



Industrial Automation Headquarters

**Taiwan: Delta Electronics, Inc.**  
Taoyuan Technology Center  
No.18, Xinglong Rd., Taoyuan District,  
Taoyuan City 33068, Taiwan  
TEL: +886-3-362-6301 / FAX: +886-3-371-6301

Asia

**China: Delta Electronics (Shanghai) Co., Ltd.**  
No.182 Minyu Rd., Pudong Shanghai, P.R.C.  
Post code : 201209  
TEL: +86-21-6872-3988 / FAX: +86-21-6872-3996  
Customer Service: 400-820-9595

**Japan: Delta Electronics (Japan), Inc.**  
Industrial Automation Sales Department  
2-1-14 Shibadaimon, Minato-ku  
Tokyo, Japan 105-0012  
TEL: +81-3-5733-1155 / FAX: +81-3-5733-1255

**Korea: Delta Electronics (Korea), Inc.**  
1511, 219, Gasan Digital 1-Ro., Geumcheon-gu,  
Seoul, 08501 South Korea  
TEL: +82-2-515-5305 / FAX: +82-2-515-5302

**Singapore: Delta Energy Systems (Singapore) Pte Ltd.**  
4 Kaki Bukit Avenue 1, #05-04, Singapore 417939  
TEL: +65-6747-5155 / FAX: +65-6744-9228

**India: Delta Electronics (India) Pvt. Ltd.**  
Plot No.43, Sector 35, HSIIDC Gurgaon,  
PIN 122001, Haryana, India  
TEL: +91-124-4874900 / FAX: +91-124-4874945

**Thailand: Delta Electronics (Thailand) PCL.**  
909 Soi 9, Moo 4, Bangpoo Industrial Estate (E.P.Z),  
Pattana 1 Rd., T.Phraksa, A.Muang,  
Samutprakarn 10280, Thailand  
TEL: +66-2709-2800 / FAX: +66-2709-2827

**Australia: Delta Electronics (Australia) Pty Ltd.**  
Unit 2, Building A, 18-24 Ricketts Road,  
Mount Waverley, Victoria 3149 Australia  
Mail: [IA.au@deltaww.com](mailto:IA.au@deltaww.com)  
TEL: +61-1300-335-823 / +61-3-9543-3720

Americas

**USA: Delta Electronics (Americas) Ltd.**  
5101 Davis Drive, Research Triangle Park, NC 27709, U.S.A.  
TEL: +1-919-767-3813 / FAX: +1-919-767-3969

**Brazil: Delta Electronics Brazil Ltd.**  
Estrada Velha Rio-São Paulo, 5300 Eugênio de  
Melo - São José dos Campos CEP: 12247-004 - SP - Brazil  
TEL: +55-12-3932-2300 / FAX: +55-12-3932-237

**Mexico: Delta Electronics International Mexico S.A. de C.V.**  
Gustavo Baz No. 309 Edificio E PB 103  
Colonia La Loma, CP 54060  
Tlalnepantla, Estado de México  
TEL: +52-55-3603-9200

EMEA

**EMEA Headquarters: Delta Electronics (Netherlands) B.V.**  
Sales: [Sales.IA.EMEA@deltaww.com](mailto:Sales.IA.EMEA@deltaww.com)  
Marketing: [Marketing.IA.EMEA@deltaww.com](mailto:Marketing.IA.EMEA@deltaww.com)  
Technical Support: [iatechnicalsupport@deltaww.com](mailto:iatechnicalsupport@deltaww.com)  
Customer Support: [Customer-Support@deltaww.com](mailto:Customer-Support@deltaww.com)  
Service: [Service.IA.emea@deltaww.com](mailto:Service.IA.emea@deltaww.com)  
TEL: +31(0)40 800 3900

**BENELUX: Delta Electronics (Netherlands) B.V.**  
Automotive Campus 260, 5708 JZ Helmond, The Netherlands  
Mail: [Sales.IA.Benelux@deltaww.com](mailto:Sales.IA.Benelux@deltaww.com)  
TEL: +31(0)40 800 3900

**DACH: Delta Electronics (Netherlands) B.V.**  
Coesterweg 45,D-59494 Soest, Germany  
Mail: [Sales.IA.DACH@deltaww.com](mailto:Sales.IA.DACH@deltaww.com)  
TEL: +49(0)2921 987 0

**France: Delta Electronics (France) S.A.**  
ZI du bois Challand 2, 15 rue des Pyrénées,  
Lisses, 91090 Evry Cedex, France  
Mail: [Sales.IA.FR@deltaww.com](mailto:Sales.IA.FR@deltaww.com)  
TEL: +33(0)1 69 77 82 60

**Iberia: Delta Electronics Solutions (Spain) S.L.U**  
Ctra. De Villaverde a Vallecas, 265 1º Dcha Ed.  
Hormigueras – P.I. de Vallecas 28031 Madrid  
TEL: +34(0)91 223 74 20

Carrer Llacuna 166, 08018 Barcelona, Spain  
Mail: [Sales.IA.Iberia@deltaww.com](mailto:Sales.IA.Iberia@deltaww.com)

**Italy: Delta Electronics (Italy) S.r.l.**  
Via Meda 2-22060 Novedrate(CO)  
Piazza Grazioli 18 00186 Roma Italy  
Mail: [Sales.IA.Italy@deltaww.com](mailto:Sales.IA.Italy@deltaww.com)  
TEL: +39 039 8900365

**Russia: Delta Energy System LLC**  
Vereyskaya Plaza II, office 112 Vereyskaya str.  
17 121357 Moscow Russia  
Mail: [Sales.IA.RU@deltaww.com](mailto:Sales.IA.RU@deltaww.com)  
TEL: +7 495 644 3240

**Turkey: Delta Greentech Elektronik San. Ltd. Sti. (Turkey)**  
Şerifali Mah. Hendem Cad. Kule Sok. No:16-A  
34775 Ümraniye – İstanbul  
Mail: [Sales.IA.Turkey@deltaww.com](mailto:Sales.IA.Turkey@deltaww.com)  
TEL: + 90 216 499 9910

**MEA: Eltek Dubai (Eltek MEA DMCC)**  
OFFICE 2504, 25th Floor, Saba Tower 1,  
Jumeirah Lakes Towers, Dubai, UAE  
Mail: [Sales.IA.MEA@deltaww.com](mailto:Sales.IA.MEA@deltaww.com)  
TEL: +971(0)4 2690148

AS Series Hardware and Operation Manual



Digitized Automation for a Changing World

AS Series Hardware and Operation Manual



# AS Series Hardware and Operation Manual

## Revision History

| Version         | Revision  | Date       |
|-----------------|---|------------|
| 1 <sup>st</sup> | The first version was published.  | 2016/11/30 |
| 2 <sup>nd</sup> | 1.Added new models AS08AD-B, AS08AD-C and UB-10-IO32D product information.<br>2.Updated module weights.<br>3.Updated Emergency Request Message information  | 2018/02/09 |
| 3 <sup>rd</sup> | 1.Chapter 2: Specification Corrections  | 2018/03/22 |
| 4 <sup>th</sup> | 1.Updated new models AS08AD-B/C, AS02/04PU-A, AS320T/P-B, AS300N-A, AS228R/T/P-A, AS218RX/TX/PX-A, AS06RTD-A, AS08TC-A, AS-FEN02 and AS01DNET-A product information<br>2.Chapter 9: Updated operation and monitor on the webpage in section 9.10<br>3.Chapter 10: Updated AS200 series information  | 2018/09/25 |
| 5 <sup>th</sup> | 1.Updated digital output specifications in section 1.1.2.<br>2.Added specification of ambient air. temperature-barometric pressure-altitude in section 2.1.<br>3.Added specifications of program capacity (step) and Ethernet in section 2.2.1.<br>4.Added specifications of input impedance and leakage current in section 2.2.2.<br>5.Added specifications of digital conversion range and update input impedance for 04DA/06XA.<br>6.Added a note for the function specification in section 2.5.1.<br>7.Updated specifications of input impedance in section 2.9.1.<br>8.Updated the cable specification image in section 4.2.1.<br>9.Updated the contents of initializing a memory card in section 7.4.1 and added root directory of the memory card in sections 7.6, 7.8 and 7.9.<br>10.Added an example of Daylight Saving Timing in section 8.2.2.1.<br>11.Added specification for AS-FEN02 in section 9.3.1 and 9.3.2.<br>12.Updated EIP Scanner/Adapter and data mapping information, EIP Builder operations in section 9.4.<br>13.Updated assembly object, TCP/IP interface object and Ethernet link object in section 9.8.<br>14.Added new EIP products in the EIP product list in section 9.9.<br>15.Updated operation and monitor on the web information in section 9.10.<br>16.Added AS200 series descriptions as well as application examples and updated CANopen introduction as well | 2019/1/11  |



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|                 | <p>as troubleshooting.</p> <p>17.Added descriptions on the Error LED Indicators in section 12.3.1 and 12.3.2.</p> <p>18.Added a new chapter, chapter 13 for Data Tracer and Data Logger.</p> <p>19.Updated the list of Function Codes and Number of Devices Supported for Modbus Protocols in section B.2.</p>   |            |
| 6 <sup>th</sup> | <p>1. Manual corrections in the response time of electrical specification for the inputs on AS300 series in section 2.2.2.</p>   | 2019/06/04 |
| 7 <sup>th</sup> | <p>1. Added information of new products AS02PU-A, AS04PU-A, AS02HC-A, AS04SIL-A, and AS-FPFN02.</p> <p>2. Added AS200 analog input/output information in section 2.2.5.</p> <p>3. Updated electrical specification (24 VDC) for IO module in section 2.3.</p> <p>4. Updated A/D functional specification for AS04AD-A, AS08AD-B, AS08AD-C and AS06XA-A in section 2.4.1.</p> <p>5. Added electrical specification and parameter settings for AS02PU-A and AS04PU-A in section 2.6.</p> <p>6. Added specification for AS02HC-A in section 2.7.</p> <p>7. Added specification for AS04SIL-A in section 2.8.</p> <p>8. Updated specification for AS-F2AD, AS-F2DA and AS-FPFN02 in section 2.10.</p> <p>9. Added descriptions for SM204 and SM204 in section 5.1.3.</p> <p>10.Updated device register range in section 5.1.4.</p> <p>11.Added device function description for AS02HC-A in section 5.2.11.</p> <p>12.Updated data register description in section 5.2.12.</p> <p>13.Updated software setting description "Options - System Information Page" in section 8.2.2.1.</p> <p>14.Updated Send and Receive Length in section 8.2.2.4.</p> <p>15.Updated description of "Options - Function Card 2 Setting" in section 8.2.2.6.</p> <p>16.Updated HWCONFIG image for AS Series CPU module in section 8.2.3.</p> <p>17.Updated description of "Options - Function Card 2 Setting" in section 8.3.1.</p> <p>18.Added AS-FPFN02 product information and updated socket information in section 9.3.</p> <p>19.Updated operational description for EIP Builder in section 9.4.</p> <p>20.Added AS-FPFN02 product information in section 9.6.</p> <p>21.Added instance attribute and object examples in section 9.8.5.</p> <p>22.Added object examples in section 9.8.8.</p> <p>23.Added data type for instance 1 in section 9.8.12.</p> <p>24.Added new product information AHCPU501-EN and</p> | 2019/12/20 |

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|                 | <p>AHCPU560-EN2 in section 9.9.</p> <p>25.Updated SR829 information in section 10.5.1.</p> <p>26.Added descriptions of SM5=ON and SM0=ON in section 12.1.4.</p> <p>27.Updated error codes 16#0102, 16#0202, 16#0302, 16#0D03, 16#0E05, and 16#200A in section 12.2.2.</p> <p>28.Added error codes 16#19B0-16#19FC and updated 16#2001, 16#2003, 16#300B-200E, 16#2012-2014, 16#2017, 16#2027-2031 in section 12.2.9.</p> <p>29.Added troubleshooting information for AS02PU-A, AS04PU-A, AS02HC-A, and AS04SIL-A in section 12.3.2, 12.3.3 and 12.3.5.</p> <p>30.Added error codes 16#1500 and 16#1505 in section 12.3.7.2.</p> <p>31.Updated error code #162003 and added 16#2030 and 16#2031 and added information for AS02PU-A, AS04PU-A, AS02HC-A, and AS04SIL-A in section 12.4.</p>  |            |
| 8 <sup>th</sup> | <ol style="list-style-type: none"> <li>Updated power supply information on all CPU Series, added new product information, AS100 Series and AS-FOPC02, updated model description on Positioning Modules, Counter Modules, AS-FEN02, and AS-FPFN02 in section 1.1.2.</li> <li>Added the durability information in general specification in section 2.1.</li> <li>Updated electrical input insulation information in section 2.2.2, 2.3.1, and 2.7.1.</li> <li>Updated the Software filter time setting range in section 2.31.</li> <li>Updated the general specification on Positioning Module in section 2.6.1.</li> <li>Updated the general specification on Counter Module in section 2.7.1.</li> <li>Updated the general specification of the Ethernet Communication Interface on Network Module in section 2.8.1.</li> <li>Updated the descriptions of the Error LED Indicator, function card slots 1&amp;2 and mode switch for AS00SCM-A in section 2.8.2.</li> <li>Added information of Ethernet Communication Interface for AS-FEN02 and AS-FPFN02 in section 2.10.1.</li> <li>Added a description for the example of 16-bit counters in section 5.2.10.</li> <li>Added a description for the example of 32-bit counters in section 5.2.11.</li> <li>Added a description for data register range in section 5.2.12.</li> <li>Added a notice in section 8.1.</li> <li>Added a device range table for modules in section 8.1.2.2.</li> <li>Updated the image and description in point 5 in section 8.2.2.2.</li> </ol> | 2020/07/07 |

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|                 | <p>16.Updated the EtherNet/IP specification table in section 9.3.2.</p> <p>17.Updated PROFINET specification in section 9.3.3.</p> <p>18.Update a number in AS300 Series PLC master register in section 10.6.</p> <p>19.Added a new description in section 12.2.8.</p> <p>20.Updated the table of ERROR LED Indicators Are ON in section 12.3.3.1.</p> <p>21.Added two new error codes in section 12.3.5.2.</p>  |          |
| 9 <sup>th</sup> | <p>1.AS Series Hardware Manual and AS Series Operation Manual are combined into AS Series Hardware and Operation Manual to enhance more concise reading experiences.</p> <p>2.Added new product information, AS-PS03C, AS-ATXB, AS-FOPC02, AS100 and added power input specifications for AS300 and AS200 series. Updated specifications on AS02PU-A, AS04PU-A, AS02HC-A, AS-FEN02, and AS-FPFN02.</p> <p>3.Added contents from Chapter 3 of AS Series Hardware Manual in Chapter 2.</p> <p>4.Added contents from Chapter 2 and 5 of AS Series Hardware Manual in Chapter 4.</p> <p>5.Added contents from Chapter 4 of AS Series Hardware Manual in Chapter 5.</p> <p>6.Updated HWCONFIG 4.0 operation images in Chapter 8.</p> <p>7.Added section 9.2.3 Network Communication Parameter Setting. Updated maximum connection quantity for Client and Server in Modbus TCP specification in 9.3.1. Updated PROFINET specification in section 9.3.3. Updated TAG description in section 9.5.2. Updated Delta EIP Products in section 9.9.</p> <p>8.Added section 10.1.3 Refreshing Mechanism in the Input/Output Mapping Area and updated HWCONFIG 4.0 operation images in Chapter 10.</p> <p>9.Added Execution Timing of Interrupts in section 11.1.3.</p> <p>10.Updated 12.2.8 Status and Operation under Different Operating Modes, and troubleshooting sections in 12.3.3 High-Speed Counter Module AS02HC, 12.3.4 Load Cell Module AS02LC, 12.3.5 the Module AS04SIL as a Communication Module and 12.3.6 Module AS00SCM as a Communication Module.</p> <p>11.Added Delta Drive Parameters Backup and Restore in section 13.3.</p> <p>12.Added Appendix C to introduce EMC Standards and Appendix D to illustrate Maintenance and Inspection.</p> | 2021/2/5 |

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| 10 <sup>th</sup> | 1. Manual correction in Chapter 1.3 presentation.   | 20210225 |
| 11 <sup>th</sup> | <ol style="list-style-type: none"> <li>Chapter 1: Deleted product information AS-PS03C. Added product information including AS02ADH-A and AS-FFTP01. Updated conversion times for I/O modules and sensor types for temperature measurement modules.</li> <li>Chapter 2: Added new product information including AS100 series PLC CPU, AS02ADH-A, and AS-FFTP01. Added the information of maximum inrush current in the specification. Updated conversion times for I/O modules and sensor types for temperature measurement modules.</li> <li>Chapter 4: Added new product information including AS100 series PLC CPU, AS02ADH-A, and AS-FFTP01. Updated wiring information for positioning modules, counter modules and temperature measurement modules.</li> <li>Chapter 5: Changed the stepping relays to relays.</li> <li>Chapter 7: Added new product information AS100 series PLC CPU.</li> <li>Chapter 8: Updated contents of Select Action When 24Vdc Input Unstable, AS Remote Module Updated Method and I601 to I604 Timer Interrupt Setting Time Base in section 8.2.2.</li> <li>Chapter 9: Changed EIP Builder operation procedures to HWCONFIG's. Added a note that Array-typed tags are NOT supported in explicit messages in section 9.3.2. Updated operation procedures and added demonstrations of EIP Tag deployment in section 9.4, removed the 3<sup>rd</sup> party product software images in section 9.7, added Network Security section in section 9.10 and added a web operation restriction in section 9.11.1.</li> <li>Chapter 10: Added new product information AS100 series PLC CPU. Updated non-synchronous mode information in section 10.1.3. Added product information including AS100 Series PLC CPU and DVP-ES3 Series PLC CPU.</li> <li>Chapter 11: Updated the contents of Execution Timing of Interrupts in section 11.1.3.</li> <li>Chapter: Updated the content and the solution for error code 16#1807 in section 12.3.4.2. Added error codes 16#1980 to 16#19FC and 16#C000 to 16#CFFF in sections 12.4. Added a new error LED indicator for "When power-on, the module is not detected by CPU"</li> </ol> | 20220112 |

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|                  | <p>module.” in section 12.4.5.</p> <p>11. Chapter 13: Added new product information AS100 series PLC CPU.</p> <p>12. Appendix B: Added new product information AS100 series PLC CPU.</p>  |            |
| 12 <sup>th</sup> | <p>1. Added information about DIADesigner software and new function card AS-FECAT in every chapter.</p> <p>2. Chapter 2: Added information for specifications of UL 94 Flame Classifications in section 2.1. Updated information for specification of resolution in section 2.5. Updated information for connector types specification of AS00SCM-A and filtering time for AS04SIL-A in section 2.8.1. Updated information for extreme pulse value range and averaging weights of AS02LC-A in section 2.9.1. Updated the extension card profiles in section 2.10.2.</p> <p>3. Chapter 9: Deleted software images from 3rd party manufacturers.</p> <p>4. Chapter 12: Added the following error codes, 16#000D, 16#0020, 16#0021, 16#0028, 16#0040-16#0047, 16#1000-10FF, and 16#140C.</p> | 2022/05/30 |

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**\* All the Windows screenshots are used with permission from Microsoft.**



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# Chapter 1   Product Introduction

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## 1.1 Overview

This manual introduces the AS Series PLC CPU functions, devices, module tables, basic instructions, applied instructions, electrical specifications troubleshooting, as well as appearances, dimensions, and so forth.

### 1.1.1 Related Manuals

The related manuals for AS Series programmable logic controllers are listed below.

- **AS Series Quick Start**  
This guides you in how to use the system before reading the related manuals.
- **AS Series Programming Manual**  
This introduces programming for the AS Series programmable logic controllers, basic instructions, and applied instructions.
- **ISPSoft / DIADesigner User Manual**  
This introduces the use of the ISPSoft and DIADesigner software, programming language (Ladder, IL, SFC, FBD, and ST), POU's, and tasks.
- **AS Series Hardware and Operation Manual**  
This introduces electrical specifications, appearances, dimensions, CPU functions, devices, module tables, troubleshooting, and so forth.
- **AS Series Module Manual**  
This introduces special I/O modules such as network modules, analog I/O modules, temperature measurement modules, motion control modules, and so forth.

### 1.1.2 Models Descriptions

| Classification              | Model Name | Description   |
|-----------------------------|------------|---|
| Power supply module         | AS-PS02    | Input: 100-240 VAC, 50/60 Hz<br>Output: 24VDC/2A, 48W (for PLC internal use)  |
|                             | AS-PS02A   | Input: 100-240 VAC, 50/60 Hz<br>Output: 24VDC/1.5A, 36W (for PLC internal use)<br>Output: 24VDC/0.5A, 12W (for external use)  |
| AS CPU power module adaptor | AS-ATXB    | For easier wiring, this adaptor allows wiring on the bottom of the module instead of on the left-side of the module.  |
| AS300 Series CPU module     | AS332P-A   | CPU module, 24VDC power input, PNP 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. Program capacity:128K steps, high-density terminal blocks |
|                             | AS332T-A   | CPU module, 24VDC power input, NPN output, 1x Ethernet port, 2x RS-485 ports, 1x USB port, 1x Micro SD interface, 2x function cards (optional), supporting 32 I/Os  |

| Classification             | Model Name | Description  |
|----------------------------|------------|--|
|                            |            | (16DI+16DO) and up to 1024 I/Os. Program capacity:128K steps, high-density terminal blocks   |
|                            | AS324MT-A  | CPU module, 24VDC power input, 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. Program capacity:128K steps, high-density terminal blocks |
|                            | AS320P-B   | CPU module, 24VDC power input, PNP output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, 2x function cards (optional), supporting 20 I/Os (8DI+12DO) and up to 1024 I/Os. Program capacity:128K steps, removable terminal blocks                 |
|                            | AS320T-B   | CPU module, 24VDC power input, NPN output, 1x Ethernet port, 2x RS-485 ports, 1x USB port, 1x Micro SD interface, 2x function cards (optional), supporting 20 I/Os (8DI+12DO) and up to 1024 I/Os. Program capacity:128K steps, removable terminal blocks                  |
|                            | AS300N-A   | CPU module, 24VDC power input, no I/Os, 1x Ethernet port, 2x RS-485 ports, 1x USB port, 1x Micro SD interface, 2x function cards (optional), and supporting up to 1024 I/Os. Program capacity:128K steps   |
| AS200 Series<br>CPU module | AS228P-A   | CPU module, 24VDC power input, PNP output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 28 I/Os (16DI+12DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks                      |
|                            | AS228T-A   | CPU module, 24VDC power input, NPN output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 28 I/Os (16DI+12DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks                      |
|                            | AS228R-A   | CPU module, 24VDC power input, Relay output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 28 I/Os (16DI+12DO) and up to 1024 I/Os. Program capacity: 64K   |



| Classification             | Model Name | Description   |
|----------------------------|------------|---|
|                            |            | steps, removable terminal blocks  |
|                            | AS218PX-A  | CPU module, 24VDC power input, PNP output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 18 I/Os (8DI+6DO+2AI+2AO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks   |
|                            | AS218TX-A  | CPU module, 24VDC power input, NPN output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 18 I/Os (8DI+6DO+2AI+2AO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks   |
|                            | AS218RX-A  | CPU module, 24VDC power input, Relay output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 18 I/Os (8DI+6DO+2AI+2AO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks |
| AS100 Series<br>CPU module | AS132P-A   | CPU module, 100-240VDC power input, PNP output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 32 I/Os (16DI+16DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks    |
|                            | AS132T-A   | CPU module, 100-240VDC power input, NPN output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 32 I/Os (16DI+16DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks    |
|                            | AS132R-A   | CPU module, 100-240VDC power input, Relay output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 32 I/Os (16DI+16DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks  |
|                            | AS148P-A   | CPU module, 100-240VDC power input, PNP output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 48 I/Os (24DI+24DO) and up to 1024 I/Os. Program capacity: 64K                                     |

| Classification              | Model Name  | Description  |
|-----------------------------|-------------|--|
|                             |             | steps, removable terminal blocks   |
|                             | AS148T-A    | CPU module, 100-240VDC power input, NPN output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 48 I/Os (24DI+24DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks   |
|                             | AS148R-A    | CPU module, 100-240VDC power input, Relay output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 48 I/Os (24DI+24DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks |
|                             | AS164P-A    | CPU module, 100-240VDC power input, PNP output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 64 I/Os (32DI+32DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks   |
|                             | AS164T-A    | CPU module, 100-240VDC power input, NPN output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 64 I/Os (32DI+32DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks   |
|                             | AS164R-A    | CPU module, 100-240VDC power input, Relay output, 1x Ethernet port , 2x RS-485 ports, 1x USB port, 1x Micro SD interface, CAN communication port, supporting 64 I/Os (32DI+32DO) and up to 1024 I/Os. Program capacity: 64K steps, removable terminal blocks |
| Digital input/output module | AS08AM10N-A | 24VDC<br>5mA<br>8 inputs<br>Spring-clamp terminal block  |
|                             | AS08AN01P-A | 5 - 30VDC<br>0.5A/output, 4A/COM<br>8 outputs<br>Sourcing output<br>Spring-clamp terminal block  |

| Classification | Model Name  | Description  |
|----------------|-------------|--|
|                | AS08AN01R-A | 240VAC/24VDC<br>2A/output, 8A/COM<br>8 outputs<br>Relay<br>Spring-clamp terminal block           |
|                | AS08AN01T-A | 5 - 30VDC<br>0.5A/output, 4A/COM<br>8 outputs<br>Sinking output<br>Spring-clamp terminal block   |
|                | AS16AM10N-A | 24VDC<br>5mA<br>16 inputs<br>Spring-clamp terminal block   |
|                | AS16AN01P-A | 5 - 30VDC<br>0.5A/output, 4A/COM<br>16 outputs<br>Sourcing output<br>Spring-clamp terminal block |
|                | AS16AN01R-A | 240VAC/24VDC<br>2A/output, 8A/COM<br>16 outputs<br>Relay<br>Spring-clamp terminal block          |
|                | AS16AN01T-A | 5 - 30VDC<br>0.5A/output, 4A/COM<br>16 outputs<br>Sinking output<br>Spring-clamp terminal block  |
|                | AS16AP11P-A | 24VDC<br>5mA<br>8 inputs   |

| Classification | Model Name  | Description  |
|----------------|-------------|--|
|                |             | 5 - 30VDC<br>0.5A/output, 4A/COM<br>8 outputs<br>Sourcing output<br>Spring-clamp terminal block                            |
|                | AS16AP11R-A | 24VDC<br>5mA<br>8 inputs<br>240VAC/24VDC<br>2A/output, 8A/COM<br>8 outputs<br>Relay<br>Spring-clamp terminal block         |
|                | AS16AP11T-A | 24VDC<br>5mA<br>8 inputs<br>5 - 30VDC<br>0.5A/output, 4A/COM<br>8 outputs<br>Sinking output<br>Spring-clamp terminal block |
|                | AS32AM10N-A | 24VDC<br>3.2mA<br>32 inputs<br>MIL connector   |
|                | AS32AN02T-A | 5 - 30VDC<br>0.1A/output, 3.2A/COM<br>32 outputs<br>Sinking output<br>MIL connector  |
|                | AS64AM10N-A | 24VDC<br>3.2mA   |

| Classification                   | Model Name  | Description   |
|----------------------------------|-------------|---|
|                                  |             | 64 inputs<br>MIL connector  |
|                                  | AS64AN02T-A | 5 - 30VDC<br>0.1A/output, 3.2A/COM<br>64 outputs<br>Sinking output<br>MIL connector   |
| Analog<br>input/output<br>module | AS04AD-A    | 4-channel analog input module<br>Hardware resolution: 16 bits<br>0–10V, 0/1–5V, -5 to +5V, -10 to +10V, 0/4–20mA, -20–<br>+20mA<br>Conversion time: 2 ms/channel; for FW V1.02.00 or later,<br>upgraded to 1 ms/channel |
|                                  | AS08AD-B    | 8-channel analog input module<br>Hardware resolution: 16 bits<br>0 to +10V, 0/1–5V, -5V to +5V, -10V to +10V<br>Conversion time: 2 ms/channel; for FW V1.02.00 or later,<br>upgraded to 1 ms/channel                    |
|                                  | AS08AD-C    | 8-channel analog input module<br>Hardware resolution: 16 bits<br>0/4–20mA, -20mA→+20mA<br>Conversion time: 2 ms/channel; for FW V1.02.00 or later,<br>upgraded to 1 ms/channel  |
|                                  | AS04DA-A    | 4-channel analog output module<br>Hardware resolution: 12 bits<br>-10 to +10V, 0–20mA, 4–20mA<br>Conversion time: 2 ms/channel  |
|                                  | AS06XA-A    | 4-channel analog input<br>Hardware resolution: 16 bits<br>0–10V, 0/1–5V, -5 to +5V, -10 to +10V, 0/4–20mA, -20 to<br>+20mA<br>Conversion time: 2 ms/channel; for FW V1.02.00 or later,<br>upgraded to 1 ms/channel      |

| Classification                 | Model Name | Description   |
|--------------------------------|------------|---|
|                                |            | 2-channel analog output<br>Hardware resolution: 12 bits<br>-10 to +10V, 0–20mA, 4–20mA<br>Conversion time: 2 ms/channel   |
|                                | AS02ADH-A  | 2-channel analog input<br>Hardware resolution: 16 bits<br>0–10V, 0/1–5V, -5 to +5V, -10 to +10V, 0/4–20mA, -20 to +20mA<br>High-speed conversion time: 20 $\mu$ s<br>The analog channels are isolated from one another.<br>Digital output value (2000 per channel), peak value<br>Low-pass and band-pass filters are available. |
| Temperature measurement module | AS04RTD-A  | 4-channel, 2-wire/3-wire RTD<br>Sensor type: Pt100 / Ni100 / Pt1000 / Ni1000 / JPt100 / LG-Ni1000 / Cu50 / Cu100 / 0-300 $\Omega$ / 0-3000 $\Omega$ / Ni120 (FW V1.06 or later) input impedance<br>Resolution: 0.1°C/0.1°F (16 bits)<br>Conversion time: 200ms/channel  |
|                                | AS06RTD-A  | 6-channel, 2-wire/3-wire RTD<br>Sensor type: Pt100 / Ni100 / Pt1000 / Ni1000 / JPt100 / LG-Ni1000 / Cu50 / Cu100 / 0-300 $\Omega$ / 0-3000 $\Omega$ / Ni120 (FW V1.06 or later) input impedance, Resolution: 0.1°C/0.1°F (16 bits)<br>Conversion time: 200ms/channel  |
|                                | AS04TC-A   | 4-channel thermocouple<br>Sensor type: J, K, R, S, T, E, N, B and -100 to +100 mV<br>Resolution: 0.1°C/0.1°F (24 bits)<br>Conversion time: 200ms/channel  |
|                                | AS08TC-A   | 8-channel thermocouple<br>Sensor type: J, K, R, S, T, E, N, B and -100 to +100 mV<br>Resolution: 0.1°C/0.1°F (24 bits)<br>Conversion time: 200ms/channel  |
| Load cell                      | AS02LC-A   | 2-channel, 4-wire/6-wire load cell sensor   |

| Classification     | Model Name                 | Description  |
|--------------------|----------------------------|--|
| module             |                            | Eigenvalues for a load cell: 1, 2, 4, 6, 20, 40, 80 mV/V<br>Highest precision 1/10000 @ 50ms of conversion time<br>ADC Resolution : 4 bits<br>Conversion time: 2.5–400ms (nine options to choose from)   |
| Positioning module | AS02PU-A                   | 2-axis motion control<br>5-24 VDC, 1 differential input (A/B/Z phase), maximum hardware input frequency at 200 kHz<br>24 VDC, 5 mA, 5 inputs, maximum hardware input frequency at 1 kHz,<br>5 VDC, 2-axis (4 points) differential outputs, maximum output frequency at 200 kHz |
|                    | AS04PU-A                   | 4-axis motion control<br>24 VDC, 5mA, 6 inputs, maximum hardware input frequency at 1 kHz<br>5-30 VDC, 0.1A, 4-axis (8 points) open collector output, maximum output frequency at 100 kHz  |
| Counter module     | AS02HC-A                   | 2-channel high-speed counters<br>Input methods are pulse-input (max. at 200 kHz) and SSI communication interface input (max. at 1.25 MHz)<br>4-axis high-speed open collector output, 5-30 VDC, 0.1A, can work with high-speed instructions to output                          |
| Network module     | AS00SCM-A                  | Serial communication module, 2x communication ports for communication cards, supporting Modbus protocols   |
|                    | AS01DNET-A                 | DeviceNet communication port, functioning as master or slave   |
|                    | AS04SIL-A                  | IO-Link module, built-in with 4 IO-Link communication ports  |
| Remote I/O module  | AS00SCM-A<br>+<br>AS-FCOPM | For AS-FCOPM function cards  |
|                    | AS00SCM-A<br>+<br>AS-FEN02 | For AS-FEN02 function cards  |
|                    | AS01DNET-A (RTU)           | DeviceNet remote IO slave, its right side connectswith AS Series extension modules, including digital modules, analog  |



| Classification    | Model Name              | Description  |
|-------------------|-------------------------|--|
|                   |                         | modules, temperature modules, etc.   |
| Function cards    | AS-F232                 | Serial communication port, RS232, functioning as master or slave   |
|                   | AS-F422                 | Serial communication port, RS422, functioning as master or slave   |
|                   | AS-F485                 | Serial communication port, RS485, functioning as master or slave   |
|                   | AS-FCOPM                | CANopen communication port, supporting DS301, AS series remote modules and Delta servo systems   |
|                   | AS-F2AD                 | 2-channel analog input<br>0-10V (12 bits), 4-20mA (11 bits)<br>Conversion time: 3ms/channel  |
|                   | AS-F2DA                 | 2-channel analog output<br>0-10V, 4-20mA (12 bits)<br>Conversion time: 2ms/channel   |
|                   | AS-FEN02                | Only available for AS300 Series PLC CPU, 2x Ethernet ports, supporting switch function, Modbus TCP, EtherNet/IP Adapter and AS Series remote control   |
|                   | AS-FPFN02               | Only available for AS300 Series PLC CPU, 2x Ethernet ports, supporting switch function and PROFINET Device (Slave)   |
|                   | AS-FOPC02               | Only available for AS300 Series PLC CPU, 2x Ethernet ports, supporting switch function, OPC-UA Server and Modbus TCP   |
|                   | AS-FFTP01               | Only available for AS300 Series PLC CPU, 1x Ethernet ports, supporting FTP Server, OPC-UA Server, MQTT Client, Web Server, and Data Log  |
|                   | AS-FECAT                | Only available for AS300 Series PLC CPU, 2x Ethernet ports, supporting data exchange (before EtherCAT Master enabled), MODBUS TCP Server (1 connection), EtherCAT Master 16-axes point-to-point positioning control (only available for Delta drive) |
| Programming cable | UC-PRG015-01A<br>(1.5M) | Used for the connection between a PLC and a PC via a mini USB port, use for AS332T-A, AS332P-A, and AS324MT-A  |

| Classification                 | Model Name           | Description   |
|--------------------------------|----------------------|---|
|                                | UC-PRG030-01A (3M)   | Use for the connection between a PLC and a PC with a mini USB port, use for AS332T-A, AS332P-A, and AS324MT-A   |
|                                | UC-PRG030-20A (3M)   | Use for the connection between a PLC and a PC with a RJ45 port, use for AS332T-A, AS332P-A, AS324MT-A, AS-FEN02, AS-FPFN02 and AS-FECAT.                          |
| I/O extension<br>cable         | UC-ET010-24B (1M)    | MIL connector, 40Pin ↔ 40Pin, shielded, use for AS32AM10N-A, AS32AN02T-A, AS64AM10N-A and AS64AN02T-A   |
|                                | UC-ET020-24B (2M)    |   |
|                                | UC-ET030-24B (3M)    |   |
|                                | UC-ET010-24D (1M)    | MIL connector, 40Pin↔ 2x 20Pin, shielded, use for AS332T-A, AS332P-A, AS324MT-A, AS32AM10N-A, AS32AN02T-A, AS64AM10N-A, and AS64AN02T-A                           |
|                                | UC-ET020-24D (2M)    |   |
|                                | UC-ET030-24D (3M)    |   |
| External<br>terminal<br>module | UB-10-ID16A          | 16 inputs/outputs, 20-Pin MIL connector, use for AS332T-A, AS332P-A, AS324MT-A, AS32AM10N-A, AS32AN02T-A, AS64AM10N-A and AS64AN02T-A                             |
|                                | UB-10-ID32A          | 32 inputs, 40-Pin MIL connector, use for AS32AM10N-A and AS64AM10N-A  |
|                                | UB-10-IO32D          | Terminal block (spring clamp/MIL connector), MIL connector to 40-Pin spring clamp terminal block, use for AS332T-A, AS332P-A, AS324MT-A, AS32AM10N-A, AS32AN02T-A |
|                                | UB-10-OR16A          | 16 relay outputs, 20-Pin MIL connector, NPN, use for AS332T-A, AS32AN02T-A and AS64AN02T-A  |
|                                | UB-10-OR16B          | 16 relay outputs, 20-Pin MIL connector, PNP, use for AS332P-A   |
|                                | UB-10-OT32A          | 32 transistor outputs, 40-Pin MIL connector, NPN, use for AS32AN02T-A and AS64AN02T-A   |
| Network cables                 | UC-CMC003-01A (0.3M) | CANopen communication cable, use for AS-FCOPM series  |
|                                | UC-CMC005-01A (0.5M) | CANopen communication cable, use for AS-FCOPM series  |
|                                | UC-CMC010-01A (1M)   | CANopen communication cable, use for AS-FCOPM series  |
|                                | UC-CMC015-01A (1.5M) | CANopen communication cable, use for AS-FCOPM series  |
|                                | UC-CMC020-01A (2M)   | CANopen communication cable, use for AS-FCOPM series  |
|                                | UC-CMC030-01A (3M)   | CANopen communication cable, use for AS-FCOPM series  |
|                                | UC-CMC050-01A (5M)   | CANopen communication cable, use for AS-FCOPM series  |

| Classification | Model Name           | Description  |
|----------------|----------------------|--|
|                | UC-CMC100-01A (10M)  | CANopen communication cable, use for AS-FCOPM series   |
|                | UC-CMC200-01A (20M)  | CANopen communication cable, use for AS-FCOPM series   |
|                | UC-EMC003-02A (0.3M) | Ethernet communication cable, use for AS Series CPU modules, AS-FEN02, AS-FPFN02 and AS-FECAT. |
|                | UC-EMC005-02A (0.5M) | Ethernet communication cable, use for AS Series CPU modules, AS-FEN02, AS-FPFN02 and AS-FECAT. |
|                | UC-EMC010-02A (1M)   | Ethernet communication cable, use for AS Series CPU modules, AS-FEN02, AS-FPFN02 and AS-FECAT. |
|                | UC-EMC020-02A (2M)   | Ethernet communication cable, use for AS Series CPU modules, AS-FEN02, AS-FPFN02 and AS-FECAT. |
|                | UC-EMC050-02A (5M)   | Ethernet communication cable, use for AS Series CPU modules, AS-FEN02, AS-FPFN02 and AS-FECAT. |
|                | UC-EMC100-02A (10M)  | Ethernet communication cable, use for AS Series CPU modules, AS-FEN02, AS-FPFN02 and AS-FECAT. |
|                | UC-EMC200-02A (20M)  | Ethernet communication cable, use for AS Series CPU modules, AS-FEN02, AS-FPFN02 and AS-FECAT. |

## 1.2 Overview

An AS series CPU module is an advanced controller with built-in 6 high speed counters for inputs, up to 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), continuous function chart (CFC) and C language dealt with by IEC 61131-3 according to their needs when writing programs in ISPSOft or DIADesigner. 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 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

Characteristics of the AS series CPU module:

### (1) High efficiency

- The AS Series CPU module uses a 32-bit high-speed processor. The module executes basic instructions at 25 ns each and moving instructions at 150ns each. The module executes instructions 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 AS Series uses the Soc architecture, built with six (or three) high speed counters. The maximum frequency is 200 kHz for each counter (differential output models can reach 4 MHz); six-axis high speed position output at 200 kHz (differential output models can reach 4 MHz).

### (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 works with SCM/DNETcommunication modules (AS-FCOPM, and AS-FEN02 included) to create a remote connection, and you can connect up to 15 remote modules.

Note: For the connections between the CPU modules and the remote modules, the I/O points cannot exceed 1024 I/Os, 32 I/O modules (any type), or 16 analog I/O modules.

### (3) Multiple I/O modules

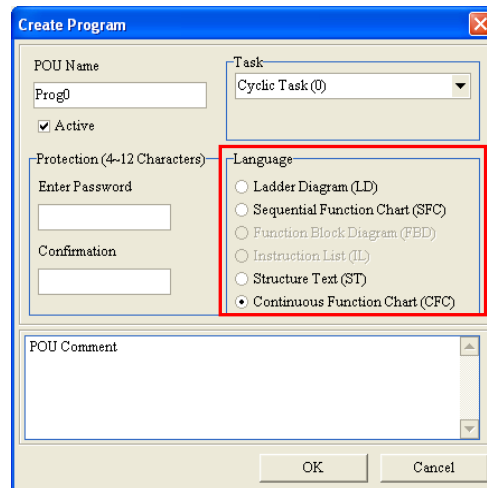
- The AS series CPU module supports the following I/O modules: digital input/output modules, analog input/output modules, temperature measurement modules, positioning/counter modules, network modules, and function cards. Refer to section 1.1.2 section for more details.

### (4) Larger program capacity and memory

- The AS300 Series advanced CPU modules have 128k steps of program capacity. 60000 general registers (30000 for specific use and 30000 for programming editing), and 64k words of memory (that can be used for storing parameters).
- The AS100 and AS200 Series advanced CPU modules have 64k steps of program capacity. 60000 general registers (30000 for specific use and 30000 for programming editing), and 64k words of memory (that can be used for storing parameters).

### (5) Supporting IEC 61131-3

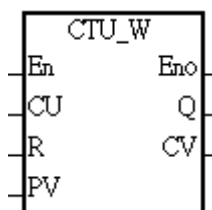
- The AS series CPU module supports IEC 61131-3.
- Supported programming languages are ladder diagrams (LD), sequential function chart (SFC), structured text (ST), continuous function chart (CFC) (ISPSOft V3.01 or later) and C language (ISPSOft V3.08 or later).



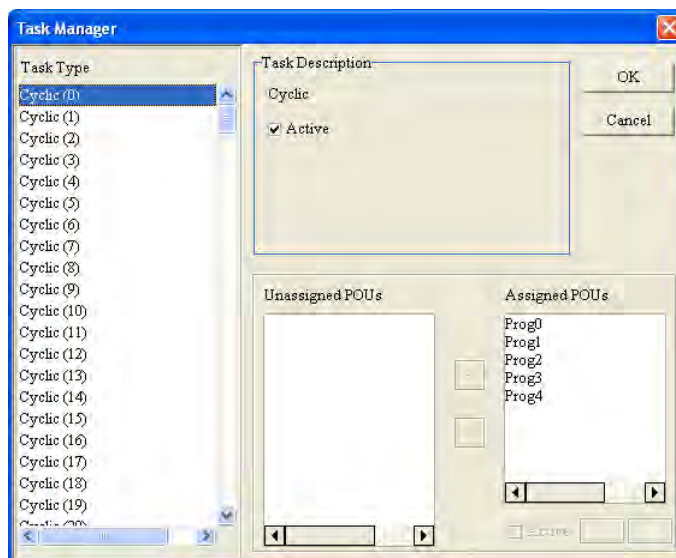
- You can select a programming language according to your preference. Programming languages support one another so that programs written by different users are compatible.

#### (6) Strong function block

- Both standard IEC61131-3 function blocks and convenient functions blocks provided by Delta Electronics, Inc. are supported. You can use function blocks for frequently used programs for greater structure and convenience.
- The symbol for a function block in a ladder diagram is similar to an integrated circuit (IC) in a circuit diagram. Because the ladder diagram is based on the traditional circuit diagram, the operation of a function block is similar to the function of an integrated circuit. You only need to send the signal to the corresponding input of the function block. You 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 cannot operate by itself, and must be called through the main program POU. The function defined by the function block is executed after being called with the related parameters. The final result can be sent to the device or variable in the superior POU after the function block completes.
- You can set passwords in ISPSOft or DIADesigner to provide function block security. The program inside a function block cannot be read, and business patents cannot be compromised.

**(7) Task**

(ISPSOFT image)

- You can assign 283 tasks at most to a program. Among these tasks, 32 are cyclic, 32 are I/O interrupts, 4 are timer interrupts, two are communication interrupts, one is an external 24 V low-voltage interrupt, and 212 are user-defined tasks.
- You can enable and disable a task when running a program by using the TKON and TKOFF instructions.

**(8) Increasing hardware configuration efficiency through a USB cable and ISPSOFT / DIADesigner**

- The AS 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. You do not need to buy a special communication cable for the CPU module. You can use a general USB cable to connect to the AS Series CPU module.

**(9) Serial control interface with multiple functions**

- AS Series CPU modules provide two RS-485 serial control interfaces, COM1 and COM2, which can be set as either master or slave.
- You use the communication cards to work with two extension serial communication ports and to set the port as a master or slave.

**(10) High-speed Ethernet communication interface**

- AS Series CPU modules are equipped with a 10/100 M Ethernet communication interface and support email, web, and socket services.
- System error messages can be sent to your email immediately. You do not need to be on location to

understand the problem.

#### (11) Memory card

- The memory card has the following functions.

System backup: user program, CPU parameters, module table, and the device setting values

System recovery: user program, CPU parameters, module table, and device setting values

Parameter storage: device value

Log storage: system error log and system status log


#### (12) I/O module installation

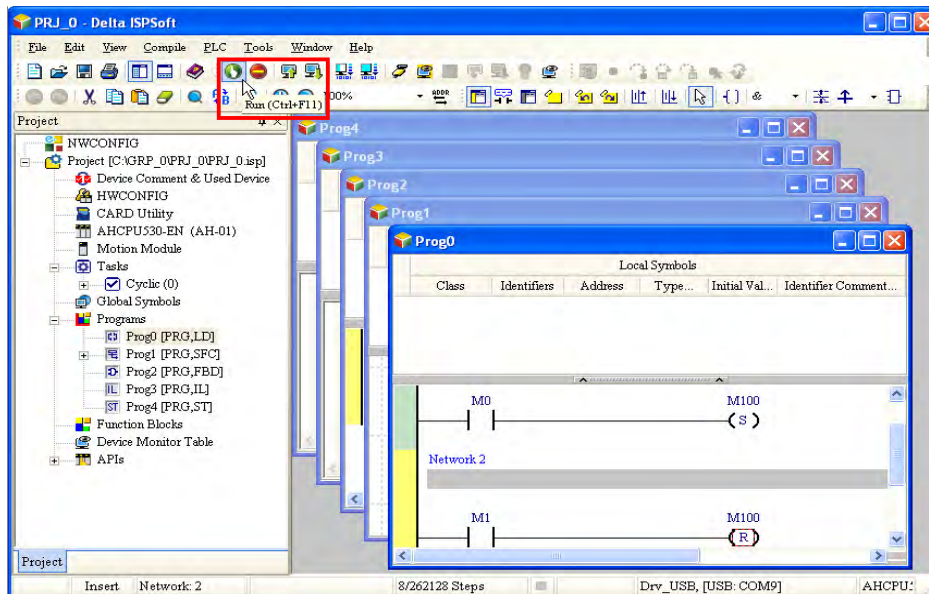
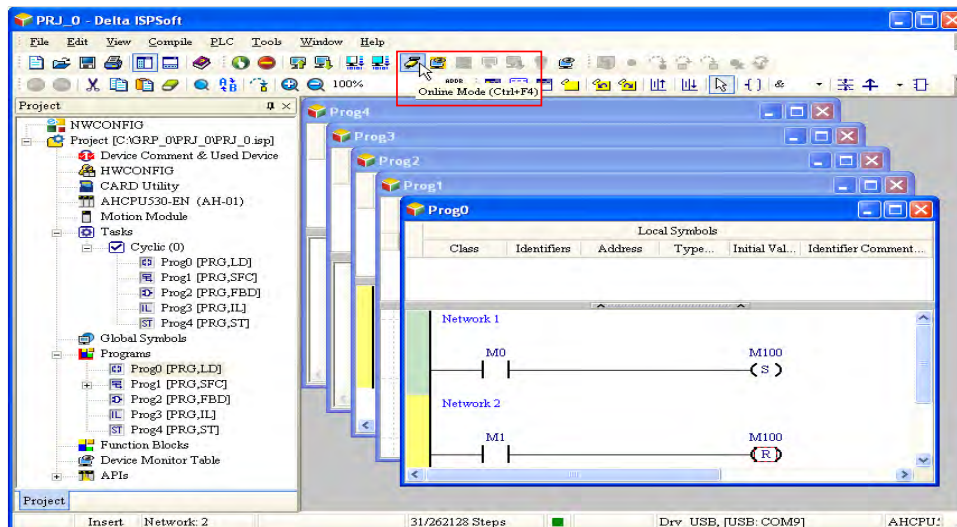
- The AS Series PLC supports slide-and-lock installation on I/O modules when the power is off. After the PLC is powered off, you can remove the defective module and replace it with a new one without removing other modules.



#### (13) Supporting on-line debugging mode

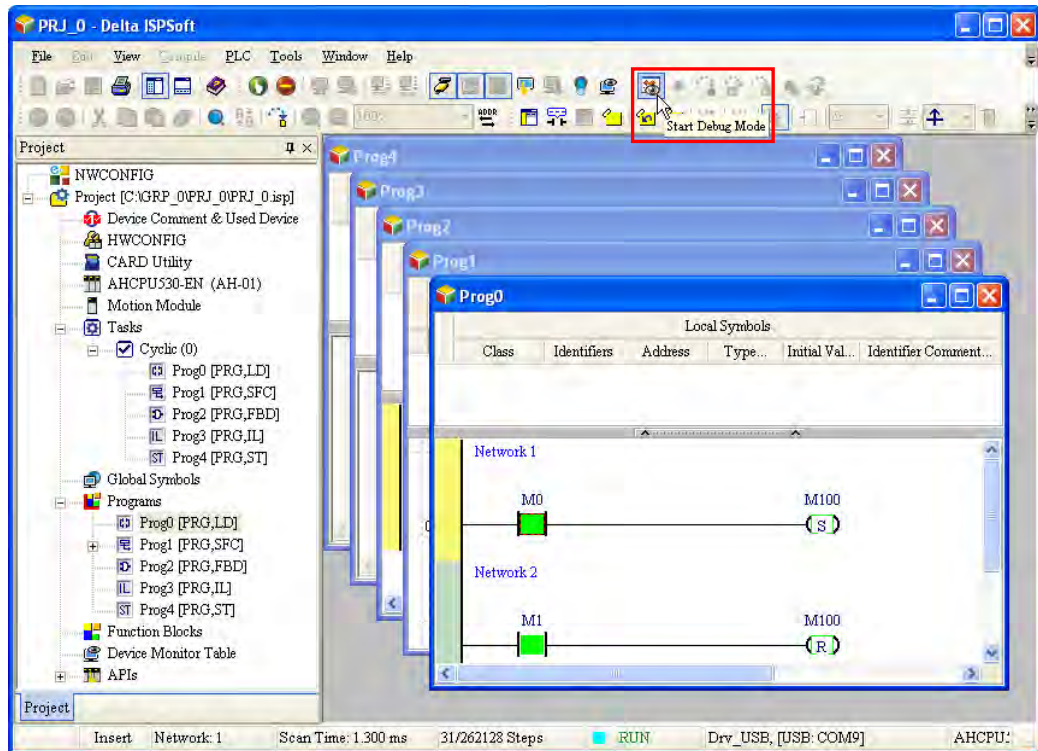
- You can use the on-line debugging mode in the AS series CPU module after a single instruction step completes, or after a breakpoint is specified, to find bugs in the program.
- The CPU module must be running to enter the debugging mode. After enabling the on-line monitoring

function, 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 text does not support debugging mode, and sequential function charts supports debugging mode during the action and the transition.


**Using ISPSOft to demonstrate:****Step 1: Set the PLC to RUN****Step 2: Entering the on-line mode**

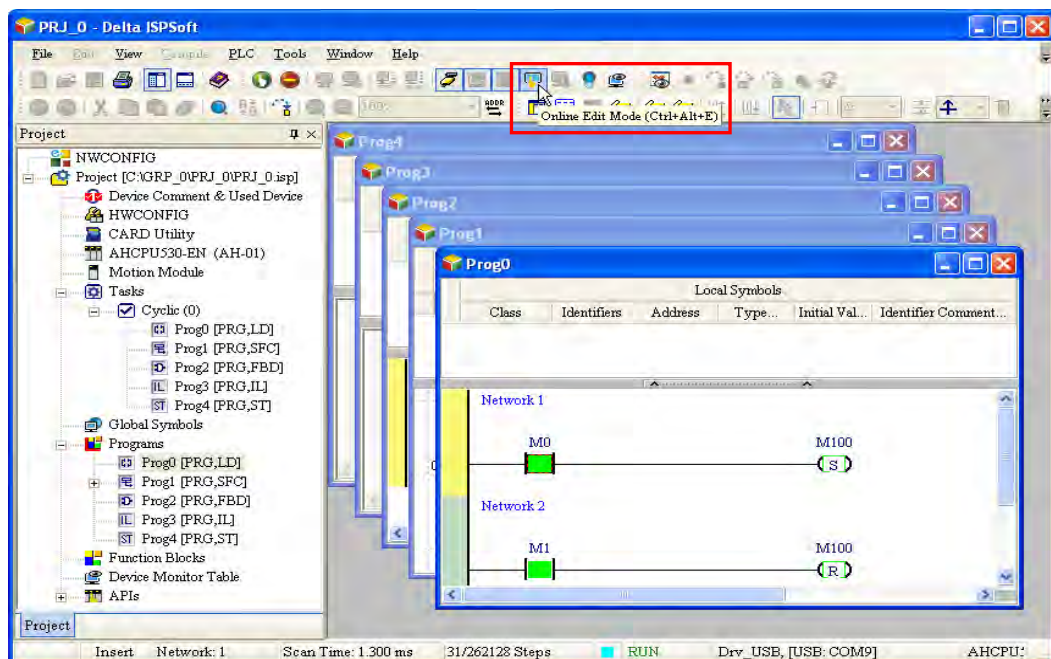


## Step 3: Enter debugging mode



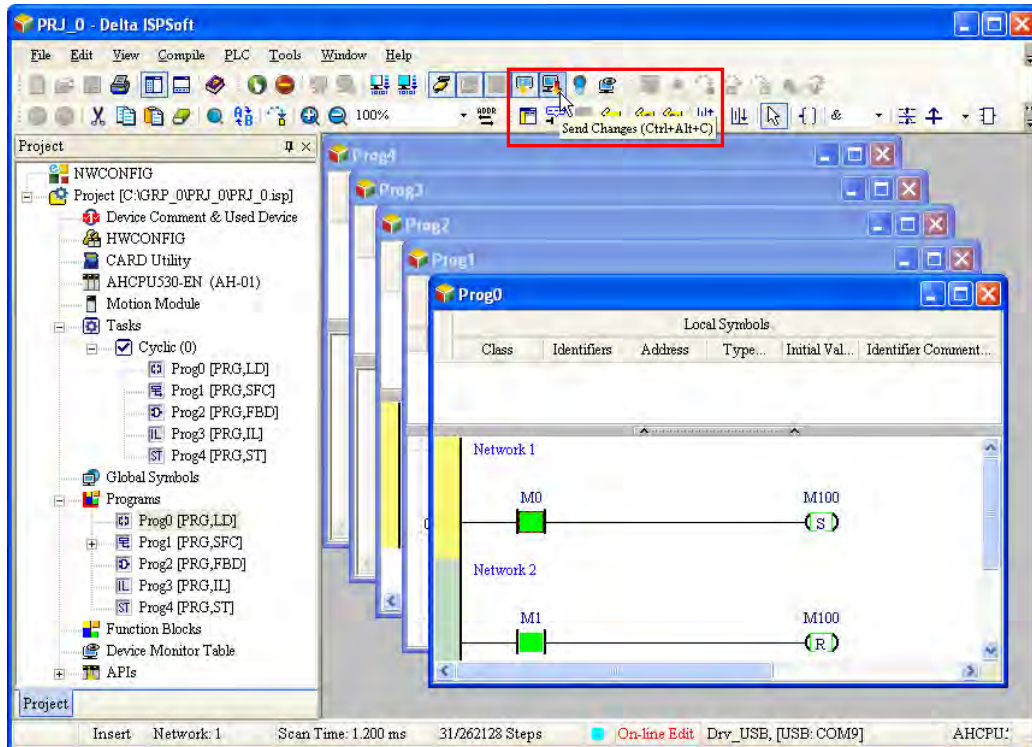
## (14) On-line editing mode

- You can use the on-line editing mode when the system is running to update the program without affecting the system operation.
- Using ISPSoft to demonstrate, when the system is in the on-line monitoring mode, enter the on-line editing mode by clicking .



- After the program is modified and compiled, you can update the program in the CPU module by

clicking  to download it to the CPU.



## Chapter 2 Specifications and System Configuration

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## 2.1 General Specifications

| Item  | Specifications   |
|---|--|
| <b>Operating temperature</b>                                | -20 to 60°C  |
| <b>Storage temperature</b>                                  | -40 to 80°C  |
| <b>Operating humidity</b>                                   | 5–95%<br>No condensation   |
| <b>Storage humidity</b>                                     | 5–95%<br>No condensation   |
| <b>Work environment</b>                                     | No corrosive gas exists.   |
| <b>Installation location</b>                                | In a control box   |
| <b>Pollution degree</b>                                     | 2  |
| <b>Ingress protection (IP ratings)</b>                      | IP20   |
| <b>EMC (electromagnetic compatibility)</b>                  | Refer to Appendix C for more information.  |
| <b>Vibration resistance</b>                                 | Tested with:<br>5 Hz $\leq$ f $\leq$ 8.4 Hz, constant amplitude 3.5 mm;<br>8.4 Hz $\leq$ f $\leq$ 150 Hz, constant acceleration 1g<br>Duration of oscillation: 10 sweep cycles<br>per axis on each direction of the three mutually perpendicular axes<br>International Standard IEC 61131-2 & IEC 60068-2-6 (TEST Fc)  |
| <b>Shock resistance</b>                                     | Tested with:<br>Half-sine wave:<br>Strength of shock 15 g peak value, 11 ms duration;<br>Shock direction: The shocks in each in direction per axis, on three mutually perpendicular axes (total of 18 shocks)<br>International Standard IEC 61131-2 & IEC 60068-2-27 (TEST Ea)   |
| <b>Safety</b>   | Conforms to IEC 61131-2, UL508   |
| <b>Ambient air temperature-barometric pressure-altitude</b> | Operating: 1080 ~ 795hPa (-1000 ~ 2000 m)<br>Storage: 1080 ~ 660hPa (-1000 ~ 3500 m)   |
| <b>Endurance</b>  | Applicable to the removable terminal block, function card slot, SD card slot, Ethernet port, USB port on the modules and the connecting ports between modules.<br>Plugging: more than 100 times (Each plugging in is counted as 1 time and pins inside the slots or ports should not be bent or crooked.)<br>Force used for plugging in: to plug in a removable terminal block, the force used is around 70 g and for other slots and ports, the force is around 220 g.<br>Force used for plugging out: to plug out a removable terminal block, the force used is around 1000 g and for other slots and ports, the force is around 20 g. |
| <b>UL 94 Flame Classifications</b>                          | UL 94 V-0  |

## 2.2 CPU Module Specifications

### 2.2.1 Functional specifications

| Item   | AS324MT-A / AS332T-A /<br>AS332P-A   | AS164T-A / AS164R-A<br>AS164P-A / AS148T-A<br>AS148R-A / AS148P-A<br>AS132T-A / AS132R-A<br>AS132P-A<br>AS228T-A / AS228P-A<br>AS228R-A / AS218TX-A<br>AS218PX-A / AS218RX-A | Remark   |
|--|--|--|--|
| Execution  | The program is executed cyclically.  |  |  |
| Input/Output control                             | Regenerated inputs/outputs<br>Direct inputs/outputs  |  | The inputs and outputs can be controlled through the direct inputs and direct outputs. |
| Programming language                             | IEC 61131-3  |  |  |
|  | Ladder diagrams, continuous function charts, structured text, and sequential function charts |  |  |
| Instruction execution speed                      | 40K steps/ms   |  |  |
| Number of instructions                           | Approximately 666 instructions   |  |  |
| Constant scan cycle (ms)                         | 1-32000<br>(The scan cycle can be increased by one millisecond.)                             |  | Setting the parameter  |
| Program capacity (step)                          | 128K steps (256K bytes)  | 64K steps (128K bytes)   |  |
| Installation                                     | DIN rails or screws  |  |  |
| 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; four timed interrupts, etc.)                  |  | Refer to the AS Series 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]                                | 30000 (D0–D29999)  |  |  |
| Data register [W]                                | 30000 (W0–W29999)  |  |  |
| Stepping relay [S]                               | 2048 (S0–S2047)  |  |  |

| Item                         | AS324MT-A / AS332T-A / AS332P-A   | AS164T-A / AS164R-A<br>AS164P-A / AS148T-A<br>AS148R-A / AS148P-A<br>AS132T-A / AS132R-A<br>AS132P-A<br>AS228T-A / AS228P-A<br>AS228R-A / AS218TX-A<br>AS218PX-A / AS218RX-A | Remark  |
|------------------------------|---|--|---|
| 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  |  | Refer to the section 9.3 for more details on Ethernet specificaltions |
| 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 | None   | Function card is only available for AS300 Series.                     |
| CANopen DS301 (Master)       | Maximum node: 64; maximum bytes: 2000   |  | *A function card AS-FCOPM is required for AS300 Series.               |
| CANopen DS301 (Slave)        | Maximum PDO: 8; maximum bytes: 8  |  |   |

## 2.2.2 Electrical specifications

### ● AS200 Series and AS300 Series

| Model<br>Item                | AS332T-A/<br>AS332P-A/<br>AS324MT-A   | AS320T-B/<br>AS320P-B | AS300N-A | AS228T-A/<br>AS228P-A | AS218TX-A/<br>AS218PX-A | AS228R-A/<br>AS218RX-A |
|------------------------------|---|-----------------------|----------|-----------------------|-------------------------|------------------------|
| Supply voltage               | 24 VDC (20.4 VDC–28.8 VDC) (-15% to +20%)   |                       |          |                       |                         |                        |
| Max. inrush current          | 95 A (@28.8VDC · I <sup>2</sup> t = 4.5 A <sup>2</sup> S)   |                       |          |                       |                         |                        |
| Power consumption (W)        | 3.6   | 3.6                   | 3        | 3.6                   | 4.32                    | 4.56 / 4.8             |
| Weight (g)                   | 260   | 285                   | 235      | 285                   | 290                     | 325 / 310              |
| Communication port isolation | USB, COM1, COM2, and CAN*1 ports: 500 VAC<br>Ethernet: 1500 VAC:<br>*1: CAN port is not built-in for AS300 Series. You need to purchase a communication card AS-FCOPM to have a CAN port. |                       |          |                       |                         |                        |

● **AS100 Series**

| Item \ Model                             | AS132T-A<br>AS132P-A   | AS132R-A | AS148T-A<br>AS148P-A | AS148R-A | AS164T-A<br>AS164P-A | AS164R-A |
|--|--|----------|----------------------|----------|----------------------|----------|
| Supply voltage                           | 100 ~ 240VAC (-15% ~ 10%); 50 / 60Hz ± 5%  |          |                      |          |                      |          |
| Max. inrush current                      | 140 A (@264VAC · I <sup>2</sup> t = 29.4 A <sup>2</sup> S)   |          |                      |          |                      |          |
| Power fuse rating                        | 2.5 A / 250 VAC  |          |                      |          |                      |          |
| Power consumption (W)                    | 130 V <sub>A</sub> MAX   |          |                      |          |                      |          |
| Internal power consumption (W)           | 2.64   | 3.84     | 3                    | 4.8      | 3.36                 | 5.76     |
| Current output (DC 24V)                  | 500 mA   |          |                      |          |                      |          |
| Output short-circuit protection (DC 24V) | Yes  |          |                      |          |                      |          |
| Electronical isolation                   | 3,000 VAC (Primary-secondary); 3,000 VAC (Primary-FE); 500 VAC (Secondary-FE)                                      |          |                      |          |                      |          |
| Insulation voltage                       | Above 5 MΩ<br>The voltage between all inputs/outputs and the ground is 500 VAC.                                    |          |                      |          |                      |          |
| Ground                                   | The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N. |          |                      |          |                      |          |
| Weight (g)                               | 550  | 600      | 650                  | 700      | 750                  | 800      |
| Communication port isolation             | USB, COM1, COM2, and CAN ports: 500 VAC<br>Ethernet: 1500 VAC  |          |                      |          |                      |          |

- **AS300 Series: Electrical specifications for the inputs on digital input/output module. The signals passing through the inputs are 24 VDC signals.**

| Item \ Model            | AS332T-A<br>AS332P-A                 | AS320T-B<br>AS320P-B   | AS324MT-A  |
|-------------------------|--------------------------------------|--|--|
| Number of inputs        | 16 (X0.0-X0.15)                      | 8 (X0.0-X0.7)  | 12 (X0.0-X0.11)  |
| Terminal connector type | MIL connector                        | Removable spring-type terminal blocks                          | MIL connector  |
| Input type              | Digital input                        |  |  |
| Input form              | Direct current (sinking or sourcing) |  | X0.0+—X0.3+/X0.0- to X0.3-: differential input<br>X0.4—X0.11: Direct current (sinking or sourcing) |
| Input voltage/ current  | 24 VDC<br>5 mA                       |  | X0.0+—X0.3+/X0.0- to X0.3-: 5 VDC, 5 mA<br>X0.4—X0.11: 24 VDC, 5 mA                                |
| Action level            | OFF→ON                               | >15 VDC  |  |
|                         | ON→OFF                               | <5 VDC   |  |
| Response time           | OFF→ON                               | X0.0~X0.11: < 2.5μs<br>X0.12~X0.15: < 50μs                     |  |
|                         |                                      | X0.0+—X0.3+/X0.0- to X0.3- : < 0.125 μs<br>X0.4—X0.11: < 2.5μs |  |



| Model                   |        | AS332T-A<br>AS332P-A   | AS320T-B<br>AS320P-B | AS324MT-A   |
|-------------------------|--------|--|----------------------|---|
| Item                    |        |  |                      |   |
|                         | ON→OFF | X0.0~X0.11: < 2.5μs<br>X0.12~X0.15: < 50μs   |                      | X0.0+~X0.3+/X0.0- to<br>X0.3- : < 0.125 μs<br>X0.4~X0.11: < 2.5μs |
| Maximum input frequency |        | X0.0~X0.11: 200 kHz<br>X0.12~X0.15: 10 kHz   |                      | X0.0+~X0.3+/X0.0- to<br>X0.3-: < 4 MHz<br>X0.4~X0.11: < 200 kHz   |
| Input impedance         |        | 5.6 k Ω  |                      |   |
| Input signal            |        | Voltage input<br>Sinking: The inputs are NPN transistors whose collectors are open collectors.<br>Sourcing: The inputs are PNP transistors whose collectors are open collectors. |                      |   |
| Input isolation         |        | 500 VAC  |                      |   |
| Input display           |        | When the optocoupler is driven, the input LED indicator is ON.   |                      |   |

Note: AS300N-A does not come with inputs/outputs.

● AS300 Series: Electrical specifications for the outputs

| Model                      |            | AS332T-A<br>AS332P-A  | AS320T-B<br>AS320P-B                        | AS324MT-A   |
|----------------------------|------------|---|---|---|
| Item                       |            |   |   |   |
| Number of outputs          |            | 16 (Y0.0-Y0.15)   | 12 (Y0.0-Y0.11)                             | 12 (Y0.0-Y0.11)   |
| Terminal connector type    |            | MIL connector   | Removable<br>spring-type<br>terminal blocks | MIL connector   |
| Output form                |            | Transistor-T (sinking)<br>Transistor-P (sourcing)   |   | Y0.0+~Y0.3+/Y0.0- to Y0.3-: differential<br>input<br>Y0.4~Y0.11: Transistor-T (sinking)   |
| Voltage                    |            | 5-30 VDC  |   | Y0.0+~Y0.3+/Y0.0- to Y0.3- : 5 VDC<br>Y0.4~Y0.11: 5-30VDC   |
| Leakage current            |            | <10uA   |   |   |
| Max. inrush current        |            | Transistor-T (sinking): 0.8 A<br>Transistor-P (sourcing): 1.2 A<br>(Tested condition: Ta = 25 °C, V <sub>DS</sub> = 30VDC and pulse duration = 1ms) |   |   |
| Maximum load               | Resistance | 0.1A/output,<br>1.6A/COM  | 0.1A/output,<br>1.2A/COM                    | Y0.0+~Y0.3+/Y0.0-Y0.3- : 20mA/output<br>(+ and – as a group, e.g. Y0.0+ and<br>Y0.0- is a group)<br>Y0.4-Y0.11: 0.1A/output, 0.8A/COM |
|                            | Inductance | N/A   |   |   |
|                            | Bulb       | N/A   |   |   |
| Minimum load               |            | 1mA / 5V  |   |   |
| Maximum output frequency*1 | Resistance | Y0.0-Y0.11: 200 kHz<br>Y0.12-Y0.15: 100 Hz  |   | Y0.0+~Y0.3+/Y0.0- to Y0.3- : 4 MHz<br>Y0.4~Y0.11: 200 kHz   |
|                            | Inductance | N/A   |   |   |
|                            | Bulb       | N/A   |   |   |
| Maximum Response time      |            | Y0.0~Y0.11: 2.5μs<br>Y0.12~Y0.15: 0.5ms   |   | Y0.0+~Y0.3+/Y0.0- to Y0.3-: 0.125 μs<br>Y0.4~Y0.11: 2.5 μs  |
| Output isolation           |            | 500 VAC   |   |   |

- **AS200 Series: Electrical specifications for the inputs. The signals passing through the inputs are 24 VDC signals.**

| Model                          |        | AS228P-A / AS228R-A / AS228T-A  | AS218PX-A / AS218RX-A / AS218TX-A                     |
|--------------------------------|--------|---|---|
| Item                           |        |   |   |
| Number of inputs               |        | 16 (X0.0-X0.15)   | 8 (X0.0-X0.7)   |
| Terminal connector type        |        | Removable spring-type terminal blocks   |   |
| Input type                     |        | Digital input   |   |
| Input form                     |        | Direct current (sinking or sourcing)  |   |
| Input voltage/ current         |        | 24 VDC, 5 mA  |   |
| Action level                   | OFF→ON | >15 VDC   |   |
|                                | ON→OFF | <5 VDC  |   |
| Response time                  | OFF→ON | X0.0–X0.7: < 2.5 μs<br>X0.8–X0.15: < 50 μs  |   |
|                                | ON→OFF | X0.0–X0.7: < 2.5 μs<br>X0.8–X0.15: < 50 μs  |   |
| Maximum input frequency        |        | X0.0–X0.7: 200 kHz<br>X0.8–X0.15: 10 kHz  |   |
| Input impedance                |        | X0.0–X0.7: 3.9 k Ω<br>X0.8–X0.15: 5.6 k Ω   | 3.9 k Ω   |
| Input signal                   |        | Voltage direct input<br>Sinking: The inputs are NPN transistors whose collectors are open collectors.<br>Sourcing: The inputs are PNP transistors whose collectors are open collectors.   |   |
| Digital input isolation        |        | 500 VAC   |   |
| Input display                  |        | When the optocoupler is driven, the input LED indicator is ON.  |   |
| Analog inputs                  |        | N/A   | 2   |
| Analog input conversion time*1 |        | N/A   | 3 ms / channel  |
| Analog input resolution        |        | N/A   | 12bits  |
| Analog input mode              |        | N/A   | -10V~10V (voltage mode) or<br>20mA~20mA (currentmode) |
| Analog linearity error         |        | N/A   | ±1% (full scale)                                      |
| Analog input impedance         |        | N/A   | ≥1 MΩ (Voltage mode)<br>250 Ω (Current mode)          |
| Analog input isolation         |        | When there is isolation between alaog and digital electricals and there is no isolation among analog channels.<br>Isolation between analog electrical and gronunding: 500 VAC<br>Isolation between analog and digital electrical: 500 VAC |   |

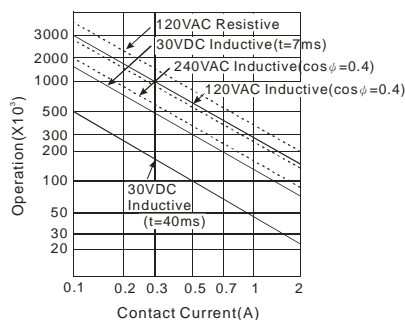
\*1: Analog input data updates automatically in every PLC program scan.

● **AS200 Series: Electrical specifications for the outputs**

| Model                           |            |       | AS228R-A<br>AS218RX-A   | AS228T-A<br>AS218TX-A   | AS228P-A<br>AS218PX-A   |
|---------------------------------|------------|-------|---|---|-------------------------|
| Item                            |            |       |   |   |                         |
| Number of outputs               |            |       | AS228 Series: 12 outputs (Y0.0-Y0.11)<br>AS218 Series 6 outputs (Y0.0-Y0.5)   |   |                         |
| Terminal connector type         |            |       | Removable spring-type terminal blocks   |   |                         |
| Output form                     |            |       | Relay   | Transistor-T (sinking)  | Transistor-P (sourcing) |
| Voltage / current               |            |       | 240 VAC / 24 VDC  | 5-30 VDC  | 5-30 VDC                |
| Leakage current                 |            |       | 0uA   | <10uA   |                         |
| Max. inrush current             |            |       | N/A   | Transistor-T (sinking): 0.8 A<br>Transistor-P (sourcing): 7.5 A<br>(Tested condition: Ta = 25 °C, Vbs = 30VDC and pulse duration = 1ms) |                         |
| Maximum load                    | Resistance | AS228 | 2A/output, 8A/COM   | 0.5A/output, 2A/COM   | 0.5A/output, 2A/COM     |
|                                 |            | AS218 | 2A/output, 6A/COM   | 0.5A/output, 1.5A/COM   | 0.5A/output, 1.5A/COM   |
|                                 | Inductance |       | Life cycle curve*2  | N/A   | N/A                     |
|                                 | Bulb       |       | 20W (24 VDC)<br>100W (230 VAC)  | N/A   | N/A                     |
| Minimum load                    |            |       | 1mA / 5V  |   |                         |
| Maximum output frequency        | Resistance |       | 1Hz   | 200kHz  | 200kHz                  |
|                                 | Inductance |       | 0.5Hz   | N/A   | N/A                     |
|                                 | Bulb       |       | 1Hz   | N/A   | N/A                     |
| Maximum Response time           | OFF→ON     |       | 10 μs   | 2.5 μs  | 2.5 μs                  |
|                                 | ON→OFF     |       |   |   |                         |
| Analog outputs                  |            |       | AS218 Series: 2 outputs   |   |                         |
| Analog output conversion time*1 |            |       | 3 ms / channel (for AS218 PLC CPU)  |   |                         |
| Analog output resolution        |            |       | AS218 Series: 12bits  |   |                         |
| Analog output mode              |            |       | AS218 Series: -10V~10V (voltage mode) or 0mA~20mA (currentmode)   |   |                         |
| Electrical output isolaiton     |            |       | 1500 VAC  | 500 VAC   |                         |
| Analog output isolation         |            |       | When there is isolation between alaog and digital electricals and there is no isolation among analog channels.<br>Isolation between analog electrical and gronunding: 500 VAC<br>Isolation between analog and digital electrical: 500 VAC |   |                         |

\*1: Analog output data updates automatically in every PLC program scan.

\*2: Life cycle curve: The lifetime of a relay terminal varies with the working voltage, the load type (the power factor  $\cos\psi$ , the time constant  $t(L/R)$ ), and the current passing through the terminal. The relation is shown in the life cycle curve below.



- **AS100 Series: Electrical specifications for the inputs. The signals passing through the inputs are 24 VDC signals.**

| Item \ Model            |        | AS164T-A<br>AS164P-A<br>AS164R-A  | AS148T-A<br>AS148P-A<br>AS148R-A  | AS132T-A<br>AS132P-A<br>AS132R-A |
|-------------------------|--------|---|-----------------------------------|----------------------------------|
| Number of inputs        |        | 32<br>(X0.0~X0.15)<br>(X1.0~X1.15)  | 24<br>(X0.0~X0.15)<br>(X1.0~X1.7) | 16<br>(X0.0 ~ X0.15)             |
| Terminal connector type |        | Removable screw-type terminal blocks  |                                   |                                  |
| Input type              |        | Digital input   |                                   |                                  |
| Input form              |        | Direct current (sinking or sourcing)  |                                   |                                  |
| Input voltage/ current  |        | 24 VDC, 5 mA  |                                   |                                  |
| Action level            | OFF→ON | >15 VDC   |                                   |                                  |
|                         | ON→OFF | <5 VDC  |                                   |                                  |
| Response time           | OFF→ON | X0.0~X0.7: < 2.5 μs<br>X0.8~X0.15: <25 μs<br>X1.0~X1.15: < 500 μs   |                                   |                                  |
|                         | ON→OFF | X0.0~X0.7: < 2.5 μs<br>X0.8~X0.15: <25 μs<br>X1.0~X1.15: < 500 μs   |                                   |                                  |
| Maximum input frequency |        | X0.0~X0.7: 200 kHz<br>X0.8~X0.15: 20 kHz<br>X1.0~X1.15: 1 kHz   |                                   |                                  |
| Input impedance         |        | X0.0~X0.7: 3.9 k Ω<br>X0.8~X0.15; X1.0~X1.15: 5.6 k Ω   |                                   |                                  |
| Input signal            |        | Voltage direct input<br>Sinking: The inputs are NPN transistors whose collectors are open collectors.<br>Sourcing: The inputs are PNP transistors whose collectors are open collectors. |                                   |                                  |
| Digital input isolation |        | 500 VAC   |                                   |                                  |
| Input display           |        | When the optocoupler is driven, the input LED indicator is ON.  |                                   |                                  |

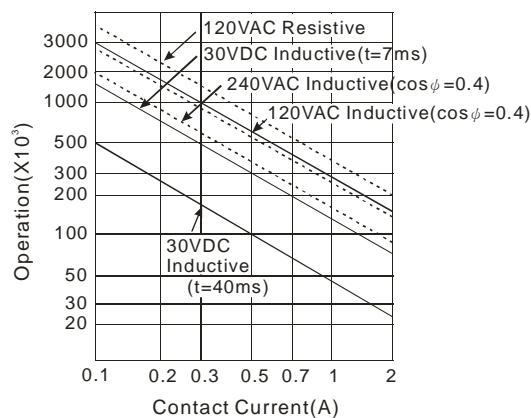
- **AS100 Series: Electrical specifications for the outputs**

| Item \ Model            |            | AS164R-A<br>AS148R-A<br>AS132R-A   | AS164T-A<br>AS148T-A<br>AS132T-A  | AS164P-A<br>AS148P-A<br>AS132P-A |
|-------------------------|------------|--|---|----------------------------------|
| Number of outputs       |            | AS132R/T/P-A: 16 outputs (Y0.0~Y0.15)<br>AS148R/T/P-A: 24 outputs (Y0.0~Y0.15) (Y1.0~Y1.7)<br>AS164R/T/P-A: 32 outputs (Y0.0~Y0.15) (Y1.0~Y1.15) |   |                                  |
| Terminal connector type |            | Removable screw-type terminal blocks   |   |                                  |
| Output form             |            | Relay  | Relay   | Relay                            |
| Voltage / current       |            | 240 VAC/24 VDC   | 5~30 VDC  |                                  |
| Leakage current         |            | 0uA  | <10uA   |                                  |
| Max. inrush current     |            | NA   | Transistor-T (sinking): 0.8 A<br>Transistor-P (sourcing): 7.2 A<br>(Tested condition: Ta = 25 °C, V <sub>DS</sub> = 30VDC and pulse duration = 1ms) |                                  |
| Maximum load            | Resistance | 2A/output, 5A/COM  | 0.5A/output, 2A/COM   |                                  |
|                         | Inductance | Life cycle curve*2   | 15W (30 VDC)  |                                  |

| Item \ Model                |        | AS164R-A<br>AS148R-A<br>AS132R-A | AS164T-A<br>AS148T-A<br>AS132T-A                 | AS164P-A<br>AS148P-A<br>AS132P-A |
|-----------------------------|--------|----------------------------------|--|----------------------------------|
|                             | Bulb   | 20W (24 VDC)<br>100W (230 VAC)   | 2.5W (30 VDC)                                    |                                  |
| Maximum output frequency    |        | 1 Hz                             | Y0.0~Y0.11: 200 kHz<br>Y0.12~*1: 1 kHz           |                                  |
| Maximum Response time       | OFF→ON | 10 ms                            | Y0.0~Y0.11: 2.5 $\mu$ s<br>Y0.12~*1: 500 $\mu$ s |                                  |
|                             | ON→OFF |                                  | Y0.0~Y0.11: 2.5 $\mu$ s<br>Y0.12~*1: 500 $\mu$ s |                                  |
| Electrical output isolation |        | 1500 VAC                         | 500 VAC  |                                  |

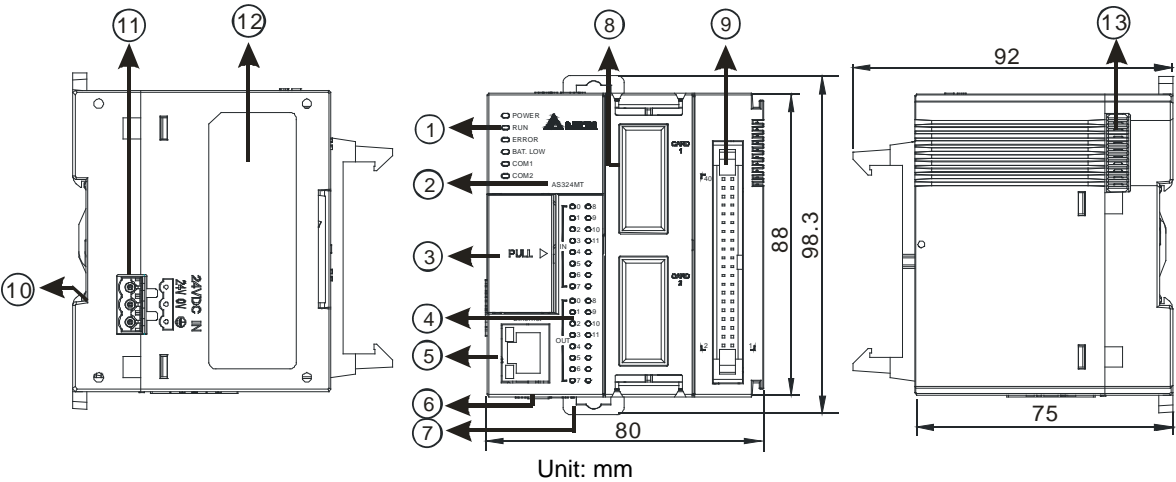
\*1: Refere to section 2.2.4 for more information on the maximum output points of each model.

\*2: Life cycle curve: The lifetime of a relay terminal varies with the working voltage, the load type (the power factor  $\cos\psi$ , the time constant  $t(L/R)$ ), and the current passing through the terminal. The relation is shown in the life cycle curve below.

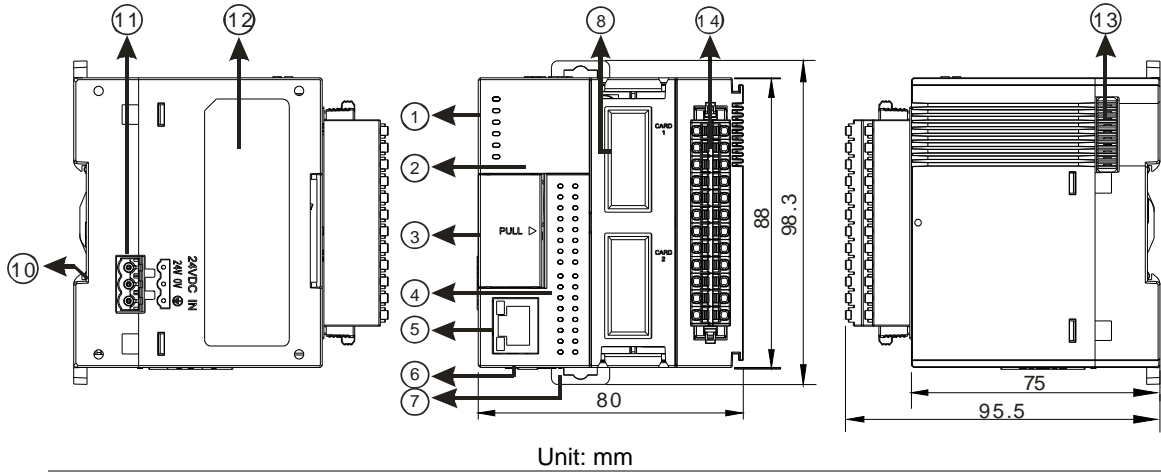


2.2.3 CPU Module Profiles

- AS324MT-A/AS332T-A/AS332P-A/AS300N-A



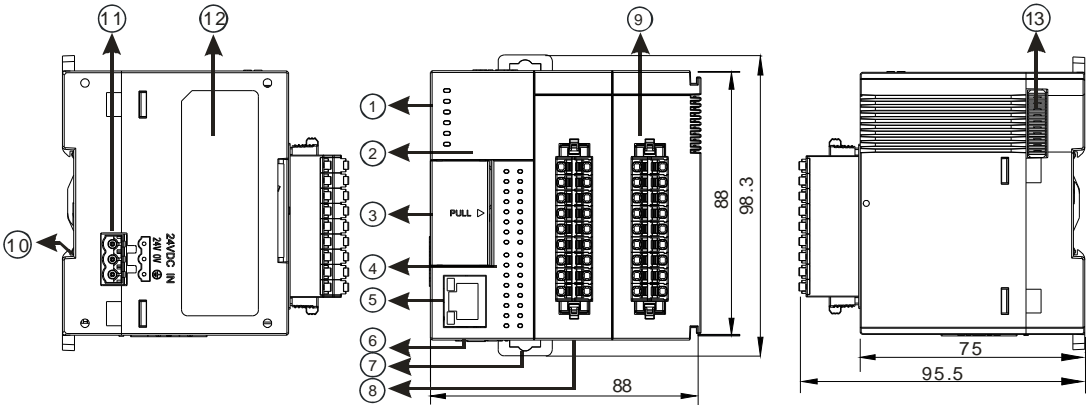
- AS320T-B/AS320P-B



| Number | Name                  | Description  |
|--------|-----------------------|--|
| 1      | Power LED indicator   | Indicates the power status of the CPU module   |
|        | Run LED indicator     | Operating status of the module<br>ON: the module is running.<br>OFF: the module is stopped.  |
|        | Error LED indicator   | Error status of the module<br>ON: a serious error occurs in the module.<br>OFF: the module is normal.<br>Blinking: a minor error occurs in the module. |
|        | BAT.LOW LED indicator | Indicates the battery status of the CPU module.<br>(Enable/Disable this display in HWCONFIG in ISPSOft)  |
|        | COM1 LED<br>COM2 LED  | Indicates the communication status of the COM port.<br>OFF: no communication over the COM port<br>Blinking: communication over the COM port            |
| 2      | Model name            | Shows the model name of the CPU module.  |
| 3      | Run/Stop              | RUN: execute the programs<br>STOP: stop the programs   |
|        | USB port              | Mini USB communication port  |

| Number | Name   | Description  |
|--------|--|--|
|        | SD card slot   | Provides an interface for an SD card   |
|        | VR0/VR1  | VR0: use the flag SM166 to activate the values in SR166<br>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.<br>If there is an output signal, the output LED indicator is ON.   |
| 5      | Ethernet port  | Provides an interface for a n Ethernet communication   |
| 6      | COM1/COM2  | Provides an interface for RS-485 communication   |
| 7      | DIN rail clip  | Secures the DIN rail   |
| 8      | Extension card slot  | Provides an interface for an extension card  |
| 9      | MIL connector  | Connects the module and the wiring module  |
|        | AS300N-A does not come with inputs/outputs; no MIL connector for it. |  |
| 10     | Grounding clip   | For grounding  |
| 11     | Power supply   | For power supply   |
| 12     | Label  | Nameplate  |
| 13     | External module port   | Connects the modules   |
| 14     | Removable terminal blocks  | For wiring the input and output;<br>Note: Since AS300N-A does not come with inputs/outputs, no terminal block for this series. |

● AS200 Series (AS218PX-A/AS218RX-A/AS218TX-A/AS228R-A/AS228T-A/AS228P-A)

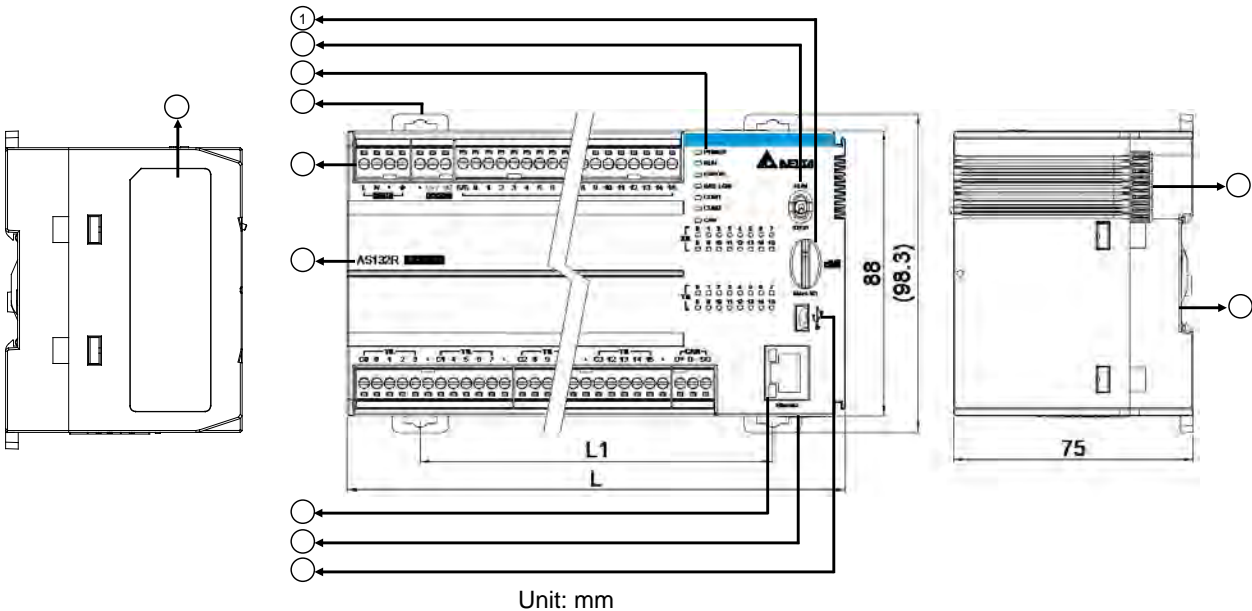


Unit: mm

| Number | Name                            | Description   |
|--------|---------------------------------|---|
| 1      | Power LED indicator             | Indicates the power status of the CPU module  |
|        | Run LED indicator               | Operating status of the module<br>ON: the module is running.<br>OFF: the module is stopped.<br>Blinking: the module is detecting an error.              |
|        | Error LED indicator             | Error status of the module<br>ON: a serious error occurs in the module.<br>OFF: the module is normal.<br>Blinking: a minor error occurs in the module.  |
|        | BAT.LOW LED indicator           | Indicates the battery status of the CPU module.<br>(Enable/Disable this display in HWCONFIG in ISPSOft)   |
|        | COM1 LED<br>COM2 LED<br>CAN LED | Indicates the communication status of the COM/CAN port.<br>OFF: no communication over the COM/CAN port<br>Blinking: communication over the COM/CAN port |

| Number | Name                       | Description  |
|--------|----------------------------|--|
| 2      | Model name                 | Shows the model name of the CPU module.  |
| 3      | Run/Stop                   | RUN: execute the programs<br>STOP: stop the programs   |
|        | USB port                   | Mini USB communication port  |
|        | SD card slot               | Provides an interface for an SD card   |
|        | VR0/VR1                    | VR0: use the flag SM166 to activate the values in SR166<br>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.<br>If there is an output signal, the output LED indicator is ON. |
| 5      | Ethernet port              | Provides an interface for a n Ethernet communication   |
| 6      | COM1/COM2                  | Provides an interface for RS-485 communication   |
| 7      | DIN rail clip              | Secures the DIN rail   |
| 8      | CAN port                   | Provides an interface for CAN communication  |
| 9      | Removable terminal blocks  | For wiring the input and output  |
| 10     | Grounding clip             | For grounding  |
| 11     | Power supply               | For power supply   |
| 12     | Label                      | Nameplate  |
| 13     | External module port       | Connects the modules   |

● **AS100 Series (AS132T-A/AS132P-A/AS132R-A/AS148T-A/AS148P-A/AS148R-A/AS164T-A/AS164P-A/AS164R-A)**



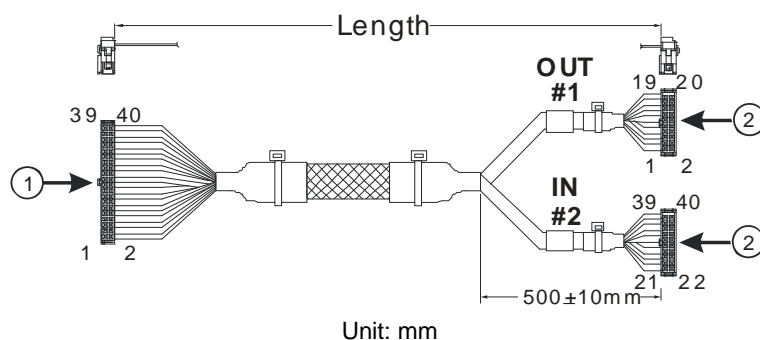
| Model name | AS132R/T/P-A | AS148R/T/P-A | AS164R/T/P-A |
|------------|--------------|--------------|--------------|
| L          | 156          | 207          | 249.5        |
| Model name | AS132R/T/P-A | AS148R/T/P-A | AS164R/T/P-A |
| L1         | 110.3        | 161.3        | 203.8        |



| Number | Name                            | Description   |
|--------|---------------------------------|---|
| 1      | SD card slot                    | Provides an interface for an SD card  |
| 2      | Run/Stop                        | RUN: execute the programs<br>STOP: stop the programs  |
| 3      | Power LED indicator             | Indicates the power status of the CPU module  |
|        | Run LED indicator               | Operating status of the module<br>ON: the module is running.<br>OFF: the module is stopped.<br>Blinking: the module is detecting an error.              |
|        | Error LED indicator             | Error status of the module<br>ON: a serious error occurs in the module.<br>OFF: the module is normal.<br>Blinking: a minor error occurs in the module.  |
|        | BAT.LOW LED indicator           | Indicates the battery status of the CPU module.<br>(Enable/Disable this display in HWCONFIG in ISPSOft)   |
|        | COM1 LED<br>COM2 LED<br>CAN LED | Indicates the communication status of the COM/CAN port.<br>OFF: no communication over the COM/CAN port<br>Blinking: communication over the COM/CAN port |
| 4      | DIN rail clip                   | Secures the DIN rail  |
| 5      | Removable terminal blocks       | Connects the wirings of power, input/output and CAN communication.  |
| 6      | Model name                      | Shows the model name of the CPU module.   |
| 7      | Ethernet port                   | Provides an interface for a n Ethernet communication  |
| 8      | COM1/COM2                       | Provides an interface for RS-485 communication  |
| 9      | USB port                        | Mini USB communication port   |
| 10     | External module port            | Connects the modules  |
| 11     | Grounding clip                  | For grounding   |
| 12     | Label                           | Nameplate   |

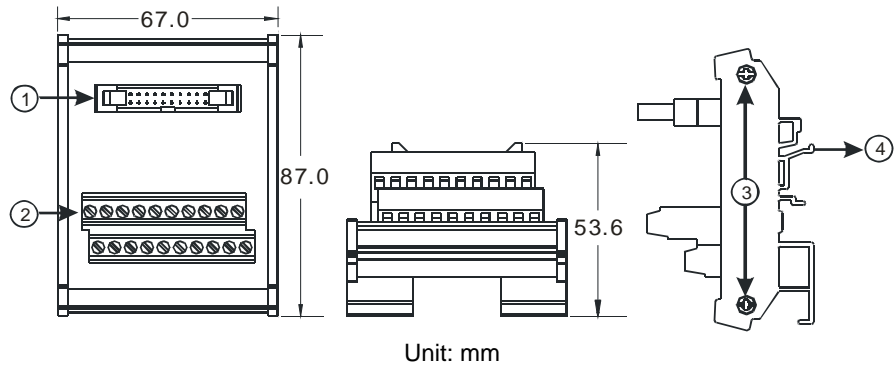
● **MIL connector, extension cable, and wiring modules (for AS332T-A/AS332P-A/AS324MT-A)**

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



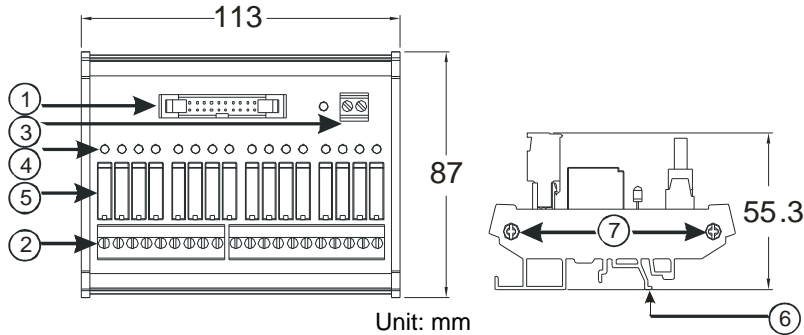
| Number | Name                | Description  |
|--------|---------------------|--|
| 1      | IDC 40-pin terminal | Connects a digital input/output module and an external terminal module.    |
| 2      | IDC 20-pin terminal | Connects the external terminal modules UB-10-ID16A/UB-10-OR16A/UB-10-OR16B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

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



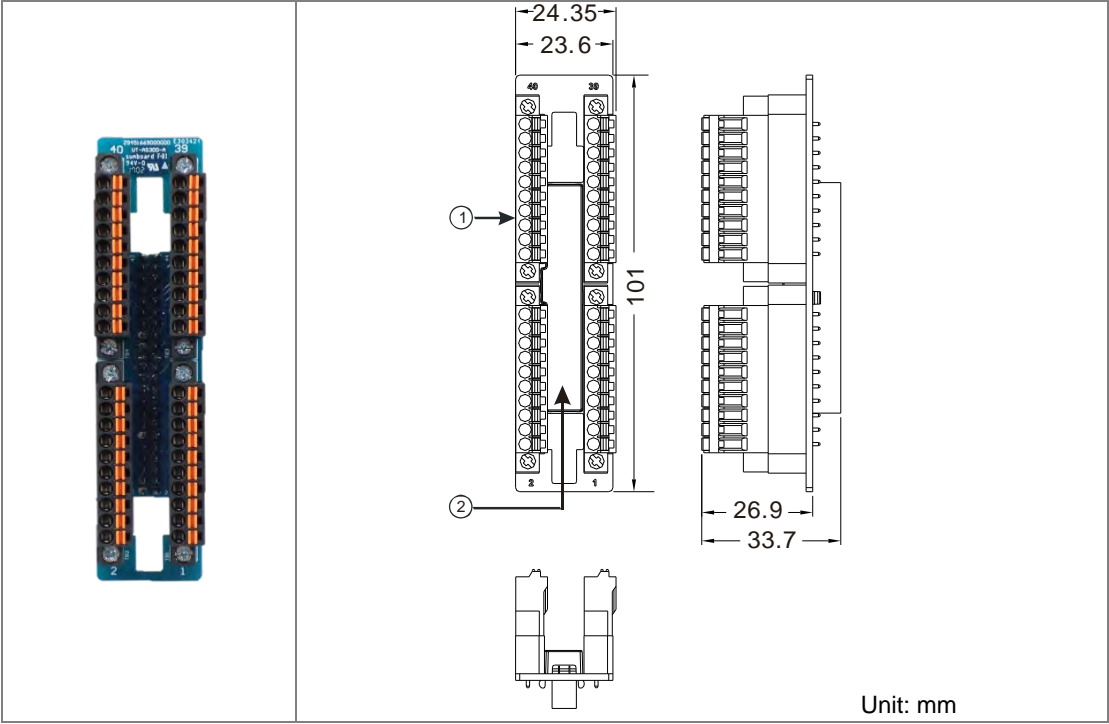
| Number | Name                 | Description   |
|--------|----------------------|---|
| 1      | 20-pin MIL connector | Connects the external terminal module and a wiring module |
| 2      | Terminals            | Input/Output terminals for wiring                         |
| 3      | Clip                 | Hangs the external terminal module on a DIN rail          |
| 4      | Set screw            | Fixes the base  |

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



| Number | Name                       | Description   |
|--------|----------------------------|---|
| 1      | 20-pin MIL connector       | Connects 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                       | Hangs the external terminal module on a DIN rail              |
| 7      | Set screw                  | Fixes the base  |

● Spring clamp/MIL connector terminal block UB-10-IO32D for AS332T-A/AS332P-A/AS324MT-A

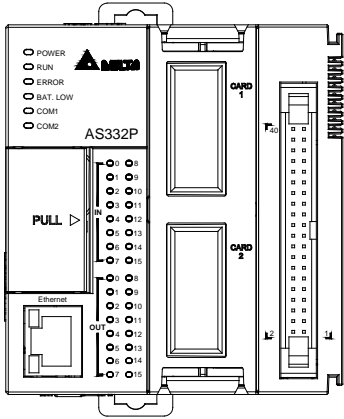
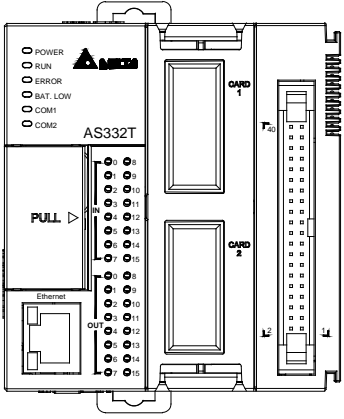
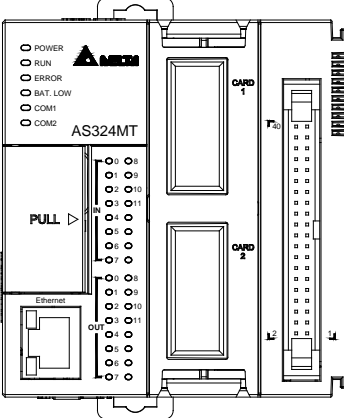
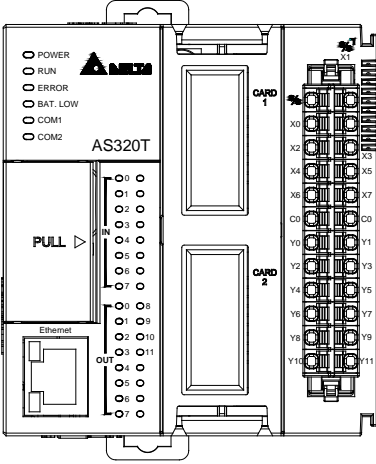


| Number | Name                      | Description                               |
|--------|---------------------------|---|
| 1      | Terminal block for output | Terminal block                            |
| 2      | 40-pin MIL connector      | Connects the module and the wiring module |

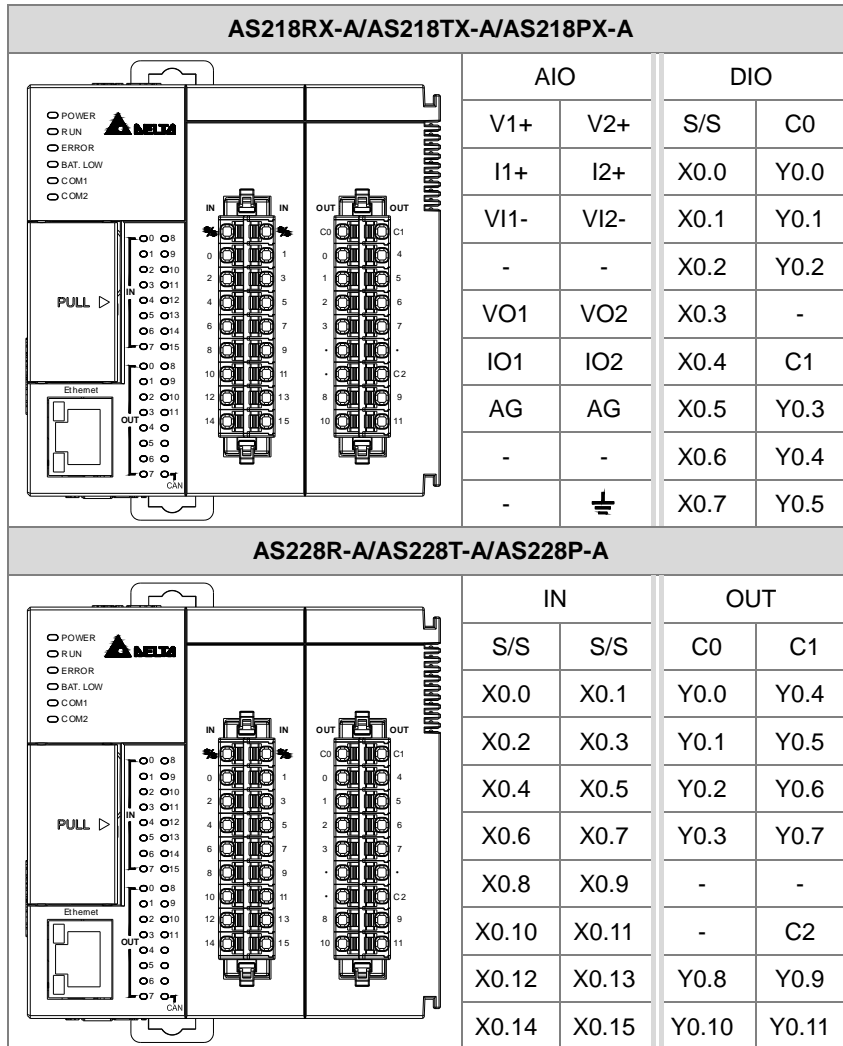
Note: It is suggested to use simple test for input and output points. Its right-side cannot be connected to the same terminal block typed module, e.g. 64 points DIO module to prevent two terminal blocks from interfering with each other.

2.2.4 CPU Module Input/Output Terminals

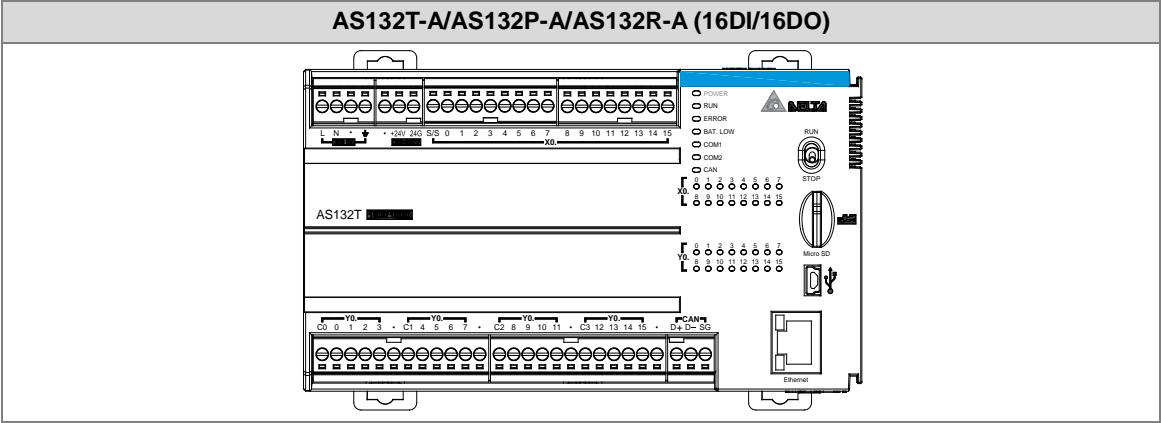
AS300 Series PLC CPU

| AS332P-A  |       |       | AS332T-A   |       |       |
|---|-------|-------|--|-------|-------|
|    | -     | -     |    | -     | -     |
|   | S/S   | S/S   |  | S/S   | S/S   |
|   | X0.15 | X0.14 |  | X0.15 | X0.14 |
|   | X0.13 | X0.12 |  | X0.13 | X0.12 |
|   | X0.11 | X0.10 |  | X0.11 | X0.10 |
|   | X0.9  | X0.8  |  | X0.9  | X0.8  |
|   | X0.7  | X0.6  |  | X0.7  | X0.6  |
|   | X0.5  | X0.4  |  | X0.5  | X0.4  |
|   | X0.3  | X0.2  |  | X0.3  | X0.2  |
|   | X0.1  | X0.0  |  | X0.1  | X0.0  |
|   | C0    | C0    |  | -     | -     |
|   | -     | -     |  | C0    | C0    |
|   | Y0.15 | Y0.14 |  | Y0.15 | Y0.14 |
|   | Y0.13 | Y0.12 |  | Y0.13 | Y0.12 |
|   | Y0.11 | Y0.10 |  | Y0.11 | Y0.10 |
|   | Y0.9  | Y0.8  |  | Y0.9  | Y0.8  |
|   | Y0.7  | Y0.6  |  | Y0.7  | Y0.6  |
|   | Y0.5  | Y0.4  |  | Y0.5  | Y0.4  |
|   | Y0.3  | Y0.2  |  | Y0.3  | Y0.2  |
|   | Y0.1  | Y0.0  |  | Y0.1  | Y0.0  |
| AS324MT-A   |       |       | AS320T-B/AS320P-B  |       |       |
|  | S/S   | S/S   |  | S/S   | S/S   |
|   | X0.11 | X0.10 |  | X0    | X1    |
|   | X0.9  | X0.8  |  | X2    | X3    |
|   | X0.7  | X0.6  |  | X4    | X5    |
|   | X0.5  | X0.4  |  | X6    | X7    |
|   | SG0   | SG0   |  | C0    | C0    |
|   | X0.3- | X0.3+ |  | Y0    | Y1    |
|   | X0.2- | X0.2+ |  | Y2    | Y3    |
|   | X0.1- | X0.1+ |  | Y4    | Y5    |
|   | X0.0- | X0.0+ |  | Y6    | Y7    |
|   | C0    | C0    |  | Y8    | Y9    |
|   | Y0.11 | Y0.10 |  | Y10   | Y11   |
|   | 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+ |  |       |       |

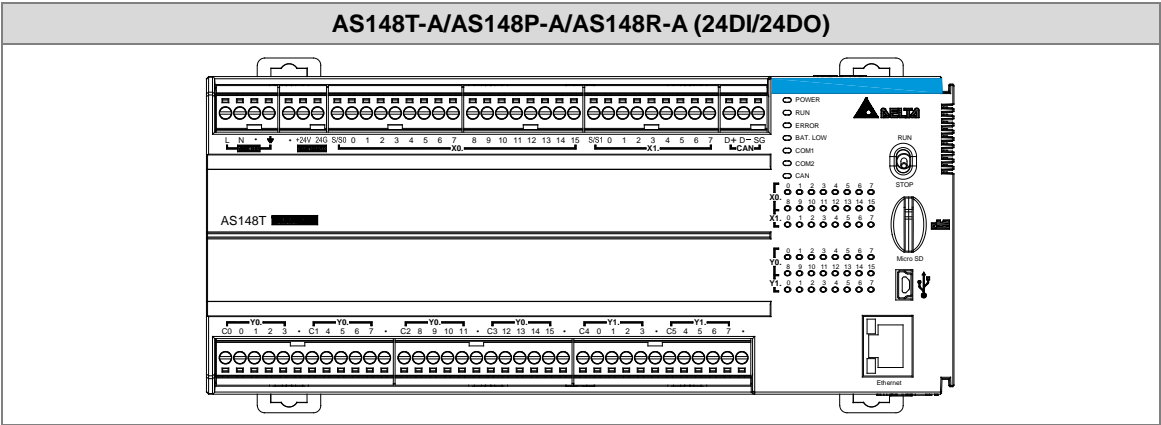
## AS200 Series PLC CPU




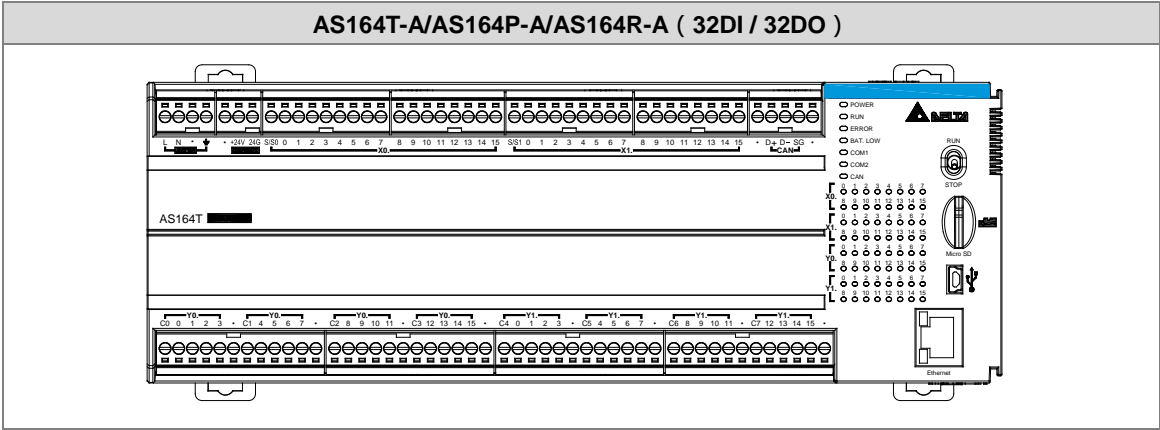
● AS100 Series PLC CPU



|           |       |       |       |       |      |      |     |      |      |      |      |      |      |      |      |       |       |      |       |       |
|-----------|-------|-------|-------|-------|------|------|-----|------|------|------|------|------|------|------|------|-------|-------|------|-------|-------|
| Upper row | 1     | 2     | 3     | 4     | 5    | 6    | 7   | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16    | 17    | 18   | 19    | 20    |
| AS132     | L     | N     | •     | ⏏     | •    | +24V | 24G | S/S0 | X0.0 | X0.1 | X0.2 | X0.3 | X0.4 | X0.5 | X0.6 | X0.7  | X0.8  | X0.9 | X0.10 | X0.11 |
|           | 21    | 22    | 23    | 24    |      |      |     |      |      |      |      |      |      |      |      |       |       |      |       |       |
|           | X0.12 | X0.13 | X0.14 | X0.15 |      |      |     |      |      |      |      |      |      |      |      |       |       |      |       |       |
| Lower row | 1     | 2     | 3     | 4     | 5    | 6    | 7   | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16    | 17    | 18   | 19    | 20    |
| AS132     | 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 |
|           | 21    | 22    | 23    | 24    | 25   | 26   | 27  |      |      |      |      |      |      |      |      |       |       |      |       |       |
|           | Y0.13 | Y0.14 | Y0.15 | •     | D+   | D-   | SG  |      |      |      |      |      |      |      |      |       |       |      |       |       |



|           |       |       |       |   |      |      |      |      |      |      |      |      |      |      |      |       |       |      |       |       |
|-----------|-------|-------|-------|---|------|------|------|------|------|------|------|------|------|------|------|-------|-------|------|-------|-------|
| Upper row | 1     | 2     | 3     | 4   | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16    | 17    | 18   | 19    | 20    |
| AS148     | L     | N     | •     |  | •    | +24V | 24G  | S/S0 | X0.0 | X0.1 | X0.2 | X0.3 | X0.4 | X0.5 | X0.6 | X0.7  | X0.8  | X0.9 | X0.10 | X0.11 |
|           | 21    | 22    | 23    | 24  | 25   | 26   | 27   | 28   | 29   | 30   | 31   | 32   | 33   | 34   | 35   | 36    |       |      |       |       |
|           | X0.12 | X0.13 | X0.14 | X0.15   | S/S1 | X1.0 | X1.1 | X1.2 | X1.3 | X1.4 | X1.5 | X1.6 | X1.7 | D+   | D-   | SG    |       |      |       |       |
| Lower row | 1     | 2     | 3     | 4   | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16    | 17    | 18   | 19    | 20    |
| AS148     | 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 |
|           | 21    | 22    | 23    | 24  | 25   | 26   | 27   | 28   | 29   | 30   | 31   | 32   | 33   | 34   | 35   | 36    |       |      |       |       |
|           | Y0.13 | Y0.14 | Y0.15 | •   | C4   | Y1.0 | Y1.1 | Y1.2 | Y1.3 | •    | C5   | Y1.4 | Y1.5 | Y1.6 | Y1.7 | •     |       |      |       |       |



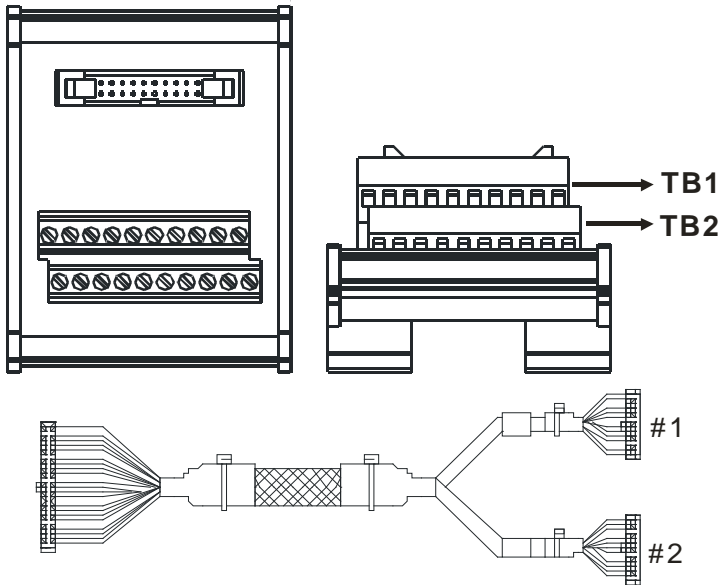
Upper row

|       |       |       |       |       |      |      |      |      |      |      |      |      |      |      |      |       |       |       |       |       |
|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|
| AS164 | 1     | 2     | 3     | 4     | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16    | 17    | 18    | 19    | 20    |
|       | L     | N     | •     | ⏏     | •    | +24V | 24G  | S/S0 | X0.0 | X0.1 | X0.2 | X0.3 | X0.4 | X0.5 | X0.6 | X0.7  | X0.8  | X0.9  | X0.10 | X0.11 |
|       | 21    | 22    | 23    | 24    | 25   | 26   | 27   | 28   | 29   | 30   | 31   | 32   | 33   | 34   | 35   | 36    | 37    | 38    | 39    | 40    |
|       | X0.12 | X0.13 | X0.14 | X0.15 | S/S1 | X1.0 | X1.1 | X1.2 | X1.3 | X1.4 | X1.5 | X1.6 | X1.7 | X1.8 | X1.9 | X1.10 | X1.11 | X1.12 | X1.13 | X1.14 |
|       | 41    | 42    | 43    | 44    | 45   | 46   |      |      |      |      |      |      |      |      |      |       |       |       |       |       |
|       | X1.15 | •     | D+    | D-    | SG   | •    |      |      |      |      |      |      |      |      |      |       |       |       |       |       |

Lower row

|       |       |       |       |       |       |       |       |      |      |      |      |      |      |      |      |       |       |      |      |       |
|-------|-------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|-------|-------|------|------|-------|
| AS164 | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 16    | 17    | 18   | 19   | 20    |
|       | 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 |
|       | 21    | 22    | 23    | 24    | 25    | 26    | 27    | 28   | 29   | 30   | 31   | 32   | 33   | 34   | 35   | 36    | 37    | 38   | 39   | 40    |
|       | Y0.13 | Y0.14 | Y0.15 | •     | C4    | Y1.0  | Y1.1  | Y1.2 | Y1.3 | •    | C5   | Y1.4 | Y1.5 | Y1.6 | Y1.7 | •     | C6    | Y1.8 | Y1.9 | Y1.10 |
|       | 41    | 42    | 43    | 44    | 45    | 46    | 47    | 48   |      |      |      |      |      |      |      |       |       |      |      |       |
|       | Y1.11 | •     | C7    | Y1.12 | Y1.13 | Y1.14 | Y1.15 | •    |      |      |      |      |      |      |      |       |       |      |      |       |

- MIL connector and the external terminal module UB-10-ID16A for AS332T-A / AS332P-A / AS324MT-A

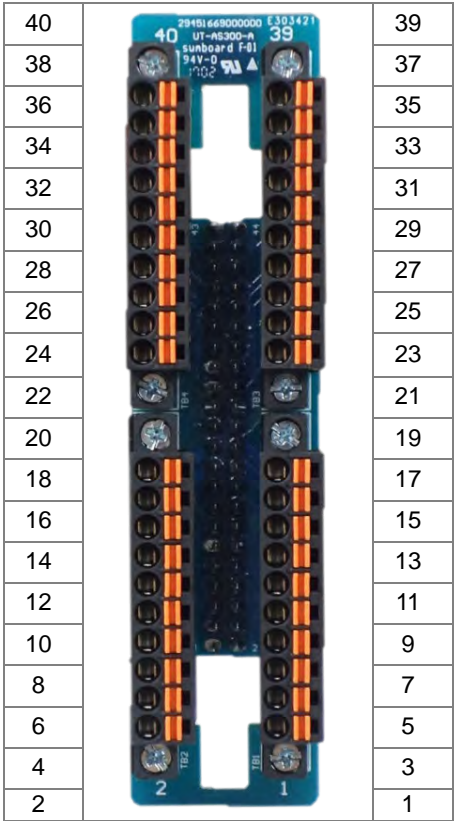


| AS332T-A |     |      |      |      |      |      |       |       |       |     |   |
|----------|-----|------|------|------|------|------|-------|-------|-------|-----|---|
| #1       | TB1 | Y0.0 | Y0.2 | Y0.4 | Y0.6 | Y0.8 | Y0.10 | Y0.12 | Y0.14 | C0  | - |
|          | TB2 | Y0.1 | Y0.3 | Y0.5 | 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 |

- Spring clamp/MIL connector terminal block UB-10-IO32D for AS332T-A/AS332P-A/AS324MT-A





## 2.2.5 AS200 Input/Output Terminals

### ● Analog Input

Two analog signal input channels:

| Item                               | Voltage Input            | Current input   |
|------------------------------------|--------------------------|---|
| Analog Signal                      | -10 to +10 V             | -20 to 20 mA<br>4 to 20mA (for FW V1.08 or later)     |
| Resolution                         | 12-bit                   | 11-bit  |
| Input impedance                    | $\geq 1 \text{ M}\Omega$ | 250 $\Omega$  |
| Conversion time                    | 3 ms / CH                |   |
| Analog to digital conversion range | -2000 to 2000            | -1000 to 1000 (-20 to 20 mA)<br>0 to 1000 (4 to 20mA) |
| Digital value output               | SR168 (CH1)              | SR169 (CH2)   |

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

### ● Analog Output

Two analog signal output channels:

| Item                               | Voltage output           | Current output    |
|------------------------------------|--------------------------|-------------------|
| Analog Signal                      | -10 to +10 V             | 0 to 20 mA        |
| Resolution                         | 12-bit                   | 12-bit            |
| Impedance allowance                | $\geq 1 \text{ k}\Omega$ | $\leq 500 \Omega$ |
| Conversion time                    | 2ms / CH                 |                   |
| Analog to digital conversion range | -2000 to 2000            | 0 to 4000         |
| Digital value output               | SR172 (CH1)              | SR173 (CH2)       |

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

## 2.3 Digital Input/Output Module Specifications

### 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<br>-A  | 16AM10N<br>-A | 32AM10N<br>-A | 64AM10N<br>-A    | 16AP11R<br>A             | 16AP11T<br>-A | 16AP11P<br>-A |
|-------------------------|--------|--|---------------|---------------|------------------|--------------------------|---------------|---------------|
| Number of inputs        |        | 8  | 16            | 32            | 64               | 8                        | 8             | 8             |
| Connector type          |        | Removable terminal block   |               | MIL connector |                  | Removable terminal block |               |               |
| Input type              |        | Digital input  |               |               |                  |                          |               |               |
| Input form              |        | Direct current (sinking or sourcing)   |               |               |                  |                          |               |               |
| Input voltage/ current  |        | 24 VDC · 5 mA  |               |               | 24 VDC<br>3.2 mA | 24 VDC · 5 mA            |               |               |
| Input impedance         |        | 4.7 k Ω  |               |               | 7.5k Ω           | 4.7 k Ω                  |               |               |
| Action level            | OFF→ON |  |               |               | >15 VDC          |                          |               |               |
|                         | ON→OFF |  |               |               | <5 VDC           |                          |               |               |
| Response time           | OFF→ON |  |               |               | < 20 us          |                          |               |               |
|                         | ON→OFF |  |               |               | < 200 us         |                          |               |               |
| Software filter time    |        | Setting range: 0 ~ 25 ms; default: 10 ms   |               |               |                  |                          |               |               |
| Maximum input frequency |        | Varies according to the filter time; for example when the filter is 1 ms, the maximum input frequency is 500 Hz, when 2 ms, 250 Hz.<br>Note: CPU scan time also affects the maximum input frequency. |               |               |                  |                          |               |               |
| Input signal            |        | Voltage input<br>Sinking: The inputs are NPN transistors whose collectors are open collectors.<br>Sourcing: The inputs are PNP transistors whose collectors are open collectors.                     |               |               |                  |                          |               |               |
| Input isolation         |        | 500 VAC  |               |               |                  |                          |               |               |
| Input display           |        | When the optocoupler is driven, the input LED indicator is ON.   |               |               |                  |                          |               |               |
| Weight                  |        | 100 g  | 117 g         | 100 g         | 140 g            | 138 g                    | 120 g         | 120 g         |

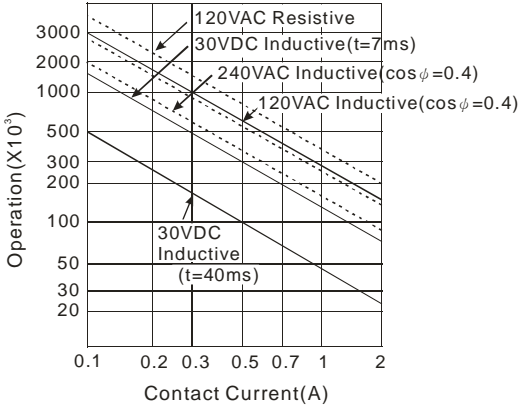
● **Electrical specifications for the outputs on a digital input/output module**

| Model                      |            | 08AN01                           | 16AN01 | 16AP11 | 08AN01                 | 16AN01 | 16AP11 | 08AN01   | 16AN01 | 16AP11 |
|----------------------------|------------|----------------------------------|--------|--------|------------------------|--------|--------|--|--------|--------|
| Item                       |            | R-A                              | R-A    | R-A    | T-A                    | T-A    | T-A    | P-A  | P-A    | P-A    |
| Number of outputs          |            | 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)  |        |        |
| Voltage/ current           |            | 240 VAC/24 VDC                   |        |        | 5–30 VDC               |        |        | 5–30 VDC *2  |        |        |
| Leakage current            |            | 0uA                              |        |        | <10uA                  |        |        | <250uA (@V1.00A0)<br><10uA (@V1.00A1)  |        |        |
| Max. inrush current        |            | NA                               |        |        | Overcurrent protection |        |        | 7.5A<br>(Tested condition: Ta = 25 °C, V <sub>DS</sub> = 30VDC and pulse duration = 1ms) |        |        |
| Maximum load               | Resistance | 2A/output, 8A/COM                |        |        | 0.5A/output, 4A/COM    |        |        | 0.5A/output, 4A/COM  |        |        |
|                            | Inductance | Life cycle curve*2               |        |        | 12 W (24 VDC)          |        |        | 12 W (24 VDC)  |        |        |
|                            | Bulb       | 20 W (24 VDC)<br>100 W (230 VAC) |        |        | 2 W (24 VDC)           |        |        | 2 W (24 VDC)   |        |        |
| Minimum load               |            | 1 mA / 5V                        |        |        |                        |        |        |  |        |        |
| Maximum output frequency*1 | Resistance | 1 Hz                             |        |        | 100 Hz                 |        |        | 100 Hz   |        |        |
|                            | Inductance | 0.5 Hz                           |        |        | 0.5 Hz                 |        |        | 0.5 Hz   |        |        |
|                            | Bulb       | 1 Hz                             |        |        | 10 Hz                  |        |        | 10 Hz  |        |        |
| Maximum Response time      | OFF→ON     | < 10 ms                          |        |        | < 0.5 ms               |        |        | < 0.5 ms   |        |        |
|                            | ON→OFF     | < 10 ms                          |        |        | < 0.5 ms               |        |        | < 0.5 ms   |        |        |
| Output isolation           |            | 1500 VAC                         |        |        | 500 VAC                |        |        |  |        |        |
| Weight                     |            | 120 g                            | 158 g  | 138 g  | 100 g                  | 122 g  | 120 g  | 100 g  | 123 g  | 120 g  |

| Model                      |            | 32AN02T-A              | 64AN02T-A |
|----------------------------|------------|------------------------|-----------|
| Item                       |            |                        |           |
| Number of outputs          |            | 32                     | 64        |
| Connector type             |            | MIL connector          |           |
| Output type                |            | Digital output         |           |
| Output form                |            | Transistor-T (sinking) |           |
| Output voltage             |            | 5–30 VDC               |           |
| Leakage current            |            | <10uA                  |           |
| Max. inrush current        |            | Overcurrent protection |           |
| Maximum load               | Resistance | 0.1A/output, 3.2A/COM  |           |
|                            | Inductance | N/A                    |           |
|                            | Bulb       | N/A                    |           |
| Minimum load               |            | 1 mA / 5V              |           |
| Maximum output frequency*1 |            | 100 Hz (resistance)    |           |
| Maximum Response time      | OFF→ON     | < 0.5 ms               |           |
|                            | ON→OFF     |                        |           |
| Output isolation           |            | 500 VAC                |           |

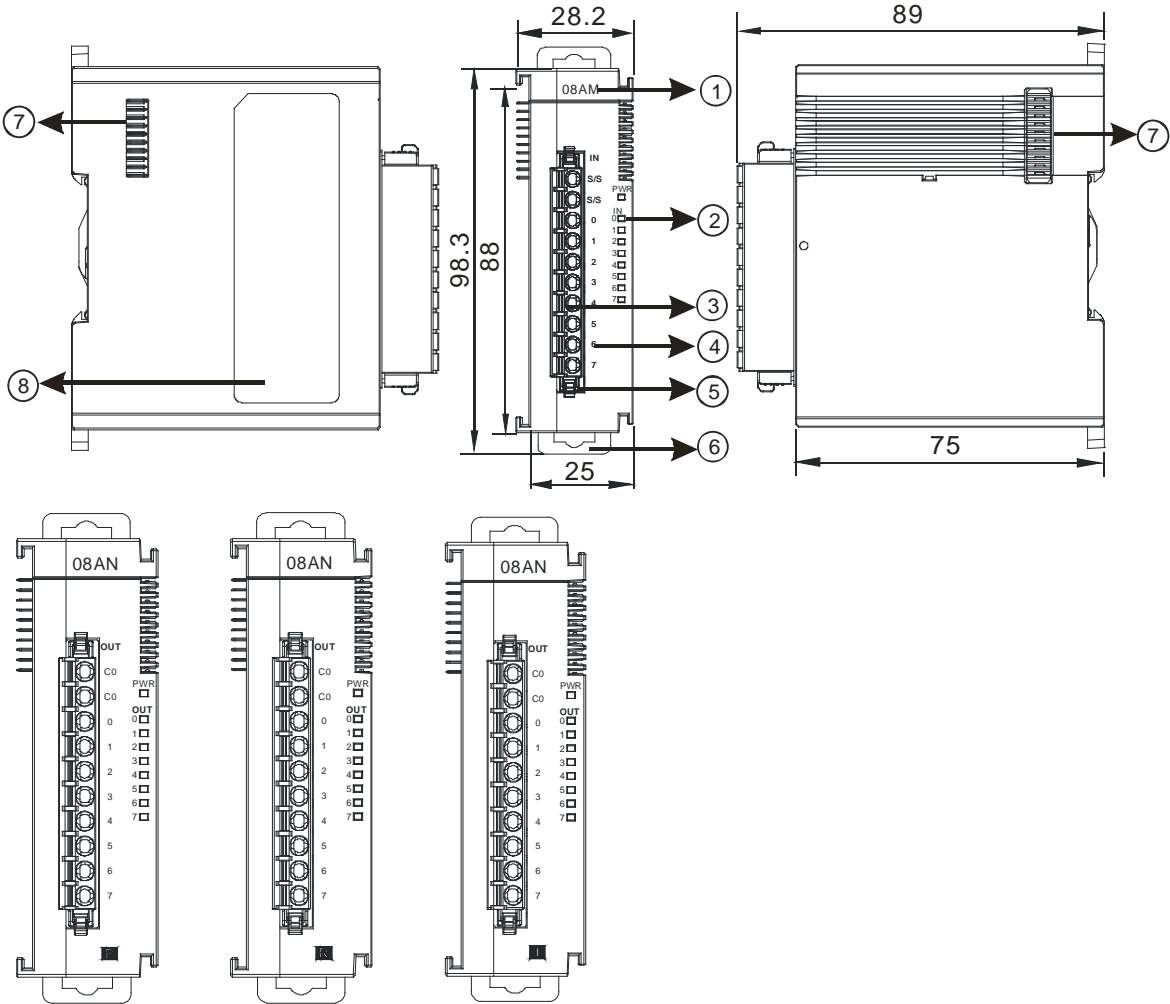
| Model  |           |           |
|--------|-----------|-----------|
| Item   | 32AN02T-A | 64AN02T-A |
| Weight | 100 g     | 142 g     |

- \*1: The scan cycle affects the frequency. Here shows the maximum output frequency. The load type should be taken into account while designing for the application.
- \*2: Life cycle curve: The lifetime of a relay terminal varies with the working voltage, the load type (the power factor  $\cos\psi$ , the time constant  $t(L/R)$ ), and the current passing through the terminal. The relation is shown in the life cycle curve below.



2.3.2 Digital Input/Output Module Profiles

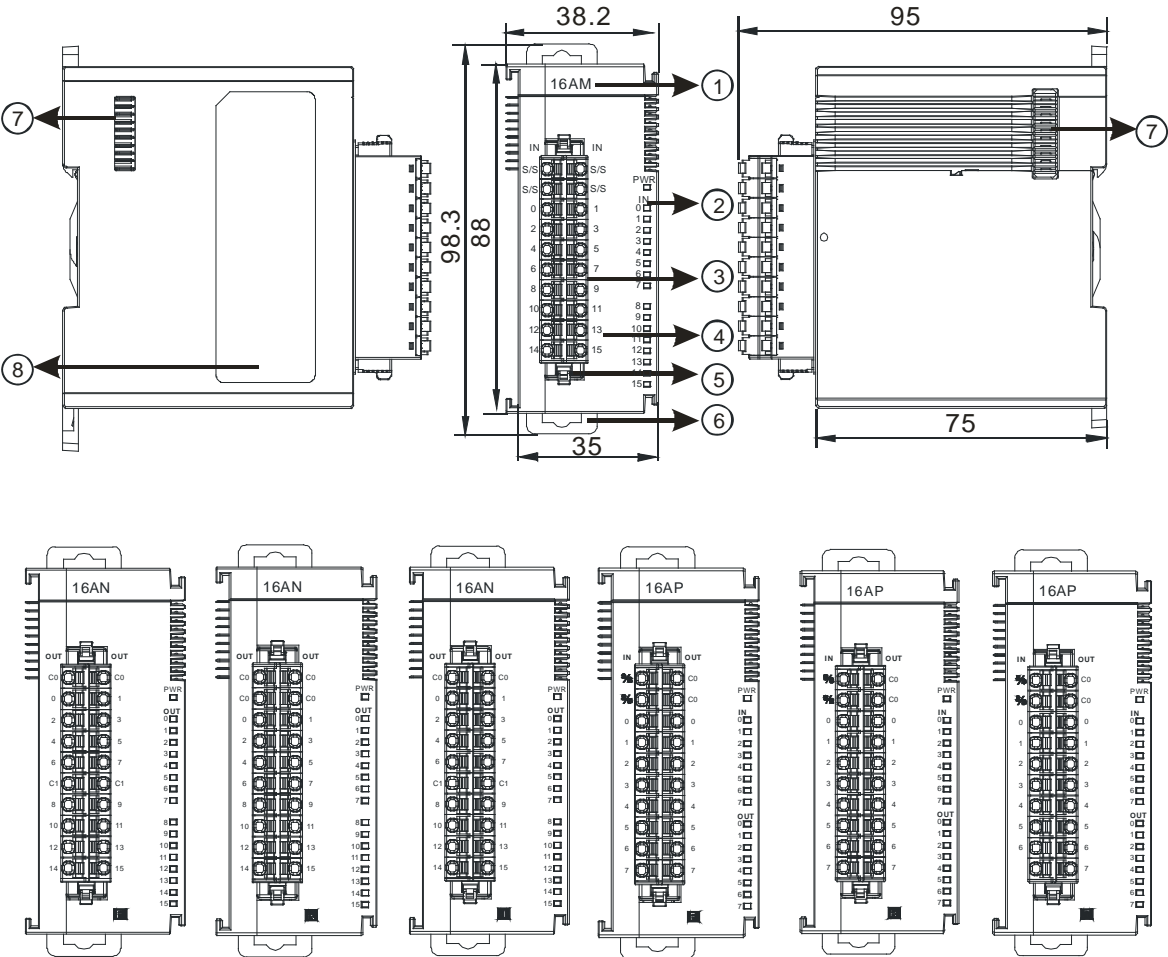
- AS08AM10N-A/AS08AN01P-A/AS08AN01R-A/AS08AN01T-A



Unit: mm

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

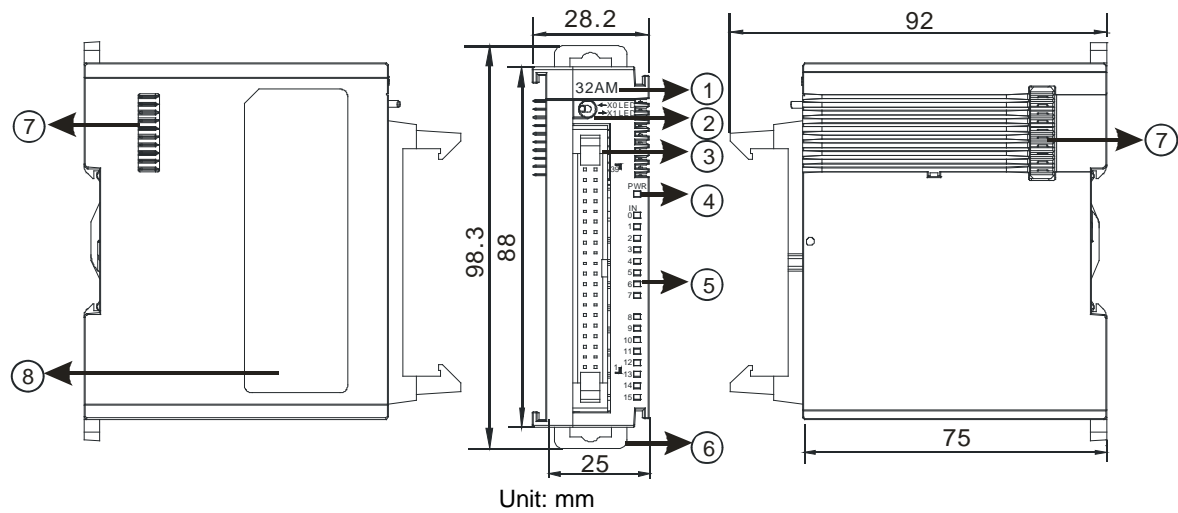
- AS16AM10N-A/AS16AN01P-A/AS16AN01R-A/AS16AN01T-A/AS16AP11P-A/AS16AP11R-A/AS16AP11T-A



Unit: mm

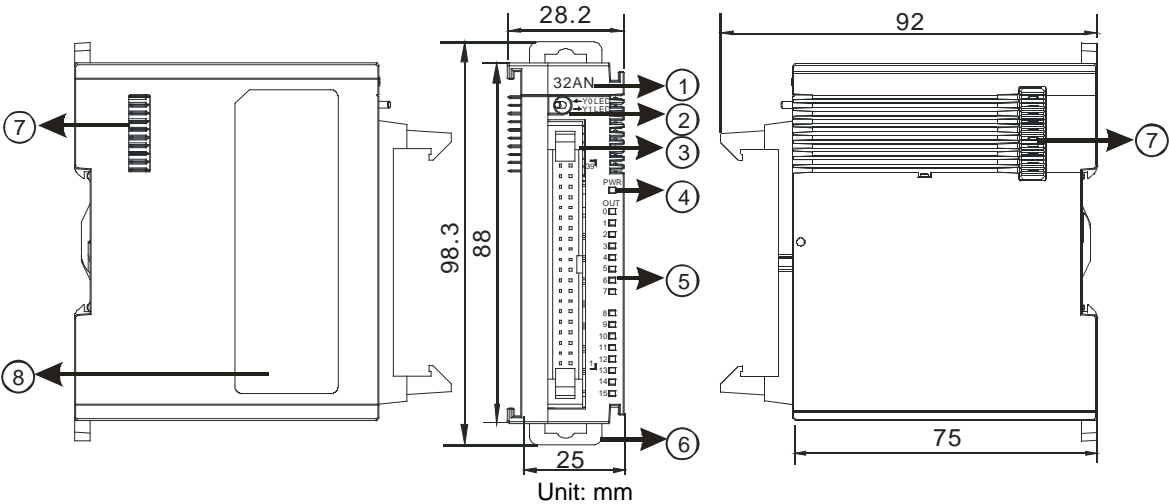
| Number | Name                                      | Description  |
|--------|---|--|
| 1      | Model name                                | Model name of the module   |
| 2      | Input/Output LED indicator                | If there is an input signal, the input LED indicator is ON.<br>If there is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

● AS32AM10N-A



| Number | Name                       | Description   |
|--------|----------------------------|---|
| 1      | Model name                 | Model name of the module  |
| 2      | X0/X1 LED Indicator switch | Switches the LED indicators to 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        | Indicates the power status of the module  |
| 5      | Input LED indicator        | LED indicator is ON during input.   |
| 6      | DIN rail clip              | Secures the DIN rail  |
| 7      | External module port       | Connects the modules  |
| 8      | Label                      | Nameplate   |

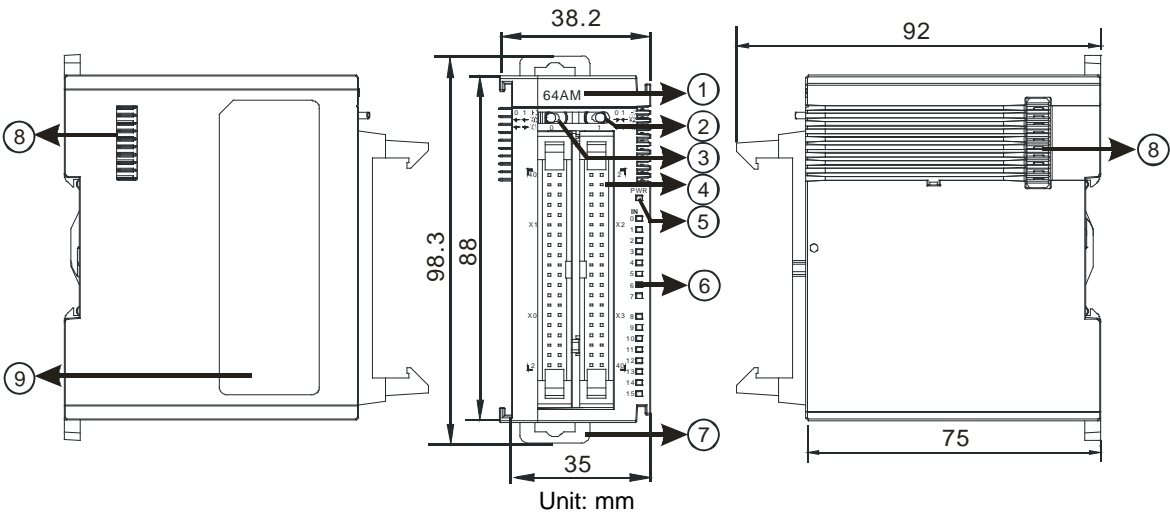
● AS32AN02T-A



| Number | Name                       | Description   |
|--------|----------------------------|---|
| 1      | Model name                 | Model name of the module  |
| 2      | Y0/Y1 LED indicator switch | Switches the LED indicators to 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        | Indicates the power status of the module  |
| 5      | Output LED indicator       | LED indicator is ON during output.  |
| 6      | DIN rail clip              | Secures the DIN rail  |
| 7      | External module port       | Connects the modules  |
| 8      | Label                      | Nameplate   |

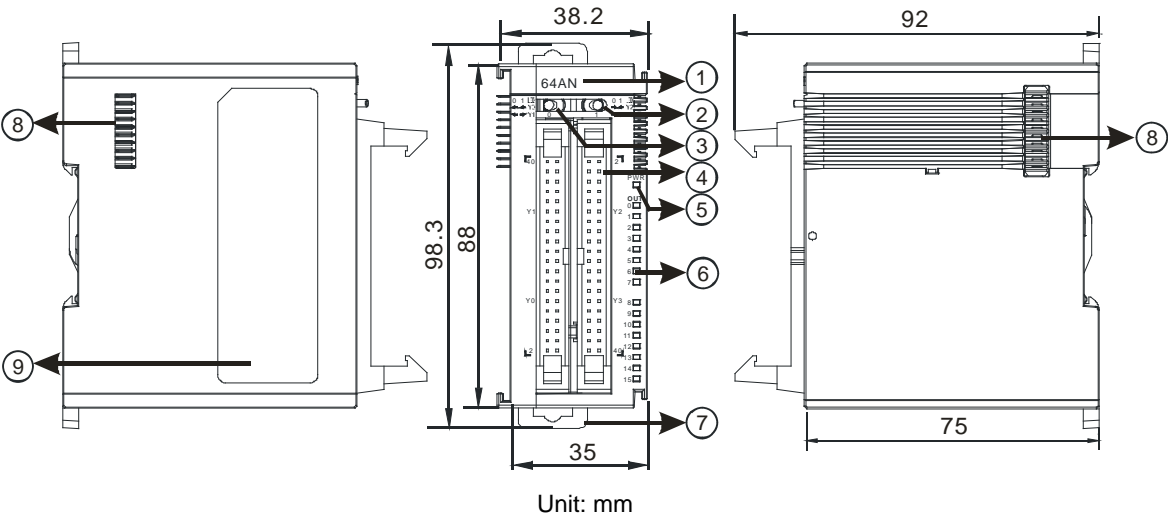


● AS64AM10N-A



| Number | Name                   | Description   |
|--------|------------------------|---|
| 1      | Model name             | Model name of the module  |
| 2      | LED indicator switch 1 | Switches the LED indicators to their represented inputs.                        |
| 3      | LED indicator switch 2 | Switches the LED indicators to 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    | Indicates 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          | Secures the DIN rail  |
| 8      | External module port   | Connects the modules  |
| 9      | Label                  | Nameplate   |

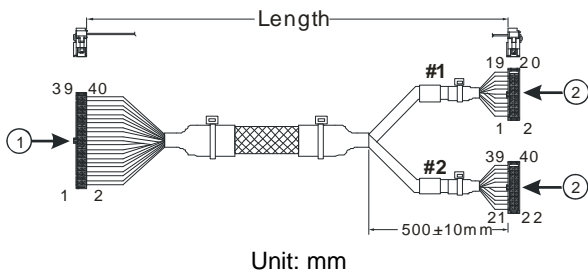
● AS64AN02T-A



| Number | Name                   | Description   |
|--------|------------------------|---|
| 1      | Model name             | Model name of the module  |
| 2      | LED indicator switch 1 | Switches the LED indicators to their represented outputs.                       |
| 3      | LED indicator switch 2 | Switches the LED indicators to 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    | Indicates 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          | Secures the DIN rail  |
| 8      | External module port   | Connects the modules  |
| 9      | Label                  | Nameplate   |

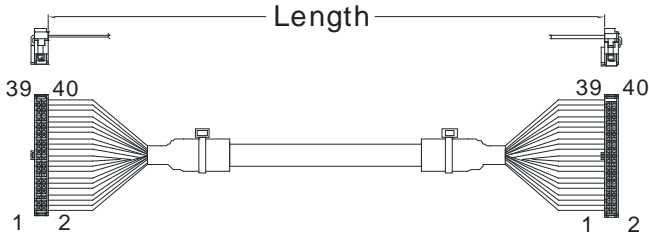
● **ML connector, extension cable, and wiring modules**

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



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

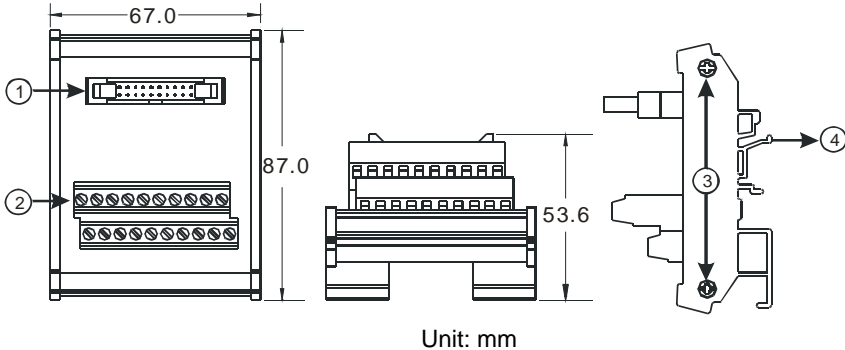
2. I/O connecting cables UC-ET010-24B (1M) / UC-ET020-24B (2M) / UC-ET030-24B (3M)



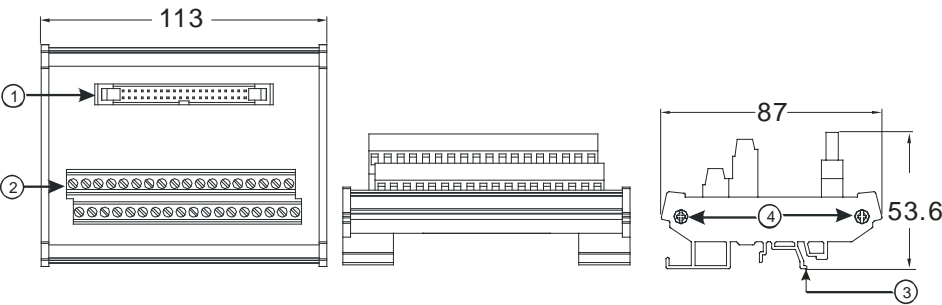
| Number | Name                | Description   |
|--------|---------------------|---|
| 1      | IDC 40-pin terminal | Connects an external terminal module and a wiring module UB-10-ID32A, and UB-10-OT32A |

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

◆ **UB-10-ID16A**



◆ UB-10-ID32A

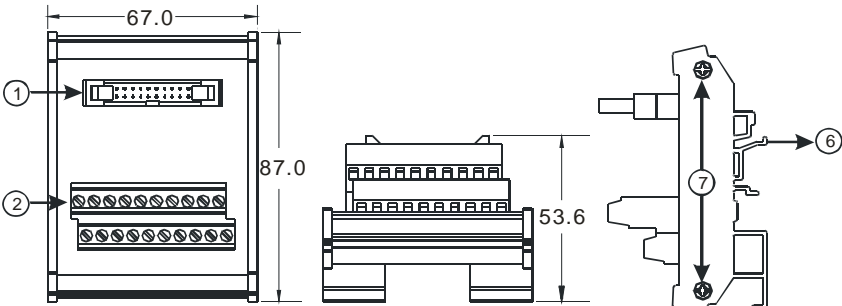


Unit: mm

| Number | Name   | Description   |
|--------|--|---|
| 1      | UB-10-ID16A: 20-pin ML connector<br>UB-10-ID32A: 40-pin ML connector | Connects the external terminal module and a wiring module |
| 2      | Terminals  | Input/Output terminals for wiring                         |
| 3      | Clip   | Hangs the external terminal module on a DIN rail          |
| 4      | Set screw  | Fixes the base  |

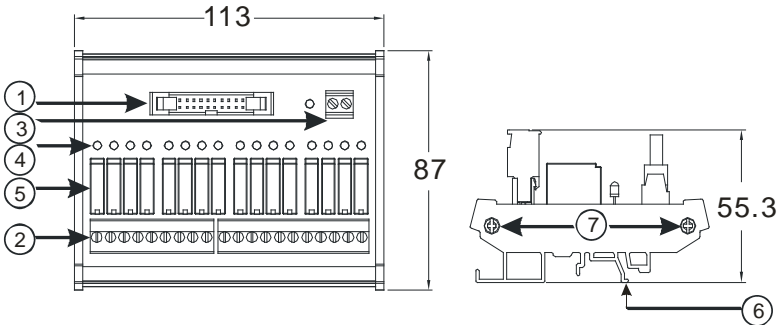
4. AS332T-A/AS64AN02T-A and the external terminal modules UB-10-ID16A, UB-10-OR16A, and UB-10-OT32A.

◆ UB-10-ID16A

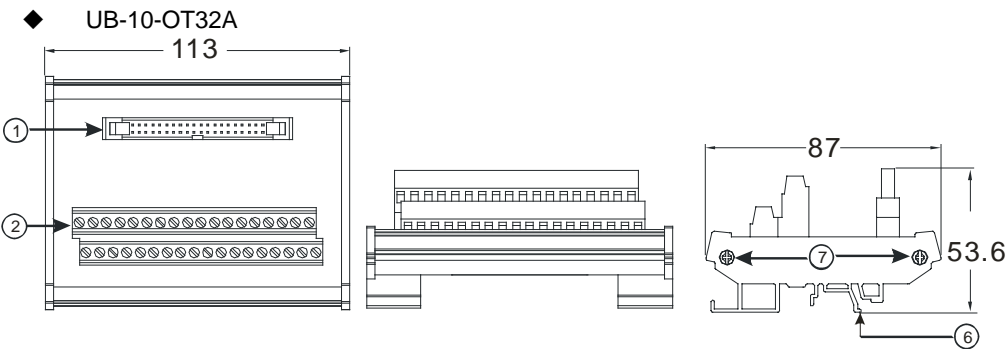


Unit: mm

◆ UB-10-OR16A



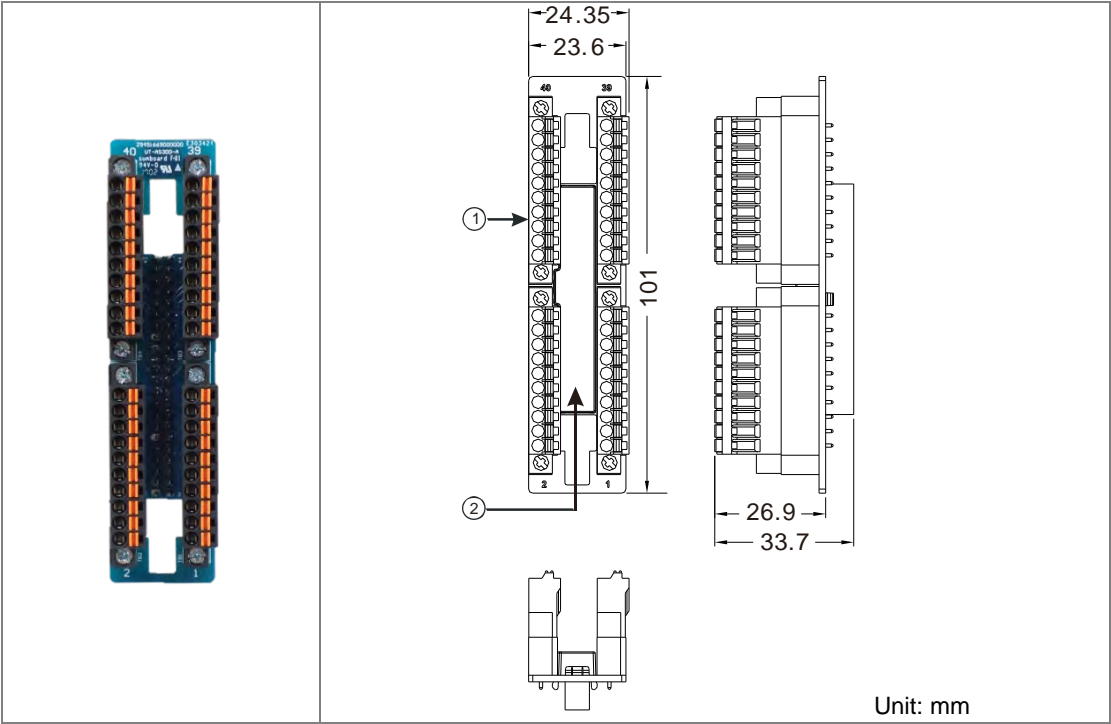
Unit: mm



Unit: mm

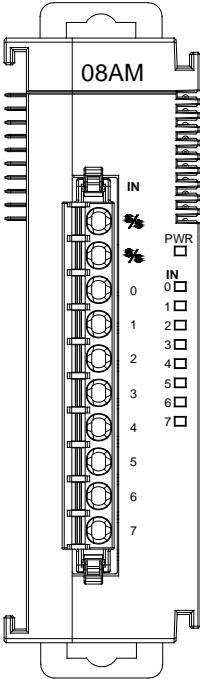
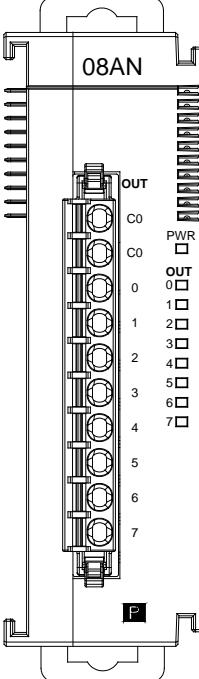
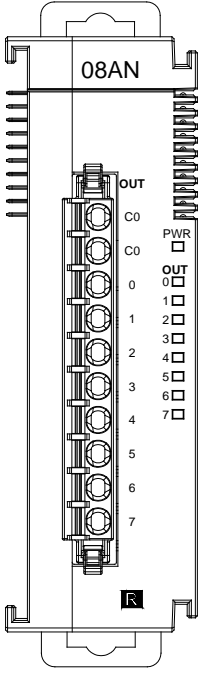
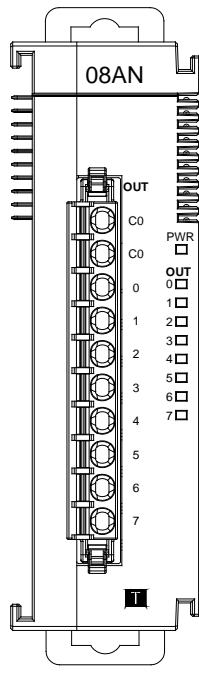
| Number | Name   | Description   |
|--------|--|---|
| 1      | UB-10- ID16A /OR16A: 20-pin ML connector<br>UB-10-OT32A: 40-pin ML connector | Connects the external terminal module and a wiring module |
| 2      | Terminals  | Input/Output terminals for wiring                         |
| 3      | 2-pin power input terminal   | Power input terminal for wiring                           |
| 4      | Output LED indicator   | LED indicator is ON during output.                        |
| 5      | Relay output   | Relay output  |
| 6      | Clip   | Hangs the external terminal module on a DIN rail          |
| 7      | Set screw  | Fixes the base  |

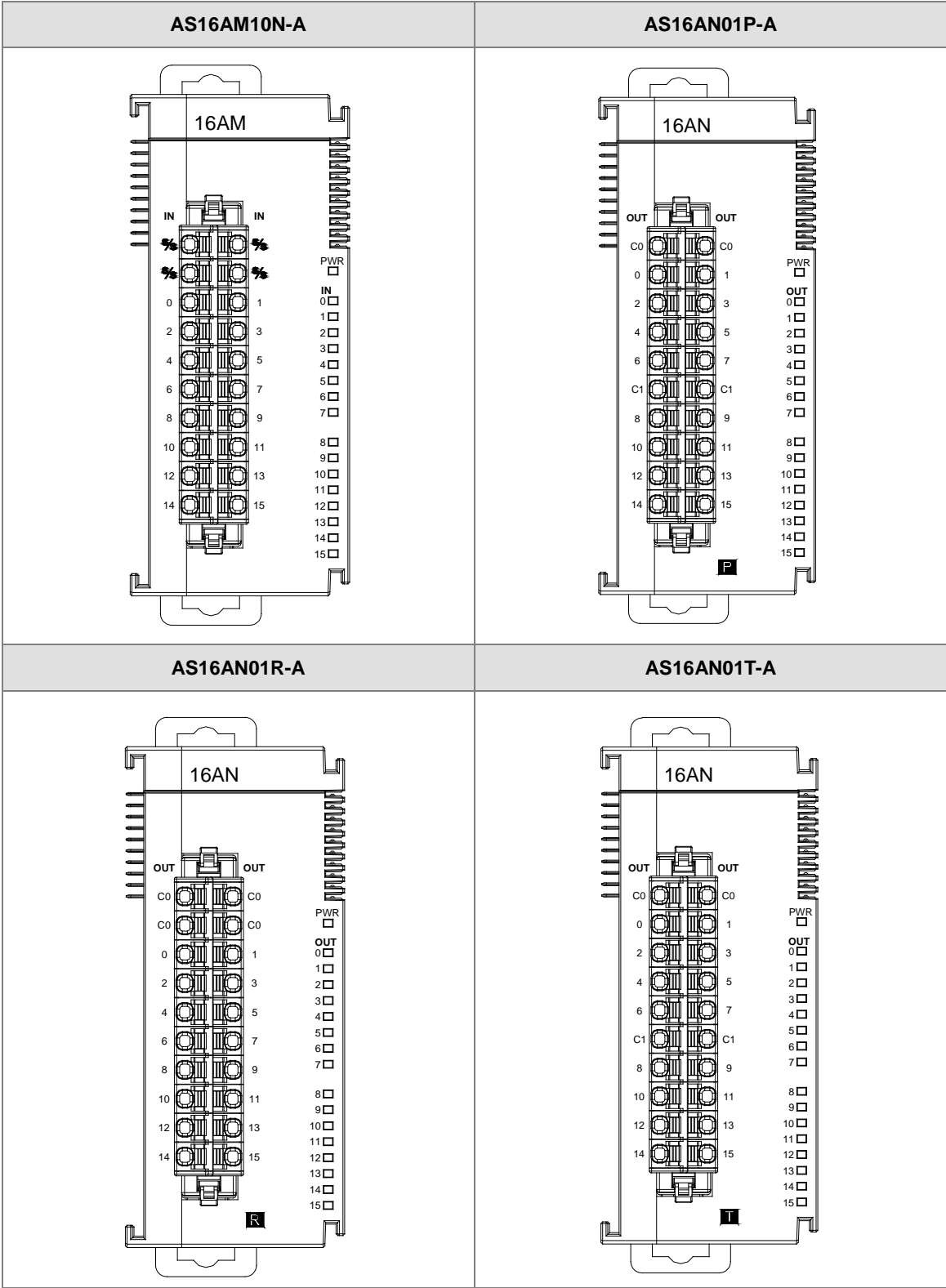
● Spring clamp/MIL connector terminal block UB-10-IO32D for AS32AM10N-A/AS32AN02T-A

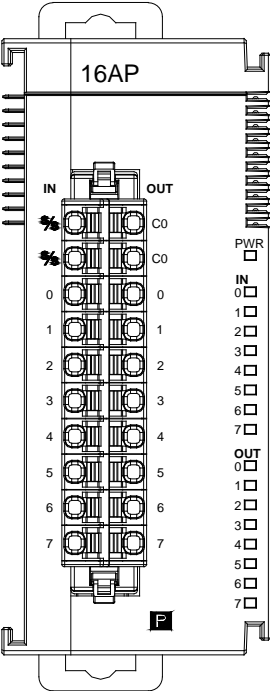
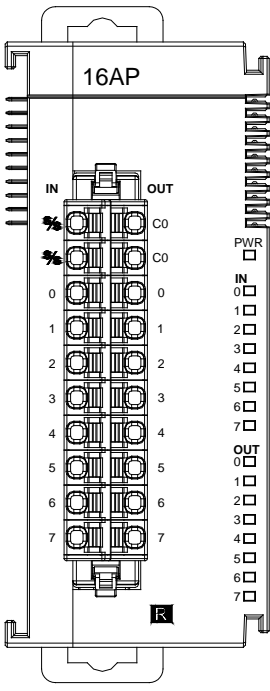
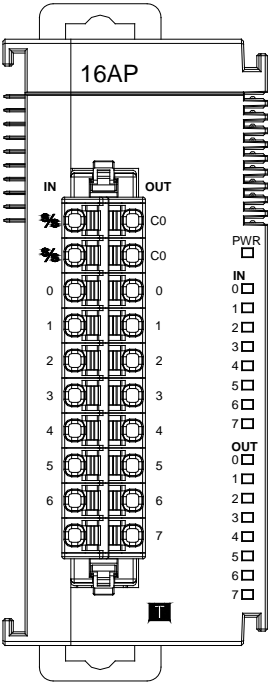
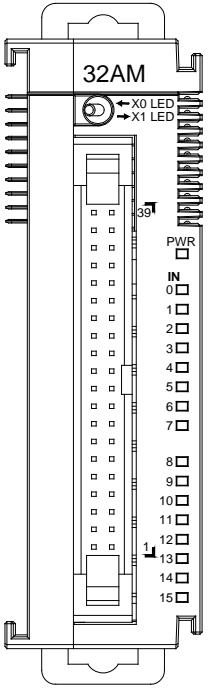


| Number | Name                      | Description                               |
|--------|---------------------------|---|
| 1      | Terminal block for output | Terminal block                            |
| 2      | 40-pin MIL connector      | Connects the module and the wiring module |

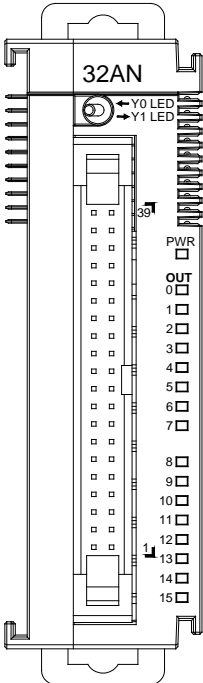
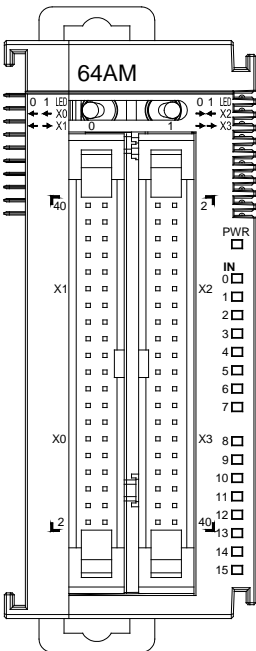
2.3.3 Digital Input/Output Module Terminals

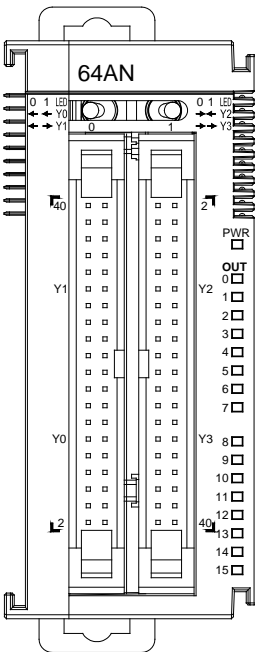
|   |  |
|---|--|
| <div><div>AS08AM10N-A</div><div></div></div>  | <div><div>AS08AN01P-A</div><div></div></div>  |
| <div><div>AS08AN01R-A</div><div></div></div> | <div><div>AS08AN01T-A</div><div></div></div> |



|  |   |   |   |     |     |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     |     |   |   |     |     |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     |     |
|--|---|---|---|-----|-----|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|-----|-----|------|------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <div>AS16AP11P-A</div>    | <div>AS16AP11R-A</div>    |   |   |     |     |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     |     |   |   |     |     |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     |     |
| <div>AS16AP11T-A</div>  | <div>AS32AM10N-A</div> <div><table><tr><td>-</td><td>-</td></tr><tr><td>S/S</td><td>S/S</td></tr><tr><td>1.15</td><td>1.14</td></tr><tr><td>1.13</td><td>1.12</td></tr><tr><td>1.11</td><td>1.10</td></tr><tr><td>1.9</td><td>1.8</td></tr><tr><td>1.7</td><td>1.6</td></tr><tr><td>1.5</td><td>1.4</td></tr><tr><td>1.3</td><td>1.2</td></tr><tr><td>1.1</td><td>1.0</td></tr><tr><td>-</td><td>-</td></tr><tr><td>S/S</td><td>S/S</td></tr><tr><td>0.15</td><td>0.14</td></tr><tr><td>0.13</td><td>0.12</td></tr><tr><td>0.11</td><td>0.10</td></tr><tr><td>0.9</td><td>0.8</td></tr><tr><td>0.7</td><td>0.6</td></tr><tr><td>0.5</td><td>0.4</td></tr><tr><td>0.3</td><td>0.2</td></tr><tr><td>0.1</td><td>0.0</td></tr></table></div>  | - | - | 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 |
| -  | -   |   |   |     |     |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     |     |   |   |     |     |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     |     |
| 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   |   |   |     |     |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     |     |   |   |     |     |      |      |      |      |      |      |     |     |     |     |     |     |     |     |     |     |



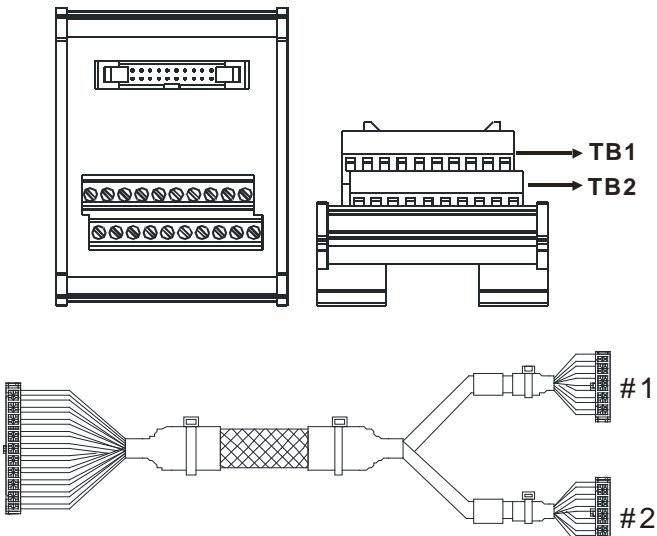
| AS32AN02T-A   |      |      | AS64AM10N-A  |      |      |      |      |
|---|------|------|--|------|------|------|------|
|  | -    | -    |  | -    | -    | 2.0  | 2.1  |
|   | C0   | C0   |  | S/S0 | S/S0 | 2.2  | 2.3  |
|   | 1.15 | 1.14 |  | 1.15 | 1.14 | 2.4  | 2.5  |
|   | 1.13 | 1.12 |  | 1.13 | 1.12 | 2.6  | 2.7  |
|   | 1.11 | 1.10 |  | 1.11 | 1.10 | 2.8  | 2.9  |
|   | 1.9  | 1.8  |  | 1.9  | 1.8  | 2.10 | 2.11 |
|   | 1.7  | 1.6  |  | 1.7  | 1.6  | 2.12 | 2.13 |
|   | 1.5  | 1.4  |  | 1.5  | 1.4  | 2.14 | 2.15 |
|   | 1.3  | 1.2  |  | 1.3  | 1.2  | S/S  | S/S  |
|   | 1.1  | 1.0  |  | 1.1  | 1.0  | -    | -    |
|   | -    | -    |  | -    | -    | 3.0  | 3.1  |
|   | C0   | C0   |  | S/S0 | S/S0 | 3.2  | 3.3  |
|   | 0.15 | 0.14 |  | 0.15 | 0.14 | 3.4  | 3.5  |
|   | 0.13 | 0.12 |  | 0.13 | 0.12 | 3.6  | 3.7  |
|   | 0.11 | 0.10 |  | 0.11 | 0.10 | 3.8  | 3.9  |
|   | 0.9  | 0.8  |  | 0.9  | 0.8  | 3.10 | 3.11 |
|   | 0.7  | 0.6  |  | 0.7  | 0.6  | 3.12 | 3.13 |
|   | 0.5  | 0.4  |  | 0.5  | 0.4  | 3.14 | 3.15 |
|   | 0.3  | 0.2  |  | 0.3  | 0.2  | S/S1 | S/S1 |
|   | 0.1  | 0.0  |  | 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**

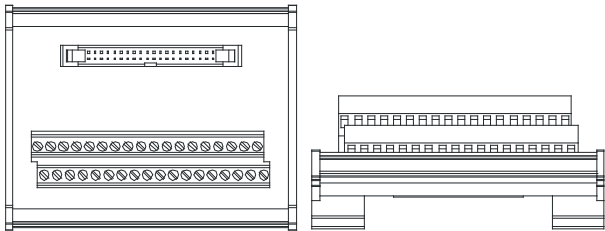
1. AS32AM10N-A/AS64AM10N-A

◆ 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

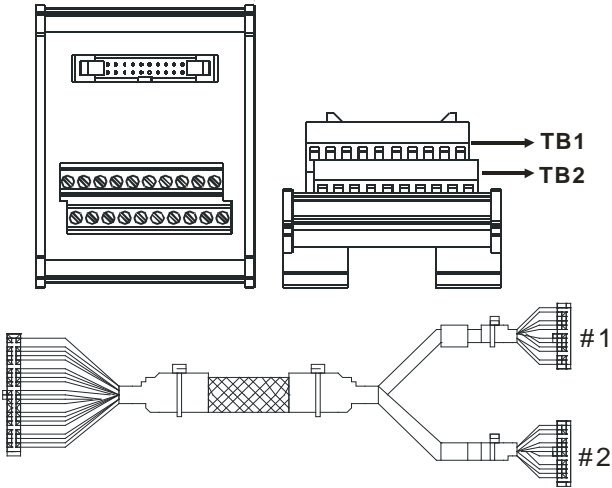


AS series terminals:

| 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 |

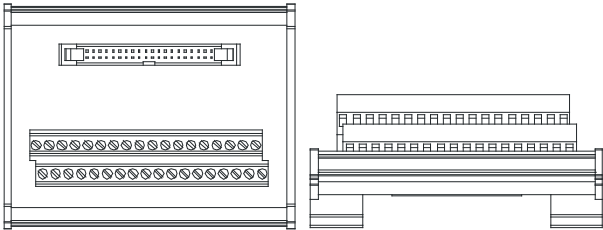
2. AS32AN02T-A/AS64AN02T-A and the wiring modules:

◆ 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 | - |

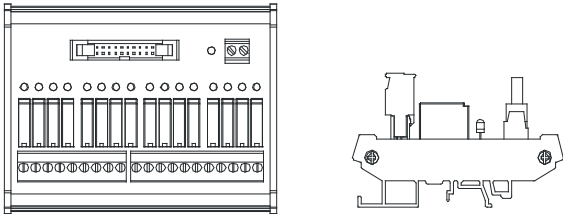
◆ UB-10-OT32A



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:

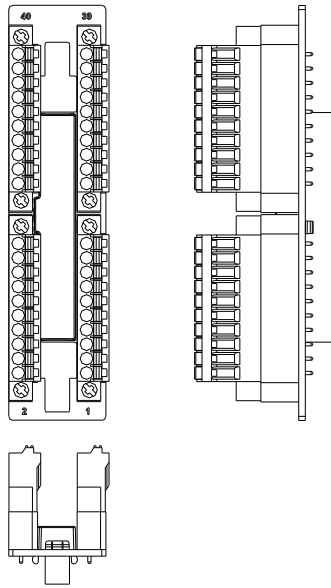
|    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |    |     |     |          |     |
|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|----|-----|-----|----------|-----|
|    |    |    |    |    |    |    |    |    |    |    |     |     |     |     |    |     | GND | +24<br>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 |

3. AS32AM10N-A/AS32AN02T-A and the wiring modules:

◆ UB-10-IO32D



## 2.4 Analog Input/Output Module Specifications

### 2.4.1 General Specifications

- AS04AD-A / AS08AD-B / AS08AD-C

Electrical specifications

| Module Name                  | AS04AD-A  | AS08AD-B      | AS08AD-C      |
|------------------------------|---|---------------|---------------|
| Number of Inputs             | 4   | 8             | 8             |
| Analog-to-Digital Conversion | Voltage input/Current input   | Voltage input | Current input |
| Supply Voltage               | 24 VDC (20.4 VDC–28.8 VDC) (-15% to +20%)   |               |               |
| Connector Type               | Removable terminal block  |               |               |
| Conversion Time              | 2 ms / channel; for FW V1.02.00 or later, upgraded to 1 ms/channel  |               |               |
| Isolation                    | An analog circuit is isolated from a digital circuit by a digital integrated circuit/ optocoupler, but the analog channels are not isolated from one another.<br>Isolation between a digital circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a digital circuit: 500 VAC<br>Isolation between the 24 VDC and a ground: 500 VAC |               |               |
| Weight                       | 145g  |               |               |

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            |
| Rated Conversion Range       | K-32000<br>~<br>K32000                                  | K0<br>~<br>K32000     | K-32000<br>~<br>K32000 | K0<br>~<br>K32000    | K0<br>~<br>K32000    |
| Hardware Input Limit*1       | -10.12V<br>~<br>10.12V                                  | -0.12V<br>~<br>10.12V | -5.06V<br>~<br>5.06V   | -0.06V<br>~<br>5.06V | 0.95V<br>~<br>5.05V  |
| Conversion Limit*2           | K-32384<br>~<br>K32384                                  | K-384<br>~<br>K32384  | K-32384<br>~<br>K32384 | K-384<br>~<br>K32384 | K-384<br>~<br>K32384 |
| Error Rate                   | Room Temperature: ±0.2% ; Full Temperature Range: ±0.5% |                       |                        |                      |                      |
| Hardware Resolution          | 16 bits   |                       |                        |                      |                      |
| Input Impedance              | 2MΩ   |                       |                        |                      |                      |
| Absolute Input Range*3       | ±15 V   |                       |                        |                      |                      |

\*1: If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value. And an error flag will be set.

\*2: If the input signal exceeds the hardware input limit, it also exceeds the conversion limit and a conversion limit error appears. For example in the voltage input mode (-10 V to +10 V), when the input signal is 10.15 V, exceeding the hardware upper limit, it also exceeds the conversion upper limit. The module uses the upper limit value (32387) as the input signal and a conversion limit error appears.

\*3: If an input signal exceeds the absolute range, it might damage the channel.

| Analog-to-Digital Conversion       | Current Input   |                      |                      |
|------------------------------------|---|----------------------|----------------------|
| Rated Input Range                  | ±20 mA  | 0 mA–20 mA           | 4 mA–20 mA           |
| Rated Conversion Range             | K-32000<br>~<br>K+2000                                  | K0<br>~<br>K32000    | K0<br>~<br>K32000    |
| Hardware Input Limit* <sup>1</sup> | -20.24 mA ~ 20.24 mA                                    | -0.24 mA ~ 20.24 mA  | 3.81 mA ~ 20.19 mA   |
| Conversion Limit* <sup>2</sup>     | K-32384<br>~<br>K32384                                  | K-384<br>~<br>K32384 | K-384<br>~<br>K32384 |
| Error Rate                         | Room Temperature: ±0.2% ; Full Temperature Range: ±0.5% |                      |                      |
| Hardware Resolution                | 16 bits   |                      |                      |
| Input Impedance                    | 250Ω  |                      |                      |
| Absolute Input Range* <sup>3</sup> | ±32 mA  |                      |                      |

\*1: If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value. And an error flag will be set.

\*2: If the input signal exceeds the hardware input limit, it also exceeds the conversion limit and a conversion limit error appears. For example in the voltage input mode (4 mA to 20 mA), when the input signal is 0 mA, exceeding the hardware upper limit, it also exceeds the conversion upper limit. The module uses the upper limit value (-384) as the input signal and a conversion limit error appears.

\*3: If an input signal exceeds the absolute range, it might damage the channel.

## ● AS04DA-A

Electrical specifications

|                              |   |
|------------------------------|---|
| Module name                  | AS04DA-A  |
| Number of outputs            | Four  |
| Digital-to-analog conversion | Voltage output/Current output   |
| Supply voltage               | 24 VDC (20.4 VDC–28.8 VDC) (-15%–+20%)  |
| Connector type               | Removable terminal block  |
| Conversion time              | 2 ms/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.<br>Isolation between a digital circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a digital circuit: 500 VAC<br>Isolation between the 24 VDC and a ground: 500 VAC |
| Weight                       | 145 g   |

## Functional specifications

| Digital-to-analog conversion             | Voltage output          |                   |                         |                   |                   |
|--|-------------------------|-------------------|-------------------------|-------------------|-------------------|
| Rated output range                       | ±10 V                   | 0 V–10 V          | ±5 V                    | 0 V–5 V           | 1 V–5 V           |
| Conversion Range                         | K-32000<br>~<br>K+32000 | K0<br>~<br>K32000 | K-32000<br>~<br>K+32000 | K0<br>~<br>K32000 | K0<br>~<br>K32000 |
| Hardware output range                    | -10.1V to +10.1V        | -0.1V to +10.1V   | -5.05V to +5.05V        | -0.05V to +5.05V  | 0.95V–5.05V       |
| Error rate (Room temperature)            | ±0.2%                   |                   |                         |                   |                   |
| Error rate (Full temperature range)      | ±0.5%                   |                   |                         |                   |                   |
| Linearity error (Room temperature)       | ±0.05%                  |                   |                         |                   |                   |
| Linearity error (Full temperature range) | ±0.05%                  |                   |                         |                   |                   |
| Hardware resolution                      | 12 bits                 |                   |                         |                   |                   |
| Input impedance                          | ≥1 k Ω                  |                   | ≥500 Ω                  |                   |                   |

| Digital-to-analog conversion                                | Current output      |                |
|---|---------------------|----------------|
| Rated output range  | 0 mA–20 mA          | 4 mA–20 mA     |
| Conversion Range  | K0 ~ K32000         | K0 ~ K32000    |
| Hardware output range                                       | -0.2 mA to +20.2 mA | 3.8 mA–20.2 mA |
| Error rate (Room temperature)                               | ±0.2%               |                |
| Error rate (Full temperature range)                         | ±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

|                                     |   |
|-------------------------------------|---|
| <b>Module name</b>                  | <b>AS06XA-A</b>   |
| <b>Number of inputs/outputs</b>     | Inputs: four; Outputs: two  |
| <b>Analog-to-digital conversion</b> | Voltage input/Current input; Voltage output/Current output;   |
| <b>Supply voltage</b>               | 24 VDC (20.4 VDC–28.8 VDC) (-15% to +20%)   |
| <b>Connector type</b>               | Removable terminal block  |
| <b>Conversion time</b>              | 2ms/channel; for FW V1.02.00 or later, upgraded to 1 ms/channel   |
| <b>Isolation</b>                    | 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.<br>Isolation between a digital circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a digital circuit: 500 VAC<br>Isolation between the 24 VDC and a ground: 500 VAC |
| <b>Weight</b>                       | 145 g   |

### Functional specifications for the analog-to-digital conversion

| <b>Analog-to-Digital Conversion</b> | <b>Voltage Input</b>                                    |             |             |             |             |
|-------------------------------------|---|-------------|-------------|-------------|-------------|
| <b>Rated Input Range</b>            | -10 V ~ +10 V   | 0 V ~ 10 V  | ±5 V        | 0 V ~ 5 V   | 1 V ~ 5 V   |
| <b>Rated Conversion Range</b>       | K-32000   | K0          | K-32000     | K0          | K0          |
|                                     | ~<br>K32000   | ~<br>K32000 | ~<br>K32000 | ~<br>K32000 | ~<br>K32000 |
| <b>Hardware Input Limit*1</b>       | -10.12V   | -0.12V      | -5.06V      | -0.06V      | 0.95V       |
|                                     | ~<br>10.12V   | ~<br>10.12V | ~<br>5.06V  | ~<br>5.06V  | ~<br>5.05V  |
| <b>Conversion Limit*2</b>           | K-32384   | K-384       | K-32384     | K-384       | K-384       |
|                                     | ~<br>K32384   | ~<br>K32384 | ~<br>K32384 | ~<br>K32384 | ~<br>K32384 |
| <b>Error Rate</b>                   | Room Temperature: ±0.2% ; Full Temperature Range: ±0.5% |             |             |             |             |
| <b>Hardware Resolution</b>          | 16 bits   |             |             |             |             |
| <b>Input Impedance</b>              | 2MΩ   |             |             |             |             |
| <b>Absolute Input Range*3</b>       | ±15 V   |             |             |             |             |

\*1: If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value. And an error flag will be set.

\*2: If the input signal exceeds the hardware input limit, it also exceeds the conversion limit and a conversion limit error appears. For example in the voltage input mode (-10 V to +10 V), when the input signal is 10.15 V, exceeding the hardware upper limit, it also exceeds the conversion upper limit. The module uses the upper limit value (32384) as the input signal and a conversion limit error appears.

\*3: If an input signal exceeds the absolute range, it might damage the channel.



| Analog-to-Digital Conversion       | Current Input   |                      |                      |
|------------------------------------|---|----------------------|----------------------|
| Rated Input Range                  | ±20 mA  | 0 mA–20 mA           | 4 mA–20 mA           |
| Rated Conversion Range             | K-32000<br>~<br>K+2000                                  | K0<br>~<br>K32000    | K0<br>~<br>K32000    |
| Hardware Input Limit* <sup>1</sup> | -20.24 mA ~ 20.24 mA                                    | -0.24 mA ~ 20.24 mA  | 3.81 mA ~ 20.19 mA   |
| Conversion Limit* <sup>2</sup>     | K-32384<br>~<br>K32384                                  | K-384<br>~<br>K32384 | K-384<br>~<br>K32384 |
| Error Rate                         | Room Temperature: ±0.2% ; Full Temperature Range: ±0.5% |                      |                      |
| Hardware Resolution                | 16 bits   |                      |                      |
| Input Impedance                    | 250Ω  |                      |                      |
| Absolute Input Range* <sup>3</sup> | ±32 mA  |                      |                      |

\*1: If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value. And an error flag will be set.

\*2: If the input signal exceeds the hardware input limit, it also exceeds the conversion limit and a conversion limit error appears. For example in the voltage input mode (4 mA to 20 mA), when the input signal is 0 mA, exceeding the hardware upper limit, it also exceeds the conversion upper limit. The module uses the upper limit value (-384) as the input signal and a conversion limit error appears.

\*3: If an input signal exceeds the absolute range, it might damage the channel.

Functional specifications for the digital-to-analog conversion

| Digital-to-Analog Conversion             | Voltage Output          |                       |                         |                         |                     |
|--|-------------------------|-----------------------|-------------------------|-------------------------|---------------------|
| Rated Output Range                       | ±10 V                   | 0 ~ 10 V              | ±5 V                    | 0 ~ 5 V                 | 1 ~ 5 V             |
| Conversion Range                         | K-32000<br>~<br>K32000  | K0<br>~<br>K32000     | K-32000<br>~<br>K32000  | K0<br>~<br>K32000       | K0<br>~<br>K32000   |
| Hardware Output Range                    | -10.1 V<br>~<br>+10.1 V | -0.1 V<br>~<br>10.1 V | -5.05 V<br>~<br>+5.05 V | -0.05 V<br>~<br>+5.05 V | 0.95<br>~<br>5.05 V |
| Error Rate (Room Temperature)            | ±0.2%                   |                       |                         |                         |                     |
| Error Range (Full temperature range)     | ±0.5%                   |                       |                         |                         |                     |
| Linearity Error (Room Temperature)       | ±0.05%                  |                       |                         |                         |                     |
| Linearity Error (Full Temperature Range) | ±0.05%                  |                       |                         |                         |                     |
| Hardware Resolution                      | 12 bits                 |                       |                         |                         |                     |
| Permissible load impedance               | ≥1k Ω                   | ≥500Ω                 |                         |                         |                     |

| Digital-to-Analog Conversion             | Current Output     |                   |
|--|--------------------|-------------------|
| Rated Output Range                       | 0–20 mA            | 4–20 mA           |
| Conversion Range                         | K0<br>~<br>K32000  | K0<br>~<br>K32000 |
| Hardware Output Range                    | -0.2 mA to 20.2 mA | 3.8–20.2 mA       |
| Error Range (Room Temperature)           | ±0.2%              |                   |
| Error Range (Full Temperature Range)     | ±0.5%              |                   |
| Linearity Error (Room Temperature)       | ±0.03%             |                   |
| Linearity Error (Full Temperature Range) | ±0.10%             |                   |
| Hardware Resolution                      | 12 bits            |                   |
| Permissible Load Impedance               | ≤ 550 Ω            |                   |

## ● AS02ADH-A

### Electrical specifications

|  |   |
|--|---|
| <b>Supply Voltage</b>  | 24 VDC (20.4 VDC–28.8 VDC) (-15% to +20%)   |
| <b>Connector Type</b>  | Removable terminal block  |
| <b>Isolation</b>   | An analog circuit is isolated from a digital circuit by a digital integrated circuit/ optocoupler, but the analog channels are not isolated from one another.<br>Isolation between a digital circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a digital circuit: 500 VAC<br>Isolation between the 24 VDC and a ground: 500 VAC |
| <b>Rated voltage of external input point</b>                       | 24 VDC  |
| <b>Rated current of external input point</b>                       | 5 mA  |
| <b>Resistance value of external input point</b>                    | 3.9 kΩ  |
| <b>Hardware response time of external input point OFF -&gt; ON</b> | < 5 μs  |
| <b>Hardware response time of external input point ON -&gt; OFF</b> | < 5 μs  |
| <b>Weight</b>  | 154 g   |

### Functional specifications

|   |  |
|---|--|
| <b>Number of input channels</b>                             | 2  |
| <b>Analog input</b>   | Voltage: -10 V to 10 V, 0 V to 10 V, 5 V to -5 V, 0 V to 5 V, 1 V to 5 V<br>Current: -20 mA to 20 mA, 0 mA to 20 mA, 4 mA to 20 mA |
| <b>Digital output</b>                                       | 16-bit integer<br>32-bit floating point  |
| <b>Error rate</b>   | Room temperature: ±0.1% ; full temperature range: ±0.2%  |
| <b>Hardware resolution</b>                                  | 16 bits  |
| <b>Input resistance value</b>                               | Voltage: ≥2 MΩ<br>Current: 250 Ω   |
| <b>Absolute input range*1</b>                               | Voltage: ±15 V<br>Current: ±32 mA  |
| <b>Channel sampling Cycle*2</b>                             | 20 μs, 40 μs and 80 μs   |
| <b>Bandwidth of analog input signal</b>                     | 20 kHz   |
| <b>Average function</b>                                     | Time average, moving average: 1 to 1000 times  |
| <b>Digital filtering</b>                                    | Low-pass filter, band-pass filter  |
| <b>Logging function*3</b>                                   | Digital output value (2000 per channel), peak value  |
| <b>Digital calibration</b>                                  | Maximum / minimum digital output value clipping, gain, offset  |
| <b>Abnormal input signal detection</b>                      | Limit-exceeding detection, disconnection detection*4   |
| <b>External input triggering</b>                            | 2 points (1 point / channel), rising-edge or falling-edge triggered  |
| <b>Maximum frequency of external input point triggering</b> | 10 kHz   |

\*1: If an input signal exceeds the absolute range, it might damage the channel.

\*2: Two channels are in A/D conversion simultaneously.

\*3: Logging function should be used with API instructions.

\*4: Disconnect detecton can only be used in the modes of 4 mA to 20 mA and 1V to 5 V.

#### Functional specifications for the analog-to-digital conversion – Voltage Input

| Analog-to-Digital Conversion | Voltage Input          |               |                        |              |              |
|------------------------------|------------------------|---------------|------------------------|--------------|--------------|
| Rated Input Range            | -10V~10V               | 0V~10V        | ±5V                    | 0V~5V        | 1V~5V        |
| Rated Conversion Range       | K-32000<br>~<br>K32000 | K0~K32000     | K-32000<br>~<br>K32000 | K0~K32000    | K0~K32000    |
| Hardware Input Limit*1       | -<br>10.12V~10.12V     | -0.12V~10.12V | -5.06V~5.06V           | -0.06V~5.06V | 0.95V~5.05V  |
| Conversion Limit*2           | K-32384<br>~<br>K32384 | K-384~K32384  | K-32384<br>~<br>K32384 | K-384~K32384 | K-384~K32384 |

\*1: If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value. And an error flag will be set.

\*2: If the input signal exceeds the hardware input limit, it also exceeds the conversion limit and a conversion limit error appears. For example in the voltage input mode (-10 V to +10 V), when the input signal is 10.15 V, exceeding the hardware upper limit, it also exceeds the conversion upper limit. The module uses the upper limit value (32384) as the input signal and a conversion limit error appears.

#### Functional specifications for the analog-to-digital conversion – Current Input

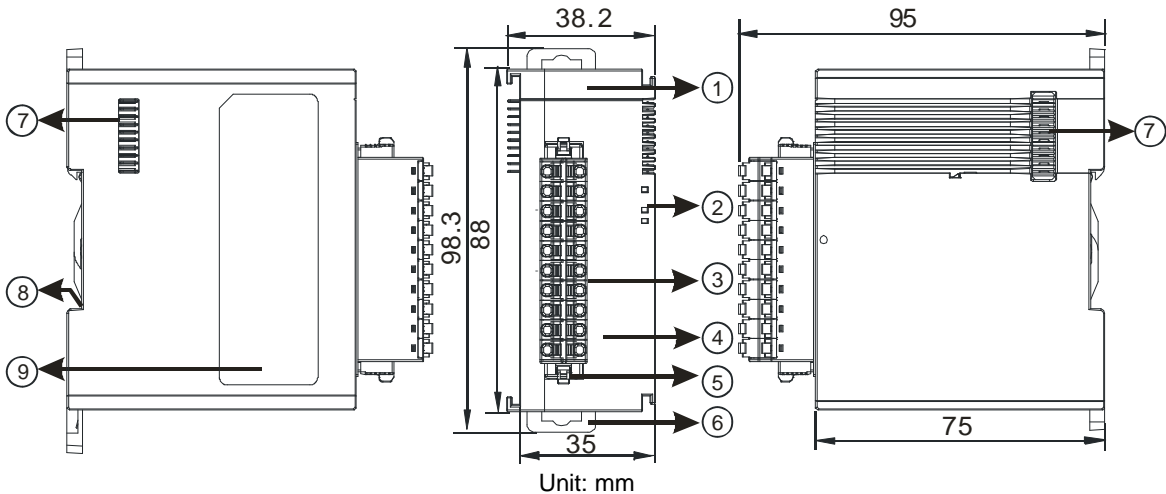
| Analog-to-Digital Conversion | Current Input          |                 |                |
|------------------------------|------------------------|-----------------|----------------|
| Rated Input Range            | ±20mA                  | 0mA~20mA        | 4mA~20mA       |
| Rated Conversion Range       | K-32000<br>~<br>K32000 | K0~K32000       | K0~K32000      |
| Hardware Input Limit*1       | -20.24mA~20.24mA       | -0.24mA~20.24mA | 3.81mA~20.19mA |
| Conversion Limit*2           | K-32384~ K32384        | K-384~K32384    | K-384~K32384   |

\*1: If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value. And an error flag will be set.

\*2: If the input signal exceeds the hardware input limit, it also exceeds the conversion limit and a conversion limit error appears. For example in the voltage input mode (4 mA to 20 mA), when the input signal is 0 mA, exceeding the hardware upper limit, it also exceeds the conversion upper limit. The module uses the upper limit value (-384) as the input signal and a conversion limit error appears.

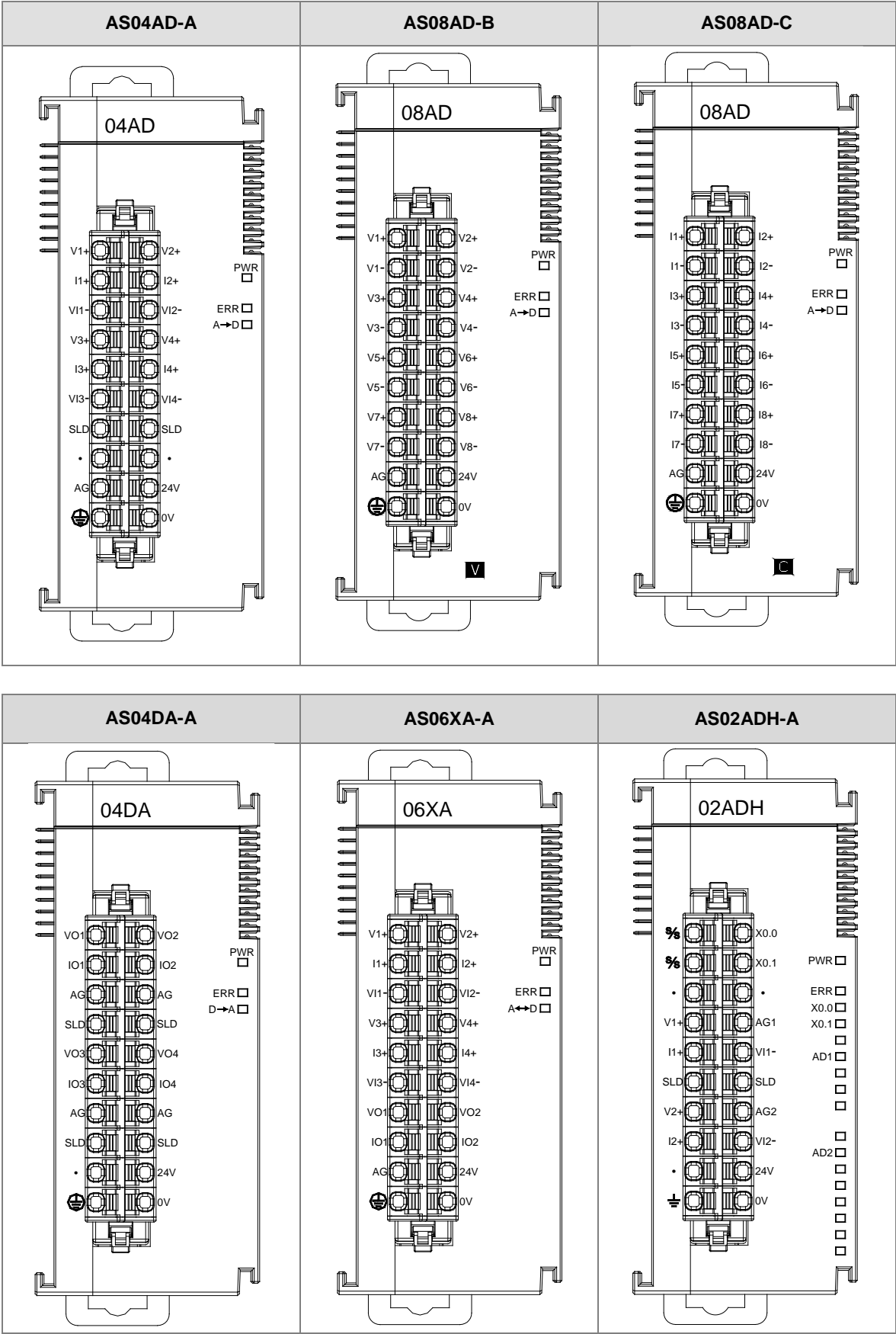
2.4.2 Analog Input/Output Module Profiles

- AS04AD-A/AS08AD-B/AS08AD-C/AS04DA-A/AS06XA-A/AS02ADH-A



| Number | Name   | Description   |
|--------|--|---|
| 1      | Model name   | Model name of the module  |
| 2      | POWER LED indicator  | Indicates the status of the power supply<br>ON: the power is on<br>OFF: no power  |
|        | ERROR LED indicator  | Error status of the module<br>ON: a serious error occurs in the module.<br>OFF: the module is normal.<br>Blinking: a minor error occurs in the module.              |
|        | Input LED indicator  | Indicates the status of the input point<br>ON: If there is an input signal, the input LED indicator is ON.<br>OFF: No input signal, the input LED indicator is OFF. |
|        | Analog-to-digital / digital-to-analog conversion indicator | Indicates the conversion status<br>Blinking: conversion is taking place<br>OFF: stop conversion   |
| 3      | Removable terminal block                                   | The inputs are connected to sensors.<br>The outputs are connected to loads to be driven.  |
| 4      | Arrangement of the input/output terminals                  | Arrangement of the terminals  |
| 5      | Terminal block clip  | Removal of the terminal block   |
| 6      | DIN rail clip  | Secures the module onto the DIN rail  |
| 7      | Module connecting set                                      | Connects the modules  |
| 8      | Ground clip  |   |
| 9      | Label  | Nameplate   |

2.4.3 Analog Input/Output Terminals



## 2.5 Temperature Measurement Modules Specifications

### 2.5.1 General Specifications

- **AS04RTD-A / AS06RTD-A**

Electrical specifications

|                                |   |
|--------------------------------|---|
| <b>Number of analog inputs</b> | AS04RTD-A: four ; AS06RTD-A: six  |
| <b>Applicable sensor</b>       | 2-WIRE & 3-WIRE<br>Pt100: DIN 43760-1980 JIS C1604-1989; 100 $\Omega$ 3850 PPM/ $^{\circ}$ C<br>Pt1000: DIN EN60751; 1 k $\Omega$ 3850 PPM/ $^{\circ}$ C<br>Ni100/Ni1000: DIN 43760<br>JPt100: JIS C1604-1989LG-Ni1000<br>Cu50/Cu100<br>Ni120 (available for FW V1.06 or later)<br>0–300 $\Omega$ /0–3000 $\Omega$  |
| <b>Supply voltage</b>          | 24 VDC (20.4 VDC–28.8 VDC) (-15% to +20%)   |
| <b>Connector type</b>          | Removable terminal block  |
| <b>Overall accuracy</b>        | Pt100/Ni100/Ni120/Pt1000/Ni1000/JPt100:<br>25 $^{\circ}$ C/77 $^{\circ}$ F: The error is $\pm$ 0.1% of the input within the range.  |
|                                | -20 to +60 $^{\circ}$ C/-4 to +140 $^{\circ}$ F: The error is $\pm$ 0.5% of the input within the range.   |
|                                | LG-Ni1000: 25 $^{\circ}$ C/77 $^{\circ}$ F: The error is $\pm$ 0.2% of the input within the range.  |
|                                | Cu50: 25 $^{\circ}$ C/77 $^{\circ}$ F: The error is $\pm$ 4 $^{\circ}$ C of the input within the range.   |
|                                | Cu100: 25 $^{\circ}$ C/77 $^{\circ}$ F: The error is $\pm$ 2 $^{\circ}$ C of the input within the range.  |
| <b>Resolution</b>              | 0.1 $^{\circ}$ C / 0.1 $^{\circ}$ F   |
| <b>Conversion time</b>         | Two-wire/three-wire configuration: 200 ms/channel   |
| <b>Isolation</b>               | 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.<br>Isolation between a digital circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a digital circuit: 500 VAC<br>Isolation between the 24 VDC and a ground: 500 VAC |
| <b>Weight</b>                  | AS04RTD-A: 115g ; AS06RTD-A: 125g   |

## Functional specifications

| Analog-to-digital conversion       | Centigrade (°C)  | Fahrenheit (°F)  | Input impedance     |
|------------------------------------|--|--|---------------------|
| <b>Rated input range</b> *1        | Pt100: -180°C to +800°C<br>Ni100: -80°C to +170°C<br>Ni120 : -80°C~320°C<br>Pt1000: -180°C to +800°C<br>Ni1000: -80°C to +170°C<br>JPt100: -180°C to +500°C<br>LG-Ni1000: -50°C to +180°C<br>Cu50: -50°C to +150°C<br>Cu100: -50°C to +150°C | Pt100: -292°F to +1,472°F<br>Ni100: -112°F to +338°F<br>Ni120: -112°F~608°F<br>Pt1000: -292°F to +1,472°F<br>Ni1000: -112°F to +338°F<br>JPt100: -292°F to +932°F<br>LG-Ni1000: -58°F to +356°F<br>Cu50: -58°F to +302°F<br>Cu100: -58°F to +302°F | 0–300 Ω<br>0–3000 Ω |
| <b>Maximum Measurable Range</b> *2 | Pt100: -200°C to 850°C<br>Ni100: -100°C to 180°C<br>Pt1000: -200°C to 850°C<br>Ni1000: -100°C to 180°C<br>JPt100: -200°C to 510°C<br>LG-Ni1000: -60°C to 200°C<br>Cu50: -50°C to 150°C<br>Cu100: -50°C to 150°C                              | Pt100 : -328°F to 1,562°F<br>Ni100: -148°F to 356°F<br>Pt1000 : -328°F to 1,562°F<br>Ni1000 : -148°F to 356°F<br>JPt100 : -328°F to 950°F<br>LG-Ni1000 : -76°F to 392°F<br>Cu50 : -58°F to 302°F<br>Cu100 : -58°F to 302°F                         | 0–320 Ω<br>0–3200 Ω |
| <b>Average function</b>            | Range: 1–100   |  |                     |
| <b>Self-diagnosis</b>              | Disconnection detection  |  |                     |

\*1: If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

\*2: If the to be measured temperature exceeds the upper/lower limit, it only shows the maximum / minimum value.

- AS04TC-A / AS08TC-A

## Electrical specifications

|                                |  |
|--------------------------------|--|
| <b>Number of analog inputs</b> | AS04TC-A: four ; AS08TC-A: eight   |
| <b>Applicable sensor</b>       | Type J, K, R, S, T, E, N, B, C, U, L, TXK thermocouple;<br>input impedance: $\pm 100\text{mV}$   |
| <b>Supply voltage</b>          | 24 VDC (20.4 VDC–28.8 VDC) (-15% to +20%)  |
| <b>Connector type</b>          | Removable terminal block   |
| <b>Overall accuracy</b>        | 25°C/77°F: The error is $\pm 0.5\%$ of the input within the range.<br>-20 to +60°C/-4 to +140°F: The error is $\pm 1\%$ of the input within the range.   |
| <b>Resolution</b>              | 0.1°C / 0.1°F  |
| <b>Conversion time</b>         | 200 ms/channel   |
| <b>Isolation</b>               | 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.<br>Isolation between a digital circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a ground: 500 VAC<br>Isolation between an analog circuit and a digital circuit: 500 VAC<br>Isolation between two group circuits: 500 VAC<br>Isolation between the 24 VDC and a ground: 500 VAC<br>Isolation between the analog channels: 120VAC |
| <b>Weight</b>                  | AS04TC-A: 115g ; AS08TC-A: 125g  |



## Functional specifications

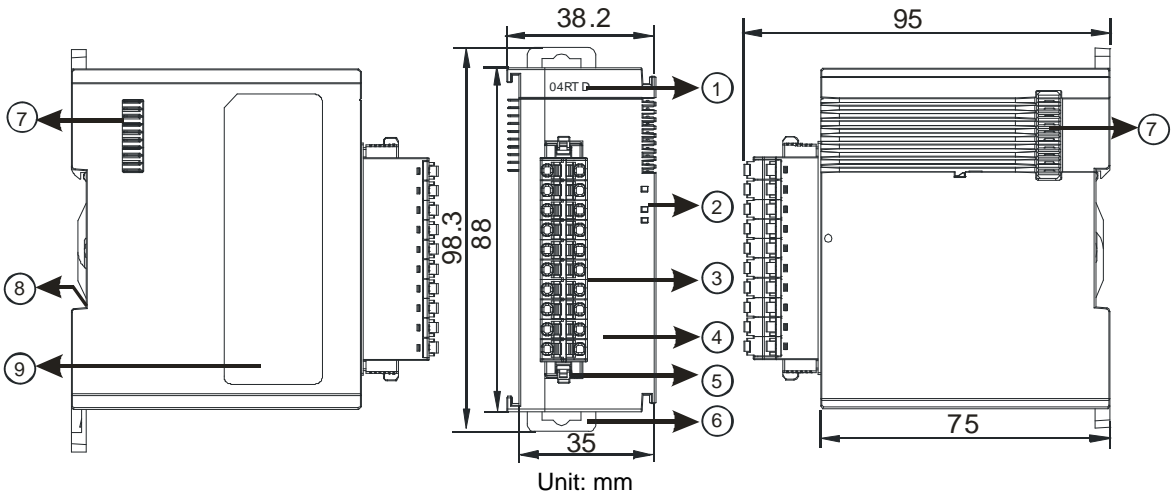
| Analog-to-digital conversion       | Centigrade (°C)   | Fahrenheit (°F)  | Input impedance |
|------------------------------------|---|--|-----------------|
| <b>Rated input range</b> *1        | Type J: -100°C~1200°C<br>Type K: -100°C~1,350°C<br>Type R: 0°C~1,750°C<br>Type S: 0°C~1,750°C<br>Type T: -150°C~400°C<br>Type E: -150°C~980°C<br>Type N: -150°C~1,300°C<br>Type B: 200°C~1,800°C<br>Type C: 0°C~2,320°C<br>Type U: -200°C~600°C<br>Type L: -200°C~900°C<br>Type TXK: -200°C~800°C     | Type J: -148°F~2,192°F<br>Type K: -148°F~2,462°F<br>Type R: 32°F~3,182°F<br>Type S: 32°F~3,182°F<br>Type T: -238°F~752°F<br>Type E: -238°F~1,796°F<br>Type N: -238°F~2,372°F<br>Type B: 392°F~3,272°F<br>Type C: NA<br>Type U: -328°F~1,112°F<br>Type L: -328°F~1,652°F<br>Type TXK: -328°F~1,472°F  | ±100mV          |
| <b>Maximum Measurable Range</b> *2 | Type J: -210°C~1200°C<br>Type K: -250°C~1,350°C<br>Type R: -50°C~1,760°C<br>Type S: -50°C~1,760°C<br>Type T: -250°C~400°C<br>Type E: -250°C~1000°C<br>Type N: -250°C~1,300°C<br>Type B: 20°C~1,800°C<br>Type C: 0°C~2,320°C<br>Type U: -200°C~600°C<br>Type L: -200°C~900°C<br>Type TXK: -200°C~800°C | Type J: -346°F~2,192°F<br>Type K: -418°F~2,462°F<br>Type R: -58°F~3,200°F<br>Type S: -25°F~3,200°F<br>Type T: -418°F~752°F<br>Type E: -418°F~1,832°F<br>Type N: -418°F~2,372°F<br>Type B: 68°F~3,272°F<br>Type C: NA<br>Type U: -328°F~1,112°F<br>Type L: -328°F~1,652°F<br>Type TXK: -328°F~1,472°F | ±100mV          |
| <b>Average function</b>            | Range: 1~100  |  |                 |
| <b>Self-diagnosis</b>              | Disconnection detection   |  |                 |

\*1: If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

\*2: If the to be measured temperature exceeds the upper/lower limit, it only shows the maximum / minimum value.

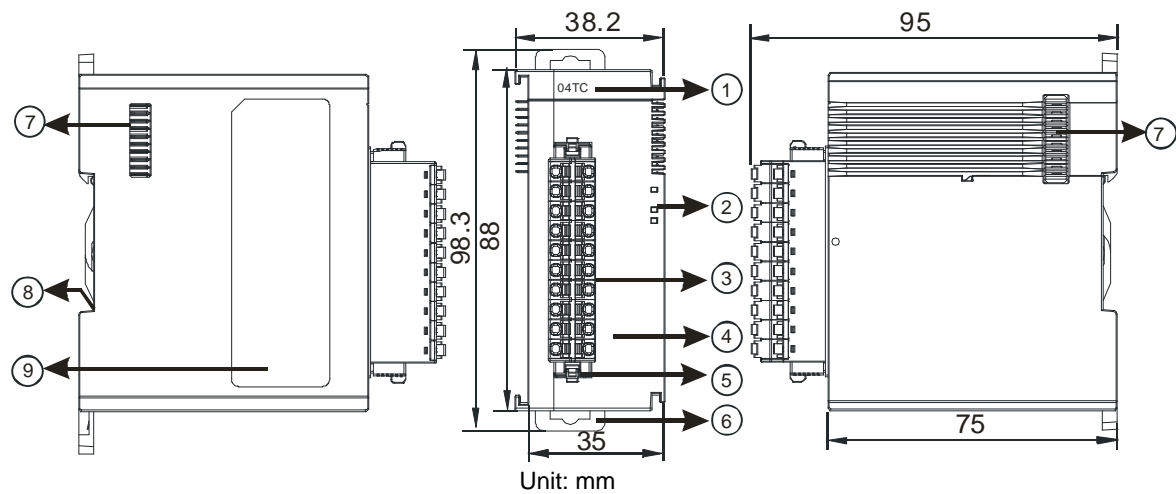
2.5.2 Temperature Measurement Module Profiles

- AS04RTD-A / AS06RTD-A



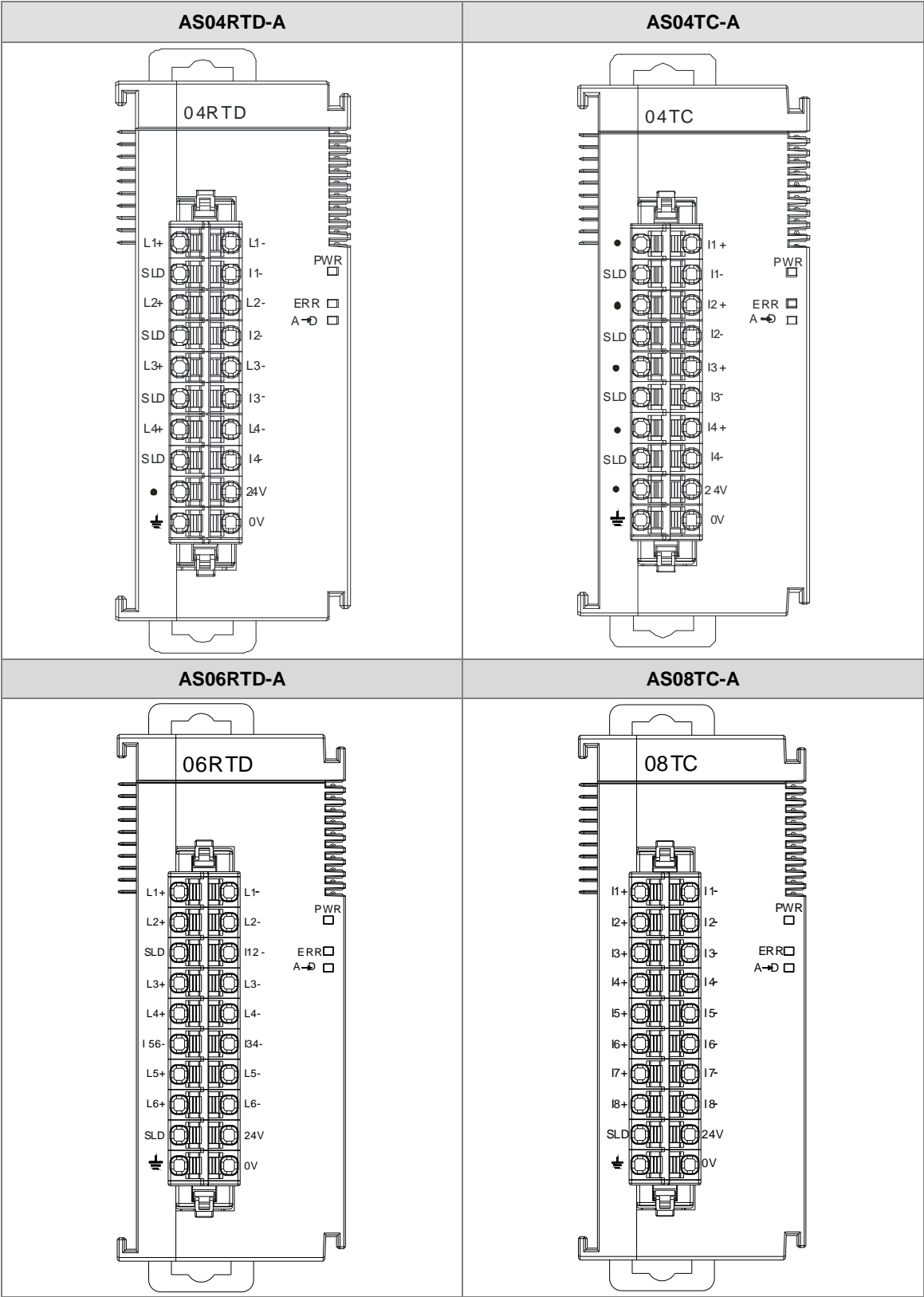
| Number | Name                                      | Description  |
|--------|---|--|
| 1      | Model name                                | Model name of the module   |
| 2      | POWER LED indicator                       | Indicates the status of the power supply<br>ON: the power is on<br>OFF: no power   |
|        | ERROR LED indicator                       | Error status of the module<br>ON: a serious error occurs in the module.<br>OFF: the module is normal.<br>Blinking: a minor error occurs in the module. |
|        | Analog to digital conversion indicator    | Indicates the analog to digital conversion status<br>Blinking: conversion is taking place<br>OFF: stop conversion                                      |
| 3      | Removable terminal block                  | The inputs are connected to sensors.<br>The outputs are connected to loads to be driven.   |
| 4      | Arrangement of the input/output terminals | Arrangement of the terminals   |
| 5      | Terminal block clip                       | Removal of the terminal block  |
| 6      | DIN rail clip                             | Secures the module onto the DIN rail   |
| 7      | Module connecting set                     | Connects the modules   |
| 8      | Ground clip                               |  |
| 9      | Label                                     | Nameplate  |

● AS04TC-A / AS08TC-A



| Number | Name                                      | Description  |
|--------|---|--|
| 1      | Model name                                | Model name of the module   |
| 2      | POWER LED indicator                       | Indicates the status of the power supply<br>ON: the power is on<br>OFF: no power   |
|        | ERROR LED indicator                       | Error status of the module<br>ON: a serious error occurs in the module.<br>OFF: the module is normal.<br>Blinking: a minor error occurs in the module. |
|        | Analog to digital conversion indicator    | Indicates the analog to digital conversion status<br>Blinking: conversion is taking place<br>OFF: stop conversion                                      |
| 3      | Removable terminal block                  | The inputs are connected to sensors.<br>The outputs are connected to loads to be driven.   |
| 4      | Arrangement of the input/output terminals | Arrangement of the terminals   |
| 5      | Terminal block clip                       | Removal of the terminal block  |
| 6      | DIN rail clip                             | Secures the module onto the DIN rail   |
| 7      | Module connecting set                     | Connects the modules   |
| 8      | Ground clip                               |  |
| 9      | Label                                     | Nameplate  |

2.5.3 Temperature Measurement Module Dimensions



Unit: mm

## 2.6 Positioning Module Specifications

### 2.6.1 General Specifications

Electrical specifications for the inputs

- AS02PU-A

| Model                   |        | High-speed Input   | Normal Input                         |
|-------------------------|--------|--|--------------------------------------|
| Item                    |        |  |                                      |
| Number of inputs        |        | 3 (A+/A-, B+/B-, Z+/Z-)  | 5 (X0.0-X0.4)                        |
| Connector type          |        | Removable terminal blocks                                      |                                      |
| Input form              |        | Differential input   | Direct current (sinking or sourcing) |
| Input current           |        | 5-24 VDC, 5 mA   | 24 VDC, 5 mA                         |
| Action level            | OFF→ON | >3 VDC   | >15 VDC                              |
|                         | ON→OFF | <1.5 VDC   | <5 VDC                               |
| Response time           |        | 1.5 $\mu$ s  | < 0.5 ms                             |
| Maximum input frequency |        | 200 kHz (A+/A-, B+/B-, Z+/Z-)                                  | 1 kHz                                |
| Input impedance         |        | 4.7 k $\Omega$   |                                      |
| Input isolation         |        | 500 VAC  |                                      |
| Input display           |        | When the optocoupler is driven, the input LED indicator is ON. |                                      |
| Weight                  |        | 120 g  |                                      |

- AS04PU-A

| Model                   |        | Normal  |
|-------------------------|--------|---|
| Item                    |        |   |
| Number of inputs        |        | Six   |
| Connector type          |        | Removable terminal blocks   |
| Input form              |        | Direct current (sinking or sourcing)<br>Sinking: The inputs are NPN transistors whose collectors are open collectors.<br>Sourcing: The inputs are PNP transistors whose collectors are open collectors. |
| Input current           |        | 24 VDC, 5 mA  |
| Action level            | OFF→ON | >15 VDC   |
|                         | ON→OFF | <5 VDC  |
| Response time           |        | < 0.5 ms  |
| Maximum input frequency |        | 1 kHz   |
| Input impedance         |        | 4.7 k $\Omega$  |
| Input isolation         |        | 500 VAC   |
| Input display           |        | When the optocoupler is driven, the input LED indicator is ON.  |
| Weight                  |        | 120 g   |

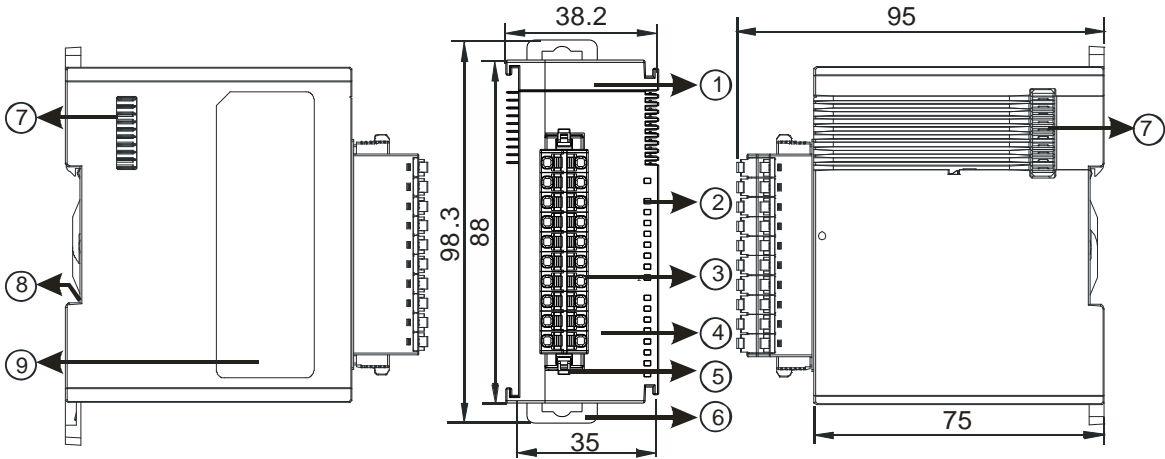
Electrical specifications for the outputs

| Model                    |            | AS02PU-A                  | AS04PU-A                     |
|--------------------------|------------|---------------------------|------------------------------|
| Item                     |            |                           |                              |
| Number of outputs        |            | Four (2-axis)             | Eight (4-axis)               |
| Connector type           |            | Removable terminal blocks |                              |
| Output form              |            | differential output       | Transistor-T (sinking) (NPN) |
| Output voltage           |            | 5 VDC*1                   | 5-30 VDC, 0.1A               |
| Leakage current          |            | < 10 uA                   |                              |
| Minimum load             |            | 1 mA / 5 VDC              |                              |
| Maximum load             | Resistance | 10 mA                     | 0.1A                         |
|                          | Inductance | N/A                       |                              |
|                          | Bulb       | N/A                       |                              |
| Maximum output frequency | Resistance | 200 kHz                   | 100 kHz                      |
| Maximum Response time    | OFF→ON     | 0.1 μs                    | 1.5 μs                       |
|                          | ON→OFF     | 0.1 μs                    | 1.5 μs                       |
| Output isolation         |            | 500 VAC                   |                              |
| Weight                   |            | 120 g                     |                              |

Note \*1: Acutal output 4 VDC (high input impedance) to 3.3 VDC (10 mA)/point

2.6.2 Positioning Module Profiles

- AS02PU-A / AS04PU-A



| Number | Name                                      | Description  |
|--------|---|--|
| 1      | Model name                                | Model name of the module   |
| 2      | POWER LED indicator (Blue)                | Indicates the status of the power supply<br>ON: the power is on<br>OFF: no power   |
|        | Run LED indicator (Green)                 | Operating status of the module<br>ON: the module is running and ready to accept instructions.<br>OFF: the module is stopped and can NOT accept instructions. |
|        | Error LED indicator (Red)                 | Error status of the module<br>OFF: the module is normal.<br>Blinking (0.2 seconds ON/OFF): hardware error occurs in the module, can NOT operate normally     |
|        | Input LED indicator (Red)                 | ON: Receives an input signal<br>OFF: Receives no input signal  |
|        | Output LED indicator (Red)                | ON: Receives an output signal<br>OFF: Receives no output signal  |
| 3      | Removable terminal block                  | The inputs are connected to sensors.<br>The outputs are connected to loads to be driven.   |
| 4      | Arrangement of the input/output terminals | Arrangement of the terminals   |
| 5      | Terminal block clip                       | Removal of the terminal block  |
| 6      | DIN rail clip                             | Secures the module onto the DIN rail   |
| 7      | Module connecting set                     | Connects the modules   |
| 8      | Ground clip                               | On the DIN rail for grounding  |
| 9      | Label                                     | Nameplate  |

2.6.3 Positioning Module Terminals

AS02PU-A

02PU

IN A+ B+ Z+ 1 3 OUT 0+ 1+ 2+ 3+

IN A- B- Z- 0 2 4 1 2

OUT 0 1 2 3

PWR RUN ERR A B Z 0 1 2 3

AS04PU-A

04PU

IN S/S X0.0 X0.1 X0.2 X0.3 X0.4 X0.5 •

OUT C0 Y0.0 Y0.1 Y0.2 Y0.3 Y0.4 Y0.5 Y0.6 Y0.7

PWR RUN ERR C0 0 1 2 3 4 5 6 7

AS02PU-A

Wordings with the same indications that are used on the terminal block and manual

| Manual | Terminal Block (left) | Manual | Terminal Block (right) |
|--------|-----------------------|--------|------------------------|
| A+     | A+                    | A-     | A-                     |
| B+     | B+                    | B-     | B-                     |
| Z+     | Z+                    | Z-     | Z-                     |
| S/S    | S/S                   | X0.0   | 0                      |
| X0.1   | 1                     | X0.2   | 2                      |
| X0.3   | 3                     | X0.4   | 4                      |
| Y0.0+  | 0+                    | Y0.0-  | 0-                     |
| Y0.1+  | 1+                    | Y0.1-  | 1-                     |
| Y0.2+  | 2+                    | Y0.2-  | 2-                     |
| Y0.3+  | 3+                    | Y0.3-  | 3-                     |

AS04PU-A

Wordings with the same indications that are used on the terminal block and manual

| Manual | Terminal Block (left) | Manual | Terminal Block (right) |
|--------|-----------------------|--------|------------------------|
| S/S    | S/S                   | C0     | C0                     |
| S/S    | S/S                   | Y0.0   | 0                      |
| X0.0   | 0                     | Y0.1   | 1                      |
| X0.1   | 1                     | Y0.2   | 2                      |
| X0.2   | 2                     | Y0.3   | 3                      |
| X0.3   | 3                     | C1     | C1                     |
| X0.4   | 4                     | Y0.4   | 4                      |
| X0.5   | 5                     | Y0.5   | 5                      |
|        | •                     | Y0.6   | 6                      |
|        | •                     | Y0.7   | 7                      |



## 2.7 Counter Module Specifications

### 2.7.1 General Specifications

| Item                           |                                       | Description   |
|--------------------------------|---------------------------------------|---|
| Number of channels             |                                       | 2   |
| Pulse Input                    | Input signal type                     | Phase differential (A/B): x2, x4; CW/CCW; Pulse/Direction   |
|                                | Max. transmission distance            | 200 kHz at 30 m   |
|                                | Counter type                          | Circular counter, linear encoder  |
| SSI Input                      | Max. data length                      | 32-bit (The single-turn, multi-turn, and status data length can be set.)  |
|                                | Coding method                         | Binary code, gray code  |
|                                | Max. transmission distance            | 250 kHz at 150 m, 500 kHz at 50 m, 625 kHz at 40 m, 1 MHz at 20 m, 1.25 MHz at 10 m   |
|                                | Parity check bit                      | None, odd parity, even parity   |
|                                | Counter type                          | Circular counter, absolute counter  |
| Counter                        | Counting range                        | -2147483648 ~ 2147483647 (32-bit)   |
|                                | Counter control                       | Reset, preset, gate, capture, offset correction for absolute position   |
|                                | Output state check                    | Direction to count, counting overflow/underflow, linear counting beyond the lower and upper limit values, SSI feedback, SSI position exceeding the protection limit, SSI parity checking, SSI communication status, a zero point is set beyond SSI encoder resolution |
| External input point (phase Z) | Input point                           | 2 (one for each channel)  |
|                                | Function                              | Reset, gate, capture  |
|                                | Digital filtering                     | OFF, 100 $\mu$ s, 200 $\mu$ s to 20 ms  |
|                                | Min. software interrupt response time | 20 $\mu$ s (hardware response time included)  |
| External output point          | Output point                          | 4   |
|                                | Output type                           | NPN transistor (sinking)  |
| Comparison function            | Instruction                           | General comparison output instruction, table comparison output instruction  |
|                                | Interrupt                             | Using comparison to achieve the interrupt function  |
| Measurement function           | Measured item                         | Input frequency and revolution  |
|                                | Average times                         | 1 to 10 times   |

**Electrical specifications for the inputs**

| Model                   |        | Pulse input  | External input |
|-------------------------|--------|--|----------------|
| Item                    |        |  |                |
| Number of inputs        |        | 4 (A+/B+, A-/B-)   | 2 (Z+/Z-)      |
| Connector type          |        | D-sub 15   |                |
| Input current           |        | 5-24 VDC, 6-15 mA  |                |
| Action level            | OFF→ON | 3 V  |                |
|                         | ON→OFF | 1 V  |                |
| Maximum input frequency |        | 200 kHz  | 20 kHz         |
| Input impedance         |        | 4.7 kΩ   |                |
| Input signal            |        | Signal signal: 5 – 24 VDC (sinking or sourcing) ; differential signal: 5 V |                |
| Input isolation         |        | 500 VAC  |                |
| Input display           |        | When the optocoupler is driven, the input LED indicator is ON.             |                |
| Weight                  |        | 138 g  |                |

**Electrical specifications for the SSI input and output**

| Model                          |        | SSI input  | SSI output           |
|--------------------------------|--------|--|----------------------|
| Item                           |        |  |                      |
| Number of inputs / outputs     |        | 2 (DATA+/DATA-)  | 2 (CLK+/CLK-)        |
| Connector type                 |        | D-sub 15   |                      |
| Voltage / Current              |        | 5 VDC, 1 mA  | 5 VDC, ±60 mA (max.) |
| Action level                   | OFF→ON | $V_{ID}^{*1} \geq 0.2V$  | -                    |
|                                | ON→OFF | $V_{ID} \leq 0.2V$   | -                    |
| Maximum input/output frequency |        | 1.25 MHz   |                      |
| Input impedance                |        | 12 kΩ (terminal resistor 120 Ω)                                | -                    |
| Input signal                   |        | RS-422   |                      |
| Input isolation                |        | 500 VAC  |                      |
| Input display                  |        | When the optocoupler is driven, the input LED indicator is ON. |                      |

\*1:  $V_{ID}$  is the voltage difference between DATA+ and DATA-.

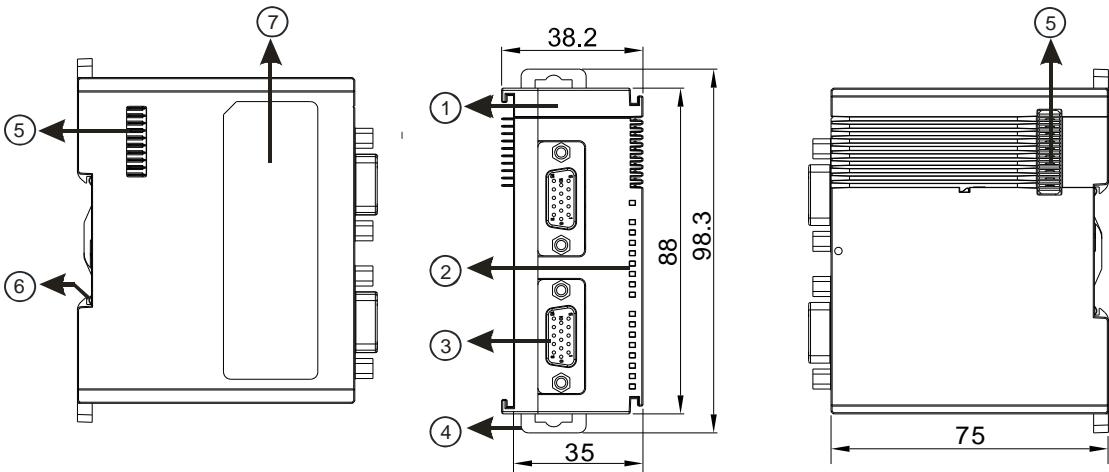
**Electrical specifications for the external outputs**

| Model                      |            | AS02HC-A                 |
|----------------------------|------------|--------------------------|
| Item                       |            |                          |
| Number of outputs          |            | 4                        |
| Connector type             |            | D-sub 15                 |
| Output type                |            | NPN transistor (sinking) |
| Voltage                    |            | 5 – 30 VDC               |
| Minimum load               |            | 1 mA / 5 VDC             |
| Maximum load               | Resistance | 0.1A/output              |
|                            | Inductance | -                        |
|                            | Bulb       | -                        |
| Maximum output frequency*1 | Resistance | 10 kHz                   |
| Maximum Response time      | OFF→ON     | 25 μs                    |
|                            | ON→OFF     |                          |
| Output isolation           |            | 500 VAC                  |

**Electrical specifications for the +5 V encoder power supply**

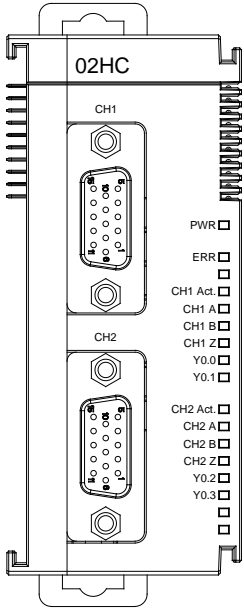
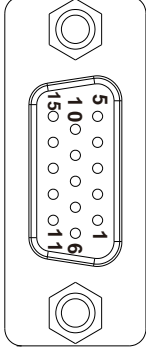
| Model             |  | AS02HC-A                    |
|-------------------|--|-----------------------------|
| Item              |  |                             |
| Number of outputs |  | 2 (+5 VO/GND)               |
| Connector type    |  | D-sub 15                    |
| Voltage / Current |  | 5 VDC (±5%), ±100 mA (max.) |

2.7.2 Counting Module Profiles



| Number | Name  | Description   |
|--------|---|---|
| 1      | Model name  | Model name of the module  |
| 2      | POWER LED indicator (Blue)                            | Indicates the status of the power supply<br>ON: the power is on<br>OFF: no power  |
|        | Error LED indicator (Red)                             | Error status of the module<br>ON: a serious error occurs in the module.<br>OFF: the module is normal.<br>Blinking: a minor error occurs in the module.  |
|        | Counter LED indicator for Ch1 Act. & Ch2 Act. (Green) | Counting status of the module<br>OFF: the counter is disabled.<br>ON: the counter is enabled but the result of counting is not changed.<br>Blinking: the result of counting is updating.<br>When SSI input:<br>Blinking: the counter is enabled and the position value is updating. |
|        | Input / output LED indicator                          | ON: Receives an input / output signal<br>OFF: Receives no input / output signal   |
| 3      | D-sub 15  | Input: connected for pulse input and encoder<br>Output: connected to loads to be driven<br>Power: providing external encoder +5 VDC   |
| 4      | DIN rail clip   | Secures the module onto the DIN rail  |
| 5      | Module connecting set                                 | Connects the modules  |
| 6      | Ground clip   | On the DIN rail for grounding   |
| 7      | Label   | Nameplate   |

2.7.3 Counting Module Terminals

|  |         |        |        |
|--|---------|--------|--------|
|   | Pin No. | CH1    | CH2    |
|  | 8       | A1+    | A2+    |
|  | 3       | A1-    | A2-    |
|  | 7       | B1+    | B2+    |
|  | 2       | B1-    | B2-    |
|  | 6       | Z1+    | Z2+    |
|  | 1       | Z1-    | Z2-    |
|  | 10      | CLK1+  | CLK2+  |
|  | 5       | CLK1-  | CLK2-  |
|  | 9       | DATA1+ | DATA2+ |
|  | 4       | DATA1- | DATA2- |
|  | 14      | +5VO1  | +5VO2  |
|  | 15      | GND1   | GND2   |
|  | 12      | Y0.0   | Y0.2   |
|  | 11      | Y0.1   | Y0.3   |
|  | 13      | COM0   | COM1   |

## 2.8 Network Module Specifications

### 2.8.1 General Specifications

- AS00SCM-A

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

| Item                   | Specifications  |
|------------------------|---|
| Connector type         | 5-pin European-style terminal block, spring-clamp terminal block  |
| Electronical isolation | 500 VAC   |
| Communication format   | Stop bit: 1 stop bit or 2 stop bits<br>Parity bit: none, an odd parity bit, or an even parity bit<br>Data bit: 7 data bits or 8 data bits |
| Communication protocol | CAN   |

**CAN communication interface**

| Item                   | Specifications  |
|------------------------|---|
| Connector type         | RJ-45*2   |
| Transmission speed     | 10K, 20K, 50K, 125K, 250K, 500K, 1000 Kbps  |
| Communication protocol | AS special remote mode (for RTU mode)<br>CANopen (available for models with firmware V2.0 or later) |

**Ethernet communication interface**

| Item                   | Specifications   |
|------------------------|--|
| Connector type         | RJ-45*2  |
| Transmission speed     | 10M, 100 Mbps  |
| Communication protocol | EtherNet/IP (available for models with firmware V2.02 or later),<br>PROFINET (available for models with firmware V2.06 or later) |

**Electrical specifications**

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

- **AS01DNET-A**

**CAN communication interface**

| Item                          | Specifications   |
|-------------------------------|--|
| <b>Connector type</b>         | Removable terminal blocks (enclosed with fastening screws, 5.08 mm ) |
| <b>Electronical isolation</b> | 500 VAC  |
| <b>Transmission cables</b>    | Communication cable *2, power cable *2, shield cable *1              |
| <b>Communication protocol</b> | DeviceNet  |

**Communication interface**

| Item                      | Specifications   |
|---------------------------|--|
| <b>Data type</b>          | I/O polling, explicit message  |
| <b>Transmission speed</b> | Standard mode: 125K, 250K, 500Kbps<br>Extension mode: 10K, 20K, 50K, 125K, 250K, 500K, 1000K, 800Kbps and 1M bps |

**Electrical specifications**

| Item           | Specifications                                       |
|----------------|--|
| <b>Voltage</b> | 11~25 VDC supplied by power cable of the network     |
| <b>Current</b> | Ttypical value: 28 mA; rush current: 125 mA (24 VDC) |

- AS04SIL-A

#### Unit Specifications

| Item   |                                      | Specifications   |
|--|--------------------------------------|--|
| Model type                                   |                                      | IO-Link master   |
| Model name                                   |                                      | AS04SIL-A  |
| Number of ports                              |                                      | 4  |
| Communication                                | Baud rate                            | 4.8 kbps ; 38.4 kbps ; 230.4 kbps  |
|  | Topology                             | 1 : 1  |
|  | Compliant standards                  | <ul style="list-style-type: none"> <li>■ IO-Link Interface and System Specification Version 1.1.2</li> <li>■ IO-Link Test Specification Version 1.1.2</li> </ul> |
| Modes  | IO-Link                              | Yes  |
|  | SIO (DI)                             | Yes  |
|  | SIO (DO)                             | Yes, up to 100 mA / channel  |
| Cyclic communications                        |                                      | 2 ms min. ; dynamic, according to the valid data length  |
| Input: data size in each communication port  |                                      | 32 bytes max.  |
| Output: data size in each communication port |                                      | 32 bytes max.  |
| Input: data size in each module              |                                      | 128 bytes max.   |
| Output: data size in each module             |                                      | 128 bytes max.   |
| Input PDO data size                          |                                      | 100 words max.   |
| Output PDO data size                         |                                      | 100 words max.   |
| Back up                                      |                                      | Yes  |
| Cable specification                          | Type                                 | Unshielded (can also apply to shielded ones)   |
|  | Length                               | 20 m max.  |
|  | Electrostatic capacity between lines | 3 nF max.  |
|  | Loop resistance                      | 6 $\Omega$ max.  |
| External connection terminals                |                                      | Clamping terminal block  |

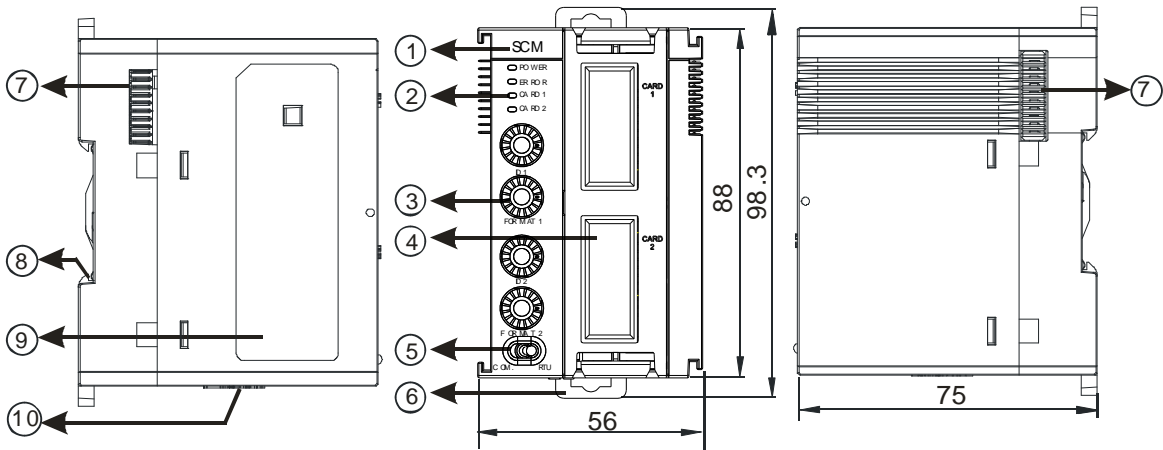


**Electrical specifications**

| Item  |                          | Specifications                           |
|---|--------------------------|--|
| Power supply to device in IO-Link mode or SIO (DI) mode | Rated voltage            | 24 VDC (20.4 VDC~ 28.8 VDC) (9-15%~+20%) |
|   | Maximum load current     | 0.2A/port                                |
|   | Short-circuit protection | Yes                                      |
| Digital inputs in SIO (DI) mode                         | Internal I/O common      | NPN, PNP                                 |
|   | Input voltage / current  | 24 VDC, 5 mA                             |
|   | ON voltage               | >15 VDC                                  |
|   | OFF voltage              | <5 VDC                                   |
|   | Filter time              | 0 – 65 ms (0: no filter)                 |
| Digital outputs in SIO (DO) mode                        | Internal I/O common      | NPN, PNP                                 |
|   | Output voltage / current | 24 VDC (20.4 VDC~ 28.8 VDC), 0.1A/port   |
|   | Short-circuit protection | Yes                                      |
|   | Leakage current          | <0.1 mA                                  |
|   | Residual voltage         | <1.5 VDC                                 |
| Digital inputs for pin 2 in IO-Link mode                | Internal I/O common      | NPN, PNP                                 |
|   | Input voltage / current  | 24 VDC, 2 mA                             |
|   | ON voltage               | >15 VDC                                  |
|   | OFF voltage              | <5 VDC                                   |
|   | Filter time              | 0 – 65 ms (0: no filter)                 |
| Electronical isolation                                  |                          | 500 VAC                                  |
| Power consumption                                       |                          | 0.8 W                                    |
| Weight  |                          | 133g                                     |

2.8.2 Network Module Profiles

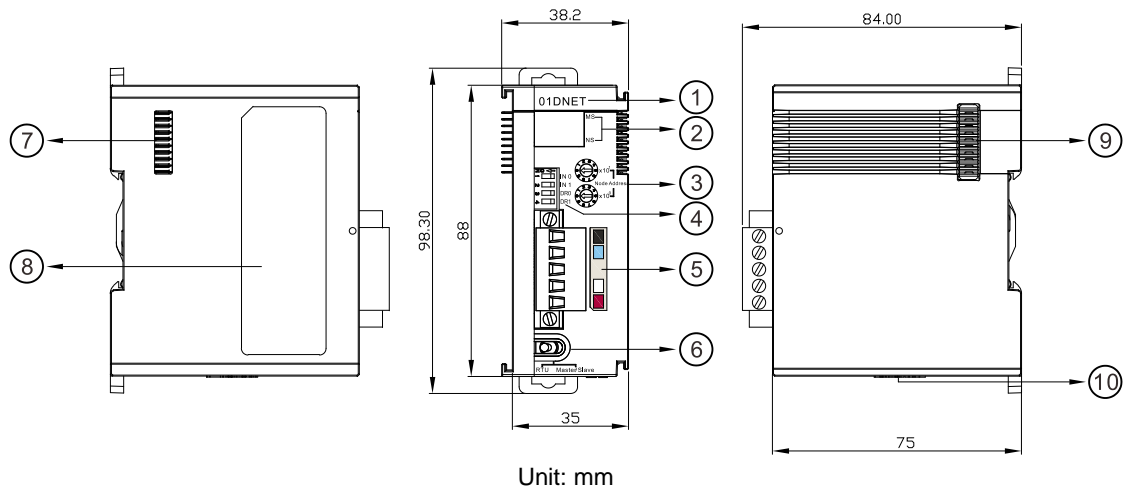
● AS00SCM-A



Unit: mm

| Number | Name  | Description   |
|--------|---|---|
| 1      | Model name                                  | Model name of the module  |
| 2      | POWER LED indicator                         | Indicates the status of the power supply<br>ON: The power is on<br>OFF: No power or the power is low                |
|        | ERROR LED indicator                         | Error status of the module<br>OFF: The module is normal.<br>Blinking: Error occurs now or error had occurred before |
|        | Extension card 1 indicator (orange)         | Blinking: Communication is taking place in card 1<br>OFF: No communication in card 1                                |
|        | Extension card 2 indicator (orange)         | Blinking: Communication is taking place in card 2<br>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 of function card 1                     | COM mode: Available for AS-F232, AS-F422, AS-F485   |
|        | Slot of function card 2                     | COM mode: Available for AS-F232, AS-F422, AS-F485, AS-FCOPM<br>RTU mode: AS-FCOPM, AS-FEN02, AS-FPFN02              |
| 5      | Mode switch                                 | COM: Serial communication mode; RTU: remote module mode   |
| 6      | DIN rail clip                               | Secures the module onto the DIN rail  |
| 7      | Module connecting set                       | Connects the modules  |
| 8      | Ground clip                                 |   |
| 9      | Label                                       | Nameplate   |
| 10     | Input for supplying power to remote modules | Power supply for the remote module (NOT for COM mode)   |

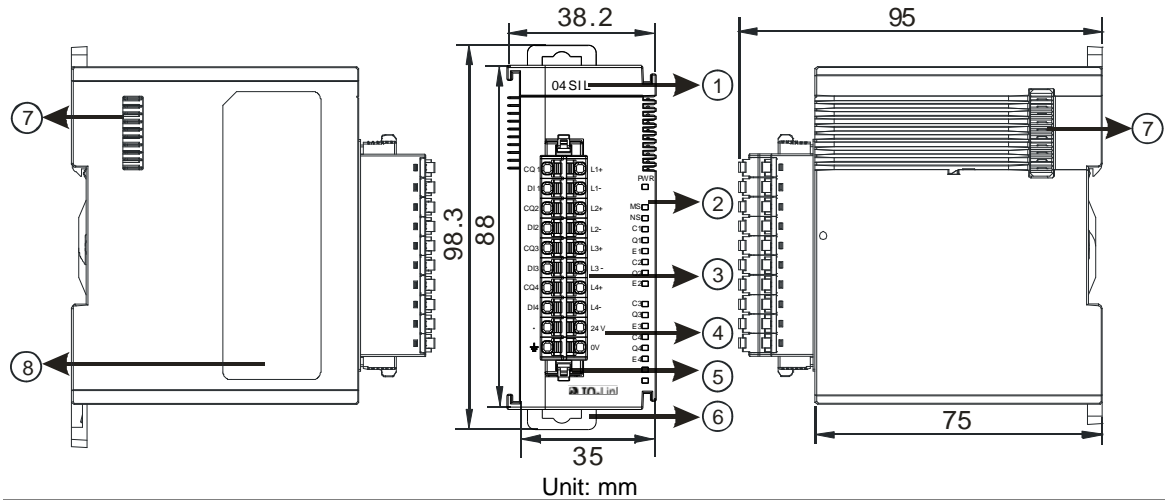
● AS01DNET-A



| Number | Name                | Description  |
|--------|---------------------|--|
| 1      | Model name          | Model name of the module   |
| 2      | State LED indicator | <p><b>Master/slave mode:</b></p> <ul style="list-style-type: none"><li>● <b>NS LED</b><br/><b>OFF:</b> no power or duplicate ID check has not been completed.<br/><b>Green light blinking every 0.5 seconds:</b> the connection to the DeviceNet network failed.<br/><b>Green light ON:</b> online; the connection to the DeviceNet network is normal.<br/><b>Red light blinking every 0.5 seconds:</b> communication error<br/><b>Red light ON:</b> Network trouble, duplicate node ID, no network power or Bus-OFF.</li><li>● <b>MS LED</b><br/><b>OFF:</b> no power<br/><b>Green light blinking every 0.5 seconds:</b> no module is configured.<br/><b>Green light ON:</b> input and output data are normal.<br/><b>Red light blinking every 0.5 seconds:</b> when AS01DNET works as the master, the slave in Scan List can not work normally. When AS01DNET works as the slave, an error occurs in the configuration.<br/><b>Red light ON:</b> hardware error</li><li>● <b>Combination of NS LED and MS LED</b><br/><b>NS LED OFF &amp; MS LED OFF:</b> no power<br/><b>NS LED OFF &amp; MS LED green light ON:</b> duplicate ID check has not been completed.<br/><b>NS LED red light ON &amp; MS LED green light ON:</b> duplicate ID check failed or Bus-OFF.<br/><b>NS LED red light ON &amp; MS LED red light blinking every 0.5 seconds:</b> no network power<br/><b>NS LED red light ON &amp; MS LED red light ON:</b> hardware error</li></ul> |

| Number | Name  | Description  |
|--------|---|--|
|        |   | <p><b>RTU mode:</b></p> <ul style="list-style-type: none"> <li>● <b>NS LED</b><br/> <b>OFF:</b> no power or duplicate ID check has not been completed.<br/> <b>Green light blinking every 0.5 seconds:</b> the connection to the DeviceNet network failed.<br/> <b>Green light ON:</b> online; the connection to the DeviceNet network is normal.<br/> <b>Red light blinking every 0.5 seconds:</b> I/O connection timeout between AS01DNET (RTU) and DeviceNet master<br/> <b>Red light ON:</b> Network trouble, duplicate node ID, no network power or Bus-OFF.</li> <li>● <b>MS LED</b><br/> <b>OFF:</b> no power<br/> <b>Green light blinking every 0.5 seconds:</b><br/> - AS01DNET (RTU) is waiting for the I/O data from DeviceNet master.<br/> - No I/O data transmission between AS01DNET(RTU) and DeviceNet master<br/> - The PLC connected to DeviceNet master is in STOP state.<br/> <b>Green light ON:</b> normal transmission of I/O data between AS01DNET (RTU) and DeviceNet master<br/> <b>Red light blinking every 0.5 seconds:</b> no network power supply; configuration error; module alarms.<br/> <b>Red light ON:</b> hardware error</li> </ul> |
| 3      | Address switch                              | Setting up the address   |
| 4      | Function switch                             | Setting up the functions, including the work mode and baud rate of DeviceNet network   |
| 5      | DeviceNet communication port                | Connects the modules via DeviceNet communication. Use AS01DNET-A connector for wiring.   |
| 6      | Mode switch (RTU/DNET; Master/Slave)        | Master/Slave mode: the port does not need an external 24VDC power supply connected<br>RTU mode: the power input port of the network module is required to connect an external 24VDC power supply only. You can connect   |
| 7      | Left-side extension port                    | Connects the modules   |
| 8      | Label                                       | Nameplate  |
| 9      | Right-side extension port                   | Connects the modules   |
| 10     | Input for supplying power to remote modules | Power supply for the remote module   |

● **AS04SIL-A**



| Number | Name                                      | Description   |
|--------|---|---|
| 1      | Model name                                | Model name of the module  |
| 2      | POWER LED indicator                       | Indicates the status of the power supply<br>ON: the power is on<br>OFF: no power or the power is low  |
|        | Module LED indicator                      | Error status of the module<br>OFF: The module is normal.<br>Blinking:<br>● Module setting or communication error (blinks every 1 second)<br>● Hardware or low power error (blinks every 0.2 second)   |
|        | Network LED indicator                     | Error status of the network<br>ON: No external power supply<br>Blinking: Scanning is under going or the module is configured and the diagnosis is done.<br>OFF: The module is configured but the diagnosis has not done yet.  |
|        | C1, C2, C3, C4 LED indicator (orange)     | IO-Link connection status of each communication port<br>ON: The communication port is in IO-Link mode and a device is connected.<br>Blinking: The communication port is in IO-Link mode but no device is connected or thhe device connected is not configured.<br>OFF: The communication port is disabled or in SIO mode. |
|        | Q1, Q2, Q3, Q4 LED indicator (orange)     | Indicates the status of input / output in SIO mode<br>ON: The input/output is working in SIO mode.<br>OFF: The communication port is disabled or in IO-Link mode.   |
|        | E1, E2, E3, E4 LED indicator (red)        | Indicates if any warning or error occurs in the IO-Link connection<br>Blinking: A warning or error occurs<br>OFF: No warnings or errors   |
| 3      | Removable terminal block                  | IO-Link   |
| 4      | Arrangement of the input/output terminals | Arrangement of the terminals  |
| 5      | Terminal block clip                       | Removal of the terminal block   |
| 6      | DIN rail clip                             | Secures the module onto the DIN rail  |
| 7      | Module connecting set                     | Connects the modules  |
| 8      | Label                                     | Nameplate   |

## 2.9 Load Cell Module Specifications

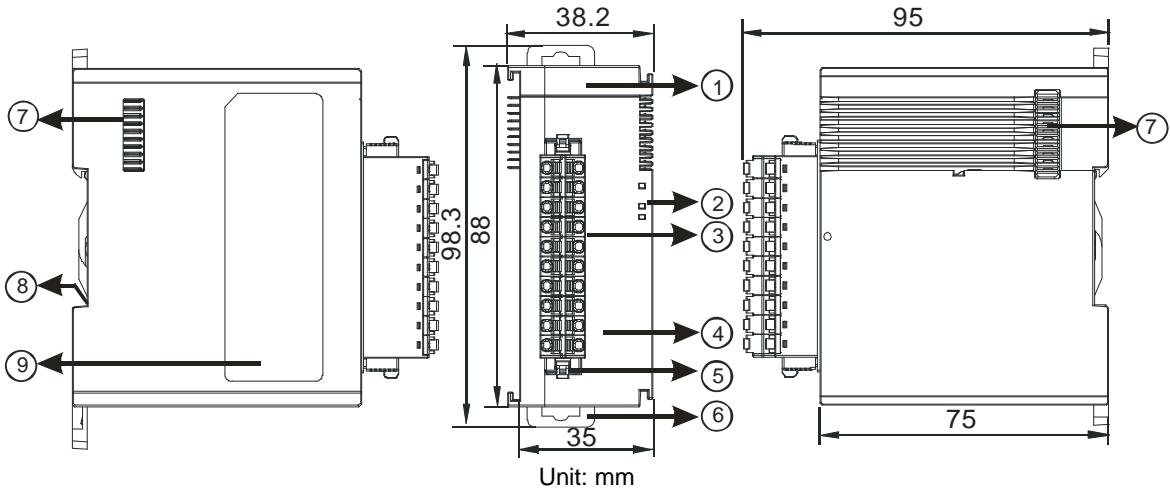
### 2.9.1 General Specifications

- AS02LC-A

| Item   | Description  |
|--|--|
| 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                       | Four-wire or six-wire load cell  |
| Expanding a temperature coefficient          | $\leq \pm 50$ ppm/K v. E   |
| Reducing a temperature coefficient to zero   | $\leq \pm 0.4$ $\mu$ V/K   |
| Linearity error                              | $\leq 0.02\%$  |
| 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 $\Omega$  |
| Common-mode rejection ratio (CMRR @50/60 Hz) | $\geq 100$ dB  |
| Extreme pulse value range                    | 0-8  |
| Averaging weights                            | 1-100 (FW V1.04: 1 to 400)   |
| Isolation                                    | Between a digital circuit and the ground: 500 VAC<br>Between an analog circuit and the ground: 500 VAC<br>Between an analog circuit and a digital circuit: 500 VAC |
| Weight                                       | 147 g  |

2.9.2 Load Cell Module Profiles

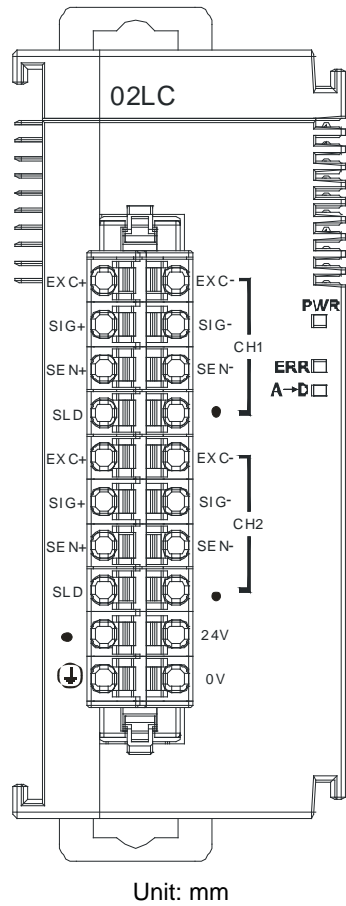
- AS02LC-A



| Number | Name                                      | Description  |
|--------|---|--|
| 1      | Model name                                | Model name of the module   |
| 2      | POWER LED indicator                       | Indicates the status of the power supply<br>ON: the power is on<br>OFF: no power   |
|        | ERROR LED indicator                       | Error status of the module<br>ON: a serious error occurs in the module.<br>OFF: the module is normal.<br>Blinking: a minor error occurs in the module. |
|        | Analog to digital conversion indicator    | Indicates the analog to digital conversion status<br>Blinking: conversion is taking place<br>OFF: stop conversion                                      |
| 3      | Removable terminal block                  | The inputs are connected to sensors.<br>The outputs are connected to loads to be driven.   |
| 4      | Arrangement of the input/output terminals | Arrangement of the terminals   |
| 5      | Terminal block clip                       | Removal of the terminal block  |
| 6      | DIN rail clip                             | Secures the module onto the DIN rail   |
| 7      | Module connecting set                     | Connects the modules   |
| 8      | Ground clip                               |  |
| 9      | Label                                     | Nameplate  |

2.9.3 Load Cell Module Dimensions

- AS02LC-A



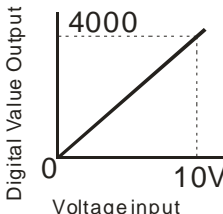
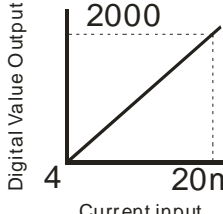


## 2.10 Extension Card Specifications

### 2.10.1 General Specifications

- **AS-F2AD**

Two DC analog signal input channels:

| Item                              | Voltage Input   | Current Input   |
|-----------------------------------|---|---|
| <b>Rated Input Range</b>          | 0 V - 10 V  | 4 mA - 20 mA  |
| <b>Resolution</b>                 | 12-bit  | 11-bit  |
| <b>Digital Conversion Range</b>   | 0 - 4000  | 0 - 2000  |
| <b>Hardware Input Limit*1</b>     | 0V ~ +10.24V  | 4mA ~ 20.37mA (FW V1.00)<br>3.63mA ~ 20.37mA (FW V1.20 or later)                      |
| <b>Digital Conversion Limit*2</b> | 0 ~ 4095  | 0 ~ 2047 (FW V1.00)<br>- 48 ~ 2047(FW V1.20 or later)                                 |
| <b>Error Rate</b>                 | room temperature: $\pm 0.5\%$ ; full temperature range: $\pm 1.0\%$                 |   |
| <b>Isolation</b>                  | The isolation between digital and analog is 500 VAC; no isolation between channels. |   |
| <b>Input Impedance</b>            | 2 M $\Omega$  | 250 $\Omega$  |
| <b>Conversion Time*3</b>          | 3 ms / CH   |   |
| <b>Characteristic Curve</b>       |  |  |
| <b>Digital Value Output*4</b>     | Card 1  | SR168 (CH1), SR169 (CH2)  |
|                                   | Card 2  | SR170 (CH1), SR171 (CH2)  |

\*1: The input signal should NOT exceed the limit. If exceeding the limit, damage may occur.

\*2: If the input signal exceeds the hardware input limit, the module only shows the maximum value. If the input signal is below the lower limit, it only shows the minimum value. If the input signal exceeds the hardware input limit, it also exceeds the digital conversion limit and a conversion limit error appears. For example in the current input mode (4 mA to 20 mA), when the input signal is 0 mA, exceeding the hardware lower limit, it also exceeds the conversion lower limit. The module uses the lower limit value (-48) as the input signal. If a disconnected analysis is required, you can check if the digital conversion value is -48.

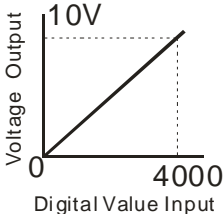
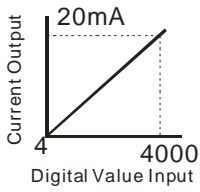
\*3: The conversion time is the time for each channel to convert signals to hardware input signals. If you need to calculate a complete conversion time, you need to add the PLC scan time.

\*4: Use the program to read the values in SR to obtain the corresponding A/D conversion value for the channel.

\*5: Refer to section 2.2.16 SM/SR notes for more information on descriptions of SM27/SR27 analog input error codes.

● **AS-F2DA**

Two DC analog signal output channels:

| Item                     | Voltage Output  |             | Current Output   |             |
|--------------------------|---|-------------|--|-------------|
| Analog Signal            | 0 V - 10 V  |             | 4 mA - 20 mA   |             |
| Resolution               | 12-bit  |             | 12-bit   |             |
| Digital Conversion Limit | 0 - 4000  |             | 0 - 4000   |             |
| Error Rate               | room temperature: ±0.5% ; full temperature range: ±1.0%                             |             |  |             |
| Isolation                | The isolation between digital and analog is 500 VAC; no isolation between channels. |             |  |             |
| Impedance Allowance      | ≥1 kΩ   |             | ≤500 Ω   |             |
| Conversion Time*1        | 2ms / CH  |             |  |             |
| Characteristic Curve     |   |             |  |             |
| Digital Value Output*2   | Card 1  | SR172 (CH1) |  | SR173 (CH2) |
|                          | Card 2  | SR174 (CH1) |  | SR175 (CH2) |

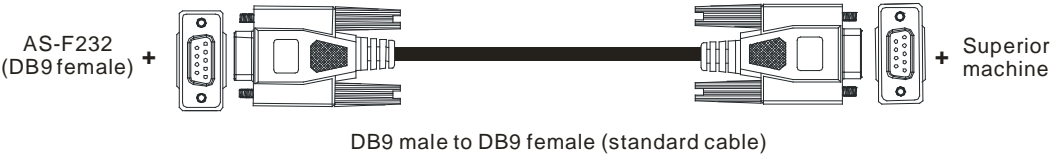
\*1: The conversion time is the time for each channel to convert signals to hardware input signals. If you need to calculate a complete conversion time, you need to add the PLC scan time.

\*2: Use the MOV instruction to move the value to the SR to obtain the corresponding voltage output value.

● **AS-F232**

The AS series PLC is built with COM1 (RS-485), and COM2 (RS-485). You can use this extension card for communication with different interfaces such as RS-232 and a PC. The communication functions and isolation levels are the same as the PLU CPU built-in ones. It can be used in slave or master mode. After installing the extension card, go to the HWCONFIG in the ISPSOft for communication setup.

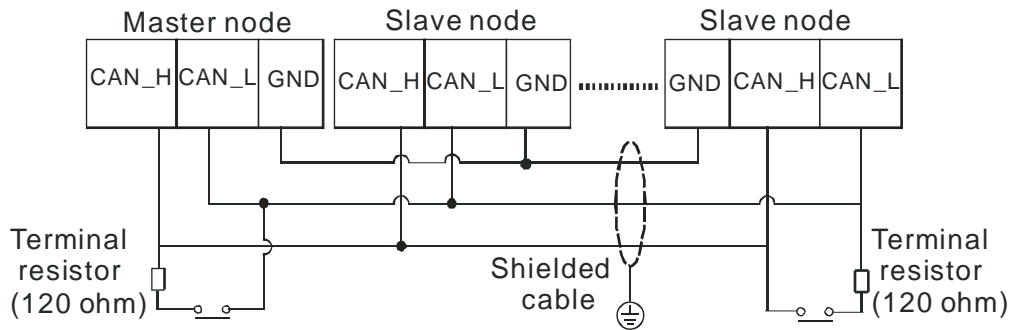
■ Wiring example



● **AS-FCOPM**

With its own standalone communication port, the extension card can work independently and can act as a master or a sloave. After installing the extension card, go to the HWCONFIG in ISPSoft to set up the communication.

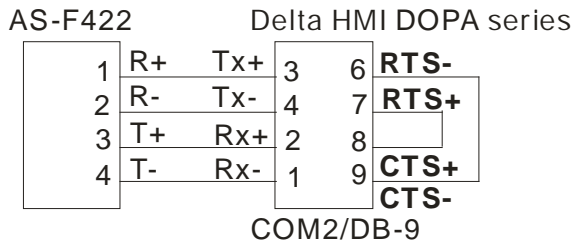
■ Wiring example



● **AS-F422**

You can use this extension card for communication with Delta HMI series or other devices through the RS-422 communication port. You can use this extension card for communication with different interfaces such as RS-232 and a PC. The communication functions and isolation levels are the same as the PLU CPU built-in ones. It can be used in slave or master mode. After installing the extension card, go to the HWCONFIG in the ISPSoft for communication setup.

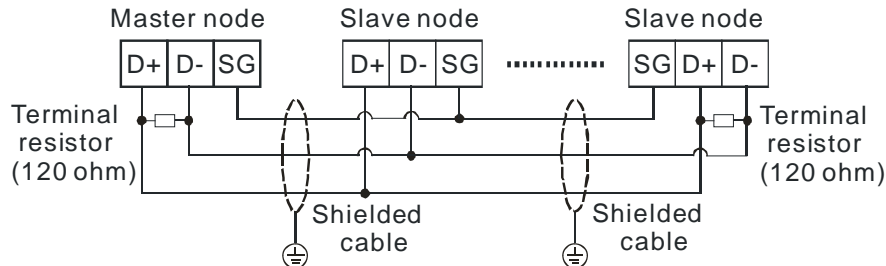
■ Wiring example of the communication with Delta HMI DOPA series via COM2



● **AS-F485**

With its own standalone communication port, the extension card can work independently. You can use this extension card for communication with different interfaces such as RS-232 and a PC. The communication functions and isolation levels are the same as the PLU CPU built-in ones. It can be used in slave or master mode. After installing the extension card, go to the HWCONFIG in the ISPSoft for communication setup.

■ Wiring example



- **AS-FEN02**

With its own standalone communication port, the extension card can work independently and can be set as a MODBUS TCP server, Client or EtherNet/IP Adapter. After installing the extension card, go to the HWCONFIG in ISPSOFT to set up the communication.

**Ethernet communication interface**

| Item                          | Specifications                                    |
|-------------------------------|---|
| <b>Connector type</b>         | RJ-45*2   |
| <b>Transmission speed</b>     | 10/100BASE-T (X) full duplex, switched Ethernet   |
| <b>Cable</b>                  | CAT5e (up to 100 m)                               |
| <b>Communication protocol</b> | Modbus TCP Server, Client and EtherNet/IP Adapter |
| <b>Isolation</b>              | 1500 VAC  |

- **AS-FOPC02**

With its own standalone communication port, the extension card can work independently and can be set as a Modbus TCP Server and OPC UA Server. After AS-FOPC02 is installed on the PLC, you need to go to HWCONFIG to edit the parameters.

**Ethernet communication interface**

| Item                          | Specifications                                  |
|-------------------------------|---|
| <b>Connector type</b>         | RJ-45*2   |
| <b>Transmission speed</b>     | 10/100BASE-T (X) full duplex, switched Ethernet |
| <b>Cable</b>                  | CAT5e (up to 100 m)                             |
| <b>Communication protocol</b> | Modbus TCP Server and OPC UA Server             |
| <b>Isolation</b>              | 1500 VAC  |

- **AS-FPFN02**

With its own standalone communication port, the extension card can work independently and can be set as a PROFINET slave to connect to PROFINET network and exchange data with PROFINET master. After installing the extension card, go to the PROFINET Configurator to set up the communication and download the configurations to the master and then the master sends the configurations to the function card.

**Ethernet communication interface**

| Item                          | Specifications                                  |
|-------------------------------|---|
| <b>Connector type</b>         | RJ-45*2   |
| <b>Transmission speed</b>     | 10/100BASE-T (X) full duplex, switched Ethernet |
| <b>Cable</b>                  | CAT5e (up to 100 m)                             |
| <b>Communication protocol</b> | PROFINET RT                                     |
| <b>Isolation</b>              | 1500 VAC  |

### ● AS-FFTP01

With its own standalone communication port, the extension card can work independently and can be set as a MODBUS TCP server, Client or EtherNet/IP Adapter. After installing the extension card, go to the HWCONFIG in ISPSOft to set up the communication.

#### Ethernet communication interface

| Item                          | Specifications                                    |
|-------------------------------|---|
| <b>Connector type</b>         | RJ-45*2   |
| <b>Transmission speed</b>     | 10/100BASE-T (X) full duplex, switched Ethernet   |
| <b>Cable</b>                  | CAT5e (up to 100 m)                               |
| <b>Communication protocol</b> | Modbus TCP Server, Client and EtherNet/IP Adapter |
| <b>Isolation</b>              | 1500 VAC  |

#### Micro SD

| Item  | Specifications            |
|---|---------------------------|
| <b>Applicable SD card</b>   | Micro SD card             |
| <b>Capacity</b>   | Max.<= 2TB (SD/SDHC/SDXC) |
| <b>Speed class rating</b>   | Class 10 (C1)             |
| <b>Busbar interface</b>   | High Speed (25MB/s)       |
| ➤ It is suggested to use the Micro SD with 32GB capacity and Class10 rating |                           |

### ● AS-FECAT

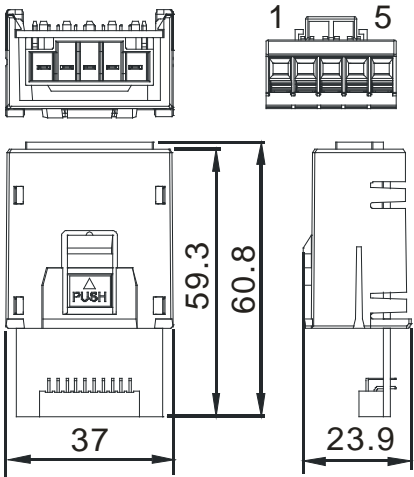
This communication card can work independently and does NOT occupy the communication port of PLC CPU. It can act as Modbus TCP Server and EtherCAT Master. After AS-FECAT is installed, you can go to HWCONFIG from ISPSOft for editing in the Function Card 2 section.

#### Ethernet communication interface

| Item                          | Specifications   |
|-------------------------------|--|
| <b>Connector type</b>         | RJ-45*2  |
| <b>Transmission speed</b>     | 10/100BASE-T (X) full duplex, switched Ethernet (before EtherCAT Master enabled) |
| <b>Cable</b>                  | CAT5e (up to 100 m)  |
| <b>Communication protocol</b> | Modbus TCP Server and EtherCAT Master  |
| <b>Isolation</b>              | 1500 VAC   |

2.10.2 Extension Card Profiles

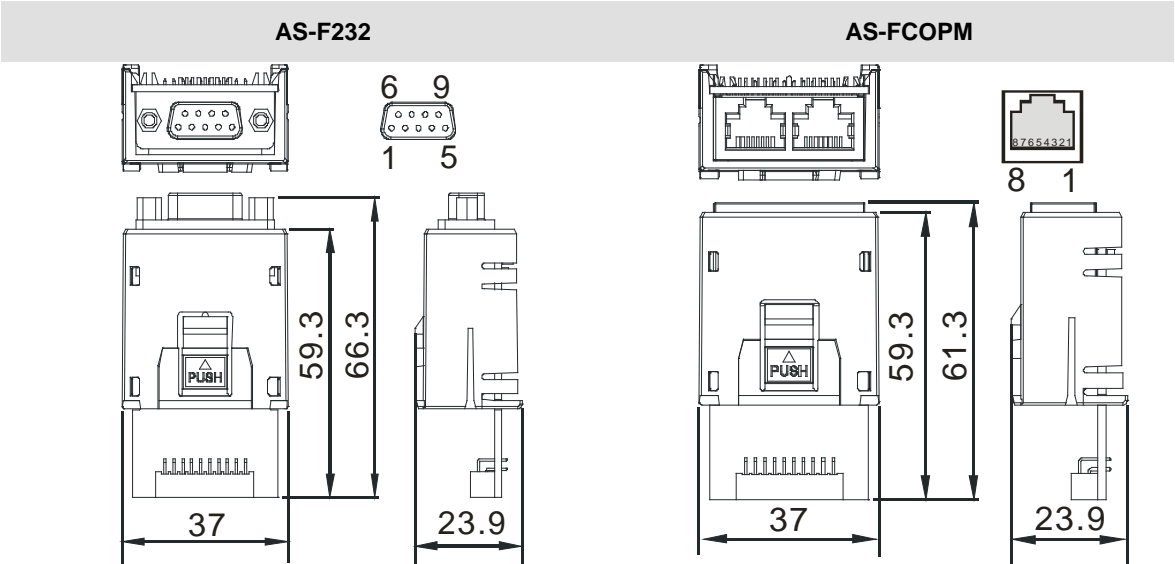
- AS-F2AD/AS-F2DA/AS-F422/AS-F485



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      |

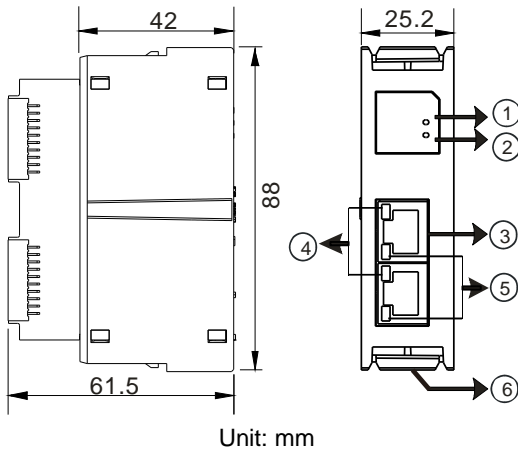
- AS-F232/AS-FCOPM



Unit: mm

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

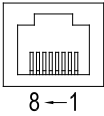
● AS-FEN02



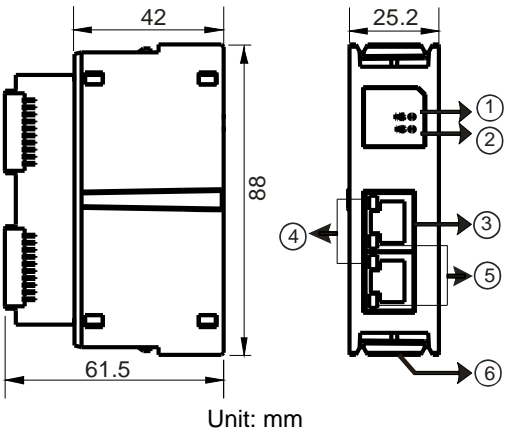
| Number | Name                 | Description   |
|--------|----------------------|---|
| 1      | MS indicator         | Indicates the status of the communication card<br>Green light ON: the operation is working normal<br>Green light BLINKING: the setting is not complete<br>Red light ON: internal communication fail, can NOT be recovered<br>Red light BLINKING: internal communication timeout<br>OFF: no power  |
| 2      | NS indicator         | Indicates the status of Ethernet connection<br>Green light ON: a CIP connection is established<br>Green light BLINKING: a CIP connection is not established after power-on<br>Red light ON: duplicated IP address<br>Red light BLINKING: communication timeout (a CIP connection has been established after power-on) / IP address change<br>OFF: no power / network cable is not connected |
| 3      | RJ-45 port X1/X2     | For network connections   |
| 4      | LINK indicator X1/X2 | Indicate the status of Ethernet connection<br>Green light ON: a network connection is established<br>OFF: a network connection is not established   |
| 5      | ACT indicator X1/X2  | Indicate the status of Ethernet communication<br>Orange BLINKING: data transmission<br>OFF: no data transmission  |
| 6      | Clip ring            | Secures AS series   |

RJ-45 Pin Definition

|       |       |       |       |
|-------|-------|-------|-------|
| 1 TX+ | 2 TX- | 3 RX+ | 4 N/C |
| 5 N/C | 6 RX- | 7 N/C | 8 N/C |



● AS-FPFN02



| Number | Name                 | Description  |
|--------|----------------------|--|
| 1      | SF indicator         | System Fault Indicator<br>Red light ON: an error occurs in the topology or RTU module<br>OFF: no system error  |
| 2      | BF indicator         | Bus Fault Indicator<br>Red light ON: no PROFINET connection<br>Red light BLINKING: the connection is working fine but the communication with PROFINET Controller is NOT normal.<br>OFF: the connection with PN-Controller is working fine. |
| 3      | RJ-45 port X1/X2     | Uses for network connections   |
| 4      | LINK indicator X1/X2 | Indicates the status of Ethernet connection<br>Green light ON: a network connection is established<br>OFF: a network connection is not established   |
| 5      | ACT indicator X1/X2  | Indicates the status of Ethernet communication<br>Orange BLINKING: data transmission<br>OFF: no data transmission  |
| 6      | Clip ring            | Secures AS series  |

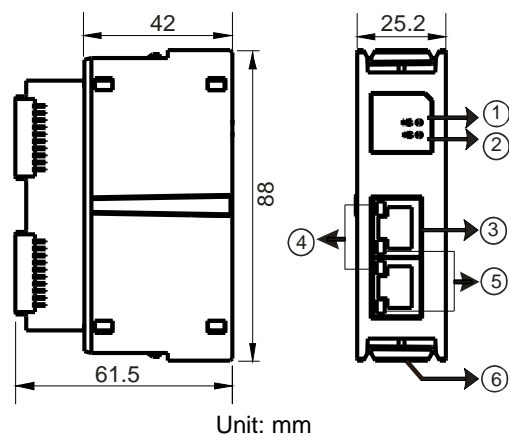
RJ-45 Pin Definition

|       |       |       |       |
|-------|-------|-------|-------|
| 1 TX+ | 2 TX- | 3 RX+ | 4 N/C |
| 5 N/C | 6 RX- | 7 N/C | 8 N/C |

8 --1



● AS-FOPC02



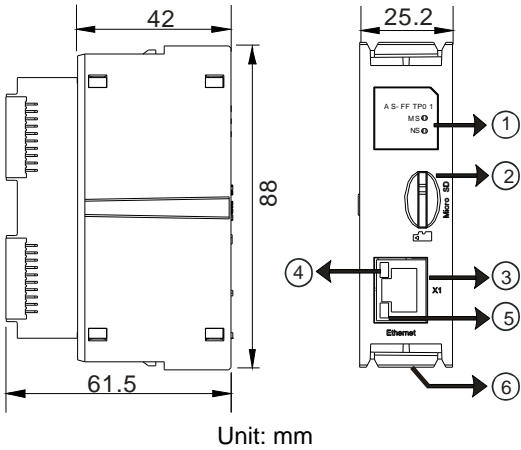
| Number | Name                 | Description  |
|--------|----------------------|--|
| 1      | MS indicator         | Indicates the status of the communication card<br>Green light ON: the operation is working normal<br>Green light BLINKING: the setting is not complete<br>Red light ON: powering on, or internal communication fail, can NOT be recovered<br>Red light BLINKING: internal communication timeout<br>OFF: no power   |
| 2      | NS indicator         | Indicates the status of Ethernet connection<br>Green light ON: an OPC UA connection is established<br>Green light BLINKING: an OPC UA connection is not established after power-on<br>Red light ON: duplicated IP address<br>Red light BLINKING: communication timeout (OPC UA connection has been established after power-on) / IP address change<br>OFF: no power / network cable is not connected |
| 3      | RJ-45 port X1/X2     | For network connections  |
| 4      | LINK indicator X1/X2 | Indicate the status of Ethernet connection<br>Green light ON: a network connection is established<br>OFF: a network connection is not established  |
| 5      | ACT indicator X1/X2  | Indicate the status of Ethernet communication<br>Orange BLINKING: data transmission<br>OFF: no data transmission   |
| 6      | Clip ring            | Secures AS series  |

RJ-45 Pin Definition

|       |       |       |       |
|-------|-------|-------|-------|
| 1 TX+ | 2 TX- | 3 RX+ | 4 N/C |
| 5 N/C | 6 RX- | 7 N/C | 8 N/C |

8—1

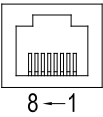
● AS-FFTP01



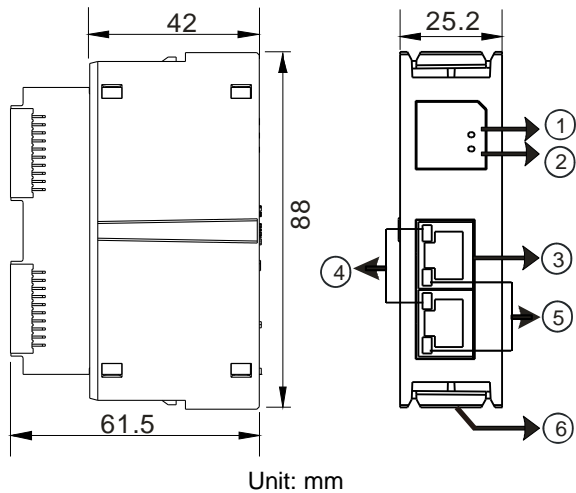
| Number | Name               | Description  |
|--------|--------------------|--|
| 1      | MS indicator       | Indicates the status of the communication card<br>Green light ON: the communication card operation is working normal<br>Green light BLINKING: communication card is initializing<br>Red light ON: powering on or internal communication fail, can NOT be recovered<br>Red light BLINKING: internal communication timeout; reboot is required.<br>OFF: no power |
|        | NS indicator       | Red light ON: IP address conflict; remove the device with the same IP address on the network   |
| 2      | Micro SD card slot | For Micro SD card  |
| 3      | RJ-45 port         | For network connections  |
| 4      | LINK indicator     | Indicate the status of Ethernet connection<br>Green light ON: a network connection is established<br>OFF: a network connection is not established  |
| 5      | ACT indicator      | Indicate the status of Ethernet communication<br>Orange BLINKING: data transmission<br>OFF: no data transmission   |
| 6      | Clip ring          | Secures AS series  |

RJ-45 Pin Definition

|       |       |       |       |
|-------|-------|-------|-------|
| 1 TX+ | 2 TX- | 3 RX+ | 4 N/C |
| 5 N/C | 6 RX- | 7 N/C | 8 N/C |



● **AS-FECAT**

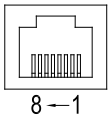


Unit: mm

| Number | Name                   | Description   |
|--------|------------------------|---|
| 1      | SYS indicator          | Indicates the power status of the communication card and the status of the firmware update<br>Green light ON: Power On<br>Green light BLINKING: firmware updating<br>OFF: no power or firmware updating is complete.  |
| 2      | ECAT indicator         | Indicates the status of EtherCAT communication<br>Green light ON: the communication card operation is working normal (All slaves are in the operational state.)<br>Red light ON: the network connection between master and slave is not established.<br>Red light BLINKING (2s): the connection of slave is lost.<br>Red light BLINKING (5s): the state of slave is not normal<br>OFF: ECAT master function is not enabled. Going to state of firmware updating |
| 3      | RJ-45 ports x1, x2     | For network connections   |
| 4      | LINK indicators x1, x2 | Indicate the status of Ethernet connection<br>Green light ON: a network connection is established<br>OFF: a network connection is not established   |
| 5      | ACT indicators x1, x2  | Indicate the status of Ethernet communication<br>Orange BLINKING: data transmission<br>OFF: no data transmission  |
| 6      | Clip ring              | Secures AS series   |

**RJ-45 Pin Definition**

|       |       |       |       |
|-------|-------|-------|-------|
| 1 TX+ | 2 TX- | 3 RX+ | 4 N/C |
| 5 N/C | 6 RX- | 7 N/C | 8 N/C |



**2.10.3 Function Card Weights**

|        | AS-F2AD | AS-F2DA | AS-F422 | AS-F485 | AS-F232 | AS-FCOPM | AS-FEN02 | AS-FEN02 / AS-FOPC02 / AS-FFTP01 / AS-FECAT |
|--------|---------|---------|---------|---------|---------|----------|----------|---|
| Weight | 30 g    | 30 g    | 22 g    | 29 g    | 26 g    | 29 g     | 51 g     | 51 g  |

## 2.11 Power Supply Module Specifications

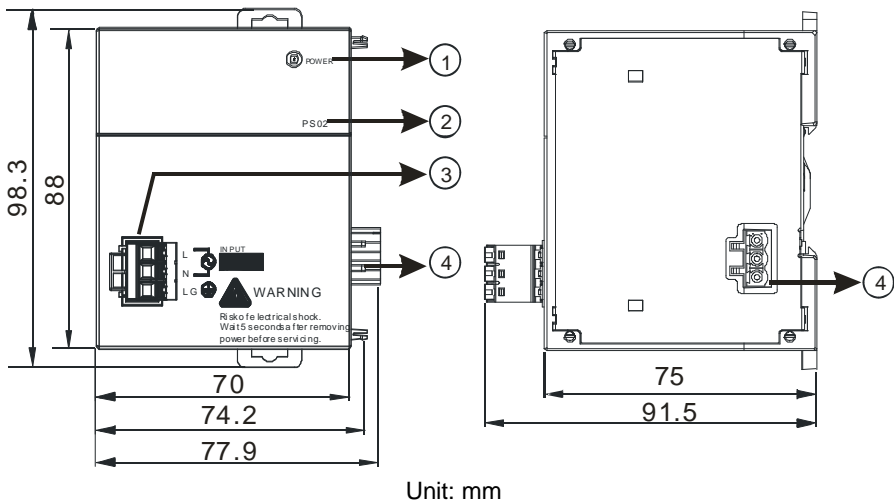
### 2.11.1 General Specifications

- AS-PS02/AS-PS02A

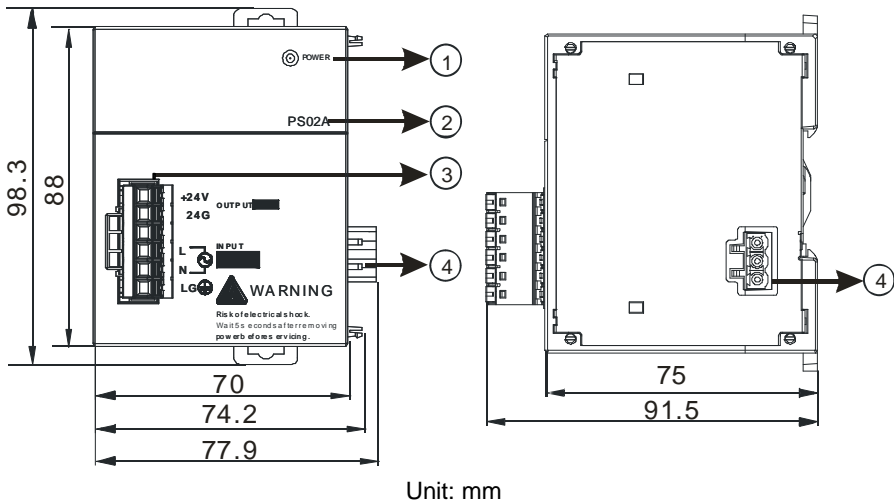
| Item                                       |          | Specifications   |
|--|----------|--|
| Supply voltage                             |          | 100–240 VAC (-15% to +10%)<br>50/60 Hz±5%  |
| Action specifications                      |          | If the input power supply is larger than 85 VAC, the power supply module can function normally.  |
| Allowable instantaneous power failure time |          | If the instantaneous power failure time is less than ten milliseconds, the power supply module keeps running.                                    |
| Fuse                                       |          | 2.5A/250 VAC   |
| Inrush current                             |          | < 70A@115 VAC  |
| 24 VDC output                              |          | AS-PS02: 2 A for internal use: the CPU and the modules.<br>AS-PS02A: 1.5 A for internal use: the CPU and the modules;<br>0.5 A for external use. |
| Power protection                           |          | The 24 VDC output is equipped with the short circuit protection and the overcurrent protection.  |
| Electronical isolation                     |          | 1,500 VAC (Primary-secondary),<br>1,500 VAC (Primary-PE),<br>500 VAC (Secondary-PE)  |
| Insulation voltage                         |          | Above 5 MΩ<br>The voltage between all inputs/outputs and the ground is 500 VAC.  |
| Ground                                     |          | The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.                               |
| Weight                                     | AS-PS02  | 270 g  |
|  | AS-PS02A | 310 g  |

2.11.2 Power Supply Module Profiles

● AS-PS02



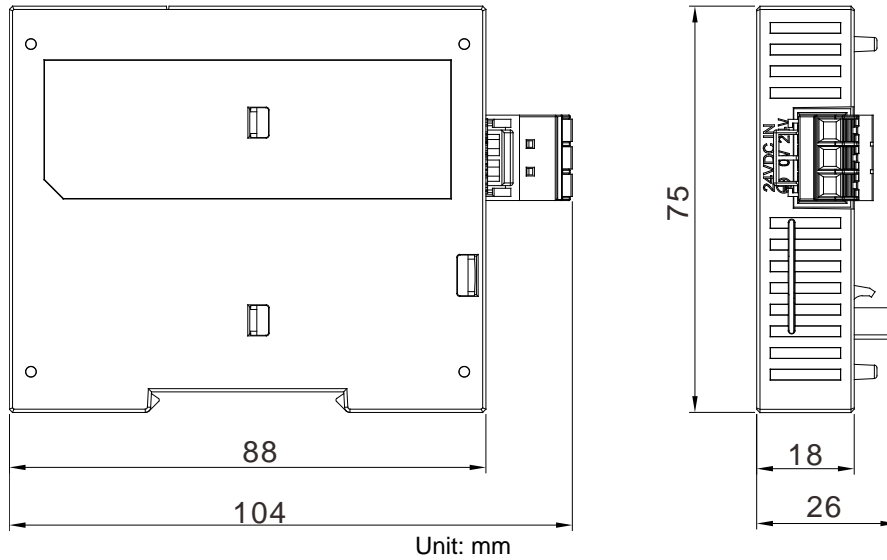
● AS-PS02A



| Number | Name                         | Description   |
|--------|------------------------------|---|
| 1      | POWER LED indicator (green)  | Indicates the status of the power supply  |
| 2      | Model name                   | Model name of the power supply module   |
| 3      | Arrangement of the terminals | +24V: connecting external 24VDC +<br>24G: connecting external 24G<br>LG: Line ground<br>L: AC power input (Line)<br>N: AC power input (Neutral) |
| 4      | Power output                 | Connected with AS series  |

## 2.12 Power Supply Module Adapter Specification

For easier wiring, this adaptor allows wiring on the bottom of the module instead of on the left-side of the module. If you already purchased AS-PS02 or AS-PS02A, you do not need this adaptor to have an easier wiring.





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# Chapter 3 Installing Software

## Table of Contents

|            |   |            |
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| <b>3.1</b> | <b>Installing and Uninstalling ISPSOft.....</b> | <b>3-2</b> |
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| 3.1.2      | Uninstalling ISPSOft.....                       | 3-9        |
| <b>3.2</b> | <b>Installing and Uninstalling COMMGR .....</b> | <b>3-9</b> |
| 3.2.1      | Installing COMMGR.....                          | 3-10       |
| 3.2.2      | Uninstalling COMMGR .....                       | 3-13       |

Before creating an AS Series system, you need to install ISPSOft / DIADesigner and COMMGR. ISPSOft or DIADesigner is a software platform for integrating the hardware, network configuration, and program development for a system. COMMGR functions as middleware between a computer and devices. It functions as a communication management interface between ISPSOft / DIADesigner and AS Series hardware. This chapter uses ISPSOft for demonstration. For DIADesigner operation, refer to Chapter 3 from DIADesigner software manual. AS for COMMGR operation, refer to software manual (DIAInstaller -> Software Manual).

## 3.1 Installing and Uninstalling ISPSOft

- System requirements

| Item                   | System requirement  |   |
|------------------------|---|---|
| Operating system       | Windows XP / 7 / 8 / 10   |   |
| CPU                    | Pentium 1.5 G or above  |   |
| Memory                 | 256 MB or above (512 MB or above is recommended.)   |   |
| Hard disk drive        | Capacity : 500 MB or above  |   |
| CD-ROM drive           | This is optional for installing ISPSOft.  |   |
| Monitor                | Resolution: 800×600 or above<br>(suggested setting: 1024x768/96 dpi)  |   |
| Keyboard/Mouse         | A general keyboard/mouse or devices compatible with Windows   |   |
| Printer                | A printer with a driver for Windows. This is needed to print projects.  |   |
| RS-232 port            | For connecting to a PLC   | One of them is used, but a PLC that 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. (*2)  |   |
| Supported Models       | 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 to connect a computer to a PLC. Make sure the port and the mode supported by the PLC are correct before you connect a computer to the PLC.

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

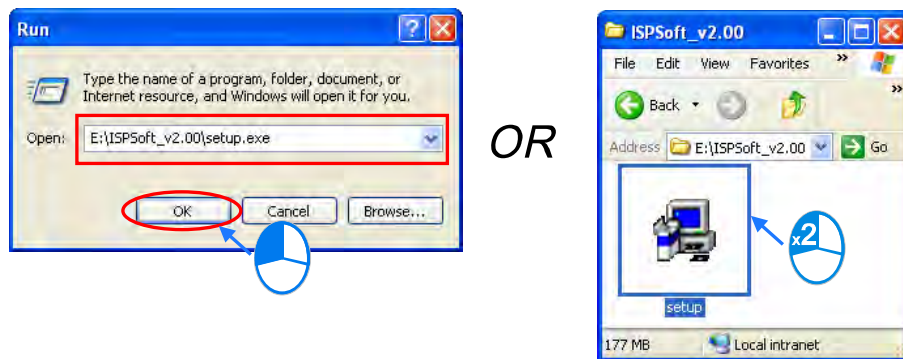
\*3. The functions and specifications mentioned above are only applicable to ISPSOft version 3.00 or above. The older versions are not equipped with complete functions.



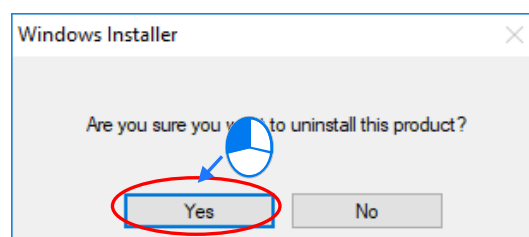
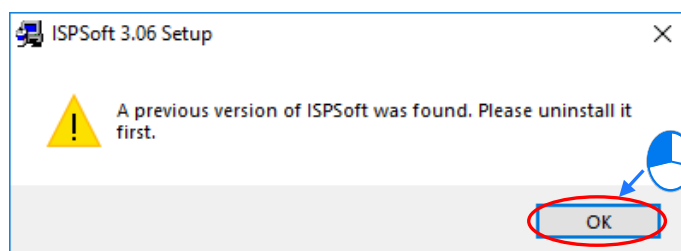
### 3.1.1 Installing ISPSOft

If an older version of ISPSOft has been installed on a computer, uninstall it before you install ISPSOft. Refer to section 3.1.2 for more information about uninstalling ISPSOft. The following are the steps to install ISPSOft.

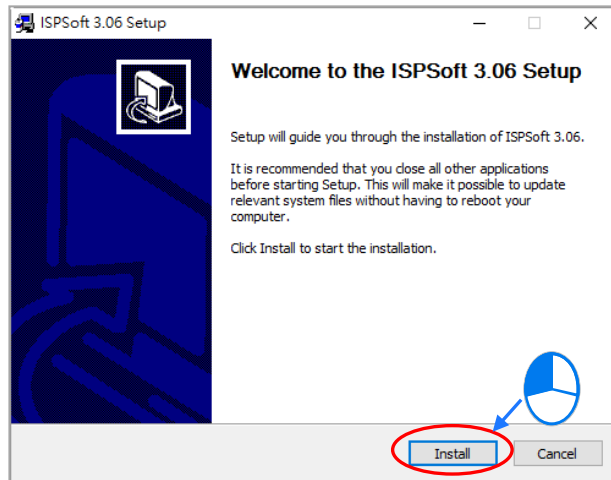
- (1) Start the Windows operating system and then install ISPSOft. You may need administrative privileges to install the software.
- (2) Put the ISPSOft CD in the CD-ROM drive, or download the installation program from the official Delta website <http://www.delta.com>. Before you install the installation program downloaded from the website, you must decompress the file.
- (3) Click **Start**, and then click **Run...** to open the **Run** window. Specify the path to the file called setup.exe in the **Open** box, and then click **OK**. You can also double-click the **setup** icon to execute the installation program.



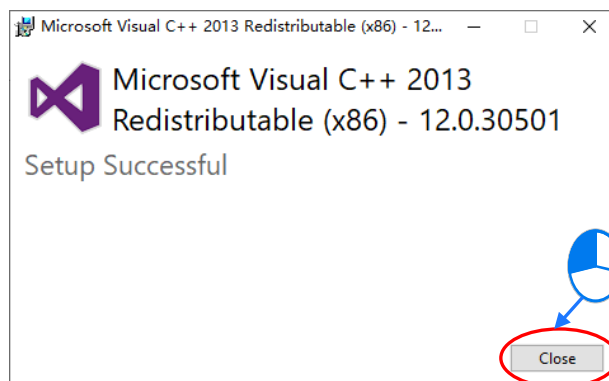
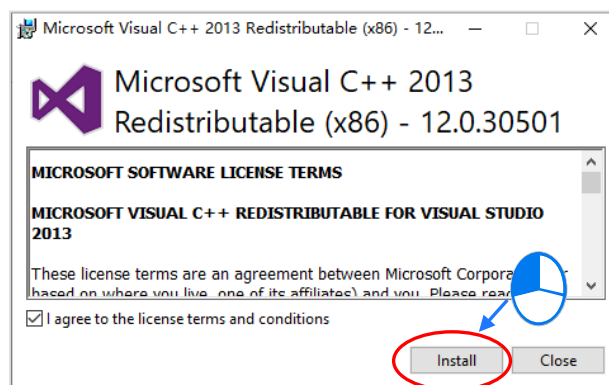
- (4) When a previous version of the ISPSOft is found, click **OK** then **Yes** to uninstall that version shown in the pop-up windows (see below).



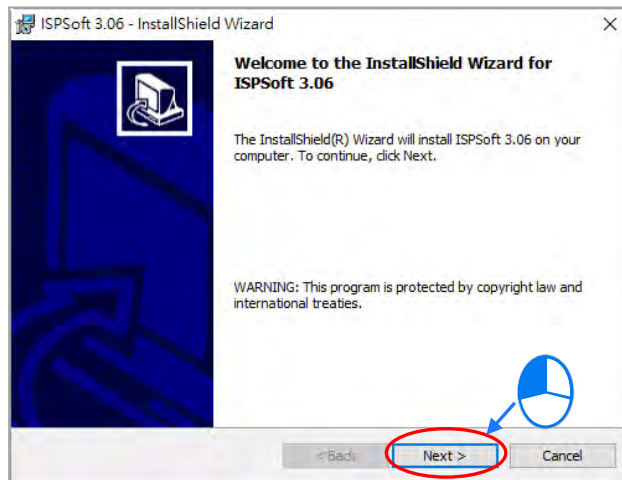
(5) Click **Install** once Shield Wizard window appears.



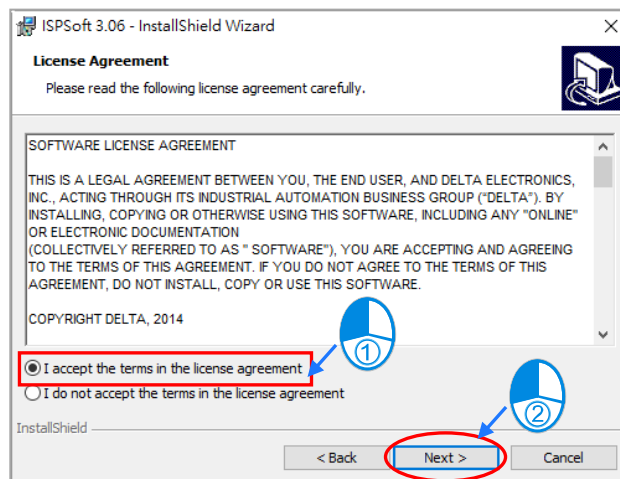
(6) The installation program detects if your computer has installed Microsoft Visual C++ 2013 or not. If not, the following installation steps will show up. Click **Install** to install and after the installation is done, click **Close**.



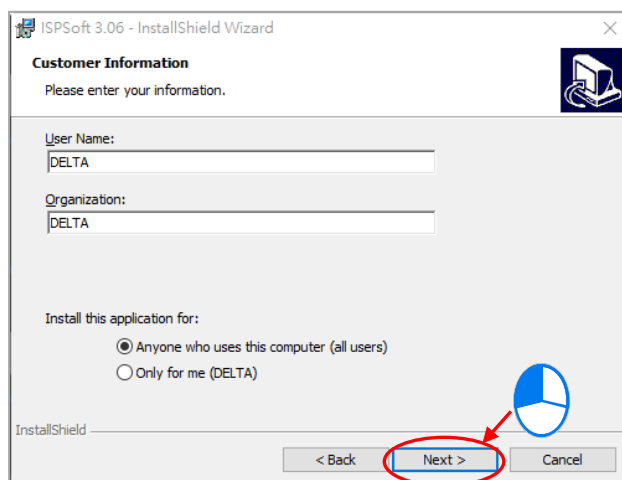
- (7) After the ISPSOft x.xx – Install Shield Wizard window appears, click **Next**.



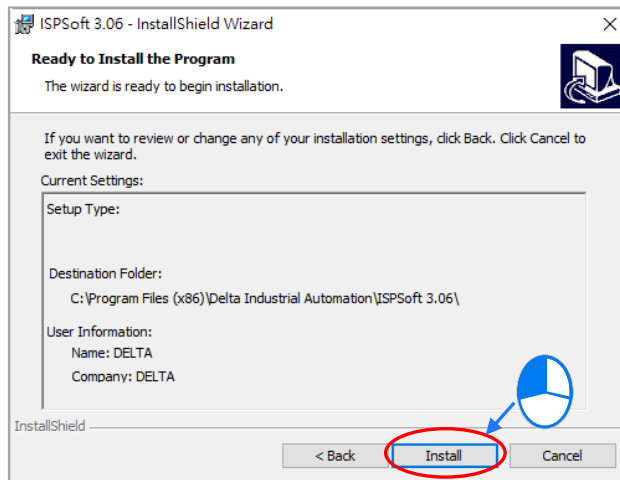
- (8) Select **I accept the terms in the license agreement** and click **Next**.



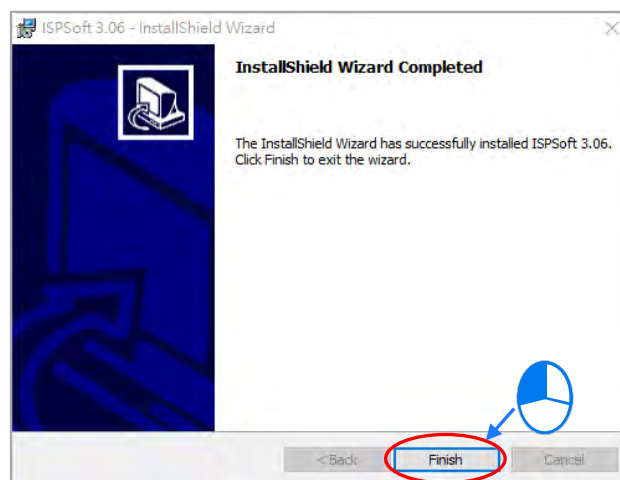
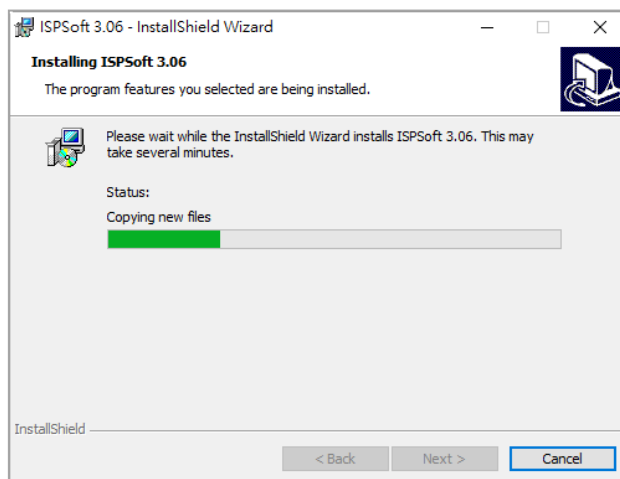
- (9) Type the necessary information in the **User Name** and **Organization** boxes, and then click **Next**.



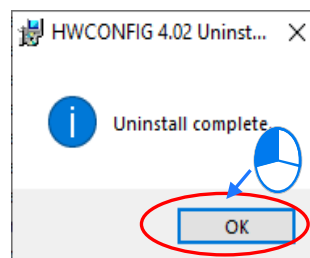
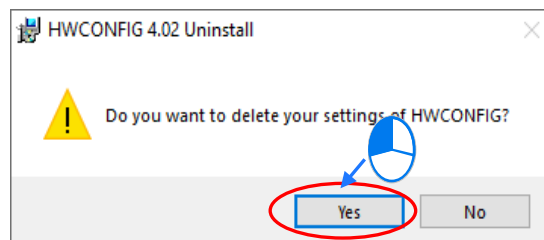
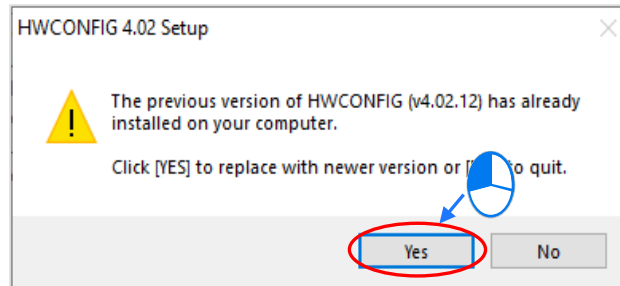
(10) Check if the installation information is correct and then click **Install**.



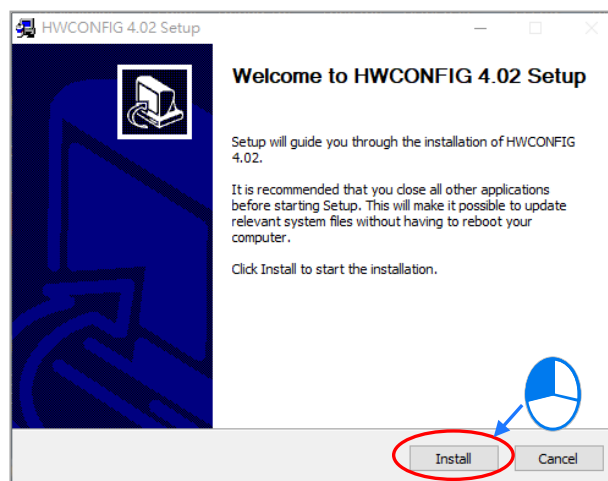
(11) After ISPSOft is installed, click **Finish** to complete the installation.



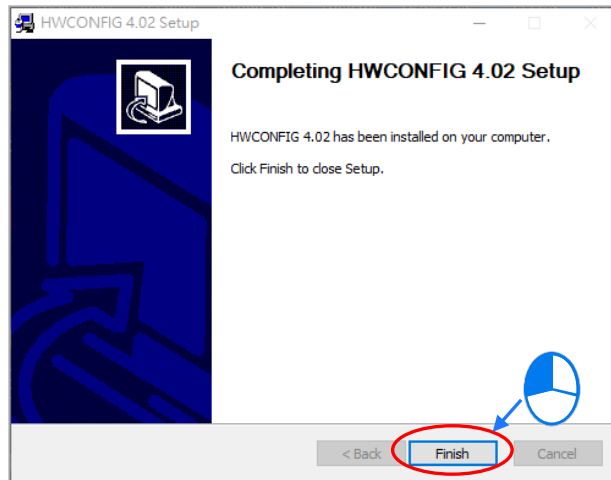
- (12) Next the HWCONFIG is about to be installed. If there is a previous version of HWCONFIG installed in your computer. The following image appears. Click **Yes** to replace the previous version of HWCONFIG with a newer version.



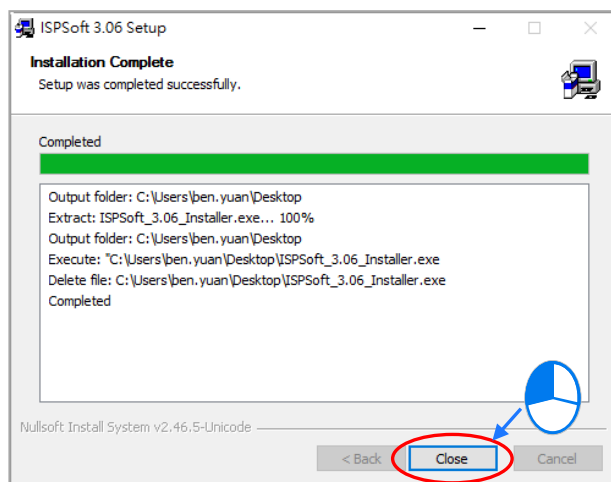
- (13) Click **Install**, once the installation window appears.



(14) After HWCONFIG is installed, click **Finish** to complete the installation.



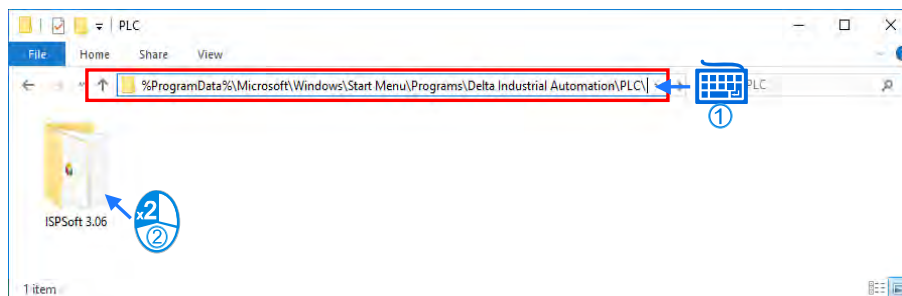
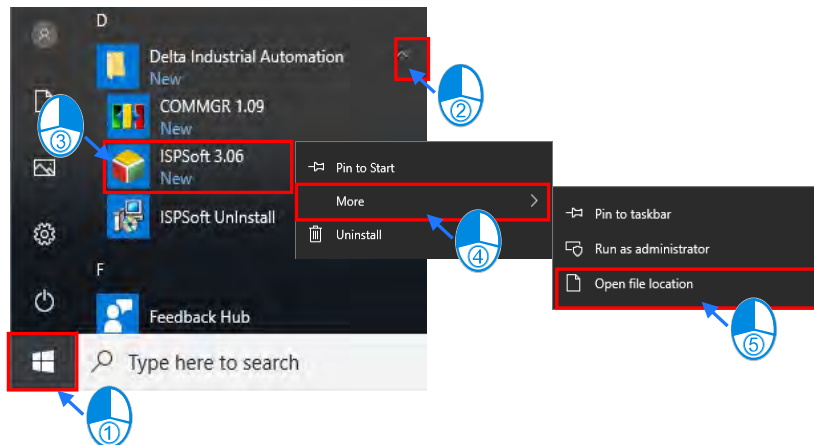
(15) After installation is done, the installation program creates shortcuts on the desktop and the Start menu. Click **Close** to complete the installation.



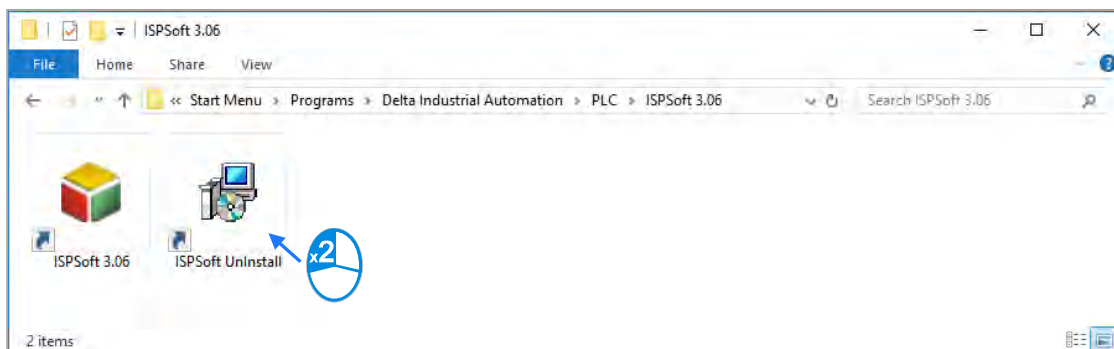
### 3.1.2 Uninstalling ISPSOft

- (1) Generally, you can click **ISPSOft Uninstall** or select **Programs** under **Control Panel** to remove the ISPSOft; when **ISPSOft Uninstall** is not found, there are two methods to uninstall the software:

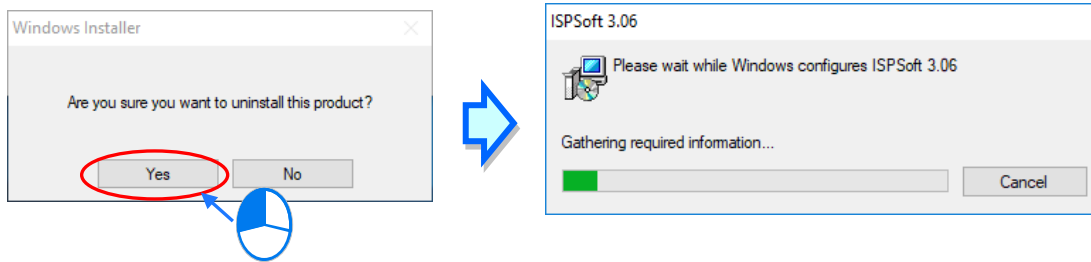
- Method 1: Select **ISPSOft x.xx** from the Windows list, click **More** then select **Open file location**.
- Method 2: Place **%ProgramData%\Microsoft\Windows\Start Menu\Programs\Delta Industrial Automation\PLC\** in the address box and press Enter. Then, double click ISPSOft x.xx file.



- (2) Remove the software by double-click the **ISPSOft Uninstall**.



- (3) To uninstall ISPSOft, click **Yes** shown in the pop-up window. The window will automatically close once the software is removed.

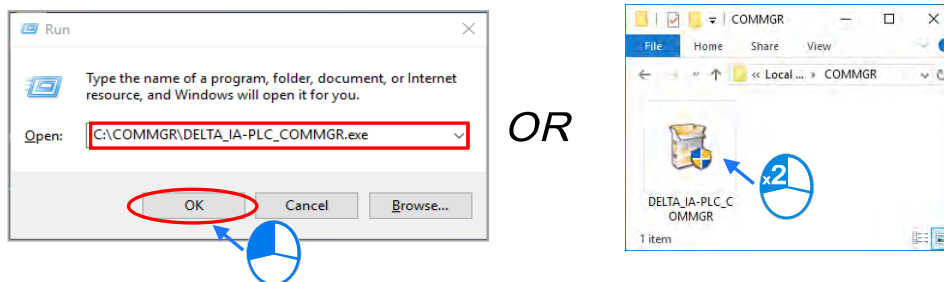


## 3.2 Installing and Uninstalling COMMGR

### 3.2.1 Installing COMMGR

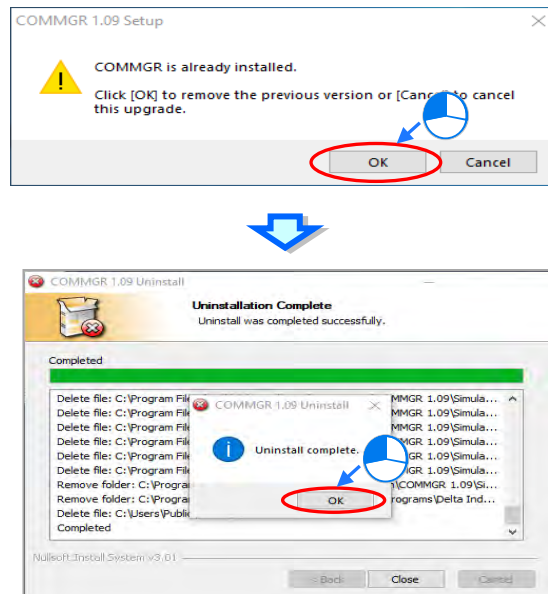
COMMGR is a software independent of ISPSOft. It must be installed separately. When the previous version of COMMGR is detected in a computer, that version is advised to be uninstalled first before the latest COMMGR can be installed.

- (1) Start a computer and enter the Windows operating system. You need to log on to the system as a system administrator before installing COMMGR.
- (2) Put a COMMGR CD in the CD-ROM drive, or download the installation program from official Delta website <http://www.deltaww.com/>. Before you install the program downloaded from the website, you must decompress the file.
- (3) Click **Start**, and then click **Run...** to open the **Run** window. Specify the path to the file called setupComm.exe in the **Open** box, and then click **OK**. Alternatively, you can double-click the icon which is used to install COMMGR to execute the installation program.





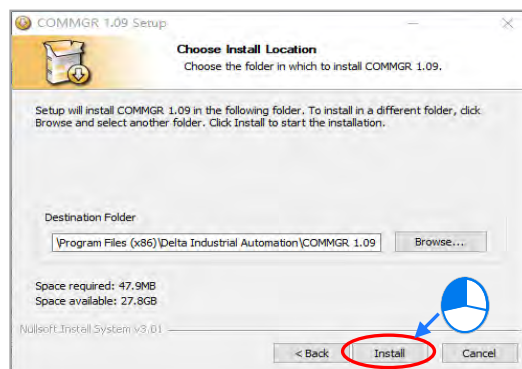
- (4) When the previous version of COMMGR is installed, click **OK** to remove that version shown in the pop-up window (see below) and when uninstall is complete, click **OK** again.



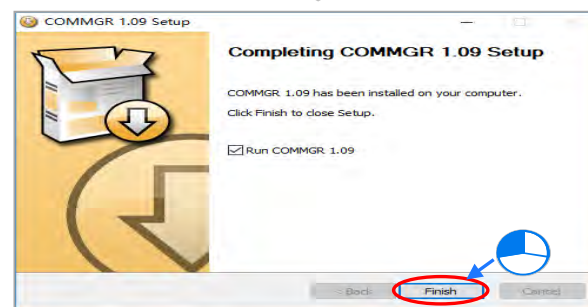
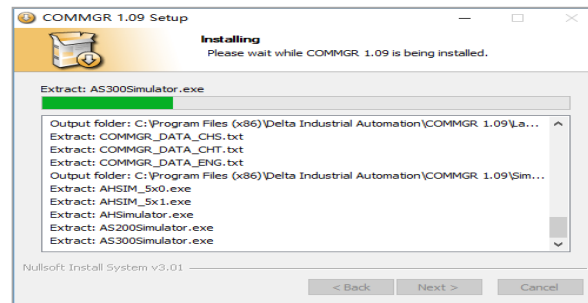
- (5) Click **Next** after the Setup window appears.



- (6) Use default setup in the destination folder. Click **Install** to start the installation.

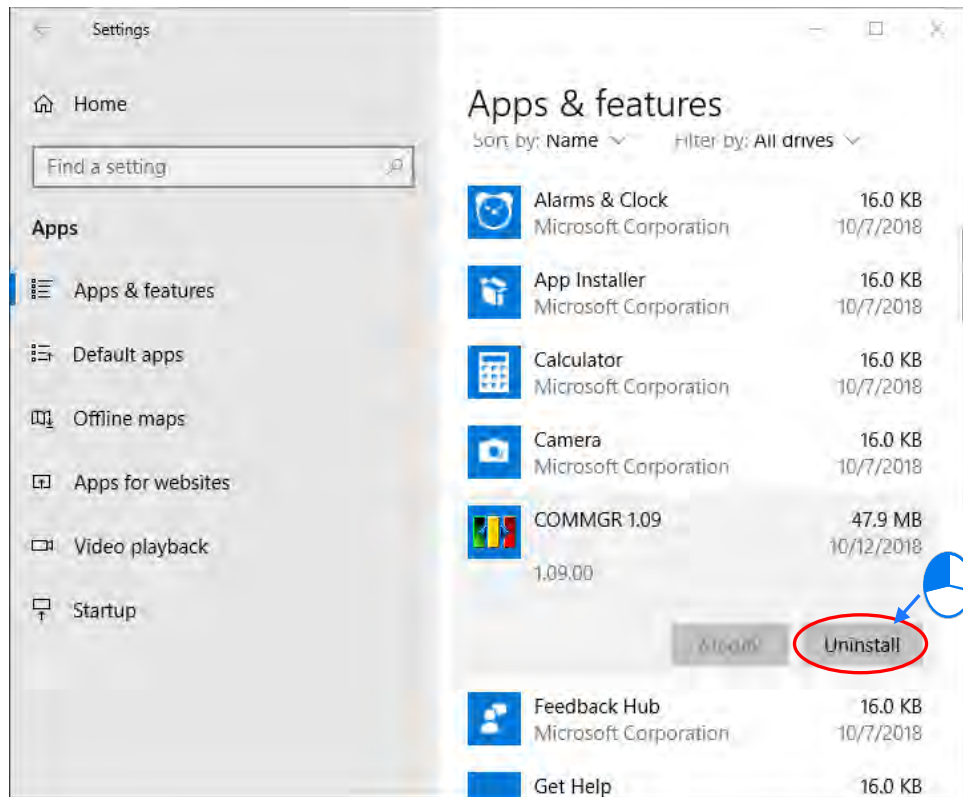


- (7) After you install COMMGR, the installation program creates a shortcut to the program on the **Start** menu. Click **Finish** to complete the installation.

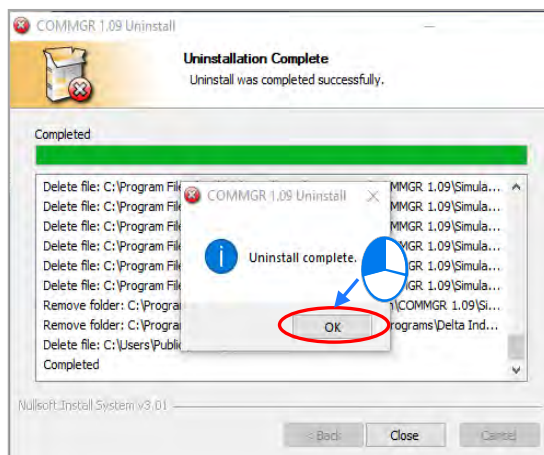
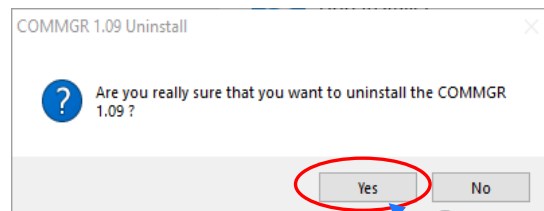


### 3.2.2 Uninstalling COMMGR

- (1) Enter the settings of **Apps & features** in Windows, select **COMMGR x.xx** and click **Uninstall**.



- (2) Click **Yes** and then **OK** to complete COMMGR uninstallation.



**MEMO**

# Chapter 4 Installing Hardware and Wiring

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## 4.1 AS Series Hardware Framework

### 4.1.1 AS Series Hardware Component

The AS series programmable logic controller is a medium-to-small programmable logic control (PLC). The execution speed and memory capacity are increased. Use of function blocks is also supported. In order to meet your more advanced application requirements, the AS series programmable logic controllers provide more flexible system extension frameworks. Under such system frameworks, you do not need to use several CPU modules to control the system because there are too many I/O points or the equipment is too far away. This retains system completeness, and you can be more efficient in developing projects. Several PLC CPUs are available for various sectors; users can make their choices according to their applications.

- **The minimum requirements for an AS200 / AS300 Series framework**

The minimum framework of the AS200 / AS300 series system consists of one CPU module (AS200 / AS300 PLC CPU) and one power supply module (AS-PS02). AS-PS02 converts AC into DC, providing PLC CPU with direct current power supply. As for AS200 / 300 Series PLC CPU, it is the heart of the system and is responsible for the system control and management.



● **The minimum requirements for an AS100 Series framework**

Since AS100 Series PLC CPU does NOT require a power supply module, AS100 Series PLC CPU is all you need to run a whole system.



● **Communication cable**

Several communication interfaces are included in a CPU module, and many types of network modules are available. You can select a suitable communication cable according to the actual situation.

The following table lists information about communication interfaces and main applications.

| Interface          | Connector                         | Application  |
|--------------------|-----------------------------------|--|
| Communication port | Five-pin removable terminal block | Computer/HMI communication/Industrial control network (2x RS-485)                  |
| Ethernet           | RJ45                              | Computer/HMI communication/Remote control/Data exchange/Industrial control network |
| USB                | Mini USB                          | Computer communication   |

● **Extension module**

AS Series CPU module is equipped with standard communication ports, select suitable modules according to the actual situation. Various kinds of modules can be purchased according to your needs. Refer to section 1.1.2 for detailed information on the modules that can be used with your AS Series System.

● **The limitations of setting up a standard AS PLC framework**

The following lists the limits for setting up a standard framework of the AS PLC system. Exceeding any one of the limits causes the PLC to send an error message.

Limit 1: You can connect up to 32 extension modules to the PLC, not including the power module, CPU module, and remote module.

Limit 2: The maximum number of digital I/O points is 1024. The built-in digital I/O points of the CPU module are included.



Limit 3: You can connect up to 16 analog modules (AD, DA, XA, RTD, TC and LC) to the PLC.

Limit 4: You can connect up to 4 communication modules (AS00SCM, AS01DNET-A, and AS04SIL-A) to the PLC.

Limit 5: You can connect up to 8 positioning modules (AS02PU-A, AS04PU-A and AS02HC-A) to the PLC.

Limit 6: You can connect up to 15 remote modules (AS00SCM+AS-FCOPM) to the PLC. The remote modules can work with up to eight digital/analog modules.

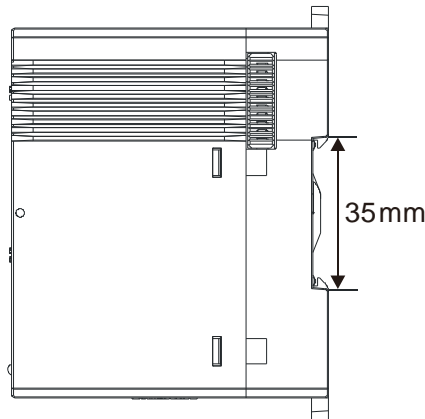
Limit 7: You can connect up to 15 remote modules (AS00SCM+AS-FEN02) to the PLC. The remote modules can work with up to eight digital/analog modules.

Limit 8: You can connect up to 8 extension modules (digital modules, analog modules, temperature measurement module, etc.) to AS01DNET-A (RTU mode).

Limit 9: You can connect remote modules to digital/analog modules (temperature measurement and load cell modules), but not to communication or positioning modules.

## 4.2 Installation Notes

- To ensure you have sufficient installation space for AS Series System, before installation begins, be sure to measure the size of your AS Series System and the size of the communication cable connectors and the space between devices should also be taken into account.
- Make sure that the work environment conforms to the specifications for the products. It is necessary to consider the basic temperature/humidity control and dust/corrosion prevention.
- Electromagnetic interference can result in system malfunction. Therefore, you must design the EMC carefully. Refer to Appendix C in this manual for more information on EMC standards.
- If components such as screws and washers are specified in the manual, do use components conforming to the specifications.
- If a cable is connected to a communication port, make sure the cable connector is properly joined to the port on the module.
- For the installation of DIN Rail, use a 35 mm wide rail or use the one that complies with EN 60715.

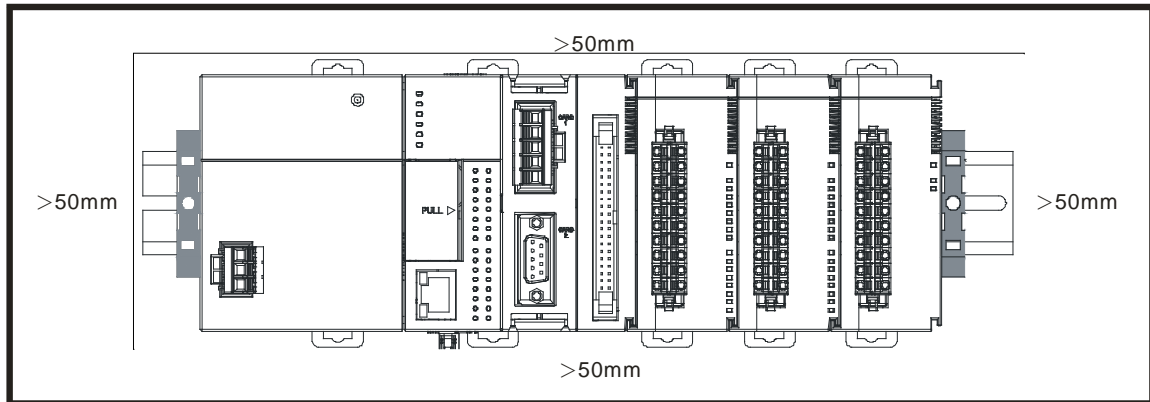


## 4.3 Installation

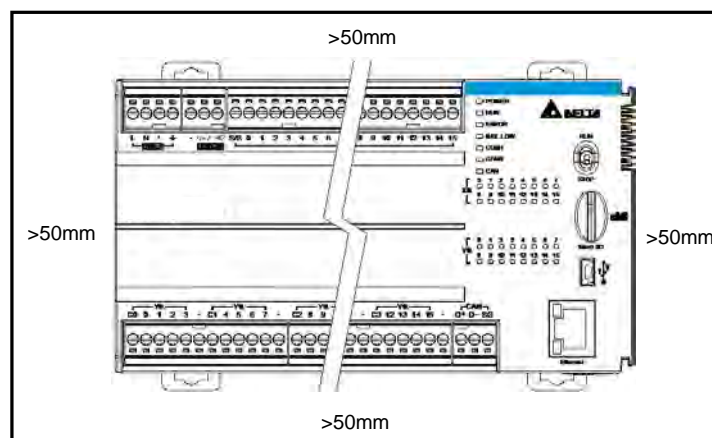
### 4.3.1 Installing Modules in a Control Box

A PLC has to be installed in a closed control box. In order to ensure that the PLC radiates heat normally, the space between the PLC and the control box must be larger than 50 millimeters.

- AS200 / AS300



- AS100

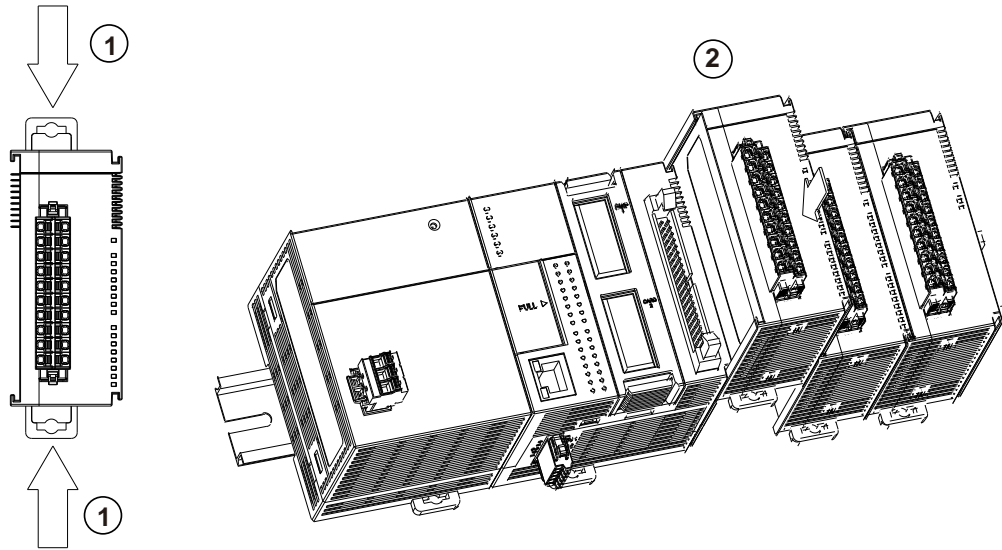


- Keep the PLC away from high-voltage equipment, high-voltage wires, and high-voltage motors.
- In order to prevent the PLC from overheating, please do not install the PLC vertically on the bottom or top of the control box.
- Please install the PLC horizontally in the control box, as shown above.
- If you intend to increase the number of modules, you must leave some space for installing the modules in the control box.

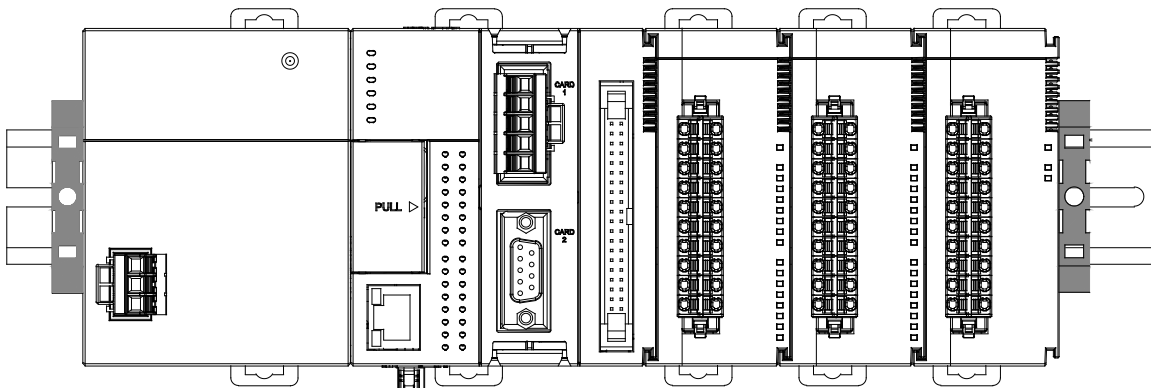
### 4.3.2 Installing a Module

The methods to install a module are the same for AS100, AS200 and AS300 series PLC CPU. Here we use AS200 / AS300 as an example for demonstration.

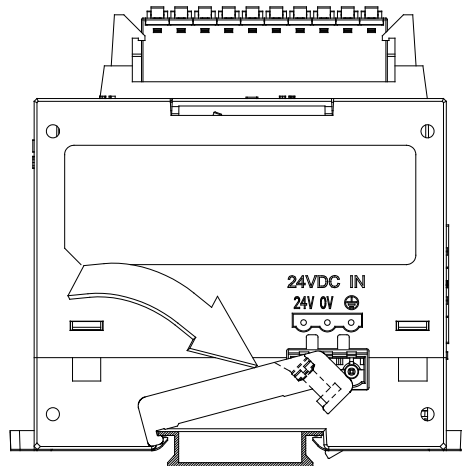
1. Press the clip rings if they are out as the image 1 shown. Push the module to the desire position until you hear a click to finish installation.
2. Link the I/O modules on the right side of the PLC and make sure they are hooked together. Push the modules into the DIN rail until you hear a click.
3. After you installed the module, fasten the screws on the modules to secure the module on the DIN rail.



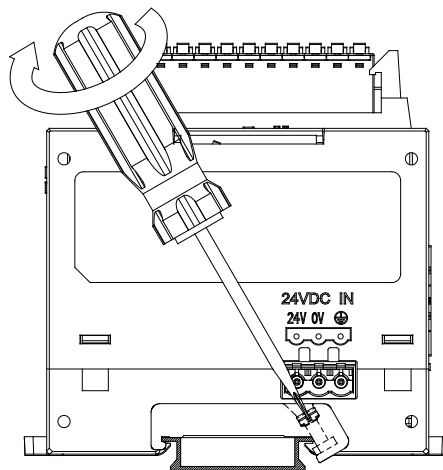
If there is a vibration source near the installation site, install anti-vibration baffles on the sides of the AS Series modules for better stabilization, such as the gray baffles show below.



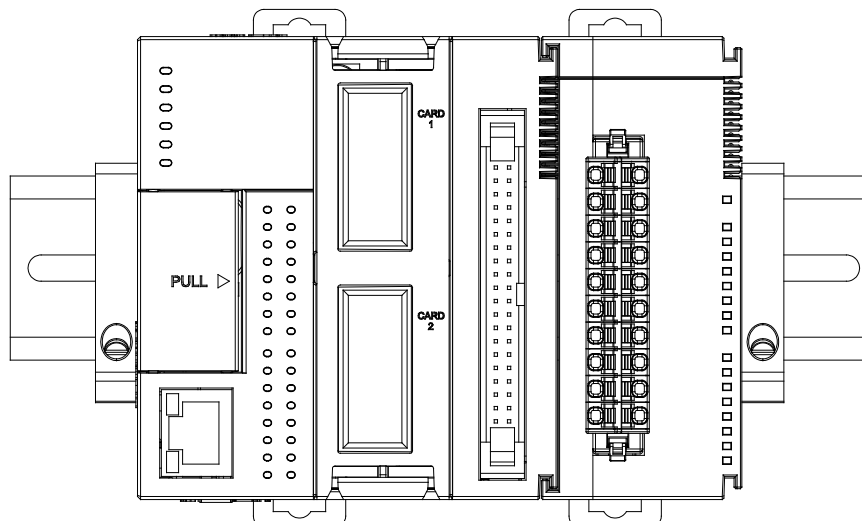
- **Install the baffles:**
  - Hook the baffle onto the DIN rail and press it down as the directional arrow shows below.



- Use screws to secure the baffle.



- a. The completed baffle installation is shown below.

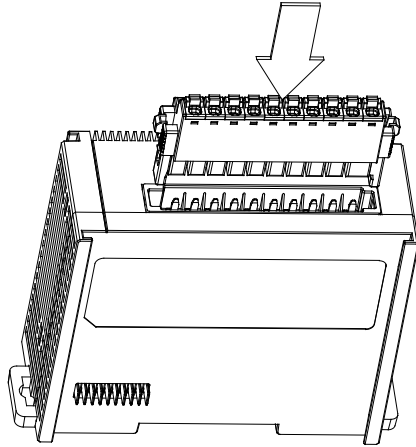


### 4.3.3 Installing a Removable Terminal Block

For AS200 / AS300 Series PLC CPU: install the removable terminal block on the module as shown below.

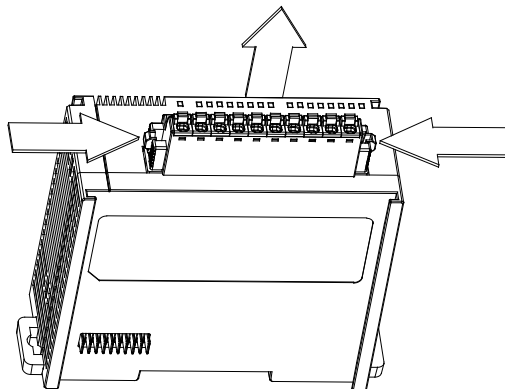
- **Installation**

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



- **Removal**

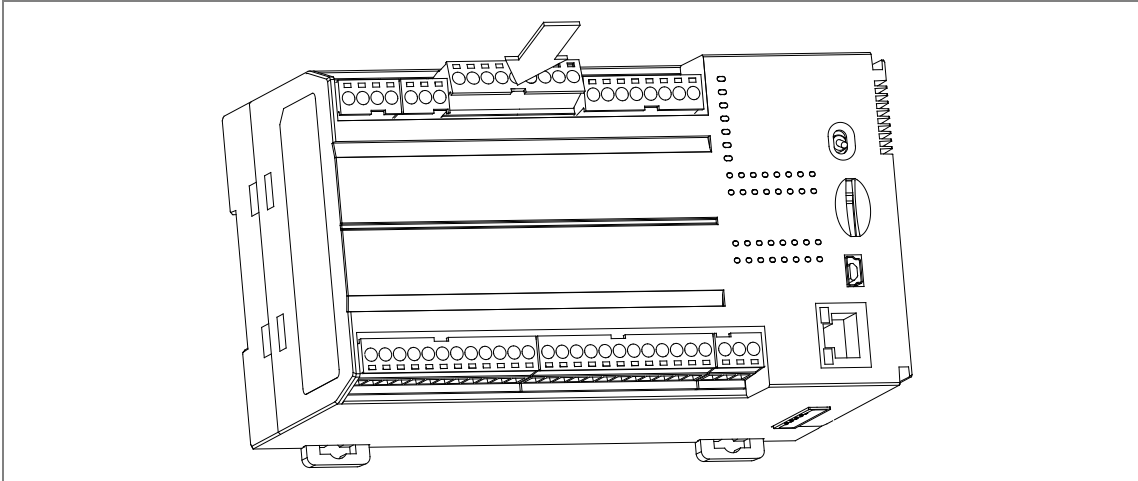
Pull the clips down in the direction shown by the arrow, and then pull the terminal block up as shown below.



For AS100 Series PLC CPU: install the removable terminal block on the module as shown below.

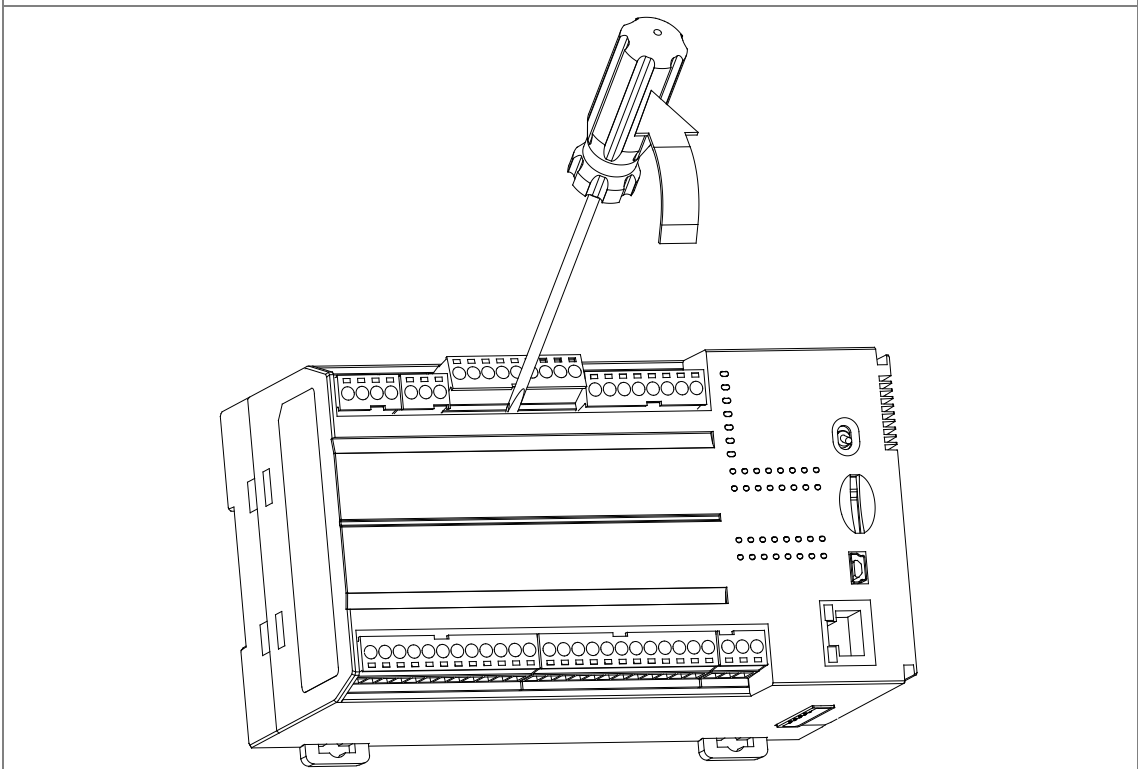
- **Installation**

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



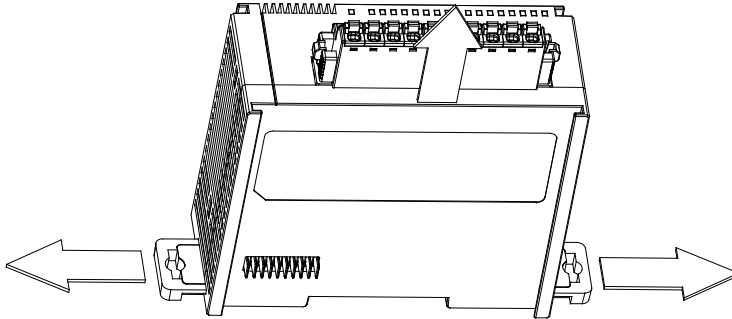
- **Removal**

Use a screwdriver to separate the terminal block from the module and then pull the terminal block out as shown below.

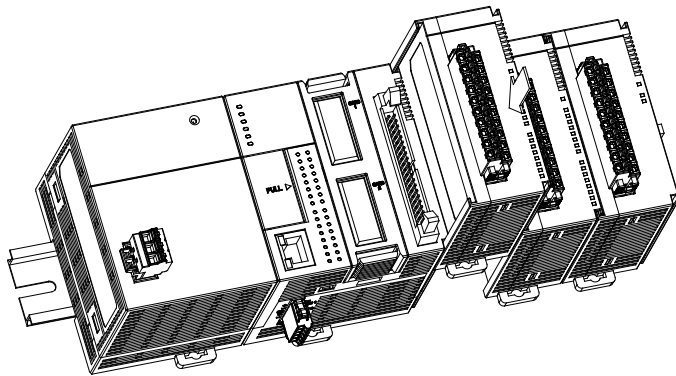


#### 4.3.4 Changing a Module

1. Take the removable terminal block out of the module and pull the clip out from the DIN rail as the image shown below.



2. Remove the module to be changed out.
3. Slide the new module in as the image shows below.

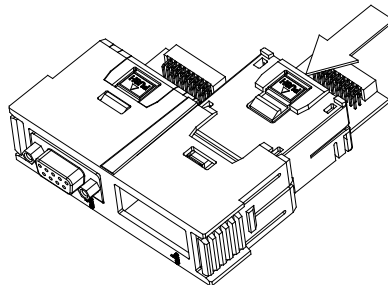


#### 4.3.5 Installing and Removing an Extension Card for AS300 PLC CPU

##### A. AS-F232/AS-F422/AS-F485/AS-F2AD/AS-F2DA/AS-FCOPM


##### 1. Installation

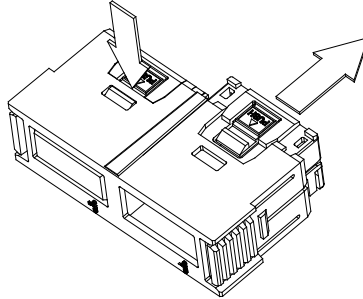
Push the extension card into the extension card slot until you hear a click.





## 2. Removal

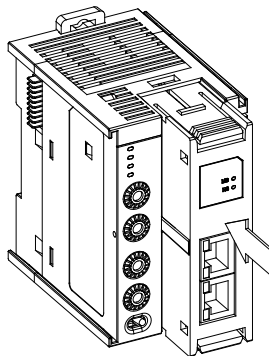
Press the  button to release the extension card and then take the extension card out.



## B. AS-FEN02 / AS-FPFN02 / AS-FOPPC02 / AS-FECAT

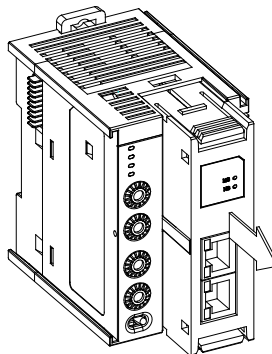
### 1. Installation

Push the extension card into the extension card slot until you hear a click.



### 2. Removal

Press the buttons on the upper and lower ends to release the extension card and then take the extension card out.

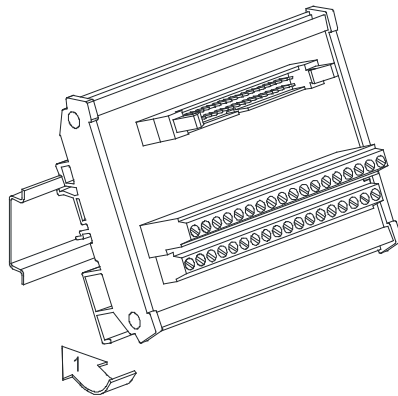


### 4.3.6 Installing and Removing a Wiring Module for AS300 PLC CPU

Put a communication cable in the port on a CPU module, and make sure the connector of the cable is properly joined to the port.

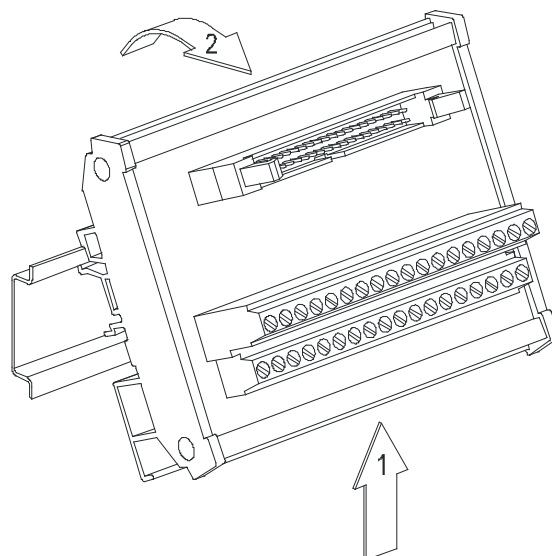
- **Installation**

1. One side of the wiring module has to be fixed first.
2. Press the driver board in the direction indicated by arrow 1, and make sure the groove is aligned with the DIN rail.




- **Removal**

1. Push the wiring module in the direction indicated by arrow 1.
2. Pull the wiring module in the direction indicated by arrow 2.



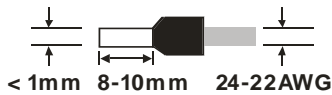
## 4.4 Wiring

- Please pay attention to the following warnings.

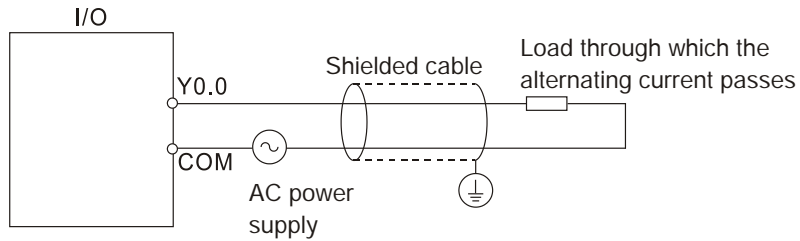
|   |  |
|---|--|
|  | <ul style="list-style-type: none"><li>● Before installing or wiring a module, you must verify that the external power supply is turned off. If the power supply is not turned off, you may get an electric shock, or the product may be damaged.</li><li>● After you complete installing or wiring the module, make sure that a terminal block cover is installed on the module before turning on the power supply or operating the module. If the terminal block cover is not installed properly, you may get an electric shock, or the module may not operate normally.</li><li>● Be sure to connect the terminals FG and LG with protective grounding conductors. Otherwise, you may get an electric shock, or the module may not operate normally.</li><li>● To ensure that a PLC is wired correctly, you must check the rated voltage of the product and the arrangement of the terminals. If the PLC is connected to a power supply that does not conform to the rated voltage, or the product is not wired correctly, a fire may occur, or the product may be damaged.</li><li>● The external connections should be crimped, press-welded by specific tools, or soldered correctly. Improper connections may result in a short circuit, fire, or malfunction.</li><li>● Tighten the terminal screws to the specified torque. If the terminal screws are loose, a short circuit, fire, or faulty operation may occur. Tightening the terminal screws too far may cause damage to the terminal screws or the module, resulting in a short circuit or malfunction.</li><li>● Make sure there are no foreign substances such as iron filings or wiring debris inside the module. Foreign substances may result in a fire, damage, or malfunction.</li></ul> |
|---|--|

- I/O module wiring notes

- (1) Terminal definitions
  - ◆ Two-/three-wire (passive sensor): the sensor and the system share the same power circuit.
  - ◆ Four-wire (active sensor): the sensor uses an independent power supply and should not share the same power circuit with the system.
- (2) Terminals with insulation sleeves cannot be used as a terminal block. It is recommended that the terminals be covered with insulation tubes.
- (3) Use single-wire cables or two-wire cables with a diameter of 24 AWG to 22 AWG and with less than 1mm pin-type terminals. Only use copper conducting wires with a temperature rating of 60/75°C.



- (4) Keep the input cables, output cables, and power cable separate from one another.
- (5) If the main circuit and the power cable cannot be separated from each other, use a shielded cable, and ground it at the side of the I/O module. In some cases, the shielded cable can be grounded at the opposite side.



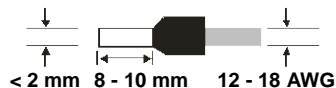
- (6) If you wire a module through conduit, you must ground the conduit correctly.
- (7) Keep 24 VDC input cables separate from 110 VAC input cables and 220 VDC input cables.
- (8) If the wiring length is more than 200 meters (656.19 feet), leakage current can result from parasitic capacitance, and the system will not function properly.

## 4.5 Connecting Power Cables

### 4.5.1 Power Cable Wiring Notes

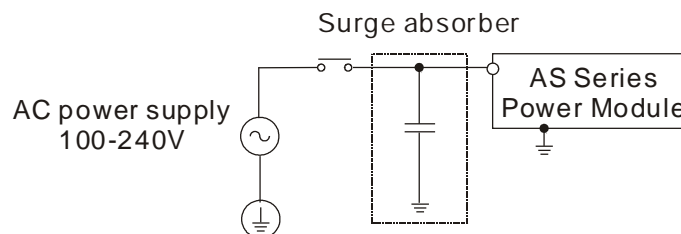
- **Connecting AC power cables**

- (1) If a power grid's input voltage source is alternating current (AC), ranging from 100 VAC to 240 VAC, you need to connect the power supply to the terminals L and N. Do NOT connect 110 VAC or 220 VAC to the input terminals +24V or -24V that will damage the PLC CPU.
- (2) The cables carrying the 110 VAC, 220 VAC, and 24 VDC should be single or two-wire cables.
- (3) Do not bundle 110 VAC cable, 220 VAC cable, 24 VDC cable, the (high-voltage high-current) main circuit, and the I/O signal cable together. The distance between adjacent cables should be more than 100 millimeters (3.94 inches).
- (4) If a power failure lasts less than 10 ms, PLC keeps running without being affected. If the time of power loss lasts longer or the voltage of the power supply is too low, the PLC will stop running and all outputs will be stopped. After the power is back on, the PLC will resume working automatically. (Some auxiliary relays and registers are retainable in the PLC, you can make use of these advantages while designing a PLC program.)
- (5) For the input terminals L and N as well as LG /  $\perp$ , use single-wire cables or two-wire cables in a diameter of 12 AWG to 18 AWG and with less than 1mm pin-type terminals. Only use copper conducting wires with a temperature rating of 60/75°C.



- (6) If cables are connected to the terminals LG or  $\perp$ , you must ground the cables. Do not connect LG or  $\perp$  to any devices. If LG and  $\perp$  are not grounded, the PLC will be susceptible to noise. Since LG /  $\perp$  carries electric potential, you will get an electric shock if you touch the metal parts.

- (7) To prevent electrical surge from lightning, install a surge protector as shown below.



**Points for attention:**

1. Ground the surge protector and the PLC system.
2. Select the surge protector with a working voltage that is not less than the maximum allowable input voltage.

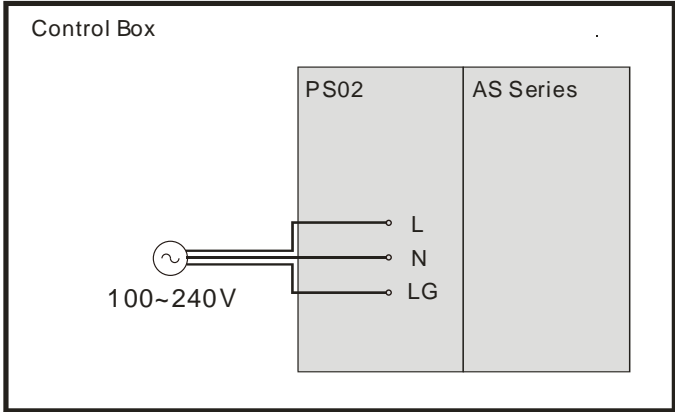
4.5.2 Ground

|  |   |
|--|---|
| <ul style="list-style-type: none"><li>• The diameter of the ground should not be less than the diameters of the cables connected to the terminals L and N.</li><li>• If using multiple pieces of equipment, use a single-point ground.</li></ul> | <div><div>AS Series<br/>Power Module<br/>or<br/>AS100 PLC CPU</div><div>Another piece of<br/>equipment</div><div>The single-point ground is better.</div></div>             |
| <ul style="list-style-type: none"><li>• If you cannot use a single-point ground, use a common-point ground.</li></ul>  | <div><div>AS Series<br/>Power Module<br/>or<br/>AS100 PLC CPU</div><div>Another piece of<br/>equipment</div><div>The common-point ground is permitted.</div></div>          |
| <ul style="list-style-type: none"><li>• Do not connect equipment ground wires together as shown on the right.</li></ul>  | <div><div>AS Series<br/>Power Module<br/>or<br/>AS100 PLC CPU</div><div>Another piece of<br/>equipment</div><div>The equipment can not be grounded in this way.</div></div> |

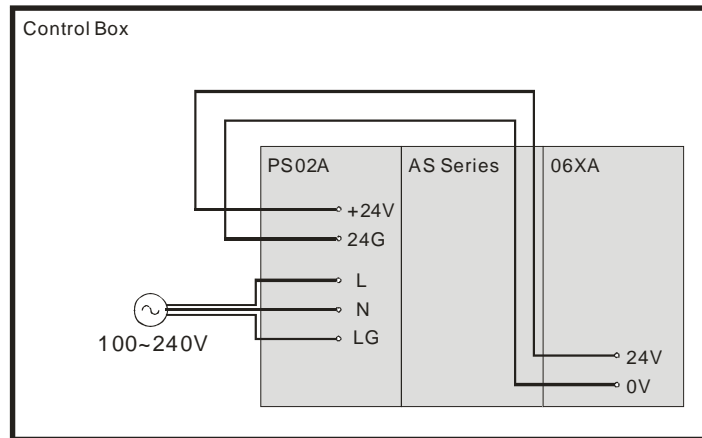
4.5.3 Wiring Power Supply

AS200 / AS300 PLC CPU

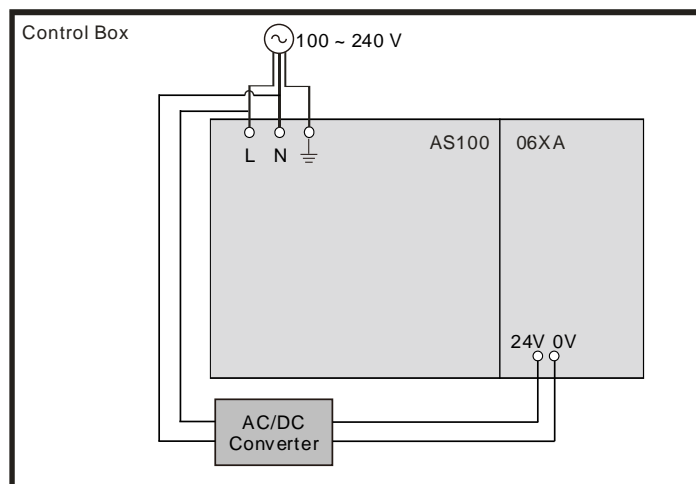
- AS-PS02



- **AS-PS02A**



### AS100 PLC CPU



\*1. The live wire and the neutral wire in the AC power cable are connected to L and N on the power supply module respectively. To prevent incorrect system operation, the ground in the AC power cable must be connected to LG on the power supply module or  $\perp$  of AS100 PLC CPU.

#### 4.5.4 Power Consumption

The following table lists the power consumption for AS Series modules.

| Classification                 | Model name  | Internal power consumption (mA) | Internal power consumption (W) | External power consumption (W) |
|--------------------------------|-------------|---------------------------------|--------------------------------|--------------------------------|
| CPU module                     | AS332P-A    | 150                             | 3.6                            | N/A                            |
|                                | AS332T-A    | 150                             | 3.6                            | N/A                            |
|                                | AS324MT-A   | 150                             | 3.6                            | N/A                            |
|                                | AS320P-B    | 150                             | 3.6                            | N/A                            |
|                                | AS320T-B    | 150                             | 3.6                            | N/A                            |
|                                | AS300N-A    | 125                             | 3                              | N/A                            |
|                                | AS228T-A    | 150                             | 3.6                            | N/A                            |
|                                | AS228P-A    | 150                             | 3.6                            | N/A                            |
|                                | AS228R-A    | 190                             | 4.56                           | N/A                            |
|                                | AS218TX-A   | 180                             | 4.32                           | N/A                            |
|                                | AS218PX-A   | 180                             | 4.32                           | N/A                            |
|                                | AS218RX-A   | 200                             | 4.8                            | N/A                            |
|                                | AS132T-A    | 110                             | 2.64                           | N/A                            |
|                                | AS132P-A    | 110                             | 2.64                           | N/A                            |
|                                | AS132R-A    | 160                             | 3.84                           | N/A                            |
|                                | AS148T-A    | 125                             | 3                              | N/A                            |
|                                | AS148P-A    | 125                             | 3                              | N/A                            |
|                                | AS148R-A    | 200                             | 4.8                            | N/A                            |
|                                | AS164T-A    | 140                             | 3.36                           | N/A                            |
|                                | AS164P-A    | 140                             | 3.36                           | N/A                            |
|                                | AS164R-A    | 240                             | 5.76                           | N/A                            |
| Digital I/O module             | AS08AM10N-A | 20                              | 0.5                            | N/A                            |
|                                | AS08AN01T-A | 30                              | 0.72                           | N/A                            |
|                                | AS08AN01P-A | 60                              | 1.4                            | N/A                            |
|                                | AS08AN01R-A | 70                              | 1.7                            | N/A                            |
|                                | AS16AM10N-A | 20                              | 0.5                            | N/A                            |
|                                | AS16AP11T-A | 30                              | 0.7                            | N/A                            |
|                                | AS16AP11P-A | 30                              | 0.7                            | N/A                            |
|                                | AS16AP11R-A | 80                              | 1.9                            | N/A                            |
|                                | AS16AN01T-A | 60                              | 1.4                            | N/A                            |
|                                | AS16AN01P-A | 60                              | 1.4                            | N/A                            |
|                                | AS16AN01R-A | 140                             | 3.4                            | N/A                            |
|                                | AS32AM10N-A | 20                              | 0.48                           | N/A                            |
|                                | AS32AN02T-A | 30                              | 0.72                           | N/A                            |
|                                | AS64AM10N-A | 30                              | 0.72                           | N/A                            |
|                                | AS64AN02T-A | 60                              | 1.44                           | N/A                            |
| Analog I/O module              | AS04AD-A    | 50                              | 1.2                            | 2.16                           |
|                                | AS08AD-B    | 50                              | 1.2                            | 2.5                            |
|                                | AS08AD-C    | 50                              | 1.2                            | 2.5                            |
|                                | AS04DA-A    | 50                              | 1.2                            | 2.64                           |
|                                | AS06XA-A    | 50                              | 1.2                            | 2.16                           |
|                                | AS02ADH-A   | 50                              | 1.2                            | 2                              |
| Temperature measurement module | AS04RTD-A   | 30                              | 0.75                           | 2                              |
|                                | AS06RTD-A   | 30                              | 0.75                           | 2                              |
|                                | AS04TC-A    | 30                              | 0.75                           | 2                              |
|                                | AS08TC-A    | 30                              | 0.75                           | 2                              |
| Load cell                      | AS02LC-A    | 30                              | 0.75                           | 3                              |



| Classification     | Model name | Internal power consumption (mA) | Internal power consumption (W) | External power consumption (W) |
|--------------------|------------|---------------------------------|--------------------------------|--------------------------------|
| module             |            |                                 |                                |                                |
| Positioning module | AS02PU-A   | 62.5                            | 1.5                            | N/A                            |
|                    | AS04PU-A   | 62.5                            | 1.5                            | N/A                            |
| Network module     | AS00SCM-A  | 25                              | 0.6                            | N/A                            |
|                    | AS01DNET-A | 33                              | 0.8                            | N/A                            |
|                    | AS04SIL-A  | 33                              | 0.8                            | 0.5                            |
| Function cards     | AS-F232    | 20                              | 0.48                           | N/A                            |
|                    | AS-F422    | 30                              | 0.72                           | N/A                            |
|                    | AS-F485    | 20                              | 0.48                           | N/A                            |
|                    | AS-FCOPM   | 20                              | 0.48                           | N/A                            |
|                    | AS-F2AD    | 15                              | 0.36                           | N/A                            |
|                    | AS-F2DA    | 50                              | 1.2                            | N/A                            |
|                    | AS-FEN02   | 50                              | 1.2                            | N/A                            |
|                    | AS-FPFN02  | 50                              | 1.2                            | N/A                            |
|                    | AS-FOPC02  | 50                              | 1.2                            | N/A                            |
|                    | AS-FFTP01  | 55                              | 1.32                           | N/A                            |
|                    | AS-FECAT   | 50                              | 1.2                            | N/A                            |

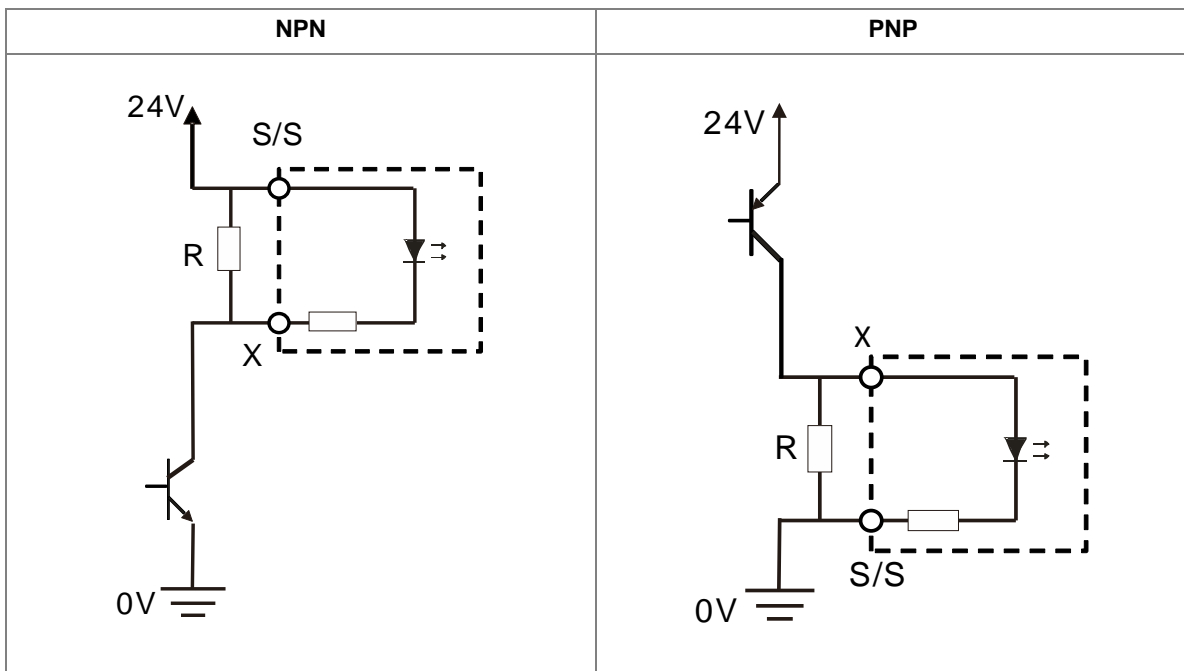
## 4.6 Wiring CPU Modules

- When you use open collector NPN/PNP outputs to activate AS300 high speed inputs, you need to have the pull up/pull down resistor connected to X point and S/S. Only use 3 W / 470 ohm or 2 W / 1 Kohm resistors.
- When you use Push-Pull outputs to activate AS PLC CPU high speed inputs, you don't need to use any pull up/pull down resistor connected to X point and S/S.
- While using ports Y as output ports, all the C0 points should be connected. Do NOT only use ONE C0 point.

### Note:

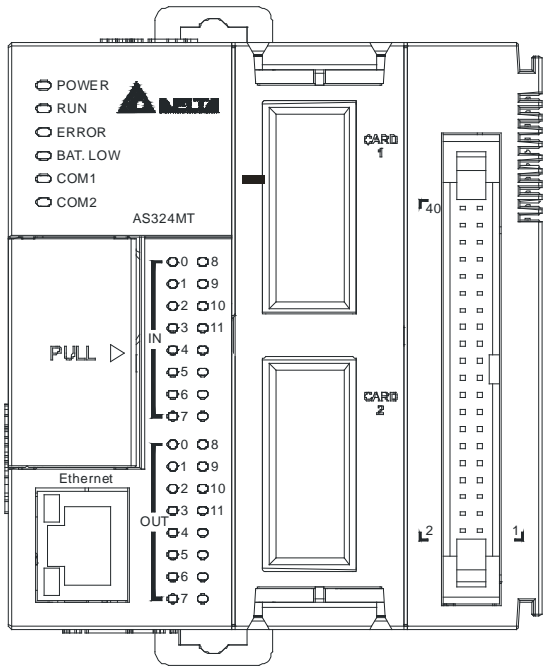
- In case open collector NPN/PNP outputs are used to activate AS300 high speed inputs, you need to have the pull up/pull down resistor connected to X point and S/S.
- In case Push-Pull outputs are used to activate AS300 high speed inputs, you don't need to use any pull up/pull down resistor connected to X point and S/S.
- It is recommended to use the resistor of 3W/470ohm or 2W/1Kohm.
- While using ports Y as output ports, all the C0 points should be connected. Do NOT only use ONE C0 point.

Through the following wiring you can increase the resistance of a resistor. See the illustration below for reference.

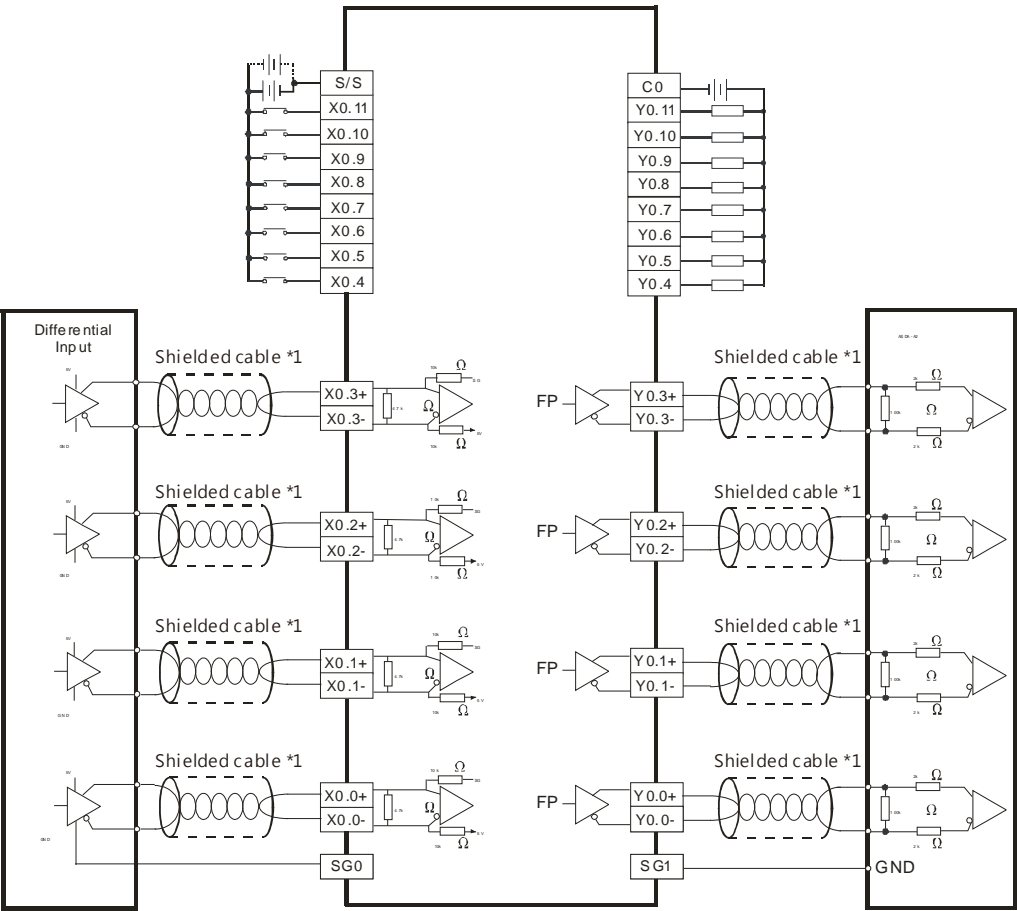


4.6.1 Wiring AS324MT-A

|                        |   |
|------------------------|---|
| Input form             | X0.0+ to X0.3+/X0.0- to X0.3- : Differential input<br>X0.4–X0.11: Direct current (sinking or sourcing)  |
| Input current/voltage  | X0.0+ to X0.3+/X0.0- to X0.3- : 5V DC, 5 mA<br>X0.4–X0.11: 24 VDC, 5 mA   |
| Output form            | Y0.0+ to Y0.3+/Y0.0- to Y0.3- : Differential input<br>Y0.4–Y0.11: Transistor-T (sinking)  |
| Output current/voltage | Y0.0+ to Y0.3+/Y0.0- to Y0.3-: 5V DC, 20mA/output<br>(+ and – as a group, e.g. Y0.0+ and Y0.0- is a group)<br>Y0.4 to Y0.11: 5 to 30V DC, 0.1A/output, 0.8A/COM |

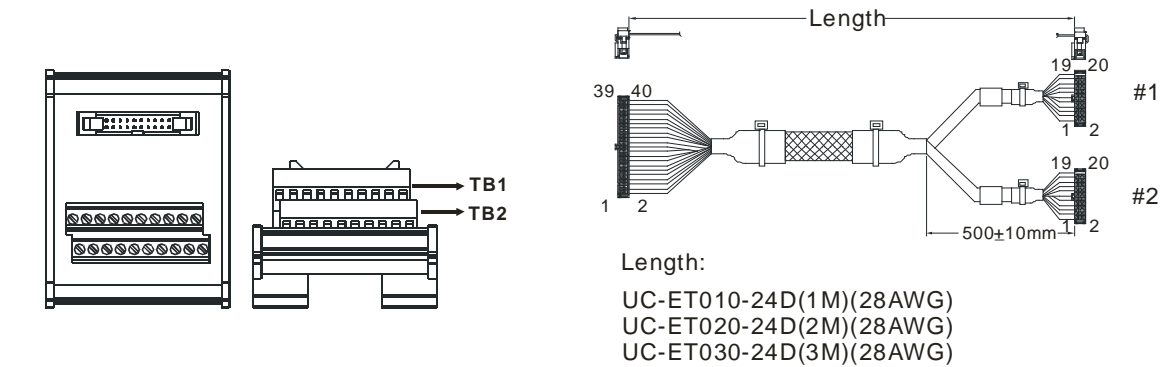


|    |    |       |       |
|----|----|-------|-------|
| 40 | 39 | S/S   | S/S   |
| 38 | 37 | X0.11 | X0.10 |
| 36 | 35 | X0.9  | X0.8  |
| 34 | 33 | X0.7  | X0.6  |
| 32 | 31 | X0.5  | X0.4  |
| 30 | 29 | SG0   | SG0   |
| 28 | 27 | X0.3- | X0.3+ |
| 26 | 25 | X0.2- | X0.2+ |
| 24 | 23 | X0.1- | X0.1+ |
| 22 | 21 | X0.0- | X0.0+ |
| 20 | 19 | C0    | C0    |
| 18 | 17 | Y0.11 | Y0.10 |
| 16 | 15 | Y0.9  | Y0.8  |
| 14 | 13 | Y0.7  | Y0.6  |
| 12 | 11 | Y0.5  | Y0.4  |
| 10 | 9  | SG1   | SG1   |
| 8  | 7  | Y0.3- | Y0.3+ |
| 6  | 5  | Y0.2- | Y0.2+ |
| 4  | 3  | Y0.1- | Y0.1+ |
| 2  | 1  | Y0.0- | Y0.0+ |



● Wiring the External Terminal Module UB-10-ID16A

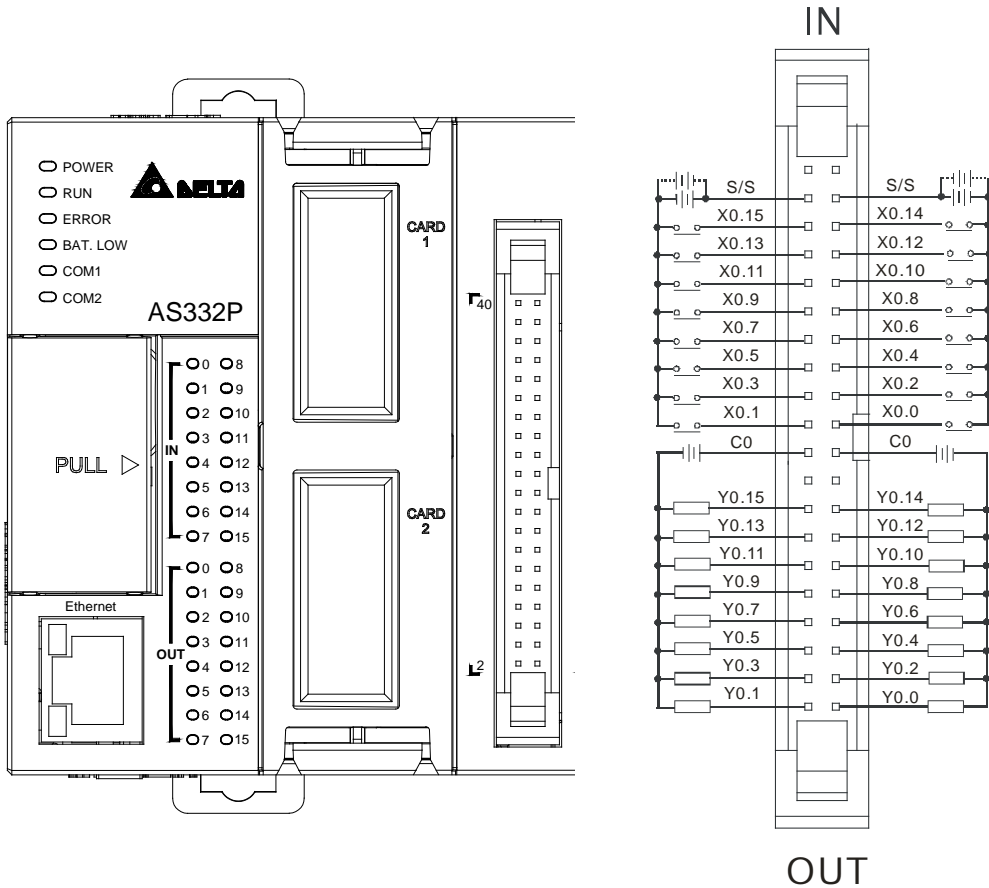
|                        |   |
|------------------------|---|
| Input form             | X0.0+ to X0.3+/X0.0- to X0.3-: Differential input<br>X0.4–X0.11: Direct current (sinking or sourcing) |
| Input current/voltage  | X0.0+ to X0.3+/X0.0- to X0.3- : 5 VDC, 5 mA<br>X0.4–X0.11: 24 VDC, 5 mA                               |
| Output form            | Y0.0+ to Y0.3+/Y0.0- to Y0.3- : Differential input<br>Y0.4–Y0.11: Transistor-T (sinking)              |
| Output current/voltage | Y0.0+ to Y0.3+/Y0.0- Y0.3-: 5 VDC, 20 mA<br>Y0.4–Y0.11: 5 to 30 VDC, 0.1 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 |

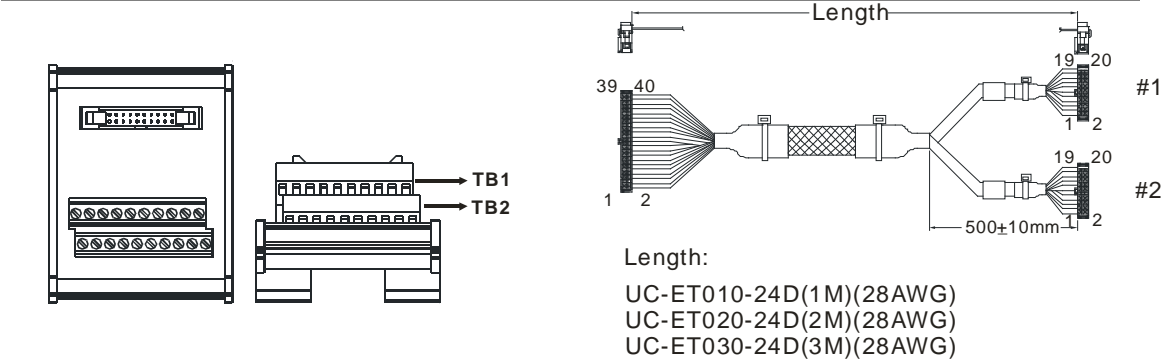
4.6.2 Wiring AS332P-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-P (sourcing)              |
| Output current/voltage | 5 to 30 VDC, 0.1A/output, 1.6A/COM   |



● Wiring the External Terminal Module UB-10-ID16A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC. 5 mA                         |
| Output form            | Transistor-P (sourcing)              |
| Output current/voltage | 5 to 30 VDC. 0.1A                    |

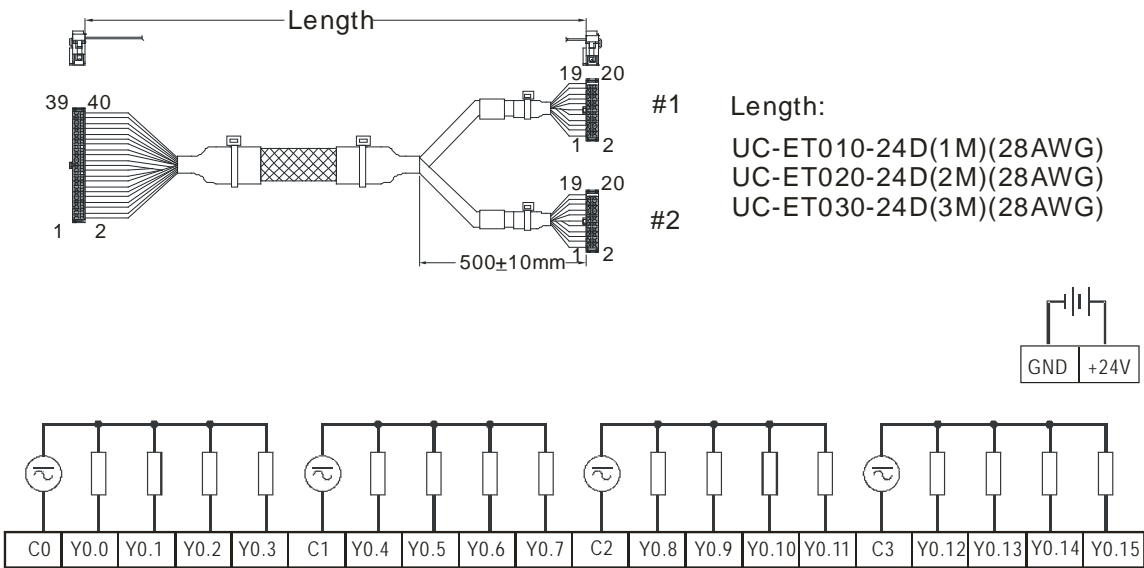


|    |     |      |      |      |      |      |       |       |       |     |    |
|----|-----|------|------|------|------|------|-------|-------|-------|-----|----|
| #1 | TB1 | Y0.0 | Y0.2 | Y0.4 | Y0.6 | Y0.8 | Y0.10 | Y0.12 | Y0.14 | -   | C0 |
|    | TB2 | Y0.1 | Y0.3 | Y0.5 | Y0.7 | Y0.9 | Y0.11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

● Wiring the External Terminal Module UB-10-OR16B

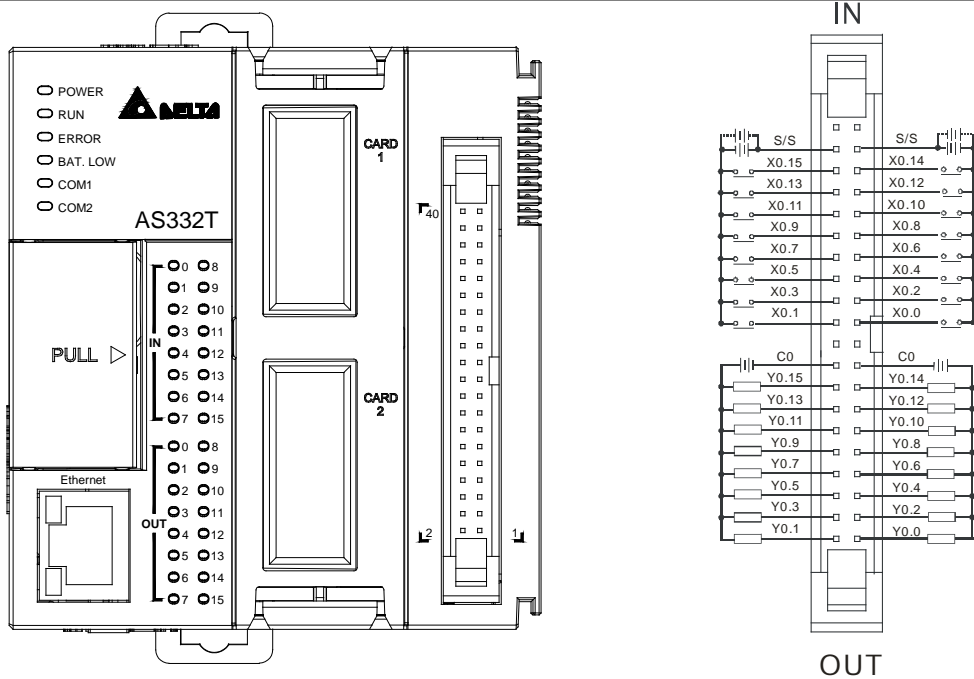
For cables that can only be connected to the cables of group #1, see below.

|                |                           |
|----------------|---------------------------|
| Output form    | Relay                     |
| Output voltage | Less than 250 VAC, 30 VDC |



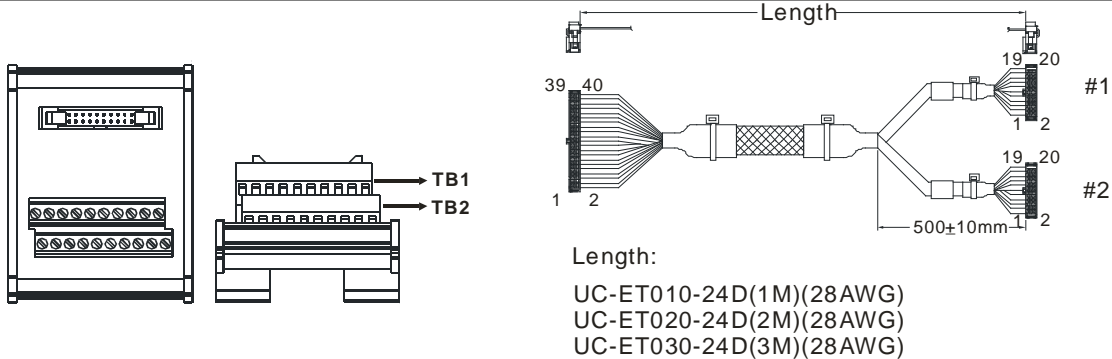
4.6.3 Wiring AS332T-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-T (sinking)               |
| Output current/voltage | 5 to 30 VDC, 0.1A/output, 1.6A/COM   |



● Wiring the External Terminal Module UB-10-ID16A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-T (sinking)               |
| Output current/voltage | 5 to 30 VDC, 0.1 A                   |

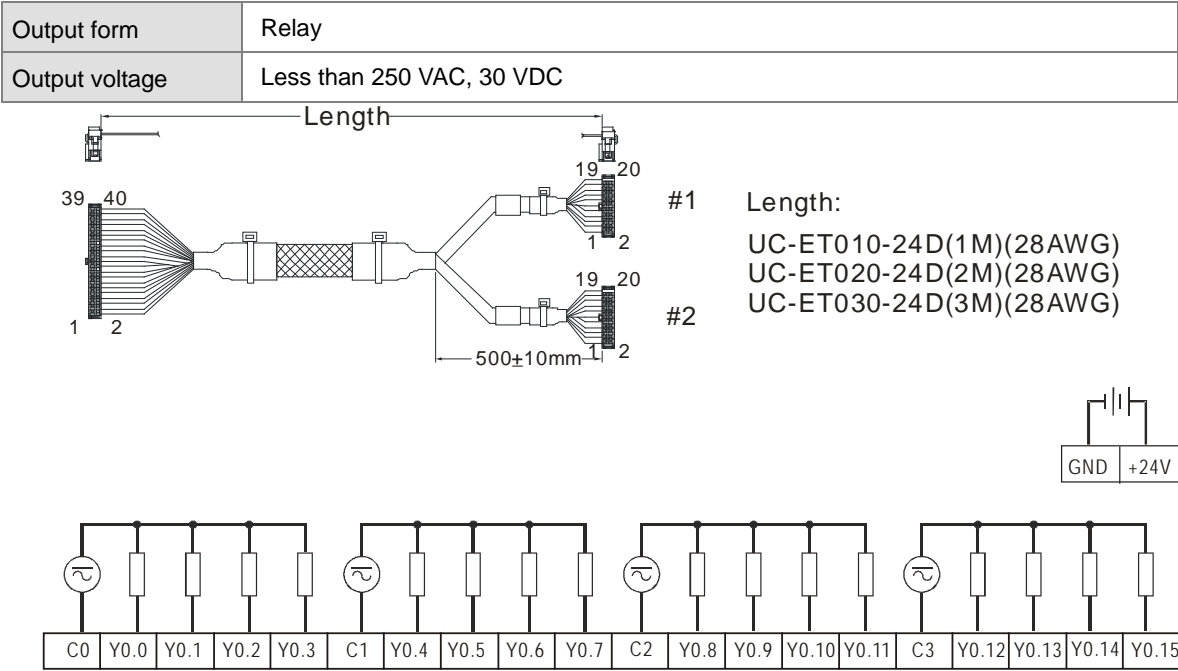


|    |     |      |      |      |      |      |       |       |       |     |   |
|----|-----|------|------|------|------|------|-------|-------|-------|-----|---|
| #1 | TB1 | Y0.0 | Y0.2 | Y0.4 | Y0.6 | Y0.8 | Y0.10 | Y0.12 | Y0.14 | C0  | - |
|    | TB2 | Y0.1 | Y0.3 | Y0.5 | Y0.7 | Y0.9 | Y0.11 |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



●     Wiring the External Terminal Module UB-10-OR16A

For cables that can only be connected to the cables of group #1, see below.

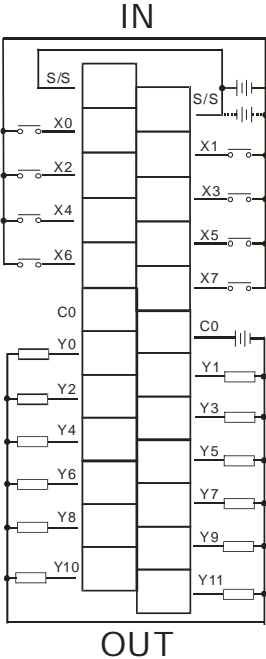
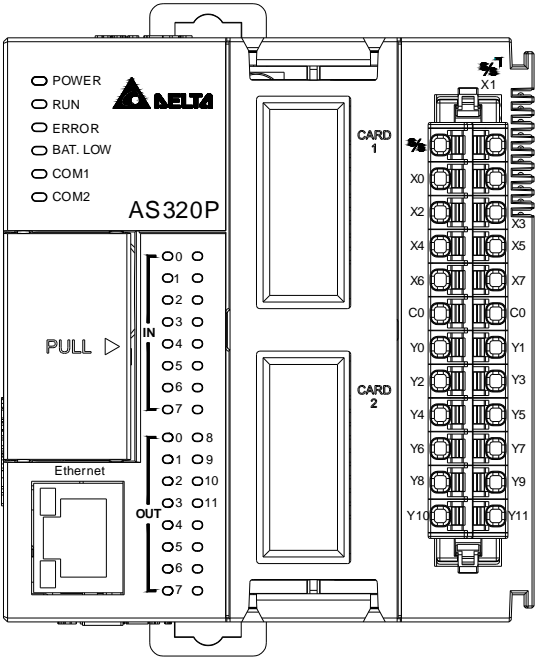


Note: UB-10-OR16A can be used with AS Series and DVP Series. The indications on the UB-10-OR16A board is for DVP Series. For the definitions of terminal connections for AS Series, you can see the reference table below. Or refer to the enclosed sticker for AS Series.

|     |    |      |      |      |      |    |      |      |      |      |    |      |      |       |       |    |       |       |       |       |
|-----|----|------|------|------|------|----|------|------|------|------|----|------|------|-------|-------|----|-------|-------|-------|-------|
| AS  | 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 |
| DVP | C0 | Y0   | Y1   | Y2   | Y3   | C1 | Y4   | Y5   | Y6   | Y7   | C2 | Y10  | Y11  | Y12   | Y13   | C3 | Y14   | Y15   | Y16   | Y17   |

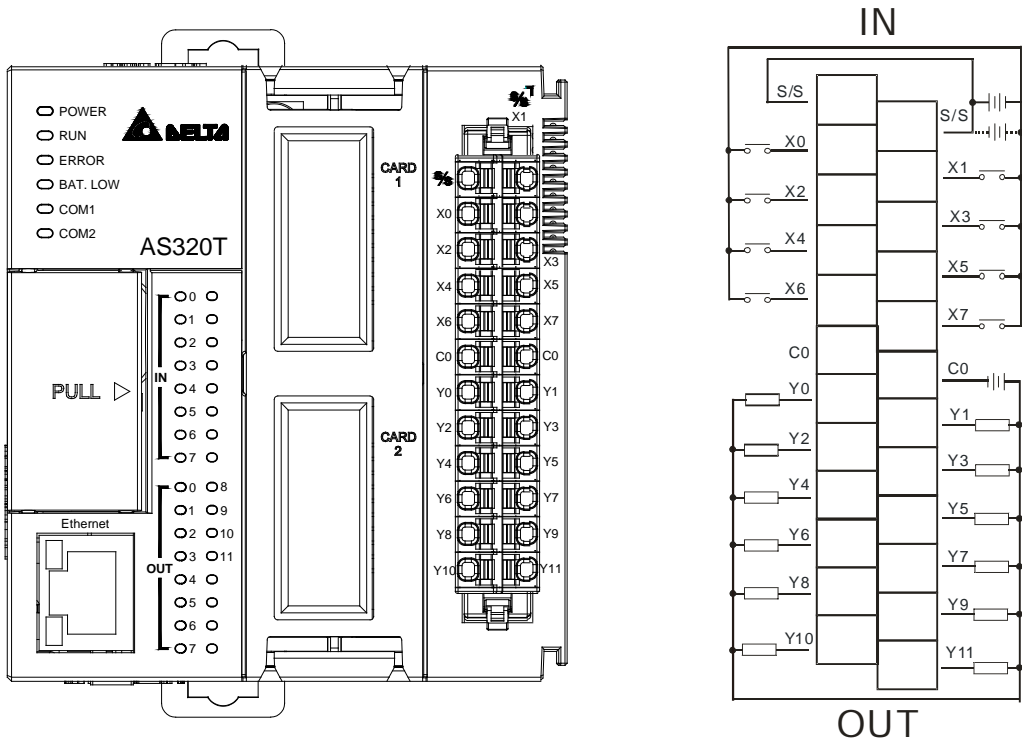
4.6.4 Wiring AS320P-B

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-P (sourcing)              |
| Output current/voltage | 5 to 30 VDC, 0.1A/output, 1.2A/COM   |



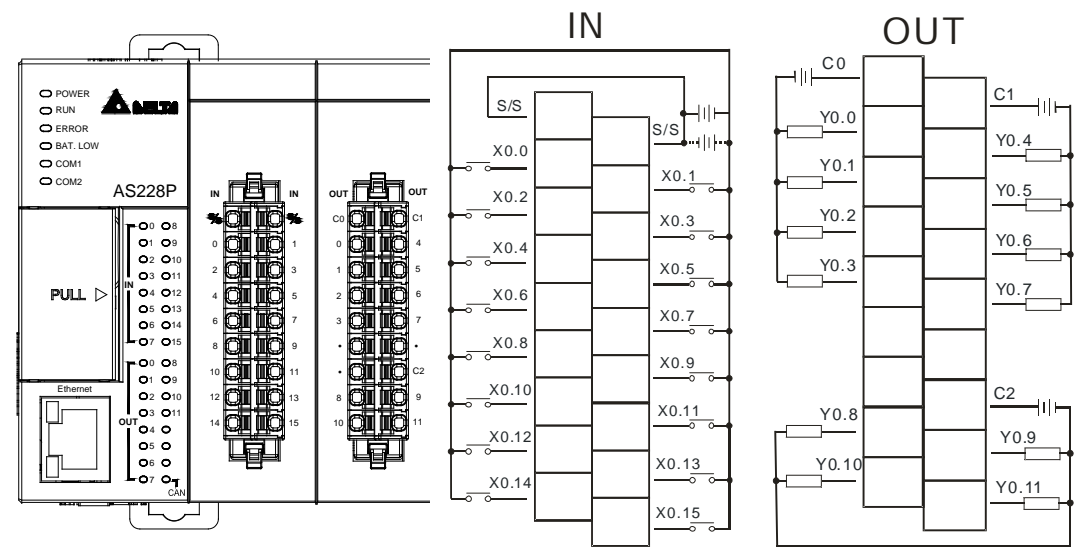
4.6.5 Wiring AS320T-B

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-T (sinking)               |
| Output current/voltage | 5 to 30 VDC, 0.1A/output, 1.2A/COM   |



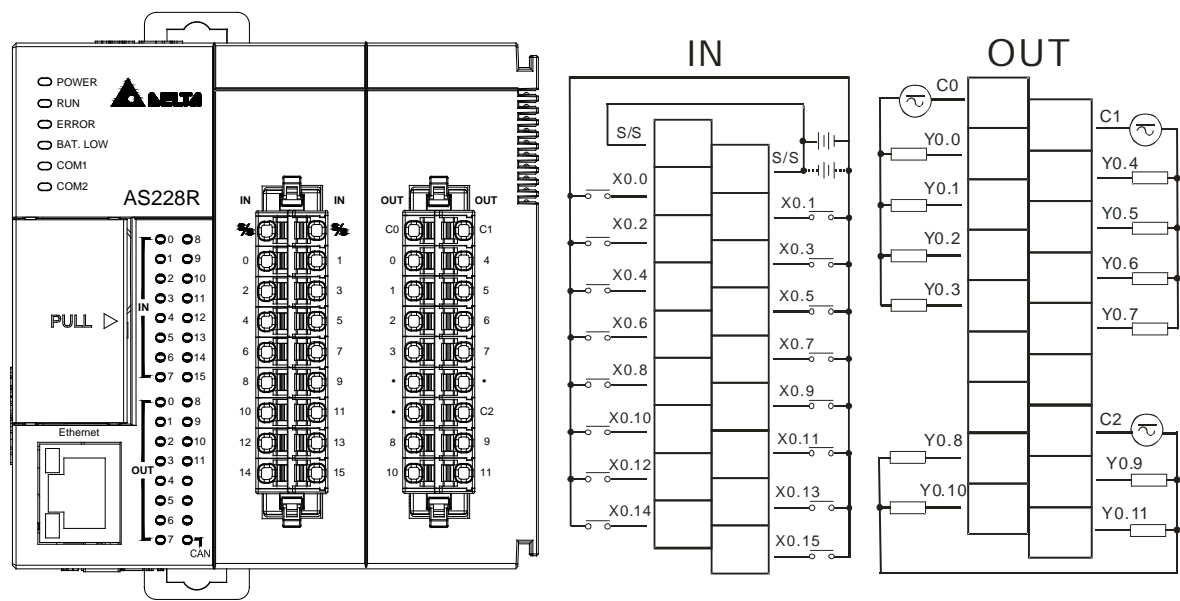
4.6.6 Wiring AS228P-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-P (sourcing) (PNP)        |
| Output current/voltage | 5 to 30 VDC, 0.5A/output, 2A/COM     |

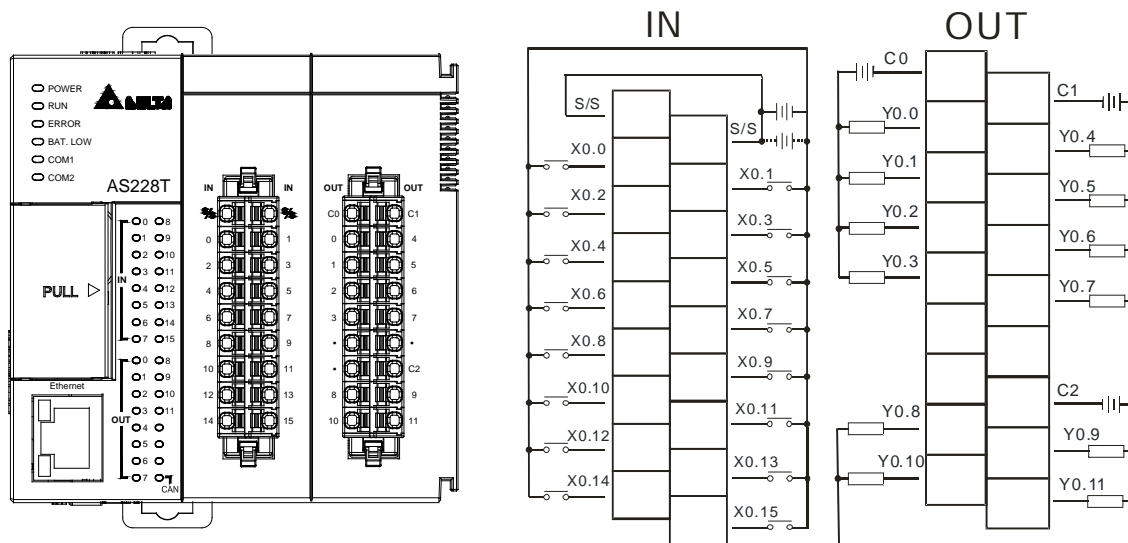


4.6.7 Wiring AS228R-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Relay                                |
| Output current/voltage | 240VAC/24VDC, 2A/output, 8A/COM      |



|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-T (sinking) (NPN)         |
| Output current/voltage | 5 to 30 VDC, 0.5A/output, 2A/COM     |

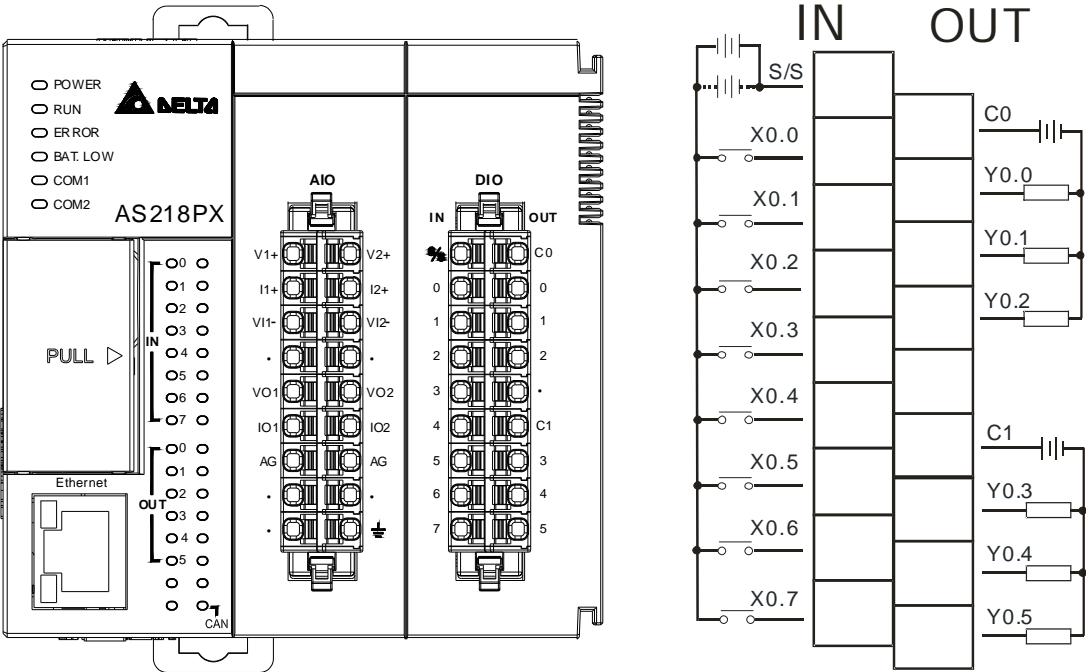


4.6.9 Wiring AS218PX-A / AS218RX-A / AS218TX-A

4.6.9.1 Wiring AS218PX-A

|                        |  |
|------------------------|--|
| Input form             | Direct current (sinking or sourcing)             |
| Input current/voltage  | 24 VDC, 5 mA                                     |
| Output form            | Transistor-P (sourcing) (PNP)                    |
| Output current/voltage | 5 to 30 VDC, 0.5A/output, 1.5A/COM               |
| Analog input*1         | 12bits, -10V-10V (voltage), -20mA-20mA (current) |
| Analog output*1        | 12bits, -10V-10V(voltage), 0- 20mA (current)     |

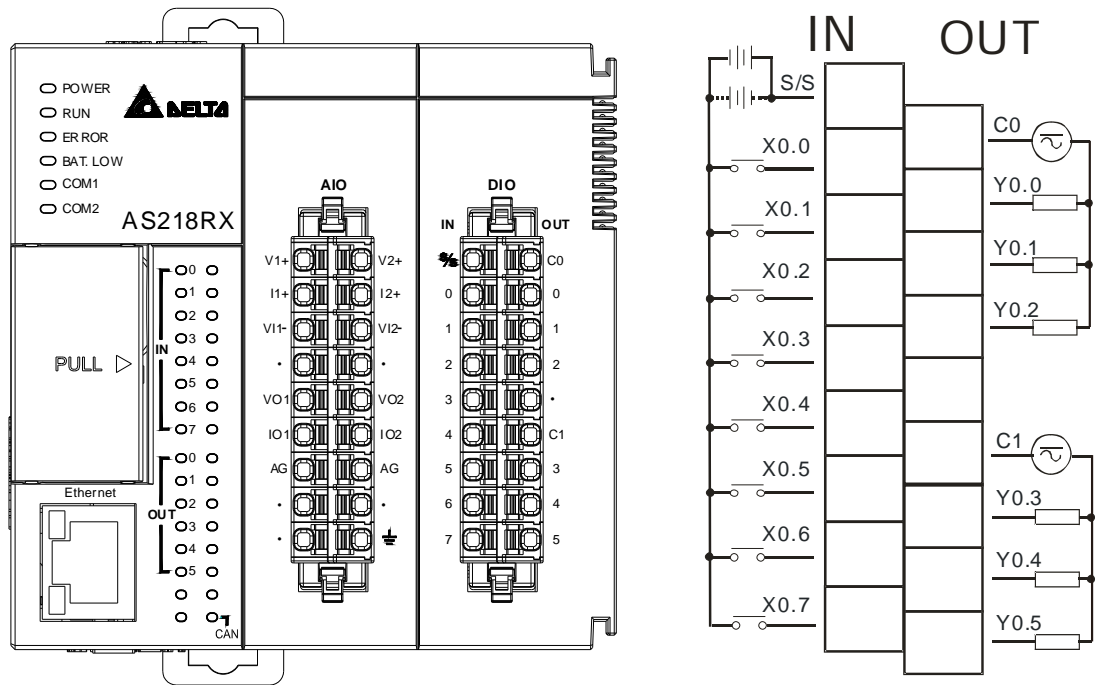
\*1. Refer to section 4.6.9.4 for more details on wiring analog input and output.



4.6.9.2 Wiring AS218RX-A

|                        |   |
|------------------------|---|
| Input form             | Direct current (sinking or sourcing)              |
| Input current/voltage  | 24 VDC, 5 mA                                      |
| Output form            | Relay   |
| Output current/voltage | 240 VAC / 24 VDC, 2A/output, 6A/COM               |
| Analog input*1         | 12 bits, -10V-10V (voltage), -20mA-20mA (current) |
| Analog output*1        | 12 bits, -10V-10V(voltage), 0- 20mA (current)     |

\*1. Refer to section 4.6.9.4 for more details on wiring analog input and output.

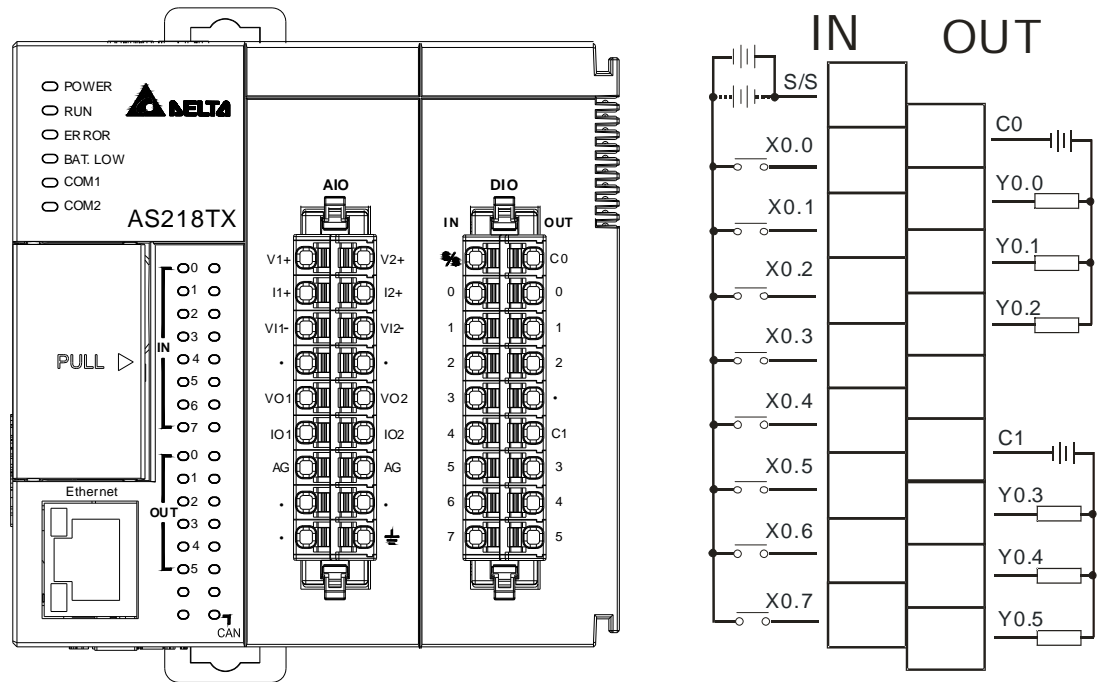




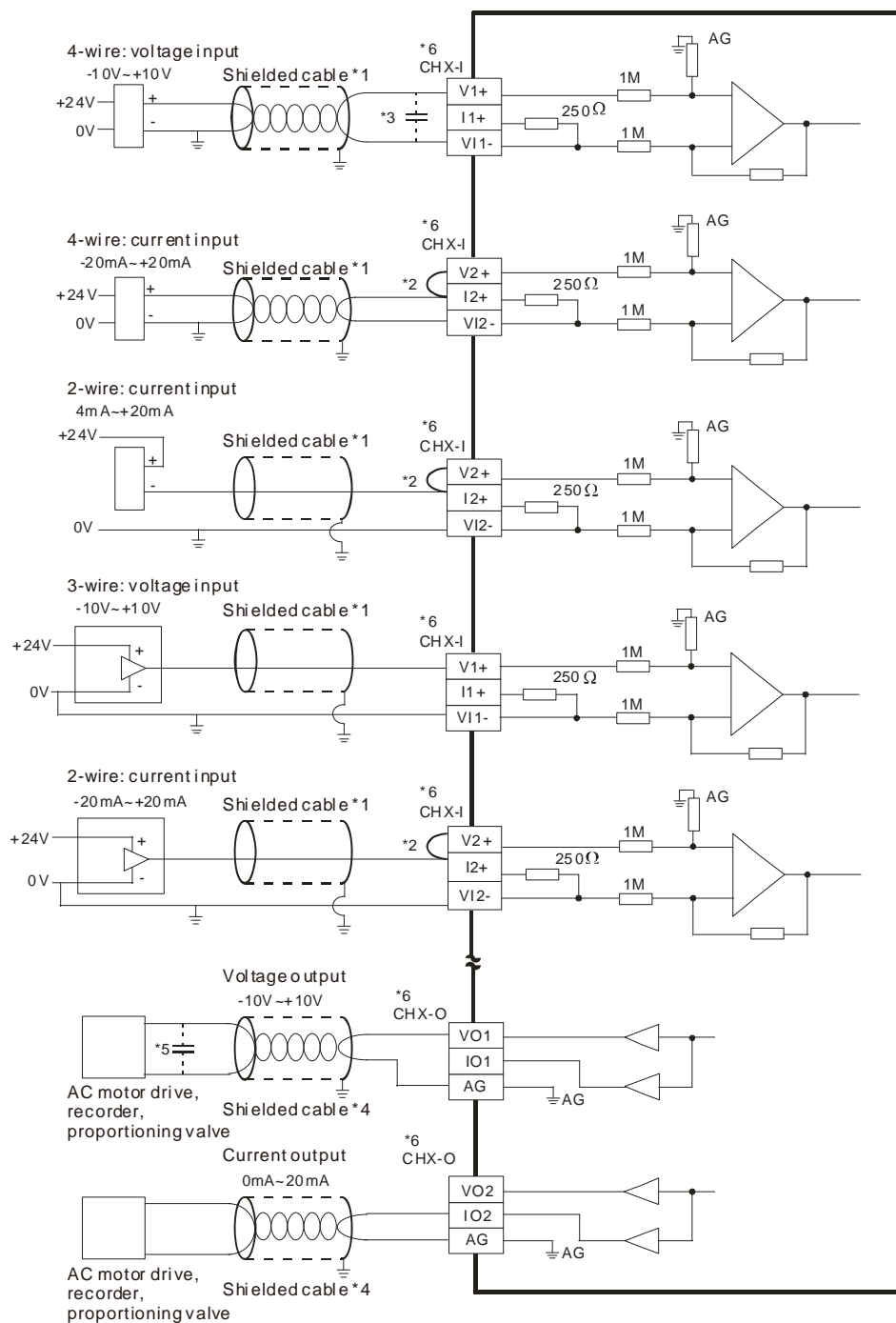
4.6.9.3 Wiring AS218TX-A

|                        |   |
|------------------------|---|
| Input form             | Direct current (sinking or sourcing)              |
| Input current/voltage  | 24 VDC, 5 mA                                      |
| Output form            | Transistor-T (sinking) (NPN)                      |
| Output current/voltage | 5 to 30 VDC, 0.5A/output, 1.5A/COM                |
| Analog input*1         | 12 bits, -10V-10V (voltage), -20mA-20mA (current) |
| Analog output*1        | 12 bits, -10V-10V(voltage), 0- 20mA (current)     |

\*1. Refer to section 4.6.9.4 for more details on wiring analog input and output.



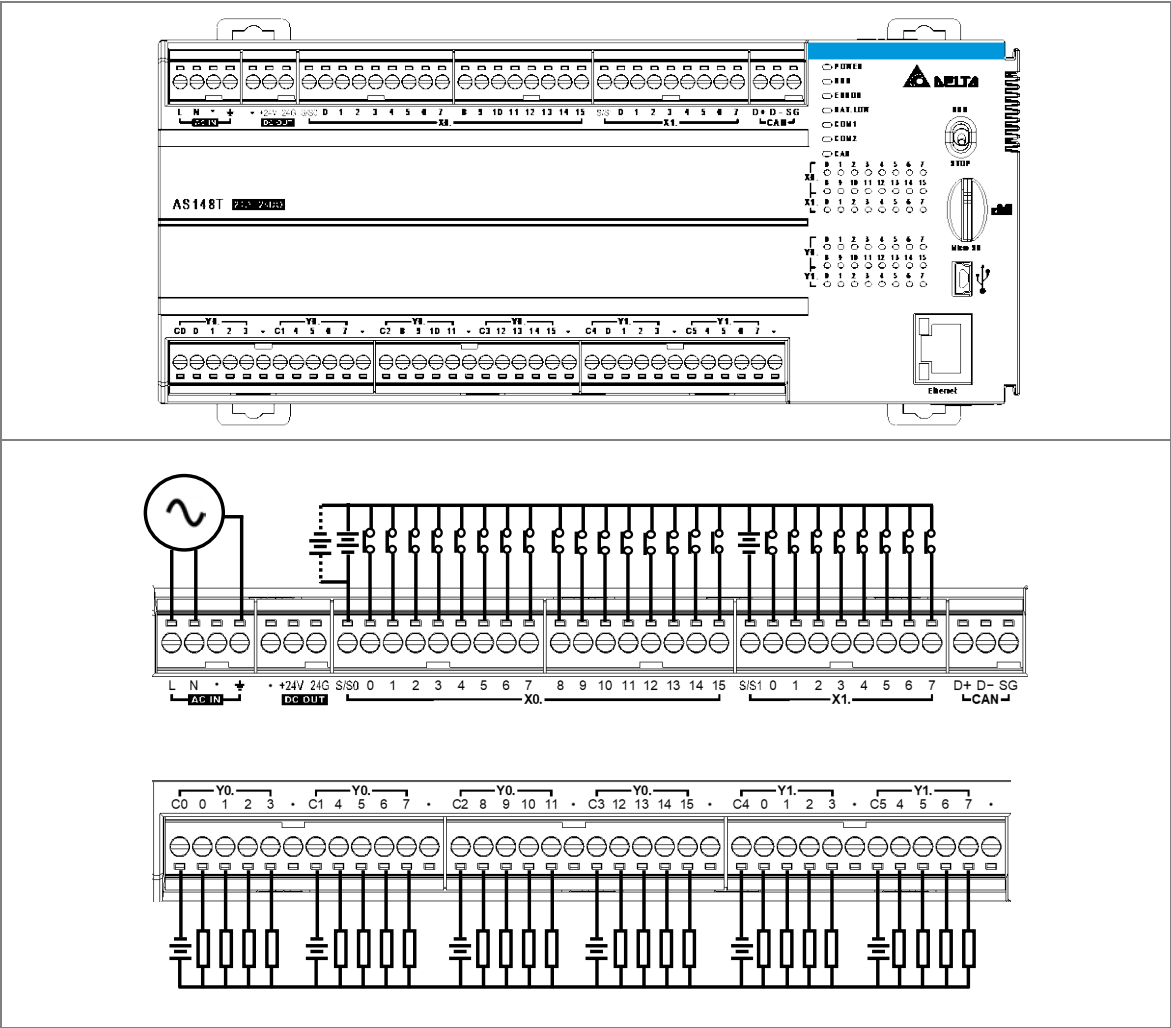
#### 4.6.9.4 Wiring Details on AS218PX-A/AS218RX-A/AS218TX-A



4.6.10 Wiring AS132T-A/AS148T-A/AS164T-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-T (sinking) (NPN)         |
| Output current/voltage | 5 to 30 VDC, 0.5A/output, 2A/COM     |

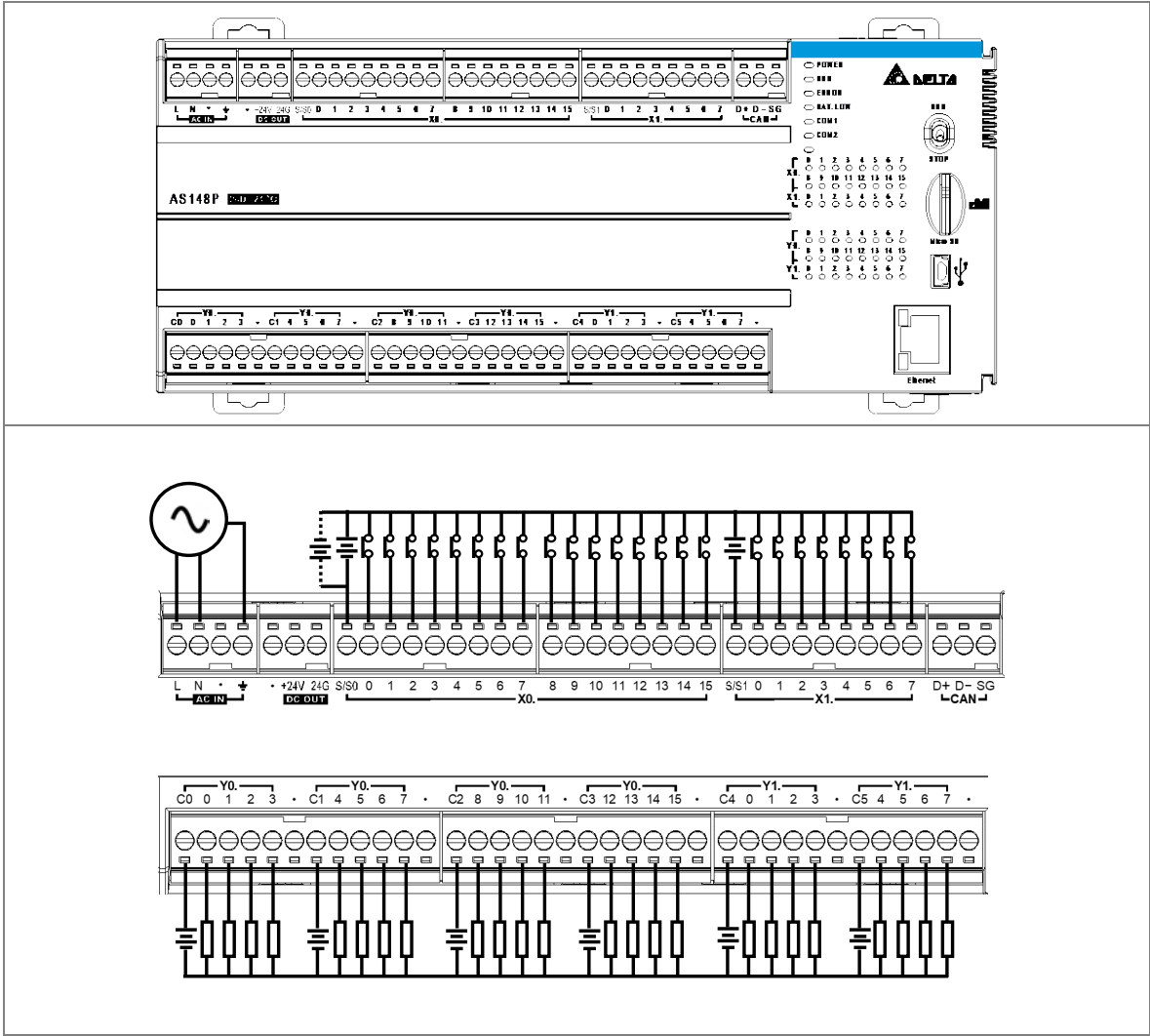
The following illustrations uses AS148T-A as an example. The wiring method is similar to AS132T-A and AS164T-A.



4.6.11 Wiring AS132P-A/AS148P-A/AS164P-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Transistor-P (sourcing) (PNP)        |
| Output current/voltage | 5 to 30 VDC, 0.5A/output, 2A/COM     |

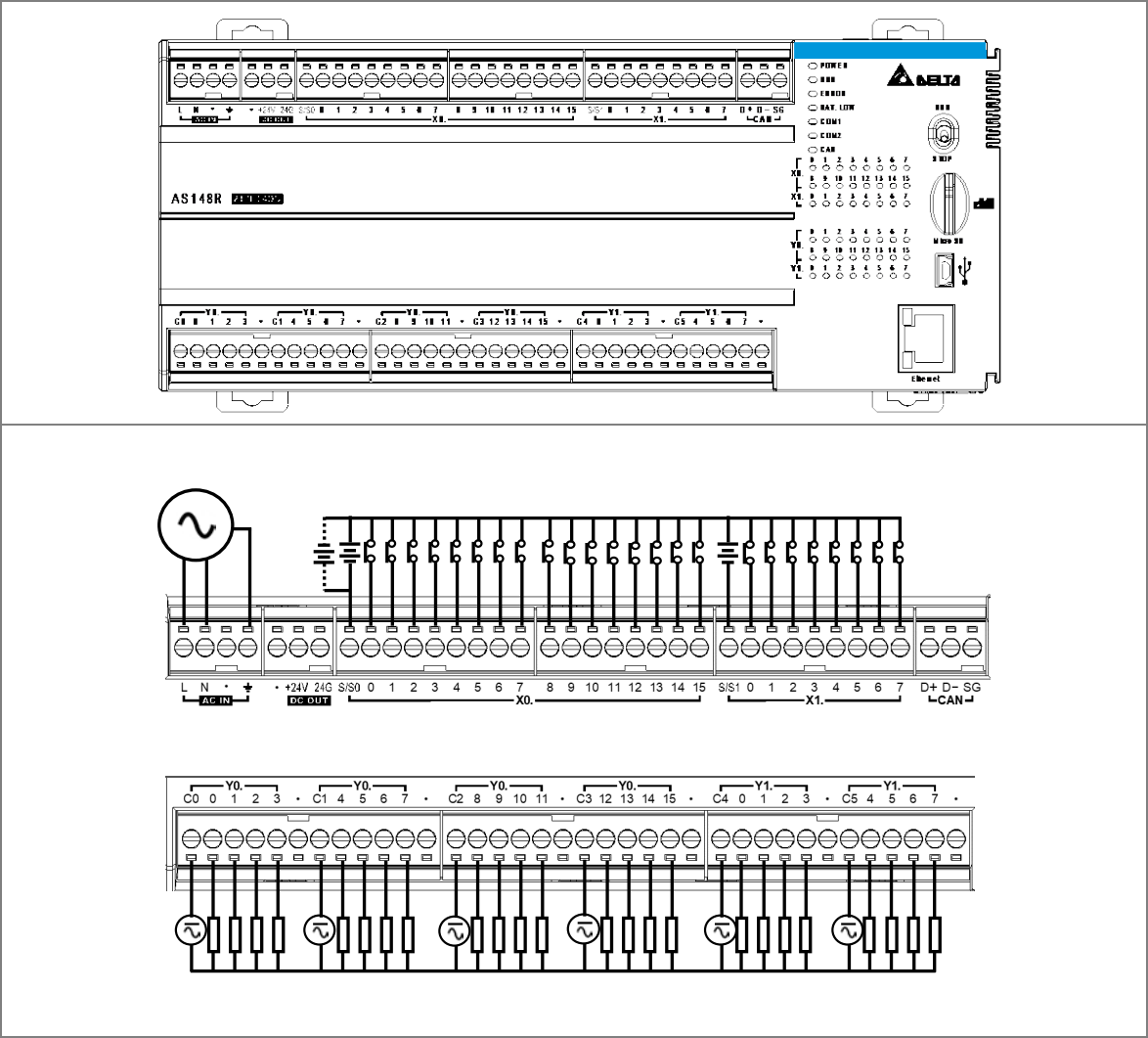
The following illustrations uses AS148P-A as an example. The wiring method is similar to AS132P-A and AS164P-A.



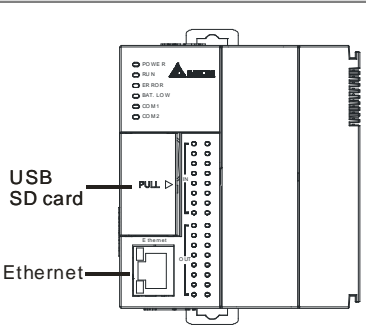
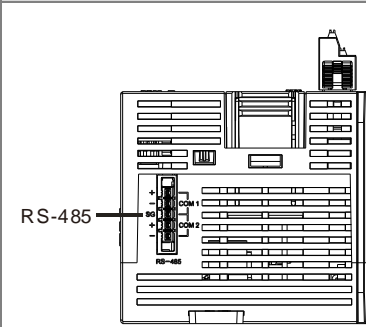
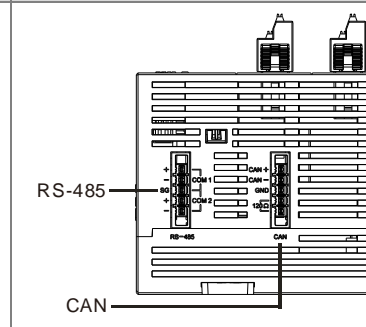
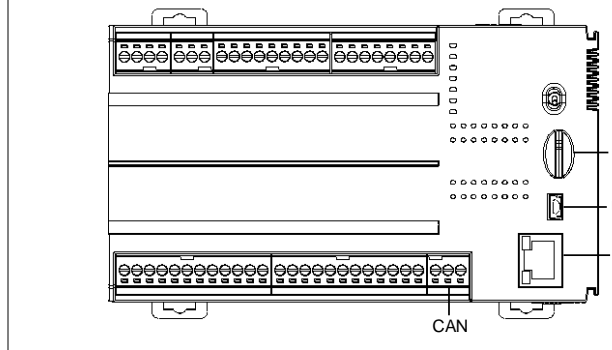
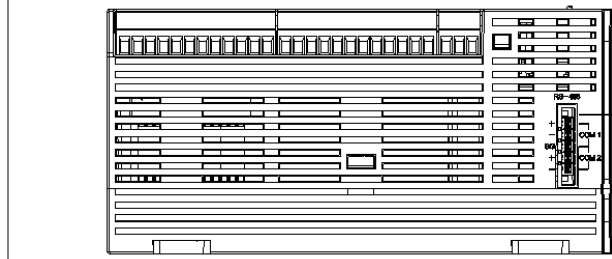
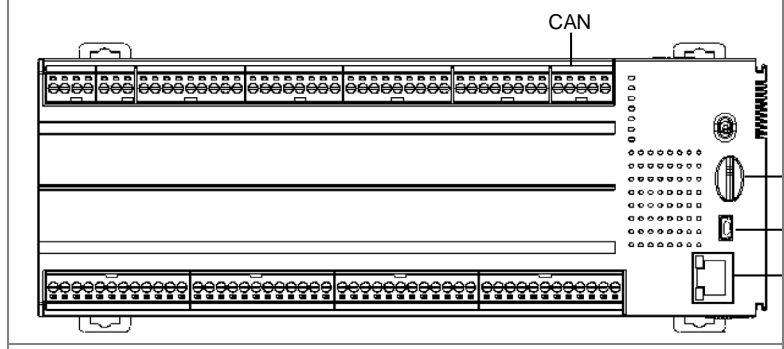
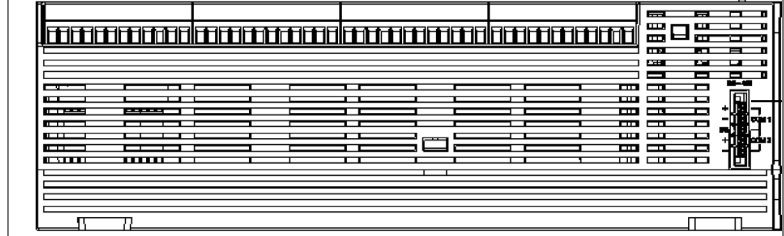
4.6.12 Wiring AS132R-A/AS148R-A/AS164R-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Input current/voltage  | 24 VDC, 5 mA                         |
| Output form            | Relay                                |
| Output current/voltage | 240VAC/24VDC, 2A/output, 5A/COM      |


The following illustrations uses AS148R-A as an example. The wiring method is similar to AS132R-A and AS164R-A.



4.6.13 Wiring AS Series PLC CPU Communication Ports

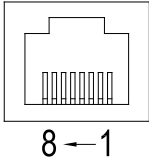
| AS300/AS200 Series  | AS300 Series   | AS200 Series   |
|---|--|--|
|  |     |  |
| AS100 Series  |  |  |
| AS132T/P/R-A  |   |  |
|   |  |  |
| AS148T/P/R-A<br>AS164T/P/R-A  |  |  |
|   |  |  |

● **USB port**

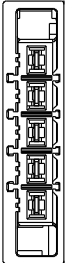
| Pin | Function          | <br>Mini-B |
|-----|-------------------|---|
| 1   | VBUS (4.4–5.25 V) |   |
| 2   | D–                |   |
| 3   | D+                |   |
| 4   | Ground            |   |
| 5   | Ground            |   |

- Refer to Appendix A : Installing a USB Driver, if it is the first time for AS Series to use USB port to communicate.
- Time to use USB port: uploading/downloading PLC programs, monitoring during calibration and upgrading firmware.
- NOT suggested to use USB port: applications that require a long and un-interruptible communication.
- What to do when a communication failure occurs: unplug any communication connector from the USB port and then plug the connector back. After that reconnect and try communication again.

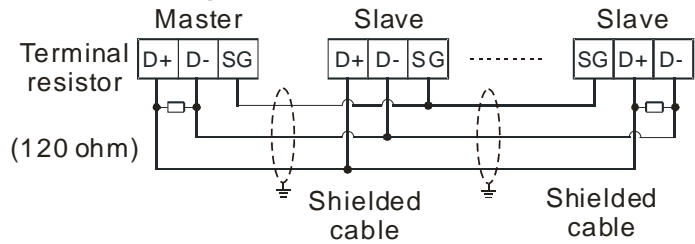
● **Ethernet port**

| Pin | Signal | Description                       | <br>8 ← 1 |
|-----|--------|-----------------------------------|--|
| 1   | TX+    | Transmitting data (positive pole) |  |
| 2   | TX-    | Transmitting data (negative pole) |  |
| 3   | RX+    | Receiving data (positive pole)    |  |
| 4   | --     | N/C                               |  |
| 5   | --     | N/C                               |  |
| 6   | RX-    | Receiving data (negative pole)    |  |
| 7   | --     | N/C                               |  |
| 8   | --     | N/C                               |  |

● **RS485**

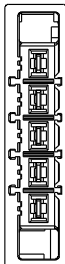
| Pin | Signal | Description   |  |
|-----|--------|---------------|---|
| 1   | +      | COM1 D+       |   |
| 2   | -      | COM1 D-       |   |
| 3   | SG     | Signal Ground |   |
| 4   | +      | COM2 D+       |   |
| 5   | -      | COM2 D-       |   |

■ **RS485 Wiring**



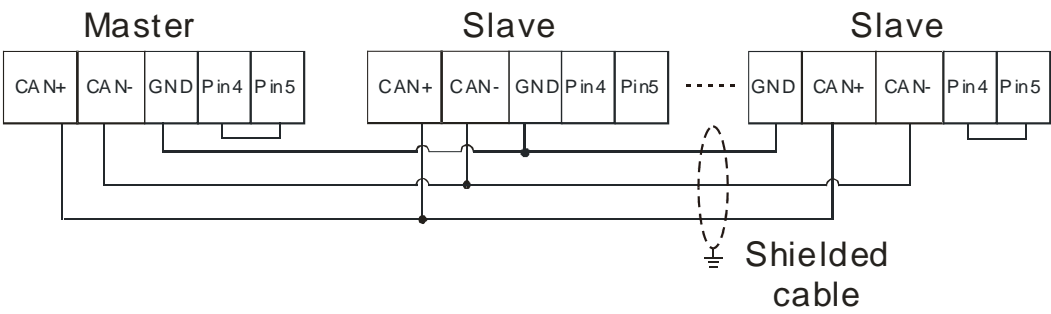
● **CAN Pins and Wiring**

■ **CAN Pins for AS200 / AS300 Series PLC CPU**

| Pin | Signal | Description       |  |
|-----|--------|-------------------|---|
| 1   | CAN+   | CAN_H             |   |
| 2   | CAN-   | CAN_L             |   |
| 3   | GND    | GROUND            |   |
| 4   | 120Ω   | Terminal resistor |   |
| 5   |        |                   |   |

Note: Pin4 and Pin5 must be short-circuited to activate the built-in terminal resistor 120Ω and work as an impedance to reduce noise inference when signal reflections occur and ensure signal can be transmitted normally.

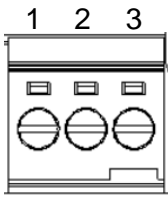
■ **CAN Wiring for AS200 / AS300 Series PLC CPU**

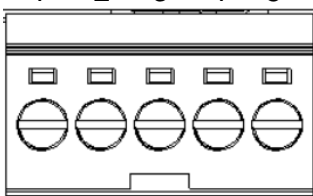


1. It is recommended to use Daisy Chain for connection and be sure to use terminal resistor in the beginning and the end of the terminal arrangement.
2. Pin4 and Pin5 must be short-circuited to activate the built-in terminal resistor 120Ω.



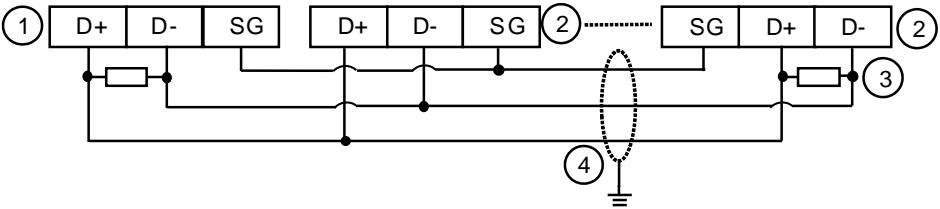
■ CAN Pins for AS100

| AS132T/P/R-A |  |       |       |        |
|--------------|--|-------|-------|--------|
| AS148T/P/R-A |  |       |       |        |
| Terminal     |  |       |       |        |
|              | PIN  | 1     | 2     | 3      |
|              | Signal   | D+    | D-    | SG     |
|              | Description  | CAN_H | CAN_L | GROUND |

| AS164T/P/R-A |   |   |       |       |        |   |
|--------------|---|---|-------|-------|--------|---|
| Terminal     |  |   |       |       |        |   |
|              | PIN   | 1 | 2     | 3     | 4      | 5 |
|              | Signal  | - | D+    | D-    | SG     | - |
|              | Description   | - | CAN_H | CAN_L | GROUND | - |

■ CAN Wiring for AS100

1.
- It is recommended to use Daisy Chain for CANopen network connection and be sure to use 120Ω terminal resistor in the beginning and the end of the terminal arrangement.
2.
- SG is the grounding signal for CANopen network.



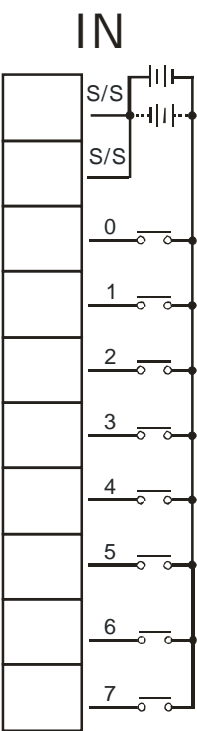
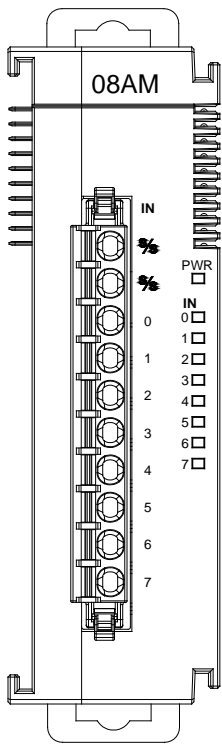
|   |        |   |       |   |                   |   |                |
|---|--------|---|-------|---|-------------------|---|----------------|
| ① | Master | ② | Slave | ③ | Terminal resistor | ④ | Shielded cable |
|---|--------|---|-------|---|-------------------|---|----------------|

## 4.7 Wiring Digital Input/Output Modules

This section illustrates how to wire digital input/output modules. The wiring diagrams below also illustrate how the power supplies are connected to S/S, and COM. If you need more information about wiring of digital input/output terminals, refer to Section 4.8 in this manual.

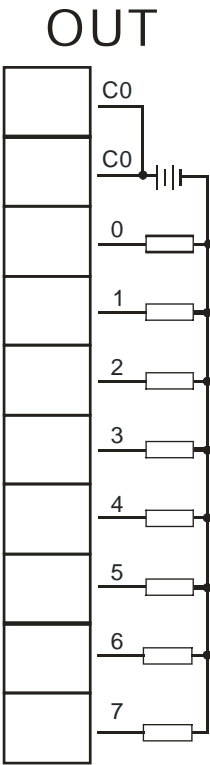
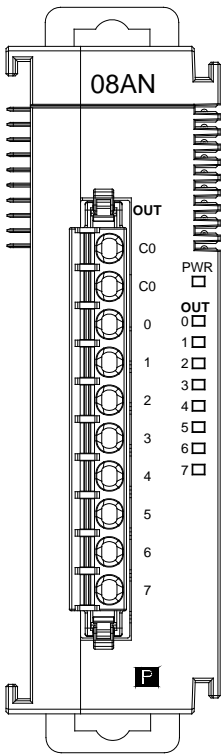
### 4.7.1 Wiring AS08AM10N-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Voltage specifications | 24 VDC, 5 mA                         |



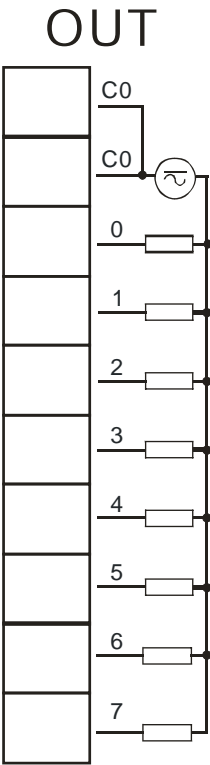
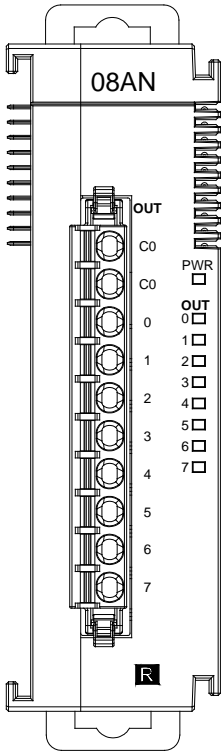
4.7.2 Wiring AS08AN01P-A

|                        |                                  |
|------------------------|----------------------------------|
| Output form            | Transistor-P (sourcing)          |
| Voltage specifications | 5 to 30 VDC, 0.5A/output, 4A/COM |



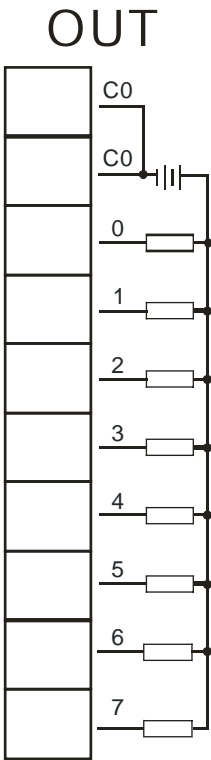
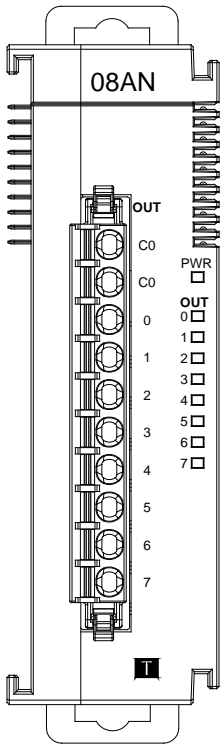
4.7.3   Wiring AS08AN01R-A

|                        |                                |
|------------------------|--------------------------------|
| Output form            | Relay                          |
| Voltage specifications | 5 to 30 VDC, 2A/output, 8A/COM |



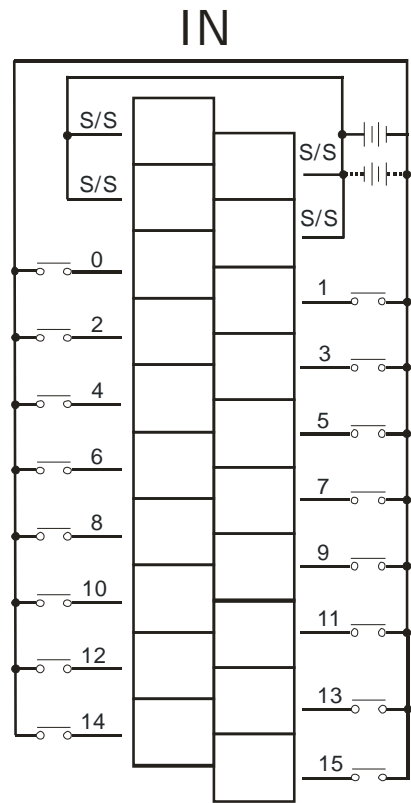
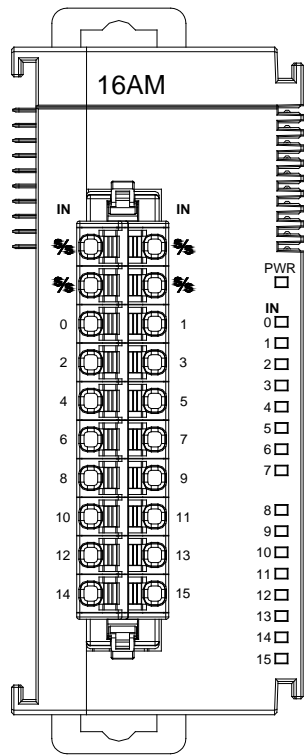
4.7.4 Wiring AS08AN01T-A

|                        |                                  |
|------------------------|----------------------------------|
| Output type            | Transistor-T (sinking)           |
| Voltage specifications | 5 to 30 VDC, 0.5A/output, 4A/COM |



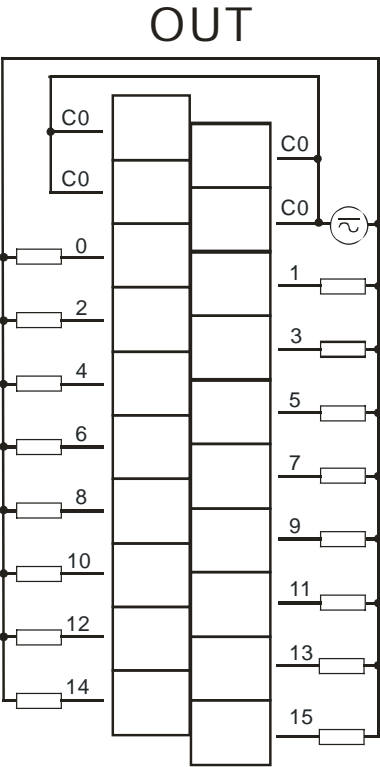
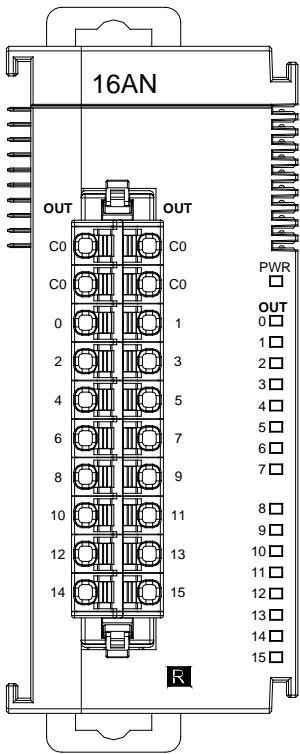
4.7.5 Wiring AS16AM10N-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input type             | Direct current (sinking or sourcing) |
| Voltage specifications | 24 VDC, 5 mA                         |



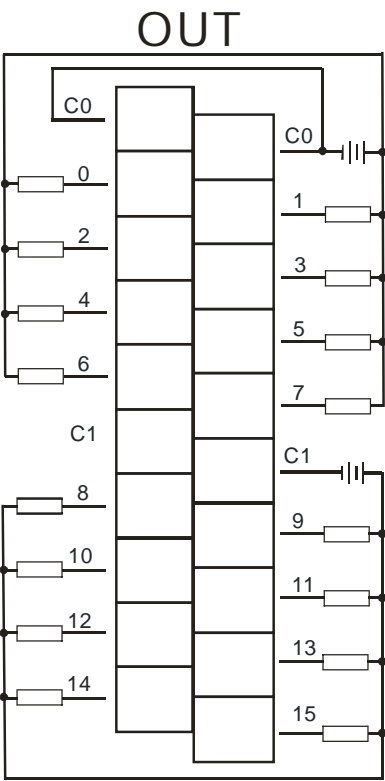
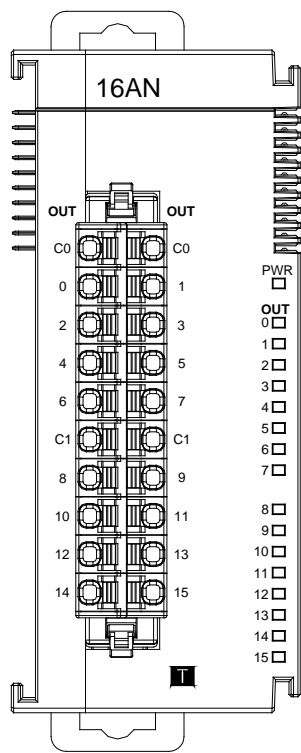
4.7.6 Wiring AS16AN01R-A

|                        |                                   |
|------------------------|-----------------------------------|
| Output type            | Relay                             |
| Voltage specifications | 240 VAC/24 VDC, 2A/output, 8A/COM |



4.7.7   Wiring AS16AN01T-A

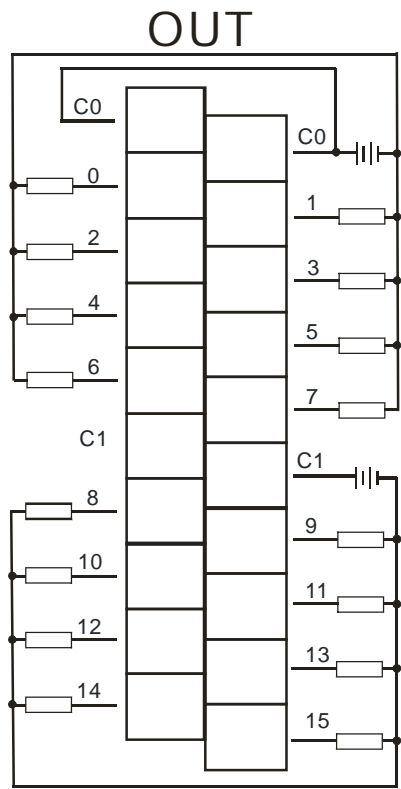
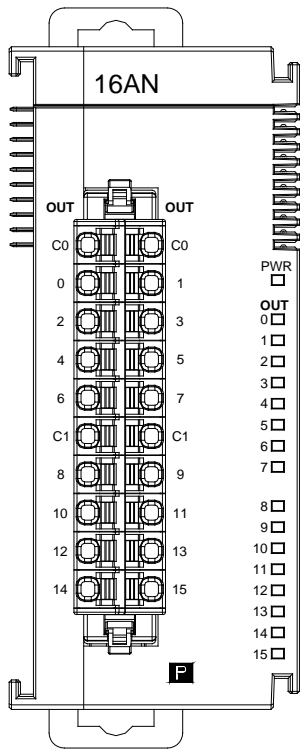
|                        |                                  |
|------------------------|----------------------------------|
| Output type            | Transistor-T (sinking)           |
| Voltage specifications | 5 to 30 VDC, 0.5A/output, 4A/COM |





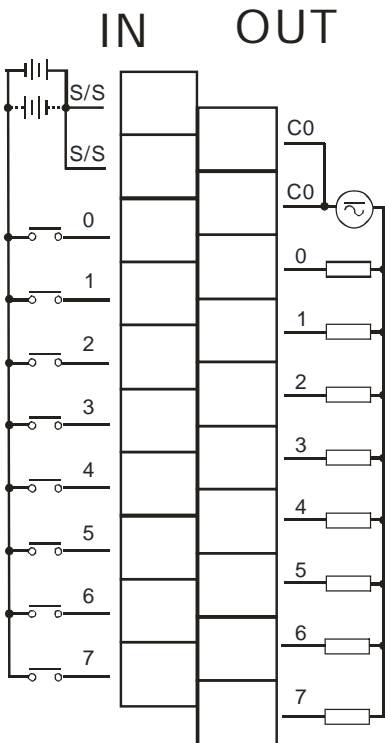
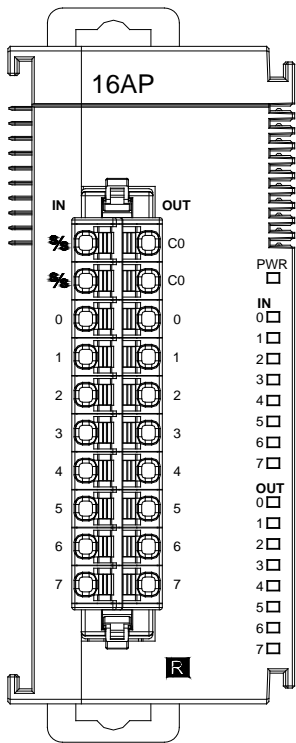
4.7.8 Wiring AS16AN01P-A

|                        |                                  |
|------------------------|----------------------------------|
| Output type            | Transistor-P (sourcing)          |
| Voltage specifications | 5 to 30 VDC, 0.5A/output, 4A/COM |



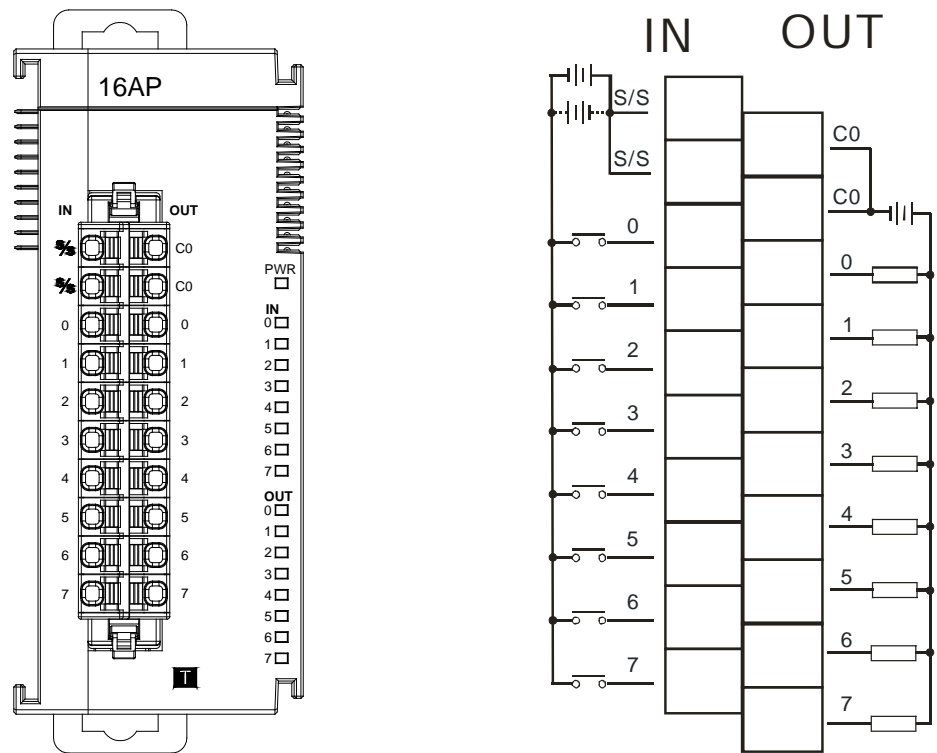
4.7.9 Wiring AS16AP11R-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Voltage specifications | 24 VDC, 5 mA                         |
| Output type            | Relay                                |
| Voltage specifications | 240 VAC/24 VDC, 2 A/inputs, 8 A/COM  |



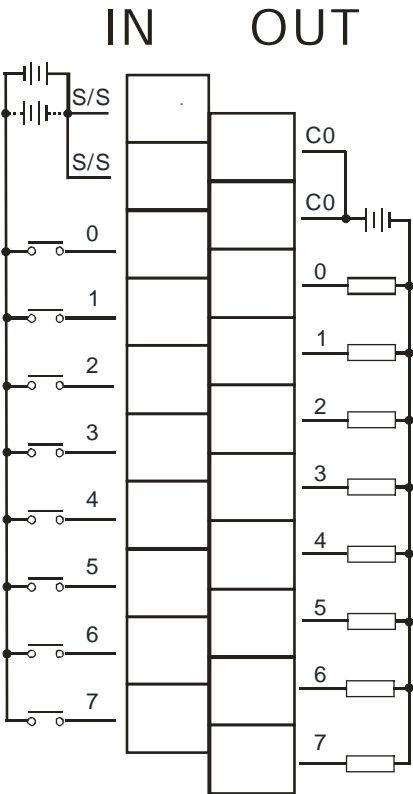
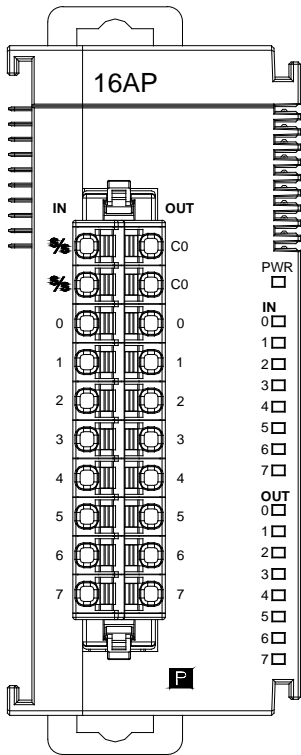
4.7.10 Wiring AS16AP11T-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Voltage specifications | 24 VDC, 5 mA                         |
| Output type            | Transistor-T (sinking)               |
| Voltage specifications | 5 to 30 VDC, 0.5A/output, 4A/COM     |



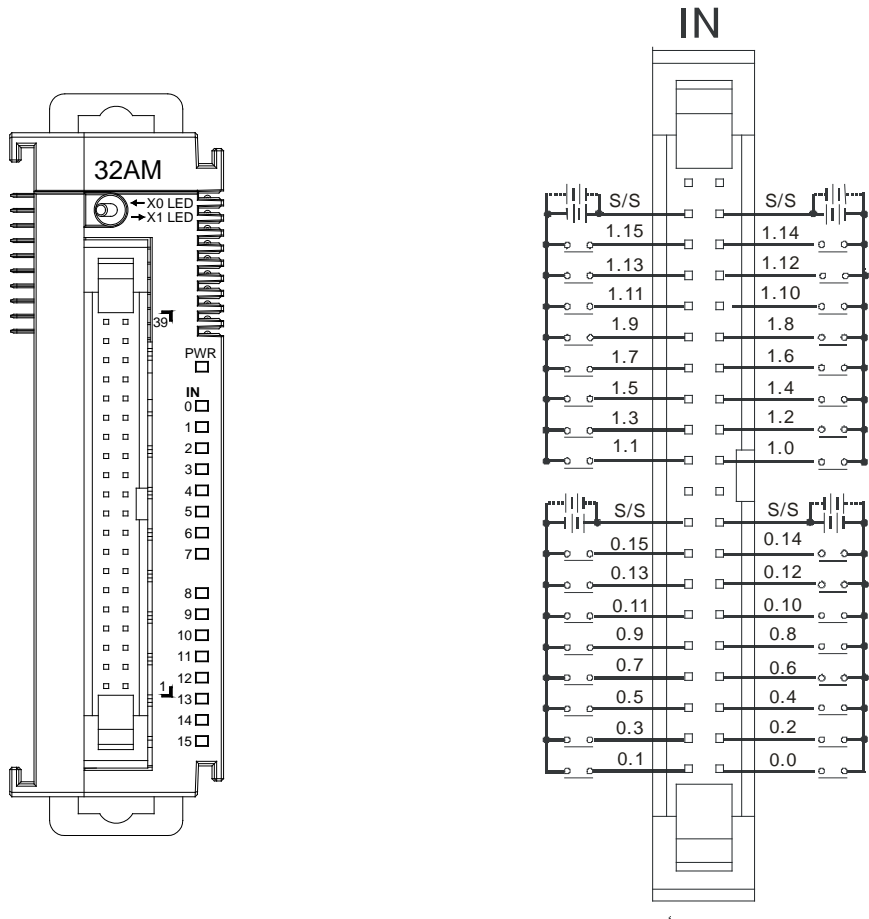
4.7.11 Wiring AS16AP11P-A

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Voltage specifications | 24 VDC, 5 mA                         |
| Output type            | Transistor-P (sourcing)              |
| Voltage specifications | 5 to 30 VDC, 0.5A/output, 4A/COM     |



4.7.12 Wiring AS32AM10N-A

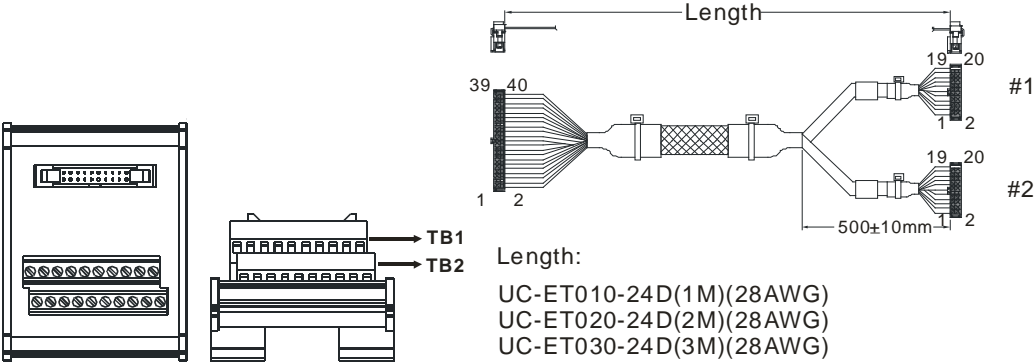
|               |                                      |
|---------------|--------------------------------------|
| Input form    | Direct current (sinking or sourcing) |
| Input current | 24 VDC, 5 mA                         |



- Wiring the External Terminal Module UB-10-ID16A

For cables that can only be connected to the cables of group #2, see below.

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Voltage specifications | 24 VDC, 5 mA                         |

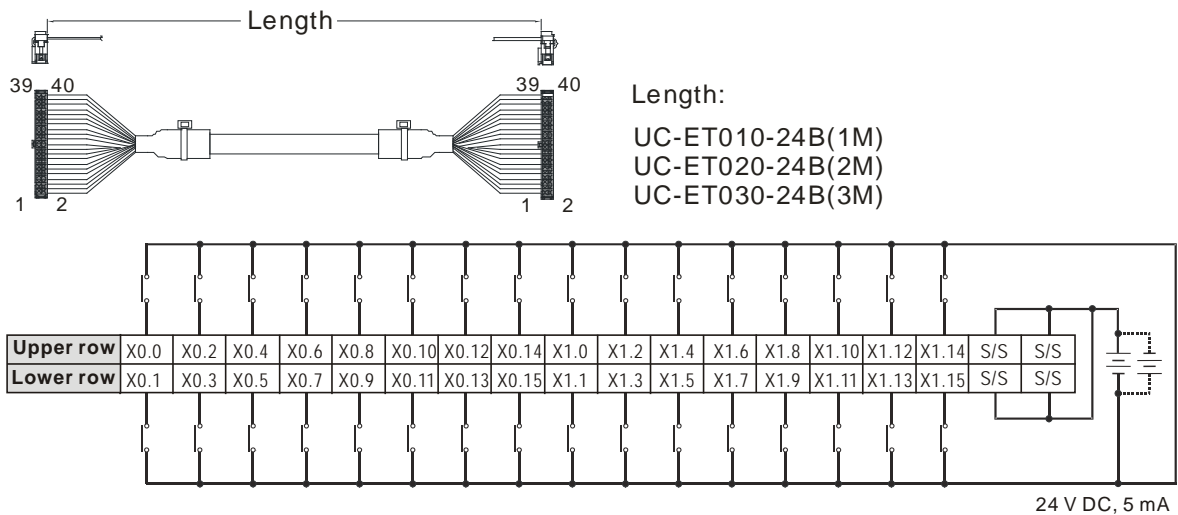


Length:  
UC-ET010-24D(1M)(28AWG)  
UC-ET020-24D(2M)(28AWG)  
UC-ET030-24D(3M)(28AWG)

|    |     |      |      |      |      |      |       |       |       |     |   |
|----|-----|------|------|------|------|------|-------|-------|-------|-----|---|
| #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 | - |

● Wiring the External Terminal Module UB-10-ID32A

|                       |                                      |
|-----------------------|--------------------------------------|
| Input form            | Direct current (sinking or sourcing) |
| Input current/voltage | 24 VDC, 5 mA                         |

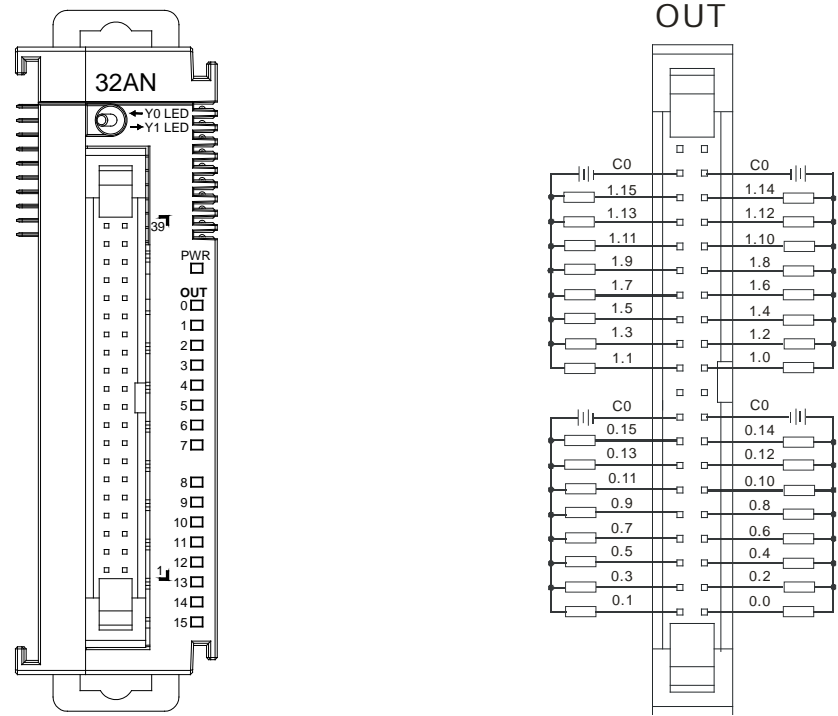


Note: UB-10-ID32A can be used with AS Series and DVP Series. The indications on the UB-10-ID32A board is for DVP Series. For the definitions of terminal connections for AS Series, you can see the reference table below. Or refer to the enclosed sticker for AS Series.

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

4.7.13    Wiring AS32AN02T-A

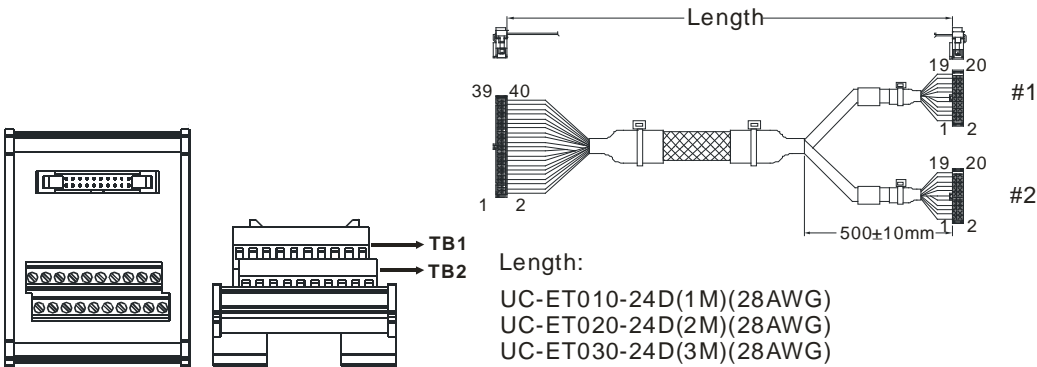
|                        |                                    |
|------------------------|------------------------------------|
| Output form            | Transistor-T (sinking)             |
| Voltage specifications | 5 to 30 VDC, 0.1A/output, 3.2A/COM |



- Wiring the External Terminal Module UB-10-ID16A

For cables that can only be connected to the cables of group #1, see below.

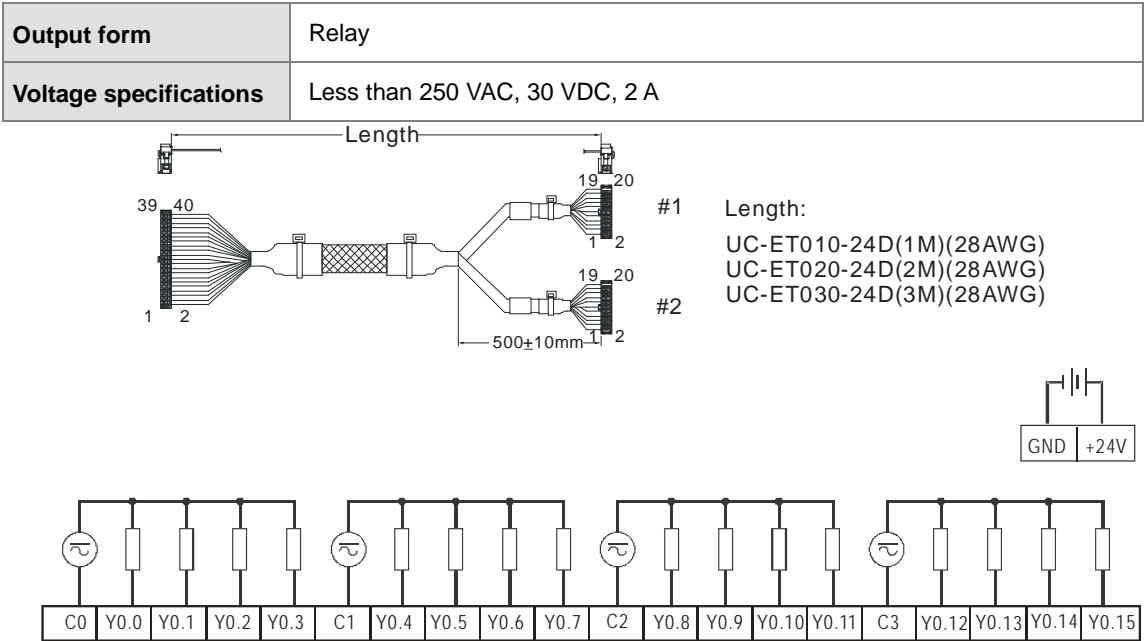
|                        |                        |
|------------------------|------------------------|
| Output form            | Transistor-T (sinking) |
| Voltage specifications | 5 to 30 VDC, 0.1 A     |



|    |     |      |      |      |      |      |       |       |       |    |   |
|----|-----|------|------|------|------|------|-------|-------|-------|----|---|
| #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 | - |

● Wiring the External Terminal Module UB-10-OR16A

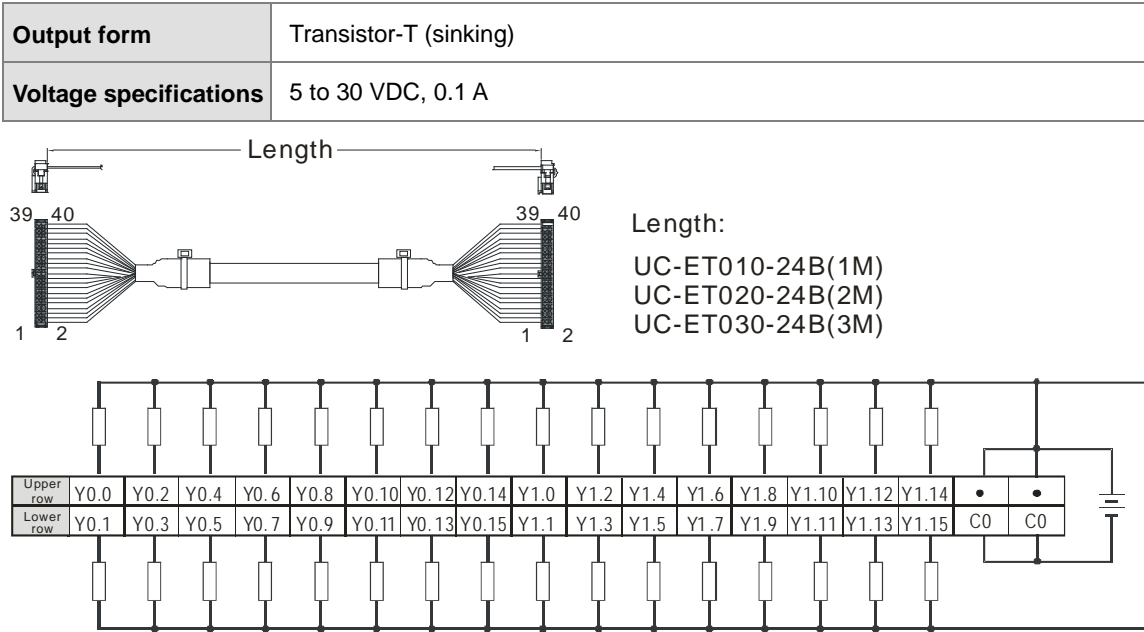
For cables that can only be connected to the cables of group #1, see below.



Note: UB-10-OR16A can be used with AS Series and DVP Series. The indications on the UB-10-OR16A board is for DVP Series. For the definitions of terminal connections for AS Series, you can see the reference table below. Or refer to the enclosed sticker for AS Series.

|     |    |      |      |      |      |    |      |      |      |      |    |      |      |       |       |    |       |       |       |       |
|-----|----|------|------|------|------|----|------|------|------|------|----|------|------|-------|-------|----|-------|-------|-------|-------|
| AS  | 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 |
| DVP | C0 | Y0   | Y1   | Y2   | Y3   | C1 | Y4   | Y5   | Y6   | Y7   | C2 | Y10  | Y11  | Y12   | Y13   | C3 | Y14   | Y15   | Y16   | Y17   |

● Wiring the External Terminal Module UB-10-OT32A



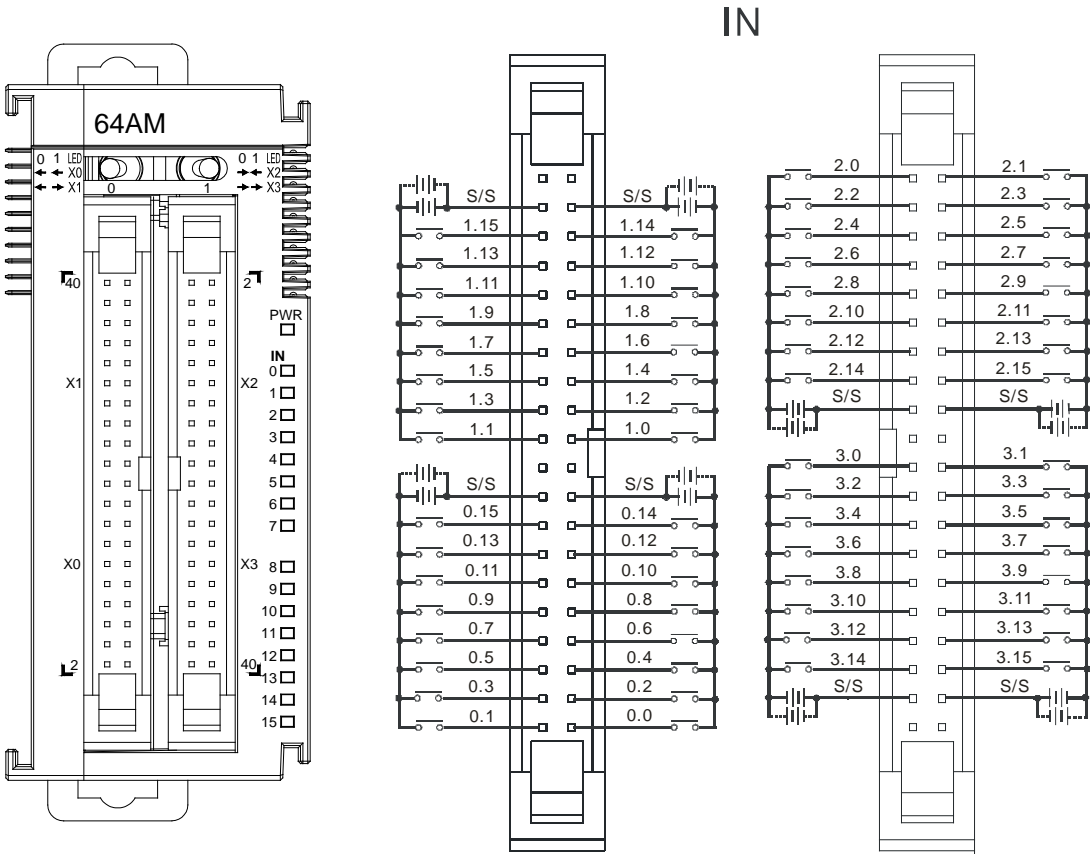


Note: UB-10-OT32A can be used with AS Series and DVP Series. The indications on the UB-10-OT32A board is for DVP Series. For the definitions of terminal connections for AS Series, you can see the reference table below. Or refer to the enclosed sticker for AS Series.

| Upper<br>row | AS  | 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 | ●  | ●  |
|--------------|-----|------|------|------|------|------|-------|-------|-------|------|------|------|------|------|-------|-------|-------|----|----|
|              | DVP | Y0   | Y2   | Y4   | Y6   | Y10  | Y12   | Y14   | Y16   | Y20  | Y22  | Y24  | Y26  | Y30  | Y32   | Y34   | Y36   | ●  | ●  |
| Lower<br>row | DVP | Y1   | Y3   | Y5   | Y7   | Y11  | Y13   | Y15   | Y17   | Y21  | Y23  | Y25  | Y27  | Y31  | Y33   | Y35   | Y37   | C0 | C0 |
|              | AS  | 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 |

4.7.14    Wiring AS64AM10N-A

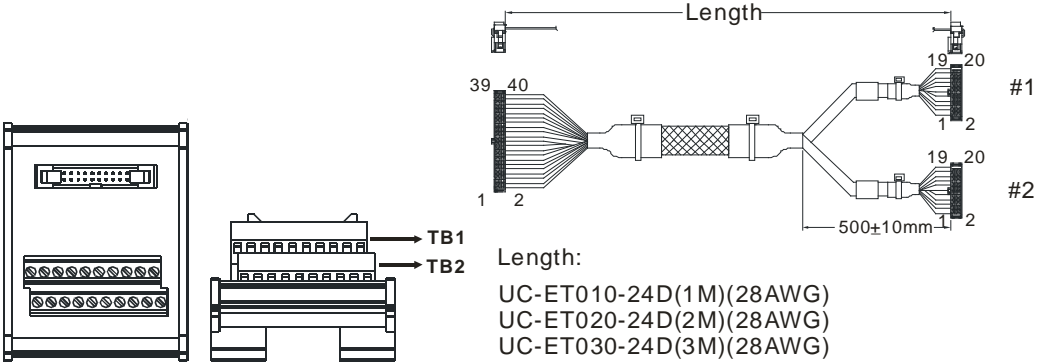
|                        |                                      |
|------------------------|--------------------------------------|
| Input type             | Direct current (sinking or sourcing) |
| Voltage specifications | 24 VDC, 5 mA                         |



- Wiring the External Terminal Module UB-10-ID16A

For cables that can only be connected to the cables of group #2, see below.

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Voltage specifications | 24 VDC, 5 mA                         |

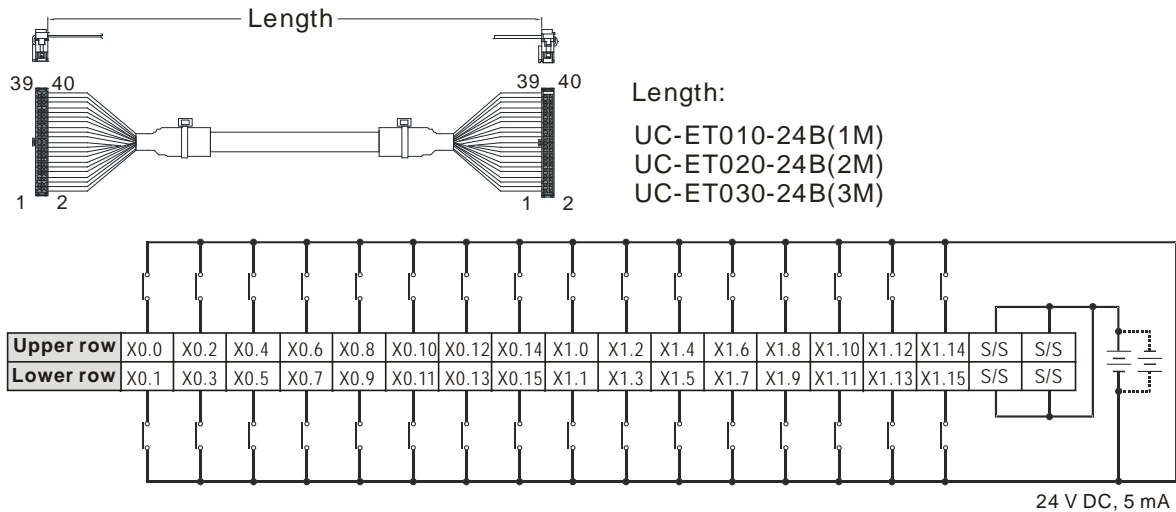


|    |     |      |      |      |      |      |       |       |       |     |   |
|----|-----|------|------|------|------|------|-------|-------|-------|-----|---|
| #2 | TB1 | X0.0 | X0.2 | X0.4 | X0.6 | X0.8 | X0.10 | X0.12 | X0.14 | S/S | - |
|    | TB2 | X0.1 | X0.3 | X0.5 | X0.7 | X0.9 | X0.11 |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

●     Wiring the External Terminal Module UB-10-ID32A

For cables that can only be connected to the cables of group #2, see below.

|                        |                                      |
|------------------------|--------------------------------------|
| Input form             | Direct current (sinking or sourcing) |
| Voltage specifications | 24VDC, 5mA                           |



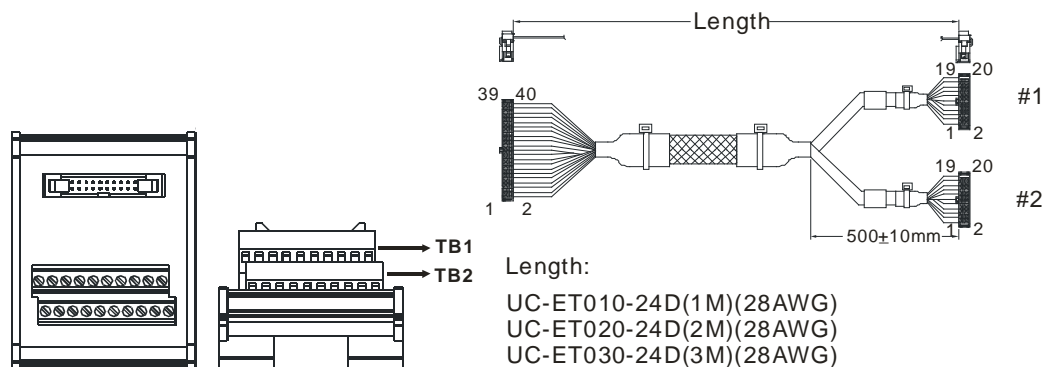
Note: UB-10-ID32A can be used with AS Series and DVP Series. The indications on the UB-10-ID32A board is for DVP Series. For the definitions of terminal connections for AS Series, you can see the reference table below.  
Or refer to the enclosed sticker for AS Series.

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

|                               |                                    |
|-------------------------------|------------------------------------|
| <b>Output type</b>            | Transistor-T (sinking)             |
| <b>Voltage specifications</b> | 5 to 30 VDC, 0.1A/output, 3.2A/COM |

- For cables that can only be connected to the cables of group #1, see below.

|                               |                        |
|-------------------------------|------------------------|
| <b>Output type</b>            | Transistor-T (sinking) |
| <b>Voltage specifications</b> | 5 to 30 VDC, 0.1 A     |

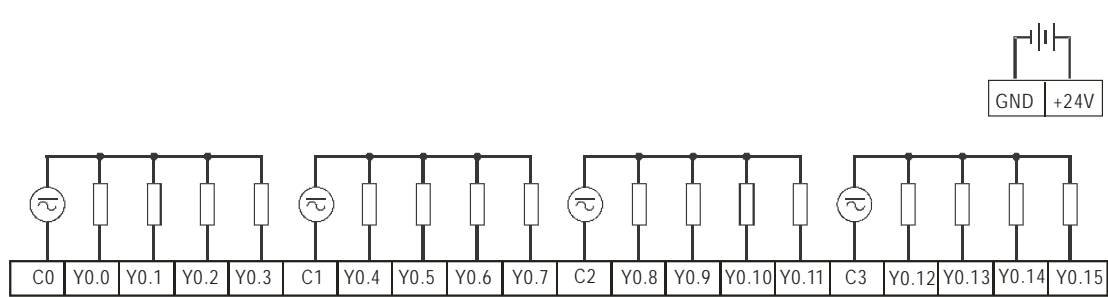
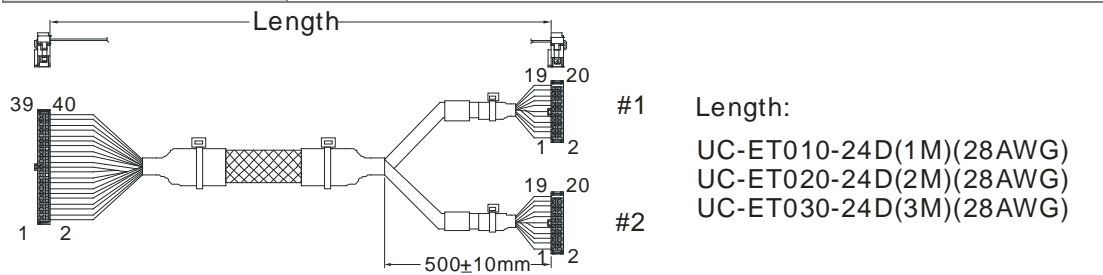


|    |     |      |      |      |      |      |       |       |       |    |   |
|----|-----|------|------|------|------|------|-------|-------|-------|----|---|
| #1 | TB1 | Y0.0 | Y0.2 | Y0.4 | Y0.6 | Y0.8 | Y0.10 | Y0.12 | Y0.14 | C0 | - |
|    | TB2 | Y0.1 | Y0.3 | Y0.5 | Y0.7 | Y0.9 | Y0.11 | Y0.13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

●     Wiring the External Terminal Module UB-10-OR16A

For cables that can only be connected to the cables of group #1, see below.

|                        |                                |
|------------------------|--------------------------------|
| Output form            | Relay                          |
| Voltage specifications | Less than 250 VAC, 30 VDC, 2 A |

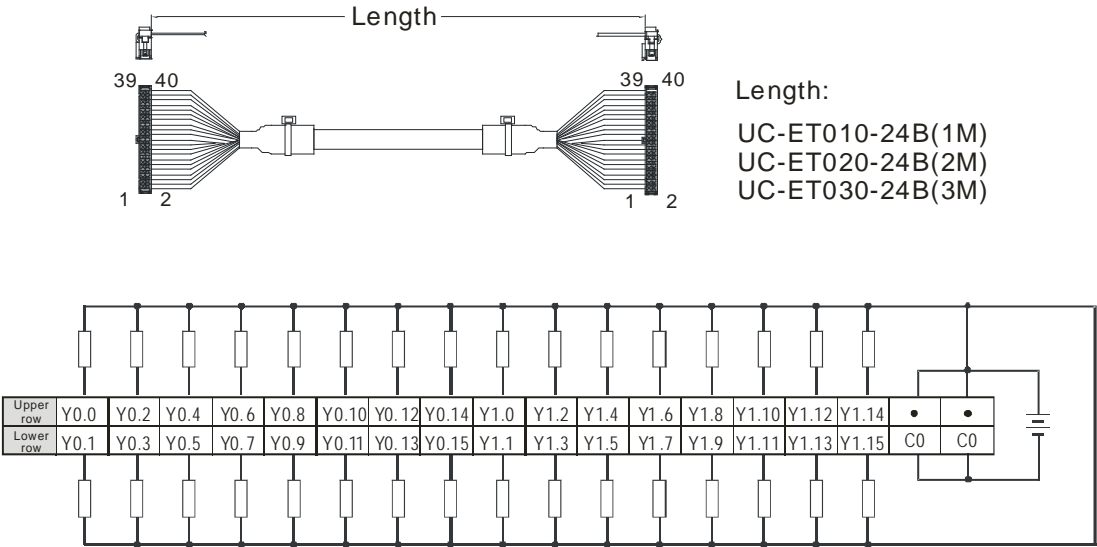


Note: UB-10-OR16A can be used with AS Series and DVP Series. The indications on the UB-10-OR16A board is for DVP Series. For the definitions of terminal connections for AS Series, you can see the reference table below. Or refer to the enclosed sticker for AS Series.

|     |    |      |      |      |      |    |      |      |      |      |    |      |      |       |       |    |       |       |       |       |
|-----|----|------|------|------|------|----|------|------|------|------|----|------|------|-------|-------|----|-------|-------|-------|-------|
| AS  | 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 |
| DVP | C0 | Y0   | Y1   | Y2   | Y3   | C1 | Y4   | Y5   | Y6   | Y7   | C2 | Y10  | Y11  | Y12   | Y13   | C3 | Y14   | Y15   | Y16   | Y17   |

● Wiring the External Terminal Module UB-10-OT32A

|                        |                        |
|------------------------|------------------------|
| Output type            | Transistor-T (sinking) |
| Voltage specifications | 5 to 30 VDC, 0.1 A     |



Note: UB-10-OT32A can be used with AS Series and DVP Series. The indications on the UB-10-OT32A board is for DVP Series. For the definitions of terminal connections for AS Series, you can see the reference table below. Or refer to the enclosed sticker for AS Series.

|           |     |      |      |      |      |      |       |       |       |      |      |      |      |      |       |       |       |    |    |
|-----------|-----|------|------|------|------|------|-------|-------|-------|------|------|------|------|------|-------|-------|-------|----|----|
| Upper row | AS  | 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 | ●  | ●  |
|           | DVP | Y0   | Y2   | Y4   | Y6   | Y10  | Y12   | Y14   | Y16   | Y20  | Y22  | Y24  | Y26  | Y30  | Y32   | Y34   | Y36   | ●  | ●  |
| Lower row | DVP | Y1   | Y3   | Y5   | Y7   | Y11  | Y13   | Y15   | Y17   | Y21  | Y23  | Y25  | Y27  | Y31  | Y33   | Y35   | Y37   | C0 | C0 |
|           | AS  | 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 |

## 4.8 Wiring Digital Input/Output Terminals

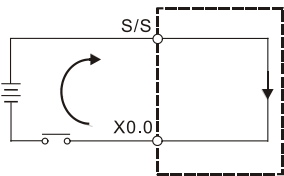
### 4.8.1 Wiring Digital Input Terminals

#### 4.8.1.1 Sinking and Sourcing

The input signal is the 24 VDC power input. Sinking and sourcing are the current driving capabilities of a circuit. They are defined as follows.

- Sinking

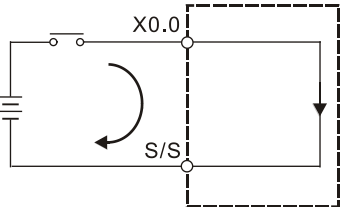
Sinking=The current flows into the common terminal S/S.



The diagram shows a 24VDC power source connected to a switch. The switch is connected to terminal X0.0. The other side of the switch is connected to the common terminal S/S. A dashed box encloses the switch and the S/S terminal. An arrow indicates current flowing from the switch into the S/S terminal.

- Sourcing

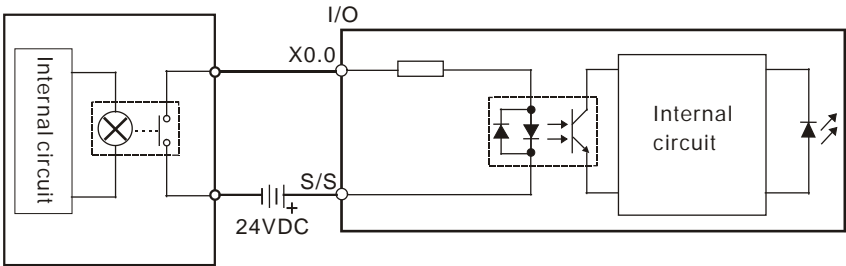
Sourcing=The current flows from the common terminal S/S.



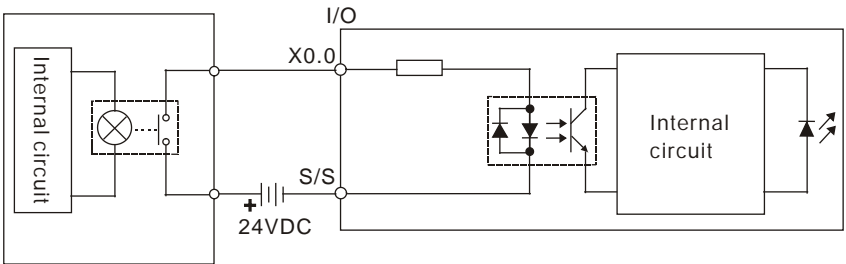
The diagram shows a 24VDC power source connected to a switch. The switch is connected to terminal X0.0. The other side of the switch is connected to the common terminal S/S. A dashed box encloses the switch and the S/S terminal. An arrow indicates current flowing from the S/S terminal into the switch.

#### 4.8.1.2 Relay Type

- Sinking



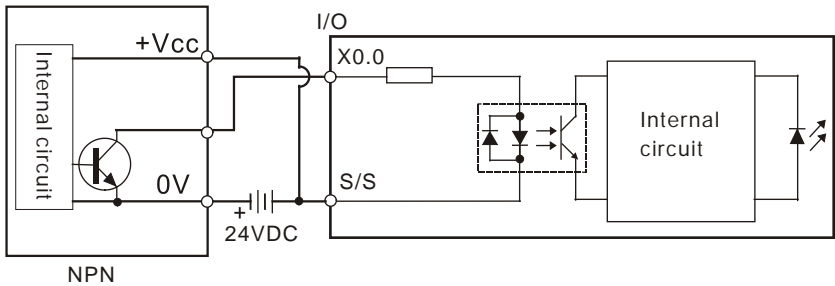
- Sourcing



4.8.1.3 Open-collector Input Type

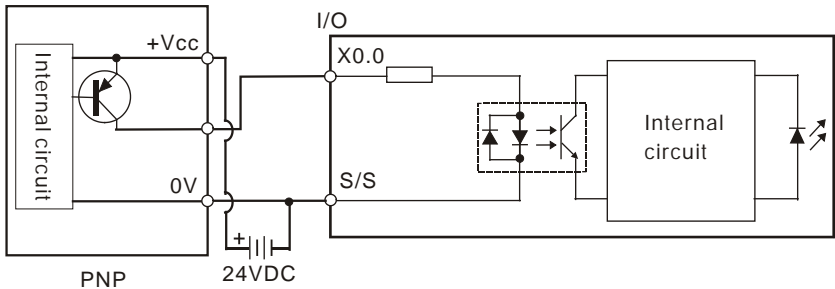
- Sinking

(NPN transistor whose collector is open)



- Sourcing

(PNP transistor whose collector is open)

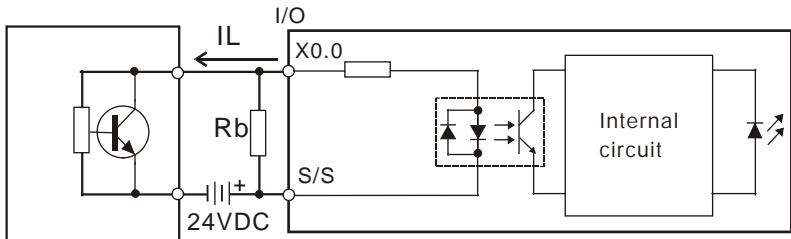


4.8.1.4 Two-wire Proximity Switch

Use the two-wire proximity switch whose leakage current  $I_L$  is less than 1.5 mA when the switch is OFF. If the leakage current is larger than 1.5 mA, connect the divider resistance  $R_b$  using the formula below.

$$R_b \leq \frac{6}{I_L - 1.5} \text{ (k } \Omega \text{)}$$

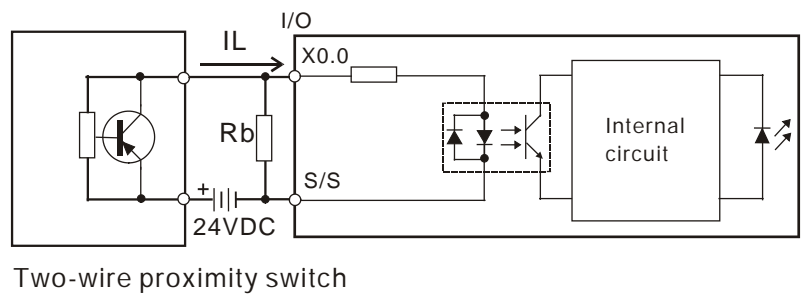
- Sinking



Two-wire proximity switch

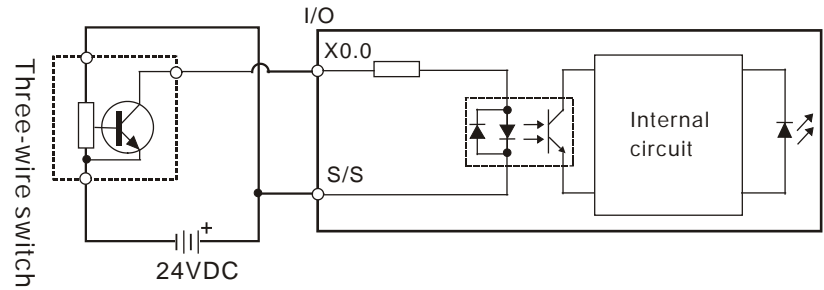


- Sourcing

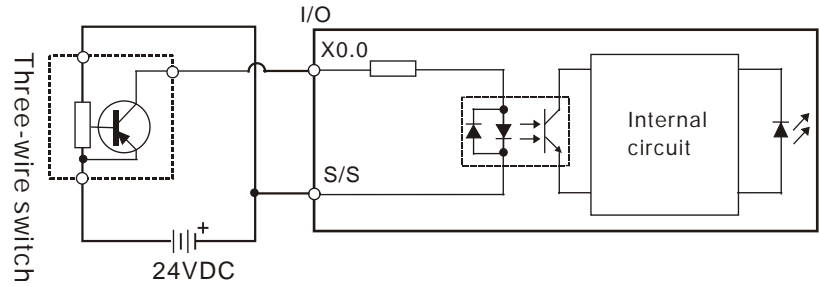


4.8.1.5 Three-wire Switch

- Sinking

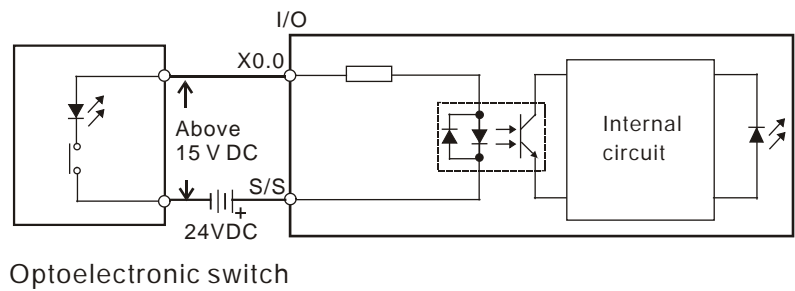


- Sourcing

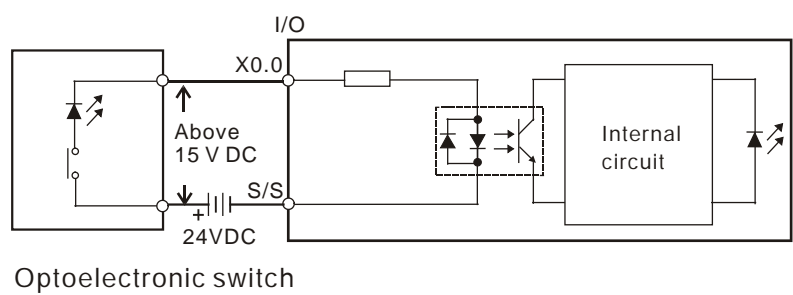


4.8.1.6 Optoelectronic Switch

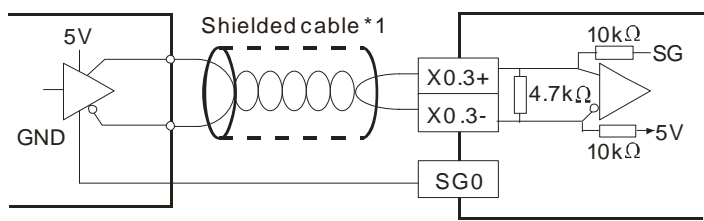
- Sinking



- Sourcing



4.8.1.7 Differential Input

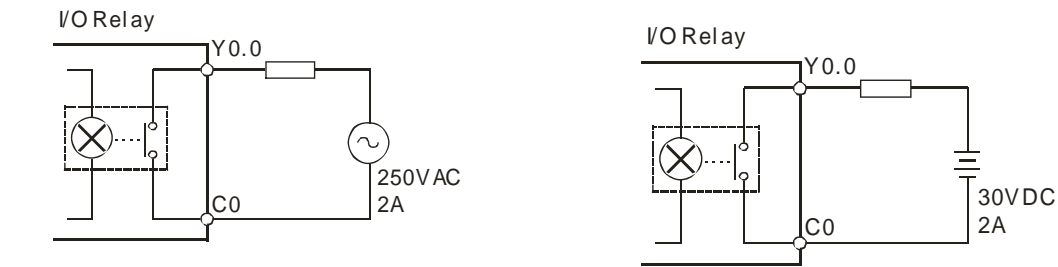


## 4.8.2 Wiring Digital Output Terminals

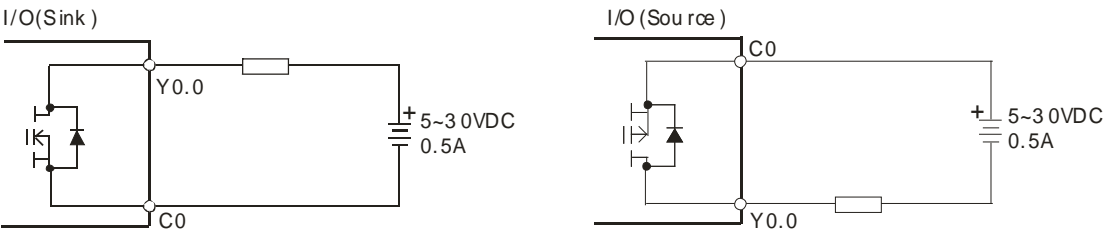
### 4.8.2.1 Output Circuits

There are three types of output units. They are relay outputs, transistor outputs, and differential outputs.

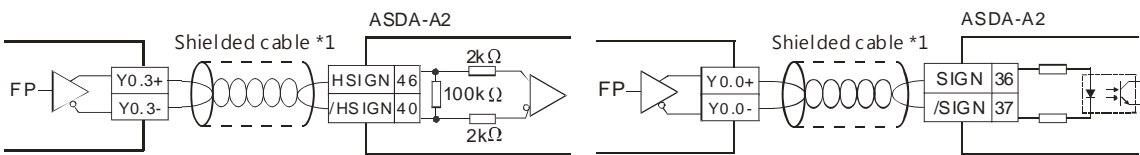
#### 1. Relay output



#### 2. Transistor output

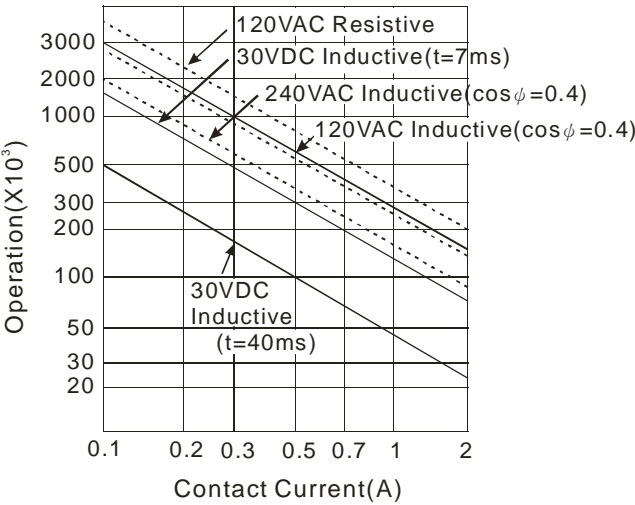


#### 3. Differential output

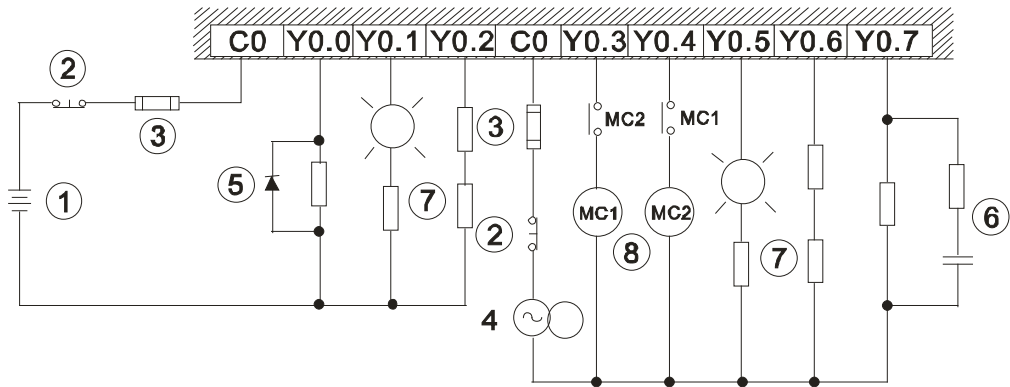


4.8.2.2 Relay Output Circuit

Relay terminals have no polarity. They can be used with alternating current that passes through a load, or with direct current that passes through a load. The maximum current that can pass through every relay terminal is 2 A, and refer to each product specification for the maximum current that can pass through every common terminal. Life cycle curve: The lifetime of a relay terminal varies with the working voltage, the load type (the power factor  $\cos\phi$ , the time constant  $t(L/R)$ ), and the current passing through the terminal. The relation is shown in the life cycle curve below.



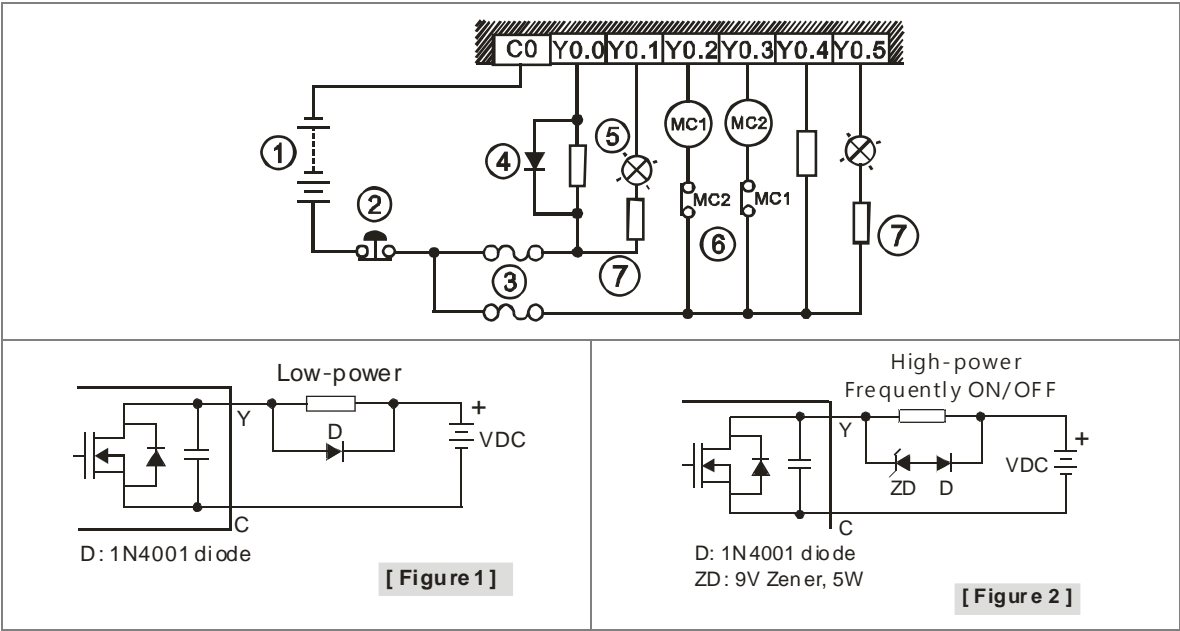
● Relay output circuit



|   |   |
|---|---|
| ① | Direct-current power supply   |
| ② | Emergency stop using an external switch.  |
| ③ | Fuse: to protect the output circuit, a fuse having a breaking capacity between 5 A to 10 A is connected to the common terminal. |
| ④ | Alternating-current power supply  |

|   |  |
|---|--|
| ⑤ | <p>A relay or a solenoid valve is used as a DC load. A diode is connected in parallel to absorb the surge voltage that occurs when the load is OFF.</p> <p>D: 1N4001 diode</p>   |
| ⑥ | <p>An electromagnetic contactor is used as an AC load. A resistor and a capacitor are connected in parallel to absorb the surge voltage that occurs when the load is OFF.</p> <p>R: 100~120 <math>\Omega</math><br/>C: 0.1~0.24 <math>\mu</math>F</p>  |
| ⑦ | <p>A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current that occurs when the load is ON.</p> <p>NTC: 10 <math>\Omega</math></p> <p>A bulb (neon lamp) is used as an AC load. A thermistor is connected in series to absorb the surge current that occurs when the load is ON.</p> <p>NTC: 10 <math>\Omega</math></p> |
| ⑧ | <p>Mutually exclusive output: For example, Y0.3 controls the clockwise rotation of the motor, and Y0.4 controls the counterclockwise rotation of the motor. This interlock circuit and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.</p>   |

4.8.2.3 Transistor Output Circuit (NPN)



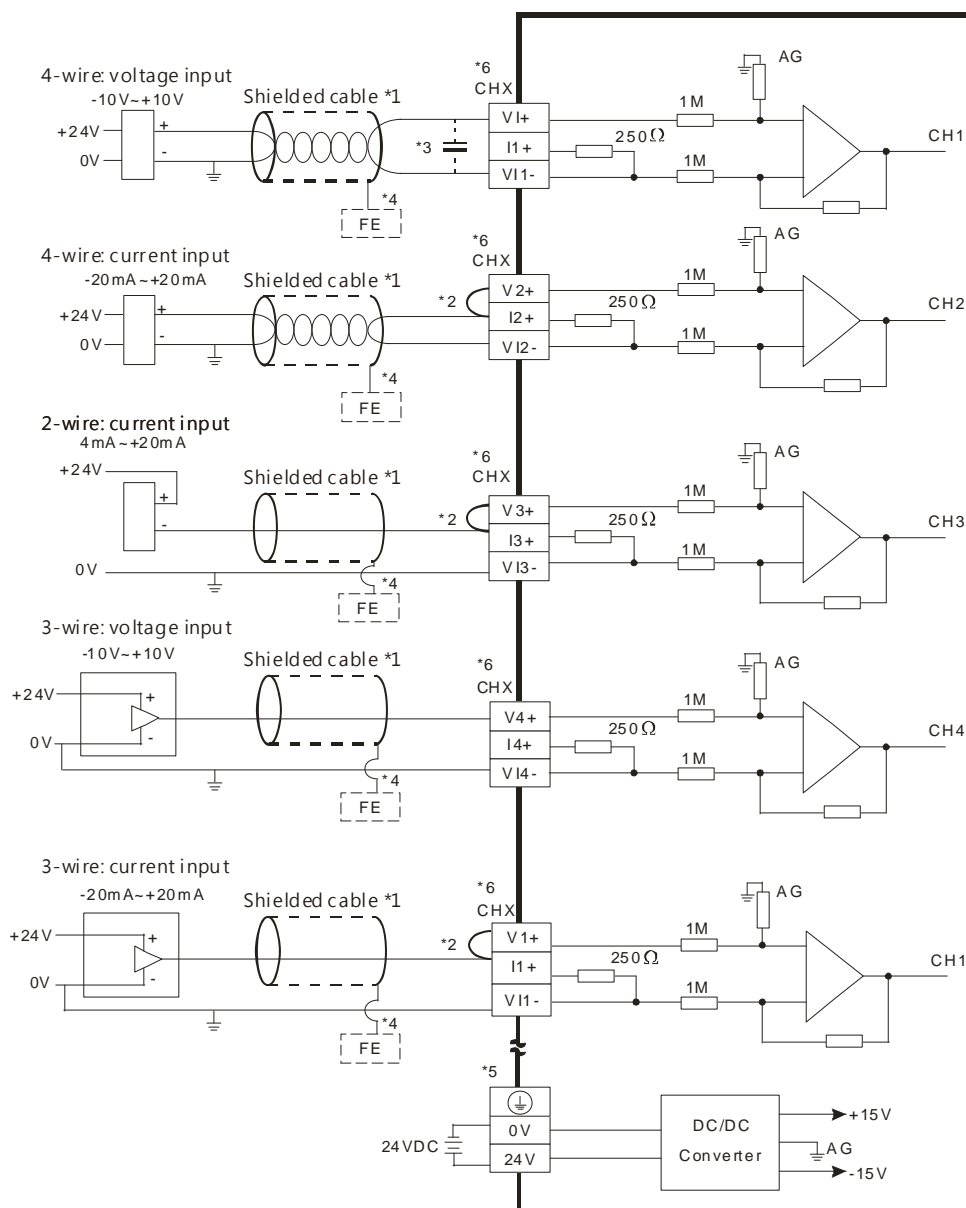
|   |   |
|---|---|
| ① | Direct-current power supply   |
| ② | Emergency stop  |
| ③ | Fuse  |
| ④ | <p>The output terminals of a transistor module are open-collector output terminals. If Y0.0/Y0.1 is a pulse train output terminal of a transistor module, the output current passing through its output pull-up resistor must be greater than 0.1 A to ensure that the transistor module operates normally.</p> <ol style="list-style-type: none"><li>1. A diode is connected in parallel to absorb the surge voltage: used in low-power situations (refer to Figure 1).</li><li>2. A diode and Zener are connected in parallel to absorb the surge voltage: used in high-power and power-on/off frequently situations (refer to Figure 2).</li></ol> |
| ⑤ | A bulb (incandescent lamp) is used as a DC load. A thermistor is connected in series to absorb the surge current which occurs when the load is ON.  |
| ⑥ | Mutually exclusive output: For example, Y0.2 controls the clockwise rotation of the motor, and Y0.3 controls the counterclockwise rotation of the motor. This interlock circuit and the program in the PLC ensure that there are protective measures if an abnormal condition occurs.   |
| ⑦ | Connected to a NTC thermistor (negative temperature coefficient), when a bulb (incandescent lamp) is used as a DC load and a thermistor is connected in series to absorb the surge current.   |

## 4.9 Wiring Analog Input/Output Modules

### Definitions of the terminals

- ◆ Two/three-wire (passive sensor): the sensor and the system share the same power circuit.
- ◆ Four-wire (active sensor): the sensor uses an independent power supply and should not share the same power circuit with the system.
- ◆ Note: use cables with the same length (less than 200 m) and use terminal resistors of less than 100 ohm.

### 4.9.1 Wiring AS04AD-A

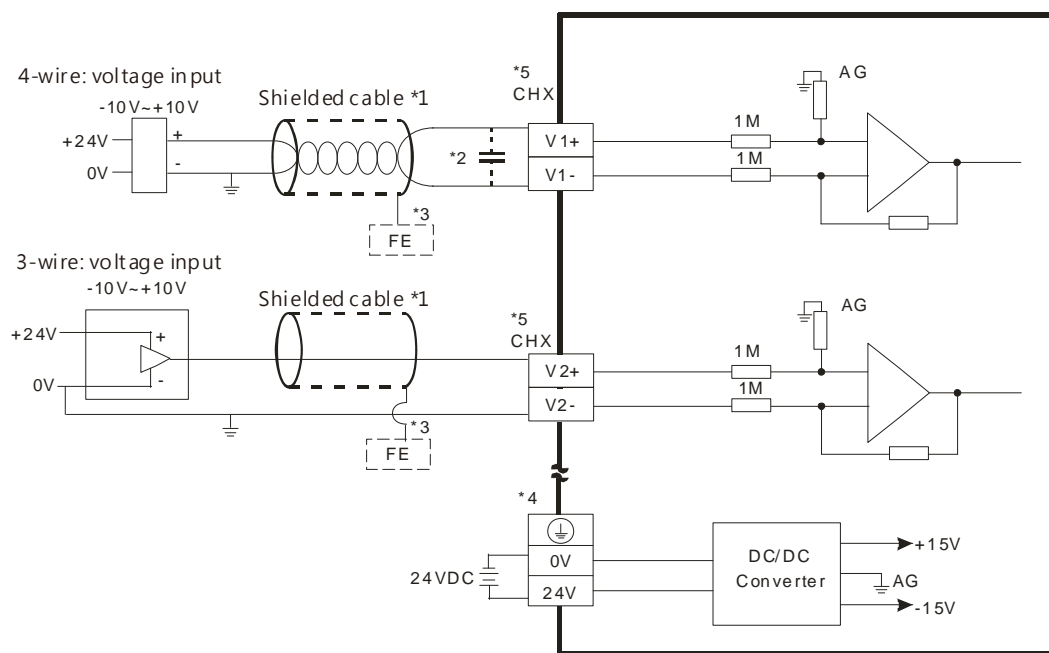


\*1. Use shielded cables to isolate the analog input signal cable from other power cables.

\*2. If the module is connected to a current signal, the terminals Vn and In+ (n=1–4) must be short-circuited.

- \*3. If noise in the input voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47  $\mu\text{F}$  with a working voltage of 25 V.
- \*4. Connect FE of the shielded cable to ground.
- \*5. Connect the terminal  $\text{⏏}$  to ground.
- \*6. Every channel can work with the wiring shown above.

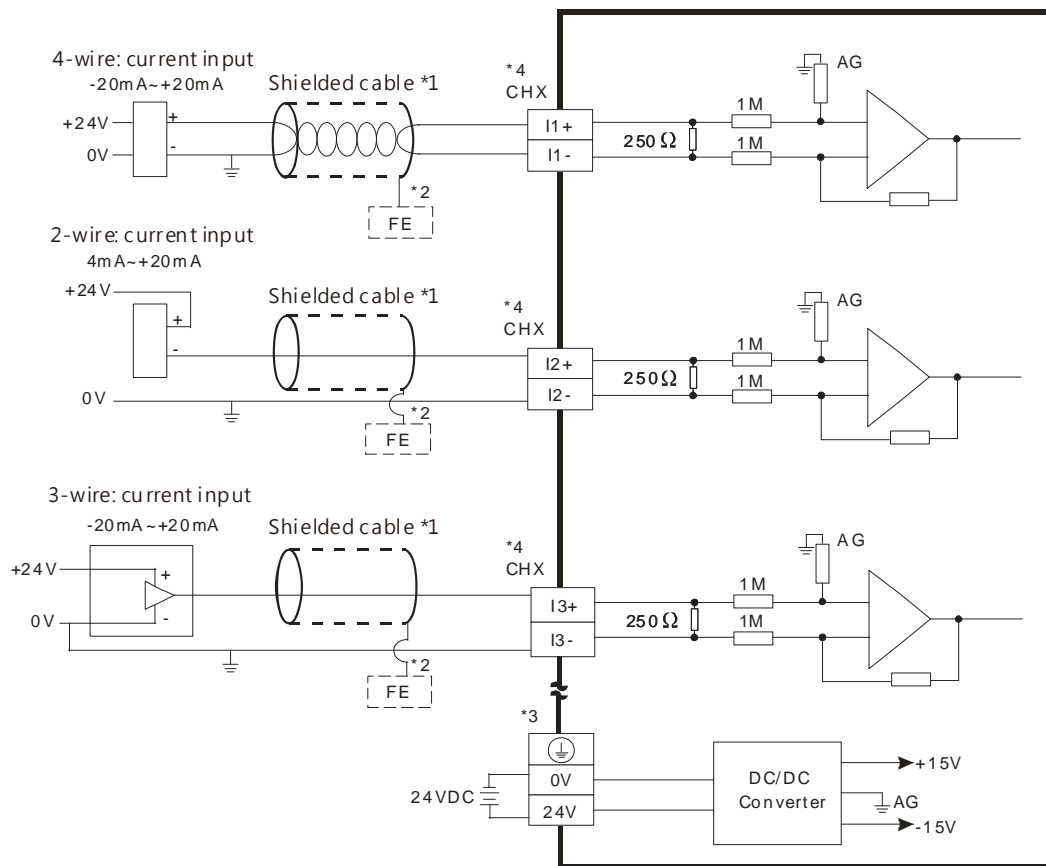
#### 4.9.2 Wiring AS08AD-B



- \*1. Use shielded cables to isolate the analog input signal cable from other power cables.
- \*2. If noise in the input voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47  $\mu\text{F}$  with a working voltage of 25 V.
- \*3. Connect FE of the shielded cable to ground.
- \*4. Connect the terminal  $\text{⏏}$  to ground.
- \*5. Every channel can work with the wiring shown above.




### 4.9.3 Wiring AS08AD-C



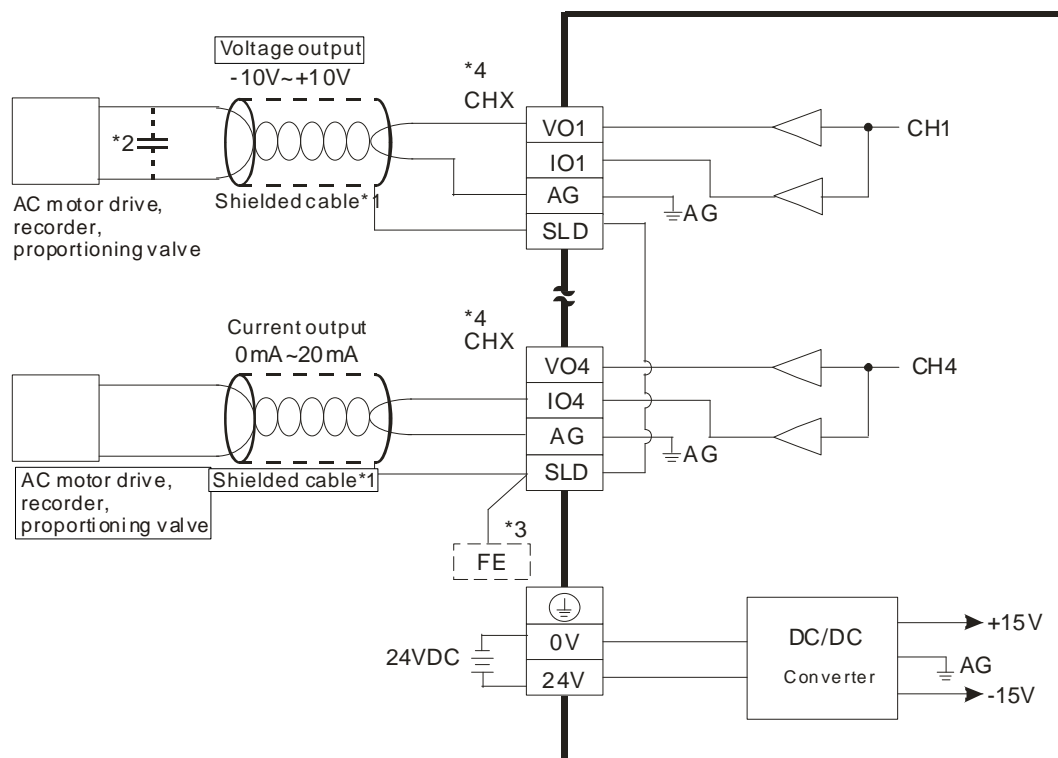
\*1. Use shielded cables to isolate the analog input signal cable from other power cables.

\*2. Connect FE of the shielded cable to ground.

\*3. Connect the terminal  to ground.

\*4. Every channel can work with the wiring shown above.

#### 4.9.4 Wiring AS04DA-A



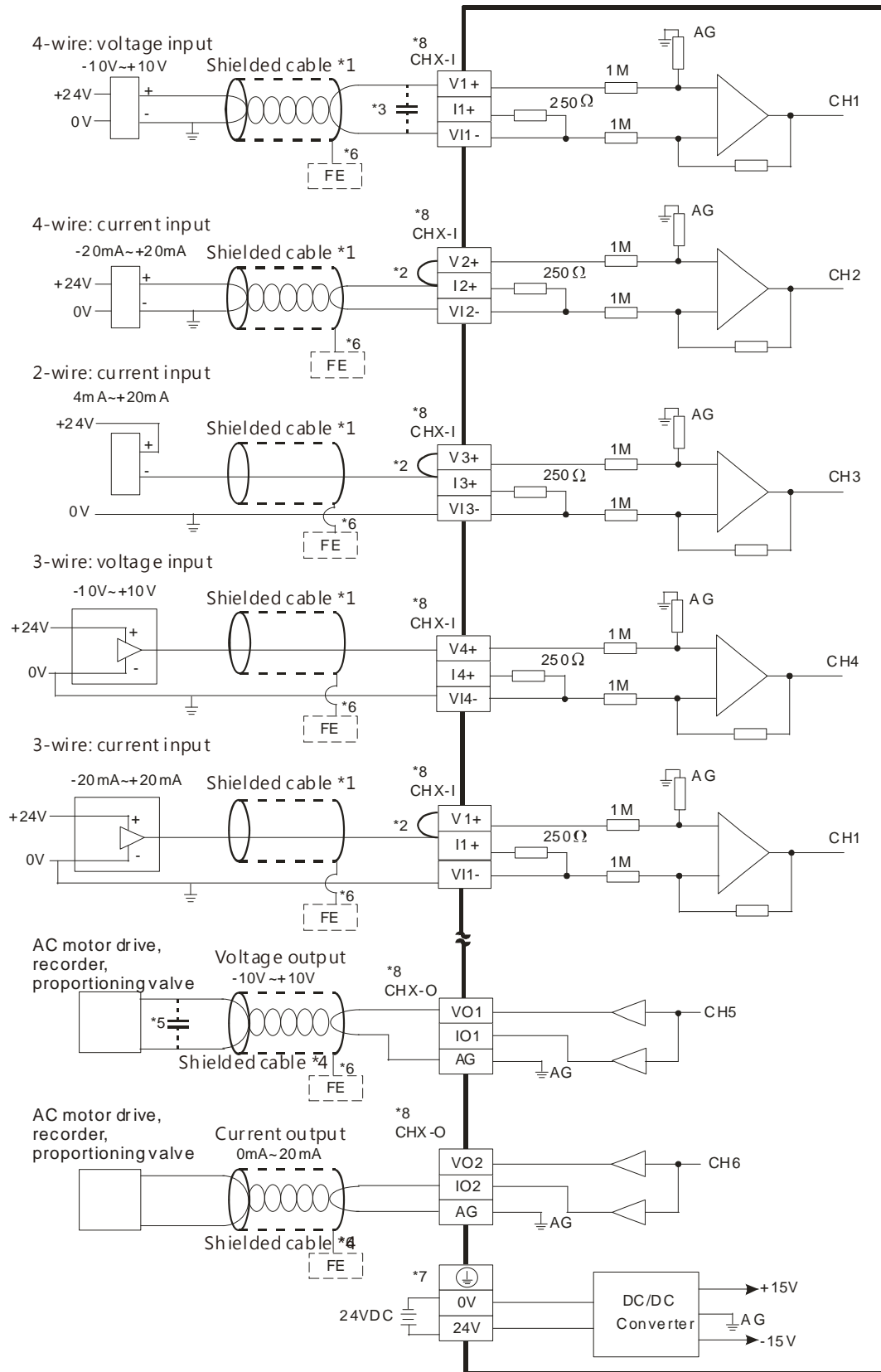
\*1. Use shielded cables to isolate the analog input signal cable from other power cables.


\*2. If noise in the input voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47  $\mu\text{F}$  with a working voltage of 25 V.

\*3. Connect the SLD to FE. Connect FE and the terminal  $\oplus$  to ground.

\*4. Every channel can work with the wiring shown above.

### 4.9.5 Wiring AS06XA-A



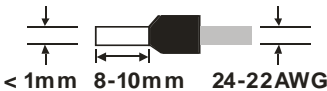
- \*1. Use shielded cables to isolate the analog input/output signal cable from other power cables.
- \*2. If the module is connected to a current signal, the terminals  $V_n$  and  $In+$  ( $n=1-4$ ) must be short-circuited.
- \*3. If noise in the input voltage results in noise interference with the wiring, connect the module to a capacitor with a capacitance between  $0.1-0.47 \mu F$  with a working voltage of 25 V.
- \*4. Use shielded cables to isolate the analog output signal cable from other power cables.
- \*5. If noise in the output voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between  $0.1 \mu F-0.47 \mu F$  with a working voltage of 25 V.
- \*6. Connect FE of the shielded cable to ground.
- \*7. Connect the terminal  to ground.
- \*8. CHX-I: Every channel can work with the input wiring shown above. CHX-O: Every channel can work with the output wiring shown above.

### 4.9.6 Wiring AS02ADH-A

● **Precautions**

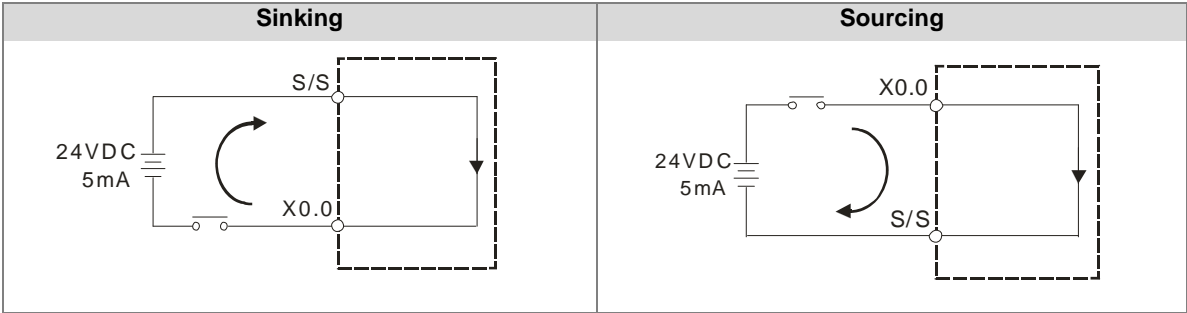
To ensure the analog-to-digital module functions well and reliably, the external wiring must prevent noise. Before you install the cables, follow the precautions below.

- (1) To prevent a surge and induction, the AC cable and the input signal cables that are connected to the module must be separate cables.
- (2) Do not install the cable near a main circuit, a high-voltage cable, or a cable connected to a load that is not a PLC. In addition, the cable must not be bound to a main circuit, a high-voltage cable, or a cable connected to a load which is not a PLC.
- (3) Ground shielded cables and hermetically sealed cables separately.
- (4) Terminals with insulation sleeves cannot be arranged as a terminal block, so you should cover the terminals with insulation tubes.
- (5) Use single-core cables or twin-core cables in a diameter of 24 AWG–22 AWG with pin-type connectors smaller than 1 mm. Use only copper conducting wires that can resist temperatures above 60° C-75° C.



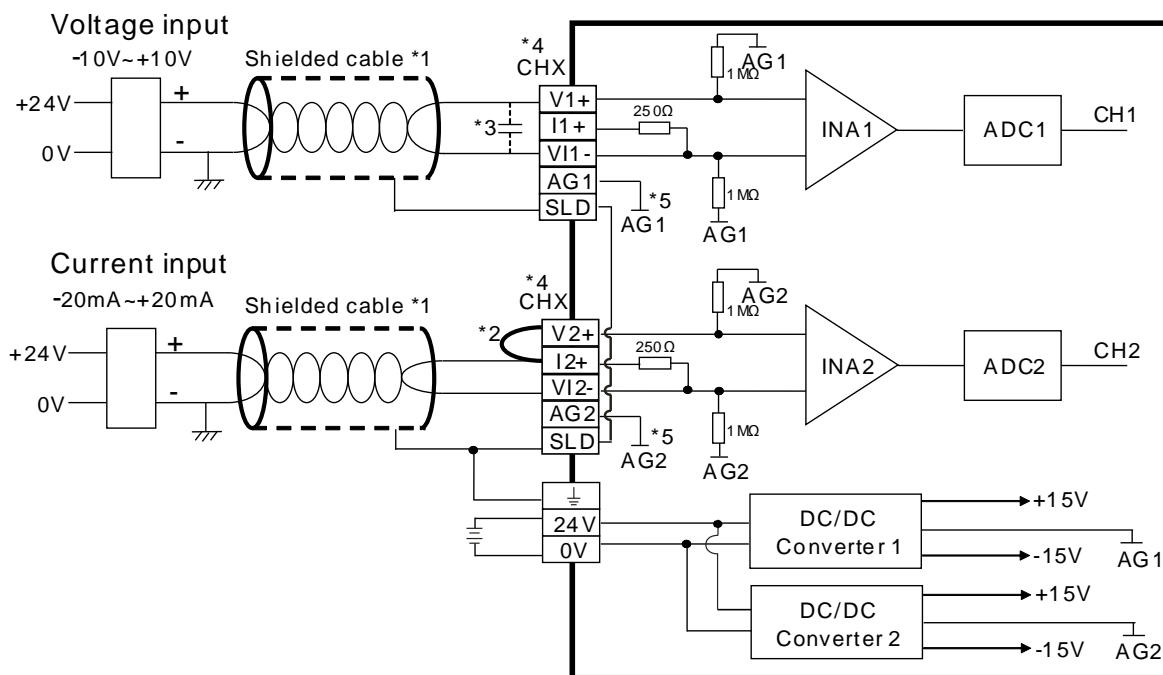
- (6) Notes on two-wire, three-wire, and four-wire connections:
  - Two-wire connection/three-wire connection (passive transducer): connect the transducer and the analog input module to the same power circuit.
  - Four-wire connection (active transducer): the transducer uses an independent power supply so do not connect it to the same power circuit as the analog input module.
- (7) Note: use cables with the same length (less than 200 m) and use wire resistance of less than 20 ohm.

#### 4.9.6.1 Digital Input Wiring



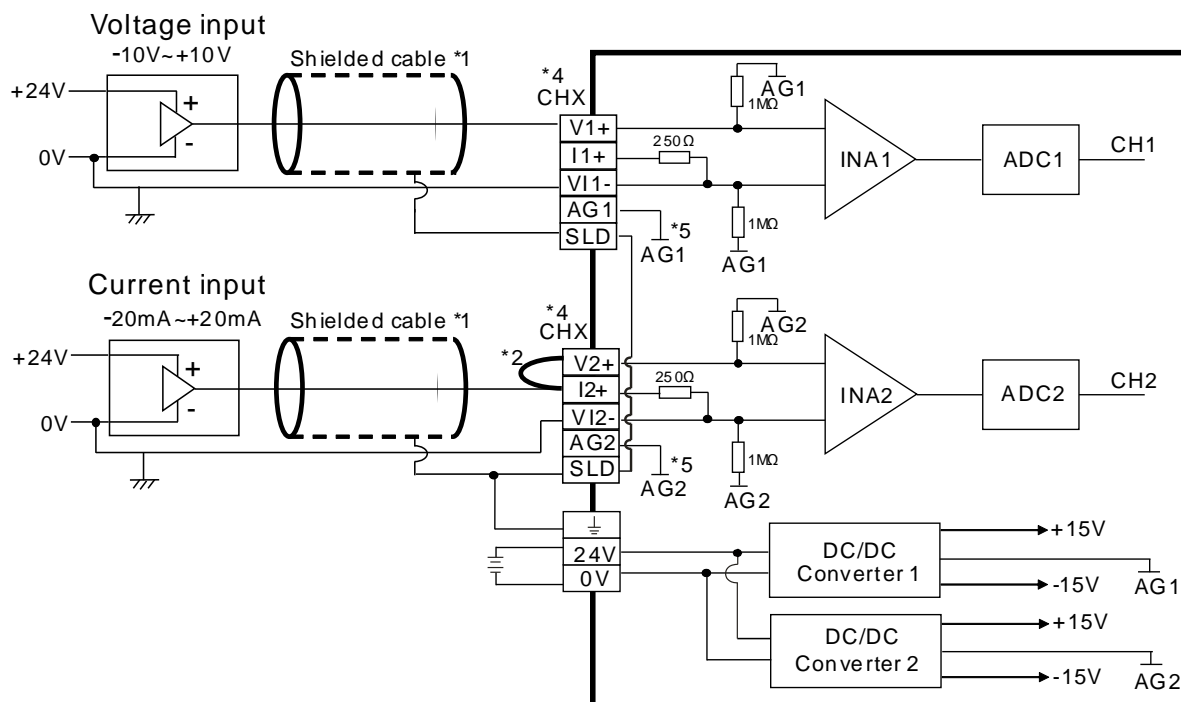
#### 4.9.6.2 Analog Input Wiring

- 4-wired



- \*1. Use shielded cables to isolate the analog input signal cable from other power cables.
- \*2. If the module is connected to a current signal, the terminals Vn and In+ (n=1-2) must be short-circuited.
- \*3. If variability in the input voltage results in interference within the wiring, connect the module to a capacitor with a capacitance between 0.1-0.47  $\mu$ F and a working voltage of 25 V.
- \*4. The wording "CHX" indicates that very channel can operate with the wiring presented above.
- \*5. If the environment is severe or there is interferences in 24 V pwer supply, short-circuit AGn (n=1-2) and the input signal.

● **3-wired**



\*1. Use shielded cables to isolate the analog input signal cable from other power cables.

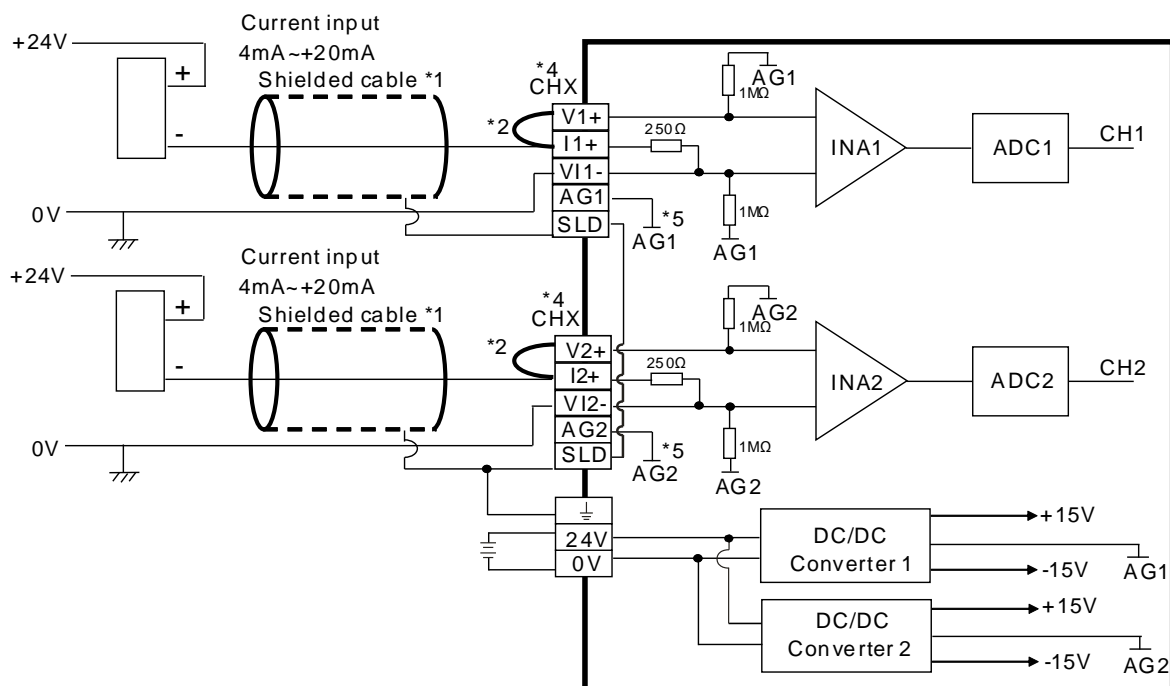
\*2. If the module is connected to a current signal, the terminals  $V_n$  and  $I_n$  ( $n=1-2$ ) must be short-circuited.

\*3. If variability in the input voltage results in interference within the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47  $\mu\text{F}$  and a working voltage of 25 V.

\*4. The wording "CHX" indicates that very channel can operate with the wiring presented above.

\*5. If the environment is severe or there is interferences in 24 V pwer supply, short-circuit  $AG_n$  ( $n=1-2$ ) and the input signal.

● **2-wired**

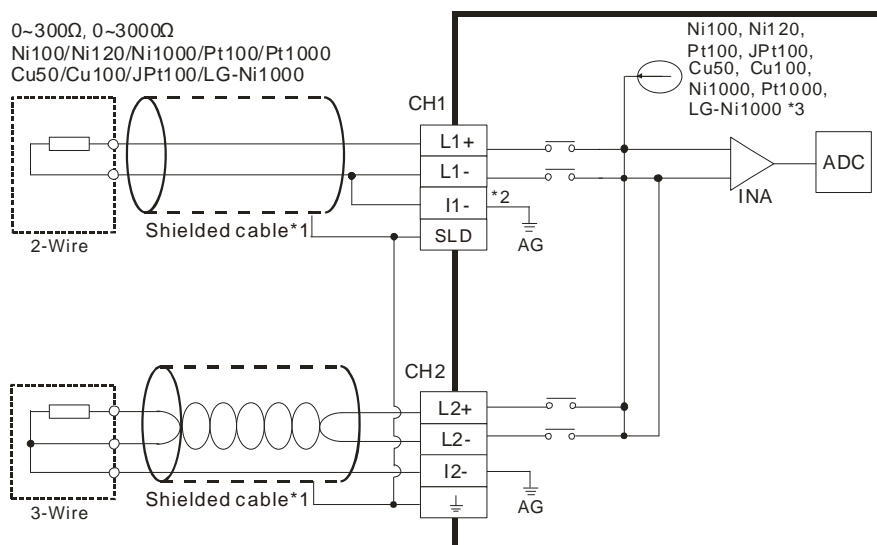


- \*1. Use shielded cables to isolate the analog input signal cable from other power cables.
- \*2. If the module is connected to a current signal, the terminals  $V_n$  and  $I_n+$  ( $n=1-2$ ) must be short-circuited.
- \*3. If variability in the input voltage results in interference within the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47  $\mu\text{F}$  and a working voltage of 25 V.
- \*4. The wording “CHX” indicates that very channel can operate with the wiring presented above.
- \*5. If the environment is severe or there is interferences in 24 V pwr supply, short-circuit  $AG_n$  ( $n=1-2$ ) and the input signal.



## 4.10 Wiring Temperature Measurement Modules

### 4.10.1 Wiring AS04RTD-A



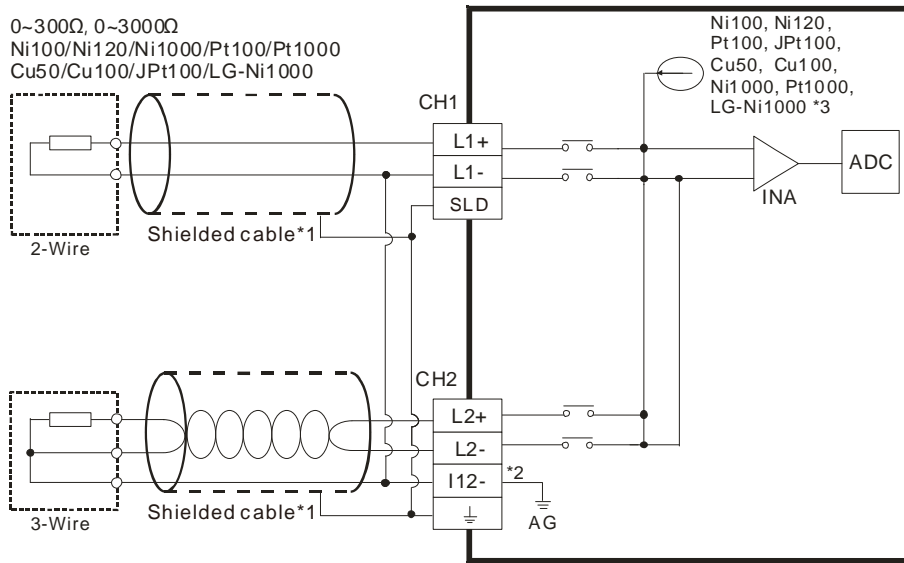
\*1. Use shielded twisted pair cables for temperature sensors, and keep them away from power cables and other cables that generate noise.

\*2. If you use two-wire temperature sensors,  $L_n-$  and  $I_n-$  must be short-circuited (where  $n$  is between 1–4).

\*3. There are two different internal excitation currents. If you are using temperature sensors, such as Ni100, Ni120, Pt100, JPt100, Cu50/Cu100, or a 0~300 Ω resistance sensor, the internal excitation current is 1.0 mA. If you are using a Ni1000 temperature sensor, a Pt1000 temperature sensor, a LG-Ni1000 sensor, or a 0~3000 Ω resistance sensor, the internal excitation current is 0.2 mA.

Note: use cables with the same length (less than 200 m) and use terminal resistors of less than 200 ohm.

### 4.10.2 Wiring AS06RTD-A



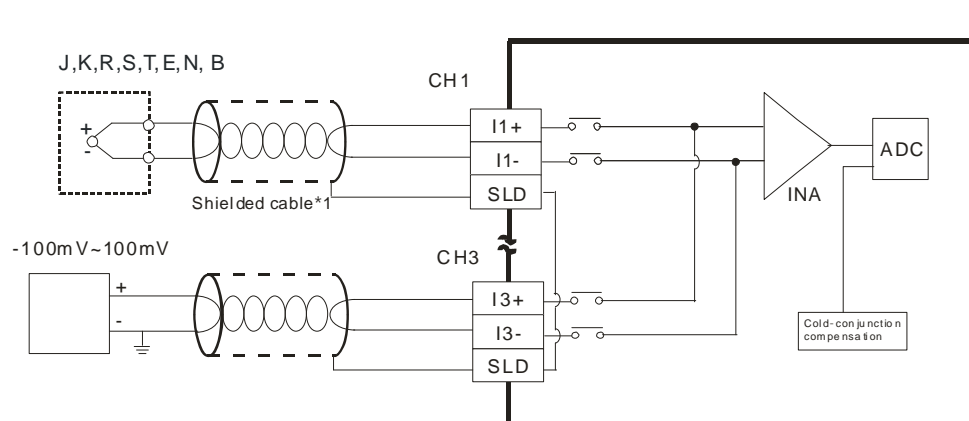
\*1. Use shielded twisted pair cables for temperature sensors and keep them away from power cables and other cables that generate noise.

\*2. Terminal "I12-" indicates "I1- & I2-", terminal "I34-" indicates "I3- & I4-", and terminal "I56-" indicates "I5- & I6-". If you use two-wire temperature sensors, Ln- and In- must be short-circuited (where n is between 1-6).

\*3. There are two different internal excitation currents. If you are using temperature sensors, such as Ni100, Ni120, Pt100, JPt100, Cu50/Cu100, or a 0~300 Ω resistance sensor, the internal excitation current is 1.0 mA. If you are using a Ni1000 temperature sensor, a Pt1000 temperature sensor, a LG-Ni1000 sensor, or a 0~3000 Ω resistance sensor, the internal excitation current is 0.2 mA.

Note: use cables with the same length (less than 200 m) and use terminal resistors of less than 200 ohm.

### 4.10.3 Wiring AS04TC-A / AS08TC-A



\*1. The cable connected to the input terminal should be the cable or the shielded twisted pair cable connected to a type J, K, R, S, T, E, N, B thermocouple. It should be kept separate from other power cables and cables that generate noise.

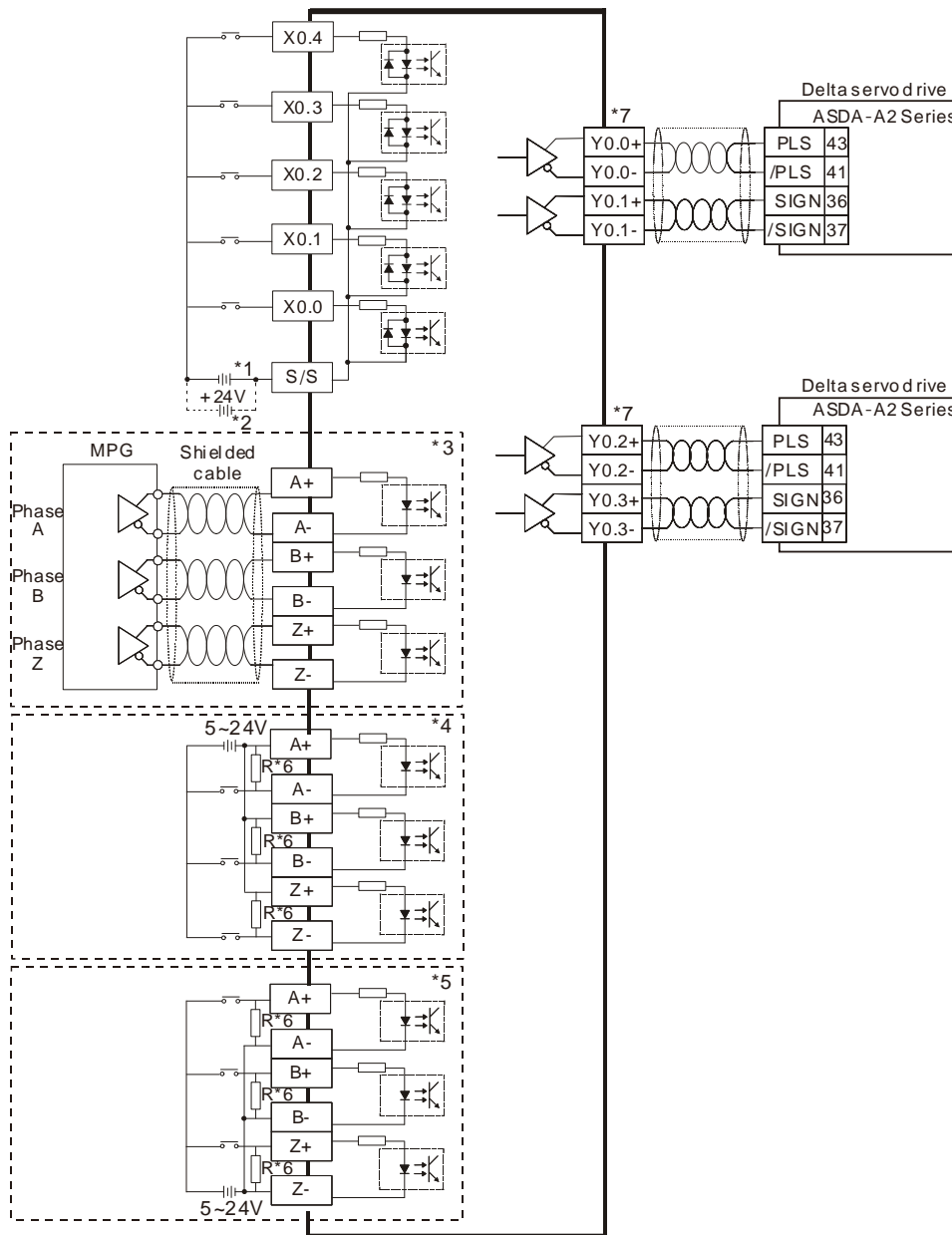
Note1: do not wire empty terminals.

Note2: only use copper conducting wires with a temperature rating of 60/75°C and the length must be less than 50 m.

Note3: TC modules must run for 30 minutes before they start to take any temperature measurement.

## 4.11 Wiring Positioning Modules and Counter Modules

### 4.11.1 Wiring AS02PU-A



\*1. Sinking

\*2. Sourcing

\*3. Differential input

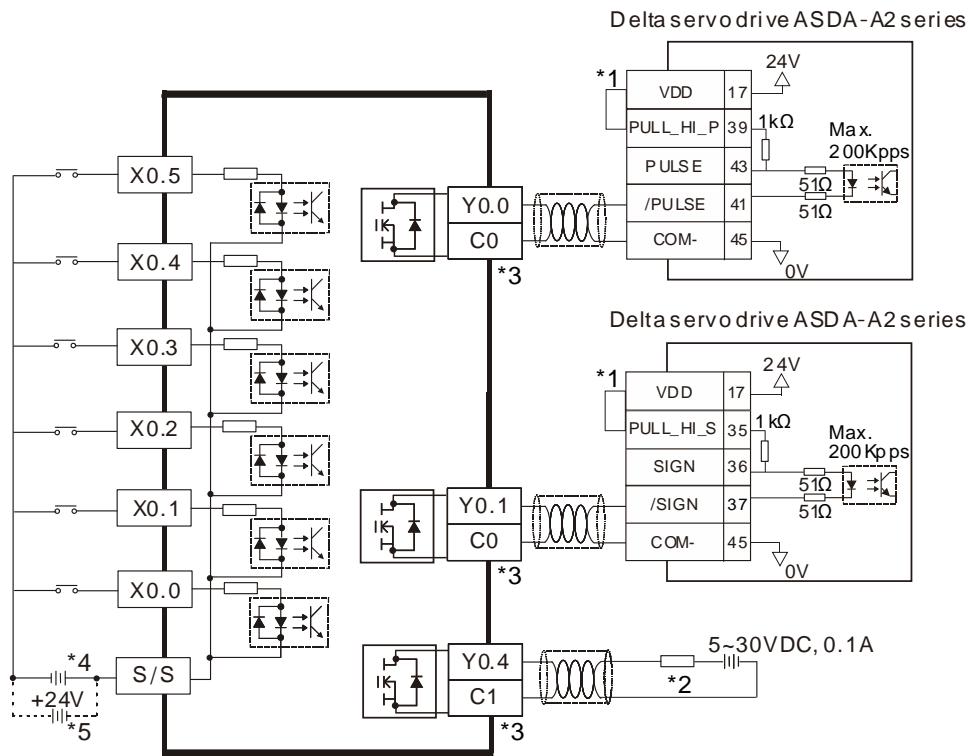
\*4. Open collector sinking

\*5. Open collector sourcing

\*6. Open collector sinking/sourcing to connect to phase A/B/Z and if the input frequency is higher than 100 kHz, add a 3W/470 ohm resistor between + the positive end and – the negative end.

\*7. Refer to API1402 in AS Series Programming Manual and Delta Servo Drive Manual for more information on the output mode.

### 4.11.2 Wiring AS04PU-A



\*1. VDD and COM are seen as a group and its power is provided by Delta servo drive.

\*2. It is a load or an input point.

\*3. Use the same power supply for the same COM group.

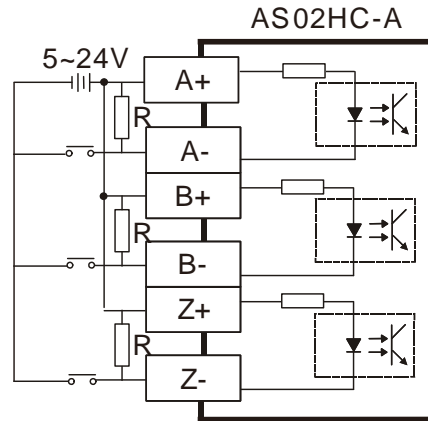
\*4. Sinking

\*5. Sourcing

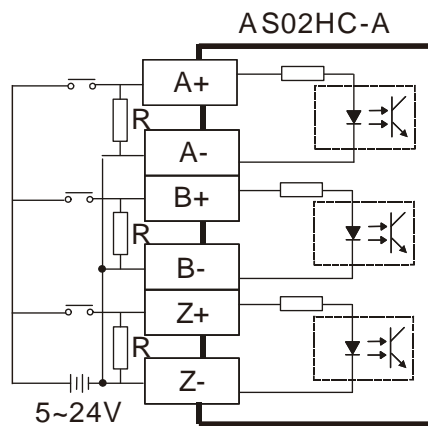
### 4.11.3 Wiring AS02HC-A

#### 4.11.3.1 Pulse Input

- **Sinking**

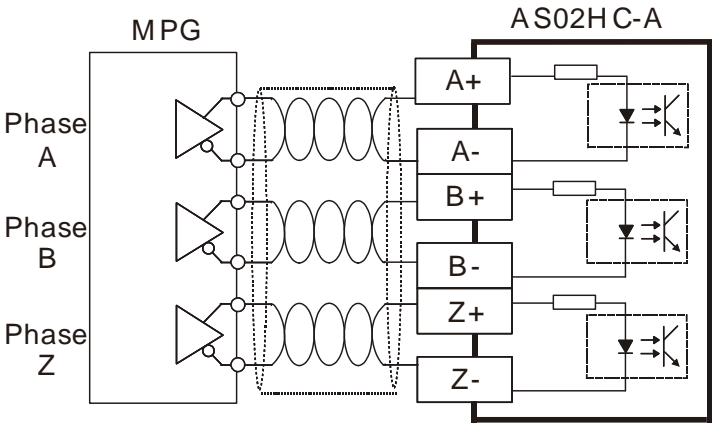


- **Sourcing**

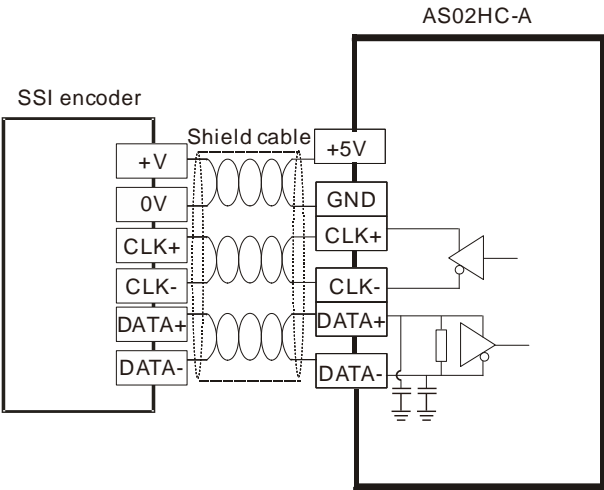


Note: Open collector sinking/sourcing to connect to phase A/B/Z and if the input frequency is higher than 100 kHz, add a 3W/470 ohm resistor between + the positive end and – the negative end.

- 5V differential output encoder

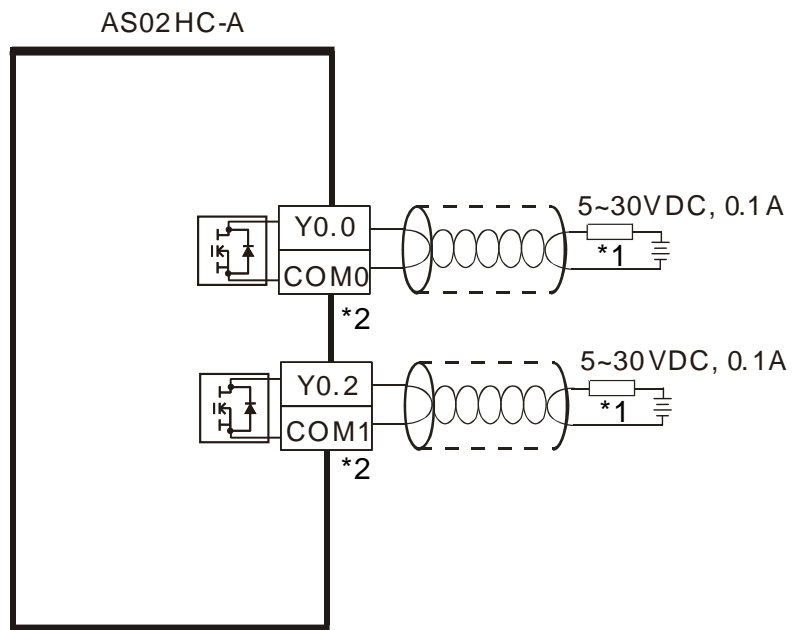


4.11.3.2 SSI Input / Output Encoder



Note: The power supply of the SSI encoder you are using may NOT be 5 VDC, check for the actual power supply of your SSI encoder.

#### 4.11.3.3 External Output



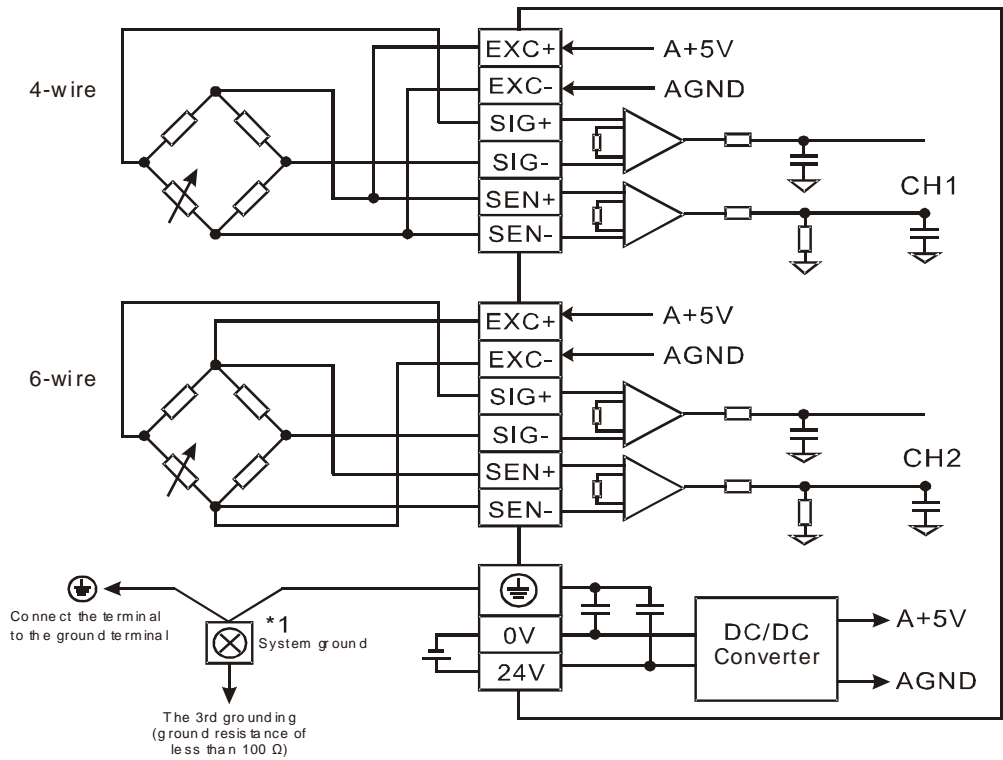
\*1: A load or an input point

\*2: The same COM should use power from the same supply.

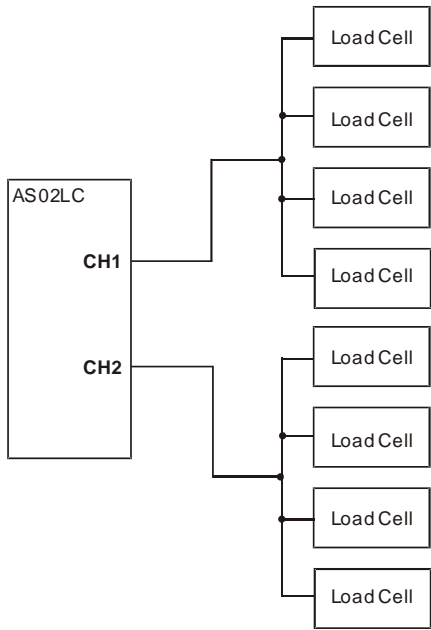




4.12Load Cell Modules

4.12.1 Wiring AS02LC-A



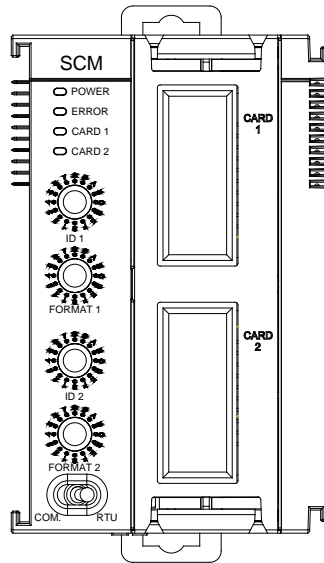
- Multiple load cells connected to one load cell module:



- \*1. Connect the  of the power module and the  of the load cell module to the system ground terminal. Use the system ground as the third grounding or connect it to the control box.
- \*2. When connecting multiple load cells, the total resistance of the load cells should be greater than 40 Ω.

## 4.13 Wiring Network Modules

### 4.13.1 AS00SCM-A



### 4.13.2 Wiring AS00SCM-A

#### 4.13.2.1 AS00SCM-A module wiring for communication

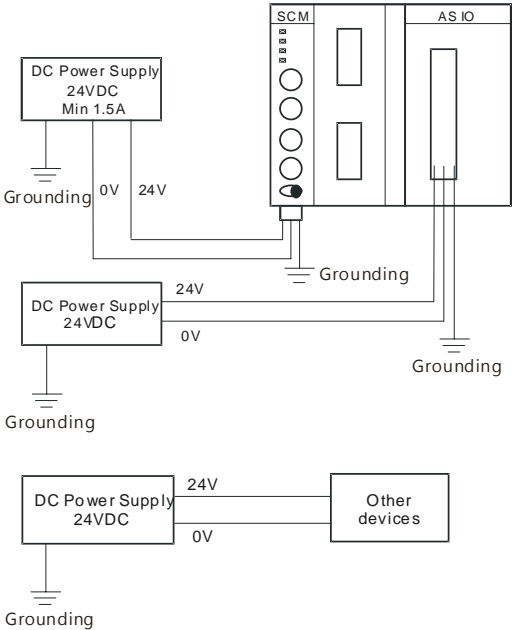
- **COM communication mode**  
AS00SCM-A module has with two function card slots, CARD1 and CARD2, supporting function cards AS-F232, AS-F422, and AS-F485. Refer to Section 4.14 for wiring.
- **RTU remote control mode**  
The card slot CARD2 supports AS-FCOPM and both CARD1 & CARD2 support AS-FEN02 and AS-PF02. Refer to Section 4.14 for wiring.

#### 4.13.2.2 AS00SCM-A module wiring for power

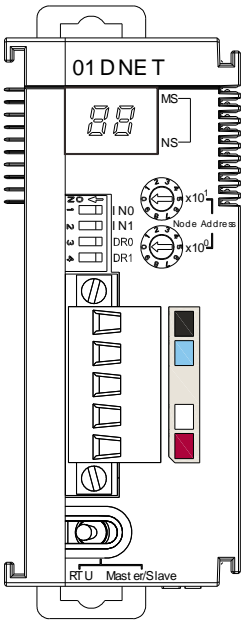
- **COM: extension via serial ports**  
Switch the dip switch of the AS00SCM-A module to COM and install the module on the right side of the AS300 series CPU module. To avoid errors, do not supply extra power to this module.
- **RTU remote control mode**  
Switch the dip switch of the AS00SCM-A module to RTU. This module uses an independent direct-current power supply. Note the following when wiring.
  - (1) Keep the input cables, the output cables, and the power cable separate from one another as shown in the following illustration. Use an independent power supply for this module.
  - (2) The 24 VDC cable should be twisted and connected to a module within a short distance. Do not

bundle 110 VAC cable, 220 VAC cable, 24 VDC cable, the (high-voltage high-current) main circuit, and the I/O signal cable together. The distance between adjacent cables should be more than 100 millimeters.

- (3) Use single-wire cables or two-wire cables with a diameter of 20 AWG to 14 AWG. Only use copper conducting wires with a temperature rating of 60/75°C.



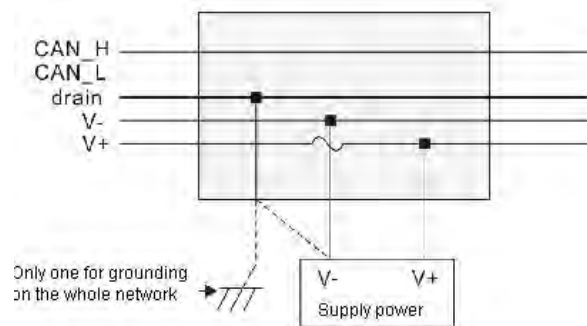
4.13.3 ASO1DNET-A



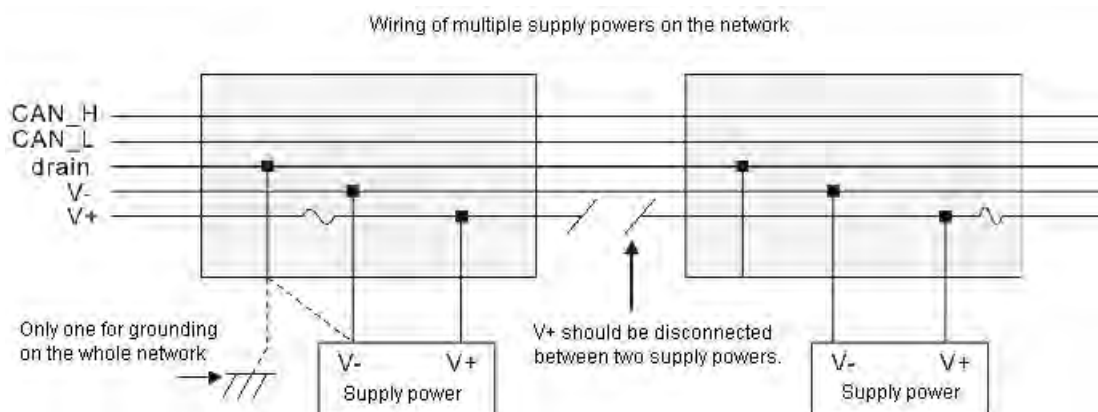
#### 4.13.4 Wiring AS01DNET-A

The network requires one or multiple supply powers to supply the power to each piece of network equipment via the bus cable. Delta DeviceNet communication cable consists of five wires, among which the power cable and signal cable occupy two wires respectively and the one on the left is the shielded wire as the above figure shows. The supply power for the bus is optional and could be a single supply power or multiple supply powers according to the actual demand.

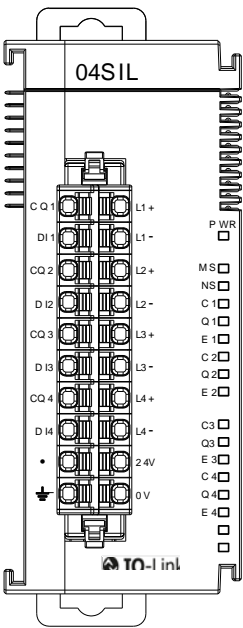
- **Single Supply Power**



- **Multiple Supply Powers**



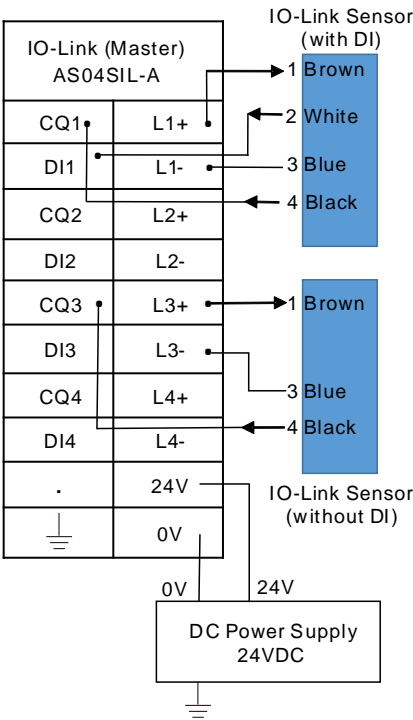
4.13.5 AS04SIL-A



4.13.6 Wiring AS04SIL-A

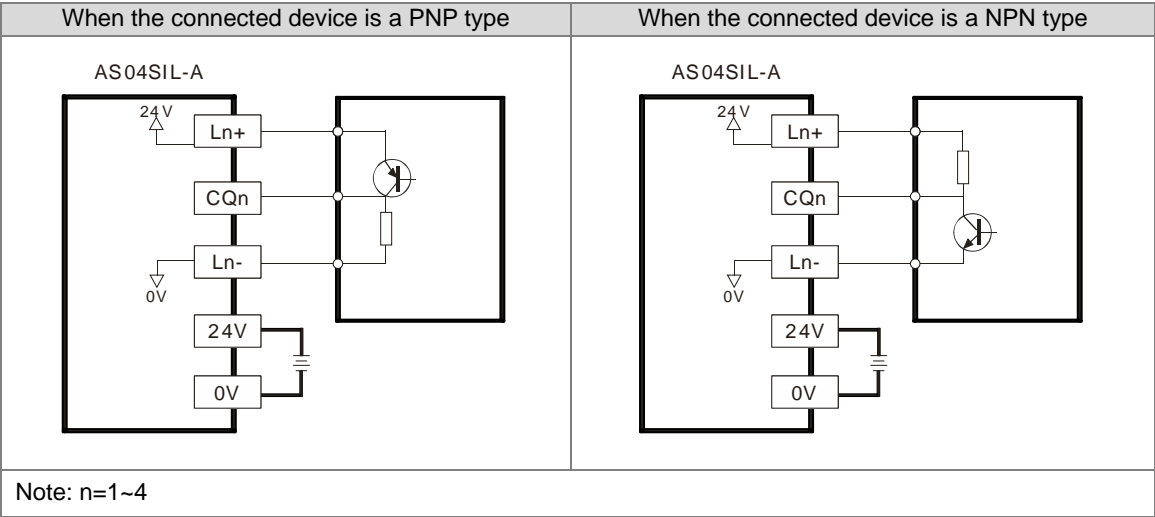
4.13.6.1 IO-Link mode communication and power wiring

- (1) Keep the input cables, output cables, and power cable separate from one another. It is suggested to use independent power for AS04SIL-A. See the example below.

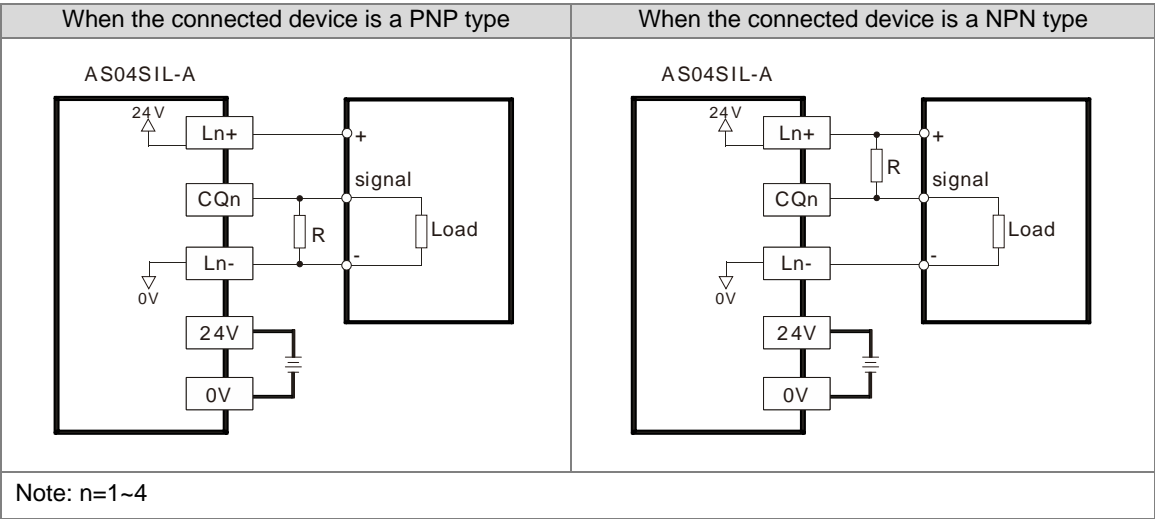


- (2) The 24 VDC cable should be twisted and connected to a module within a short distance.
- (3) Do not bundle 110 VAC cable, 220 VAC cable, 24 VDC cable, the (high-voltage high-current) main circuit, and the I/O signal cable together. The distance between adjacent cables should be more than 100 millimeters.
- (4) Connect a cable with a diameter of 14 AWG or higher to ground.
- (5) Use single-wire cables or two-wire cables with a diameter of 20 AWG to 14 AWG. Only use copper conducting wires with a temperature rating of 60/75°C.

4.13.6.2 Digital Input Wiring (SIO Mode)



4.13.6.3 Digital Output Wiring (SIO Mode)

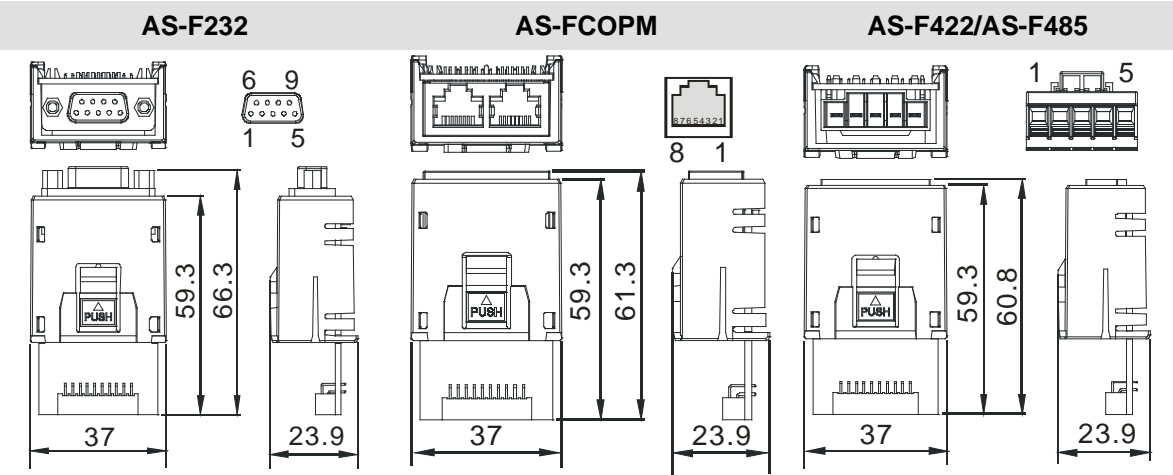


4.13.6.4 Digital Input Wiring

| When the connected device is a PNP type | When the connected device is a NPN type |
|---|---|
| <div><p>AS04SIL-A</p></div>             | <div><p>AS04SIL-A</p></div>             |
| Note: n=1~4                             |   |

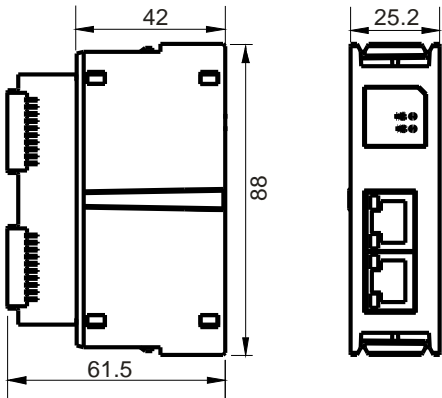
4.14Wiring Function Cards

4.14.1 Communicational Function Card Profiles and the Pin Definitions

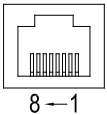


| Pin no. | AS-F232 | AS-FCOPM | AS-F422 | AS-F485 |
|---------|---------|----------|---------|---------|
| 1       | -       | CAN_H    | R+      | -       |
| 2       | TX      | CAN_L    | R-      | -       |
| 3       | RX      | GND      | T+      | D+      |
| 4       | -       | -        | T-      | D-      |
| 5       | GND     | -        | SG      | SG      |
| 6-9     | -       | -        |         |         |

AS-FEN02 / AS-PPFN02 / AS-FECAT

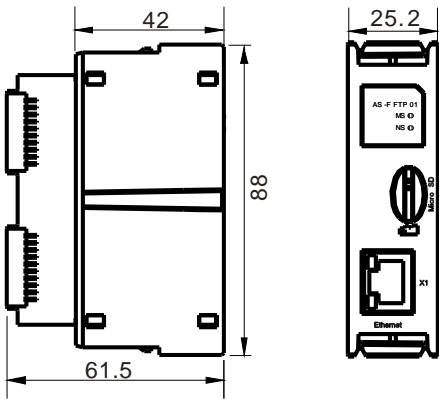


|       |       |       |       |
|-------|-------|-------|-------|
| 1 TX+ | 2 TX- | 3 RX+ | 4 N/C |
| 5 N/C | 6 RX- | 7 N/C | 8 N/C |





● **AS-FFTP01**

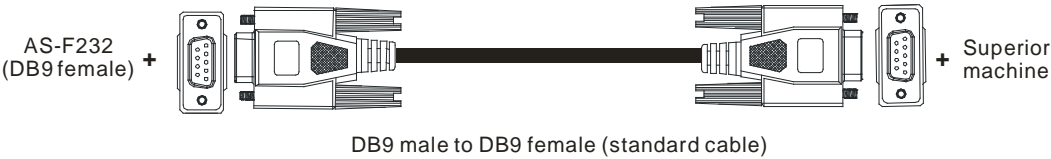


|       |       |       |       |
|-------|-------|-------|-------|
| 1 TX+ | 2 TX- | 3 RX+ | 4 N/C |
| 5 N/C | 6 RX- | 7 N/C | 8 N/C |

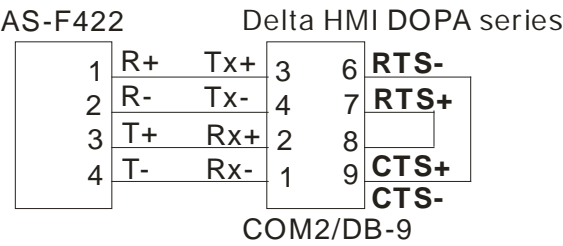
8 ← 1

**4.14.2 Wiring the Communicational Function Cards**

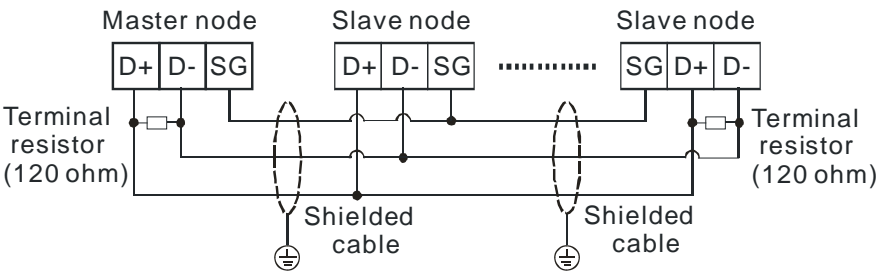
■ **AS-F232 wiring example:**



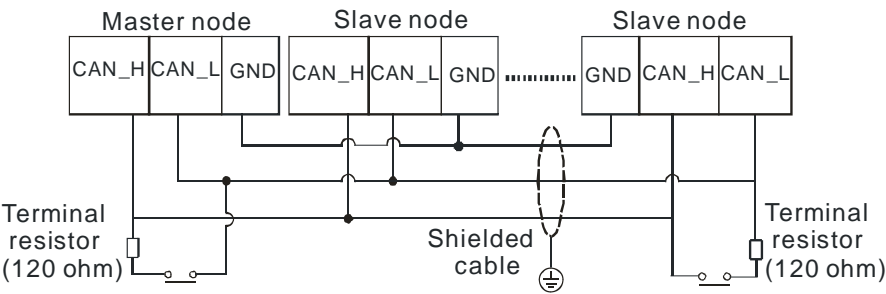
■ **AS-F422 wiring example:**



■ **AS-F485 wiring example:**

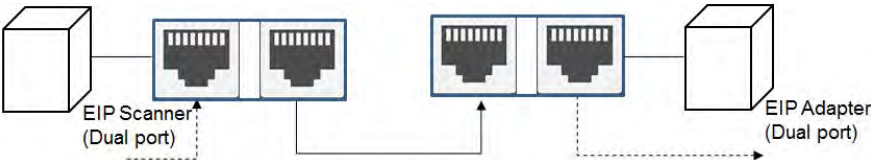


■ AS-FCOPM wiring example:

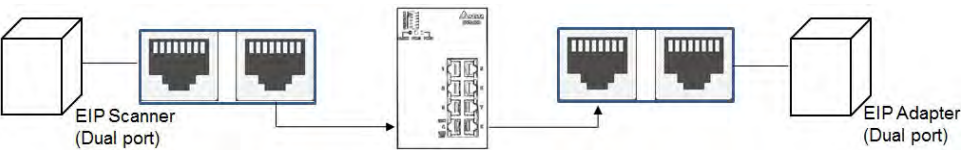


■ AS-FEN02 wiring example:

● Linear Topology

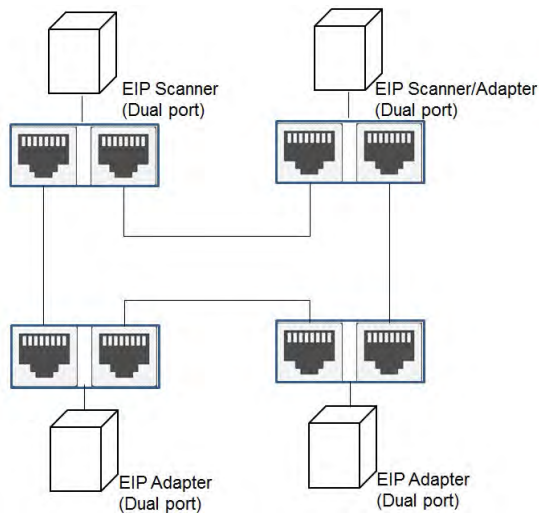


● Star Topology

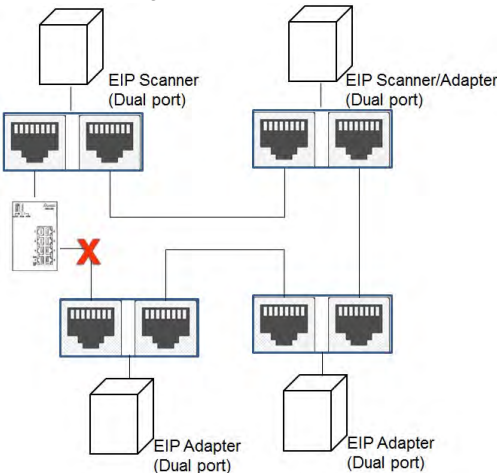


● Ring Topology

A DLR function is required to create a ring topology.

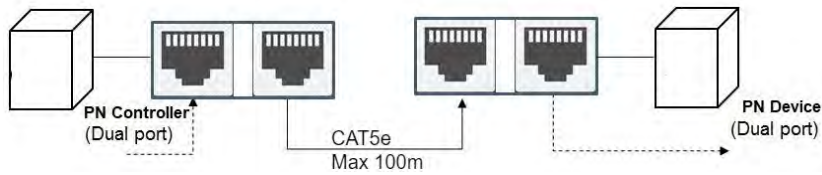


When a switch is needed for topology, the switch should support the DLR function. If not, the connection might fail.

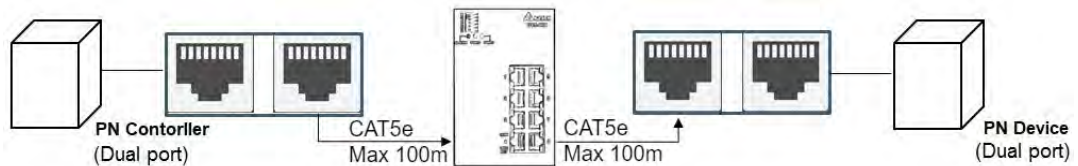


## ■ AS-FPFN02 wiring example:

### ● Linear Topology



### ● Star Topology

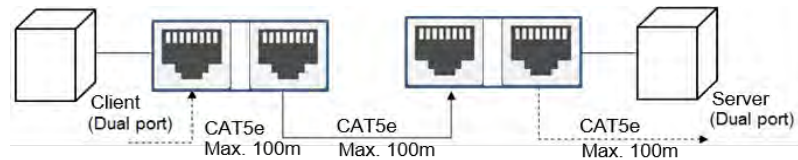


## ■ AS-FECAT (EtherCAT OFF)

### ● Linear Topology

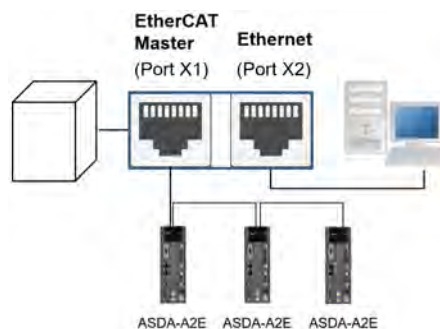


### ● Star Topology

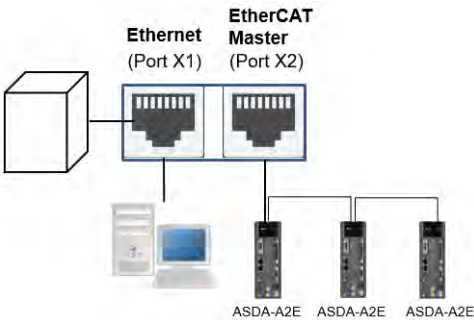


## ■ AS-FECAT sets EtherCAT Master Port via HWCONFIG (EtherCAT ON)

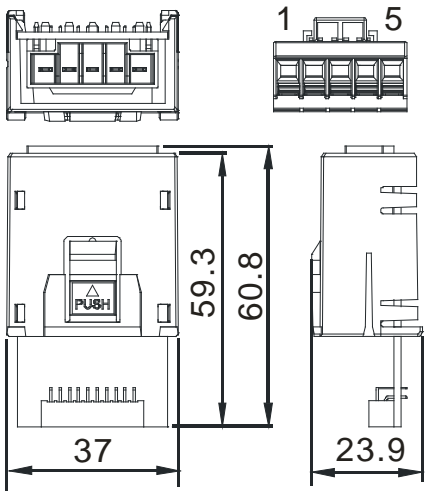
### ● Use Port x1 as EtherCAT Master



- Use Port x2 as EtherCAT Master

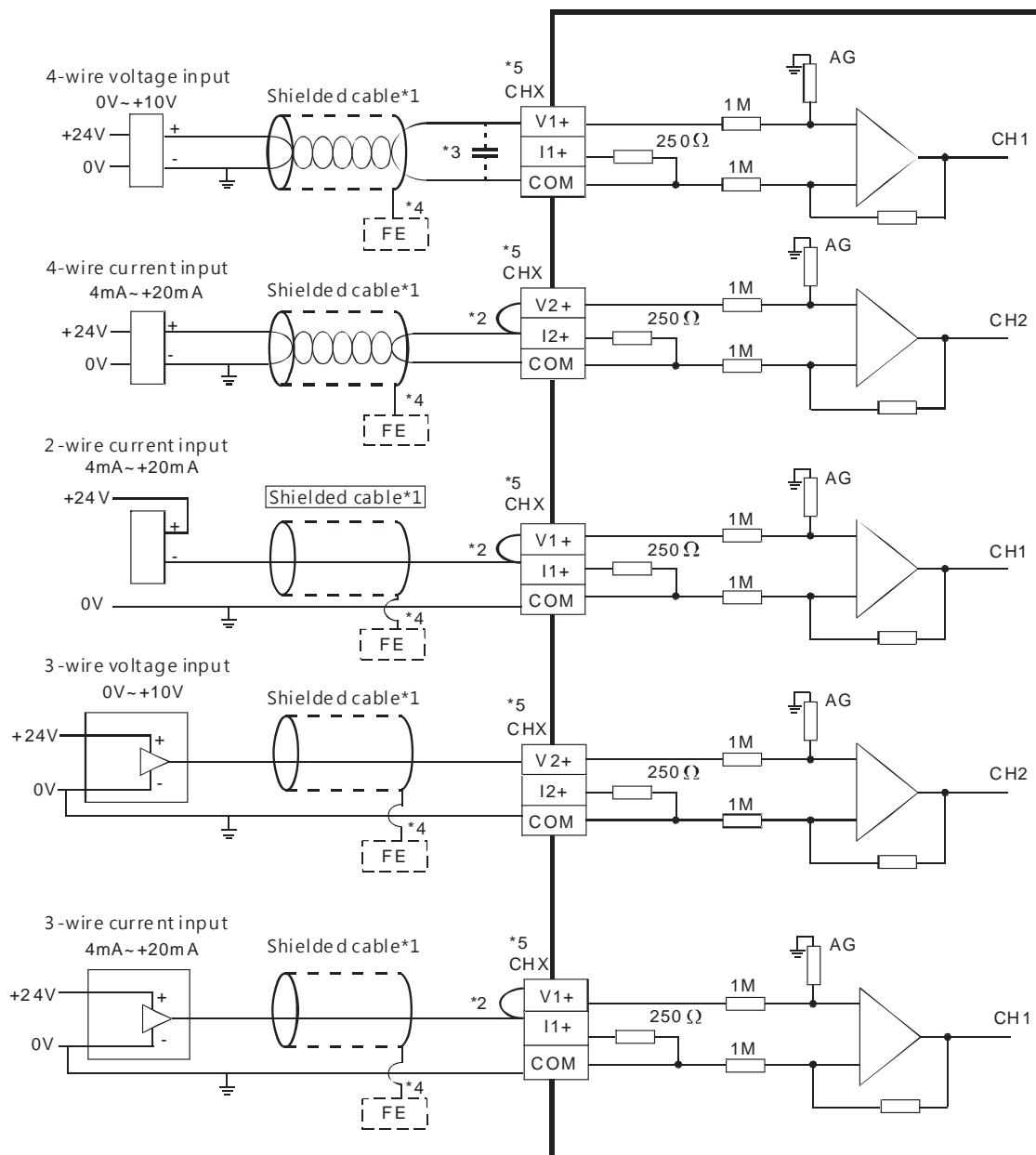


4.14.3 Analog Function Card Profiles and the Pin Definitions



| Pin no. | AS-F2AD | AS-F2DA |
|---------|---------|---------|
| 1       | V1+     | VO1     |
| 2       | I1+     | IO1     |
| 3       | V2+     | VO2     |
| 4       | I2+     | IO2     |
| 5       | COM     | COM     |

#### 4.14.4 Wiring AS-F2AD



\*1. Use shielded cables to isolate the analog input signal cable from other power cables.

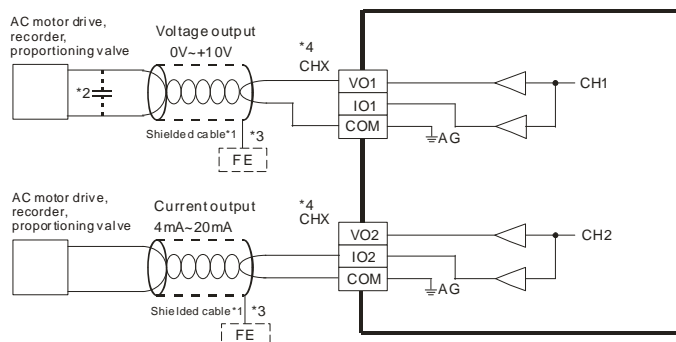
\*2. If the module is connected to a current signal, the terminals  $V_n$  and  $I_n$  ( $n=1-2$ ) must be short-circuited.

\*3. If noise in the input voltage results in noise interference in the wiring, connect the module to a capacitor with a capacitance between 0.1–0.47  $\mu\text{F}$  with a working voltage of 25 V.

\*4. Connect FE of the shielded cable to ground.

\*5. CHX: Every channel can work with the input wiring shown above.

### 4.14.5 Wiring AS-F2DA



- \*1. Use shielded cables to isolate the analog input signal cable from other power cables.
- \*2. If noise in the input voltage results in noise interference in the wiring, Connect the module to a capacitor with a capacitance between 0.1–0.47  $\mu\text{F}$  with a working voltage of 25 V.
- \*3. Connect FE of the shielded cable to ground.
- \*4. CHX: Every channel can work with the input wiring shown above.



## Chapter 5 Devices

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## 5.1 Introduction of Devices

This section describes the values and strings processed by the PLC. It also describes the functions of devices that include input, output, and auxiliary relays, as well as timers, counters, and data registers. The PLC simulates external devices in the PLC's internal memory, so the word "device" is a generic name that refers to all the internal memory locations in the PLC. A device can be a bit device or a word device. Bit devices simulate coils, contacts and flags, while word devices simulate 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 | 4096   | SM0–SM4095        |
|             | 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 to 32767<br>32 bits: -2147483648 to 2147483647 |                   |



| Type               | Device name                            |      | Number of devices   | Range |
|--------------------|--|------|---|-------|
| <b>Constant</b> *2 | Hexadecimal system                     | 16#  | 16 bits: 16#0–16#FFFF<br>32 bits: 16#0–16#FFFFFFFF        |       |
|                    | Single-precision floating-point number | F    | 32 bits: $\pm 1.17549435^{-38}$ to $\pm 3.40282347^{+38}$ |       |
| <b>String</b> *3   | String                                 | "\$" | 1–31 characters   |       |

\*1: Constants are indicated by K in the device lists in Chapter 5 and Chapter 6 in the AS Series Programming Manual. An example when "K50" appears in the AS Series Programming Manual, enter only the number 50 in ISPSof / DIADesigner.

\*2: Floating-point numbers are indicated by F/DF in the device lists in Chapter 5 and Chapter 6 in the AS Series Programming Manual, but they are represented by decimal points in ISPSof. For example, for the floating-point number F500, enter 500.0 in ISPSof / DIADesigner.

\*3: Strings are indicated by "\$" in Chapter 5 and Chapter 6 in the AS Series Programming Manual, but they are represented by quotes (" ") in ISPSof / DIADesigner. For example, for the string 1234, enter "1234" in ISPSof / DIADesigner.

\*4: This is used for editing in ISPSof only.

### 5.1.2 Basic Structure of I/O Storages

| Device    | Function                | Access by bits | Access by words | Modify by ISPSof / DIADesigner | Force the bit ON/OFF |
|-----------|-------------------------|----------------|-----------------|--------------------------------|----------------------|
| <b>X</b>  | Input relay             | OK             | OK              | OK                             | OK                   |
| <b>Y</b>  | Output relay            | OK             | OK              | OK                             | OK                   |
| <b>M</b>  | Auxiliary relay         | OK             | -               | OK                             | -                    |
| <b>SM</b> | Special auxiliary relay | OK             | -               | OK                             | -                    |
| <b>S</b>  | Relay                   | OK             | -               | OK                             | -                    |
| <b>T</b>  | Timer                   | OK             | OK              | OK                             | -                    |
| <b>C</b>  | Counter                 | OK             | OK              | OK                             | -                    |
| <b>HC</b> | 32-bit counter          | OK             | OK              | OK                             | -                    |
| <b>D</b>  | Data register           | OK             | OK              | OK                             | OK                   |
| <b>SR</b> | Special data register   | -              | OK              | OK                             | -                    |
| <b>FR</b> | File register           | -              | OK*1            | -                              | -                    |

| Device | Function       | Access by bits | Access by words | Modify by ISPSOft / DIADesigner | Force the bit ON/OFF |
|--------|----------------|----------------|-----------------|---------------------------------|----------------------|
| E      | Index register | -              | OK              | OK                              | -                    |

\*1: Use an instruction for writing to an FR.

### 5.1.3 Relation Between the PLC Action and the Device Type

| Device type<br>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<br>↓<br>RUN*1                               | This clears the non-latched area state.  |              | Cleared          | Cleared       | Retained      | Retained      |
|  | This retains the non-latched area state. |              | Retained         | Retained      | Retained      | Retained      |
| RUN<br>↓<br>STOP*1                               | This clears the device Y.                | SM203 = OFF  | Cleared          | Retained      | Retained      | Retained      |
|  | This retains the device Y.               | SM203 = OFF  | Retained         | Retained      | Retained      | Retained      |
|  | This clears the device Y.                | SM203 = ON*3 | Cleared          | Cleared       | Retained      | Retained      |
|  | This retains the device Y.               | SM203 = ON   | Retained         | Cleared       | Retained      | Retained      |
| SM204 is ON.This clears all non-latched areas.*2 |  |              | Cleared          | Cleared       | Retained      | Retained      |
| SM205 is ON.This clears all latched areas.*2     |  |              | Retained         | Retained      | Retained      | Cleared       |

\*1: For state setups, see HWCONFIG in ISPSOft. The PLC STOP->RUN default is “clear the non-latched area state”. The PLC RUN->STOP default is “clear the state of device Y”.

\*2: The timing for clearing the SM is when SM turns from OFF to ON. After PLC completes clearing, the system turns SM from ON to OFF.

\*3: When SM203 is ON, the system clears all non-latched area once when PLC is from RUN to STOP, available for AS PLC CPU with FW V1.08.30 or later.

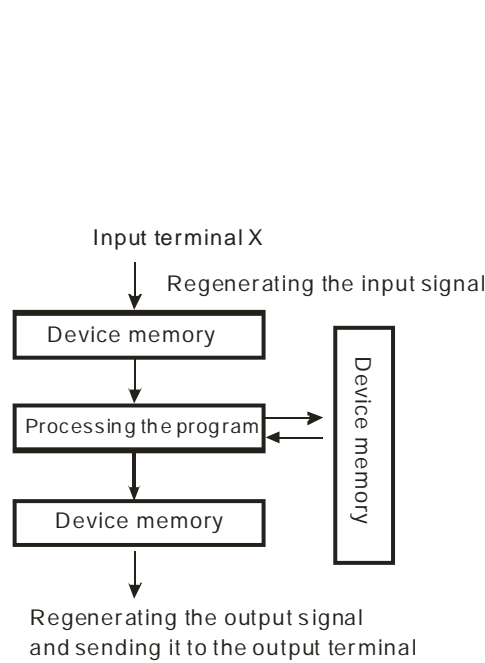
### 5.1.4 Latched Areas in the Device Range

| Device      | Function                | Device range | Latched area   |
|-------------|-------------------------|--------------|--|
| <b>X</b>    | Input relay             | X0–X63       | All devices are non-latched.   |
| <b>Y</b>    | Output relay            | Y0–Y63       | All devices are non-latched.   |
| <b>M*1</b>  | Auxiliary relay         | M0–M8191     | The default range is M6000–M8191.  |
| <b>SM</b>   | Special auxiliary relay | SM0–SM2047   | Some devices are latched and cannot be changed.<br>Refer to the list of special auxiliary relays for more information. |
| <b>S*1</b>  | Relay                   | S0–S1023     | The default range is S512–S1023  |
| <b>T</b>    | Timer                   | T0–T511      | All devices are non-latched.   |
| <b>C*1</b>  | Counter                 | C0–C511      | The default range is C448–C511   |
| <b>HC*1</b> | 32-bit counter          | HC0–HC255    | The default range is HC128–HC255   |
| <b>D*1</b>  | Data register           | D0–D29999    | The default range is D20000–D23999   |
|             |                         | W0–W29999    | Use this for editing in ISPSOft only.  |
| <b>FR</b>   | File register           | FR0–FR65535  | All devices are latched.   |
| <b>SR</b>   | Special data register   | SR0–SR2047   | Some are latched and cannot be changed. Refer to the list of special data registers for more information.              |
| <b>E</b>    | Index register          | E0–E9        | All devices are non-latched.   |
|             |                         | E10–E14      | Use this for editing in ISPSOft only.  |

\*1: For the latched area setups, see HWCONFIG in ISPSOft. Setting the latched area means the other areas show as non-latched areas. The range of latched areas cannot exceed the device range. For example, if you set the M600–M7000 as latched areas, M0–M5999 and M7001–M8191 become non-latched areas.

## 5.2. Device Functions

Procedure for processing the program in the PLC:



- Regenerating the input signal
  1. Before executing the program, the external input signal state is read into the memory for the input signal.
  2. When the program is executed, the state in the memory location for the input signal does not change even if the input signal changes from ON to OFF or from OFF to ON. The input signal is not refreshed until the next scan begins.
- Processing the program

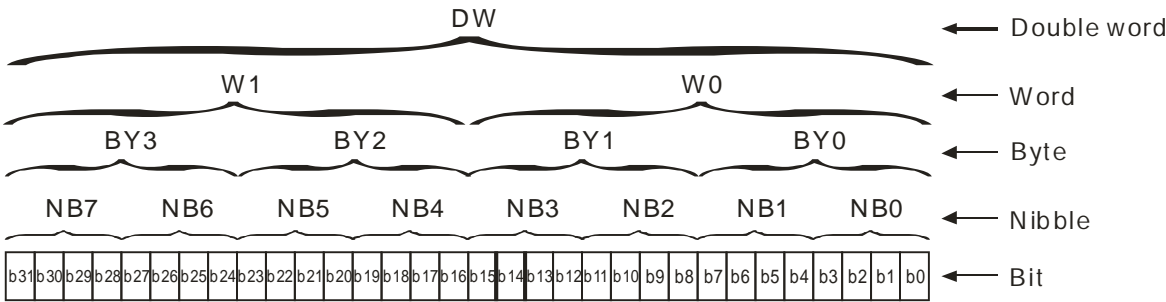
After the input signal is refreshed, the instructions in the program are executed in order from the starting address of the program. The results are stored in the device memories.
- Regenerating the state of the output

After the instruction END is executed, the device memory 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 (for example b3–b0). Nibbles can 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 represent 00–FF in the hexadecimal system.                             |
| Word        | A word is composed of two consecutive bytes (i.e. 16 bits, b15–b0). Words can 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 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 following illustrates the values of these functions.:

1. Binary number (BIN)

The PLC uses the binary system to operate the values.

2. Decimal number (DEC)

The PLC uses decimal numbers for;

- The setting value of a timer (T) or the setting value of a 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**: used as the operand in an 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, so that sixteen consecutive bits represent a four-digit decimal value.

4. Hexadecimal number (HEX)

The PLC uses hexadecimal numbers for;

- **the constant 16#**: used as the operand in an applied instruction; for example, MOV 16#1A2B D0 (hexadecimal constant).

The following table shows the corresponding values.

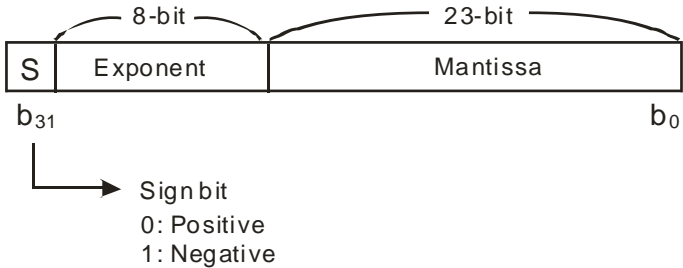
| <b>Binary Number<br/>(BIN)</b> | <b>Decimal Number<br/>(DEC)</b>     | <b>Binary Code Decimal<br/>(BCD)</b> | <b>Hexadecimal Number<br/>(HEX)</b> |
|--------------------------------|-------------------------------------|--------------------------------------|-------------------------------------|
| PLC internal execution         | <b>Constant K,</b><br>Device number | BCD related instruction              | Instant 16#,<br>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 / DIADesigner. For example, the floating-point number of 500 is 500.0. Refer to Section 2.2.2 in the AS Series Programming Manual for more information.

5.2.2.1 Single-precision Floating-point Numbers

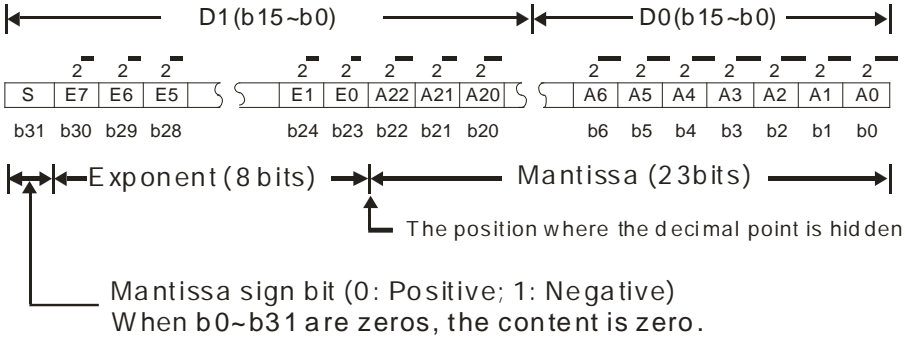
Floating-point numbers are represented by the 32-bit register. The representation adopts the IEEE754 standard, and the format is as follows.



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 a 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 ×2<sup>4</sup> (0111 is the mantissa, and 4 is the exponent.).

Step 3: Get the value of the exponent.

$\therefore E-B=4 \rightarrow E-127=4 \therefore E=131=100000112$

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

$0\ 10000011\ 011100000000000000000000_2=41B80000_{16}$

**Example 2:**

**-23 is represented by a single-precision floating-point number.**

Converting -23.0 into the floating-point number uses the same steps as converting 23.0 into the floating-point number, except that the sign bit is 1.

1 10000011 011100000000000000000000<sub>2</sub>=C1B80000<sub>16</sub>

**5.2.2.2 Decimal Floating-point Numbers**

**-23 is represented by a single-precision floating-point number.**

Converting -23.0 into the floating-point number uses the same steps as converting 23.0 into the floating-point number, except that the sign bit is 1.

1 10000011 011100000000000000000000<sub>2</sub>=C1B80000<sub>16</sub>

**5.2.2.2 Decimal Floating-point Numbers**

- Single-precision floating-point numbers and double-precision floating-point numbers can be converted into decimal floating-point numbers so people can read them. However, the PLC uses single-precision floating-point numbers and double-precision floating-point numbers internally.
- A 32-bit 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.

Decimal floating-point number=[Constant D0]<sup>[Exponent D1]</sup> 10

Base number D0=±1,000 to ±9,999

Exponent D1=-41—+35

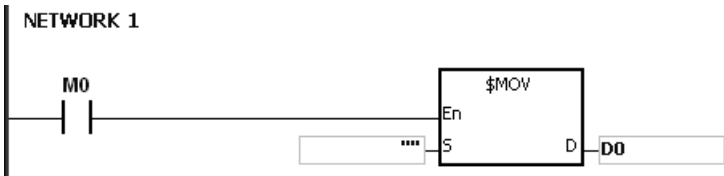
The base number 100 does not exist in D0 because 100 is represented by  $1,000 \times 10^{-1}$ . 32-bit decimal floating-point numbers range from  $\pm 1175 \times 10^{-41}$  to  $\pm 402 \times 10^{+35}$ .



5.2.3 Strings

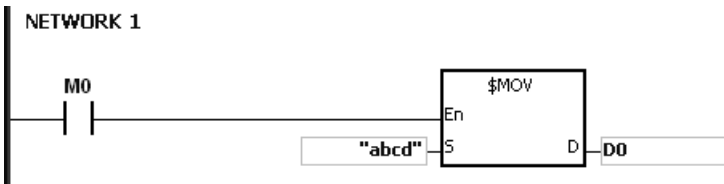
The PLC can process strings composed of ASCII codes (\*1). A complete string begins with a start character and ends with an ending character (NULL code). Strings can be a maximum of 31 characters, and the ending character 16#00 is added automatically in ISPSoft / DIADesigner.

1. No string (NULL code) is moved.



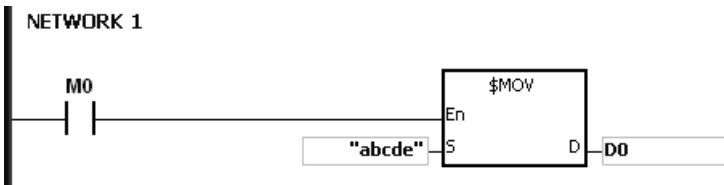
D0=0 (NULL)

2. The string has an even number of characters.



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

3. The string has an odd number of characters.



|    |           |           |
|----|-----------|-----------|
| 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)

● Input function

The input is connected to the input device (external devices such as button switches, rotary switches, and number switches), and PLC reads the input signal. You can use input contact A or contact B several times in the program, and the ON/OFF input state varies with the ON/OFF input device state.

● 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. 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 for the PLC is 8192, and the input number range is between X0.0 and X511.15.

● Input type: Inputs are classified into two types.

1. Regenerated inputs: PLC reads the state of a regenerated input before the program is executed. For example, LD X0.0.
2. Direct input: The state of a direct input is read by the PLC during the execution of the instructions. For example, LD DX0.0.

### 5.2.5 Output Relays (Y)

- Output function

The output sends the ON/OFF signal to drive the load connected to the output, such as an external signal lamp, a digital display, or an electromagnetic valve. There are four types of outputs: relays, transistors (NPN and PNP), and TRIACs (thyristors). You can use the output contact A or contact B several times in the program. Use output Y only once in the program; otherwise, according to the PLC's program-scanning principle, the state of the output depends on the circuit connected to the last output Y in the program.

- Output number (the decimal number)

For the PLC, the output numbers start from Y0.0. The number of outputs varies with the number of outputs on the digital input/output modules. 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 is 1024, and the range is between Y0.0 and Y63.15.

An output that is not used as an output device can be used as a general device.

- Output types

Outputs are classified into two types.

1. Regenerated output: The state of a regenerated output is not written until the program executes the instruction END according to the states of the outputs. For example, OUT Y0.0.
2. Direct output: The state of a direct output is written by the PLC during the execution of the instructions 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. You can combine the control loops with the auxiliary relay, but you cannot drive the external load with the auxiliary relay. You can use the auxiliary relays in either of two ways.

1. For general use: In general use, if an electrical power interruption occurs when the PLC is running, the auxiliary relay is reset to OFF. When the power is restored, the auxiliary relay remains OFF.
2. For latched use: In latched use, if an electrical power interruption occurs when the PLC is running, the state of the auxiliary relay states for latched use is retained. When the power supply is restored, the state remains the same as before the power interruption.

### 5.2.7 Special Auxiliary Relays (SM)

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

### 5.2.8 Relays (S)

Relay is the most basic device to set procedures, especially common in ladder diagram (LD) programming.

Refer to the ISPSOFT User Manual for more information on using ladder diagram.

There are 2048 relays, (S0–S2047). Every relay (device S) is like an auxiliary relay (device M) which contains an output coil, contact A, and contact B. There is no limit on the number of usage in a program. For the retainable relays, their statuses can be retained after power loss. However, for the unretainable relays, the statuses cannot be retained after power loss and all the statuses will be restored to OFF after the power returns.

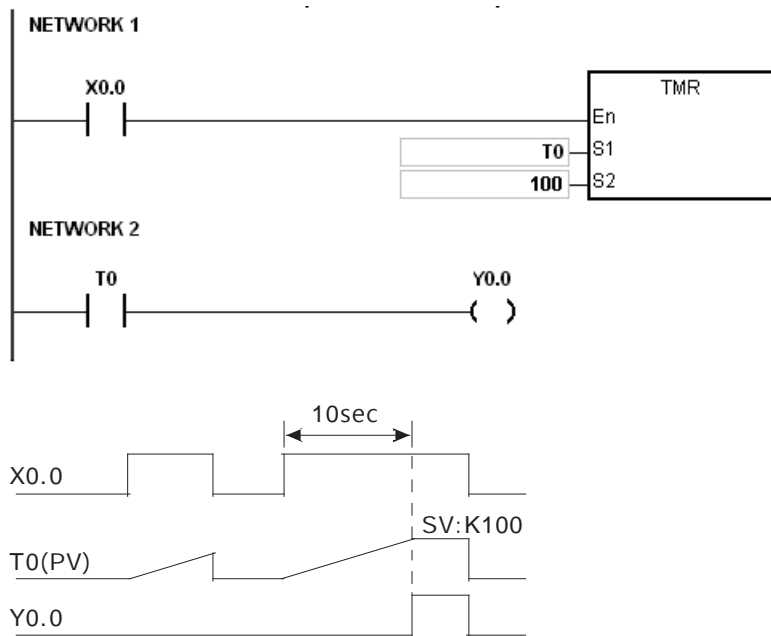
### 5.2.9 Timers (T)

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

### A. General-purpose timer

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

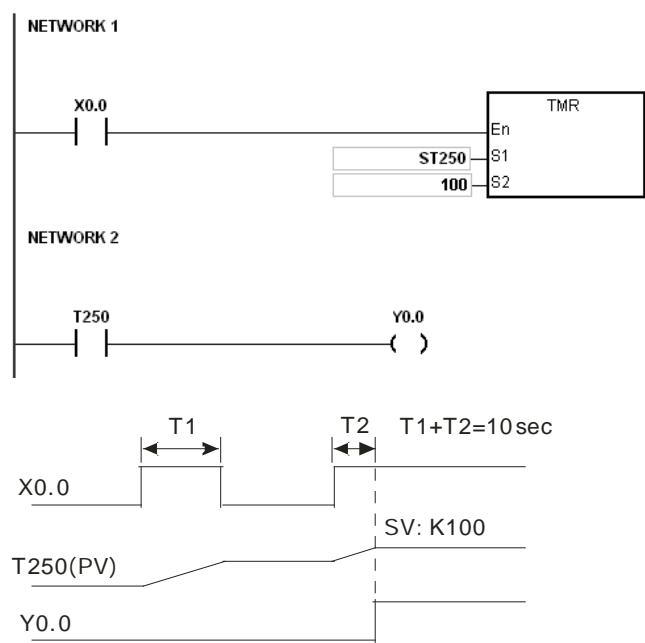
- When X0.0=ON and the timer takes 100 ms as the timing unit, the output coil T0 is ON when the value of the timer = setting value 100.
- When X0.0=OFF or the power is off, the value of the timer is 0 and the output coil T0 is OFF.



### B. Accumulative timer

When the instruction TMR is executed, the accumulative timer begins to count. When the value of the timer matches the timer setting value, the output coil is ON. As long as you add the letter S in front of the letter T, the timer becomes an 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 counts from the current value.

- When X0.0=ON and the timer T250 takes 100 ms as the timing unit, the output coil T250 is ON when the value of the timer = timer setting value 100.
- 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 value of the timer is accumulating value. When the accumulated value = timer setting value 100, the output coil T250 is ON.



C. Timer used in the function block

Use the T412–T511 timers for the function block or the interrupt.

When the instruction TMR or END is executed, the timer used in the functional block begins to count.

When the value of the timer matches the timer setting value, the output coil is ON.

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

5.2.10 16-bit 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  |
| Specifying the counter 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. |
| Output contact                       | The contact is ON when the value of the counter matches the setting value.          |

| Item                  | 16-bit counter   |
|-----------------------|--|
| 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 scan completes, the contact acts.  |

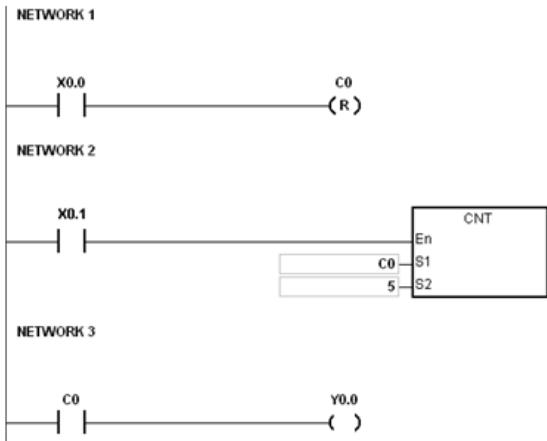
● Counter function

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

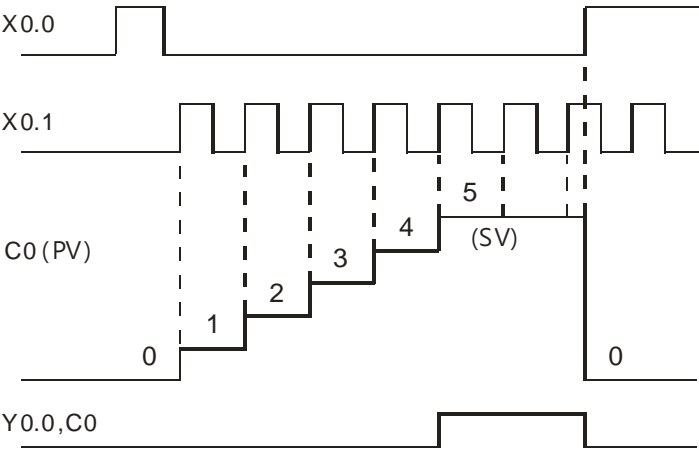
● 16-bit counter:

1. Setting range: 0–32,767. The setting values 0 and 1 both 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 interruption. If the counter is latching, the current value of the counter and the state of the contact before the power interruption are retained. The latched counter counts from the current value when the power supply is restored.
3. If you use the instruction MOV or ISPSOft / DIADesigner to transmit a value bigger than the counter setting value to the current value register C0, the contact of the counter C0 is ON and the current value becomes the same as the counter setting value next time X0.1 switches from OFF to ON.
4. Use either the constant or the value in the data register as the counter setting value.
5. The counter setting value can be a positive or negative value. If the counter counts up from 32,767, the next value is 0.
6. Here we uses the most common application as an example. You can use this counter with API 1003 CNT instruction; refer to CNT instruction for more description.

Example:



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 counter C0 reached the setting value 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 to +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.<br>The contact is reset to OFF when the value of the subtraction counter matches the setting value. |             |                    |
| Reset                              | When the RST instruction is executed, the current value is cleared to zero, and the contact is reset to OFF.  |             |                    |

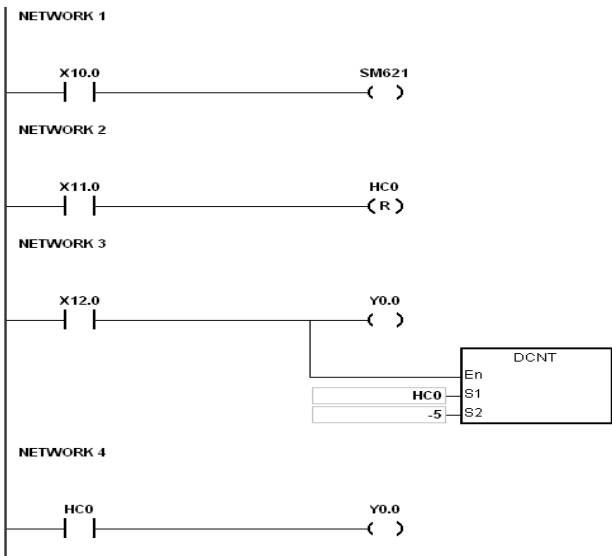


| Item                  | 32-bit counter  |
|-----------------------|---|
| Action of the contact | After the DCNT instruction scan is complete, the contact activates. |

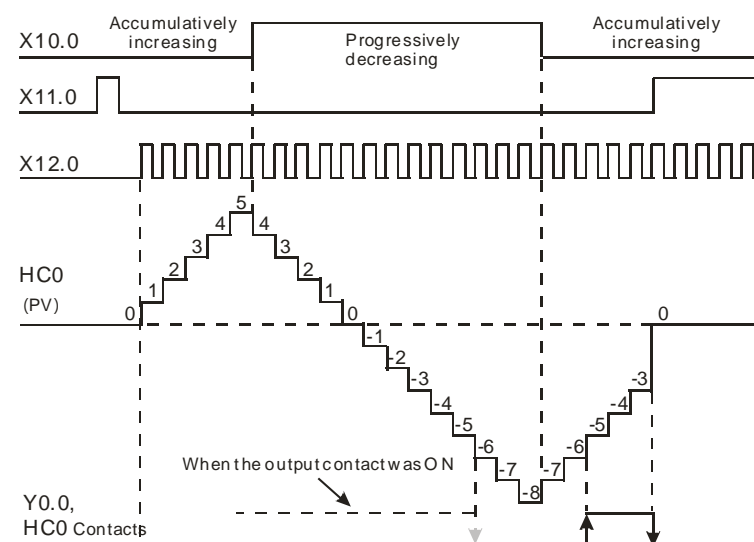
- 32-bit general-purpose addition/subtraction counter
  1. Setting range: -2,147,483,648 to 2,147,483,647
  2. The switch between the 32-bit general-purpose addition counters and the 32-bit general-purpose subtraction counters depends on the states of the special auxiliary relays SM621–SM684. For example, the counter HC0 is the addition counter when SM621 is OFF, but HC0 is the subtraction counter when SM621 is ON. Use either the constant or the value in the data registers as the setting value for the counter, and the setting value can be a positive or a negative number. If you use the value in the data registers as the setting value of the counter, the setting value occupies two consecutive registers.
  3. For the general-purpose counter, the current value of the counter is cleared when there is a power interruption. If the counter is latched, the current value of the counter and the state of the contact before the power interruption are retained. The latched counter counts from the current value when the power supply is restored.
  4. If the counter counts up from 2,147,483,647, the next current value is -2,147,483,648. If the counter counts down from -2,147,483,648, the next current value is 2,147,483,647.
  5. Here we uses the most common application as an example. You can use this counter with API 1004 DCNT instruction; refer to DCNT instruction for more description.
- 32-bit high speed addition/subtraction counter

Refer to the DCNT instruction description (API 1004) in the 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 executes, the PV in HC0 is cleared to 0, and its contact is OFF.
3. When X12.0 goes from OFF to ON, PV of HC0 counts up (plus 1) or down (minus 1).
4. When PV in HC0 changes from -6 to -5, the contact HC0 goes from OFF to ON. When PV in HC0 changes from -5 to -6, the contact HC0 goes from ON to OFF.



### 5.2.12 Data Registers (D)

The data register stores 16-bit data. The highest bit represents either a positive sign or a negative sign, and the values that you can store in the data registers are between -32,768 to +32,767. Two 16-bit registers can be combined into a 32-bit register, that is, (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 that you can store in the data registers are between -2,147,483,648 to +2,147,483,647. Four 16-bit registers can be combined into a 64-bit register; that is, (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 are between -9,223,372,036,854,776 to +9,223,372,036,854,775,807. You can also use the data registers to refresh the values in the control registers in the modules other than digital I/O modules. Refer to the ISPSOft / DIADesigner User Manual for more information about refreshing the values in the control registers.

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

1. General-purpose register: when the PLC begins to run or is disconnected, the value in the register clears to zero. To retain the data when the PLC begins to RUN, refer to the ISPSOft / DIADesigner User Manual for more information. Notice that the value still clears to zero when the PLC is disconnected.
2. Latched register: if the PLC is disconnected, the data in the latched register is not cleared. In other words, the value before the disconnection is still retained. To clear the data in the latched area, use the RST or ZRST instruction.
3. Data exchange area: When the PLC is connected with a module, the PLC exchanges data with the connected module at every scan cycle. And the data is stored in data registers D26000 to D29999. Refer to the ISPSOft > HWCONFIG > Module > Device Setting > Normal Exchange Area to see the data register range and refer to Chapter 8 for more descriptions.

### **5.2.13 Special Data Registers (SR)**

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

### **5.2.14 Index Register (E)**

The index register is a 16-bit data register. Like the general register, you can read data from it and write data into it. However, it is mainly used as the index register. The index registers range from E0–E9. Refer to section 4.4 in the AS Series Programming Manual for more information about using index registers.

### **5.2.15 File Registers (FR)**

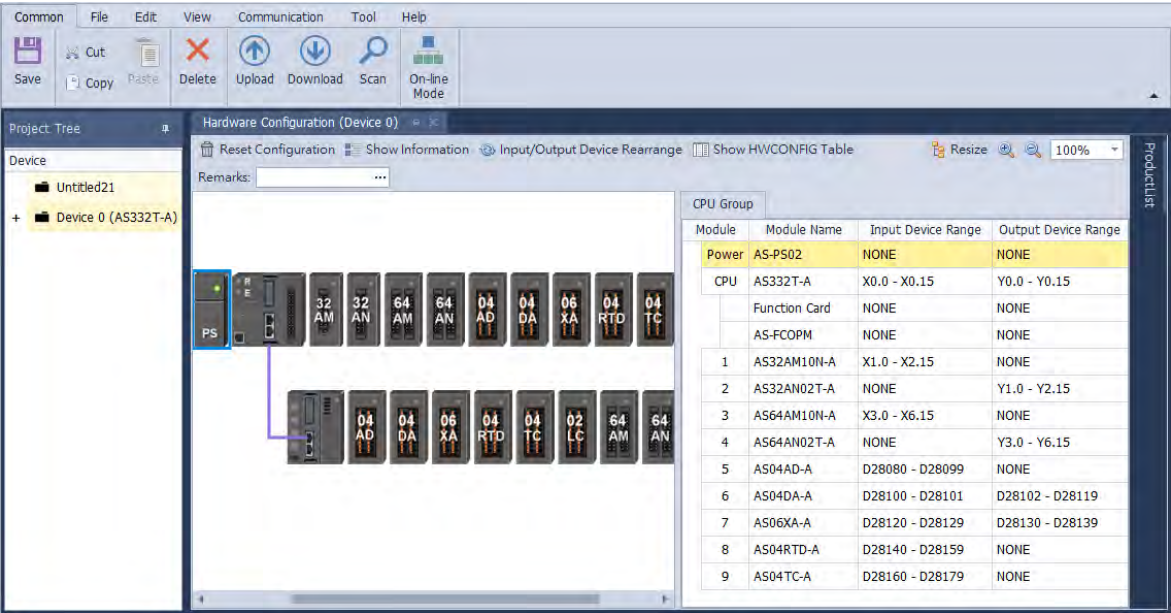
The AS Series PLC provides you with file registers for storing larger numbers of parameters. You can edit, upload, and download the system parameters with ISPSOft / DIADesigner. You can read the values in a file register can be read while operating the PLC. Refer to the MEMW instruction (API 2303) in the AS Series Programming Manual for more information about how to write to a file register.

### 5.3. Assigning I/O Addresses for Modules

This chapter explains how to assign input and output devices to an AS Series input/output module in ISPSoft. For DIADesigner operation, refer to section 6.1 from DIADesigner software manual.

#### Using HWCONFIG in ISPSoft

The following picture shows the **HWCONFIG** window in ISPSoft. Please refer to Chapter 8 for more information on the hardware configuration.



- **Module addresses defined by software**

Through HWCONFIG, the system automatically assigns a starting address to every slot of an input/output module in ISPSoft.

- **Remote module addresses defined by software**

You use HWCONFIG to assign a starting address to a remote module in ISPSoft. Double-click the CPU module and select Function Card 2. Change the Card 2 Detect mode to Manual and then select AS-FCOPM from the Manual Select Card. You can assign a starting address to the first remote module installed on the right side of the I/O module slot. Then the following I/O modules are assigned addresses automatically and consecutively.

## 5.4 Module Addresses Defined by Software

This section uses ISPSOft for demonstration. For DIADesigner operation, refer to section 6.1 from DIADesigner software manual.

### 5.4.1 Starting Addresses for Digital Input/Output Modules

HWCONFIG automatically assigns input/output devices to a digital input/output module in ISPSOft according to the number of inputs and outputs in the digital input/output module (X0.0–X0.15, X1.0–X1.15, X2.0–X2.15...; Y0.0–Y0.15, Y1.0–Y1.15, Y2.0–Y2.15). The default starting addresses are shown below.

Note: each digital I/O module reserves 20 words of data devices and it assigns consecutive data devices automatically starting from D28000.

- AS332T/AS332P: There are 16 inputs. The input and output device range occupies 16 bits. (Xn.0–Xn.15), (Yn.0–Yn.15) and 20 words of data devices.
- AS324MT: There are 16 outputs. The input and output device range occupies 16 bits. (Xn.0–Xn.15), (Yn.0–Yn.15) and 20 words of data devices.
- 08AM: There are eight inputs. The input device range occupies 16 bits (Xn.0–Xn.15) and 20 words of data devices.
- 08AN: There are eight outputs. The output device range occupies 16 bits (Yn.0–Yn.15) and 20 words of data devices.
- 16AM: There are 16 inputs. The input device range occupies 16 bits (Xn.0–Xn.15) and 20 words of data devices.
- 16AN: There are 16 outputs. The output device range occupies 16 bits (Yn.0–Yn.15) and 20 words of data devices.
- 16AP: There are eight inputs and eight outputs. The input and output device range occupies 16 bits. (Xn.0–Xn.15), (Yn.0–Yn.15) and 20 words of data devices.
- 32AM: There are 32 inputs. The input device range occupies 32 bits (Xn.0–Xn+1.15) and 20 words of data devices.
- 32AN: There are 32 outputs. The output device range occupies 32 bits (Yn.0–Yn+1.15) and 20 words of data devices.
- 64AM: There are 64 inputs. The input device range occupies 64 bits (Xn.0–Xn+3.15) and 20 words of data devices.
- 64AN: There are 64 outputs. The output device range occupies 64 bits (Yn.0–Yn+3.15) and 20 words of data devices.



| CPU Group |               |                    |                     |
|-----------|---------------|--------------------|---------------------|
| Module    | Module Name   | Input Device Range | Output Device Range |
| Power     | AS-PS02       | NONE               | NONE                |
| CPU       | AS332T-A      | X0.0 - X0.15       | Y0.0 - Y0.15        |
|           | Function Card | NONE               | NONE                |
|           | Function Card | NONE               | NONE                |
| 1         | AS04AD-A      | D28000 - D28019    | NONE                |
| 2         | AS08AM10N-A   | X1.0 - X1.7        | NONE                |
| 3         | AS08AN01R-A   | NONE               | Y1.0 - Y1.7         |
| 4         | AS16AM10N-A   | X2.0 - X2.15       | NONE                |
| 5         | AS16AN01T-A   | NONE               | Y2.0 - Y2.15        |
| 6         | AS16AP11T-A   | X3.0 - X3.7        | Y3.0 - Y3.7         |
| 7         | AS32AM10N-A   | X4.0 - X5.15       | NONE                |
| 8         | AS32AN02T-A   | NONE               | Y4.0 - Y5.15        |
| 9         | AS64AM10N-A   | X6.0 - X9.15       | NONE                |
| 10        | AS64AN02T-A   | NONE               | Y6.0 - Y9.15        |

Note: though there is no information on the occupied data devices in the image shown above, the CPU reserves 20 words of data devices.

5.4.2 Starting Addresses for Analog Input/Output Modules

HWCONFIG automatically assigns consecutive input and output data registers starting from D28000 to an analog input/output module in ISPSOft according to the number of registers defined for the analog input/output module.

1. 04AD: There are four input channels. The input device range occupies 20 data registers.
2. 08AD: There are eight input channels. The input device range occupies 20 data registers.
3. 004DA: There are four output channels. The input device range occupies two data registers and the output device range occupies 18 data registers.
4. 06XA: There are four input channels and two output channels. The input device range occupies 10 data registers, and the output device range occupies 10 data registers.




| CPU Group |               |                    |                     |
|-----------|---------------|--------------------|---------------------|
| Module    | Module Name   | Input Device Range | Output Device Range |
| Power     | AS-PS02       | NONE               | NONE                |
| CPU       | AS332T-A      | X0.0 - X0.15       | Y0.0 - Y0.15        |
|           | Function Card | NONE               | NONE                |
|           | Function Card | NONE               | NONE                |
| 1         | AS04AD-A      | D28000 - D28019    | NONE                |
| 2         | AS08AD-B      | D28020 - D28039    | NONE                |
| 3         | AS04DA-A      | D28040 - D28041    | D28042 - D28059     |
| 4         | AS06XA-A      | D28060 - D28069    | D28070 - D28079     |

### 5.4.3 Starting Addresses for Temperature Measurement Modules

HWCONFIG automatically assigns consecutive input and output data registers starting from D28000 to a temperature measurement module in ISPSOft according to the number of registers defined for the temperature measurement module.

1. 04RTD: There are four input channels. The input device range occupies 20 data registers.
2. 06RTD: There are six input channels. The input device range occupies 20 data registers.
3. 04TC: There are four input channels. The input device range occupies 20 data registers.
4. 08TC: There are eight input channels. The input device range occupies 20 data registers.




| CPU Group |       | Module        | Module Name | Input Device Range | Output Device Range |
|-----------|-------|---------------|-------------|--------------------|---------------------|
|           | Power | AS-PS02       |             | NONE               | NONE                |
|           | CPU   | AS332T-A      |             | X0.0 - X0.15       | Y0.0 - Y0.15        |
|           |       | Function Card |             | NONE               | NONE                |
|           |       | Function Card |             | NONE               | NONE                |
| 1         |       | AS04RTD-A     |             | D28000 - D28019    | NONE                |
| 2         |       | AS06RTD-A     |             | D28020 - D28039    | NONE                |
| 3         |       | AS04TC-A      |             | D28040 - D28059    | NONE                |
| 4         |       | AS08TC-A      |             | D28060 - D28079    | NONE                |

### 5.4.4 Starting Addresses for Positioning/Counter Modules

HWCONFIG automatically assigns consecutive input and output data registers starting from D28000 to a network module in ISPSOft according to the number of registers defined for the network module.

1. 02PU: The input device range occupies 20 data registers.
2. 04PU: The input device range occupies 20 data registers.
3. 02HC: The input device range occupies 20 data registers.




| CPU Group |       | Module        | Module Name | Input Device Range | Output Device Range |
|-----------|-------|---------------|-------------|--------------------|---------------------|
|           | Power | AS-PS02       |             | NONE               | NONE                |
|           | CPU   | AS332T-A      |             | X0.0 - X0.15       | Y0.0 - Y0.15        |
|           |       | Function Card |             | NONE               | NONE                |
|           |       | Function Card |             | NONE               | NONE                |
| 1         |       | AS02PU-A      |             | D28000 - D28019    | NONE                |
| 2         |       | AS04PU-A      |             | D28020 - D28039    | NONE                |
| 3         |       | AS02HC-A      |             | D28040 - D28059    | NONE                |

5.4.5 Starting Addresses for Network Modules


HWCONFIG automatically assigns consecutive input and output data registers starting from D28000 to a network module in ISPSOft according to the number of registers defined for the network module.

- SCM, as a general COM communication module:  
Communication status and communication method; the input device range occupies 20 data registers, and the output device range occupies 20 data registers.




| CPU Group |       | Module Name   | Input Device Range | Output Device Range |
|-----------|-------|---------------|--------------------|---------------------|
|           | Power | AS-PS02       | NONE               | NONE                |
|           | CPU   | AS332T-A      | X0.0 - X0.15       | Y0.0 - Y0.15        |
|           |       | Function Card | NONE               | NONE                |
|           |       | Function Card | NONE               | NONE                |
| 1         |       | AS00SCM-A     | D28000 - D28019    | D28020 - D28039     |
|           |       | Function Card | NONE               | NONE                |
|           |       | Function Card | NONE               | NONE                |

- Remote module SCM: the input device range and output device range each occupy 10 data registers.



| Group_1 |        | Module Name | Input Device Range  | Output Device Range |
|---------|--------|-------------|---------------------|---------------------|
|         | Remote | AS00SCM-A   | D29000 - D29009 ... | D29010 - D29019     |
|         |        | AS-FCOPM    | NONE                | NONE                |
| 1       |        | AS08AM10N-A | X1.0 - X1.7         | ... NONE            |
| 2       |        | AS08AN01T-A | NONE                | Y1.0 - Y1.7 ...     |
| 3       |        | AS16AM10N-A | X2.0 - X2.15        | NONE                |
| 4       |        | AS16AN01T-A | NONE                | Y2.0 - Y2.15        |
| 5       |        | AS16AP11T-A | X3.0 - X3.7         | Y3.0 - Y3.7         |
| 6       |        | AS32AM10N-A | X4.0 - X5.15        | NONE                |
| 7       |        | AS32AN02T-A | NONE                | Y4.0 - Y5.15        |
| 8       |        | AS64AM10N-A | X6.0 - X9.15        | NONE                |


- AS01DNET-A: when selecting the COM communication mode, its communication status and communication method: the input device range occupies 20 data registers, and the output device range occupies 20 data registers.



| CPU Group |               | Module Name   | Input Device Range | Output Device Range |
|-----------|---------------|---------------|--------------------|---------------------|
|           | Power         | AS-PS02       | NONE               | NONE                |
|           | CPU           | AS332T-A      | X0.0 - X0.15       | Y0.0 - Y0.15        |
|           |               | Function Card | NONE               | NONE                |
|           |               | Function Card | NONE               | NONE                |
| 1         |               | AS01DNET-A    | D28000 - D28019    | D28020 - D28039     |
|           | Data Exchange |               | D26000 - D26099    | D26100 - D26199     |



- AS04SIL-A: when selecting the COM communication mode, its communication status and communication method: the input device range occupies 20 data registers.




| CPU Group |               |                    |                     |
|-----------|---------------|--------------------|---------------------|
| Module    | Module Name   | Input Device Range | Output Device Range |
| Power     | AS-PS02       | NONE               | NONE                |
| CPU       | AS332T-A      | X0.0 - X0.15       | Y0.0 - Y0.15        |
|           | Function Card | NONE               | NONE                |
|           | Function Card | NONE               | NONE                |
| 1         | AS04SIL-A     | D28000 - D28019    | NONE                |
|           | Data Exchange | D26000 - D26099    | D26100 - D26199     |

5.4.6 Starting Addresses for Load Cell Modules

HWCONFIG automatically assigns consecutive input and output data registers starting from D28000 to a load cell module in ISPSOft according to the number of registers defined for the load cell module.

- 02LC: The input device range occupies 7 data registers and the output device range occupies 13 data registers.

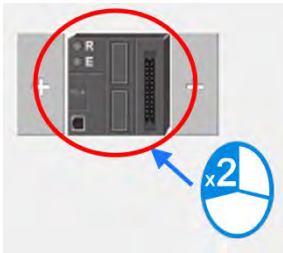


| CPU Group |               |                    |                     |
|-----------|---------------|--------------------|---------------------|
| Module    | Module Name   | Input Device Range | Output Device Range |
| Power     | AS-PS02       | NONE               | NONE                |
| CPU       | AS332T-A      | X0.0 - X0.15       | Y0.0 - Y0.15        |
|           | Function Card | NONE               | NONE                |
|           | Function Card | NONE               | NONE                |
| 1         | AS02LC-A      | D28000 - D28006    | D28007 - D28019     |

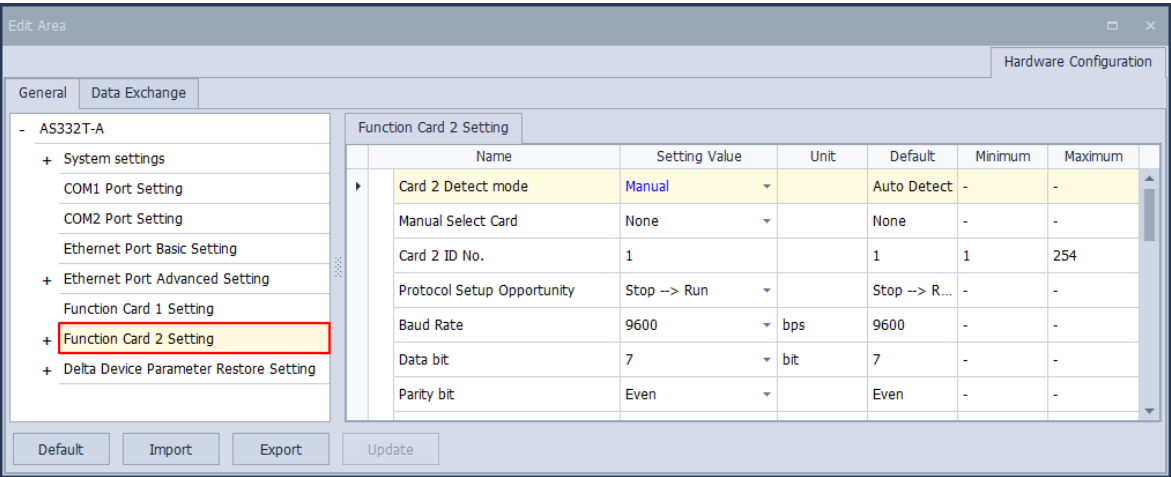
## 5.5 Remote Module Addresses Defined by Software

This section uses ISPSoft for demonstration. For DIADesigner operation, refer to section 6.1 from DIADesigner software manual.

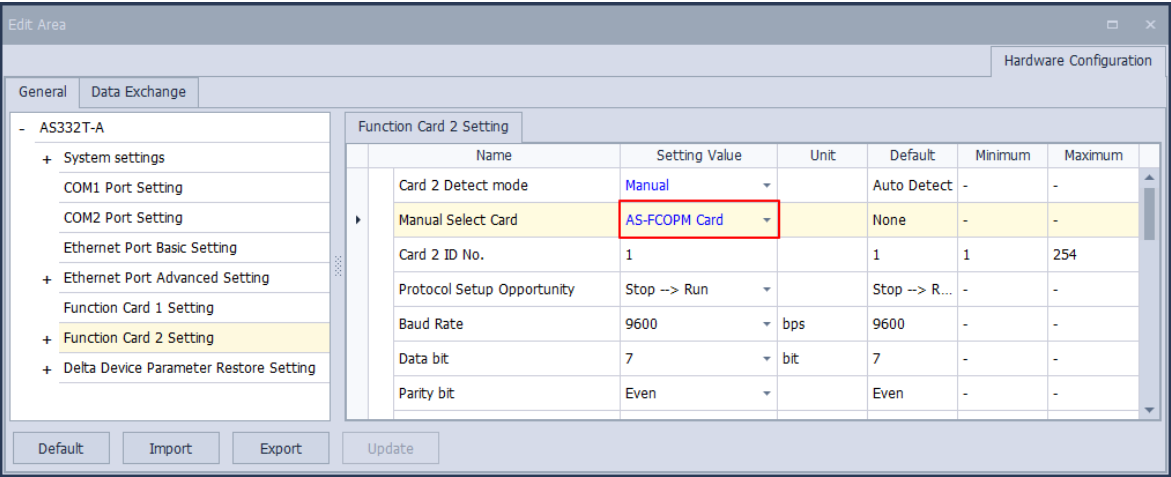
Double-click the CPU module to see the setting page where you can set up the PLC parameters. Select options on the left under the General or Data Exchange tab, you can see the setting items on the right under the tab of the option you have selected.



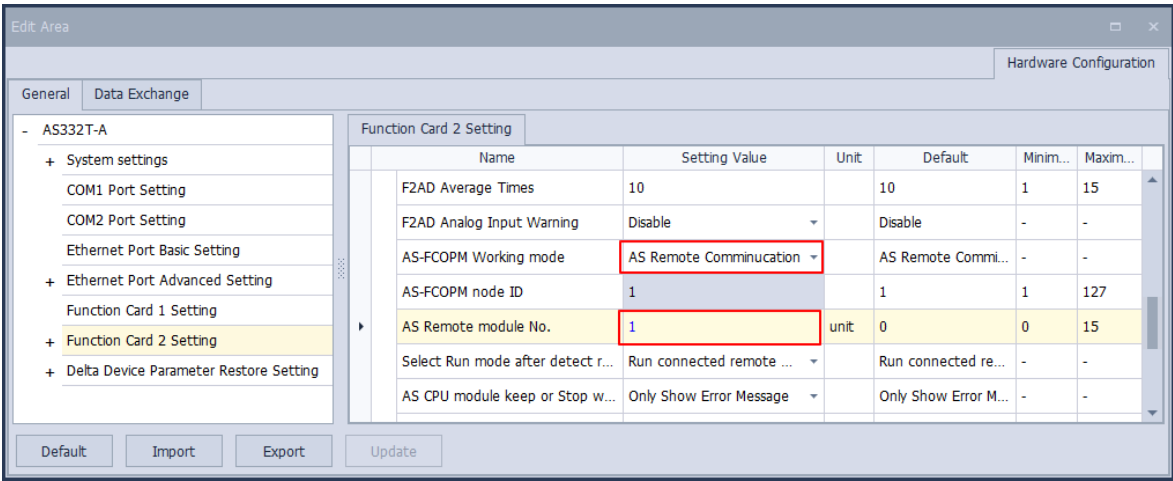
- Click **Function Card2** on the left to see the Function Card 2 Setting tab on the right and find setting items under the tab.



- For **Card 2 Detect mode**, select **Manual**. For **Manual Select Card**, select **AS-FCOPM Card**.

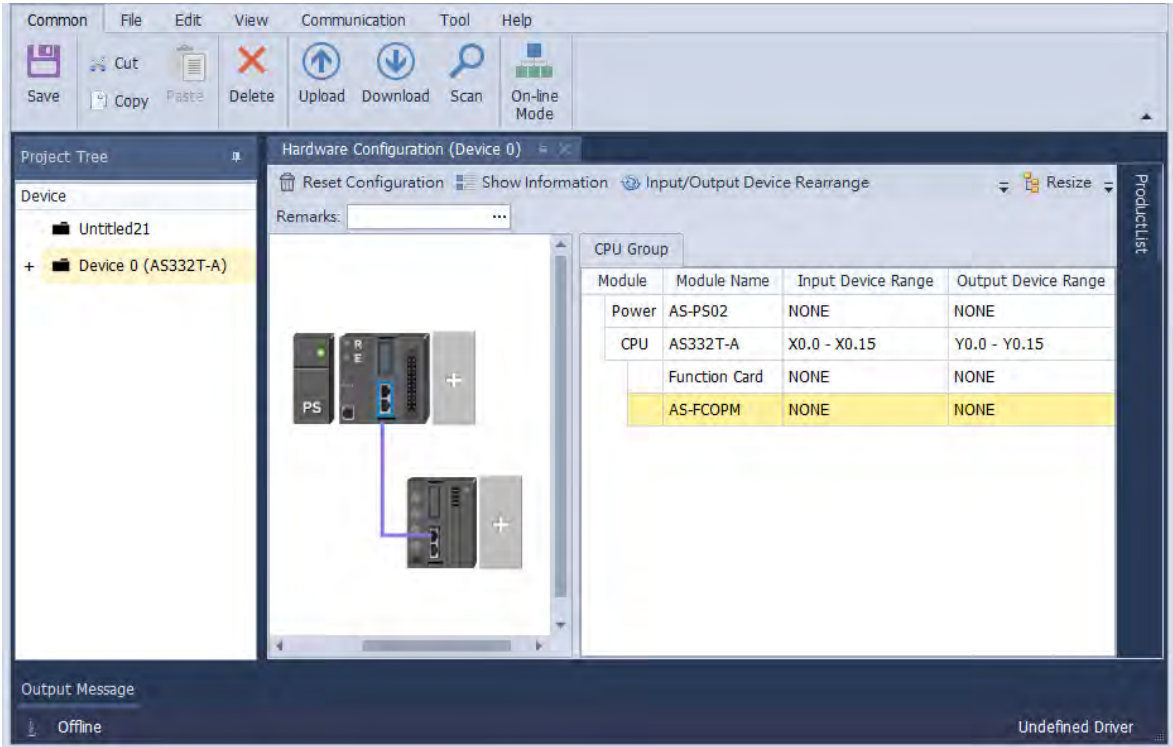


- For **AS-FCOPM Working mode**, select **AS Remote Communication**, and then enter the number of the connected AS Remote module. Click **Update** and then close the setting page.



- You can see the new remote module on the main page. For the configurations of remote modules, refer to the configurations of modules.

Note: You can add up to 15 modules in the remote group. The total number of I/O modules and connected remote modules cannot exceed 32. Only digital I/O modules, analog I/O modules, temperature measurement modules, load cell modules and AS04SIL-A can be used for remote modules.



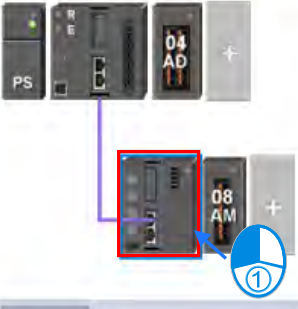
- Change the address of the remote module

You can change the remote module address by simply double-click the ... behind the Input Device Range and then you can see the Manual Assignment window. Define the starting address of your remote module and click OK to confirm and save the change.

Device 0 (AS324MT-A)

Reset Configuration Show Information Input/Output Device Rearrange

Remarks: ...



Group\_1

| Module | Module Name | Input Device Range  | Output Device Range |
|--------|-------------|---------------------|---------------------|
| Remote | AS00SCM-A   | D29000 - D29009 ... | D29010 - D29019     |
|        | AS-FCOPM    |                     |                     |
| 1      | AS08AM10N-A | X1.0 - X1.7         | ...                 |

②

Manual Assignment

Input Device Range

Device Name : D

Device Number : 29900

D29000 - D29999

Length : 10

OK Cancel

③

④

| Module | Module Name | Input Device Range  | Output Device Range |
|--------|-------------|---------------------|---------------------|
| Remote | AS00SCM-A   | D29900 - D29909 ... | D29910 - D29919     |

### 5.5.1 Starting Addresses for Digital Input/Output Modules

The remote module AS00SCM-A can connect to up to eight modules on its right side. HWCONFIG automatically assigns input and output devices to a digital input/output module in ISPSoft according to the number of inputs/outputs in the digital input/output module (X1.0–X1.15, X2.0–X2.15... ; Y0.0–Y0.15, Y1.0–Y1.15, Y2.0–Y2.15). The default starting addresses are shown below.

Note: each digital I/O module reserves 20 words of data devices and it assigns consecutive data devices automatically starting from D29000.

- 08AM: There are eight inputs. The input device range occupies 16 bits (Xn.0–Xn.15) and 20 words of data devices.
- 08AN: There are eight outputs. The output device range occupies 16 bits (Yn.0–Yn.15) and 20 words of data devices.
- 16AM: There are 16 inputs. The input device range occupies 16 bits (Xn.0–Xn.15) and 20 words of data devices.
- 16AN: There are 16 outputs. The output device range occupies 16 bits (Yn.0–Yn.15) and 20 words of data devices.
- 16AP: There are eight inputs and eight outputs. The input and output device range occupies 16 bits. (Xn.0–Xn.15), (Yn.0–Yn.15) and 20 words of data devices.
- 32AM: There are 32 inputs. The input device range occupies 32 bits (Xn.0–Xn+1.15) and 20 words of data devices.
- 32AN: There are 32 outputs. The output device range occupies 32 bits (Yn.0–Yn+1.15) and 20 words of data devices.
- 64AM: There are 64 inputs. The input device range occupies 64 bits (Xn.0–Xn+3.15) and 20 words of data devices.
- 64AN: There are 64 outputs. The output device device range occupies 64 bits (Yn.0–Yn+3.15) and 20 words of data devices.



| Group_1 |             |                     |                     |
|---------|-------------|---------------------|---------------------|
| Module  | Module Name | Input Device Range  | Output Device Range |
| Remote  | AS00SCM-A   | D29000 - D29009 ... | D29010 - D29019     |
|         | AS-FCOPM    | NONE                | NONE                |
| 1       | AS04AD-A    | D29020 - D29039     | NONE                |
| 2       | AS08AM10N-A | X1.0 - X1.7 ...     | NONE                |
| 3       | AS08AN01T-A | NONE                | Y1.0 - Y1.7 ...     |
| 4       | AS16AM10N-A | X2.0 - X2.15        | NONE                |
| 5       | AS16AN01T-A | NONE                | Y2.0 - Y2.15        |
| 6       | AS32AM10N-A | X3.0 - X4.15        | NONE                |
| 7       | AS32AN02T-A | NONE                | Y3.0 - Y4.15        |
| 8       | AS04AD-A    | D29160 - D29179     | NONE                |

### 5.5.2 Starting Addresses for Analog Input/Output Modules

HWCONFIG automatically assigns input and output data registers to an analog input/output module in ISPSOft according to the number of registers defined for the analog input/output module. The default starting address is D29000.

1. 04AD: There are four input channels. The input device range occupies 20 data registers.
2. 08AD: There are eight input channels. The input device range occupies 20 data registers.
3. 004DA: There are four output channels. The input device range occupies two data registers and the output device range occupies 18 data registers.
4. 06XA: There are four input channels, and two output channels. The input device range occupies 10 data registers, and the output device range occupies 10 data registers.




| Group_1 |             |                     |                     |
|---------|-------------|---------------------|---------------------|
| Module  | Module Name | Input Device Range  | Output Device Range |
| Remote  | AS00SCM-A   | D29000 - D29009 ... | D29010 - D29019     |
|         | AS-FCOPM    | NONE                | NONE                |
| 1       | AS04AD-A    | D29020 - D29039     | NONE                |
| 2       | AS08AD-B    | D29040 - D29059     | NONE                |
| 3       | AS04DA-A    | D29060 - D29061     | D29062 - D29079     |
| 4       | AS06XA-A    | D29080 - D29089     | D29090 - D29099     |

5.5.3 Starting Addresses for Temperature Measurement Modules

You can use HWCONFIG to assign input registers to a temperature measurement module in ISPSOft. The default starting address is D29000.

- 1. 04RTD: There are four input channels. The input device range occupies 20 data registers.
- 2. 06RTD: There are six input channels. The input device range occupies 20 data registers.
- 3. 04TC: There are four input channels. The input device range occupies 20 data registers.
- 4. 08TC: There are eight input channels. The input device range occupies 20 data registers.




| Group_1 |             |                     |                     |
|---------|-------------|---------------------|---------------------|
| Module  | Module Name | Input Device Range  | Output Device Range |
| Remote  | AS00SCM-A   | D29000 - D29009 ... | D29010 - D29019     |
|         | AS-FCOPM    | NONE                | NONE                |
| 1       | AS04RTD-A   | D29020 - D29039     | NONE                |
| 2       | AS06RTD-A   | D29040 - D29059     | NONE                |
| 3       | AS04TC-A    | D29060 - D29079     | NONE                |
| 4       | AS08TC-A    | D29080 - D29099     | NONE                |

5.5.4 Starting Addresses for Load Cell Modules

HWCONFIG automatically assigns input data registers to a load cell module in ISPSOft according to the number of registers defined for the load cell module. The default starting address is D29000.


- 02LC: The input device range occupies 7 data registers and the output device range occupies 13 data registers.



| Group_1 |             |                     |                     |
|---------|-------------|---------------------|---------------------|
| Module  | Module Name | Input Device Range  | Output Device Range |
| Remote  | AS00SCM-A   | D29000 - D29009 ... | D29010 - D29019     |
|         | AS-FCOPM    | NONE                | NONE                |
| 1       | AS02LC-A    | D29020 - D29026     | D29027 - D29039     |

5.5.5 Starting Addresses for AS04SIL-A Modules

- AS04SIL-A: when selecting the COM communication mode, its communication status and communication method: the input device range occupies 20 data registers.



| Group_1 |               |                     |                     |
|---------|---------------|---------------------|---------------------|
| Module  | Module Name   | Input Device Range  | Output Device Range |
| Remote  | AS00SCM-A     | D29000 - D29009 ... | D29010 - D29019     |
|         | AS-FCOPM      | NONE                | NONE                |
| 1       | AS04SIL-A     | D29020 - D29039     | NONE                |
|         | Data Exchange | D26000 - D26099     | D26100 - D26199     |





# Chapter 6 Writing a Program

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## 6.1 Quick Start

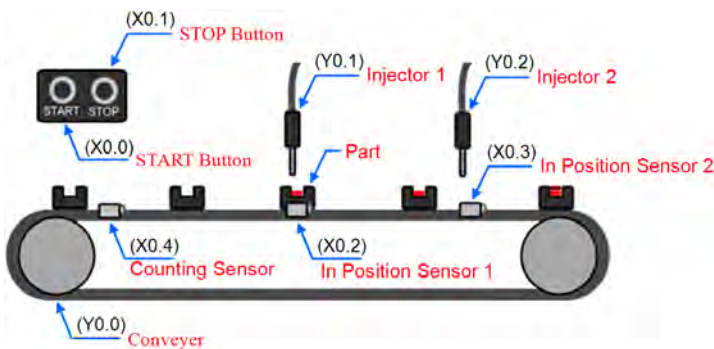
This section uses ISPSOft for demonstration. For DIADesigner operation, refer to Chapter 8 from DIADesigner software manual.

This chapter provides a simple example showing you how to create a traditional ladder diagram in ISPSOft. Because you may not be familiar with IEC 61131-3 and may not understand the functions provided by ISPSOft, the chapter does not introduce programming concepts related to IEC 61131-3. For example, the chapter does not include POU, function blocks, variables, and so on.

### 6.1.1 Example

When the equipment in this example operates, the parts on the conveyor move from left to right. If a sensor senses that a part is under an injector, the PLC sends a trigger signal to the injector, and the injector injects the glue. The injection length is set externally and is not controlled by the PLC program . However, the PLC program 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 conveyor, and the two injectors inject glue in the same way.

There is a sensor at the left side of the conveyor. When a part passes the sensor, the sensor value increases by one increment. When the sensor value is 100, the internal completion flag is set to ON. The flag state can be used by other procedures later. However, this example does not introduce the use of flag states.



### 6.1.2 Hardware

In this example, the AS series CPU module used is the **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 |

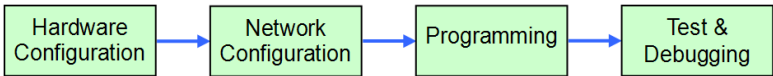
| Type           | ID   | Description                   |
|----------------|------|-------------------------------|
| Digital input  | X0.4 | Counting sensor               |
| Digital output | Y0.0 | Conveyer                      |
| Digital output | Y0.1 | Trigger signal for injector 1 |
| Digital output | Y0.2 | Trigger signal for injector 2 |

### 6.1.3 Program

- (1) When the START button (X0.0) switches from OFF to ON, the internal operation flag is set to ON, and the conveyer (Y0.0) starts. When the STOP button (X0.1) switches from OFF to ON, an error occurs (the error flag is ON), the operation flag is reset to OFF, and the conveyer stops.
- (2) When the in position sensor 1 (X0.2) is ON, the trigger signal for injector 1 (Y0.1) is set to ON. When the in position sensor 1 is OFF, the trigger signal for injector 1 is reset to OFF.
- (3) When the in position sensor 2 (X0.3) is ON, the trigger signal for injector 2 (Y0.2) is set to ON. When the in position sensor 2 is OFF, the trigger signal for injector 2 is reset to OFF.
- (4) When the counting sensor (X0.4) switches 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 is set to ON.

## 6.2 Procedure for Creating a Project in ISPSOft

This section shows you the procedure for creating a project in ISPSOft. You can adjust the procedure according to your needs.



- **Hardware configuration**

You set the parameters such as a range of latched devices and a port number in a PLC. You configure the modules with an AS Series CPU module, and set the parameters in these modules.

- **Network configuration**

If a system uses a network architecture, or devices need to exchange data, use the network configuration tool **NWCONFIG** in ISPSOft to configure a network and exchange data with COM as well as Ethernet.

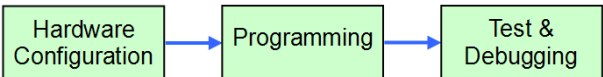
- **Programming**

After you write a program in ISPSOft, compile the program. If the compiling is unsuccessful, messages in the **Compile Message** page show where the errors occur.


- **Testing and debugging**

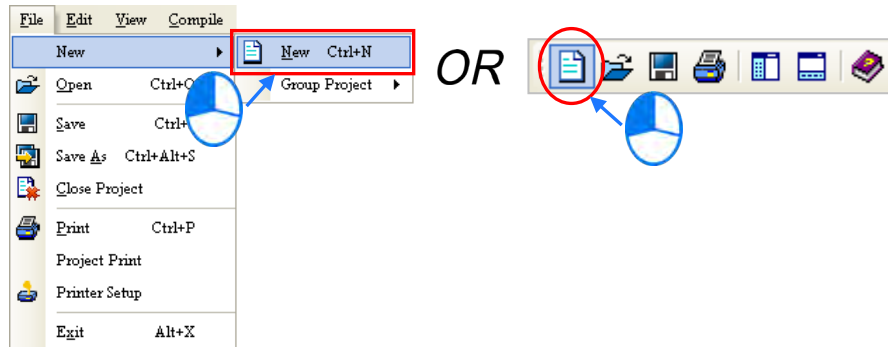
Download the compiled program, the hardware configuration, and the network configuration to a PLC. You can then test and debug the program online with the functions provided by ISPSOft.

Because the example introduced in this chapter does not discuss a network configuration, you only perform the following procedure.

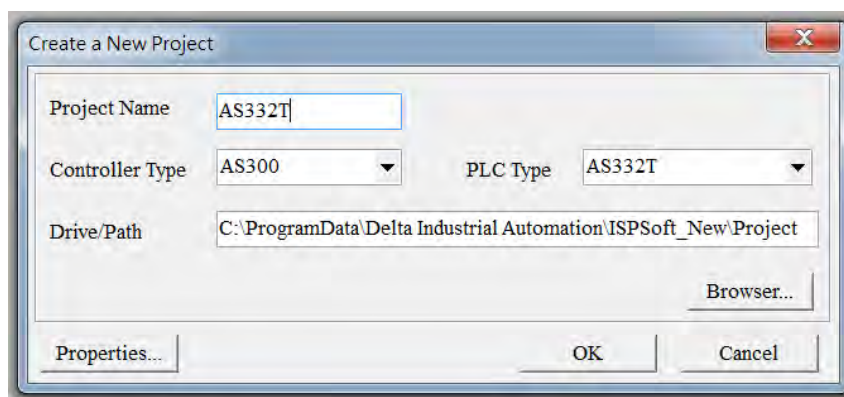



## 6.3 Creating a Project

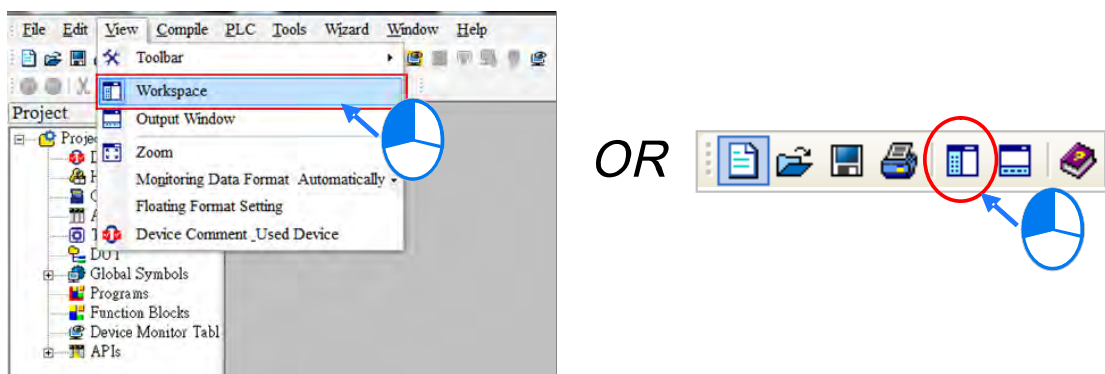
After you start ISPSOft, on the **File** menu, point to **New**, and then click **New** to create a new project. You can also create a new project by clicking  on the toolbar after you start ISPSOft.



In the **Create a New Project** dialog box, 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 then click **OK**. The PLC in this example is the AS332T.

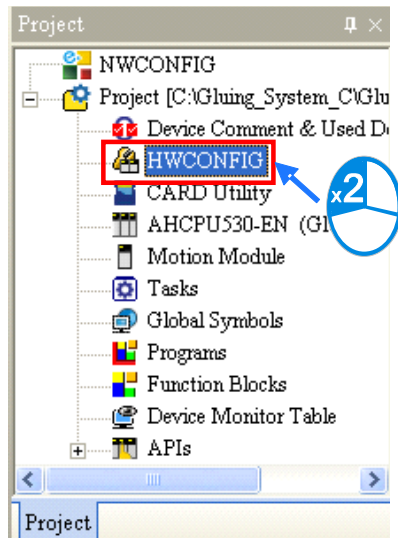


After you create the project, a project management area appears at the left side of the main screen. The relation between the items listed in the project management area is represented by a hierarchical tree structure. If the project management area does not appear, on the **View** menu, click **Workspace**, or click  on the toolbar.



## 6.4 Hardware Configuration

After you double-click **HWCONFIG** in the project management area, the **HWCONFIG** window appears.



In the **HWCONFIG** window, the default setting is for a CPU module. Refer to Chapter 8 for more information on settings for other types of modules.

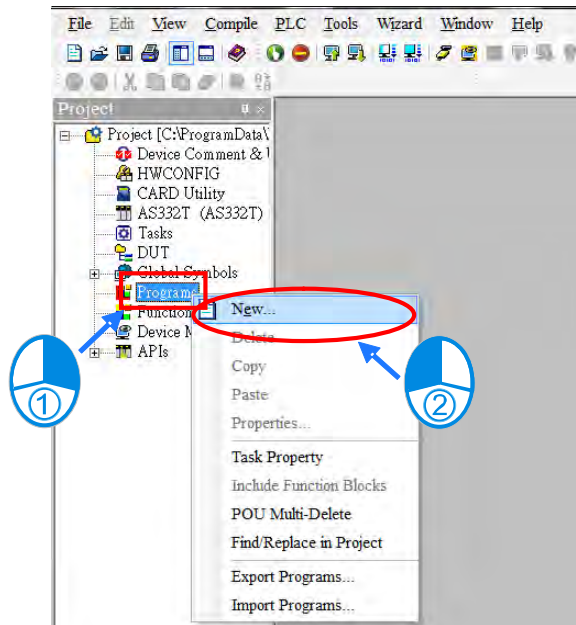
When the hardware configuration is complete, download the configuration and the settings to the CPU module to take effect. Save the configuration and settings now, and you can download them with the program later in the project. After that close the **HWCONFIG** window.

## 6.5 Creating a Program

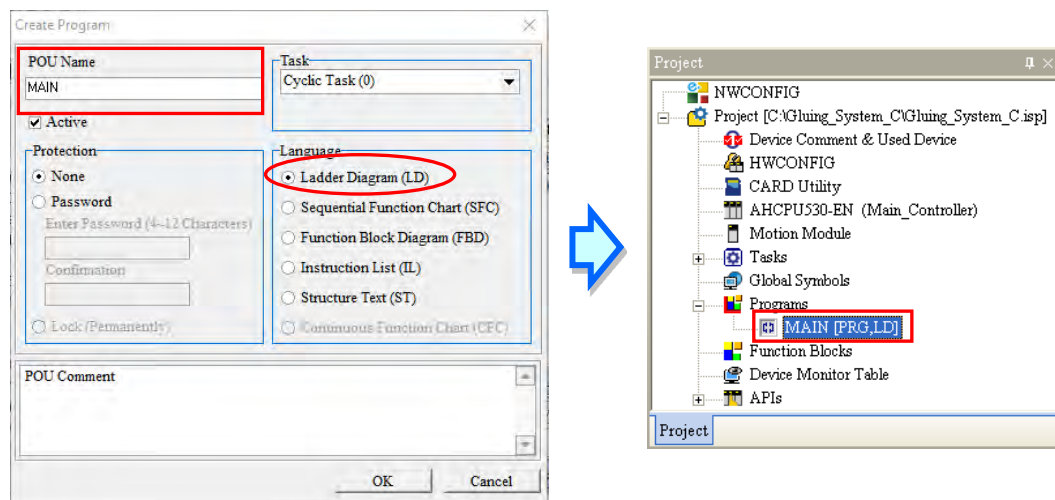
The following sections show you how to create a traditional ladder diagram in ISPSOft. The sections include creating a POU, editing a traditional diagram, and compiling a program.

### 6.5.1 Adding a Ladder Diagram

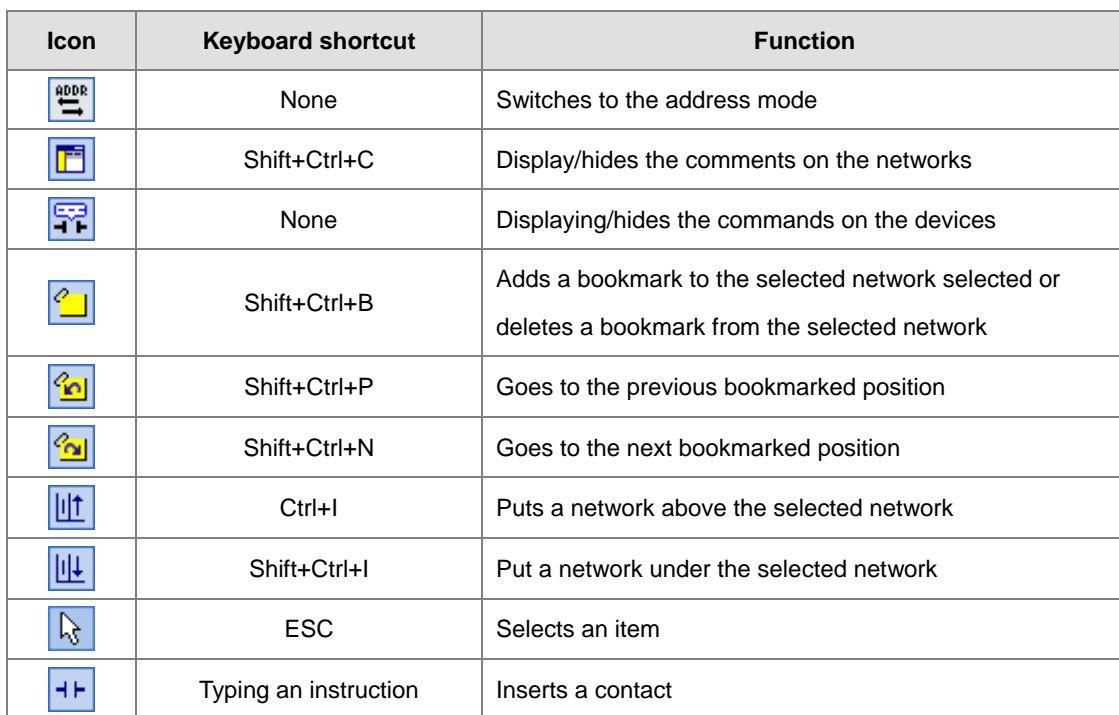
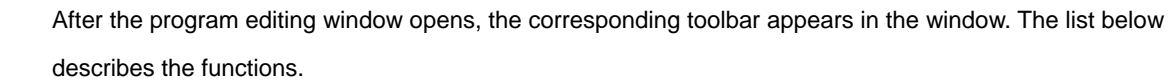
- (1) Right-click **Programs** in the project management area, point to **POU** (program organization unit), and then click **New....**



- (2) In the Create Program dialog box, type a program name in the **POU Name** box, select **Ladder Diagram (LD)** in the **Language** section, and keep the other default values. Click **OK** after the setting is complete. A new program organization unit (POU) appears under **Programs** in the project management area.



The screenshot shows the Siemens STEP 7 LAD editor. On the left, the 'Project' tree is visible, showing the hierarchy of the project. The 'Programs' folder is expanded, and 'Prog0 (FPG.LD)' is selected. On the right, the Ladder Logic diagram is displayed, showing a network with a timer T1 and a coil.





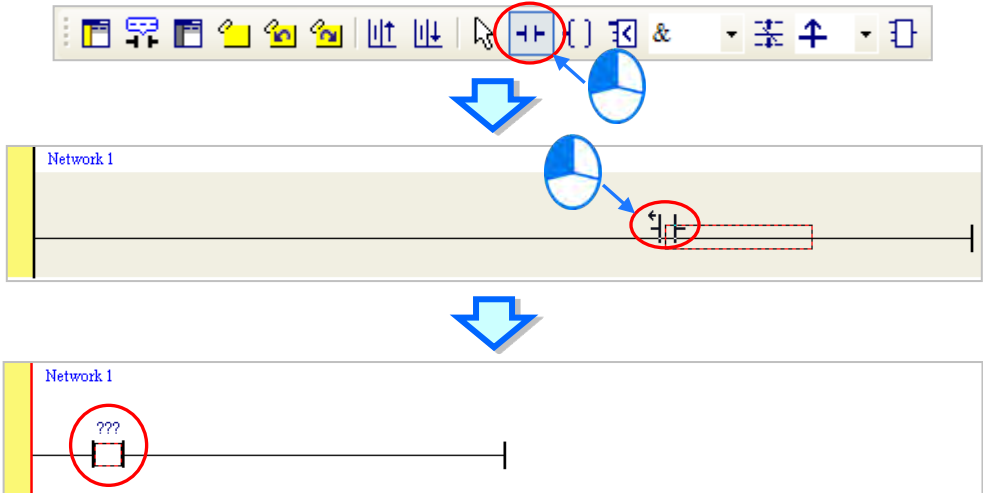
| Icon | Keyboard shortcut     | Function   |
|------|-----------------------|--|
|      | Typing an instruction | Inserts a coil   |
|      | Typing an instruction | Inserts a comparison contact   |
|      | Typing an instruction | Selects a type of comparison contact                                 |
|      | Typing an instruction | Inserts a block logic instruction<br>(NP/PN/INV/FB_NP/FB_PN)         |
|      | Typing an instruction | Selects a type of block logic instruction<br>(NP/PN/INV/FB_NP/FB_PN) |
|      | Shift+Ctrl+U          | Inserts an instruction or a function block                           |


\*. Refer to Section 6.5.3 for more information about typing an instruction.

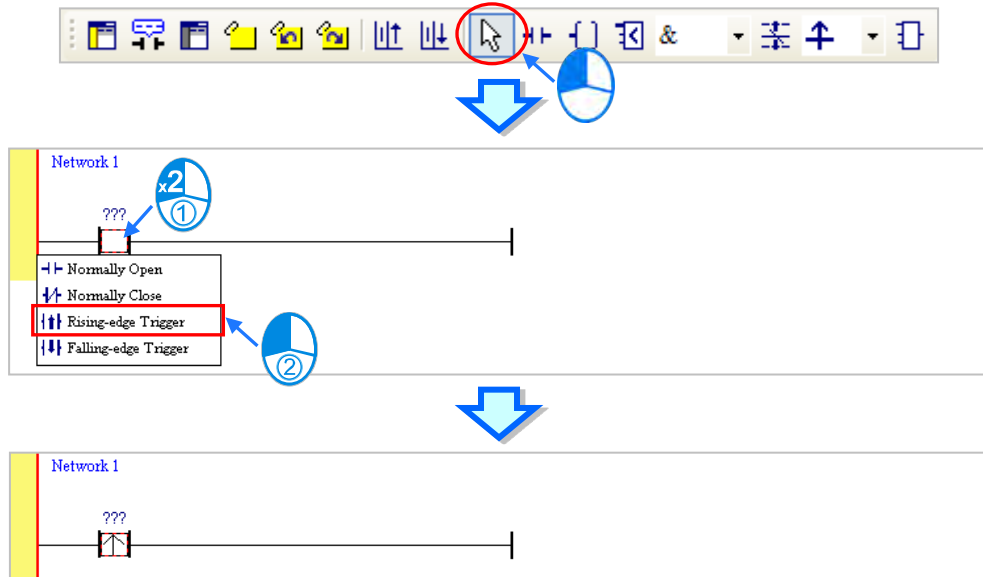
6.5.2 Basic Editing – Creating a Contact and a Coil


- (1) Click on the toolbar, and then move the mouse cursor to the red frame in Network 1. The mouse cursor changes to a contact when the mouse cursor is moved to the left, right, or bottom of the red frame. Decide where to insert a contact. If you edit a ladder diagram, the mouse cursor must be near a position you want to edit. The system automatically arranges an inserted object; you cannot move the object.

In this example, you do not need to decide where to insert the contact. Place the mouse cursor near the red frame and click the left mouse button.

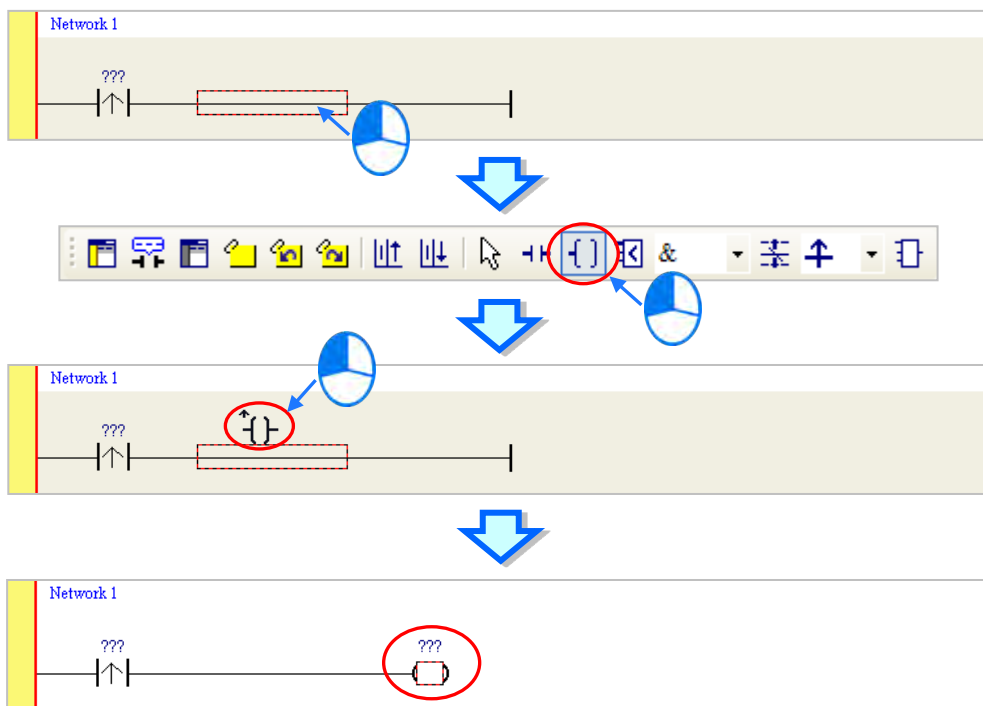



- (2) Click  on the toolbar, or press Esc on the keyboard. After you double-click the contact, a list appears. The items on the list are **Normally Open**, **Normally Close**, **Rising-edge Trigger**, and **Falling-edge Trigger**. In this example, click **Rising-edge Trigger**.

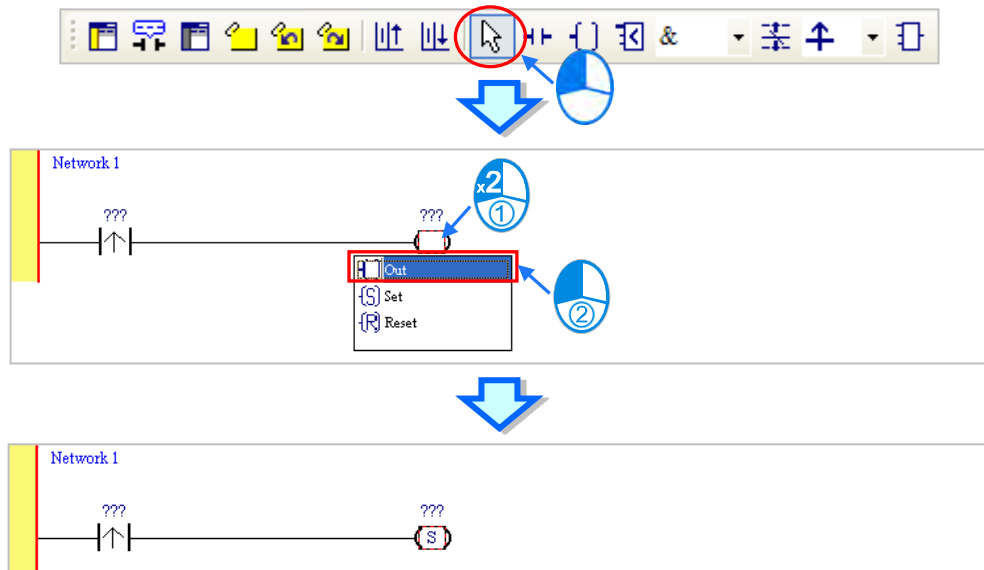


- (3) Click the line at the right side of the contact, click  on the toolbar, and then move the mouse cursor to the red frame. The mouse cursor changes to a coil when the mouse cursor is above or under the red frame. Decide where to insert the coil.

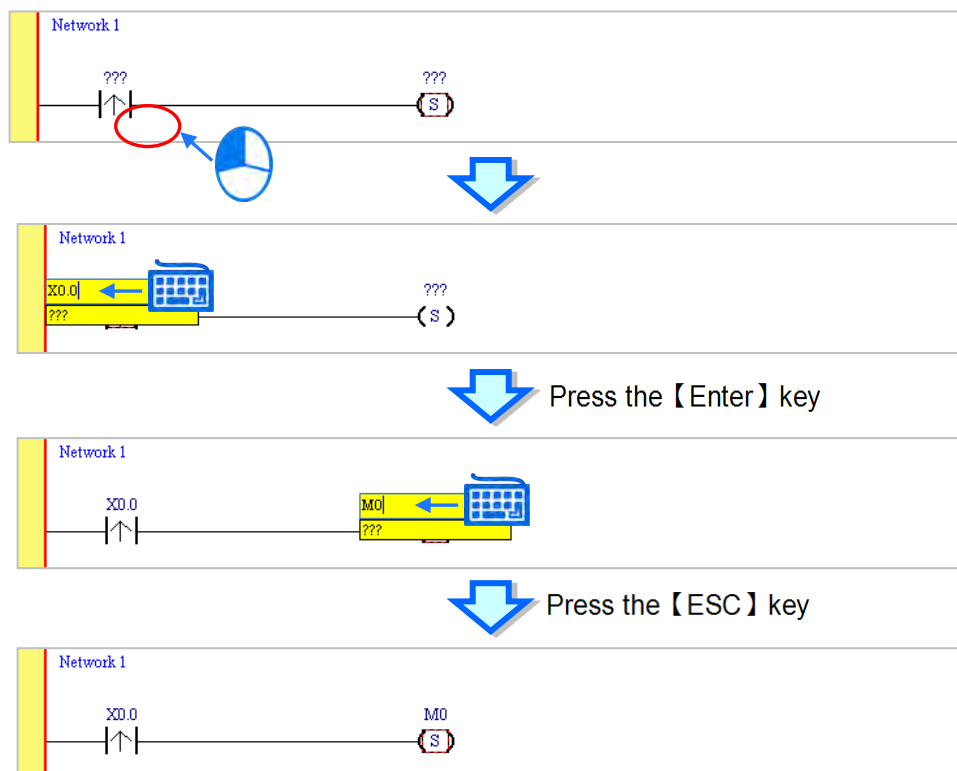
In this example, you do not need to decide where to insert the coil. Place the mouse cursor near the red frame and click the left mouse button.



- (4) Click  on the toolbar, or press Esc on the keyboard. After you double-click the coil, a list appears. The items on the list are **Out**, **Set**, and **Reset**. In this example, click **Set**.




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



**Additional remark**

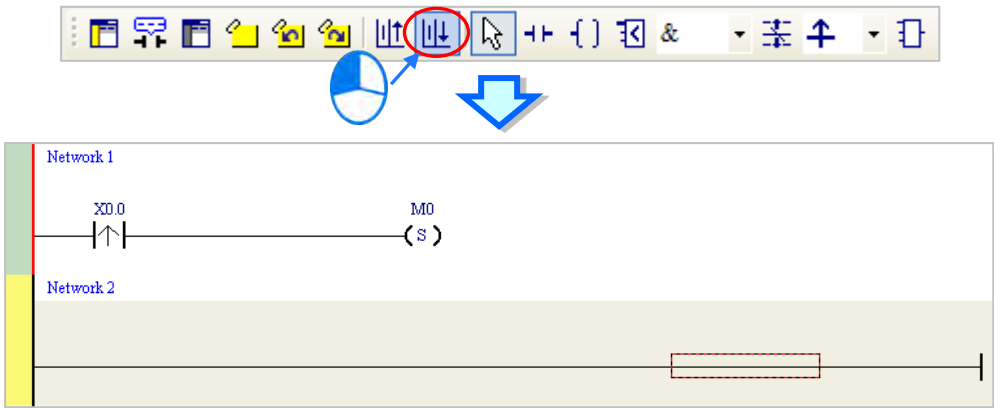
After you click a network and press Enter on the keyboard, you can edit a box. Press Enter on the keyboard to edit the next box in the network. Press Tab on the keyboard to select the next network. Use the keyboard to edit boxes. After you finish the editing, press Enter on the keyboard to jump to the next box. Press Esc on the keyboard to exit editing.



If you have declared symbols, click  in a box, or press Page Down on the keyboard when you edit the box. The symbols on the drop-down list are the symbols that you can assign to the object. Select a symbol with the mouse or the up/down key on the keyboard. Refer to Chapter 6 in the ISPSoft User Manual for more information about symbols.



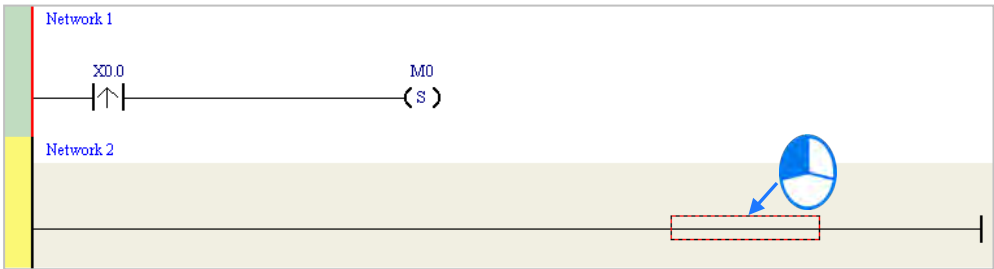
**6.5.3 Basic Editing – Inserting a Network and Typing an Instruction**

Click  on the toolbar to select a network. Click  on the toolbar to place another network above the selected network. In this example, Network 2 is under Network 1.

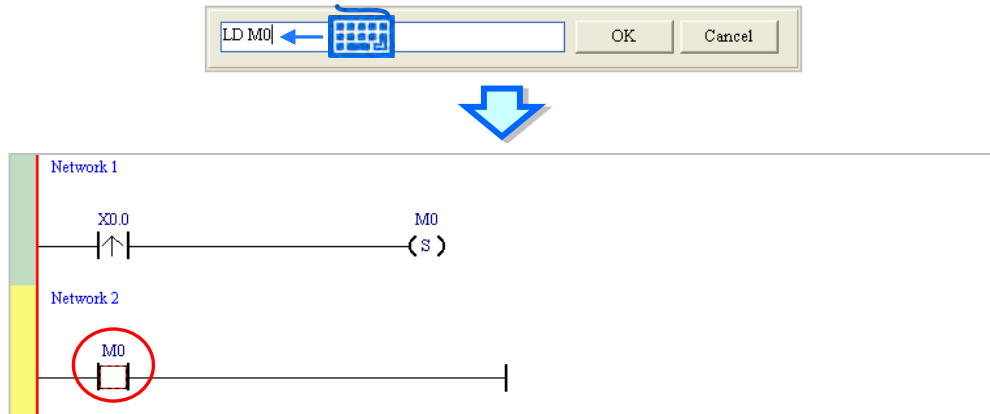


Create a contact and a coil by clicking  and  on the toolbar or by typing instructions.

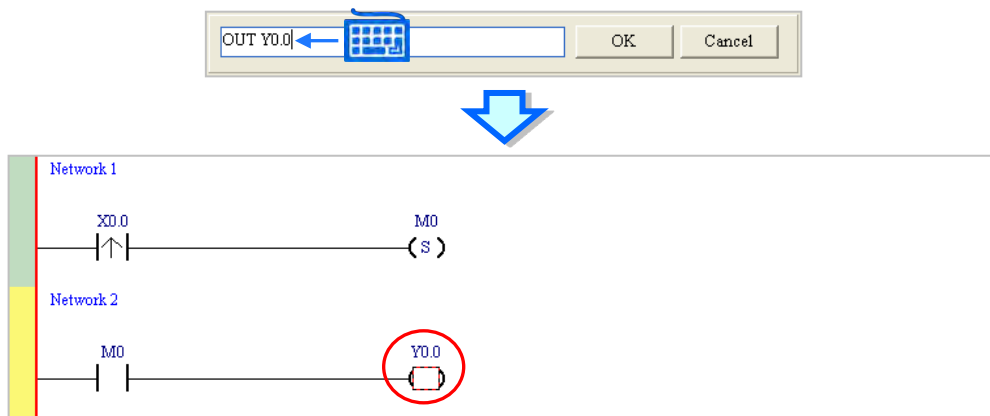
(1) Click the line in Network 2.



- (2) Type the IL instruction “LD M0”. This instruction is not case-sensitive. As soon as you type the IL instruction, a box which you can edit appears. After you finish typing the IL instruction, press Enter on the keyboard or click **OK** at the right side of the box.



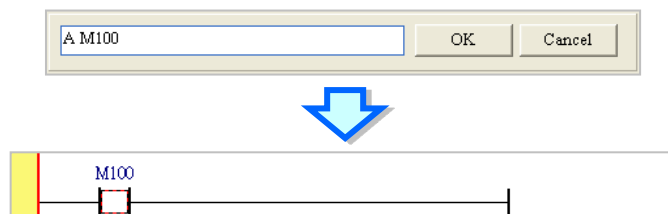
- (3) Type the IL instruction “OUT Y0.0”, and write the program shown below.



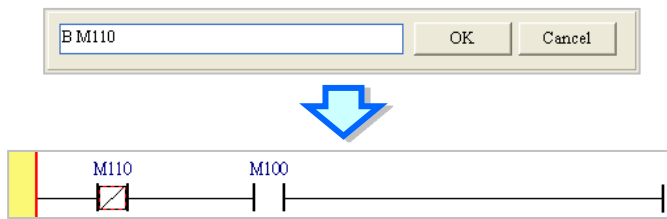
### **Additional remark**

You create a contact and a coil by typing simple instructions. Refer to the description below. The instructions typed are not case-sensitive.

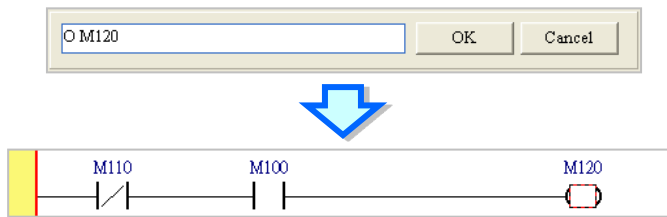
- To Insert a normally-open contact (contact A), type “A <device address>”




- To insert a normally-closed contact (contact B), type "B <device address>"

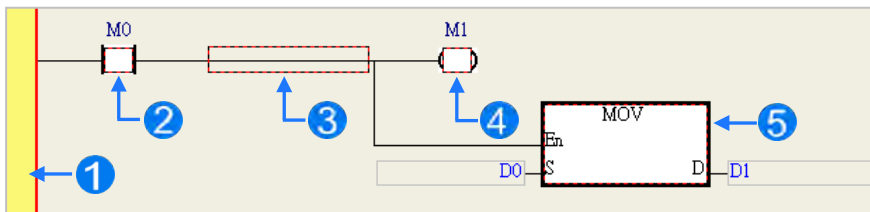


- To insert an output coil (OUT), type "O <device address>"



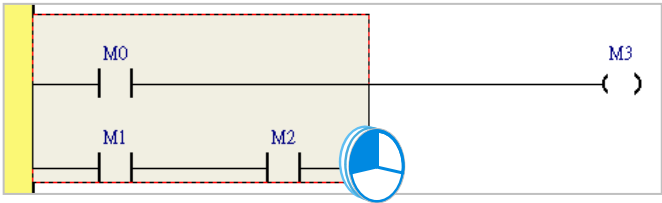
#### 6.5.4 Basic Editing – Selecting a Network and Operation

Before you select an object in a network, press Esc on the keyboard, or click  on the toolbar. After the cursor appears as a small arrow, click the object in the network. The basic selection shows below.

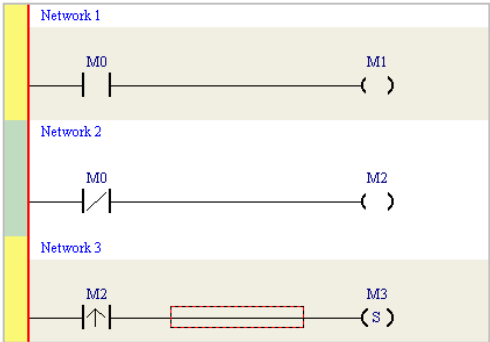


- 1 Select the network
- 2 Select the input contact
- 3 Select the network
- 4 Select the output coil
- 5 Select the block

To select a group of devices, click a device and drag it to draw a frame around the group of devices. You can also select the group of devices by clicking the first device, pressing Ctrl+B on the keyboard, clicking the last device, and then pressing Ctrl+B on the keyboard. You must draw a frame around devices that are in the same network, and the devices must be adjacent to one another. Input and output devices cannot be in the same frame.



To select several networks, press and hold the Ctrl key on the keyboard and click the networks. You can also select a range of networks by pressing and holding Shift on the keyboard, clicking the first network within the range, and then clicking the last network within the range.



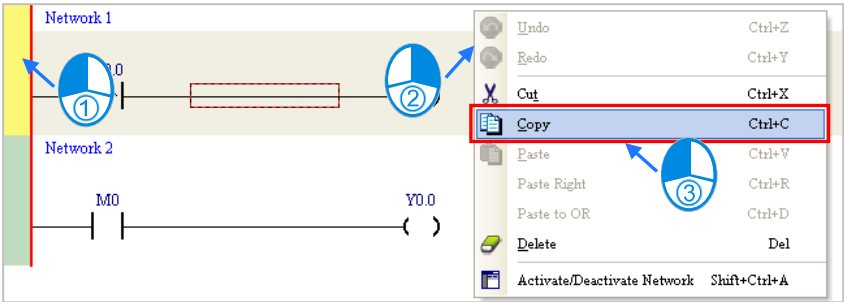
Right-click an object after selecting it to show the context menu.

| Item                        | Function   |
|-----------------------------|--|
| Undo                        | Undo the last action.<br>You can undo up to 20 previous actions.   |
| Redo                        | You can redo an action that has been undone.   |
| Cut                         | Cut a device, block, or network.   |
| Copy                        | Copy a device, block, or network.  |
| Paste                       | Paste an object that has been copied or cut into the present position.   |
| Paste right                 | Paste an object at the right side of the selected position.<br>The object is connected in series to the selected position. |
| Paste under                 | Paste an object under the selected position.<br>The object is connected in parallel to the selected position.              |
| Delete                      | Delete a device, block, or network.  |
| Activate/Inactivate Network | Activate or deactivate the selected network.<br>The deactivated network is ignored when you compile the program.           |
| Fold/Unfold Network         | Fold or unfold the network section.  |
| Auto Generate Symbols       | Used on the contacts of the function block to generate symbols automatically.  |

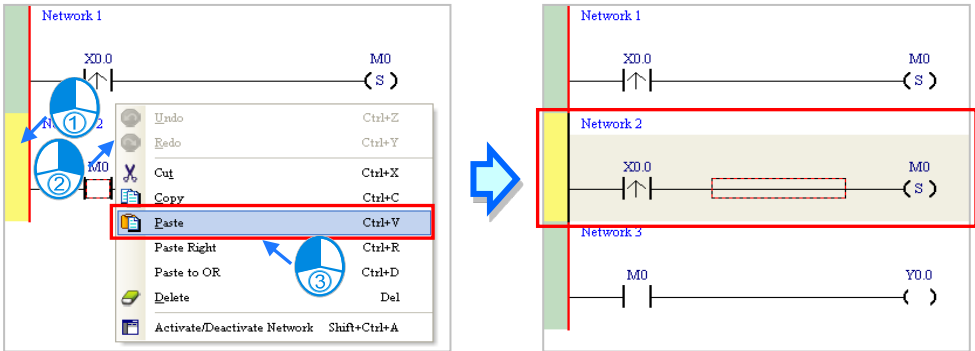
| Item                        | Function  |
|-----------------------------|---|
| Add to Device Monitor Table | Used on the selected contacts to quickly add the device to the Monitor Table. |

Proceed with the steps in the example below.

- (1) Select Network 1, then right-click Network 1, and then click **Copy**.





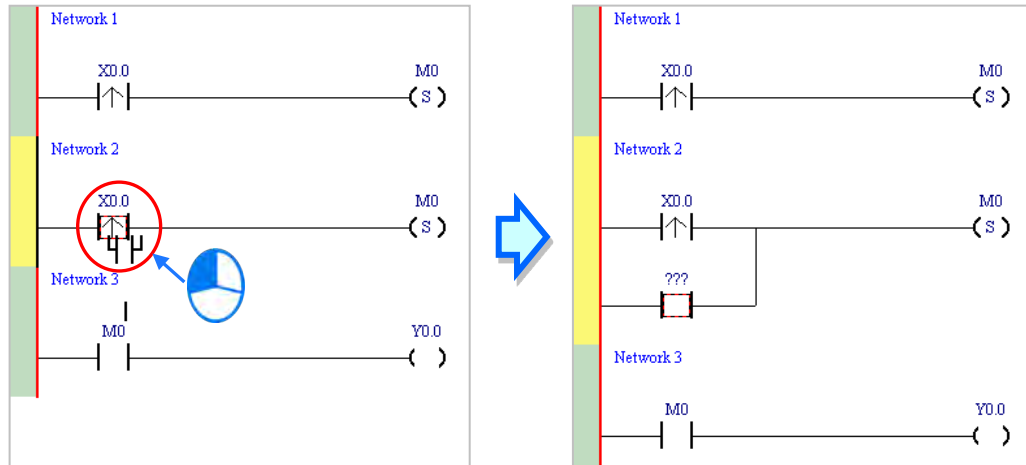
- (2) Select Network 2, right-click Network 2, and then click **Paste**. A copy of Network 1 is put above Network 2, and Network 2 becomes Network 3.



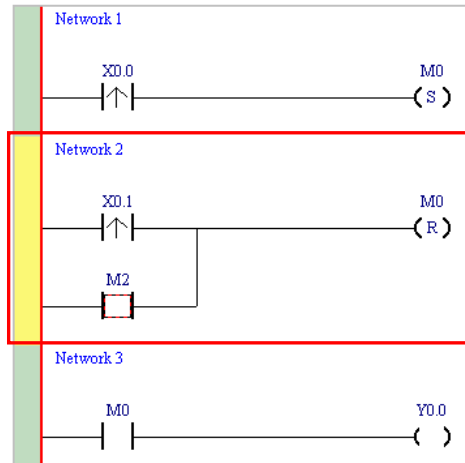


### 6.5.5 Basic Editing – Connecting a Contact in Parallel

- (1) Click  on the toolbar, and then move the mouse cursor to the input contact in Network 2. The mouse cursor changes to a contact. Move the mouse cursor to the input contact in Network 2. After the mouse cursor changes to , click the left mouse button. This connects a contact in parallel with the input contact in Network 2.

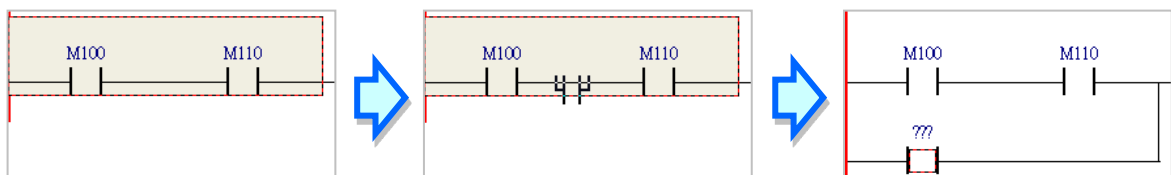


- (2) Write the program in Network 2 shown below.




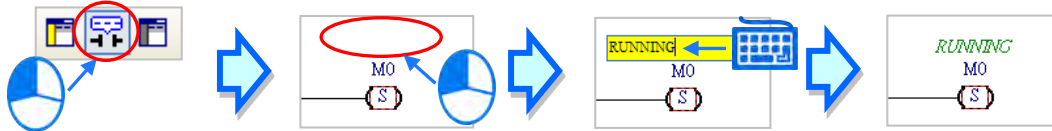
#### Additional remark


After you select a group of contacts, connect a contact to the group of contacts as described above.

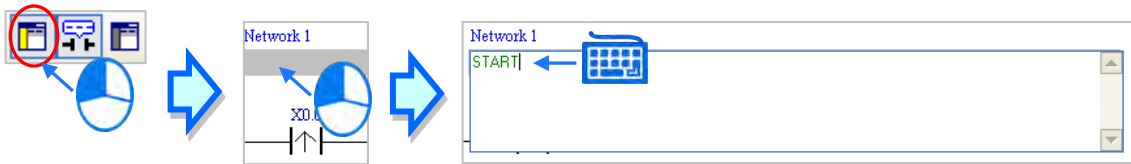


### 6.5.6 Basic Editing – Editing a Comment

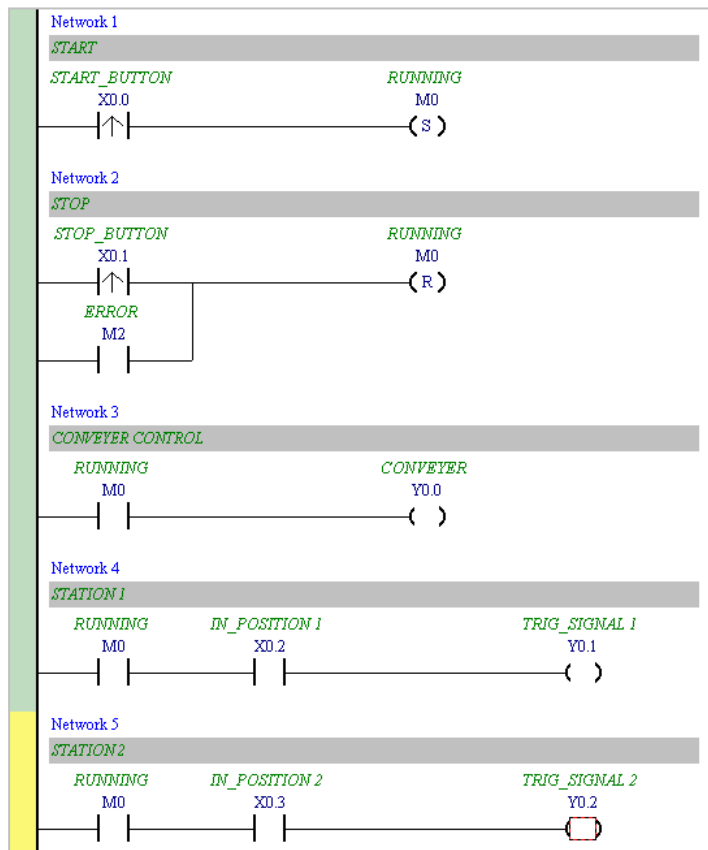
- (1) Press  on the toolbar. Click the position above a device name, type a comment in the box, and then press Enter on the keyboard.



- (2) Press  on the toolbar. Click the position under a network number, and then type a comment in the box. To start a new line of text, press Shift+Enter on the keyboard. Press Enter on the keyboard after the you complete the editing.

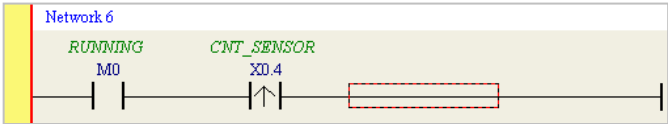


- (3) Write the program shown below.



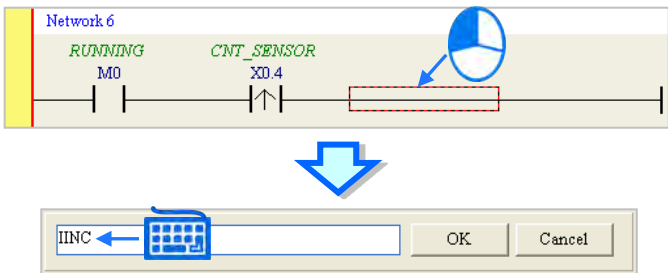
6.5.7 Basic Editing – Inserting an Applied Instruction

Add Network 6 under Network 5, and then write the program shown below. Insert an applied instruction in one of the three ways described below.



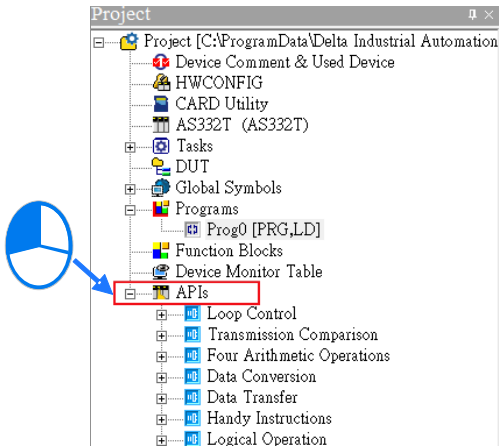
Method 1

Click the position where you want to insert an instruction, type the instruction (INC in this example), and then press Enter on the keyboard.

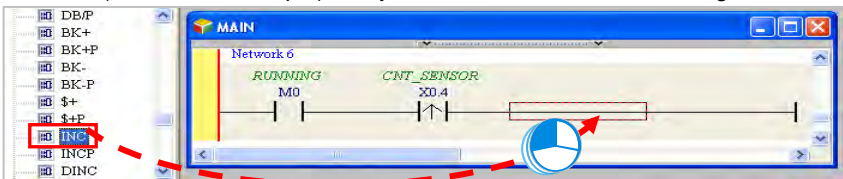


Method 2


Click **APIs** in the project management area and find the instruction type.

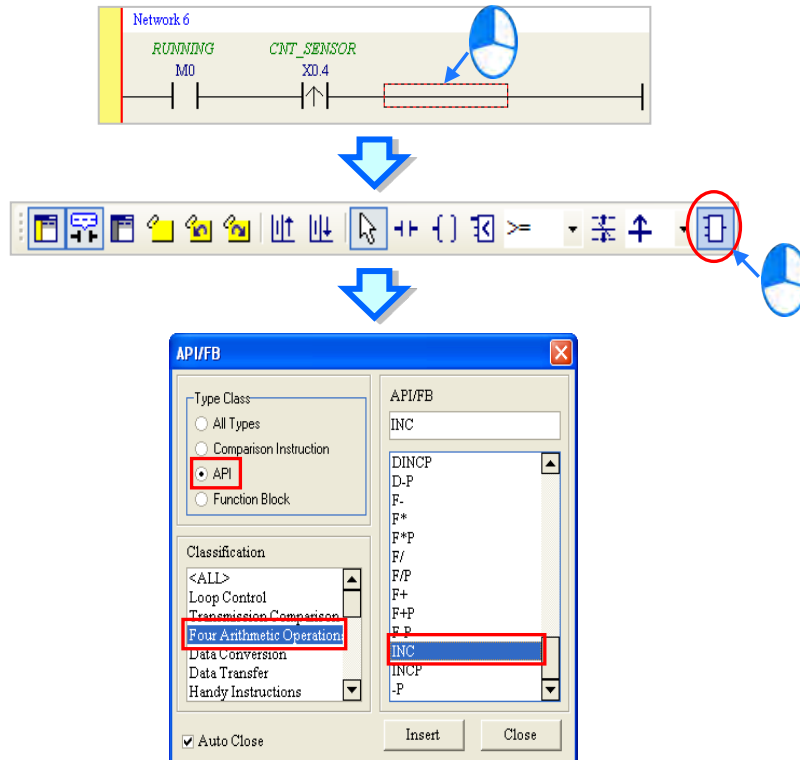


Click the instruction (INC in this example) that you want to insert, and then drag it to the desired position.

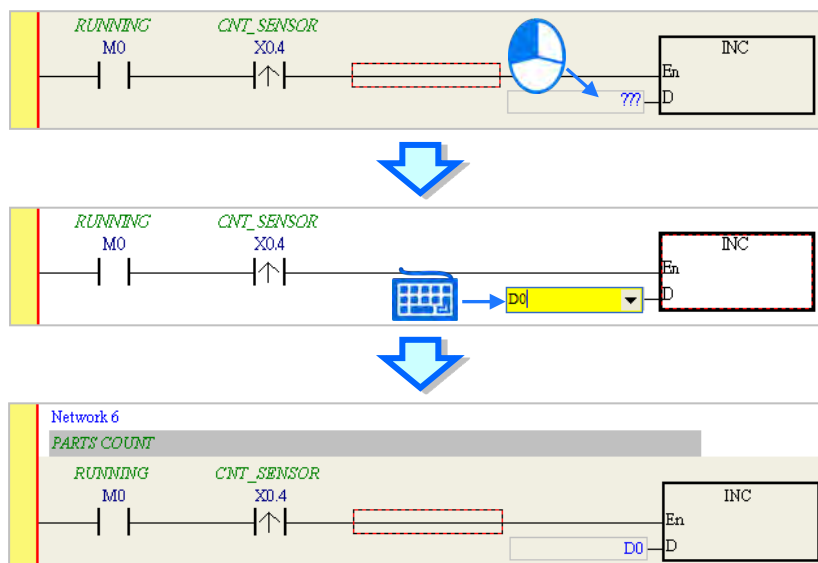


- Method 3

Click the position where you want to insert an instruction, click  on the toolbar, select the instruction (INC in this example) to insert in the **API/FB** dialog box, and then click **Insert**.

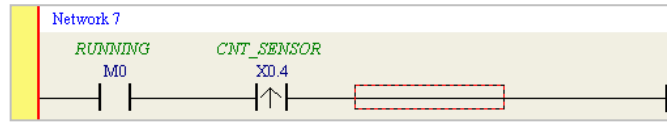



After you insert the instruction, assign a device address to the operand, and write the program shown below.




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

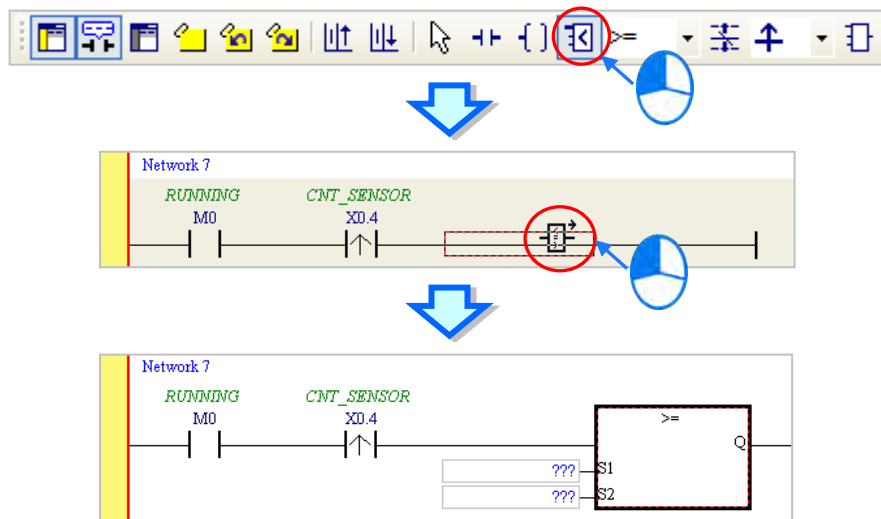
You can insert a comparison contact with the following steps. Add Network 7 under Network 6, and write the program shown below.



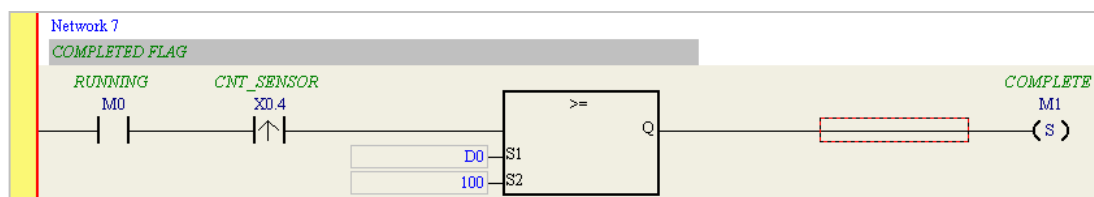
- (1) Click  on the toolbar, and then select an operator ( $\geq$  in this example).



- (2) Click  on the toolbar, and then move the mouse cursor to the position where you want to insert the comparison contact. The mouse cursor changes to a comparison contact when you move the mouse to the left, right, or bottom of the red frame. Decide where to insert the comparison contact, and then click the left mouse button to insert the comparison contact.

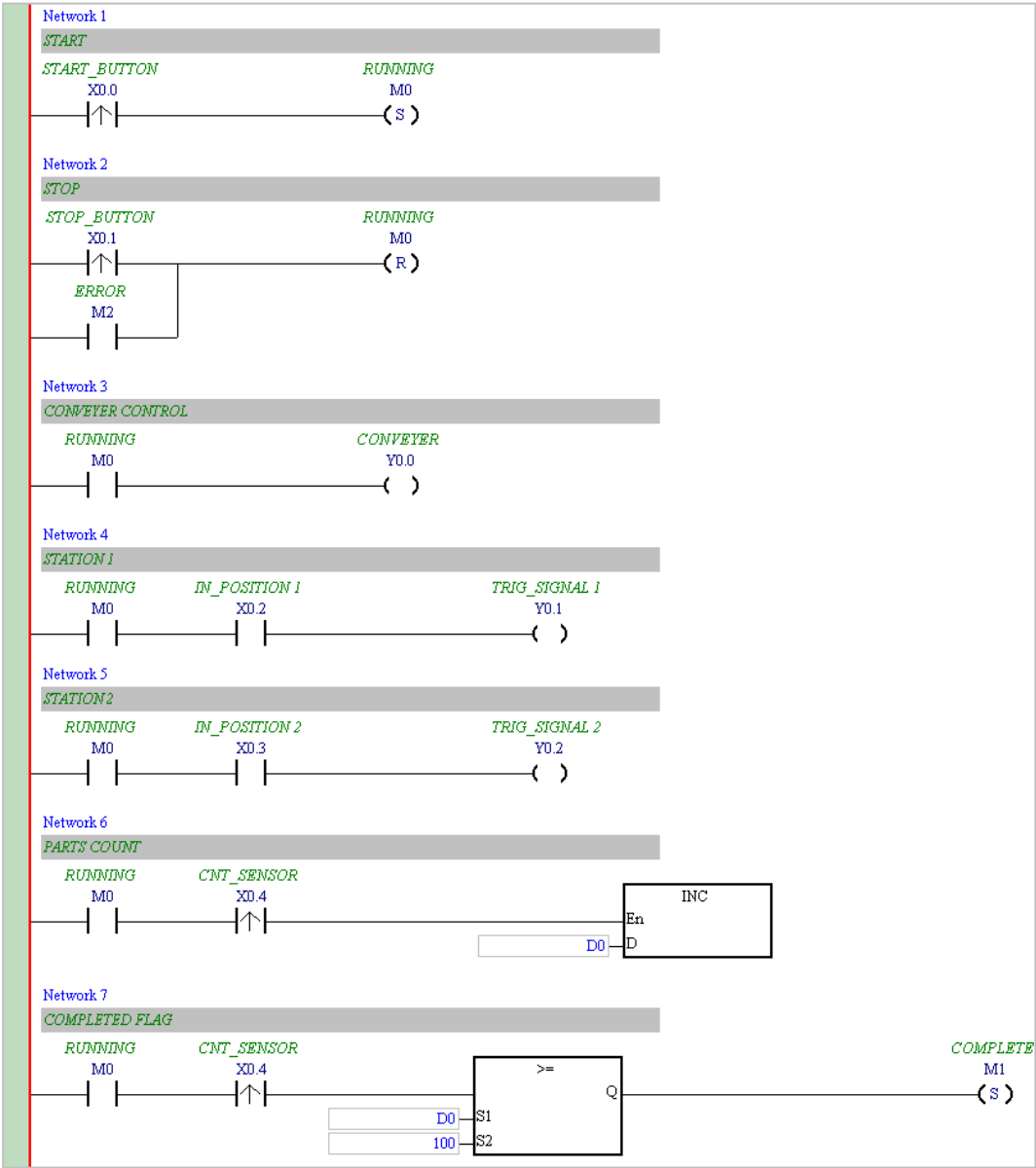


Write the program shown below. In ISPSOft, K precedes a decimal value and H precedes a hexadecimal value. To type a decimal value in ISPSOft, type it directly. To type a hexadecimal value in ISPSOft, type "16#" and the hexadecimal value; e.g. 16#7FFF. In ISPSOft, 8# precedes an octal value, and 2# precedes a binary value.



6.5.9 Writing a Program

The previous sections introduced creating a traditional ladder diagram in ISPSOft. Write the program shown below. Because the program is not yet compiled for the PLC, the mother line at the left side of the ladder diagram is colored red while you write the program. The following sections show how to compile and download the compiled program for testing.



- \*1. The program above saves in the folder ...\ISPSOft x.xx\Project\Example\Gluing\_System\_C.
- \*2. Refer to Chapter 10 in the ISPSOft User Manual for more information about creating a ladder diagram.

### 6.5.10 Checking and Compiling a Program

After you write a program, check the syntax of the programming language or compile the program. The syntax and structure in the present window are checked after you run the **Check** function. The system checks the entire project after you run the **Compile** function. If the system does not find any errors in the project, it automatically generates execution code. After you successfully compile the program, the mother line at the left side of the ladder diagram becomes black.

- **Check**

From the **Compile** menu, click **Check**, or  on the toolbar.

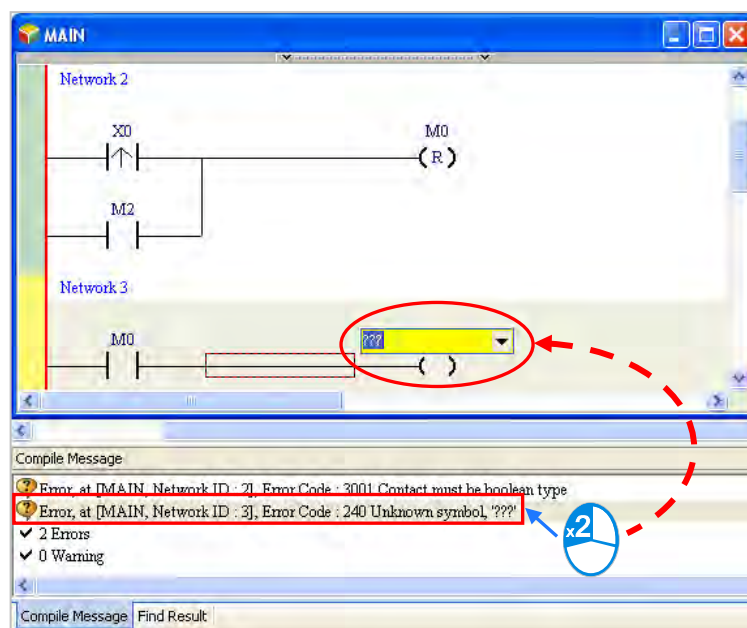


- **Compile**

From the **Compile** menu, click **Compile**, or  on the toolbar.



After you complete the check, the **Compile Message** page shows the check result. If there are any errors in the project, the **Compile Message** window shows the related message. After you click the message, the system automatically shows you where the error occurs. You can run the **Check** function or the **Compile** function after you correct the error.



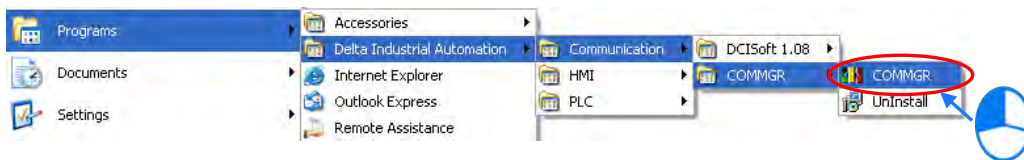
## 6.6 Testing and Debugging a Program

### 6.6.1 Creating a Connection

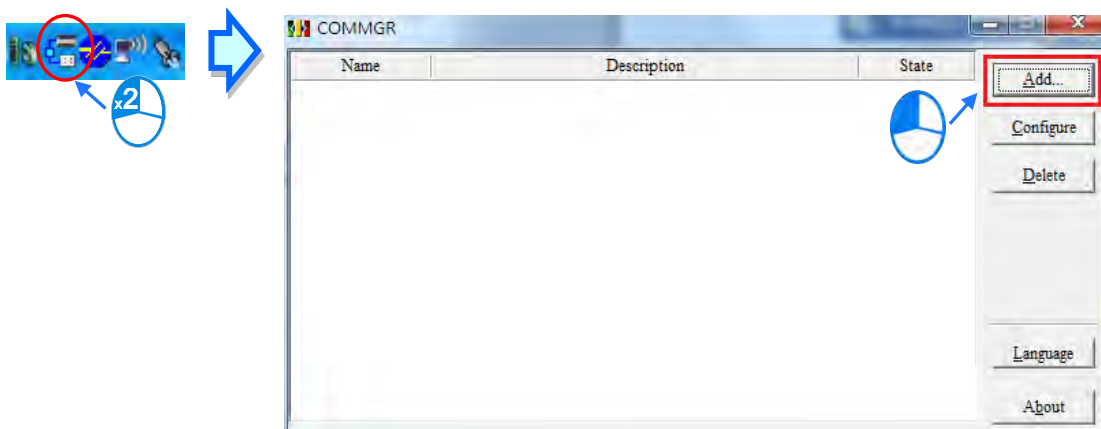
Before you download a program and parameters to a PLC or monitor them online, connect ISPSOft to the PLC. In this example, connect ISPSOft to the CPU module AS332T-A with a USB cable. Refer to Section 2.4 in the ISPSOft User Manual for more information about connecting ISPSOft to a PLC in other ways. Refer to the AS Operation Manual for more information about wiring.

**You can skip this section if you have connected ISPSOft to a PLC successfully as described in Section 2.4 in the ISPSOft User Manual.**

- (1) Install the modules on the main backplane to match the hardware configuration in HWCONFIG. Make sure that the wiring is correct, and then power on the CPU module.
- (2) Connect the CPU module to the computer with a USB cable. If the USB driver for the AS series CPU module is installed on the computer, **Delta PLC** appears in the **Device Manager** window, and a port number is assigned to **Delta PLC**. 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, start COMMGR by clicking the shortcut on the **Start** menu (**Start > Programs > Delta Industrial Automation > Communication > COMMGR**).

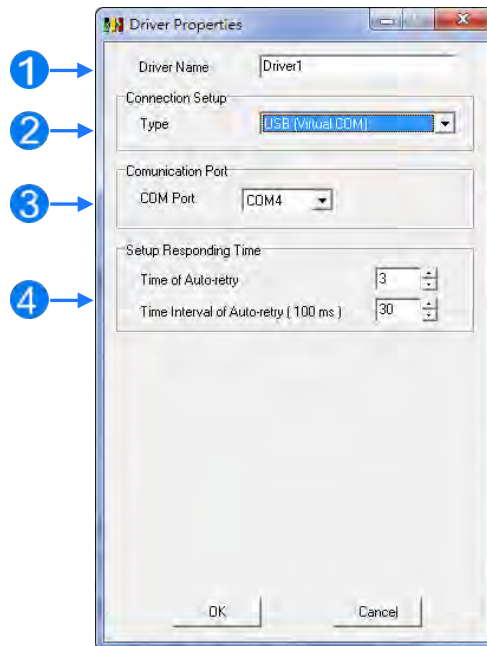


- (4) Double-click the icon representing COMMGR on the system tray to open the **COMMGR** window. Click **Add** in the **COMMGR** window to create a driver.

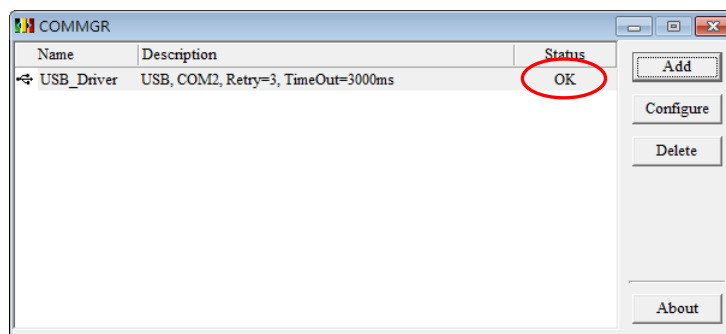




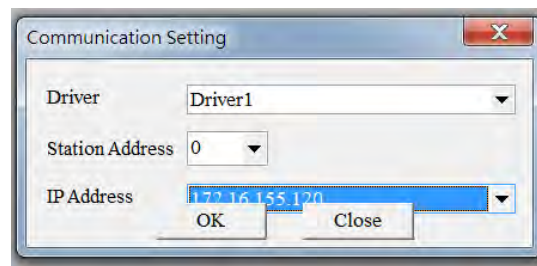
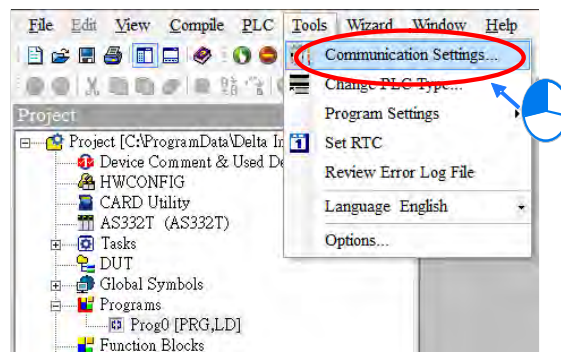
- (5) Set the parameters in the **Driver Properties** dialog box, and then click **OK**.



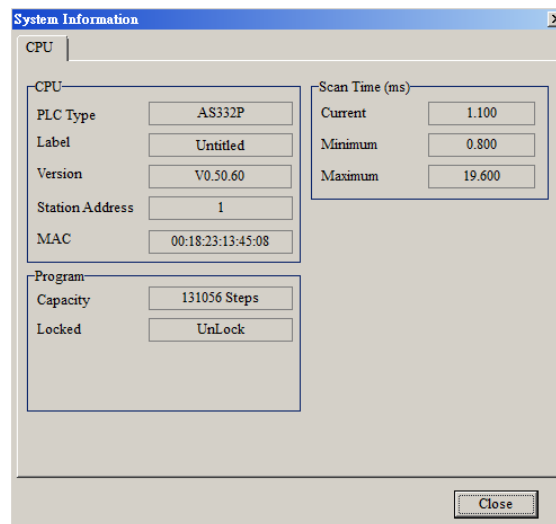
- ① Type a driver name in the **Driver Name** box.
  - ② Select **USB (Virtual COM)** in the **Type** list in the **Connection Setup** section.
  - ③ Select a communication port in the **COM Port** list. If the first two steps are complete, the connected PLC and its communication port display in the **COM Port** list.
  - ④ Select the number of times to retry the sending of a command if a connection error occurs in the **Time of Auto-retry** box, and select a retry interval in the **Time Interval of Auto-retry** box.
- (6) After you finish the setup, USB\_Driver appears in the COMMGR window. When the connection is normal, OK appears in the Status column.



- (7) Click the driver you created in the **COMMGR** window, and then click **Start**. Start ISPSOft, and then on the **Tools** menu, click **Communication Settings....** In the **Communication Setting** dialog box, select the driver you created in the **Driver** list, select 0 in the **Station Address** list, and then click **OK**. The driver information displays in the ISPSOft status bar.



- (8) On the **PLC** menu, click **System Information**. ISPSoft retrieves related information from the PLC. If the computer communicates with the CPU module normally, the related information retrieved from the PLC displays in the **System Information** dialog box.

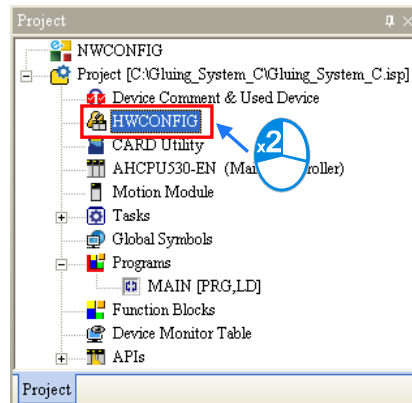


## 6.6.2 Downloading a Program and Parameters

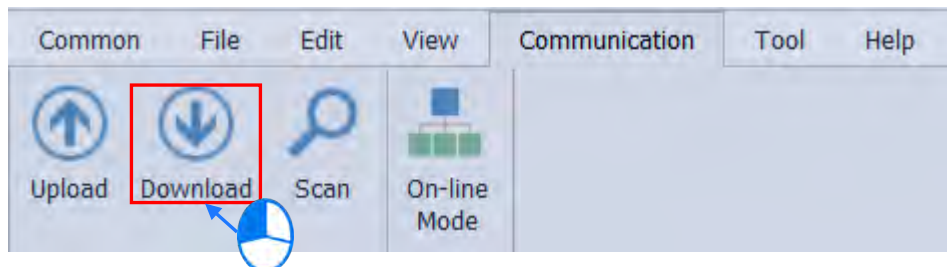
If ISPSOft is correctly connected to a PLC, you can download the parameters and program in the project to the PLC. First, start ISPSOft and open the project you created in the previous sections. In this example, you download two types of parameters to the CPU module: hardware configuration and the program itself.

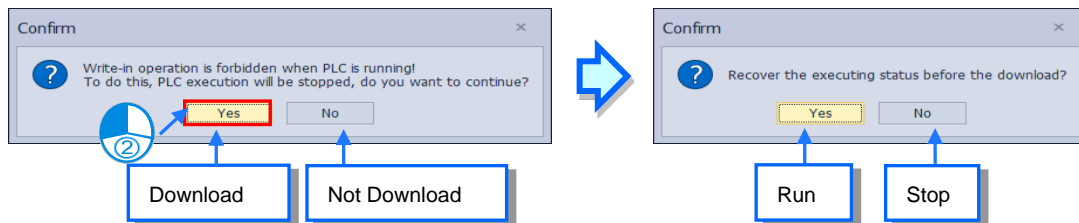
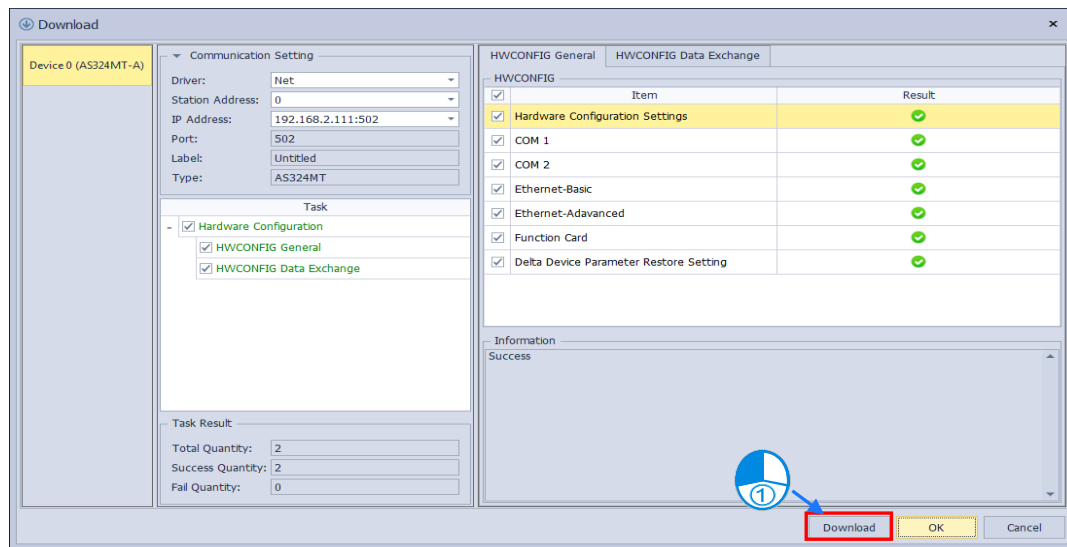
- **Downloading the hardware configuration**

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




- (2) The hardware configuration displays in the window. Before you download the hardware configuration to the CPU module, make sure the actual hardware configuration is the same as the hardware configuration in the window.
- (3) Click **Download** under the Communication tab to see the Download page. Select the PLC parameters that you'd like to download to the PLC and then click **OK** to download.

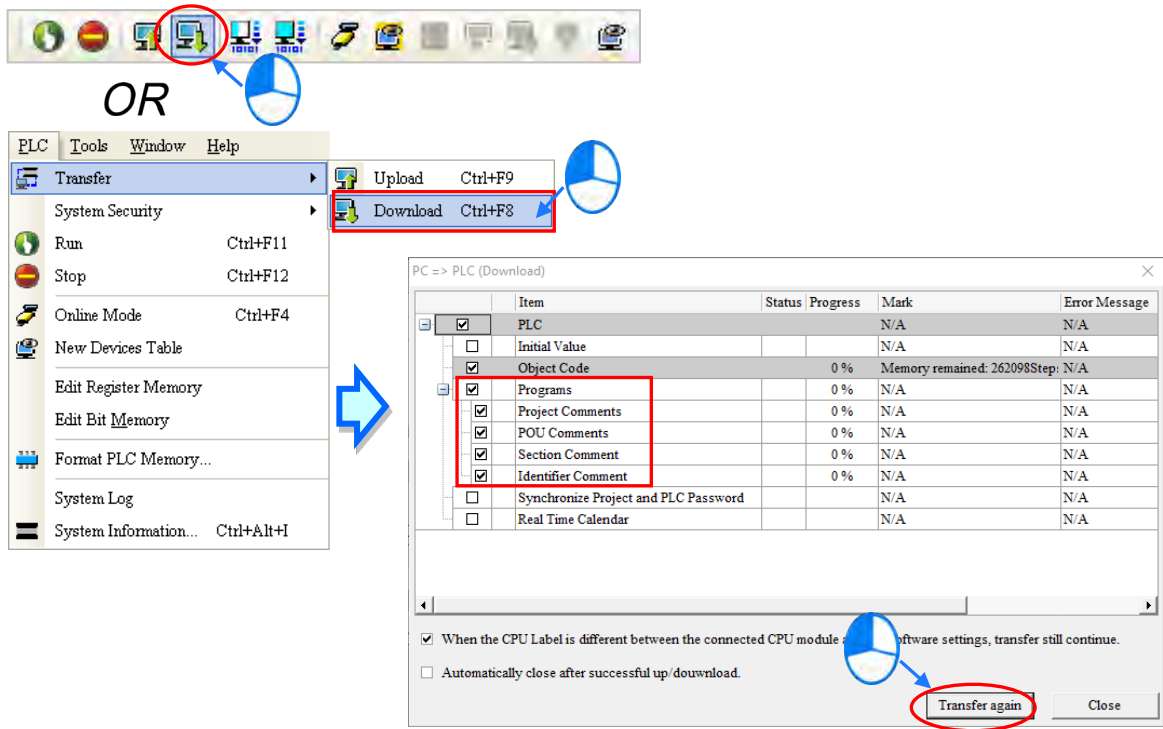




- (4) After you successfully download the hardware configuration to the CPU module, the BUS FAULT LED indicator on the CPU module is OFF. Close the **HWCONFIG** window. If the BUS FAULT LED indicator on the CPU module is still ON or blinking, the CPU module is in an abnormal state. Make sure the actual hardware configuration is the same as the hardware configuration in the **HWCONFIG** window, and refer to the operation manual for more information about eliminating the error. Refer to Chapter 8 for more information about HWCONFIG.



● **Downloading the program**

After the program is compiled, select **Transfer** under the PLC tab and click **Download** to see the Download page. You can also click  on the toolbar to see the Download page. Select the **Program** and the **Comments** so that you can upload the program in the CPU module later, and then click **Transfer** again.




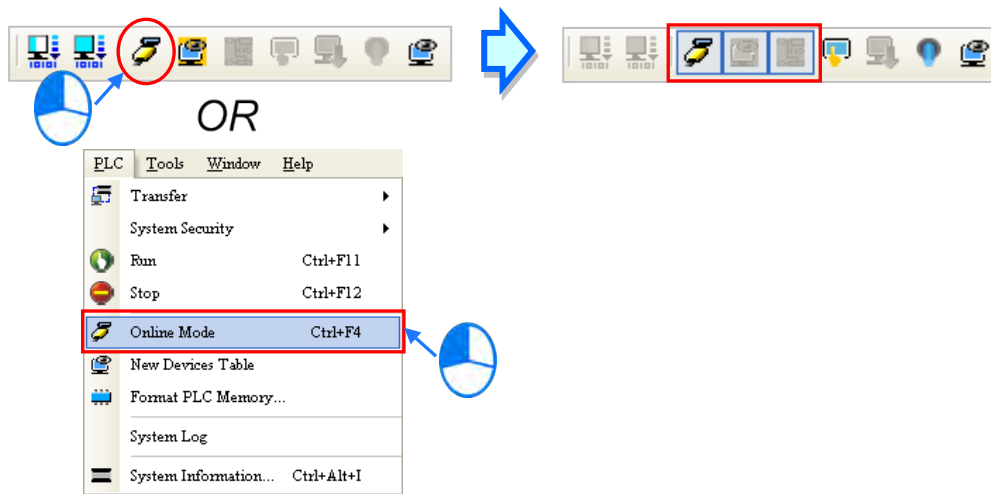
**6.6.3 Connection Test**

After you download a program to a PLC, you can monitor the execution status of the PLC through ISPSOFT. ISPSOFT provides two monitoring modes; device monitoring mode and program monitoring mode.

| Monitoring mode  | Description   |
|--|---|
| <br>Device monitoring mode  | You can monitor the status of the devices in the PLC through the monitoring table. In this mode, ISPSOFT updates only the status of the devices. The current program in ISPSOFT does not have to be the same as the program in the PLC. |
| <br>Program monitoring mode | In this mode, the operating status of the program is displayed in the program editing window. The present program in ISPSOFT must be the same as the program in the PLC.  |

\*. You can enable the device monitoring function without program monitoring; however, if you enable the program monitoring function, the device monitoring function is also enabled.

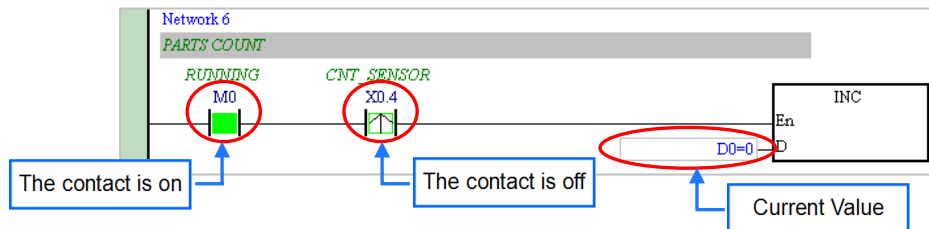
On the **PLC** menu, click **Online Mode**, or  on the toolbar, to enable the online monitoring function. The system also enables device monitoring mode and program monitoring mode.





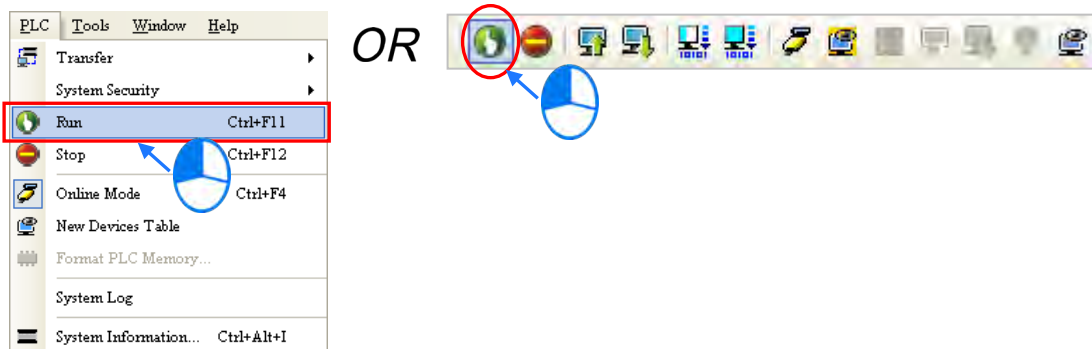
In the online monitoring mode, you can view the present scan time, the communication status, and the status of the PLC in the status bar in ISPSOft.



The present status of the devices display in the original program editing window after you enable the program monitoring function.

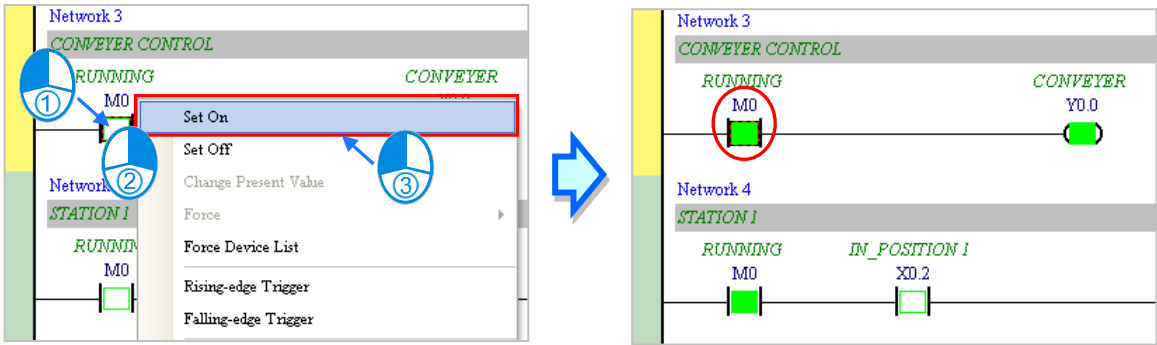


You can change the operating state of a PLC with the RUN/STOP switch on the PLC. You can also change the operating status of a PLC with the functions provided by ISPSOft. On the **PLC** menu, click **Run** or  on the toolbar to start the PLC. On the **PLC** menu, click **Stop** or  on the toolbar to stop the PLC.



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

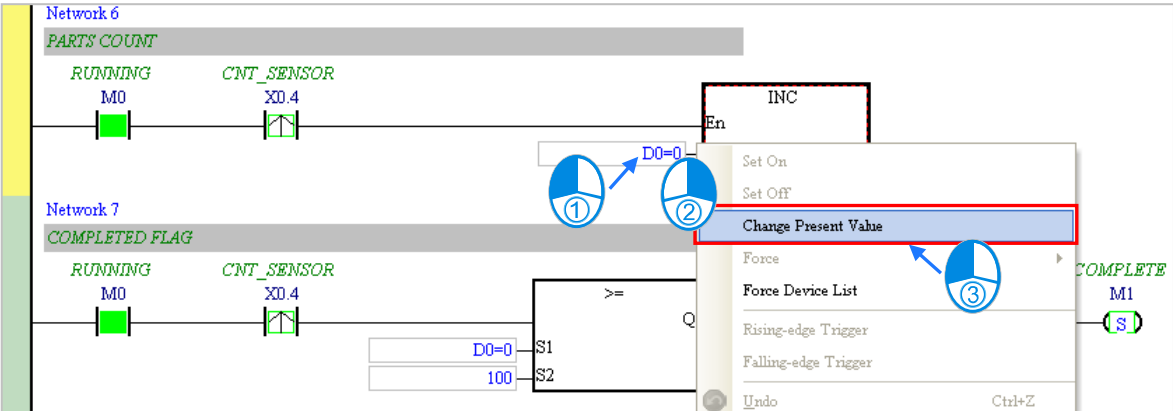
**⚠ Before you change the status of a device, make sure the operation does not cause damage to equipment or personnel.**



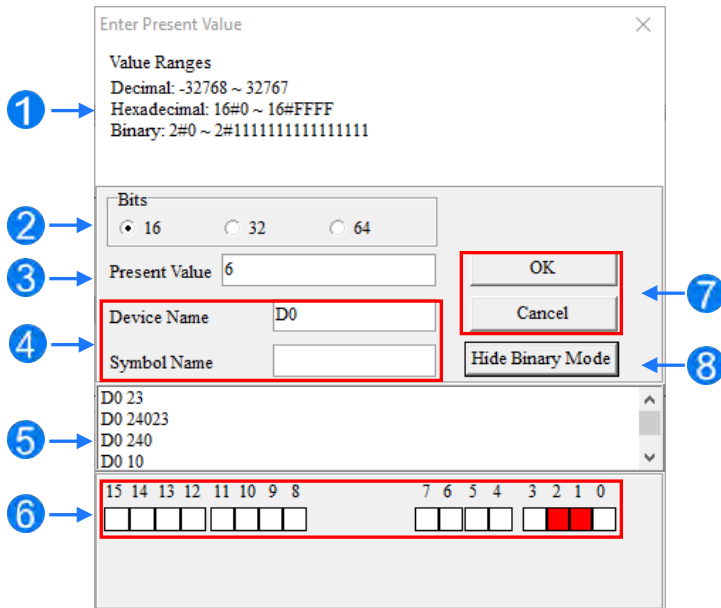
The table below describes the items in the context menu. The **Force** command only applies to input and output contacts.

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

To change the value in a device, right-click the device, click **Change Present Value**, and set a present value in the **Enter Present Value** dialog box.

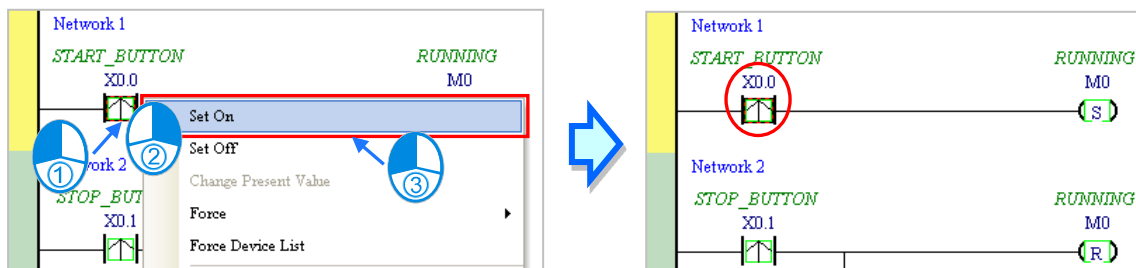


The list below describes the **Enter Present Value** dialog box.



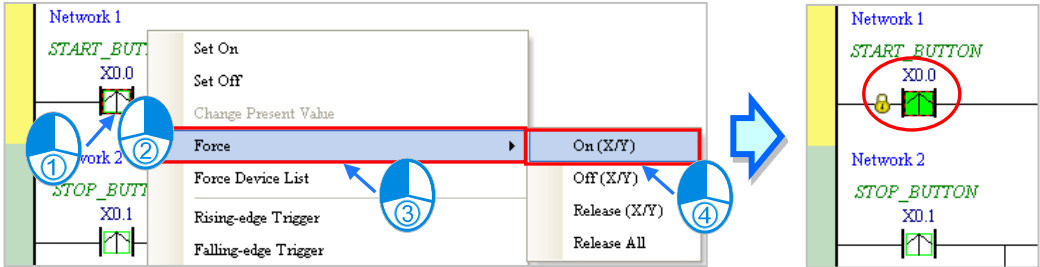
- ❶ Message
- ❷ Type a 16-bit, 32-bit or 64-bit value.
- ❸ Type a value in the **Present Value** box.
- ❹ Type the name of a device or a symbol whose present value you want to change
- ❺ Value change history (Format: Device name Value)
- ❻ In binary mode, use the mouse to set the bit states.
- ❼ Click **OK** to apply the setting values. Click **Cancel** to close the window without applying the values.
- ❽ Display or hide binary mode.

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





However, you can force an input contact ON or OFF during a test. Click an input or output contact to set, right-click the contact, point to **Force**, and click **On (X/Y)**, **Off (X/Y)**, **Release (X/Y)**, or **Release All**. If you force an input or output contact ON or OFF, a lock symbol appears at the left side of the contact.



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

If you force an output contact in the program ON or OFF, the program execution result does not affect the output state of this contact.

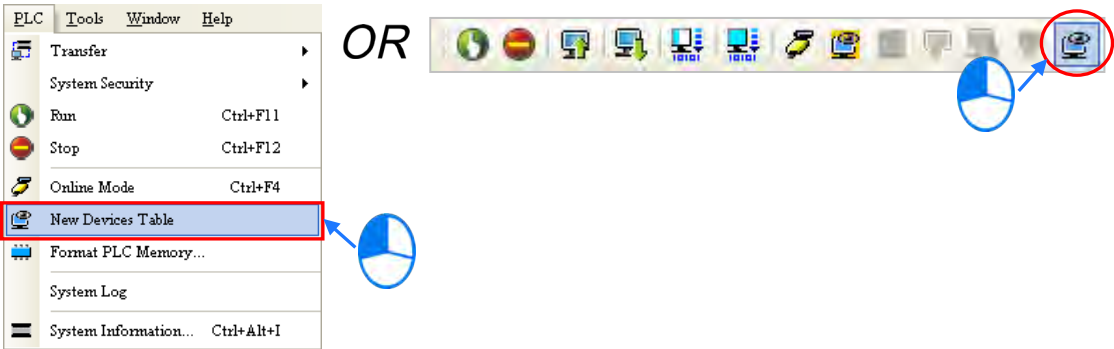


**\*. If you disable the online monitoring function, the contacts are not automatically released from the locked states. You must check whether the contacts need to be released from the locked states after you complete the test.**

You can create a monitoring table online or offline.

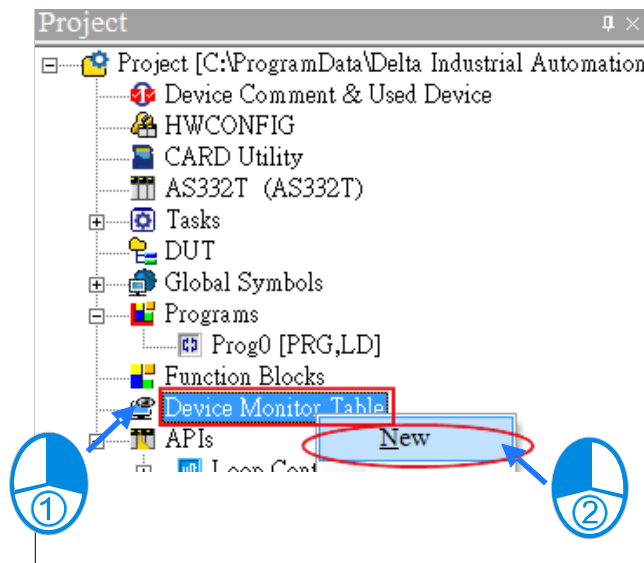
● **Method 1**

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

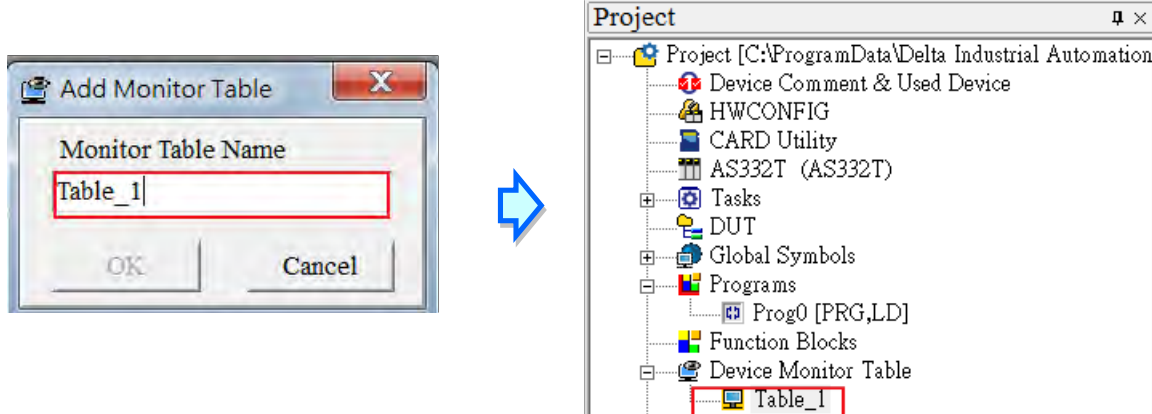


- **Method 2**

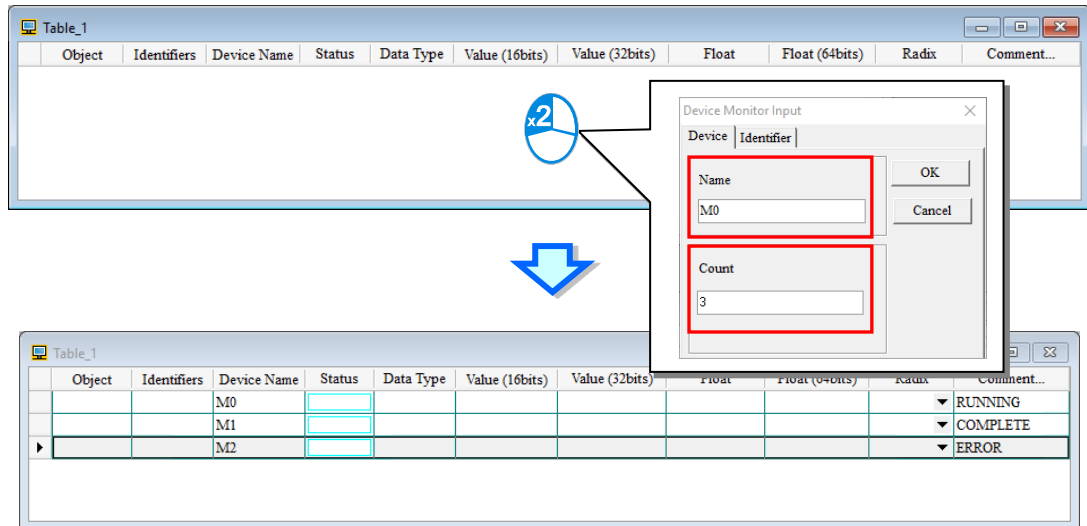
Right-click **Device Monitoring Table** in the project management area, and click **New**.



Type a table name in the **Add Monitor Table** dialog box, and then click **OK**. An item appears under **Device Monitor Table** in the project management area. Double-click the item to open the monitoring table. You can create several monitoring tables in the project, and the monitoring tables are saved with the project.

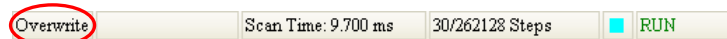


After you double-click the item, a item monitoring window appears. You can add items to be monitored to the window. To add an item to the window, double-click the blank space in the monitoring table, type a device name, type a start address, and the number of devices to be monitored in the **Device Monitor Input** dialog box. You can add up to 100 items to a monitoring table.

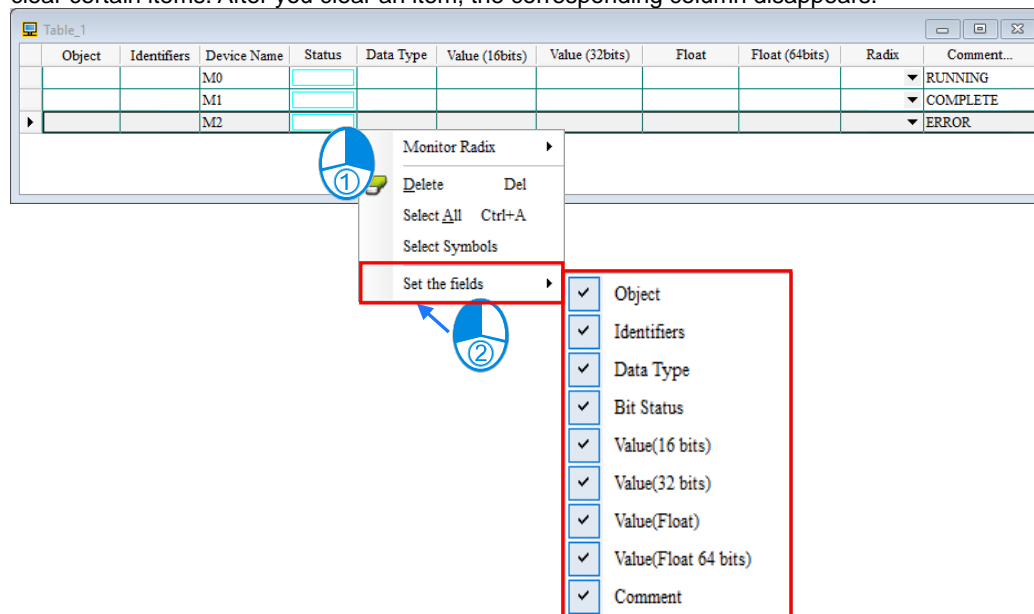


Press Insert on the keyboard to switch between inserting and replacing an item in the monitoring table. The selected mode displays in the status bar in ISPSOft.

If you select insert mode, the new item is added above the selected item in the monitoring table. If you select replacement mode, the new item overwrites the selected item in the monitoring table.



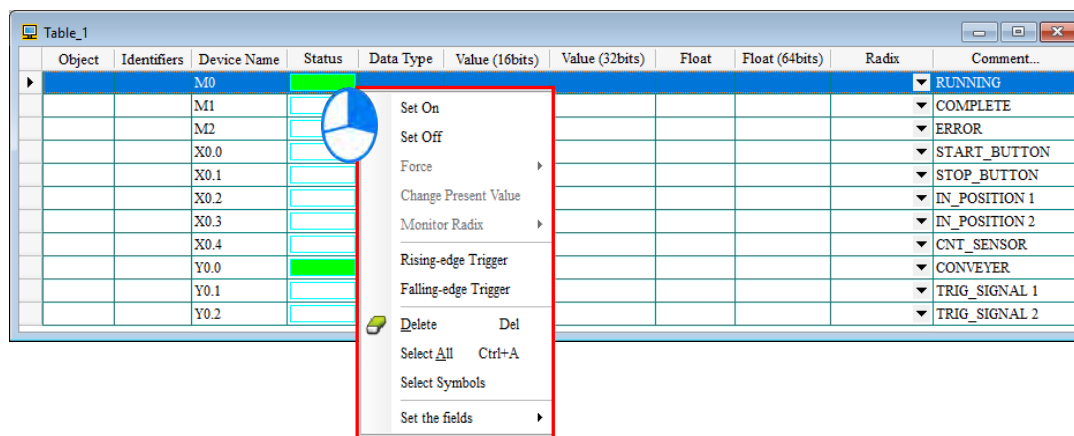
To hide certain columns in the monitoring table, right-click the monitoring table, point to **Set the Fields**, and clear certain items. After you clear an item, the corresponding column disappears.



The following describes the columns in the monitoring table.

| Column                              | Description   |
|-------------------------------------|---|
| Source                              | Source of a symbol  |
| Identifier                          | Identifier of a symbol                                    |
| Device name                         | Name of a monitored device                                |
| Status                              | State of a monitored bit device or a contact (ON or OFF). |
| Data type                           | Data type of a monitored symbol.                          |
| Value (16 bits)                     | In online mode, displays a 16-bit value.                  |
| Value (32 bits)                     | In online mode, displays a 32-bit value.                  |
| Value (32-bit floating-point value) | In online mode, displays a 32-bit floating-point number.  |
| Value (64-bit floating-point value) | In online mode, displays a 64-bit floating-point number.  |
| Radix                               | Select a format to represent a value.                     |
| Comment                             | Display the comments on a device or on a symbol.          |

After you create the monitoring table, you can monitor the items in the monitoring table in online mode. Right-click an item in the monitoring table in online mode to display a context menu which is the same as the context menu in the program editing window. You can change the item state or the item value by clicking an item in this context menu.

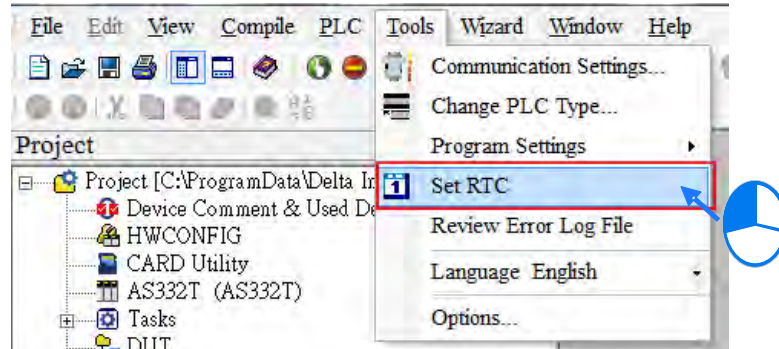


You can test and debug the program you created in this chapter through the monitoring table you created in this section. Refer to Chapter 18 in the ISPSOFT User Manual for more information about testing and debugging a program.

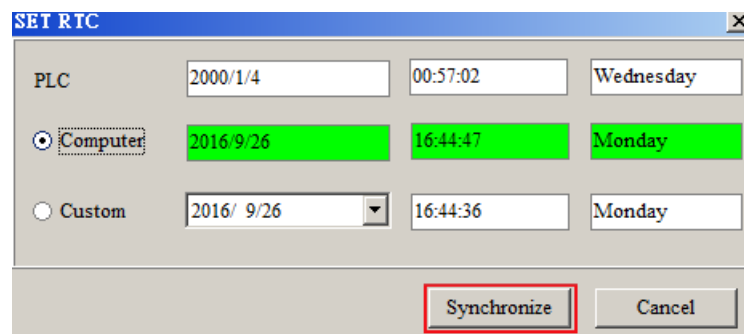
## 6.7 Setting a Real-time Clock

After you connect an AS Series CPU module to a computer, you can set the real-time clock in the CPU module through ISPSoft.

- (1) On the **Tools** menu, click **Set RTC**.



- (2) Select **Computer**, and then click **Synchronize** to complete setting the real time clock.



**MEMO**



# Chapter 7 Memory Card

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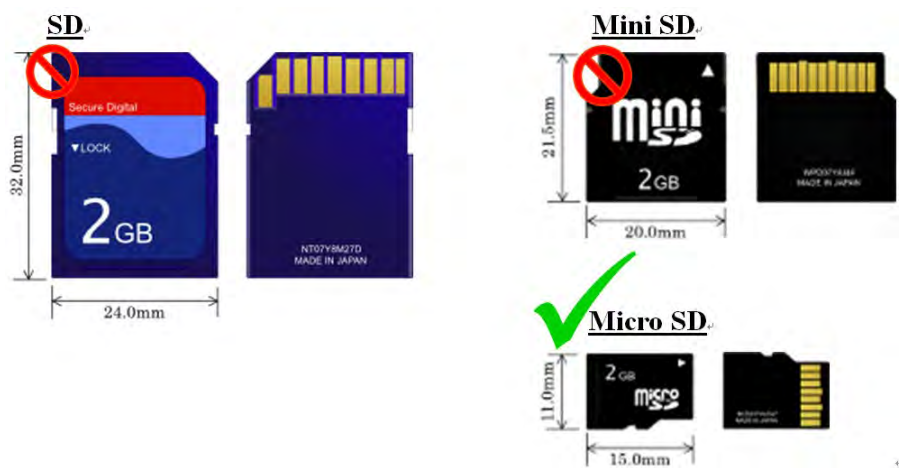
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## 7.1 Overview of Memory Cards

The AS Series CPU modules support standard MicroSD cards that meet the specifications in this chapter. This chapter describes the specifications and usage for the MicroSD cards supported by the AS series CPU modules.

### 7.1.1 Appearances of Memory Cards

SD cards are classified into three types according to size: SD cards, MiniSD cards, and MicroSD cards. AS Series CPU modules support MicroSD cards.



### 7.1.2 Memory Card Specifications

SD cards are also classified into three types according to capacity: SD cards, SDHC cards, and SDXC cards. The AS Series currently only supports a maximum of 32GB in FAT32 format. SD card families are shown in the table below. The Micro SDHC in the SDHC column indicates the specifications supported by the AS Series. Be sure to purchase products that meet these 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.)<br>CLASS 4 (Min. 4MB/Sec.)<br>CLASS 6 (Min. 6MB/Sec.)<br>CLASS 10 (Min. 10MB/Sec.) |           |            | CLASS 2 (Min. 2MB/Sec.)<br>CLASS 4 (Min. 4MB/Sec.)<br>CLASS 6 (Min. 6MB/Sec.)<br>CLASS 10 (Min. 10MB/Sec.) |            |



## 7.2 Before using a Memory Card

### 7.2.1 Formatting a Memory Card

You may need to format a new SDHC memory card with the FAT32 file system before you use it for the first time. You cannot use an unformatted SDHC memory card in an AS Series CPU module.

The following example introduces the most common way to format an SDHC card: formatting an SDHC card through a card reader. Also carefully read the documents provided by the SDHC card manufacturer.



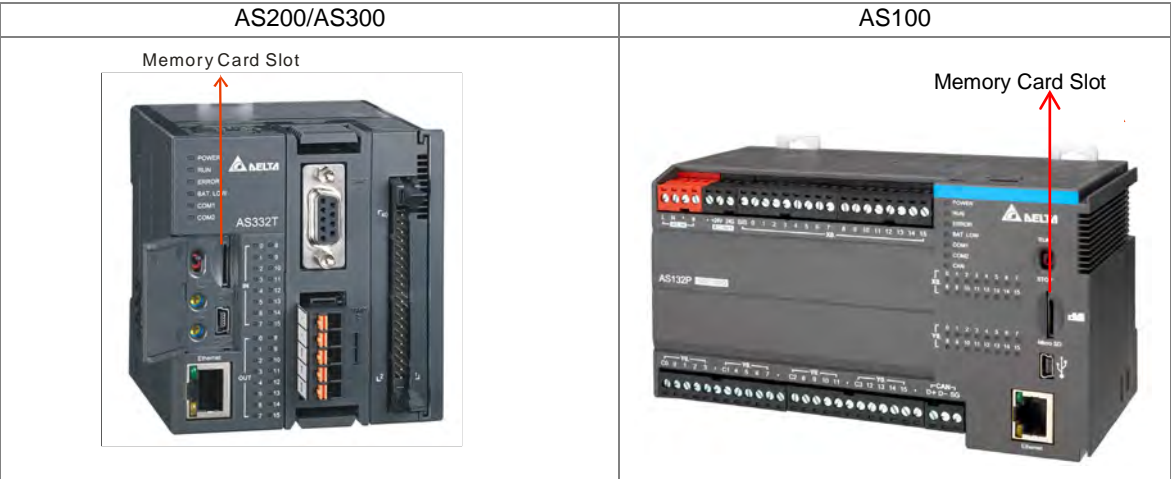
When you format a memory card, you also delete all the data in the memory card. Verify whether you need to back up the data in a memory card before you format the memory card.

- (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) You must format the memory card with the FAT32 file system. Do not change any other default settings. Click **Quick Format**, and then click **Start**.
- (4) After you click **OK** in the warning window, the SDHC card formats.

### 7.3 Installing and Removing a Memory Card

#### 7.3.1 Memory Card Slot in a CPU Module

The memory card slot is on the front side of the AS Series PLC.



#### 7.3.2 Installing a Memory Card

Insert a memory card into the CPU module memory card slot and push it in until it clicks. Be sure the memory card is fixed firmly in the slot; if the memory card is loose, it is not installed correctly. The memory card can only be inserted in one direction. Do not force the memory card or you may damage the CPU module. The following example uses AS300 Series PLC CPU to show you a correct way to insert the memory card.



#### 7.3.3 Removing a Memory Card

Remove a memory card by pushing it in and the card then springs from the slot. (uses AS300 as an example)



## 7.4 Memory Card Contents

### 7.4.1 Initializing a Memory Card

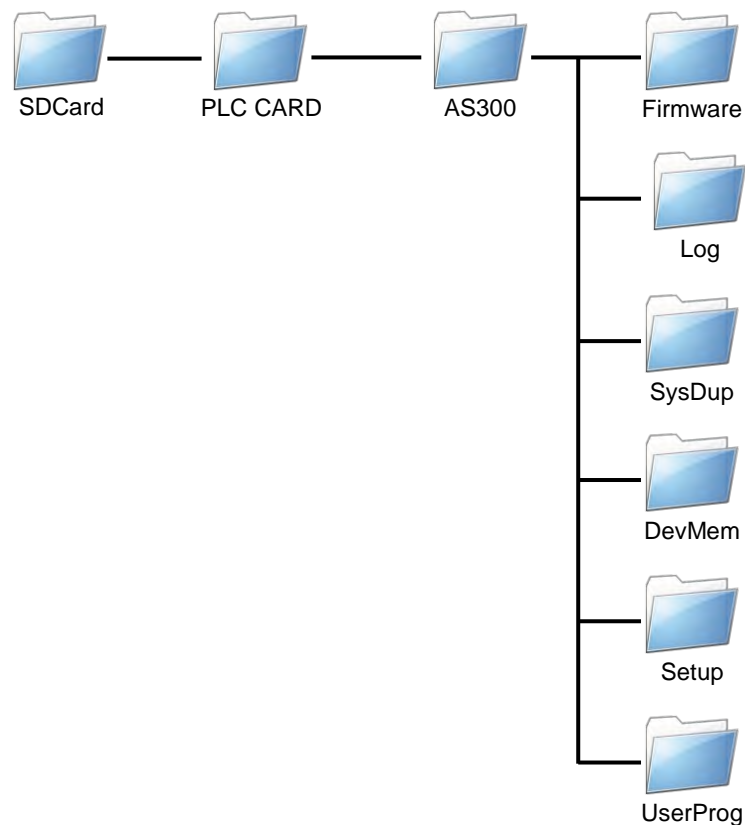
When you insert an SDHC card into a CPU module that is powered on, and use ISPSOft -> CARD Utility to back up a project, the system initializes the SDHC card, and creates a default folder named according to the model of the CPU module. (If the folder is already existed, the system does not create a second folder for the same model.)

When the system initializes an SDHC card, it automatically adds any missing folders to the directory structure. However, if the initialization of a SDHC card fails, you cannot initialize the SDHC card again until you reformat it.

When you initialize a memory card, the SYSTEM indicator in the software blinks.

### 7.4.2 Folder Structure in a Memory Card

The image below shows the default folder group created by an AS System. The folder name is AS100/200/300. Several subfolders are contained inside the AS100/200/300 folder. Related files created by you and the AS system are stored in the subfolders.



| Folder        | Description  |
|---------------|--|
| Firmware      | Stores firmware files (.ext)<br>You can store firmware file here for a firmware upgrade; after that use the USB port on the computer to connect to the USB port of the AS Series PLC CPU for a firmware upgrade. |
| Log           | Stores Log files (.log)  |
| SysDup        | Stores backup files (.dup)   |
| UserProg      | Stores device memory files (.txt, .dmd, .csv)  |
| DevMem, Setup | Reserved for the system use  |

## 7.5 Introduction to the CARD Utility

The AS Series CPU modules include SDHC slots, and you can back up and restore PLC CPU data with a memory card. ISPSOFT includes the CARD Utility for the AS Series CPU modules. With this utility, you can back up and restore data in an AS Series CPU module or backup and restore an ISPSOFT project. The backup can include the program code, parameter settings, hardware configuration, network configuration, and the values in the latched area in an AS series CPU module. Refer to AS Series Manuals for more information about the specifications and usage of SDHC cards with AS Series CPU modules.

For AS Series PLC CPU firmware V1.08.20 or previous versions, the PLC CPU backs up and restores the following data:

- Programs includes PLC execution code, PLC programs, project password, and PLC ID.
- Parameters includes HWCONFIG settings, configurations of CPU module and modules, data exchange table, and positioning planning table.
- Retainable data includes device setting range, values in retainable devices.

Note: Ethernet/IP and CANopen DS301 data exchange tables created by the network planning tool cannot be backed up or restored.

For AS Series PLC CPU firmware V1.10.00 or later versions, the PLC CPU backs up and restores the above-mentioned data and the following data:

- User Language C execution code
- Device default value table
- E-CAM table
- Data Logger parameters
- Ethernet/IP Tag
- Ethernet/IP data exchange table
- OPC UA Tag
- IOLINK device parameters of AS04SIL
- CANopen DS301 data exchange table

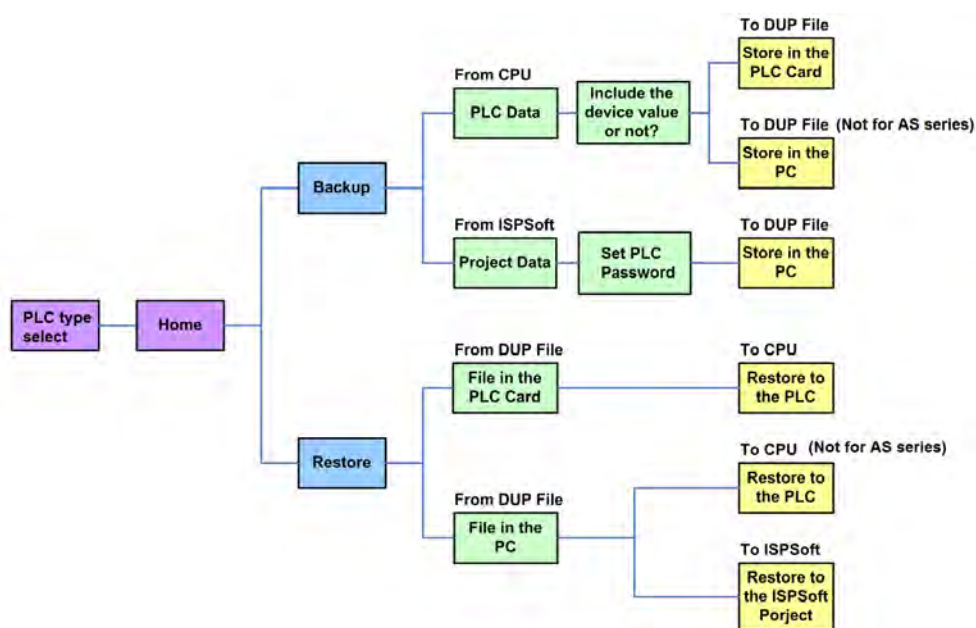
NOTE: if the backup file created by the PLC CPU whose firmware is different from the one you are going to perform restoring, things will be like one of the followings:

\* Backing up on the older firmware version of the PLC CPU and restoring to a later firmware version of the PLC CPU: Backup file can be restored on the later firmware version of the PLC.

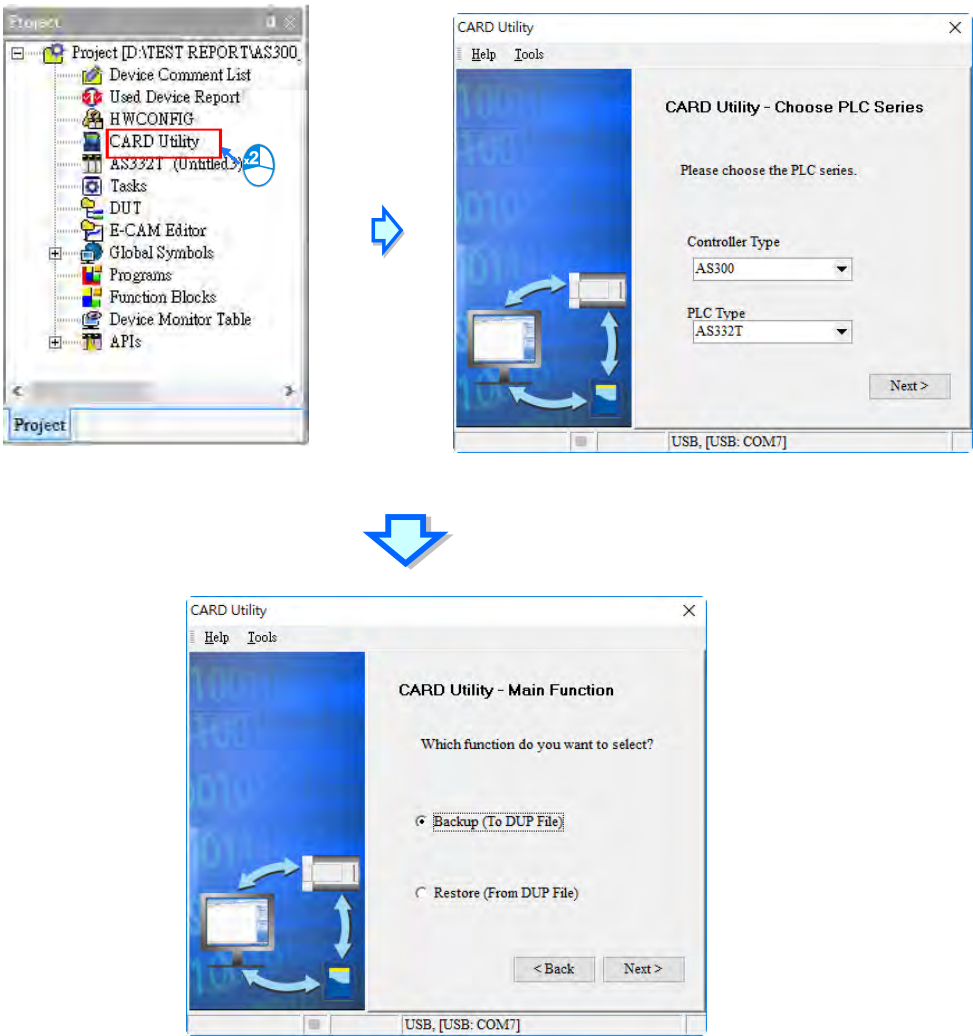
\* Backing up on the later firmware version of the PLC CPU and restoring to an older firmware version of the PLC CPU: Backup file can NOT be restored on the older firmware version of the PLC. It is suggested to upgrade the PLC firmware or use a backup file created by the same firmware version of the PLC CPU to perform restoring.

The list below describes the functions supported by the CARD Utility, including a flowchart.

- If you export data from an AS Series CPU module as a backup file (\*.dup), you can save the exported data in the memory card in the module or in a folder on the computer. You can also decide whether to back up the values in the devices in the AS Series CPU module.
- If you export an ISPSOft project for an AS Series CPU module as a backup file (\*.dup), you can only save the exported ISPSOft project in a folder in the computer. You can see data such as register editing (\*.dvl), device status editing (\*.dvb), file register editing (\*.wft) for the AS Series as values in the device and back them up. You can put a memory card with the backup file into the AS series CPU module. You can copy a backup file (\*.dup) saved on the computer into the AS series CPU module connected to the computer, or restore the backup file to an ISPSOft project. If you choose to restore the backup file to an ISPSOft project, the system automatically skips the values in the devices and the hardware configuration in the backup file.
- If you restore the backup file (\*.dup) from the PC to an ISPSOft project for an AS Series CPU module, you can also restore data such as register editing (\*.dvl), device status editing (\*.dvb), and file register editing (\*.wft) for the AS Series.



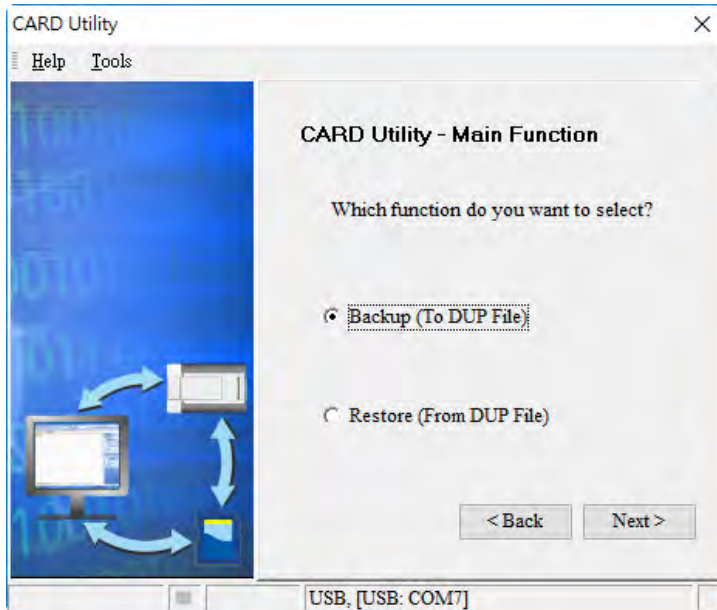
Double-click **CARD Utility** in the project management area to open the **CARD Utility** wizard. After selecting the controller type, click “Next” to proceed.



## 7.6 Backing Up a Project

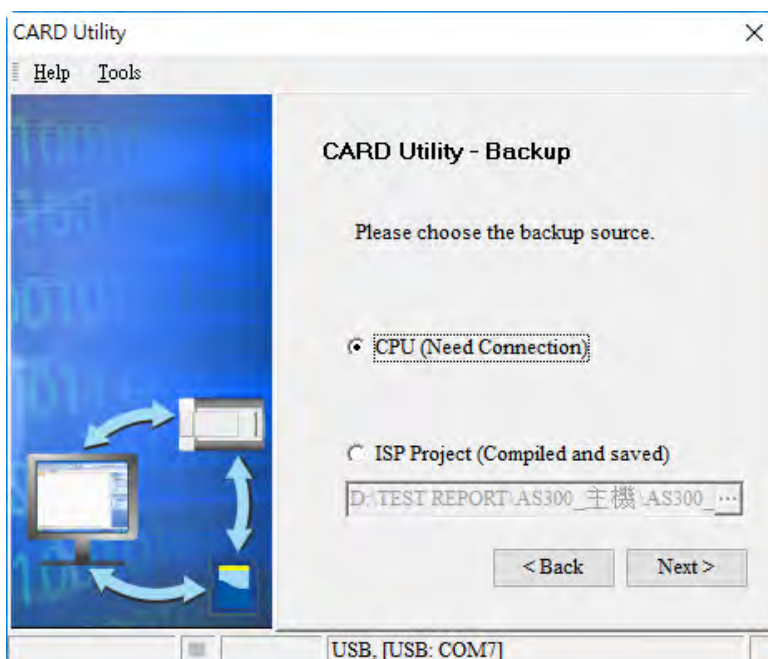
If the backup source or backup destination is an AS Series CPU module or memory card, make sure that ISPSOFT is connected to the AS Series CPU module. During backup, the CPU LED and Error LED blinks alternatively and SM452 flag is ON. After the backup is done, the CPU LED and Error LED stops blinking and SM452 flag is OFF. Refer to Section 2.4 in the ISPSOFT User Manual for more information.

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




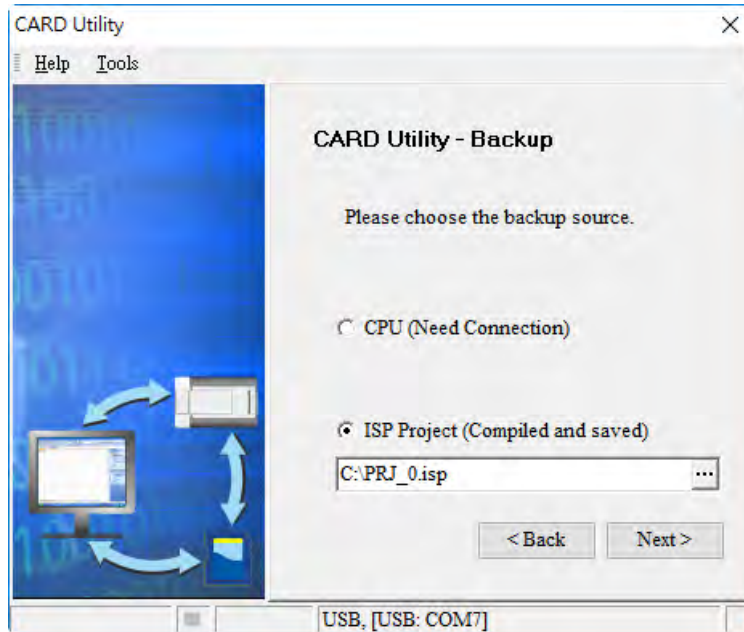
- (2) Select a backup source, and then click **Next**.

- a. If you select the **CPU (Need Connection)**, the backup file is stored in the memory card.

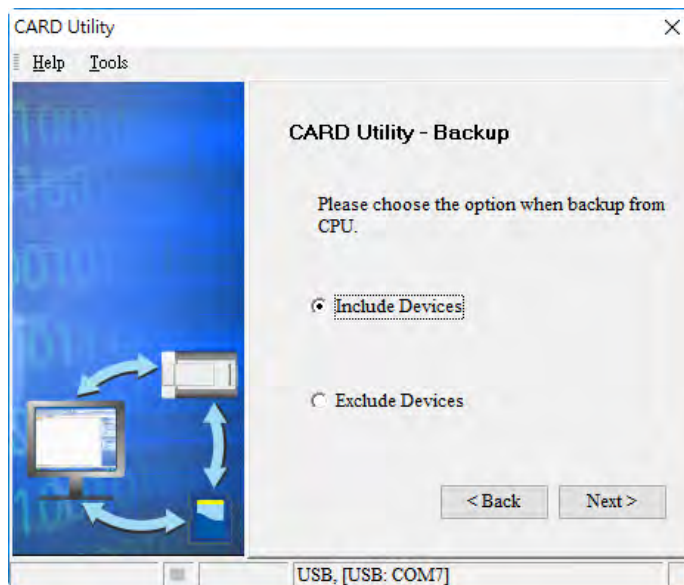





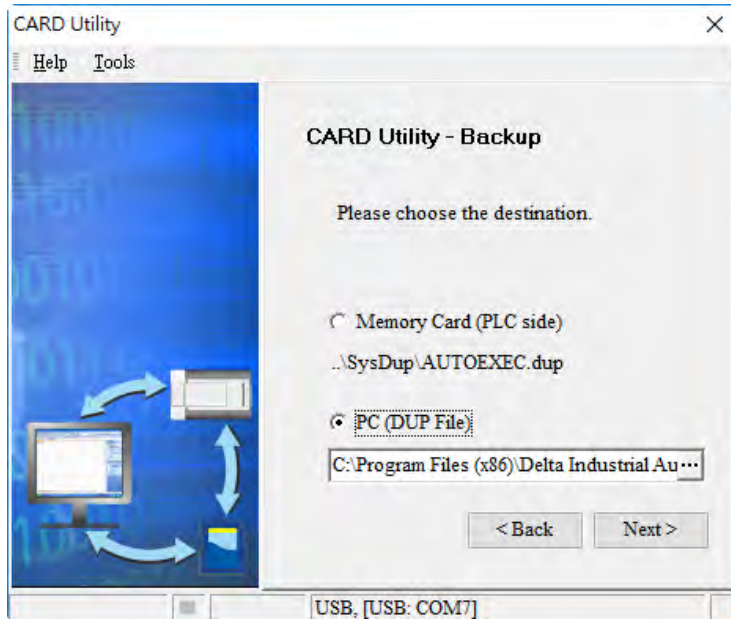
b. If you select the **ISP Project (Compiled and saved)**, the backup file is stored in your computer. Click  and select an isp file in the **Open** dialog box. If the program in the isp file selected is not compiled, a message appears when you back up the isp file. Open the isp file with ISPSOft, compile the program in the isp file, and then save the isp file. After the program in the isp file is compiled, you can back up the isp file.



- (3) After you select **CPU (Need Connection)** / **ISP Project (Compiled and saved)**, click **Next**,
- a. If you select the **CPU (Need Connection)**, a prompted window appears. And you need to decide whether to back up the values in devices on the AS Series CPU module that is connected to ISPSOft.



- b. If you select the **ISP Project (Compiled and saved)**, the backup file is stored in your computer. Click  and select an isp file in the **Open** dialog box and then decide the file path where you'd like to store the backup file in your computer and then define its file name.



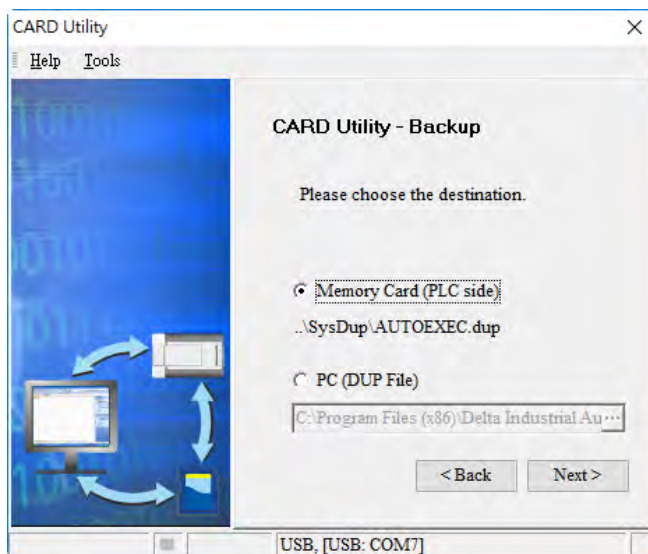
- (4) Select a backup destination. If the backup source is an ISPSoft project, the backup destination must be a computer.


- a. If you select **Memory Card (PLC Side)**, the filename of the backup file is **AUTOEXEC.dup**, and the backup file paths for AS100, AS200 and AS300 are shown below.

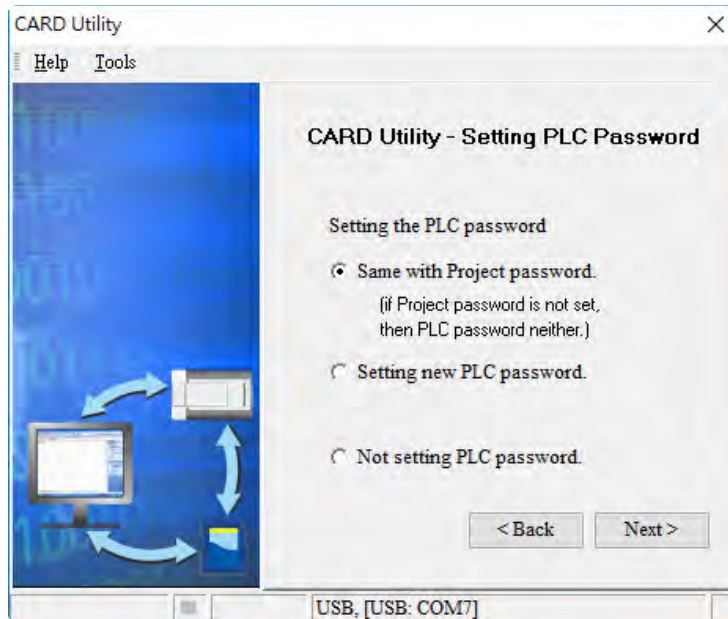
**AS100:** Root directory of the memory card\SDCard\PLC CARD\AS100\SysDup\AUTOEXEC.dup

**AS200:** Root directory of the memory card\SDCard\PLC CARD\AS200\SysDup\AUTOEXEC.dup

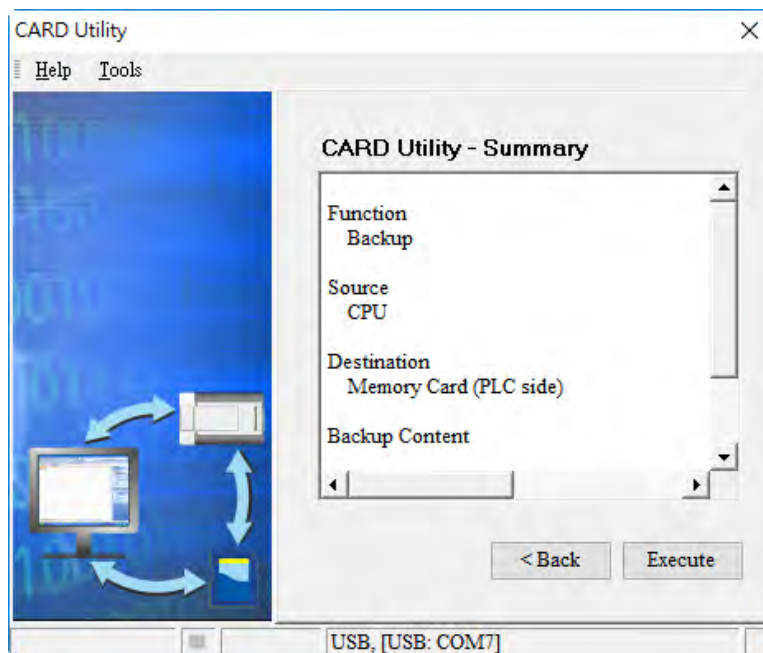
**AS300:** Root directory of the memory card\SDCard\PLC CARD\AS300\SysDup\AUTOEXEC.dup



- b. If you select **PC (DUP File)**, click , select a folder in the **Save in** list in the **Save As** dialog box, and type a filename in the **File name** box. When you select the backup source for the ISPSoft Project, set the PLC password. You can set the password to be the same as the Project password, set a new PLC password, or not set a PLC password. If you do not set a password for the Project, the PLC password is also not set. When you select **Setting new PLC password**, the wizard looks like the following image. And you can set new PLC password and number of the attempt times.

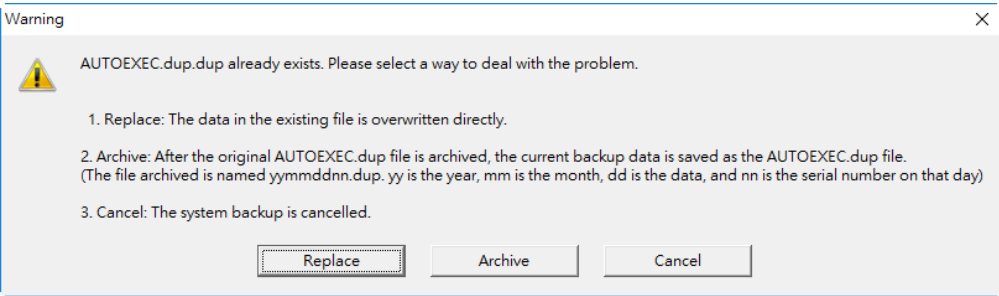


- (5) After that you can see the summary. Make sure that the summary in the **CARD Utility** wizard is consistent with the data backup you want to perform, and then click **Execute**.



(6) The AS Series CPU module still performs the data backup even if you click **Cancel**. You can turn off the AS Series CPU module to stop the data backup; however, the backup file produced is not a complete backup file, and you must delete the backup file from the memory card.

If you select **Memory Card (PLC Side)**, the filename of the backup file is **AUTOEXEC.dup**, and the backup file path is **Root directory of the memory card\AS300\SysDup\AUTOEXEC.dup**. If there is an old backup file in the memory card, the **Warning** message appears. Click **Replace**, **Archive**, or **Cancel** in the Warning message.



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

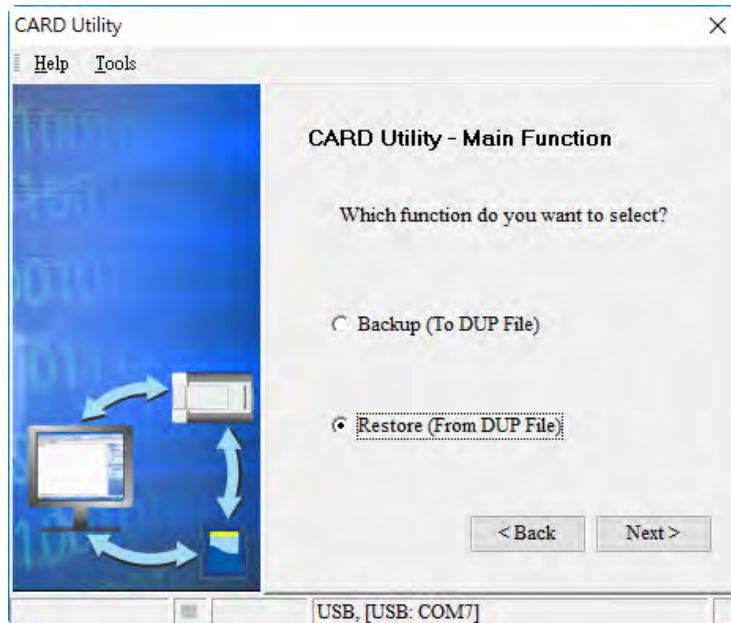
| Data backup                | Description   |
|----------------------------|---|
| CPU module → Memory card   | The backed up data includes the PLC ID and the PLC password set in the CPU module.              |
| ISPSOft project → Computer | The backed up data includes the program ID and the project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



(7) After you perform the data backup, click **Home** or **Close** in the **CARD Utility** wizard.

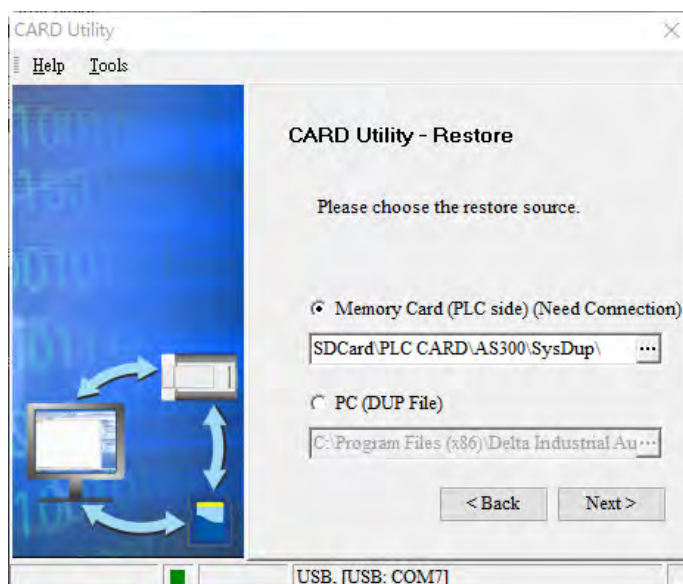
## 7.7 Restoring a Project

If the restoration source or restoration destination is an AS Series CPU module or memory card, make sure that ISPSOFT is connected to the AS Series CPU module. During restoration, the CPU LED and Error LED blinks alternatively and SM452 flag is ON. After restoration is done, the CPU LED and Error LED stops blinking and SM452 flag is OFF. Refer to Section 2.4 in the ISPSOFT User Manual for more information.

- (1) Select **Restore (From DUP File)** in the **CARD Utility** wizard and then click **Next**.




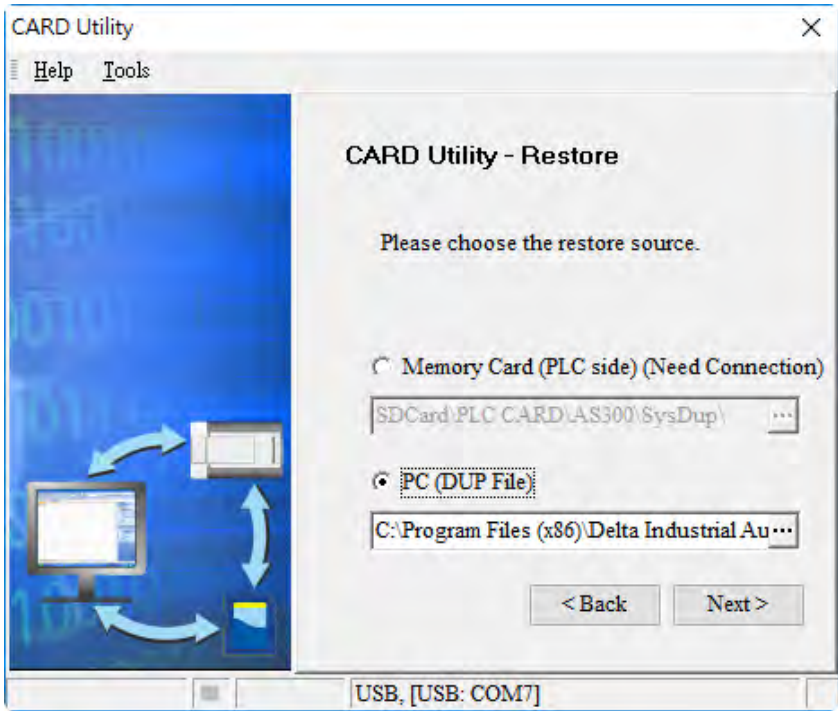
- (2) Select a restoration source, click  and then select a backup file to be restored.
  - a. If you select **Memory Card (PLC side) (Need Connection)**, the backup files in the memory card display in a window after you click . Double-click a backup file in the window to choose it.





| Name         | Size   | Type     | Modified Time        |
|--------------|--------|----------|----------------------|
| AUTOEXEC.dup | 202 KB | DUP File | 2000/1/1 上午 03:13:16 |

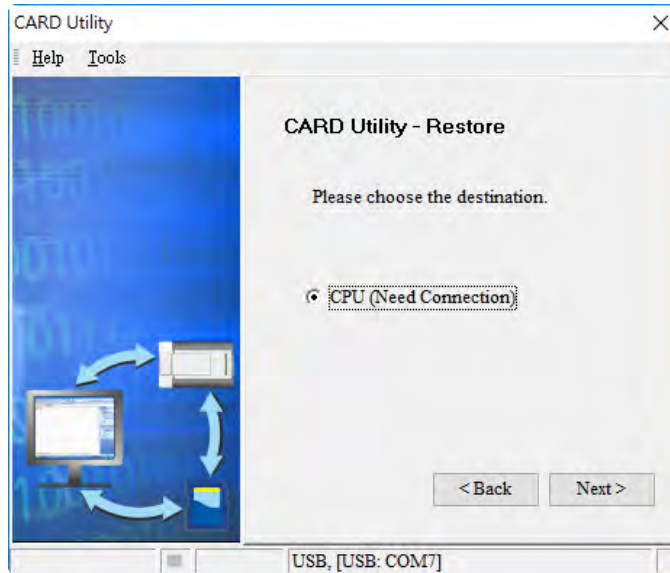
- b. If you select **PC (Need Connection)**, the backup files in the PC display in a window after you click . Double-click a backup file in the window to choose it.




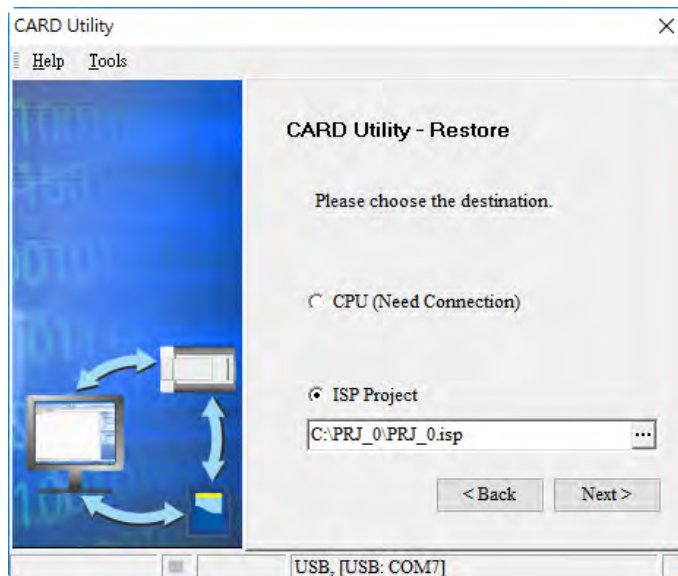
| Name         | Size   | Type     | Modified Time        |
|--------------|--------|----------|----------------------|
| AUTOEXEC.dup | 202 KB | DUP File | 2000/1/1 上午 03:13:16 |

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

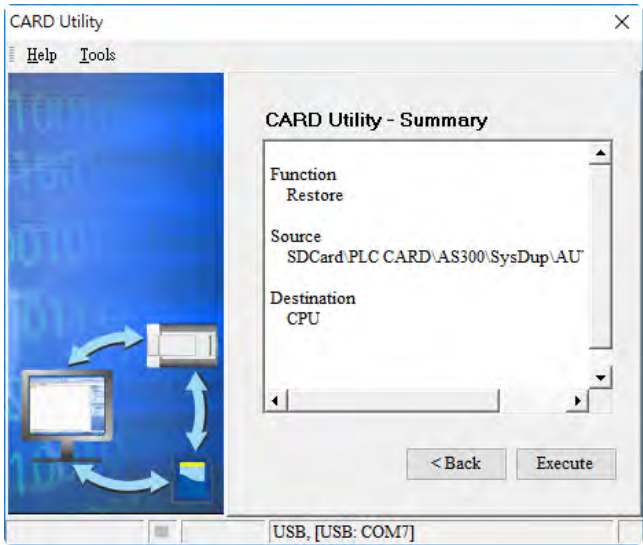
- a. To put the selected backup file into the AS Series CPU module, select **CPU (Need Connection)**. If the restoration source is the **CPU (Need Connection)**, the restoration destination must be the AS Series CPU module.



- b. If you select **ISP Project**, click  and then specify a filename and a path. If the path specified point to a file that already exists, the file is overwritten when you restore the data.



- (4) Make sure that the summary in the **CARD Utility** wizard is consistent with the data restoration you want to perform and then click **Execute**.



If you click **Cancel** in the process of restoring data to the AS Series CPU module, the data is not completely restored. The AS Series CPU module still performs the data restoration even if you click **Cancel** in the process of restoring a backup file in the memory card. You can turn off the AS Series CPU module to stop the data restoration from being performed. To prevent the AS Series CPU module from operating incorrectly, restore the AS Series CPU module to the factory setting, or perform the data restoration again.

The restoration source or restoration destination may contain a password and an ID. The following table describes the password and the ID process.

| Data restoration             | Description   |
|------------------------------|---|
| Memory card<br>→ PU module   | <div>a. The ID in the backup file must be the same as the ID in the CPU module; otherwise the data is not restored.</div> <div>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 is not restored.</div> <div>c. If there is no PLC password in the CPU module, and there is a password in the backup file, the system restores the data, and the password in the backup file becomes the PLC password in the CPU.</div> |
| Computer→<br>ISPSoft project | The ID and the password in the backup file become the program ID and the project password in the ISPSoft project.   |

- (5) After you perform the data restoration, click **Home** or **Close** in the **CARD Utility** wizard.



## 7.8 Restoration Starts Once CPU is supplied with Power

When the backup file in the memory card is consistent with the specific path and file name, the CPU can perform restoration once it is supplied with power. During restoration, the CPU LED and Error LED blinks alternatively and SM452 flag is ON. After restoration is done, the CPU LED and Error LED stops blinking and SM452 flag is OFF.

### Operation Steps:

- (1) Set up the backup file path and file name for the memory card backup file. The filename of the backup file is **BACKUP.dup** and the backup file paths for AS100, AS200 and AS300 are shown below.

**AS100: Memory card root directory\SDCard\PLC CARD\AS100\SysDup\AS200 BACKUP.dup**

**AS200: Memory card root directory\SDCard\PLC CARD\AS200\SysDup\AS200 BACKUP.dup**

**AS300: Memory card root directory\SDCard\PLC CARD\AS300\SysDup\AS300 BACKUP.dup**

Insert the memory card into the card slot when the CPU power is off.

- (2) When the CPU power is on, it automatically checks if the memory card data is consistent with the PLC data. If not, the restoration begins. The data check is specifically on the data in CPU programs and HWCONFIG parameters.
- (3) During the restoration, the CPU LED and Error LED blinks alternatively. Once the restoration is done, the blinking stops.

## 7.9 CPU Error Log

The system stores CPU error messages in the memory card whenever the quantity of the error messages reached to 20. You can also use special flag SM36 and special device SR36 to read the CPU error messages and state change logs. If there is error logs recorded in the memory card, the memory card keeps storing the error logs. You can change the file path to store other error logs or change the file name to store other error logs.

| Special Device | Function Code Description   |
|----------------|---|
| SR36           | a. when the value is 0, it indicates there is no recording.<br>b. when the value is 1234, it indicates the logs are stored in the memory card.<br>c. when the value is 3456, it indicates the error logs and state change logs are stored in the memory card. |

Operation Steps to read CPU error logs and state change logs:

Make sure the memory card is in the slot before reading the CPU error logs and state change logs.

- (1) Set SM36 to ON and the value in SR36 to 1234 or 3456 to read the CPU error logs and state change logs.
- (2) The root directory path of the memory card for the error log is

**AS100: Memory card root directory****SDCard\PLC CARD\AS100\Log\Error.log**

**AS200: Memory card root directory****SDCard\PLC CARD\AS200\Log\Error.log**

**AS300: Memory card root directory****SDCard\PLC CARD\AS300\Log\Error.log**

Use ISPSOft to read the error logs. ISPSOft Tools -> Review Error Log File -> Open Log File

The root directory path of the memory card for the status log is

**AS100: Memory card root directory****SDCard\PLC CARD\AS100\Log\STATUS.log**

**AS200: Memory card root directory****SDCard\PLC CARD\AS200\Log\STATUS.log**

**AS300: Memory card root directory****SDCard\PLC CARD\AS300\Log\STATUS.log**

- (3) Use ISPSOft to read the status logs. ISPSOft Tools -> Review Error Log File -> Open Log File



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# Chapter 8     Hardware Configuration and Data Exchange Setups

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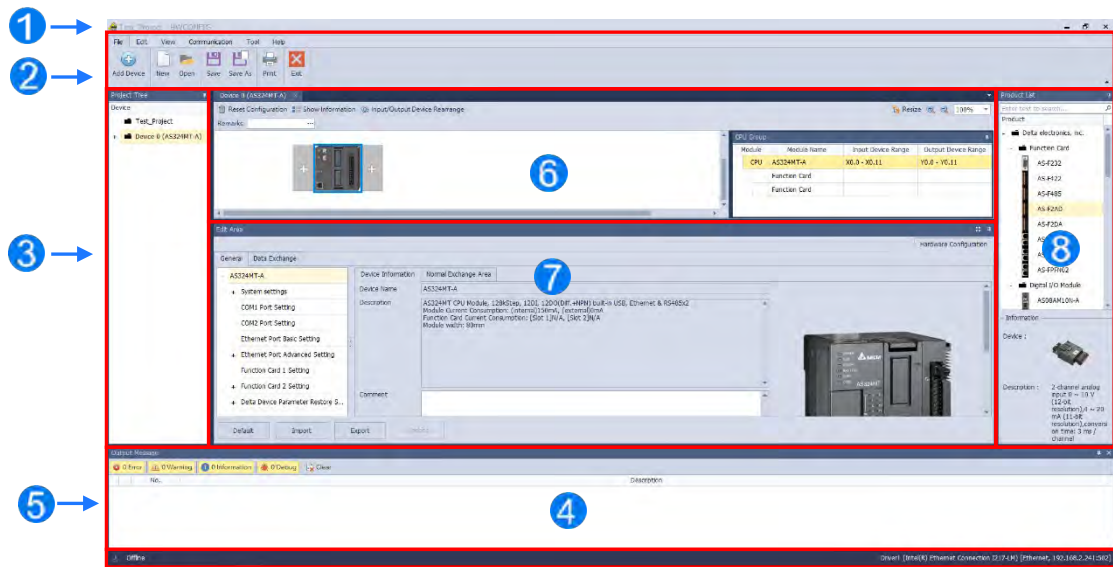
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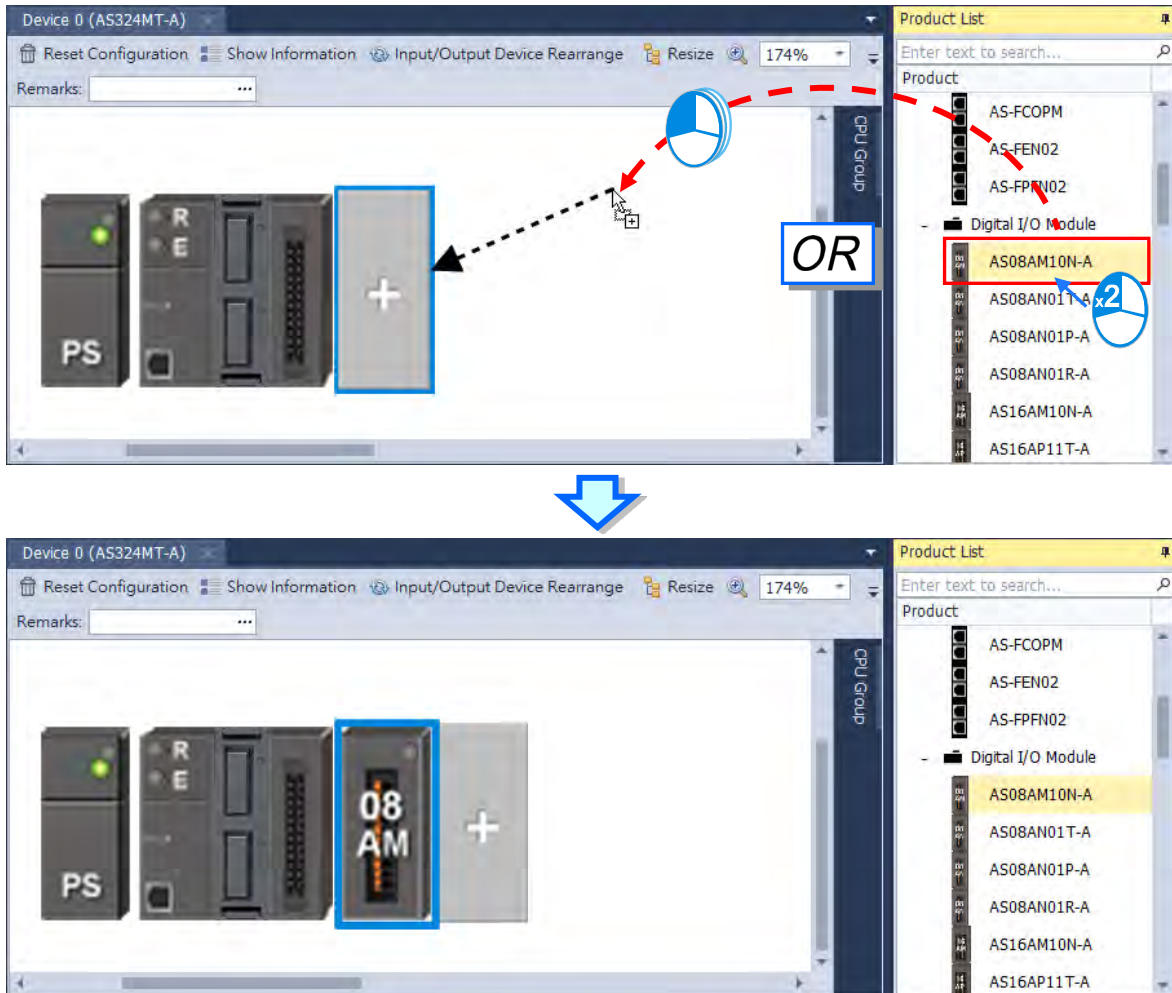
- 1 Window Title:** Here shows the current project name and the program name.
- 2 Tool Bar:** There are 6 tabs on the tool bar.
- 3 Project Tree:** Tree-structured projects for easier management
- 4 Output Message Section:** Here shows project related information.
- 5 Status Bar:** Here shows the connection status and the communication parameters.
- 6 Hardware Configuration Area:** You can set up hardware configuration here.
- 7 Edit Area:** You can set up parameters for PLC CPU and modules.
- 8 Product list:** Available hardware is listed in the catalog.

## 8.1.2 Configuring a Module

### 8.1.2.1 Adding a Module

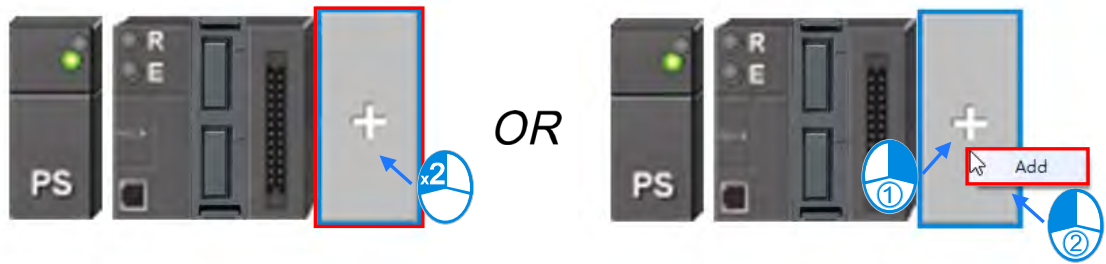
- **Method 1**

Double-click the module you want to add in the project or select it from the **Product List** and drag that module to the desired position. There will be a suggestive dotted line to indicate the legitimate position for the selected module.

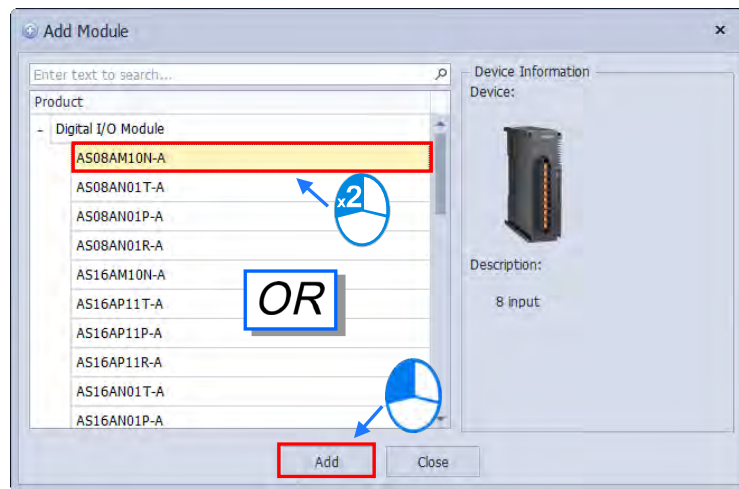


- **Method 2**

- (1) Double-click a vacant slot or right-click the slot and choose **Add**.

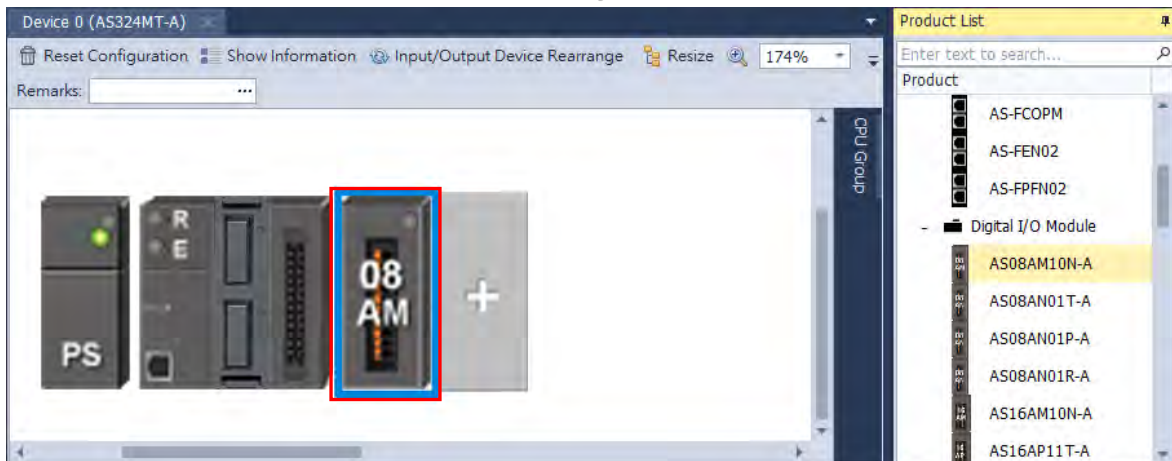
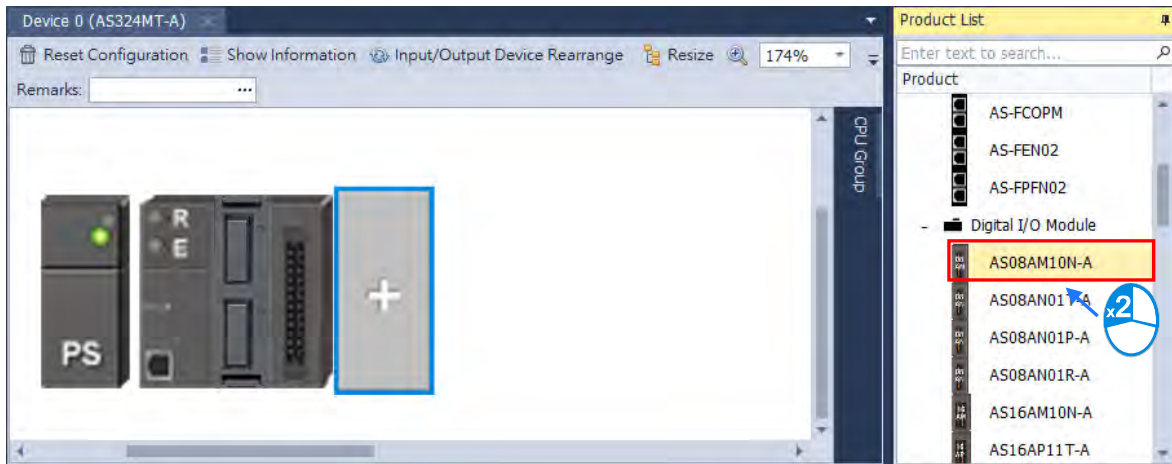


- (2) Double-click the selected module to add. You can repeat these two steps to add more modules in.



- **Method 3**

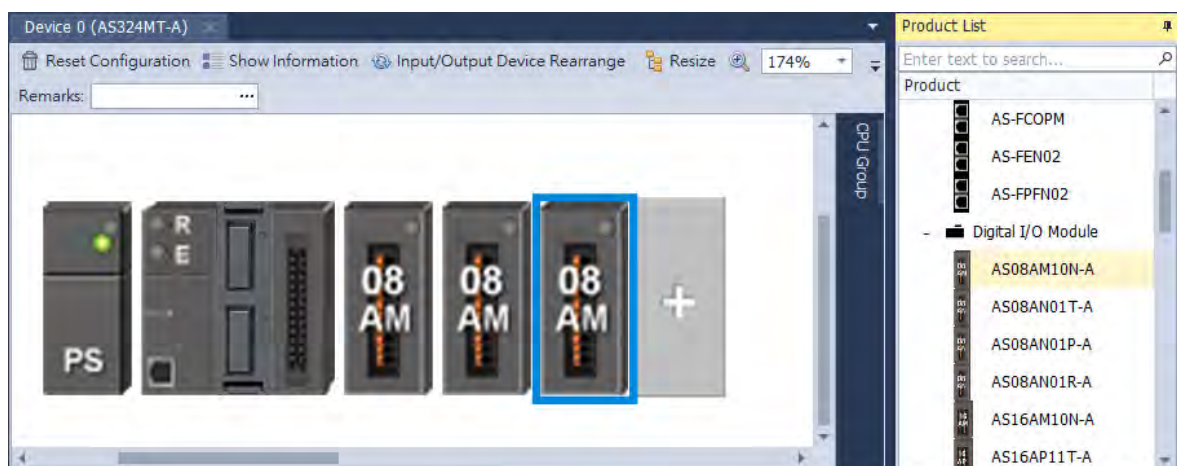
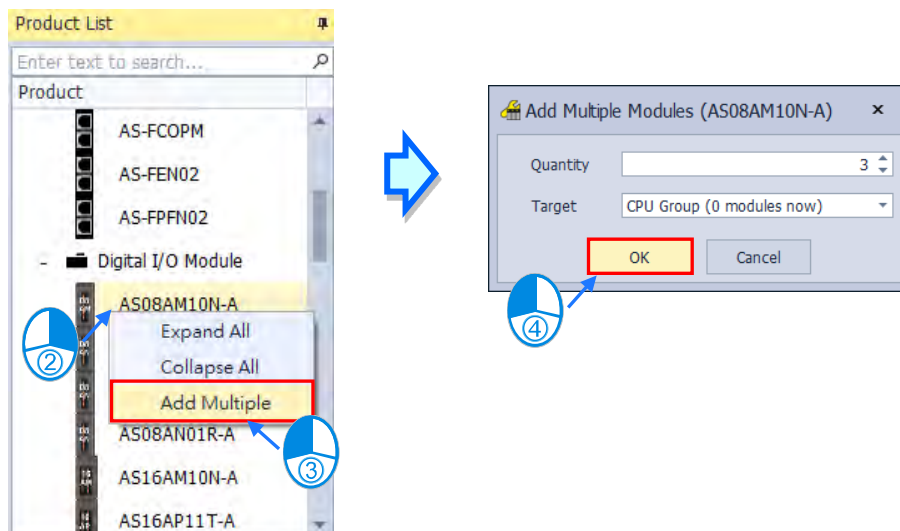
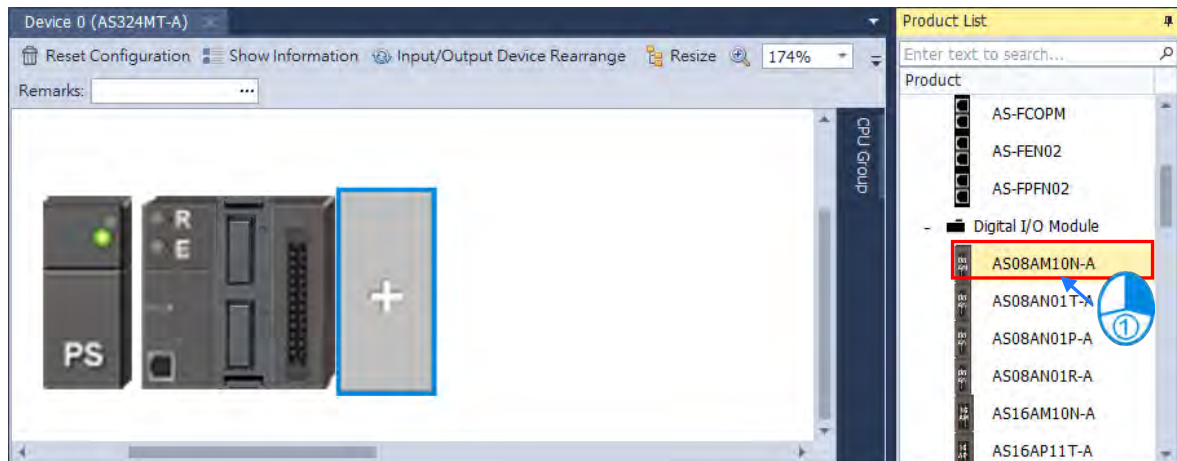
In the **Product List** section, double-click the selected module or select the desired module and press **Enter** on the keyboard to add the selected module in the hardware configuration area.





### ● Add More Modules at the Same Time

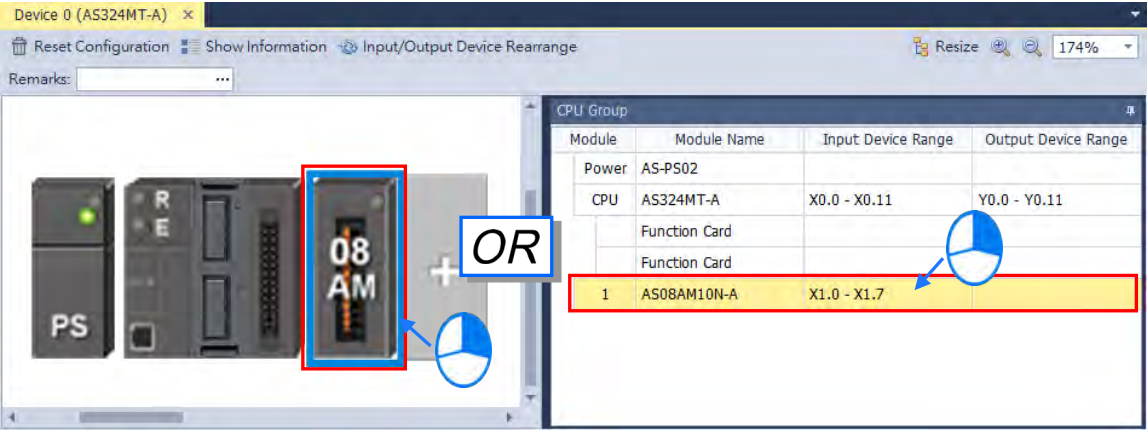
In the **Product List** section, right-click the selected module that you need for more than one, and you will see the context menu showing three options **Expand All**, **Collapse All**, and **Add Multiple**. Click **Add Multiple**, and then an Add Multiple Modules (your desired module name) window appears, use the up and down arrows to increase or decrease the quantity number that you need and then click **OK** to confirm the setting.



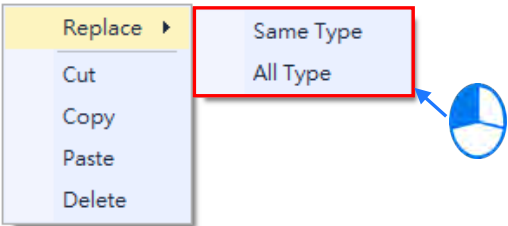
8.1.2.2 Replacing the Module

The following steps show you how to replace the module.

- (1) Select and right-click the module for replacement in **Hardware Configuration** area or from **CPU Group Information** section.



- (2) Choose **Replace** on the context menu. After that you can see two different types of replacements for selection, **Same Type** and **All Type**.



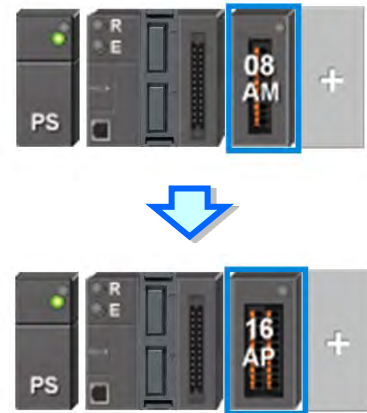
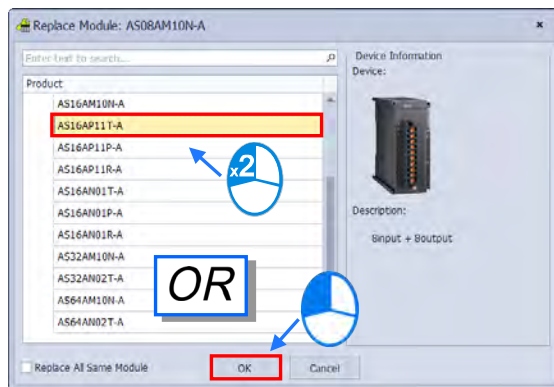
➤ Same Type

Replace only the selected module with the same type module. The new module **Input/Output Device Range** will be the same, while other parameters may return to system defaults if they cannot be matched.

➤ All

Replace selected module to be any type of module. The result is similar to deleting the original module by adding a new one, so the new module **Input/Output Device Range** will be re-configured and other parameter settings will also return to system defaults.

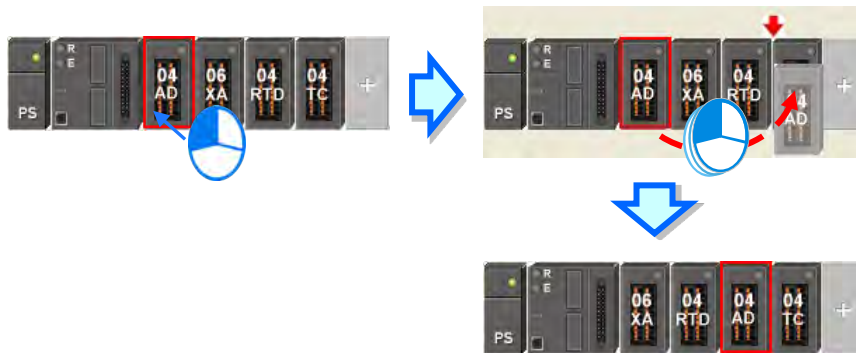
- (3) Once the replace type is selected, the Module Selection window appears with modules available for the selected replace type. Double click or select the module you want to replace with and click **OK**.



### 8.1.2.3 Rearrange Module Position by Drag and Drop

Except CPU modules, you can drag and drop all module graphics in Hardware Configuration area to rearrange their positions.

AS Series PLC is non-backplane designed. When the module is dragged to a position between two modules, a red arrow mark appears indicating the position where the module will be after dropping.

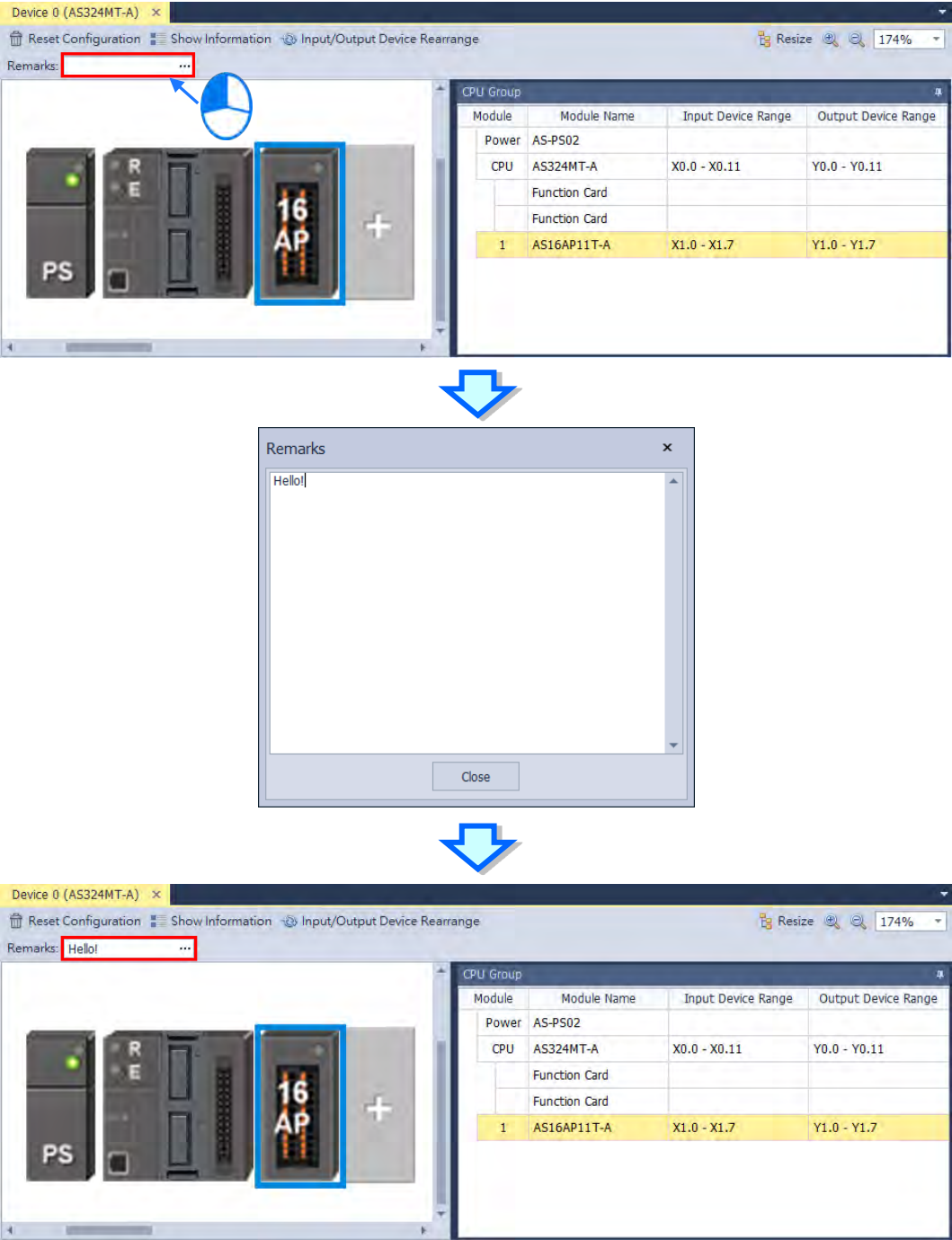


\* When rearranging the module position, the input/output device range, comment, internal parameters, corresponding device D and advanced parameters for intelligent modules are also rearranged with the module.

8.1.2.4 Remarks and Comments

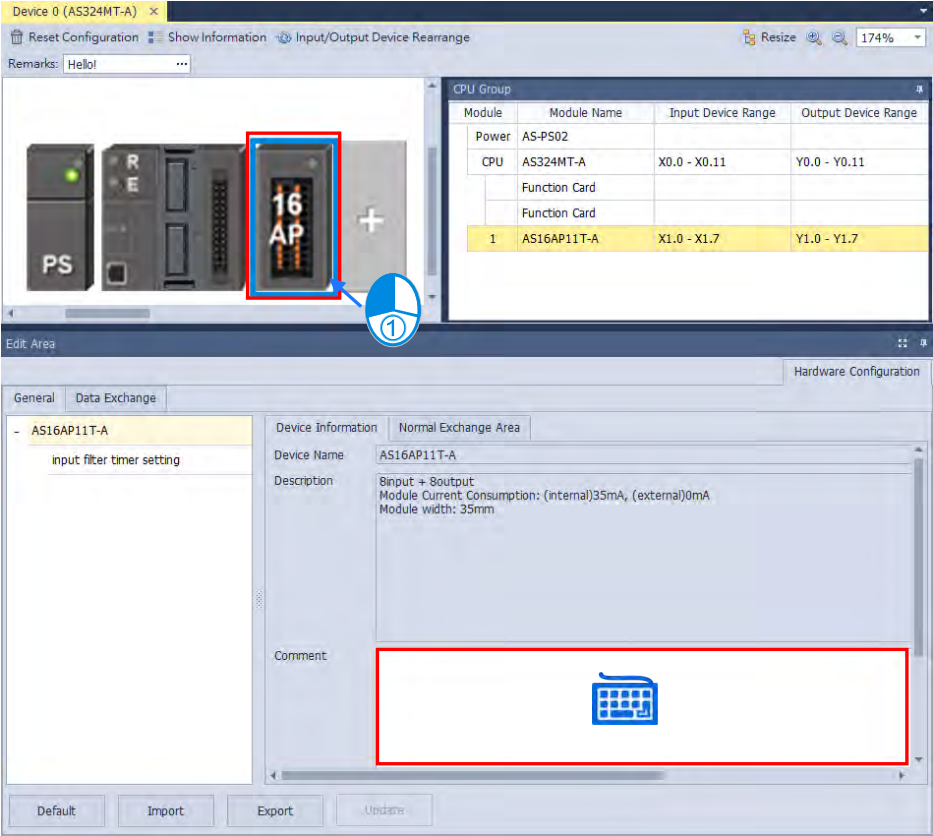
- Remarks for the project

Click **Remarks** field on the top of the **Hardware Configuration** area and a blank box appears for you to leave remarks for the project. After typing the remarks, press **Enter** on the keyboard or click **Close** to save the remarks.



● **Comments for PLC CPU and Modules**

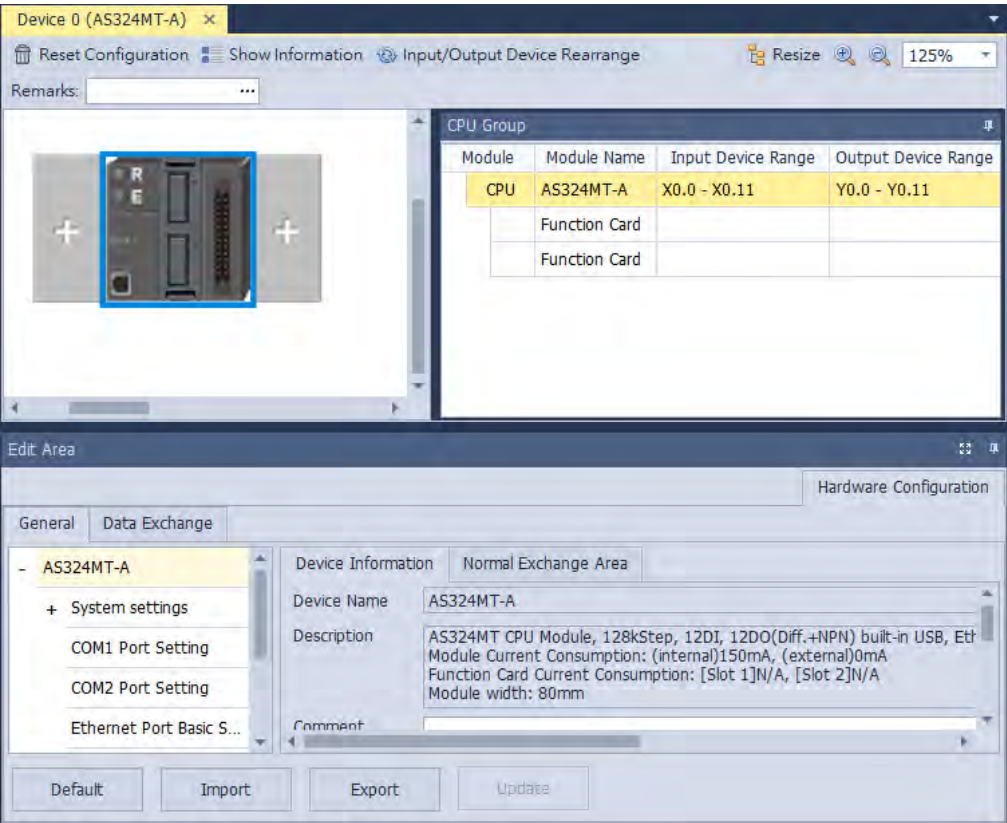
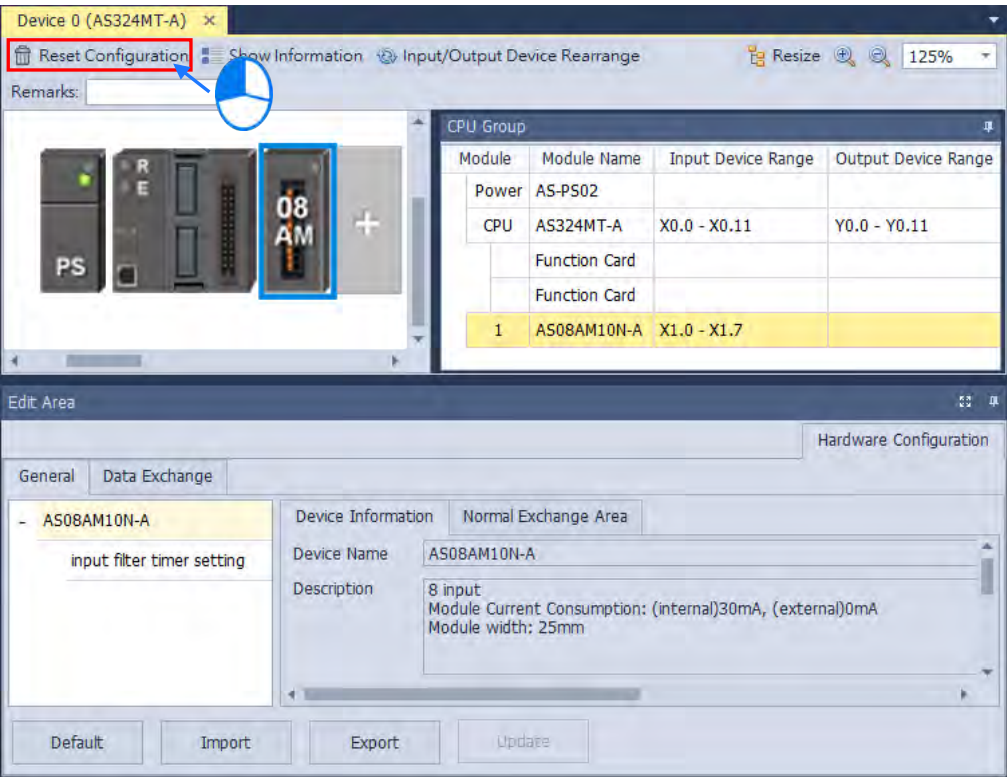
Click the module graphic and you can see its details in the Edit Area. You can leave comments for the PLC CPU and Modules. After typing the comments, it saves the comments automatically.





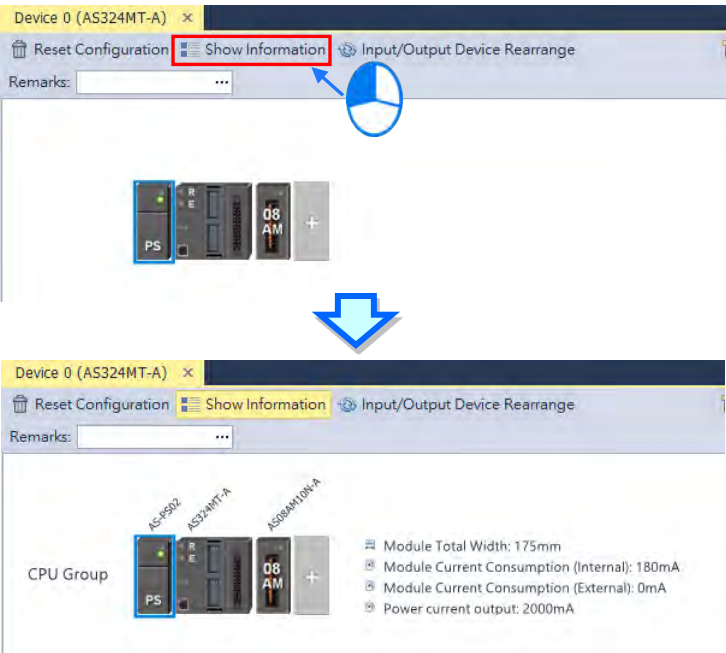
8.1.2.5 Hardware Configuration Area – Reset Configuration

Use the functional button **Reset Configuration** to set the PLC configurations back to default values.



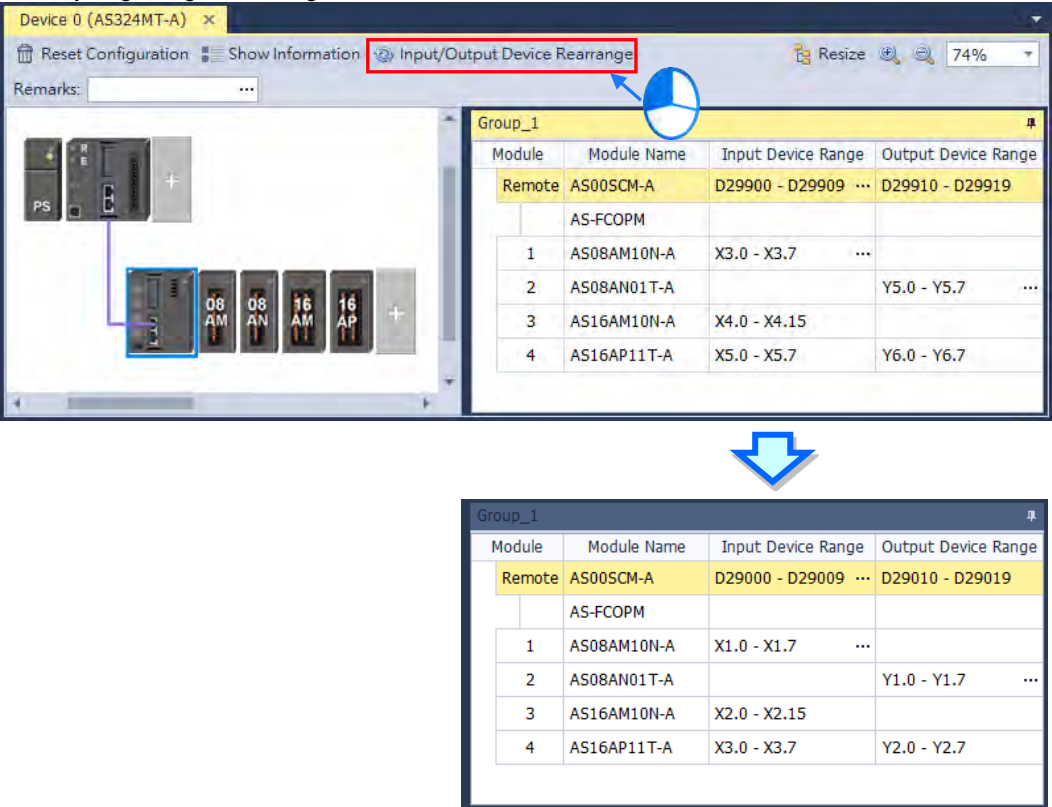
8.1.2.6 Hardware Configuration Area – Show Information

Use the functional button **Show Information** to show / hide the hardware configurations.



8.1.2.7 Hardware Configuration Area – Input / Output Device Rearrange

Use the functional button **Input / Output Device Rearrange** to rearrange the device ranges and assign the devices to the very beginning of the range.



### 8.1.2.8 Assigning I/O Addresses

The AS Series does not support manually assigned addresses. Addresses are automatically assigned to an input/output module through HWCONFIG in ISPSOft. You assign a start address to the first remote module installed on the right side of the I/O module slot (SCM module). The following I/O module is automatically assigned with the next address. For remote module configuration, refer to Section 8.1.2.9 for more details.

The following table shows the addresses (devices) that are automatically assigned to an input/output module through HWCONFIG in ISPSOft. Refer to the following table to see the actual allowable range for program design, while editing a PLC program. Below, local indicates the IO module is connected on the right side of the CPU and Remote indicates the IO module is connected on the right side of remote module.

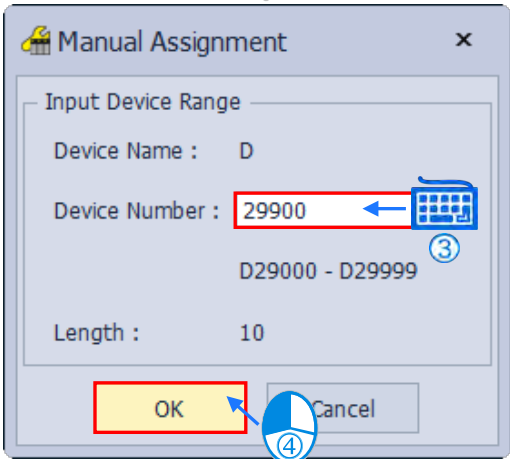
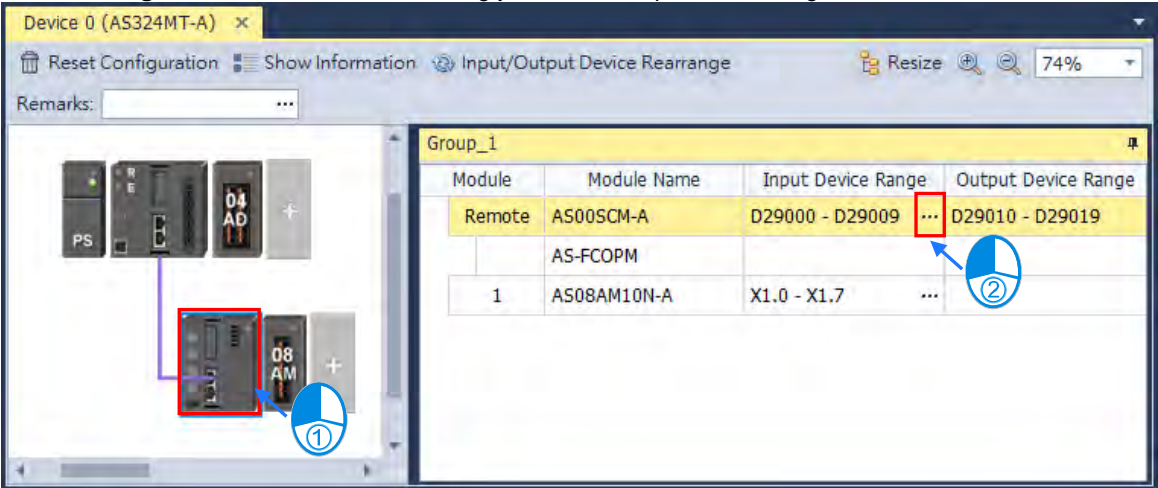
| Module type              | X/Y device range  | D device range  | Remark  |
|--------------------------|---|---|---|
| Digital module (DIO)     | Input points:<br>X1.0 ~ X63.15<br><br>Output points:<br>Y1.0 ~ Y63.15 | Local: D28000 ~ D28999<br>Remote: D29000 ~ D29999 <sup>#1</sup><br>Each module takes 20 devices.  | Data device number will not be shown; it is only for PLC internal use.<br>Maximum points in total: 1024 points.<br>For modules with less than 16 points, they will be counted as 16 points.   |
| Analog module (AIO)      | N/A   | Local: D28000 ~ D28999<br>Remote: D29000 ~ D29999 <sup>#1</sup><br>Each module takes 20 devices.  | Up to 16 AIO modules are configurable.  |
| Positioning module (PIO) | N/A   | Local: D28000 ~ D28999<br>PU module takes 40 devices.<br>HC module takes 20 devices.  | Up to 8 PIO modules are configurable locally, but not available remotely.   |
| Network module (NIO)     | N/A   | Local: D28000 ~ D28999<br>Remote: D29000 ~ D29999 <sup>#1</sup><br>Each module takes 20 devices.<br><br>Communication data area:<br>D26000 ~ D27599<br>Each module takes 400 devices. | Up to 4 NIO modules are configurable locally. SCM module can be used as remote module but not on the right-side of the remote module.<br>DNET modules can only be connected locally.<br>SIL modules can either be used locally or remotely. |

Note: #1: the remote module itself also takes 20 devices.





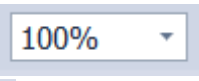

8.1.2.9 Hardware Configuration Area - Change Input Device Range of the Remote Modules

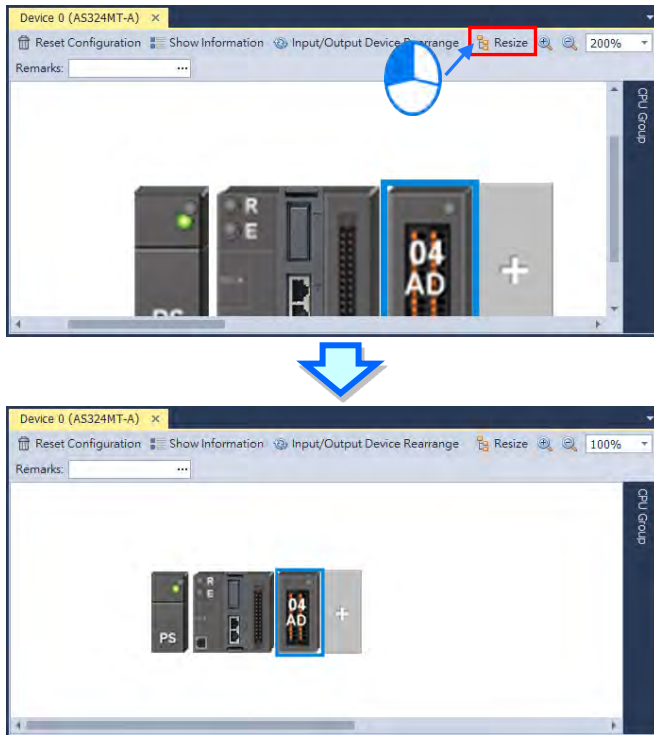
Click the remote module and then you can see ... in the column of **Input Device Range**. Double-click it to see the **Manual Assignment** window and start editing your desired input device range.



| Module | Module Name | Input Device Range  | Output Device Range |
|--------|-------------|---------------------|---------------------|
| Remote | AS00SCM-A   | D29900 - D29909 ... | D29910 - D29919     |

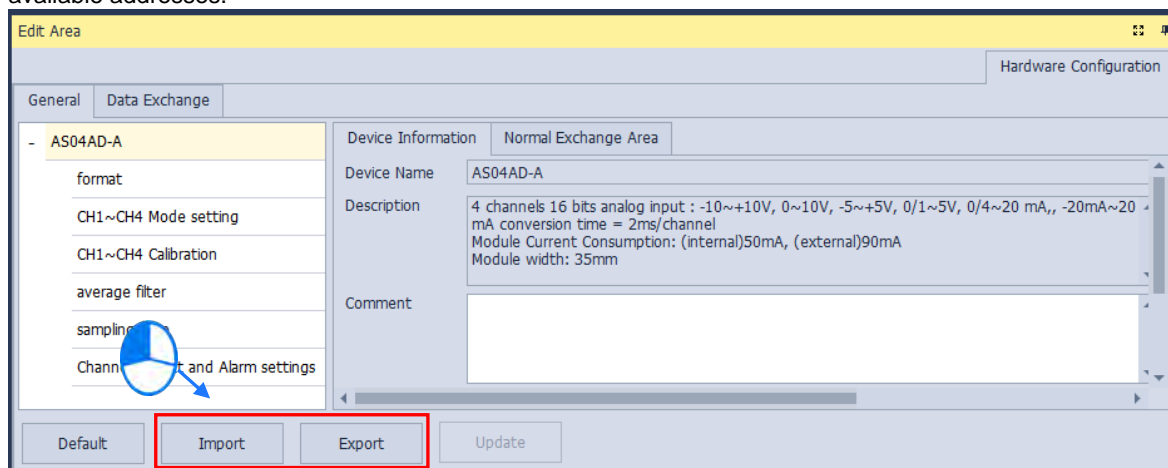
### 8.1.2.10 Hardware Configuration Area - Resize

Use the functional buttons ,  or  to rearrange the size of the device images in Hardware Configuration Area. Use  to set the display of the configuration area back to its default values (shown at 100% and in the center).



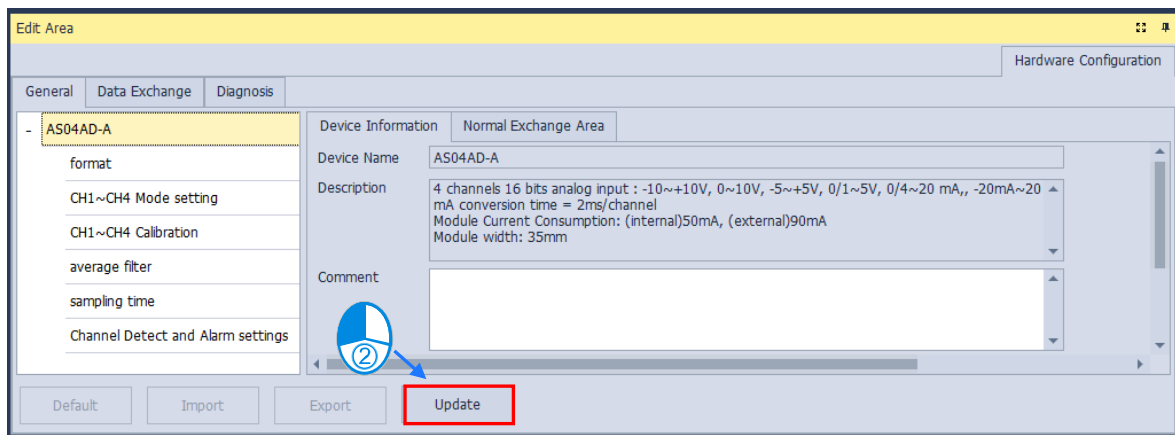
### 8.1.2.11 Edit Area – Import and Export

You can import/export the module parameters in .dep format. Click the **Import** button and then choose a file to import. Click the **Export** button and then choose a path and enter a file name for the exported file. Click the **Import** button to import. When importing, the system checks if the file format and the module name are matched. If not, an error message shows up. If the addresses of the imported data device are already taken, the addresses will be assigned to other available addresses.






### 8.1.2.12 Edit Area – Update

To update the module parameters, first you need to be in the online mode. Select the module that you want to update its parameters and then click the **Update** button. This functionality is only available for digital IO modules, analog IO modules and network modules.

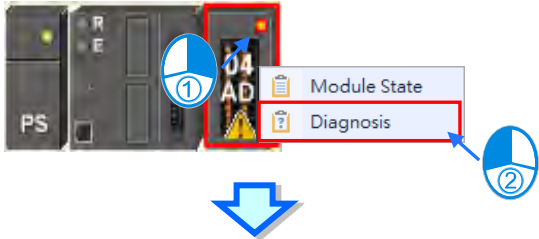


### 8.1.2.13 Show or Hide the Display

Click  or  to hide the display area and after that only its tab remains shown. Move your cursor to the tab to have the hidden display area shown. Click  to pin and lock the display area to keep it shown.

8.1.2.14 Module State and Diagnosis

To check the module state and diagnosis, first you need to be in the online mode. Right-click the module that you want to check its module state and diagnosis and then a context menu appears.



Edit Area

Hardware Configuration

General

Data Exchange



Diagnosis

Refresh


Delete All

Current Error Log

|   | Group Number | Module Number | Module Name | Error Code | Date & Time         | Description                      |
|---|--------------|---------------|-------------|------------|---------------------|----------------------------------|
| ▶ | 1            | 1             | AS04AD-A    | 16#1801    | 2019/11/26 00:00:00 | The external voltage is abnormal |
| 2 | 1            | 1             | AS04AD-A    | 16#1801    | 2019/11/26 00:00:00 | The external voltage is abnormal |

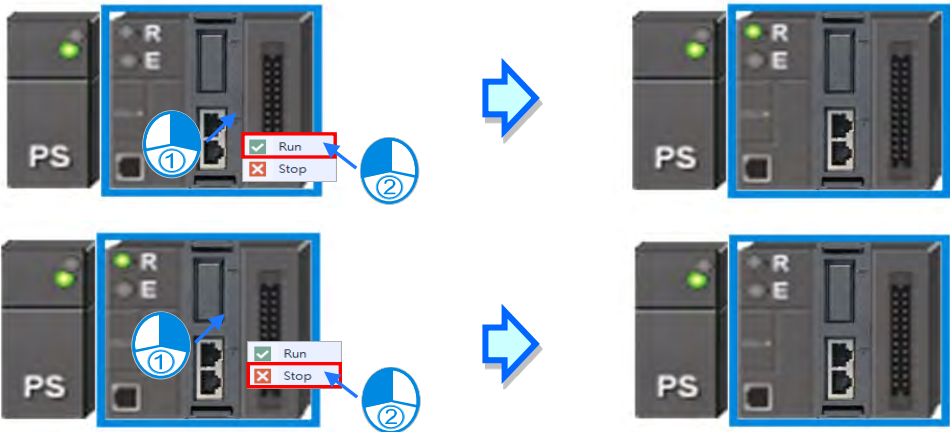
After you click Diagnosis, you can see a table with three tabs. On the Diagnosis tab, you can see the Current Error Log table. When the error is cleared, you can use  to clear the error log stored in the module and the module state can be restored to normal. Use  to update the module state.

8.1.2.15 Change Module State in Online Mode

You can change the module state in online mode.  
 Before changing the module state, make sure no personnel or system will be affected.

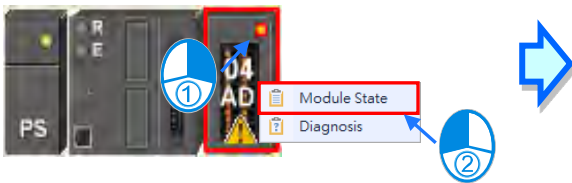
- **Change the module operation state**

Right-click the PLC CPU to see the context menu and click **Run** for the PLC CPU and module to start running (RUN LED ON) or click **Stop** for the PLC CPU and module to stop running.



● **Change the module I/O state**

This functionality is only available for digital IO modules, analog IO modules and temperature modules. Right-click the module to see the context menu and click **Module State** and then you can see an IO state table shows up. For digital IO modules, you can right-click to set the input/output channel to ON or OFF, when the PLC CPU and the module are on the RUN state.



①

Module State

Diagnosis

②

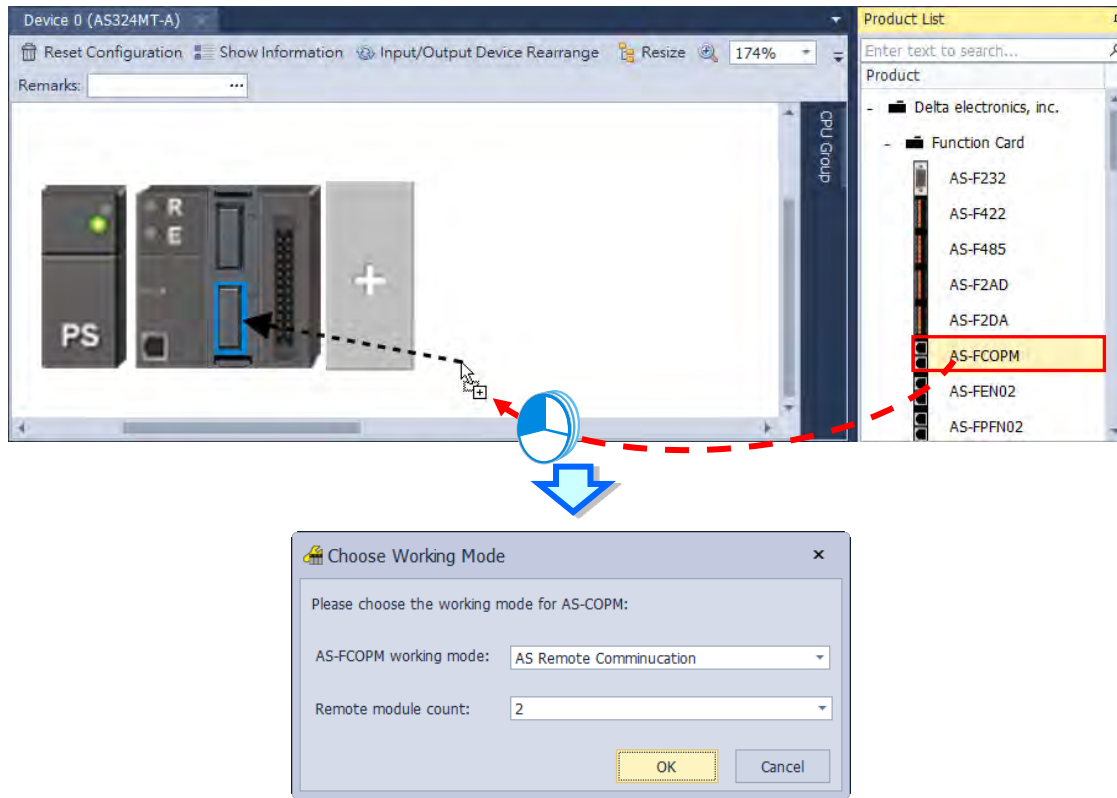
AS04AD-A

| Channel    | Value (Decimal) | Value (Float) |
|------------|-----------------|---------------|
| Error code | 6145            | 0.000         |
| CH1 Input  | 0               | 0.000         |
| CH2 Input  | 0               | 0.000         |
| CH3 Input  | 0               | 0.000         |
| CH4 Input  | 0               | 0.000         |

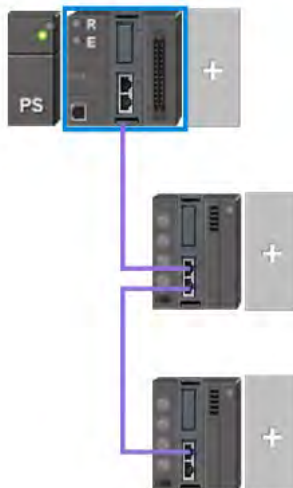
- **Force to ON** : Force to set the channel state to ON
- **Force to OFF** : Force to set the channel state to OFF
- **Release** : Release the selected channel from the force
- **Release all** : Release all channels from the force

### 8.1.2.16 Configure a Remote Module

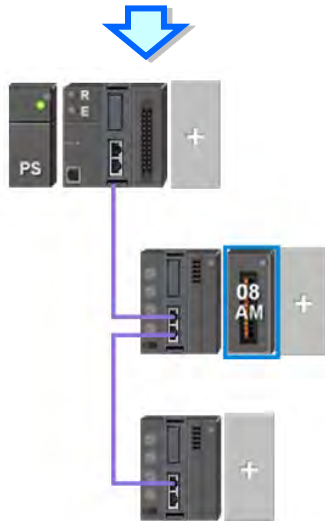
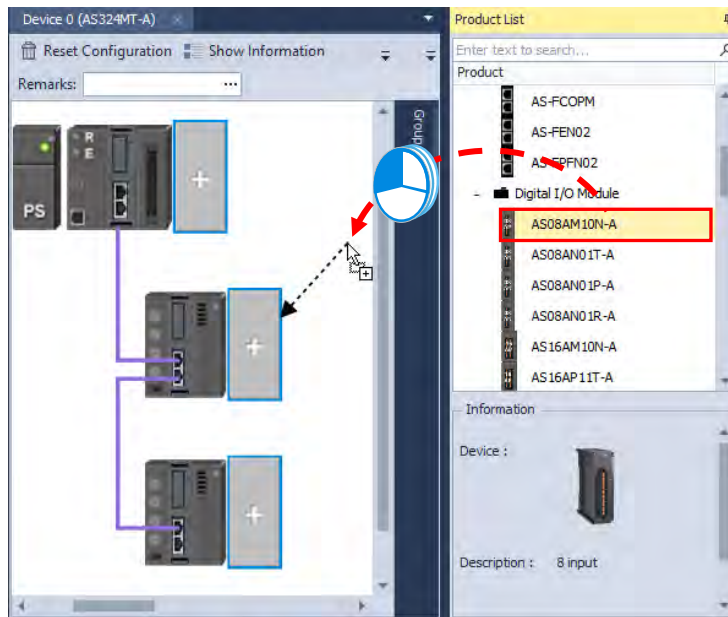
Drag AS-FCOPM from the Product List to the Function Card Slot 2 of the PLC CPU. After that you can set the Working Mode for the AS-FCOPM as AS Remote Communication and then you can set the quantity of the Remote Modules that you want to connect.



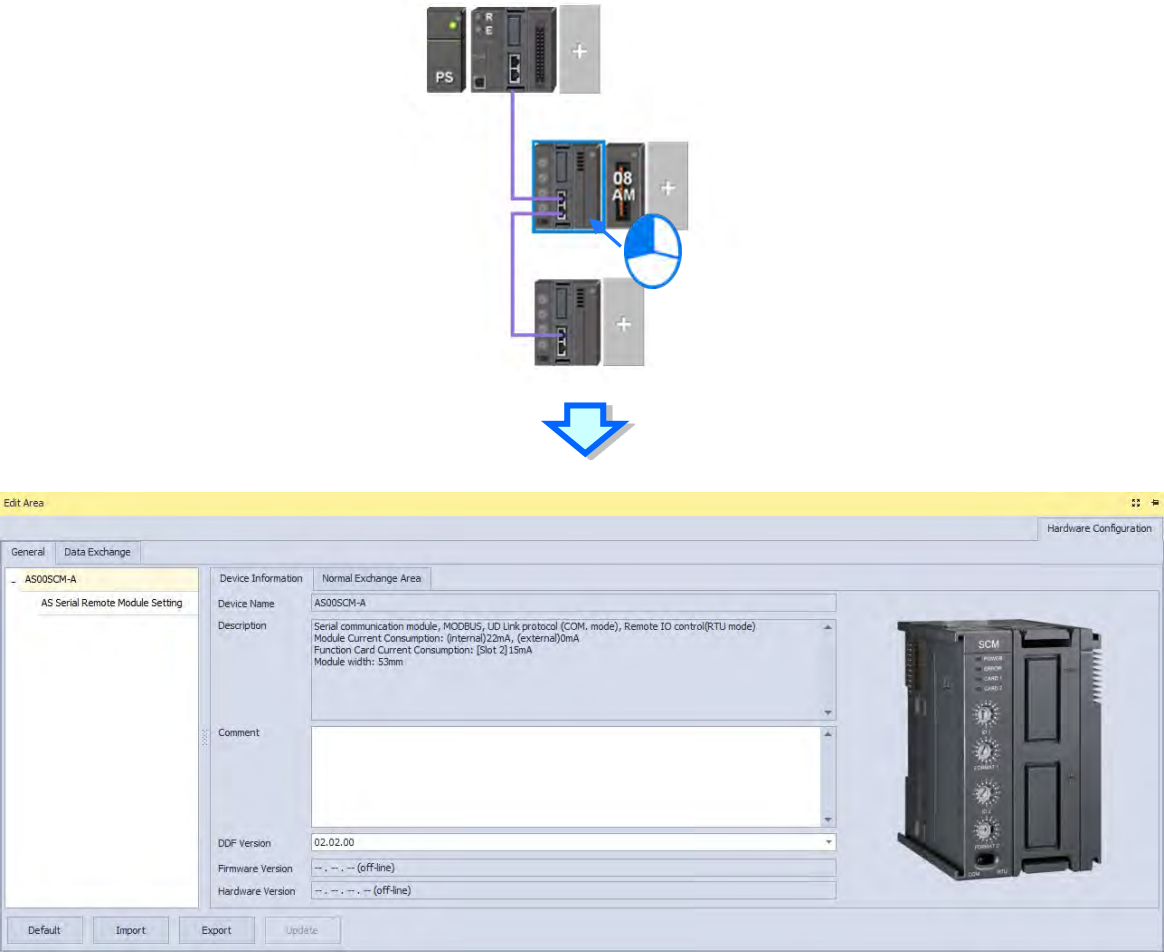
If you set the Remote module count to 2 and click OK, you can see two remote modules connected to the PLC CPU.



You can add more digital IO modules or analog modules to the remote module.

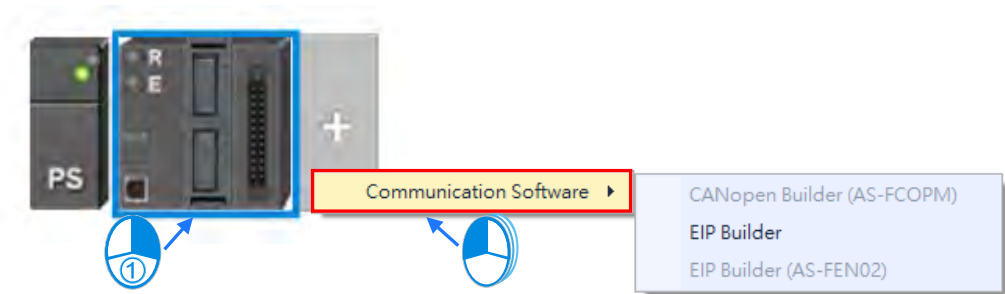


And then you can click the module to open its configuration page to configure.



8.1.2.17 Open Communication Software from HWCONFIG

Right-click the PLC CPU and click **Communication Software** to see which software is available for this PLC CPU. If the software option is grayed out, you may need applicable function cards to work along with the project.

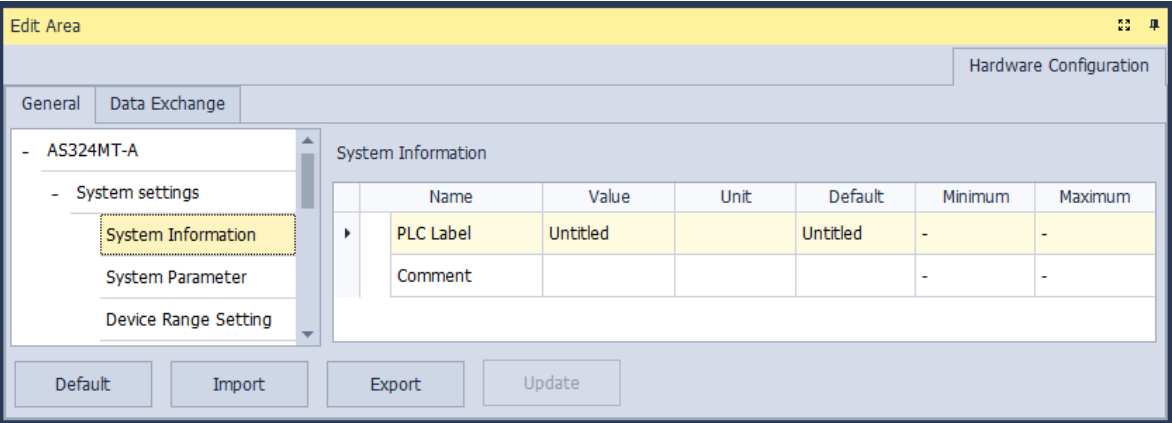




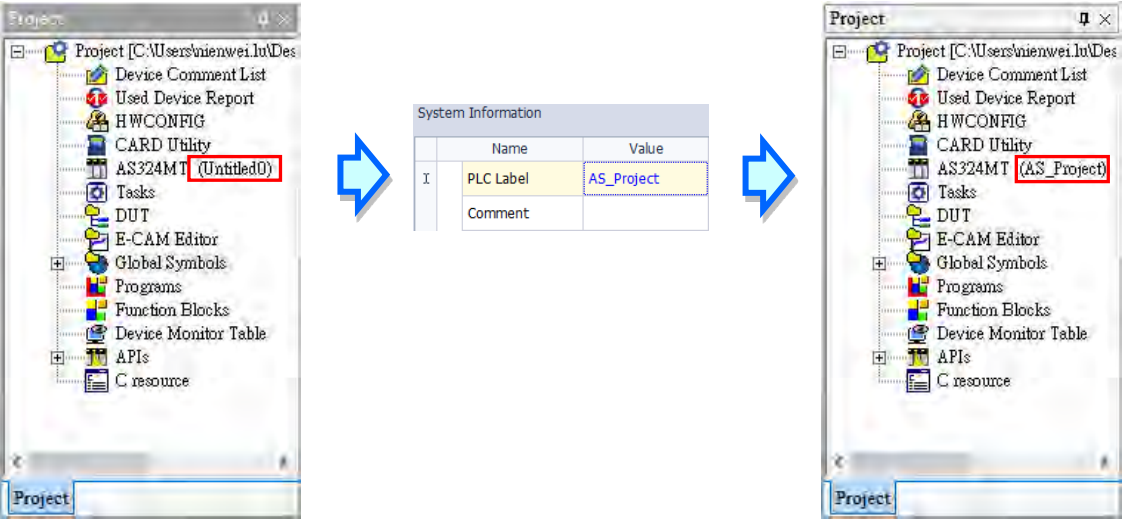
## 8.2 Setting the Parameters in an AS Series CPU Module

### 8.2.1 System Settings – System Information

In the Edit Area, select the option **System Settings** and you can find two items, **PLC Label** and **Comment** under this option. You can input up to 16 characters in the value field of **PLC Label** and 32 characters in the value field of **Comment**. You can use all in the fields, including special characters and spaces. Note: One Chinese character occupies two characters. characters



After the project is created, you can find the PLC label behind the product name in the project management area. You can change the PLC label in HWCONFIG as it is mentioned above. The PLC label is very useful when you have more than one PLC in the project. This label can be seen as the PLC identity. So that you will not change other PLC parameters by mistake. To prevent errors, when you download/upload the program, the system will remind you to check the name of the PLC CPU and the PLC label.



## 8.2.2 System Settings – System Parameter

The parameters on **System Parameter** table are shown in the following window. You can set appropriate values via a drop-down list or type the values in the box.

| Name  | Value       | Unit   | Default     | Minimum | Maximum |
|---|-------------|--------|-------------|---------|---------|
| Clear non-latched area when Stop→Run                        | Enable      |        | Enable      | -       | -       |
| Y keeps outputting when Run→Stop                            | Off         |        | Off         | -       | -       |
| I/O allocation setting when Power On                        | Auto        |        | Auto        | -       | -       |
| Select Action when I/O Module Parameter with Manual CONF... | Auto update |        | Auto update | -       | -       |
| CPU module Stop when I/O Module No Response                 | Stop        |        | Stop        | -       | -       |
| CPU module Stop when I/O Module Occurred Error              | Keep Run    |        | Keep Run    | -       | -       |
| Setting delay time to detect I/O Module                     | 20          | 0.1sec | 20          | 20      | 200     |
| Non-Retain Symbol Initial Value Take Effect When Stop→Run   | Disable     |        | Disable     | -       | -       |

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

This determines whether the states and values of the non-latched devices are cleared when the PLC changes from Stop to Run.

- **Disable:** All the states and values in the non-latched devices stay the same.
- **Enable:** All the states and values in the non-latched devices are cleared and restored to defaults.

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

This determines the states of the Y devices when the CPU module begins to run or stop.

- **Off:** All Y devices are set to OFF.
- **Keep:** The states of the Y devices stay the same.

- **I/O allocation setting when Power On**

This determines whether the CPU module is automatically configured, or you configure the parameters in HWCONFIG.

- **Auto:** Operates based on actual connected modules without any module and parameters set.
- **Manual:** You configure the parameters in HWCONFIG and PLC checks the parameters automatically once it is supplied with power.
- **Manual + Flags (only I/O module of CPU module):** This function is available for PLC with firmware V1.06.00 or above and you need to use ISPSOFT V3.07 or above to execute this function. Firstly you can create the largest possible module allocation design and use this option along with the SM flags (refer to Chapter 2 in AS Series Programming Manual for more information on SM flags) to activate or deactivate the modules on the right-side of the PLC CPU to set up a smaller I/O application without changing the PLC program, the original I/O allocation table or its corresponding device address.

- **Manual + Flags (I/O module of CPU and Remote module):** This function is available for PLC with firmware V1.08.50 or above and you need to use ISPSOft V3.12 or above to execute this function. Selected this option, you can control both the right-side modules of the PLC CPU and the remote modules. The operation is the same as the operation of the option above, Manual + Flags (only I/O module of CPU module). Refer to the explanation on Manual + Flags (only I/O module of CPU module) for more details.

- **Select Action when I/O Module Parameter with Manual CONFIG Different**

This determines which action is taken when the actual settings are NOT the same as the parameters that you manually set when the previous setting option is set to **Manual**.

- **Auto update:** the CPU module is automatically configured.
- **Show error:** the CPU module shows an error.

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

This determines how the CPU module and other modules react when a connected extension module is not responding.

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

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

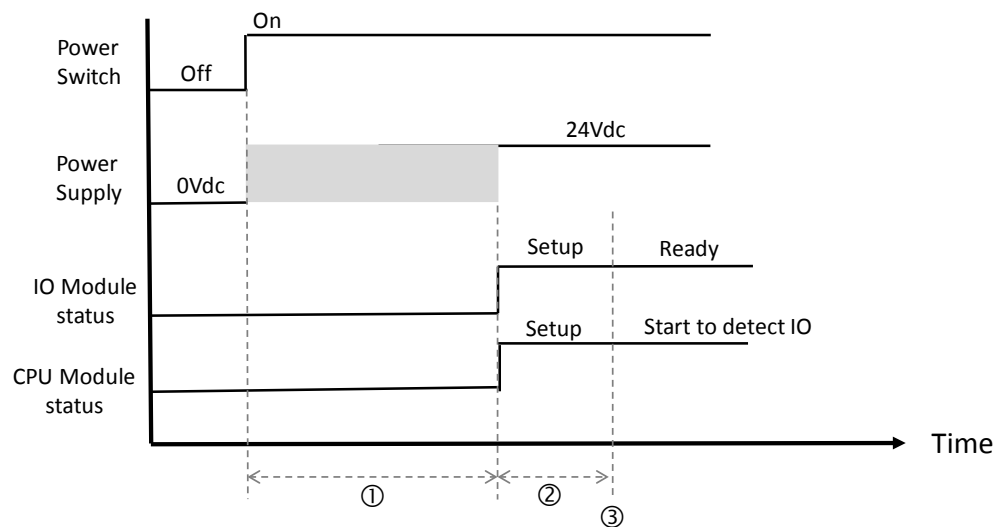
This determines how the CPU module reacts when a minor module error occurs.

- **Stop:** the CPU module stops running and sends an error.
- **Keep Run:** the CPU module keeps running and sends an error.

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

This sets the timing when to start detecting the connected I/O module after CPU module is power-on.

Normally the CPU module detects its connected I/O module once it is supplied with power. But you can set the delay time (unit: 0.1 second) for the CPU module to postpone detecting. This function is very useful when it takes time for the supply power to be stable or when the remote I/O module is not supplied with power at the same time as the CPU module is. With a set delay time, the detection on the connected sets can be more accurate. Refer to the image below for the time frame.



- ① When the power is switched from OFF to ON, the power supply will be unsteady for a short time. During this short period of time, the CPU module and I/O module are not ready to operate normally.
- ② When the supply power for the CPU module and the I/O module is stable, the system starts to initialize for about 1 second. After that the I/O module is ready to be detected by the CPU module.
- ③ The CPU module starts to wait for the set delay time to pass. Once the delay time is up, it starts to detect the connected I/O modules locally and remotely.

It is suggested using ① + ② to set the delay time. Default delay time is 2 seconds.

#### ● Non-Retain Symbol Initial Value Take Effect When Stop → RUN

This determines whether the states and values of the non-latched devices are restored to initial values when the PLC changes from Stop to Run.

- **Disable:** All the states and values in the non-latched devices stay the same.
- **Enable:** All the states and values in the non-latched devices are restored to initial values when the PLC changes from Stop to Run. .

#### ● Retain Symbol Initial Value Take Effect When Stop → RUN

This determines whether the states and values of the latched devices are restored to initial values when the PLC changes from Stop to Run.

- **Disable:** All the states and values in the latched devices stay the same.
- **Enable:** All the states and values in the latched devices are restored to initial values when the PLC changes from Stop to Run. .

#### ● Assign X Input Point Control Run/Stop

This assigns an input point to have the CPU module run or stop.

- **Disable:** Run or stop the CPU module by the dip switch of the CPU module.

- **Enable:** Run or stop the CPU module by the assigned input point, and the dip switch of the CPU module still controls the run stop state of the CPU module.

- **Select X Input Point**

If you select **Enable** in the previous option, you can select one input point to control the Run or Stop state of the CPU module from the dropdown list.

- **Constant Scan Cycle Time**

This sets the minimum scan cycle time.

- **Disable:** Disables this function.
- **Enable:** When the actual scan cycle time is less than the setting time, the CPU module waits until the setting time is met, and then starts the next scan. When the actual scan time is longer than the setting time, the CPU module starts the next scan after the actual scan time completes.

- **Input Constant Time**

If you selected **Enable** in the previous option, you set the scan cycle time here. If the actual scan time is less than the setting time, the CPU module waits to begin the next scan until the setting time is met. If the actual scan time is larger than the setting time, the CPU module ignores the setting time and operates according to the actual scan time. If you set the scan time longer than the watchdog timeout set, a watchdog timeout occurs when the CPU module operates.

- **Setting Watchdog Time**

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

- **Show Battery Low Voltage Error (BAT.LV)**

This parameter sets whether to show an alarm when the lithium battery for the real-time clock has low voltage or is not installed in the AS Series PLC.

- **Disable:** Disables this function.
- **Enable:** Enables the alarm by keeping the low voltage LED ON when the lithium battery has low voltage or is not installed.

Note: If the PLC self-checks and finds an error in the RTC, this low voltage LED will be ON, even if this option is disabled.

- **Save Error History Info**

This specifies where to store the error log.

- **PLC:** Store error logs in the PLC. The PLC can store up to twenty error logs. If there are more than twenty error logs, the oldest error log is overwritten by the latest error log.
- **PLC & SD Card:** When there are more than twenty error logs, the oldest error log is backed up to the memory card before the oldest error log is overwritten in the PLC.

- **COM Communication Error Record**

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

- **Disable:** Disables this function.
- **Enable:** Enables this function and starts recording COM errors in the error log.

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

What to do when the 24Vdc power is unstable: When the power is unstable, this incident will be recorded in error log and SM7 will be ON.

- **Continue Running when power stable:** When the power is unstable for 20 to 100 ms, the AS Series PLC CPU pauses, and after the power stabilizes for at least 2 seconds, the PLC continues running.
- **Into Error Status:** When the power is unstable, the error LED blinks and the AS Series stops running. The voltage is unstable and the communication will also be affected. You need to cut the power off and then solve the power problem. After that you can power-on again and AS Series PLC CPU will start running. If the communication is not affected, it indicates the power is back to normal. But you still need to find out what went wrong.

- **Communication Module Refreshed Priority**

- **Scan time first:** Only refresh the data that is different from the original ones to save scan time.
- **Synchronous Data first:** Scan and refresh all the data to ensure all data are synchronized.

- **AS remote module updated method**

- **PLC Scan cycle first:** update according to PLC program scan cycle. Whenever the instruction END is scanned, one remote module is updated.
- **Update one remote module by one scan time:** update one remote module at one scan time. Whenever the instruction END is scanned, one remote module is updated and its output points are outputting at the same time.
- **Update all remote modules at one scan time:** update all remote modules at one scan time. Whenever the instruction END is scanned, all remote modules are updated and all output points are outputting at the same time.

- **I601 Timer interrupt Setting Time Base**

Sets the interval for triggering the 1601 timer interrupt. This function is used together with Timer Interrupt 0. If you need to modify the time of the I601 timer interrupt during the PLC program execution, you can use SR421 for editing.

- **I602 Timer interrupt Setting Time Base**

Sets the interval for triggering the 1602 timer interrupt. This function is used together with Timer Interrupt 1. If you need to modify the time of the I601 timer interrupt during the PLC program execution, you can use SR422 for editing.

- **I603 Timer interrupt Setting Time Base**

Sets the interval for triggering the 1603 timer interrupt. This function is used together with Timer Interrupt 2. If you need to modify the time of the I601 timer interrupt during the PLC program execution, you can use SR423 for editing.

- **I604 Timer interrupt Setting Time Base**

Sets the interval for triggering the 1604 timer interrupt. This function is used together with Timer Interrupt 3. If you need to modify the time of the I601 timer interrupt during the PLC program execution, you can use SR424 for editing.

8.2.3 System Settings – Device Range Setting

The parameters on **Device Range Setting** table are shown in the following window.

Edit Area

Hardware Configuration

GeneralData Exchange

- AS324MT-A

- System settings

System Information

System Parameter

Device Range Setting

Input Point Filter Time

Position Control Parameter

Daylight Saving Timing

COM1 Port Setting

COM2 Port Setting

Ethernet Port Basic Setting

+ Ethernet Port Advanced Setting

Function Card 1 Setting

+ Function Card 2 Setting

Device Range Setting


| Name                                 | Value | Unit | Default | Minimum | Maximum |
|--------------------------------------|-------|------|---------|---------|---------|
| Latched D Device Start Address       | 20000 | ...  | 20000   | 0       | 29999   |
| Latched D Device End Address         | 23999 |      | 23999   | 0       | 29999   |
| Latched 16bit C Device Start Address | 448   | ...  | 448     | 0       | 511     |
| Latched 16bit C Device End Address   | 511   |      | 511     | 0       | 511     |
| Latched 32bit C Device Start Address | 128   | ...  | 128     | 0       | 255     |
| Latched 32bit C Device End Address   | 255   |      | 255     | 0       | 255     |
| Latched M Device Start Address       | 6000  | ...  | 6000    | 0       | 8191    |
| Latched M Device End Address         | 8191  |      | 8191    | 0       | 8191    |
| Latched S Device Start Address       | 512   | ...  | 512     | 0       | 2047    |
| Latched S Device End Address         | 1023  |      | 1023    | 0       | 2047    |
| Subroutine T Device Start Address    | 412   | ...  | 412     | 0       | 511     |
| Subroutine T Device End Address      | 511   |      | 511     | 0       | 511     |


Default

Import

Export

Update

Click  to open the parameter dialog box to set the start and end address. In the dialog box, click **Default** to restore the setting to the default values; click **Clear** to clear the set values; click **OK** to save the values and close the dialog box; click **Cancel** to discard the setting and close the dialog box.

Parameter Setting

Start Address

20000

End Address

23999

Default

Clear

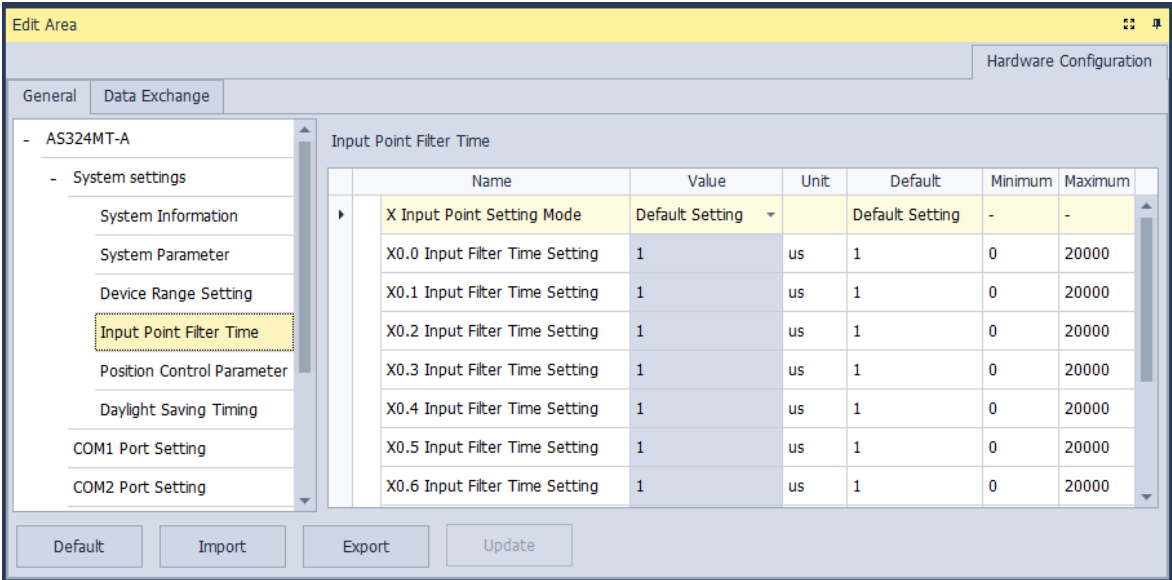
OK

Cancel



8.2.4 System Settings – Input Point Filter Time

On the Input Point Filter Time page, you can set the input point filter time for each input. If the duration of the received signal time is less than the filter time setting value, it is processed as noise and filtered out. Select an appropriate filter time according to your needs.

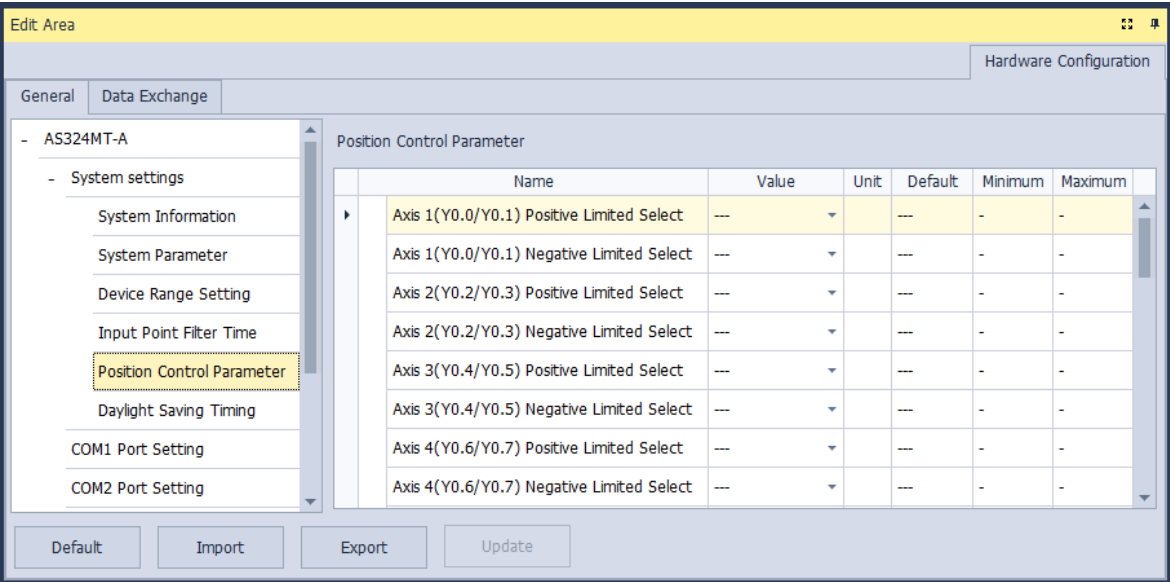


- X Input Point Filter for CPU module
  - **Default Setting:** uses the default values in the input point filter.
  - **Manual Setting:** uses the values you enter for the filter time for each X input point.
- X0.0–X0.15 Input Point Filter Time

If you select **Manual Setting** for the previous parameter, you can set the filter time individually for X0.0–X0.15.

8.2.5 System Settings – Position Control Parameter

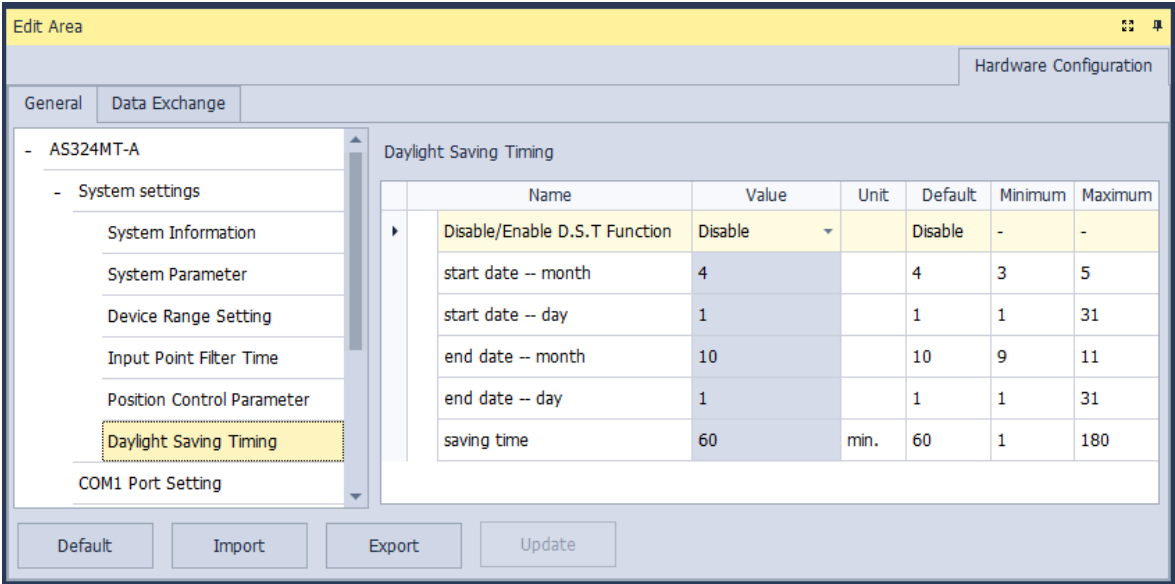
The parameters on **Position Control Parameter** table set to specify input points as the positive and negative limits of axis 1~ axis 6 channels. 12 limit points can be set at most. Axis No. 1~6 can also be set as Z phase triggers, home function finish points and clear output selects or positive/negative limited position.



- **Axis1 (Y0.0/Y0.1) Positive/negative Limited Select ~ Axis 6 (Y0.10/Y0.11) Positive/negative Limited Select.**  
Select the rising or falling edge trigger and X input point on the drop-down list.
- **Axis1 (Y0.0/Y0.1) Z Phase Trigger ~ Axis6 (Y0.10/Y0.11) Z Phase Trigger**  
Select the rising or falling edge trigger and X input point on the drop-down list.
- **Axis1 (Y0.0/Y0.1) Home Function Finish and Clear Output Select ~ Axis6 (Y0.10/Y0.11) Home Function Finish and Clear Output Select**  
Select the rising or falling edge trigger and X input point on the drop-down list.
- **Axis1 (Y0.0/Y0.1) Positive/negative Limited Position ~ Axis6 (Y0.10/Y0.11) Positive/negative Limited Position**  
Set up the number of pulses as the positive or negative limited position in axis 1~6; setting range is - 2147483647 ~ 2147483647.

8.2.6 System Settings – Daylight Saving Timing

The parameters on **Daylight Saving Timing** table are used to enable or disable the function of daylight saving time and set the date when the daylight saving is conducted. The clock will automatically set the daylight saving time in advance based on the period of time set after the function is enabled.



● **Disable/Enable D.S.T Function**

The parameter sets to enable or disable daylight saving time.

● **Start date- month**

The parameter sets the month from which the daylight saving time starts.

● **Start date- day**

The parameter sets the date on which the daylight saving time starts.

● **End date- month**

The parameter sets the month in which the daylight saving time ends.

● **End date- day**

The parameter sets the date on which the daylight saving time ends.

● **Saving time**

The parameter is used to adjust to the earlier daylight saving time with the unit of minute.

**Example explanation:** example from the above image and all the options are enabled.

| Date shown in SR | Time shown in SR | PLC time<br>(Real Time Clock) | Remarks                |
|------------------|------------------|-------------------------------|------------------------|
| 3/31             | 23:59:58         | 23:59:58                      | Normal                 |
| 3/31             | 23:59:59         | 23:59:59                      |                        |
| 4/01             | 01:00:00         | 00:00:00                      | Shown after 60 minutes |
| 4/01             | 01:00:01         | 00:00:01                      |                        |
| : (to)           | : (to)           | : (to)                        |                        |

|        |          |                 |        |
|--------|----------|-----------------|--------|
| 9/30   | 23:59:59 | 22:59:59        |        |
| 10/01  | 00:00:00 | (9/30) 23:00:00 |        |
| : (to) | : (to)   | : (to)          |        |
| 10/01  | 00:59:59 | (9/30) 23:59:59 |        |
| 10/01  | 00:00:00 | 00:00:00        | Normal |
| 10/01  | 00:00:01 | 00:00:01        |        |

## 8.2.7 Options - COM1 Port Setting & COM2 Port Setting

PLC modules are equipped with one or two COM ports based on different models. COM1 and COM2 parameters are set by clicking **COM1 Port Setting** and **COM2 Port Setting** in the list on the left-side of the following window. And the setting items for the two COM ports are the same.

| Name                         | Value        | Unit    | Default      | Minimum | Maximum |
|------------------------------|--------------|---------|--------------|---------|---------|
| COM1 ID No.                  | 1            |         | 1            | 1       | 254     |
| Protocol Setup Opportunity   | Stop --> Run |         | Stop --> Run | -       | -       |
| Baud Rate                    | 9600         | bps     | 9600         | -       | -       |
| Custom Baud Rate             | 96           | 0.1kbps | 96           | 1       | 5000    |
| Data bit                     | 7            | bit     | 7            | -       | -       |
| Parity bit                   | Even         |         | Even         | -       | -       |
| Stop bit                     | 1            | bit     | 1            | -       | -       |
| MODBUS mode                  | ASCII        |         | ASCII        | -       | -       |
| Delay time to Reply          | 0            | ms      | 0            | 0       | 3000    |
| Received Data Timeout        | 200          | ms      | 200          | 0       | 3000    |
| Setting COM1 LED to show for | COM1         |         | COM1         | -       | -       |

- 1 Set a station address. You can identify a device on a network by the station address. The station address cannot be the same as the station address for 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 broadcasts 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 is sent to all slaves. No matter what the station address of these slaves are, these slaves receive the data packet addressed to station address 0.
- 2 Set when the communication port runs. Select **Stop --> Run**, and communication works when the CPU module switches from Stop to Run. If you instead select **Power-on**, the communication starts working when you Power-on the module.
- 3 Select a communication speed in the **Baud Rate** list, or select **Custom** and enter a new rate.
- 4 Set the communication parameters for the port.
- 5 Set the **Delay Time to Sending** when the AS CPU is in Slave mode, after receiving communication, the time you set here indicates the time it waits before responding. For AS CPU (FW V1.08 or later), this function also works

for data exchange application. You can set the time it waits before exchanging any data. This is useful for some Slaves with slower responses in communication. **Received Data Timeout** applies when the AS Series CPU module acts as a server to send out communications. The timeout is how long the module waits before the received data times out.

- 6 Set COM1 LED to show: when COM1 is selected from the drop-down list, it shows the RS485 communication status of the COM1. If CARD1 is selected, it shows the CARD1 communication status.
- Set COM2 LED to show: when COM2 is selected from the drop-down list, it shows the RS485 communication status of the COM2. If CARD2 is selected, it shows the CARD2 communication status.

8.2.8 Options - Ethernet Port Basic Setting

The communication parameters can be set for the Ethernet port in the CPU module in this page. Refer to other related documents or manuals for more information about Ethernet.

Edit Area

Hardware Configuration

GeneralData Exchange

AS324MT-A

- System settings
  - COM1 Port Setting
  - COM2 Port Setting
  - Ethernet Port Basic Setting
- Ethernet Port Advanced Setting
- Function Card 1 Setting
- Function Card 2 Setting
- Delta Device Parameter Restore Setting

Ethernet Port Basic Setting

| Name                   | Value         | Unit | Default       | Minimum | Maximum         |
|------------------------|---------------|------|---------------|---------|-----------------|
| IP Address             | 192.168.1.5   |      | 192.168.1.5   | 1.1.1.1 | 223.255.255.255 |
| Subnet Mask            | 255.255.255.0 |      | 255.255.25... | 0.0.0.0 | 255.255.255.255 |
| Gateway                | 192.168.1.1   |      | 192.168.1.1   | 1.1.1.1 | 223.255.255.255 |
| TCP Keep Alive Timeout | 30            | sec  | 30            | 1       | 65535           |
| Mode                   | Static        |      | Static        | -       | -               |

DefaultImportExportUpdate

**Mode** sets the addressing mode of the IP of the CPU module.

If users select **Static**, they can specify an IP address directly. If **DHCP** or **BOOTP** is selected, the IP address is assigned dynamically by a DHCP/BOOTP server.

## 8.2.9 Ethernet Port Advance Setting – IP Filter

**IP Filter** sets the filter function of network devices. Devices whose IP addresses are listed in the table are allowed to communicate with the CPU module; the CPU module discards data packets sent from devices whose IP addresses are not in the table. Devices on a network are filtered. This setting ensures that objects communicating with the CPU module are known devices. You can set up to 8 address ranges for allowed devices.

The screenshot shows the 'Edit Area' window with the 'Data Exchange' tab selected. On the left, the 'AS324MT-A' tree view has 'IP Filter' selected under 'Ethernet Port Advanced Setting'. The main area displays the 'IP Filter' table with the following data:

| Name                      | Value                    | Unit | Default                  | Minimum | Maximum         |
|---------------------------|--------------------------|------|--------------------------|---------|-----------------|
| IP Filter Function Enable | <input type="checkbox"/> |      | <input type="checkbox"/> | -       | -               |
| 1st Beginning IP Address  | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 1st Ending IP Address     | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 2nd Beginning IP Address  | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 2nd Ending IP Address     | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 3rd Beginning IP Address  | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 3rd Ending IP Address     | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 4th Beginning IP Address  | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 4th Ending IP Address     | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 5th Beginning IP Address  | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |
| 5th Ending IP Address     | 0.0.0.0                  |      | 0.0.0.0                  | 0.0.0.0 | 223.255.255.255 |

Buttons at the bottom: Default, Import, Export, Update.

Select **IP Filter Function Enable** checkbox to enable the IP filter function and type the start address and end address of group 1~8 IP.

## 8.2.10 Ethernet Port Advance Setting – NTP

You can use **NTP** table to enable the CPU module and adjust time via NTP server. Relevant parameters are set here. For more information on NTP, refer to related literature and manuals.

The screenshot shows the 'Edit Area' window with the 'Data Exchange' tab selected. On the left, the 'Ethernet Port Advanced Setting' tree view has 'NTP' selected. The main area displays the 'NTP' table with the following data:

| Name                       | Value                               | Unit | Default                  | Minimum | Maximum         |
|----------------------------|-------------------------------------|------|--------------------------|---------|-----------------|
| NTP Client Function Enable | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> | -       | -               |
| NTP Server                 | 1.1.1.1                             |      | 1.1.1.1                  | 1.1.1.1 | 223.255.255.255 |
| Update Cycle               | 30                                  | min  | 30                       | 1       | 1440            |
| Time Zone                  | (GMT-12:00) Eniwetok, Kwajalein     |      | (GMT-12:00...            | -       | -               |

Buttons at the bottom: Default, Import, Export, Update. Numbered callouts: 1 points to 'NTP Client Function Enable', 2 points to 'NTP Server', and 3 points to 'Time Zone'.

- ❶ Select **NTP Client Function Enable** checkbox to enable the function.
- ❷ Set the address of NTP server and cycle of constant update. Take the figure above as an example. The CPU module connects to the NTP server every 30 minutes.
- ❸ Set up the time zone for the daylight saving time area.

## 8.2.11 Ethernet Port Advance Setting – Email

**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.

| Name                   | Value                               | Unit | Default                  | Minimum | Maximum        |
|------------------------|-------------------------------------|------|--------------------------|---------|----------------|
| Email Function Enable  | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> | -       | -              |
| SMTP Server            | 192.168.1.1                         |      | 1.1.1.1                  | 1.1.1.1 | 223.255.255... |
| Port                   | 25                                  |      | 25                       | 1       | 65535          |
| Local Email            | AS300@delta.com                     |      |                          | -       | -              |
| Mail Subject           | Message                             |      |                          | -       | -              |
| Account Identification | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> | -       | -              |
| User name              | AS                                  | ...  |                          | -       | -              |
| Password               | *****                               |      |                          | -       | -              |
| 1st Remote Address     | user1@delta.com                     |      |                          | -       | -              |
| 2nd Remote Address     | user2@delta.com                     |      |                          | -       | -              |
| 3rd Remote Address     | user3@delta.com                     |      |                          | -       | -              |
| 4th Remote Address     | user4@delta.com                     |      |                          | -       | -              |

- 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.

| Name                  | Value           | Unit | Default        | Minimum | Maximum |
|-----------------------|-----------------|------|----------------|---------|---------|
| 1st Trigger Name      | Conditional     |      |                | -       | -       |
| 1st Trigger Min Cycle | 6               | min  | 6              | 1       | 14400   |
| 1st Trigger Mode      | Trigger Disable |      | Trigger Dis... | -       | -       |

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.

|                               |                   |
|-------------------------------|-------------------|
| 1st Trigger Mode              | Bit Status Change |
| 1st Trigger Bit Address       | M0                |
| 1st Trigger Bit Trigger State | Rising            |



|                               |                   |
|-------------------------------|-------------------|
| 1st Trigger Mode              | Bit Status Change |
| 1st Trigger Bit Address       | X1.0              |
| 1st Trigger Bit Trigger State | Rising            |

Parameter Setting

Device Name

X

Device Number

1

Bit

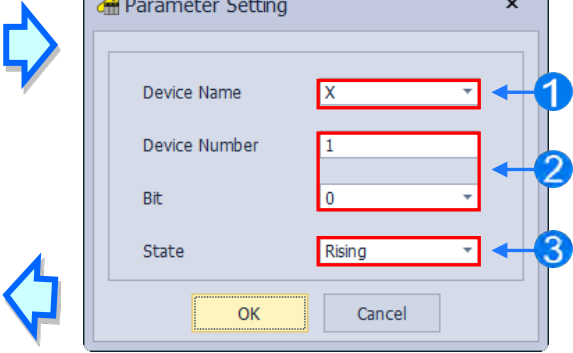
0

State

Rising

OK


Cancel

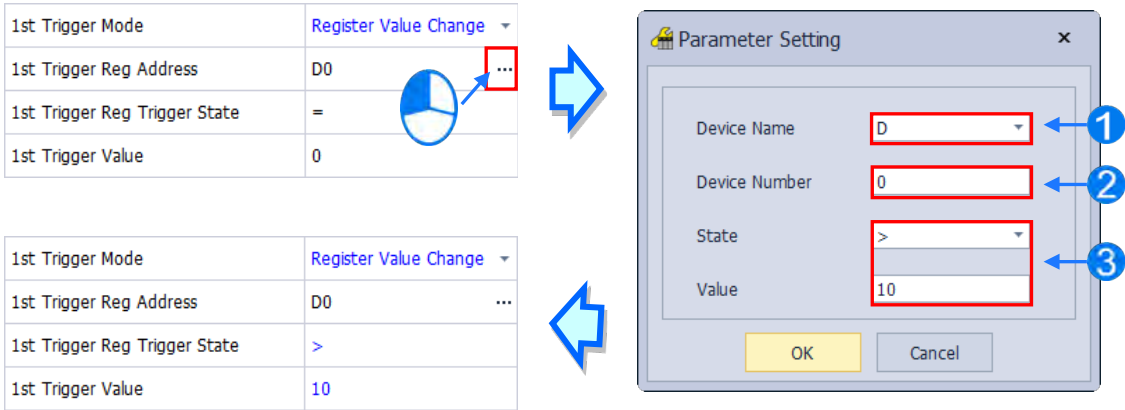


- ❶ **Device Name:** Users can select a device type in the **Device Name** drop-down list box.
- ❷ **Device Number & Bit:** Users can type a device address in the **Device Number** box. If the device type selected is X/Y, the users have to specify a bit number.
- ❸ **State:** Users can select **Rising** 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.

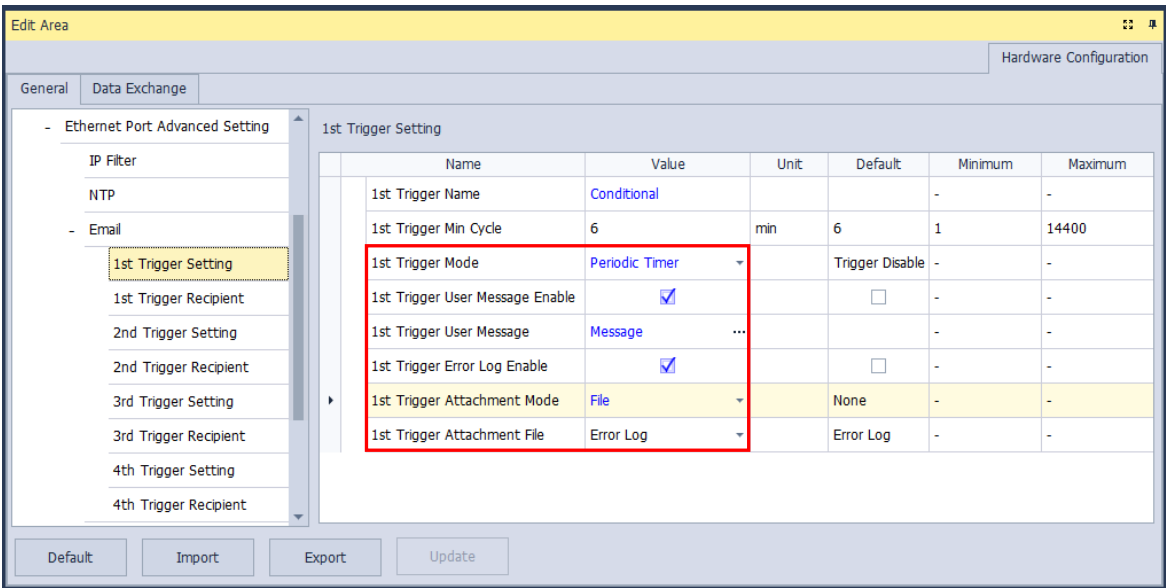



- ❶ **Device Name:** Users can select a device type in the **Device Name** drop-down list.
- ❷ **Device Number:** Users can type a device address in the **Device Number** field.
- ❸ **State & Value:** Users can set s condition of triggering the sending of an email here.

● **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.

|                             |            |
|-----------------------------|------------|
| 1st Trigger Attachment Mode | File       |
| 1st Trigger Attachment File | None       |
|                             | File       |
|                             | PLC Device |

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.

|                                       |                                     |
|---------------------------------------|-------------------------------------|
| 1st Trigger Error Log Enable          | <input checked="" type="checkbox"/> |
| 1st Trigger Attachment Mode           | PLC Device                          |
| 1st Trigger Attachment Data 1 Address | D0                                  |
| 1st Trigger Attachment Data 1 Length  | 10                                  |



|                                       |                                     |
|---------------------------------------|-------------------------------------|
| 1st Trigger Error Log Enable          | <input checked="" type="checkbox"/> |
| 1st Trigger Attachment Mode           | PLC Device                          |
| 1st Trigger Attachment Data 1 Address | D0                                  |
| 1st Trigger Attachment Data 1 Length  | 0                                   |

Parameter Setting

Device Name

D

Device Number

0

Length

10

OK

Cancel

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.

Edit Area

Hardware Configuration

GeneralData Exchange

Ethernet Port Advanced Setting

IP Filter

NTP

Email

1st Trigger Setting

1st Trigger Recipient

2nd Trigger Setting

2nd Trigger Recipient

3rd Trigger Setting

3rd Trigger Recipient

4th Trigger Setting

4th Trigger Recipient

1st Trigger Recipient

| Name               | Value                               | Unit | Default                  | Minimum | Maximum |
|--------------------|-------------------------------------|------|--------------------------|---------|---------|
| 1st Remote Address | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> | -       | -       |
| 2nd Remote Address | <input type="checkbox"/>            |      | <input type="checkbox"/> | -       | -       |
| 3rd Remote Address | <input checked="" type="checkbox"/> |      | <input type="checkbox"/> | -       | -       |
| 4th Remote Address | <input type="checkbox"/>            |      | <input type="checkbox"/> | -       | -       |

Default

Import

Export

Update

8.2.12 Ethernet Port Advance Setting – Socket

In the **Socket** table, you can set COM port parameters for data transmission through Ethernet; however, you need to use this function along with specific API instructions. For more details, refer to the AS Series Programming Manual. The AS300 Series PLC supports data transmissions between the CPU module and other CPU module or device through sockets and the communication protocols including TCP and UDP are supported; four groups of connections can be set respectively for each protocol. As for AS100 and AS200 Series PLC, two groups of connections are supported respectively.

Edit Area

Hardware Configuration

GeneralData Exchange

Ethernet Port Advanced Setting

IP Filter

NTP

+ Email

- Socket

1st TCP Socket Setting

2nd TCP Socket Setting

3rd TCP Socket Setting

4th TCP Socket Setting

1st UDP Socket Setting

2nd UDP Socket Setting

3rd UDP Socket Setting

4th UDP Socket Setting

1st TCP Socket Setting

| Name                             | Value       | Unit | Default | Minimum | Maximum        |
|----------------------------------|-------------|------|---------|---------|----------------|
| 1st TCP Socket Remote IP         | 192.168.1.1 |      | 0.0.0.0 | 0.0.0.0 | 223.255.255... |
| 1st TCP Socket Remote Port       | 65500       |      | 0       | 0       | 65535          |
| 1st TCP Socket Local Port        | 65501       |      | 0       | 0       | 65535          |
| 1st TCP Socket Send Address      | D0          | ...  | D0      | -       | -              |
| 1st TCP Socket Send Length       | 10          |      | 0       | 0       | 512            |
| 1st TCP Socket Receive Address   | D100        | ...  | D0      | -       | -              |
| 1st TCP Socket Receive Length    | 20          |      | 0       | 0       | 512            |
| 1st TCP Socket Keep Alive Tim... | 60          | sec  | 30      | 0       | 65535          |

Default

Import

Export

Update

| Name                           | Value       | Unit | Default | Minimum | Maximum         |
|--------------------------------|-------------|------|---------|---------|-----------------|
| 1st UDP Socket Remote IP       | 192.168.1.1 |      | 0.0.0.0 | 0.0.0.0 | 223.255.255.... |
| 1st UDP Socket Remote Port     | 65500       |      | 0       | 0       | 65535           |
| 1st UDP Socket Local Port      | 65501       |      | 0       | 0       | 65535           |
| 1st UDP Socket Send Address    | D0          | ...  | D0      | -       | -               |
| 1st UDP Socket Send Length     | 10          |      | 0       | 0       | 512             |
| 1st UDP Socket Receive Address | D100        | ...  | D0      | -       | -               |
| 1st UDP Socket Receive Length  | 20          |      | 0       | 0       | 512             |

Buttons at the bottom: Default, Import, Export, Update

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 initial device in the CPU module where data which will be sent is stored.
- **Send Length:** 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 and 200 bytes. For PLC CPU with FW V1.06.20 or later, the range is between 0 and 512 bytes.
- **Receive Address:** Users can set an initial device in the CPU module where data which will be received is stored.
- **Receive Length:** 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 and 200 bytes. For PLC CPU with FW V1.06.20 or later, the range is between 0 and 512 bytes.
- **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 cannot 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.

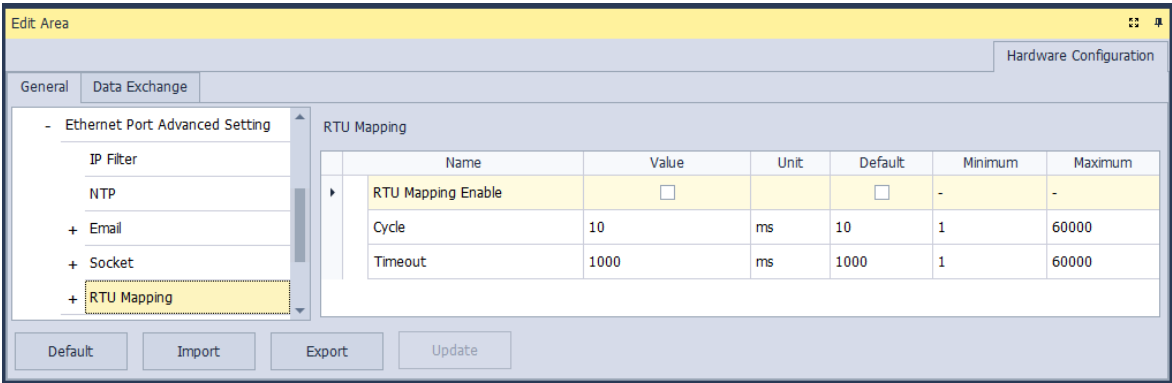
If the local CPU module wants to send 10-word data to the remote device, the data will be stored in D0~D9 before the data is sent. If the local CPU module receives 20-word data from the remote device, the data will be stored in D100~D119.

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.

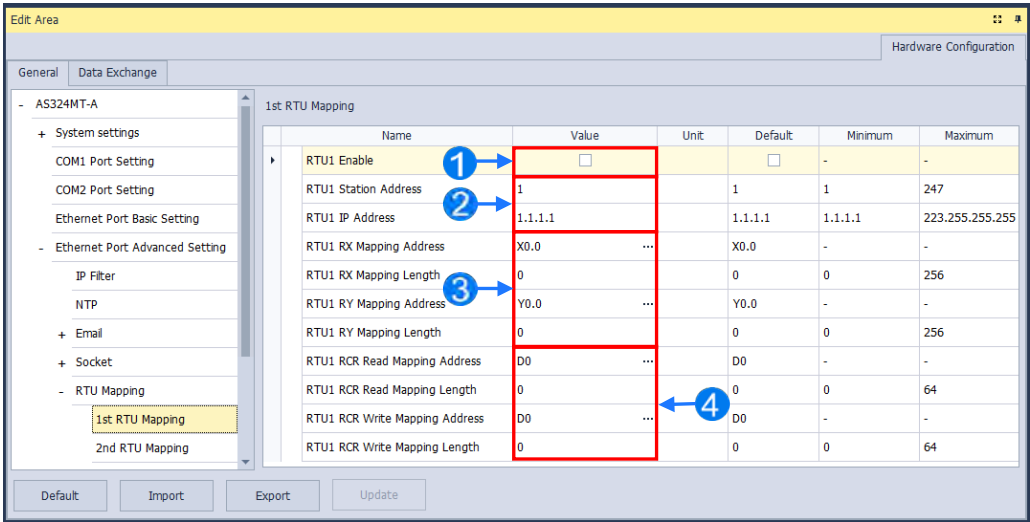
8.2.13 Ethernet Port Advance Setting – RTU Mapping

In the **RTU Mapping** table, users can set Delta RTU-EN01 slave in connection with PLC CPU. The remote device can be controlled via Ethernet. 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 PLC CPU. 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 PLC CPU 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 PLC CPU. 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 PLC CPU.
- 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 PLC CPU. 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 PLC CPU.

### 8.2.14 Function Card 1 Setting

The **Function Card 1 Setting** table is used for setting parameters of function card in AS300 series CPU module, which is installed by inserting to the slot. For AS100 and AS200 Series PLC CPU, there is no Function Card 1 and thus there is no settings for Function Card 1.

| Name                       | Value        | Unit | Default      | Minimum | Maximum |
|----------------------------|--------------|------|--------------|---------|---------|
| Card 1 Detect mode         | Auto Detect  |      | Auto Detect  | -       | -       |
| Manual Select Card         | None         |      | None         | -       | -       |
| Card 1 ID No.              | 1            |      | 1            | 1       | 254     |
| Protocol Setup Opportunity | Stop --> Run |      | Stop --> Run | -       | -       |
| Baud Rate                  | 9600         | bps  | 9600         | -       | -       |
| Data bit                   | 7            | bit  | 7            | -       | -       |
| Parity bit                 | Even         |      | Even         | -       | -       |
| Stop bit                   | 1            | bit  | 1            | -       | -       |
| MODBUS mode                | ASCII        |      | ASCII        | -       | -       |
| Delay time to Reply        | 0            | ms   | 0            | 0       | 3000    |
| Received Data Timeout      | 200          | ms   | 200          | 0       | 3000    |
| F2AD Analog Input mode     | 0~10V        |      | 0~10V        | -       | -       |
| F2DA Analog Output mode    | 0~10V        |      | 0~10V        | -       | -       |
| F2AD Sampling Time         | 3            | ms   | 3            | 3       | 15      |
| F2AD Average Times         | 10           |      | 10           | 1       | 15      |

- 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.
- ❸ 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 average times are set in **F2AD Sampling Time** and **Average Times** boxes respectively.

## 8.2.15 Function Card 2 Setting

The Function Card 2 Setting table is used for setting parameters of Function Card 2 in AS300 Series PLC CPU, which is installed by inserting to the slot. Besides settings for Function Card 2, settings for AS-FPFN02, AS-FOPC02, AS-FEN02, AS-FECAT and IP filter are also included. The only difference between Function Card 1 and Function Card 2 is the settings options of AS-FCOPM, AS-FPFN02, AS-FOPC02, AS-FEN02, AS-FECAT are added in **Manual Select Card** box for Function Card 2. For AS100 and AS200 Series PLC CPU, the AS-FCOPM is used for internal communication port and no changes can be made. If you have inserted AS-FCOPM or AS-FEN02 in AS300 Series PLC CPU, you can set up their parameters here. For AS-FCOPM card, the parameters can be set as shown in the following window.

| Name   | Value                       | Unit | Default                     | Minimum | Maximum |
|--|-----------------------------|------|-----------------------------|---------|---------|
| F2DA Analog Output mode                                  | 0~10V                       |      | 0~10V                       | -       | -       |
| F2AD Sampling Time                                       | 3                           | ms   | 3                           | 3       | 15      |
| F2AD Average Times                                       | 10                          |      | 10                          | 1       | 15      |
| AS-FCOPM Working mode                                    | AS Remote Communication     |      | AS Remote Communication     | -       | -       |
| AS-FCOPM node ID   | 1                           |      | 1                           | 1       | 127     |
| AS Remote module No.                                     | 0                           | unit | 0                           | 0       | 15      |
| Select Run mode after detect remote module               | Run connected remote module |      | Run connected remote module | -       | -       |
| AS CPU module keep or Stop when slave node dis-connected | Only Show Error Message     |      | Only Show Error Message     | -       | -       |
| Remote and CANopen communication time out                | 100                         | ms   | 100                         | 0       | 3000    |
| Re-connected Retry number after time out                 | 60                          |      | 60                          | 0       | 255     |
| Auto Retry connection after Disconnected                 | 60                          | sec  | 60                          | 0       | 255     |
| AS-FCOPM Bit Rate  | 125k                        | bps  | 125k                        | -       | -       |
| Communication data sampling position                     | Auto                        |      | Auto                        | -       | -       |
| DS301 PDO Data Exchanged                                 | Start after power-on        |      | Start after power-on        | -       | -       |
| CAN Hardware error counter                               | Enable                      |      | Enable                      | -       | -       |

- 1 Select AS Remote Control/Delta Servo Drives and AS Remote Module/CANopen DS301 from the **AS-FCOPM working mode** box. The AS Remote Module and Delta Servo Drives adopts communication protocols exclusive to Delta servo products and AC motor drives. In addition, the AS Remote Module and Delta Servo Drives are also applied in connecting remote I/O AS series as well as CANopen DS301 for the application of DS301 standard protocol.
- 2 Set the address of the station when CANopen DS301 is selected from the **AS-FCOPM working mode** box.
- 3 The remote I/O parameters can be set if AS Remote Mode is selected from the AS-FCOPM working mode box. The **AS Remote Module No.** sets the number of remote I/O modules and each one can connect one expansion module.
- 4 If AS Remote Mode/Delta servo drives and AS Remote Mode is selected from the AS-FCOPM working mode box, you can set the followings:

The actions after detecting the remote modules in **Select run mode after detect remote module**: **Run connected remote module** or **All remote module stop**.

The actions when the remote I/O module is disconnected during operation in **AS CPU module keep or Stop when slave node dis-connected**: **only Shows Error Message** or **PLC Stop & Show Error Message**.

You can define after how long the remote I/O module does not give a reply can be seen as timeout in **Remote**

**and CANopen Communication Timeout.**

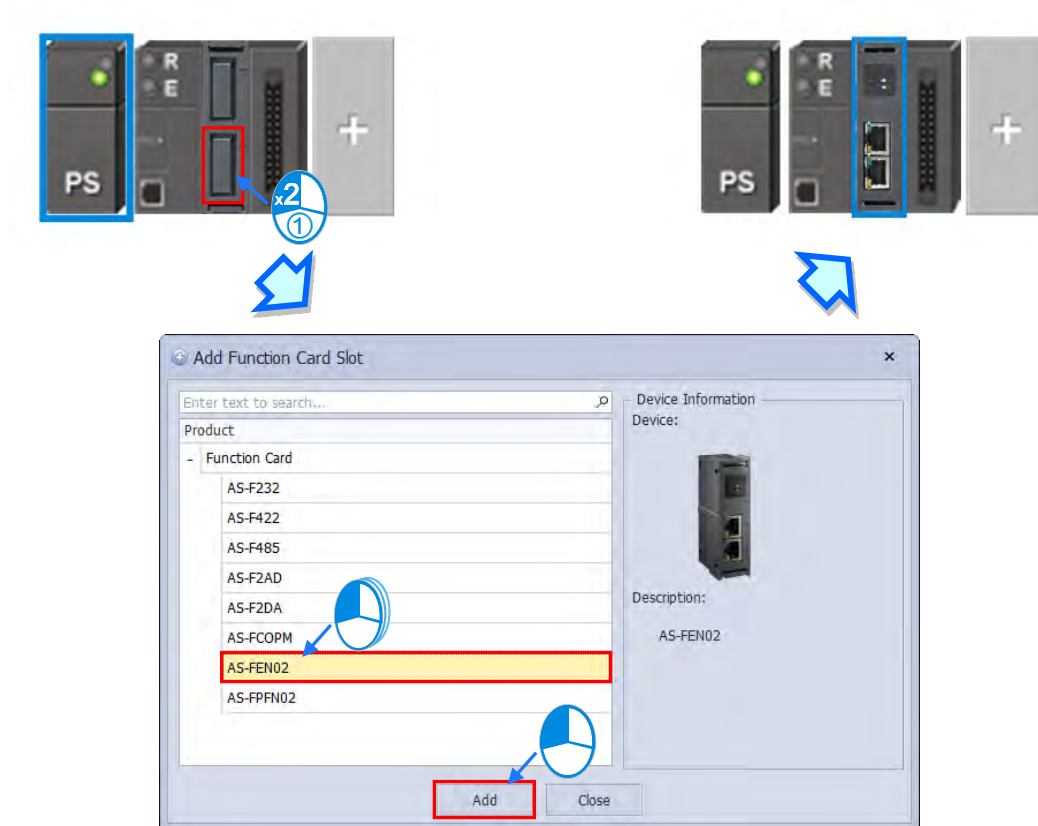
You can define the times of trying to connect after a timeout occurs in **Auto Retry connection after Disconnected**.

- ⑤ All three AS-FCOPM working modes can set the **AS-FCOPM Bit Rate**.

**Communication data sampling position:** It is suggested to select **Auto**, but if the communication with the slave is unstable, you can select the data sampling position in percentage.

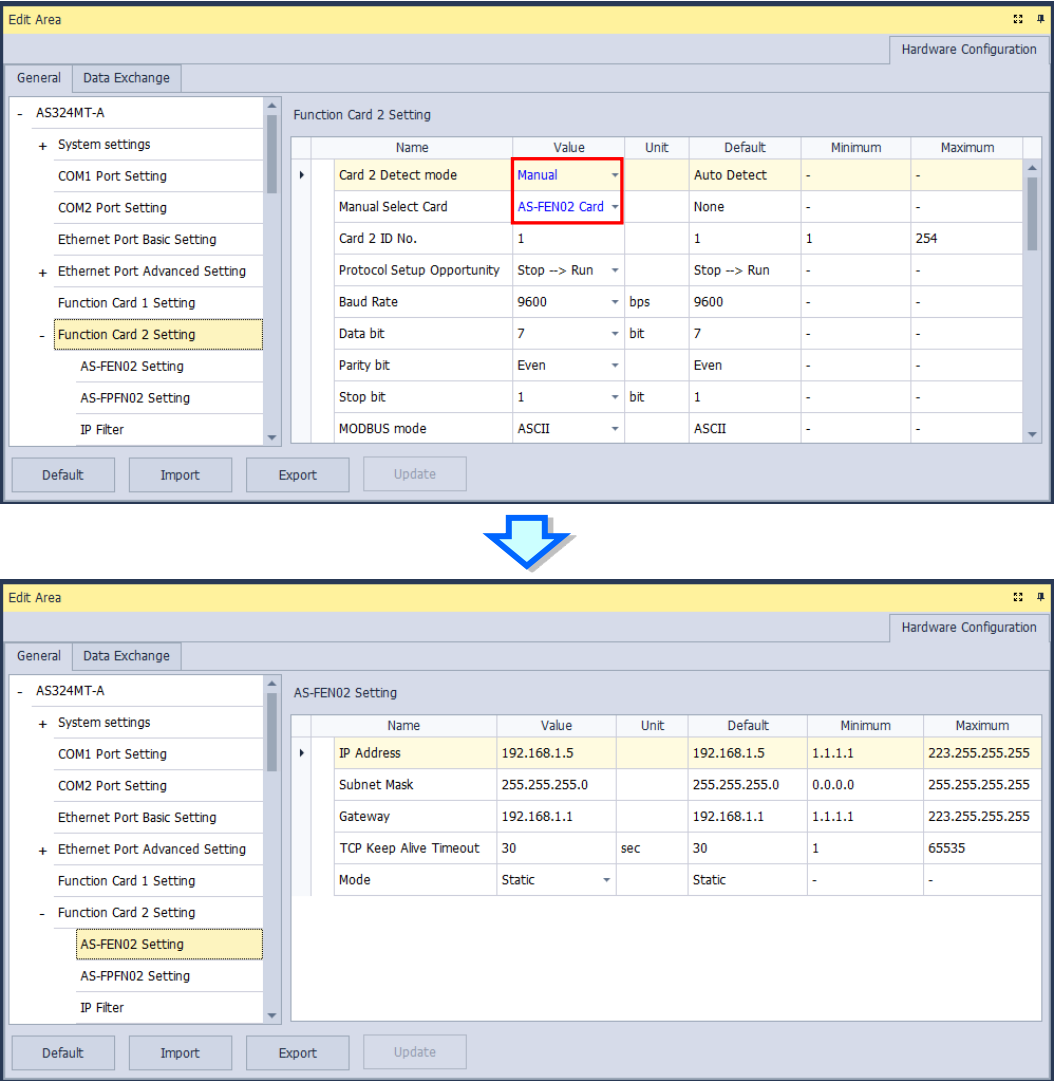
- ⑥ When CANopen DS301 protocol is selected from the AS-FCOPM working mode box, you can set **DS301 PDO Data Exchanged: Start after power-on** or **Start after CPU running**

Insert AS-FPFN02, AS-FOPC02, AS-FEN02, or AS-FECAT by clicking the function card slot 2 and selecting the inserted function card, as the image shown below.

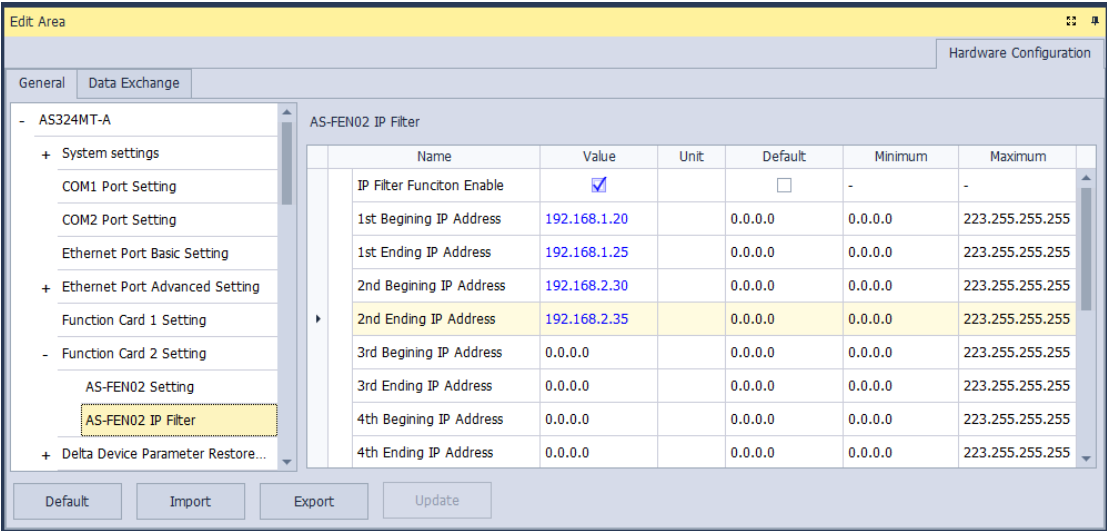




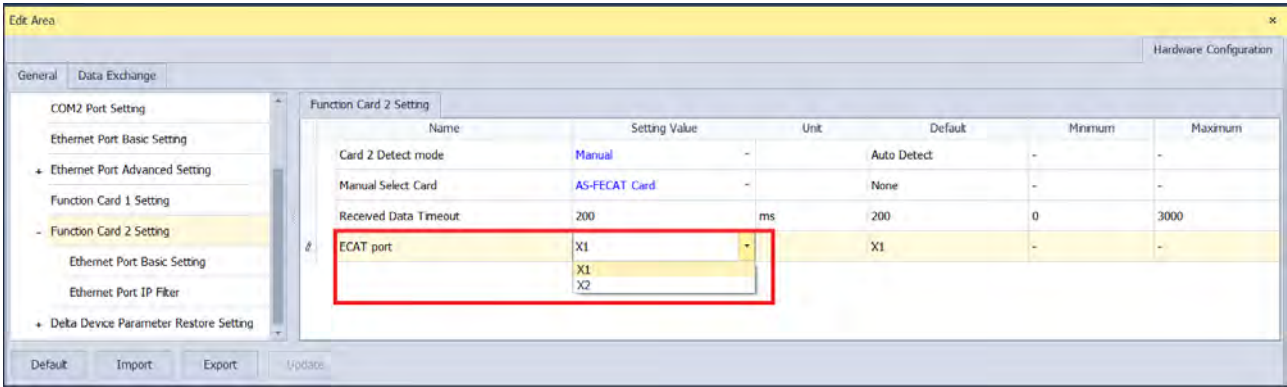
You can also set AS-FPFN02, AS-FOPC02, AS-FEN02, or AS-FECAT in the Edit Area. Set AS-FPFN02, AS-FOPC02, AS-FEN02, or AS-FECAT 2 as **Manual Select Card** (Note: If AS-FPFN02, AS-FOPC02, AS-FEN02, or AS-FECAT is selected from **Manual Select Card**, then Function Card 1 cannot be set.) After that you can set up Ethernet communication parameters.



The IP filter adds another layer of confirmation to ensure the devices for communication are permitted. This function can also limit communication objects. When IP filter function enables, only the devices within the listed IP address from the IP filter table are allowed to communicate with AS-FPFN02, AS-FOPC02, AS-FEN02, or AS-FECAT. By selecting **IP Filter Function Enable**, users can input the beginning and ending of 1-8 set of IP address.

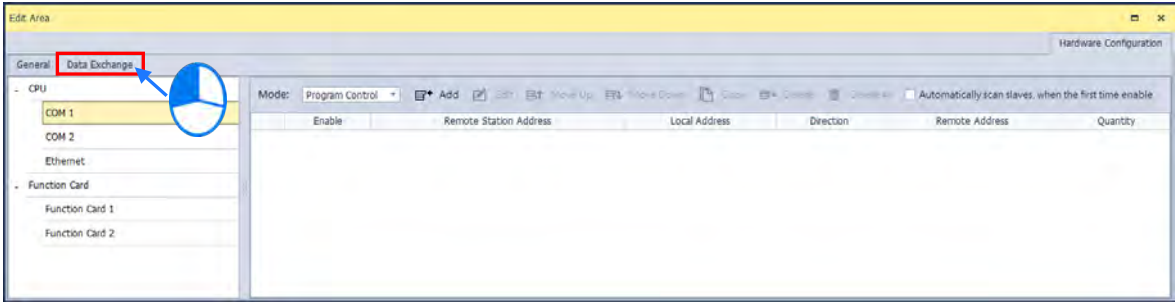


When AS-FECAT is installed on AS300 Series PLC CPU, you can use the INITEC instruction (API2820) to initialize EtherCAT communication and then set up one of the AS-FECAT port as the EtherCAT Master's port in HWCONFIG. As for the other port, it can be used by Server of Modbus TCP. Two ports work independently. If the EtherCAT communication is NOT initialized, the two ports of AS-FECAT can be used by Servers of Modbus TCP.



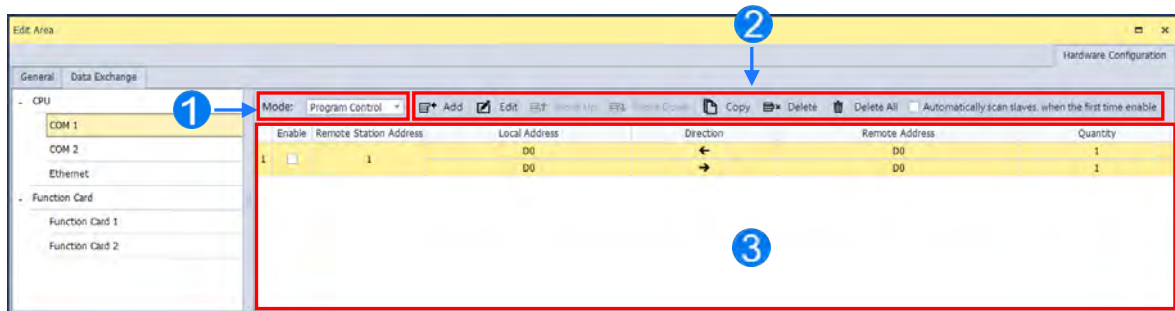
8.2.16 Data Exchange

AS Series PLC CPU is equipped with the data exchange function through standard Modbus TCP. You can find the relevant settings under the Data Exchange tab.



AS Series PLC CPU is built with two ports, two COM ports or one COM port and one Ethernet port varied by different models. When acted as a Master and performs data exchange with a remote Slave, the data exchange through

COM1 and COM2 is via the Modbus protocol; if the data exchange through Ethernet is via the Modbus TCP protocol. The setting items for COM1, COM2 and Ethernet are the same.



❶ You can set the three Modes to start data exchange.

**A. Program Control:** PLC decides whether or not to execute the set flags for data exchange. Refer to special flags (SM) descriptions for more details in AS Series Programming Manual.

**B. PLC Run:** The set data exchange will be executed automatically when PLC is in RUN state. If the PLC is in STOP state, the communication will stop.


**C. Always Enable:** The data exchange will be executed constantly after PLC is powered on.

❷ Function buttons and descriptions:

| Function Button  | Description  |
|--|--|
| <b>Add</b>   | Click <b>Add</b> to add a new data exchange item in area ❶.  |
| <b>Edit</b>  | Click <b>Edit</b> to enter the selected data exchange setting page.  |
| <b>Move Up</b> <b>Move Down</b>  | Select the data exchange item and click <b>Move Up</b> and <b>Move Down</b> to rearrange the order of data exchange table.   |
| <b>Copy</b>  | Select the data exchange item and click <b>Copy</b> and the copied item will be pasted to the last raw of the data exchange table.   |
| <b>Delete</b>  | Select the data exchange item and click <b>Delete</b> to delete the selected item.   |
| <b>Delete All</b>  | Click <b>Delete All</b> to delete all data exchange items presented.   |
| <input checked="" type="checkbox"/> <b>Automatically scan slaves, when the first time enable</b> | Select this option to detect if the assigned slaves of the data exchange table exist. If the slave does NOT exist, the connection to the slave will stop to increase efficiency.<br><br>Note: It is suitable for applications that the time it takes |

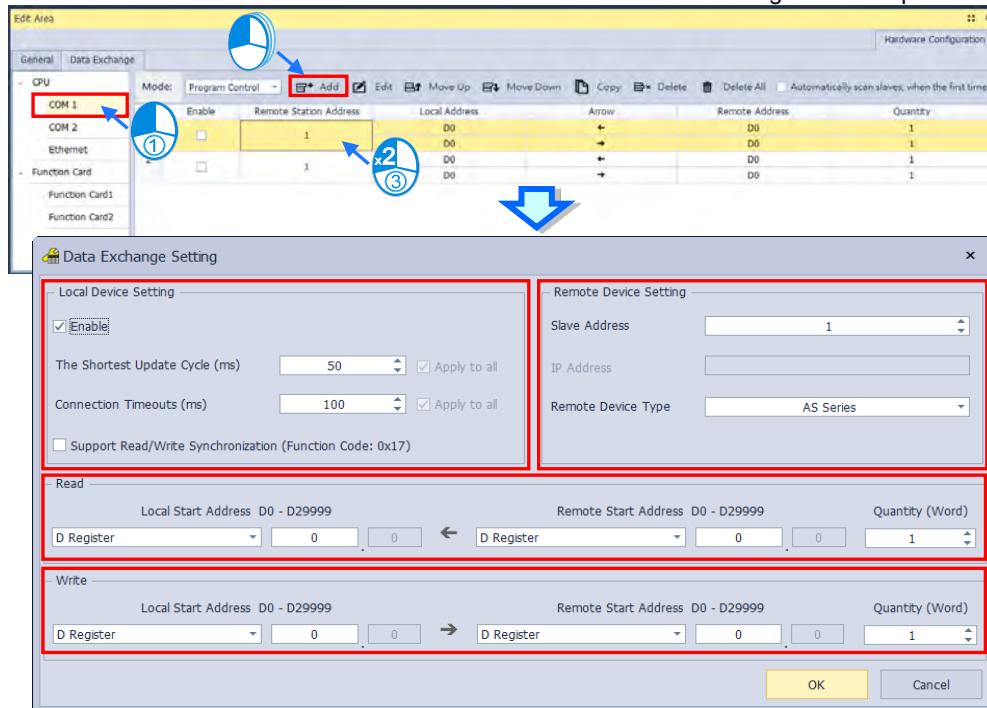
| Function Button | Description  |
|-----------------|--|
|                 | for the slaves to power-on is less than the master does.<br>If not, do not select this option. |

⑨ Items on the data exchange table:

| Name  | Description   |
|---|---|
| Item  | The number of the block for data exchange.  |
| Enable  | Selects whether to enable the data exchange table when the data exchange is performed.  |
| Station Address/<br>IP Address  | The slave station address for the data exchange table. You can set one address for multiple data exchange tables. It is a station address under the COM1 and COM2 tabs, and an IP under the Ethernet tab. |
| Local Address   | The device address range used by the master in the data exchange table  |
|  | <p>← : Input: the data block where the master reads from a slave</p> <p>→ : Output: the data block where the master writes to a slave</p>   |
| Remote Address  | <p>This is the device address range used by a slave in the data exchange table.</p> <p>The device range is in hexadecimal if the slave in the data exchange table is a user-defined Modbus Device.</p>    |
| Quantity  | This is the size of the data exchange table, which is consistent with the result calculated from the device range.  |

## Data Exchange Setting Page

Under the Data Exchange Tab, you can set up data exchange for COM communication, Ethernet communication and Function Card. Click **Add** and then **Edit** or double-click the data exchange table to open the editing page.



### ● Local Device Setting

Select the option **Enable** for data exchange to start. You can set the shortest update cycle and connection timeout time in ms. If there is no response from the target device for a period of time that you have set, that is considered as a timeout. If you select the option **Support Read/Write Synchronization (Function Code: 0x17)**, the master PLC CPU can use Modbus function code to complete read and write synchronization at one execution. However you need to make sure all the devices support Modbus function codes; otherwise, the slaves devices may NOT recognize the function code and fail to complete read/write synchronization.

### ● Remote Device Setting

**Slave Address:** station number of the slave device for data exchange

**IP Address:** IP address of the slave device (only available for EtherNet)

**Remote Device Type:** slave device model type, such as Delta PLC or standard Modbus devices

● **Read:** When PLC CPU reads data from the remote device: PLC CPU defines a device range to store data including the device type, starting address and quantity which are read from the remote device. Define the device type, starting address and quantity in the remote device that will be read by PLC CPU.

**Local Start Address:** Device type and start address of devices where PLC CPU store data

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

**Quantity:** Data length of input

● **Write:** PLC CPU writes data to a remote device; PLC CPU defines a device range for the remote device to read the following data, the device type, starting address and quantity. Define the device type, starting address and quantity in the remote device that will be written by the PLC CPU.

**Local Start Address:** Device type and start address of the source data of PLC CPU

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

**Quantity:** Data length of output

**MEMO**



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# Chapter 9. EtherNet/IP Specification and Operation

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## 9.1 Introduction

### 9.1.1 Section Overview

This section uses ISPSOft for demonstration. For DIADesigner operation, refer to Chapter 7 from DIADesigner software manual.

This section introduces Ethernet communication. Section 9.2 is about Ethernet network installation. Section 9.3 is about the specifications of Ethernet and EtherNet/IP. Section 9.4 to section 9.9 are for EtherNet/IP specification and operations. Section 9.11 is about operations and monitoring from the webpage.

### 9.1.2 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 the 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 that support EtherNet/IP. In addition, you can also use EDS files to connect to other brands of EtherNet/IP devices. Find HWCONFIG in ISPSOft software to edit EtherNet/IP devices. Download the ISPSOft software at: [Delta | Download Center \(deltawww.com\)](http://Delta | Download Center (deltawww.com))

### 9.1.3 Definitions of Common Network Terms

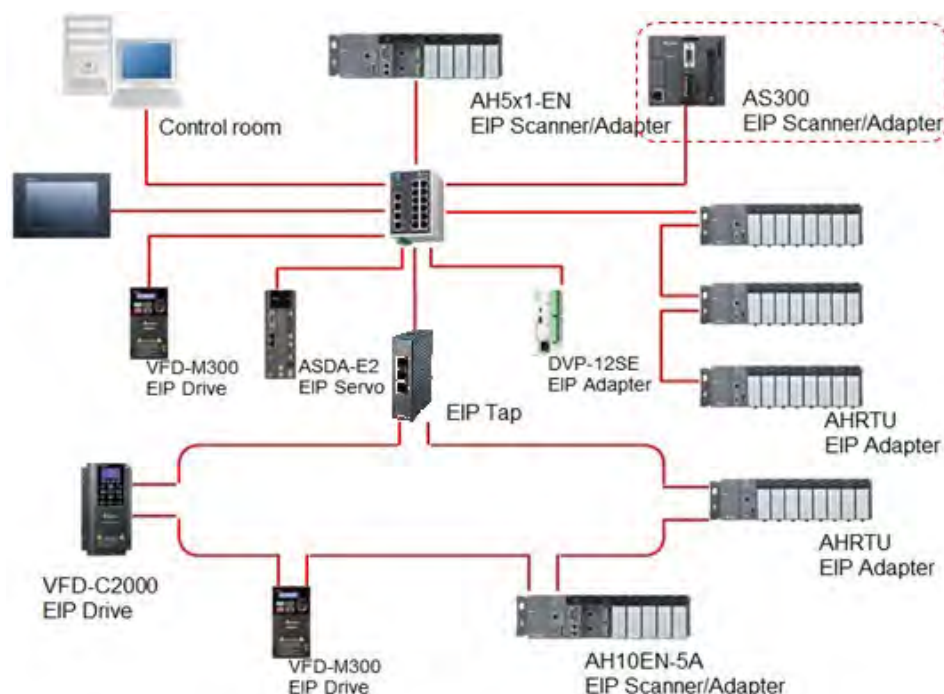
| Term                            | Definition  |
|---------------------------------|---|
| ODVA                            | Open DeviceNet Vendor Association for EtherNet/IP   |
| EIP                             | EtherNet/IP, an industrial Ethernet network, provides interoperability for system providers. IP stands for Industrial Protocol. The term “EIP” (EtherNet/IP) is used in this manual.  |
| I/O Connection                  | Use 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 is exchanged piece by piece through instructions.  |
| RPI                             | Requested Packet Interval, through the I/O connection to connect to EtherNet/IP to exchange data at regular time intervals.   |
| ACD                             | Address Conflict Detection to detect IP address duplications.   |
| Produced/Consumed Tag (P/C Tag) | <ul style="list-style-type: none"> <li>You use Tags for assigning and referencing memory locations for Rockwell PLCs, the same as registers for Delta PLCs.</li> <li>Produced tag: A tag that a controller makes available for other controllers. Multiple controllers can simultaneously consume (receive) the data. A produced tag sends its data to consumed tags (consumers) without using logic.</li> <li>Consumed Tag: A tag that receives the data of a produced tag. The data type of the consumed tag and the produced tag must match (including any array dimensions).</li> <li>The data is transferred over Ethernet/IP. For example, PLC-A needs data from</li> </ul> |

|               |   |
|---------------|---|
|               | PLC-B, so PLC-B sends the data to PLC-A. Therefore, PLC-B is the producer and PLC-A 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 Exchange | Exchanging data between devices   |
| EIP Scanner   | The master station is called an EIP Scanner in EtherNet/IP.   |
| EIP Adapter   | The slave station is called an 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. It 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. |
| Modbus TCP    | This is a Modbus variant used for communications over TCP/IP networks.  |

## 9.1.4 Ethernet Features

### 9.1.4.1 Delta EIP Architecture

This typical Delta EIP architecture includes an EIP Scanner and Adapters; data exchange is achieved between devices through an I/O connection and explicit messaging. The AS Series supports single port Ethernet; thus you can install and configure devices with embedded switch technology over EtherNet/IP.



#### 9.1.4.2 EIP Features

- **Flexibility**

- Flexible topology: EIP devices may include single port Ethernet as well as dual port Ethernet, 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 Wi-fi connection. Even personnel with no IT background can build the network easily.
- Applicable networks include linear topology, ring topology, star topology, Ethernet, EtherNet/IP, one or more LANs, etc. You can set configuration through USB or an interface.

- **Simplicity**

- With a connector: Delta provides a full range of products, including human machine interfaces (HMI), programmable logic controllers (PLC), and inverter drives for application in an industrial operation. You can build a network simply through an RJ-45 connector, saving costs on cables and other connecting tools.
- Single network: in place of the 3-tier industrial architecture, single network architecture provides 100MB/bits high-speed cyclical and non-cyclical data exchange functions, ensuring complete network diagnosis and effectively shortening debugging time.
- Graphical user interface software: the HWCONFIG uses a graphical user interface designed for intuitive operation.

- **Integration**

- Data exchange: the HWCONFIG provides a consistent setting interface, allowing you to reduce the time to learn and set up configurations.
- Listed device parameters: the HWCONFIG presents the device parameters in a list. Instead of looking them up in the user manual, you can quickly check on the parameters in the list.
- EDS file: you can connect to Delta and other brands of EtherNet/IP products with EDS files.

## 9.2 Installation

### 9.2.1 EtherNet/IP Device

A Delta EtherNet/IP (EIP) device allows you to build a linear topology, ring topology, and star topology networks. A Delta EIP device includes the EIP Builder software, EIP Scanner, EIP Adapter, EIP Tap, and an Ethernet switch. EIP Scanners and EIP Adapters can be further divided into single port and dual port devices. The AS Series are single port devices. 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 Cable Installation

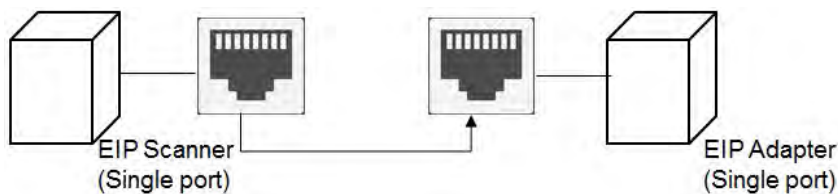
Each EtherNet/IP device is connected to an Ethernet switch with a CAT 5e cable. Please use Delta standard cables and the DVS series industrial switches. Refer to the Delta PLC/HMI Cable Selection Guide for more information.

#### 9.2.2.1. Single Port Device

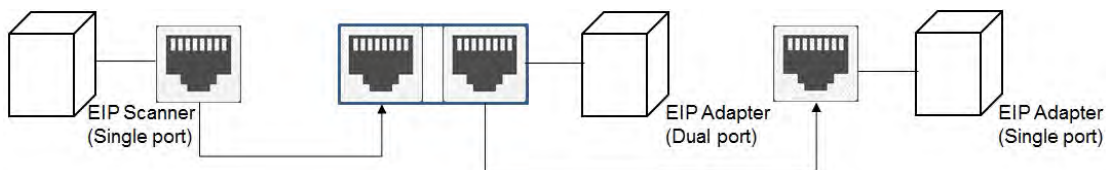
You can use a single port device to build up either a linear or a star network topology. An Ethernet switch and an Ethernet tap are required to create a star topology or a ring topology.

#### Linear Topology

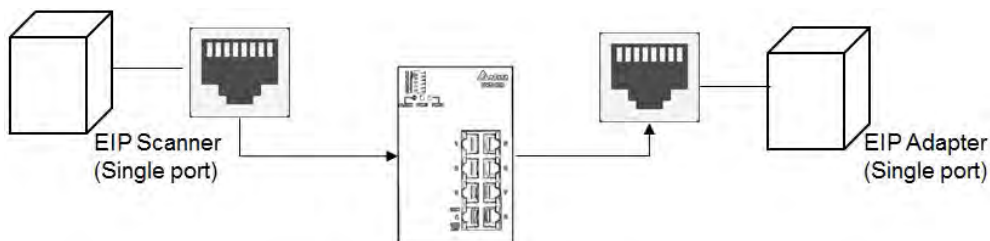
##### ● Linear Topology 1



##### ● Linear Topology 2



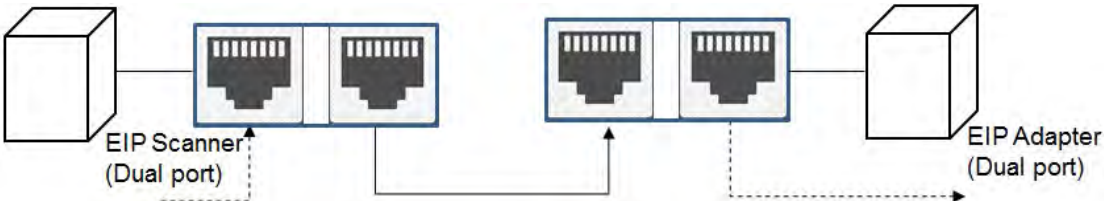
#### Star Topology



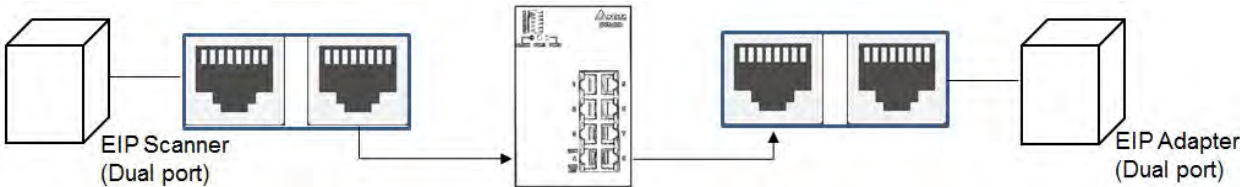
9.2.2.2. Dual Port Device

You can use a dual port device to build a linear, a star or a ring network topology. A DLR function is required to create a ring topology. Refer to Section 9.9.2 for DLR supported series.

Linear Topology

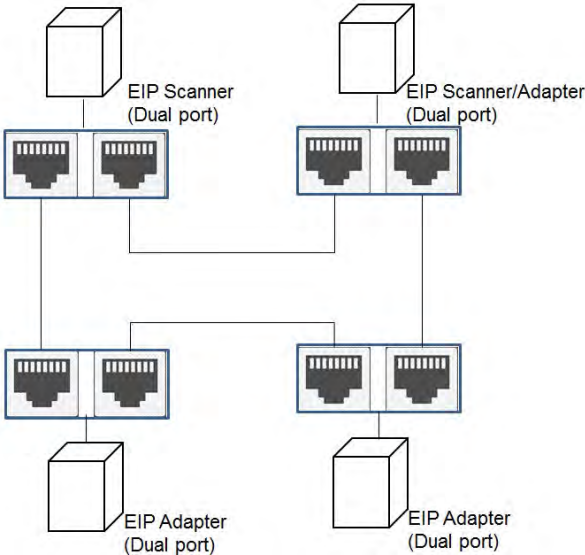


Star Topology

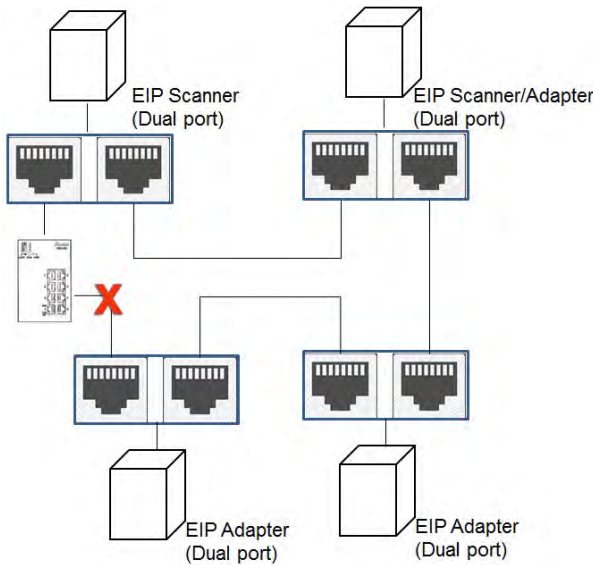


Ring Topology

A DLR function is required to create a ring topology. Refer to Section 9.9.2 for DLR supported devices.



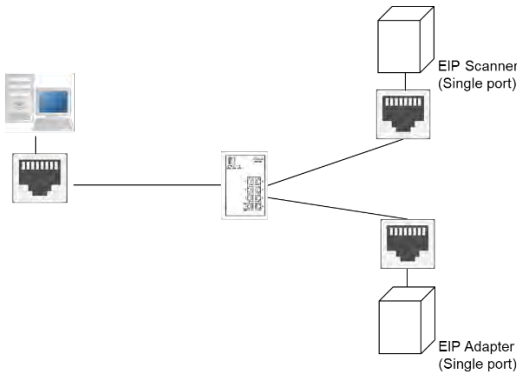
When a switch is needed for the particular topology, the switch should support the DLR function. If not, the connection might fail. Since AS Series PLC CPU does NOT support DLR function, you will need a DLR switch DVS-103I02C-DLR for a ring topology.



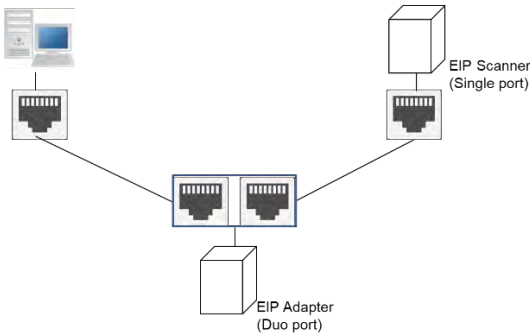
9.2.2.3 EIP Builder Software

Linear and star topology

Firstly install the EIP editing software on your PC to monitor and configure the EIP devices and use a switch to connect to the EIP Scanner and EIP Adapter.

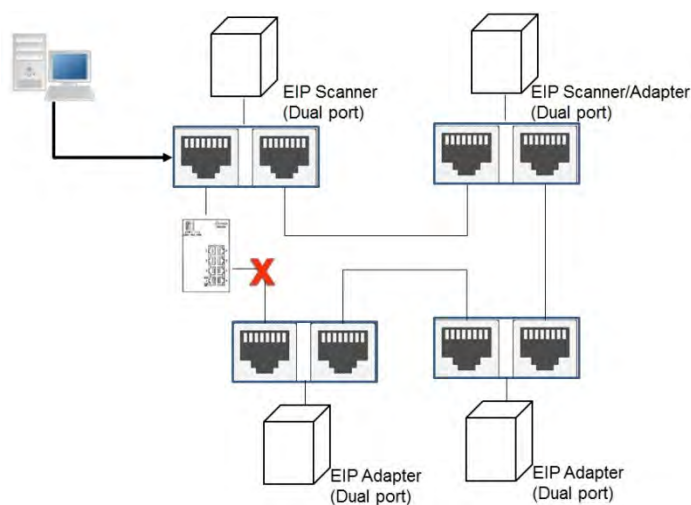


If there is a duo port on the EIP Adapter, you can also take this advantage to start a Daisy-chain topology.

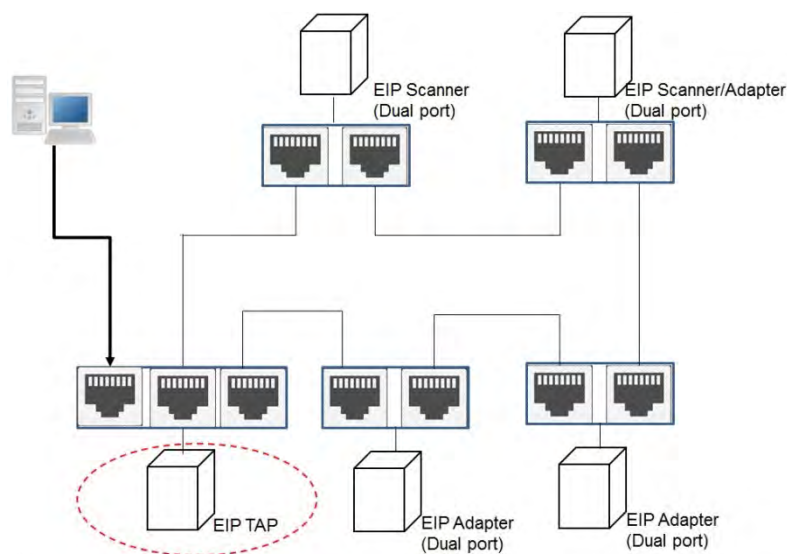


## Ring topology

Install the EIP editing software on your PC to monitor and configure the EIP devices. If there is no DLR switch (DVS-103I02C-DLR), you need to save a network connection for your PC to connect to the EIP device.



If you have a DLR switch (DVS-103I02C-DLR), you can connect your PC to the Device port of the switch so that the ring topology stays intact.



## 9.2.3 Network Communication Parameter Setting

In ISPSOft you can edit, upload, download and monitor AS PLC CPU programs through Ethernet communication. Refer to section 2.4.3.4 in ISPSOft User Manual for more details. Go to *ISPSOft -> Help -> ISPSOft User Index* and then find section concerning **Communication Parameter Setting – Ethernet** for more details.

## 9.3 Specifications

### 9.3.1 Ethernet Specification

|                                     |   |
|-------------------------------------|---|
| <b>Model</b>                        | AS300 & AS200 & AS100 Series              |
| <b>Communication Protocols</b>      | EtherNet/IP Scanner / Adapter, Modbus TCP |
| <b>Protocols</b>                    | BOOTP, DHCP, SMTP, NTP, Socket, HTTP      |
| <b>Communication Speed</b>          | 10/100 Mbps Auto-Detection                |
| <b>Communication Interface</b>      | RJ-45 with Auto MDI/MDIX                  |
| <b>Numbers of the Ethernet Port</b> | 1   |

|                                     |   |
|-------------------------------------|---|
| <b>Model</b>                        | AS-FEN02 ( work with AS300 Series)        |
| <b>Communication Protocols</b>      | EtherNet/IP Scanner / Adapter, Modbus TCP |
| <b>Protocols</b>                    | BOOTP, DHCP, SMTP, NTP, Socket, HTTP      |
| <b>Communication Speed</b>          | 10/100 Mbps Auto-Detection                |
| <b>Communication Interface</b>      | RJ-45 with Auto MDI/MDIX                  |
| <b>Numbers of the Ethernet Port</b> | 2   |

|                                     |                                     |
|-------------------------------------|-------------------------------------|
| <b>Model</b>                        | AS-FPFN02 ( work with AS300 Series) |
| <b>Communication Protocols</b>      | PROFINET RT                         |
| <b>Protocols</b>                    | PROFINET IO                         |
| <b>Communication Speed</b>          | 100 Mbps Auto-Detection             |
| <b>Communication Interface</b>      | RJ-45 with Auto MDI/MDIX            |
| <b>Numbers of the Ethernet Port</b> | 2                                   |

|                                     |                                    |
|-------------------------------------|------------------------------------|
| <b>Model</b>                        | AS-FECAT ( work with AS300 Series) |
| <b>Communication Protocols</b>      | EtherCAT Master, Modbus TCP        |
| <b>Protocols</b>                    | BOOTP, DHCP, HTTP                  |
| <b>Communication Speed</b>          | 10/100 Mbps Auto-Detection         |
| <b>Communication Interface</b>      | RJ-45 with Auto MDI/MDIX           |
| <b>Numbers of the Ethernet Port</b> | 2                                  |



| Item / per transmission       |   | Specification |               |          |          |
|-------------------------------|---|---------------|---------------|----------|----------|
|                               |   | AS300         | AS200 / AS100 | AS-FEN02 | AS-FECAT |
| Modbus TCP                    | Maximum connection quantity for Client *1 | 32            | 16            | 8        | 0        |
|                               | Maximum connection quantity for Server*1  | 32            | 16            | 8        | 1        |
|                               | Max. data length                          | 100 words     |               |          |          |
| Socket (communication port)*1 | TCP connection quantity                   | 4             | 2             | N/A      | N/A      |
|                               | UDP connection quantity                   |               |               |          |          |
|                               | Max. data length                          | 200 bytes     |               |          |          |
| SMTP (for emailing)           | Emailing quantity                         | 4             | 4             |          |          |

\*1: Numbering is used for connections via the communication port. You can use connection 1 in TCP mode or UDP mode and up to 4 connections can be made per transmission. If connection 1 is used in TCP mode, the same connection number cannot be used in UDP mode.

### 9.3.2 EtherNet/IP Specification

| Item                         |  | AS300  |                | AS200 / AS100   |                | AS-FEN02                              |
|------------------------------|--|--|----------------|---|----------------|---------------------------------------|
|                              |  | Scanner  | Adapter        | Scanner   | Adapter        | Adapter                               |
| General                      | Device type  | Scanner / Adapter  |                |   |                | Adapter                               |
|                              | Topology type  | Star topology  |                |   |                | Star, linear topologies               |
| CIP Network I/O Connection   | CIP connection number (data exchange)                | 32   | 8              | 16  | 8              | 8                                     |
|                              | TCP connection number                                | 16<br>(Clients + Servers)  |                | 8<br>(Clients + Servers)  |                | 8                                     |
|                              | Requested Packet Interval (RPI)                      | 5 ms – 1000 ms   |                |   |                | 1 ms – 1000 ms                        |
|                              | Max. Transmission Speed                              | 3,000 pps  |                |   |                | 10,000 pps                            |
|                              | Max. Data Length/per transmission                    | 500 bytes  |                |   |                | 200 bytes                             |
|                              | Supported devices, registers, and flags              | FMV1.08<br>or<br>previous<br>versions:<br>D<br>FW V1.10<br>or later:<br>D/M*   | D, X, Y,<br>SR | FMV1.08<br>or<br>previous<br>versions:<br>D<br>FW<br>V1.10 or<br>later:<br>D/M* | D, X, Y,<br>SR | D, X, Y, SR                           |
| CIP Network Explicit Message | Class 3 (Connected Type)                             | 16   | 8              | 8   | 8              | 8                                     |
|                              | UCMM (Non-Connected Type, only uses TCP connections) | Total 16<br>(for all connection types)   |                | Total 8<br>(for all connection types)   |                | Total 8<br>(for all connection types) |
|                              | CIP Objects  | Identity Object (16#01)<br>Message Router Object (16#02)<br>Assembly Object (16#04)<br>Connection Manager Object (16#06)<br>Port Object (16#F4)<br>TCP/IP Interface Object (16#F5) |                |   |                |                                       |

| Item            |                                 | AS300   |         | AS200 / AS100 |         | AS-FEN02 |
|-----------------|---------------------------------|---|---------|---------------|---------|----------|
|                 |                                 | Scanner   | Adapter | Scanner       | Adapter | Adapter  |
|                 |                                 | Ethernet Link Object (16#F6)                                |         |               |         |          |
| CIP Network Tag | Max. Consumed Tag Number        | 32  |         | 16            |         | N/A      |
|                 | Max. Produced Tag Number        | 32  |         | 16            |         |          |
|                 | Max. Data Length                | 500 bytes (IO Connection)<br>400 bytes (Explicit Message)** |         |               |         |          |
|                 | Requested Packet Interval (RPI) | 5 ms – 1000 ms  |         |               |         |          |

Maximum number of connections when using AS300 to connect to other devices through Ethernet/IP:

- AS300 can act as a Scanner and an Adapter simultaneously. It can connected up to 16 devices (for example 8 Scanners and 8 Adapters).
- When AS300 acts as a Scanner, it can connect to up to 16 devices. Each device can establish up to 32 connections for data exchange. Data exchange types can be I/O connection and Consumed Tag. You can use explicit message for data exchange at the same time, up to 16 explicit message connections can be created.
- When AS300 acts as an Adapter, it can connect to up to 16 devices. Each device can establish up to 8 connections for data exchange. Data exchange types can be I/O connection and Produced Tag. You can use explicit message for data exchange at the same time, up to 8 explicit message connections can be created.

\* Using device D or device M takes 2 bytes (16 bits) as a unit in data length for IO connections, for example M0 to M15 (16 bits), M12 to M43 (32 bits). If you need to store the data of 200 bits from M100, the data length should be set in a value larger than 200 bits and in bytes it will be 26 bytes (26 bytes = 208 bits), the actual devices to be mapped will be M100 to M307. D0.0 will be stored in M100 (the first bit).

\*\* Array-typed tags are NOT supported in explicit messages.

### 9.3.3 PROFINET Specification

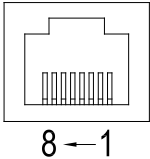
When AS-FPFN02 is installed on AS300 PLC CPU, this communication card can work independently and does NOT occupy the communication port of PLC CPU. AS-FPFN02 can act as a PROFINET adapter and connect to a PROFINET scanner to exchange data on the PROFINET Network (PN) Refer to section 10.2.8 of AS Module Manual for more information.

| Item                                      | Specification   |
|---|---|
| Communication Protocol                    | PROFINET  |
| EtherNet/IP Interface                     | 100 Mbit with 2 x RJ45                                      |
| Device Type                               | PROFINET Devices  |
| Network Cable Length                      | 100 meter   |
| Error Indicator                           | System Fail (SF): Red; Bus Fail (BF): Red                   |
| Max. IO Slot Supported                    | 17  |
| Register to Read and Write                | AS300 series data registers are supported to read and write |
| Minimum Time for Data Exchange to Operate | 10 ms   |
| Maximum Data Length/Per Transmission      | Input: 250 words<br>Output: 250 words                       |
| PROFINET Configuration                    | Download PROFINET Configurations from PN Controller         |

### 9.3.4 EtherNet Communication Port

#### 9.3.4.1 Communication Port Pin Assignment

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

| 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              |   |

#### 9.3.4.2 Communication LED Indicator

| LED Indicator |        | LED Status | Description   |
|---------------|--------|------------|---|
| LINK          | Green  | ON         | <ul style="list-style-type: none"><li>● Communication port is connected.</li><li>● Connected to Ethernet</li></ul>                            |
|               |        | OFF        | <ul style="list-style-type: none"><li>● Communication port is not connected.</li><li>● Not Connected to Ethernet</li></ul>                    |
| ACK           | Yellow | Blinking   | <ul style="list-style-type: none"><li>● Packets transmitting/receiving</li><li>● Packets transmitting/receiving over Ethernet</li></ul>       |
|               |        | OFF        | <ul style="list-style-type: none"><li>● No packets transmitting/receiving</li><li>● No packets transmitting/receiving over Ethernet</li></ul> |

Note: The LED indicator is at the RJ45 connection.

## 9.4 EtherNet/IP Software

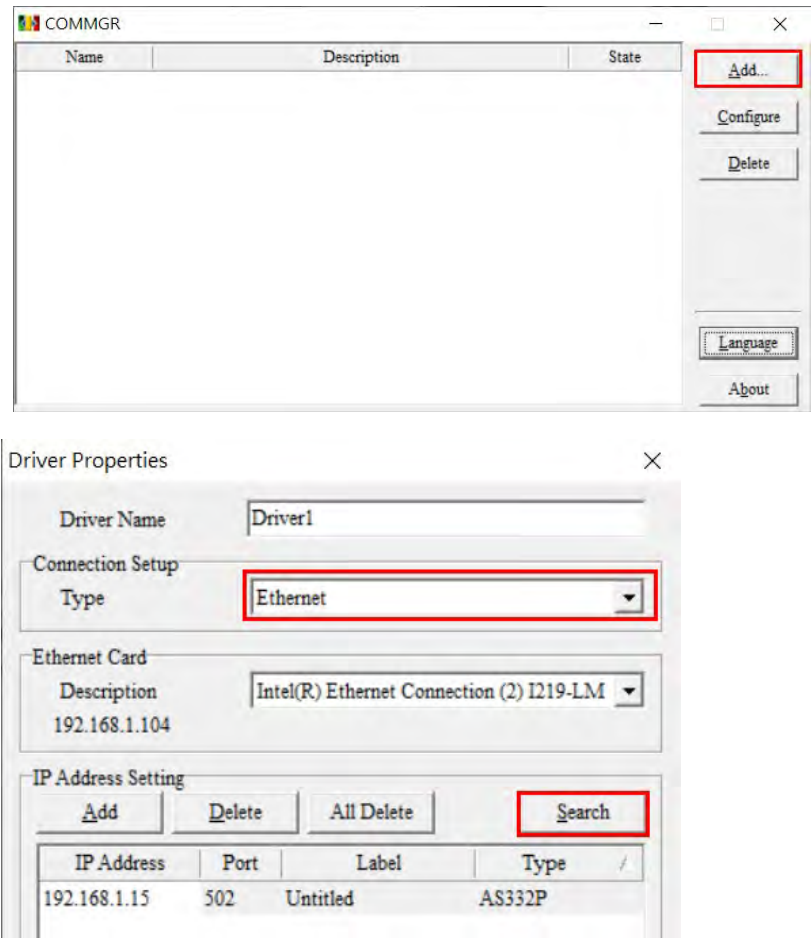
EtherNet/IP related parameters are set through HWCONFIG, which is embedded in ISPSOft. Call HWCONFIG from ISPSOft (version 3.12 and above). Download the ISPSOft software at: [Delta | Download Center \(deltaww.com\)](https://Delta | Download Center (deltaww.com))

### 9.4.1 Run HWCONFIG via an Ethnet/IP Scanner

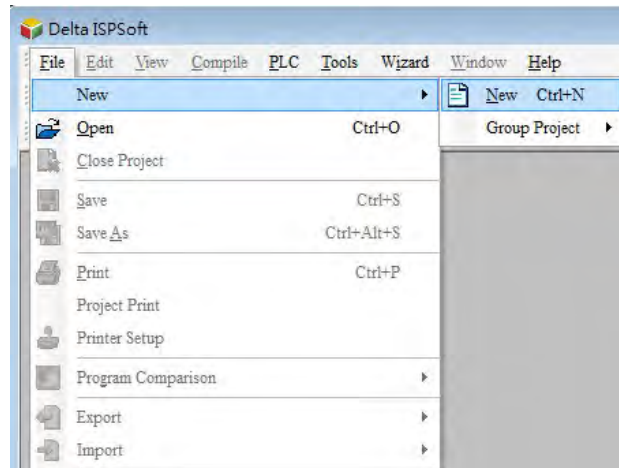
You can call HWCONFIG from Delta EIP Scanner's ISPSOft project. The Delta EIP Scanner is the EtherNet/IP communication PLC and the EtherNet/IP module. When using a Delta EIP Scanner, you set up an Ethnet/IP module through HWCONFIG in ISPSOft. Make sure the current communication is via EtherNet in ISPSOft. Refer to Section 9.9.3 for a list of Delta EIP Scanner products supported by HWCONFIG.

#### 1. Operation Steps

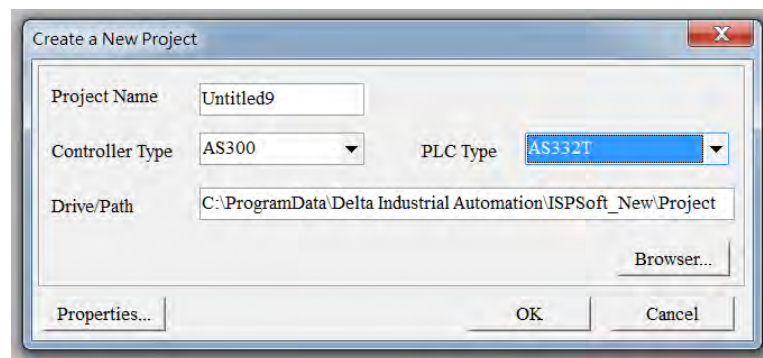
1. Open COMMGR: click the **Start** menu and go to **Programs > Delta Industrial Automation > COMMGR**  
Add a new Driver, Ethernet. And start searching for IP addresses of the current devices.



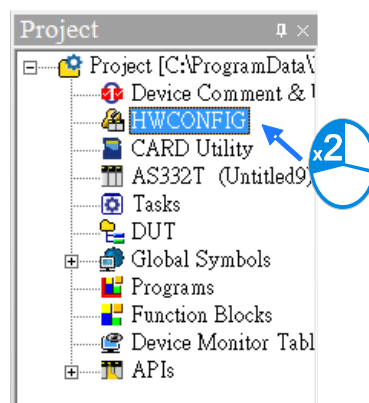
2. Open ISPSOft: click the **Start** menu and go to *Programs -> Delta Industrial Automation -> ISPSOft*
3. *ISPSOft -> Tools -> Communication Settings*: Select the previous set Ethernet driver and the IP address.
4. ISPSOft : Create a new project: on the **File** menu, click **New** to display the Create a New Project dialog box.



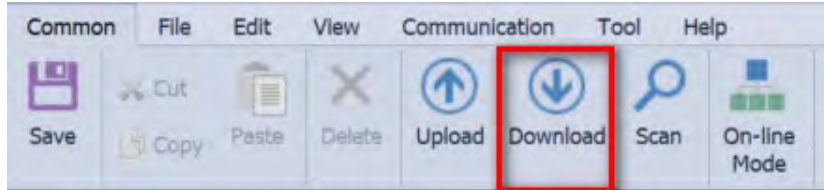
5. Select a PLC: in the Create a New Project dialog box, select a PLC that supports Ethernet/IP.



6. Open HWCONFIG: double-click **HWCONFIG** in the Project window.



7. Upload settings to HWCONFIG: click **Upload** to copy the parameters from the PLC to HWCONFIG. If there's any change on the module configuration, you can use **Scan** to update the parameters in HWCONFIG.
8. Save and download the settings from HWCONFIG : on the **File** menu click **Save** to save the settings and then click the download button on the toolbar to download the file to PLC. You must save the configuration in HWCONFIG before opening the other communication tools. While working in the communication tools, you cannot work in HWCONFIG.



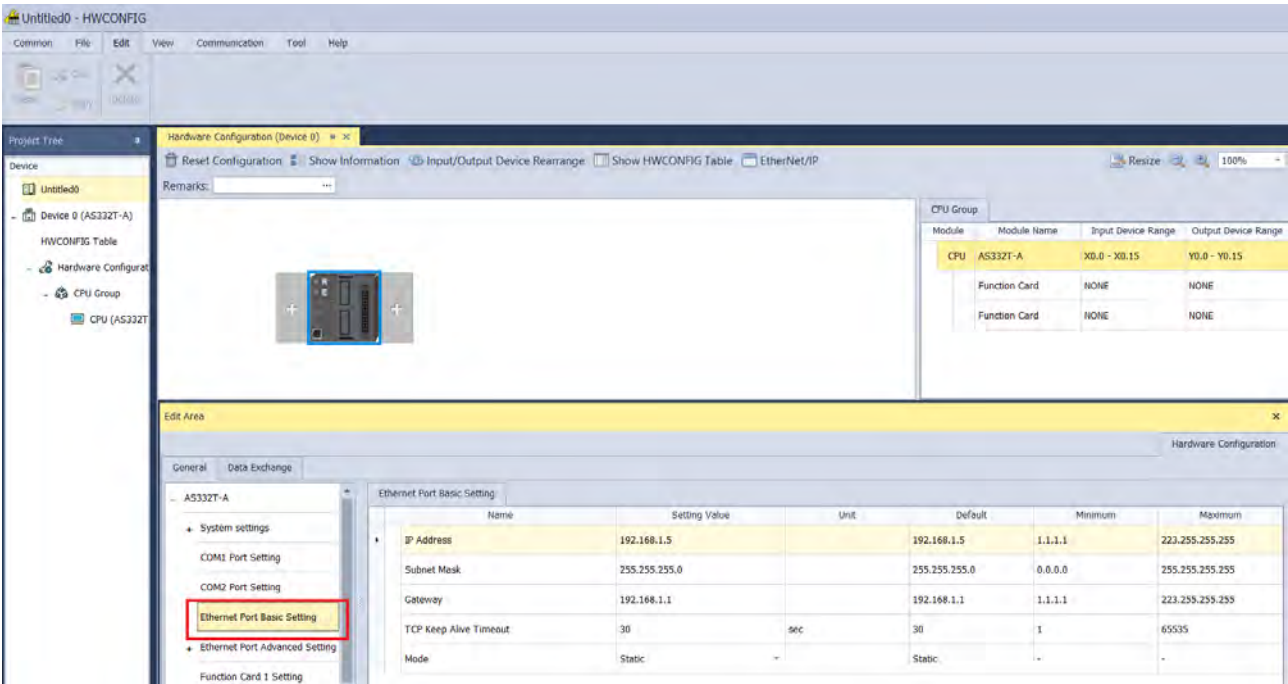
9. Open EtherNet/IP editing page: right-click the CPU module in the system configuration area to see the EtherNet/IP button. Click the button to open the EtherNet/IP editing page.





9.4.2 Set up the IP Address

This section provides an overview on how to set up IP address for AS Series modules. Set up the IP address before configuring the EIP related parameters or data exchange settings. For the editing on the network parameters, you need to go to HWCONFIG -> Edit Area -> General -> Ethernet Port Basic Setting.



9.4.2.1 IP Address Types

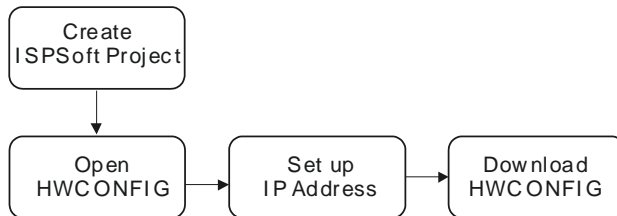
The AS Series supports 3 types of IP addressing, BOOTP, DHCP and static IP address.

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

### 9.4.2.2 Set the IP Address (Static IP)

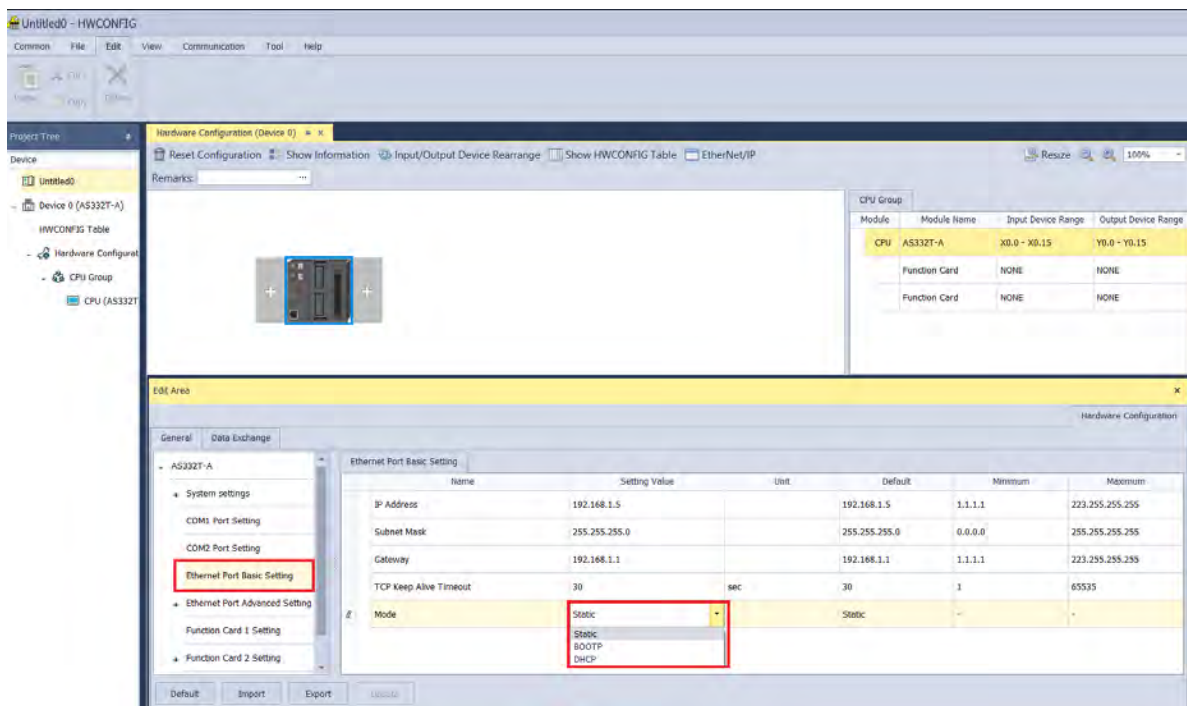
#### ● Steps to set the IP address

When using an EIP product with a static IP address, set up the IP address in HWCONFIG in ISPSOft. The following example uses the AS Series.

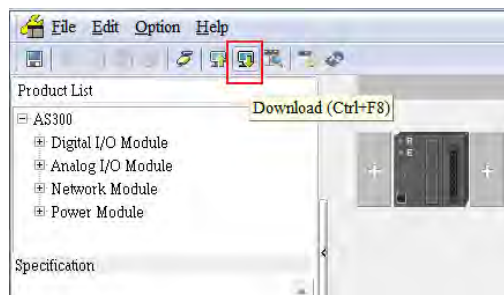


#### 1. Configure the network parameters

- ◆ Double-click the AS Series module in HWCONFIG to see the Edit Area.
- ◆ On the **Ethernet Port Basic Setting** tab, set the IP address and then click **OK**.

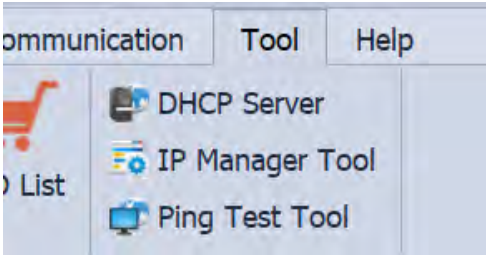


- #### 2. Save and download the settings from HWCONFIG: on the **File** menu click **Save** to save the settings and then click Download button on the toolbar.



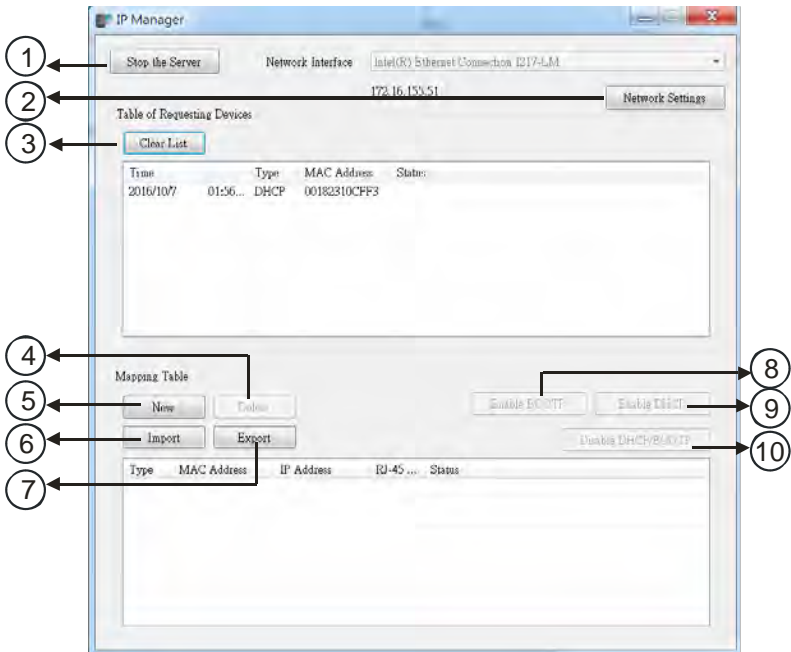
9.4.2.3 Set up the IP Address (BOOTP/DHCP)

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



If the default IP type is DHCP, open DHCP Server to set up the IP address.

DHCP :

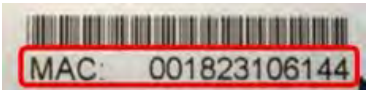


|   | Item             | Definition   |
|---|------------------|--|
| ① | Stop the Server  | Stops the BOOTP/DHCP server; the IP manager does not request an IP addresses from the BOOTP/DHCP server. |
| ② | Network Settings | Opens a dialog box to set up the subnet mask, gateway, primary DNS, secondary DNS, and domain name.      |
| ③ | Clear List       | Clears the contents of the list.   |
| ④ | Delete           | Deletes the selected item from the list.   |
| ⑤ | New              | Adds a new IP/MAC address.   |
| ⑥ | Import           | Imports the IP/MAC address list; the file format is .CSV.  |
| ⑦ | Export           | Exports the IP/MAC address list; the file format is .CSV.  |

|   |                    |   |
|---|--------------------|---|
| ⑧ | Enable BOOTP       | Enables the BOOTP to assign an IP address for the selected item.                                    |
| ⑨ | Enable DHCP        | Enables the DHCP to assign an IP address to the selected item.                                      |
| ⑩ | Disable BOOTP/DHCP | Disables the BOOTP/DHCP on the device; the device does not request an IP addresses from the server. |

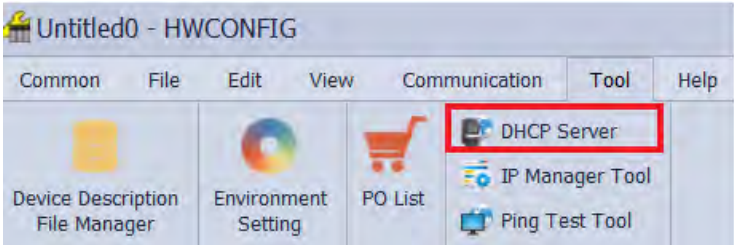
● **Steps to set the IP address:**

1. MAC address: find the MAC address on the EIP device. The MAC address uniquely identifies the device.

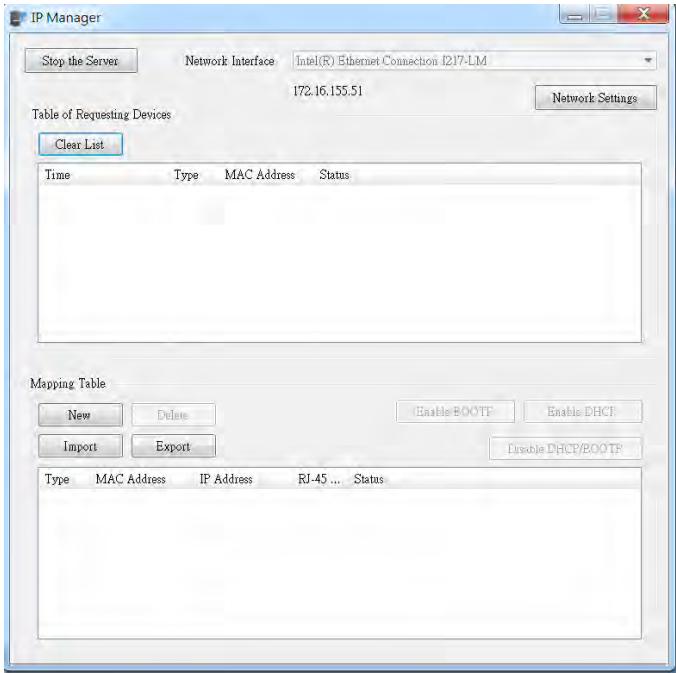


2. Open the DHCP Server

◆ HWCONFIG : Click **Tool** and then click **DHCP Server**.

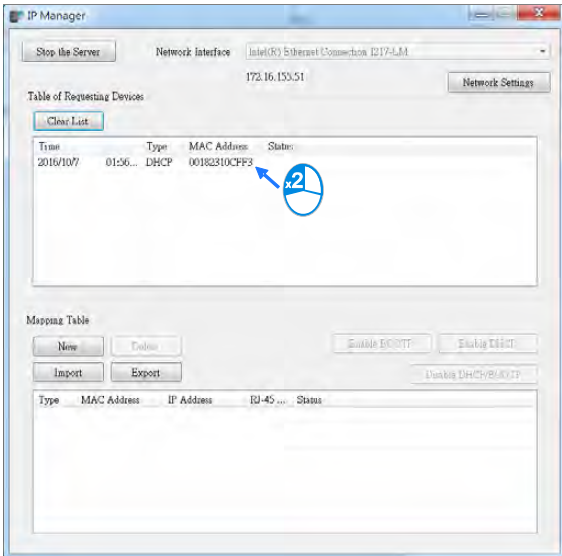


◆ The IP Manager can be the BOOTP/DHCP Server, receiving IP address requests from devices. The IP Manager window is shown below.

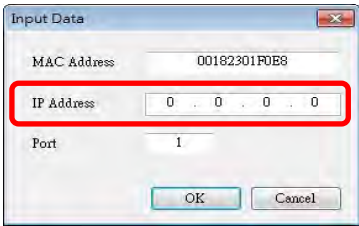


3. Set up the IP address

- ◆ Double-click the listed MAC address for your device to open the Input Data dialog box.

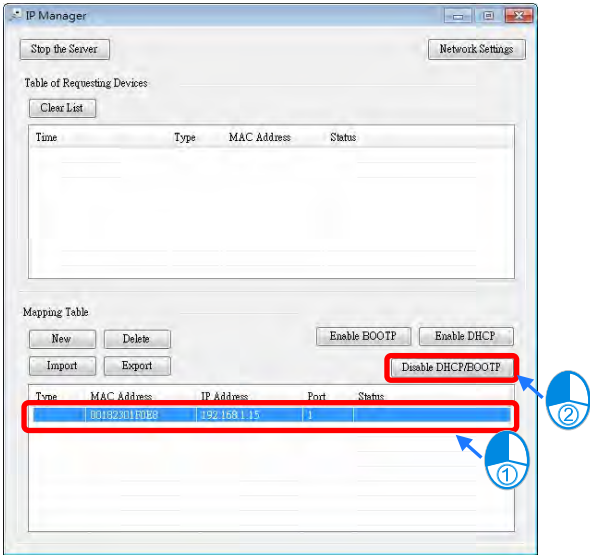


- ◆ Enter the IP address and click **OK**.



4. Disable DHCP/BOOTP

Click the device in the Exchange Table that you want to disable, then click **Disable DHCP/BOOTP**. The selected device does not send DHCP/BOOTP requests. To change the IP address receiving mode, refer to Section 9.4.2.2 for more information.



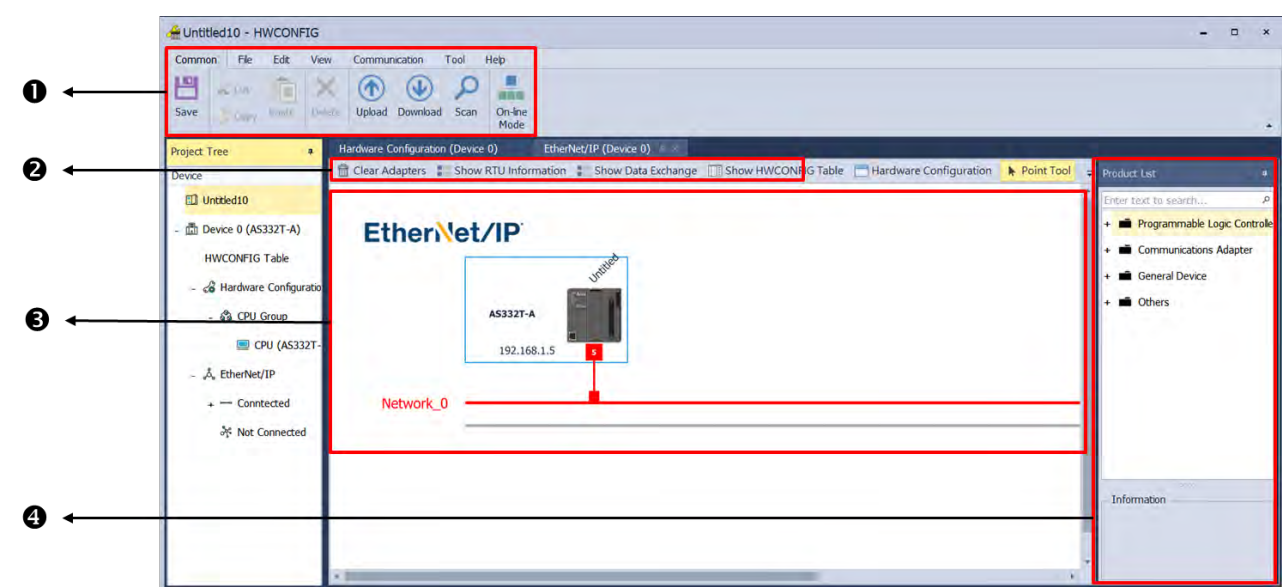
Notes

- Enable BOOTP: when the IP address receiving mode is BOOTP (BOOTP is enabled), the IP address is assigned, and the device sends out BOOTP requests for IP addresses during each power-on.
- Enable DHCP: when the IP address receiving mode is DHCP (DHCP is enabled), the IP address is assigned, and the device sends out DHCP requests for IP addresses during each power-on.
- Disable DHCP/BOOTP: when BOOTP is disabled, the device does not send out any DHCP/BOOTP requests for IP addresses during each power-on.

9.4.3 Network

HWCONFIG provides a graphical user interface, and you can see the devices and their EtherNet/IP connections in the Network View.










EtherNet/IP Page












|   | Item               | Definition  |
|---|--------------------|---|
| ❶ | Toolbar            | Toolbar buttons   |
| ❷ | Network View       | Displays the connected devices and their connection status          |
| ❸ | Configuration Area | Displays the configurations and allows you to set the parameters    |
| ❹ | Product List       | Displays the available devices that can be connected to EtherNet/IP |




Function Buttons

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |
| Save  | Copy  | Paste   | Delete  | Upload  | Download  | Scan  | On-line Mode  |   |


| Icon  | Name         | Definition                                |
|---|--------------|---|
|    | Save         | Saves the project                         |
|    | Cut          | Cuts the selected item                    |
|    | Copy         | Copies the selected item                  |
|    | Paste        | Pastes the selected item                  |
|    | Delete       | Deletes the selected item                 |
|    | Uploader     | Uploads from a device                     |
|   | Downloader   | Downloads to a device                     |
|  | Scan Network | Scans the network for device availability |
|  | On-line Mode | Switches to on-line mode                  |

Setting Area

 Clear Adapters

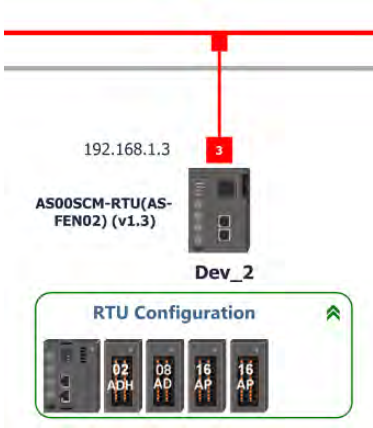
 Show RTU Information

 Show Data Exchange

 Show HWCONFIG Table

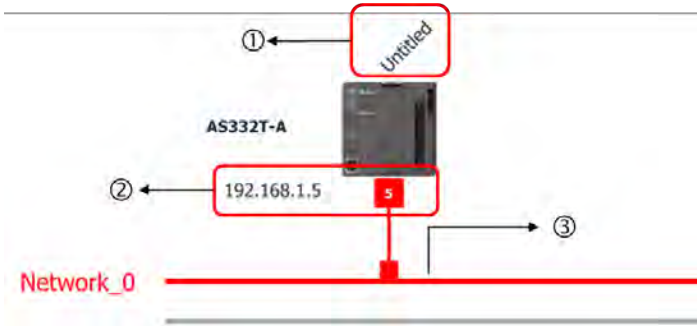
 Hardware Configuration

- Clear Adapters: Use this button to clear EIP Builder of the network and the data exchange table.
- Show RTU Information: Use this button when the PLC works with AS00SCM-RTU (AS-FEN02) and once you click this option, the placement of RTU will show up.



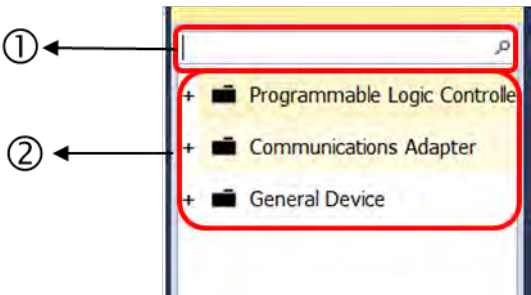
- Show Data Exchange: Use this button to open the data exchange table. More information on data exchange will be given in the following sections.
- Show HWCONFIG Table: Use this button when the PLC works with AS00SCM-RTU (AS-FEN02). Refer to Chapter 9 from AS Series Module Manual for more information.
- Hardware Configuration: Use this button to switch back to HWCONFIG main page.

Network View



|   | Name        | Definition  |
|---|-------------|---|
| ① | Device name | Name of the device; Scanner name can be edited in hardware configuration, while Adapter name can be changed here.                                       |
| ② | IP address  | Shows the IP address of the device; the red box indicates it is the communication port and the number shown is the last digit of the device IP address. |
| ③ | Network_0   | Displays the connection status; devices on the same line indicate they are in the same network.   |

Product List



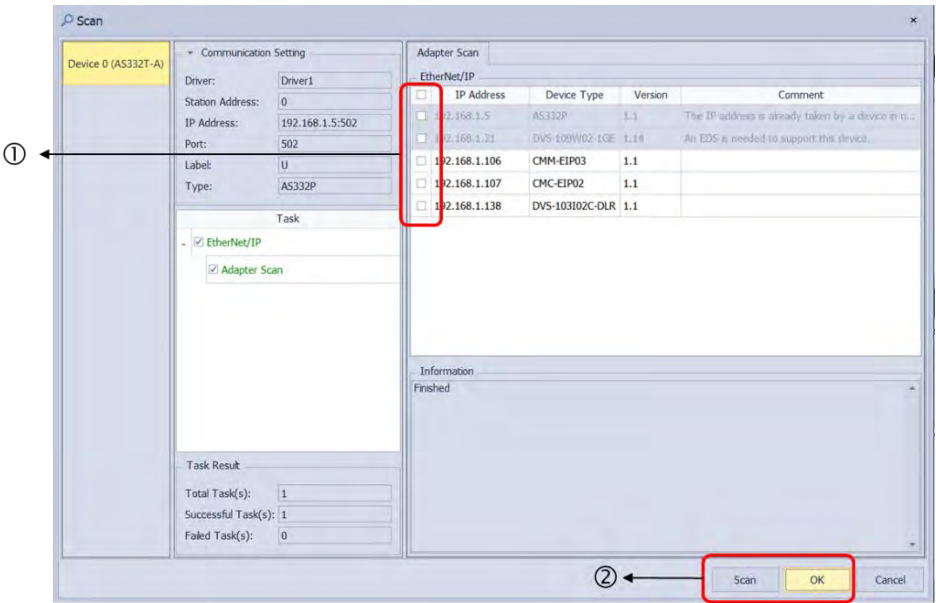
|   | Name         | Definition   |
|---|--------------|--|
| ① | Search Bar   | Type the module name you want to find; if no match is found, that means there is no EDS file in the system matching the module name. |
| ② | Product List | Categorizes the devices according to the EtherNet/IP definition; devices from third parties are in the <b>Others</b> folder.         |



9.4.4 Add New Devices

Scan Network

- Steps to add new devices by scanning the network
  1. Click the **Scan** button to scan the network and the scanned devices are shown in the Adapter Scan.
  2. Select the devices to add to the Network View, and then click **OK** to add the selected devices.

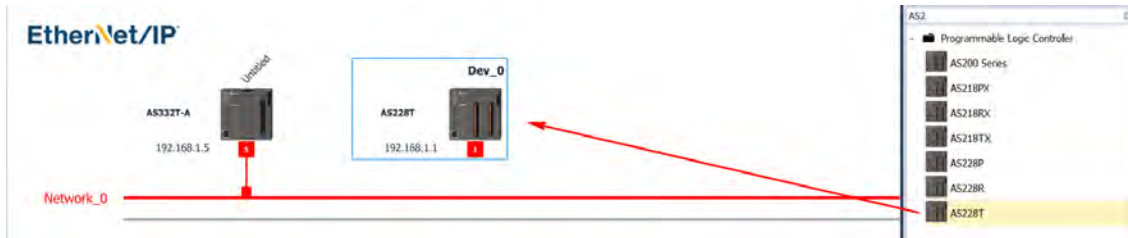


|   | Name                 | Definition  |
|---|----------------------|---|
| ① | Selection checkboxes | Select the devices you want to add to the network view. |
| ② | Scan                 | Scan the network again                                  |
| ② | OK                   | Add the selected device to the network view             |

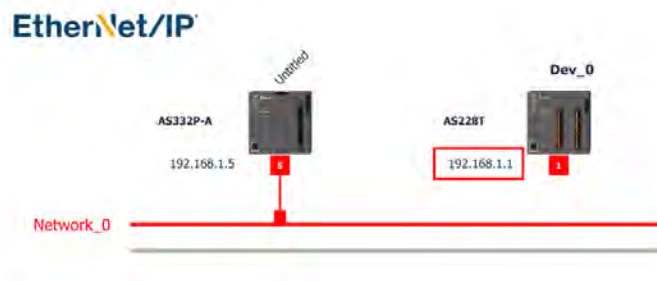
## Add devices (Manually)

- Steps to add new devices manually

1. Select the devices to add from the Product List. You can also enter the module name in the search bar. Drag the device onto the Network View.



2. Double-click the IP address of the added device to edit its IP address.



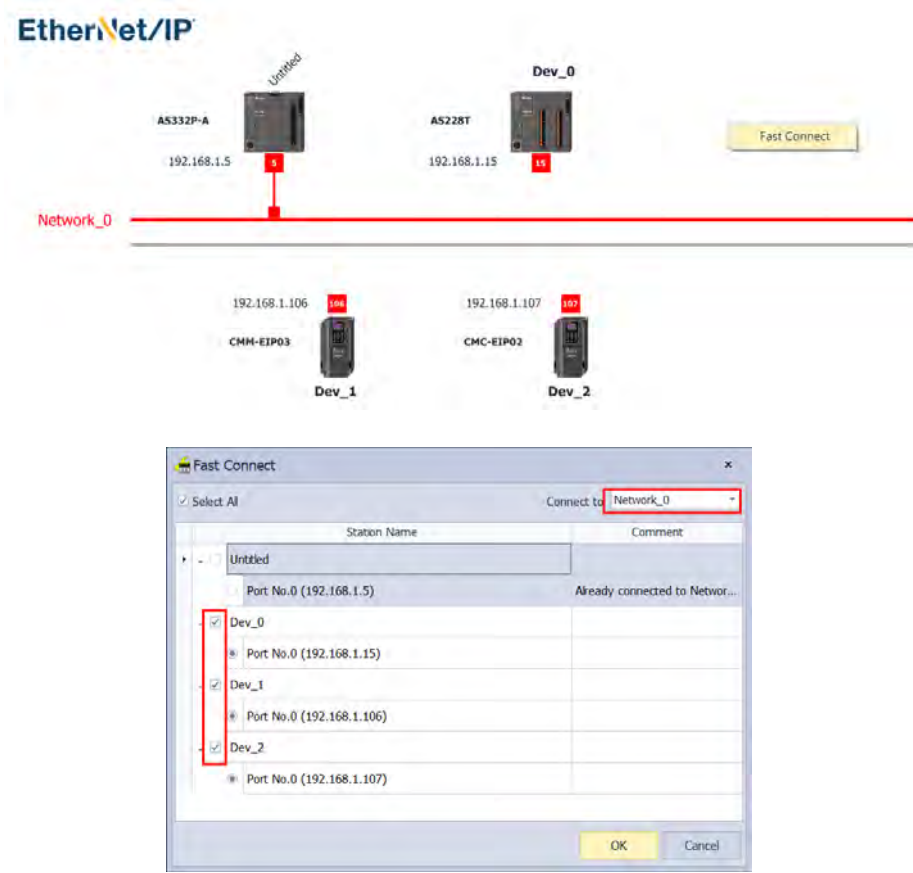
## Set EIP parameters

1. Create the network

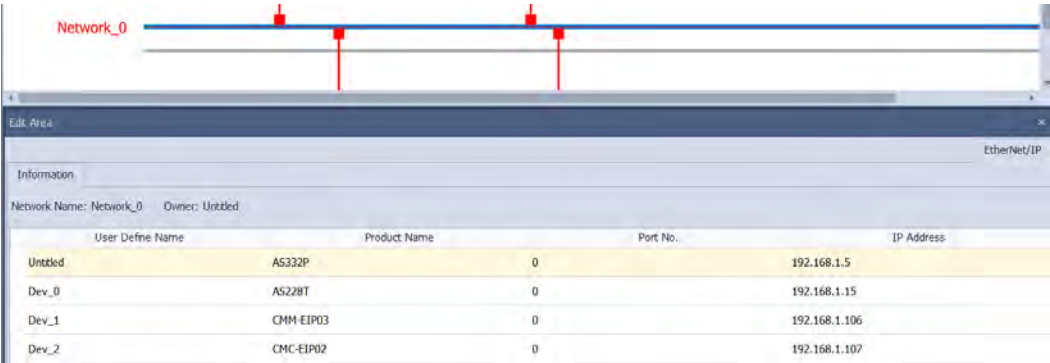
- (a) Drag the Ethernet communication port (the red box) of the device to the network to create a new connection.



- (b) Right-click on the blank area to see the **Fast Connect** option and then click it to see a list of available devices. Select the ones you need to add multiple devices at the same time to the network.



- (c) Once the connection is established, click the network line “Network\_0” to see all the connected devices in this network in the Information window.



2. Set the parameters

Click the tabs in the Information window to view and edit the Data Exchange, Information and the Device Parameter.



- Data Exchange

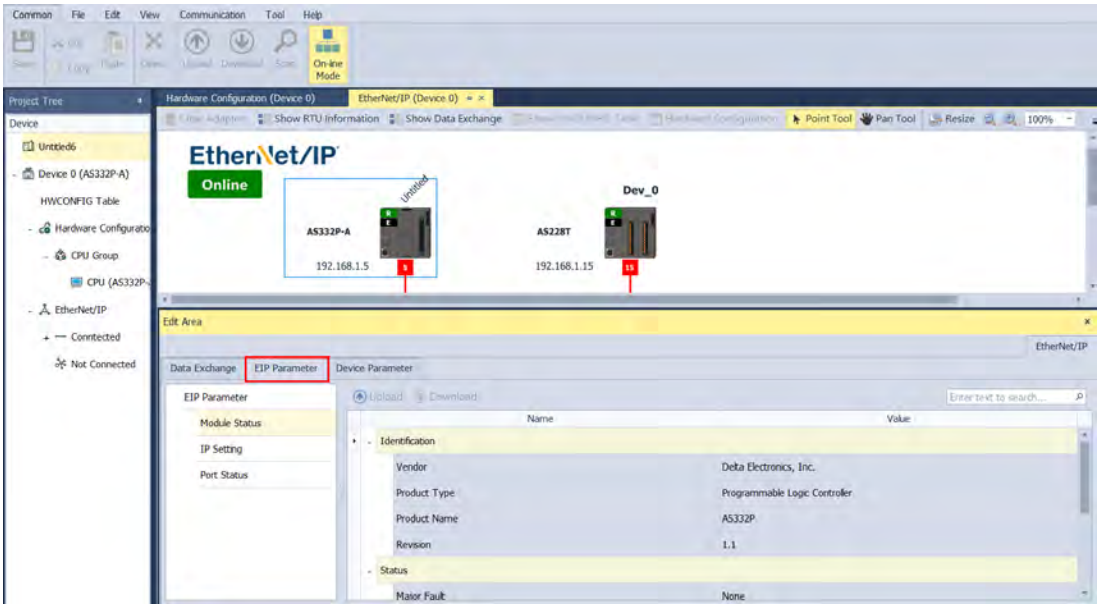
Only when the selected device is an EIP Scanner, this tab can be functional. Refer to section 9.4.5 for more information on Data Exchange.

- Information / EIP Parameter

When offline, this tab is shown as Information. You can check information in the EDS file. When adding an EIP Adapter, you will need to set up the device IP address here. Refer to section 9.4.4.2 for more information.



When the device is connected, this tab is shown as EIP Parameter. You can click the **Upload** button to upload the related parameters from the device. Or click the **Download** button to download the related parameters to the device.



|   | Name          | Definition   |
|---|---------------|--|
| ① | Module Status | <ul style="list-style-type: none"><li>● Identification: displays information regarding Vendor, Product Type, Product Name, Revision, etc.</li><li>● Status: displays connection status, including Major Fault, Minor Fault, Internal State, Configuration Status, and Module Identity.</li></ul> |
| ② | IP Setting    | <ul style="list-style-type: none"><li>● Port1: indicates port 1 of the device, for editing IP Address, Subnet Mask, Gateway Address, and Host Name.</li></ul> <p>Note: when there is a Port2, that means there are 2 Ethernet communication ports.</p>   |
| ④ | Port Status   | <ul style="list-style-type: none"><li>● Displays Link Status, Speed, Duplex, Negotiation Status and Hardware Fault.</li></ul>  |

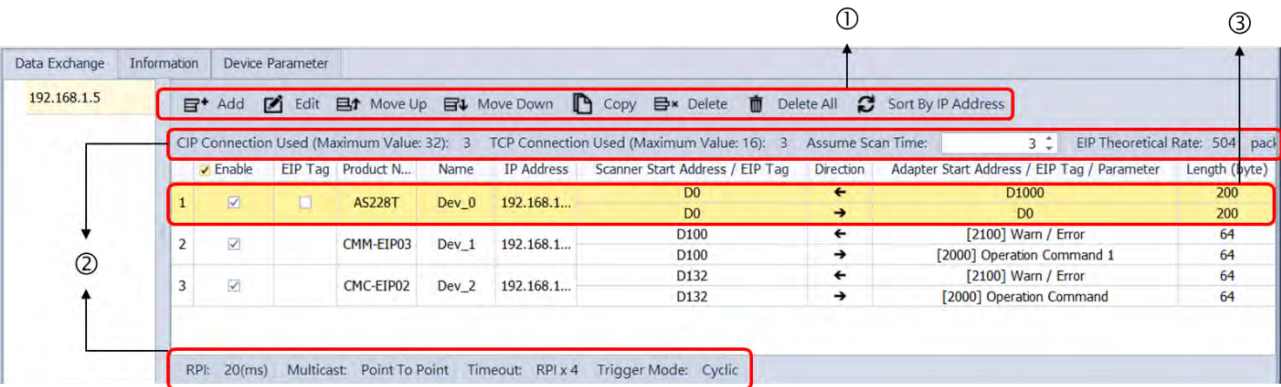
9.4.5 Data Exchange – Implicit Message

When the connection between devices is established, you can use exchange data between devices. This section provides an overview of how to create a data exchange table.



9.4.5.1 Data Exchange page

1. Data Exchange Table



| No. | Category        | Item                     | Description  |
|-----|-----------------|--------------------------|--|
| ①   | Tool bar        | Add                      | Use this button to add new item for data exchange. Click the IP address column of the newly added row to select the IP address of the to-be-added device.  |
|     |                 | Edit                     | Use this button to open the data exchange table for editing.   |
|     |                 | Move Up / Move Down      | Use this button to change the order of data exchange. (this order is related to the order in SR1020 to SR1083, the EtherNet/IP connection 1 to 32).  |
|     |                 | Copy / Delete            | Use this button to copy or delete the selected row.  |
|     |                 | Delete All               | Use this button to delete the whole data exchange table.   |
|     |                 | Sort By IP Address       | Use this button to arrange the order of data exchange by IP addresses.   |
| ②   | Information bar | Number of connections    | <ul style="list-style-type: none"><li>● CIP Connection Used: the total number of connections for data exchange</li><li>● TCP Connection Used: the total number of connected devices</li></ul> Connection for data exchange; each row represents one independent EtherNet/IP connection. The number of connections cannot exceed the maximum number of connections for the Scanner. For example, AS Series can be connected to up to 16 adapters and the maximum number of connections for data exchange is 32. |
|     |                 | Communication capacity   | Enter the assumed PLC scan time to estimate the network loading for the data exchange. Refer to section 9.3.2 for more information.  |
|     |                 | Communication parameters | Display the essential parameters of the selected row.  |
| ③   | Data            | Enable                   | Enable or disable the data exchange of the connection.   |

| No. | Category       | Item  | Description  |
|-----|----------------|---|--|
|     | exchange table | EIP Tag                                     | <p>You must create a Consumed Tag in the Global Symbols in ISPSOft before using this function.</p> <p>Use EIP Tag to perform data exchange with adapters.</p> <p>After selecting this check box,</p> <ul style="list-style-type: none"> <li>• The directional arrow points left of (←) (READ only)</li> <li>• Registers cannot be used in this row.</li> <li>• The length format is defined by the data format in the Global Symbols; you cannot change the length format here.</li> <li>• Refer to section 9.4.6 for more information.</li> </ul> |
|     |                | Product name                                | Once you select the IP address, its name is displayed. And it cannot be changed here.  |
|     |                | Name  | Go to the network view to change the device name. Refer to section 9.4.3.3 for more information.   |
|     |                | IP Address                                  | The IP address of the Adapter for the Scanner to connect to. After the data exchange connection is established, the system loads the connected devices' IP addresses. After that you can select the device's IP address from the list to add or edit the connection.   |
|     |                | Scanner Start Address / EIP Tag             | <p>Starting address of the Scanner register in the data exchange table</p> <p>FW V1.08 or previous versions support device D.</p> <p>FW V1.10 or later version support device D and M.</p> <p>Using device D or device M takes 2 bytes as a unit in data length.</p>   |
|     |                | Adapter Start Address / EIP Tag / Parameter | Starting address of the target Adapter register in the data exchange table / EIP Tag / Parameters  |
|     |                | Length (byte)                               | Set the data exchange length. The data length is set according to EDS file and the maximum is 500 bytes; unit: byte. You cannot change the length here when using EIP Tag.   |

## 2. Data Exchange Parameters

Click **Data Exchange** tab and click the Data Exchange device. After that click **Edit** to open the data exchange setting page.

**Data Exchange** device: AS228T (Dev\_0) Remote Address: 192.168.1.15

**General Setting**

Connection Manager: Connection1

EDS Compare Rule: Compatible Keying

☒ Enable

☐ EtherNet/IP Tag

**I/O Parameter Setting**

RPI (ms): 10 ☐ Apply to all

Multicast: Point To Point

Timeout: RPI x 4 ☐ Apply to all

Trigger Mode: Cyclic

**Connection Path Setting**

Input Instance: 101

Output Instance: 100

Configure Instance: 128

**Read**

Scanner Start Address: D 0 Adapter Start Address: D 1000 Length (byte): 200

**Write**

Scanner Start Address: D 0 Adapter Start Address: D 0 Length (byte): 200

**Config Data** Data Type: UINT Minimum Value:0 Maximum Value:3

|   | Name                              | Value |
|---|-----------------------------------|-------|
| 1 | Conn1_Input(T->O) DeviceType      | D     |
| 2 | Conn1_Input(T->O) DeviceQuantity  | 200   |
| 3 | Conn1_Input(T->O) DeviceIndex     | 1000  |
| 4 | Conn1_Output(O->T) DeviceType     | D     |
| 5 | Conn1_Output(O->T) DeviceQuantity | 200   |
| 6 | Conn1_Output(O->T) DeviceIndex    | 0     |

Default OK Cancel

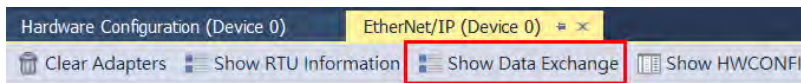
| Name                         | Item                            | Description  |
|------------------------------|---------------------------------|--|
| <b>General Setting</b>       | Connection Manager              | Select the connection from the EDS file. Different connections may have different exchange parameters.   |
|                              | EDS Compare Rule                | EIP Scanner checks the followings according to the setting: <ul style="list-style-type: none"> <li>Disable keying: Disable key checking the product information and versions.</li> <li>Compatible keying: Check the product information (Vendor ID, Device Type, Product Code), and Major Revision (should be matched). Minor revision is not checked.</li> <li>Exact match: Check the product information, major revision and minor version should be matched with what stated in EDS file.</li> </ul>                  |
|                              | Enable                          | Enable or disable the data exchange.   |
|                              | EtherNet/IP Tag                 | Use EtherNet/IP Tag to perform data exchange with adapters. You must create a Consumed Tag in the Global Symbols in ISPSOft before using this function. After selecting this check box, <ul style="list-style-type: none"> <li>The directional arrow points left of (←) (READ only)</li> <li>Registers cannot be used in this row.</li> <li>The length format is defined by the data format in the Global Symbols; you cannot change the length format here.</li> <li>Refer to section 9.4.6 for more details</li> </ul> |
| <b>I/O Parameter Setting</b> | Requested Packet Interval (RPI) | <ul style="list-style-type: none"> <li>Time interval to request packets through the I/O connection, unit: ms</li> <li>Click <b>Apply to all</b>: to apply the I/O parameter settings to all the items on the data exchange list.</li> </ul>  |
|                              | Multicast                       | <ul style="list-style-type: none"> <li>Communication mode setup: <b>Multicast</b> or <b>Point-to-Point</b></li> <li><b>Point-to-Point</b> is more common; use <b>Multicast</b> when the connection is Listen_only.</li> </ul>  |
|                              | Timeout                         | <ul style="list-style-type: none"> <li>Sets the timeout according to the <b>RPI</b> or a multiple of RPI (RPI*X).</li> <li>Click <b>Apply to all</b>: to apply the settings to all the items on</li> </ul>   |



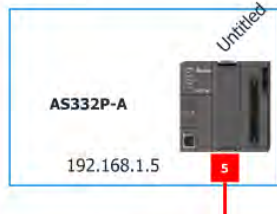
| Name  | Item  | Description   |
|---|---|---|
|   |   | <p>the data exchange list.</p> <ul style="list-style-type: none"> <li>The minimum value is 100 ms. When a value that is less than 100 ms, the PLC will automatically double the timeout setting. For example, if the RPI=20 ms and the multiple value is set to 4, the total will be 80 which is less than 100. PLC will automatically double the multiple value from 4 to 8 to make the timeout setting value bigger than 100 ms.</li> </ul> |
|   | Trigger Mode  | <p>Data refreshing trigger mode; common use: cyclic</p> <ul style="list-style-type: none"> <li>Cyclic: refreshing data cyclically</li> <li>Change of State: refreshing data once there is any change</li> <li>Application: refreshing data according to product definition</li> </ul>   |
| <b>Connection Setting</b>                                     | Path  |   |
|   | Input Instance  | <ul style="list-style-type: none"> <li>The instance number is the same as the data exchange connection number. You can tell the mapped data is from which corresponding device by the instance number. The parameters are read from the EDS file, when connected, if the connection of the Connection Manager changes, this section updates values accordingly.</li> </ul>  |
|   | Output Instance   |   |
|   | Configure Instance  | <ul style="list-style-type: none"> <li>You can edit input instance, output instance and configure instance in some of the EDS files. If not the section is grayed-out.</li> </ul>   |
| <b>Input (T-&gt;O) Instance<br/>Output (O-&gt;T) Instance</b> | Address   | <ul style="list-style-type: none"> <li>Delta controller products: you can set the register address for data exchange.</li> <li>Delta drive products: the supported products are listed on the editing page. Click "... " on the editing page for more information.</li> </ul>   |
|   | Length  | <ul style="list-style-type: none"> <li>Set the length for data exchange; unit: byte and 2 bytes</li> <li>When device M is used in the beginning address of the scanner; the data length unit can be set to 2 bytes (16 bits).</li> </ul>  |
| <b>Configure Instance</b>                                     | <p>You can use self-defined parameters. But the parameters are set according to the EDS file from the EIP Adapter. After editing, download the parameters to EIP Scanner and then after the connection is established, write the parameters into EIP Adapter.</p> |   |

### 9.4.5.2 Delta Adapter

1. Refer to section 9.4.4 to add new devices and create connections for all the added devices.
2. Click Show Data Exchange to open the editing page for data exchange.



**EtherNet/IP**



3. Set up the address for data exchange

Set up the register address for the Scanner. Make sure the register address is free for use. The following examples use 3 different types of devices for demonstrations.

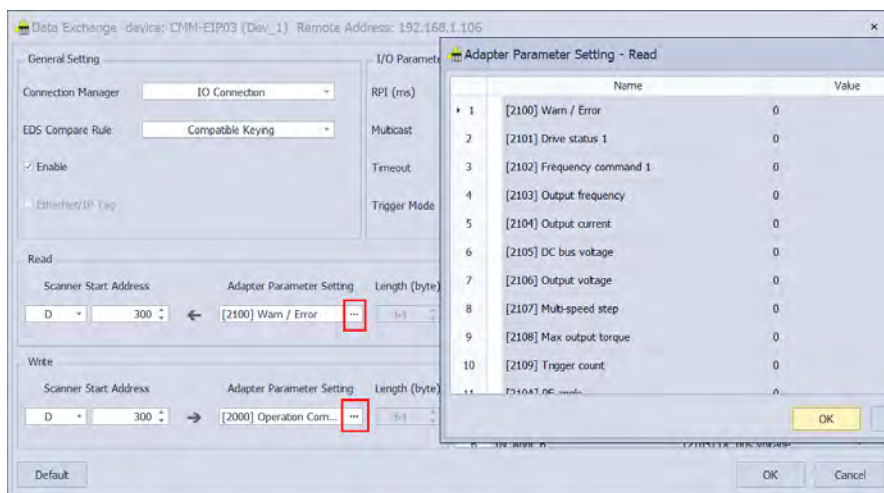
- **PLC Controller - AS200**

Multiple data exchanges can be executed for one PLC controller at a time. One connection is for one data exchange. You can edit the addresses and data lengths for data exchange. Unit: 2 bytes.

| CIP Connection Used (Maximum Value: 32):   |                                     | 3            | TCP Connection Used (Maximum Value: 16): |              | 1                               | Assume Scan Time: |   | 3 | EIP Theoretical Rate: |               | 304 | packet p |
|--|-------------------------------------|--------------|--|--------------|---------------------------------|-------------------|---|---|-----------------------|---------------|-----|----------|
| <input checked="" type="checkbox"/> Enable | EIP Tag                             | Product Name | Name                                     | IP Address   | Scanner Start Address / EIP Tag | Direction         | Adapter Start Address / EIP Tag / Parameter |   |                       | Length (byte) |     |          |
| 1  | <input checked="" type="checkbox"/> | AS228T       | Dev_0                                    | 192.168.1.15 | D0                              | ←                 | D1000                                       |   |                       | 200           |     |          |
|  |                                     |              |  |              | D0                              | →                 | D0  |   |                       | 200           |     |          |
| 2  | <input checked="" type="checkbox"/> | AS228T       | Dev_0                                    | 192.168.1.15 | D100                            | ←                 | D1100                                       |   |                       | 200           |     |          |
|  |                                     |              |  |              | D100                            | →                 | D100  |   |                       | 200           |     |          |
| 3  | <input checked="" type="checkbox"/> | AS228T       | Dev_0                                    | 192.168.1.15 | D200                            | ←                 | D1200                                       |   |                       | 200           |     |          |
|  |                                     |              |  |              | D200                            | →                 | D200  |   |                       | 200           |     |          |

- **Servo drive – CMM-EIP02 (MS300)**

- 1) Only one data exchange can be executed for one servo drive at a time. The data length is fixed and cannot be edited.
- 2) Click “...” to see more servo drive settings.



- 3) Most of the functions in the data exchange area are fixed. Some self-defined options are in HWCONFIG. Make sure your ISPSOft is up to date.

|    | Name                   | Value |
|----|------------------------|-------|
| 23 | [6106] Output Torque 2 | 0     |
| 24 | Reserved               | 0     |
| 25 | Reserved               | 0     |
| 26 | User Defined           | ...   |
| 27 | User Defined           | ...   |
| 28 | User Defined           | ...   |
| 29 | User Defined           | ...   |
| 30 | User Defined           | ...   |
| 31 | User Defined           | ...   |
| 32 | User Defined           | ...   |

- 4) Refer to Delta High Frequency Motor Drive C2000 User Manual for more details.
- Delta Temperature Controller (DTME)

1) Multiple data exchanges can be executed for one PLC controller at a time. One connection indicates one module. Connection 1 represents the CPU and connection 2 represents the first DTME module and so forth.  
2) You can edit all the corresponding parameters.

|     | Name                             | Value |
|-----|----------------------------------|-------|
| ▶ 1 | [X268] MON-PV1 CH1 Present Value | ...   |
| 2   | [X269] MON-PV2 CH2 Present Value | ...   |
| 3   | [X26A] MON-PV3 CH3 Present Value | ...   |
| 4   | [X26B] MON-PV4 CH4 Present Value | ...   |
| 5   | [X26C] MON-PV5 CH5 Present Value | ...   |
| 6   | [X26D] MON-PV6 CH6 Present Value | ...   |
| 7   | [X26E] MON-PV7 CH7 Present Value | ...   |

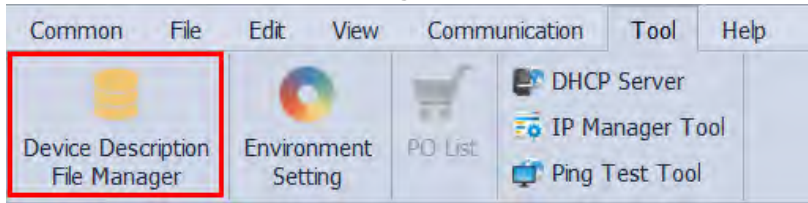
- 3) Refer to Delta Temperature Controller Operating Manual for more details.

### 9.4.5.3 The 3<sup>rd</sup> Party Adapter

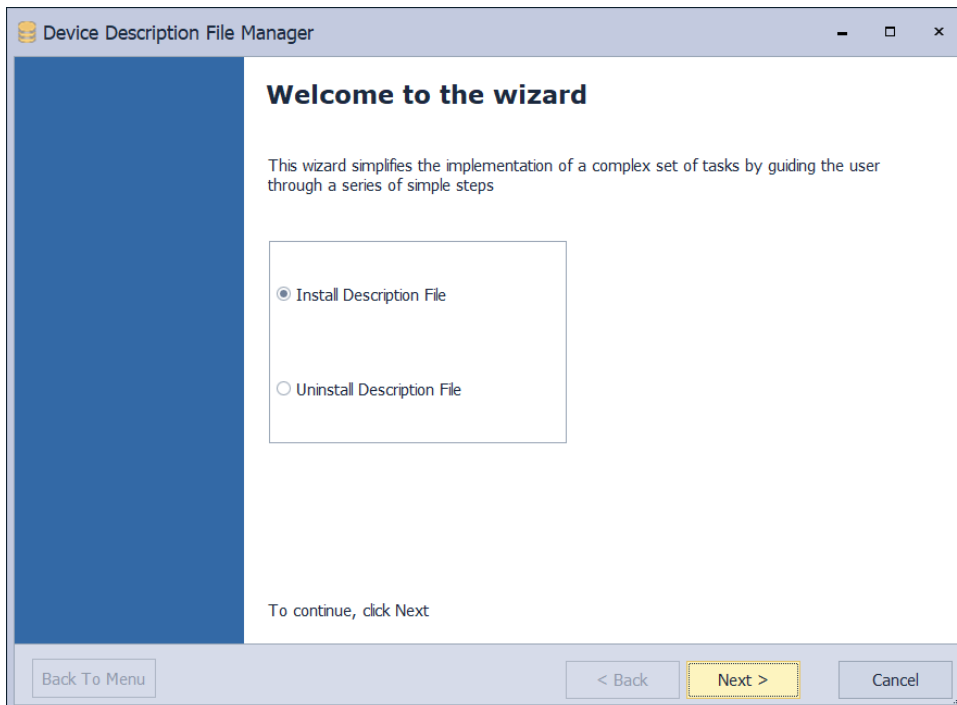
If you need to use a 3<sup>rd</sup> party adapter, you should read its user manual carefully or work closely with its trained and competent personnel to obtain the EDS file. The followings demonstrate how to add devices in with and without EDS files.

- **With EDS Files:**

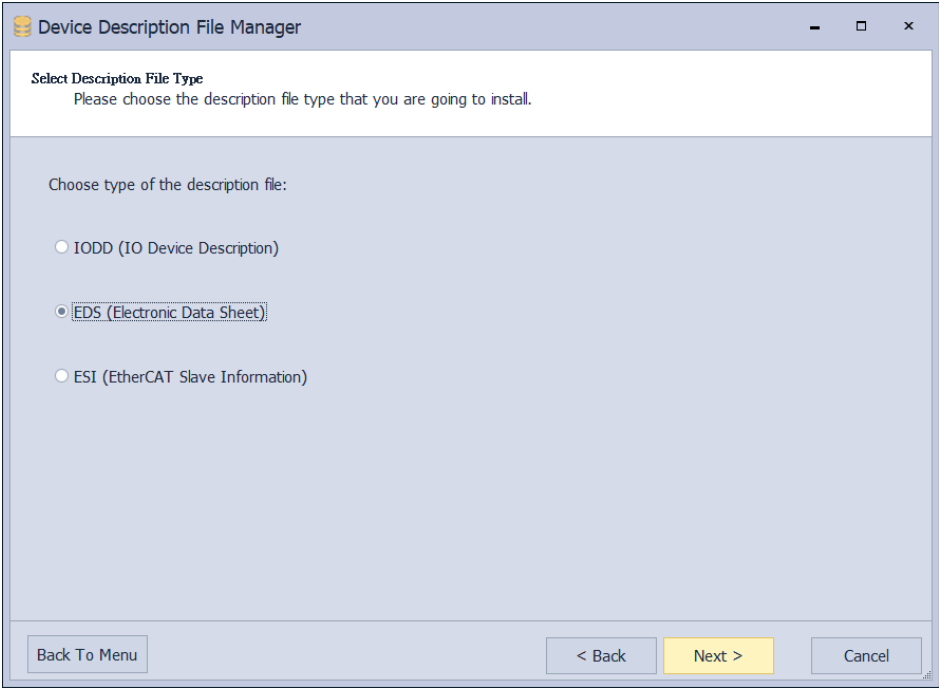
1. Import the EDS file to HWCONFIG and the wizard will guard you through the process to add the 3<sup>rd</sup> party device in the network. The parameters of the 3<sup>rd</sup> party device will be brought in automatically.
2. Click **Device Description File Manager** to open the wizard.



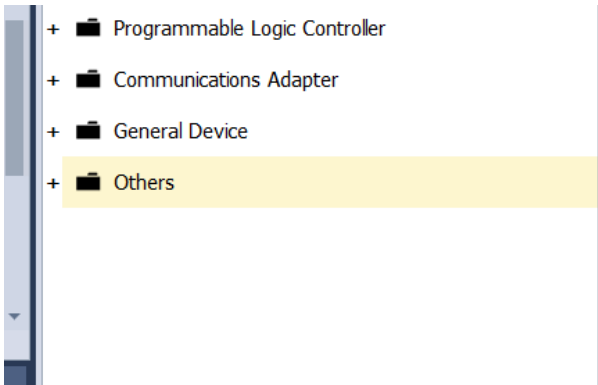
3. Select **Install Description File** and click **Next**.



4. Select **EDS (Electronic Data Sheet)** and click **Next**.

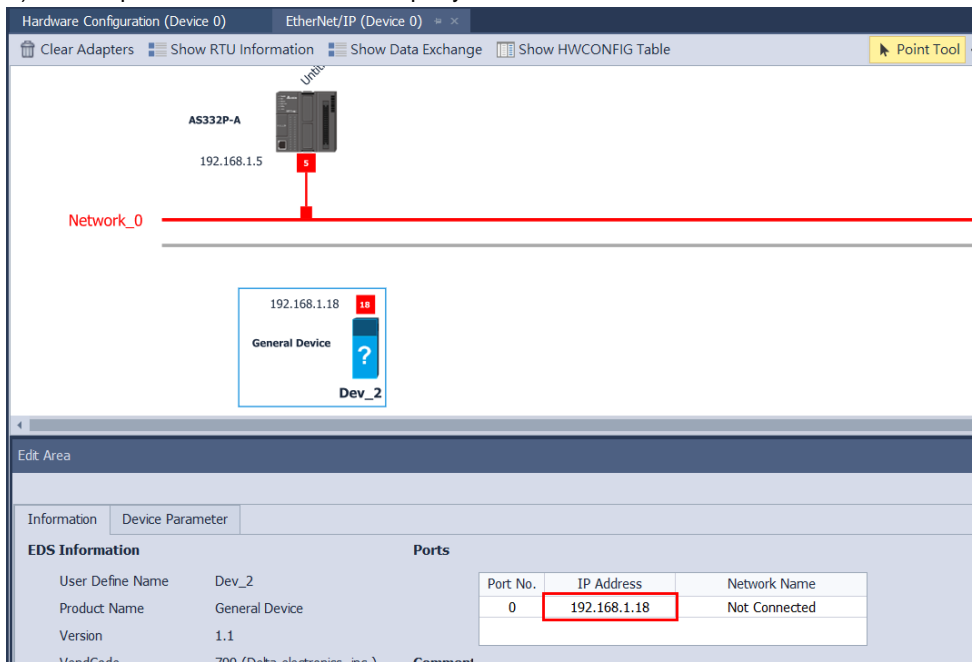


5. Select and locate where you store the EDS file and then follow the wizard to complete the import.
6. After the import is done, you can scan the network to add the device in or select it form the group of Others in Product List.

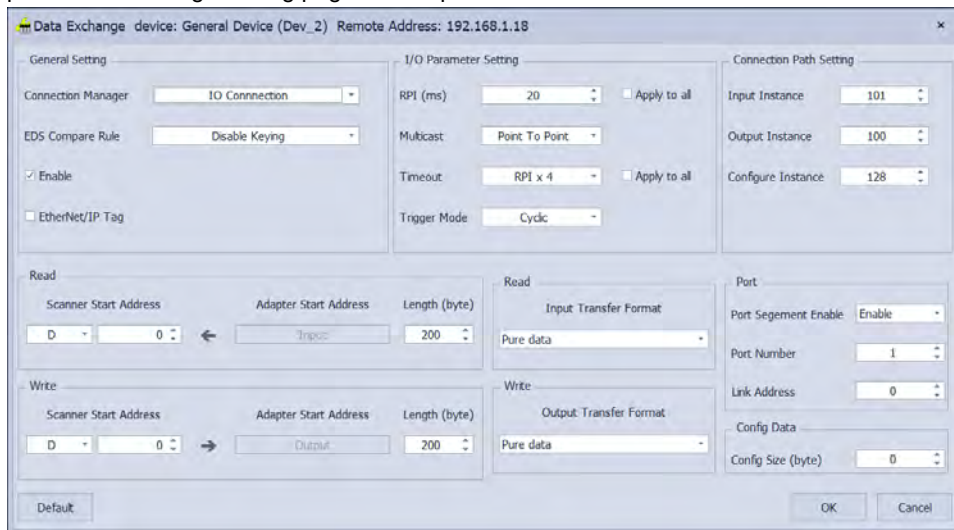


● **Without EDS Files:**

1. When there is no EDS file, you can use **General Device** to set up.
  - a) Select General Device from the Product List and add it to the network.
  - b) Set up the IP address for the 3<sup>rd</sup> party device.



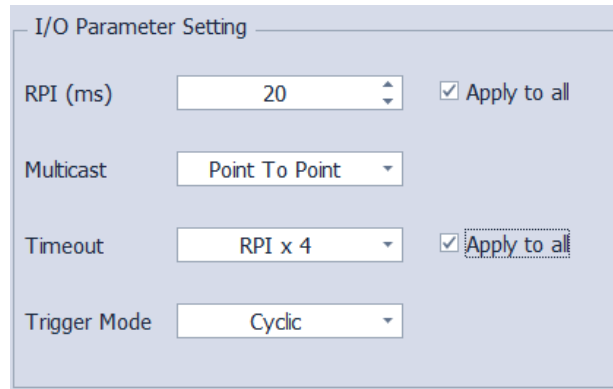
- c) Connect the device to Network\_0.
2. Open Data Exchange setting page to set up.



- a) General Setting: No need to change anything here.
- b) I/O Parameter Setting: You can edit the settings here according to your requirements.
- c) Connection Path Setting (required): You need to set up the instances for the device.
- d) Length (required): Each input/output instances has its own data length. Refer to its user manual and input the data length in. If the data here is incorrect, the connection may fail to be created.
- e) Input/output Transfer Format: For common use, input: Pure data; output: 32-bit run or Idle header.
- f) Port: No need to change anything here.
- g) Config Data: Refer to its user manual and size value in.

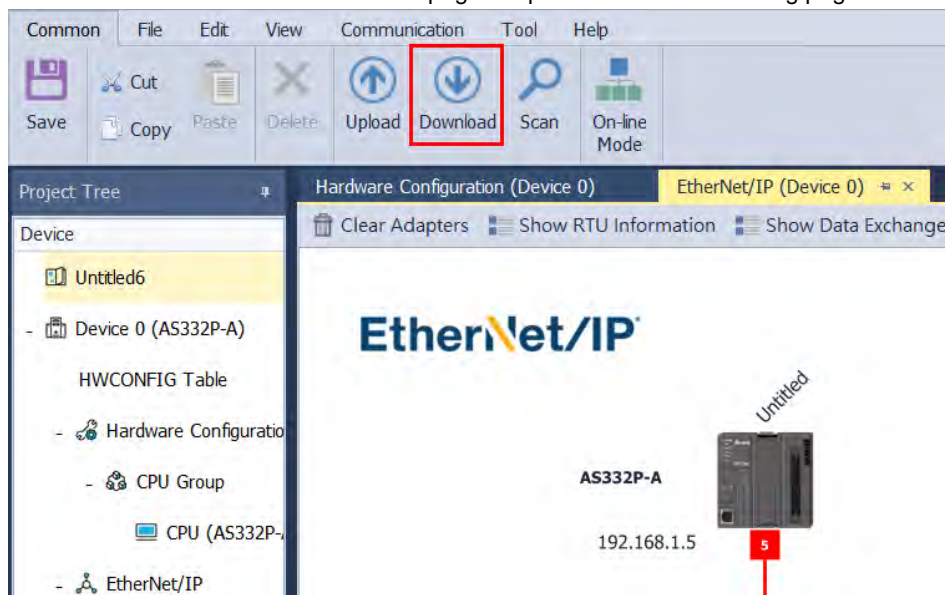
#### 9.4.5.4 I/O Parameters

- Click **Data Exchange** tab and click the Data Exchange device. After that click **Edit** to open the data exchange setting page.
- Set the data exchange interval time in RPI to have Scanner and Adapter to exchange data at a regular time interval, for example, every 20 ms.



#### 9.4.5.5 Download Parameters

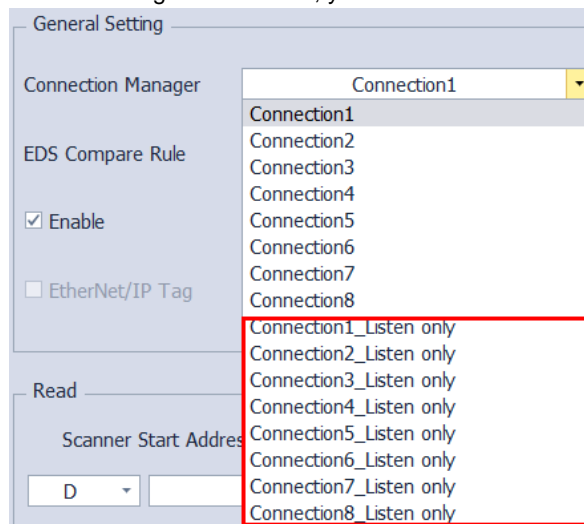
- Click **Download** on the tool bar of the EtherNet/IP page to open the Download setting page.



#### 9.4.5.6 Listen Only Connection

When using Listen only connection, multiple devices can read the same data from one EIP Adapter, but only one device can write data into the EIP Adapter. This type of connection is the least-frequently used. Setting steps are as follows.

1. Create a dual connection (input/output) between one Exclusive Owner and EIP Adapter.
2. When creating a connection to EIP Adapter, you need to select the corresponding Listen only connection. For example, when the Exclusive Owner is using Connection 1, you need to select Connection 1\_ Listen only.



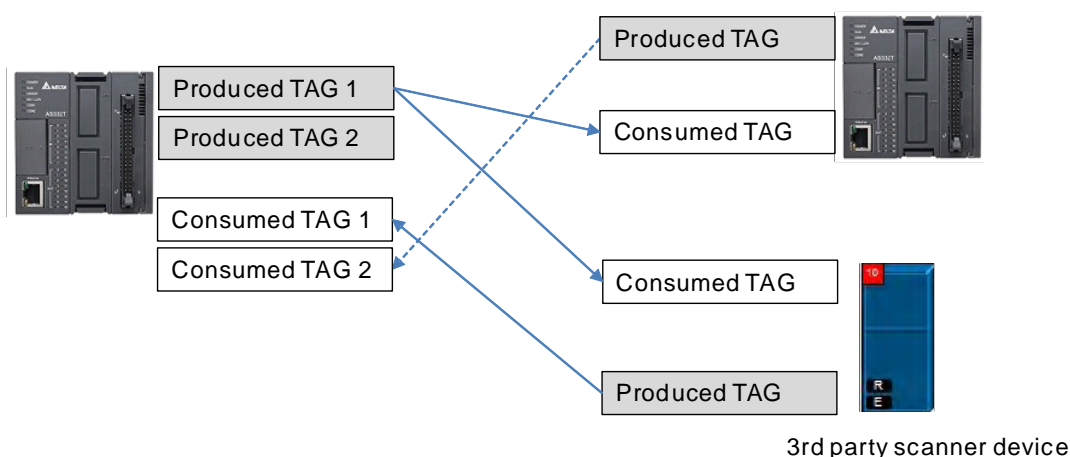
3. When the connection is established, the Exclusive Owner can read/write data on EIP Adapter. For Listen only connection, the device can read data that is as what the Exclusive Owner reads. But the device cannot write data into the EIP Adapter.
4. When the connection of Exclusive Owner and the EIP Adapter is disconnected, the Listen only connection will be closed too. After the connection of Exclusive Owner and the EIP Adapter is reconnected, the Listen only connection will be resumed.



## 9.4.6 EtherNet/IP Tags

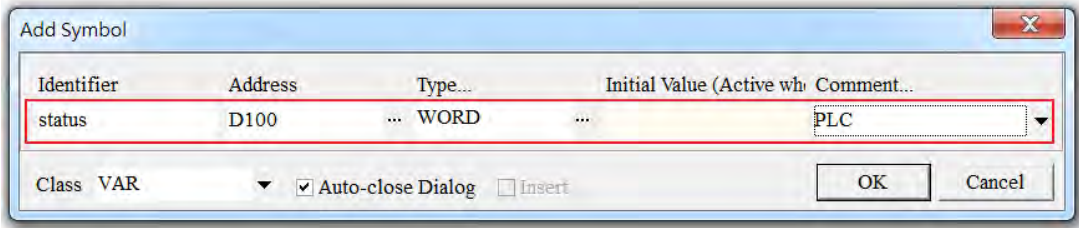
EtherNet/IP Tag can be used for data transfer among different controllers. Create the tags from global symbols in ISPSOft. And then you can use tags to communication with Delta HMI and the 3<sup>rd</sup> party devices while they are attached to the same EtherNet/IP network.

- Tags can be further defined as Produced Tag and Consumed Tag.
  - Produced Tag: a tag that a controller makes available for other controller. Multiple controllers (EIP scanner devices) can simultaneously consume (receive) the data. A produced tag sends its data to consumed tags (consumers).
  - Consumed Tag: a tag that receives the data of a produced tag. The data type of the consumed tag and the produced tag must be matched (including any array dimensions).
- Before connecting to a Produced Tag, you should check the IP address and the names of the tags (Produced Tag and Consumed Tag). One controller can have multiple Tags created, including produced Tag and consumed Tag. See the example below:



- The following Delta products support Tag function:
  - AS Series PLC CPU: V1.08.20 or later
  - ISPSOft software: V3.09 or later
  - DOPSoft software (Delta HMI editing software for DOP-100 series): V4.00.07 or later

● Creating symbols as tags in ISPSOft



| Name          | Description  |
|---------------|--|
| Identifier    | User can create a name for the tag in the PLC; up to 40 characters can be used.  |
| Address       | The address is corresponding to the registers or bits in the PLC; selections are data register and M bits.                                 |
| Data Type     | The data type BOOL, WORD, DWORD, INT, DINT, REAL, and ARRAY are supported. One-dimensional array is supported; up to 512 byte can be used. |
| Initial Value | N/A  |
| Comment       | Descriptions can be added to describe the Tag; up to 128 characters are supported.   |

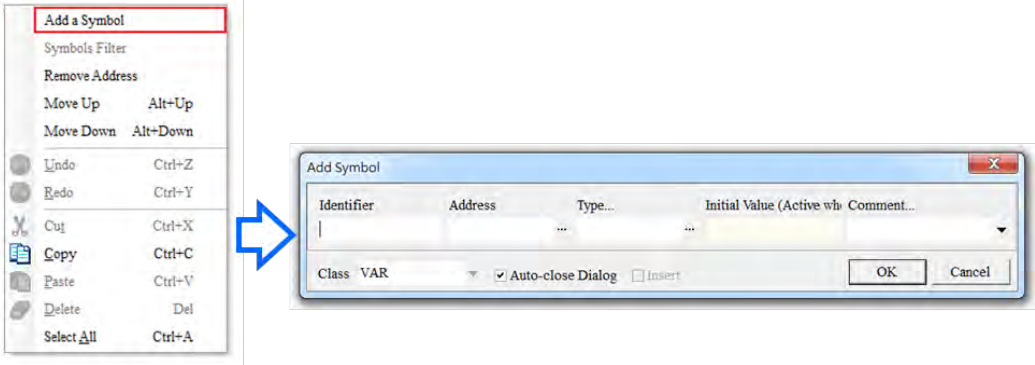
9.4.6.1 Produced Tag

How to create a Produced Tag:

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



2. After double clicking the EtherNet/IP (Produced Tag) option, the EtherNet/IP Table (Produced Tag) will show up for editing.
3. Right click on the EtherNet/IP Table (Produced Tag) to see the context menu and select the option “Add a Symbol”. And then an Add Symbol window will appear.



4. Set up the Produced Tag: as the example shown below.

| Identifier | Address | Type... | Initial Value (Active wh... | Comment... |
|------------|---------|---------|-----------------------------|------------|
| status     | D100    | WORD    | ...                         | PLC        |

Class: VAR ☒ Auto-close Dialog ☐ Insert OK Cancel

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

Example of using DOP-100WS to read the Produced Tag created by AS332P.

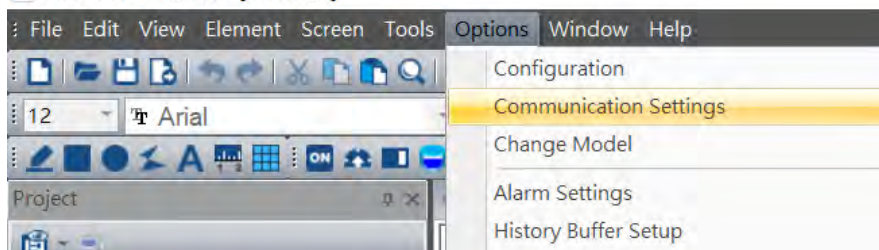
1. Create Produced Tag in ISPsoft.

|     |                 |       |                    |     |  |
|-----|-----------------|-------|--------------------|-----|--|
| VAR | From_AS_D0_A_20 | D0    | ARRAY [20] OF WORD | N/A |  |
| VAR | From_AS_D50     | D5000 | WORD               | N/A |  |

2. Right-click on blank area to bring out the context menu. Click Export Global Symbol in ISPSoft.

3. Open DOPSoft and select Communication Settings under Options tab.

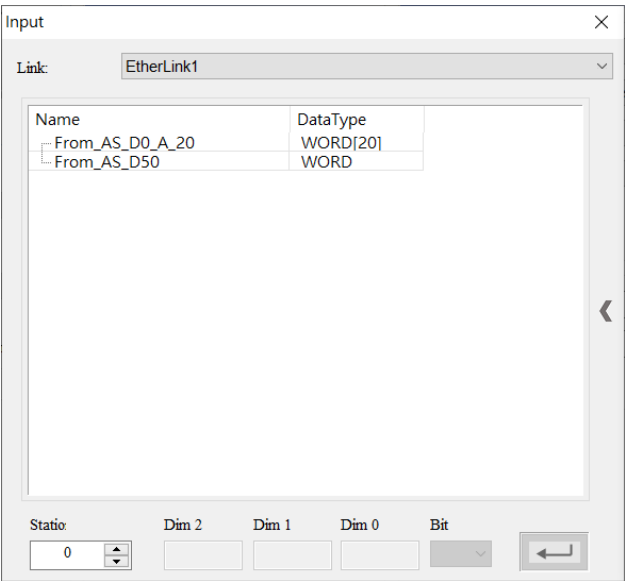
DOPSoft - EIP\_TAG - [Screen\_1]



4. Select **00-EtherLink1** and set the controller to **Delta EtherNet/IP (Use Tags)**. After that enter the IP address of AS332P. And then click **Import** to import the .csv file that was exported from the previous step to DOPSoft.

| Link Name      | Detail   |
|----------------|--|
| 00- EtherLink1 | <p>Controller: <b>Delta EtherNet/IP (Use Tags)</b> <span>Import</span></p> <p>Communication Parameters</p> <p>HMI Station: 0</p> <p>Controller IP : Port: <b>192 . 168 . 1 . 5</b> : 44818</p> |

5. Create a component and then you can use the imported tags from the previous step.



6. After the setting is complete, download the DOPSoft project to HMI.

9.4.6.2 Consumed Tag

The way to create a consumed Tag is the same the way to create a Produced Tag. Refer the section above for more information. After the setups are complete, download the parameters to the PLC, even if using one’s own EIP data exchange table.

9.4.6.3 Use Tag to Execute Data Exchange

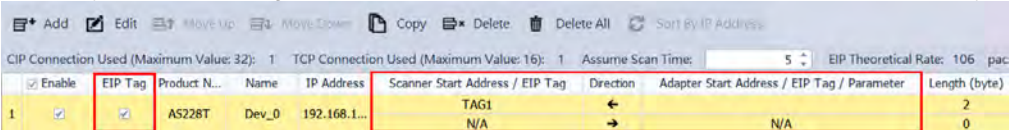
1. Make sure Consumed Tag is created. After the ISPSOft project is saved, open HWCONFIG.

|     |      |      |      |     |
|-----|------|------|------|-----|
| VAR | TAG1 | D100 | WORD | N/A |
| VAR | TAG2 | D500 | WORD | N/A |

2. Refer to section 9.4.3 to 9.4.4 for adding devices in the network. And then Enter the IP address of the Produced Tag device to be connected. The length of the produced tag and the consumed tag should be exactly the same.

3. Switch to the data exchange setting page.

4. Once you select the Tag check box, the directional arrow is to the left with (←) (READ only)



5. Select the created Consumed Tag from ISPSOft and HWCONFIG will bring in the length automatically. It does not require further setting.



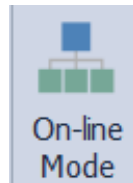
6. Enter the Produced Tag name of the remote device in the Adapter’s EIP tag table. After that you can download the EIP tag table in HWCONFIG.

7. For the 3<sup>rd</sup> party device, after importing the EDS file, the procedures of using tags to perform data exchange are the same. EDS file. If there is no EDS file, you can use **General Device** to set up. The only requirement is the IP address, no need to set up input, output, instances, you can use tags to perform data exchange.

## 9.4.7 Diagnosis

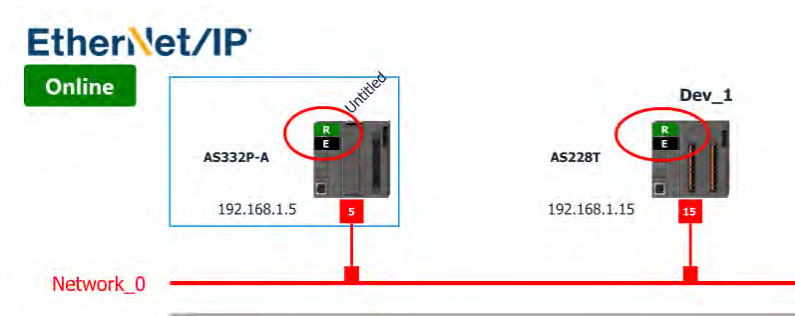
HWCONFIG provides diagnostic information on the connection and data exchange status. For the connection status, refer to the Adapter connection status and indicator. For data exchange status and error codes, refer to Data Exchange tab.

First, click On-line Mode on the tool bar.

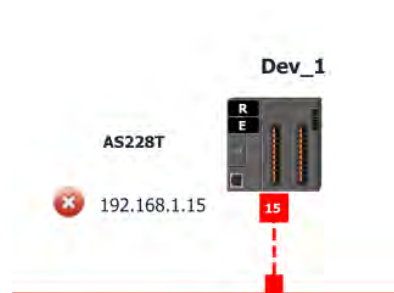


### ◆ Connection Status

- a) Check the device status from the indicators: for example RUN / STOP and Error indicators for the PLC.



- b) The status of connection has nothing to do with EtherNet/IP data exchange. It is the network connection status. HWCONFIG sends an ICMP request (ping) to devices, if nothing returns, it is seen as disconnected from the network. The dotted line and the warning sign indicate a connection error, as shown below.




◆ Data Exchange

a) Normal communication:

| CIP Connection Used (Maximum Value: 32): 1 |         | TCP Connection Used (Maximum Value: 16): 1 |                                     | Assume Scan Time: 5 |       | EIP Theoretical Rate: 106 packet per second (PPS) |                                 |           |   |               |
|--|---------|--|-------------------------------------|---------------------|-------|---|---------------------------------|-----------|---|---------------|
| Status                                     | Message | Enable                                     | EIP Tag                             | Pr...               | N...  | IP Address  | Scanner Start Address / EIP Tag | Direction | Adapter Start Address / EIP Tag / Parameter | Length (byte) |
| 1  |         | -  | <input checked="" type="checkbox"/> |                     | AS... | De... 192.168.1.15                                | D0<br>D0                        | ↔         | D1000<br>D0                                 | 200<br>200    |

b) Error occurs during communication. Check the data exchange status and the error codes. For error code definitions, refer to Section 9.6.2.

| CIP Connection Used (Maximum Value: 32): 1 |   | TCP Connection Used (Maximum Value: 16): 1 |                          | Assume Scan Time: 5 |       | EIP Theoretical Rate: 106 packet per second (PPS) |                                 |           |   |               |
|--|---|--|--------------------------|---------------------|-------|---|---------------------------------|-----------|---|---------------|
| Status                                     | Message   | Enable                                     | EIP Tag                  | Pr...               | N...  | IP Address  | Scanner Start Address / EIP Tag | Direction | Adapter Start Address / EIP Tag / Parameter | Length (Byte) |
| 1  |  The connection timeout. (16#0203) | <input checked="" type="checkbox"/>        | <input type="checkbox"/> | AS...               | De... | 192.168.1.15                                      | D0<br>D0                        | ←<br>→    | D1000<br>D0                                 | 200<br>200    |

## 9.5 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 or client/server connections, requiring that the instruction include the memory location of the data to be sent to the client. Implicit messaging uses UDP/IP, in which 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 interval. For details on using implicit messages, please refer to Section 9.4.5. This section provides an overview of how the AS Series uses explicit messaging instructions.

When EtherNet/IP uses CIP Objects as parameters and the AS Series PLC CPU acts a Scanner, you can use the EIPRW instruction (API 2208) to read and write Adapter's objects. Each object includes various parameters, you need to obtain relative object parameters from the Adapter's manual. For details on the EIPRW instruction (API 2208), please refer to the AS Series Programming Manual. For details on Objects that are supported by the AS Series, please refer to Section 9.8.

## 9.6 Troubleshooting

This section provides an overview of error codes and troubleshooting for the AS Series.

### 9.6.1 Error Code Classification

There are two types of error code categories for the AS Series: Configuration Errors, and Application Errors. These error codes are defined by the ODVA for EtherNet/IP errors. Refer to the following table for AS Series error codes.

| Error Code Classification  |                           | Description   |
|--|---------------------------|---|
| 1 <sup>st</sup> Phase  | 2 <sup>nd</sup> 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 are shown; for example, only 011C appears for the error code H'1101011C. |                           |   |

## 9.6.2 Error Codes & How to fix them

### 9.6.2.1 Configuration Errors

(HWCONFIG only shows Low word error codes)

| 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 match.<br>2. Reload the EDS file.<br>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 match.<br>2. Reload the EDS file.<br>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 match.<br>2. Reload the EDS file.<br>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 match.<br>2. Reload the EDS file.<br>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 match.<br>2. Reload the EDS file.<br>3. Ask the vendor of the device for the EDS file. |
|                      | H'1101011F | The fixed / variable output flag in the EDS file is mismatched.                                     | 1. Check if the product information and the EDS file match.<br>2. Reload the EDS file.<br>3. Ask the vendor of the device for the EDS file. |
|                      | H'11010120 | The fixed / variable input flag in the EDS file is mismatched.                                      | 1. Check if the product information and the EDS file match.<br>2. Reload the EDS file.<br>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 match.<br>2. Reload the EDS file.<br>3. Ask the vendor of the device for the EDS file. |



| Category                  | Error Code | Description   | How to fix them   |
|---------------------------|------------|---|---|
|                           | H'11010122 | The input priority in the EDS file is mismatched.                         | <ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file match.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol> |
|                           | H'11010123 | The output connection type parameters in the EDS file are mismatched.     | <ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file match.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol> |
|                           | H'11010124 | The input connection type parameters in the EDS file are mismatched.      | <ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file match.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol> |
|                           | H'11010125 | The redundant ownership output parameters in the EDS file are mismatched. | <ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file match.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol> |
|                           | H'11010126 | The configuration size parameters in the EDS file are mismatched.         | <ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file match.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol> |
|                           | H'11010129 | The configuration path parameters in the EDS file are mismatched.         | <ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file match.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol> |
|                           | H'11010132 | The EDS file does not support Null forward open.                          | <ol style="list-style-type: none"> <li>1. Check if the product information and the EDS file match.</li> <li>2. Reload the EDS file.</li> <li>3. Ask the vendor of the device for the EDS file.</li> </ol> |
|                           |            |   |   |
| Data Exchange Setup Error | H'12010100 | I/O connections duplicated  | <ol style="list-style-type: none"> <li>1. Check if the system has created the I/O connections.</li> <li>2. Change the connection type to Listen Only.</li> </ol>  |
|                           | H'12010106 | Scanner ownership of I/O connections conflicts                            | <ol style="list-style-type: none"> <li>1. Check the scanner owner.</li> <li>2. Reconfigure the invalid scanner.</li> <li>3. Change the connection to multicast.</li> </ol>                                |
|                           | H'12010110 | Incorrect adapter configuration   | <ol style="list-style-type: none"> <li>1. Check the I/O connection status.</li> <li>2. Activate the I/O connections again.</li> </ol>   |

| Category | Error Code | Description   | How to fix them  |
|----------|------------|---|--|
|          | H'12010111 | Adapter RPI not supported                             | 3. Check the RPI for the adapter.  |
|          | H'12010113 | Insufficient I/O connections                          | 1. Check if the number of connections exceeds the limit.<br>2. Reduce the number of the product connections.                             |
|          | H12010119  | The connection of non-Listen only is not established. | 1. Check if the system has created the I/O connections.<br>2. Check the scanner I/O connection status.                                   |
|          | H'12010127 | Incorrect adapter input size                          | Check the module number and the product setup file to see if they match.   |
|          | H'12010128 | Incorrect adapter output size                         | Check the output size in the connection parameters.  |
|          | H'1201012D | Consumed Tag does not exist.                          | Check if the parameters in the Consumed tag are set correctly.   |
|          | H'1201012E | Produced Tag does not exist.                          | Check if the parameters in the Produced tag are set correctly.   |
|          | H'12010204 | I/O connection connecting timeout                     | No response from the adapter; check if the power and the network connection for 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.<br>2. Increase the RPI value or reduce the number of connections. |
|          | H'12010315 | Incorrect adapter input/output instance               | Check the module number and the product setup file to see if they match.   |

### 9.6.2.2 Application Error

| Category              | Error Code | Description            | How to fix them  |
|-----------------------|------------|------------------------|--|
| EtherNet/<br>IP Error | H'00010203 | I/O connection timeout | 1. Check the network connection status.<br>2. Check if the module is working properly.<br>3. Increase the RPI value. |

### 9.6.3 AS-FPFN02 Error Codes & How to fix them

#### 9.6.3.1 LED Indicators

| Description                                | Procedure   |
|--|---|
| System Fail (SF) indicator RED light ON    | Check if the parameters downloaded to the Controller are the same as the actual placement   |
| Bus Fail (BF) indicator RED light BLINKING | <ol style="list-style-type: none"> <li>1. Check if the upper device is well-connected</li> <li>2. Check if the device name set in the software is the same as the device name shown in the function card</li> <li>3. Check if the MAC address and the device name are assigned correctly</li> </ol> |
| Bus Fail (BF) indicator RED light ON       | <ol style="list-style-type: none"> <li>1. Check if the network cable is securely connected</li> <li>2. Check if the controller and the function card are both supplied with power</li> </ol>  |

#### 9.6.3.2 Status Registers of Siemens S7-1500

| Status Register<br>(Siemens S7-1500) | Description  |
|--------------------------------------|--|
| Input Data Available<br>%I0.0        | <p>If the value is TRUE, the input data is valid.</p> <p>If the value is 0, the input data is invalid.</p> <p>Check if the AS300 firmware version is V1.08 or higher.</p>  |
| Connection Status<br>%I4.0 - %I4.7   | <p>Indicates PN connection status of Slot 1 ~ Slot 8.</p> <p>If the value is TRUE, the Slot is with a working PN connection (with IO module)</p> <p>If the value is FALSE, the Slot is without a working PN connection.</p>  |
| Connection Status<br>%I5.0 - %I5.7   | <p>Indicates PN connection status of Slot 9 ~ Slot 16.</p> <p>If the value is TRUE, the Slot is with a working PN connection (with IO module)</p> <p>If the value is FALSE, the Slot is without a working PN connection.</p> |

## 9.7 Software Operation

This section provides an overview using Ethernet/IP to connect to a Delta Ethernet/IP PLC with third party software.

### 9.7.1 Operation Demonstration I

The example EIP Scanner uses Ethernet to connect to a Delta Adapter.



#### 9.7.1.1 Creating a New Project and a Scanner

1. Open the editing software and under **Create**, click **New Project**.
2. Select a PLC and select the chassis.
3. Click **Finish** to create the new project.
4. After creating the project, Studio 5000 displays the Controller Organizer and workspace.
5. Add the Ethernet/IP module, and then connect to the Ethernet/IP devices through the Ethernet/IP module.

#### 9.7.1.2 Connecting to Delta Adapter

This section provides an overview of connecting to a Delta Ethernet/IP Adapter with the example software.

- Import an EDS file from Delta Official Website
  1. Under the **Tools** menu, click **EDS Hardware Installation Tool**.
  2. Select **Register an EDS file(s)** and click **Next**.
  3. Select **Register a single file** and click **Browse** to find the EDS file to import.
  4. Follow the instructions in the wizard and then click **Finish** to complete importing the EDS file.
- Creating an Adapter
  1. In example software, in the Controller Organizer under EtherNet/IP Scannerr, right-click **Ethernet** and then click **New Module**.
  2. Type the module number of the imported Delta EDS file in the filter field, click the Delta module, and then click **Create**.
  3. Verify that the product name and IP address are the same as the information shown in the **Module Definition** section.
  4. Click **Change** if you need to make a change to the module definition.

5. Modify the module definition
  - 1) Name: Click the arrow button to select a valid connection.
  - 2) Size: The example PLC supports maximum 500 bytes data size. (Data for input contains 2 bytes of Serial Number and for output contains 4 bytes 32-bit Run-idle header and 2 bytes of Serial Number.) If using AS300, you can set the maximum data length 498 SINT for input and 494 SINT for output.
  - ※ In general, there is no need to change the parameters from the imported EDS files which can usually be used without modification.
6. In the New Module dialog box, click the **Connection** tab to modify the **Requested Packet Interval** and **Input Type** settings. The RPI uses the I/O connection to a Scanner to exchange data at regular intervals, and the units are micro-seconds. For **Input Type** select either **Unicast** or **Multicast**. The Input Type selections may vary for different products.
7. Click **OK** to create the adapter. The new Delta Adapter appears in the Controller Organizer tree.

### 9.7.1.3 Editing Corresponding Addresses for AS300

Refer to section 9.8.5 Assembly Object for defaults of exchange address. Refer to section 9.7.1.5 on how to open Program Tag and modify the contents of Tag:C to edit the exchange addresses. Refer to section 9.8.5 Assembly Object for details on Tag:C.

You can edit the corresponding addresses of input and output for each connection through Configuration.

| Configuration address | Data type | Description  | Defaults (Connection 1) |
|-----------------------|-----------|--|-------------------------|
| Word[0]               | UINT      | Corresponding components for input<br>0: D, 1: X, 2: Y | 0                       |
| Word[1]               | UINT      | Reserved   | 200                     |
| Word[2-3]             | DWORD     | Number of corresponding component for input            | 1000                    |
| Word[4]               | UINT      | Corresponding components for output<br>0: D, 2: Y      | 0                       |
| Word[5]               | UINT      | Reserved   | 200                     |
| Word[6-7]             | DWORD     | Number of corresponding component for output           | 0                       |

#### 9.7.1.4 Download

The next step is to download the project to the PLC and go online.

1. In Studio 5000, on the **Communications** menu, click **Who Active**. To establish a connection, select the Scanner connected to the PC, and then on the **Communications** menu click **Download**.
2. After the connection is successfully established, the I/O status shows green by **I/O OK**.

#### 9.7.1.5 Data Exchange

In the Controller Organizer, you can map data, including Configuration, Input and Output parameters. When you create a device I/O Configuration, the tags are added automatically.

1. Click **Program Tags** to display the Tags window.
2. Tags are listed in the **Name** column. Tag names begin with a product name and end with **C** or **I1** or **O1**, separated from the name by a colon (:).
3. Tag name : C indicates the tag contains information from the Adapter EDS file, including Input and Output parameters (refer to section 9.7.1.3). You can edit these parameters in the example software.
4. Tag name : I1 indicates that the exchange starts from Tag : I1[0], and is mapped to the first parameters of the Adapter output. The length is the output length provided by the Adapter.
5. Tag name: O1, indicates that the exchange starts from Tag : O1[0], and is mapped to the first parameters of the Adapter Input. The length is the input length provided by the Adapter.

## 9.7.2 Operation Demonstration II

Delta EtherNet/IP PLC connects to the example EtherNet/IP Adapter through Ethernet communication.

### 9.7.2.1 Tag Connection

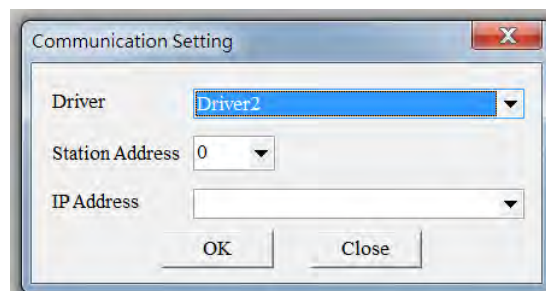
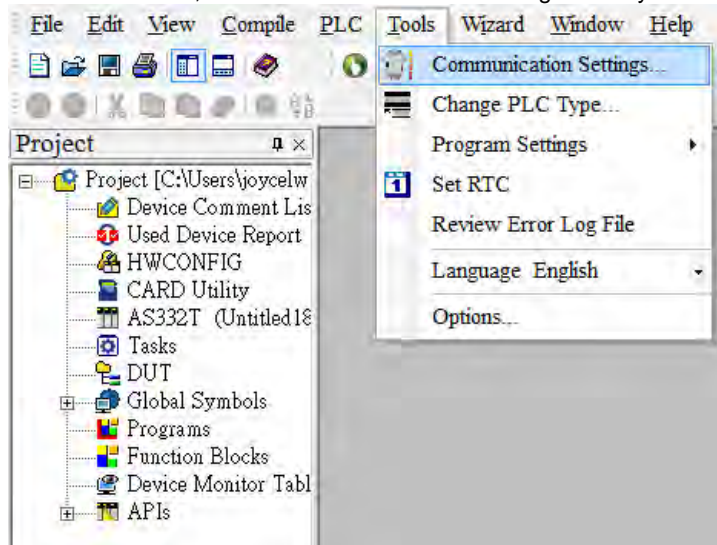
This section demonstrates how to use Tag Connection to execute EtherNet/IP communication with the example PLC. Firstly create Produced Tag from the example PLC and then create Consumed Tag from Delta PLC.

- **Create Produced Tag**

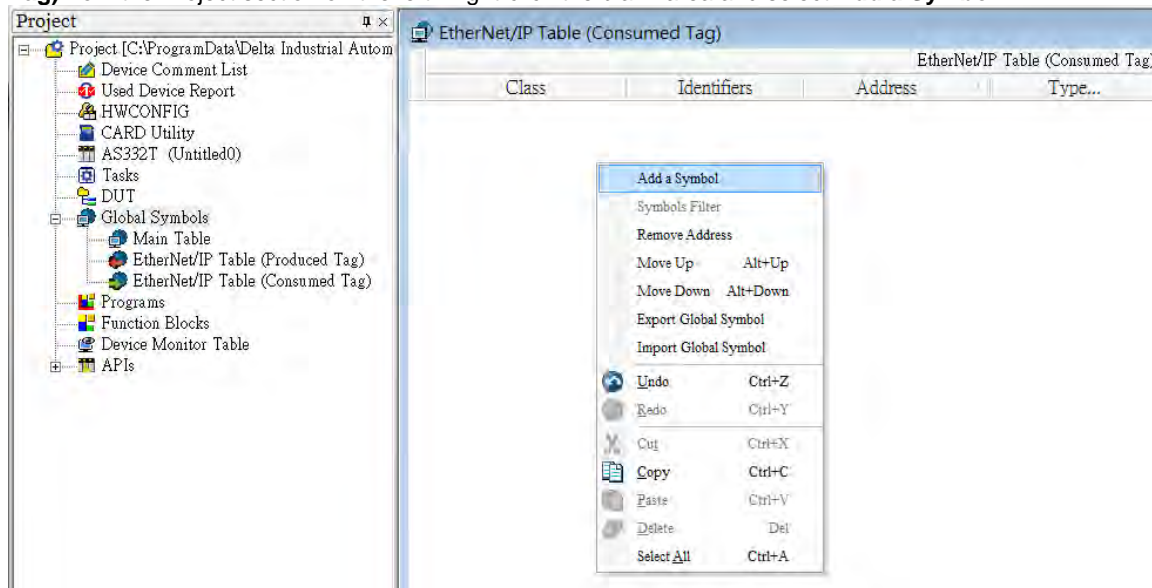
1. Start the example software Sysmac Studio. Select **Connect to Device**. Configure the parameters and then click **Connect**.
2. After the connection is successfully established, click **Tools** on the menu bar. And then select **EtherNet/IP Connection Settings** to access the EtherNet/IP connection settings.
3. Right-click the cell of the Node Address you'd like to edit its EtherNet/IP settings and then select **Edit** to open the EtherNet/IP communication setting window.
4. Double-click **Global Variables** under **Programming - Data** in the Multiview Explorer. Right-click in the global variable table and select **Create New** from the menu.
5. Right-click in the global variable table and select **Create New** from the menu.  
\*Click **Controller** on the menu bar and change the **Project** to **Disconnected** before creating a new global variable.
6. Set the Network Publish to **Output**.  
And then with this attribute, you can access a variable from external devices through CIP communications or a tag data link. For tag data links, this can be a variable for data output (from the local Controller to another Controller).
7. Select the tab of **Built-in EtherNet/IP Connection Settings** and select the **Tag Set** from the left. Right-click in the editing area and select **Create New Tag Set** from the menu and then name the tag set as ToAS. Data type: ARRAY[0..99] OF WORD.
8. Right-click on the created Tag Set and select **Create New Tag** from the menu.
9. The tag is added in the created tag set.
10. Click **Controller** and then **Synchronize...** from the menu bar to synchronize the setting with OMRON Scanner.
11. Create Tag sets in **Network Configurator**. Open **Network Configurator** and select *Option-> Select Interface-> Ethernet I/F*.
12. Select *Network -> Connect*
13. Select **Interface** and click **OK** to confirm the setting.
14. The blue light indicates the connection is working normally.
15. Drag the example PLC from the EtherNet/IP Hardware section to the network view.
16. Right-click the example PLC (the scanner) and select *Parameter -> Edit* from the menu.
17. Click **Edit Tags** on the **Tag Sets** tab and click **New** on the **Out-Produce** tab to create a new tag with the same name and length as the one from the "output" tag set in Sysmac. Set the size of ToAS to 200 bytes.
18. The new tag is created.
19. After setting, click *Network -> Download*.
20. After downloading, the Network Configurator dialog box is displayed.

- **Create a Consumed Tag**

1. Start ISPSOft and click *Tools -> Communication Settings* and select a driver with Ethernet communication.  
 ※ Before setting the communication, make sure COMMGR is working normally and save the driver settings.

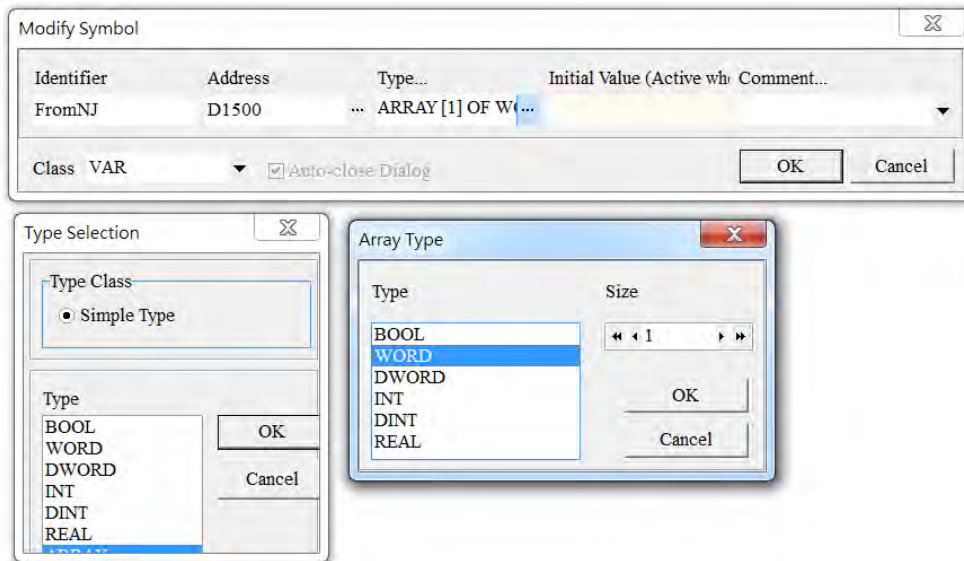


2. Click **Global Symbols** to expand the tree node and see the options. Double-click **EtherNet/IP Table (Consumed Tag)** from the Project section on the left. Right-click the blank area and select **Add a Symbol**.

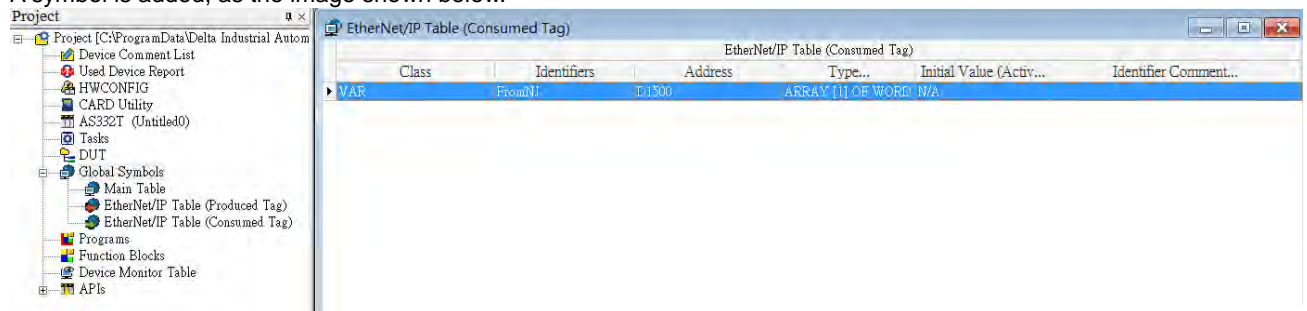




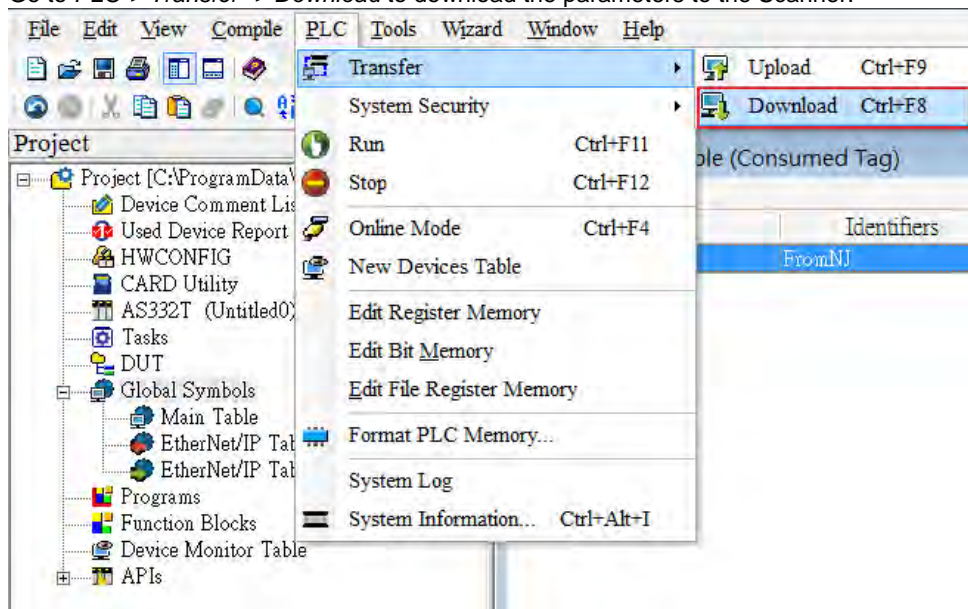
3. Set the data type to **ARRAY[200] OF WORD** and then click **OK** to confirm the setting.
- ※ Data size should be the same as the Produced Tag data size set in the scanner.



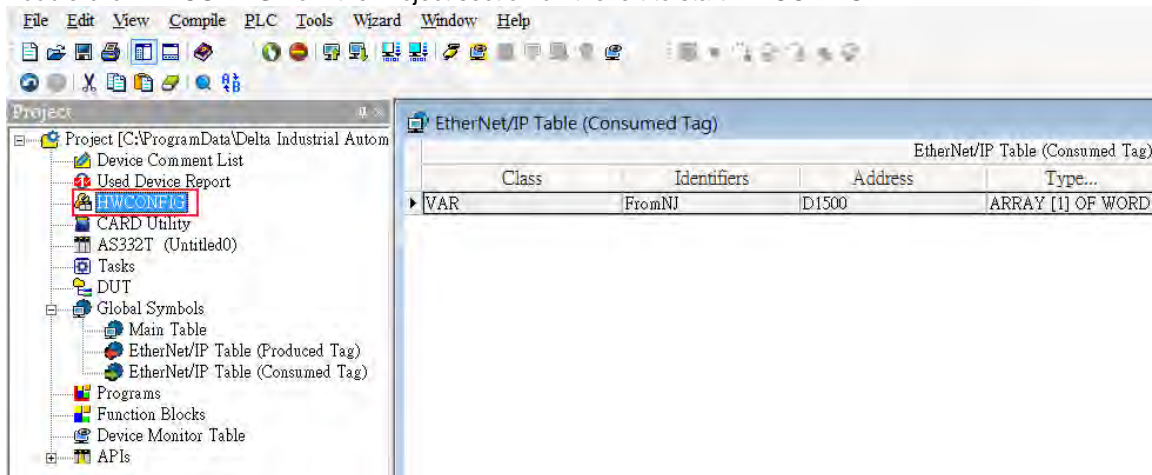
A symbol is added, as the image shown below.



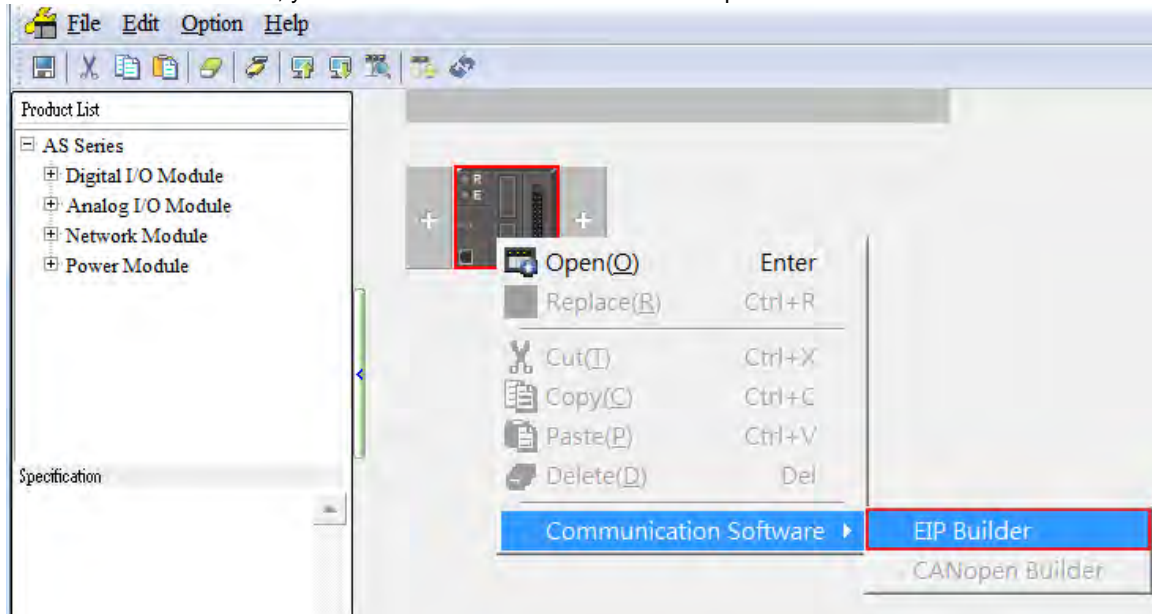
4. Go to **PLC-> Transfer -> Download** to download the parameters to the Scanner.



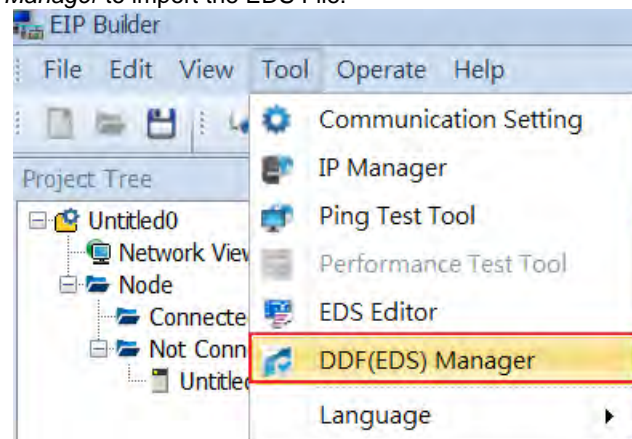
5. Double-click **HWCONFIG** from the Project section on the left to start HWCONFIG.



6. Right-click the **PLC** and select **Communication Software - > EIP Builder** to start EIP Builder.  
For ISPSOFT V3.12 or later, you can edit EtherNet/IP communication parameters in HWCONFIG.

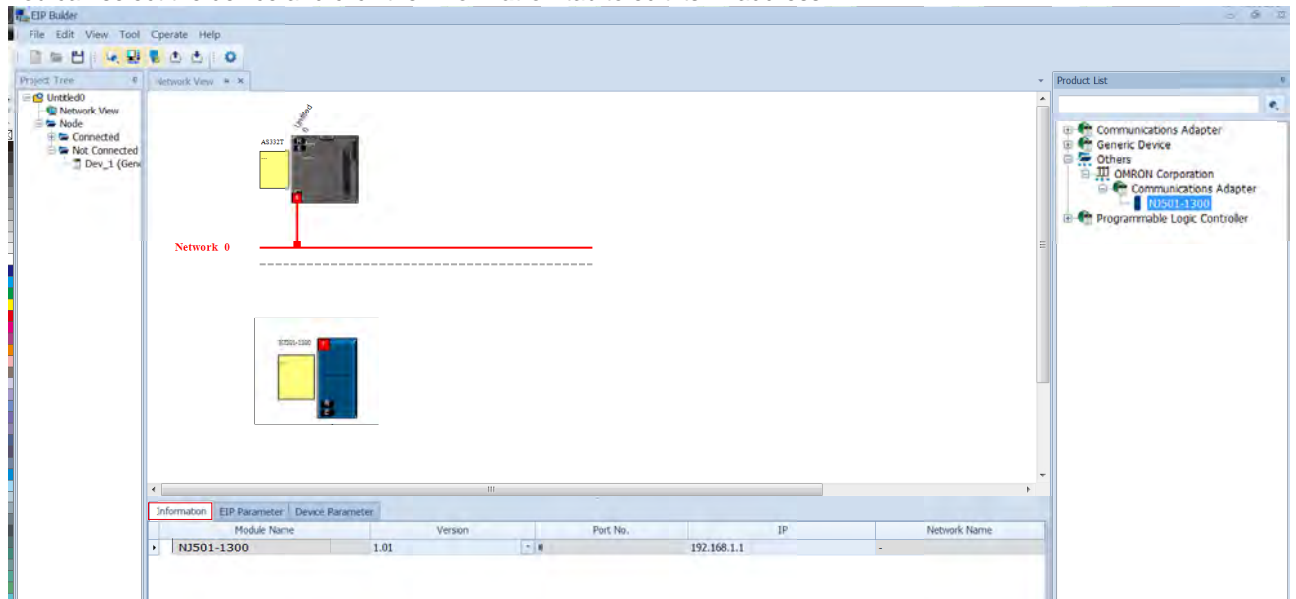


7. Click **Tool-> DDF(EDS) Manager** to import the EDS File.

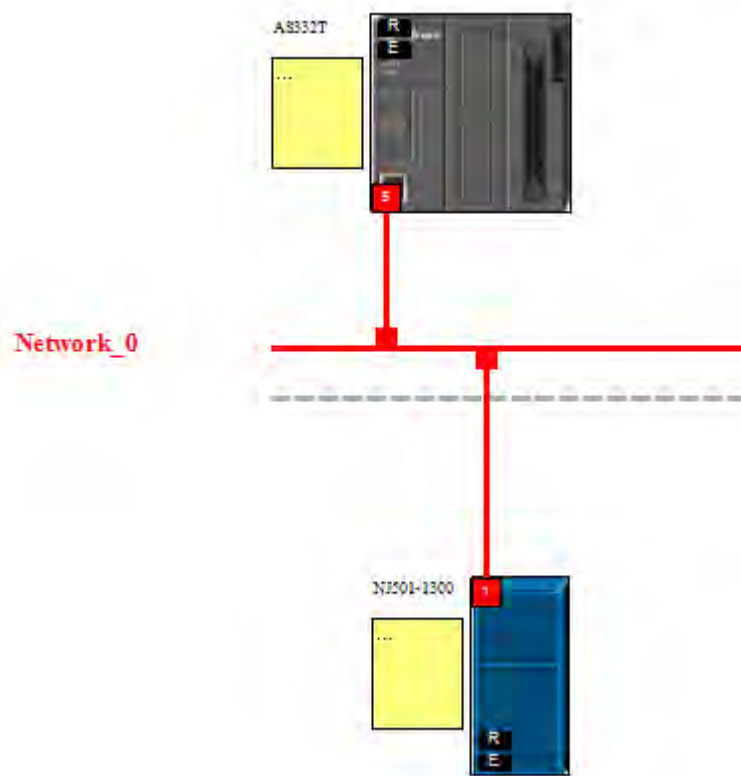


8. Drag and drop the device from the Product List on the right to add have it added in the Network View.

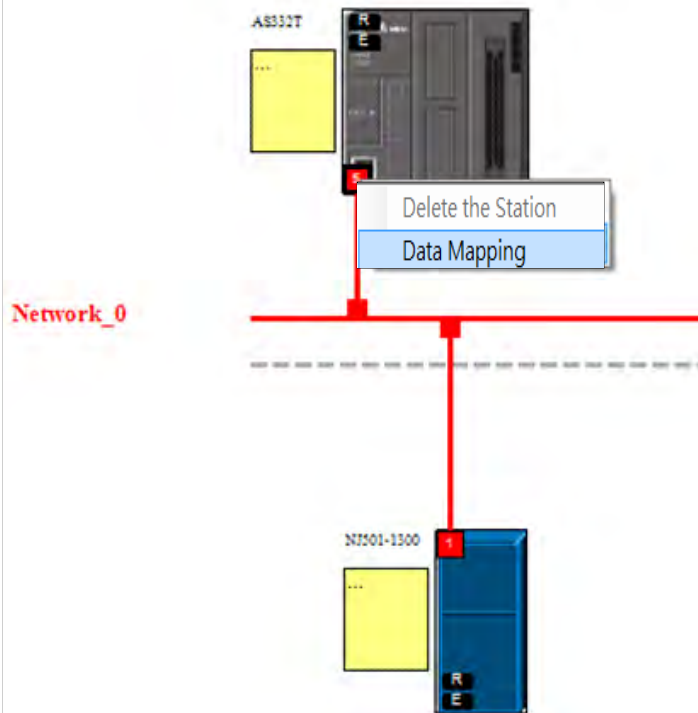
※ You can select the device and click the **Information** tab to edit its IP address.



9. Drag and drop the red spare to have the Ethernet communication port connected to the network.



10. Right-click the CPU's communication port and select **Data Exchange** to create a data exchange table.



11. Make sure the data below CPU Address/Tag and Adapter/Tag is correct.

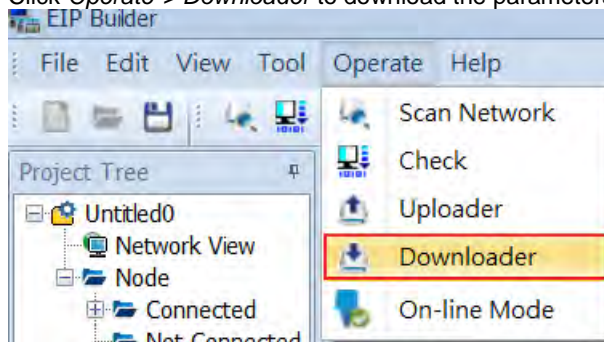
- ※ CPU Address/Tag: Consumed Tag
- Adapter /Tag: Produced Tag, created by Producer

Network View    Network\_0

The screenshot shows the 'Network View' window with the same network diagram as in step 10. Below the diagram, there is a table titled 'Connection Count: 1' and 'Sort'. The table has columns for 'Enable', 'TAG', 'IP Address', 'Adapter Name', 'CPU Address/TAG', '<->', 'Adapter', 'Length', and 'Property'.

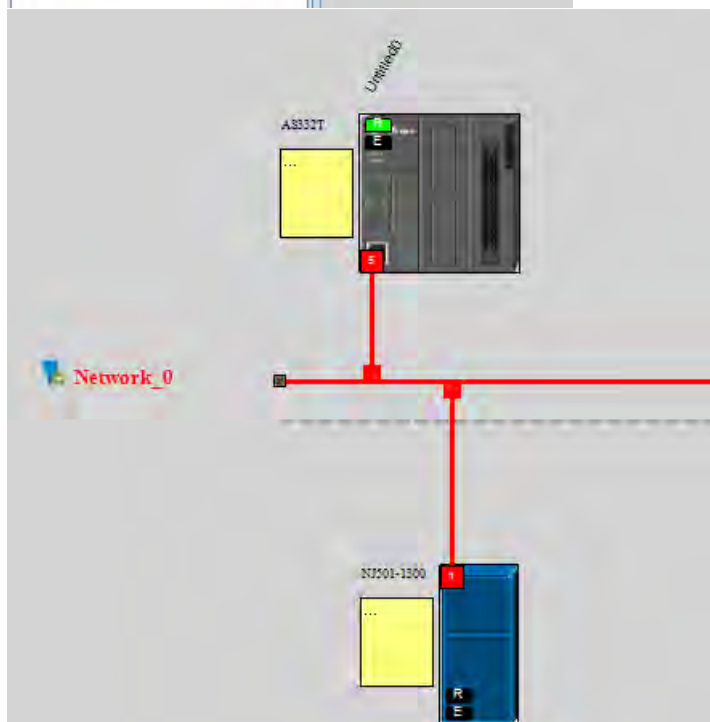
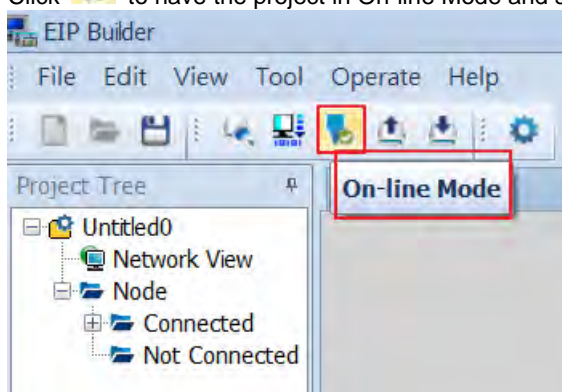
|     | Enable                              | TAG                                 | IP Address    | Adapter Name | CPU Address/TAG | <-> | Adapter | Length | Property |
|-----|-------------------------------------|-------------------------------------|---------------|--------------|-----------------|-----|---------|--------|----------|
| ✓ 1 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 192.168.250.1 | User Define  | FromNI          | ←   | ToAS    | 2      | ...      |

12. Click *Operate*-> *Downloader* to download the parameters to the Scanner.



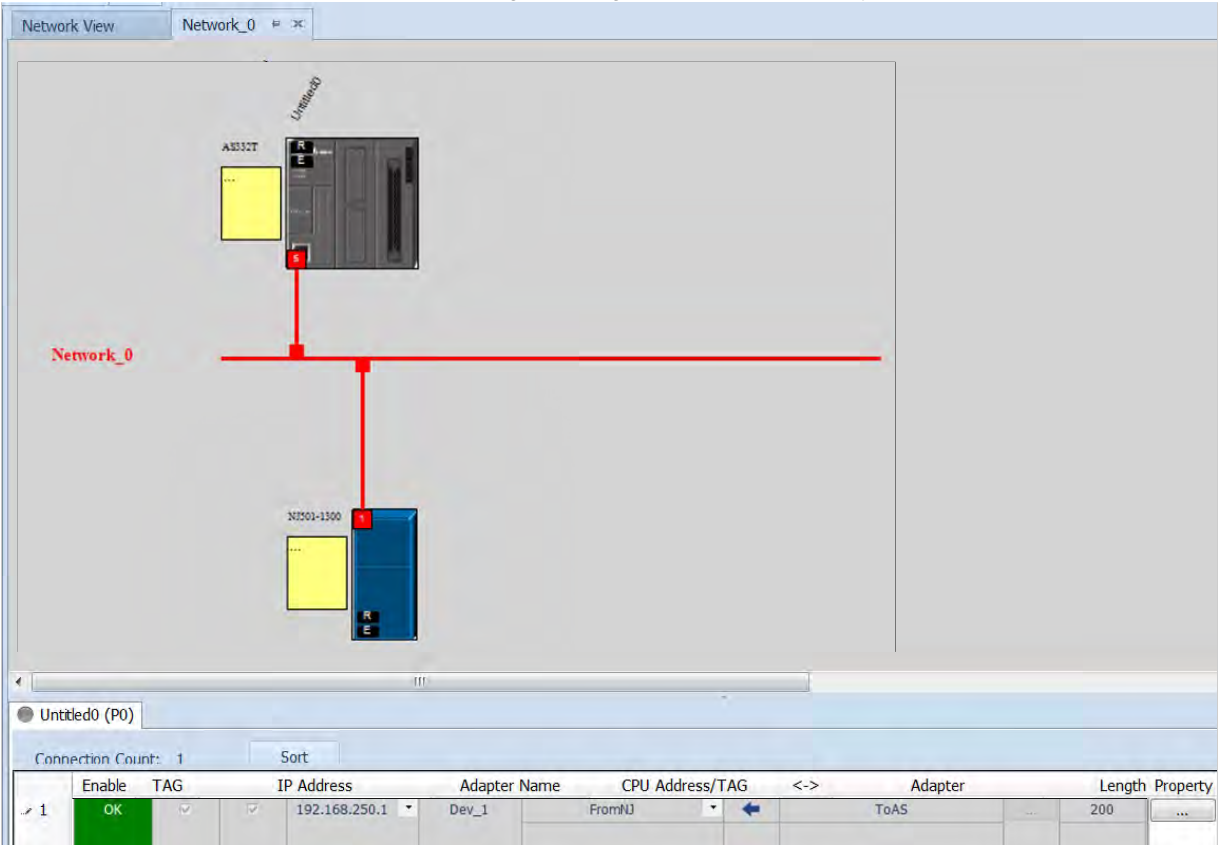
- **Connection Check**

1. Click  to have the project in On-line Mode and see if the network lines are solid ones.





2. The solid network lines indicate the data exchange is being monitored successfully.



### 9.7.2.2 IO Connection

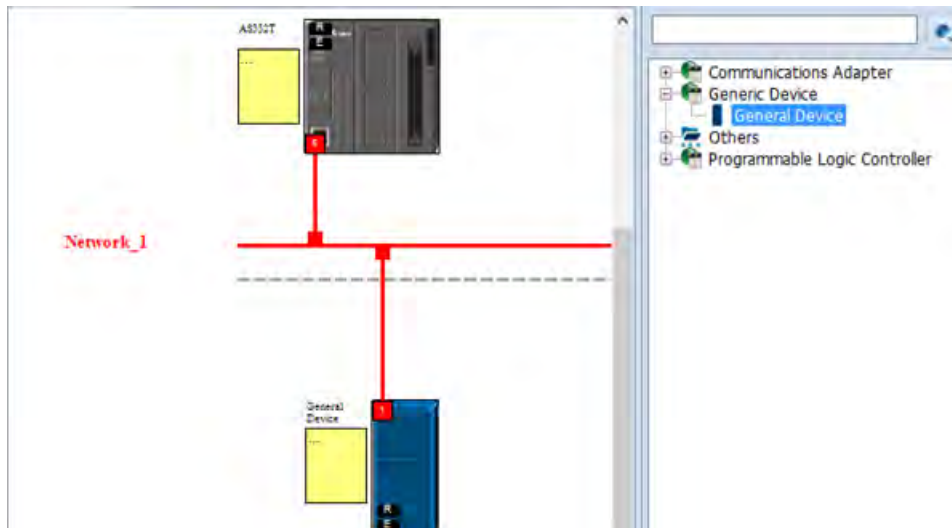
This section demonstrates how to use IO Connection to execute EtherNet/IP communication with the example PLC. Here Delta PLC acts as an EtherNet/IP Scanner.

- **Set up an IO Connection from a Slave**

1. Create two variables and set the rule of one variable as **input** and set the rule of the other variable as **output**. Set the data type and length as **Array[0..99] of word**.
2. Go to *Tools -> Export Global Variables -> Network Configurator* on the menu bar.
3. Start **Network Configurator** and then add and edit the example PLC from the **Ethernet Hardware List** on the left. Select *Parameter -> Edit* and click *To/From File -> Export to File* on lower right corner of the Tag Sets page.
4. After the file is imported, make sure the input and output variables are imported in In-Consume and Out-Produce sections.
5. Click the variable in In-Consume section and select **Edit**.
6. Click **Advanced** button in the Edit Tag Set window and set the Instance ID to **Manual** and then input the Instance ID you'd like to use for IDs in In-Consume section. Set Instance ID = 100.
7. Use the same method to set the Instance ID manually for IDs in In-Consume section as you have set for IDs in Out-Produce section. Set Instance ID = 110.
8. When the settings for Instance ID are done, click **OK** to confirm the settings on Edit Device Parameter.
9. Click *Network -> Download* to download the parameters to the slave.

- **Set up an IO Connection from a Master**

1. Start EIP Builder and drag and drop a **General Device** into the Network View area and set up network connection. For ISPSOft V3.12 or later, you can edit EtherNet/IP communication parameters in HWCONFIG.



2. Click slave icon and set up its IP address and then configure the parameters in the EIP Parameter tab.

| Information | EIP Parameter  | Device Parameter |          |             |              |  |
|-------------|----------------|------------------|----------|-------------|--------------|--|
|             | Module Name    | Version          | Port No. | IP          | Network Name |  |
| ▶           | General Device | 1.01             | 0        | 192.168.1.1 | Network_1    |  |

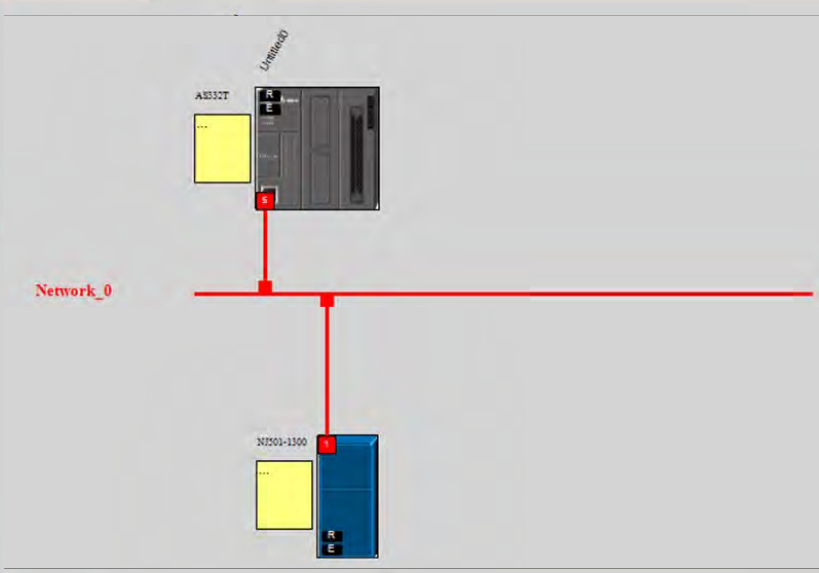
| Information            |  |                 |
|------------------------|--|-----------------|
| EIP Parameter          |  |                 |
| Device Parameter       |  |                 |
| Connection             |  |                 |
| Name                   |  | Value           |
| Electronic keying      |  | Disable Keying  |
| Transport Type         |  | Exclusive Owner |
| Input                  |  |                 |
| Assembly instance      |  | 101             |
| Size (Byte)            |  | 200             |
| Input Transfer Format  |  | Pure data       |
| Output                 |  |                 |
| Assembly instance      |  | 100             |
| Size (Byte)            |  | 200             |
| Output Transfer Format |  | Pure data       |
| Configure              |  |                 |
| Assembly instance      |  | 128             |
| Size (Byte)            |  | 0               |
| Port                   |  |                 |
| Port Segment Enable    |  | Enable          |
| Port number            |  | 1               |
| Link address           |  | 0               |

3. Set up the slave IO connection:
- a. Master Output Instance ID = Slave Input (In-Consume) Instance ID

b. Master Input Instance ID = Slave Output (Out-Produce)Instance ID
- ※ Refer to slave’s operation manual for more information on Instance IDs.
4. Set up the connection and start data exchange.

Network View

Network\_0



Untitled0 (P0)

Connection Count: 1

Sort

|     | Enable                              | TAG                      | IP Address    | Adapter Name | CPU Address/TAG | <-> | Adapter | Length | Property |
|-----|-------------------------------------|--------------------------|---------------|--------------|-----------------|-----|---------|--------|----------|
| ▶ 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 192.168.250.1 | Dev_1        | D0              | ←   | Input   | 200    | ...      |
|     |                                     |                          |               |              | D500            | →   | Output  | 200    | ...      |



5. Download the EIP parameters to the master.

Network View

Network\_0

Connection Count: 1

Sort

Untitled0 (P0)

Select All

Invert Selection

| Name          | Status | Comment |
|---------------|--------|---------|
| Untitled      |        |         |
| Data exchange |        |         |

Auto close after completing

Communication Setting

Start

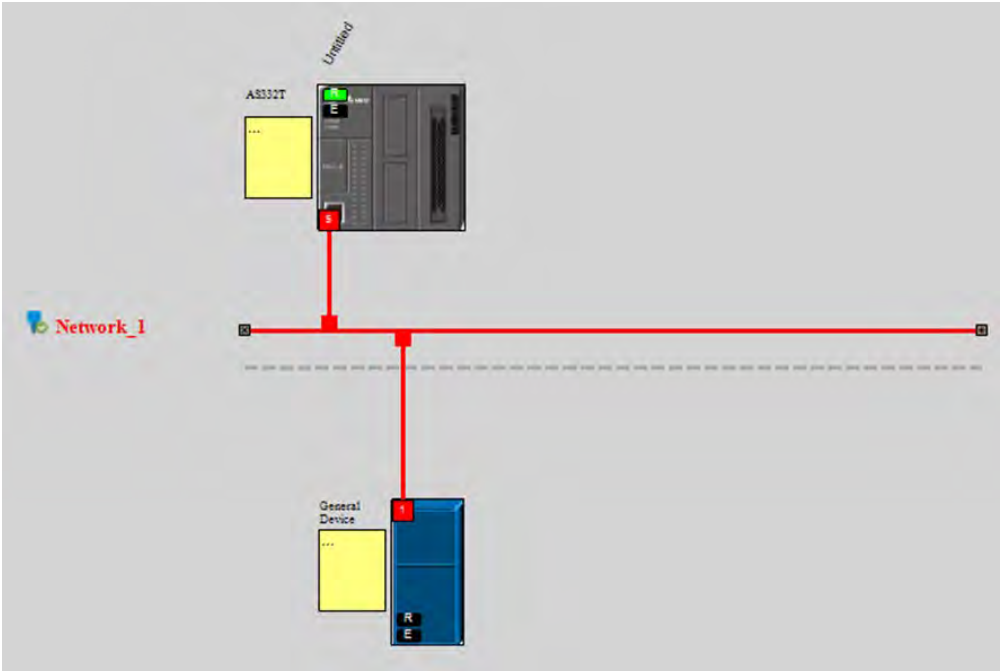
Close

|   | Enable                              | TAG                      | IP Address    | Adapter Name | CPU Address/TAG | <-> | Adapter | Length | Property |
|---|-------------------------------------|--------------------------|---------------|--------------|-----------------|-----|---------|--------|----------|
| 1 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 192.168.250.1 | Dev_1        | D0              |     | Input   | 200    | ...      |
|   |                                     |                          |               |              | D500            |     | Output  | 200    | ...      |

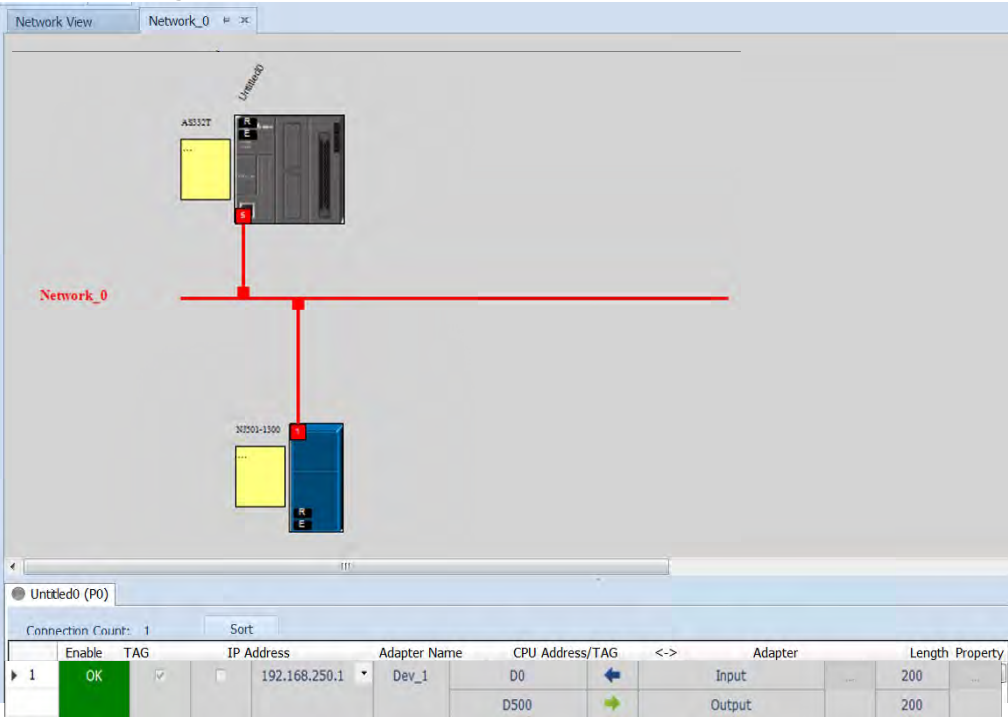
● **Connection status**

1. After the parameters are downloaded, change the project to Online Mode. And make sure the monitoring on the network and the data exchange table is normal.

**Network View**



Data exchange status

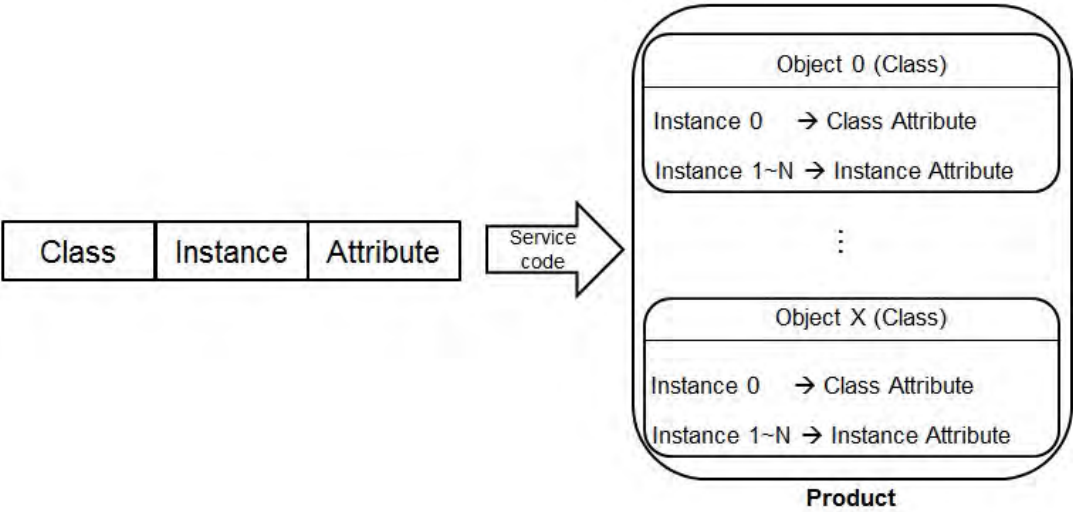


| Master_Address |   | Slave_Address                   |
|----------------|---|---------------------------------|
| D0             | ← | ToAS_IO<br>( Instance ID=110)   |
| D500           | → | FromAS_IO<br>( Instance ID=100) |

## 9.8 CIP Object

### 9.8.1 Object List

CIP requires objects (groups of related data and behaviors associated with this data) to describe a device, how it functions, communicates, and to define its unique identity. Objects can be further defined by Class (a set of objects representing the same type of system), Instance (a copy of an object), and Attribute (data values). An object's instance and class have attributes, providing services and implementing behaviors. Instance 0 contains the basic information for every object, that is: version and length. Instance 1–N contains parameters for creating connections. You can get product parameters from the supported service code through objects.



You can use API 2208 EIPRW instruction or explicit messages to read / write objects. The supported EtherNet/IP objects are listed in the following table. Refer to Section 9.8.2 for the data type definitions. Refer to Section 9.8.3 ~ 9.8.19 for object contents.

| Object Name               | Function  | Class ID   |
|---------------------------|---|------------|
| Identity Object           | Provides identification of general information about the device.  | 1 (H'01)   |
| Message Router Object     | Provides a messaging connection point through which a client can address a service to any object class or instance residing in the physical device.                               | 2 (H'02)   |
| Assembly Object           | 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 | Provides connection and connectionless communications, including establishing connections across multiple subnets.  | 6 (H'06)   |
| Port Object               | 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 | 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    | 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 provides an overview of the data types supported by objects.

| Data Type   | Description  |                       |                            |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|---|--|-----------------------|----------------------------|----------------------------|----------------------------|------|-------|--------|--------|-----|------|---------|----|----|----|----|----|----|----|-----|------|------|--|--|--|--|--|--|------|------|------|------|------|--|--|--|--|------|------|------|------|------|------|------|------|------|
| BOOL  | False (H'00) or True (H'01)  |                       |                            |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| SIGNED<br>INTEGER   | 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> | Number                | 1st                        | 2nd                        | 3rd                        | 4th  | 5th   | 6th    | 7th    | 8th | SINT | 0LSB    |    |    |    |    |    |    |    | INT | 0LSB | 1LSB |  |  |  |  |  |  | DINT | 0LSB | 1LSB | 2LSB | 3LSB |  |  |  |  | LINT | 0LSB | 1LSB | 2LSB | 3LSB | 4LSB | 5LSB | 6LSB | 7LSB |
|   | Number   | 1st                   | 2nd                        | 3rd                        | 4th                        | 5th  | 6th   | 7th    | 8th    |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | SINT   | 0LSB                  |                            |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | INT  | 0LSB                  | 1LSB                       |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | DINT   | 0LSB                  | 1LSB                       | 2LSB                       | 3LSB                       |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| LINT  | 0LSB   | 1LSB                  | 2LSB                       | 3LSB                       | 4LSB                       | 5LSB | 6LSB  | 7LSB   |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| Example: 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>   | Number   | 1st                   | 2nd                        | 3rd                        | 4th                        | DINT | 78    | 56     | 34     | 12  |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| Number  | 1st  | 2nd                   | 3rd                        | 4th                        |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| DINT  | 78   | 56                    | 34                         | 12                         |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| UNSIGNED<br>INTEGER   | 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>   | Number                | 1st                        | 2nd                        | 3rd                        | 4th  | UDINT | DD     | CC     | BB  | AA   |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| Number  | 1st  | 2nd                   | 3rd                        | 4th                        |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| UDINT   | DD   | CC                    | BB                         | AA                         |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| STRING  | ASCII CODES, 1 or 2 bytes/words  |                       |                            |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | STRING: 2 bytes character count + 1 byte character   |                       |                            |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | <table><tr><th></th><th colspan="2">Contents (Char count)</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>   |                       | Contents (Char count)      |                            | Contents (String contents) |      |       |        | STRING | 04  | 00   | 4D      | 69 | 6C | 6C |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   |  | Contents (Char count) |                            | Contents (String contents) |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | STRING   | 04                    | 00                         | 4D                         | 69                         | 6C   | 6C    |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | STRING2: 2 bytes character count + 2 byte character  |                       |                            |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| <table><tr><th></th><th colspan="2">Contents (Char count)</th><th colspan="8">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> |  | Contents (Char count) |                            | Contents (String contents) |                            |      |       |        |        |     |      | STRING2 | 04 | 00 | 4D | 00 | 69 | 00 | 6C | 00  | 6C   | 00   |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | Contents (Char count)  |                       | Contents (String contents) |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| STRING2   | 04   | 00                    | 4D                         | 00                         | 69                         | 00   | 6C    | 00     | 6C     | 00  |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| SHORT_STRING: 1 bytes character count + 1 byte character  |  |                       |                            |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| <table><tr><th></th><th colspan="2">Contents (Char count)</th><th colspan="4">Contents (String contents)</th></tr><tr><td>STRING</td><td colspan="2">04</td><td>4D</td><td>69</td><td>6C</td><td>6C</td></tr></table>   |  | Contents (Char count) |                            | Contents (String contents) |                            |      |       | STRING | 04     |     | 4D   | 69      | 6C | 6C |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
|   | Contents (Char count)  |                       | Contents (String contents) |                            |                            |      |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |
| STRING  | 04   |                       | 4D                         | 69                         | 6C                         | 6C   |       |        |        |     |      |         |    |    |    |    |    |    |    |     |      |      |  |  |  |  |  |  |      |      |      |      |      |  |  |  |  |      |      |      |      |      |      |      |      |      |

| Data Type                  | Description   |       |                             |         |  |         |                 |         |         |
|----------------------------|---|-------|-----------------------------|---------|--|---------|-----------------|---------|---------|
| Fixed LENGTH<br>BIT STRING | BYTE (1 byte), WORD (2 bytes), DWORD (4 bytes), LWORD (8 bytes) |       |                             |         |  |         |                 |         |         |
|                            |   | 1st   | 2nd                         | 3rd     | 4th  | 5th     | 6th             | 7th     | 8th     |
|                            | Byte  | 7...0 |                             |         |  |         |                 |         |         |
|                            | WORD  | 7...0 | 15...8                      |         |  |         |                 |         |         |
|                            | DWORD   | 7...0 | 15...8                      | 23...16 | 31...24  |         |                 |         |         |
|                            | LWORD   | 7...0 | 15...8                      | 23...16 | 31...24  | 39...32 | 47...40         | 55...48 | 63...56 |
| STRINGI                    | A single string consists of multiple language representation    |       |                             |         |  |         |                 |         |         |
|                            | Name  |       | Data Type                   |         | Meaning  |         |                 |         |         |
|                            | Number  |       | USINT                       |         | The number of internationalized character strings  |         |                 |         |         |
|                            | Strings   |       | Array of:<br>Struct of:     |         | Array of individual internationalized character strings  |         |                 |         |         |
|                            | LanguageChar1   |       | USINT                       |         | The first ASCII character of the ISO 639-2/T language  |         |                 |         |         |
|                            | LanguageChar2   |       | USINT                       |         | The second ASCII character of the ISO 639-2/T language   |         |                 |         |         |
|                            | LanguageChar3   |       | USINT                       |         | The third ASCII character of the ISO 639-2/T language  |         |                 |         |         |
|                            | CharStringStruct  |       | USINT                       |         | The structure of the character string, limited to the Elementary Data type value 0xD0 (STRING), 0xD5 (STRING2), 0xD9 (STRINGN) and 0xDA (SHORT_STRING) |         |                 |         |         |
|                            | CharSet   |       | UINT                        |         | The character set which the character string is based on which comes from IANA MIB Printer Code (RFC 1759).  |         |                 |         |         |
|                            | International String  |       | Defined in CharStringStruct |         | An array of 8-bit octet elements which is the actual international character string  |         |                 |         |         |
|                            | ISO 639-2/T language:   |       |                             |         |  |         |                 |         |         |
|                            | Language  |       | First Character             |         | Second Character   |         | Third Character |         |         |
|                            | English   |       | e                           |         | n  |         | G               |         |         |
|                            | French  |       | f                           |         | r  |         | e               |         |         |

| Data Type | Description  |     |     |     |     |     |     |     |
|-----------|--|-----|-----|-----|-----|-----|-----|-----|
|           | Spanish  |     | s   |     | p   |     | a   |     |
|           | Italian  |     | i   |     | t   |     | a   |     |
| STRUCT    | STRUCT of: Composed of any data types.<br>Ex.: STRUCT of { BOOL, UINT, DINT } = { TRUE, H'1234, H'56789ABC }   |     |     |     |     |     |     |     |
|           |  | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th |
|           | Byte   | 01  | 34  | 12  | BC  | 9A  | 78  | 56  |
| ARRAY     | Array of: Composed of one data type.<br>Ex.: ARRAY of UINTs = { 1 · 2 · 3 }  |     |     |     |     |     |     |     |
|           | Number   | 1st | 2nd | 3rd | 4th | 5th | 6th |     |
|           | Array  | 01  | 00  | 02  | 00  | 03  | 00  |     |
| EPATH     | A path that consists of multiple segments and references the class, instance and attribute of another object.<br><br>Example : Identity Object, Instance attribute 5 = “ 20 01 24 01 30 05 “ |     |     |     |     |     |     |     |

### 9.8.3 Identity Object (Class ID: 01 Hex)

This object stores identity information that 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. |



| Instance Attribute | Name           | Access Rule | Data Type | Values   | Description  |
|--------------------|----------------|-------------|-----------|----------|--|
| H'02               | Device Type    | Get         | UINT      | H'0C     | Communication Adapter                                  |
| 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 table                |
| 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 length of a product name is 32 characters. |

**\*1 Status Description (H'05)**

| Bit (s) | Name                    | Description  |
|---------|-------------------------|--|
| 0       | Owned                   | Does the device has an owner connection?<br>0: No<br>1: Yes  |
| 1       | Reserved                | 0 : Always OFF   |
| 2       | Configured              | Is the device configured?<br>0: No<br>1: Yes   |
| 3       | Reserved                | 0 : Always OFF   |
| 4-7     | Extended Device Status  | 0: Self-testing<br>1: Firmware update<br>2: At least one faulted I/O connection<br>3: No I/O connections established<br>4: Non-volatile configuration error<br>5: Major fault<br>6: At least one I/O connection in run mode<br>7: At least one I/O connection established, all in idle mode.<br>8-15: Reserved |
| 8       | Minor Recoverable Fault | 0: No minor recoverable fault detected   |

| Bit (s) | Name                      | Description   |
|---------|---------------------------|---|
|         |                           | 1: Minor recoverable fault detected   |
| 9       | Minor Unrecoverable Fault | 0: No minor unrecoverable fault detected<br>1: Minor unrecoverable fault detected |
| 10      | Major Recoverable Fault   | 0: No major recoverable fault detected<br>1: Major recoverable fault detected     |
| 11      | Major Unrecoverable Fault | 0: No major unrecoverable fault detected<br>1: Major unrecoverable fault detected |

## 9.8.4 Message Router Object (Class ID: 02 Hex)

This object 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   |
| H'03               | Number Active    | Get         | UINT      | H'0    | The number of connected connections |

### 9.8.5 Assembly Object (Class ID: 04 Hex)

This object 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
  - H'C : Listen-Only Connection Number
  - 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 maximum number of instances |
|------|--------------|-----|------|------|---------------------------------|

- When Instance = 64–87, the Instance Attributes are listed below. (Length of input and output is editable. The maximum length is 250 words; supports only even bytes)

| I/O Message Connection |               |                    |                          |
|------------------------|---------------|--------------------|--------------------------|
| Connection No.         | Function      | Instance Attribute | Length                   |
| Connection 1           | Input (T→O)   | 0x65               | D1000~D1099              |
|                        | Output (O→T)  | 0x64               | D0~D99                   |
|                        | Configuration | 0x80               | Refer to the table below |
| Connection 2           | Input (T→O)   | 0x67               | D1100~D1199              |
|                        | Output (O→T)  | 0x66               | D100~D199                |
|                        | Configuration | 0x81               | Refer to the table below |
| Connection 3           | Input (T→O)   | 0x69               | D1200~D1299              |
|                        | Output (O→T)  | 0x68               | D200~D299                |
|                        | Configuration | 0x82               | Refer to the table below |
| Connection 4           | Input (T→O)   | 0x6B               | D1300~D1399              |
|                        | Output (O→T)  | 0x6A               | D300~D399                |
|                        | Configuration | 0x83               | Refer to the table below |
| Connection 5           | Input (T→O)   | 0x6D               | D1400~D1499              |
|                        | Output (O→T)  | 0x6C               | D400~D499                |
|                        | Configuration | 0x84               | Refer to the table below |
| Connection 6           | Input (T→O)   | 0x6F               | D1500~D1599              |
|                        | Output (O→T)  | 0x6E               | D500~D599                |
|                        | Configuration | 0x85               | Refer to the table below |
| Connection 7           | Input (T→O)   | 0x71               | D1600~D1699              |
|                        | Output (O→T)  | 0x70               | D600~D699                |
|                        | Configuration | 0x86               | Refer to the table below |
| Connection 8           | Input (T→O)   | 0x73               | D1700~D1799              |
|                        | Output (O→T)  | 0x72               | D700~D799                |
|                        | Configuration | 0x87               | Refer to the table below |

- Instance Attribute

| Instance Attribute | Name | Access Rule | Data Type | Values | Description                         |
|--------------------|------|-------------|-----------|--------|-------------------------------------|
| H'03               | Data | Get/Set     | UINT      | H'0    | The maximum number of connections   |
| H'04               | Size | Get         | UINT      | H'0    | The number of connected connections |

\* For connection input data, WRITE function is not supported.

\* When IO connection is established, and the status of CPU module is RUN, WRITE function cannot be executed.

Configure the contents of input and output to edit the exchange address.

| Configuration Address | Data Type | Contents                                       | Defaults (Connection 1) |
|-----------------------|-----------|--|-------------------------|
| Word[0]               | UINT      | Input corresponding element<br>0: D, 1:X, 2: Y | 0                       |
| Word[1]               | UINT      | Reserved                                       | 200                     |
| Word[2-3]             | DWORD     | Input corresponding element number             | 1000                    |
| Word[4]               | UINT      | Output corresponding element<br>0: D, 2: Y     | 0                       |
| Word[5]               | UINT      | Reserved                                       | 200                     |
| Word[6-7]             | DWORD     | Output corresponding element number            | 0                       |

- Examples of objects to be read and written

(1) Read data from connection 1 input:

Service code: H'0E

Class ID: H'04

Instance ID: H'65

Attribute ID: H'03

(2) Read data length of connection 2 output:

Service code: H'0E

Class ID: H'04

Instance ID: H'66

Attribute ID: H'04

(3) Read data from connection 2 output:

Service code: H'10

Class ID: H'04

Instance ID: H'66

Attribute ID: H'03

Data byte [0 ~ 200]: 00112233

(The range of data length is determined by configurations; default: 100 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. |



| Attribute | Name                   | Access Rule | Data Type | Values | Description  |
|-----------|------------------------|-------------|-----------|--------|--|
| H'02      | Open Format Rejects    | Get         | UINT      | H'0    | Number of Forward Open service requests that were rejected due to bad format.                                      |
| H'03      | Open Resources Rejects | Get         | UINT      | H'0    | Number of Forward Open service requests that were rejected due to lack of resources.                               |
| H'04      | Open Other Rejects     | Get         | STRUCT    | H'0    | Number of Forward Open service requests that 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 that were rejected due to bad format.                                     |
| H'07      | Close Other Rejects    | Get         | STRING    | H'0    | Number of Forward Close service requests that 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)

This section 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<br>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   | Identifies 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   | Identifies each communication port                                |
| H'03               | Link Object                  | Get         | STRUCT of    | --     | Identifies 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)

This object 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;<br>192.168.1.5                   |
|                    | Network Mask                     |             | UDINT     | H'FFFFFF00 | The device's network mask:<br>255.255.255.0               |
|                    | Gateway Address                  |             | UDINT     | H'C0A80001 | Default gateway address:<br>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   |
| H'13               | Encapsulation Inactivity Timeout | Get/Set     | UINT      | 120        | EIP device active connection time;<br>unit:0-3600 seconds |

※ When the device is communicating with the CPU module, the Instance Attribute H'03 and H'05 cannot be written.

● Examples of objects to be read and written

(1) Read data from Instance Attribute H'03:

Service code: H'0E

Class ID: H'F5

Instance ID: H'01

Attribute ID: H'03

(2) Write data into Instance Attribute H'05:

Service code: H'10

Class ID: H'F5

Instance ID: H'01

Attribute ID: H'05

Data Byte[0~3]: IP Address

Byte[4~7]: Network Mask

Byte[8~11]: Gateway Mask

Byte[12~15]: Name Server

Byte[16~19]: Name Server2

Byte[20~25]: Domain Name

(Ex: AS300, 05 41 53 33 30 30; the first byte indicates the string length, its following bytes is for ASCII data.)

\*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 uses the interface configuration values previously stored (for example, in non-volatile memory or through hardware switches). |
| 1      | The device obtains its interface configuration values through BOOTP.   |
| 2      | The device obtains its interface configuration values through DHCP on start-up.  |

### 9.8.9 Ethernet Link Object (Class ID: F6 Hex)

This object 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<br>10(H'0A), 100(H'64), 1000(H'3E8)<br>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_S TRING       | NA         | Define the name of the Ethernet port<br>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_S TRING       | NA         | Use ASCII characters to name the Ethernet port name.  |
| H'0B               | Interface Capability     | Get         | STRUCT of:          | --         | Ethernet interface capability bits table *2   |
|                    | Capability Bits          |             | DWORD               | H'00000007 | Ethernet interface capability bits definition   |
|                    | Speed/Duplex Options     |             | STRUCT of:          | --         | Ethernet interface capability speed & duplex option definition  |
|                    | Speed/Duplex Array Count |             | USINT               | H'04       | Ethernet interface capability speed & duplex array count  |
|                    | Speed/Duplex Array       |             | ARRAY of STRUCT of: | --         | Ethernet interface capability speed & duplex array contents   |
|                    | Interface Speed          |             | UINT                | NA         | Ethernet interface speed; ex:<br>H'0A: 10 bps and H'64: 100 bps   |
|                    | Interface Duplex Mode    |             | USINT               | NA         | Ethernet interface duplex mode;<br>H'00: duplex mode and H'01: full duplex mode                                 |

## \*1 Interface Flag Table

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

## \*2 Interface Capability Bits

| Bits | Item                          | Description  |
|------|-------------------------------|--|
| 0    | Manual Setting Requires Reset | Indicates if the device requires a reset when instance attribute #6 (Interface Control attribute) changes.<br>0 indicates the device does not require a reset<br>1 indicates the device requires a reset |
| 1    | Auto-negotiate                | 0 indicates the interface does not support auto-negotiation<br>1 indicates the interface supports auto-negotiation   |
| 2    | Auto-MDIX                     | 0 indicates the interface does not support auto MDIX operation<br>1 indicates the interface supports auto MDIX operation   |
| 3    | Manual Speed/Duplex           | 0 indicates the interface does not support speed/duplex setting. (Instance attribute #6, Interface Control attribute)<br>1 indicates the interface supports speed/duplex setting                         |
| 4-31 | Reserved                      | Should be 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        | Get/Set     | BOOL      | H'00   | Y0.0 bit register        |
| H'01               | Y0.1        | Get/Set     | BOOL      | H'00   | Y0.1 bit register        |
| H'02-H'03FE        | Y0.2-Y63.14 | Get/Set     | BOOL      | H'00   | Y0.2-Y63.14 bit register |
| H'3FF              | Y63.15      | Get/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     | Get/Set     | INT       | H'00   | Y0 word register     |
| H'01               | Y1     | Get/Set     | INT       | H'00   | Y1 word register     |
| H'02-H'3E          | Y2-Y62 | Get/Set     | INT       | H'00   | Y2-Y62 word register |
| H'3F               | Y63    | Get/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           | Get/Set     | BOOL      | H'00   | D0.0 bit register           |
| H'01               | D0.1           | Get/Set     | BOOL      | H'00   | D0.1 bit register           |
| H'02-H'752FE       | D0.2-D29999.14 | Get/Set     | BOOL      | H'00   | D0.2-D29999.14 bit register |
| H'752FF            | D29999.15      | Get/Set     | BOOL      | 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        | Get/Set     | INT       | H'00   | D0 word register        |
| H'01               | D1        | Get/Set     | INT       | H'00   | D1 word register        |
| H'02-H'752E        | D2-D29998 | Get/Set     | INT       | H'00   | D2-D29998 word register |
| H'752F             | D29999    | Get/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       | Get/Set     | BOOL      | H'00   | M0 bit register       |
| H'01               | M1       | Get/Set     | BOOL      | H'00   | M1 bit register       |
| H'02-H'1FFE        | M2-M8190 | Get/Set     | BOOL      | H'00   | M2-M8190 bit register |
| H'1FFF             | M8191    | Get/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       | Get/Set     | BOOL      | H'00   | S0 bit register       |
| H'01               | S1       | Get/Set     | BOOL      | H'00   | S1 bit register       |
| H'02-H'7FE         | S2-S2046 | Get/Set     | BOOL      | H'00   | S2-S2046 bit register |
| H'7FF              | S2047    | Get/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      | Get/Set     | BOOL      | H'00   | T0 bit register      |
| H'01               | T1      | Get/Set     | BOOL      | H'00   | T1 bit register      |
| H'02-H'1FE         | T2-T510 | Get/Set     | BOOL      | H'00   | T2-T510 bit register |
| H'1FF              | T511    | Get/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      | Get/Set     | INT       | H'00   | T0 word register      |
| H'01               | T1      | Get/Set     | INT       | H'00   | T1 word register      |
| H'02-H'1FE         | T2-T510 | Get/Set     | INT       | H'00   | T2-T510 word register |
| H'1FF              | T511    | Get/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      | Get/Set     | BOOL      | H'00   | C0 bit register      |
| H'01               | C1      | Get/Set     | BOOL      | H'00   | C1 bit register      |
| H'02-H'1FE         | C2-C510 | Get/Set     | BOOL      | H'00   | C2-C510 bit register |
| H'1FF              | C511    | Get/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      | Get/Set     | INT       | H'00   | C0 word register      |
| H'01               | C1      | Get/Set     | INT       | H'00   | C1 word register      |
| H'02-H'1FE         | C2-C510 | Get/Set     | INT       | H'00   | C2-C510 word register |
| H'1FF              | C511    | Get/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       | Get/Set     | BOOL      | H'00   | HC0 bit register       |
| H'01               | HC1       | Get/Set     | BOOL      | H'00   | HC1 bit register       |
| H'02-H'FE          | HC2-HC254 | Get/Set     | BOOL      | H'00   | HC2-HC254 bit register |
| H'FF               | HC255     | Get/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       | Get/Set     | DINT      | H'00   | HC0 word register       |
| H'01               | HC1       | Get/Set     | DINT      | H'00   | HC1 word register       |
| H'02-H'FE          | HC2-HC254 | Get/Set     | DINT      | H'00   | HC2-HC254 word register |
| H'FF               | HC255     | Get/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        | Get/Set     | BOOL      | H'00   | SM0 bit register        |
| H'01               | SM1        | Get/Set     | BOOL      | H'00   | SM1 bit register        |
| H'02-H'FFE         | SM2-SM4094 | Get/Set     | BOOL      | H'00   | SM2-SM4094 bit register |
| H'FFF              | SM4095     | Get/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        | Get/Set     | INT       | H'00   | SR0 word register        |
| H'01               | SR1        | Get/Set     | INT       | H'00   | SR1 word register        |
| H'02-H'7FE         | SR2-SR2046 | Get/Set     | INT       | H'00   | SR2-SR2046 word register |
| H'7FF              | SR2047     | Get/Set     | INT       | H'00   | SR2047 word register     |

## 9.9 Delta EIP Product List

### 9.9.1 Delta EIP Products

| Positioning   | Product  | Firmware Version |
|---------------|--|------------------|
| Mid-range PLC | AHCPU501-EN, AHCPU511-EN, AHCPU521-EN, AHCPU531-EN               | V2.00            |
|               | AHCPU560-EN2   | V1.00            |
|               | AH10EN-5A  | V2.00            |
|               | AHRTU-ETHN-5A  | V1.00            |
|               | AH10EMC-5A   | V1.00            |
|               | AS300 Series   | V1.00            |
|               | AS200 Series   | V1.00            |
|               | AS100 Series   | V1.10            |
|               | AS-FEN02 communication card (V1.06) for AS300 Series (V1.00)     | V1.06            |
|               | AS-FEN02 communication card (V2.02) for AS00SCM-A Series (V1.00) | V2.02            |
| Small PLC     | DVP-ES2-E Series   | V3.60            |
|               | DVP26SE Series   | V1.00            |
|               | DVP-ES3 Series   | V1.00            |
| Inverter      | CMM-EIP01/02 Communication Card for VFD-MS300 Series             | V1.00            |
|               | CMM-EIP03 Communication Card for VFD-MS300 Series                | V1.00            |
|               | CMC-EIP01 Communication Card for VFD-C2000 Series                | V1.06            |
|               | CMC-EIP02 Communication Card for VFD-C2000 Series                | V1.00            |

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

| Positioning     | Product   | Firmware Version |
|-----------------|---|------------------|
| Mid-range PLC   | AHCPU560-EN2                                      | V1.00            |
|                 | AH10EN-5A   | V2.00            |
|                 | AHRTU-ETHN-5A                                     | V1.00            |
| Inverter        | CMM-EIP03 Communication Card for VFD-MS300 Series | V1.00            |
|                 | CMC-EIP02 Communication Card for VFD-C2000 Series | V1.00            |
| Ethernet Switch | DVS-103I02C-DLR                                   | V1.00            |

9.9.3 Delta EIP Products, Scanner supported

| Positioning   | Product  | Firmware Version |
|---------------|--|------------------|
| Mid-range PLC | AHCPU501-EN, AHCPU511-EN, AHCPU521-EN, AHCPU531-EN | V2.00            |
|               | AHCPU560-EN2                                       | V1.00            |
|               | AH10EN-5A  | V2.00            |
|               | AS300 Series, AS200 Series                         | V1.00            |
|               | AS100 Series                                       | V1.10            |
| Small PLC     | DVP-ES3 Series                                     | V1.00            |

9.10 Network Security

To enhance security and performance of the system, it is suggested to use closed network or LAN with firewall protection to prevent cyber-attacks.

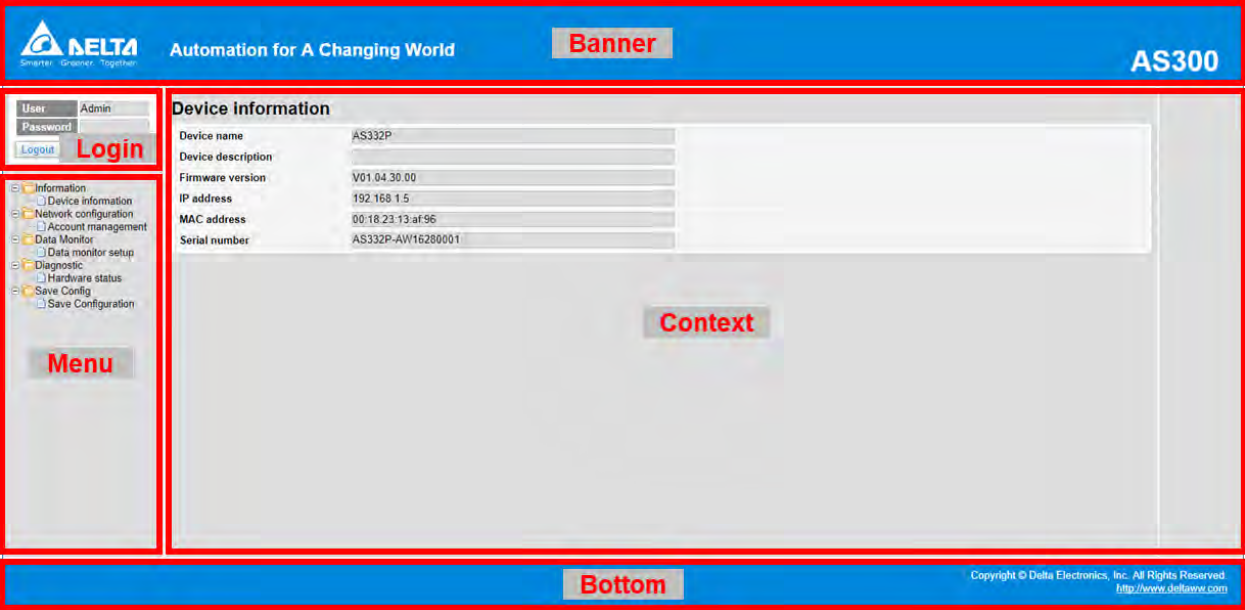
## 9.11 Operation and Monitor on the Web

### 9.11.1 Getting Started

You can enter AS Series PLC IP address in the search bar of your browser to connect to your device. After that you can set up and monitor AS Series PLC. This only works in local network (LAN). Do not use it remotely.

#### 9.11.1.1 Exploring the Webpage

After connected to the module, you can see the AS300 webpage with 5 sections as the image shown below.



**Descriptions:**

| Section | Contents  |
|---------|---|
| Banner  | Delta logo and the name of the connected device   |
| Login   | Username and password   |
| Menu    | Sitemap is shown in tree diagram.<br>(The menu shows data based on the permission of the current user.) |
| Context | Main contents; click an item on the menu section, its content appears here.                             |
| Bottom  | Copyright information and Delta webpage information   |

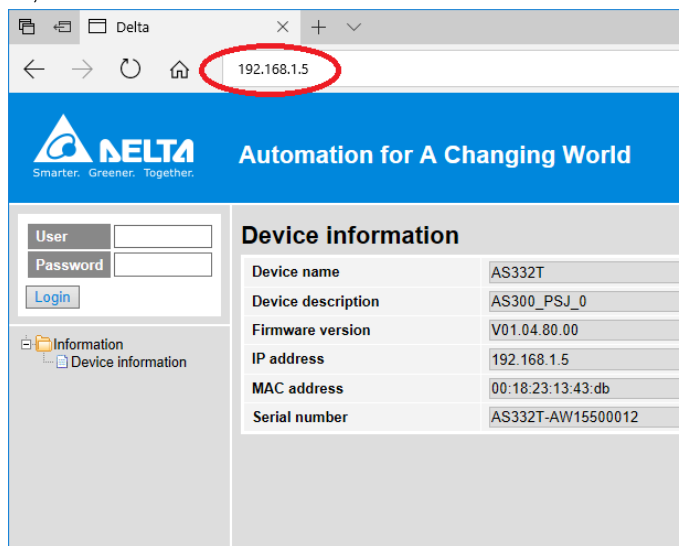
### 9.11.1.2 Using the Webpage

List of browsers that support AS300 webpage:

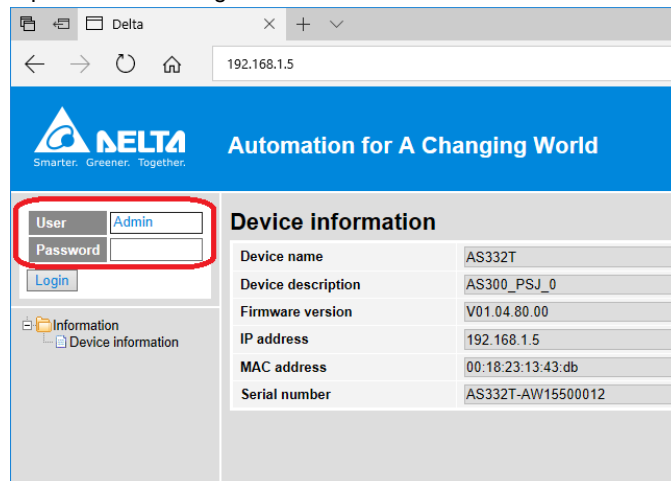
| Provider  | Browser           | Supported versions |
|-----------|-------------------|--------------------|
| Microsoft | Internet Explorer | V10.0 and later    |
| Microsoft | Edge              | V20 and later      |
| Google    | Chrome            | V14 and later      |
| Apple     | Safari            | V5.1 and later     |

#### ● Operation Steps:

- a. Open your browser, enter AS300 PLC IP address in the search bar to connect to AS300 PLC.



- b. After the webpage appears, enter "Admin" in the User section and click Login without entering any password. You can set up the password after login.



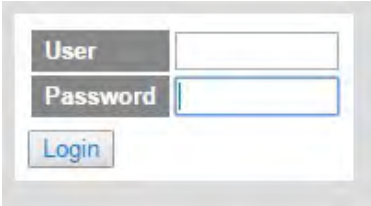


9.11.1.3 Login

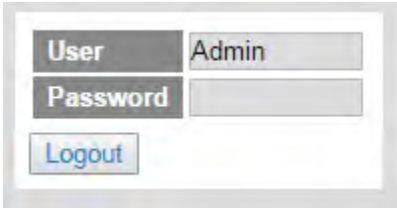
You need to login to your account to set up.

● Operation Steps:

- a. Provide the login information to login.

A screenshot of a login interface. It features two input fields: one labeled 'User' and another labeled 'Password'. Below these fields is a button labeled 'Login'.

- b. After login successfully, the user field shows your account name (read only). After setting up, you can click **Logout** here to leave this webpage.

A screenshot of the interface after a successful login. The 'User' field now displays the text 'Admin' and is read-only. The 'Password' field remains empty. A button labeled 'Logout' is visible below the fields.

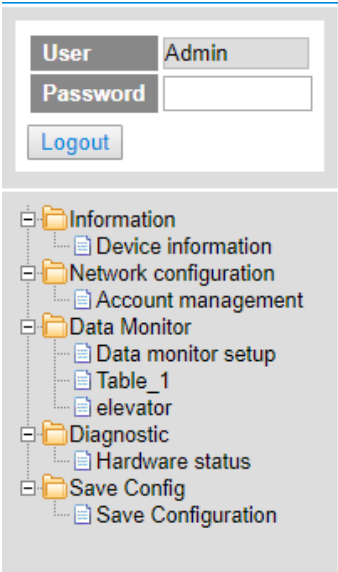
| Item               | Description   |
|--------------------|---|
| User               | Your account name   |
| Password           | Your password   |
| “Login” / “Logout” | Login: to enter the webpage<br>Logout: to leave the webpage |

9.11.1.4 Menu

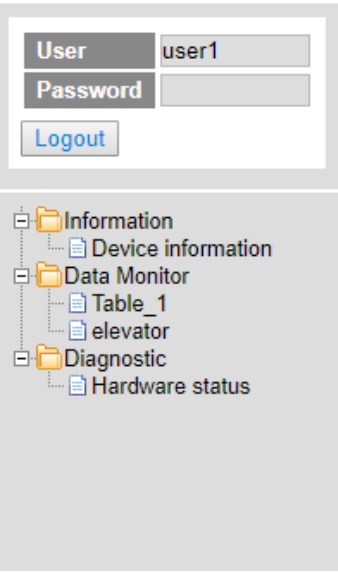
The menu shows data based on the permission of the current user.

| Nodes                    | Permission    |            |           |
|--------------------------|---------------|------------|-----------|
|                          | Administrator | Write/Read | Read      |
| Device information       | V             | V          | V         |
| Account management       | V             |            |           |
| Data monitor setup       | V             |            |           |
| Data monitor table 1 - 4 | V             | V          | Read-only |
| Hardware status          | V             | Read-only  | Read-only |
| Save configuration       | V             |            |           |

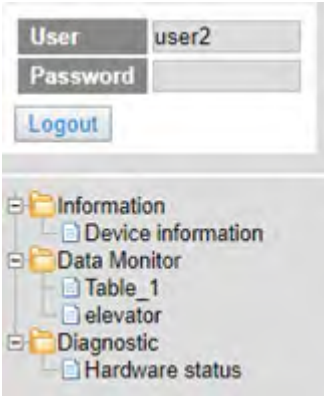
- Log in as an Administrator, the following nodes appear.



- Log in with Write/Read permission, the following nodes appear.



- Log in with Read only permission, the following nodes appear.



### 9.11.2 Device Information

Here provides AS Series PLC product information.

You do not need to log in to see the device information. This page is read only, not for editing.

Device information

|                    |                   |
|--------------------|-------------------|
| Device name        | AS332P            |
| Device description |                   |
| Firmware version   | V01.04.30.00      |
| IP address         | 192.168.1.5       |
| MAC address        | 00:18:23:13:af:96 |
| Serial number      | AS332P-AW16280001 |

| Item               | Description                                     |
|--------------------|---|
| Device name        | Product name                                    |
| Device description | Device description that user defined in ISPsoft |
| Firmware version   | Firmware version                                |
| IP address         | Product IP address                              |
| MAC address        | Product MAC address                             |
| Serial number      | Product serial number                           |

9.11.3 Network configuration

You can set network related configurations here.

9.11.3.1 Account management

You can set 3 kinds of access types for up to 8 user accounts.

Account management

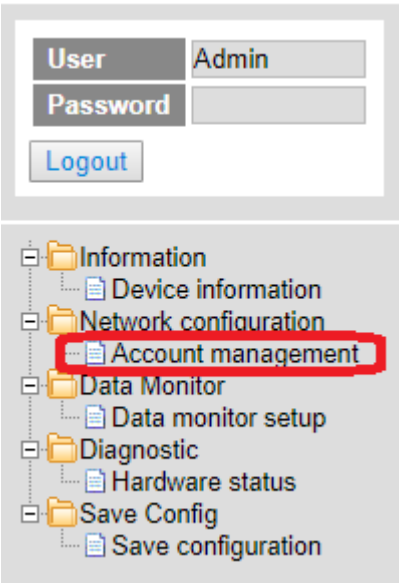
| No. | User ID | Password | Access type   | Delete |
|-----|---------|----------|---------------|--------|
| 1   | Admin   |          | Administrator | Delete |
| 2   |         |          | Administrator | Delete |
| 3   |         |          | Administrator | Delete |
| 4   |         |          | Administrator | Delete |
| 5   |         |          | Write / Read  | Delete |
| 6   |         |          | Read          | Delete |
| 7   |         |          | Administrator | Delete |
| 8   |         |          | Administrator | Delete |

Apply

| Item        | Description   |
|-------------|---|
| User ID     | <p>To name your user ID, you can use up to 16 characters from the following characters, A through Z (case-insensitive ), 0 through 9, _ (underscore) , (comma) and . (dot) .</p> <ul style="list-style-type: none"><li>The first default user ID is “Admin” (read only).</li></ul>  |
| Password    | <p>To name your password, you can use up to 16 characters from the following characters, A through Z (case-insensitive ), 0 through 9, _ (underscore) , (comma) and . (dot) .</p> <ul style="list-style-type: none"><li>No password for the default user ID “Admin” (read only), you can set up the password later.</li></ul>   |
| Access type | <p>Administrator: You can set up all parameters and have permission to edit the password and permission.</p> <p>Write/Read: You can open the data monitor pages and the diagnostic page. You can also edit the parameters.</p> <p>Read: You can open the data monitor pages and the diagnostic page. But you cannot edit parameters.</p> <ul style="list-style-type: none"><li>Default user is “Administrator”.</li></ul> |
| “Delete”    | Use “Delete” to clear the user ID and password.   |
| “Apply”     | Use “Apply” to save the settings.   |

● **Operation Steps:**

- a. After log in, double-click **Account management** to open the setting page.



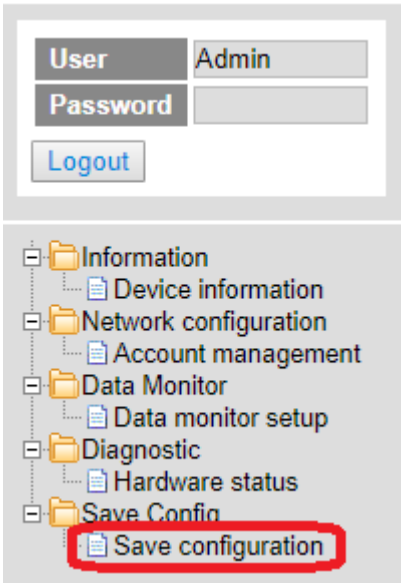
- b. Set up the User ID, the password and the access type. After editing, click “Apply” to save the setting or click “Delete” to clear the account.

**Account management**

| No. | User ID | Password | Access type   | Delete |
|-----|---------|----------|---------------|--------|
| 1   | Admin   |          | Administrator | Delete |
| 2   | user1   | .....    | Write/Read    | Delete |
| 3   | user2   | .....    | Read          | Delete |
| 4   |         |          | Administrator | Delete |
| 5   |         |          | Administrator | Delete |
| 6   |         |          | Administrator | Delete |
| 7   |         |          | Administrator | Delete |
| 8   |         |          | Administrator | Delete |

Apply

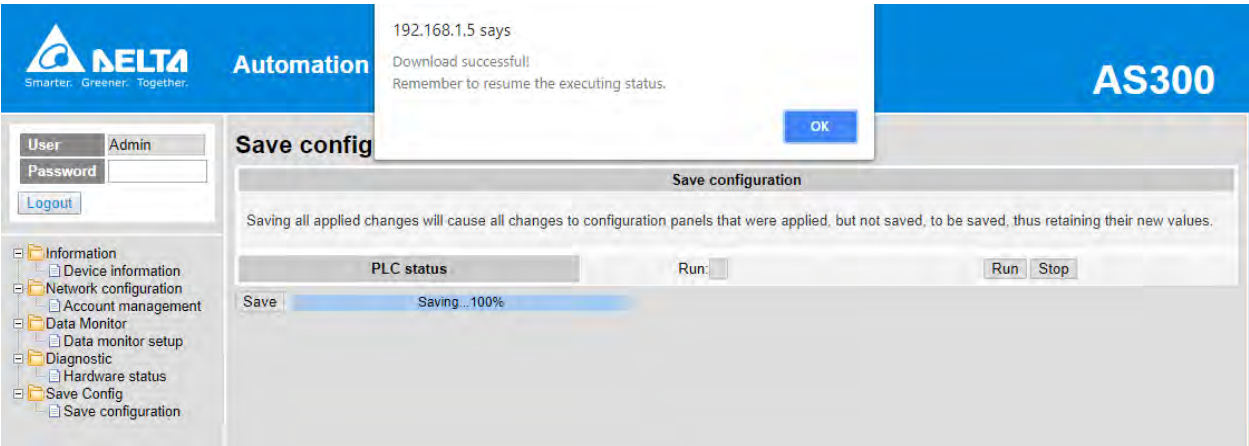
c. Double-click **Save configuration** to open the setting page.



d. Click “Save” to save and download the settings to the device.



After download is complete, it will be prompted with a Download successful message.



9.11.4 Data Monitoring

You can set monitoring related configurations here.

9.11.4.1 Data Monitoring Setup Page

You can set up 4 pages of monitoring data and up to 30 items can be monitored on each page.

Data monitor setup

| No. | Table name | Device quantity | Default update cycle<br>(1s-60s) | Edit | Delete |
|-----|------------|-----------------|----------------------------------|------|--------|
| 1   | Table_1    | 17              | 1                                | Edit | Delete |
| 2   |            | 0               | 10                               | Edit | Delete |
| 3   | Table_3    | 0               | 1                                | Edit | Delete |
| 4   | Table_4    | 0               | 5                                | Edit | Delete |

Table name: Table\_1

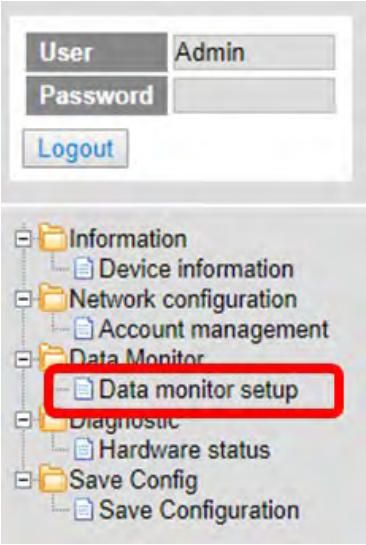
| No. | Device | Radix                  | Read only                | Description |
|-----|--------|------------------------|--------------------------|-------------|
| 1   | I0     | Binary                 | <input type="checkbox"/> |             |
| 2   |        | Signed Decimal         | <input type="checkbox"/> |             |
| 3   | Y0     | Signed Decimal         | <input type="checkbox"/> |             |
| 4   | Y63.15 | Unsigned Decimal       | <input type="checkbox"/> |             |
| 5   | HIC0   | Hexadecimal            | <input type="checkbox"/> |             |
| 6   |        | Octal                  | <input type="checkbox"/> |             |
| 7   | Y0.0   | Binary                 | <input type="checkbox"/> |             |
| 8   |        | 32bit Signed decimal   | <input type="checkbox"/> |             |
| 9   | X0.0   | 32bit Unsigned decimal | <input type="checkbox"/> |             |
| 10  |        | 32bit Hex              | <input type="checkbox"/> |             |
| 11  |        | 32bit Octal            | <input type="checkbox"/> |             |
| 12  |        | 32bit Binary           | <input type="checkbox"/> |             |
| 13  |        | 32bit Float            | <input type="checkbox"/> |             |
| 14  |        | 64bit Double           | <input type="checkbox"/> |             |
| 15  |        | Signed Decimal         | <input type="checkbox"/> |             |
| 16  |        | Signed Decimal         | <input type="checkbox"/> |             |
| 17  | D400   | Hexadecimal            | <input type="checkbox"/> |             |
| 18  | D401   | Hexadecimal            | <input type="checkbox"/> |             |
| 19  | D402   | Hexadecimal            | <input type="checkbox"/> |             |
| 20  | D403   | Hexadecimal            | <input type="checkbox"/> |             |
| 21  |        | Signed Decimal         | <input type="checkbox"/> |             |
| 22  |        | Signed Decimal         | <input type="checkbox"/> |             |
| 23  | D400   | 32bit Float            | <input type="checkbox"/> | 32          |
| 24  | D400   | 64bit Double           | <input type="checkbox"/> | 64          |
| 25  | HIC123 | 32bit Float            | <input type="checkbox"/> |             |
| 26  |        | Signed Decimal         | <input type="checkbox"/> |             |
| 27  | C0     | Signed Decimal         | <input type="checkbox"/> |             |
| 28  |        | Signed Decimal         | <input type="checkbox"/> |             |
| 29  |        | Signed Decimal         | <input type="checkbox"/> |             |
| 30  |        | Signed Decimal         | <input type="checkbox"/> |             |

Apply

| Item                 | Description   |
|----------------------|---|
| Table name           | To name your table, you can use up to 16 characters from the following characters, A through Z (case-insensitive ), 0 through 9, _ (underscore) , (comma) and . (dot) . |
| Device quantity      | Device quantity to be monitored; default: read only   |
| Default update cycle | Set up the updated cycle time; default: 5 seconds; unit: second   |
| “Edit”               | Click “Edit” to edit the table and the table name column turns green. The table contents appear below.  |
| “Delete”             | Click “Delete” to delete the table and its contents.  |

| Item        | Description  |
|-------------|--|
| Device      | Devices to be monitored; you can enter the following devices to monitor xX, yY, mM, sSmM, sSrR, dD, sS, tT, cC, hHcC and eE.   |
| Radix       | Positional numeral system to be shown on the monitoring page; available formats are Signed decimal, Unsigned decimal, Hexadecimal, Octal, Binary, 32bit Signed decimal, 32bit Unsigned decimal, 32bit Hexadecimal, 32bit Octal, 32bit Binary, 32bit Float and 64bit Double |
| Read only   | Set up the monitored devices to read only or not.  |
| Description | Add a description here for the table.  |
| “Apply”     | Click “Apply” to save the settings.  |

- **Operation Steps:**
  - a. After log in, double-click **Data monitor setup** to open the setting page.



- b. Use “Edit” to edit the table name, device quantity, and update cycle time.

| Data monitor setup |            |                 |                               |      |        |
|--------------------|------------|-----------------|-------------------------------|------|--------|
| No.                | Table name | Device quantity | Default update cycle (1s~60s) | Edit | Delete |
| 1                  | Table_1    | 17              | 1                             | Edit | Delete |
| 2                  |            | 0               | 10                            | Edit | Delete |
| 3                  | Table_3    | 0               | 1                             | Edit | Delete |
| 4                  | Elevator   | 0               | 10                            | Edit | Delete |



c. The corresponding table contents appear below.

| Table name: Elevator |        |                |                          |             |
|----------------------|--------|----------------|--------------------------|-------------|
| No.                  | Device | Radix          | Read only                | Description |
| 1                    |        | Signed Decimal | <input type="checkbox"/> |             |
| 2                    |        | Signed Decimal | <input type="checkbox"/> |             |
| 3                    |        | Signed Decimal | <input type="checkbox"/> |             |
| 4                    |        | Signed Decimal | <input type="checkbox"/> |             |
| 5                    |        | Signed Decimal | <input type="checkbox"/> |             |

d. Edit the devices to be monitored, radix to be shown, read only or not and the description. After editing, click “Apply” to save the setting.

| Table name: Elevator |        |                |                          |             |
|----------------------|--------|----------------|--------------------------|-------------|
| No.                  | Device | Radix          | Read only                | Description |
| 1                    | M0     | Binary         | <input type="checkbox"/> |             |
| 2                    |        | Signed Decimal | <input type="checkbox"/> |             |
| 3                    | Y0     | Signed Decimal | <input type="checkbox"/> |             |
| 4                    | Y63.15 | Binary         | <input type="checkbox"/> |             |
| 5                    | HC0    | 32bit Octal    | <input type="checkbox"/> |             |
| 6                    |        | Signed Decimal | <input type="checkbox"/> |             |
| 7                    | Y0.0   | Binary         | <input type="checkbox"/> |             |
| 8                    |        | Signed Decimal | <input type="checkbox"/> |             |
| ⋮                    |        |                |                          |             |
| 28                   |        | Signed Decimal | <input type="checkbox"/> |             |
| 29                   |        | Signed Decimal | <input type="checkbox"/> |             |
| 30                   |        | Signed Decimal | <input type="checkbox"/> |             |
| Apply                |        |                |                          |             |

e. Double-click **Save configuration** to open the setting page.

UserAdmin

Password

Logout

Information

Device information

Network configuration

Account management

Data Monitor

Data monitor setup

Table\_1

Table\_3

Diagnostic

Hardware status

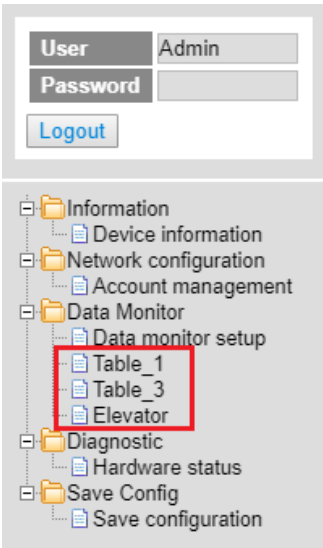
Save Config

Save configuration

f. Click “Save” to save and download the settings to the device.



g. Once the download is complete, you can see the newly added table to be monitored under the Data Monitor node.



h. Note: The data monitor table must be downloaded to the device otherwise even if the data monitor table is created, it cannot be monitored.

9.11.4.2 Data Monitor Table Pages

The setting results are shown as below.

| Table name: Table_1 |        | Monitor status: <span></span> |              | Update cycle (1s - 60s): <span>1</span> |             | Floating Format Settings: <span>3</span> |     |           |     |
|---------------------|--------|-------------------------------|--------------|---|-------------|--|-----|-----------|-----|
| No.                 | Device | Status                        | Value        | Radix                                   | Description | Set Status                               |     | Set value | Set |
| 1                   | M0     |                               |              | Binary                                  |             | ON                                       | OFF |           | Set |
| 2                   |        |                               |              |   |             | ON                                       | OFF |           | Set |
| 3                   | Y0     |                               | K57          | Signed Decimal                          |             | ON                                       | OFF | 57        | Set |
| 4                   | Y63.15 |                               |              | Binary                                  |             | ON                                       | OFF |           | Set |
| 5                   | H00    |                               | 000000000000 | 32bit Octal                             |             | ON                                       | OFF |           | Set |
| 6                   |        |                               |              |   |             | ON                                       | OFF |           | Set |
| 7                   | Y0.0   | <span></span>                 |              | Binary                                  |             | ON                                       | OFF |           | Set |
| 8                   |        |                               |              |   |             | ON                                       | OFF |           | Set |
| 9                   | X0.0   |                               |              | Binary                                  |             | ON                                       | OFF |           | Set |
| 10                  |        |                               |              |   |             | ON                                       | OFF |           | Set |
| 11                  |        |                               |              |   |             | ON                                       | OFF |           | Set |
| 12                  | D400   |                               | H3576        | Hexadecimal                             |             | ON                                       | OFF |           | Set |
| 13                  | D401   |                               | H4641        | Hexadecimal                             |             | ON                                       | OFF |           | Set |
| 14                  | D402   |                               | H8000        | Hexadecimal                             |             | ON                                       | OFF |           | Set |
| 15                  | D403   |                               | H4048        | Hexadecimal                             |             | ON                                       | OFF |           | Set |
| 16                  |        |                               |              |   |             | ON                                       | OFF |           | Set |
| 17                  | D400   |                               | 12365.365    | 32bit Float                             | 32          | ON                                       | OFF |           | Set |
| 18                  | D400   |                               | 55.000       | 64bit Double                            | 64          | ON                                       | OFF |           | Set |

| Item                           | Description   |
|--------------------------------|---|
| <b>Table name</b>              | Name of the table; read only  |
| <b>Monitor status</b>          | Status of the monitoring; read only<br>Yellow light: reading, Green light: reading complete, Red light: reading error   |
| <b>Update cycle</b>            | Update cycle time; default is what you set up in data monitor setup page; unit: second  |
| <b>“-“</b>                     | Minus; click once to decrease 1; the minimum value is 1   |
| <b>“+“</b>                     | Plus; click once to increase 1; the maximum value is 60   |
| <b>Floating format setting</b> | Floating point setting; round down; default: round the number down to three decimal places  |
| <b>Device</b>                  | Devices to be monitored; read only  |
| <b>Radix</b>                   | Positional numeral system to be shown on the monitoring page; available formats are Signed decimal, Unsigned decimal, Hexadecimal, Octal, Binary, 32bit Signed decimal, 32bit Unsigned decimal, 32bit Hexadecimal, 32bit Octal, 32bit Binary, 32bit Float and 64bit Double  |
| <b>Description</b>             | Add a description here for the table; read only   |
| <b>Status</b>                  | Status of bit; read only<br>Green LED: ON; No LED: OFF  |
| <b>Value</b>                   | Values in devices to be monitored; read only<br>Signed decimal: K+ Number<br>Unsigned decimal: K+ Number<br>Hexadecimal: H + hex Number<br>Octal: O + octal Number<br>Binary: B + binary Number<br>32bit Signed decimal: K+ Number<br>32bit Unsigned decimal: K+ Number<br>32bit Hexadecimal: H + hex Number<br>32bit Octal: O + octal Number<br>32bit Binary: B + binary Number<br>32bit Float: float Number<br>64bit Double: float Number |
| <b>“On” / ”Off”</b>            | “ON”: the status of Bit is ON.<br>“OFF”: the status of Bit is OFF.<br>● If the authority level for the logged in user is READ, this column is read only.  |
| <b>Set Value</b>               | Change the value for the device to be monitored<br>● Type the value in and click “SET” and the changed value appears in the VALUE column as the image shown above.<br>● If the authority level for the logged in user is READ, this column is read only.  |
| <b>“Set”</b>                   | Click “Set” to confirm the changed value.<br>● If the authority level for the logged in user is READ, this column is read only.   |

9.11.5 Diagnostic

You can set diagnostic related configurations here.

9.11.5.1 Hardware Status Page

This page displays information on hardware status, CPU module, power module, and function cards. You can set CPU to run or stop. Here also shows the CPU running status and error codes.

- For AS300, the hardware status page looks like below.

Hardware status

Refresh cycle (1s ~ 60s): - 10 +

| Extension No.      | Module name                     | Status  | Error code |
|--------------------|---------------------------------|---|------------|
| Power module       |                                 |   |            |
| CPU module         | AS332T-A<br><div>Run Stop</div> | Run: <input type="checkbox"/> Err: <input type="checkbox"/> |            |
| ---Function card 1 |                                 |   |            |
| ---Function card 2 |                                 |   |            |
| Module 1           | AS00SCM-A                       | <input type="checkbox"/>                                    |            |
| ---Function card 1 | AS-F485                         |   |            |
| ---Function card 2 | AS-F485                         |   |            |

- For AS200, the hardware status page looks like below.

Hardware status

Refresh cycle (1s ~ 60s): - 10 +

| Extension No.      | Module name                     | Status  | Error code |
|--------------------|---------------------------------|---|------------|
| Power module       |                                 |   |            |
| CPU module         | AS228T-A<br><div>Run Stop</div> | Run: <input type="checkbox"/> Err: <input type="checkbox"/> |            |
| Module 1           | AS00SCM-A                       | <input type="checkbox"/>                                    |            |
| ---Function card 1 | AS-F485                         |   |            |
| ---Function card 2 | AS-F485                         |   |            |

- For AS100, the hardware status page looks like below.

Hardware status

Refresh cycle (1s ~ 60s): - 10 +

| Extension No.      | Module name                   | Status  | Error code |
|--------------------|-------------------------------|---|------------|
| Power module       |                               |   |            |
| CPU module         | AS164T<br><div>Run Stop</div> | Run: <input type="checkbox"/> Err: <input type="checkbox"/> |            |
| Module 1           | AS00SCM-A                     | <input type="checkbox"/>                                    |            |
| ---Function card 1 | AS-F485                       |   |            |
| ---Function card 2 | AS-F485                       |   |            |

| Item                      | Description  |
|---------------------------|--|
| <b>Refresh cycle</b>      | Refresh cycle time; default: 10; unit: second  |
| <b>“-“</b>                | Minus; click once to decrease 1; the minimum value is 1  |
| <b>“+“</b>                | Plus; click once to increase 1; the maximum value is 60  |
| <b>Power module name</b>  | Name of the power module; read only  |
| <b>CPU module name</b>    | Name of the CPU module; read only  |
| <b>CPU Run LED</b>        | LED of CPU running status; read only<br>Green light: RUN<br>LED Not Lit: STOP  |
| <b>CPU Error LED</b>      | LED of CPU Error; read only  |
| <b>CPU Error code</b>     | Error codes of CPU module; read only   |
| <b>“Run” / “Stop”</b>     | Click “RUN” to set the running status to RUN<br>Click “Stop” to set the running status to STOP<br><ul style="list-style-type: none"> <li>If the authority level for the logged in user is WRITE/READ or READ, this column is read only.</li> </ul> |
| <b>Function card name</b> | Name of the function card; read only<br><ul style="list-style-type: none"> <li>For communication module, two extra rows for the names of the communication function cards are shown here</li> </ul>  |
| <b>Module name</b>        | Name of the module; read only<br>When the actual placement is not the same as the arrangement in HWCONFIG, the background of this column will be in red.   |
| <b>Module Error LED</b>   | LED of module error; read only   |
| <b>Module Error code</b>  | Error codes of module; read only   |

## 9.11.6 Configurations

### 9.11.6.1 Save Configuration Page

You can save the configurations and download the parameters to your device here.

Save configuration

Save configuration

Saving all applied changes will cause all changes to configuration panels that were applied, but not saved, to be saved, thus retaining their new values.

PLC Status

Run: ☐

Run

Stop

Save

| Item           | Description  |
|----------------|--|
| “Save”         | Download the saved parameters to the device.   |
| PLC Status     | LED of PLC running status; read only<br>Green light: RUN<br>LED Not Lit: STOP                  |
| “Run” / “Stop” | Click “RUN” to set the running status to RUN<br>Click “Stop” to set the running status to STOP |

Note: The data monitor table must be downloaded to the device. If not, once you log out, close the page or restart the PLC, all the temporary saved parameters will be cleared.



# Chapter 10 CANopen Function and Operation

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## 10.1 Introduction to CANopen

1. Because of its simple wiring, immediate and stable communication, strong debugging ability, and low cost, the CANopen network is widely used in fields such as industrial automation, the automotive industry, the medical equipment industry, and the building trades.
2. The AS300 Series PLC is compatible with CANopen when using the AS-FCOPM function card for the CAN port, and can work in master mode or slave mode. The CAN port conforms to the basic communication protocol CANopen DS301. It supports master and slave modes.
3. AS200 Series PLC is built with CAN communication port. The CAN port conforms to the basic communication protocol CANopen DS301. It supports master and slave modes.
4. This chapter explains the functions of CANopen. In master mode, CANopen can support up to 64 slaves, station addresses 1~64.
5. CANopen Builder is the CANopen network configuration software for the AS Series. You set the CANopen station address and the communication rate with this software. ISPSOft / DIADesigner is the programming software for the AS Series.
6. This chapter mainly focuses on the CANopen functions. Refer to Section 10.3 for more information.

### 10.1.1 CANopen Function Descriptions

**The CAN port has the following functions when acting as a master.**

1. It supports the standard CANopen protocol DS301 V4.02.
2. It supports the NMT (network management object) service.
  - It supports NMT state control.  
Use NMT state control to control the state of a slave in the CANopen network.
  - It supports NMT error control.  
Use NMT error control detect the disconnection of a slave. The NMT error control is classified into two types; Heartbeat and Node Guarding. The AS Series PLC does not support Node Guarding.
3. It supports the PDO (Process Data Object) service.
  - Use PDO messaging to transmit immediate input and output data.
  - It supports up to 256 RxPDO and 1894 bytes.
  - It supports up to 256 TxPDO and 1894 bytes.
  - It supports synchronous and asynchronous modes for the PDO transmission type.
4. It supports the SDO (Service Data Object) service.
  - Use SDO to read, write, or configure the slave parameters.
  - It supports standard SDO transmission mode.
  - It supports automatic SDO functions. You can write up to 20 pieces of data to a slave.
  - It supports using the SDO service in a PLC ladder diagram to read the data from a slave or write the data to a slave.



5. It supports the reading emergencies from a slave service.
  - Use this service to read an error or an alarm from a slave.
  - You can store up to 5 emergencies in a slave.
  - You can read emergencies from a slave through a PLC ladder diagram.
6. It supports the SYNC object (synchronous object) service.
7. Several devices can operate synchronously through the synchronous object service.
8. The supported CANopen communication rates are: 20K, 50K, 125K, 250K, 500K, and 1Mbps.

The supported mapping data types are:

| 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 |

**The CAN port has the following functions when acting as a slave.**

- 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 the AS series in the CANopen network is controlled by a master.
  - It supports the NMT error control.  
The AS Series supports Heartbeat but not Node Guarding.
- It supports the PDO (process data object) service.
  - The PDO message transmits the immediate input data and output data.
  - It supports up to 8 TxPDO and 8 RxPDO.
  - The PDO transmission type: synchronous mode and asynchronous mode
- It supports the emergency service.  
If an error or an alarm occurs in the AS series, the master is notified through the emergency service.

### 10.1.2 The Input/Output Mapping Areas

The following table lists the CANopen DS301 specifications for the AS series PLC.

| Type   | Item  | Description  |
|--------|---|--|
| Master | Maximum slave nodes                           | Up to 64 nodes   |
|        | Maximum transfer size of a PDO (Read + Write) | Up to 2000 Bytes (including some system configurations)                |
| 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 |

When the AS Series PLC acts as a Master, the output mapping areas are D25000-D25999, and the input mapping areas are D24000-D24999, as the following table shows.

| 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 (Master → Slave)   | 1894 bytes     |
| D24032–D24978     | TxPDO mapping area (Master ← Slave)   | 1894 bytes     |

When the AS Series PLC acts as a Slave, the output mapping areas are D25032–25063, and the input mapping areas are D24032–24063 as the following table shows.

| Device in the PLC | Mapping area                        | Mapping length |
|-------------------|-------------------------------------|----------------|
| D24032–24063      | RxPDO mapping area (Slave ← Master) | 64 bytes       |
| D25032–25063      | TxPDO mapping area (Slave → Master) | 64 bytes       |

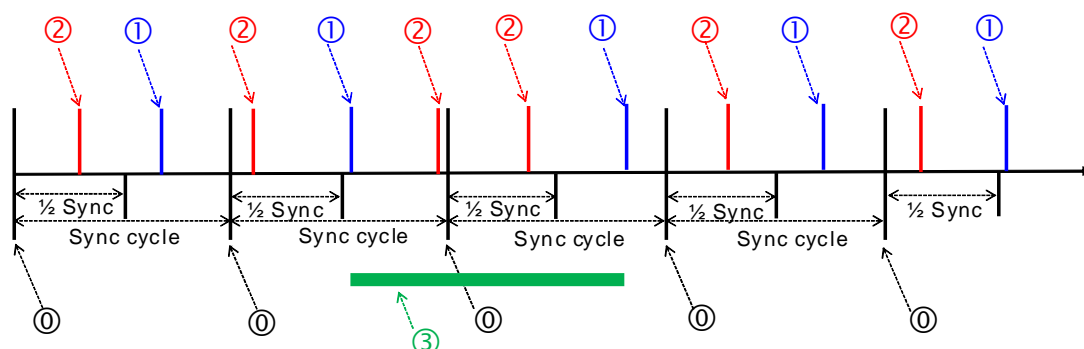
### 10.1.3 Refreshing Mechanism in the Input/Output Mapping Areas

When AS PLC CPU acts as a Master, the factors including PLC scan time and the synchronization options affect the refreshing mechanism for data mapping in the input/output mapping area. Here we list three scenarios in synchronous mode and one scenario in non-synchronous mode for your reference.

- **Synchronous mode**

**Scenario A:  $\frac{1}{2}$  synchronization cycle time (for the slave to send data) > PLC scan time**

A half of the synchronization cycle time is longer than a PLC scan time: at least one PDO will be sent within one synchronization cycle time.



**Explanation:**

①: Once the synchronization cycle starts, the timer starts to count. The counted time should be longer than a half of the set synchronization time (a rounded-down number) for Master to send PDO to Slave.

②: After PLC scan time ends, PLC CPU refreshes to update the synchronization task:

PLC CPU sends PDO and then clears the counted time.

③: After PLC scan time ends, PLC CPU refreshes to update the synchronization task:

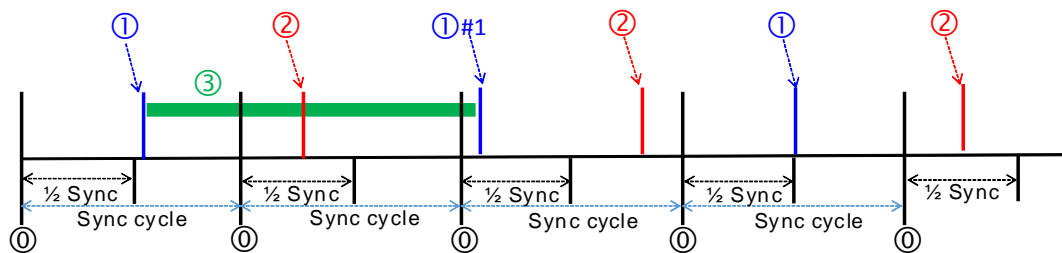
The counted time of the synchronization cycle is less than half of the synchronization cycle time (for the slave to send data), or the PDO had already been sent before, the PDO here cannot be sent and the time of the synchronization cycle continues to be counted.

③: From the cases in the green section, we know that the time for the PDO to be sent does NOT equal to the time to perform synchronization, but what we can be sure is that a Master can send at least one PDO within every synchronization cycle.

**Scenario B:**

**Synchronous mode;  $\frac{1}{2}$  synchronization cycle time (for the slave to send data)  $\leq$  PLC scan time  $<$  synchronization cycle time**

A half of the synchronization cycle time is less than a PLC scan time and the PLC scan time is less than or equals to a whole synchronization cycle time: it is possible that zero PDO will be sent during a synchronization cycle.

**Explanation:**

①: Once the synchronization cycle starts, the timer starts to count. The counted time should be longer than a half of the set synchronization time (a rounded-down number) for Master to send PDO to Slave.

①: After PLC scan time ends, PLC CPU refreshes to update the synchronization task:  
PLC CPU sends PDO and then clears the counted time.

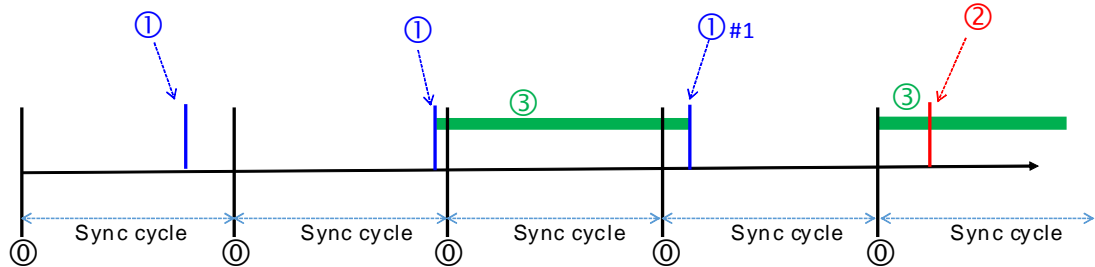
①#1: There was no PDO sent from the previous synchronization cycle. Before PLC scan time ends, the next synchronization cycle comes and the counted time is longer than a half of the set synchronization time (a rounded-down number), PLC CPU sends PDO and then clears the counted time.

②: After PLC scan time ends, PLC CPU refreshes to update the synchronization task:  
The counted time of the synchronization cycle is less than half of the synchronization cycle time (for the slave to send data), the PDO here cannot be sent and the time of the synchronization cycle continues to be counted.

③: From the cases in the green section, we know that the time for the PDO to be sent does NOT equal to the time to perform synchronization, and it is possible that Master can send zero PDO during a synchronization cycle.

**Scenario C:****Synchronous mode; synchronization cycle time  $\leq$  PLC scan time**

The synchronization cycle time is less than a PLC scan time: it is possible that zero PDO will be sent during a synchronization cycle.

**Explanation:**

①: Once the synchronization cycle starts, the timer starts to count. The counted time should be longer than a half of the set synchronization time (a rounded-down number) for Master to send PDO to Slave.

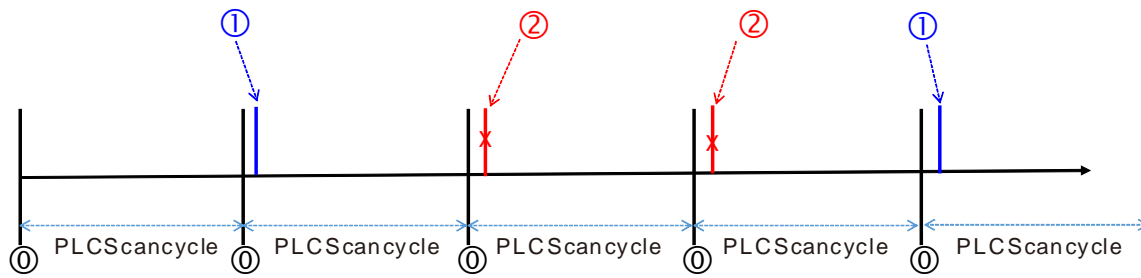
①: After PLC scan time ends, PLC CPU refreshes to update the synchronization task:  
PLC CPU sends PDO and then clears the counted time.

①#1: There was no PDO sent from the previous synchronization cycle. Before PLC scan time ends, the next synchronization cycle comes and the counted time is longer than a half of the set synchronization time (a rounded-down number), PLC CPU sends PDO and then clears the counted time.

②: After PLC scan time ends, PLC CPU refreshes to update the synchronization task:  
The counted time of the synchronization cycle is less than half of the synchronization cycle time (for the slave to send data), the PDO here cannot be sent and the time of the synchronization cycle continues to be counted.

③: From the cases in the green section, we know that the time for the PDO to be sent does NOT equal to the time to perform synchronization, and it is possible that Master can send zero PDO during a synchronization cycle. The chance of Master not sending any PDO during a synchronization cycle is higher than what happened in scenario B.

- **Non-synchronous mode**

**Explanation:**

①: After PLC scan time ends, PLC CPU refreshes to update the task of sending PDO.

①: If the data in PDO changes, PLC CPU sends PDO.

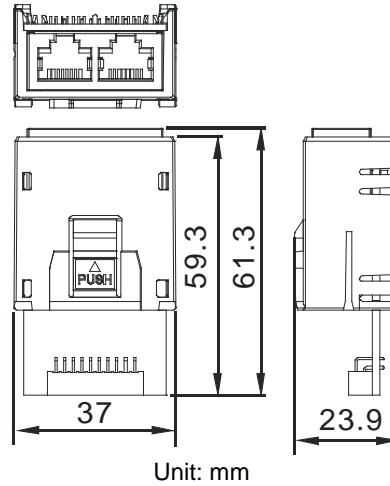
②: The data in PDO remains the same, the PDO here is NOT sent.

Note: You can use the function of setting up the PLC scan time to ensure PLC CPU checks the task of sending PDO in every set scan time.

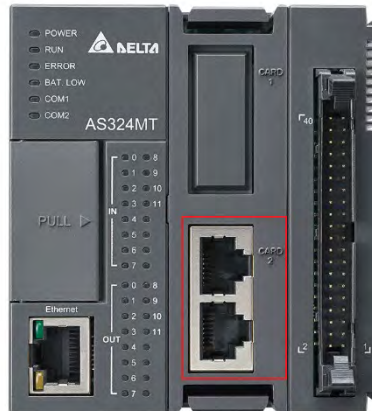
## 10.2 Installation and Network Topology

This section introduces the physical dimensions of AS-FCOPM function card, the HWCONFIG settings of the AS Series, the CAN interface, the CANopen network framework, and the maximum communication distance.

### 10.2.1 The Dimensions of AS-FCOPM



### 10.2.2 AS-FCOPM on AS300 PLC



Note: the AS-FCOPM card can only be installed in the Card 2 slot in the AS series

10.2.3 Configure the AS-FCOPM with HWCONFIG

This section uses ISPSoft for demonstration. For DIADesigner operation, refer to Chapter 6 from DIADesigner software manual.

Before using the AS-FCOPM card in an AS300 Series PLC, use HWCONFIG in ISPSoft to configure the AS-FCOPM card. If you are using an AS100 or AS200 Series PLC, the first two steps can be ignored.

1.
- You can only install the AS-FCOPM in the card 2 slot as marked in red below. Double click the function card 2 slot to go to the Device Setting dialog box.



2.
- Select **Manual** for **Card 2 Detect mode** and select **AS-FCOPM Card** for **Manual Select Card**.

Hardware Configuration

AS332T-A

Function Card 2 Setting

| Name                       | Setting Value | Unit | Default      | Minimum | Maximum |
|----------------------------|---------------|------|--------------|---------|---------|
| Card 2 Detect mode         | Manual        |      | Auto Detect  | -       | -       |
| Manual Select Card         | AS-FCOPM Card |      | None         | -       | -       |
| Card 2 ID No.              | 1             |      | 1            | 1       | 254     |
| Protocol Setup Opportunity | Stop -> Run   |      | Stop -> R... | -       | -       |
| Baud Rate                  | 9600          | bps  | 9600         | -       | -       |
| Data bit                   | 7             | bit  | 7            | -       | -       |
| Parity bit                 | Even          |      | Even         | -       | -       |

3.
- Select the working mode, node ID and the bit rate for AS-FCOPM.

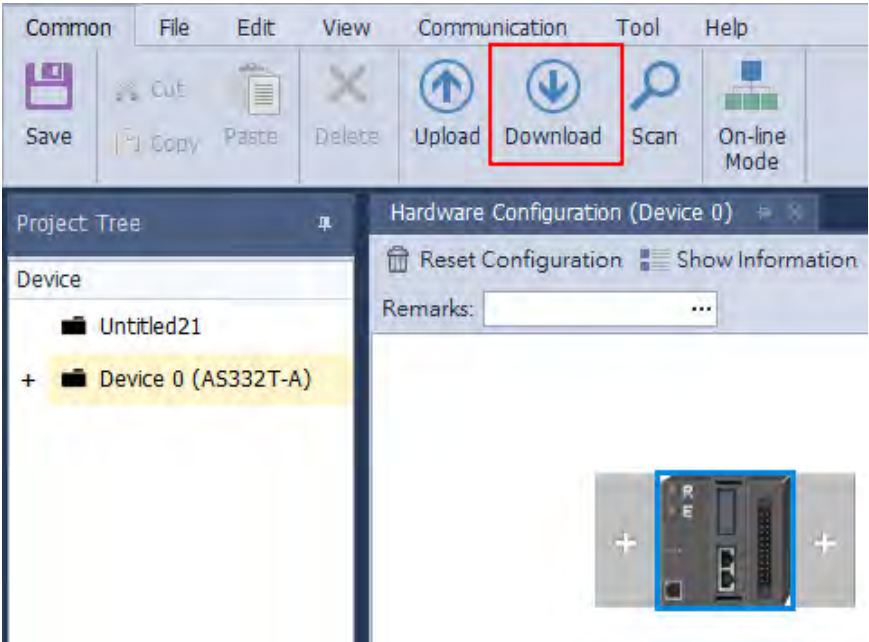
- \* Working mode: CANopen DS301
- \* Node ID: 1
- \* Bit rate: 125k bps (the default, or you can select your own bit rate)

Function Card 2 Setting

| Name   | Setting Value               | Unit | Default                     | Minimum | Maximum |
|--|-----------------------------|------|-----------------------------|---------|---------|
| F2AD Analog Input mode                                   | 0~10V                       |      | 0~10V                       | -       | -       |
| F2DA Analog Output mode                                  | 0~10V                       |      | 0~10V                       | -       | -       |
| F2AD Sampling Time                                       | 3                           | ms   | 3                           | 3       | 15      |
| F2AD Average Times                                       | 10                          |      | 10                          | 1       | 15      |
| F2AD Analog Input Warning                                | Disable                     |      | Disable                     | -       | -       |
| AS-FCOPM Working mode                                    | CANopen DS301               |      | AS Remote Communication     | -       | -       |
| AS-FCOPM node ID   | 1                           |      | 1                           | 1       | 127     |
| Select Run mode after detect remote module               | Run connected remote module |      | Run connected remote module | -       | -       |
| AS CPU module keep or Stop when slave node dis-connected | Only Show Error Message     |      | Only Show Error Message     | -       | -       |
| Remote and CANopen communication time out                | 100                         | ms   | 100                         | 0       | 3000    |
| Re-connected Retry number after time out                 | 60                          |      | 60                          | 0       | 255     |
| Auto Retry connection after Disconnected                 | 60                          | sec  | 60                          | 0       | 255     |
| AS-FCOPM Bit Rate  | 125k                        | bps  | 125k                        | -       | -       |



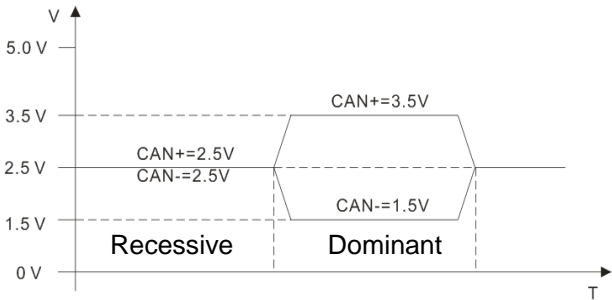
4. When finished, click the **Download** button on the toolbar to download the settings to the PLC.



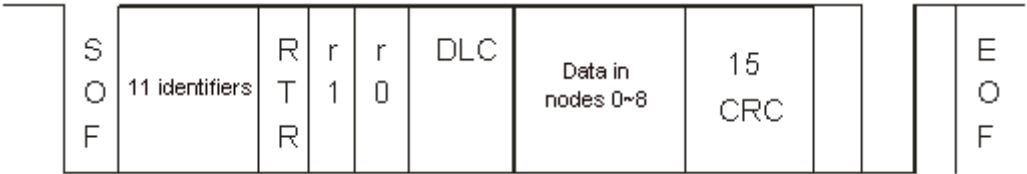
10.2.4 The CAN Interface and Network Topology

10.2.4.1 Definitions of the CAN Signal and Data Types

The CAN signal is a differential signal. The voltage of the signal is the voltage difference between CAN+ and CAN-. The CAN+ and CAN- voltages take SG as a reference point. The CAN network can be in one of two states. One state is a dominant level, and is indicated by the logical “0”. The other state is a recessive level, and is indicated by the logical “1”. The CAN signal level shows below.

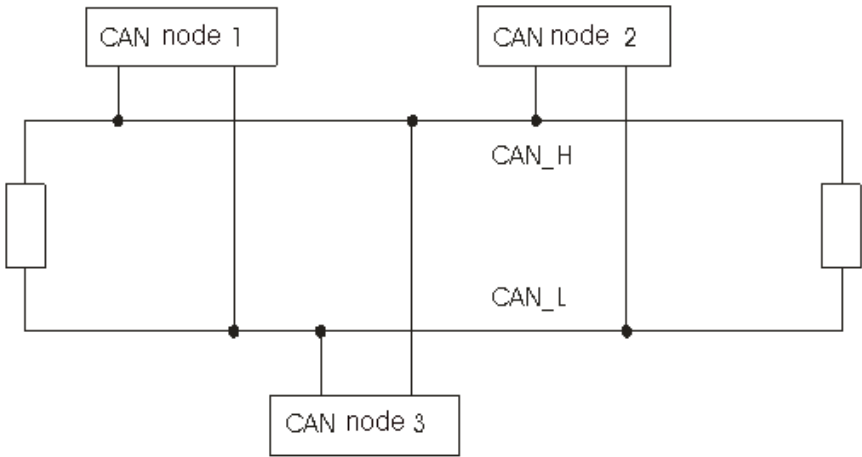


The following picture shows the data frame format. The CAN nodes transmit the CAN messages to the network from left to right.

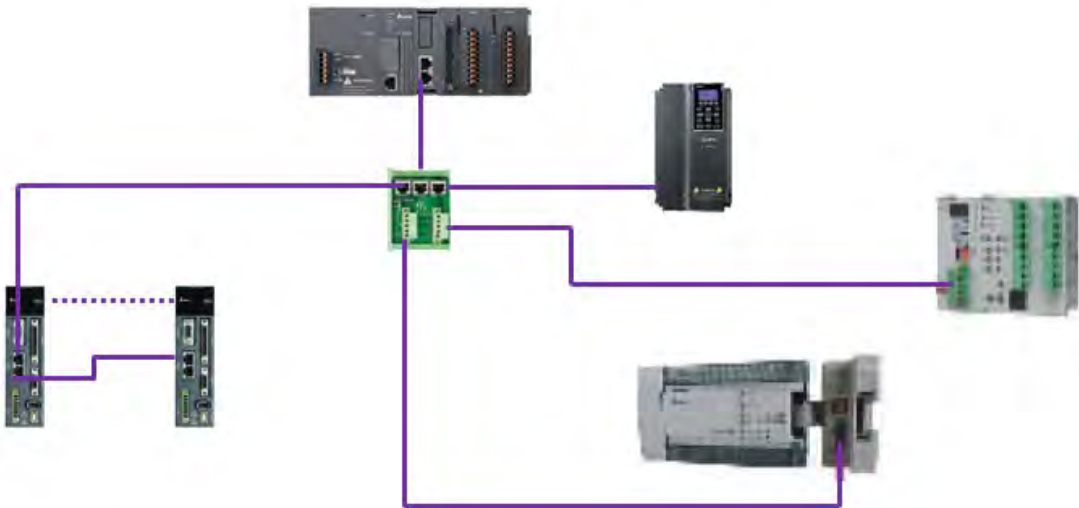


10.2.4.2 The CAN Network Endpoint and the Topology Structure

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 appears below.



10.2.4.3 The Topology Structure of the CANopen Network




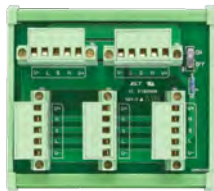




- 1) Use standard Delta cables when wiring the CANopen network. These cables are the thick cable UC-DN01Z-01A, the thin cable UC-DN01Z-02A, and the thin cable UC-DN01Z-02A. Separate the communication cables from any power cables to avoid interference.
- 2) Connect the CAN+ (white) and CAN- (blue), which are at the endpoints of the network, to 120 ohm resistors. The AS-FCOPM card is equipped with a 120 ohm resistor switch; you can enable the resistor with the switch. Purchase the standard Delta terminal resistor for use with the other devices and the RJ45 connector.
- 3) Note 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 following table shows the relation between the transmission rate and the maximum communication distance.

| Transmission rate (bit/seconds)         | 20K  | 50K  | 125K | 250K | 500K | 1M |
|---|------|------|------|------|------|----|
| Maximum communication distance (meters) | 2500 | 1000 | 500  | 250  | 100  | 25 |

## 4) The list below shows the Delta network products for the CANopen network.

| Product   | Model   | Function   |
|---|---|--|
|    | AS332T-A<br>AS332P-A<br>AS324MT-A<br>AS320T-B<br>AS320P-B<br>AS300N-A   | The AS300 series PLC can function as the CANopen master or slave when you install an AS-FCOPM function card. The AS-FCOPM is equipped with a 120 ohm resistor controlled by a switch.  |
|    | AS228T-A<br>AS228P-A<br>AS228R-A<br>AS218TX-A<br>AS218PX-A<br>AS218RX-A   | AS200 Series PLC is built with CAN communication port. The CAN port conforms to the basic communication protocol CANopen DS301. It supports master and slave modes. The CAN communication terminal is equipped with a 120 $\Omega$ resistor. You can use a short circuit to use this resistor. |
|   | AS132P-A<br>AS132T-A<br>AS132R-A<br>AS148P-A<br>AS148T-A<br>AS148R-A<br>AS164P-A<br>AS164T-A<br>AS164R-A                            | AS100 Series PLC is built with CAN communication port. The CAN port conforms to the basic communication protocol CANopen DS301. It supports master and slave modes.  |
|  | DVP32ES300R<br>DVP32ES300T<br>DVP32ES311T<br>DVP48ES300R<br>DVP48ES300T<br>DVP64ES300R<br>DVP64ES300T<br>DVP80ES300R<br>DVP80ES300T | The DVP-ES3-C series PLC has a built-in CAN interface. The CAN port conforms to the basic communication protocol CANopen DS301. It supports master and slave modes.  |
|  | DVP32ES200RC<br>DVP32ES200TC  | The DVP-ES2-C series PLC has a built-in CAN interface. The CAN port conforms to the basic communication protocol CANopen DS301. It supports master and slave modes.  |
|  | 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 that you can connect to the DVPCOPM-SL are the DVP-28SV, DVP-28SV2, DVP-SX2, DVP-SA2, and DVP-EH2-L.  |

| Product   | Model   | Function   |
|---|---|--|
|    | IFD9503   | The IFD9503 gateway converts CANopen to Modbus, and connects a device (with an RS-232 or RS-485 interface) that conforms to the standard Modbus protocol to a CANopen network. You can connect up to 15 devices.   |
|    | DVPCP02-H2  | The CANopen slave module is connected to the right side of an EH2 series PLC. It can connect the EH2 series PLC to a CANopen network.  |
|    | IFD6503   | This analyzes CANopen network data, and has ports both ends for a CAN interface and a USB interface. Use it to monitor CAN network data, or allow CAN nodes to transmit the data. The product is used with the Netview Builder software.   |
|  | ASD-A2-xxxx-M<br>servo driver                       | This servo driver has a built-in CANopen interface. It controls positioning, speed, and torque.  |
|  | VFD-<br>C2000/CP2000/C200<br>series AC motor drives | This AC motor drive has a built-in CANopen function, and controls positioning, speed, and torque. For the C2000/CP2000 series AC motor drives, you must purchase a CMC-COP01 to provide the CAN interface. Only the C200 series AC motor drive has the built-in CANopen interface. |
|  | VFD-EC series AC motor<br>drive                     | The EC series AC motor drive has a built-in CANopen interface. It controls speed and torque.   |

| Product   | Model   | Function  |
|---|---|---|
|    | TAP-CN01  | This CANOpen network topology distribution box has a 120 ohm resistor enabled with a switch.  |
|    | TAP-CN02  | This CANOpen network topology distribution box has a 120 ohm resistor enabled with a switch.  |
|   | TAP-CN03  | This CANOpen network topology distribution box has a 120 ohm resistor enabled with switch.  |
|  | UC-CMC003-01A<br>UC-CMC005-01A<br>UC-CMC010-01A<br>UC-CMC015-01A<br>UC-CMC020-01A<br>UC-CMC030-01A<br>UC-CMC050-01A<br>UC-CMC100-01A<br>UC-CMC200-01A | These CANOpen sub cables have RJ45 connectors at both ends.<br>UC-CMC003-01A: 0.3 meters<br>UC-CMC005-01A: 0.5 meters<br>UC-CMC010-01A: 1 meter<br>UC-CMC015-01A: 1.5 meters<br>UC-CMC020-01A: 2 meters<br>UC-CMC030-01A: 3 meters<br>UC-CMC050-01A: 5 meters<br>UC-CMC100-01A: 10 meters<br>UC-CMC200-01A: 20 meters |
|  | UC-DN01Z-01A<br>UC-DN01Z-02A  | CANOpen network cable<br>UC-DN01Z-01A: CANOpen main cable<br>UC-DN01Z-02A: CANOpen sub cable  |
|  | TAP-TR01  | This 120 ohm resistor has an RJ45 connector.  |

## 10.3 The CANopen Protocol

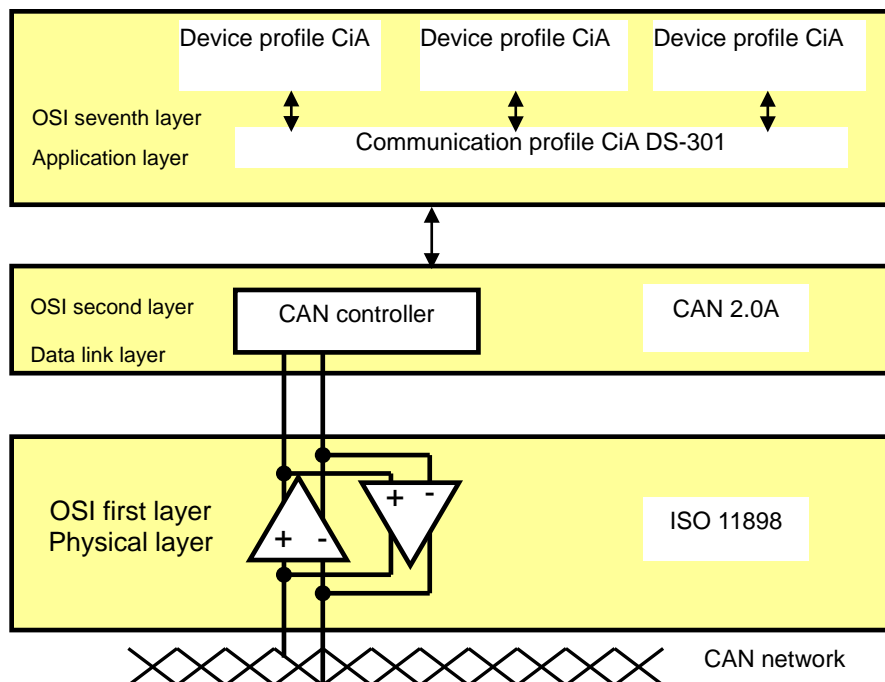
### 10.3.1 Introduction to the CANopen Protocol

The CAN (controller area network) fieldbus only defines the physical layer and the data link layer of a network. See the ISO11898 standard for information. The CAN fieldbus does not define the application layer. In practice, the hardware contains the physical layer and the data link layer. The CAN fieldbus itself is not complete, and needs a superior protocol to define the use of 11/29-bit identifier and 8-byte data.

The CANopen protocol is the superior protocol based on the CAN fieldbus. It is one of the protocols defined and maintained by CiA (CAN-in-Automation) and was developed on the basis of the CAL (CAN application layer) protocol, using a subset of the CAL communication and service protocols.

The CANopen protocol contains the application layer and the communication profile (CiA DS301). It also contains a framework for programmable devices (CiA 302), recommendations for cables and connectors (CiA 303-1), and SI units and prefix representations (CiA 303-2).

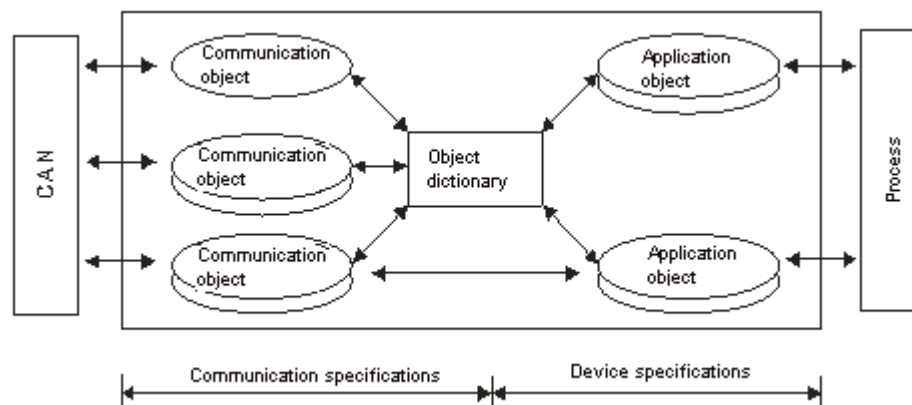
In the OSI model, the relation between the CAN standard and the CANopen protocol is described in the following diagram.



#### 1. The object dictionary

CANopen uses an object-based method to define a standard device. Every device is represented by a set of objects and can be visited by the network. The diagram below illustrates the CANopen device model. 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 set of objects. Every object has a 16-bit index for addressing and also defines an 8-bit subindex. Every node in the CANopen network has an object dictionary that includes the parameters that describe the device and the network behavior. The object dictionary of a node is also described in the electronic data sheet (EDS) for the device.



### 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 channel for the device application object, and transmits the real-time data. It has high priority. Every byte in the PDO CAN message data list transmits data, and the message usage rate is high.
- There are two kinds of uses for PDOs; data transmission and data reception. They are distinguished by Transmit-PDOs (TxPDOs) and Receive-PDOs (RxPDOs). Devices supporting TxPDOs are called PDO producers, and devices that receive PDOs are called PDO consumers.
- The PDO is described by the “producer/consumer mode”. The data transmits from one producer to one or many consumers. The data that can be transmitted is limited to between 1-byte and 8-byte data. After the producer transmits the data, the consumer does not need to reply to the data. Every node in the network detects the transmitted data and decides whether to process the received data .
- Every PDO is described by two objects in the object dictionary: the PDO communication parameters and the PDO mapping parameters

PDO communication parameters: the COB-ID used by PDO, the transmission type, the prohibition time, and the counter cycle

PDO mapping parameters: 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 both have to understand the mapping.

The PDO transmission modes: synchronous and asynchronous

Synchronous mode: synchronous periodic and synchronous non-periodic

Asynchronous: The producer transmits the PDO when the data changes, or after a trigger.

The following table lists supported transmission modes.

| Type    | PDO transmission |              |             |              |     |
|---------|------------------|--------------|-------------|--------------|-----|
|         | Periodic         | Non-periodic | Synchronous | Asynchronous | RTR |
| 0       |                  | X            | X           |              |     |
| 1 – 240 | X                |              | X           |              |     |
| 254     |                  |              |             | X            |     |
| 255     |                  |              |             | X            |     |



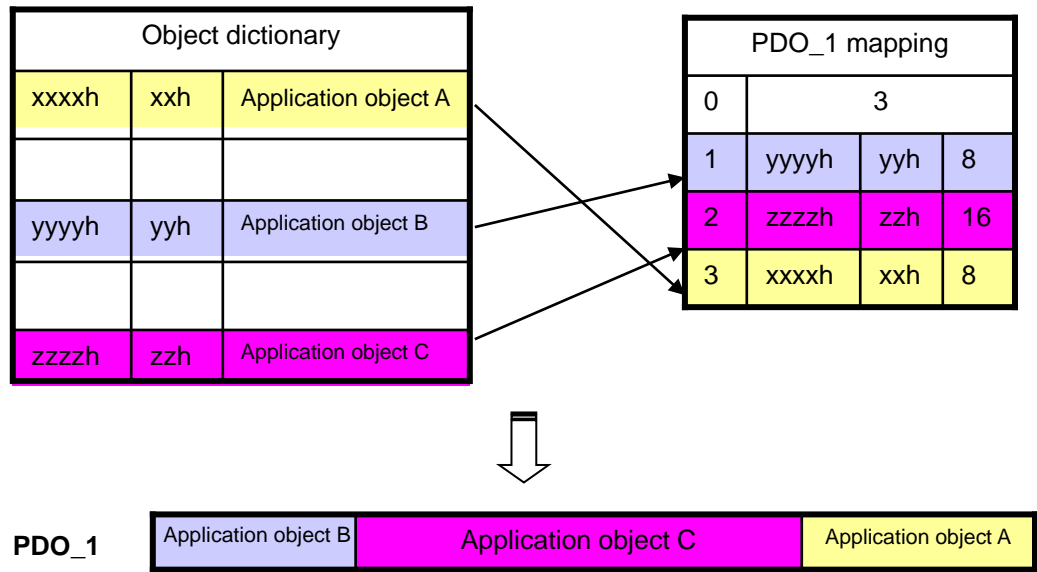
Mode 0: The PDO information is transmitted only when the PDO data changes and the synchronous signal is received.

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 in the PLC is the same as mode 255.

Mode 255: The 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 diagram shows an example of PDO mapping.



The following table shows the data format for RxPDO and TxPDO.

| 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 builds the client/server relation between two CANopen devices. The client device can read the data from the object dictionary on the server device and write the data into the object dictionary on the server device. The SDO visit mode is “client/server” mode. The mode which is visited is the SDO server. Every CANopen device has at least one service data object that provides the visit channel for the object dictionary of the device. SDO can read all the objects in the object dictionary, and write all objects into the object dictionary.
- The SDO message contains the index and subindex information used to position the objects in the object dictionary, and the composite data structure can easily be passed by the SDO visit. After the SDO client sends the reading/writing request, the SDO server replies. The client and the server can stop SDO transmission. The requested message and the reply message are separated by different COB-IDs.
- The SDO can transmit the data in any length. If the data length is more than 4 bytes, the data must be transmitted by segment. The last segment of the data contains an end flag.



- The following table shows the structures of the SDO requested message and reply message.

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 4-byte data               |
| 2B                 | Writing 2-byte data               |
| 2F                 | Writing 1-byte data               |
| 40                 | Reading 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:

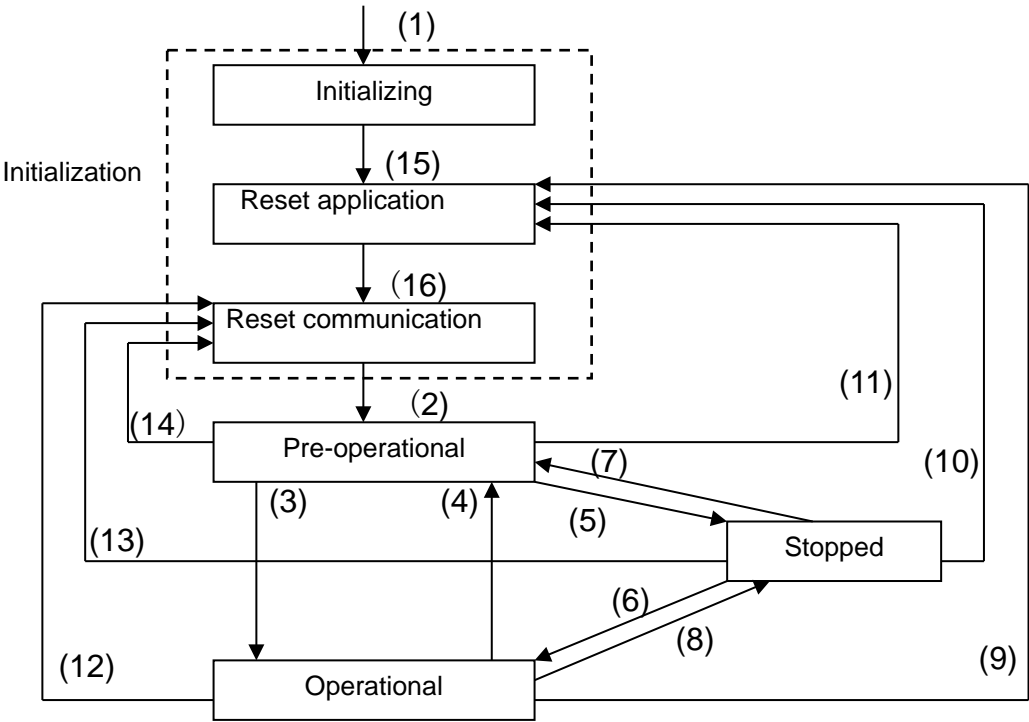
| Reply code (hex) | Description                       |
|------------------|-----------------------------------|
| 43               | Reading 4-byte data               |
| 4B               | Reading 2-byte data               |
| 4F               | Reading 1-byte data               |
| 60               | Writing 1/2/4-byte data           |
| 80               | Stopping the current 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 all other nodes are considered to be slaves. NMT includes three services: module control, error control, and boot-up services.

- **Module control services**

The master node in the CANopen network controls the slave by sending commands. The slave receives and executes the command, and does not need to reply. All CANopen nodes have internal NMT states. The slave node has four states: initialization, pre-operational, operational, and stop states. The following diagram illustrates the device states.



- (1) After 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 starts.
- (4)(7) The device enters the pre-operational state.
- (5)(8) The remote node stops.
- (9)(10)(11) The application layer resets.
- (12)(13)(14) The communication resets.
- (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 following table shows the relation between the communication object and the state. You can only execute the communication object service in the correct state. For example, you can only execute SDO in the operational state and pre-operational states.

|            | 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 control message format for the node state:

| COB-ID | Byte 0                 | Byte 1                          |
|--------|------------------------|---------------------------------|
| 0      | Command specifier (CS) | Slave address<br>(0: Broadcast) |

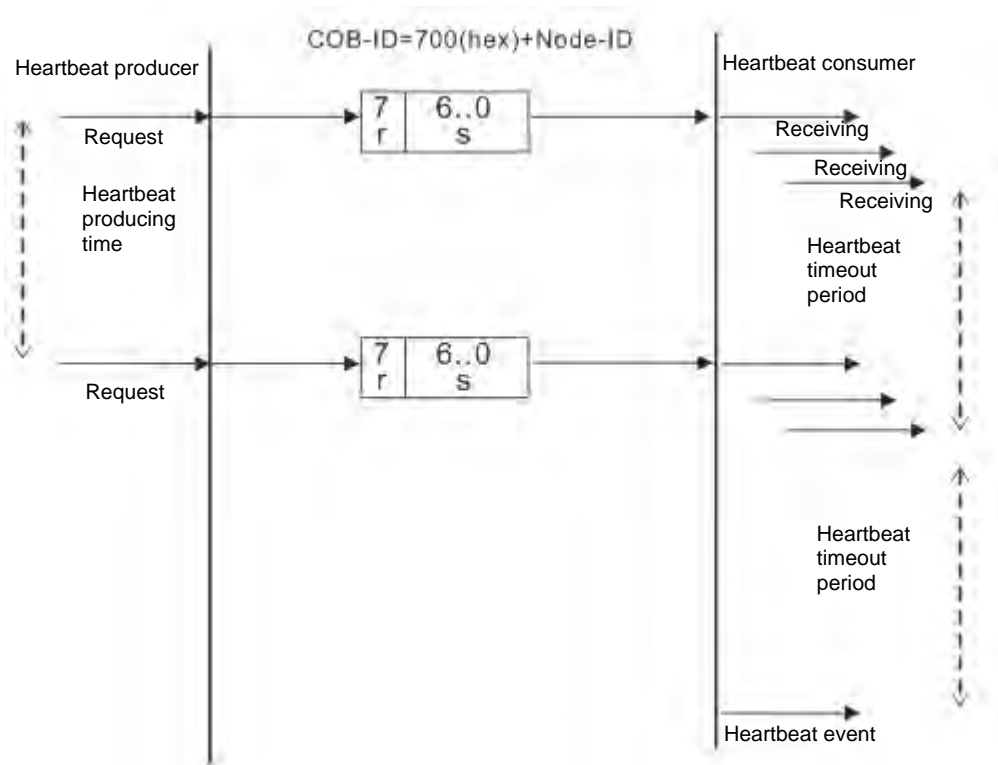
The command specifiers:

| 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 detects the disconnection of a network node. The error control services are classified into two types: Heartbeat and Node Guarding. The AS Series PLC only supports Heartbeat. For example, the master can detect the disconnection of the slave only after the slave enables the Heartbeat service.

The following illustrates the Heartbeat principle. The Heartbeat producer transmits the Heartbeat message according to the set Heartbeat producing time. 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, there is a problem in the CANopen communication or the producer is disconnected.



- **Boot-up services**

After the slave completes the initialization and enters the pre-operational state, it transmits the Boot-up message.

1. Other predefined CANopen communication objects (SYNC and EMCY)

- **SYNC Object (Synchronous object)**

The synchronous object is the message that the master node periodically broadcasts on the CANopen network. This object recognizes the network clock signal. Every device decides whether to use the event use synchronous communication with other network devices depending on its configuration. For example, when controlling a driving device, the devices do not act immediately after they receive the command sent by the master. They do act when they receive the synchronous message. This makes multiple devices act synchronously.

The format of the SYNC message:

| COB-ID   |
|----------|
| 80 (hex) |

- **Emergency object**

The emergency object is used by a CANopen device to indicate an internal error. When an emergency error occurs in the device, the device sends the emergency message (including the emergency error code), and the device enters an error state. After the error is eliminated, the device sends another emergency message with emergency error code 0, and the device enters the normal state.

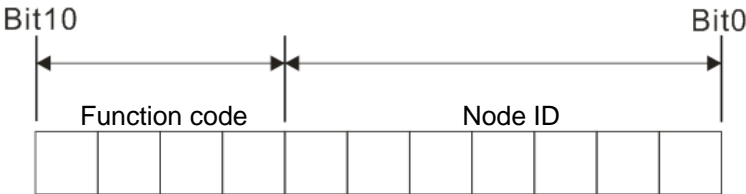
The format of the emergency message:

| COB-ID               | Byte 0               | Byte 1 | Byte 2         | Byte 3                     | Byte 4 | Byte 5 | Byte 6 | Byte 7 |
|----------------------|----------------------|--------|----------------|----------------------------|--------|--------|--------|--------|
| 80 (hex)<br>+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 occurred. If the value is 1, a normal error occurred. If the value is H'80, an internal error occurred 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 predefined connection set, the structure of the 11-bit identifier is as follows.



The following tables list the objects that are supported and the COB-IDs that are assigned to the objects.

1. 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                         |

2. 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

You can edit the request message mapping area to affect the transmission of SDO, NMT and Emergency messages. The following table shows the corresponding relations between the request message mapping area, response message mapping area, and PLC device.

| 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       |

The CANopen master can only send one SDO, NMT, or Emergency request message to the same device at a time. Clear the request message mapping area to zero when sending SDO, NMT, or Emergency request message through the WPL program.

### 10.4.1 Data Structure of SDO Request Message

Sending SDO through the ladder diagram reads or writes the slave parameter.

- 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                |
| 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                |                        |

- **ReqID:** the request ID. Whenever an SDO request message is sent out, the message is given a ReqID for CANopen master to identify. When reading/writing another SDO message, the original ID number must be changed. In other words, reading/writing SDO is triggered by changing of the value of "ReqID". The ReqID range is between 00–FF (Hex).
- **Size:** the length of the message data. The counting starts from D6253 with a byte as the unit. When reading, it is fixed to four and when writing, it is four plus the byte number of data types of index and subindex and the maximum value is eight. But when writing, if the data type of the index and subindex is word, the data length is six. The data length is file if the data type is byte.
- **Node ID:** the node address for the target equipment on a CANopen network.
- **Type:** 01 indicates the read access; 02 indicates the write access.

The following table shows 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 following table lists 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   |
| 9           | Error: Incorrect node address                               |
| 0A          | Error message (See the error code for SDO response message) |
| 0B-FF       | Reserved  |

- ResID: the same as the request ID in the request message.
- Size: the length of the message data, maximum of 20 bytes. The unit is bytes. When writing, the maximum is four; 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 the SDO response message, 43 (Hex) refers to reading four bytes of data; 4B (Hex) refers to reading two bytes of data; 4F (Hex) refers to reading one 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 in slave of No. 3 through SDO; 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 in slave of No. 3 through SDO; 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             |
| 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

Use the NMT service to manage the CANopen network such as start, operation, reset of nodes, etc.

The following table shows 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, the message is 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, change the value of ReqID. The ReqID range is between 00–FF (Hex) to trigger sending the NMA request message.
- Node ID: the node address for the target equipment on the 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             |

The following table shows 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, the NMT operation has succeeded. When status code is not equal to 1, the NMT operation has failed and you should verify that the data in NMT request message is correct.
- Node ID: the node address for the target equipment on the 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

The Emergency request message communicates the slave error and alarm information.

The following table shows 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, the message is 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, change the value of ReqID. The ReqID range is between 00–FF (Hex) to trigger the sending the Emergency request message.
- Node ID: the node address of the target equipment on CANopen network.

The following table shows 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               |
| D24005     |                  | Datum 3              | Datum 2               |

| PLC device    | Response message |                |               |
|---------------|------------------|----------------|---------------|
|               |                  | High byte(Hex) | Low byte(Hex) |
| 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, reading the Emergency message has succeeded. When status code is not equal to 1, reading the Emergency message has failed and you should verify that the data in the Emergency message is correct.
- Node ID: the node address for the target equipment on the 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).
- An Emergency 1 consists of the data in D6004-D6007 and every Emergency message consists of 8 bytes of data.

The following table shows the data format of Emergency messages on the CAN bus. 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)<br>+Node-ID | Emergency error code |        | Error storage register | Vendor custom error code |        |        |        |        |

Example 1: read the Emergency message from the slave No.2, and the Emergency messages the slave sends out successively.

| 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

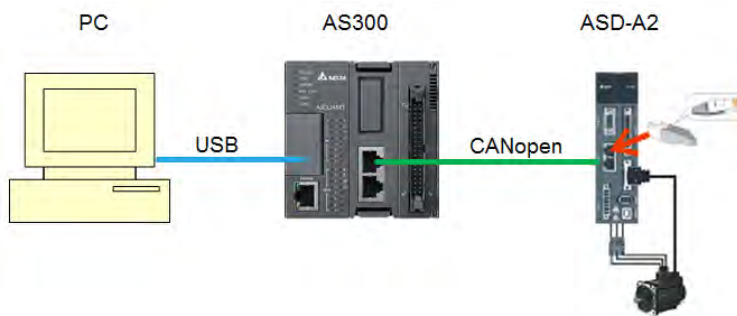
| PLC device | Response message |                         |                          |
|------------|------------------|-------------------------|--------------------------|
|            |                  | High byte               | Low byte                 |
| D24000     | Message header   | ResID=01                | 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                |

#### 10.4.4 Example of Sending SDO through the Ladder Diagram

##### 1. Control Requirement:

Read the value of P0-09 from the servo through SDO.

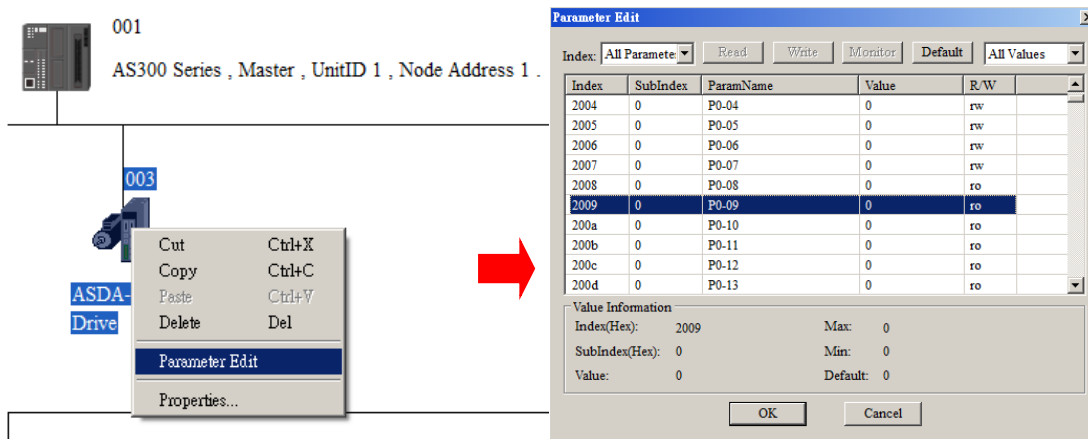
##### 2. Hardware Connection:



##### 3. The Corresponding Relation between Slave Parameter and Index/Subindex

The index\_subindex corresponding to P0-09 in servo is 2009\_0. In the CANopen Builder network configuration software, right click the servo icon, and then click **Parameter Edit**. In the **Parameter Edit** dialog box, you can see the index\_subindex corresponding to the servo parameter.

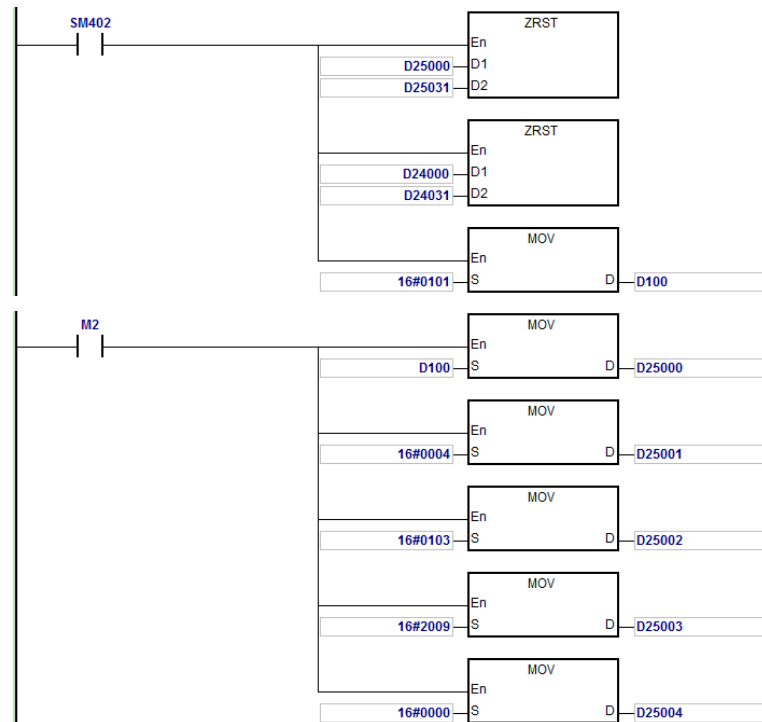
For more details on how to operate the network configuration interface, refer to Section 11.1.1 in the CANopen Builder software help file



#### 4. The Structure of the Request Message Devices:

| PLC device                                   |        | Content<br>(Hex) | Explanation          |                     |
|--|--------|------------------|----------------------|---------------------|
|  |        |                  | High byte(Hex)       | Low byte(Hex)       |
| SDO<br>request<br>message<br>mapping<br>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 in ISPSoft



When M2=ON, after reading succeeds, the program stores the data from the target device in D24000–D24005. The value of D24005: 100 (hex) is the value read from P0-09.

#### 6. The Structure of the Response Message Devices:

| PLC device                                    |        | Content<br>(Hex) | Explanation               |                     |
|---|--------|------------------|---------------------------|---------------------|
|   |        |                  | High byte(Hex)            | Low byte(Hex)       |
| SDO<br>response<br>message<br>mapping<br>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. In the AS Series PLC, while you enable the CANopen function, it uses SR825–893 as the special registers as shown in the following table.

| Special register | Function                                      |
|------------------|---|
| SR825            | Displays the state of AS300 series PLC.       |
| SR830–SR893      | Displays the state of 64 nodes in the network |
| SR826            | Flag for the state of the slave 1–16          |
| SR827            | Flag for the state of the slave 17–32         |
| SR828            | Flag for the state of the slave 33–48         |
| SR829            | Flag for the state of the slave 49–64         |
| SR821            | Version of CANopen DS301                      |
| SR822            | Displays the CANopen baud rate (unit: 1kpps)  |

2. As a master, the AS series PLC supports a maximum of 64 slaves ranging from node 1 to node 64. You can use SR826–829 to monitor the state of the nodes in the network. The 16 bits in SR826 correspond to 16 slaves and their corresponding relations are shown in the following table.

| 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 (for example, initializing fails or the slave is offline for some reason), 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) is shown in the following table. (You can also judge for other correspondings that are not listed here.)

| 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. Node codes displayed in SR830–893 when the ASSeries PLC is the master:

| Code | Indication  | How to correct   |
|------|---|--|
| 0    | The node is error free or the node is not configured.   | N/A  |
| E0   | ASSeries PLC master module receives the emergency message sent from slave.                      | Read the relevant message with the 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 the slave and re-download.  |
| 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 connected slave device is consistent with the configured slave in the software.  |
| E6   | The slave does not exist in the network   | Ensure that the power supply of slave is normal and slave is correctly connected to the network. |
| E7   | Slave error control is timed-out.   |  |
| E8   | The node IDs of master and slave repeat.  | Set the node ID of the master and slave again and ensure their node IDs are unique.              |

## 5. Codes displayed in SR825 when the AS300 Series PLC is the master:

| Code | Indication   | How to correct   |
|------|--|--|
| 0    | In CANopen DS301 mode: the PLC works as master and is working normally.<br>Not in CANopen DS301 mode: the master mode function is not activated. | N/A  |
| F1   | No slave in the list   | Add slave into the node list and then re-download the configuration data.  |
| F2   | The data are being downloaded to AS Series PLC   | Wait to finish downloading the configuration data.   |
| F3   | The configuration receiving error in AS Series PLC   | Download parameter configuration again.  |
| F4   | Bus-OFF is detected.   | Check that the CANopen bus cables are properly connected and ensure that all the node devices run at the same baud rate before you reboot. |
| F5   | AS Series PLC setting error such as incorrect node address   | The node address in the AS300 Series PLC should be between: 1–127.   |
| F8   | Internal error; the error is detected in the internal memory   | If the same error occurs after cycling the power, replace it with a new AS300 PLC.   |
| FB   | The sending buffer in the AS Series PLC is full.   | Check that the CANopen bus cable is properly connected and then reboot.  |
| FC   | The receiving buffer in the AS Series PLC is full.   | Check that the CANopen bus cable is properly connected and then reboot.  |

## 6. Codes displayed in SR825 when the AS Series PLC is the slave:

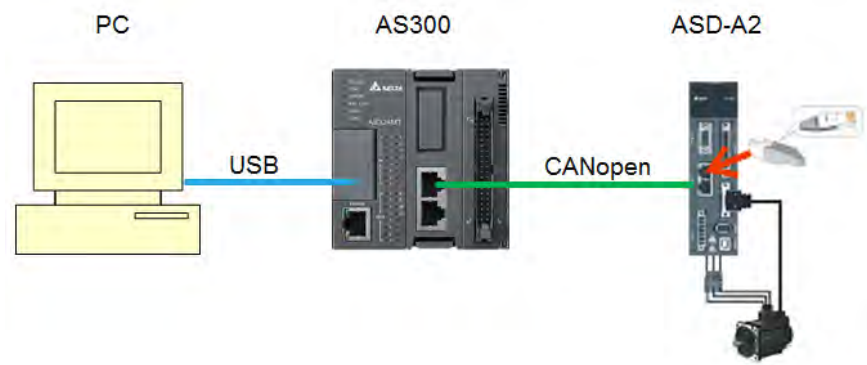
| Code | Indication  | How to correct   |
|------|---|--|
| 0    | Working normally  | N/A<br>Note: When the heartbeat alarm function is not activated, if the connection is normal before a disconnection occurs, the code for the slave will still be working normally after the connection is back on. |
| A0   | AS Series PLC is being initialized.   | --   |
| A1   | AS Series PLC is pre-operational.   | Check if the CANopen bus cable is properly connected. If the master communication is not activated, no handling is needed.   |
| A3   | The data are being downloaded to AS Series PLC  | Wait to finish downloading the configured data.  |
| B0   | Heartbeat message time-out  | Check if the CANopen bus cable is properly connected.  |
| B1   | PDO data length returned from the slave is not consistent with the length set in the node list. | Reset the PDO data length in the slave and download the new setting to the AS Series PLC.  |
| F4   | BUS-OFF state is detected.  | Check if the CANopen bus cables are properly connected and ensure that all the node devices run at the same baud rate before you reboot.   |
| FB   | The sending buffer in the AS Series PLC is full.  | Check if the CANopen bus cable is properly connected and then reboot.  |
| FC   | The receiving buffer in the AS Series PLC is full.  | Check if the CANopen bus cable is properly connected and then reboot.  |



## 10.6 Application Example

The AS300 Series PLC can control Delta A2 servo rotation, and monitor the actual rotation speed of the motor in real time. It does this by mapping the relevant servo drive parameters to the corresponding PDO, and reads or writes the relevant servo drive parameters through the CAN bus.

### 1. Connecting the Hardware



**Note:**

- Use a standard communication cable such as UC-DN01Z-01A / UC-DN01Z-02A / UC-CMC010-01A. and connect the terminal resistors (Delta standard terminal resistor TAP-TR01) to both ends of the network when you construct 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 shown in the following table.

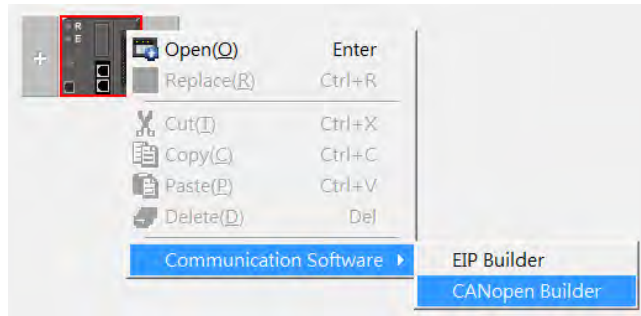
| Parameter | Setting | Explanation                                     |
|-----------|---------|---|
| 3-00      | 03      | Node ID of the A2 servo is 2                    |
| 3-01      | 400     | CAN communication rate is 1Mbps.                |
| 1-01      | 04      | Speed mode                                      |
| 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 the CANopen Baud Rate and Node ID of AS300 Series PLC

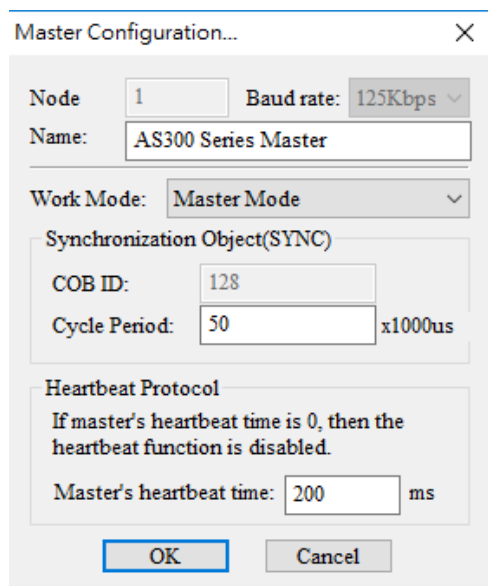
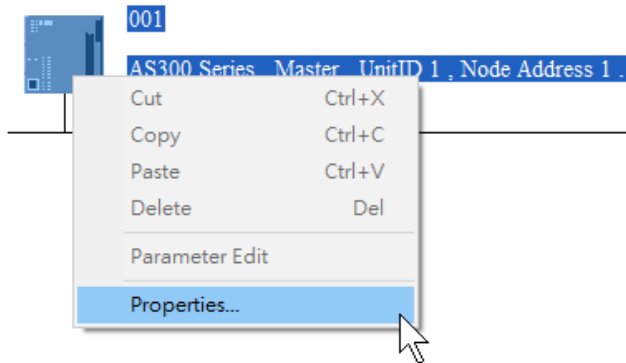
The AS300 Series PLC uses the default setting values: Node ID: 1 and baud rate: 1Mbps.


You set the CANopen Node ID and baud rate for the AS300 series PLC in the CANopen Builder software, as shown in the following steps.

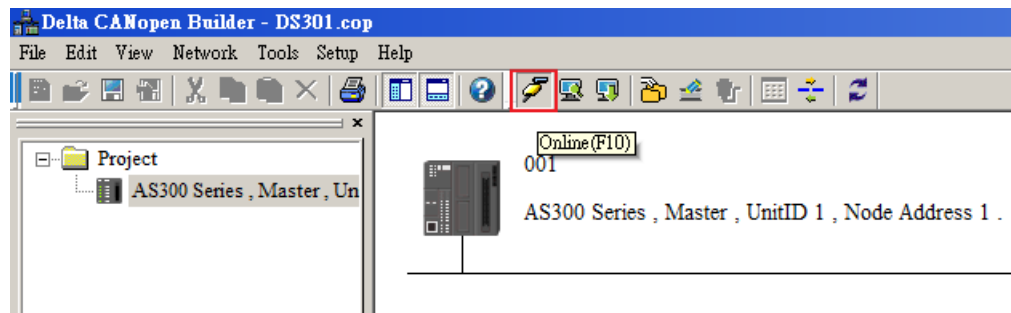
- A. Right click the AS300 Series PLC icon in HWCONFIG, then click **Communication Software**, and then click **CANopen Builder**.



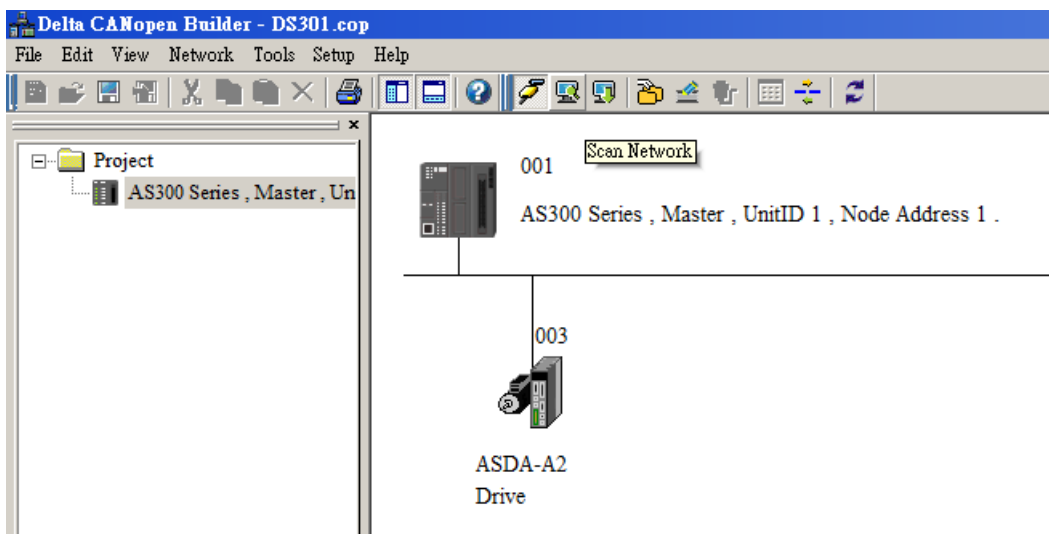
- B. IF AS300 is in master mode, you can skip this step. If not, you can go to Properties and set it in Master mode. After that download the parameter to AS300. Set AS300 Power off for 2 seconds and supply power again and then proceed to the next step.



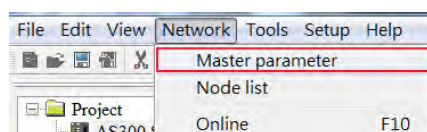
- C. Click the Online  button on the Toolbar to enter on-line mode.

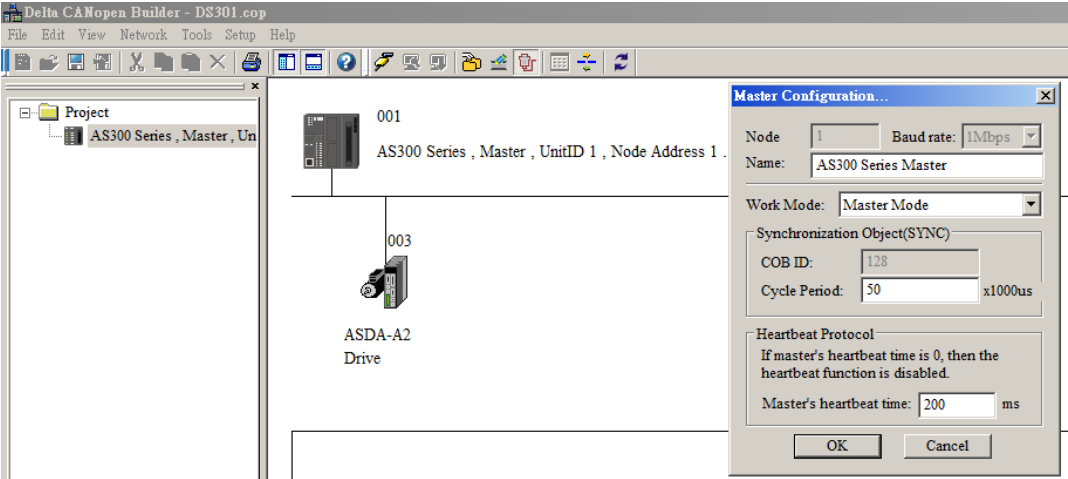


- D. Click the Scan Network  button on the Toolbar to scan the network.




- E. On the **Network** menu, click **Master parameter** to display the Master Configuration dialog box.

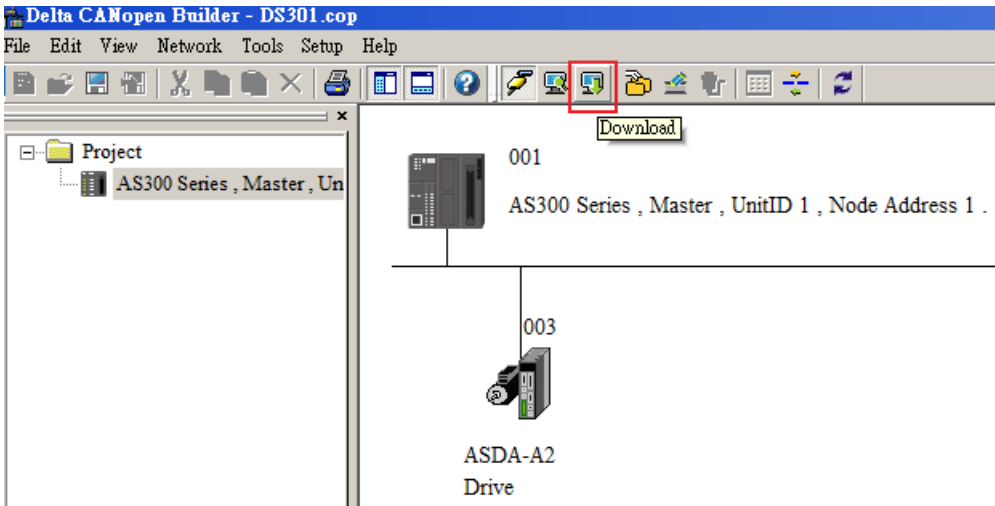




| Item                  | Explanation  | Default       |
|-----------------------|--|---------------|
| Node ID               | Node ID of AS300 series PLC on the CANopen network     | 1             |
| Baud rate             | CANopen communication rate                             | 1M bit/second |
| Work mode             | CANopen master/slave mode                              | Master        |
| Cycle period          | Cycle time for sending one SYNC message                | 50ms          |
| Master heartbeat time | Interval time for sending the master heartbeat message | 200ms         |


Configure the CANopen communication stations and rates in HWCONFIG.

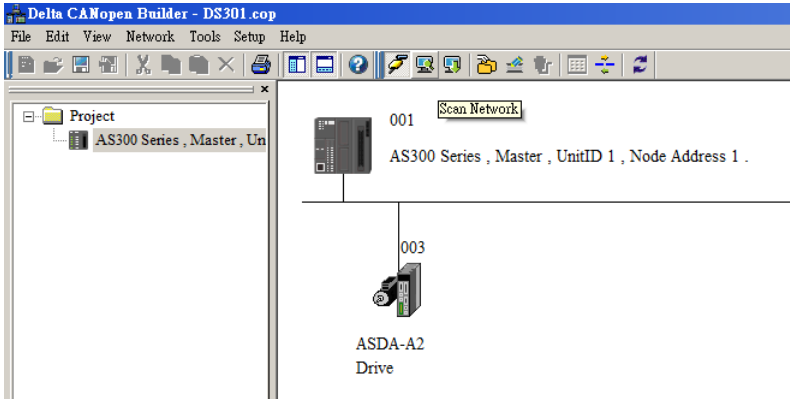
- F. After you complete the previous steps, click the Download  button on the Toolbar to download the parameters to the PLC.



Note: you must reboot the AS300 Series PLC to enable the downloaded parameters.

4. Scanning the Network:

On the **Network** menu, click **Online** or click the  button to scan for the master and slaves on the CANopen network. The master and slave found by the scan appear in CANopen Builder. For more information, refer to Section 11.1.1 in the CANopen Builder software help file.



5. Configuring Nodes:

Double click the slave icon in CANopen Builder to display the **Node configuration** dialog box.

● Error Control Protocol

Sets the error control protocol for the master to monitor if the slave is offline.

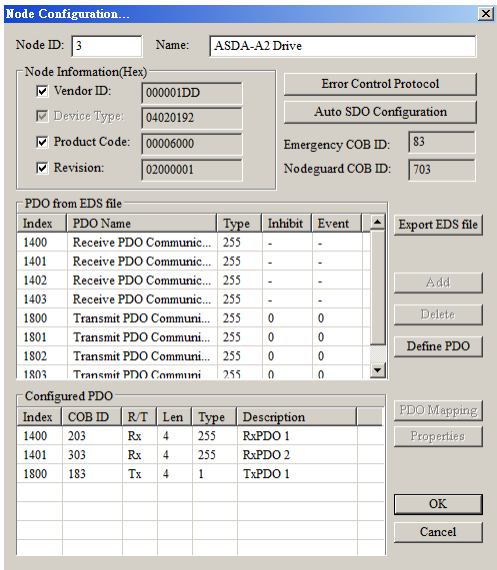
● Auto SDO Configuration

Perform one write action to the slave parameter with SDO. The write action is finished when the slave enters the operational state from the pre-operational state. You can configure up to 20 SDOs by clicking Auto SDO configuration.

● PDO Mapping and Properties

Sets the mapping parameter and transmission type for the PDO.

For more details on the function of these buttons, refer to Section 11.1.1 in the CANopen Builder software help file.

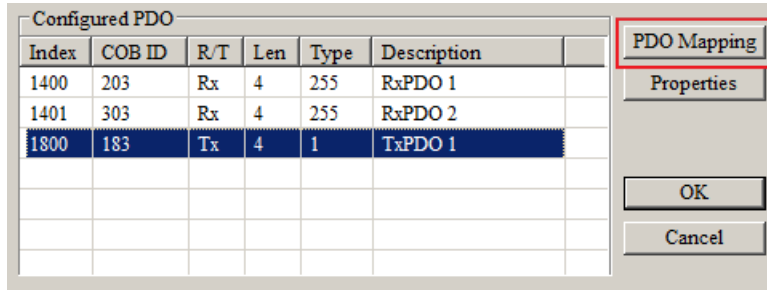


- PDO Mapping:

**RxPDO1:** mapping parameter P1-09; transmission type 255.

**RxPDO2:** mapping parameter P3-06, P4-07; transmission type 255.

**TxPDO1:** mapping parameter P0-09; transmission type 1.



- PDO transmission type :

PDOs can be classified into RxPDO or TxPDO. RxPDO data are sent from master to slave and TxPDO data are sent from slave to master.

The PDO transmission types can be synchronous or asynchronous. In synchronous transmission, the master sends out the SYNC message in a fixed cycle. You set the length of the cycle in the Master Properties dialog box (default is 50ms). In asynchronous transmission, the message is sent out when the PDO mapping parameter changes.

The following table describes the PDO Transmission types.

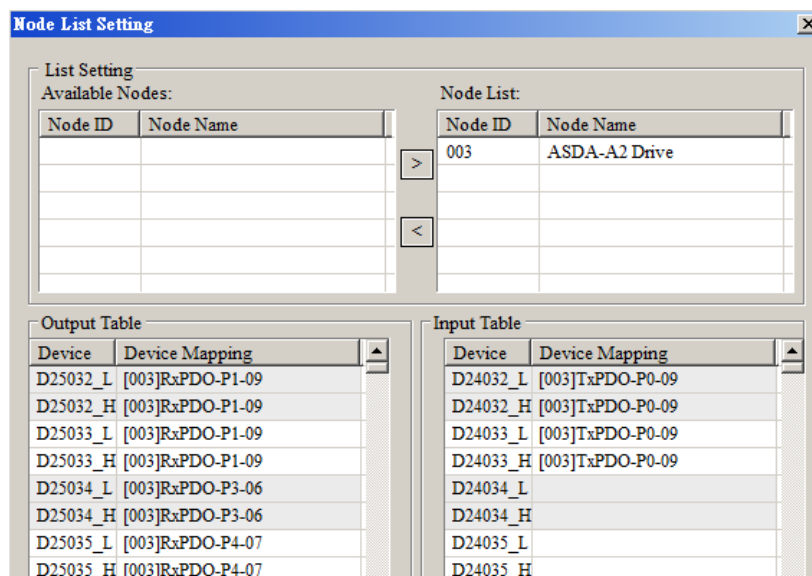
| Transmission Type |       | Description   | Remark          |
|-------------------|-------|---|-----------------|
| 0                 | RxPDO | When any change in the mapped data happens, RxPDO data is sent out immediately. The data the slave receives is valid only when receiving the next SYNCH message. RxPDO data is not sent out if there is no change in the data.                        | SYNCH non-cycle |
|                   | TxPDO | When any change in the mapped data happens and the slave receives the SYNC message, the data are sent out immediately. The TxPDO data are valid immediately after master receives them. TxPDO data is not sent out if there is no change in the data. |                 |
| N<br>(N:1–240)    | RxPDO | After N messages are sent out, and regardless of whether the mapped data changes, the data that the slave receives is valid only when receiving the next SYNCH message.   | SYNCH cycle     |
|                   | TxPDO | After N messages are sent out and regardless of whether the mapped data is changed, the data that the master receives is valid at once.   |                 |
| 254               | RxPDO | The mapped data is sent out immediately when it changes and is valid when the slaves receives it. RxPDO data is not sent out if there is no change in the data.   | ASYNCH          |

| Transmission Type |                 | Description   | Remark |
|-------------------|-----------------|---|--------|
|                   | TxPDO           | The slave sends out the data once every one Event timer time. After that, the TxPDO data is not allowed to be sent out within an inhibit timer time.<br><br>When the Event timer and Inhibit timer are both equal to 0, the slave sends TxPDO data to the master immediately when the data changes, and the data that master receives is immediately valid. |        |
| 255               | Same as Type254 |   |        |


Note:


- Synchronous transmission type can fulfill multi-axis motion at the same time.
- If you monitor a real-time changing parameter such as the actual rotation speed of the motor, set the TxPDO to the synchronous transmission type; otherwise the frequent change in the slave data can block the CANopen network.

After you finish setting the above parameters, double click the master device to display the **Node List Setting** dialog box. Select ASDA-A2 Drive, and click > to move the A2 drive to the right-side list, and then download the configured data.

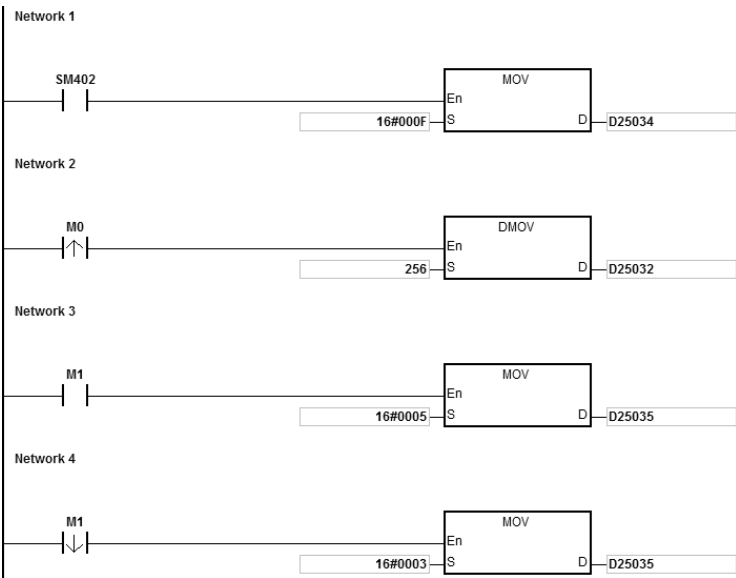


The mapping relation between master and slave:

| 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              |
| D25035                           |   | P4-07 of servo              |

| AS300 Series PLC master register | Data transmission on CANopen bus  | A2 device                   |
|----------------------------------|---|-----------------------------|
| 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 in ISPSoft; that is, the speed command is set as 256r/min in the following diagram.



7. Program explanation

When the AS300 Series PLC runs for the first time, set the parameter P3-06 for servo drive to F.

- When M0 switches from OFF to ON, the instruction writes 256 to D25032 and then writes the value to the servo parameter P1-09 through RxPDO1.
- When M1 switches from OFF to ON, change P4-07 to 5. DI1 and DI3 are ON. DI1 means the SERVO is ON and DI3 calls the speed specified by parameter P1-09 for servo rotation.
- When M1 switches from ON to OFF, the speed command becomes 0 and the motor stops running.



## 10.7 Object Dictionary

The following table lists the communication objects in the object dictionary.

| 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                  |
| H'1403 | --       | RxPDO4 communication parameter |                  |           |                    |

| Index  | Subindex | Object name                    | Data type        | Attribute | Default value |
|--------|----------|--------------------------------|------------------|-----------|---------------|
|        | 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    |
|        | H'01     | The second mapped object       | Unsigned 32 bits | RW        | 0x20000210    |

| Index  | Subindex | Object name              | Data type        | Attribute | Default value |
|--------|----------|--------------------------|------------------|-----------|---------------|
|        | 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             |
|        | H'02     | The third mapped object  | Unsigned 32 bits | RW        | 0             |

| Index  | Subindex | Object name                    | Data type        | Attribute | Default value      |
|--------|----------|--------------------------------|------------------|-----------|--------------------|
|        | 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         |
|        | H'02     | Transmission mode              | Unsigned 8 bits  | RW        | 0xFF               |

| Index  | Subindex | Object name                    | Data type        | Attribute | Default value |
|--------|----------|--------------------------------|------------------|-----------|---------------|
|        | 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             |
|        | H'02     | The second mapped object       | Unsigned 32 bits | RW        | 0             |

| Index  | Subindex | Object name              | Data type        | Attribute | Default value |
|--------|----------|--------------------------|------------------|-----------|---------------|
|        | 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             |
|        | H'04     | The fourth mapped object | Unsigned 32 bits | RW        | 0             |



# Chapter 11 CPU Module Operating Principles

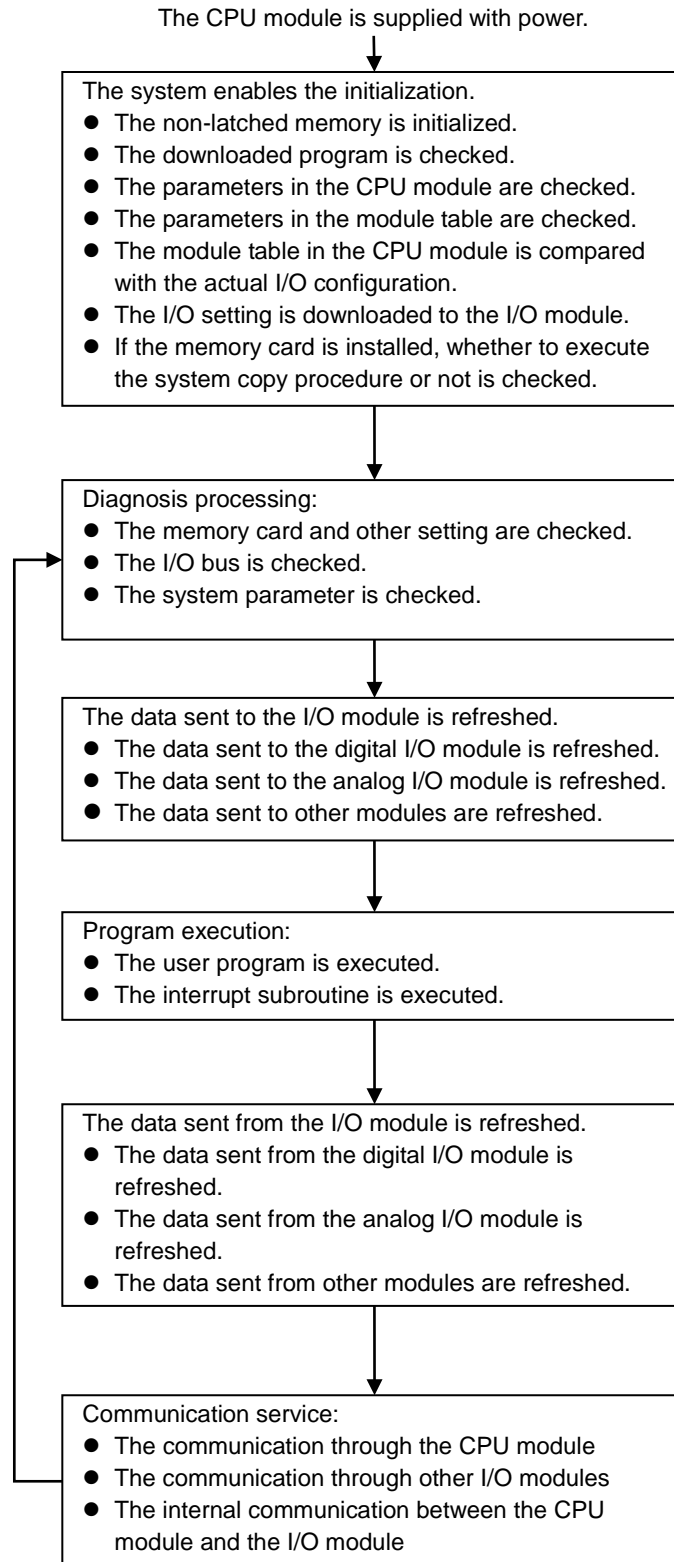
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## 11.1 CPU Module Operations

### 11.1.1 Procedure

The following diagram describes the operation of the CPU module.





### 11.1.2 I/O Refreshing and Communication Service

#### ● Refreshing I/O

The CPU module reads external I/O data periodically or outputs data to an external I/O. Refreshing the I/O includes the following.

- Refreshing data in a digital I/O module
- Refreshing data in an analog I/O module, temperature measurement module, loadcell module, positioning and counter module
- Refreshing data in a network module

All I/O refreshing executes in the same loop. The data in an input device refreshes before a program executes, and the data in an output device refreshes after the program executes.

| Unit   | Maximum data exchange                                       | Data exchange area       |
|--|---|--------------------------|
| Digital I/O module   | Depends on the number of input/output channels in the unit. | Input relay/Output relay |
| Analog I/O module, temperature measurement module, loadcell module, positioning and counter module | Depends on the number of input/output channels in the unit. | Data register            |
| Network module   | Depends on the unit.  | Data register            |

#### ● Communication service

Communication service is the unscheduled communication service for a network module. It includes the communication requests sent from external equipment to a CPU module, and the communication requests sent from the CPU module to the external equipment. The communication requests may be received from time to time but the data or state refreshing on the devices or components will only start after the END instruction is scanned and executed if the communication is concerning the internal devices or components of the PLC CPU.

### 11.1.3 Execution Timing of Interrupts

Interrupts can be categorized into three types, periodic interrupts, timer interrupts, and condition interrupts. The timing to execute any interrupt is after the current executing instruction is complete and the position and state of the next to be executed instruction is retained. After the interrupt is executed, the execution of the next instruction will resume.

## 11.2 CPU Module Operating Modes

### 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 in 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 in this mode. Users can NOT download a module table, and initialize CPU configuration and other setting.

### 11.2.2 Status and Operation under Different Operating Modes

The following table lists the status and operation states for RUN and STOP modes.

- **Basic operation**

| CPU mode | Program                             | I/O refreshing           | External output  | Program memory                                |              |
|----------|-------------------------------------|--------------------------|--|---|--------------|
|          |                                     |                          |  | Non-latched area                              | Latched area |
| STOP     | The execution of the program stops. | I/O refreshing executes. | OFF. If you 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 is retained. | The data in the program memories is retained. |              |
| RUN      | The program executes.               | I/O refreshing executes. | The program controls the external output.  | The program controls the program memories.    |              |

- **Relationship between the operating modes and tasks**

| Mode | Loop task   | Interrupt task   |
|------|---|--|
| STOP | Execution of a loop tasks stops.  | Execution of an interrupt task stops.                                  |
| RUN  | <ul style="list-style-type: none"> <li>● The tasks that have not been executed are in the HALT state.</li> <li>● If a task is active, or the instruction TKON is executed, the task executes.</li> <li>● If a task is not active, or the instruction TKOFF</li> </ul> | If the condition of the interrupt is met, the interrupt task executes. |

|  |                                      |  |
|--|--------------------------------------|--|
|  | executes, the task does not execute. |  |
|--|--------------------------------------|--|

● Relationship between changing modes and the program memory

| Change of the mode | Non-latched area                                       | Latched area          |
|--------------------|--|-----------------------|
| STOP→RUN           | Data is cleared or retained depending on your setting. | The data is retained. |
| RUN→STOP           | The data is retained.                                  | The data is retained. |

**MEMO**

# Chapter 12 Troubleshooting

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|         |  |       |
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## 12.1 Troubleshooting

This section uses ISPSOft for demonstration. For DIADesigner operation, refer to Chapter 18 from DIADesigner software manual.

### 12.1.1 Basic troubleshooting steps

This chapter includes the possible errors that can occur during operation, their causes, and corrective actions.

(1) Check the following:

- The PLC should be operated in a safe environment (consider environmental, electronic, and vibration safeties).
- Connect power supply correctly to the PLC.
- Secure the module, terminal, and cable installations.
- All LED indicators show correctly.
- Set all switches correctly.

(2) Check the following operational functions:

- Switch the RUN/STOP state
- Check the settings for the AS Series to RUN/STOP
- Check and eliminate errors from external devices
- Use the System Log function in ISPSOft to check system operation and logs

(3) Identify possible causes:

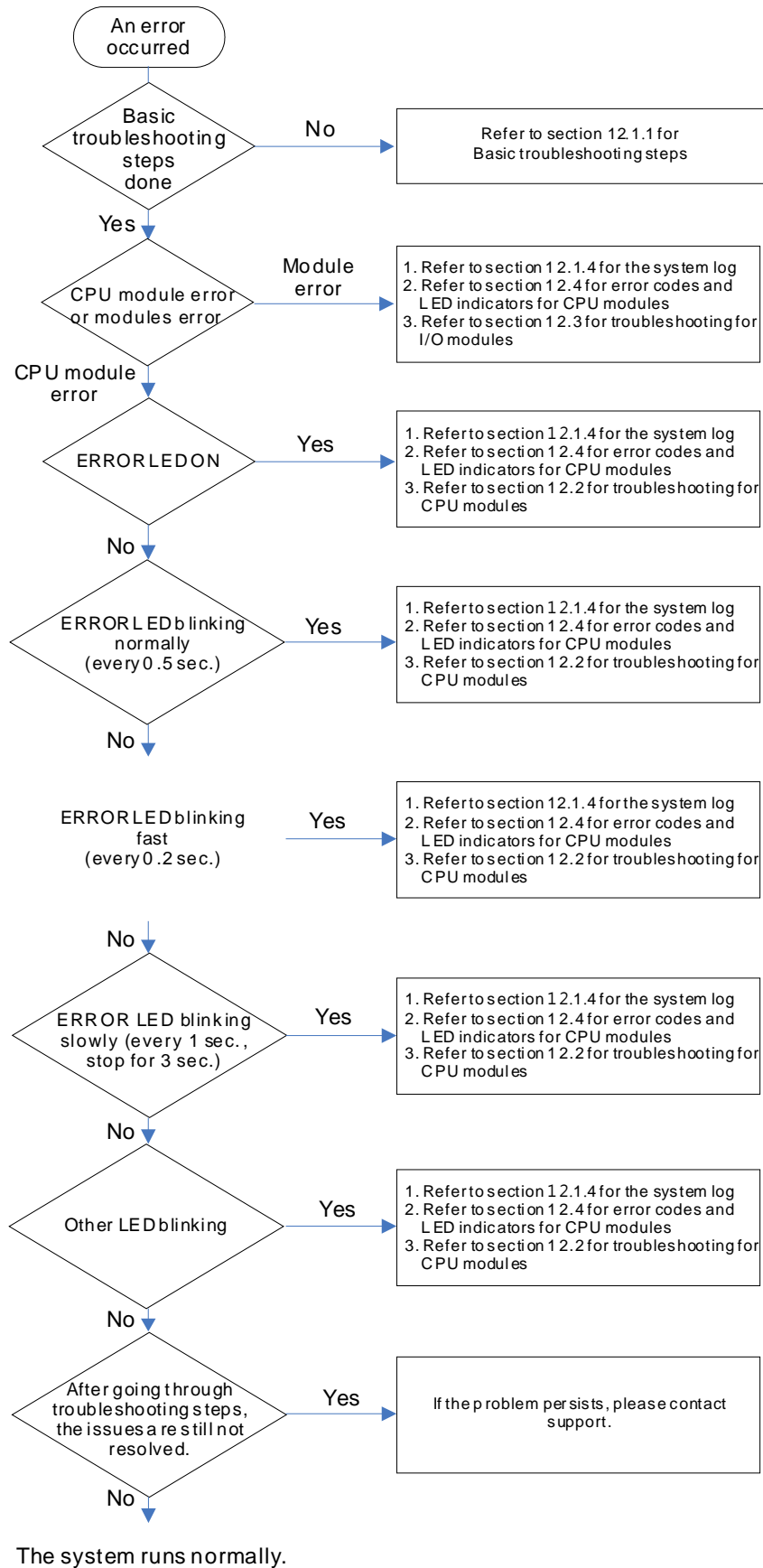
- AS Series or external device
- CPU or extension modules
- Parameters or program settings

### 12.1.2 Clear the Error States

Use the following methods to clear the error states. If the error source is not corrected, the system continues to show errors.

- (1) Switch the CPU model state to STOP and then to RUN.
- (2) Turn off the CPU and turn it on again.
- (3) Use ISPSOft to clear the error logs.
- (4) Reset the CPU to the default settings and download the program again.

### 12.1.3 Troubleshooting SOP

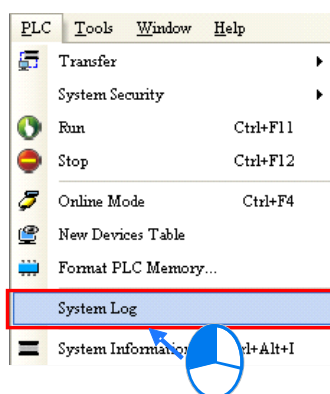




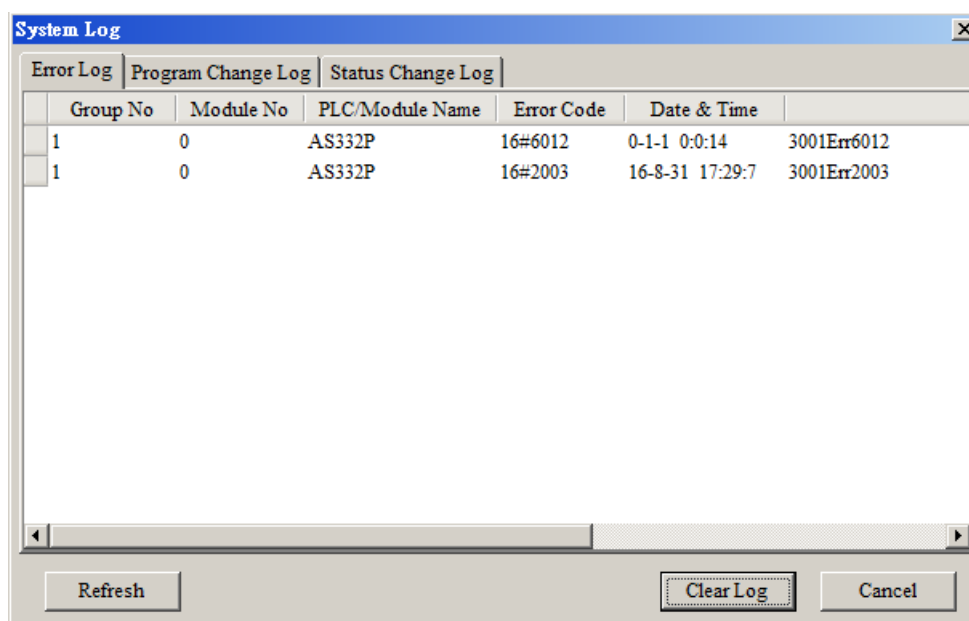
### 12.1.4 Viewing System Log and Error Step

If ISPSOft is connected to an AS Series, you can view actions and errors in the AS Series by clicking **System Log** on the **PLC** menu. The CPU can store up to 20 error log sets. After the 20 sets are stored, the 1<sup>st</sup> log is replaced with the 21<sup>st</sup> if there are new logs coming in, and the old logs are replaced with the new ones sequentially. When the memory card is installed in the CPU module, 20 sets of the old logs are backed up in the memory card and up to 1000 logs can be recorded. If the stored logs exceed 1000, the oldest 20 logs are replaced with the newest 20 logs in the memory card.

- (1) On the **PLC** menu, click **System Log**.

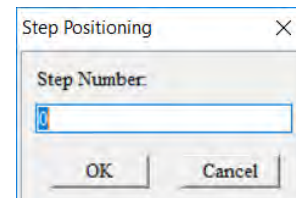
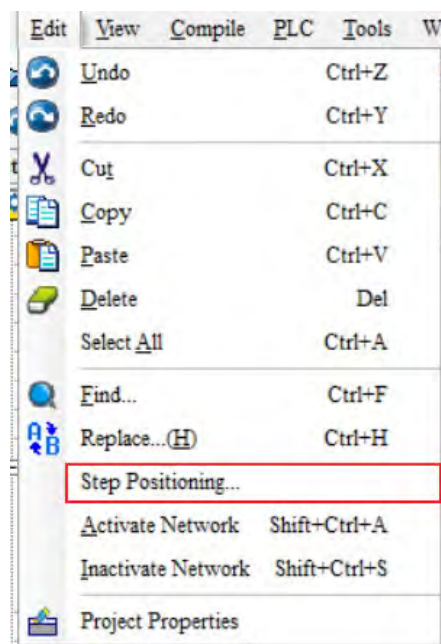


- (2) The **System Log** window appears. Click **Clear Log** to clear the error log in the window and the error log in the CPU module, and reset the CPU module.



- Group No.: The number 1 indicates that the error occurred in the CPU module or the right-side module 1. The numbers 2–16 indicate the error occurred in the remote modules 1–15.
- Module No.: The number 0 indicates that the error occurred in the CPU module or the remote module. The numbers 1–32 indicate 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 from the CPU module or the remote module. Note: up to eight extension modules can be connected to the right-side of the remote module.
- PLC/Module name: Model names of the CPU, remote, and extension modules.

- Error Code: Error codes in the error log.
  - Date & Time: The date and time the error occurred. The most recently occurring error is listed on the top.
  - The last column shows the descriptions for the error.
- (3) If the error occurred is an exceeding device range error (SM0 = ON; stored in SR4) or a program syntax error (SM5 = ON; stored in SR0), you can use the following steps to see the problematic step in the program.
- SM0 = ON: Check the value (32-bit) in SR1 to see the latest exceeding device range error in the program.
  - SM5 = ON: Check the value (32-bit) in SR5 to see the latest syntax error step in the program.
  - After knowing which the problematic step is, go to ISPSOft -> Edit -> Step positioning and then enter the number of the problematic step, the system will take you to the specified step in the program.



## 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 is recorded in the log. X in the Log column indicates the error is not recorded in the log. H in the Log column indicates whether or not you can set recording the error in the log in HWCONFIG. Error records will be also stored in SR; refer to Chapter 2 for more information on SR.

### 12.2.1 ERROR LED Indicators Are ON

| Error Code (16#) | Description  | Solution  | Flag | Log |
|------------------|--------------|---|------|-----|
| 000A             | Scan timeout | 1. Check the setting of the watchdog timer in HWCONFIG.<br>2. Check whether the program causes a long scan time | SM8  | V   |

### 12.2.2 ERROR LED Indicators 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   |
| 000D             | The initial value of the device and the PLC program are not completely downloaded. | Download the program again.   | SM9  | V   |
| 0010             | CPU memory access is denied.   | If the problem persists, contact the local authorized distributors.   | SM9  | V   |
| 0020             | CPU operation speed is not at its highest.   | If the problem persists, contact the local authorized distributors.   | SM9  | V   |
| 0021             | Failed to restore Delta device parameters back to defaults                         | 1. Check if the EDS file of the device is the same as the device that is to be restored to defaults.<br>2. Check if the network connection is normal for the PLC CPU and the device that is to be restored to defaults.<br>3. Check the compatibility of the device to be restored to defaults. | SM9  | H   |
| 002E             | CPU external memory access is denied.  | If the problem persists, contact the local authorized distributors.   | SM9  | V   |
| 002F             | PLC programs are not consistent with the system logs.                              | Download the program again.   | SM34 | V   |
| 0070             | The arrangement of the function cards is not consistent with the settings.         | Check whether the settings in HWCONFIG are consistent with the arrangement of the function cards.   | SM10 | V   |
| 0102             | The interrupt number exceeds the range.  | Check the syntax error step in the program. Modify and compile the program and then download the program again.   | SM5  | X   |
| 0202             | The MC instruction exceeds the range.  |   | SM5  | X   |
| 0302             | The MCR instruction exceeds the range.   |   | SM5  | X   |
| 0D03             | The operands used in DHSCS are   |   | SM5  | X   |

| Error Code (16#)  | Description  | Solution   | Flag | Log |
|-------------------|--|--|------|-----|
|                   | not used properly.   |  |      |     |
| 0E05              | The operands HCXXX used in DCNT are not used properly.                     |  | SM5  | X   |
| 1000<br>-<br>10FF | System error   | If the problem persists, contact the local authorized distributors.  | -    | V   |
| 1300<br>-<br>130F | Errors occurred in the remote modules                                      | Refer to Section 12.3.7 for more information on the error codes for the remote modules.  | SM30 | V   |
| 1402              | The arrangement of the I/O modules is not consistent with the settings.    | Check whether the settings in HWCONFIG are consistent with the arrangement of the I/O modules.   | SM10 | V   |
| 140B              | The number of connected communication modules exceed the maximum number 4. | Check the total number of communication modules.   | SM10 | V   |
| 140C              | The number of connected positioning modules exceed the maximum number 8.   | Check the total number of positioning modules.   | SM10 | V   |
| 140D              | The number of connected extension modules exceed the maximum number 32.    | Check the total number of extension modules.   | SM10 | V   |
| 140E              | More than eight remote modules on the right side of the CPU module.        | Check the total number of remote modules on the right side of the CPU module (maximum is 8).   | SM30 | V   |
| 1600              | The extension module ID exceeds the range.                                 | 1. Make sure the module is properly connected to the CPU module and turn the modules on again.<br>2. If the problem persists, contact the local authorized distributors. | SM10 | V   |
| 1601              | The extension module ID cannot be set.                                     | 1. Make sure the module is properly connected to the CPU module and turn the modules on again.<br>2. If the problem persists, contact the local authorized distributors. | SM10 | V   |
| 1602              | The extension module ID is duplicated.                                     | 1. Make sure the module is properly connected to the CPU module and turn the modules on again.<br>2. If the problem persists, contact the local authorized distributors. | SM10 | V   |
| 1603              | The extension module cannot be operated.                                   | 1. Make sure the module is properly connected to the CPU module and turn the modules on again.<br>2. If the problem persists, contact the local authorized distributors. | SM10 | V   |
| 1604              | Extension module communication timeout                                     | 1. Make sure the module is properly connected to the CPU module and turn the modules on again.<br>2. If the problem persists, contact the local authorized distributors. | SM10 | V   |
| 1605              | Hardware failure   | If the problem persists, contact the local authorized distributors.  | SM10 | V   |
| 1606              | Errors on the communication module function card                           | Make sure the function card is properly connected to the CPU module and turn the modules on again.   | SM10 | V   |
| 1607              | The external voltage is abnormal.  | Check whether the external 24 V power supply to the  | SM10 | V   |

| Error Code (16#)  | Description  | Solution  | Flag    | Log |
|-------------------|--|---|---------|-----|
|                   |  | module is normal.   |         |     |
| 1608              | The Internal factory calibration or the CJC is abnormal. | If the problem persists, contact the local authorized distributors.   | SM10    | V   |
| 1609<br>-<br>160F | Reserved (Error codes for the extension modules)         |   |         |     |
| 200A              | Invalid instruction                                      | Check the syntax error step in the program. Modify and compile the program and then download the program again. | SM5     | V   |
| 6010              | The number of MODBUS TCP connections exceeds the range.  | Check the number of superior devices (maximum is 32).   | SM 1092 | V   |
| 6011              | The number of EtherNet/IP connections exceeds the range. | Check the number of connections (maximum is 16).  | SM 1093 | V   |
| C000<br>-<br>CFFF | The program syntax is incorrect.                         | Save the PLC program and hand the file to the company or the technicians.                                       |         |     |

### 12.2.3 ERROR LED Indicators Blinking Rapidly Every 0.2 Seconds

The blinking happens when the power supply 24 VDC of the CPU module is disconnected, or the power supply is not sufficient, not stable or abnormal.

| 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 Indicators Slow Blinking Every 3 Seconds and Lighting up for 1 Second

| Error Code (16#) | Description   | Solution                      | Flag | Log |
|------------------|---|-------------------------------|------|-----|
| 0040             | The converted value in the function card 1 (AS-F2AD) or in the built-in AD input channel 1 exceeds the setting range. | Check the actual input signal | SM27 | H   |
| 0041             | The converted value in the function card 1 (AS-F2AD) or in the built-in AD input channel 2 exceeds the setting range. | Check the actual input signal | SM27 | H   |
| 0042             | The converted value in the input channel 1 of the function card 2 (AS-F2AD) exceeds the setting range.                | Check the actual input signal | SM27 | H   |
| 0043             | The converted value in the input channel 2 of the function card 2 (AS-F2AD) exceeds the setting range.                | Check the actual input signal | SM27 | H   |

|                   |   |  |      |   |
|-------------------|---|--|------|---|
| 0044              | Connection lost in the mode of current input 4 mA - 20 mA for the function card 1 (AS-F2AD) or for the built-in AD input channel 1. | Check the connection cable.  | SM27 | H |
| 0045              | Connection lost in the mode of current input 4 mA - 20 mA for the function card 1 (AS-F2AD) or for the built-in AD input channel 2. | Check the connection cable.  | SM27 | H |
| 0046              | Connection lost in the mode of current input 4 mA - 20 mA for the input channel 1 of the function card 2 (AS-F2AD).                 | Check the connection cable.  | SM27 | H |
| 0047              | Connection lost in the mode of current input 4 mA - 20 mA for the input channel 2 of the function card 2 (AS-F2AD).                 | Check the connection cable.  | SM27 | H |
| 1500              | Connection lost in the remote modules   | Check the network connection cable.  | SM30 | V |
| 1502<br>-<br>150F | Errors occurred in the remote modules   | Refer to Section 12.3.7 for more information on the remote module error codes.   | SM30 | V |
| 1800<br>-<br>180F | Errors occurred in the extension modules  | Refer to Section 12.3 for more information on the extension module error codes.  | SM10 | V |
| 1900<br>-<br>191C | Heartbeat errors occurred in the slave in CANopen / ECAT communication.   | 1. Check the CANopen / ECAT connection cable.<br>2. Check if the specific slave is working properly.<br>Note: The last 2 digits of the error code represent the ID number of the slave (convert hexadecimal to decimal). | -    | V |

### 12.2.5 BAT. LOW LED Indicators Are ON

The blinking happens when there is no battery (CR1620) or the power is low. Turn this option off in the HWCONFIG > CPU > Device Setting > Show Battery Low Voltage Error CPU when you don't need the RTC function to keep track of the current time (default is enabled).

| Error Code (16#) | Description | Solution                               | Flag  | Log |
|------------------|-------------|--|-------|-----|
| 0027             | Battery Low | Change battery or turn this option off | SM219 | X   |

### 12.2.6 BAT. LOW LED Indicators Blinking Every 0.5 Seconds

The blinking 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 | If the problem persists, contact the local authorized distributors. | SM218 | V   |
| 0028             | No response from RTC                      | If the problem persists, contact the local authorized distributors. | SM217 | V   |

### 12.2.7 The LED RUN and ERROR Indicators are Blinking Simultaneously Every 0.5 Seconds

The blinking 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 RUN and ERROR LED Indicators are Blinking One After Another Every 0.5 Seconds.

The blinking happens when the CPU module memory card is backing up, restoring, or saving.

If you are using AS218 Series CPU and without engaging any SD card, the RUN and LED indicators blinking indicates the AIO firmware is being updated. If the blinking happens at the instant when the CPU is supplied with power, the blinking means AIO firmware update failed and you need to update the firmware again. If you are not updating the AIO firmware, the blinking indicates CPU error and you need to contact the local authorized distributors.

### 12.2.9 Other Errors (Without LED Indicators)

| Error Code (16#) | Description  | Solution   | Flag | Log |
|------------------|--|--|------|-----|
| 0011             | The PLC ID is incorrect.   | Check the PLC ID.  | SM34 | V   |
| 0012             | The PLC password is incorrect.                                     | Check the PLC password.  | SM34 | V   |
| 002D             | The PLC maximum password attempts exceeded.                        | Reset the CPU module or restore the CPU module to its default 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 default settings, and then download the program and the parameters again.<br>2. If the problem persists, contact the local authorized distributors. | SM6  | V   |
| 0051             | The latched special data registers are abnormal.                   | 1. Reset the CPU module or restore the CPU module to its default settings, and then download the program and the parameters again.<br>2. If the problem persists, contact the local authorized distributors. | SM6  | V   |
| 0052             | The memories in the latched auxiliary relays are abnormal.         | 1. Reset the CPU module or restore the CPU module to its default settings, and then download the program and the parameters again.<br>2. If the problem persists, contact the local authorized distributors. | SM6  | V   |
| 0054             | The latched counters are abnormal.                                 | 1. Reset the CPU module or restore the CPU module to its default settings, and then download the program and the parameters again.<br>2. If the problem persists, contact the local authorized distributors. | SM6  | V   |
| 0055             | The latched 32-bit counters are abnormal.                          | 1. Reset the CPU module or restore the CPU module to its default settings, and then download the program and the parameters again.<br>2. If the problem persists, contact the local authorized distributors. | SM6  | V   |

|  |  |  |       |   |
|--|--|--|-------|---|
| 0056   | The latched special auxiliary relay is abnormal.   | 1. Reset the CPU module or restore the CPU module to its default settings, and then download the program and the parameters again.<br>2. If the problem persists, contact the local authorized distributors. | SM6   | V |
| 0059   | The latched data registers are abnormal.   | 1. Reset the CPU module or restore the CPU module to its default settings, and then download the program and the parameters again.<br>2. If the problem persists, contact the local authorized distributors. | SM6   | V |
| 005D   | The CPU module does not detect a memory card.  | Check that the memory card is inserted correctly into the CPU module.  | 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 is malfunctioning.   | 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 the Delta ASD-A2 control has not yet been completed, the CANopen instructions cannot be executed.  | 1. Check the CANopen connection cable.<br>2. Check if the specific slave is working properly.<br>3. If nothing is wrong, initialize the Delta ASD-A2 again.  | -     | V |
| 19B0   | Heartbeat timeout occurred in the slave mode   | Check the CANopen connection cable.  | -     | V |
| 19B1   | The data length of PDO (process data object) in the slave mode is not matched with the setting.  | Revise the PDO data length setting in the slave mode and download the setting again.   | -     | V |
| Check the value in SR830~SR893 to see which slave (1~64) is experience an error and refer to the following error codes 19E1~19E8 to check the details. |  |  |       |   |
| 19E1   | The data length of PDO (process data object) in the slave mode is not matched with the setting of the scan list. Refer to CANopen communication related descriptions in AS Series Operation Manual for more details on the error codes 19E1 to 19E8. | Revise the PDO data length setting in the slave mode and download the setting again.   | -     | V |
| 19E2   | PDO in the slave mode is not received.   | Check if the configurations are correctly set.   | -     | V |
| 19E3   | The function of auto downloading SDO fails at the first startup.   | Check if the SDO contents for auto downloading are correct.  | -     | V |
| 19E4   | PDO configurations are set incorrectly.  | Make sure to set the PDO configurations correctly.   | -     | V |
| 19E5   | The main settings are not consistent with the connected slave.   | Make sure the connected slaves are the ones configured in ISPSOft.   | -     | V |
| 19E6   | This slave does NOT exist in this network.   | Make sure the power supply of slave is normal and slave is correctly connected to the network.   | -     | V |
| 19E7   | Timeout on the slave error control   | Make sure the power supply of slave is normal and slave is correctly connected to the network.   | -     | V |
| 19E8   | The node IDs of master and slave are duplicated.   | Set the node ID of the master and slave again and make sure their node IDs are unique.   | -     | V |
| 19F3   | Error in the configuration   | 1. Download the parameter configuration again.<br>2. If the problem persists, contact the local authorized distributors.   | -     | V |
| 19F4   | CANopen communication is in the BUS-   | 1. Check if the network cable is normal and the  | -     | V |



|      |  |   |        |   |
|------|--|---|--------|---|
|      | OFF state.   | shielded cable is grounded.<br>2. Check if the start and end of the network cable are both connected with a 121Ω terminal resistor.<br>3. Check if all the node devices run at the same baud rate on the network. |        |   |
| 19FB | The sending registers exceed the range.  | Revise the time to synchronize (suggested to use a longer time).  | -      | V |
| 19FC | The receiving registers exceed the range.  | Revise the time to synchronize (suggested to use a longer time).  | -      | V |
| 2001 | Not using the FCOMP card or not in the right mode for the ASDA-A2 while using the CANopen communication instruction.                         | 1. Use the FCOMP card in the function card slot to check if the operation mode is correct.<br>2. Check the syntax error step in the program. Modify and compile the program and then download the program again.  | SM0    | V |
| 2003 | The device used in the program exceeds the device range.   | Check the syntax error step in the program. Modify and compile the program and then download the program again.   | SM0    | V |
| 200B | The operand n or the other constant operands K/H exceed the range.   |   | SM0    | V |
| 200C | The operands overlap.  |   | SM0    | V |
| 200D | The binary to binary-coded decimal conversion is incorrect.  |   | SM0    | V |
| 200E | The string does not end with 00.   |   | SM0    | V |
| 2012 | Incorrect division operation   |   | SM0    | V |
| 2013 | The value exceeds the range of values that can be represented by the floating-point numbers.   |   | SM0    | V |
| 2014 | The task designated by the TKON or YKOFF instruction is incorrect or exceeds the range.  |   | SM0    | V |
| 2017 | The instruction BREAK is written outside of the FOR-NEXT loop.   |   | SM0    | V |
| 2027 | No such position planning table number or the format is incorrect.   | 1. Check the syntax error step in the program. Modify and compile the program and then download the program again.<br>2. Check the settings of the position planning table.                                       | SM0    | V |
| 2028 | 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 |
| 2030 | During the execution of CSFO instruction, the output frequency exceeds the upper limit.  | Modify the ratio of input / output frequency or lower the input frequency value.  | -      | V |
| 2031 | During the execution of CSFO instruction, when the output frequency is set to 0, but even after 2 seconds, the output is still not complete. |   | -      | 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.<br>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. Solve the problem 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.<br>2. Retry sending of the email later. This error does not cause the PLC to stop running. Solve the problem 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.<br>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.<br>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.<br>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.<br>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.<br>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 received through the TCP socket exceeds the device range.             | 1. Check the program and the related special data registers.<br>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.<br>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.<br>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.<br>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.<br>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 received through the UDP socket exceeds the device range.             | 1. Check the program and the related special data registers.<br>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.<br>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 the remote device operates normally.  | - | X |
| 6215 | The socket is not opened.  | Check whether operational sequence in the   | - | X |

|      |  |  |   |   |
|------|--|--|---|---|
|      |  | program is correct.  |   |   |
| 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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>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 slave.<br>2. Check the communication cable.                        | - | H |
| 70B1 | The device communication function code in function card 1 is incorrect.                | 1. Check the communication setting in the master and the slave.<br>2. Check the communication cable.                        | - | H |
| 70B2 | The device communication address used in function card 1 is incorrect.                 | 1. Check the communication setting in the master and the slave.<br>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 slave.<br>2. Check the communication cable.                        | - | H |
| 70B4 | The device length of the communication data in function card 1 exceeds the limit.      | 1. Check the communication setting in the master and the slave.<br>2. Check the communication cable.                        | - | H |
| 70B7 | The device checksum for the communication serial port of function card 1 is incorrect. | 1. Check the communication setting in the master and the slave.<br>2. Check the communication cable.                        | - | H |
| 70C1 | The device communication function code in function card 2 is incorrect.                | 1. Check the communication setting in the master and the slave.<br>2. Check the communication cable.                        | - | H |
| 70C2 | The device communication address used in function card 2 is incorrect.                 | 1. Check the communication setting in the master and the slave.<br>2. Check the communication cable.                        | - | H |
| 70C3 | The device used in function card 2 exceeds the device range.                           | 1. Check the communication setting in the master and the slave.<br>2. Check the communication cable.                        | - | H |
| 70C4 | The device length of the communication data in function card 2 exceeds the limit.      | 1. Check the communication setting in the master and the slave.<br>2. Check the communication cable.                        | - | H |
| 70C7 | The device checksum for the communication serial port of function card 2 is incorrect. | 1. Check the communication setting in the master and the slave.<br>2. Check the communication cable.                        | - | H |
| 7203 | Invalid communication function code  | 1. Refer to the function codes defined by the communication protocols.<br>2. Check if the product firmware and the software | - | H |

|                   |   |   |   |   |
|-------------------|---|---|---|---|
|                   |   | <p>used are the most updated versions.</p> <p>3. Make a note of the operation procedures and screenshots of the error windows and hand this note to the company or the technicians from the agents.</p>   |   |   |
| 8105              | <p>The contents of the program downloaded are incorrect.</p> <p>The program syntax is incorrect.</p>                    | <p>1. Download the program and parameters again.</p> <p>2. Check the communication cable.</p> <p>3. Save all the projects and compress the projects into one compressed file and then hand this file to the company or the technicians from the agents.</p> | - | H |
| 8106              | <p>The contents of the program downloaded are incorrect.</p> <p>The length of the execution code exceeds the limit.</p> | <p>1. Download the program and parameters again.</p> <p>2. Save all the projects and compress the projects into one compressed file and then hand this file to the company or the technicians from the agents.</p>  | - | H |
| 8107              | <p>The contents of the program downloaded are incorrect.</p> <p>The length of the source code exceeds the limit.</p>    | <p>1. Download the program and parameters again.</p> <p>2. Save all the projects and compress the projects into one compressed file and then hand this file to the company or the technicians from the agents.</p>  | - | H |
| 8000<br>-<br>8FFF | <p>Errors occur between software and PLC.</p>   | <p>1. Check if the product firmware and the software used are the most updated versions.</p> <p>2. Make a note of the operation procedures and screenshots of the error windows and hand this note to the company or the technicians from the agents.</p>   |   |   |

## 12.3 Troubleshooting for Other I/O Modules

### ● Introduction to troubleshooting modules

Digital I/O, analog I/O, temperature measurement, positioning, counter, load cell, and network modules can be installed in an AS Series system. There are 2 types of error codes; error and warning. The CPU module and its modules stop operating when errors occur. The CPU modules and its modules do not stop operating when warnings are triggered.

### 12.3.1 Troubleshooting for Analog Modules (AD/DA/XA) and Temperature Modules (RTD/TC)

#### 12.3.1.1 ERROR LED Indicators Are ON

You can set up HWCONFIG to have the following errors appear as warnings when they occur. Otherwise, when an error occurs, only an error message appears.

| Error Code | Description                                     | Solution  |
|------------|---|---|
| 16#1605    | Hardware failure                                | If the problem persists, contact the local authorized distributors. |
| 16#1607    | The external voltage is abnormal.               | Check the power supply.   |
| 16#1608    | The factory calibration or the CJC is abnormal. | If the problem persists, contact the local authorized distributors. |

#### 12.3.1.2 ERROR LED Indicators Blinking Every 0.2 Seconds

The following errors are specified as warnings to ensure that the CPU can still run even when the warnings are triggered by its modules. If you need the CPU STOP running immediately when the first 4 errors occur, you need to set them as errors.

| Error Code | Description  | Solution  |
|------------|--|---|
| 16#1801    | The external voltage is abnormal.  | Check the power supply.   |
| 16#1802    | Hardware failure   | If the problem persists, contact the local authorized distributors. |
| 16#1804    | The factory calibration is abnormal.   | If the problem persists, contact the local authorized distributors. |
| 16#1807    | The CJC is abnormal.   | If the problem persists, contact the local authorized distributors. |
| 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                              |

| Error Code | Description  | Solution   |
|------------|--|--|
| 16#180C    | The signal received by channel 5 exceeds the range of analog inputs (temperature). | Check the signal received by channel 5   |
| 16#180D    | The signal received by channel 6 exceeds the range of analog inputs (temperature). | Check the signal received by channel 6   |
| 16#180E    | The signal received by channel 7 exceeds the range of analog inputs (temperature). | Check the signal received by channel 7   |
| 16#180F    | The signal received by channel 8 exceeds the range of analog inputs (temperature). | Check the signal received by channel 8   |
| -          | When power-on, the module is not detected by CPU module.                           | Check if the connection between module and CPU module is working. If not, connect again. |

## 12.3.2 Troubleshooting for the Positioning Module AS02/04PU

### 12.3.2.1 ERROR LED Indicators Blinking Every 0.2 Seconds

| Error Code | Description      | Solution  |
|------------|------------------|---|
| 16#1802    | Hardware failure | If the problem persists, contact the local authorized distributors. |

## 12.3.3 Troubleshooting for the High-Speed Counter Module AS02HC

### 12.3.3.1 ERROR LED Indicators Are ON

| Error Code | Description  | Solution   |
|------------|--|--|
| 16#1605    | Counted result in the latched area is not retainable (major error)   | Counted data is lost. Switch the module power OFF and ON again. The error code is cleared by the system. If the problem persists, contact the local authorized distributors.                             |
| 16#1606    | Module settings in the latched area is not retainable. (major error) | Module setting data is lost. Switch the module power OFF and ON again. Download the HWCONFIG settings again to clear the error code. If the problem persists, contact the local authorized distributors. |
| 16#1607    | Module setting error (major error)                                   | Check if the setting in HWCONFIG is consistent with the actual placement. If the problem persists, contact the local authorized distributors.  |



### 12.3.3.2 ERROR LED Indicators Blinking Every 0.5 Seconds

The following errors are specified as warnings to ensure that the CPU module can still run even when the warnings are triggered by its AIO modules.

| Error Code | Description  | Solution  |
|------------|--|---|
| 16#1800    | Counter overflow / underflow on CH1  | Check the counter result. If the alarm is not required, disable the alarm output function in HWCONFIG. Use any of the followings to clear the error code: clear, reset, preset the counter, restart the module, or execute DHCCNT instruction again.  |
| 16#1801    | Counter overflow / underflow on CH2  |   |
| 16#1802    | Linear count exceeding the set upper/lower limit on CH1                        | Check the signal received by channel 1 and 2. Hardware counter is still counting; when the number is accumulated to the maximum and go back to the minimum, the error code will be cleared.   |
| 16#1803    | Linear count exceeding the set upper/lower limit on CH2                        |   |
| 16#1804    | The variation in relation to a SSI encoder position exceeding the limit on CH1 | Check if there is any interruption and check the device specification to see if the offset setting is matching with the actual placement. When the next reading is normal, the error code will be cleared.  |
| 16#1805    | The variation in relation to a SSI encoder position exceeding the limit on CH2 |   |
| 16#1806    | Abnormal SSI communication on CH1  | Check the execution of DHCCNT instruction. If it is parity check, check is there is any interruption and check if the data format is correct. Check if the device wiring is secure, and if the encoder power supply is normal.  |
| 16#1807    | Abnormal SSI communication on CH2  |   |
| 16#1808    | SSI absolute position cross zero point on CH1                                  | Check the SSI absolute encoder specification and modify the setting accordingly. If the alarm is not required, disable the alarm output function in HWCONFIG. Use any of the followings to clear the error code: clear, reset, preset the counter, restart the module, or execute DHCCNT instruction again. |
| 16#1809    | SSI absolute position cross zero point on CH2                                  |   |

### 12.3.4 Troubleshooting for the Load Cell Module AS02LC

#### 12.3.4.1 ERROR LED Indicators Are ON

You can set up HWCONFIG to have the following errors appear as warnings when they occur. Otherwise, when an error occurs, only an error message appears.

| Error Code | Description                                  | Solution  |
|------------|--|---|
| 16#1605    | Hardware failure (that is, the driver board) | If the problem persists, contact the local authorized distributors. |
| 16#1607    | The external voltage is abnormal.            | Check the power supply.   |

### 12.3.4.2 ERROR LED Indicators Blinking Every 0.2 Seconds

The following errors are specified as warnings to ensure that the CPU module can still run even when the warnings are triggered by its modules. The following first 3 error codes are set as warnings by default in HWCONFIG; CPU must STOP running immediately when the first 3 errors occur.

| Error Code | Description   | Solution   |
|------------|---|--|
| 16#1801    | The external voltage is abnormal.   | Check the power supply.  |
| 16#1802    | Hardware failure  | If the problem persists, contact the local authorized distributors.  |
| 16#1807    | Diver board failure   | Check if the terminal is affected by noises or is short-circuited, i.e. EXC+ and EXC-. If the problem persists, contact the local authorized distributors. |
| 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 input to channel 1 and the maximum weight setting.   |
| 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 input to channel 2 and the maximum weight setting.   |
| 16#180D    | The factory calibration in channel 2 is incorrect.  | Check the weight calibration in channel 1.   |
| -          | When power-on, the module is not detected by CPU module.  | Check if the connection between module and CPU module is working. If not, connect again.   |

### 12.3.5 Troubleshooting for the Module AS04SIL IO-Link as a Communication Module

#### 12.3.5.1 ERROR LED Indicators (Module Status) Blinking Every 0.2 Seconds

The following error codes identify possible errors when the AS04SIL module is installed on the right side of the CPU module or RTU and acts as a communication module.

| Error Code | Description   | Solution   |
|------------|---|--|
| 16#1605    | Hardware failure  | 1. Check that the module is securely installed.<br>2. Install a new AS04SIL or if the problem persists, contact the local authorized distributors. |
| 16#1606    | 24VDC power supply is not sufficient and then recovered from low-voltage for less than 10 ms. | Check whether the 24 V power supply to the module is normal.   |

### 12.3.5.2 ERROR LED Indicators (Network Status) Are ON

The following error codes identify possible errors when the AS-SIL module is installed on the right side of the CPU module or RTU and acts as a communication module.

| Error Code | Description              | Solution                        |
|------------|--------------------------|---------------------------------|
| 16#1802    | No external power supply | Check the external power supply |

### 12.3.5.3 ERROR LED Indicators (Network Status) Blinking Every 1 Seconds

The following error codes identify possible errors when the AS-SIL module is installed on the right side of the CPU module or RTU and acts as a communication module.

| Error Code | Description   | Solution  |
|------------|---|---|
| 16#1800    | Error occurs in IO-Link Master                                | See the following IO-Link Event Code table for more information.  |
| 16#1801    | Error occurs in IO-Link device                                | See the following IO-Link Event Code table for more information.  |
| 16#1803    | Error in the download of IO-Link device mapping tables        | Redownload the configuration by the software.   |
| 16#1804    | Failure to switch the process data parameter set              | Check if the configurations of the actual connected device are the same as the ones in the software.                            |
| 16#1805    | A connection error occurs in IO-Link via communication port 1 | 1. Cut the external power off for 3 seconds and then put the power back on.<br>2. Redownload the configuration by the software. |
| 16#1806    | A connection error occurs in IO-Link via communication port 2 |   |
| 16#1807    | A connection error occurs in IO-Link via communication port 3 |   |
| 16#1808    | A connection error occurs in IO-Link via communication port 4 |   |
| 16#1809    | Device scanning error and the scanning is forced to stop      | 1. Cut the external power off for 3 seconds and then put the power back on.<br>2. Scan all device again                         |

#### IO-Link Event Code Table

You can find the IO-Link event codes in the module data exchange area where the device states of communication port 1~4 are stored. Check the IO-Link device operation manual if the event occurred is from IO-Link devices.

| IO-Link Event Codes | Type    |       |              | Event                          | Solution                    | Source         |                |
|---------------------|---------|-------|--------------|--------------------------------|-----------------------------|----------------|----------------|
|                     | Warning | Error | Notification |                                |                             | IO-Link Master | IO-Link Device |
| 16#4000             |         | V     |              | Device temperature over-load   | Lower load                  |                | V              |
| 16#4210             | V       |       |              | Device temperature over-run    | Clear source of heat        |                | V              |
| 16#5101             |         | V     |              | Device fuse blown              | Change fuse                 |                | V              |
| 16#5110             | V       |       |              | Power supply voltage over-run  | Check tolerance             |                | V              |
| 16#5111             | V       |       |              | Power supply voltage under-run | Check tolerance             |                | V              |
| 16#6320             |         | V     |              | Parameter error                | Check device specifications |                | V              |
| 16#6321             |         | V     |              | Parameter missing              | Check device specifications |                | V              |

| IO-Link Event Codes | Type    |       |              | Event   | Solution  | Source         |                |
|---------------------|---------|-------|--------------|---|---|----------------|----------------|
|                     | Warning | Error | Notification |   |   | IO-Link Master | IO-Link Device |
| 16#7710             |         | V     |              | Device short circuit  | Check installation  |                | V              |
| 16#8C10             | V       |       |              | Process variable range over-run   | Check process data  |                | V              |
| 16#8C20             |         | V     |              | Measurement range over-run  | Check application   |                | V              |
| 16#8C30             | V       |       |              | Process variable range under-run  | Check process data  |                | V              |
| 16#8CA0             | V       |       |              | No connected IO-Link device   | Check installation  | V              |                |
| 16#8CA1             | V       |       |              | The version of the IO-Link protocol is different from the one configured. | Use matching IODD file and configured again.  | V              |                |
| 16#8CA2             | V       |       |              | Connected device is different from the one configured in the software     | Check configurations and installation   | V              |                |
| 16#8CA3             |         |       |              | Reserved  |   | V              |                |
| 16#8CA4             |         | V     |              | IO-Link device process cable short circuit                                | Check installation  | V              |                |
| 16#8CA5             | V       |       |              | Master temperature exceeds 135°C  | Clear source of heat  | V              |                |
| 16#8CA6             |         | V     |              | Master temperature exceeds 160°C  | Clear source of heat and lower load   | V              |                |
| 16#8CA7             | V       |       |              | Device power supply voltage under-run L+ (<18V)                           | Check the external power supply   | V              |                |
| 16#8CA8             |         | V     |              | Device power supply voltage under-run L+ (<9V)                            | Check the external power supply   | V              |                |
| 16#8CA9             | V       |       |              | Illegal device ID   | Check device specifications   | V              |                |
| 16#8CAA             | V       |       |              | IO-Link process data range over-run                                       | Check device specifications   | V              |                |
| 16#8CAB             | V       |       |              | Process data range over-run   | Scan the device and download the configuration again  | V              |                |
| 16#8CAC             |         | V     |              | Data storage error  | If the problem persists, contact the local authorized distributors.   | V              |                |
| 16#FF21             |         |       | V            | New connected device  |   | V              |                |
| 16#FF22             |         |       | V            | Device disconnected   | Check installation  | V              |                |
| 16#FF23             |         |       | V            | Data storage identification mismatch                                      | Set the Data Storage access locked and set it to backup / restore and then backing up data according to actual placement. | V              |                |
| 16#FF24             |         |       | V            | Data storage not sufficient   | Check device specifications   | V              |                |
| 16#FF25             |         |       | V            | Data storage parameter access denied                                      | Check device specifications   | V              |                |

## 12.3.6 Troubleshooting for the Module AS00SCM as a Communication Module

### 12.3.6.1 ERROR LED Indicators Are ON

The following error codes identify possible errors 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                        | <ol style="list-style-type: none"> <li>1. Check that the module is securely installed.</li> <li>2. Install a new AS00SCM or if the problem persists, contact the local authorized distributors.</li> </ol>  |
| 16#1606    | The function card setting is incorrect. | <ol style="list-style-type: none"> <li>1. Check if the function card is securely installed.</li> <li>2. Install a new function card or if the problem persists, contact the local authorized distributors.</li> <li>3. Check if the setting in HWCONFIG is consistent with the function card setting.</li> <li>4. Install a new AS00SCM or if the problem persists, contact the local authorized distributors.</li> </ol> |

### 12.3.6.2 ERROR LED Indicators Blinking Every 0.5 Seconds

The following error codes identify possible errors 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. Download the parameter again.   |
| 16#1803    | Communication timeout             | <ol style="list-style-type: none"> <li>1. Check whether the communication cable is properly connected.</li> <li>2. Check if the station number and the communication format are correctly set.</li> <li>3. Check if the connection with the function card is working correctly.</li> </ol> |
| 16#1804    | The UD Link setting is incorrect. | <ol style="list-style-type: none"> <li>1. Check the settings of the UD Link.</li> <li>2. Check the warning settings in the PLC.</li> </ol>   |

The following error codes can only be viewed with SCMSOft; when the following errors occur, they are not shown on the LED indicators and the system does not send the error messages to the CPU module.

| Error Code | Description   | Solution  |
|------------|---|---|
| 16#0107    | The settings in HWCONFIG and manual settings are not consistent with function card 1. | Check the settings in HWCONFIG and manual settings for function card 1. |
| 16#0108    | The settings in HWCONFIG and manual settings are not consistent for function card 2.  | Check the settings in HWCONFIG and manual settings for function card 2. |
| 16#0201    | Incorrect parameters  | Check the parameter in HWCONFIG. Download the parameter again.          |

| Error Code | Description                                  | Solution  |
|------------|--|---|
| 16#0301    | Function card 1 communication timeout        | <ol style="list-style-type: none"> <li>1. Check if the station number and the communication format are correctly set.</li> <li>2. Check if the connection with the function card is working correctly.</li> </ol> |
| 16#0302    | Function card 2 communication timeout        | <ol style="list-style-type: none"> <li>1. Check if the station number and the communication format are correctly set.</li> <li>2. Check if the connection with the function card is working correctly.</li> </ol> |
| 16#0400    | Invalid UD Link Group ID for function card 1 | <ol style="list-style-type: none"> <li>1. Check the UD Link settings.</li> <li>2. Check the warning settings in the PLC.</li> </ol>   |
| 16#0401    | Invalid UD Link Group ID for function card 2 | <ol style="list-style-type: none"> <li>1. Check the UD Link settings.</li> <li>2. Check the warning settings in the PLC.</li> </ol>   |
| 16#0402    | Invalid UD Link Command for function card 1  | <ol style="list-style-type: none"> <li>1. Check the UD Link settings.</li> <li>2. Check the warning settings in the PLC.</li> </ol>   |
| 16#0403    | Invalid UD Link Command for function card 1  | <ol style="list-style-type: none"> <li>1. Check the UD Link settings.</li> <li>2. Check the warning settings in the PLC.</li> </ol>   |

### 12.3.7 Troubleshooting for the Module AS00SCM as a Remote Module

Errors from the remote modules are regarded as warnings for AS Series CPU modules. The LED indicator of the CPU module blinks and the CPU module can still operate. Use flag SM30 to manage error presentation in the remote modules.

#### 12.3.7.1 ERROR LED Indicators Are ON

Error codes:

| Error Code | Description   | Solution  |
|------------|---|---|
| 16#1301    | Hardware failure  | <ol style="list-style-type: none"> <li>1. Check if the module is securely installed.</li> <li>2. Change and install a new AS00SCM or if the problem persists, contact the local authorized distributors.</li> </ol>   |
| 16#1302    | The function card setting is incorrect.                             | <ol style="list-style-type: none"> <li>1. Check if the function card is securely installed with the AS-FCOPM card.</li> <li>2. Change and install a new function card or if the problem persists, contact the local authorized distributors.</li> <li>3. Check if the setting in HWCONFIG is consistent with the function card setting.</li> <li>4. Install a new AS00SCM or if the problem persists, contact the local authorized distributors.</li> </ol> |
| 16#1304    | More than eight remote modules on the right side of the CPU module. | Check the total number of remote modules on the right side of the CPU module (maximum is 8).  |

### 12.3.7.2 ERROR LED Indicators Blinking Every 0.5 Seconds

Warning type of error codes:

| Error Code | Description                     | Solution  |
|------------|---------------------------------|---|
| 16#1506    | Remote module had been stopped. | This error code should work with AS Series Remote Module Setting in ISPSOft. When this error code shows up, it indicates the remote module had been stopped: Master Disconnected, Master Reconnected, IO Module Alarm, or IO Module Timeout. Check and clear the problem and then power-off and then power-on the remote module to refresh its state. Refer to section 9.4.3 in AS Series Module Manual for more details. |

### 12.3.7.3 ERROR LED Indicators Blinking Every 0.5 Seconds

Warning type of error codes:

| Error Code | Description   | Solution   |
|------------|---|--|
| 16#1500    | Remote module communication timeout   | Make sure the communication cable is well connected  |
| 16#1502    | Incorrect parameters  | Check the parameter in HWCONFIG. Download the parameter again.   |
| 16#1503    | Remote extension module communication timeout                               | Make sure the communication cable is well connected and the module is properly connected to the CPU module and turn the modules on again.                                |
| 16#1505    | The actual placement of the extension modules is NOT the same as it is set. | Check if the parameter in HWCONFIG is the same as the actual placement.  |
| 16#1604    | Extension module communication timeout                                      | 1. Make sure the module is properly connected to the CPU module and turn the modules on again.<br>2. If the problem persists, contact the local authorized distributors. |

### 12.3.7.4 ERROR LED Indicators Blinking Every 0.2 Seconds

This happens when the 24 VDC power supply for the remote module is not sufficient. 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. Error codes:

| Error Code | Description   | Solution   |
|------------|---|--|
| 16#1303    | 24VDC power supply is not sufficient and then recovered from low-voltage for less than 10 ms. | Check whether the 24 V power supply to the module is normal. |

## 12.3.8 Troubleshooting for AS01DNET Modules

Refer to sections 12.4.9 and 12.4.10 for more details.

## 12.4Error Codes and LED Indicators for Modules

### 12.4.1 Error Codes and LED Indicators for CPU Modules

A. Columns

- a. Error code: If an error occurs in the system, an 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 shows the status you defined for the error.
  - 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: System error

● Descriptions

| Module Type | LED indicator | Descriptions  |
|-------------|---------------|---|
| CPU         | Error LED     | <p>There are five types of error indicator states for of the CPU module errors, including LED indicator ON, OFF, blinking fast, blinking normally, and blinking slowly. When the LED indicator is ON, blinking fast/normally, 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. Clear the problems when the module is powered off.</p> <p>Error type:</p> <p>ON: A serious error occurs in the module.</p> <p>Blinking fast (every 0.2 seconds): unstable power supply or hardware Failure.</p> <p>Blinking normally (every 0.5 second): system program errors or system cannot run.</p> <p>Warning type:</p> <p>Blinking slowly (every 1 second and off for 3 seconds): a warning is triggered, but the system can still run.</p> <p>OFF:</p> <p>A warning is triggered, but the system can still run. You can modify the rules and use ISPSOft or SM/SR to show the warnings, instead of using indicators to show the errors.</p> |



| Error code  | Description   | CPU status | ERROR LED indicator |               |                   |                 |     |
|---|---|------------|---------------------|---------------|-------------------|-----------------|-----|
|   |   |            | ON                  | Blinking fast | Blinking normally | Blinking slowly | OFF |
| 000A  | Scan timeout  | Stop       | V                   |               |                   |                 |     |
| 000C  | The program in the PLC is damaged.  | Stop       |                     |               | V                 |                 |     |
| 000D  | The initial value of the device and the PLC program are not completely downloaded.  | Stop       |                     |               | V                 |                 |     |
| 0010  | CPU memory access is denied.  | Stop       |                     |               | V                 |                 |     |
| 0011  | The PLC ID is incorrect.  | Continue   |                     |               |                   |                 | V   |
| 0012  | The PLC password is incorrect.  | Continue   |                     |               |                   |                 | V   |
| 0020  | CPU operation speed is not at its highest.  | Stop       |                     |               | V                 |                 |     |
| 0021  | Failed to restore Delta device parameters back to defaults  | H          |                     |               | H                 |                 |     |
| Note: You can set to have PLC CPU stop running or not in HWCONFIG if this error occurs. If the setting is to have PLC CPU stop running once 16#0021 occurs, the PLC CPU will stop running and the ERROR LED will go blinking. If the setting is to have PLC CPU keep running, the error will be stated in the Error Log but ERROR LED will not go blinking. |   |            |                     |               |                   |                 |     |
| 0026  | RTC cannot keep track of the current time (the battery LED is blinking.)  | Continue   |                     |               |                   |                 |     |
| 0027  | Battery low (the battery LED is ON.)  | Continue   |                     |               |                   |                 |     |
| 0028  | No response from RTC  | Continue   |                     |               |                   |                 | V   |
| 002A  | 24VDC power supply is not sufficient and then is recovered from low-voltage for less than 10 ms.                                    | 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                 |                 |     |
| 0040  | The converted value in the function card 1 (AS-F2AD) or in the built-in AD input channel 1 exceeds the setting range.               | Continue   |                     |               |                   | V               |     |
| 0041  | The converted value in the function card 1 (AS-F2AD) or in the built-in AD input channel 2 exceeds the setting range.               | Continue   |                     |               |                   | V               |     |
| 0042  | The converted value in the input channel 1 of the function card 2 (AS-F2AD) exceeds the setting range.                              | Continue   |                     |               |                   | V               |     |
| 0043  | The converted value in the input channel 2 of the function card 2 (AS-F2AD) exceeds the setting range.                              | Continue   |                     |               |                   | V               |     |
| 0044  | Connection lost in the mode of current input 4 mA - 20 mA for the function card 1 (AS-F2AD) or for the built-in AD input channel 1. | Continue   |                     |               |                   | V               |     |
| 0045  | Connection lost in the mode of current input 4 mA - 20 mA for the function card 1 (AS-F2AD) or for the built-in AD input channel 2. | Continue   |                     |               |                   | V               |     |
| 0046  | Connection lost in the mode of current input 4 mA - 20 mA for the input channel 1 of the function card 2 (AS-F2AD).                 | Continue   |                     |               |                   | V               |     |
| 0047  | Connection lost in the mode of current input 4 mA - 20 mA for the input channel 2 of the function card 2 (AS-F2AD).                 | Continue   |                     |               |                   | V               |     |

| Error code        | Description  | CPU status | ERROR LED indicator |               |                   |                 |     |
|-------------------|--|------------|---------------------|---------------|-------------------|-----------------|-----|
|                   |  |            | ON                  | Blinking fast | Blinking normally | Blinking slowly | OFF |
| 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 placement 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                 |                 |     |
| 1000<br>-<br>10FF | System error   | Stop       |                     |               | V                 |                 |     |
| 1300<br>-<br>130F | Errors occurred in the remote modules  | Continue   |                     |               |                   | V               |     |
| 1402              | The arrangement of the I/O modules is not consistent with the settings.                  | Stop       |                     |               | V                 |                 |     |
| 140B              | The number of connected communication modules exceed the maximum number 4.               | Stop       |                     |               | V                 |                 |     |
| 140C              | The number of connected positioning modules exceed the maximum number 8.                 | Stop       |                     |               | V                 |                 |     |
| 140D              | The number of connected extension modules exceed the maximum number 32.                  | Stop       |                     |               | V                 |                 |     |
| 140E              | Number of remote modules exceeds the limit of eight on the right side of the CPU module. | Stop       |                     |               | V                 |                 |     |
| 1500              | Connection lost in the remote modules  | Continue   |                     |               |                   | V               |     |
| 1502<br>-<br>150F | Errors occurred in the remote modules  | Continue   |                     |               |                   | V               |     |

| Error code        | Description   | CPU status | ERROR LED indicator |               |                   |                 |     |
|-------------------|---|------------|---------------------|---------------|-------------------|-----------------|-----|
|                   |   |            | ON                  | Blinking fast | Blinking normally | Blinking slowly | OFF |
| 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 communication module function card  | Stop       |                     |               | V                 |                 |     |
| 1607              | The external voltage is abnormal.   | Stop       |                     |               | V                 |                 |     |
| 1608              | The Internal factory calibration or the CJC is abnormal.  | Stop       |                     |               | V                 |                 |     |
| 1609<br>-<br>160F | Reserved (Error codes for the extension modules)  | Stop       |                     |               | V                 |                 |     |
| 1800<br>-<br>180F | Errors occurred in the extension modules  | Continue   |                     |               |                   | V               |     |
| 1900<br>-<br>191C | Heartbeat errors occurred in the slave in CANopen / ECAT communication. (Delta ASD-A2)  | Continue   |                     |               |                   | V               |     |
| 1950              | The initialization of the Delta ASD-A2 control has not yet been completed, the CANopen instructions cannot be executed.   | Continue   |                     |               |                   |                 | V   |
| 19B0              | Heartbeat timeout occurred in the slave mode  | Continue   |                     |               |                   |                 | V   |
| 19B1              | The data length of PDO (process data object) in the slave mode is not matched with the setting.   | Continue   |                     |               |                   |                 | V   |
| 19E1              | The data length of PDO (process data object) in the slave mode is not matched with the setting of the scan list.<br>Refer to CANopen communication related descriptions in AS Series Operation Manual for more details on the error codes 19E1 to 19E8. | Continue   |                     |               |                   |                 | V   |
| 19E2              | PDO in the slave mode is not received.  | Continue   |                     |               |                   |                 | V   |
| 19E3              | The function of auto downloading SDO fails at the first startup.  | Continue   |                     |               |                   |                 | V   |
| 19E4              | PDO configurations are set incorrectly.   | Continue   |                     |               |                   |                 | V   |
| 19E5              | The main settings are not consistent with the connected slave.  | Continue   |                     |               |                   |                 | V   |
| 19E6              | This slave does NOT exist in this network.  | Continue   |                     |               |                   |                 | V   |

| Error code | Description  | CPU status | ERROR LED indicator |               |                   |                 |     |
|------------|--|------------|---------------------|---------------|-------------------|-----------------|-----|
|            |  |            | ON                  | Blinking fast | Blinking normally | Blinking slowly | OFF |
| 19E7       | Timeout on the slave error control   | Continue   |                     |               |                   |                 | V   |
| 19E8       | The node IDs of master and slave are duplicated.   | Continue   |                     |               |                   |                 | V   |
| 19F3       | Error in the configuration   | Continue   |                     |               |                   |                 | V   |
| 19F4       | CANopen communication is in the BUS-OFF state.   | Continue   |                     |               |                   |                 | V   |
| 19FB       | The sending registers exceed the range.  | Continue   |                     |               |                   |                 | V   |
| 19FC       | The receiving registers exceed the range.  | Continue   |                     |               |                   |                 | V   |
| 2001       | Not 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 or is illegal.   | 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 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 the TKON or YKOFF instruction is incorrect, or exceeds the range.   | Continue   |                     |               |                   |                 | V   |
| 2017       | The instruction BREAK is written outside of the FOR-NEXT loop.   | 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   |
| 2030       | During the execution of CSFO instruction, the output frequency exceeds the upper limit.  | Continue   |                     |               |                   |                 | V   |
| 2031       | During the execution of CSFO instruction, when the output frequency is set to 0, but even after 2 seconds, the output is still not complete. | Continue   |                     |               |                   |                 | V   |
| 6004       | The IP address filter is set incorrectly.  | Continue   |                     |               |                   |                 | V   |
| 600D       | RJ45 port is not connected.  | Continue   |                     |               |                   |                 | V   |
| 6010       | The number of MODBUS TCP connections exceeds the range.  | Continue   |                     |               | V                 |                 |     |

| Error code | Description  | CPU status | ERROR LED indicator |               |                   |                 |     |
|------------|--|------------|---------------------|---------------|-------------------|-----------------|-----|
|            |  |            | ON                  | Blinking fast | Blinking normally | Blinking slowly | OFF |
| 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 too big.  | 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 that receives the data in the TCP socket function is illegal.       | Continue   |                     |               |                   |                 | V   |
| 6208       | The data that 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 that receives the data in the UDP socket function is illegal.       | Continue   |                     |               |                   |                 | V   |
| 6210       | The data that 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   |

| Error code | Description   | CPU status | ERROR LED indicator |               |                   |                 |     |
|------------|---|------------|---------------------|---------------|-------------------|-----------------|-----|
|            |   |            | ON                  | Blinking fast | Blinking normally | Blinking slowly | OFF |
| 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 Ethernet is incorrect.                  | Continue   |                     |               |                   |                 | V   |
| 7032       | The device communication address used in Ethernet is incorrect.                   | Continue   |                     |               |                   |                 | V   |
| 7033       | The device used in Ethernet exceeds the device range.                             | Continue   |                     |               |                   |                 | V   |
| 7034       | The device length of the communication data in Ethernet exceeds the limit.        | Continue   |                     |               |                   |                 | V   |
| 7037       | The device checksum for the communication serial port of Ethernet is incorrect.   | Continue   |                     |               |                   |                 | V   |
| 7041       | The device communication function code in USB is incorrect.                       | Continue   |                     |               |                   |                 | V   |
| 7042       | The device communication address used in USB is incorrect.                        | Continue   |                     |               |                   |                 | V   |
| 7043       | The device used in USB exceeds the device range.                                  | Continue   |                     |               |                   |                 | V   |
| 7044       | The device length of the communication data in USB exceeds the limit.             | Continue   |                     |               |                   |                 | V   |
| 7047       | The device checksum for the communication serial port of USB is incorrect.        | Continue   |                     |               |                   |                 | V   |
| 70B1       | The device communication function code in function card 1 is incorrect.           | Continue   |                     |               |                   |                 | V   |
| 70B2       | The device communication address used in function card 1 is incorrect.            | Continue   |                     |               |                   |                 | V   |
| 70B3       | The device used in function card 1 exceeds the device range.                      | Continue   |                     |               |                   |                 | V   |
| 70B4       | The device length of the communication data in function card 1 exceeds the limit. | Continue   |                     |               |                   |                 | V   |

| Error code        | Description  | CPU status | ERROR LED indicator |               |                   |                 |     |
|-------------------|--|------------|---------------------|---------------|-------------------|-----------------|-----|
|                   |  |            | ON                  | Blinking fast | Blinking normally | Blinking slowly | OFF |
| 70B7              | The device checksum for the communication serial port of function card 1 is incorrect.                       | Continue   |                     |               |                   |                 | V   |
| 70C1              | The device communication function code in function card 2 is incorrect.                                      | Continue   |                     |               |                   |                 | V   |
| 70C2              | The device communication address used in function card 2 is incorrect.                                       | Continue   |                     |               |                   |                 | V   |
| 70C3              | The device used in function card 2 exceeds the device range.   | Continue   |                     |               |                   |                 | V   |
| 70C4              | The device length of the communication data in function card 2 exceeds the limit.                            | Continue   |                     |               |                   |                 | V   |
| 70C7              | The device checksum for the communication serial port of function card 2 is incorrect.                       | Continue   |                     |               |                   |                 | V   |
| 7203              | Invalid communication function code  | Continue   |                     |               |                   |                 | V   |
| 8105              | The contents of the downloaded program are incorrect.<br>The program syntax is incorrect.                    | Continue   |                     |               |                   |                 | V   |
| 8106              | The contents of the downloaded program are incorrect.<br>The length of the execution code exceeds the limit. | Continue   |                     |               |                   |                 | V   |
| 8107              | The contents of the downloaded program are incorrect.<br>The length of the source code exceeds the limit.    | Continue   |                     |               |                   |                 | V   |
| 8000<br>-<br>8FFF | Errors occur between software and PLC.   | Continue   |                     |               |                   |                 | V   |
| C000<br>-<br>CFFF | The program syntax is incorrect.   | Stop       |                     |               | V                 |                 |     |

## 12.4.2 Error Codes and LED Indicators for Analog/Temperature Modules

| Error code | Description  | ERROR LED indicator status  |  |
|------------|--|-----------------------------|--|
|            |  | A → D /<br>D → A /<br>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<br>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<br>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). |                             |  |
| 16#180C    | The signal received by channel 5 exceeds the range of analog inputs (temperature). |                             |  |
| 16#180D    | The signal received by channel 6 exceeds the range of analog inputs (temperature). |                             |  |
| 16#180E    | The signal received by channel 7 exceeds the range of analog inputs (temperature). |                             |  |
| 16#180F    | The signal received by channel 8 exceeds the range of analog inputs (temperature). |                             |  |
| -          | When power-on, the module is not detected by CPU module.                           | OFF                         | Blinking once or twice and after 2 seconds, it blinks repeatedly |

\*1: The errors are specified as warnings to ensure the CPU module can still run even when the warnings are triggered by its AIO modules. Set up HWCONFIG to have the following first 4 error codes appear as errors when they occur.

## 12.4.3 Error Codes and LED Indicators for Positioning Module AS02 / 04PU

| Error code | Description      | ERROR LED indicator status |          |
|------------|------------------|----------------------------|----------|
|            |                  | A → D                      | ERROR    |
| 16#1802    | Hardware failure | OFF                        | Blinking |



#### 12.4.4 Error Codes and LED Indicators for High Speed Counter Module AS02HC

| Error code | Description  | ERROR LED indicator status |          |
|------------|--|----------------------------|----------|
|            |  | ON                         | Blinking |
| 16#1605    | Counted result in the latched area is not retainable (major error)             | V                          |          |
| 16#1606    | Module settings in the latched area is not retainable. (major error)           | V                          |          |
| 16#1607    | Module setting error (major error)   | V                          |          |
| 16#1800    | Counter overflow / underflow on CH1  |                            | V        |
| 16#1801    | Counter overflow / underflow on CH2  |                            | V        |
| 16#1802    | Linear count exceeding the set upper/lower limit on CH1                        |                            | V        |
| 16#1803    | Linear count exceeding the set upper/lower limit on CH2                        |                            | V        |
| 16#1804    | The variation in relation to a SSI encoder position exceeding the limit on CH1 |                            | V        |
| 16#1805    | The variation in relation to a SSI encoder position exceeding the limit on CH2 |                            | V        |
| 16#1806    | Abnormal SSI communication on CH1  |                            | V        |
| 16#1807    | Abnormal SSI communication on CH2  |                            | V        |
| 16#1808    | SSI absolute position cross zero point on CH1                                  |                            | V        |
| 16#1809    | SSI absolute position cross zero point on CH2                                  |                            | V        |

#### 12.4.5 Error Codes and LED Indicators for Load Cell Module AS02LC

| Error code | Description   | ERROR LED indicator        |          |
|------------|---|----------------------------|----------|
|            |   | 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<br>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.  |                            |          |

| Error code | Description  | ERROR LED indicator |  |
|------------|--|---------------------|--|
|            |  | A → D               | ERROR  |
| -          | When power-on, the module is not detected by CPU module. | OFF                 | Blinking once or twice and after 2 seconds, it blinks repeatedly |

\*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. You can set up HWCONFIG to have the following first 3 error codes appear as errors when they occur.

### 12.4.6 Error Codes and LED Indicators for Module AS04SIL IO-Link as a Communication Module

| Error Code | Description   | MS Status LED indicator |          |
|------------|---|-------------------------|----------|
|            |   | ON                      | Blinking |
| 16#1605    | Hardware failure  |                         | V        |
| 16#1606    | 24VDC power supply is not sufficient and then recovered from low-voltage for less than 10 ms. |                         | V        |

| Error Code | Description   | NS LED indicator |          |
|------------|---|------------------|----------|
|            |   | ON               | Blinking |
| 16#1800    | Error occurs in IO-Link Master                                |                  | V        |
| 16#1801    | Error occurs in IO-Link device                                |                  | V        |
| 16#1802    | No external power supply                                      | V                |          |
| 16#1803    | Error in the download of IO-Link device mapping tables        |                  | V        |
| 16#1804    | Failure to switch the process data parameter set              |                  | V        |
| 16#1805    | A connection error occurs in IO-Link via communication port 1 |                  | V        |
| 16#1806    | A connection error occurs in IO-Link via communication port 2 |                  | V        |
| 16#1807    | A connection error occurs in IO-Link via communication port 3 |                  | V        |
| 16#1808    | A connection error occurs in IO-Link via communication port 4 |                  | V        |
| 16#1809    | Device scanning error and the scanning is forced to stop      |                  | V        |

### 12.4.7 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        |

### 12.4.8 Error Codes and LED Indicators for Module AS00SCM as a Remote Module

| Error Code | Description  | ERROR LED indicator status |          |               |               |
|------------|--|----------------------------|----------|---------------|---------------|
|            |  | ON                         | Blinking | Blinking slow | Blinking fast |
| 16#1301    | Hardware failure   | V                          |          |               |               |
| 16#1302    | The setting of the function card is incorrect.   | V                          |          |               |               |
| 16#1303    | 24 VDC power supply is not sufficient and then is recovered from a low-voltage less than 10ms situation. |                            |          |               | V             |
| 16#1304    | More than eight remote modules on the right side of the CPU module.                                      | V                          |          |               |               |
| 16#1500    | Remote module communication timeout  |                            | V        |               |               |
| 16#1502    | Incorrect parameters   |                            | V        |               |               |
| 16#1503    | Extension module communication timeout   |                            | V        |               |               |
| 16#1505    | The actual placement of the extension modules is NOT the same as it is set.                              |                            | V        |               |               |
| 16#1506    | Remote module had been stopped.  |                            |          | V             |               |
| 16#1604    | Extension module communication timeout   |                            | V        |               |               |

### 12.4.9 Error Codes and LED Indicators for Module AS01DNET (Master/Slave Mode)

| Code | Explanation   | Correction  |
|------|---|---|
| 0~63 | Node address of AS01DNET-A (in normal operation)  | --  |
| 80   | AS01DNET-A is in STOP status.   | Turn the PLC to RUN and start I/O data exchange                                 |
| F0   | The node ID of AS01DNET is the same as that of other node or exceeds the allowed range. | 1. Ensure that the node address of AS01DNET is unique.<br>2. Re-power AS01DNET. |
| F1   | No configured slave in Scan List.   | Configure the scan list and then download the configuration to AS01DNET.        |
| F2   | Too low voltage of the work power   | Check if the power supply for AS01DNET and the PLC is normal.                   |

| Code | Explanation  | Correction   |
|------|--|--|
| F3   | AS01DNET enters the test mode  | Switch the function switch IN1 from On to Off and re-power AS01DNET-A.   |
| F4   | BUS-OFF  | <ol style="list-style-type: none"> <li>1. Check if the network cable is normal and the shielded cable is grounded.</li> <li>2. Check if the baud rates of all nodes in the network are same.</li> <li>3. Check if the start and end of the network cable are both connected with a 121Ω terminal resistor.</li> <li>4. Re-power AS01DNET-A.</li> </ol> |
| F5   | No network power   | <ol style="list-style-type: none"> <li>1. Check if the network cable is normal.</li> <li>2. Ensure that the network power is normal.</li> </ol>  |
| F6   | Internal error; Flash or RAM check error   | If the error still exists after re-power, send AS01DNET-A back for repair.   |
| F8   | Error produced in factory manufacturing  | If the error still exists after re-power, send AS01DNET-A back for repair.   |
| F9   | Internal error; EEPROM access failure  | If the error still exists after re-power, send AS01DNET-A back for repair.   |
| FA   | Invalid configuration data   | <ol style="list-style-type: none"> <li>1. Configure the network correctly and re-download it to AS01DNET-A.</li> <li>2. Check if the node address of one slave in the scan list is the same as that of AS01DNET-A.</li> </ol>  |
| E0   | Identification parameters returned from the slave do not match the configuration data.   | <ol style="list-style-type: none"> <li>1. Check if there is any change in node ID of the slave in the network.</li> <li>2. Check if some node device in the network is replaced.</li> <li>3. Re-configure the network.</li> </ol>  |
| E1   | I/O Data size returned does not match that in the scan list.   | Re-configure I/O data size of the slave, download the configuration to AS01DNET-A and run the PLC.   |
| E2   | <p>The slave device in the scan list does not exist or is offline when AS01DNET-A is in master mode.</p> <p>The I/O connection between the slave AS01DNET-A and the master is broken when AS01DNET-A is in slave mode.</p> | <ol style="list-style-type: none"> <li>1. Check if there is a change in the node address of the slave.</li> <li>2. Check if the communication cable is disconnected or connected loosely.</li> <li>3. Check if the bus cable length exceeds the maximum transmission distance. If so, the system may not be stable.</li> </ol>                         |
| E3   | AS01DNET-A fails to transmit data.   | <ol style="list-style-type: none"> <li>1. Make sure that the connection between AS01DNET-A and the network is normal.</li> <li>2. Check if the baud rate of AS01DNET-A is the same as that of other node in the network.</li> </ol>  |
| E4   | Error detected in sequence of fragmented I/O data from the slave device.   | Check if the slave is operating normally.  |
| E5   | The slave device returns error when AS01DNET-A attempts to communicate with it.  | Check if the slave is operating normally.  |
| E6   | IO data size returned from the slave is bigger than that configured in Scan List.  | Check that the IO data size of the slave should be the same as that configured in Scan List.   |
| E7   | AS01DNET-A is checking MAC ID.   | If the code is displayed long, do the troubleshooting according to the following steps.  |

| Code | Explanation | Correction  |
|------|-------------|---|
|      |             | <ol style="list-style-type: none"> <li>1. Make sure that at least two nodes work normally in the network.</li> <li>2. Check if either end of the network is connected with the terminal resistor of 121Ω.</li> <li>3. Check if the baud rates of the node devices in the network are same.</li> <li>4. Check if the communication cable is normal so as to avoid that the cable is disconnected or connected loosely.</li> <li>5. Check if the bus cable length exceeds the maximum transmission distance. If so, the system may not be stable.</li> <li>6. Check if the shielded wire of the network cable is grounded.</li> <li>7. Re-power AS01DNET-A scanner module.</li> </ol> |

#### 12.4.10 Error Codes and LED Indicators for Module AS01DNET (RTU Mode)

| Code | Indication   | How to deal with  |
|------|--|---|
| 0~63 | Node ID of the scanner module (When in RUN state)                                | No correction needed  |
| F0   | The node ID is repeated or exceeds allowed range.                                | <ol style="list-style-type: none"> <li>1. Ensure that the node ID of AS01DNET (RTU) is unique in the DeviceNet network within the range of 0~63.</li> <li>2. Repower it on after changing the node ID.</li> </ol>   |
| F1   | No I/O module is configured to AS01DNET (RTU) in the DeviceNet Builder software. | Add I/O modules in AS01DNET (RTU) in the DeviceNet Builder software and download the configuration data to AS01DNET (RTU) after the configuration is finished.  |
| F2   | The work voltage of AS01DNET (RTU) is too low.                                   | Check if the power supply for AS01DNET (RTU) works normally.  |
| F3   | AS01DNET (RTU) enters the test mode.   | Repower AS01DNET (RTU).   |
| F4   | AS01DNET (RTU) is the Bus-Off state.   | <ol style="list-style-type: none"> <li>1. Check if the network communication cable is normal and the shielded cable is grounded.</li> <li>2. Ensure the baud rates of all network nodes are same.</li> <li>3. Check if the two ends of the network are both connected with a 120Ω terminal resistor.</li> <li>4. Repower the scanner module.</li> </ol> |
| F5   | No network power supply for AS01DNET(RTU)  | <ol style="list-style-type: none"> <li>1. Check if the network cable is normal.</li> <li>2. Check if the network power supply is normal. (The external 24V DC network power supply is connected between red V+ and black V- of AS01DNET (RTU) .)</li> </ol>   |
| F6   | Internal error;<br>An error in the internal storage units of AS01DNET (RTU)      | Return the product for repair if the error still exists after re-power on.  |
| F7   | Internal error;<br>An error in the data exchange units of AS01DNET (RTU)         | Return the product for repair if the error still exists after re-power on.  |
| F8   | Manufacture error  | Return the product for repair if the error still exists after re-power on.  |

| Code | Indication   | How to deal with   |
|------|--|--|
| F9   | Internal error;<br>An error in the access of the Flash of AS01DNET (RTU)     | Return the product for repair if the error still exists after re-power on.   |
| E4   | Module error   | Check if an error occurs in the modules connected to the right side of AS01DNET (RTU);<br>Check if the module exists;<br>Check if current module matches that configured in the software;<br>Check if the unconfigured module is added.  |
| E7   | Repeated node ID detection   | If the code has emerged for a long time, please shoot troubles in the methods below.<br>1. Ensure that there are at least two nodes working normally in the network.<br>2. Check if the two ends of the network are both connected with a 121Ω terminal resistor.<br>3. Ensure that the baud rates of all network nodes are same.<br>4. Check if the network cable has a problem such as being disconnected and loosened.<br>5. Check if the bus communication cable length exceeds maximum transmission distance. If the maximum transmission distance is exceeded, the stability of the system can not be ensured.<br>6. Check if the shielded wire of the network communication cable is grounded.<br>7. Turn on the power of AS01DNET (RTU) again. |
| E9   | The number of I/O modules connected to AS01DNET (RTU) exceeds the maximum 8. | Check if the number of I/O modules connected to AS01DNET (RTU) is more than 8.   |
| 80   | AS01DNET (RTU) is in STOP state.   | 1. Check if the RUN/STOP switch of the PLC connected to the DeviceNet master is turned to RUN.<br>2. Check if the value of control word of AS01DNET (RTU) is 1. For details, refer to section 11.5.4.3.4.  |
| 83   | The AS01DNET (RTU) configuration in the software is being downloading.       | Wait until the download of AS01DNET (RTU) configuration data is completed.   |

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# Chapter 13 Data Tracer and Data Logger

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# 13.1 Data Tracer

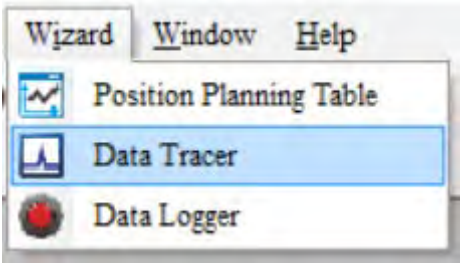
This section uses ISPSOft for demonstration. For DIADesigner operation, refer to section 14.4.1 from DIADesigner software manual.


## 13.1.1 About Data Tracer

Data Tracer is used for the real-time collection of variable symbols, values, states in devices, after some trigger condition is met so as to draw curve charts for analysis of value trends. Refer to Section 22.2 in ISPSOft User Manual for more details.

### Operation 1

- Compile the current project before using the function. Click Wizard> Data Tracer to open the Data Tracer window as shown below.



- Click the button  of **Symbol Name** to open the **Add Sample Source** window.

Sample Parameter Measurement

Sample Period

☒ System Cycle Time

☐ Customized Time  ( 1 ~ 1000 ms )

Trigger Setting

Trigger Position

Symbol / Device


Compare Condition

☒ BOOL ON

☐ Word  >

Sample Source

| Symbol Name          | Device Name | Source Category | Comment |
|----------------------|-------------|-----------------|---------|
| <input type="text"/> | M100        | BOOL            |         |
| <input type="text"/> | D0          | VALUE           |         |
| <input type="text"/> |             |                 |         |

- Click the button  of **Symbol Name** in the **Add Sample Source** window and select the variable symbol name to be added in the **Choose Symbol** window or directly type a device name in the **Device Name** box.

Add Sample Source

Add Sample Source

Symbol Name

Device Name

Add

Cancel



Sample Source

| Symbol Name          | Device Name | Source Category | Comment |
|----------------------|-------------|-----------------|---------|
| <input type="text"/> | M100        | BOOL            |         |
| <input type="text"/> | D0          | VALUE           |         |
| <input type="text"/> |             |                 |         |



- Set up the sample period and trigger setting.

Sample Parameter

Measurement

Sample Period

☒ System Cycle Time

☐ Customized Time  ( 1 ~ 1000 ms )

Trigger Setting

Trigger Position

Symbol / Device

Compare Condition



☒ BOOL

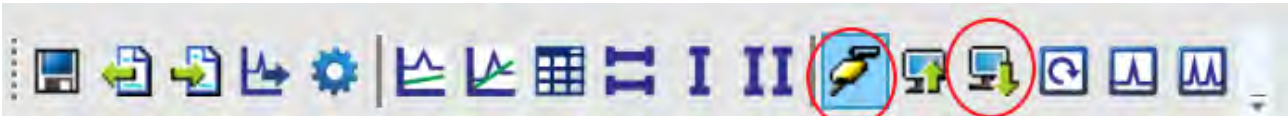
☐ Word  >

Sample Source

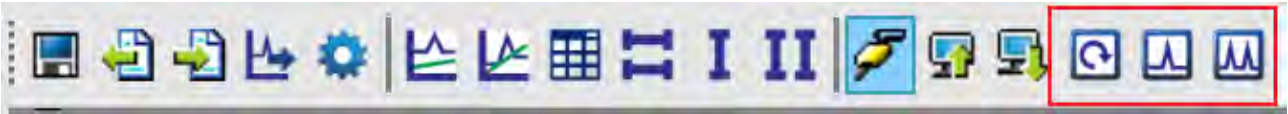
Delete


| Symbol Name          | Device Name | Source Category | Comment |
|----------------------|-------------|-----------------|---------|
| <input type="text"/> | M100        | BOOL            |         |
| <input type="text"/> | D0          | VALUE           |         |
| <input type="text"/> |             |                 |         |

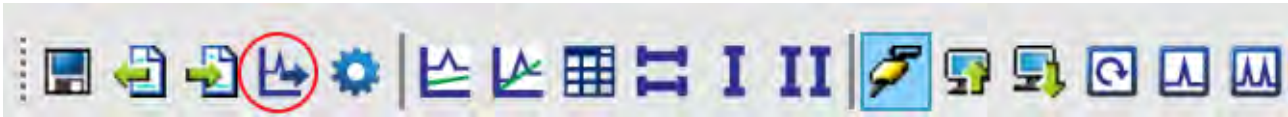
- After setting up the parameters, click  on the icon toolbar to have the system in the online mode. Then click  to download the settings to the PLC.



- After the sample parameter settings in the data tracer are completed and downloaded, any of the following three modes on the icon toolbar can be used for watching curves in the online mode.



- Click  on the icon toolbar to export the data to your computer for future use.



13.1.2 Example

If X0.0 is a signal to open/close externally. Use Data Trace to measure the width of time when X0.0 is ON.

- **Steps:**
  - ① Open Data Tracer and enter X0.0 for monitoring.
  - ② Set the Customized Time to 100 ms to take sampling, set the trigger device to X0.0, set the trigger position to 10, and then set the compare condition to ON as the image shown below.

Sample Parameter

Measurement

Sample Period

☐ System Cycle Time

☒ Customized Time 100 ( 1 ~ 1000 ms )

Trigger Setting

Trigger Position 10

Symbol / Device X0.0

Compare Condition

☒ BOOL ON

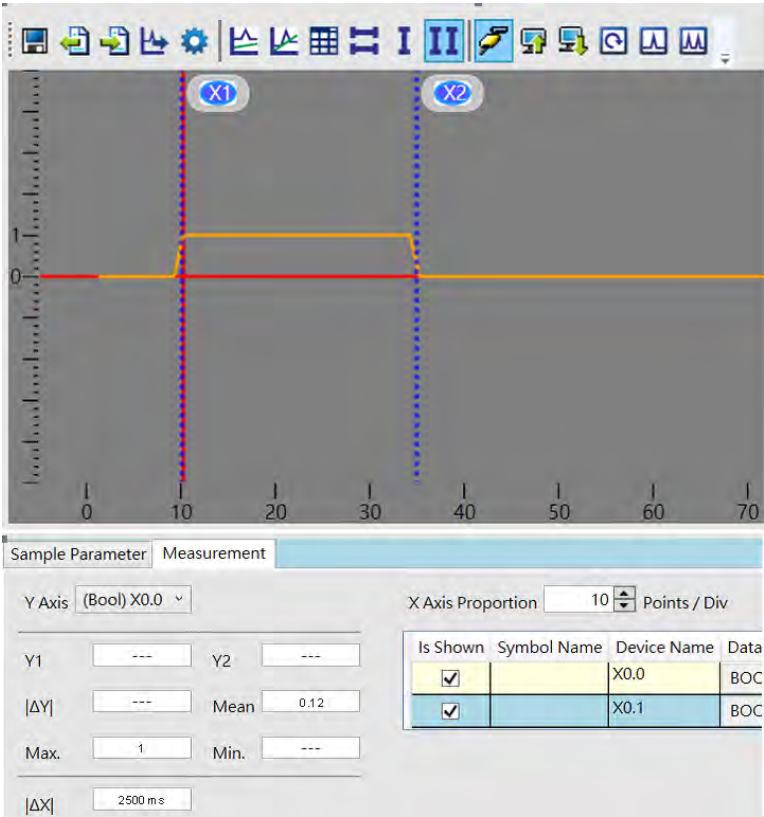
☐ Word 0 > 0

Sample Source

Delete

| Symbol Name | Device Name | Source Category | Comment |
|-------------|-------------|-----------------|---------|
| ...         | X0.0        | BOOL            |         |
| ...         | X0.1        | BOOL            |         |
| ...         |             |                 |         |

- ③ Set the mode to One-shot trigger and wait for the trigger (ON). Once it is triggered, it displays the recorded curve data.
- ④ The value in  $I \Delta X1$  is 2500 ms, the time measured between two vertical lines, X1 and X2. for X0.0.



## 13.2 Data Logger

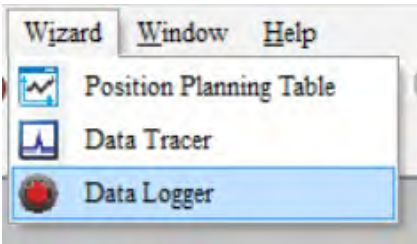
This section uses ISPSOft for demonstration. For DIADesigner operation, refer to section 14.4.2 from DIADesigner software manual.


### 13.2.1 About Data Logger

Data logger is used for the long-term recording of variable symbols, values, states in devices, and drawing curve charts. The data is stored in the PLC and the memory card of the PLC for analysis of value trends. Refer to Section 22.3 in ISPSOft User Manual for more details.

**Operation A**

- Compile the current project before using the function. Click Wizard> Data Logger to open the Data Logger window as shown below.



- Click the button  of **Symbol Name** to open the **Add Sample Source** window.

Sample Parameter Measurement

Parameters

Sample Points 1000 ( 1 ~ 16384 pts )

Sampling Method

☒ Periodical Sampling 1 ( 1 ~ 65535 sec )

☐ Triggered Sampling (M0 ~ M8191)


Action When Sample Points Reach

☒ Stop Recording

☐ Continue Recording ( Replace the old data )

Sample Source Delete

| Symbol Name | Device Name | Source Category | Comment |
|-------------|-------------|-----------------|---------|
| ...         | M0          | BOOL            |         |
| ...         | D0          | VALUE           |         |
| ...         |             |                 |         |

- Click the button  of **Symbol Name** in the **Add Sample Source** window and select the variable symbol name to be added in the **Choose Symbol** window or directly type a device name in the **Device Name** box.

Add Sample Source

Add Sample Source

Symbol Name

Device Name M0

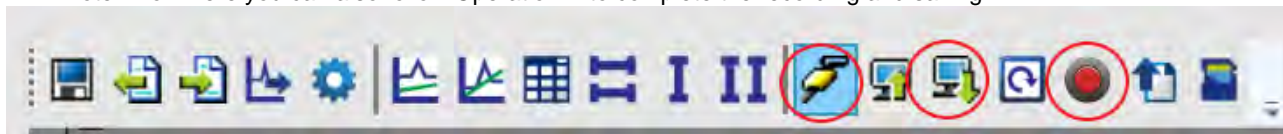
Add Cancel



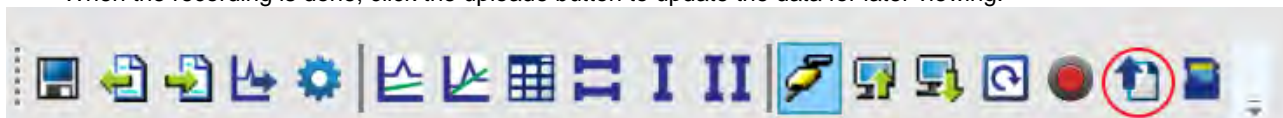
| Sample Source |             | Delete          |         |  |
|---------------|-------------|-----------------|---------|--|
| Symbol Name   | Device Name | Source Category | Comment |  |
| ...           | M0          | BOOL            |         |  |
| ...           | D0          | VALUE           |         |  |
| ...           |             |                 |         |  |

- After setting up the parameters, click  on the icon toolbar to have the system in the online mode. Then click  to download the settings to the PLC. And then click  to record data.

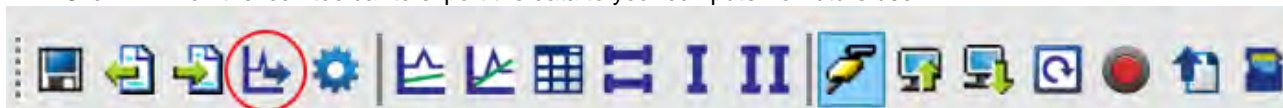
Note: From here you can also follow Operation B to complete the recording and saving.




- When the recording is done, click the upload button to update the data for later viewing.



- Click  on the icon toolbar to export the data to your computer for future use.

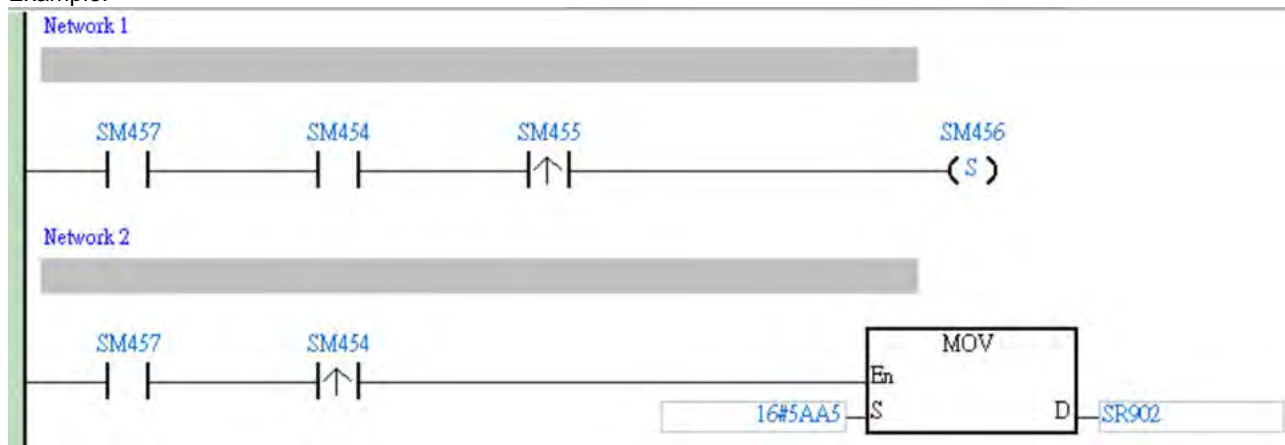


- Click  on the icon toolbar or use SM and SR to save the data to the SD Card installed on the PLC.

### Operation B

You can also use SM flags or SR registers to complete the data recording, data saving or set to store data on a SD card permanently. See the example below for reference.

Example:



- Check if the flag SM457 is ON. If the flag SM457 is ON, it indicates the valid recorded parameters are downloaded in data logger. And that means the operation A is done correctly.
- Use inputs to enable/disable or set the flag SM454 to ON for the PLC to start recording. If you need to store data on a SD card, set SR902=16#5AA5.
- When SM455 is ON or when the quantity of data has met the value set in SR900 (32-bit value), the system start saving data on a SD card.

NOTE: While sending data to the SD card for storage, the PLC needs a period of undisturbing time, approximately tens of milliseconds. During this period, the PLC is not allowed to execute interrupts. Make sure the PLC is NOT executing any interrupts, especially the external input ones before starting to send data to the SD card for storage.

- When SM455 is switching from OFF to ON, set SM456 ON. And the PLC starts to store the recorded data on the SD card. The default path and the file name are as shown below:
  - ◆ Default saving path
    - AS100: \SDCard\PLC CARD\AS100\Log
    - AS200: \SDCard\PLC CARD\AS200\Log
    - AS300: \SDCard\PLC CARD\AS300\Log
  - ◆ Default file name
    - DATA\_LOGGER\_ yyymmdd\_hhmmss.log
    - EX: DATA\_LOGGER\_20181108\_161901.log

### 13.2.2 Related SM Flags and SR Registers

| SM / SR | Attr. | Description  |
|---------|-------|--|
| SM450   | R     | Check here to see if a SD Card is installed in the PLC.<br>ON: SD card inside<br>OFF: No SD card   |
| SM452   | R     | Check here to see if data is being stored on the SD card.<br>ON: In the operation of storing<br>OFF: Not in the operation of storing   |
| SM453   | R     | Check here to see if there is any SD card operational error.<br>ON: Abnormal<br>OFF: Normal  |
| SR453   | R     | Check here to see the last operational error code of the SD card.<br>Note: Only available when SM453=ON  |
| SM454   | R/W   | Set this flag to ON/OFF to start or stop recording. The system will not set this flag to OFF automatically even if the space for recording is full. You need to set the flag to OFF manually.  |
| SM455   | R     | Check here to see if the recorded number has reached the set limit.<br>ON: The quantity of recordings has reached the set number or the SD card is in cycle recording.   |
| SM456   | R/W   | Used with SR902 to activate the settings in SR902 for the SD card.<br>Note: Set the flag from OFF to ON and the PLC starts to store the recorded data on the SD card when SR902=16#5AA5.   |
| SM457   | R     | Check here to see if there is any valid, downloaded, recorded parameters in the data logger.<br>ON: The valid recorded parameters are downloaded in data logger.   |
| SR900   | R     | Check here to see the quantity of the recorded data (32-bit value).<br>Note: It increments the number of the recorded data by 1 for each record.   |
| SR902   | R/W   | Control codes for recorded data. <ul style="list-style-type: none"> <li>● 16#5AA5: Store data to a default root and specified file name on the SD card.</li> <li>● 0: The storing is done.</li> <li>● Others: Invalid numbers</li> </ul> Note: Used with SM456 to activate this setting. |

Note: "R" in the column of attribute (Attr.) indicates the item is read only and the status can be read here.

"W" in the column of attribute (Attr.) indicates you can set, delete or write a value for this item.

## 13.3 Delta Drive Parameters Backup and Restore

This section uses ISPSOft for demonstration. For DIADesigner operation, refer to section 16.8 from DIADesigner software manual.

Delta device parameters can be backed up and restored. This function allows you to backup and restore the device parameters, including parameters of inverters and servo drives that are connected to the PLC CPU. You can backup the device parameters for later use. If a device is not functioning, you can change to a new one and use the backup the parameters to set up the new device quickly. Here we use AS Series PLC CPU as an example to backup and restore Delta device parameters. Refer to EIP Builder User Manual for detailed information on operation of other series.

### 13.3.1 System Requirement

Software: ISPSOft V3.10 or later, EIP Builder V1.07 or later

PLC CPU: AS Series PLC firmware V1.08 or later

Drive: C2000 Series inverter firmware V2.06 or later

EIP Communicaiton Card: CMC-EIP01 firmware V1.08 or later

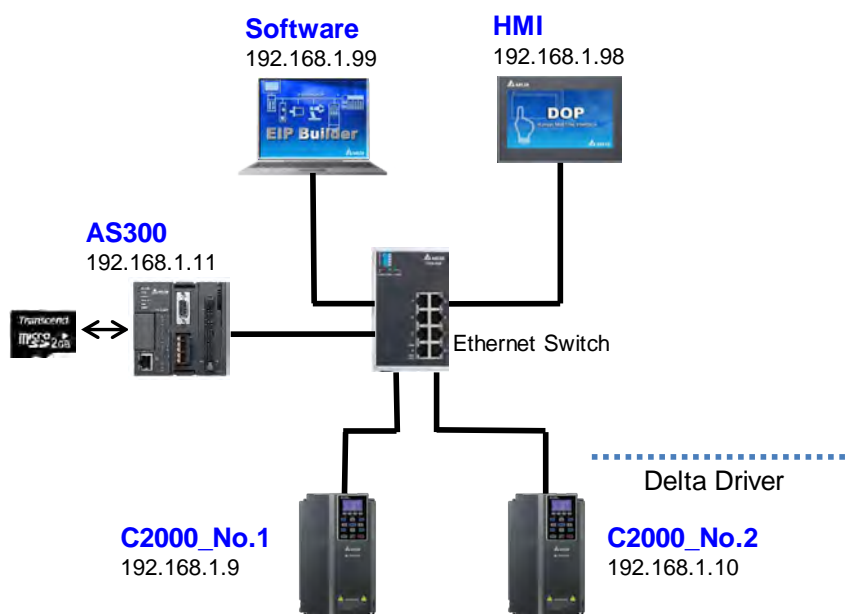
### 13.3.2 The Architecture Overview for Backup and Restore

Through EIP Builder, you can backup device parameters and store them in the SD card that is installed in AS Series PLC CPU. For restoration, you can use HMI to manage the SR from AS PLC CPU to restore the drive parameters to the Delta drive that is connected to the AS Series PLC CPU.

For AS300 Series PLC CPU, you can delay back up and restoration for up to 16 Delta drives at the same time.

For AS100 and AS200 Series PLC CPU, you can utilize back up and restoration for up to 8 Delta drives at the same time.

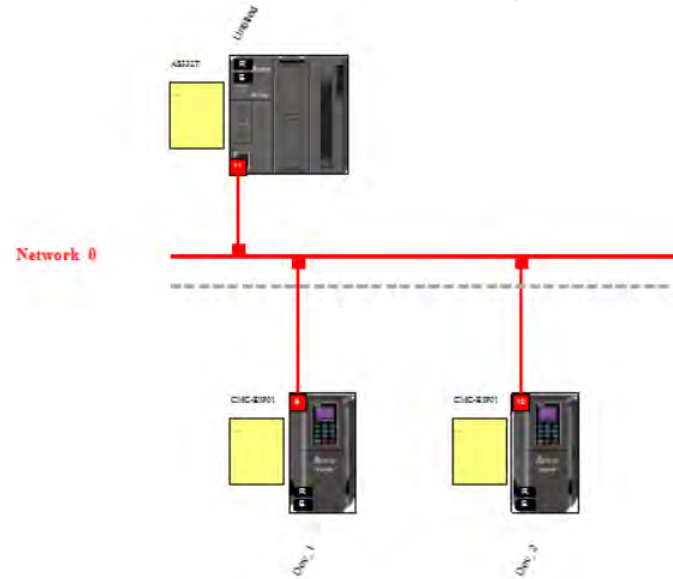
Find the architecture overview for back up and restoration below. Refer to Chapter 9 for details on the EtherNet/IP operation.





13.3.3 Steps to Backup Delta Device Parameters

Step 1: Open EIP Builder and make sure AS Series PLC CPU is well-connected and ready to communicate. And then make sure AS Series PLC CPU is also connected to the Delta drives and they are also ready to communicate.

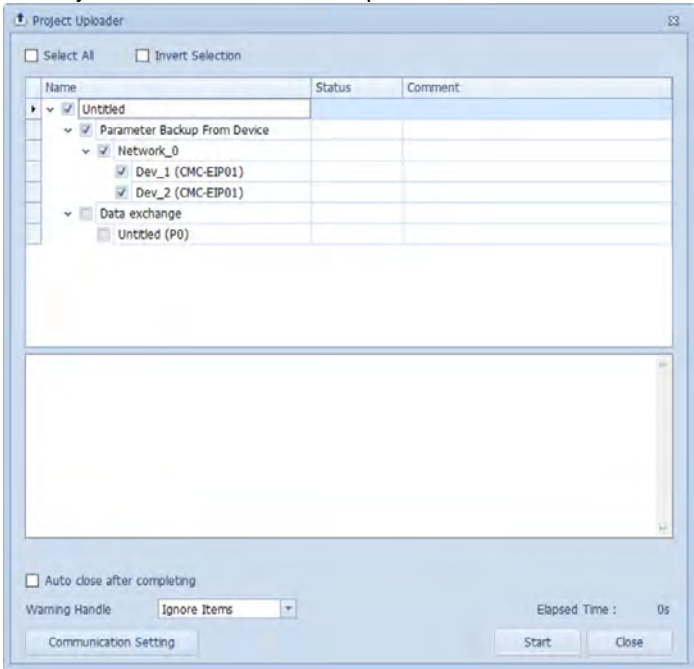


Step 2: Make sure a SD Card is installed in the AS Series PLC CPU and the AS Series PLC CPU is at the state of STOP.

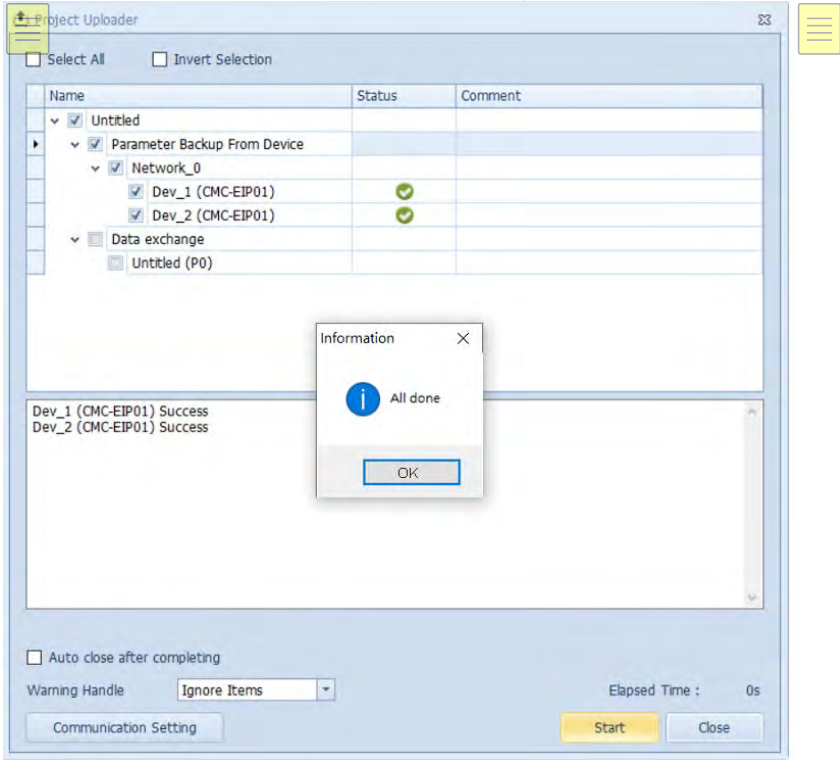
Step 3: Click the **Uploader icon**  on the tool bar for backup.



Step 4: Select the paremeters that you need to store for backup and click **Start**.



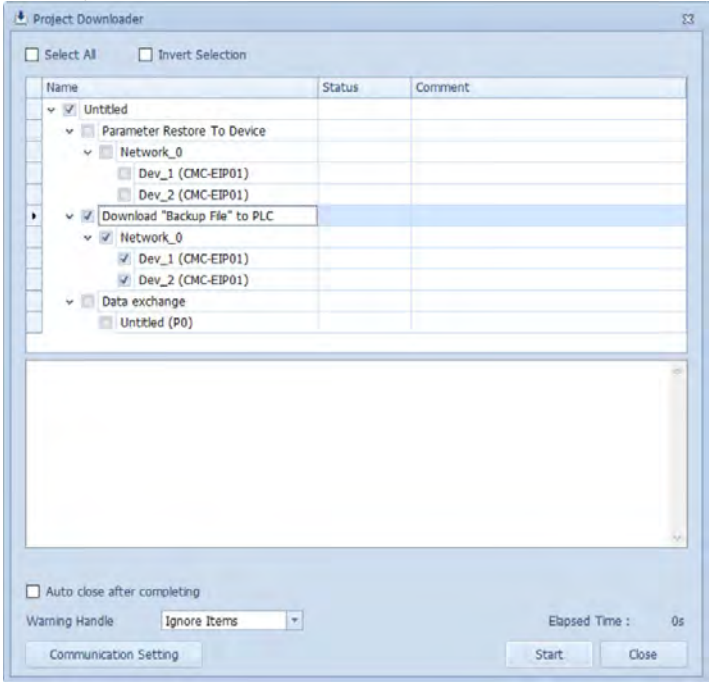
Step 5: Once all the selected parameters are uploaded to the computer, you can see the information “All done”.



Step 6: Click the **Downloader icon** on the tool bar to download the backup file from the computer to the SD card of AS Series PLC CPU.

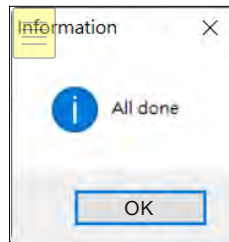


Step 7: Select the paremeters that you need to download and click **Start**.





Step 8: Once all the selected parameters are downloaded to the SD card of the AS Series PLC CPU, you can see the information "All done".



Step 9: Use your computer to check if the backup file is saved in the SD card.

**Remarks:**

- **Default backup file path**

AS100: \SDCard\PLC CARD\AS200\DevPara

AS200: \SDCard\PLC CARD\AS200\DevPara

AS300: \SDCard\PLC CARD\AS300\DevPara

- **File naming: mmmm\_nn\_tt\_pppppppppppppppp.par**

mmm: device or module code (e.g. PLC CPU is 0000.)

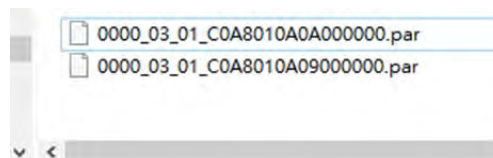
nn: communication port number (e.g. PLC Ethernet communication port is 03.)

tt: communication protocol type (e.g. Ethernet communication is fixed to 01.)

pppppppppppppppp: device information (IP + ID + 000000 in the hexadecimal format)

For example: If the device IP is 192.168.1.9 and its ID is 9, the device information is C0A80109

(IP: 192 = 16#C0, 168=16#A8, 1=16#01, 9=16#09) + 09 (ID) + 000000 = C0A8010909000000.par



Step 10: You can use ISPSOft to set the Delta drive's number in SR1601 and SR1602 for easier operation when it is required to use the restoration function on site.

### 13.3.4 Steps to Restore Delta Device Parameters

Two ways you can use to restore the Delta device parameters. One is to use ISPSoft to perform the restoration and the other way is to send commands (SM/SR) to the SD card of the AS Series PLC CPU through HMI. Refer to section 3.1.4.16 Delta Device Parameters Backup and Restore from ISPSoft User Manual for more information. Here we focus on the operation of sending commands (SM/SR) to the SD card of the AS Series PLC CPU through HMI.

Use SM/SR devices to appoint which Delta drive should be restored. Refer to the table below. After you have set the configurations, the PLC executes the restorations when the PLC is Power-On or from Stop to Run.

| SM / SR   | Function   | Description   | Retainable |
|---|--|---|------------|
| SR1600  | Parameter restoration code   | 0: No action (default)<br>1: The AS Series PLC CPU executes the restoration when the PLC is Power-On or from Stop to Run. When the restoration is complete, reset the value to 0.   | Yes        |
| SR1601.0<br>~<br>SR1601.15<br>and<br>SR1602.0<br>~<br>SR1602.15 | Target device number to perform parameter restoration  | SR1601.0: corresponding to target device #1<br>SR1601.1: corresponding to target device #2<br>:<br>SR1601.15: corresponding to target device #16<br>OFF: No action (default)<br>ON: Execute restoration on the appointed target device. | Yes        |
| SR1603  | The total number of Delta drives that error has occurred during restoration                    | 0: No error occurred<br>1~16: The total number of Delta drives that error has occurred during restoration   | No         |
| SR1604  | The last digit of the device's IP address that a most recent error occurred during restoration | 0 ~ 255: The last digit of the device's IP address that a most recent error occurred during restoration. (Only valid when SM1161 is switched to ON. Find SM1161 description below.)   | No         |
| SR1605  | The error code of the last device that error occurred  | Refer to the error code table below.  | No         |
| SM1160  | Parameter restoration complete   | OFF: When the value in SR1600 changes from 1 to 0, reset SM1160 to OFF.<br>ON: When the restoration is complete and successful, SM1160 switches to ON.  | No         |
| SM1161  | Error occurred during parameter restoration  | OFF: When the value in SR1600 changes from 1 to 0, reset SM1160 to OFF.<br>ON: If any error occurred during restoration, SM1161 switches to ON.   | No         |

In HWCONFIG, you can set up the handling method: what to do if an error occurs while restoring.

- Execution delay time when power on:**  
You can set up how loogh should the PLC CPU wait before the restoration begins. The default is 3 seconds. It means after power on, and after the PLC CPU detects its modules, it will wait for 3 seconds before executing restoration. But if the value in SR1600 is 0, the action here will be ignored.

| Delta Device Parameter Restore Setting |                                    |               |      |         |         |         |
|--|------------------------------------|---------------|------|---------|---------|---------|
|  | Name                               | Setting Value | Unit | Default | Minimum | Maximum |
| ⌘                                      | Execution delay time when power on | 3             | 1sec | 3       | 0       | 180     |

- When error occurs, CPU module:**  
You can set up if an error occurs during restoration, the PLC CPU stops or keeps running (default). If an error occurs during restoration, the PLC CPU will show warning error LED and stores the error message “H'0021”. Refer to the error code table below.

| Delta Device Parameter Restore Setting |                                    |               |      |               |         |         |
|--|------------------------------------|---------------|------|---------------|---------|---------|
|  | Name                               | Setting Value | Unit | Default       | Minimum | Maximum |
| ⌘                                      | Execution delay time when power on | 3             | 1sec | 3             | 0       | 180     |
|  | When error occurs, CPU module      | Keeps Running |      | Keeps Running | -       | -       |

Keeps Running  
Stops

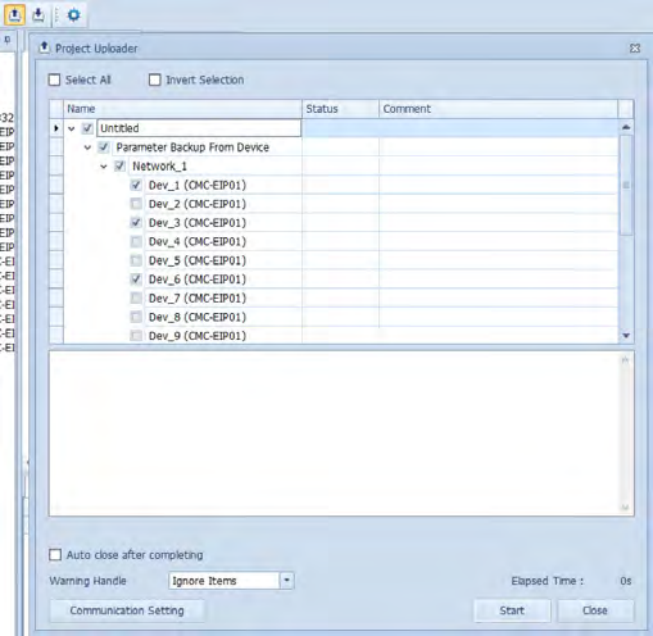
- Delta Device Parameter Restore Setting:**  
For the connected Delta devices, you can set up more configuraitons for security, including IP address, ID Number, Password Protecton, and Compatible Check.  
Note: Delta devices will also check for the compatibility, even if you have selected the option “Ignore Checks if Possible” here.

| General Data Exchange |                          |                    |      |                    |         |                 |
|-----------------------|--------------------------|--------------------|------|--------------------|---------|-----------------|
| Device 1              |                          |                    |      |                    |         |                 |
|                       | Name                     | Setting Value      | Unit | Default            | Minimum | Maximum         |
| ⌘                     | IP Address               | 192.168.1.73       |      | 192.168.1.1        | 1.1.1.1 | 223.255.255.255 |
|                       | ID No.                   | 1                  |      | 1                  | 1       | 247             |
|                       | Password (Max Length: 8) |                    |      |                    | -       | -               |
|                       | Compatible Check         | Partial Compatible |      | Partial Compatible | -       | -               |

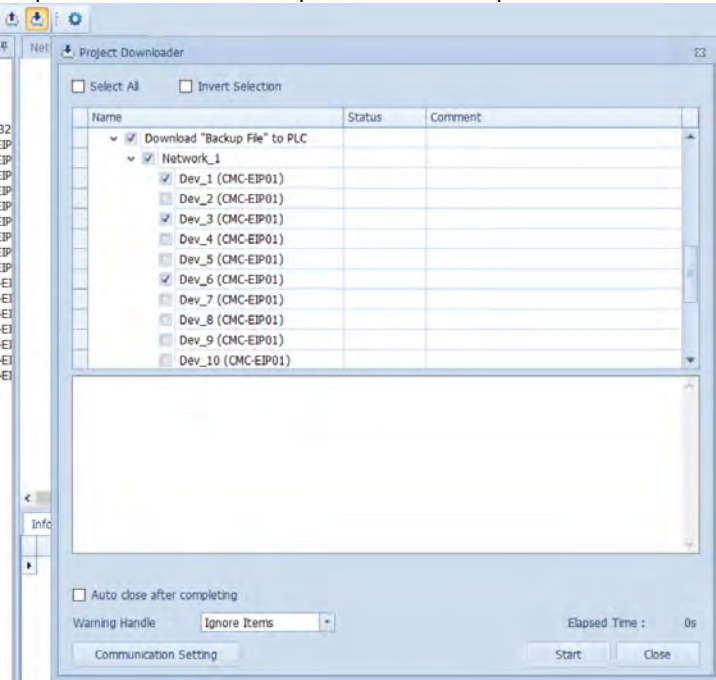
**Example: Back up parameter from Delta drives, number 1, 3, 6 and 16 and execute restorations.**

**Backup**

Step 1: Select the devices that you need to backup in EIP Builder. Here we select device 1, 3, 6 and 16.



Step 2: Download the backup file from the computer to the SD card of AS Series PLC CPU.



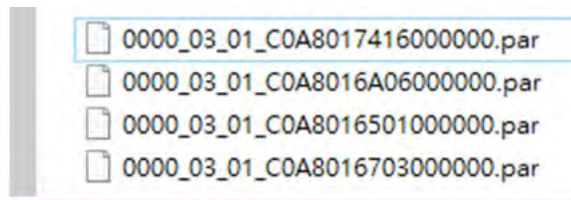
SD Card:

mmmm: device or module code (e.g. PLC CPU is 0000.)

tt: communication protocol type (e.g. Ethernet communication is fixed to 01.)

For example: If the device IP is 192.168.1.101 and its ID is 01, the device information is C0A80165

(IP: 192 = 16#C0, 168=16#A8, 1=16#01, 101=16#65) + 01 (ID) + 000000 = C0A8016501000000.par



## Restoration

Step 2: Use the HMI, e.g., Delta DOP series HMI to set up SR1601=16#8025 (SR1601.0, SR1601.2, SR1601.5, SR1601.15; these 4 bits set to ON and others set to OFF.)

Note: You can use ISPSOft to set the Delta drive's number in SR1601 and SR1602 beforehand, it would be easier for personeels to execute restoration on site.

Step 4: Use HMI to set SR1601 to 1. Switch PLC CPU from STOP to RUN.

Step 5: Check if the value in SM1160 of the PLC CPU. If it is ON, it indicates the restoration is complete. If it is not ON, go check if the value in SM1161 is ON. If it is ON, it indicates an error has occurred during restoration.

## Troubleshooting

- When SM1161 is ON and the value in SR1603 is not 0.
- Read the value in SR1604 to find the last digit of the device's IP address that a most recent error occurred during restoration to find out which device is not functioning.
- Read the value in SR1605 or use the PRST\_ErrRead to read the error code. See the table below for troubleshooting.

| Type                            | Error Code in SR1605 | Error Message  | Solution   |
|---------------------------------|----------------------|--|--|
| PLC setting and operation error | H'0001               | CPU module can NOT detect SD card  | Make sure SD card is installed securely. Unplug it and plug it in again.                               |
|                                 | H'0002               | No backup file in SD card.   | Make sure there is a backup file in SD card.   |
|                                 | H'0003               | Error occurred while reading data from SD card. For instance, failed to read or the file is corrupted.   | Check if SD card is damaged.   |
|                                 | H'0004               | Failed to write data into SD card.   | Check if SD card is written proof or if it is damaged.   |
|                                 | H'0008               | Restoration setting error<br>(For example, the IP address to be restored is set as a broadcasting one. For restoration, the IP address should be one on one, not broadcasting. | Check if the naming of IP address and ID is the same as what is set in HWCONFIG.                       |
|                                 | H'000A               | Connection lost  | Check if the network cable is well-connected and the wiring is correct.                                |
| Backup and restoration error    | H'1000               | Not supported parameter settings   | Check if the Delta drive's firmware version in the backup file is matched with the one to be restored. |
|                                 | H'1001               | Device series not matched  | Check if the Delta drive's series in the backup file is matched with the one to be restored.           |
|                                 | H'1002               | Device version not matched   | Check if the Delta drive's firmware version in the backup file is matched with the one to be restored. |
|                                 | H'1003               | Incompatible device voltage level  | Check if the Delta drive's voltage level in the backup file is matched with the one to be restored.    |
|                                 | H'1004               | Incompatible device power  | Check if the Delta drive's power in the backup file is matched with the one to be restored.            |
|                                 | H'1010               | Device model not matched   | Check if the Delta drive's model in the backup file is matched with the one to be restored.            |
|                                 | H'1011               | Incorrect device password  | Check if the Delta drive's password is the same as what is set in HWCONFIG.                            |
|                                 | H'1100               | Device communication timeout   | Check if the network cable is well-connected and free from noise interference.                         |
|                                 | H'1101               | Currently the device can NOT execute backup or restoration.  | If the problem persists, contact the local authorized distributors of the Delta drive.                 |
|                                 | H'1103               | Currently the device can NOT compete the execution of backup or restoration.   | If the problem persists, contact the local authorized distributors of the Delta drive.                 |
|                                 | H'1106               | Device responds with incomplete data   | If the problem persists, contact the   |

| Type              | Error Code in SR1605 | Error Message                                  | Solution   |
|-------------------|----------------------|--|--|
|                   |                      | for backup/restoration                         | local authorized distributors of the Delta drive.                                      |
|                   | H'1108               | Device responds with an unexpected error.      | Check if the network cable is well-connected and free from noise interference.         |
| Restoration error | H'2000               | Parameters exceed the upper limit.             | If the problem persists, contact the local authorized distributors of the Delta drive. |
|                   | H'2001               | Parameters are less than the lower limit.      | If the problem persists, contact the local authorized distributors of the Delta drive. |
|                   | H'2002               | Parameters can NOT be written.                 | If the problem persists, contact the local authorized distributors of the Delta drive. |
|                   | H'2003               | Currently the device is at the state of RUN.   | Switch the device to the state of STOP.  |
|                   | H'2004               | Currently the device is at the state of error. | Refer to the drive user manual for more information.                                   |
|                   | H'2005               | Incorrect device file                          | If the problem persists, contact the local authorized distributors of the Delta drive. |
|                   | H'2006               | Number of device parameters not matched.       | If the problem persists, contact the local authorized distributors of the Delta drive. |
|                   | H'2007               | Execution of backup or restoration timeout     | If the problem persists, contact the local authorized distributors of the Delta drive. |

### 13.3.5 FAQ

Question 1: Is Ethernet/IP the only communication protocol for backup and restoration?

Answer: Yes, currently Ethernet/IP is the only communication protocol supported. RS485 communication will also be available in the near future.

Question 2: Are the file name and the folder path editable?

Answer: The file name of the backup file contains 4 sections, PLC Ethernet communication port, Ethernet communication protocol, and device information. Only the device information can be edited according to the device to be restored. See below for more details on the file naming.

File naming: mmmm\_nn\_tt\_pppppppppppppppppp.par

nn: communication port number (e.g. PLC Ethernet communication port is 03.)

tt: communication protocol type (e.g. Ethernet communication is fixed to 01.)

pppppppppppppppppp: device information (IP + ID + 000000 in the hexadecimal format)

For example: If the device IP is 192.168.1.101 and its ID is 01, the device information is C0A80165

(IP: 192 = 16#C0, 168=16#A8, 1=16#01, 101=16#65) + 01 (ID) + 000000 = C0A8016501000000.par

Question 3: Can backup and restoration be executed when PLC CPU is at the state of RUN?

Answer: No. Backup and restoration can only be executed when PLC CPU is at the state of STOP. Since AS Series PLC CPU reads data from or writes data into the SD card, it affects the PLC scan time and may further affect the PLC operation.

**MEMO**





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# 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 ..... A-2

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A.3 Installing the USB Driver for an AS Series CPU module in Windows 8 ..... A-11

A.4 Installing the USB Driver for an AS Series CPU module in Windows 10 ..... A-13

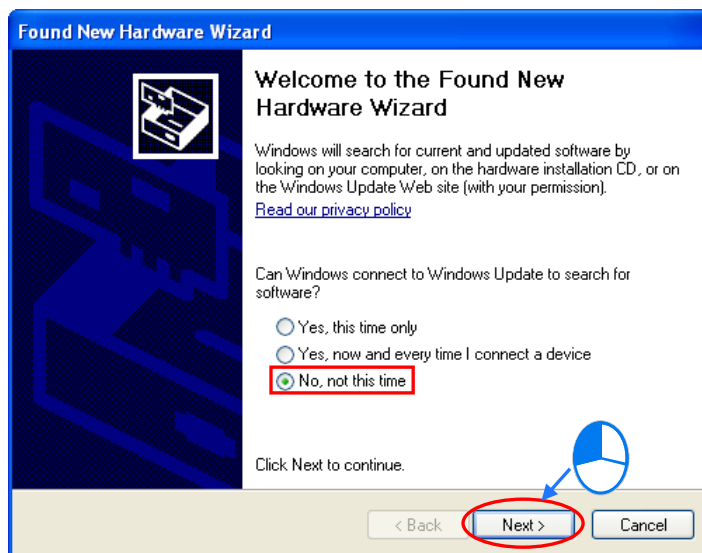
A.5 Notes on Utilizing USB Communication ..... A-16

## A.1 Installing the USB Driver for an AS Series CPU module in Windows XP with SP3

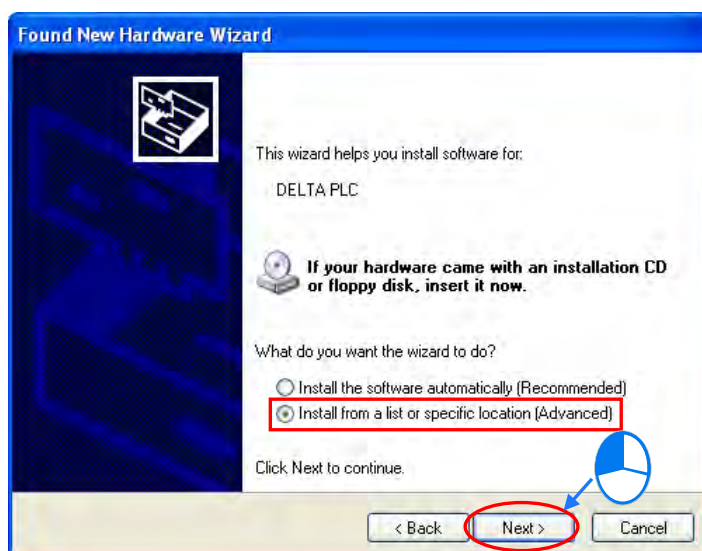
The instructions below show how to install the USB driver for an AS Series CPU module on Windows XP. To install the USB driver on another operating system, refer to the instructions in the operating system for information on installing new hardware.

Before you install the USB driver, you must install ISPSOft version 3.00 or above on your computer.

- (1) Supply power to the AS Series CPU module. Connect the AS Series CPU module to a USB port on your computer with a USB cable. In the **Found New Hardware Wizard**, select **No, not this time** and then click **Next**.

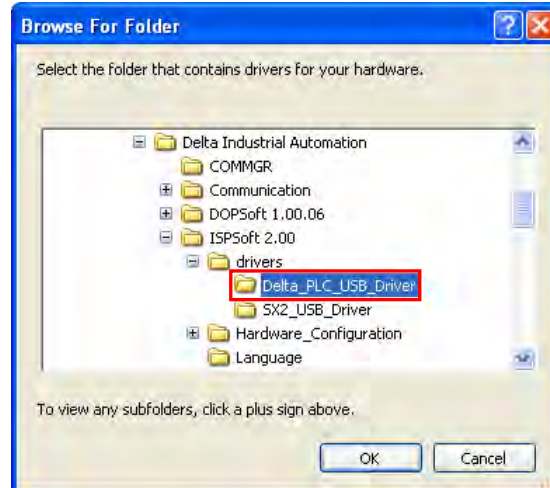
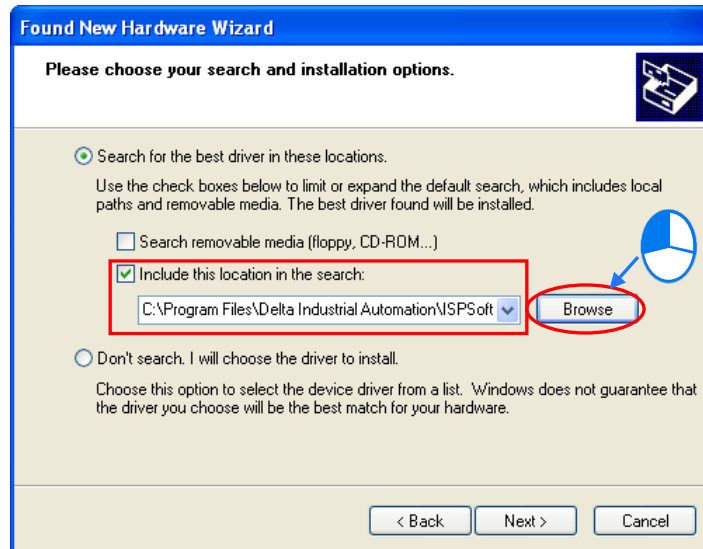


- (2) The wizard displays the name of the detected USB device. Select **Install from a list or specific location (Advanced)** and then click **Next**.



- (3) After you install ISPSOft version 3.00 or above, the driver for the AS CPU module is under the folder where you installed ISPSOft: **...\ISPSOft\drivers\Delta\_PLC\_USB\_Driver\**.

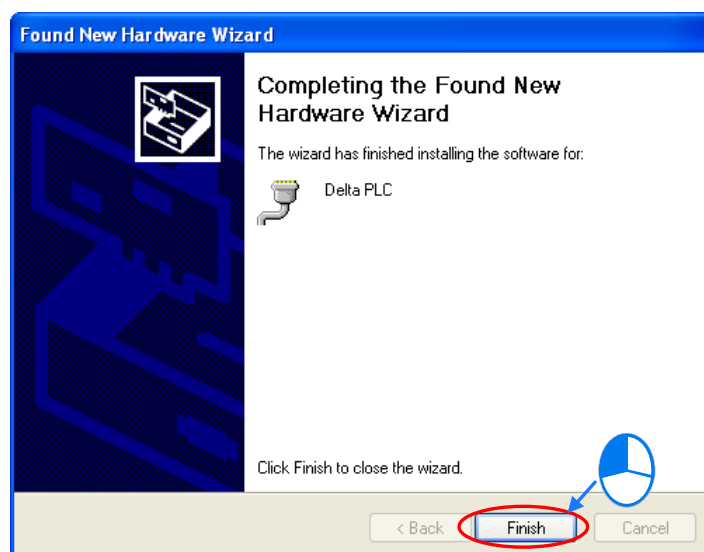
Select **Include this location in the search** and enter the correct path, or click **Browse** to browse for the correct folder. Click **Next** to continue the installation.



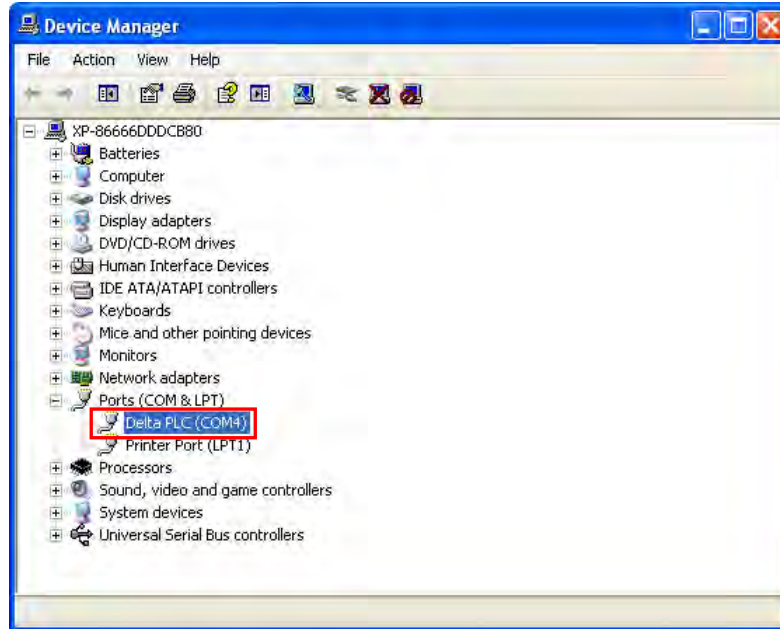
- (4) The system installs the driver. If the **Hardware Installation** message appears during the installation, click **Continue Anyway**.



- (5) Click **Finish**.



- (6) Open the Windows **Device Manager** window. If the **Delta PLC** port for the USB device is under **Ports (COM & LPT)**, the installation of the driver is successful, and Windows assigns a communication port number to the USB device.



#### **Additional remarks**

- If you connect the PLC to a different USB port on the computer, the system may ask you to install the driver again. Follow the steps above, and install the driver again. After you install the driver, the communication port number that the operating system assigns to the USB device may have changed.
- If Windows XP has not been updated to the version SP3 on the computer, an error message stating the missing files will appear during the installation. Resolve this issue with one of the following steps.
  - (a) Cancel the installation, install Windows XP SP3 on the computer, and reinstall the driver according to the steps above.
  - (b) Get the file needed, and specify the path where the file is stored for the missing file in the error message window.

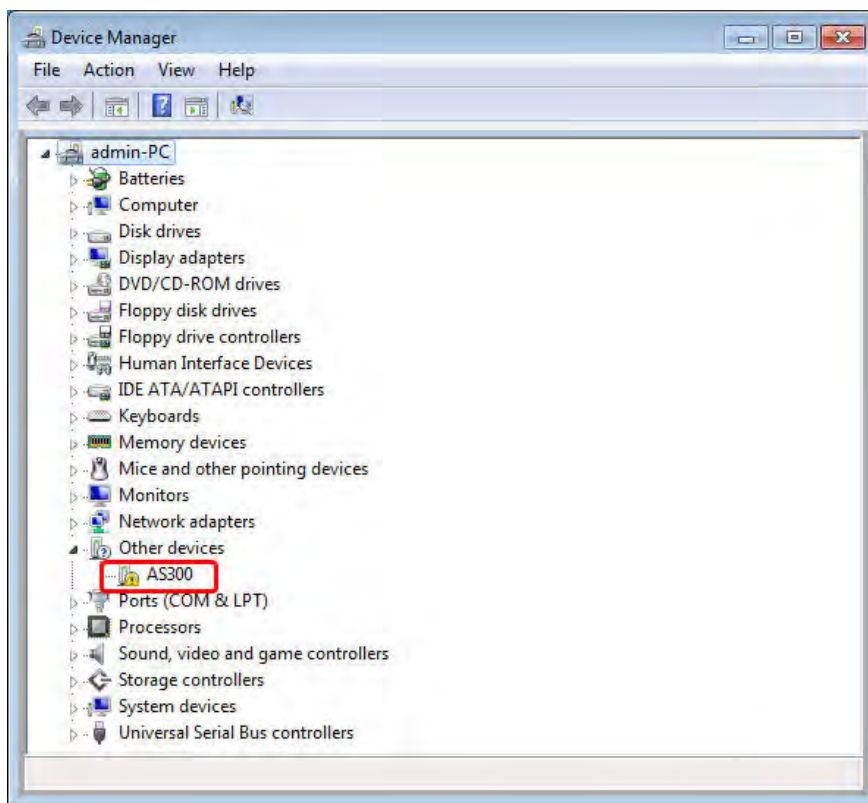
## A.2 Installing the USB Driver for an AS Series CPU module in Windows 7

This section describes the steps to install the USB driver for an AS Series CPU module on Windows 7. To install the USB driver for an AS Series CPU module on another operating system, refer to the instructions in the operating system for information about installing new hardware.

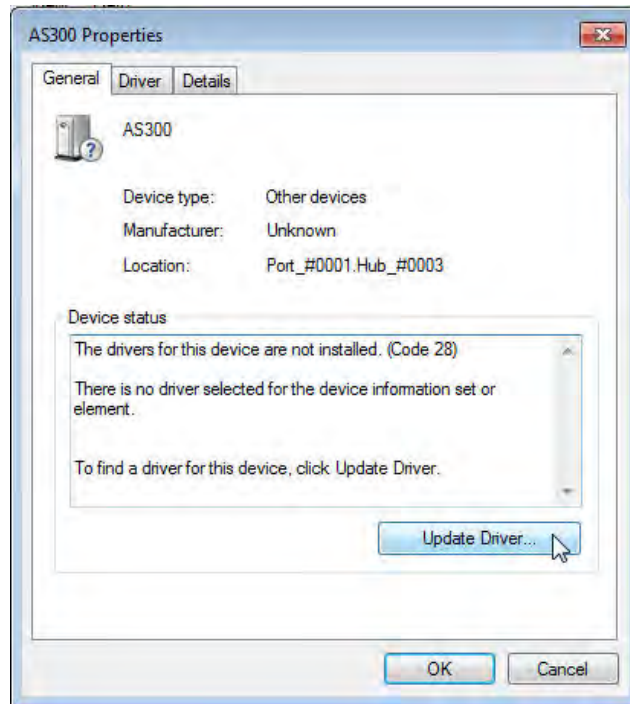
Before you install the USB driver, you must install ISPSOft version 3.00 or above on your computer.

Supply power to the AS Series CPU module. Connect the AS Series CPU module to a USB port on the computer with a USB cable.

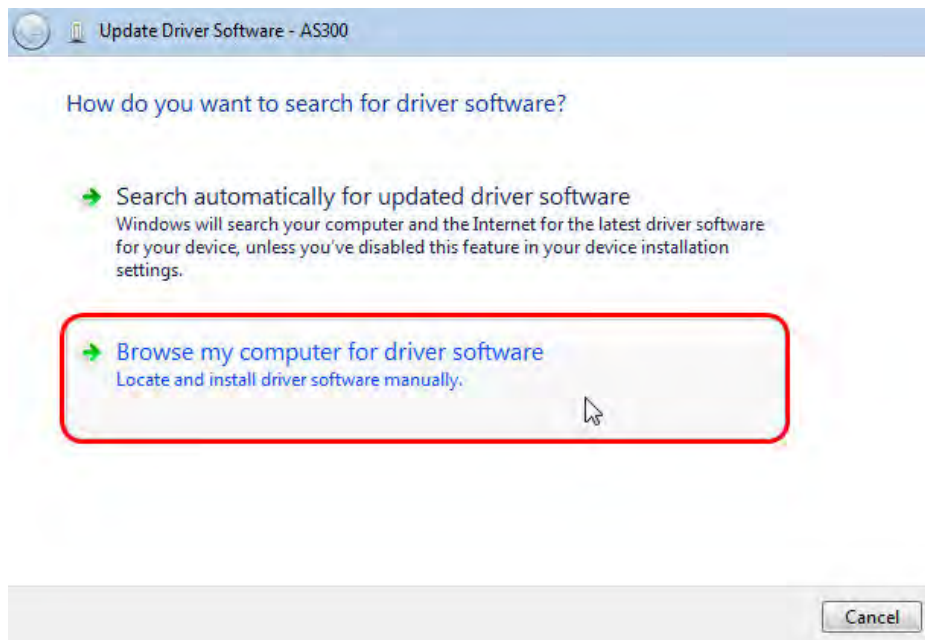
- (1) Windows detects the module. From the Windows **Control Panel**, open the **Device Manager**. The name of the USB device appears in the Device Manager window. Double-click the AS300.



- (2) In the **AS300 Properties** dialog box, click **Update Driver.....**



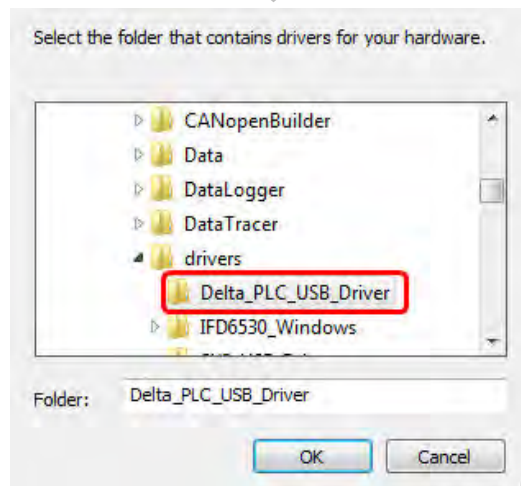
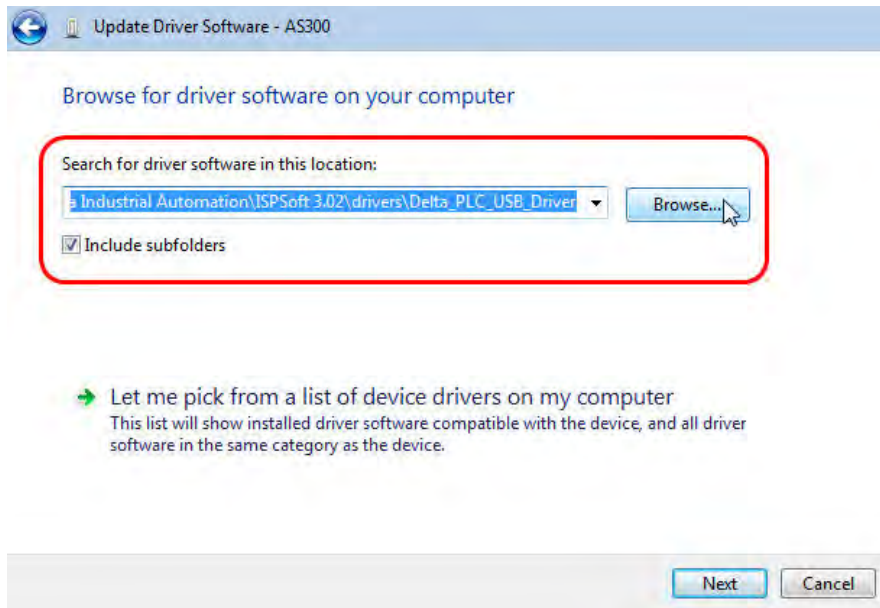
- (3) Click **Browse my computer for driver software.**





- (4) After you install ISPSOft version 3.00 or later, the driver for the AS Series CPU module is under the folder where you installed ISPSOft ...\\ISPSOft\\drivers\\Delta\_PLC\_USB\_Driver\\. Enter the path to the driver, or click **Browse** to browse to the correct folder.

Specify the correct path. If you installed the driver for the AS series CPU module to another location, specify the corresponding path. Click **Next** to continue the installation.

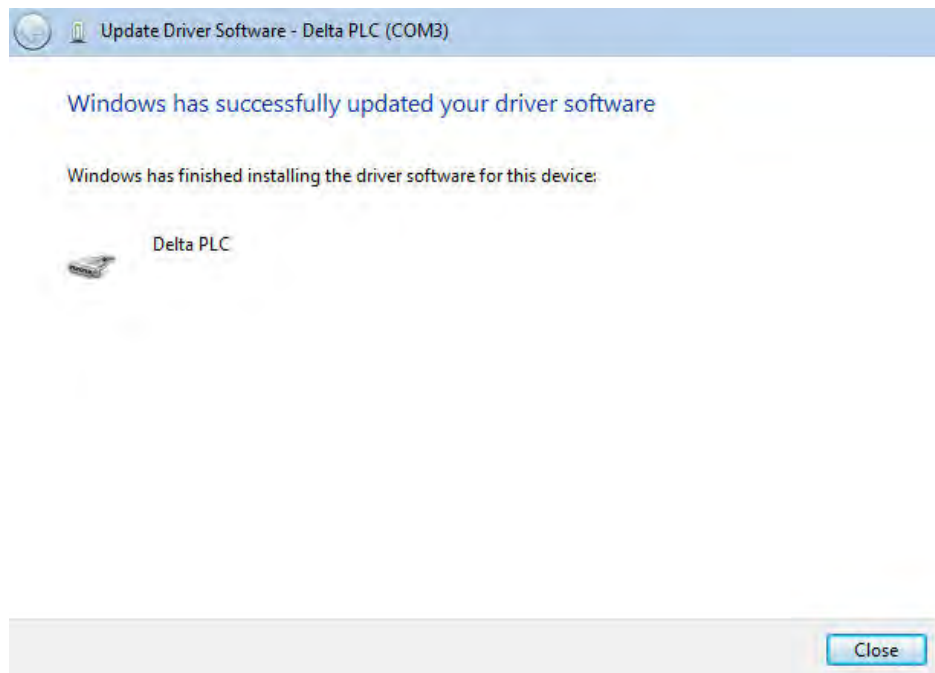




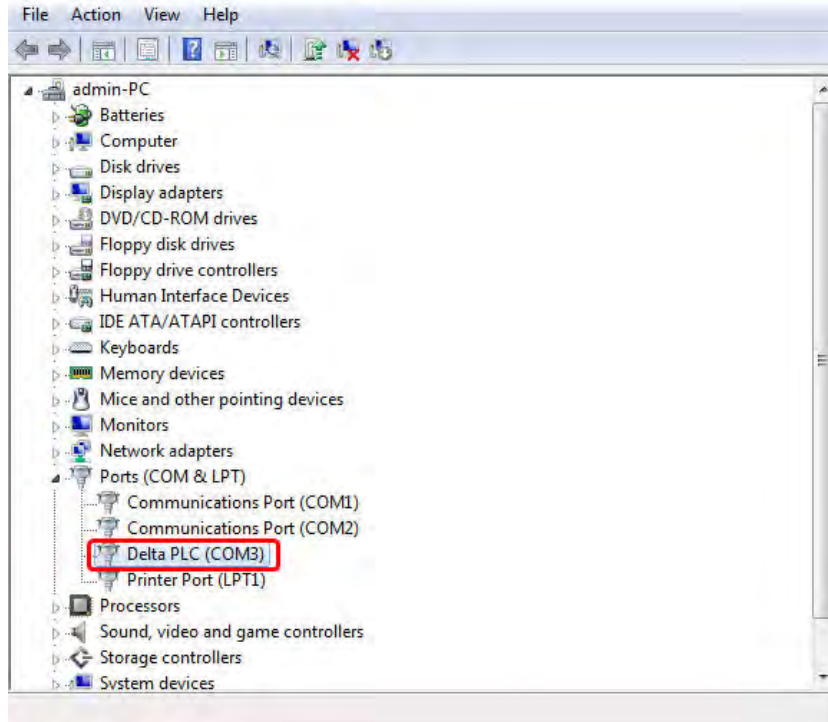
- (5) Click **OK**. The system installs the driver. If the **Windows Security** window appears during the installation, click **Install this driver software anyway**.



- (6) When the installation completes, click **Close**.



- (7) Open the **Device Manager** window again. If the name of the Delta USB device appears under **Ports (COM & LPT)**, the installation of the driver is successful. The operating system assigns a communication port number to the USB device.




#### **Additional remarks**

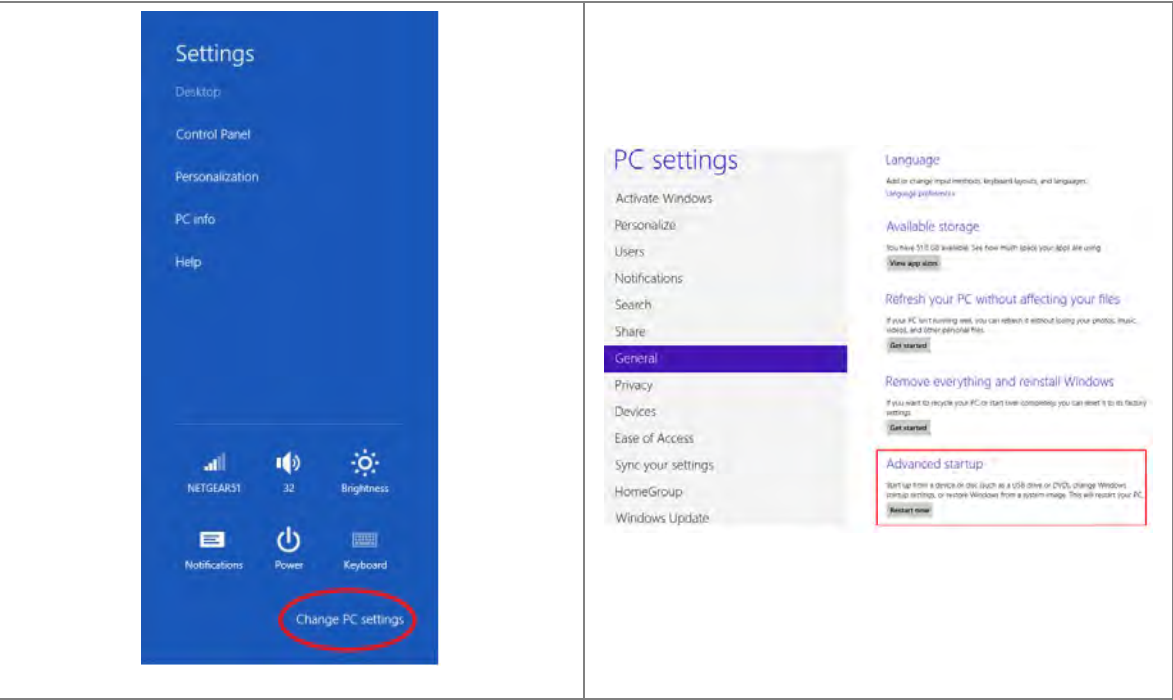
- If you connect the PLC to a different USB port on the computer, the system may ask you to install the driver again. Install the driver again. After you install the driver, the communication port number that the operating system assigns to the USB device may have changed.

### A.3 Installing the USB Driver for an AS Series CPU module in Windows 8

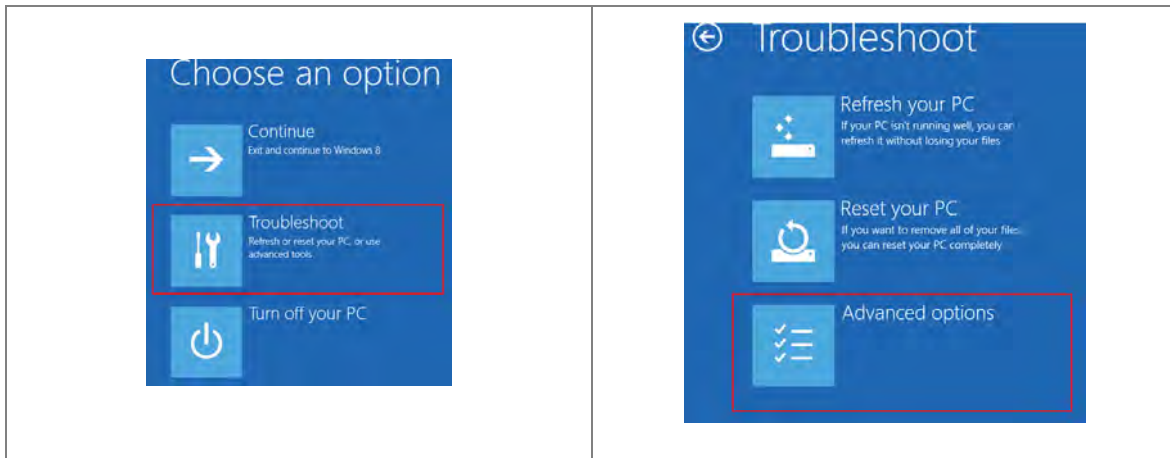
Windows 8 driver signature enforcement provides a way to improve the security of the operating system by validating the integrity of a driver or system file each time it is loaded into memory. Because the Delta PLC USB driver does not include the driver signature, this section shows you how to disable driver signature enforcement in Windows 8 to successfully install the Delta PLC USB driver. Once you disable the driver signature enforcement setting, it returns to its original state after you restart Windows.

Follow these steps to disable driver signature enforcement in Windows 8.

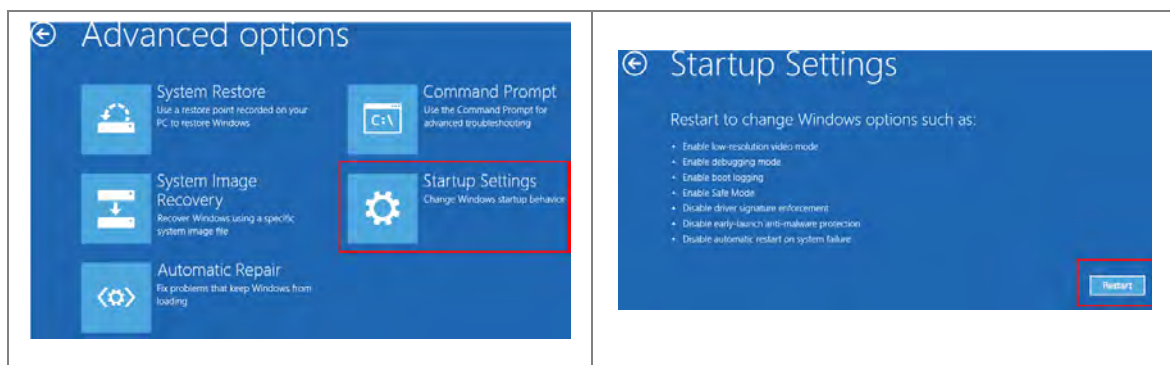
1. Press the Windows button  **【WIN】 + 【I】** on your keyboard to display the **Settings** window. Click **Change PC settings**.
2. The **PC settings** window appears. Click **General** and then click **Restart now** under **Advanced startup**.



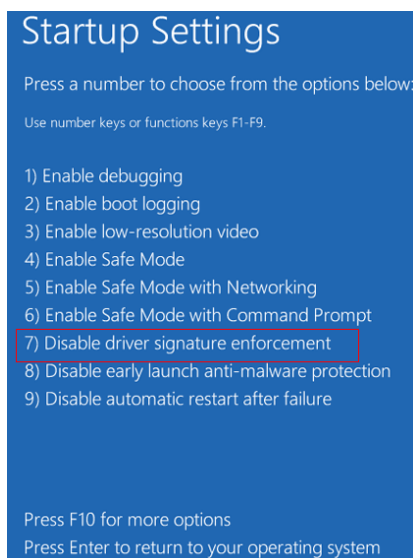
3. After the computer restarts, under **Choose an option**, click **Troubleshoot**. Under **Troubleshoot**, click **Advanced options**.



4. On the **Advanced options** page, click **Startup Settings**, and then on the **Startup Settings** page, click **Restart** to restart the computer.



5. Press the 7 or F7 key on your keyboard to choose **Disable driver signature enforcement**. Press Enter and the system directs you back to the Windows 8 operating system. Install the Delta PLC USB driver now by connecting the AS Series CPU module to your computer's USB port. Refer to Section A2 for the steps to install the USB driver.

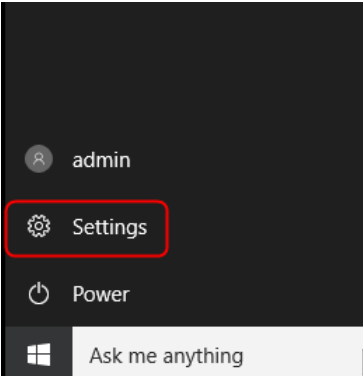
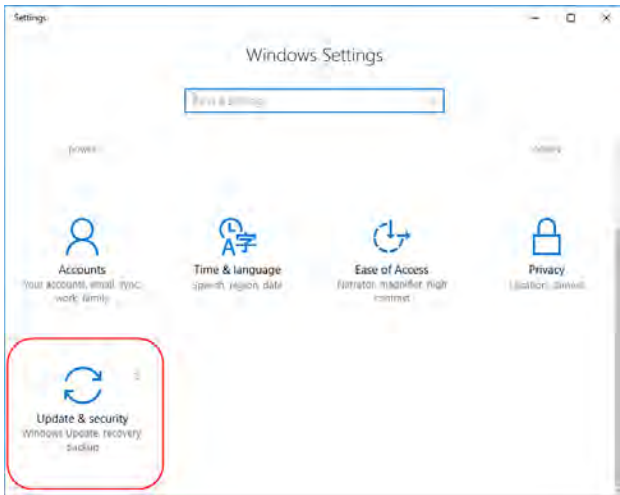


## A.4 Installing the USB Driver for an AS Series CPU module in Windows 10

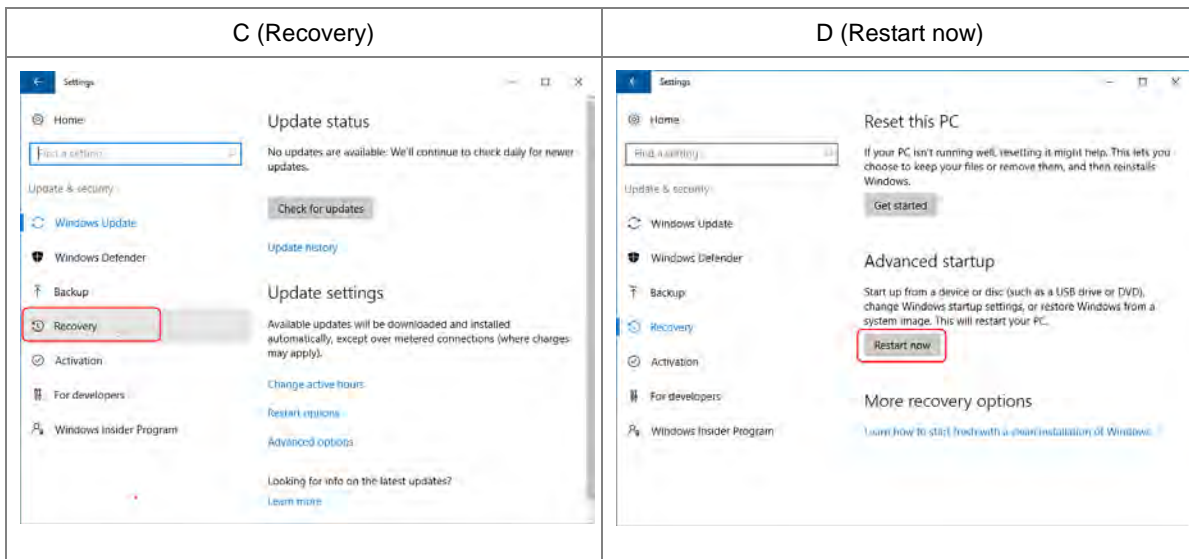
Windows 10 driver signature enforcement provides a way to improve the security of the operating system by validating the integrity of a driver or system file each time it is loaded into memory. Because the Delta PLC USB driver does not include the driver signature, this section shows you how to disable driver signature enforcement in Windows 10 to successfully install the Delta PLC USB. Once you disable the driver signature enforcement setting, it returns to its original state after restarting Windows.

This section describes the steps to disable driver signature enforcement in Windows 10.

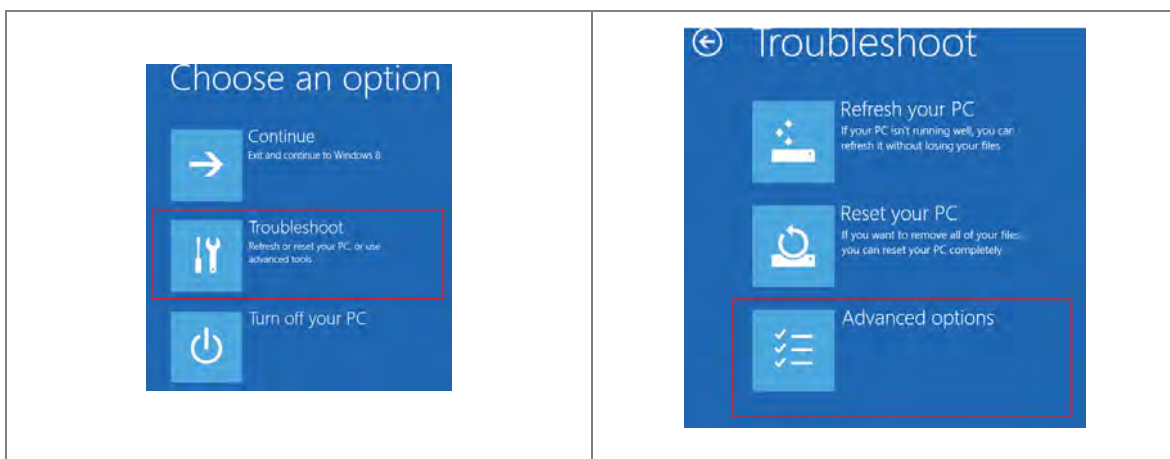
1. Click the Windows **Start** button and then click **Settings**.
2. In the **Settings** window, click **Update & Security**.

| A (Setting)  | B (Update & Security)   |
|--|---|
|  |  |

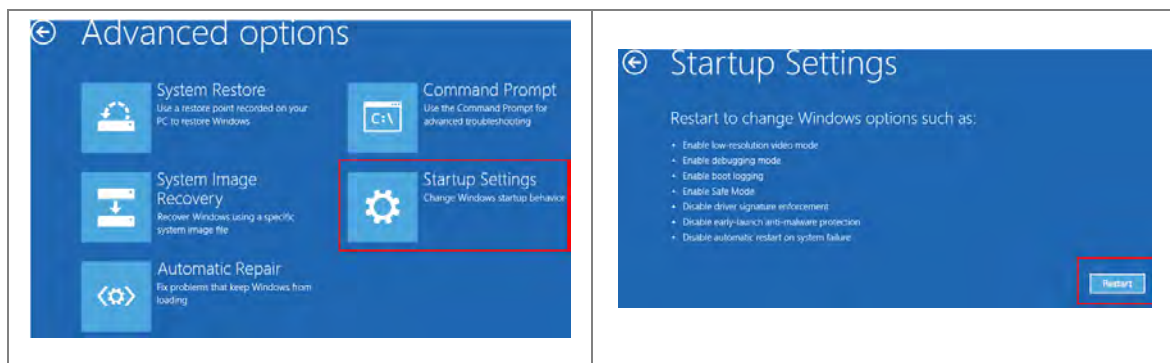
3. In the **Settings** window, click **Recovery**, and then click **Restart now**.



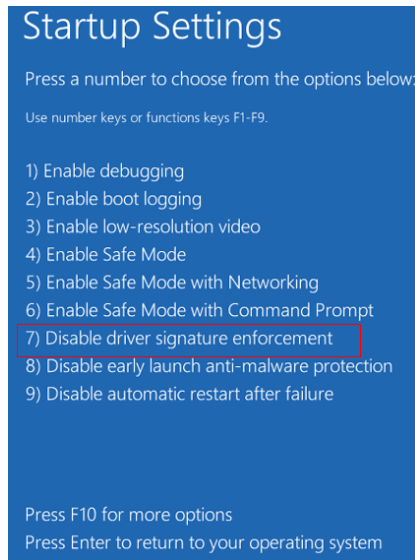
4. After the computer restarts, under **Choose an Option**, click **Troubleshoot**, and then click **Advanced options**.



5. On the **Advanced options** page, click **Startup Settings**. On the **Startup Settings** page click **Restart** to restart the computer.



6. On your keyboard, press 7 or F7 to choose **Disable driver signature enforcement**, and the system directs you to the Windows 10 operating system page. Install the Delta PLC USB driver.



7. Install the USB driver for the AS Series CPU module by connecting the AS Series CPU module to your computer's USB port. Refer to Section A2 for the steps to install the USB driver.

## A.5 Notes on Utilizing USB Communication

- Suggested to use USB communication in the following occasions: PLC program upload / download, PLC parameters monitoring, and firmware upgrade.
- Suggested NOT to use USB communication for applications that require long time communication and without any connection drop.
- When experiencing connection lost, you can unplug the USB cable and then plug it back in and try the communication again.
- For the first time USB communication user, you need to install the USB driver for the AS Series PLC CPU.
- If the communication is still not working after unplugging and plugging, you need to open the Devices (Windows settings -> Devices) to see if the USB driver is still valid. The USB driver may be lost due to Windows updates. If your USB driver is invalid, install the USB driver again.





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# Appendix B Device Addresses

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## B.1 Standard Modbus Device Addresses

Applicable to AS series PLC

| Device | Type  | Format | Device range | Modbus address<br>(Decimal number) | AS Address<br>(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                          |

## B.2 Function Codes and Number of Devices Supported for Modbus Protocols

Applicable to AS series PLC

| Function code | Name                         | Description              | Number of devices supported (FW V1.06.00 or later) | Number of devices supported (FW V1.06.10 or later) |
|---------------|------------------------------|--------------------------|--|--|
| 01            | Read Coil Status             | X, Y, M, SM, S, T, C, HC | 1~256 bits   | 1~1600 bits  |
| 02            | Read Discrete Input Status   | X, Y, M, SM, S, T, C, HC | 1~256 bits   | 1~1600 bits  |
| 03            | Read Holding Registers       | X, Y, SR, D, T, C, HC, E | 1~100 words,<br>(1~50 for HC)                      | 1~100 words,<br>(1~50 for HC)                      |
| 04            | Read Input Registers         | X                        | 1~100 words  | 1~100 words  |
| 05            | Force Single Coil            | Y, M, SM, S, T, C, HC    | 1 bit  | 1 bit  |
| 06            | Preset Single Register       | Y, SR, D, T, C, HC, E    | 1 word   | 1 word   |
| 0F            | Force Multiple Coils         | Y, M, SM, S, T, C, HC    | 1~256 bits   | 1~1600 bits  |
| 10            | Preset Multiple Register     | Y, SR, D, T, C, HC, E    | 1~100 words,<br>(1~50 for HC)                      | 1~100 words,<br>(1~50 for HC)                      |
| 17            | Read/Write Multiple Register | Y, SR, D, T, C, HC, E    | 1~100 words,<br>(1~50 for HC)                      | 1~100 words,<br>(1~50 for HC)                      |

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# Appendix C   EMC Standards

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## C.1 EMC Standards for an AS Series System

### C.1.1 AS Series System EMC Standards

The EMC standards that are applicable to an AS series system are listed in the following tables.

● EMI

| Port  | Frequency range | Level (Normative)       | Reference standard |
|---|-----------------|-------------------------|--------------------|
| Enclosure port<br>(radiated)<br><br>(measured at a distance of 10 meters) | 30-230 MHz      | 40 dB (µV/m) quasi-peak | IEC 61000-6-4      |
|   | 230-1000 MHz    | 47 dB (µV/m) quasi-peak |                    |
| AC power port<br>(conducted)  | 0.15-0.5 MHz    | 79 dB (µV) quasi-peak   | IEC 61000-6-4      |
|   |                 | 66 dB (µV) average      |                    |
|   | 0.5-30 MHz      | 73 dB (µV) quasi-peak   |                    |
|   |                 | 60 dB (µV) average      |                    |

● EMS

| Environmental phenomenon   | Reference standard | Test                        |             | Test level |
|--|--------------------|-----------------------------|-------------|------------|
| Electrostatic discharge  | IEC 61000-4-2      | Contact                     |             | ± 4 kV     |
|  |                    | Air                         |             | ± 8 kV     |
| Radio frequency electromagnetic field<br><br>Amplitude modulated | IEC 61000-4-3      | 80% AM,<br>1 kHz sinusoidal | 2.0-2.7 GHz | 1 V/m      |
|  |                    |                             | 1.4-2.0 GHz | 3 V/m      |
|  |                    |                             | 80-1000 MHz | 10 V/m     |
| Power frequency magnetic field                                   | IEC 61000-4-8      | 60 Hz                       |             | 30 A/m     |
|  |                    | 50 Hz                       |             | 30 A/m     |

- **Conducted immunity test**

| Environmental phenomenon             |                                   | Fast transient burst | High energy surge      | Radio frequency interference |
|--------------------------------------|-----------------------------------|----------------------|------------------------|------------------------------|
| Reference standard                   |                                   | IEC 61000-4-4        | IEC 61000-4-5          | IEC 61000-4-6                |
| Interface/Port                       | Specific interface/port           | Test level           | Test level             | Test level                   |
| Data communication                   | Shielded cable                    | 1 kV                 | 1 kV CM                | 10 V                         |
|                                      | Unshielded cable                  | 1 kV                 | 1 kV CM                | 10 V                         |
| Digital and analog I/O               | AC I/O (unshielded)               | 2 kV                 | 2 kV CM<br>1 kV DM     | 10 V                         |
|                                      | Analog or DC I/O(unshielded)      | 1 kV                 | 1 kV CM                | 10 V                         |
|                                      | All shielded lines (to the earth) | 1 kV                 | 1 kV CM                | 10 V                         |
| Equipment power                      | AC power                          | 2 kV                 | 2 kV CM<br>1 kV DM     | 10 V                         |
|                                      | DC power                          | 2 kV                 | 0.5 kV CM<br>0.5 kV DM | 10 V                         |
| I/O power and auxiliary power output | AC I/O and AC auxiliary power     | 2 kV                 | 2 kV CM<br>1 kV DM     | 10 V                         |
|                                      | DC I/O and DC auxiliary power     | 2 kV                 | 0.5 kV CM<br>0.5 kV DM | 10 V                         |

## C.1.2 Installation Instructions to meet EMC Standards

You must install an AS Series PLC in a control box. The control box protects the PLC and isolates electromagnetic interference generated by the PLC.

### (1) Control box

- Use a conductive control box. Remove the paint on the plate bolts to ensure good contact between the inner plate and the control box.
- Connect the control box with a thick wire to ensure that the control box is well-grounded, even if there is high-frequency noise.
- The diameter of holes in the control box must be less than 10 millimeters (3.94 inches). Radio frequency noise may be emitted if the hole diameter is larger than 10 millimeters.
- Minimize the distance between the door of the control box and the PLC to prevent radio waves from leaking. You can also prevent radio waves from leaking by putting an EMI gasket on the painted surface.

### (2) Connecting a power cable and a ground

Connect the PLC system power cable and the ground as described below.

- Provide a ground point near the power supply module. Use thick, short wires to connect the terminals LG and FG with the ground. The length of the wire should be less than 30 centimeters (11.18 inches). Noise generated by the PLC system is passed to the ground through LG and FG; therefore, the impedance should be as low as possible. Although the wires are used to reduce noise, they themselves carry a lot of noise. Using short wires can prevent the wires from acting as antennas.
- Twist the ground and the power cable together; the noise flowing through the power cable is then passed to the ground. The ground and the power cable do not need to be twisted if you install a filter on the power cable.



### C.1.3 Cables

#### Grounding a shielded cable

Cables drawn from the control box carry high-frequency noise. When they are outside of the control box, they are like antennas emitting noise. The cables connected to digital input/output modules, analog input/output modules, temperature measurement modules, network modules, and motion control modules should all be shielded cables to prevent the emission of noise. Using shielded cables also increases the resistance to external noise. You improve the resistance to noise if the signal cables that are connected to the digital input/output modules, analog input/output modules, temperature measurement modules, network modules, and motion control modules are all shielded cables that are grounded properly. If you do not use shielded cables or ground the shielded cables correctly, noise resistance will not improve. Make sure the shield of any connected cable contacts the control box. You must scrape any paint off of the control box at the contact point. All fastening must be metal, and the shield must contact the surface of the control box. Use washers to correct any unevenness or use an abrasive to level the surface.

Ground the shield of a shielded cable as close to a module as possible. Ensure that there is no electromagnetic induction between grounded cables.

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# Appendix D Maintenance and Inspection

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## D.1 Cautions

Observe the following precautions before performing maintenance and inspection. **Incorrect or careless operation will lead to injury or equipment damage.**



- To prevent a breakdown of an AS Series system or a fire, ensure that the ambient environment does not contain corrosive substances such as chloride gas, sulfide gas or flammable substances such as oil mist, cutting powder, or dirt.



- To prevent the connectors from oxidizing and to prevent electric shock, do not touch the connectors.



- To prevent electric shock, turn off the power before pulling the connectors or loosening the screws.



- To prevent cable damage, and to prevent the connectors from being loosened, do not put weight on the cables or pull on them.



- Ensure that the input voltage is within the rated range.



- To prevent product breakdown, fire, or injury, do not disassemble or alter the modules.

- To prevent a controlled element from malfunctioning, ensure that the program and parameters are written into a new CPU module before restarting the AS Series system.

- To prevent incorrect output or equipment damage, refer to the related manuals for more information about operating the modules.

- To prevent damage to the modules, touch grounded metal or wear an antistatic wrist strap to release static electricity from your body before working on a module.

- To prevent noise from causing system breakdown, keep a proper distance from the system when using a cell phone or communication device.

- Do not install an AS Series system in direct sun or in a humid environment.

- To prevent the temperature of an element from being too high, maintain a proper distance between the AS Series system and heat sources such as coils, heating devices, and resistors.

- To protect an AS Series system, install an emergency stop switch and an overcurrent protection device.

- Inserting and pulling a module several times can loosen the contact between the module and the backplane.

- To prevent an unexpected shock from resulting in damage to the AS Series system and a controlled element, ensure that the modules are correctly and firmly installed.

D.2 Daily Maintenance

To keep an AS series system operating normally, ensure that the ambient environment and the AS series system conform to the cautions listed in section D.1. You can then perform the daily inspection described below. If you find any problems, follow the solution and perform any necessary maintenance.

D.2.1 Required Inspection Tools

- A screwdriver
- Industrial alcohol
- A clean cotton cloth

D.2.2 Daily Inspection

| No. | Item                      | Inspection   | Criterion   | Remedy  |
|-----|---------------------------|--|---|---|
| 1   | Appearance                | Check visually.  | Dirt must not be present.   | Remove the dirt.                                |
| 2   | Installing of a backplane | Check whether the set screws are loose.  | The backplane must be installed firmly.   | Tighten the screws.                             |
|     |                           | Check whether the backplane is installed on the DIN rail properly.   |   | Install the backplane on the DIN rail properly. |
| 3   | Installing of a module    | Check whether the module is loose that the projection is inserted into the hole on the backplane, and that the screw is tightened. | The projection under the module must be inserted into the hole in the backplane, and the screw must be tightened. | Install the module firmly.                      |
| 4   | Connection                | Check whether the removable terminal block is loose.   | The removable terminal block must not be loose.   | Install the terminal block firmly.              |
|     |                           | Check whether the connector is loose.  | The connector must not be loose.  | Tighten the screws on the connector.            |

| No. | Item                                   |                         | Inspection   | Criterion   | Remedy   |
|-----|--|-------------------------|--|---|--|
| 5   | Power supply module                    | POWER LED indicator     | Check whether the POWER LED indicator is ON.                     | The POWER LED indicator must be ON.                             | Please refer to Chapter 12 for more information about troubleshooting. |
|     | CPU module                             | RUN LED indicator       | When the CPU module is running, check whether the RUN LED is ON. | The RUN LED indicator must be ON.                               |  |
|     |  | ERROR LED indicator     | Check whether the ERROR LED indicator is OFF.                    | The ERROR LED indicator must be OFF.                            |  |
|     |  | BUS FAULT LED indicator | Check whether the BUS FAULT LED indicator is OFF.                | The BUS FAULT LED indicator must be OFF.                        |  |
|     |  | SYSTEM LED indicator    | Check whether the SYSTEM LED indicator is OFF.                   | The SYSTEM LED indicator must be OFF.                           |  |
|     | LED indicators on an extension module* |                         | Check whether the LED indicators on the extension module are ON. | If the LED indicators are ON, the module is operating normally. |  |

\* Please refer to the Module Manual for more information related to the LED indicators on the extension modules.

## D.3 Periodic Maintenance

In addition to daily inspection, you should perform periodic maintenance depending on the actual operating environment. After making sure that the ambient environment and the AS Series system conform to the cautions listed in Section D.1, perform the periodic inspection described below. If you find any problems, follow the solution and perform any necessary maintenance.

### D3.1 Required Inspection Tools

- A screwdriver
- Industrial alcohol
- A clean cotton cloth
- A multimeter
- A thermometer
- A hygrometer

### D.3.2 Periodic Inspection

| No. | Item                 |                              | Inspection   | Criterion  | Remedy   |
|-----|----------------------|------------------------------|--|--|--|
| 1   | Ambient environment  | Ambient temperature/humidity | The ambient temperature and the ambient humidity are measured by a thermometer and a hygrometer. | The ambient temperature and the ambient humidity must conform to the specifications for the modules or the backplane. If the specifications are different, the strictest specifications have priority. | To ensure that the system operates in a stable environment, determine why the environment varies, and resolve the issue. |
|     |                      | Atmosphere                   | Measure corrosive gas.   | Corrosive gas must not be present.   |  |
| 2   | Supply voltage       |                              | Measure the AC power supply.   | The power supply should meet the specifications for the power supply module.   | Check the power supply.  |
| 3   | Installation         | Looseness                    | Check whether the module is loose.   | The module must be installed firmly.   | Please refer to Chapter 4 for more information on installing the module.   |
|     |                      | Adhesion of dirt             | Check the appearance.  | Dirt must not be present.  | Remove the dirt.   |
| 4   | Connection           | Looseness of terminal screws | Tighten the screws with a screwdriver.   | The screws must not be loose.  | Tighten the screws.  |
|     |                      | Looseness of connectors      | Pull the connectors.   | The connectors must not be loose.  | Tighten the screws on the connectors.  |
| 5   | PLC system diagnosis |                              | Check the error logs.  | No new error occurs.   | Please refer to section 12.1.3 for more information.   |

| No. | Item              | Inspection  | Criterion   | Remedy  |
|-----|-------------------|---|---|---|
| 6   | Maximum scan time | Check the states of SR413 and SR414 through the device monitoring table in ISPSOft. | The maximum scan cycle must be within the range specified in the system specifications. | Determine why the scan time exceeds specifications. |