytes
D24000~D24031	SDO reply information, and Emergency reply information	64 bytes
D25032~D25978	RxPDO mapping area	1894 bytes
D24032~D24978	TxPDO mapping area	1894 bytes

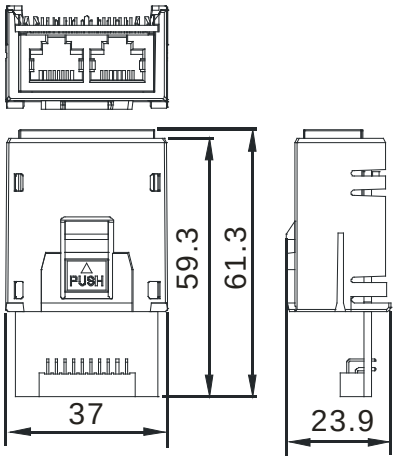
If an AS series functions as a slave station, the output mapping areas are D25032~25063, and the input mapping areas are D24032~24063.

Device in the PLC	Mapping area	Mapping length
D6032~D6063	RxPDO mapping area	64 bytes
D6282~D6313	TxPDO mapping area	64 bytes

10.2 The Installation and the Network Topology

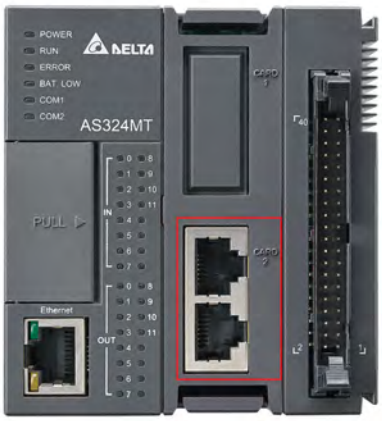
This section introduces the dimensions of AS-FCOPM function card, HWCONFIG settings, the CAN interface, the CANopen network framework, and the communication distance.

10.2.1 The Dimensions of AS-FCOPM



Unit: mm

10.2.2 AS-FCOPM on AS300 PLC

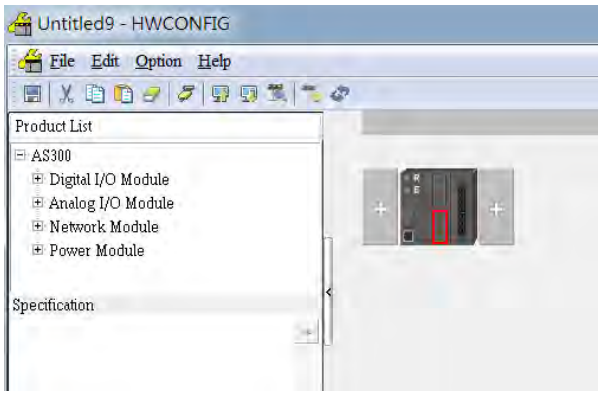


NOTE: AS-FCOPM can only be installed in the slot for card 2.

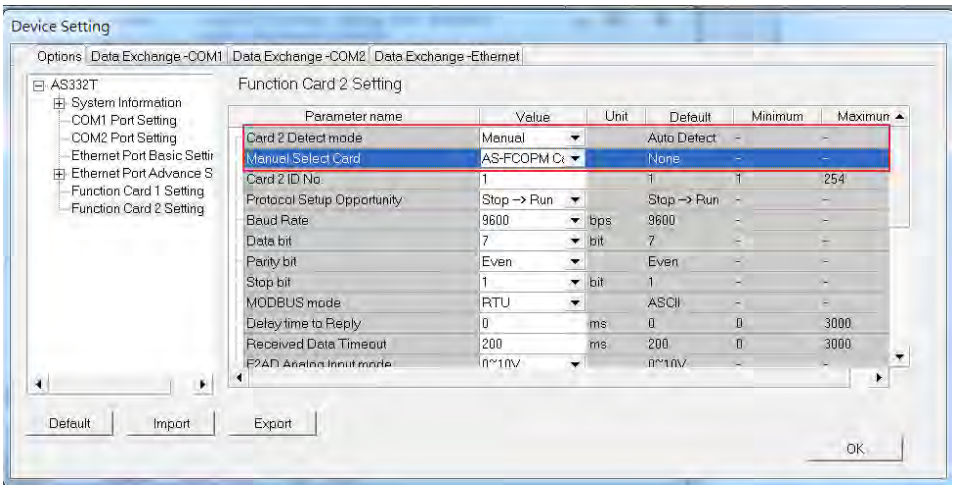
10.2.3 Configure AS-FCOPM via HWCONFIG

Before using AS-FCOPM on the AS series PLC, users need to configure AS-FCOPM via HWCONFIG in ISPSoft. The setup steps are as below:

1. AS-FCOPM can only be installed in the slot for card 2 as marked in red below. Double click the function card 2 slot to go to the device setting page.

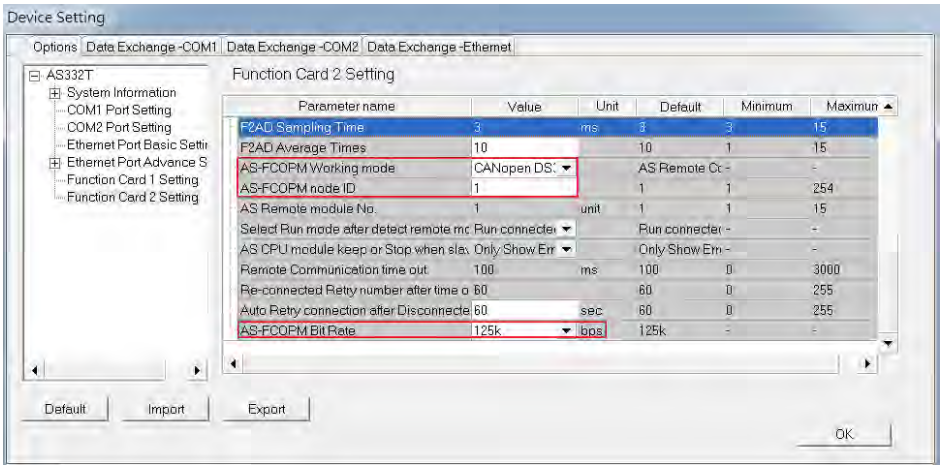


2. Select Manual in the Card 2 Detect mode and select AS-FCOPM Card in the Manual Select Card.

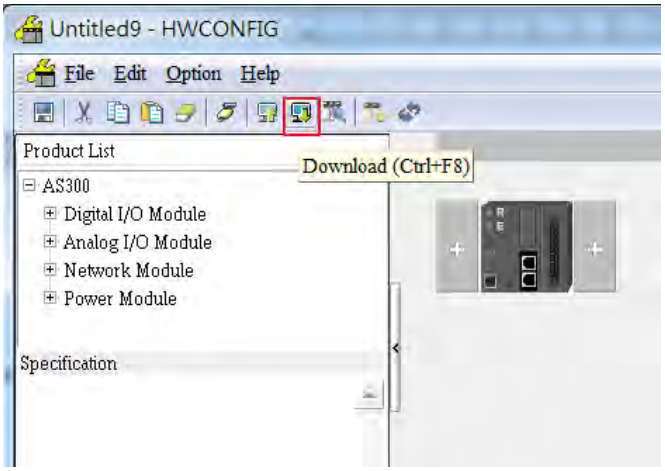


3. Select the working mode, node ID and the bit range for AS-FCOPM.

   * Working mode: CANopen DS301
   * Node ID: 1
   * Bit range: 125K bps (by default or users can select their own bit range)



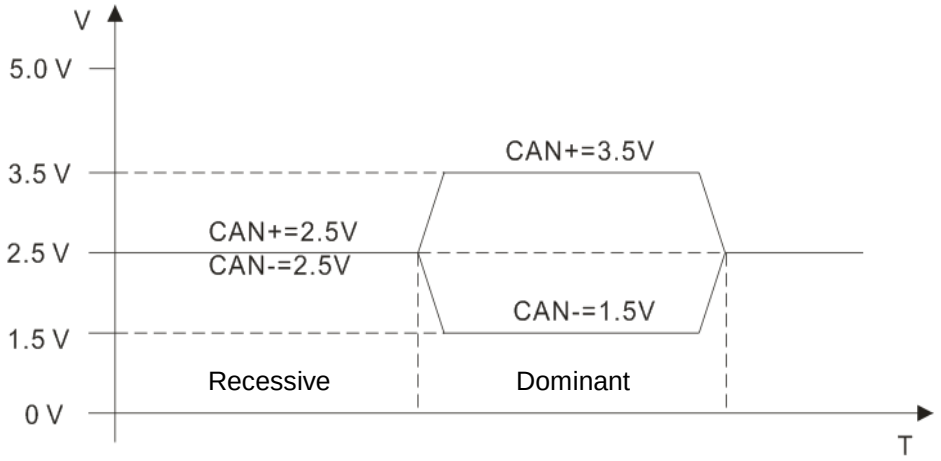
4. After the setups are done, click Download icon to download the parameters to the PLC.



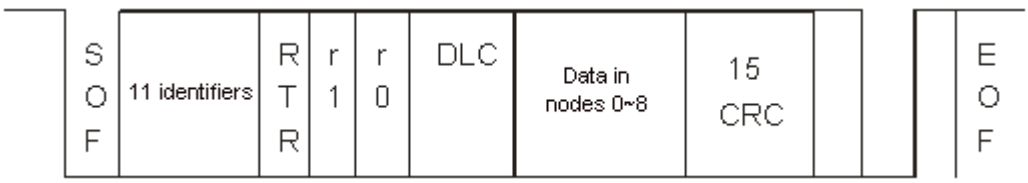
10.2.4 The CAN Interface and the Network Topology

10.2.4.1 The definitions of the CAN Signal and Their Data Types

The CAN signal is a differential signal. The voltage of the signal is the voltage difference between CAN+ and CAN-. The voltage of CAN+ and that of CAN- take SG as a reference point. The CAN network can be in two states. One is a dominant level, and is indicated by the logical “0”. The other is a recessive level, and is indicated by the logical “1”. The CAN signal level is shown below.

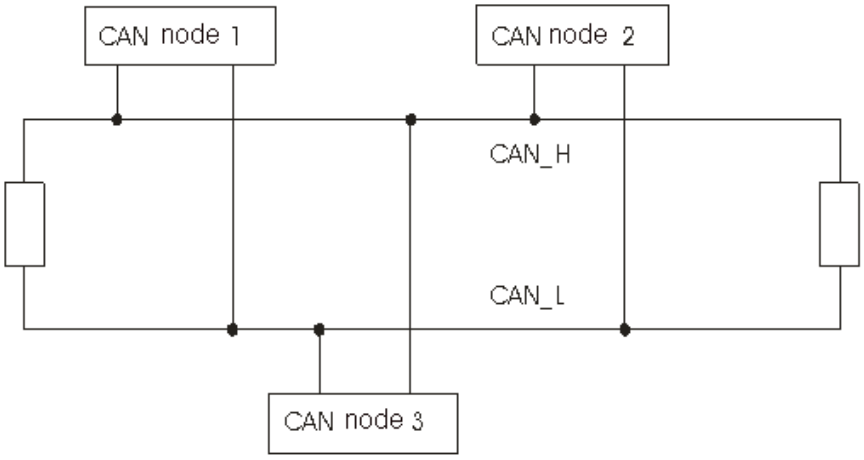


The data frame format is shown below. The CAN nodes transmit the CAN messages to the network from left to right, as the data frame format below shows.

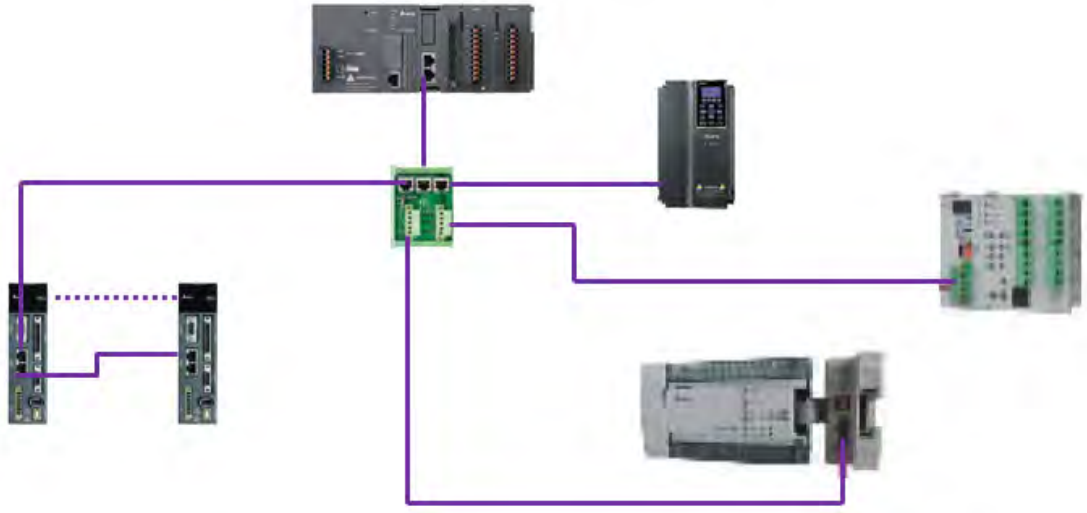


10.2.4.2 The CAN Network Endpoint and the Topology Structure

In order to make the CAN communication more stable, the two endpoints of the CAN network are connected to 120 ohm terminal resistors. The topology structure of the CAN network is illustrated below.



10.2.4.3 The Topology Structure of the CANopen Network



1) Users should use standard Delta cables when creating the CANopen network. These cables are the thick cable UC-DN01Z-01A, the thin cable UC-DN01Z-02A, and the thin cable UC-DN01Z-02A. The communication cables should be away from the power cables.

2) CAN+ (white) and CAN- (blue), which are at the endpoints of the network, should be connected to 120 ohm resistors. AS-FCOPM is equipped with a switch of 120 ohm resistor; users can enable the resistor through the switch. When users use other devices and with RJ45 connecter, they can purchase the standard Delta terminal resistor TAP-TR01.

3) The limitation on the length of the CANopen network

The transmission distance of the CANopen network depends on the transmission rate of the CANopen network. The relation between the transmission rate and the maximum communication distance is shown in the following table.

Transmission rate (bit/second)	20K	50K	125K	250K	500K	1M
Maximum communication distance (meter)	2500	1000	500	250	100	25

4) The Delta network products related to the CANopen network are listed below.

Product	Model	Function
	AS332T-A AS332P-A AS324MT-A	AS300 series PLC can function as the CANopne master or slave when works with an AS-FCOPM function card. AS-FCOPM is equipped with a switch of 120 ohm resistor
	DVP32ES200RC DVP32ES200TC	It is a DVP-ES2-C series PLC with the built-in CAN interface. It can function as the CANopne master or slave.
	DVPCOPM-SL	DVPCOPM-SL is a module connected to the left side of an S series PLC. It can function as the CANopen master or slave. The PLCs which can be connected to DVPCOPM-SL are DVP-28SV, DVP-28SV2, DVP-SX2, DVP-SA2, and DVP-EH2-L.
	IFD9503	It converts CANopen to the Modbus gateway, and connects the device (with the RS-232 or RS-485 interface) which conforms to the standard Modbus protocol to the CANopen network. 15 devices at most can be connected.
	DVPCP02-H2	It is the CANopen slave module, and is connected to the right side of an EH2 series PLC. It can connect the EH2 series PLC to the CANopen network.
	IFD6503	It is a tool used to analyze the CANopen network data. The interfaces at both ends are the CAN interface and the USB interface. It can be used to catch the CAN network data, or allow the CAN nodes to transmit the data. The product is used with the software Netview Builder.

Product	Model	Function
	ASD-A2-xxxx-M servo driver	It is a servo driver with the built-in CANopen interface. It controls the positioning, speed, and torque.
	VFD-C2000/CP2000/C200 series AC motor drives	It is an AC motor drive with the built-in CANopen function, and controls the positioning, speed, and torque. Before using the CANopne function of the C2000/CP2000 series AC motor drives, users need to purchase CMC-COP01. This card only provides the CAN interface. The C200 series AC motor drive has the built-in CANopen interface.
	VFD-EC series AC motor drive	The EC series AC motor drive has the built-in CANopen interface. It controls the speed and torque.
	TAP-CN01	It is the CANopen network topology distribution box which carries a 120 ohm resistor. Users can enable the resistor through the switch.
	TAP-CN02	It is the CANopen network topology distribution box which carries a 120 ohm resistor. Users can enable the resistor through the switch.

Product	Model	Function
	TAP-CN03	It is the CANopen network topology distribution box which carries a 120 ohm resistor. Users can enable the resistor through the switch.
	UC-CMC003-01A UC-CMC005-01A UC-CMC010-01A UC-CMC015-01A UC-CMC020-01A UC-CMC030-01A UC-CMC050-01A UC-CMC100-01A UC-CMC200-01A	CANopen sub cable with RJ45 connectors at both ends. UC-CMC003-01A: 0.3 meters UC-CMC005-01A: 0.5 meters UC-CMC010-01A: 1 meter UC-CMC015-01A: 1.5 meters UC-CMC020-01A: 2 meters UC-CMC030-01A: 3 meters UC-CMC050-01A: 5 meters UC-CMC100-01A: 10 meters UC-CMC200-01A: 20 meters
	UC-DN01Z-01A UC-DN01Z-02A	CANopen network cable UC-DN01Z-01A: CANopen main cable UC-DN01Z-02A: CANopen sub cable
	TAP-TR01	It is a 120 ohm resistor with a RJ45 connector.

10.3 The CANopen Protocol

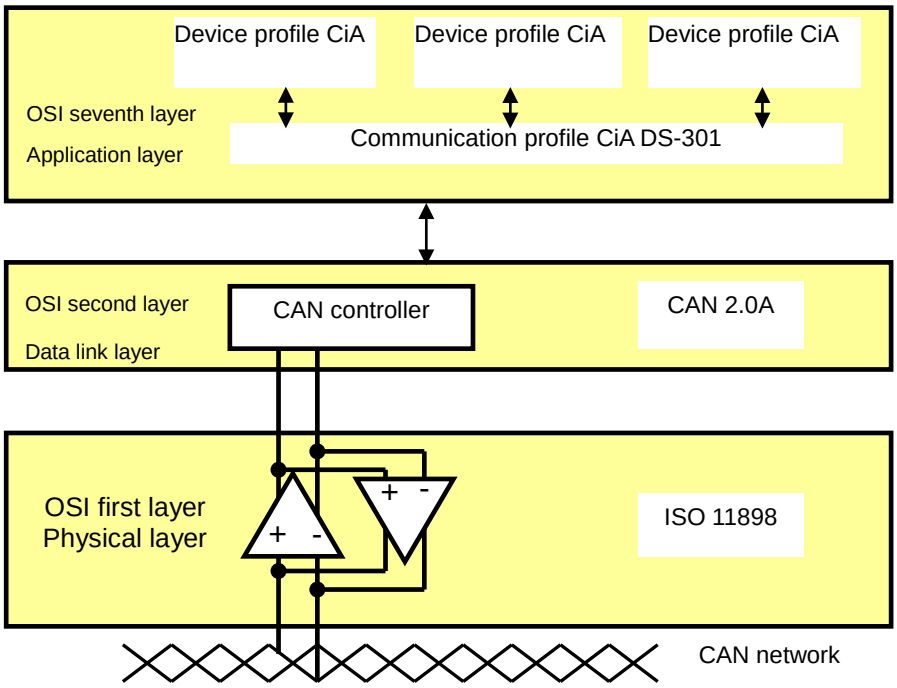
10.3.1 The Introduction of the CANopen Protocol

The CAN (controller area network) fieldbus only defines the physical layer and the data link layer. (See the ISO11898 standard.) It does not define the application layer. In the practical design, the physical layer and the data link layer are realized by the hardware. The CAN fieldbus itself is not complete. It needs the superior protocol to define the use of 11/29-bit identifier and that of 8-byte- data.

The CANopen protocol is the superior protocol base on CAN. It is one of the protocols defined and maintained by CiA (CAN-in-Automation). It is developed on the basis of the CAL (CAN application layer) protocol, using a subset of the CAL communication and service protocols.

The CANopen protocol covers the application layer and the communication profile (CiA DS301). It also covers a framework for programmable devices (CiA 302), the recommendations for cables and connectors (CiA 303-1), and SI units and prefix representations (CiA 303-2).

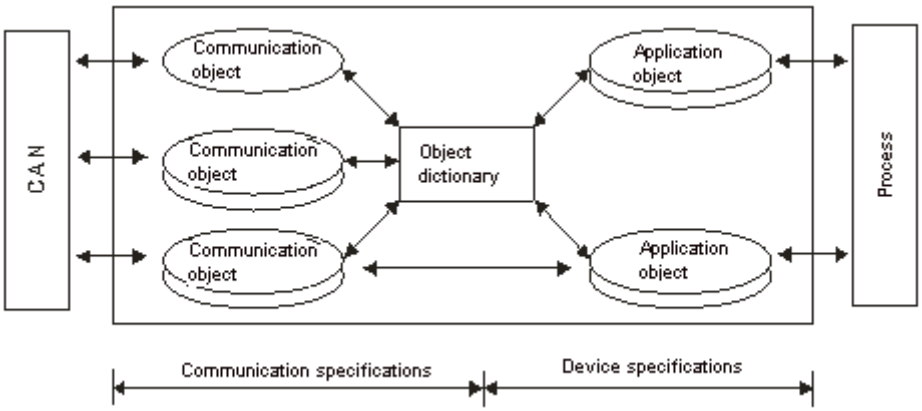
In the OSI model, the relation between the CAN standard and the CANopen protocol is as follow.



1. **The object dictionary**

CANopen uses an object-based way to define a standard device. Every device is represented by a set of objects, and can be visited by the network. The model of the CANopen device is illustrated below. As the figure below shows, the object dictionary is the interface between the communication program and the superior application program.

The core concept of CANopen is the device object dictionary (OD). It is an orderly object set. Every object adopts a 16-bit index for addressing. In order allow the visit to the single element in the data structure, it also defines, an 8-bit subindex. Every node in the CANopen network has an object dictionary. The object dictionary includes the parameters which describe the device and the network behavior. The object dictionary of a node is described in the electronic data sheet (EDS).



10.3.2 The CANopen Communication Object

The CANopen communication protocol contains the following communication objects.

1. PDO (process data object)

- The PDO provides the direct visit channel for the device application object, is used to transmit the real-time data, and has high priority. Every byte in the PDO CAN message data list is used to

transmit the data. The rate of making use of the message is high.

- There are two kinds of uses for PDOs. The first is data transmission and the second data reception. They are distinguished by Transmit-PDOs (TxPDOs) and Receive-PDOs (RxPDOs). Devices supporting TxPDOs are PDO producers, and devices which are able to receive PDOs are called PDO consumers.
- The PDO is described by means of the “producer/consumer mode”. The data is transmitted from one producer to one or many consumers. The data which can be transmitted are limited to 1-byte data to 8-byte data. After the data is transmitted by the producer, the consumer does not need to reply to the data. Every node in the network will detect the data information transmitted by the transmission node, and decides whether to process the data which is received.
- Every PDO is described by two objects in the object dictionary: The PDO communication parameters and the PDO mapping parameters

  The PDO communication parameters: The COB-ID which will be used by PDO, the transmission type, the prohibition time, and the cycle of the counter

  The PDO mapping parameters: They include the object list in an object dictionary. These objects are mapped into the PDO, including the data length (in bits). To explain the contents of the PDO, the producer and the consumer have to understand the mapping.

  The PDO transmission mode: synchronous and asynchronous

  Synchronous: Synchronous periodic and synchronous non-periodic

  Asynchronous: The PDO is transmitted when the data changes, or it is transmitted after a trigger.

  The transmission modes supported by are as follows.

Type	PDO transmission				
	Periodic	Non-periodic	Synchronous	Asynchronous	RTR
0		X	X		
1 – 240	X		X		
254				X	
255				X	

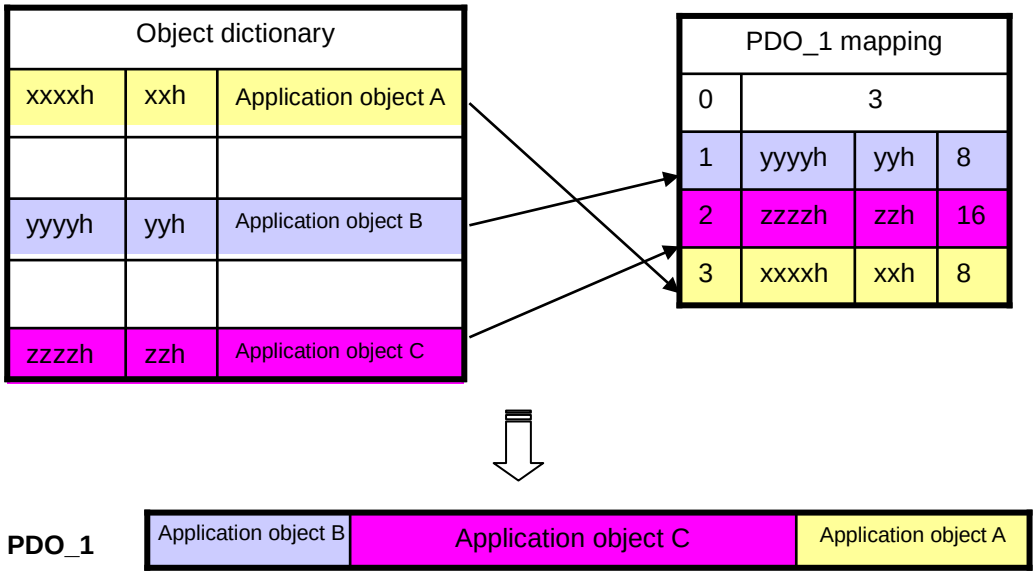
  Mode 0: The PDO information is transmitted only when the PDO data changes and the synchronous signal comes.

  Modes 1~240: One piece of PDO information is transmitted every 1~240 synchronous signals.

  Mode 254: The trigger is defined the manufacturer. The definition of the PLC is the same as mode 255.

  Mode 255: PDO is transmitted when the data changes, or it is transmitted after a trigger.

  All the data in the PDO has to be mapped from the object dictionary. The following is an example of the PDO mapping.



The data format for RxPDO and TxPDO is as follows.

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Object identifier	Data							

2. SDO (service data object)

- The SDO is used to build the client/server relation between two CANopen devices. The client device can read the data from the object dictionary of the server device, and write the data into the object dictionary of the server device. The visit mode of the SDO is “client/server” mode. The mode which is visited is the SDO server. Every CANopen device has at least one service data object which provides the visit channel for the object dictionary of the device. SDO can read all objects in the object dictionary, and write all objects into the object dictionary.
- The SDO message contains the index information and the subindex information which can be used to position the objects in the object dictionary, and the composite data structure can easily pass the SDO visit. After the SDO client sends the reading/writing request, the SDO server replies. The client and the server can stop the transmission of the SDO .The requested message and the reply message are divided by different COB-IDs.
- The SDO can transmit the data in any length. If the data length is more than 4 bytes, the data has to be transmitted by segment. The last segment of the data contains an end flag.
- The structures of the SDO requested message and reply message are as follows.

  The format of the requested message:

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
600（hex）	Requested code	Object index		Object subindex	Requested data			
+Node-ID		LSB	MSB		bit7-0	bit15-8	bit23-16	bit31-24

The definition of the requested code in the requested message:

Request code (hex)	Description
23	Writing the 4-byte data
2B	Writing the 2-byte data
2F	Writing the 1-byte data
40	Reading the data
80	Stopping the current SDO function

The format of the reply message:

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
580（hex）	Reply code	Object index		Object subindex	Reply data			
+Node-ID		LSB	MSB		bit7-0	bit15-8	bit23-16	bit31-24

The definition of the reply code in the reply message:

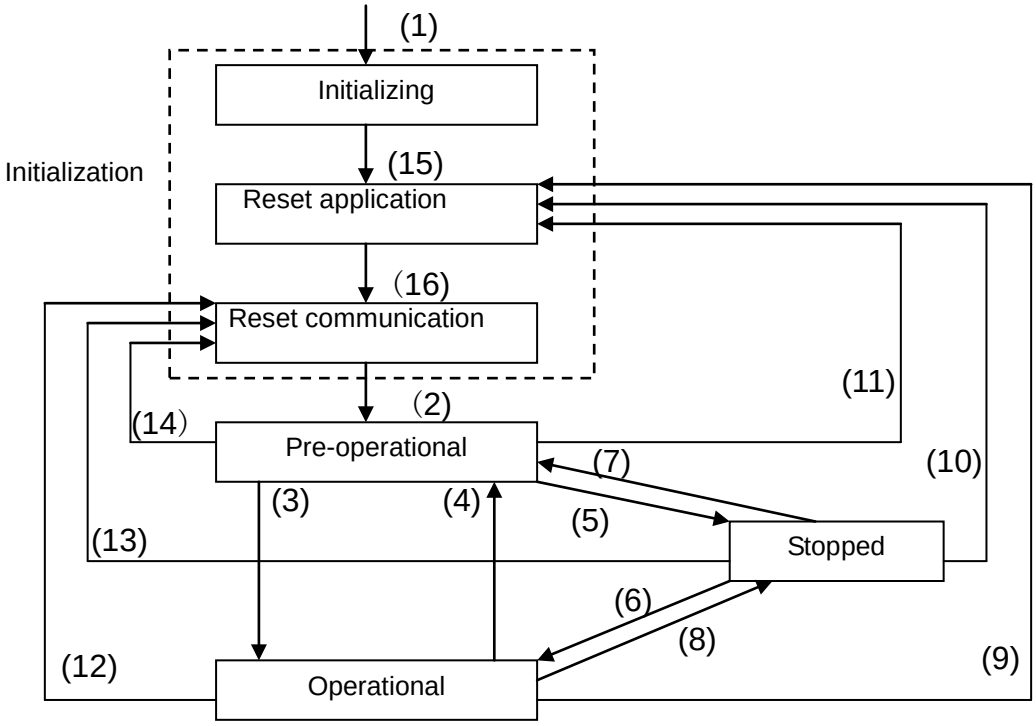
Reply code (hex)	Description
43	Reading the 4-byte data
4B	Reading the 2-byte data
4F	Reading the 1-byte data
60	Writing the 1/2/4-byte data
80	Stopping the SDO function

3. NMT (network management object)

The CANopen network management conforms to the “master/slave” mode. Only one NMT master exists in the CANopen network, and other nodes are considered slaves. NMT realized three services. They are module control services, error control services, and boot-up services.

- **Module control services**

The master node in the CANopen network controls the slave by sending the command. The slave executes the command after it received the command. It does not need to reply. All CANopen nodes have internal NMT states. The slave node has four states. They are the initialization state, the pre-operational state, the operational state, and the stop state. The state of the device is illustrated below.



(1) After the power is supplied, the device automatically enters the initialization state.

(2) After the initialization is complete, the device automatically enters the Pre-operational state.

(3)(6) The remote node is started.

(4)(7) The device enters the Pre-operational state.

(5)(8) The remote node is stopped.

(9)(10)(11) The application layer is rest.

(12)(13)(14) The communication is reset.

(15) After the initializing is complete, the device automatically enters the “reset application” state.

(16) After the “reset application” state is complete, the device automatically enters the “reset communication” state.

The relation between the communication object and the state is shown below. The communication object service can be executed only in a proper state. For example, SDO can be executed only in the operational state and in the pre-operational state.

	Initialization	Pre-operational	Operational	Stopped
PDO			X	
SDO		X	X	
SYNC		X	X	
Time Stamp		X	X	
EMCY		X	X	
Boot-up	X			
NMT		X	X	X

The format of the control message for the node state:

COB-ID	Byte 0	Byte 1
0	Command specifier (CS)	Slave address (0: Broadcast)

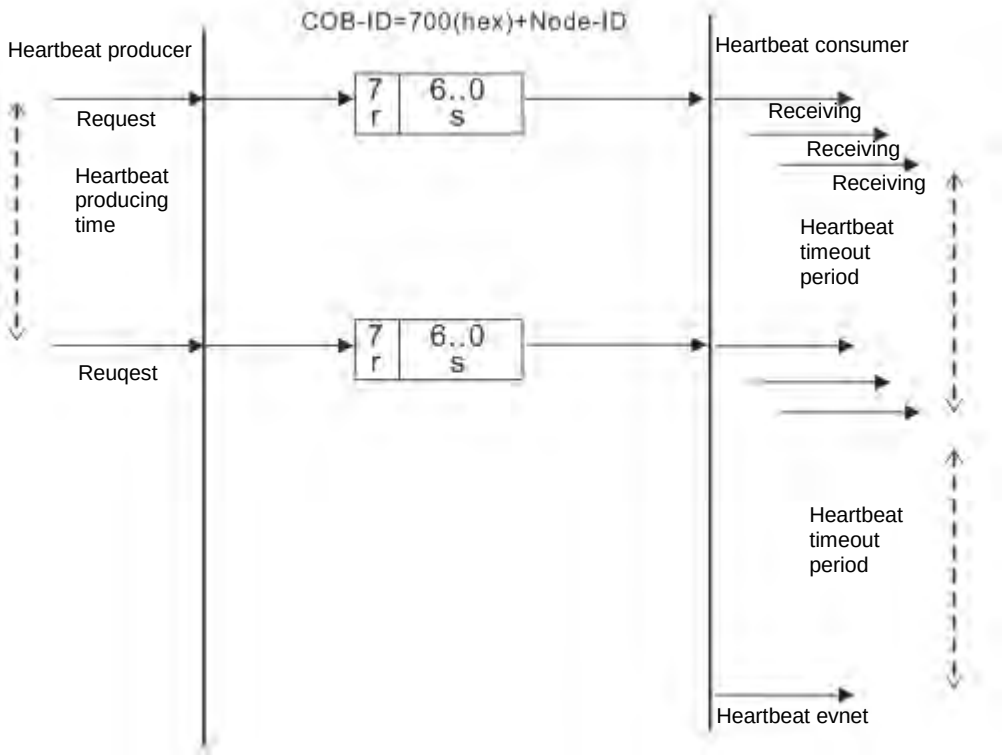
The command specifiers are listed below.

Command specifier (hex)	Function
01	Start the remote node
02	Stop the remote node
80	Enter the pre-operational state
81	Reset the application layer
82	Reset the communication

- **Error control services**

The error control service is used to detect the disconnection of the node in the network. The error control services can be classified into two types, i.e. Heartbeat and Node Guarding. The PLC only supports Heartbeat. For example, the master can detect the disconnection of the slave only after the slave enables the Heartbeat service.

The Heartbeat principle is illustrated as follows. The Hearbeat producer transmits the Heartbeat message according to the Heartbeat producing time which is set. One or many Heartbeat consumers detect the message transmitted by the Heartbeat producer. If the consumer does not receive the message transmitted by the producer within the timeout period, the CANopen communication is abnormal.



- **Boot-up services**

  After the slave completes the initialization and enters the pre-operational state, it transmits the Boot-up message.

4. Other predefined CANopen communication objects (SYNC and EMCY)

- **SYNC Object (Synchronous object)**

  The synchronous object is the message broadcasted periodically by the master node in the CANopen network. This object is used to realize the network clock signal. Every device decides whether to use the event and undertake the synchronous communication with other network devices according to its configuration. For example, when controlling the driving device, the devices do not act immediately after they receive the command sent by the master. They do act until they receive the synchronous message. In this way, many devices can act synchronously.

  The format of the SYNC message:

COB-ID
80 (hex)

- **Emergency object**

  The emergency object is used by the CANopen device to indicate an internal error. When an emergency error occurs in the device, the device sent the emergency message (including the emergency error code), and the device enters the error state. After the error is eliminated, the device sends the emergency message, the emergency error code is 0, and the device enters the normal state.

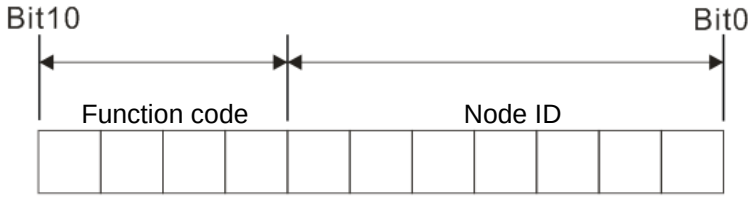
  The format of the emergency message:

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
80 (hex) +Node-ID	Emergency error code		Error register	Factory-defined error code				
	LSB	MSB						

  Note: The value in the error register is mapped to index 1001 (hex) in the object dictionary. If the value is 0, no error occurs. If the value is 1, a normal error occurs. If the value is H'80, an internal error occurs in the device.

10.3.3 The Predefined Connection Set

In order to decrease the configuration workload of the network, CANopen defines a default identifier. In the predefine connection set, the structure of the 11-bit identifier is as follows.



The objects which are supported and the COB-IDs which are assigned to the objects are listed below.

5. The broadcast object in the predefined connection setting

Object	Function code	COB-ID	Index of the communication parameter
NMT	0000	0	-
SYNC	0001	128 (80h)	1005h, 1006h, 1007h
Time stamp	0010	256 (100h)	1012h, 1013h

6. The corresponding object in the predefined connection set

Object	Function code	COB-ID	Index of the communication parameter
Emergency	0001	129 (81h)–255 (FFh)	1014h, 1015h
PDO1 (TX)	0011	385 (181h)–511 (1FFh)	1800h
PDO1 (RX)	0100	513 (201h)–639 (27Fh)	1400h
PDO2 (TX)	0101	641 (281h)–767 (2FFh)	1801h
PDO2 (RX)	0110	769 (301h)–895 (37Fh)	1401h
PDO3 (TX)	0111	879 (381h)–1023 (3FFh)	1802h
PDO3 (RX)	1000	1025 (401h)–1151 (47Fh)	1402h
PDO4 (TX)	1001	1153 (481h)–1279 (4FFh)	1803h
PDO4 (RX)	1010	1281 (501h)–1407 (57Fh)	1403h
SDO (TX)	1011	1409 (581h)–1535 (5FFh)	1200h
SDO (RX)	1100	1537 (601h)–1663 (67Fh)	1200h
NMT Error Control	1110	1793 (701h)–1919 (77Fh)	1016h, 1017h

10.4 Sending SDO, NMT and Reading Emergency Message through the Ladder Diagram

Editing the request message mapping area can realize the transmission of SDO, NMT and Emergency message.The corresponding relations between the request message mapping area, response message mapping area and PLC device are shown below.

PLC device	Mapping area	Mapping length
D25000~D25031	SDO request message, NMT service message and Emergency request message	64 bytes
D24000~D24031	SDO response message and Emergency response message	64 bytes

1. CANopen master can only send one SDO, NMT or Emergency request message to the same equipment at a time.
2. We suggest the request message mapping area should be cleared to zero when sending SDO, NMT or Emergency request message through WPL program.

10.4.1 Data Structure of SDO Request Message

Sending SDO through the ladder diagram can read or write the slave parameter.

1. The data format of the SDO request message:

PLC device	Request message		
		High byte	Low byte
D25000	Message Header	ReqID	Command (Fixed to 01)
D25001		Reserved	Size
D25002		Type	Node ID

PLC device	Request message		
		High byte	Low byte
D25003	Message Data	High byte of main index	Low byte of main index
D25004		Reserved	Sub-index
D25005		Datum 1	Datum 0
D25006		Datum 3	Datum 2
D25007 ~ D25031		Reserved	

- Command: Fixed to “01”.
- ReqID: The request ID. Whenever an SDO request message is sent out, the message will be given a ReqID for CANopen master to identify. When reading/writing another SDO message, the original ID number must be changed. In other words, to read/write SDO is triggered by changing of the value of “ReqID”. ReqID range: 00 (Hex) ~ FF (Hex).
- Size: The length of the message data. The counting starts from D6253 with byte as the unit. When reading, it is fixed to 4 and when writing, it is 4 plus the byte number of data types of index and subindex and the maximum value is 8. But when writing, if the data type of index and subindex is word, the data length is 6 or it is 5 if byte.
- Node ID: The node address of the target equipment on CANopen network.
- Type: 01 indicates the read access; 02 indicates the write access.

2. The data format of the SDO response message:

PLC device	Response message		
		High byte	Low byte
D24000	Message Header	ResID	Status code
D24001		Reserved	Size
D24002		Type	Node ID
D24003	Message Data	High byte of main index	Low byte of main index
D24004		Reserved	Sub-index
D24005		Datum 1	Datum 0
D24006		Datum 3	Datum 2
D24007~D24031		Reserved	

- Status code:

  The indication of the status code values in the response message:

Status code	Explanation
0	No data transmission request
1	SDO message transmission succeeds.
2	SDO message is being transmitted.
3	Error: SDO transmission time-out
4	Error: Illegal command code
5	Error: the length of the transmitted data is illegal.
6	Error: the length of the response data is illegal.
7	Error: Equipment to be sent messages is busy.
8	Error: Illegal type

Status code	Explanation
9	Error: Incorrect node address
0A	Error message (See the error code for SDO response message)
0B~FF	Reserved

- ResID: Same as the request ID in the request message.
- Size: The length of the message data. Max. 20 bytes. Unit: byte. When writing, it is 4; the data length is decided by the data type of index and subindex when reading.
- Node ID: The node address of the target equipment on CANopen network.
- Type: In SDO response message, 43 (Hex) refers to reading 4 bytes of data; 4B (Hex) refers to reading 2 bytes of data; 4F (Hex) refers to reading 1 byte of data; 60 (Hex) refers to writing 1/2/4 byte(s) of data; 80 (Hex) refers to stopping SDO command.

Example 1: Write 010203E8 (hex) to (Index_subindex) 212D_0 of slave of No. 3 through SDO and the data type of (Index_subindex) 212D_0 is double words (32 bits).

- Request data:

PLC device	Request message		
		High byte(Hex)	Low byte(Hex)
D25000	Message Header	ReqID=01	Command =01
D25001		Reserved =0	Size =8
D25002		Type =02	Node ID =03
D25003	Message data	Main index high byte =21	Main index low byte =2D
D25004		Reserved =0	Subindex =0
D25005		Datum 1=03	Datum 0=E8
D25006		Datum 3=01	Datum 2=02

- Response data:

PLC device	Response message		
		High byte(Hex)	Low byte(Hex)
D24000	Message Header	ResID =01	Command =01
D24001		Reserved =0	Size =4
D24002		Type =60	Node ID =03
D24003	Message data	Main index high byte =21	Main index low byte =2D
D24004		Reserved =0	Subindex =0
D24005		Datum 1=00	Datum 0=00
D24006		Datum 3=00	Datum 2=00

Example 2: Read the value of (Index_subindex) 212D_0 of slave of No. 3 through SDO and the data type of (Index_subindex) 212D_0 is double words (32 bits).

- Request data:

PLC device	Request message		
		High byte(Hex)	Low byte(Hex)
D25000	Message Header	ReqID =01	Command =01
D25001		Reserved =0	Size =4
D25002		Type =01	Node ID =03

PLC device	Request message		
		High byte(Hex)	Low byte(Hex)
D25003	Message data	Main index high byte =21	Main index low byte =2D
D25004		Reserved =0	Subindex =0
D25005		Datum 1=0	Datum 0=0
D25006		Datum 3=0	Datum 2=0

10.4.2 Data Structure of NMT Message

NMT service can be used managing the CANopen network such as start, operation, reset of nodes and etc.

1. The data format of the NMT request message:

PLC device	Request message		
		High byte	Low byte
D25000	Message Header	ReqID	Command (Fixed to 01)
D25001		Reserved	Size (Fixed to 04)
D25002		Type (Fixed to 03)	Node ID
D25003	Message data	Reserved	NMT service code
D25004		Reserved	Node ID

- Command: Fixed to 01.
- ReqID: The request ID. Whenever an NMT request message is sent out, the message will be given a ReqID for the CANopen master to identify. Before another NMT request message is sent out, the original ID number must be changed. In other words, to send out the NMT request message is triggered by changing of the value of “ReqID”. ReqID range: 00 (Hex) ~ FF (Hex).
- Node ID: The node address of the target equipment on CANopen network. (0: Broadcast)
- NMT service code:

NMT service code (Hex)	Function
01	Start remote node
02	Stop remote node
80	Enter the pre-operational state
81	Reset application
82	Reset communication

2. The data format of the NMT Response message:

PLC device	Response message		
		High byte	Low byte
D24000	Message header	ResID	Status code
D24001		Reserved	Reserved
D24002		Reserved	Node ID

- When status code is 1, it indicates that NMT operation succeeds. When status code is not equal to1, it indicates that NMT operation fails and in the meantime, you should check if the data in NMT request message are correct.

- Node ID: The node address of the target equipment on CANopen network.

Example 1: Stop slave of No. 3 through NMT

- Request data:

PLC device	Request message		
		High byte(Hex)	Low byte(Hex)
D25000	Message header	ReqID =01	Command =01
D25001		Reserved =0	Size =04
D25002		Type =03	Node ID =03
D25003	Message data	Reserved	NMT service code =02
D25004		Reserved	Node ID =03

- Response data:

PLC device	Response message		
		High byte(Hex)	Low byte(Hex)
D24000	Message header	ResID=01	Status code =01
D24001		Reserved =0	Reserved =0
D24002		Reserved =0	Node ID =03

10.4.3 Data Structure of EMERGENCY Request Message

Through reading Emergency, the slave error and alarm information can be read.

1. The data format of the Emergency request message:

PLC device	Request message		
		High byte	Low byte
D25000	Message header	ReqID	Command (Fixed to 1)
D25001		Reserved	Size (Fixed to 0)
D25002		Type (Fixed to 04)	Node ID
D25003~D25031	Message data	Reserved	

- Command: Fixed to 01.
- ReqID: The request ID. Whenever an Emergency message is sent out, the message will be given a ReqID for the CANopen master to identify. Before another Emergency request message is sent out, the original ID number must be changed. In other words, to send out the Emergency request message is triggered by changing of the value of “ReqID”. ReqID range: 00 (Hex) ~ FF (Hex).
- Node ID: The node address of the target equipment on CANopen network.

2. The data format of the Emergency response message:

PLC device	Response message		
		High byte(Hex)	Low byte(Hex)
D24000	Message header	ResID	Status code
D24001		Reserved	Size Fixed to 2A
D24002		Type (Fixed to 04)	Node ID
D24003	Message data	Total number of data	Number of data stored
D24004		Datum 1	Datum 0

PLC device	Response message		
		High byte(Hex)	Low byte(Hex)
D24005		Datum 3	Datum 2
D24006		Datum 5	Datum 4
D24007		Datum 7	Datum 6
D24008~D24011		Emergency2	
D24012~D24015		Emergency3	
D24016~D24019		Emergency4	
D24020~D24023		Emergency5	
D24024~D24031		Reserved	

- Command: Fixed to 01(Hex).
- When status code is 1, it indicates that reading Emergency message succeeds. When status code is not equal to1, it indicates that reading Emergency message fails and in the meantime, you should check if the data in Emergency message are correct.
- Node ID: The node address of the target equipment on CANopen network.
- Total number of data: The total number of Emergency messages CANopen master receives from the slave.
- Number of data stored: The latest number of Emergency messages CANopen master receives from the slave. (5 messages at most)
- The data in D6004-D6007 are the content of Emergency 1 and every Emergency message consists of 8 bytes of data.

  The data format of Emergency message on CAN bus is shown below. Datum 0~ datum 7 in Emergency response message correspond to byte 0~ byte 7 respectively

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
80（hex）+Node-ID	Emergency error code		Error storage register	Vendor custom error code				

Example 1: Read the Emergency message of slave of No.2 and the Emergency messages the slave sends out successively are shown below.

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
82（hex）	43	54	20	14	0	0	0	0

COB-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
82（hex）	42	54	20	15	0	0	0	0

- Request data:

PLC device	Request message		
		High byte	Low byte
D25000	Message header	ReqID=01	Command =01
D25001		Reserved	Size =0
D25002		Type =04	Node ID =03

- Emergency response data

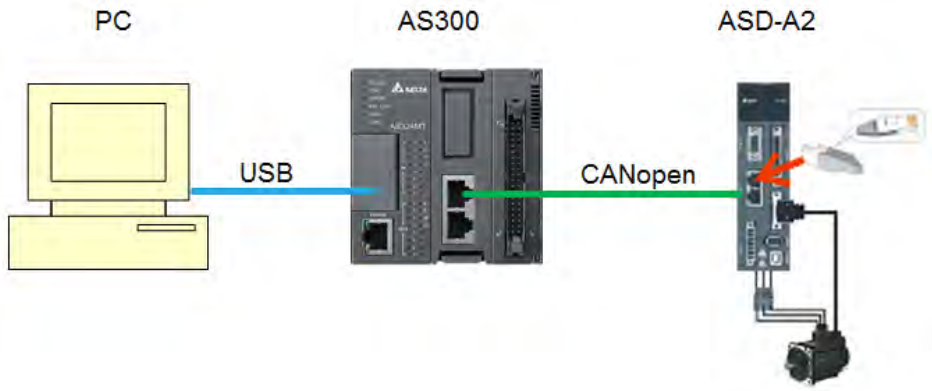
PLC device	Response message		
		High byte	Low byte
D24000	Message header	ResID=01	Status code =01
D24001		Reserved =0	Size =2A (Hex)
D24002		Type =04	Node ID =03
D24003	Message data	Total number of data =1	Number of data stored =1
D24004		Datum 1=54	Datum 0=42
D24005		Datum 3=20	Datum 2=14
D24006		Datum 5=0	Datum 4=0
D24007		Datum 7=0	Datum 6=0
D24004		Datum 1=54	Datum 0=43
D24005		Datum 3=14	Datum 2=20
D24006		Datum 5=0	Datum 4=0
D24007		Datum 7=0	Datum 6=0

10.4.4 Example on Sending SDO through the Ladder Diagram

1. Control Requirement:

Read the value of P0-09 of servo in cycle through SDO.

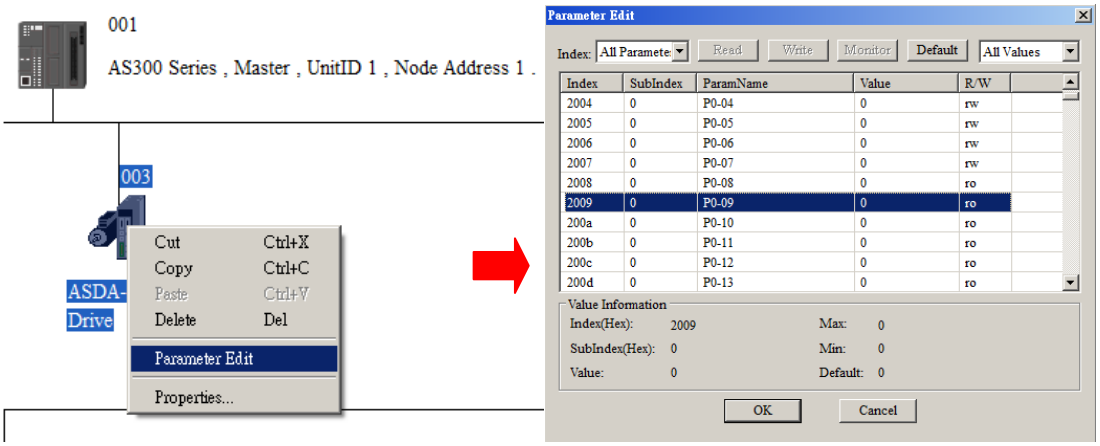
2. Hardware Connection:



3. The Corresponding Relation between Slave Parameter and Index/Subindex

The index_subindex corresponding to P0-09 of servo is 2009_0. On the interface of the network configuration software, right click the servo icon; select “Parameter Edit” and then the following dialog box will appear. You can see the index_subindex corresponding to the servo parameter in the dialog box.

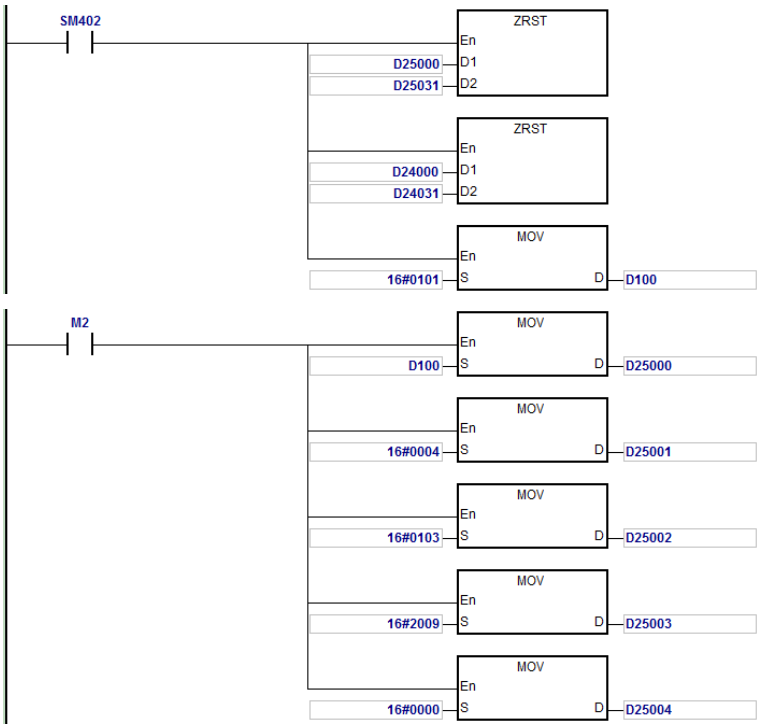
For more details on how to operate the network configuration interface, please refer to section 11.1.1 of the help file of CANopen Builder software.



4. Explanation of Request Message Devices:

PLC device		Content (Hex)	Explanation	
			High byte(Hex)	Low byte(Hex)
SDO request message mapping area	D25000	0101	ReqID = 01	Command = 01
	D25001	0004	Reserved	Size = 04
	D25002	0102	Type = 01	Node ID = 03
	D25003	2009	Index high byte = 20	Index low byte = 09
	D25004	0000	Reserved	Subindex = 00

5. Editing the Ladder Diagram through WPLsoft



When M2=ON, after reading succeeds, the data returning from the target device are stored in D24000~D24005. The value of D24005: 100（hex）is the read value of P0-09.

6. Explanation of Response Message Devices:

PLC device		Content (Hex)	Explanation	
			High byte(Hex)	Low byte(Hex)
SDO response message mapping area	D24000	0101	ResID = 01	Status code = 01
	D24001	0006	Reserved	Size = 08
	D24002	4303	Type = 43	Node ID = 03
	D24003	2009	Main index high byte = 20	Index low byte = 09
	D24004	0004	Reserved	Subindex = 00
	D24005	0100	Datum 1= 01	Datum 0= 00

10.5 Troubleshooting

10.5.1 CANopen Network Node State Display

1. While the CANopen function of AS300 series PLC is enabled, SR825~893 will be used as the special registers as the table shows below.

Special register	Function
SR825	Used for displaying the state of AS300 series PLC.
SR830~SR893	Used for displaying the state of 64 nodes in the network
SR826	The flag concerning the state of the slave 1~16
SR827	The flag concerning the state of the slave 17~32
SR828	The flag concerning the state of the slave 33~48
SR289	The flag concerning the state of the slave 49~64
SR821	Version of CANopen DS301
SR822	Used for displaying a CANopen baud rate (unit: 1kpps)

2. As a master, AS300 series PLC supports maximum 64 slaves ranging from node 1 to node 64. SR826~829 can be used for monitoring the whole state of nodes in the network. And the 16 bits of SR826 corresponds to 16 slaves and the corresponding relations of them are shown below.

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Node	Node 8	Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1
Bit	**b15**	**b14**	**b13**	**b12**	**b11**	**b10**	**b9**	**b8**
Node	Node16	Node15	Node14	Node13	Node12	Node11	Node10	Node 9

When the node in the master node list is normal, the corresponding bit is OFF; when the node in the master node list is abnormal (E.g. Initializing fails or slave is offline due to other abnormality), the corresponding bit is ON.

3. The error code of every node is displayed through the corresponding special register (SR830~893) and the relations between special register and corresponding node (1~16) are shown below.

Special register	SR830	SR831	SR832	SR833	SR834	SR835	SR836	SR837
Node	Node 1	Node 2	Node 3	Node 4	Node 5	Node 6	Node 7	Node 8
Special register	**SR838**	**SR839**	**SR840**	**SR841**	**SR842**	**SR843**	**SR844**	**SR845**
Node	Node 9	Node10	Node11	Node12	Node13	Node14	Node15	Node16

4. Code display in SR830~893 as AS300 series PLC is in master mode:

Code	Indication	How to correct
E0	AS300 series PLC master module receives the emergency message sent from slave.	Read the relevant message via PLC program
E1	PDO data length returned from the slave is not consistent with the length set in the node list.	Set the PDO data length of slave and re-download them.
E2	PDO of slave is not received.	Check and ensure the setting is correct.
E3	Downloading auto SDO fails.	Check and ensure auto SDO is correct.
E4	Configuration of PDO parameter fails.	Ensure that the PDO parameter setting is legal.
E5	Error in key parameter setting.	Ensure that the actually connected slave is consistent with the configured slave.
E6	The slave does not exist in the network	Ensure that the supply power of slave is normal and the connection in the network is proper.
E7	Slave error control is timed-out.	
E8	The node IDs of master and slave repeat.	Set the node ID of master and slave again and ensure their node IDs are sole.

5. Code display in SR825 as AS300 series PLC is in master mode:

Code	Indication	How to correct
F1	Slave has not been added to node list of CANopen Builder software	Add slave into the node list and then re-download the configured data.
F2	The data are being downloaded to AS300 series PLC	Wait to finish downloading the configured data.
F3	AS300 series PLC is in error status	Re-download parameter configuration
F4	Bus-off is detected.	Check if CANopen bus cables are properly connected and ensure that all the node devices run at the same baud rate before re-powering.
F5	AS300 series PLC setting error such as incorrect node address	The node address of AS300 series PLC should be set in the range: 1~127.
F8	Internal error; the error is detected in the internal memory	After re-powering, change into a new one if the error still exists.
FB	The sending buffer in AS300 series PLC is full.	Check if the CANopen bus cable is properly connected and then re-power.
FC	The receiving buffer in AS300 series PLC is full.	Check if the CANopen bus cable is properly connected and then re-power.

6. Code display in SR825 as AS300 series PLC is in slave mode:

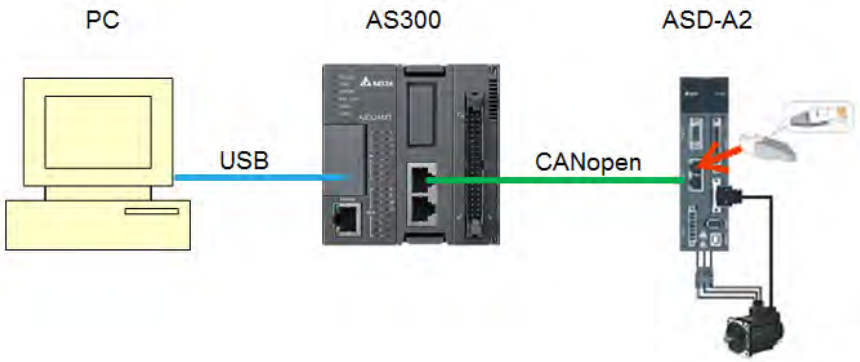
Code	Indication	How to correct
A0	AS300 series PLC is being initialized.	--
A1	AS300 series PLC is pre-operational.	Check if the CANopen bus cable is properly connected
A3	The data are being downloaded to AS300 series PLC	Wait to finish downloading the configured data.
B0	Heartbeat message is timed-out	Check if the CANopen bus cable is properly connected.
B1	PDO data length returned from the slave is not consistent with the	Reset the PDO data length in the slave and download the new setting to AS300 series PLC.

Code	Indication	How to correct
	length set in the node list.	
F4	BUS-OFF state is detected.	Check if CANopen bus cables are properly connected and ensure that all the node devices run at the same baud rate before re-powering.
FB	The sending buffer in AS300 series PLC is full.	Check if the CANopen bus cable is properly connected and then re-power.
FC	The receiving buffer in AS300 series PLC is full.	Check if the CANopen bus cable is properly connected and then re-power.

10.6 Application Example

AS300 series PLC is used to control Delta A2 servo rotation and monitor the actual rotation speed of motor in real time. The principle of operation is to map the relevant parameters of servo drive to the corresponding PDO and read or write the relevant parameters of servo drive through the CAN bus to accomplish the control requirement.

1. Hareware Connection:



Note:

- It is recommend to use the standard communication cable such as UC-DN01Z-01A / UC-DN01Z-02A / UC-CMC010-01A and connect the terminal resistors such as Delta standard terminal resistor TAP-TR01 to either terminal of the network when constructing the network.
- M of ASD-A2-xxxx-M refers to the model code and currently only the M-model servo supports CANopen communication.

2. Setting Servo Parameters:

- Set servo parameters as follows:

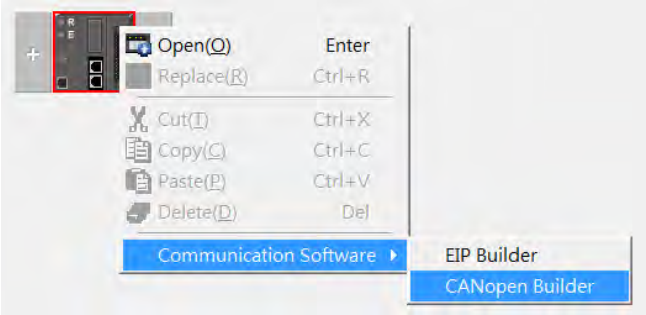
Parameter	Setting	Explanation
3-00	03	The Node ID of A2 servo is 2
3-01	400	CAN communication rate is 1Mbps.
1-01	04	Speed mode
0-17	07	Drive displays the motor rotation speed (r/min)
2-10	101	Set DI1 as the signal for Servo On
2-12	114	Set DI3 as the signal _SPD0 for speed selection
2-13	115	Set DI4 as the signal _SPD1 for speed selection

3. Setting CANopen Baud Rate and Node ID of AS300 Series PLC

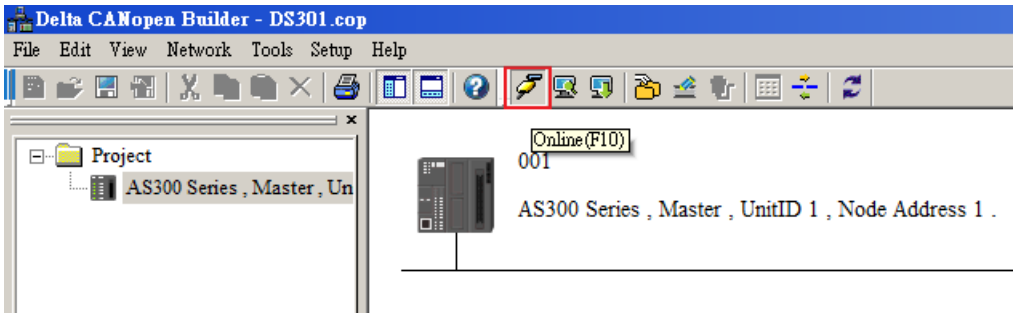
AS300 series PLC uses the default setting values: Node ID: 1 and baud rate: 1Mbps.

CANopen Node ID and baud rate of AS300 series PLC are set up through CANopen Builder software. See the detailed operation steps below:

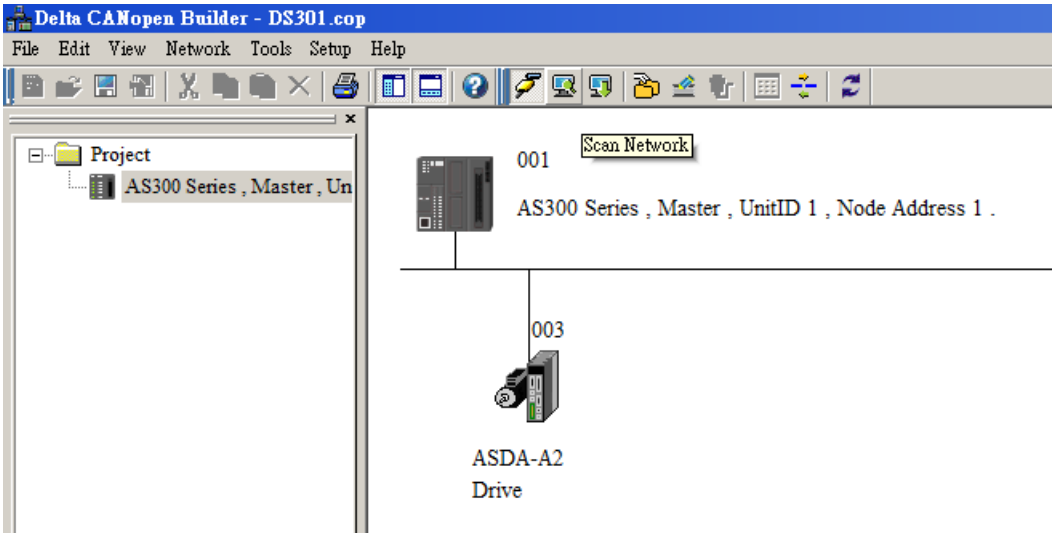
A. Right click the AS300 series PLC icon in the HWCONFIG to see and select “Communication Software” and then select “CANopen Builder”.



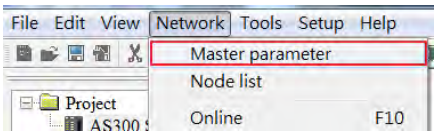
B. Click the  to be in the on-line mode.

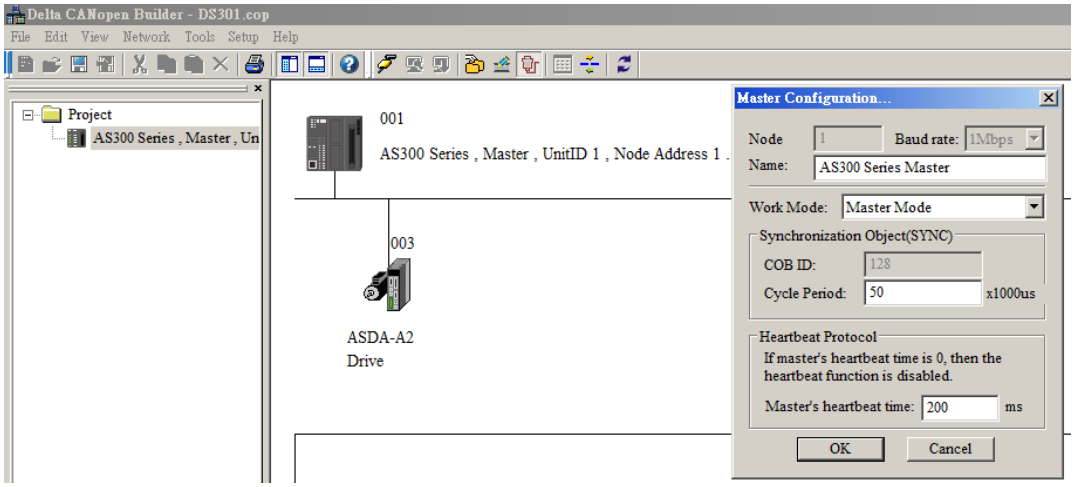


C. Click the  to scan the network.



D. Click “Network” on the tool bar and then select “Master parameter” to see the Master Configuration window.

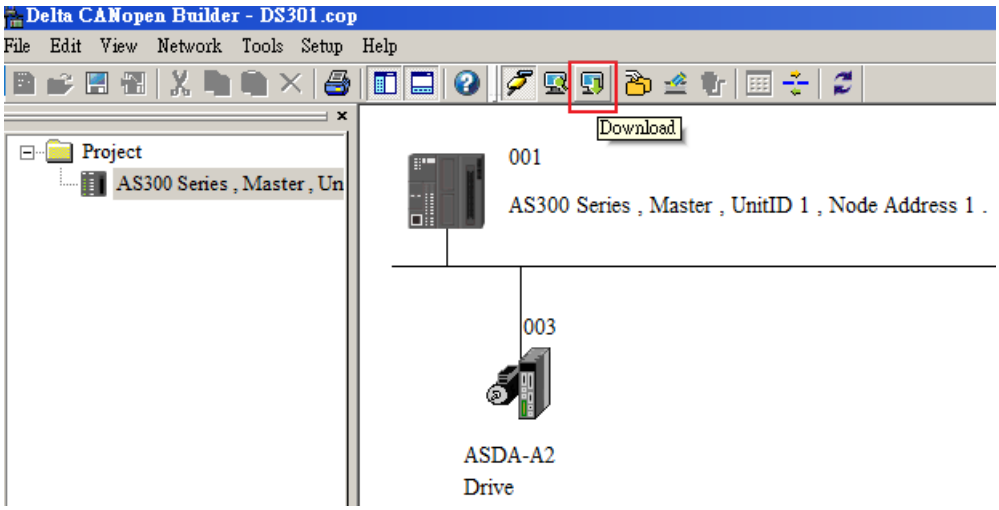




Item	Explanation	Default
Node ID	The node ID of AS300 series PLC on the CANopen network	1
Baud rate	CANopen communication rate	1M bit/second
Work mode	CANopen master/slave mode	Master
Cycle period	The cycle time for sending one SYNC message	50ms
Master’s heartbeat time	The interval time for sending the master heartbeat message	200ms

The CANopen communication stations and rates should be configured in HWCONFIG.

E. After the previous setups are done, users can click  to download the parameters to the PLC.

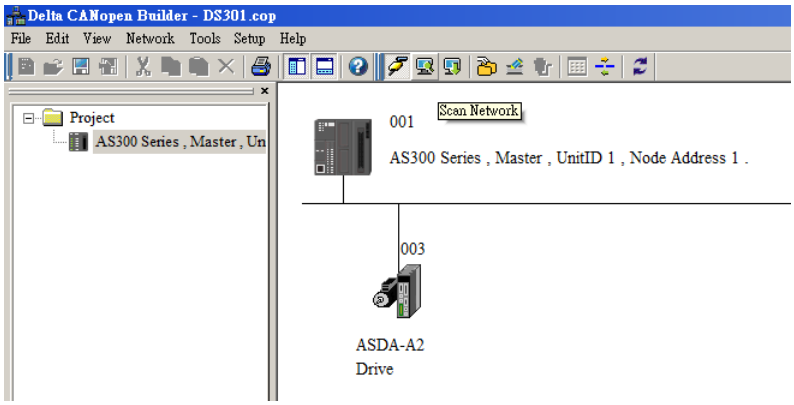


Note: all the parameters downloaded will only take effect after AS300 series PLC is re-powered.

4. Network Scanning:

Scan the master and slave on the CANopen network by clicking menu “Network”>>”Online” or the icon  .

The scanned master and slave are displayed on the page below. For detailed operation steps, please refer to Section 11.1.1 in the help file of CANopen Builder software.



5. Node Configuration:

Double click the slave icon on the above page and then the following “Node configuration” dialog box pops up.

- “Error Control Protocol”

  Used for setting the error control protocol for master to monitor if the slave is offline.

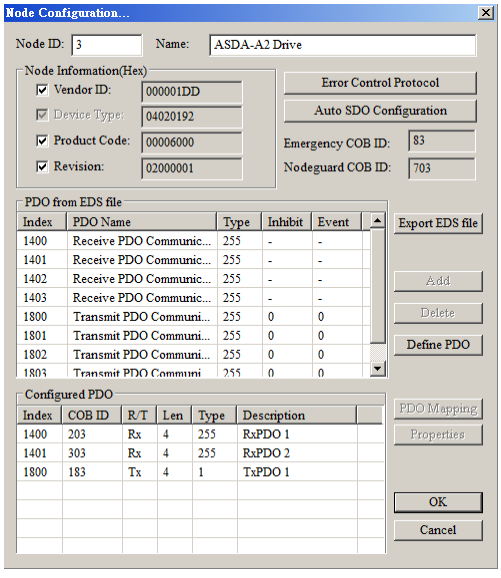
- “Auto SDO Configuration”

  Used for doing one write action to the slave parameter via SDO and the write action is finished when the slave enters the operational state from pre-operational state. Up to 20 SDOs can be configured by “Auto SDO configuration”.

- “PDO Mapping” and “Properties”

  Used for setting the mapping parameter and transmission type of PDO.

  For the details on the function buttons mentioned above, please refer to Section 11.1.1 in the help file of CANopen Builder software.

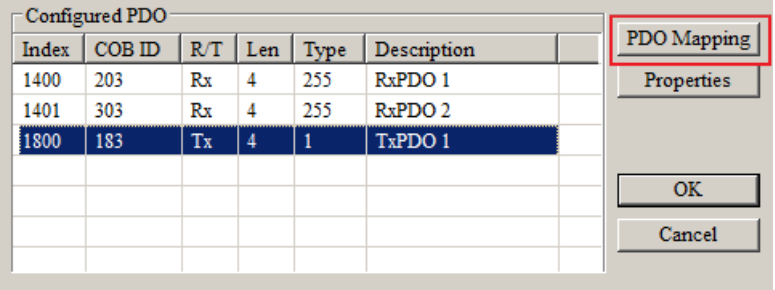


- PDO Mapping:

  RxPDO1: the mapping parameter P1-09; transmission type 255.

  RxPDO2: the mapping parameter P3-06, P4-07; transmission type 255.

  TxPDO1: the mapping parameter P0-09; transmission type 1.



- PDO transmission type :

  PDO can be classified into RxPDO and TxPDO. RxPDO data are sent from master to slave and TxPDO data are sent from slave to master.

  PDO transmission type can be synchronous transmission and asynchronous transmission. In synchronous transmission, master will send out the SYNC message in the fixed cycle. The length of the cycle is set in master properties dialog box with the default value: 50ms. In asynchronous transmission, the message is sent out once the PDO mapping parameter is changed.
  PDO Transmission types in details are introduced in the following table.

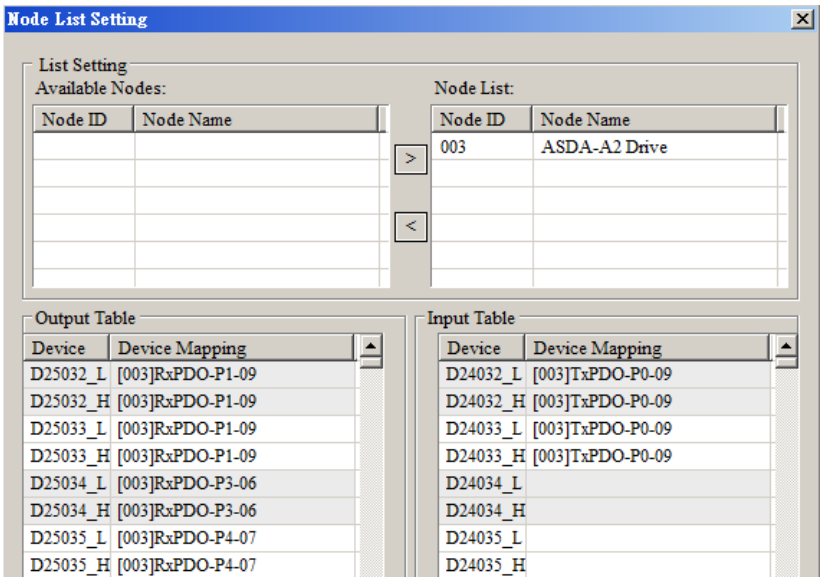
Transmission Type		Description	Remark
0	RxPDO	Once any change for the mapped data happens, RxPDO data are sent out immediately. The data that slave receives are valid only when receiving the next SYNCH message. If no change for RxPDO data, they are not sent out.	SYNCH SYNCH non-cycle
	TxPDO	Once any change for the mapped data happens and slave receives the SYNC message, the data are sent out immediately. The TxPDO data are valid immediately after master receives them. If no change for TxPDO data, the data are not sent out.	
N （N:1~240）	RxPDO	After N messages are sent out and no matter whether the mapped data are changed, the data that slave receives will be valid only when receiving the next SYNCH message.	SYNCH cycle
	TxPDO	After N messages are sent out and no matter whether the mapped data are changed, the data that master receives will be valid at once.	
254	RxPDO	The mapped data are sent out immediately once changed and they are valid once they are received by slave. RxPDO data will not be sent out if no change for the data.	ASYNCH

Transmission Type		Description	Remark
	TxPDO	Slave sends out the data once every one Event timer time and after that, the TxPDO data are not allowed to be sent out within an inhibit timer time. When Event timer and Inhibit timer are both equal to 0, TxPDO data are sent to master immediately once changed and the data that master receives will be valid at once.	
255	Same as Type254		

Note:

- Synchronous transmission type can fulfill multi-axis motion at the same time.
- If user is going to monitor the real-time changing parameter such as the actual rotation speed of the motor, we suggest TxPDO should be set as the synchronous transmission type in case the frequent changing of slave data causes to block the CANopen network.

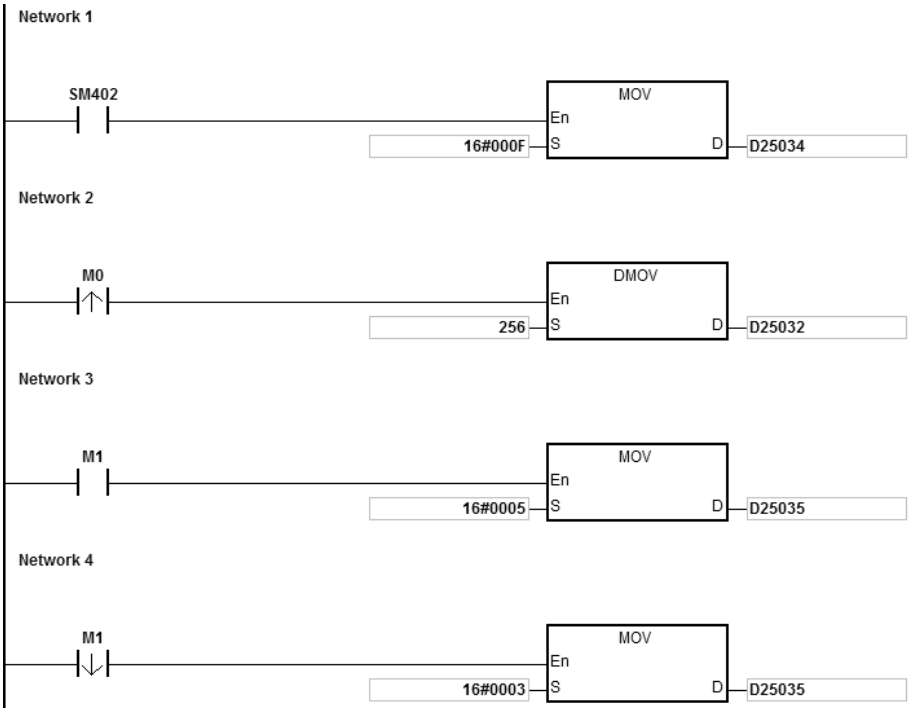
After the above setting is finished, double click the master, select ASDA-A2 Drive, and click “>” to move A2 to the right list and download the configured data.



The mapping relation between master and slave:

AS300 Series PLC master register	Data transmission on CANopen bus	A2 device
D25032	⇨	Low word of P1-09 of servo
D25033		High word of P1-09 of servo
D25034		P3-06 of servo
D25037		P4-07 of servo
D24032	⇦	Low word of P0-09 of servo
D24033		High word of P0-09 of servo

6. Program control: D25032 is given the value 256 through ISPSoft. That is, the speed command is set as 256r/min. See details in the following figure.



7. Program explanation:

While AS300 series PLC is running for the first time, set the parameter P3-06 of servo drive to F.

- When M0 turns from OFF to ON, write 256 to D25032 and then the value is written to P1-09 of servo parameter through RxPDO1.
- When M1 turns from OFF to ON, turn P4-07 to 5. DI1 and DI3 will be ON. DI1 means the SERVO is ON and DI3 means calling the speed specified by parameter P1-09 of servo for rotation.
- When M1 turns from ON to OFF, the speed command becomes 0 and the motor stops running.

10.7 Object Dictionary

The communication objects in the object dictionary are shown as below:

Index	Subindex	Object name	Data type	Attribute	Default value
H'1000	H'00	Device type	Unsigned 32 bits	R	0x00000000
H'1001	H'00	Error register	Unsigned 8 bits	R	0
H'1005	H'00	COB-ID SYNC	Unsigned 32 bits	RW	0x00000080
H'1008	H'00	manufacturer device name	Vis-String	R	AS300 Series PLC
H'1014	H'00	COB-ID EMCY	Unsigned 32 bits	R	0x80 + Node-ID
H'1016	--	Consumer heartbeat time			
	H'00	Number of valid subindex	Unsigned 8 bits	R	1
	H'01	Consumer heartbeat time	Unsigned 32 bits	RW	0
H'1017	H'00	Producer heartbeat time	Unsigned 16 bits	RW	0
H'1018	--	Identity Object			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	Vendor-ID	Unsigned 32 bits	R	0x000001DD
	H'02	Product code	Unsigned 32 bits	R	0x00000055
	H'03	Revision number	Unsigned 32 bits	R	0x00010002
H'1400	--	RxPDO1 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	COB-ID of RxPDO1	Unsigned 32 bits	RW	0x00000200 +Node-ID
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	0
H'1401	--	RxPDO2 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	COB-ID of RxPDO2	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	0
H'1402	--	RxPDO3 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	COB-ID of RxPDO3	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
H'1402	H'03	Inhibit time	Unsigned 16 bits	RW	0

Index	Subindex	Object name	Data type	Attribute	Default value
H'1403	--	RxPDO4 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	COB-ID of RxPDO4	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	0
H'1404	--	RxPDO5 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	COB-ID of RxPDO5	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	0
H'1405	--	RxPDO6 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	COB-ID of RxPDO6	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	0
H'1406	--	RxPDO7 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	COB-ID of RxPDO7	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	0
H'1407	--	RxPDO8 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	3
	H'01	COB-ID of RxPDO8	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	0
H'1600	--	RxPDO1 mapping parameter			
H'1600	H'00	Number of valid subindex	Unsigned 8 bits	RW	4
	H'01	The first mapped object	Unsigned 32 bits	RW	0x20000110

Index	Subindex	Object name	Data type	Attribute	Default value
	H'01	The second mapped object	Unsigned 32 bits	RW	0x20000210
	H'02	The third mapped object	Unsigned 32 bits	RW	0x20000310
	H'03	The fourth mapped object	Unsigned 32 bits	RW	0x20000410
H'1601	--	RxPDO2 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'01	The second mapped object	Unsigned 32 bits	RW	0
	H'02	The third mapped object	Unsigned 32 bits	RW	0
	H'03	The fourth mapped object	Unsigned 32 bits	RW	0
H'1602	--	RxPDO3 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'01	The second mapped object	Unsigned 32 bits	RW	0
	H'02	The third mapped object	Unsigned 32 bits	RW	0
	H'03	The fourth mapped object	Unsigned 32 bits	RW	0
H'1603	--	RxPDO4 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'01	The second mapped object	Unsigned 32 bits	RW	0
	H'02	The third mapped object	Unsigned 32 bits	RW	0
	H'03	The fourth mapped object	Unsigned 32 bits	RW	0
H'1604	--	RxPDO5 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
H'1604	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'01	The second mapped object	Unsigned 32 bits	RW	0
	H'02	The third mapped object	Unsigned 32 bits	RW	0
	H'03	The fourth mapped object	Unsigned 32 bits	RW	0
H'1605	--	RxPDO6 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'01	The second mapped object	Unsigned 32 bits	RW	0

Index	Subindex	Object name	Data type	Attribute	Default value
	H’02	The third mapped object	Unsigned 32 bits	RW	0
	H’03	The fourth mapped object	Unsigned 32 bits	RW	0
H’1606	--	RxPDO7 mapping parameter			
	H’00	Number of valid subindex	Unsigned 8 bits	RW	0
	H’01	The first mapped object	Unsigned 32 bits	RW	0
	H’01	The second mapped object	Unsigned 32 bits	RW	0
	H’02	The third mapped object	Unsigned 32 bits	RW	0
	H’03	The fourth mapped object	Unsigned 32 bits	RW	0
H’1607	--	RxPDO8 mapping parameter			
	H’00	Number of valid subindex	Unsigned 8 bits	RW	0
	H’01	The first mapped object	Unsigned 32 bits	RW	0
	H’01	The second mapped object	Unsigned 32 bits	RW	0
	H’02	The third mapped object	Unsigned 32 bits	RW	0
	H’03	The fourth mapped object	Unsigned 32 bits	RW	0
H’1800	--	TxPDO1 communication parameter			
	H’00	Number of valid subindex	Unsigned 8 bits	R	5
	H’01	COB-ID of TxPDO1	Unsigned 32 bits	RW	0x00000180 +Node-ID
	H’02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H’03	Inhibit time	Unsigned 16 bits	RW	50
H’1800	H’05	Timer	Unsigned 16 bits	RW	100
H’1801	--	TxPDO2 communication parameter			
	H’00	Number of valid subindex	Unsigned 8 bits	R	5
	H’01	COB-ID of TxPDO2	Unsigned 32 bits	RW	0x80000000
	H’02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H’03	Inhibit time	Unsigned 16 bits	RW	50
	H’05	Timer	Unsigned 16 bits	RW	100
H’1802	--	TxPDO3 communication parameter			
	H’00	Number of valid subindex	Unsigned 8 bits	R	5
	H’01	COB-ID of TxPDO3	Unsigned 32 bits	RW	0x80000000
	H’02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H’03	Inhibit time	Unsigned 16 bits	RW	50
	H’05	Timer	Unsigned 16 bits	RW	100
H’1803	--	TxPDO4 communication parameter			
	H’00	Number of valid subindex	Unsigned 8 bits	R	5
	H’01	COB-ID of TxPDO4	Unsigned 32 bits	RW	0x80000000

Index	Subindex	Object name	Data type	Attribute	Default value
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	50
	H'05	Timer	Unsigned 16 bits	RW	100
H'1804	--	TxPDO5 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	5
	H'01	COB-ID of TxPDO5	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	50
	H'05	Timer	Unsigned 16 bits	RW	100
H'1805	--	TxPDO6 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	5
	H'01	COB-ID of TxPDO6	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
H'1805	H'03	Inhibit time	Unsigned 16 bits	RW	50
	H'05	Timer	Unsigned 16 bits	RW	100
H'1806	--	TxPDO7 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	5
	H'01	COB-ID of TxPDO7	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	50
	H'05	Timer	Unsigned 16 bits	RW	100
H'1807	--	TxPDO8 communication parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	R	5
	H'01	COB-ID of TxPDO8	Unsigned 32 bits	RW	0x80000000
	H'02	Transmission mode	Unsigned 8 bits	RW	0xFF
	H'03	Inhibit time	Unsigned 16 bits	RW	50
	H'05	Timer	Unsigned 16 bits	RW	100
H'1A00	--	TxPDO1 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	4
	H'01	The first mapped object	Unsigned 32 bits	RW	0x20010110
	H'02	The second mapped object	Unsigned 32 bits	RW	0x20010210
	H'03	The third mapped object	Unsigned 32 bits	RW	0x20010310
	H'04	The fourth mapped object	Unsigned 32 bits	RW	0x20010410
H'1A01	--	TxPDO2 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0

Index	Subindex	Object name	Data type	Attribute	Default value
	H'02	The second mapped object	Unsigned 32 bits	RW	0
	H'03	The third mapped object	Unsigned 32 bits	RW	0
	H'04	The fourth mapped object	Unsigned 32 bits	RW	0
H'1A02	--	TxPDO3 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'02	The second mapped object	Unsigned 32 bits	RW	0
H'1A02	H'03	The third mapped object	Unsigned 32 bits	RW	0
	H'04	The fourth mapped object	Unsigned 32 bits	RW	0
H'1A03	--	TxPDO4 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'02	The second mapped object	Unsigned 32 bits	RW	0
	H'03	The third mapped object	Unsigned 32 bits	RW	0
H'1A04	--	TxPDO5 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'02	The second mapped object	Unsigned 32 bits	RW	0
	H'03	The third mapped object	Unsigned 32 bits	RW	0
	H'04	The fourth mapped object	Unsigned 32 bits	RW	0
H'1A05	--	TxPDO6 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'02	The second mapped object	Unsigned 32 bits	RW	0
	H'03	The third mapped object	Unsigned 32 bits	RW	0
	H'04	The fourth mapped object	Unsigned 32 bits	RW	0
H'1A06	--	TxPDO7 mapping parameter			
	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'02	The second mapped object	Unsigned 32 bits	RW	0
	H'03	The third mapped object	Unsigned 32 bits	RW	0
	H'04	The fourth mapped object	Unsigned 32 bits	RW	0
H'1A07	--	TxPDO8 mapping parameter			
H'1A07	H'00	Number of valid subindex	Unsigned 8 bits	RW	0
	H'01	The first mapped object	Unsigned 32 bits	RW	0
	H'02	The second mapped object	Unsigned 32 bits	RW	0
	H'03	The third mapped object	Unsigned 32 bits	RW	0

Index	Subindex	Object name	Data type	Attribute	Default value
	H'04	The fourth mapped object	Unsigned 32 bits	RW	0

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Chapter 11 Operating Principle of the CPU Module

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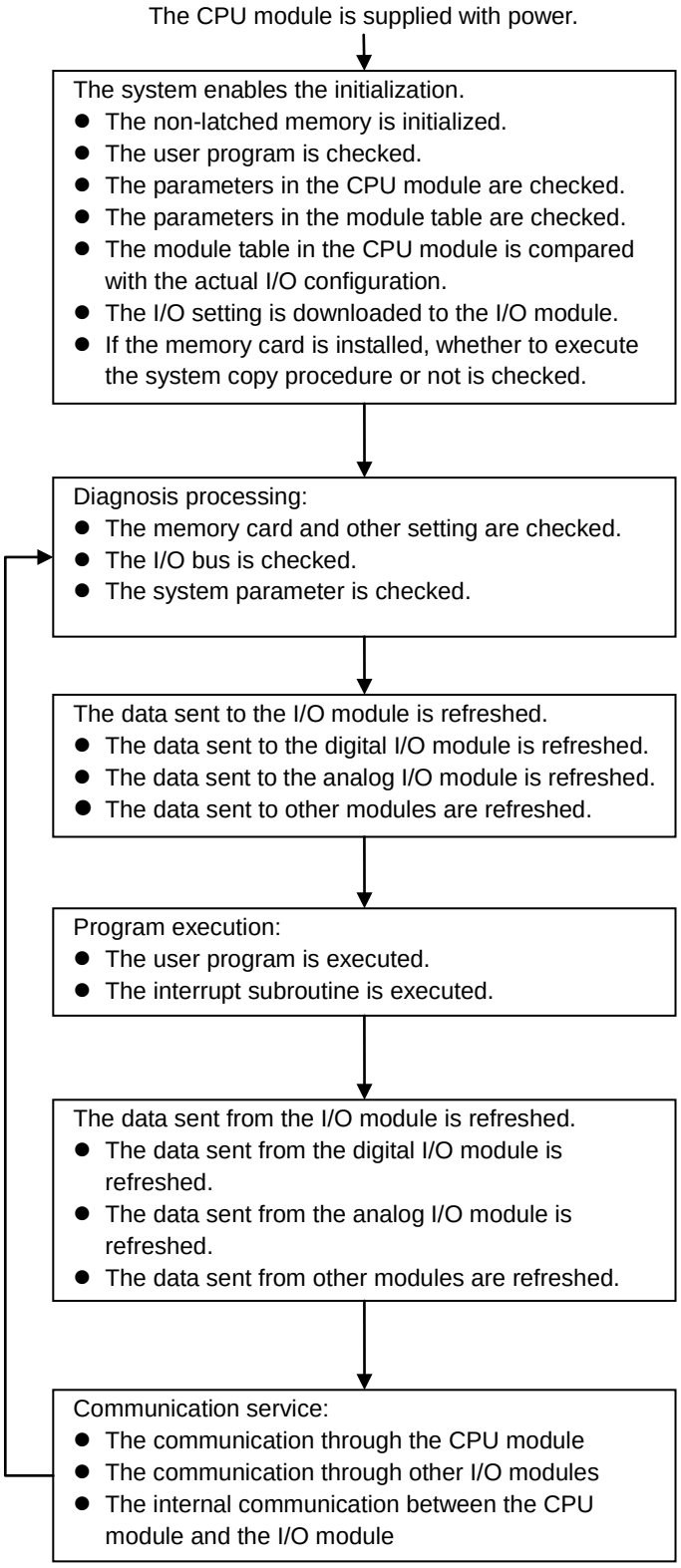
11.1 Operation of the CPU Module

11.1.1 Procedure

The operation of the CPU module is described below.



11.1.2 I/O Refreshing and Communication Service

- **I/O refreshing**

A CPU module reads external I/O data periodically or output data to external I/O. I/O refreshing includes the following.

- Refreshing data in a digital I/O module
- Refreshing data in an analog I/O module
- Refreshing data in a network module

All I/O refreshing is executed in the same loop. The data in an input device is refreshed before a program is executed, and the data in an output device is refreshed after the program is executed.

Unit	Maximum data exchange	Data exchange area
Digital I/O module	It depends on the number of input/output channels in the unit.	Input relay/Output relay
Analog I/O module	It depends on the number of input/output channels in the unit.	Data register
Network module	It depends on the unit.	Data register

- **Communication service**

Communication service is nonscheduled communication service of a network module. It includes the communication request sent from external equipment to a CPU module, and the communication request sent from the CPU module to the external equipment.

11.2 Operating Modes of the CPU Module

11.2.1 Operating Modes

There are two operating modes. They can be used to control a user program and all tasks.

STOP mode: A program is not executed under this mode. Users can download a module table, initialize CPU configuration and other setting, download a program, check a program, and force a bit ON/OFF.

RUN mode: A program is executed under this mode. Users can not download a module table, and initialize CPU configuration and other setting.

11.2.2 Statuses and Operation under Different Operating Modes

The STOP mode and the RUN mode are modes for a CPU module. The statuses and operation under these modes are listed below.

- **Basic operation**

CPU mode	Program	I/O refreshing	External output	Program memory	
				Non-latched area	Latched area
STOP	The execution of the program stops.	The I/O refreshing is executed.	OFF (If users set the I/O module so that the final state of the external output on the I/O module is retained, the final state of the external output on the I/O module will be retained.)	The data in the program memories are retained.	
RUN	The program is executed.	The I/O refreshing is executed.	The external output is controlled by the program.	The program memories are controlled by the program.	

- **Relation between the operating modes and the tasks**

Mode	Loop task	Interrupt task
STOP	The execution of the loop task stops.	The execution of the interrupt task stops.
RUN	● The tasks which have not been executed are in the halt state. ● If a task is active, or the instruction TKON is executed, the task is executed. ● If a task is not active, or the instruction TKOFF is executed, the task is not executed.	If the condition of the interrupt is met, the task is executed.

- **Relation between the change of the modes and the program memory**

Change of the mode	Non-latched area	Latched area
STOP→RUN	Whether the data is cleared or retained depends on user's setting.	The data is retained.
RUN→STOP	The data is retained.	The data is retained.

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Chapter 12 Troubleshooting

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12.1 Troubleshooting

12.1.1 Basic troubleshooting steps

This chapter includes kinds of possible errors occurred during operation and the causes of them and what actions should be taken to correct the errors.

(1) Check the followings:

- PLC should be operated in a safe environment (the environmental, electronical, vibrational safties should be considered.)
- Power supply should be correctly connected and supply power to the PLC.
- Installations of modules, terminals and cables are secured.
- All the LED indicators are shown correct.
- All the switches are correctly set.

(2) Check the followings for the AS series to operate:

- Switch the RUN/STOP
- Check the settings for the AS series to RUN/STOP
- Check and eliminate the errors from the external devices
- Use the System Log function of the ISPSoft to check the system operation and the logs.

(3) Identify the source of the possible causes:

- AS series or external device
- CPU modules or the extension moudles
- Setting parameters or programs

12.1.2 Clear the States of Errors

Use the following methods to clear the status of errors when errors occurred. But if the soruce of error is not fixed, the system will still show errors.

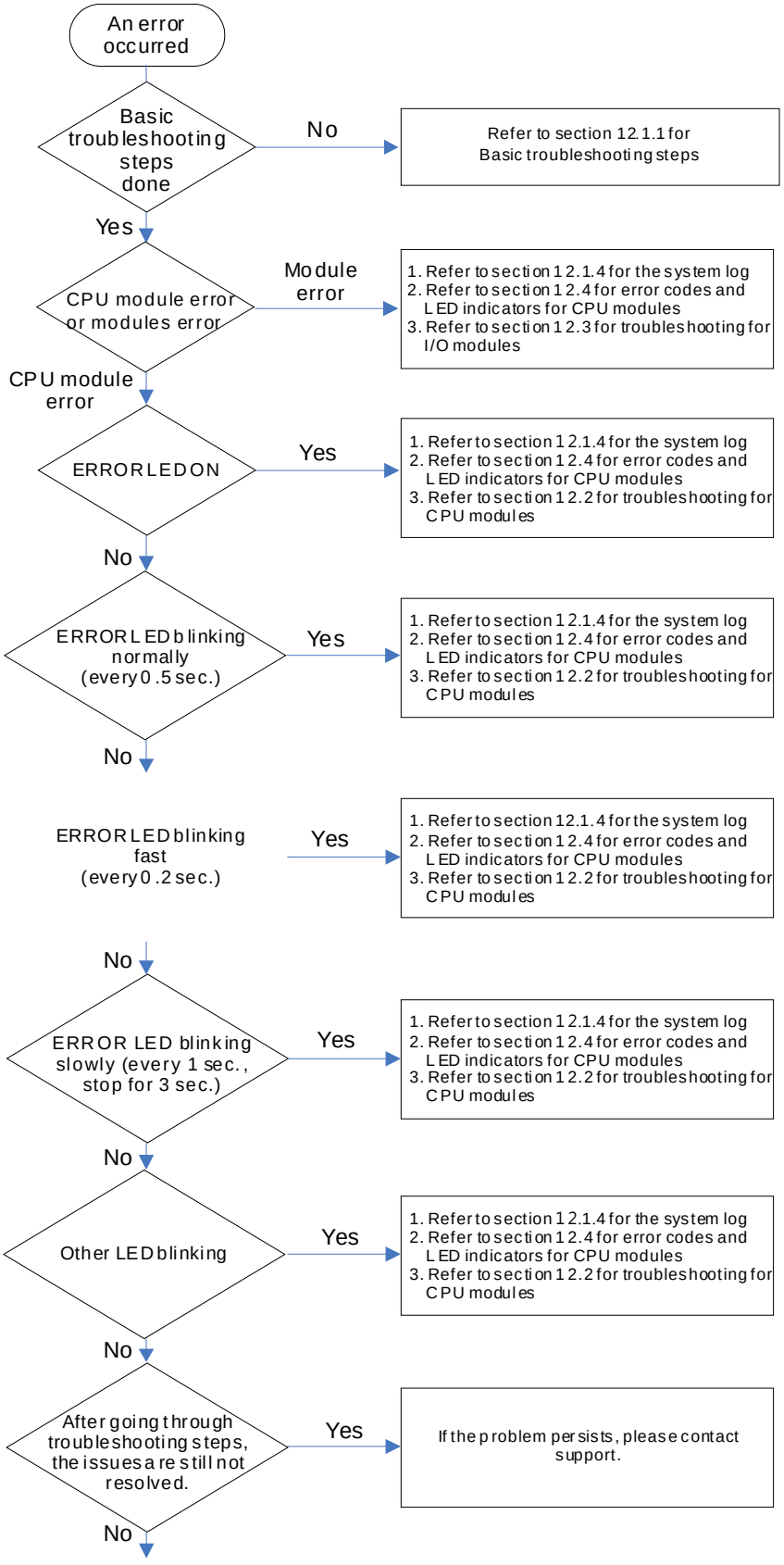
(1) Switch the state of the CPU moudel to STOP and then to RUN.

(2) Turn off the CPU and turn on again.

(3) Use the ISPSoft to clear the error logs.

(4) Reset the CPU and set the settings to defaults and download the project again to operate.

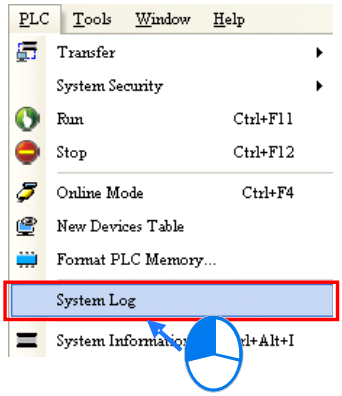
12.1.3 Troubleshooting SOP



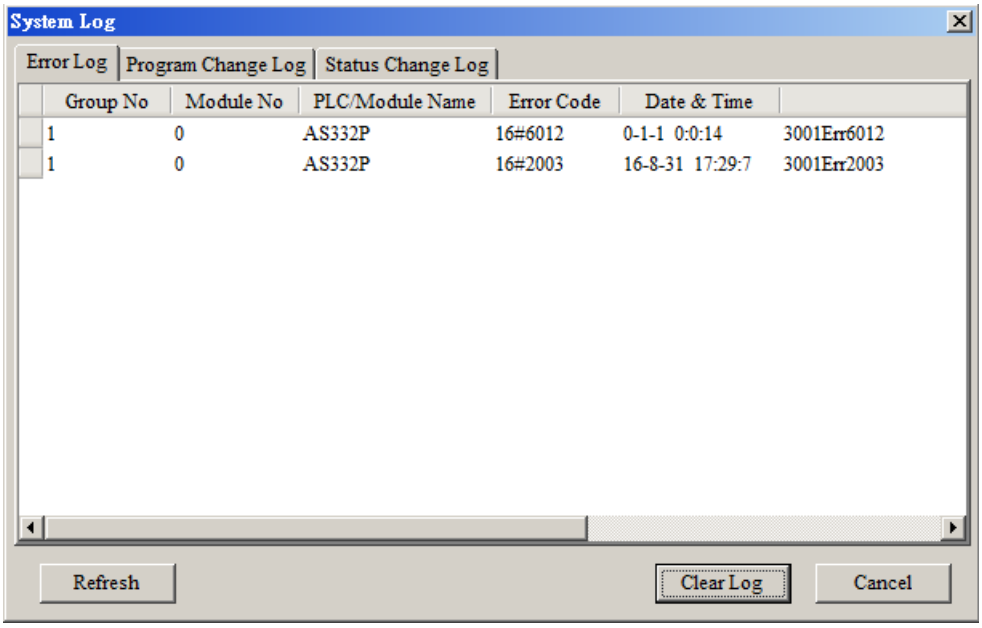
12.1.4 System Log

If ISPSoft is connected to an AS series normally, users can view the actions and the errors occur in the AS series after they click **System Log** on the **PL**C menu. Up to 20 piece of error logs can be stored in the CPU. After the 20 sets are stored, the 1st log will be replaced with the 21st if there are new logs coming in; the old logs will be replaced with the new ones accordingly. When the memory card is installed in the CPU module, 20 pieces of the old logs will be backedup in the memory card and up to 10000 logs can be recorded. If the stored log exceeds the limitation of 1000, the oldest 20 logs will be replaced with the newest 20 logs in the memeory card.

(1) Click **System Log** on the **PL**C menu. PLC> System Log.



(2) After users click **System Log** on the **PL**C menu, the **System Log** window will appear. After users click **Clear Log**, the error log in the window and the error log in the CPU module will be cleared, and the CPU module will be reset.



- Group No.: The number 1 indicates the error occurred in the CPU module or the right-side module 1. The number 2~16 indicates the error occurred in the remote module 1~15.
- Module No.: The number 0 indicates the error occurred in the CPU module or the remote module. The number 1~32 indicates the error occurred in the right-side modue of the CPU module / remote module. (The number 1 represents the closest module to the CPU module or the remote module; this number increases from the closest to the furthest to the CPU module or the remote module.) Note: Up to 8 extension modules can be connected to the right-side of the remote module.
- PLC/Module name: Model names of the CPU modules, remote modules and the extension modules.

- Error Code: Error codes of the error log.
- Date & Time: The error occurred date and time. The most recent occurred error will be listed on the top.
- The last column shows the relative descriptions for the error.

12.2 Troubleshooting for CPU Modules

Check the LED indicators and the error codes from the CPU module and refer to the following table for troubleshooting. V in the Log column indicates the error will be recorded in the log; X in the Log column indicates the error will not be recorded in the log; H in the Log column indicates whether to record the error in the log or not can be set in HWCONFIG.

12.2.1 ERROR LED Indicator's Being ON

Error Code (16#)	Description	Solution	Flag	Log
000A	Scan timeout	1. Check the setting of the watchdog timer in HWCONFIG. 2. Check whether the program causes the long scan time	SM8	V

12.2.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

Error Code (16#)	Description	Solution	Flag	Log
000C	The program in the PLC is damaged.	Download the program again.	SM9	V
0010	The access to the memory in the CPU is denied.	Please contact the factory.	SM9	V
002E	The access to the external memory of the CPU is denied.	Please contact the factory.	SM9	V
002F	PLC programs are not consistentwith the system logs.	Download the program again.	SM34	V
0070	The actual arrangement of the function cards is not consistent with the settings.	Check whether the settings in HWCONFIG are consistent with the actual arrangement of the function cards.	SM10	V
0102	The interrupt number exceeds the range.	Check the program, compile the program again, and download the program again.	SM5	X
0202	The MC instruction exceeds the range.	Check the program, compile the program again, and download the program again.	SM5	X
0302	The MCR instruction exceeds the range.	Check the program, compile the program again, and download the program again.	SM5	X
0D03	The operands used in DHSCS are not used properly.	Check the program, compile the program again, and download the program again.	SM5	X
0E05	The operands HCXXX used in DCNT are not used properly.	Check the program, compile the program again, and download the program again.	SM5	X

Error Code (16#)	Description	Solution	Flag	Log
1300 ~ 130F	Errors occurred in the remote modules	Refer to section 12.3.4 for more information on the error codes of the remote modules.	SM30	V
1402	The actual arrangement of the I/O modules is not consistent with the settings.	Check whether the settings in HWCONFIG are consistent with the actual arrangement of the I/O modules.	SM10	V
140B	The communication modules exceed the limit of 4.	Check the total number of the communication modules.	SM10	V
140D	The extension modules exceed the limit of 32.	Check the total number of the extension modules.	SM10	V
140E	The remote modules exceed the limit of 8 on the right side of the CPU module.	Check the total number of the remote modules on the right side of the CPU module.	SM30	V
1600	The ID of the extension module exceeds the range.	1. Make sure the module is well-connected to the CPU module and tuno-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1601	The ID of the extension module cannot be set.	1. Make sure the module is well-connected to the CPU module and tuno-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1602	The ID of the extension module is duplicated.	1. Make sure the module is well-connected to the CPU module and tuno-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1603	The extension module cannot be opearated.	1. Make sure the module is well-connected to the CPU module and tuno-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1604	Extension module communication timeout	1. Make sure the module is well-connected to the CPU module and tuno-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1605	Hardware failure	Please contact the factory.	SM10	V
1606	Errors on the function card of the communication module	Make sure the function card is well-connected to the CPU module and tuno-on the modules again.	SM10	V
1607	The external voltage is abnormal.	Check whether the external 24 V power supply to the module is normal.	SM10	V
1608	The Internal factory calibration or the CJC is abnormal.	Please contact the factory.	SM10	V
1609 ~ 160F	Reserved (Error codes for the extension modules)			
200A	Invalid instruction	Check the program, compile the program again, and download the program again.	SM5	V
6010	The number of the MODBUS TCP connections exceeds the range.	Check if the number of the superior devices exceeds the limit of 32.	SM 1092	V
6011	The number of the EtherNet/IP connections exceeds the range.	Check if the number of the conncetions exceeds the range of 16.	SM 1093	V

12.2.3 ERROR LED Indicator's Raipid Blinking Every 0.2 Seconds

This happens when the power supply 24VDC of the CPU module is disconnecting or the power supply is not sufficient, not stable or abnormal so that it can not be operated.

Error Code (16#)	Description	Solution	Flag	Log
002A	The external voltage is abnormal.	Check whether the external 24 V power supply to the module is normal.	SM7	V

12.2.4 ERROR LED Indicator's Slow Blinking Every 3 Seconds and Lighting up for 1 Second

Error Code (16#)	Description	Solution	Flag	Log
1500	Connection lost in the remote modules	Please check the network connection cable.	SM30	V
1502 ~ 150F	Errors occurred in the remote modules	Refer to section 12.3.4 for more information on the error codes of the remote modules.	SM30	V
1800 ~ 180F	Errors occurred in the extension modules	Refer to section 12.3 for more information on the error codes of the extension modules.	SM10	V

12.2.5 BAT. LOW LED Indicator's Being ON

This happens when there is no battery (CR1620) or the power is low. Users can set this opion off in the HWCONFIG > CPU > Device Setting > Show Battery Low Voltage Error CPU, when users don't need the function of RTC to keep track of the current time. (Default is enabled.)

Error Code (16#)	Description	Solution	Flag	Log
0027	Battery Low	Change battery or set this option off	SM219	X

12.2.6 BAT. LOW LED Indicator's Blinking Every 0.5 Seconds

This happens when RTC cannot keep track of the current time.

Error Code (16#)	Description	Solution	Flag	Log
0026	RTC cannot keep track of the current time	Please contact the factory.	SM218	V

12.2.7 The LED Indicators of RUN and ERROR are Blinking Every 0.5 Seconds Simultaneously

This happens when the firmware of the CPU module is being upgraded. If this happens once the power is supplied to the CPU module, it means errors occurred during the previous firmware upgrade. Users need to upgrade the firmware again or contact your point of purchase.

12.2.8 The LED Indicators of RUN and ERROR are Blinking One After Another Every 0.5 Seconds.

This happens when the memory card of the CPU module is backing up / restoring / or saving.

12.2.9 Other Errors (Without LED Indicators)

Error Code (16#)	Description	Solution	Flag	Log
0011	The PLC ID is incorrect.	Please check the PLC ID.	SM34	V
0012	The PLC password is incorrect.	Please check the PLC password.	SM34	V
002D	The PLC maximum password attempts exceeded.	Reset the CPU module or restore the CPU module to its factory settings.	SM34	V
0050	The memories in the latched special auxiliary relays are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0051	The latched special data registers are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0052	The memories in the latched auxiliary relays are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0054	The latched counters are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0055	The latched 32-bit counters are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0056	The latched special auxiliary relay is abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0059	The latched data registers are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, contact the factory.	SM6	V
005D	The CPU module does not detect a memory card.	Check whether a memory card is inserted into the CPU module correctly.	SM453	V
005E	The memory card is initialized incorrectly.	Check whether the memory card is broken.	SM453	V
0063	An error occurs when data is written to the memory card.	Check whether the file path is correct, or whether the memory card breaks down.	SM453	V
0064	A file in the memory card can not be read.	Check whether the file path is correct, or whether the file is damaged.	SM453	V

2001	Without using the FCOMP card or not in the right mode for the ASDA-A2 while using the CANopen communication instruction.	Make sure to use the FCOMP card in the function card 2 and check if the operation mode is correct.	SM0	V
2003	The device used in the program exceeds the device range.	Check the program, compile the program again, and download the program again.	SM0	V
200B	The operand n or the other constant operands K/H exceed the range.	Check the program, compile the program again, and download the program again.	SM0	V
200C	The operands overlap.	Check the program, compile the program again, and download the program again.	SM0	V
200D	The binary to the binary-coded decimal conversion is incorrect.	Check the program, compile the program again, and download the program again.	SM0	V
200E	The string does not end with 00.	Check the program, compile the program again, and download the program again.	SM0	V
2012	Incorrect division operation	Check the program, compile the program again, and download the program again.	SM0	V
2013	The value exceeds the range of values which can be represented by the floating-point numbers.	Check the program, compile the program again, and download the program again.	SM0	V
2014	The task designated by TKON/YKOFF is incorrect, or exceeds the range.	Check the program, compile the program again, and download the program again.	SM0	V
2017	The instruction BREAK is written outside of the FOR-NEXT.	Check the program, compile the program again, and download the program again.	SM0	V
2027	No such position planning table number or the format is incorrect.	1. Check the program, compile the program again, and download the program again. 2. Check the settings of the position planning table.	SM0	V
6004	The IP address filter is set incorrectly.	Set the Ethernet parameter for the CPU module in HWCONFIG again.	SM1108	X
600D	RJ45 port is not connected.	Check the connection.	SM1100	X
6012	There are devices using the same IP address.	1. Check if there are devices using the sameIP address. 2. Check if there are more than 1 DHCP or BOOTP server on the network.	SM1101	V
6100	The email connection is busy.	Retry the email connection later. (This error does not cause the PLC to stop running. Users can perform the corresponding solution by means of the related flag in the program.)	SM1113	X
6103	The trigger attachment mode in the email is set incorrectly.	Set up the trigger attachment mode in HWCONFIG > CPU Module > Device Setting > Options > Ethernet Port Advanced > Email > Trigger Setting > Trigger Attachment Mode.	SM1113	X
6104	The attachment in the email does not exist.	Check whether the attachment exists in the memory card.	SM1113	X
6105	The attachment in the email is oversized.	Check the size of the file which is specified as the attachment. If the size is over 2 MB, the file can not be specified as the attachment.	SM1113	X
6106	There is an SMTP server response timeout.	Check for the correct address and set up the SMTP server in HWCONFIG > CPU Module > Device Setting > Options > Ethernet Port Advanced > Email again.	SM1113	X

6107	There is an SMTP server response timeout.	1. Check whether the status of the SMTP server is normal. 2. Retry the sending of the email later. (This error does not cause the PLC to stop running. Users can perform the corresponding solution by means of the related flag in the program.)	SM1113	X
6108	SMTP verification failed	Check for the correct ID/Password and set up in HWCONFIG > CPU Module > Device Setting > Options > Ethernet Port Advanced > Email again.	SM1113	X
6200	The remote communication IP address set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6201	The local communication port set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6202	The remote communication port set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6203	The device from which the data is sent in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6206	The device which receives the data in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6208	The data which is received through the TCP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6209	The remote communication IP address set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
620A	The local communication port set in the UDP socket function is illegal.	1. Check the program and the related special data registers.	-	X

		2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.		
620C	The device from which the data is sent in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
620F	The device which receives the data in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
6210	The data which is received through the UDP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
6212	There is no response from the remote device after the timeout period.	Make sure that the remote device is connected.	-	X
6213	The data received exceeds the limit.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
6214	The remote device refuses the connection.	Make sure that the remote device operates normally.	-	X
6215	The socket is not opened.	Check whether operational sequence in the program is correct.	-	X
6217	The socket is opened.	Check whether operational sequence in the program is correct.	-	X
6218	The data has been sent through the socket.	Check whether operational sequence in the program is correct.	-	X
6219	The data has been received through the socket.	Check whether operational sequence in the program is correct.	-	X
621A	The socket is closed.	Check whether operational sequence in the program is correct.	-	X
7011	The device communication function code in COM1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7012	The device communication address used in COM1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7013	The device used in COM1 exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H

7014	The device length of the communication data in COM1 exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7017	The device checksum for the communication serial port of COM1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7021	The device communication function code in COM2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7022	The device communication address used in COM2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7023	The device used in COM2 exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7024	The device length of the communication data in COM2 exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7027	The device checksum for the communication serial port of COM2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7031	The device communication function code in the Ethernet is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7032	The device communication address used in the Ethernet is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7033	The device used in the Ethernet exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7034	The device length of the communication data in the Ethernet exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7037	The device checksum for the communication serial port of the Ethernet is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7041	The device communication function code in the USB is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7042	The device communication address used in the USB is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7043	The device used in the USB exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7044	The device length of the communication data in the USB exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7047	The device checksum for the communication serial port of the USB is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H

70B1	The device communication function code in the function card 1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B2	The device communication address used in the function card 1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B3	The device used in the function card 1 exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B4	The device length of the communication data in the function card 1 exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B7	The device checksum for the communication serial port of the function card 1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C1	The device communication function code in the function card 2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C2	The device communication address used in the function card 2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C3	The device used in the function card 2 exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C4	The device length of the communication data in the function card 2 exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C7	The device checksum for the communication serial port of the function card 2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7203	Invalid communication function code	Refer to the function codes defined by the communication prototcols	-	H
8105	The contents of the program downloaded are incorrect. The program syntax is incorrect.	Download the program and the parameters again.	-	H
8106	The contents of the program downloaded are incorrect. The length of the execution code exceeds the limit.	Download the program and the parameters again.	-	H
8107	The contents of the program downloaded are incorrect. The length of the source code exceeds the limit.	Download the program and the parameters again.	-	H

12.3 Troubleshooting for I/O Modules

- **Introduction of modules**

  Digital I/O modules, analog I/O modules, temperature measurement modules, load cell modules, and network modules can be installed in an AS series system. There are 2 types of error codes, for errors and for warning. The CPU module and its modules will stop operating when errors occurred. The CPU moduels and its modules will not stop operating when warnings triggered.

12.3.1 Troubleshootings for Analog Modules (AD/DA/XA) and Temperature Modules (RTD/TC)

12.3.1.1 ERROR LED Indicator's Being ON

The Following errors will be specified as warnings. Users need to set up in HWCONFIG to have them shown as errors when the following errors occurred.

Error Code	Description	Solution
16#1605	Hardware failure	Please contact the factory.
16#1607	The external voltage is abnormal.	Check the power supply.
16#1608	The factory calibration or the CJC is abnormal.	Please contact the factory.

12.3.1.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

The following errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Users can set up in HWCONFIG to have them shown as errors when the first 4 errors occurred.

Error Code	Description	Solution
16#1801	The external voltage is abnormal.	Check the power supply.
16#1802	Hardware failure	Please contact the factory.
16#1804	The factory calibration is abnormal.	Please contact the factory.
16#1807	The CJC is abnormal.	Please contact the factory.
16#1808	The signal received by channel 1 exceeds the range of analog inputs (temperature).	Check the signal received by channel 1
16#1809	The signal received by channel 2 exceeds the range of analog inputs (temperature).	Check the signal received by channel 2
16#180A	The signal received by channel 3 exceeds the range of analog inputs (temperature).	Check the signal received by channel 3
16#180B	The signal received by channel 4 exceeds the range of analog inputs (temperature).	Check the signal received by channel 4

12.3.2 Troubleshootings for Load Cell Module AS02LC

12.3.2.1 ERROR LED Indicator's Being ON

Users can set up in HWCONFIG to have them shown as errors when the following errors occurred.

Error Code	Description	Solution
16#1605	Hardware failure (e.g. the diver board)	Please contact the factory.
16#1607	The external voltage is abnormal.	Check the power supply.

12.3.2.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

The following errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Users can set up in HWCONFIG to have them shown as errors when the first 3 errors occurred.

Error Code	Description	Solution
16#1801	The external voltage is abnormal.	Check the power supply.
16#1802	Hardware failure	Please contact the factory.
16#1807	Diver board failure	Please contact the factory.
16#1808	The signal received by channel 1 exceeds the range of analog inputs or the SEN voltage is abnormal.	Check the signal received by channel 1 and the cable connections.
16#1809	The signal received by channel 1 exceeds the weight limit.	Check the value inputed in channel 1 and the setting of the maximum weight.
16#180A	The factory calibration in channel 1 is incorrect.	Check the weight calibration in channel 1.
16#180B	The signal received by channel 2 exceeds the range of analog inputs or the SEN voltage is abnormal.	Check the signal received by channel 2 and the cable connections.
16#180C	The signal received by channel 2 exceeds the weight limit.	Check the value inputed in channel 2 and the setting of the maximum weight.
16#180D	The factory calibration in channel 2 is incorrect.	Check the weight calibration in channel 1.

12.3.3 Troubleshootings for Module AS00SCM as a Communication Module

12.3.3.1 ERROR LED Indicator's Being ON

The following error codes are for users to identify possible errors occurred when the AS00SCM module is installed on the right side of the CPU module and acts as a ccommunication module.

Error Code	Description	Solution
16#1605	Hardware failure	1. Check if the module is securely installed. 2. Change and install a new AS00SCM or contact the factory.

Error Code	Description	Solution
16#1606	The setting of the function card is incorrect.	1. Check if the function card is securely installed. 2. Change and install a new function card or contact the factory. 3. Check if the setting in HWCONFIG is consistent with the actual setting in the function card. 4. Change and install a new AS00SCM or contact the factory.

12.3.3.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

The following error codes are for users to identify possible errors occurred when the AS00SCM module is installed on the right side of the CPU module and acts as a ccommunication module.

Error Code	Description	Solution
16#1802	Incorrect parameters	Check the parameter in HWCONFIG, and the parameter. Download the parameter again.
16#1803	Communication timeout	1. Check whether the communication cable is connected well. 2. Check if the station number and the communication format are correctly set. 3. Check if the connection with the function card is working fine.
16#1804	The settingof the UD Link is incorrect.	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.

The following error codes can only be viewed via SCMSoft; when the following errors occurred, they will not be shown on the LED indicators and the system will not send the error messages to the CPU module.

Error Code	Description	Solution
16#0107	The settings in HWCONFIG and actual manual settings are not consistent for the function card 1.	Check the settings in HWCONFIG and actual manual settings for the function card 1.
16#0108	The settings in HWCONFIG and actual manual settings are not consistent for the function card 2.	Check the settings in HWCONFIG and actual manual settings for the function card 2.
16#0201	Incorrect parameters	Check the parameter in HWCONFIG, and the parameter. Download the parameter again.
16#0301	Function card 1 communication timeout	1. Check if the station number and the communication format are correctly set. 2. Check if the connection with the function card is working fine.
16#0302	Function card 2 communication timeout	1. Check if the station number and the communication format are correctly set. 2. Check if the connection with the function card is working fine.
16#0400	Invalid UD Link Group ID for the function card 1	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.
16#0401	Invalid UD Link Group ID for the function card 2	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.

Error Code	Description	Solution
16#0402	Invalid UD Link Command for the function card 1	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.
16#0403	Invalid UD Link Command for the function card 1	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.

12.3.4 Troubleshootings for Module AS00SCM as a Remote Module

Errors from the remote modules are regarded as warnings for AS CPU modules. The LED indicator of the CPU module will blink and the CPU module can still operate. Users can use the flag SM30 to work with the programs in the PLC to manage the ways to present the errors from the remote modules.

12.3.4.1 Error LED Indicator's Being ON

Error codes for the error tyep

Error Code	Description	Solution
16#1301	Hardware failure	1. Check if the module is securely installed. 2. Change and install a new AS00SCM or contact the factory.
16#1302	The setting of the function card is incorrect.	1. Check if the function card is securely installed with the AS-FCOPM card. 2. Change and install a new function card or contact the factory. 3. Check if the setting in HWCONFIG is consistent with the actual setting in the function card. 4. Change and install a new AS00SCM or contact the factory.

12.3.4.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

Error codes for the warning type

Error Code	Description	Solution
16#1502	Incorrect parameters	Check the parameter in HWCONFIG, and the parameter. Download the parameter again.
16#1503	Extension module communication timeout	Make sure the module is well-connected to the CPU module and tuno-on the modules again.

12.3.4.3 ERROR LED Indicator's Blinking Every 0.2 Seconds

This happens when the power supply of 24VDC for the remote module is not sufficient. Please check the power supply. If the power supply is normal, remove the extension module from the CPU module and then check if the SCM remote module is out of order. The error codes below are of the warning types.

Error Code	Description	Solution
16#1303	24VDC power supply is not sufficient and then is recovered from a low-voltage less than 10ms situation.	Check whether the 24 V power supply to the module is normal.

12.4 Error Codes and LED Indicators for CPU Modules

A. Columns

a. Error code: If the error occurs in the system, the error code is generated.

b. Description: The description of the error

c. CPU status: If the error occurs, the CPU stops running, keeps running, or in the status defined by users.

- Stop: The CPU stops running when the error occurs.
- Continue: The CPU keeps running when the error occurs.

d. LED indicator status: If the error occurs, the LED indicator is ON, OFF, or blinks.

- ERROR: The system error

- **Descriptions**

Module Type	LED indicator	Descriptions
CPU	Error LED	There are 5 types of error indicator status for the errors of the CPU module, including LED indicator ON, OFF, blinking fast, blinking normally, and blinking slowly. When the LED indicator is ON, blinking fast/normally, users need to clear the problems first in order to run the CPU module. When the LED indicator is blinking slowly, indicating a warning type of error codes, it does not require immediate action. It is suggested to clear the prolems when the module is power-off. Error type: ON: A serious error occurs in the module. Blinking fast (evey 0.2 seconds): unstable power supply or hardware failure Blinking normally (evey 0.5 second): system program errors or system cannot run. Warning type: Blinking slowly (every 1 second and stop for 3 seconds): a warning is triggered, but the system can still run. OFF: a warning is triggered, but the system can still run. Users can modify the rules of how a warning is triggered or use the SM/SR to show the warnings.

12.4.1 Error Codes and LED Indicators for CPU Modules

Note: refer to the section 12.3 for the status descriptions of the Error LED indicatiors.

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
000A	Scan timeout	Stop	V				
000C	The program in the PLC is damaged.	Stop			V		
0010	The access to the memory in the CPU is denied.	Stop			V		
0011	The PLC ID is incorrect.	Continue					V

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
0012	The PLC password is incorrect.	Continue					V
0026	RTC cannot keep track of the current time (The battery LED is blinking.)	Continue					
0027	Battery low (The battery LED is ON.)	Continue					
002A	24VDC power supply is not sufficient and then is recovered from a low-voltage less than 10ms situation.	Continue		V			
002D	The PLC maximum password attempts exceeded.	Continue					V
002E	The access to the external memory of the CPU is denied.	Stop			V		
002F	PLC programs are not consistentwith the system logs.	Stop			V		
0050	The memories in the latched special auxiliary relays are abnormal.	Continue					V
0051	The latched special data registers are abnormal.	Continue					V
0052	The memories in the latched auxiliary relays are abnormal.	Continue					V
0054	The latched counters are abnormal.	Continue					V
0055	The latched 32-bit counters are abnormal.	Continue					V
0056	The latched special auxiliary relay is abnormal.	Continue					V
0059	The latched data registers are abnormal.	Continue					V
005D	The CPU module does not detect a memory card.	Continue					V
005E	The memory card is initialized incorrectly.	Continue					V
0063	An error occurs when data is written to the memory card.	Continue					V
0064	A file in the memory card can not be read.	Continue					V
0070	The actual arrangement of the function cards is not consistent with the settings.	Stop			V		
0102	The interrupt number exceeds the range.	Stop			V		
0202	The MC instruction exceeds the range.	Stop			V		
0302	The MCR instruction exceeds the range.	Stop			V		
0D03	The operands used in DHSCS are not used properly.	Stop			V		
0E05	The operands HCXXX used in DCNT are not used properly.	Stop			V		
1300 ~ 130F	Errors occurred in the remote modules	Continue				V	
1402	The actual arrangement of the I/O modules is not consistent with the settings.	Stop			V		
140B	The communication modules exceed the limit of 4.	Stop			V		
140D	The extension modules exceed the limit of 32.	Stop			V		
140E	The remote modules exceed the limit of 8 on the right side of the CPU module.	Stop			V		

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
1500	Connection lost in the remote modules	Continue				V	
1502 ~ 150F	Errors occurred in the remote modules	Continue				V	
1600	The ID of the extension module exceeds the range.	Stop			V		
1601	The ID of the extension module cannot be set.	Stop			V		
1602	The ID of the extension module is duplicated.	Stop			V		
1603	The extension module cannot be opearated.	Stop			V		
1604	Extension module communication timeout	Stop			V		
1605	Hardware failure	Stop			V		
1606	Errors on the function card of the communication module	Stop			V		
1607	The external voltage is abnormal.	Stop			V		
1608	The Internal factory calibration or the CJC is abnormal.	Stop			V		
1609 ~ 160F	Reserved (Error codes for the extension modules)	Stop			V		
1800 ~ 180F	Errors occurred in the extension modules	Continue				V	
2001	Without using the FCOMP card or not in the right mode for the ASDA-A2 while using the CANopen communication instruction.	Continue					V
2003	The device used in the program exceeds the device range.	Continue					V
200A	Invalid instruction	Stop			V		
200B	The operand n or the other constant operands K/H exceed the range.	Continue					V
200C	The operands overlap.	Continue					V
200D	The binary to the binary-coded decimal conversion is incorrect.	Continue					V
200E	The string does not end with 00.	Continue					V
2012	Incorrect division operation	Continue					V
2013	The value exceeds the range of values which can be represented by the floating-point numbers.	Continue					V
2014	The task designated by TKON/YKOFF is incorrect, or exceeds the range.	Continue					V
2017	The instruction BREAK is written outside of the FOR-NEXT.	Continue					V
2027	No such position planning table number or the format is incorrect.	Continue					V
6004	The IP address filter is set incorrectly.	Continue					V

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
600D	RJ45 port is not connected.	Continue					V
6010	The number of the MODBUS TCP connections exceeds the range.	Continue			V		
6011	The number of the EtherNet/IP connections exceeds the range.	Continue			V		
6012	There are devices using the same IP address.	Continue					V
6100	The email connection is busy.	Continue					V
6103	The trigger attachment mode in the email is set incorrectly.	Continue					V
6104	The attachment in the email does not exist.	Continue					V
6105	The attachment in the email is oversized.	Continue					V
6106	There is an SMTP server response timeout.	Continue					V
6107	There is an SMTP server response timeout.	Continue					V
6108	SMTP verification failed	Continue					V
6200	The remote communication IP address set in the TCP socket function is illegal.	Continue					V
6201	The local communication port set in the TCP socket function is illegal.	Continue					V
6202	The remote communication port set in the TCP socket function is illegal.	Continue					V
6203	The device from which the data is sent in the TCP socket function is illegal.	Continue					V
6206	The device which receives the data in the TCP socket function is illegal.	Continue					V
6208	The data which is received through the TCP socket exceeds the device range.	Continue					V
6209	The remote communication IP address set in the UDP socket function is illegal.	Continue					V
620A	The local communication port set in the UDP socket function is illegal.	Continue					V
620C	The device from which the data is sent in the UDP socket function is illegal.	Continue					V
620F	The device which receives the data in the UDP socket function is illegal.	Continue					V
6210	The data which is received through the UDP socket exceeds the device range.	Continue					V
6212	There is no response from the remote device after the timeout period.	Continue					V
6213	The data received exceeds the limit.	Continue					V
6214	The remote device refuses the connection.	Continue					V
6215	The socket is not opened.	Continue					V
6217	The socket is opened.	Continue					V
6218	The data has been sent through the socket.	Continue					V
6219	The data has been received through the socket.	Continue					V
621A	The socket is closed.	Continue					V

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
7011	The device communication function code in COM1 is incorrect.	Continue					V
7012	The device communication address used in COM1 is incorrect.	Continue					V
7013	The device used in COM1 exceeds the device range.	Continue					V
7014	The device length of the communication data in COM1 exceeds the limit.	Continue					V
7017	The device checksum for the communication serial port of COM1 is incorrect.	Continue					V
7021	The device communication function code in COM2 is incorrect.	Continue					V
7022	The device communication address used in COM2 is incorrect.	Continue					V
7023	The device used in COM2 exceeds the device range.	Continue					V
7024	The device length of the communication data in COM2 exceeds the limit.	Continue					V
7027	The device checksum for the communication serial port of COM2 is incorrect.	Continue					V
7031	The device communication function code in the Ethernet is incorrect.	Continue					V
7032	The device communication address used in the Ethernet is incorrect.	Continue					V
7033	The device used in the Ethernet exceeds the device range.	Continue					V
7034	The device length of the communication data in the Ethernet exceeds the limit.	Continue					V
7037	The device checksum for the communication serial port of the Ethernet is incorrect.	Continue					V
7041	The device communication function code in the USB is incorrect.	Continue					V
7042	The device communication address used in the USB is incorrect.	Continue					V
7043	The device used in the USB exceeds the device range.	Continue					V
7044	The device length of the communication data in the USB exceeds the limit.	Continue					V
7047	The device checksum for the communication serial port of the USB is incorrect.	Continue					V
70B1	The device communication function code in the function card 1 is incorrect.	Continue					V
70B2	The device communication address used in the function card 1 is incorrect.	Continue					V
70B3	The device used in the function card 1 exceeds the device range.	Continue					V

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
70B4	The device length of the communication data in the function card 1 exceeds the limit.	Continue					V
70B7	The device checksum for the communication serial port of the function card 1 is incorrect.	Continue					V
70C1	The device communication function code in the function card 2 is incorrect.	Continue					V
70C2	The device communication address used in the function card 2 is incorrect.	Continue					V
70C3	The device used in the function card 2 exceeds the device range.	Continue					V
70C4	The device length of the communication data in the function card 2 exceeds the limit.	Continue					V
70C7	The device checksum for the communication serial port of the function card 2 is incorrect.	Continue					V
7203	Invalid communication function code	Continue					V
8105	The contents of the program downloaded are incorrect. The program syntax is incorrect.	Continue					V
8106	The contents of the program downloaded are incorrect. The length of the execution code exceeds the limit.	Continue					V
8107	The contents of the program downloaded are incorrect. The length of the source code exceeds the limit.	Continue					V

12.4.2 Error Codes and LED Indicators for Analog / Temperature Modules

Error code	Description	ERROR LED indicator status	
		A → D / D → A / A ↔ D	ERROR
16#1605	Hardware failure	OFF	ON
16#1607	The external voltage is abnormal.	OFF	ON
16#1608	The factory calibration or the CJC is abnormal.	OFF	ON
16#1801*1	The external voltage is abnormal.	OFF	Blinking
16#1802*1	Hardware failure	OFF	Blinking
16#1804*1	The factory calibration is abnormal.	RUN: Blinking STOP: OFF	Blinking
16#1807*1	The CJC is abnormal.	OFF	Blinking
16#1808	The signal received by channel 1 exceeds the range of analog inputs (temperature).	RUN: Blinking STOP: OFF	Blinking
16#1809	The signal received by channel 2 exceeds the range of analog inputs (temperature).		

Error code	Description	ERROR LED indicator status	
		A → D / D → A / A ↔D	ERROR
16#180A	The signal received by channel 3 exceeds the range of analog inputs (temperature).		
16#180B	The signal received by channel 4 exceeds the range of analog inputs (temperature).		

*1: The following errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Users can set up in HWCONFIG to have them shown as errors when the first 4 errors occurred.

12.4.3 Error Codes and LED Indicators for Load Cell Module AS02LC

Error code	Description	ERROR LED indicator status	
		A → D	ERROR
16#1605	Hardware failure (the diver board included)	OFF	ON
16#1607	The external voltage is abnormal.	OFF	ON
16#1801*1	The external voltage is abnormal.	OFF	Blinking
16#1802*1	Hardware failure	OFF	Blinking
16#1807*1	Diver board failure	OFF	Blinking
16#1808	The signal received by channel 1 exceeds the range of analog inputs or the SEN voltage is abnormal.	RUN: Blinking STOP: OFF	Blinking
16#1809	The signal received by channel 1 exceeds the weight limit.		
16#180A	The factory calibration in channel 1 is incorrect.		
16#180B	The signal received by channel 2 exceeds the range of analog inputs or the SEN voltage is abnormal.		
16#180C	The signal received by channel 2 exceeds the weight limit.		
16#180D	The factory calibration in channel 2 is incorrect.		

*1: The following errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Users can set up in HWCONFIG to have them shown as errors when the 3 errors occurred.

12.4.4 Error Codes and LED Indicators for Module AS00SCM as a Communication Module

Error Code	Description	ERROR LED indicator status	
		ON	Blinking
16#1605	Hardware failure	V	
16#1606	The setting of the function card is incorrect.	V	
16#1802	Incorrect parameters		V
16#1803	Communication timeout		V
16#1804	The settingof the UD Link is incorrect.		V

12.4.5 Error Codes and LED Indicators for Module AS00SCM as a Remote Module

Error Code	Description	ERROR LED indicator status		
		ON	Blinking	Blinking fast
16#1301	Hardware failure	V		
16#1302	The setting of the function card is incorrect.	V		
16#1303	24VDC power supply is not sufficient and then is recovered from a low-voltage less than 10ms situation.			V
16#1502	Incorrect parameters		V	
16#1503	Extension module communication timeout		V	

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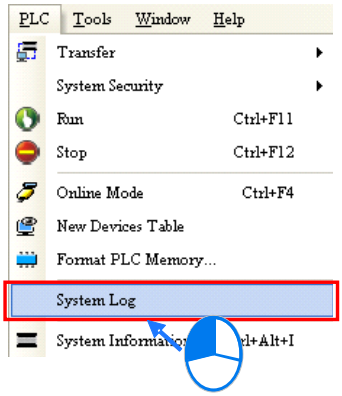
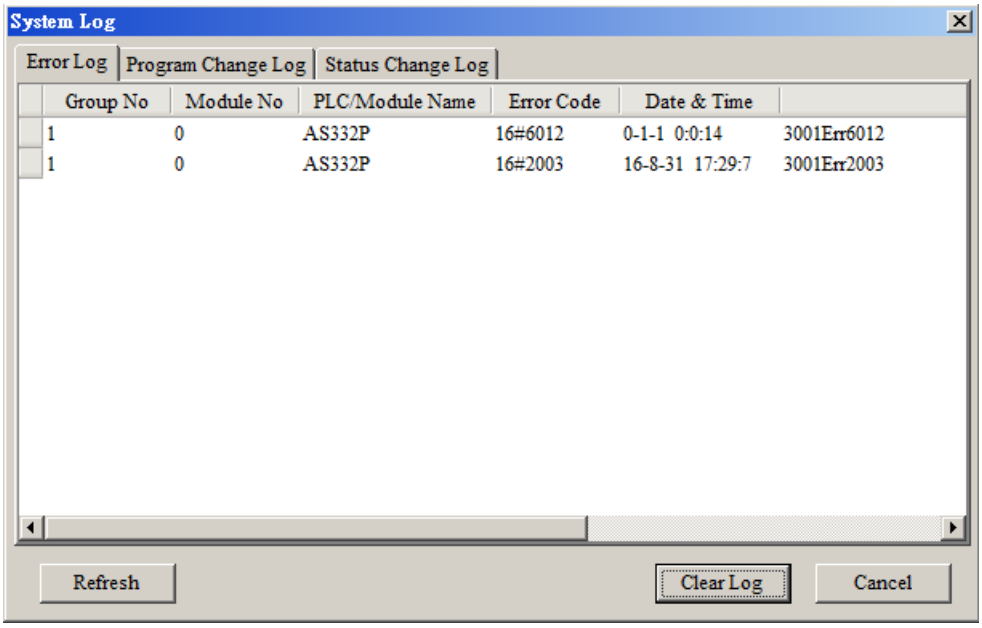
12.1.4 System Log

If ISPSoft is connected to an AS series normally, users can view the actions and the errors occur in the AS series after they click **System Log** on the **PL**C menu. Up to 20 piece of error logs can be stored in the CPU. After the 20 sets are stored, the 1st log will be replaced with the 21st if there are new logs coming in; the old logs will be replaced with the new ones accordingly. When the memory card is installed in the CPU module, 20 pieces of the old logs will be backedup in the memory card and up to 10000 logs can be recorded. If the stored log exceeds the limitation of 1000, the oldest 20 logs will be replaced with the newest 20 logs in the memeory card.

(1) Click **System Log** on the **PL**C menu. PLC> System Log.



(2) After users click **System Log** on the **PL**C menu, the **System Log** window will appear. After users click **Clear Log**, the error log in the window and the error log in the CPU module will be cleared, and the CPU module will be reset.



- Group No.: The number 1 indicates the error occurred in the CPU module or the right-side module 1. The number 2~16 indicates the error occurred in the remote module 1~15.
- Module No.: The number 0 indicates the error occurred in the CPU module or the remote module. The number 1~32 indicates the error occurred in the right-side modue of the CPU module / remote module. (The number 1 represents the closest module to the CPU module or the remote module; this number increases from the closest to the furthest to the CPU module or the remote module.) Note: Up to 8 extension modules can be connected to the right-side of the remote module.
- PLC/Module name: Model names of the CPU modules, remote modules and the extension modules.

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Chapter 12 Troubleshooting

Table of Contents

12.1 Troubleshooting

12.1.1 Basic troubleshooting steps

This chapter includes kinds of possible errors occurred during operation and the causes of them and what actions should be taken to correct the errors.

(1) Check the followings:

- PLC should be operated in a safe environment (the environmental, electronical, vibrational safeties should be considered.)
- Power supply should be correctly connected and supply power to the PLC.
- Installations of modules, terminals and cables are secured.
- All the LED indicators are shown correct.
- All the switches are correctly set.

(2) Check the followings for the AS series to operate:

- Switch the RUN/STOP
- Check the settings for the AS series to RUN/STOP
- Check and eliminate the errors from the external devices
- Use the System Log function of the ISPSoft to check the system operation and the logs.

(3) Identify the source of the possible causes:

- AS series or external device
- CPU modules or the extension modules
- Setting parameters or programs

12.1.2 Clear the States of Errors

Use the following methods to clear the status of errors when errors occurred. But if the source of error is not fixed, the system will still show errors.

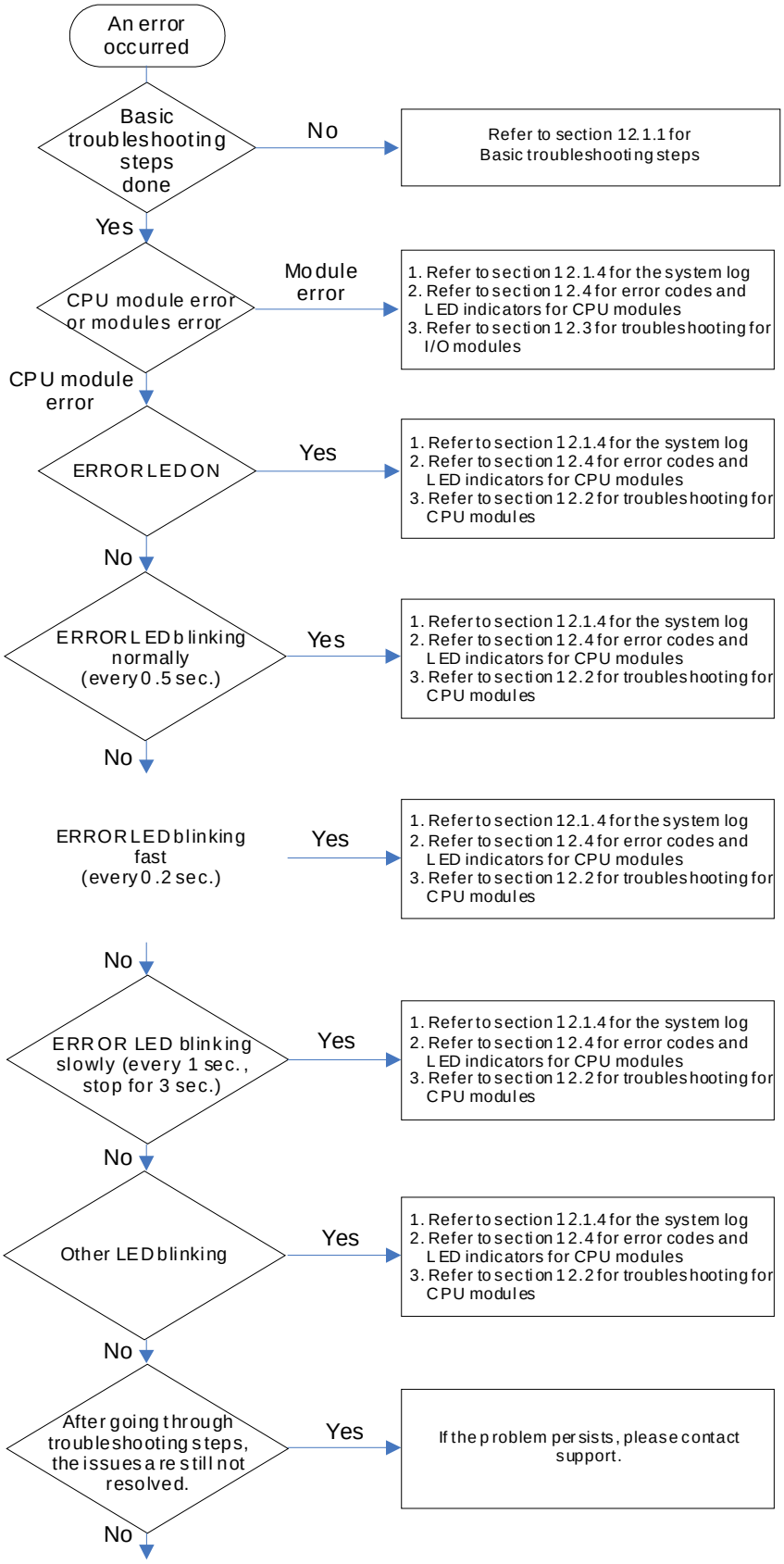
(1) Switch the state of the CPU model to STOP and then to RUN.

(2) Turn off the CPU and turn on again.

(3) Use the ISPSoft to clear the error logs.

(4) Reset the CPU and set the settings to defaults and download the project again to operate.

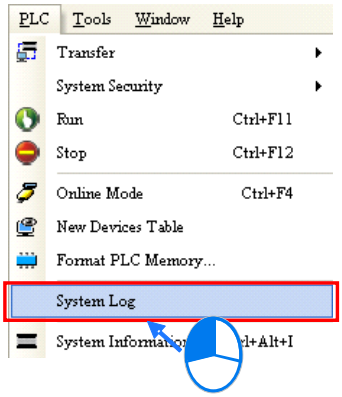
12.1.3 Troubleshooting SOP



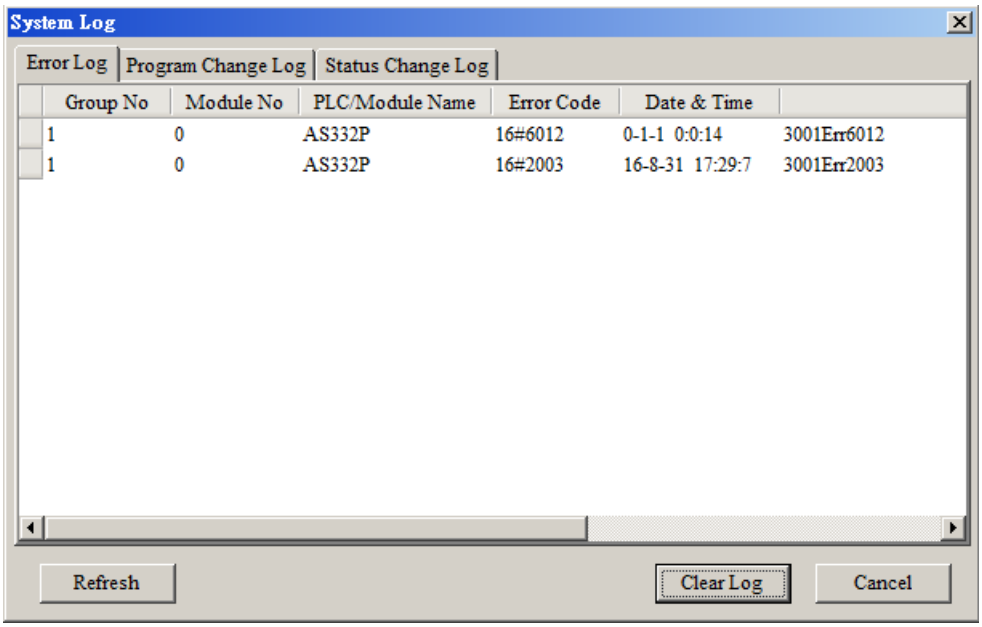
12.1.4 System Log

If ISPSoft is connected to an AS series normally, users can view the actions and the errors occur in the AS series after they click **System Log** on the **PLC** menu. Up to 20 piece of error logs can be stored in the CPU. After the 20 sets are stored, the 1st log will be replaced with the 21st if there are new logs coming in; the old logs will be replaced with the new ones accordingly. When the memory card is installed in the CPU module, 20 pieces of the old logs will be backed up in the memory card and up to 10000 logs can be recorded. If the stored log exceeds the limitation of 1000, the oldest 20 logs will be replaced with the newest 20 logs in the memory card.

(1) Click **System Log** on the **PLC** menu. PLC> System Log.



(2) After users click **System Log** on the **PLC** menu, the **System Log** window will appear. After users click **Clear Log**, the error log in the window and the error log in the CPU module will be cleared, and the CPU module will be reset.



- Group No.: The number 1 indicates the error occurred in the CPU module or the right-side module 1. The number 2~16 indicates the error occurred in the remote module 1~15.
- Module No.: The number 0 indicates the error occurred in the CPU module or the remote module. The number 1~32 indicates the error occurred in the right-side module of the CPU module / remote module. (The number 1 represents the closest module to the CPU module or the remote module; this number increases from the closest to the furthest to the CPU module or the remote module.) Note: Up to 8 extension modules can be connected to the right-side of the remote module.
- PLC/Module name: Model names of the CPU modules, remote modules and the extension modules.

- Error Code: Error codes of the error log.
- Date & Time: The error occurred date and time. The most recent occurred error will be listed on the top.
- The last column shows the relative descriptions for the error.

12.2 Troubleshooting for CPU Modules

Check the LED indicators and the error codes from the CPU module and refer to the following table for troubleshooting. V in the Log column indicates the error will be recorded in the log; X in the Log column indicates the error will not be recorded in the log; H in the Log column indicates whether to record the error in the log or not can be set in HWCONFIG.

12.2.1 ERROR LED Indicator's Being ON

Error Code (16#)	Description	Solution	Flag	Log
000A	Scan timeout	1. Check the setting of the watchdog timer in HWCONFIG. 2. Check whether the program causes the long scan time	SM8	V

12.2.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

Error Code (16#)	Description	Solution	Flag	Log
000C	The program in the PLC is damaged.	Download the program again.	SM9	V
0010	The access to the memory in the CPU is denied.	Please contact the factory.	SM9	V
002E	The access to the external memory of the CPU is denied.	Please contact the factory.	SM9	V
002F	PLC programs are not consistent with the system logs.	Download the program again.	SM34	V
0070	The actual arrangement of the function cards is not consistent with the settings.	Check whether the settings in HWCONFIG are consistent with the actual arrangement of the function cards.	SM10	V
0102	The interrupt number exceeds the range.	Check the program, compile the program again, and download the program again.	SM5	X
0202	The MC instruction exceeds the range.	Check the program, compile the program again, and download the program again.	SM5	X
0302	The MCR instruction exceeds the range.	Check the program, compile the program again, and download the program again.	SM5	X
0D03	The operands used in DHSCS are not used properly.	Check the program, compile the program again, and download the program again.	SM5	X
0E05	The operands HCXXX used in DCNT are not used properly.	Check the program, compile the program again, and download the program again.	SM5	X

Error Code (16#)	Description	Solution	Flag	Log
1300 ~ 130F	Errors occurred in the remote modules	Refer to section 12.3.4 for more information on the error codes of the remote modules.	SM30	V
1402	The actual arrangement of the I/O modules is not consistent with the settings.	Check whether the settings in HWCONFIG are consistent with the actual arrangement of the I/O modules.	SM10	V
140B	The communication modules exceed the limit of 4.	Check the total number of the communication modules.	SM10	V
140D	The extension modules exceed the limit of 32.	Check the total number of the extension modules.	SM10	V
140E	The remote modules exceed the limit of 8 on the right side of the CPU module.	Check the total number of the remote modules on the right side of the CPU module.	SM30	V
1600	The ID of the extension module exceeds the range.	1. Make sure the module is well-connected to the CPU module and turn-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1601	The ID of the extension module cannot be set.	1. Make sure the module is well-connected to the CPU module and turn-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1602	The ID of the extension module is duplicated.	1. Make sure the module is well-connected to the CPU module and turn-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1603	The extension module cannot be operated.	1. Make sure the module is well-connected to the CPU module and turn-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1604	Extension module communication timeout	1. Make sure the module is well-connected to the CPU module and turn-on the modules again. 2. If the error still occurs, please contact the factory.	SM10	V
1605	Hardware failure	Please contact the factory.	SM10	V
1606	Errors on the function card of the communication module	Make sure the function card is well-connected to the CPU module and turn-on the modules again.	SM10	V
1607	The external voltage is abnormal.	Check whether the external 24 V power supply to the module is normal.	SM10	V
1608	The Internal factory calibration or the CJC is abnormal.	Please contact the factory.	SM10	V
1609 ~ 160F	Reserved (Error codes for the extension modules)			
200A	Invalid instruction	Check the program, compile the program again, and download the program again.	SM5	V
6010	The number of the MODBUS TCP connections exceeds the range.	Check if the number of the superior devices exceeds the limit of 32.	SM 1092	V
6011	The number of the EtherNet/IP connections exceeds the range.	Check if the number of the connections exceeds the range of 16.	SM 1093	V

12.2.3 ERROR LED Indicator's Rapid Blinking Every 0.2 Seconds

This happens when the power supply 24VDC of the CPU module is disconnecting or the power supply is not sufficient, not stable or abnormal so that it cannot be operated.

Error Code (16#)	Description	Solution	Flag	Log
002A	The external voltage is abnormal.	Check whether the external 24 V power supply to the module is normal.	SM7	V

12.2.4 ERROR LED Indicator's Slow Blinking Every 3 Seconds and Lighting up for 1 Second

Error Code (16#)	Description	Solution	Flag	Log
1500	Connection lost in the remote modules	Please check the network connection cable.	SM30	V
1502 ~ 150F	Errors occurred in the remote modules	Refer to section 12.3.4 for more information on the error codes of the remote modules.	SM30	V
1800 ~ 180F	Errors occurred in the extension modules	Refer to section 12.3 for more information on the error codes of the extension modules.	SM10	V
1900 ~ 191C	Heartbeat errors occurred in the slave of Delta ASD-A2 control.	1. Check the CANopen connection cable. 2. Check if the specific salve is working properly. Note: The last 2 digits of the error code represent the ID number of the slave (hexadecimal should convert to decimal).	-	V

12.2.5 BAT. LOW LED Indicator's Being ON

This happens when there is no battery (CR1620) or the power is low. Users can set this option off in the HWCONFIG > CPU > Device Setting > Show Battery Low Voltage Error CPU, when users don't need the function of RTC to keep track of the current time. (Default is enabled.)

Error Code (16#)	Description	Solution	Flag	Log
0027	Battery Low	Change battery or set this option off	SM219	X

12.2.6 BAT. LOW LED Indicator's Blinking Every 0.5 Seconds

This happens when RTC cannot keep track of the current time.

Error Code (16#)	Description	Solution	Flag	Log
0026	RTC cannot keep track of the current time	Please contact the factory.	SM218	V

12.2.7 The LED Indicators of RUN and ERROR are Blinking Every 0.5 Seconds Simultaneously

This happens when the firmware of the CPU module is being upgraded. If this happens once the power is supplied to the

CPU module, it means errors occurred during the previous firmware upgrade. Users need to upgrade the firmware again or contact your point of purchase.

12.2.8 The LED Indicators of RUN and ERROR are Blinking One After Another Every 0.5 Seconds.

This happens when the memory card of the CPU module is backing up / restoring / or saving.

12.2.9 Other Errors (Without LED Indicators)

Error Code (16#)	Description	Solution	Flag	Log
0011	The PLC ID is incorrect.	Please check the PLC ID.	SM34	V
0012	The PLC password is incorrect.	Please check the PLC password.	SM34	V
002D	The PLC maximum password attempts exceeded.	Reset the CPU module or restore the CPU module to its factory settings.	SM34	V
0050	The memories in the latched special auxiliary relays are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0051	The latched special data registers are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0052	The memories in the latched auxiliary relays are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0054	The latched counters are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0055	The latched 32-bit counters are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0056	The latched special auxiliary relay is abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, please contact the factory.	SM6	V
0059	The latched data registers are abnormal.	1. Reset the CPU module or restore the CPU module to its factory settings, and then download the program and the parameters again. 2. If the error still occurs, contact the factory.	SM6	V
005D	The CPU module does not detect a memory card.	Check whether a memory card is inserted into the CPU module correctly.	SM453	V
005E	The memory card is initialized incorrectly.	Check whether the memory card is broken.	SM453	V
0063	An error occurs when data is written to the memory card.	Check whether the file path is correct, or whether the memory card breaks down.	SM453	V

0064	A file in the memory card cannot be read.	Check whether the file path is correct, or whether the file is damaged.	SM453	V
1950	The initialization of Delta ASD-A2 control has not yet been completed, the CANopen instructions cannot be executed.	1. Check the CANopen connection cable. 2. Check if the specific salve is working properly. 3. If nothing is wrong, initialize Delta ASD-A2 again.	-	V
2001	Without using the FCOMP card or not in the right mode for the ASDA-A2 while using the CANopen communication instruction.	Make sure to use the FCOMP card in the function card 2 and check if the operation mode is correct.	SM0	V
2003	The device used in the program exceeds the device range.	Check the program, compile the program again, and download the program again.	SM0	V
200B	The operand n or the other constant operands K/H exceed the range.	Check the program, compile the program again, and download the program again.	SM0	V
200C	The operands overlap.	Check the program, compile the program again, and download the program again.	SM0	V
200D	The binary to the binary-coded decimal conversion is incorrect.	Check the program, compile the program again, and download the program again.	SM0	V
200E	The string does not end with 00.	Check the program, compile the program again, and download the program again.	SM0	V
2012	Incorrect division operation	Check the program, compile the program again, and download the program again.	SM0	V
2013	The value exceeds the range of values which can be represented by the floating-point numbers.	Check the program, compile the program again, and download the program again.	SM0	V
2014	The task designated by TKON/YKOFF is incorrect, or exceeds the range.	Check the program, compile the program again, and download the program again.	SM0	V
2017	The instruction BREAK is written outside of the FOR-NEXT.	Check the program, compile the program again, and download the program again.	SM0	V
2027	No such position planning table number or the format is incorrect.	1. Check the program, compile the program again, and download the program again. 2. Check the settings of the position planning table.	SM0	V
2028	The high speed output instruction is being executed. Only one instruction can be executed at a time.	Refer to SR28 for the record of the axis number and rearrange the output control procedures.	-	V
6004	The IP address filter is set incorrectly.	Set the Ethernet parameter for the CPU module in HWCONFIG again.	SM1108	X
600D	RJ45 port is not connected.	Check the connection.	SM1100	X
6012	There are devices using the same IP address.	1. Check if there are devices using the same IP address. 2. Check if there is more than 1 DHCP or BOOTP server on the network.	SM1101	V
6100	The email connection is busy.	Retry the email connection later. (This error does not cause the PLC to stop running. Users can perform the corresponding solution by means of the related flag in the program.)	SM1113	X
6103	The trigger attachment mode in the email is set incorrectly.	Set up the trigger attachment mode in HWCONFIG > CPU Module > Device Setting > Options > Ethernet Port Advanced > Email > Trigger Setting > Trigger Attachment Mode.	SM1113	X

6104	The attachment in the email does not exist.	Check whether the attachment exists in the memory card.	SM1113	X
6105	The attachment in the email is oversized.	Check the size of the attachment. If the size is over 2 MB, the file cannot be sent as an attachment.	SM1113	X
6106	There is an SMTP server response timeout.	Check for the correct address and set up the SMTP server in HWCONFIG > CPU Module > Device Setting > Options > Ethernet Port Advanced > Email again.	SM1113	X
6107	There is an SMTP server response timeout.	1. Check whether the status of the SMTP server is normal. 2. Retry the sending of the email later. (This error does not cause the PLC to stop running. Users can perform the corresponding solution by means of the related flag in the program.)	SM1113	X
6108	SMTP verification failed	Check for the correct ID/Password and set up in HWCONFIG > CPU Module > Device Setting > Options > Ethernet Port Advanced > Email again.	SM1113	X
6200	The remote communication IP address set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6201	The local communication port set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6202	The remote communication port set in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6203	The device from which the data is sent in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6206	The device which receives the data in the TCP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X
6208	The data which is received through the TCP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > TCP Socket.	-	X

6209	The remote communication IP address set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
620A	The local communication port set in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
620C	The device from which the data is sent in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
620F	The device which receives the data in the UDP socket function is illegal.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
6210	The data which is received through the UDP socket exceeds the device range.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
6212	There is no response from the remote device after the timeout period.	Make sure that the remote device is connected.	-	X
6213	The data received exceeds the limit.	1. Check the program and the related special data registers. 2. Set the Ethernet parameter for the CPU module in HWCONFIG CPU Module > Device Setting > Options > Ethernet Port Advanced > UDP Socket.	-	X
6214	The remote device refuses the connection.	Make sure that the remote device operates normally.	-	X
6215	The socket is not opened.	Check whether operational sequence in the program is correct.	-	X
6217	The socket is opened.	Check whether operational sequence in the program is correct.	-	X
6218	The data has been sent through the socket.	Check whether operational sequence in the program is correct.	-	X
6219	The data has been received through the socket.	Check whether operational sequence in the program is correct.	-	X
621A	The socket is closed.	Check whether operational sequence in the program is correct.	-	X
7011	The device communication function code in COM1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H

7012	The device communication address used in COM1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7013	The device used in COM1 exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7014	The device length of the communication data in COM1 exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7017	The device checksum for the communication serial port of COM1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7021	The device communication function code in COM2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7022	The device communication address used in COM2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7023	The device used in COM2 exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7024	The device length of the communication data in COM2 exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7027	The device checksum for the communication serial port of COM2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7031	The device communication function code in the Ethernet is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7032	The device communication address used in the Ethernet is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7033	The device used in the Ethernet exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7034	The device length of the communication data in the Ethernet exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7037	The device checksum for the communication serial port of the Ethernet is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7041	The device communication function code in the USB is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7042	The device communication address used in the USB is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7043	The device used in the USB exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H

7044	The device length of the communication data in the USB exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7047	The device checksum for the communication serial port of the USB is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B1	The device communication function code in the function card 1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B2	The device communication address used in the function card 1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B3	The device used in the function card 1 exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B4	The device length of the communication data in the function card 1 exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70B7	The device checksum for the communication serial port of the function card 1 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C1	The device communication function code in the function card 2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C2	The device communication address used in the function card 2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C3	The device used in the function card 2 exceeds the device range.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C4	The device length of the communication data in the function card 2 exceeds the limit.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
70C7	The device checksum for the communication serial port of the function card 2 is incorrect.	1. Check the communication setting in the master, and the communication setting in slave. 2. Check the communication cable.	-	H
7203	Invalid communication function code	Refer to the function codes defined by the communication protocols	-	H
8105	The contents of the program downloaded are incorrect. The program syntax is incorrect.	Download the program and the parameters again.	-	H
8106	The contents of the program downloaded are incorrect. The length of the execution code exceeds the limit.	Download the program and the parameters again.	-	H
8107	The contents of the program downloaded are incorrect. The length of the source code exceeds the limit.	Download the program and the parameters again.	-	H

12.3 Troubleshooting for I/O Modules

- **Introduction of modules**

  Digital I/O modules, analog I/O modules, temperature measurement modules, load cell modules, and network modules can be installed in an AS series system. There are 2 types of error codes, for errors and for warning. The CPU module and its modules will stop operating when errors occurred. The CPU modules and its modules will not stop operating when warnings triggered.

12.3.1 Troubleshooting for Analog Modules (AD/DA/XA) and Temperature Modules (RTD/TC)

12.3.1.1 ERROR LED Indicator's Being ON

The Following errors will be specified as warnings. Users need to set up in HWCONFIG to have them shown as errors when the following errors occurred.

Error Code	Description	Solution
16#1605	Hardware failure	Please contact the factory.
16#1607	The external voltage is abnormal.	Check the power supply.
16#1608	The factory calibration or the CJC is abnormal.	Please contact the factory.

12.3.1.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

The following errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Users can set up in HWCONFIG to have them shown as errors when the first 4 errors occurred.

Error Code	Description	Solution
16#1801	The external voltage is abnormal.	Check the power supply.
16#1802	Hardware failure	Please contact the factory.
16#1804	The factory calibration is abnormal.	Please contact the factory.
16#1807	The CJC is abnormal.	Please contact the factory.
16#1808	The signal received by channel 1 exceeds the range of analog inputs (temperature).	Check the signal received by channel 1
16#1809	The signal received by channel 2 exceeds the range of analog inputs (temperature).	Check the signal received by channel 2
16#180A	The signal received by channel 3 exceeds the range of analog inputs (temperature).	Check the signal received by channel 3
16#180B	The signal received by channel 4 exceeds the range of analog inputs (temperature).	Check the signal received by channel 4

12.3.2 Troubleshooting for Load Cell Module AS02LC

12.3.2.1 ERROR LED Indicator's Being ON

Users can set up in HWCONFIG to have them shown as errors when the following errors occurred.

Error Code	Description	Solution
16#1605	Hardware failure (e.g. the diver board)	Please contact the factory.
16#1607	The external voltage is abnormal.	Check the power supply.

12.3.2.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

The following errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Users can set up in HWCONFIG to have them shown as errors when the first 3 errors occurred.

Error Code	Description	Solution
16#1801	The external voltage is abnormal.	Check the power supply.
16#1802	Hardware failure	Please contact the factory.
16#1807	Diver board failure	Please contact the factory.
16#1808	The signal received by channel 1 exceeds the range of analog inputs or the SEN voltage is abnormal.	Check the signal received by channel 1 and the cable connections.
16#1809	The signal received by channel 1 exceeds the weight limit.	Check the value inputted in channel 1 and the setting of the maximum weight.
16#180A	The factory calibration in channel 1 is incorrect.	Check the weight calibration in channel 1.
16#180B	The signal received by channel 2 exceeds the range of analog inputs or the SEN voltage is abnormal.	Check the signal received by channel 2 and the cable connections.
16#180C	The signal received by channel 2 exceeds the weight limit.	Check the value inputted in channel 2 and the setting of the maximum weight.
16#180D	The factory calibration in channel 2 is incorrect.	Check the weight calibration in channel 1.

12.3.3 Troubleshooting for Module AS00SCM as a Communication Module

12.3.3.1 ERROR LED Indicator's Being ON

The following error codes are for users to identify possible errors occurred when the AS00SCM module is installed on the right side of the CPU module and acts as a communication module.

Error Code	Description	Solution
16#1605	Hardware failure	1. Check if the module is securely installed. 2. Change and install a new AS00SCM or contact the factory.

Error Code	Description	Solution
16#1606	The setting of the function card is incorrect.	1. Check if the function card is securely installed. 2. Change and install a new function card or contact the factory. 3. Check if the setting in HWCONFIG is consistent with the actual setting in the function card. 4. Change and install a new AS00SCM or contact the factory.

12.3.3.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

The following error codes are for users to identify possible errors occurred when the AS00SCM module is installed on the right side of the CPU module and acts as a communication module.

Error Code	Description	Solution
16#1802	Incorrect parameters	Check the parameter in HWCONFIG, and the parameter. Download the parameter again.
16#1803	Communication timeout	1. Check whether the communication cable is connected well. 2. Check if the station number and the communication format are correctly set. 3. Check if the connection with the function card is working fine.
16#1804	The setting of the UD Link is incorrect.	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.

The following error codes can only be viewed via SCMSoft; when the following errors occurred, they will not be shown on the LED indicators and the system will not send the error messages to the CPU module.

Error Code	Description	Solution
16#0107	The settings in HWCONFIG and actual manual settings are not consistent for the function card 1.	Check the settings in HWCONFIG and actual manual settings for the function card 1.
16#0108	The settings in HWCONFIG and actual manual settings are not consistent for the function card 2.	Check the settings in HWCONFIG and actual manual settings for the function card 2.
16#0201	Incorrect parameters	Check the parameter in HWCONFIG, and the parameter. Download the parameter again.
16#0301	Function card 1 communication timeout	1. Check if the station number and the communication format are correctly set. 2. Check if the connection with the function card is working fine.
16#0302	Function card 2 communication timeout	1. Check if the station number and the communication format are correctly set. 2. Check if the connection with the function card is working fine.
16#0400	Invalid UD Link Group ID for the function card 1	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.
16#0401	Invalid UD Link Group ID for the function card 2	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.

Error Code	Description	Solution
16#0402	Invalid UD Link Command for the function card 1	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.
16#0403	Invalid UD Link Command for the function card 1	1. Check the settings of the UD Link. 2. Check the settings to trigger warnings in the PLC.

12.3.4 Troubleshooting for Module AS00SCM as a Remote Module

Errors from the remote modules are regarded as warnings for AS CPU modules. The LED indicator of the CPU module will blink and the CPU module can still operate. Users can use the flag SM30 to work with the programs in the PLC to manage the ways to present the errors from the remote modules.

12.3.4.1 Error LED Indicator's Being ON

Error codes for the error type

Error Code	Description	Solution
16#1301	Hardware failure	1. Check if the module is securely installed. 2. Change and install a new AS00SCM or contact the factory.
16#1302	The setting of the function card is incorrect.	1. Check if the function card is securely installed with the AS-FCOPM card. 2. Change and install a new function card or contact the factory. 3. Check if the setting in HWCONFIG is consistent with the actual setting in the function card. 4. Change and install a new AS00SCM or contact the factory.

12.3.4.2 ERROR LED Indicator's Blinking Every 0.5 Seconds

Error codes for the warning type

Error Code	Description	Solution
16#1502	Incorrect parameters	Check the parameter in HWCONFIG, and the parameter. Download the parameter again.
16#1503	Extension module communication timeout	Make sure the module is well-connected to the CPU module and turn-on the modules again.

12.3.4.3 ERROR LED Indicator's Blinking Every 0.2 Seconds

This happens when the power supply of 24VDC for the remote module is not sufficient. Please check the power supply. If the power supply is normal, remove the extension module from the CPU module and then check if the SCM remote module is out of order. The error codes below are of the warning types.

Error Code	Description	Solution
16#1303	24VDC power supply is not sufficient and then is recovered from a low-voltage less than 10ms situation.	Check whether the 24 V power supply to the module is normal.

12.4 Error Codes and LED Indicators for CPU Modules

A. Columns

a. Error code: If the error occurs in the system, the error code is generated.

b. Description: The description of the error

c. CPU status: If the error occurs, the CPU stops running, keeps running, or in the status defined by users.

- Stop: The CPU stops running when the error occurs.
- Continue: The CPU keeps running when the error occurs.

d. LED indicator status: If the error occurs, the LED indicator is ON, OFF, or blinks.

- ERROR: The system error

- **Descriptions**

Module Type	LED indicator	Descriptions
CPU	Error LED	There are 5 types of error indicator status for the errors of the CPU module, including LED indicator ON, OFF, blinking fast, blinking normally, and blinking slowly. When the LED indicator is ON, blinking fast/normally, users need to clear the problems first in order to run the CPU module. When the LED indicator is blinking slowly, indicating a warning type of error codes, it does not require immediate action. It is suggested to clear the problems when the module is power-off. Error type: ON: A serious error occurs in the module. Blinking fast (every 0.2 seconds): unstable power supply or hardware failure Blinking normally (every 0.5 second): system program errors or system cannot run. Warning type: Blinking slowly (every 1 second and stop for 3 seconds): a warning is triggered, but the system can still run. OFF: a warning is triggered, but the system can still run. Users can modify the rules of how a warning is triggered or use the SM/SR to show the warnings.

12.4.1 Error Codes and LED Indicators for CPU Modules

Note: refer to the section 12.3 for the status descriptions of the Error LED indicators.

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
000A	Scan timeout	Stop	V				
000C	The program in the PLC is damaged.	Stop			V		
0010	The access to the memory in the CPU is denied.	Stop			V		
0011	The PLC ID is incorrect.	Continue					V

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
0012	The PLC password is incorrect.	Continue					V
0026	RTC cannot keep track of the current time (The battery LED is blinking.)	Continue					
0027	Battery low (The battery LED is ON.)	Continue					
002A	24VDC power supply is not sufficient and then is recovered from a low-voltage less than 10ms situation.	Continue		V			
002D	The PLC maximum password attempts exceeded.	Continue					V
002E	The access to the external memory of the CPU is denied.	Stop			V		
002F	PLC programs are not consistent with the system logs.	Stop			V		
0050	The memories in the latched special auxiliary relays are abnormal.	Continue					V
0051	The latched special data registers are abnormal.	Continue					V
0052	The memories in the latched auxiliary relays are abnormal.	Continue					V
0054	The latched counters are abnormal.	Continue					V
0055	The latched 32-bit counters are abnormal.	Continue					V
0056	The latched special auxiliary relay is abnormal.	Continue					V
0059	The latched data registers are abnormal.	Continue					V
005D	The CPU module does not detect a memory card.	Continue					V
005E	The memory card is initialized incorrectly.	Continue					V
0063	An error occurs when data is written to the memory card.	Continue					V
0064	A file in the memory card cannot be read.	Continue					V
0070	The actual arrangement of the function cards is not consistent with the settings.	Stop			V		
0102	The interrupt number exceeds the range.	Stop			V		
0202	The MC instruction exceeds the range.	Stop			V		
0302	The MCR instruction exceeds the range.	Stop			V		
0D03	The operands used in DHSCS are not used properly.	Stop			V		
0E05	The operands HCXXX used in DCNT are not used properly.	Stop			V		
1300 ~ 130F	Errors occurred in the remote modules	Continue				V	
1402	The actual arrangement of the I/O modules is not consistent with the settings.	Stop			V		
140B	The communication modules exceed the limit of 4.	Stop			V		
140D	The extension modules exceed the limit of 32.	Stop			V		
140E	The remote modules exceed the limit of 8 on the right side of the CPU module.	Stop			V		

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
1500	Connection lost in the remote modules	Continue				V	
1502 ~ 150F	Errors occurred in the remote modules	Continue				V	
1600	The ID of the extension module exceeds the range.	Stop			V		
1601	The ID of the extension module cannot be set.	Stop			V		
1602	The ID of the extension module is duplicated.	Stop			V		
1603	The extension module cannot be operated.	Stop			V		
1604	Extension module communication timeout	Stop			V		
1605	Hardware failure	Stop			V		
1606	Errors on the function card of the communication module	Stop			V		
1607	The external voltage is abnormal.	Stop			V		
1608	The Internal factory calibration or the CJC is abnormal.	Stop			V		
1609 ~ 160F	Reserved (Error codes for the extension modules)	Stop			V		
1800 ~ 180F	Errors occurred in the extension modules	Continue				V	
1900 ~ 191C	Heartbeat errors occurred in the slave of Delta ASD-A2 control.	Continue				V	
1950	The initialization of Delta ASD-A2 control has not yet been completed, the CANopen instructions cannot be executed.	Continue					V
2001	Without using the FCOMP card or not in the right mode for the ASDA-A2 while using the CANopen communication instruction.	Continue					V
2003	The device used in the program exceeds the device range.	Continue					V
200A	Invalid instruction	Stop			V		
200B	The operand n or the other constant operands K/H exceed the range.	Continue					V
200C	The operands overlap.	Continue					V
200D	The binary to the binary-coded decimal conversion is incorrect.	Continue					V
200E	The string does not end with 00.	Continue					V
2012	Incorrect division operation	Continue					V
2013	The value exceeds the range of values which can be represented by the floating-point numbers.	Continue					V

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
2014	The task designated by TKON/YKOFF is incorrect, or exceeds the range.	Continue					V
2017	The instruction BREAK is written outside of the FOR-NEXT.	Continue					V
2027	No such position planning table number or the format is incorrect.	Continue					V
2028	The high speed output instruction is being executed. Only one instruction can be executed at a time.	Continue					V
6004	The IP address filter is set incorrectly.	Continue					V
600D	RJ45 port is not connected.	Continue					V
6010	The number of the MODBUS TCP connections exceeds the range.	Continue			V		
6011	The number of the EtherNet/IP connections exceeds the range.	Continue			V		
6012	There are devices using the same IP address.	Continue					V
6100	The email connection is busy.	Continue					V
6103	The trigger attachment mode in the email is set incorrectly.	Continue					V
6104	The attachment in the email does not exist.	Continue					V
6105	The attachment in the email is oversized.	Continue					V
6106	There is an SMTP server response timeout.	Continue					V
6107	There is an SMTP server response timeout.	Continue					V
6108	SMTP verification failed	Continue					V
6200	The remote communication IP address set in the TCP socket function is illegal.	Continue					V
6201	The local communication port set in the TCP socket function is illegal.	Continue					V
6202	The remote communication port set in the TCP socket function is illegal.	Continue					V
6203	The device from which the data is sent in the TCP socket function is illegal.	Continue					V
6206	The device which receives the data in the TCP socket function is illegal.	Continue					V
6208	The data which is received through the TCP socket exceeds the device range.	Continue					V
6209	The remote communication IP address set in the UDP socket function is illegal.	Continue					V
620A	The local communication port set in the UDP socket function is illegal.	Continue					V
620C	The device from which the data is sent in the UDP socket function is illegal.	Continue					V
620F	The device which receives the data in the UDP socket function is illegal.	Continue					V

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
6210	The data which is received through the UDP socket exceeds the device range.	Continue					V
6212	There is no response from the remote device after the timeout period.	Continue					V
6213	The data received exceeds the limit.	Continue					V
6214	The remote device refuses the connection.	Continue					V
6215	The socket is not opened.	Continue					V
6217	The socket is opened.	Continue					V
6218	The data has been sent through the socket.	Continue					V
6219	The data has been received through the socket.	Continue					V
621A	The socket is closed.	Continue					V
7011	The device communication function code in COM1 is incorrect.	Continue					V
7012	The device communication address used in COM1 is incorrect.	Continue					V
7013	The device used in COM1 exceeds the device range.	Continue					V
7014	The device length of the communication data in COM1 exceeds the limit.	Continue					V
7017	The device checksum for the communication serial port of COM1 is incorrect.	Continue					V
7021	The device communication function code in COM2 is incorrect.	Continue					V
7022	The device communication address used in COM2 is incorrect.	Continue					V
7023	The device used in COM2 exceeds the device range.	Continue					V
7024	The device length of the communication data in COM2 exceeds the limit.	Continue					V
7027	The device checksum for the communication serial port of COM2 is incorrect.	Continue					V
7031	The device communication function code in the Ethernet is incorrect.	Continue					V
7032	The device communication address used in the Ethernet is incorrect.	Continue					V
7033	The device used in the Ethernet exceeds the device range.	Continue					V
7034	The device length of the communication data in the Ethernet exceeds the limit.	Continue					V
7037	The device checksum for the communication serial port of the Ethernet is incorrect.	Continue					V
7041	The device communication function code in the USB is incorrect.	Continue					V
7042	The device communication address used in the USB is incorrect.	Continue					V

Error code	Description	CPU status	ERROR LED indicator status				
			ON	Blinking fast	Blinking normally	Blinking slowly	OFF
7043	The device used in the USB exceeds the device range.	Continue					V
7044	The device length of the communication data in the USB exceeds the limit.	Continue					V
7047	The device checksum for the communication serial port of the USB is incorrect.	Continue					V
70B1	The device communication function code in the function card 1 is incorrect.	Continue					V
70B2	The device communication address used in the function card 1 is incorrect.	Continue					V
70B3	The device used in the function card 1 exceeds the device range.	Continue					V
70B4	The device length of the communication data in the function card 1 exceeds the limit.	Continue					V
70B7	The device checksum for the communication serial port of the function card 1 is incorrect.	Continue					V
70C1	The device communication function code in the function card 2 is incorrect.	Continue					V
70C2	The device communication address used in the function card 2 is incorrect.	Continue					V
70C3	The device used in the function card 2 exceeds the device range.	Continue					V
70C4	The device length of the communication data in the function card 2 exceeds the limit.	Continue					V
70C7	The device checksum for the communication serial port of the function card 2 is incorrect.	Continue					V
7203	Invalid communication function code	Continue					V
8105	The contents of the program downloaded are incorrect. The program syntax is incorrect.	Continue					V
8106	The contents of the program downloaded are incorrect. The length of the execution code exceeds the limit.	Continue					V
8107	The contents of the program downloaded are incorrect. The length of the source code exceeds the limit.	Continue					V

12.4.2 Error Codes and LED Indicators for Analog / Temperature Modules

Error code	Description	ERROR LED indicator status	
		A → D / D → A / A ↔ D	ERROR
16#1605	Hardware failure	OFF	ON
16#1607	The external voltage is abnormal.	OFF	ON

Error code	Description	ERROR LED indicator status	
		A → D / D → A / A ↔ D	ERROR
16#1608	The factory calibration or the CJC is abnormal.	OFF	ON
16#1801*1	The external voltage is abnormal.	OFF	Blinking
16#1802*1	Hardware failure	OFF	Blinking
16#1804*1	The factory calibration is abnormal.	RUN: Blinking STOP: OFF	Blinking
16#1807*1	The CJC is abnormal.	OFF	Blinking
16#1808	The signal received by channel 1 exceeds the range of analog inputs (temperature).	RUN: Blinking STOP: OFF	Blinking
16#1809	The signal received by channel 2 exceeds the range of analog inputs (temperature).		
16#180A	The signal received by channel 3 exceeds the range of analog inputs (temperature).		
16#180B	The signal received by channel 4 exceeds the range of analog inputs (temperature).		

*1: The following errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Users can set up in HWCONFIG to have them shown as errors when the first 4 errors occurred.

12.4.3 Error Codes and LED Indicators for Load Cell Module AS02LC

Error code	Description	ERROR LED indicator status	
		A → D	ERROR
16#1605	Hardware failure (the diver board included)	OFF	ON
16#1607	The external voltage is abnormal.	OFF	ON
16#1801*1	The external voltage is abnormal.	OFF	Blinking
16#1802*1	Hardware failure	OFF	Blinking
16#1807*1	Diver board failure	OFF	Blinking
16#1808	The signal received by channel 1 exceeds the range of analog inputs or the SEN voltage is abnormal.	RUN: Blinking STOP: OFF	Blinking
16#1809	The signal received by channel 1 exceeds the weight limit.		
16#180A	The factory calibration in channel 1 is incorrect.		
16#180B	The signal received by channel 2 exceeds the range of analog inputs or the SEN voltage is abnormal.		
16#180C	The signal received by channel 2 exceeds the weight limit.		
16#180D	The factory calibration in channel 2 is incorrect.		

*1: The following errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Users can set up in HWCONFIG to have them shown as errors when the 3 errors occurred.

12.4.4 Error Codes and LED Indicators for Module AS00SCM as a Communication Module

Error Code	Description	ERROR LED indicator status	
		ON	Blinking
16#1605	Hardware failure	V	
16#1606	The setting of the function card is incorrect.	V	
16#1802	Incorrect parameters		V
16#1803	Communication timeout		V
16#1804	The setting of the UD Link is incorrect.		V

12.4.5 Error Codes and LED Indicators for Module AS00SCM as a Remote Module

Error Code	Description	ERROR LED indicator status		
		ON	Blinking	Blinking fast
16#1301	Hardware failure	V		
16#1302	The setting of the function card is incorrect.	V		
16#1303	24VDC power supply is not sufficient and then is recovered from a low-voltage less than 10ms situation.			V
16#1502	Incorrect parameters		V	
16#1503	Extension module communication timeout		V	

MEMO

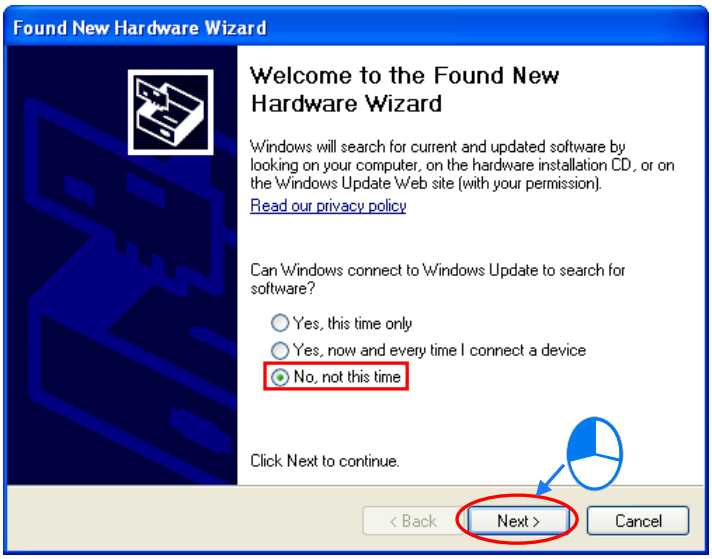
Appendix A Installing a USB Driver

Table of Contents

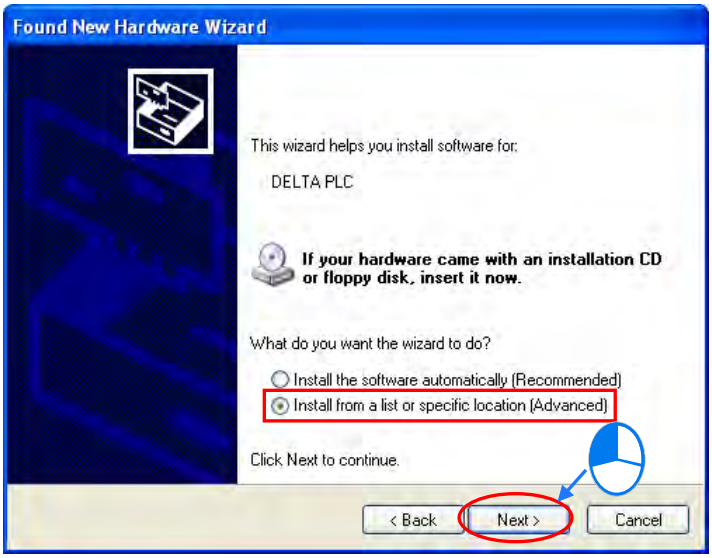
A.1 Installing the USB Driver for an AS Series CPU module in Windows XP with SP3

The installation of the USB driver for an AS series CPU module on Windows XP is introduced below. If users want to install the USB driver for an AS series CPU module on another operating system, they have to refer to the instructions in the operating system for more information about the installation of new hardware.

(1) Make sure that the AS series CPU module is supplied with power normally. Connect the AS series CPU module to a USB port on the computer with a USB cable. Select the **No, not this time** option button in the **Found New Hardware Wizard** window, and then click **Next**.

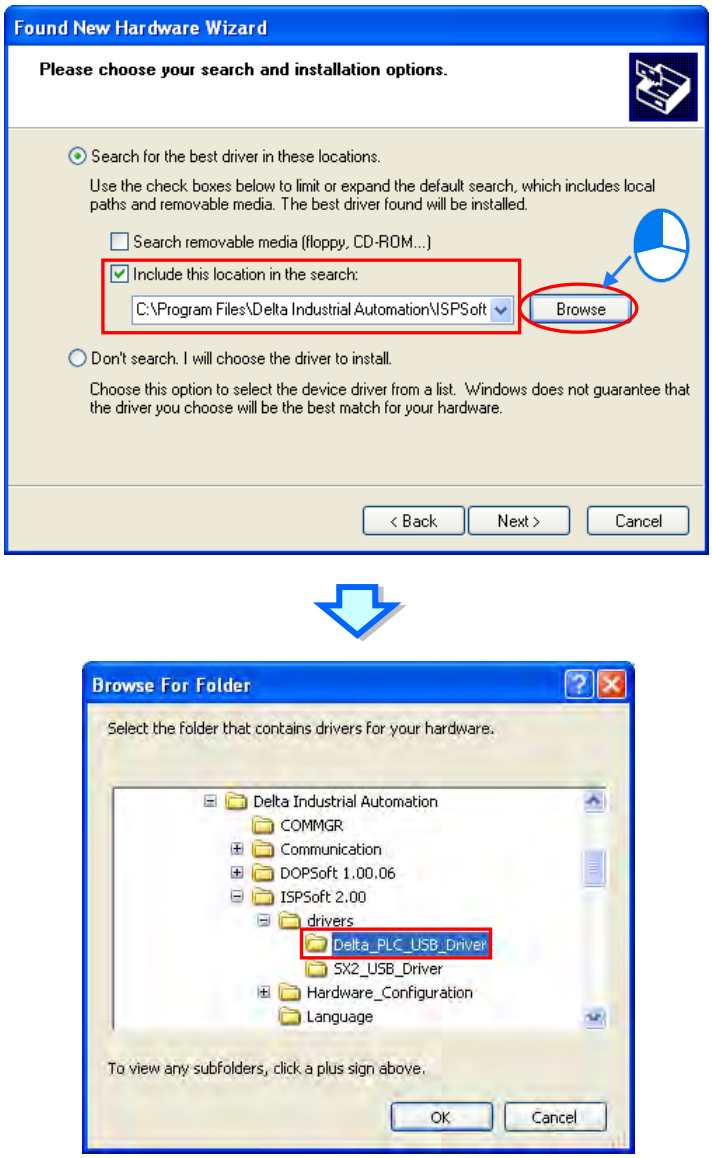


(2) The name of the USB device detected is displayed in the window. Please select the **Install from a lost or specific location (Advanced)** option button.

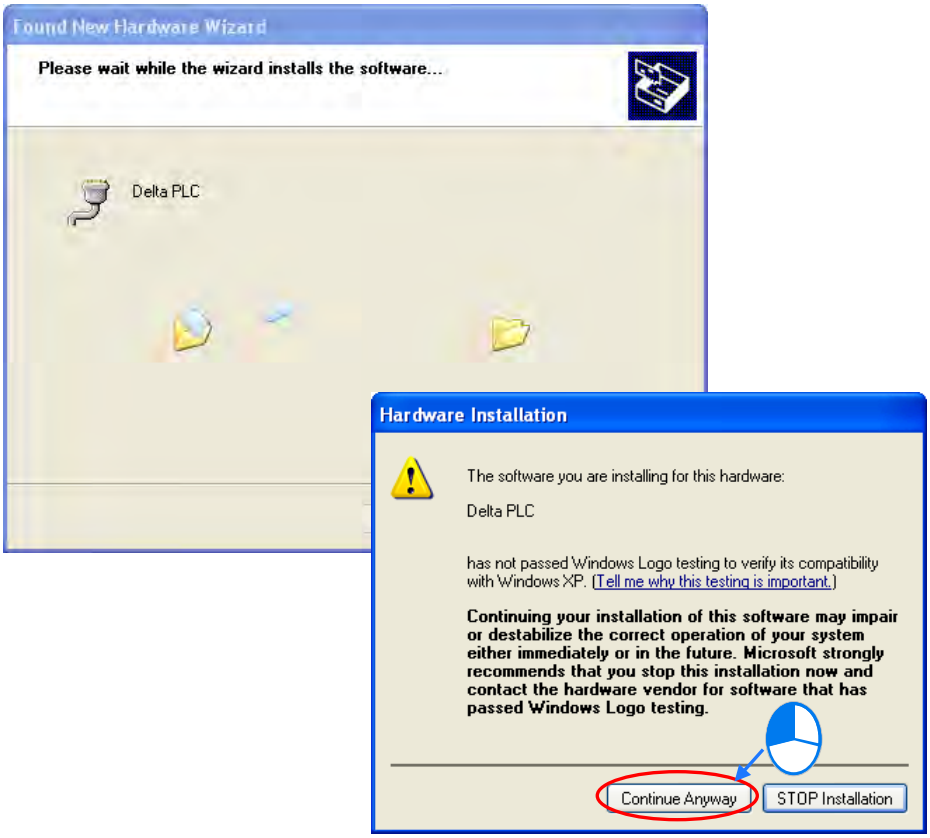


(3) After ISPSoft version 3.00 or above is installed, the driver for the AS series CPU module will be in the folder denoted by the path **Installation path of ISPSoft \drivers\Delta_PLC_USB_Driver\.**

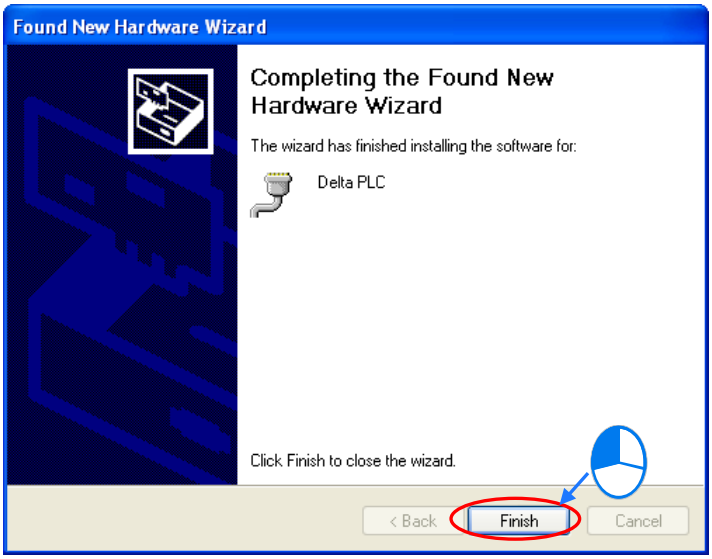
Specify the correct path. If the driver for the AS series CPU module is gotten in another way, users have to specify the corresponding path. Click **Next** to carry on the installation.



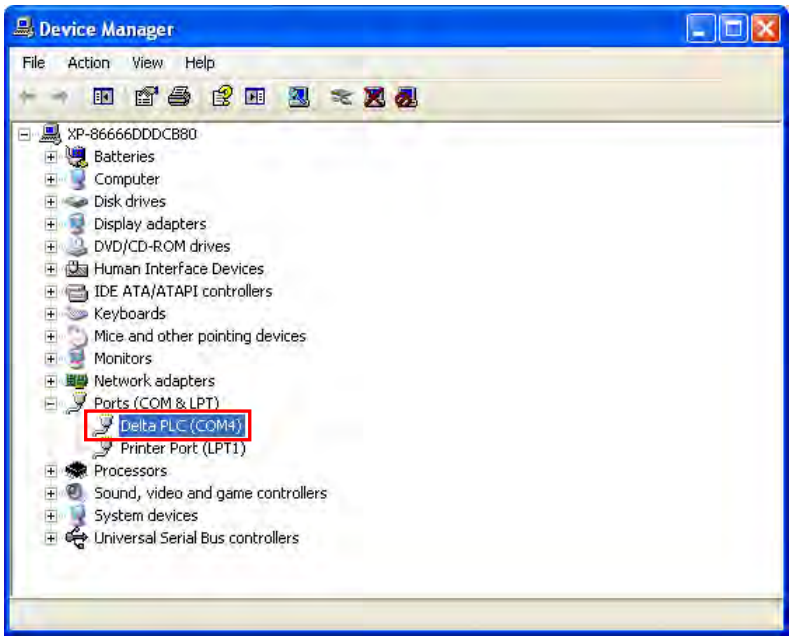
(4) After the correct driver is found in the folder denoted by the path, the system will install the driver. If the **Hardware Installation** window appears during the installation, please click **Continue Anyway**.



(5) Click **Finish** after the installation is finished.



(6) Open the **Device Manager** window after the installation is finished. If the name of the USB device connected is under **Ports (COM&LPT)**, the installation of the driver is successful. The operating system assigns a communication port number to the USB device.



Additional remark

- If the PLC is connected to another USB port on the computer, the system may ask users to install the driver again. The users can follow the steps above, and install the driver again. After the driver is installed, the communication port number that the operating system assigns to the USB device may be different.
- If Windows XP SP3 has not been installed on the computer, an error message will appear during the installation. Users can deal with the problem in either way below.

  (a) Cancel the installation, install Windows XP SP3, and reinstall the driver according to the steps above.

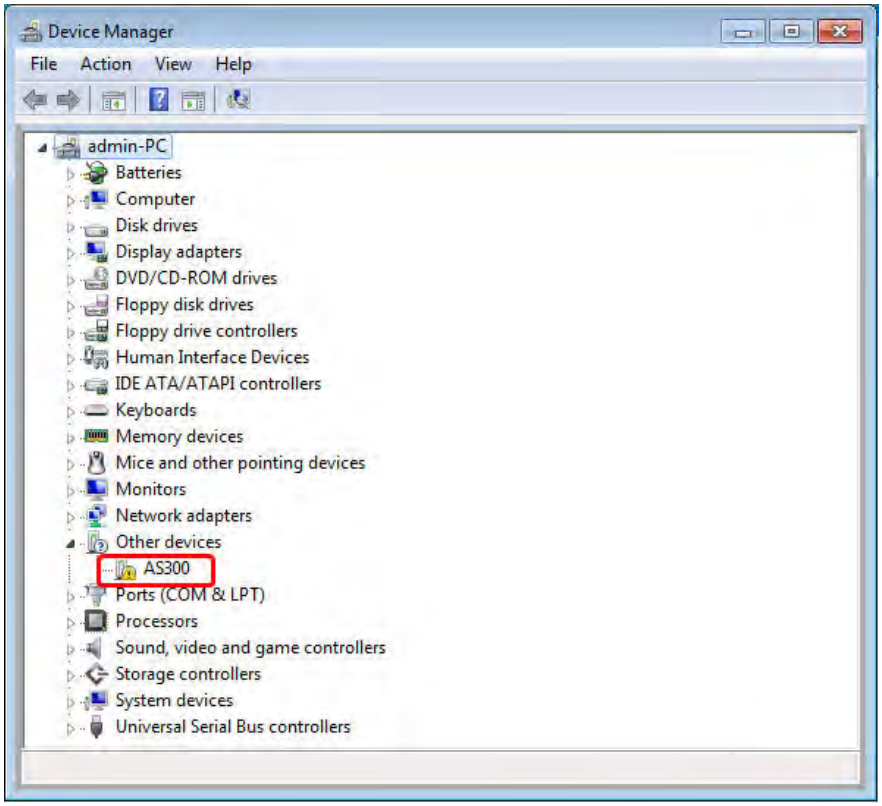
  (b) Get the file needed, and specify the path pointing to the file in the **Files Needed** window.

A.2 Installing the USB Driver for an AS Series CPU module in Windows 7

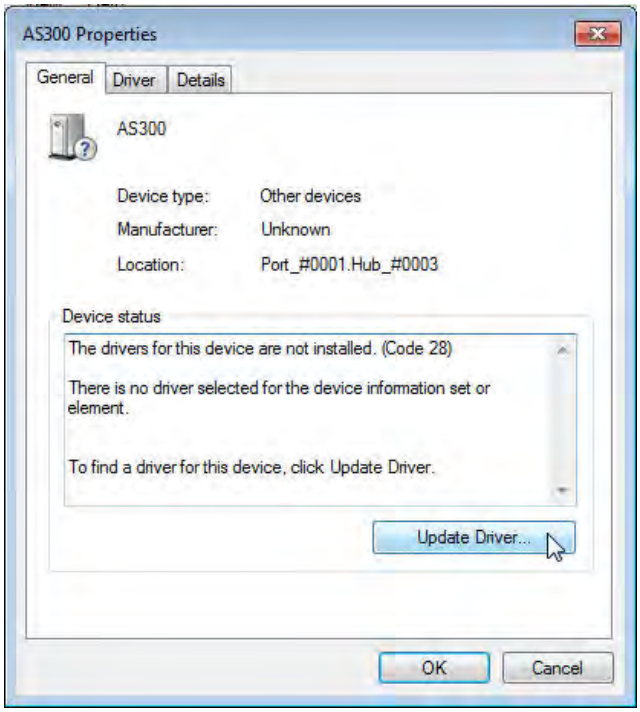
The installation of the USB driver for an AS series CPU module on Windows 7 is introduced below. If users want to install the USB driver for an AS series CPU module on another operating system, they have to refer to the instructions in the operating system for more information about the installation of new hardware.

(1) Make sure that the AS series CPU module is supplied with power normally. Connect the AS series CPU module to a USB port on the computer with a USB cable.

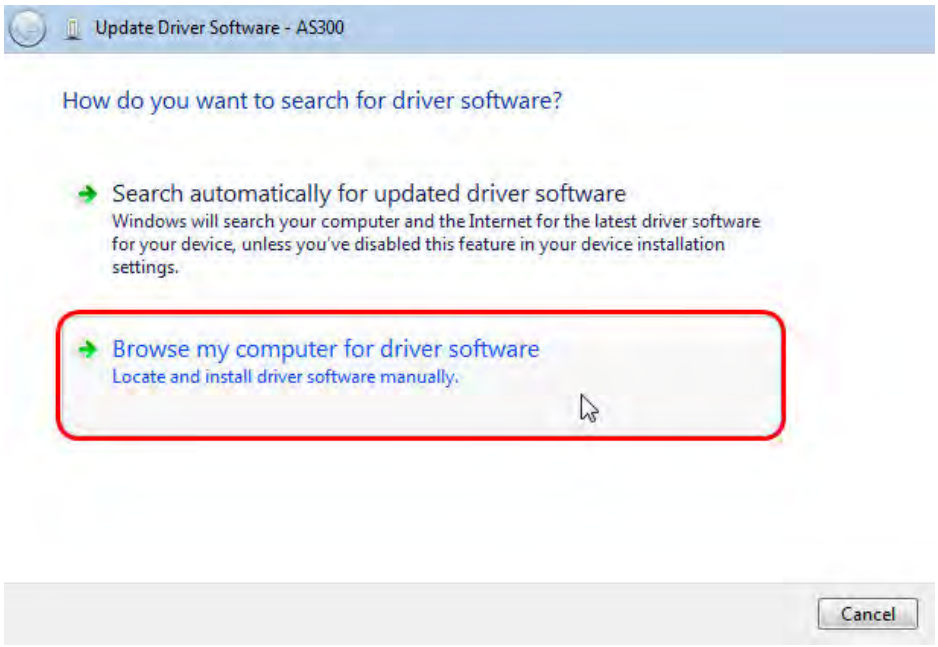
(2) The name of the USB device detected will be displayed in the Control Panel > Device Manager window. Please select and double-click AS300.



(3) Click **Update Driver....** in the **AS300 Properties** window.

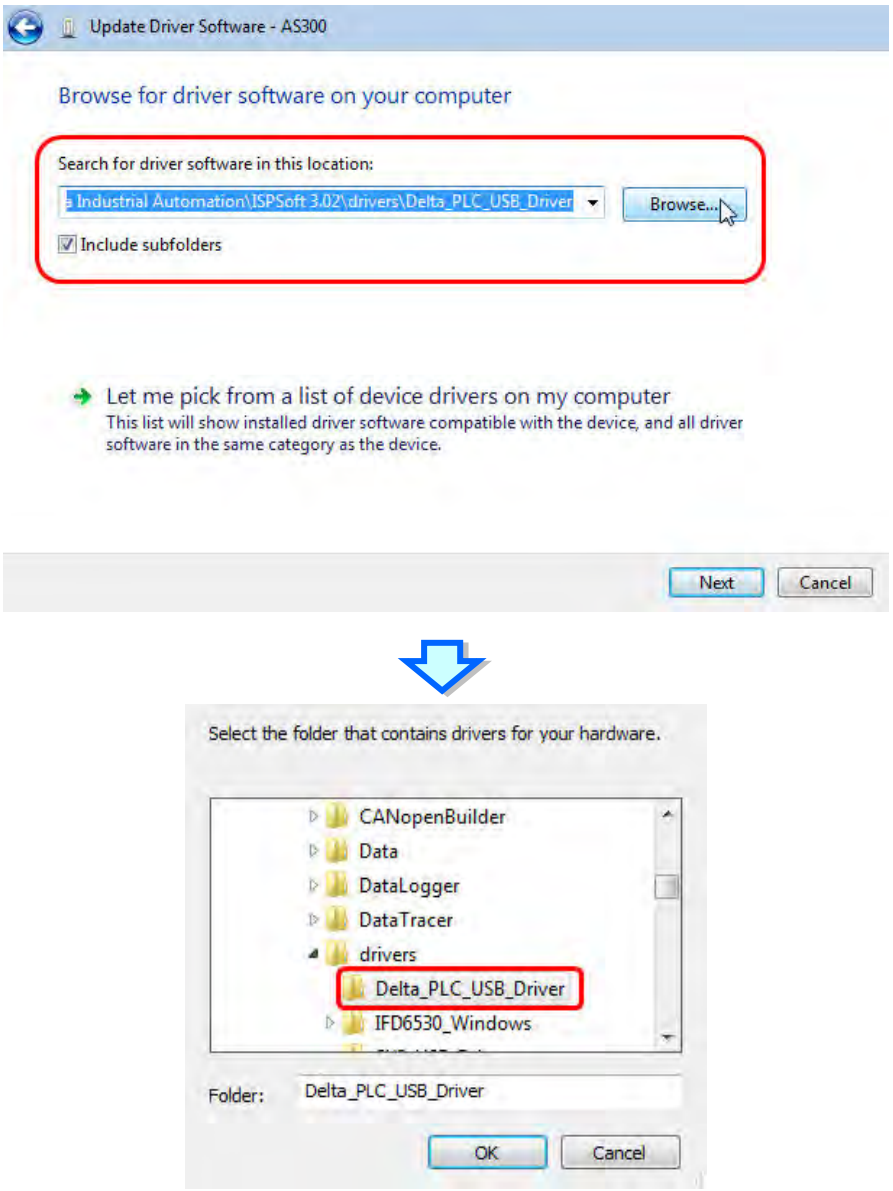


(4) Click **Browse my computer for driver software**.

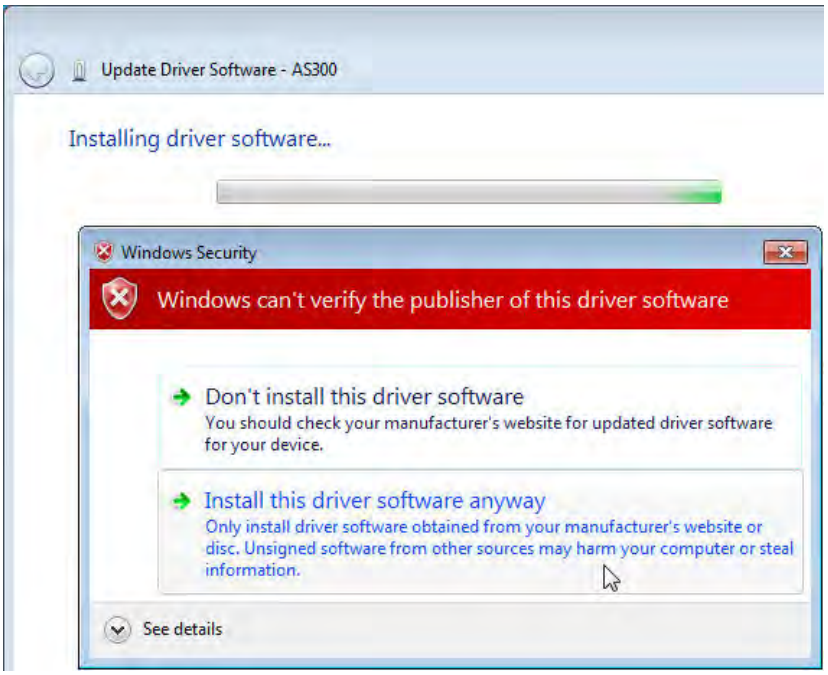


(5) After ISPSoft version 3.00 or above is installed, the driver for the AS series CPU module will be in the folder denoted by the path **Installation path of ISPSoft \drivers\Delta_PLC_USB_Driver\.**

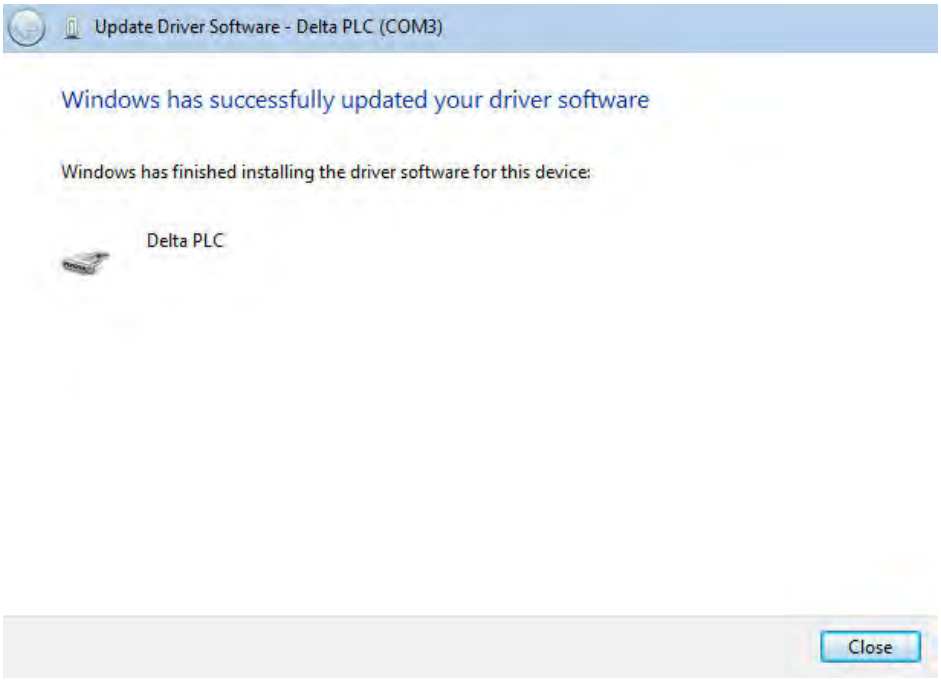
Specify the correct path. If the driver for the AS series CPU module is gotten in another way, users have to specify the corresponding path. Click **Next** to carry on the installation.



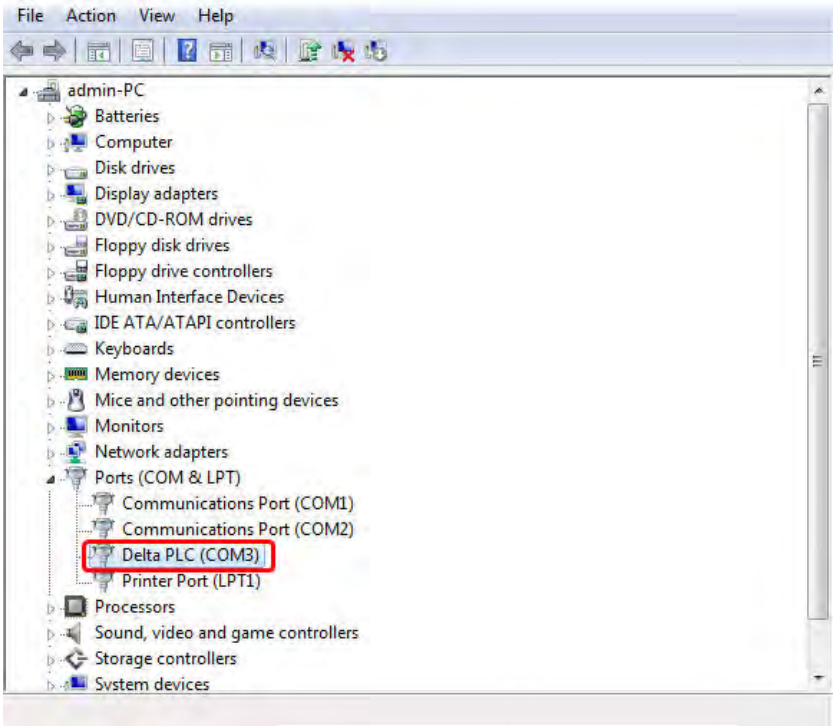
(6) After the correct driver is found in the folder denoted by the path, the system will install the driver. If the **Windows Security** window appears during the installation, please click **Install this driver software anyway**.



(7) Click **Close** after the installation is finished.



(8) Open the **Device Manager** window after the installation is finished. If the name of the USB device connected is under **Ports (COM&LPT)**, the installation of the driver is successful. The operating system assigns a communication port number to the USB device.



Additional remark

- If the PLC is connected to another USB port on the computer, the system may ask users to install the driver again. The users can follow the steps above, and install the driver again. After the driver is installed, the communication port number that the operating system assigns to the USB device may be different.

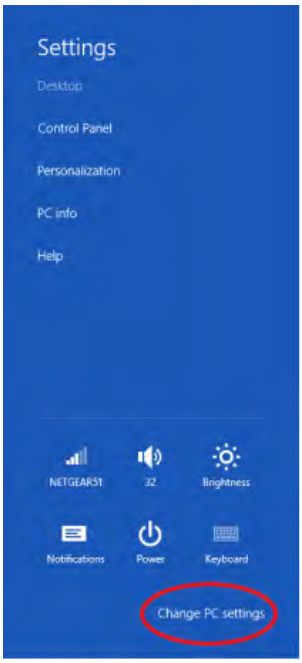
A.3 Installing the USB Driver for an AS Series CPU module in Windows 8

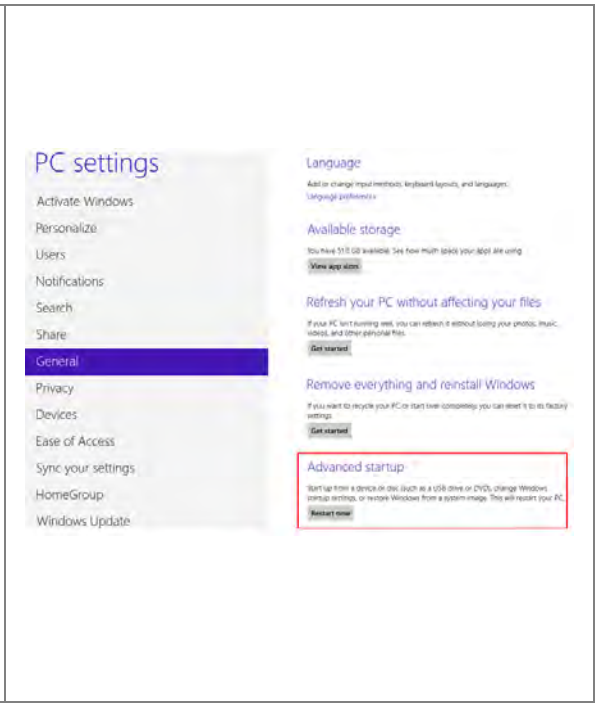
Windows 8 driver signature enforcement provides a way to improve the security of the operating system by validating the integrity of a driver or system file each time it is loaded into memory. However since Delta PLC USB driver does not include the driver signature, this section will help users to disable driver signature enforcement functionality in Windows 8 to ensure a success Delta PLC USB installation. This act is only valid for a single time. The setting will return to its original state after restarting.

Steps to disable driver signature enforcement in Windows 8:

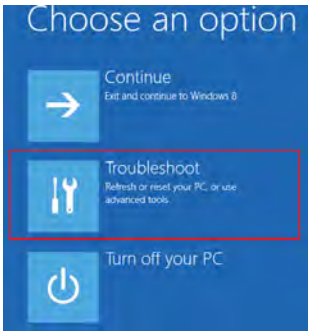
1. Press the button  【WIN】+【I】 on the keyboard to see the Setting interface. Click “Change PC settings”.

2. The PC settings window will appear. Select “General” and then “Restart now” under “Advanced startup”.



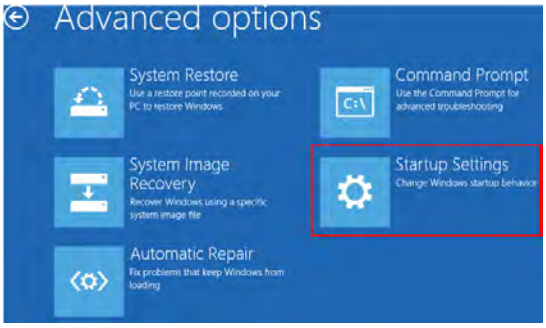


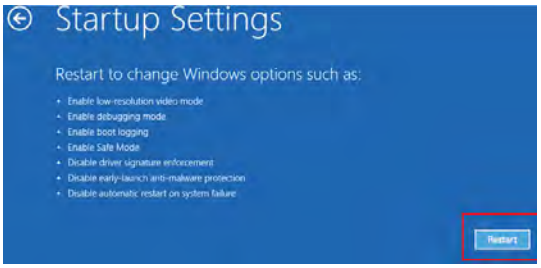
3. After the computer is restarted, select “Troubleshoot”under “Choose an option”. And then select “Advanced options”.



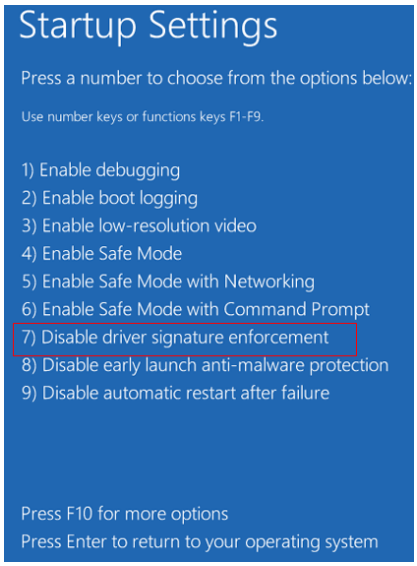
A

4. From the Advanced options page, select “Startup Settings” to see the Startup Settings. From thispage select “Restart” to restart the computer.





5. Press “7” or “F7” to choose “Disable driver signature enforcement”and the system will direct you to the Windows 8 operating page. Users can then install the Delta PLC USB driver now.

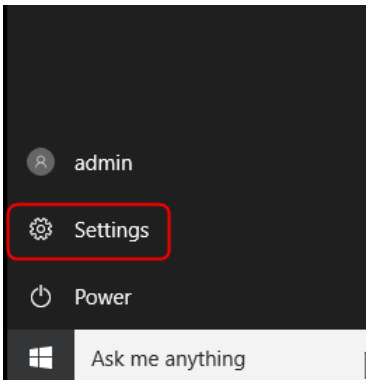
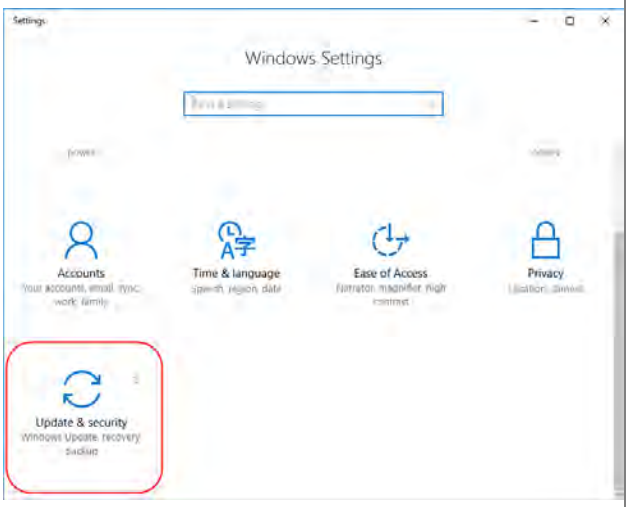


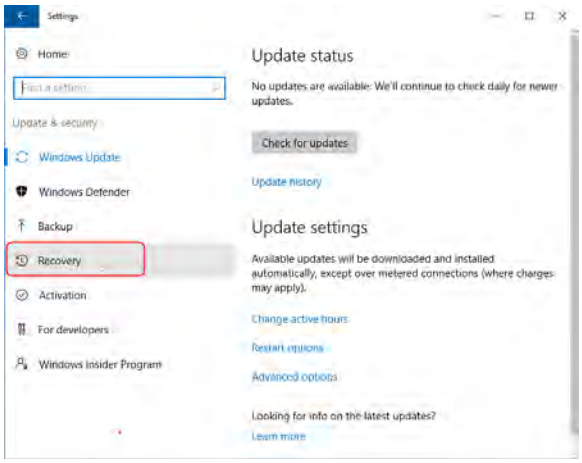
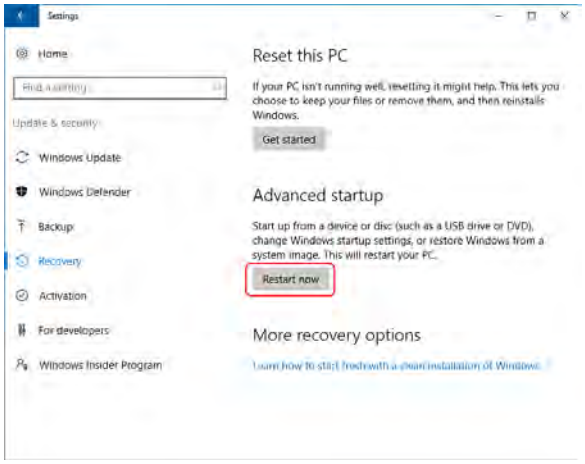
A.4 Installing the USB Driver for an AS Series CPU module in Windows 10

Windows 10 driver signature enforcement provides a way to improve the security of the operating system by validating the integrity of a driver or system file each time it is loaded into memory. However since Delta PLC USB driver does not include the driver signature, this section will help users to disable driver signature enforcement functionality in Windows 8 to ensure a success Delta PLC USB installation. This act is only valid for a single time. The setting will return to its original state after restarting.

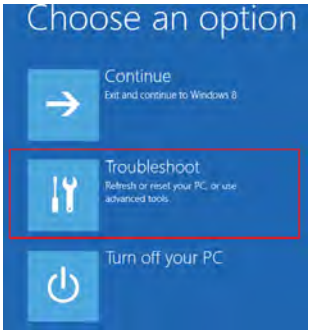
Steps to disable driver signature enforcement in Windows 10:

1. Please follow the instrucitons A (Setting) => B (Update & Security) => C (Recovery) => D (Restart now)

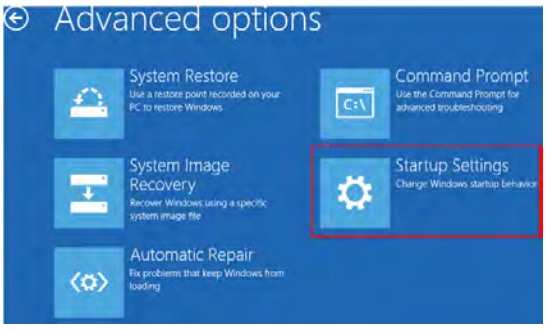
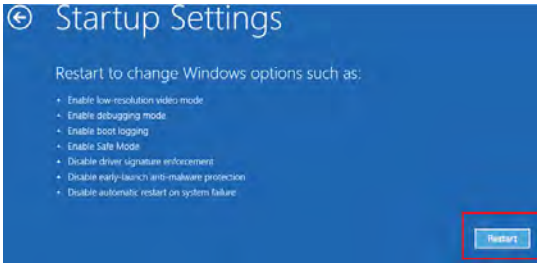
A (Setting)	B (Update & Security)
	

C (Recovery)	D (Restart now)
	

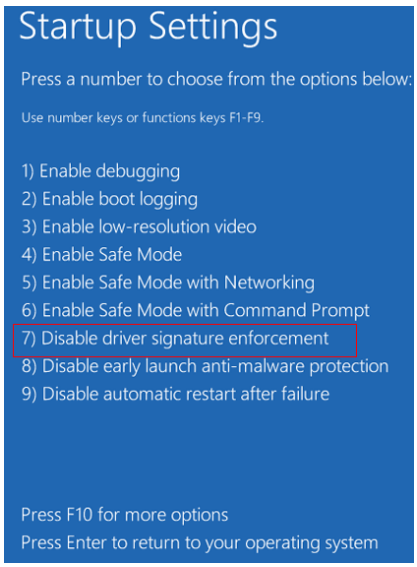
2. After the computer is restarted, select “Troubleshoot”under “Choose an option”. And then select “Advanced options”.

3. From the Advanced options page, select “Startup Settings” to see the Startup Settings. From thispage select “Restart” to restart the computer.

4. Press “7” or “F7” to choose “Disable driver signature enforcement”and the system will direct you to the Windows 10 operating page. Users can then install the Delta PLC USB driver now.



5. For the installation of the USB driver, please refer to section A2 for more information.

MEMO

B

Appendix B Device Addresses

Table of Contents

B.1 Device Addresses

Standard Modbus addresses of devices:

Device	Type	Format	Device range	Modbus address (Decimal number)	AS300 Address (Hexadecimal number)
X	Bit	DD.DD	X0.0~X63.15	124577~125600	6000~63FF
	Word	DD	X0~X63	332769~332832	8000~803F
Y	Bit	DD.DD	Y0.0~Y63.15	040961~041984	A000~A3FF
	Word	DD	Y0~Y63	440961~441024	A000~A03F
M	Bit	DDDD	M0~M8191	000001~008192	0000~1FFF
SM	Bit	DDDD	SM0~SM4095	016385~020480	4000~4FFF
SR	Word	DDDD	SR0~SR2047	449153~451200	C000~C7FF
D	Word	DDDDD	D0~D29999	400001~430000	0000~752F
S	Bit	DDDD	S0~S2047	020481~022528	5000~57FF
T	Bit	DDD	T0~T511	057345~057856	E000~E1FF
	Word	DDD	T0~T511	457345~457856	E000~E1FF
C	Bit	DDD	C0~C511	061441~061952	F000~F1FF
	Word	DDD	C0~C511	461441~461952	F000~F1FF
HC	Bit	DDD	HC0~HC255	064513~064768	FC00~FCFF
	DWord	DDD	HC0~HC255	464513~464768	FC00~FCFF
E	Word	DD	E0~E9	465025~465039	FE00~FE09