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AS Series Module Manual





AS Series Module Manual Revision History

| Version | Revision | Date |
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| 1 st | The first version was published. | 2016/11/30 |
| | Chapter 1: Added information concerning new models | |
| | AS08AD-B and AS08AD-C. | |
| | 2. Chapter 2: Added information concerning new models | |
| | AS08AD-B andAS08AD-C. | |
| | 3. Chapter 3: Updated information concerning CR#23-24 | |
| | and software new screenshots. | |
| | 4. Chapter 4: Updated information concerning CR#35- | |
| 2 nd | 54/CR#210-225 and software new screenshots. | 2017/07/07 |
| | 5. Chapter 5: Updated information concerning CR#1- | |
| | 4/CR#210-217 and software new screenshots. | |
| | 6. Chapter 6: Updated information concerning CR#210- | |
| | 217 and software new screenshots. | |
| | 7. Chapter 7: Updated information concerning theoretical | |
| | calibration and software new screenshots 8. Chapter 8: Updated information concerning new FW2.0. | |
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| | AS06RTD-A and AS08TC-A and installation information | |
| | updated in section 1.3.1. | |
| 3rd | Chapter 5: Added information concerning new model | 2018/02/09 |
| | AS06RTD-A. | 2010/02/00 |
| | 3. Chapter 6: Added information concerning new models | |
| | AS08TC-A. | |
| | 1. Chapter 1: Added information concerning ambient air | |
| | temperature-barometric pressure-altitude. | |
| | 2. Chapter 2: Added information concerning filter average, | |
| | cable length and resistance. Updated section 2.2.4 | |
| | CR#23-38 and section 2.2.5 CR#43-74. | |
| | 3. Chapter 3: Added information concerning cable length | |
| | and resistance. Updated section 3.2.1 analog to digital conversion range, output impedance and section 3.2.4 | |
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| | Chapter 4: Added information concerning filter average, | |
| | cable length and resistance. Updated section 4.2.1 | |
| | analog to digital conversion range, output impedance | |
| 4 th | and 4.2.4 CR#31-21. | 2018/11/26 |
| | 5. Chapter 5: Updated section 5.2.1 JPt100 range, section | |
| | 5.2.4-5.2.5 added notes on CR, updated section 5.2.6 | |
| | PID information, revised section 5.2.7 control mode. | |
| | 6. Chapter 6: Section 6.2.1 revised type B range, added a | |
| | note, section 6.2.4-6.2.5 added notes on CR, revised | |
| | CR# for the records, updated section 6.2.6 PID | |
| | information and revised section 6.2.7 control mode. | |
| | 7. Chapter 7: Section 7.2.4 added notes on CR. | |
| | 8. Chapter 8: New functions in new FW2.02. | |
| | 9. Chapter 9: Updated section 9.2.5 output impedance | |
| | information and added sections 9.2.7.1-9.2.7.9 for new functions added and operational examples. | |
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| | 1 Chanter 7: Revised contents at CP#0 and #50 in | |
| 5 th | 1. Chapter 7: Revised contents of CR#0 and #59 in section 7.2.4 | 2019/1/20 |
| 5 th | Chapter 7: Revised contents of CR#0 and #59 in section 7.2.4. Chapter 8: Deleted a note in section 8.6.4. | 2019/1/29 |

| Version | Revision | Date |
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| 7 th | Chapter 1: Added model information including AS02PU-A, AS04PU-A, AS02HC-A, AS04SIL-A and AS-FPFN02 Chapter 2: Updated section 2.2.1 specification, 2.2.4 and 2.2.5 CR table, and 2.4 adding a new error code. Chapter 3: Updated section 3.2.4 CR table and 3.4 adding a new error code. Chapter 4: Updated section 4.2 specification, 4.2.4 CR table and 4.4 adding a new error code. Chapter 5: Updated section 5.2 specification, 5.2.4 and 5.2.5 CR table, and 5.4 adding a new error code. Chapter 6: Updated section 6.2.4 and 6.2.5 CR table. Added DMPID instruction supporting firmware versions and section 6.4 adding a new error code. Chapter 7: Updated section 7.2.4 and 7.2.5 CR table and 7.5 adding a new error code in section 8.7.2.2. Chapter 8: Added a new error code in section 8.7.2.2. Chapter 9: Updated AS-F2AD specifications in sections 9.2.4 and 9.2.5. Deleted SM1110 and SR1540 in section 9.2.7. Added AS-FPFN02 information in sections 9.2.8 and 9.3.5. Chapter 11: New chapter introducing positioning modules AS02BIL A and AS04BIL A | 2019/11/29 |
| 8 th | modules AS02PU-A and AS04PU-A. Chapter 1: Updated section 1.1 to include software information for new AX series PLC, updated AS02HC-A specifications and added AS-FOPC02 information. Added an installation note in section 1.3.4. Chapter 2: New chapter introducing digital input/output modules. Chapter 3 – 7: Added DIADesigner+ and Hardware Configuration information. Chapter 8: Updated CR#120 default value and input values 100 to 105 of CR200 command set in section 8.2.4. Chapter 9: Added AS-FPEN02 and AS04SIL-A information, added LED indicator information of EtherNet/IP in section 9.4.2, and added error LED indicator information of AS00SCM-A in section 9.7.2.2. Chapter 10: Updated software images in section 10.2.7 and 10.2.7.2, updated section 10.2.7.7, added AS-FPFN02 installed on AS00SCM-A information in section 10.2.8, added AS-FOPC02 product information in sections 10.2.9 and 10.3.6, updated LED indicator information of AS-FEN02 in section 10.3.4. Chapter 12: Updated response time and input isolation specifications in section 12.2.1. Chapter 13: New chapter introducing IO link communication module, AS04SIL-A. Chapter 14: New chapter introducing high speed counter modules AS02PU and AS04PU. | 2020/04/30 |
| 9 th | Chapter 1: Updated AS02/04PU-A module descriptions Chapter 3-8: Added DIADesigner-AX software operation Chapter 9: Updated sections 9.7.2.2 and 9.7.2.3 AS00SCM Error LED Indicators Chapter 10: Deleted EtherNet/IP Adapter information in section 10.2.9. | 2020/10/30 |

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| | 5. Chapter 13: Added filter time in section 13.2.1 and added 13.3.2.5 Application-specific API for Communications of IO-Link Devices. 6. Chapter 14: Added the process images of the Timing to Count in section 14.2.5 Pulse Input Counting. | |
| 10 th | Chapter 1: Added new product information for AS02ADH-A and AS-FFTP01. Chapter 6: Added Maximum Measurable Range in functional specifications and Conversion Details in section 6.21. Added a label description in profile in section 6.22. Chapter 7: Added more applicable sensor types in, including C, U, L and TXK. Added Conversion Details in section 7.2.1. Added a label description in Profile in section 7.2.2 Added compatible firmware versions and more descriptions on control mode in section 7.2.7. Chapter 8: Added Weight in functional specifications in section 8.2.1. Added a label description in Profile in section 8.2.2. Added new CRs, CR#400 to #479 in section 8.2.4. Added a new illustration for zero point tracking in section 8.2.5. Updated the software images in section 8.3.2, 8.3.3 and 8.4. Added troubleshooting for diver board failure in section 8.6.2. Chapter 9: Updated Introduction and added applicable PLC CPU for AS00SCM-A in RTU mode in section 9.1. Updated Knob Function in section 9.2.3. Updated Modbus information and added software images in sections 9.3.1, 9.3.1.1 and 9.3.1.2. Updated UD Link information, added software images in section 9.4.2. Added more descriptions for SCMSoft in section 9.3.2. Added more descriptions and example for applications of AS00SCM-A in RTU mode in section 9.4.2. Deleted software image from manufacturer R in section 9.4.2. Added Network Security information in section 9.4.2. Deleted software image from manufacturer R in section 9.4.2. Added Peatures in section 10.2.7.2. Added a new section for IP Setting in section 10.2.7.2. Added a new section for IP Setting in section 10.2.7.4. Updated information in Data Mapping through EtherNet/IP Adapter in section 10.2.7.6. Updated software images (from manufacturer R) and descriptions in Example of Connecting to 3rd Party PLC Scanner through EIP Builder in section 10.2.7.7. Updated supported firmware and software versions in section 10.2.8.1. Updated Features in section | 2021/08/20 |

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| | information in Configuring the Data Length for I/O | |
| | Module (Works with AS300) in section 10.2.8.4. Updated | |
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| | features for AS-FOPC02 in section 10.2.9.2. Added | |
| | Modbus TCP Specifications and OPC UA Specifications | |
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| | Slave information in section 10.2.9.6. Added Network | |
| | Security information in section 10.2.9.7. Added The | |
| | Copyright Information about the Used External Software | |
| | Sources in 10.2.9.8. Added a new section 10.2.10 for | |
| | AS-FFTP01. Updated AS-FPFN02 LED information in | |
| | section 10.3.5. | |
| | 7. Chapter 12: Updated information in Special Features in | |
| | section 12.2.4. Updated software images in section 12.3. | |
| | 8. Chapter 13: Updated AS PLC CPU firmware version in | |
| | section 13.1. Updated application-specific API | |
| | information in section 13.3.2.5. Updated 16#FF21~ | |
| | 16#FF25 in IO-Link Event Code table in section 13.5. | |
| | 9. Chapter 14: Updated the receiving data length to 32 bits | |
| | in section 14.1.1. Move the input/output information to | |
| | section 14.3. Updated software images in section 14.4. | |
| | 10.Chapter 15: Added a new chapter for High-speed analog | |
| | module AS02ADH. | |

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Chapter 1 Introduction

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1.1 Overview

This manual introduces the use of special modules. The special modules are the analog input/output modules, temperature measurement modules, load cell modules, and network modules. For software operation, you need to use ISPSoft, if you are using AS Series PLC CPU. Refer to ISPSoft User Manual for more information. The new software DIADesigner-AX only supports AX Series PLC CPU and AS Series modules now, refer to AX-3 User Manual for more information on software operation. Refer to Section 1.1.2 of AX-3 Operation Manual for more information on modules that are supported for AX-3 Series PLC.

The following table shows the module descriptions.

| Classification | Model Name | Description |
|---------------------|---------------|---|
| | | 4-channel analog input module |
| | A CO 4 A D. A | Hardware resolution: 16 bits |
| | AS04AD-A | 0–10 V, 0/1–5 V, -5 to +5 V, -10 to +10 V, 0/4–20 mA, -20 to +20 mA |
| | | Conversion time: 2 ms/channel |
| | | 8-channel analog input module |
| | AS08AD-B | Hardware resolution: 16 bits |
| | ASUGAD-B | 0–10 V, 0/1–5 V, -5 to +5 V, -10 to +10 V |
| | | Conversion time: 2 ms/channel |
| | | 8-channel analog input module |
| | AS08AD-C | Hardware resolution: 16 bits |
| Analog | A300AD-C | 0/4-20 mA, -20 to +20 mA |
| Analog input/output | | Conversion time: 2 ms/channel |
| module | | 4-channel analog input module |
| module | AS04DA-A | Hardware resolution: 12 bits |
| | A304DA-A | -10 to +10 V, 0–20 mA, 4–20 mA |
| | | Conversion time: 2 ms/channel |
| | | 4-channel analog input module |
| | AS06XA-A | Hardware resolution: 16 bits |
| | | 0–10 V, 0/1–5 V, -5 to +5 V, -10 to +10 V, 0/4–20 mA, -20 to +20 mA |
| | | Conversion time: 2 ms/channel |
| | | 2-channel analog input module |
| | | Hardware resolution: 12 bits |
| | | -10 to +10 V, 0–20 mA, 4–20 mA |
| | | Conversion time: 2 ms/channel |
| | | 4-channel, 2-wire/3-wire RTD |
| | | Sensor type: Pt100 / Ni100 / Pt1000 / Ni1000 / JPt100 / LG-Ni1000 / |
| | AS04RTD-A | Cu50 / Cu100 / 0–300Ω / 0–3000Ω input impedance |
| | | Resolution: 0.1°C/0.1°F (16 bits) |
| | | Conversion time: 200 ms/channel |
| | | 6-channel, 2-wire/3-wire RTD |
| | | Sensor type: Pt100 / Ni100 / Pt1000 / Ni1000 / JPt100 / LG-Ni1000 / |
| Temperature | AS06RTD-A | Cu50 / Cu100 / 0–300 Ω / 0–3000 Ω input impedance |
| measurement | | Resolution: 0.1°C/0.1°F (16 bits) |
| module | | Conversion time: 200 ms/channel |
| | | 4-channel thermocouple |
| | AS04TC-A | Sensor type: J, K, R, S, T, E, N, B, and -100 to +100 mV |
| | | Resolution: 0.1°C/0.1°F (24 bits) |
| | | Conversion time: 200 ms/channel |
| | | 8-channel thermocouple |
| | AS08TC-A | Sensor type: J, K, R, S, T, E, N, B, and -100 to +100 mV |
| | | Resolution: 0.1°C/0.1°F (24 bits) |

| Classification | Model Name | Description |
|------------------------------------|----------------------------|--|
| Classification | Wiodel Hairie | Conversion time: 200 ms/channel |
| Load cell module | AS02LC-A | 2-channel, 4-wire/6-wire load cell sensor Eigenvalue applicable to a load cell: 1, 2, 4, 6, 20, 40, 80 mV/V Highest accuracy: 0.04% of full-scale ADC Resolution: 24 bits Conversion time: 2.5–400 ms (nine options to choose from) |
| | AS02PU-A | 2-axis positioning control 5-24 VDC, 1 (A/B/Z phase) differential input, hardware maximum bandwidth for input: 200 kHz; 24 VDC, 5 mA, 5 external inputs, hardware maximum bandwidth for input: 1 kHz; 5 VDC, 2-axis (4 points) high-speed differential outputs, maximum bandwidth for output: 200 kHz; |
| Positioning / counter module | AS04PU-A | 4-axis positioning control 24 VDC, 5mA, 6 inputs, hardware maximum bandwidth for input: 1 kHz; 5-30 VDC, 0.1A, 4-axis (8 points) NPN output, maximum bandwidth for output: 100 kHz; |
| | AS02HC-A | 2-channel high-speed counters Input methods for the 2-channel are pulse-input (max. at 200 kHz) and SSI communication interface input (max. at 1.25 MHz) Incrementing / decrementing encoder input 4-point high-speed open collector output, 5-30 VDC, 0.1A, |
| Network | AS00SCM-A | work with high speed differential output Serial communication module, 2x communication ports, applicable to communication cards, supporting MODBUS protocols |
| module | AS01DNET-A | DeviceNet communication port, functioning as master or slave |
| | AS04SIL-A | IO-Link module, built-in with 4 IO-Link communication ports |
| | AS00SCM-A + AS-FCOPM | Network module with AS-FCOPM function cards |
| Remote I/O module | AS00SCM-A + AS-FEN02 | Network module with AS-FEN02 function cards |
| | AS01DNET-A (RTU) | DeviceNet remote IO slave, its right side connectswith AS Series extension modules, including digital modules, analog modules, temperature modules, etc. |
| | 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 |
| Function | AS-F2AD | 2-channel analog input, 0–10 V (12 bits), 4–20 mA (11 bits), Conversion time: 3 ms/channel |
| cards | AS-F2DA | 2-channel analog input, 0–10 V, 4–20 mA (12 bits), Conversion time: 2 ms/channel |
| | AS-FEN02 | 2x Ethernet ports, supporting data exchange, supporting MODBUS TCP, EtherNet/IP Adapter, AS Series remote control, and DLR function |
| | AS-FPFN02 | 2x Ethernet ports, supporting data exchange, supporting PROFINET Device (adapter) |
| | AS-FOPC02 | 2x Ethernet ports, supporting data exchange, supporting OPC UA Server, only available for AS300 Series PLC CPU |

1.2 Specifications

1.2.1 General Specifications

| Item | Specifications |
|--|---|
| Operating temperature | -20 to +60°C |
| Storage temperature | -40 to +80°C |
| Operating humidity | 5–95% |
| | No condensation |
| Storage humidity | 5–95% |
| | No condensation |
| Work environment | No corrosive gas |
| Installation location | In a control box |
| Pollution degree | 2 |
| Ingress protection | ID00 |
| (IP ratings) | IP20 |
| EMC (electromagnetic compatibility) | Refer to Chapter 7 for more information. |
| | Tested with: |
| | 5 Hz \leq f \leq 8.4 Hz, constant amplitude 3.5 mm |
| Vibration resistance | 8.4 Hz \leq f \leq 150 Hz, constant acceleration 1 g |
| | Duration of oscillation: 10 sweep cycles per axis on each direction of the three mutually perpendicular axes |
| | International Standard IEC 61131-2 & IEC 60068-2-6 (TEST Fc) |
| | Tested with: |
| | Half-sine wave |
| Shock resistance | Strength of shock: 15 g peak value, 11 ms duration |
| | Shock direction: The shocks on each direction per axis, of the three mutually perpendicular axes (for a total of 18 shocks) |
| | International Standard IEC 61131-2 & IEC 60068-2-27 (TEST Ea) |
| Safety | Conforms to IEC 61131-2, UL508 |
| Ambient air temperature-barometric pressure-altitude | Operating: 1080 ~ 795hPa (-1000 ~ 2000 m) Storage:1080 ~ 660hPa (-1000 ~ 3500 m) |

1.2.2 EMS Standards

1.2.2.1 EMI

| Port | Frequency Range | Level (Normative) | Reference Standard |
|----------------|-----------------|--------------------------|--------------------|
| Enclosure port | 30-230 MHz | 40 dB (μV/m) quasi-peak | |
| (radiated) | | | |
| (measured at a | 230-1000 MHz | 47 dB (u)//m) guasi poak | |
| distance of 10 | 230-1000 MH2 | 47 dB (μV/m) quasi-peak | |
| meters) | | | IEC 61000-6-4 |
| | 0.15-0.5 MHz | 79 dB (μV) quasi-peak | |
| AC power port | 0.15-0.5 MHZ | 66 dB (μV) average | |
| (conducted) | 0.5-30 MHz | 73 dB (µV) quasi-peak | |
| | 0.5-30 WHZ | 60 dB (μV) average | |

1.2.2.2 EMS

| Environmental Phenomenon | Reference Standard | Test | | Test Level | |
|-----------------------------|-----------------------------|----------------|-------------|-------------|-------|
| Electrostatic | IEC 61000-4-2 | Contact | | ±4 kV | |
| Discharge | 1EC 61000-4-2 | Air | | ±8 kV | |
| Radio Frequency | agnetic Field IEC 61000-4-3 | 80% AM, | 2.0-2.7 GHz | 1 V/m | |
| Electromagnetic Field | | nagnetic Field | 1 kHz | 1.4-2.0 GHz | 3 V/m |
| Amplitude Modulated | | sinusoidal | 80-1000 MHz | 10 V/m | |
| Power Frequency | | | Hz | 30 A/m | |
| Magnetic Field | IEC 61000-4-8 | 50 Hz | | 30 A/m | |



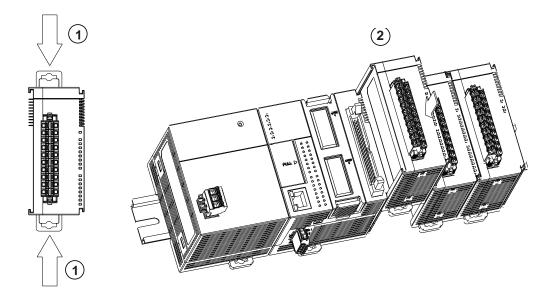
1.2.2.3 Conducted Immunity Test

| 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 |
| Data communication | Unshielded cable | 1 kV | 1 kV CM | 10 V |
| | AC I/O (unshielded) | 2 kV | 2 kV CM | 10 V |
| | | | 1 kV DM | |
| Digital and analog I/O | Analog or DC I/O (unshielded) | 1 kV | 1 kV CM | 10 V |
| | All shielded lines (earth) | 1 kV | 1 kV CM | 10 V |
| | AC power | 2 kV | 2 kV CM 1 kV DM | 10 V |
| Equipment power | DC power | 2 kV | 0.5 kV CM 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 1 kV DM | 10 V |
| | DC I/O and DC auxiliary power | 2 kV | 0.5 kV CM 0.5 kV DM | 10 V |

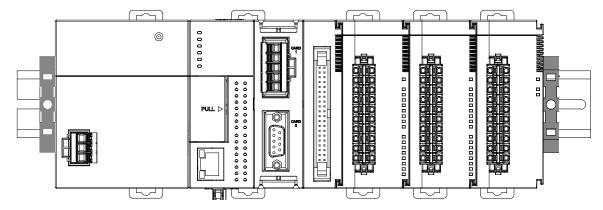
1.3 Installation

1.3.1 Installing a Module

- 1. Push 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.



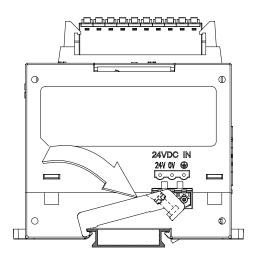
If there is a vibration source near the installation site, install anti-vibration baffles on the sides of the AS Series modules for better stabilization, such as the gray baffles show below.



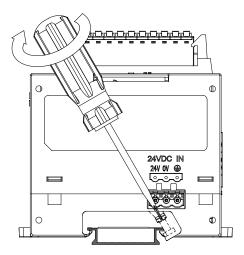


Install the baffles:

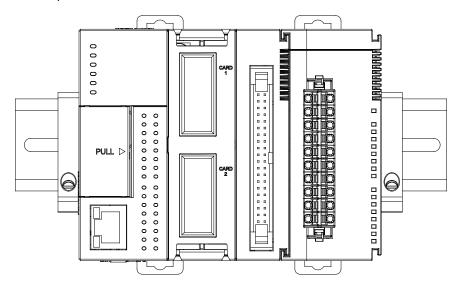
1. Hook the baffle onto the DIN rail and press it down as the directional arrow shows below.



2. Use screws to secure the baffle.



3. The completed baffle installation is as shown below.

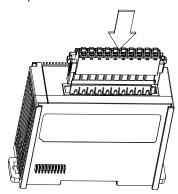


1.3.2 Installing a Removable Terminal Block

Install a removable terminal block on the module as illustrated below.

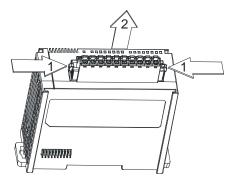
Installation

Align the terminal block at the port, and press it into the CPU.



Removal

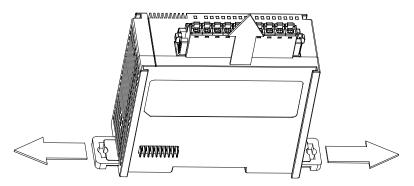
Push the clips inward as the arrow 1 shown to release the terminal block and then pull it up as the arrow 2 shown.



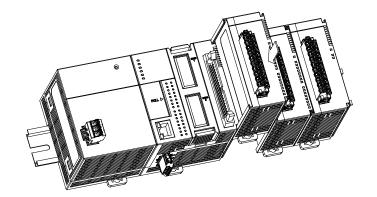


1.3.3 Changing a Module

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



- 2. Remove the module.
- 3. Slide the new module in as shown below.

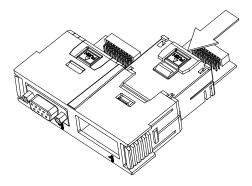


1.3.4 Installing and Removing an Extension Card

Installation

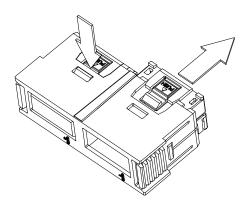
Push the extension card into the extension card slot until you hear a click.

Note: before the installation begin, you need to check if the pin arrangement and appearance are normal. If there is any bent or missing pin, you need to change to a new card. You should also check the PLC card slot to make sure everything is ok.



Removal

Press the tab labeled PUSH to release the extension card, and then remove the extension card.



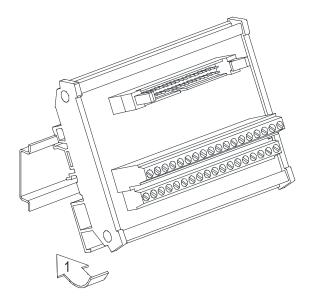


1.3.5 Installing a Wiring Module

Connect a communication cable to the port on a CPU module, and make sure that the connector of the cable is properly seated in the port.

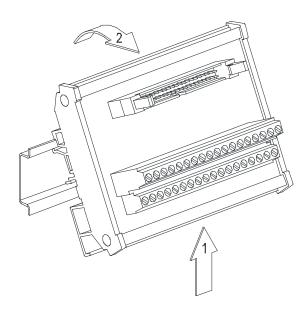
Installation

- 1. Firmly seat one side of the wiring module first.
- 2. Press the driver board in the direction indicated by arrow 1, and make sure that the groove is attached to 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.



Chapter 2 Digital Input/Output Modules

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2.1 Digital Input/Output Module Specifications

2.1.1 General Specifications

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

| Module name | | 08AM10N -A | 16AM10N -A | 32AM10N -A | 64AM10N -A | 16AP11R A | 16AP11T -A | 16AP11P -A | |
|-------------------------|-----------|--|---------------|---------------|----------------------------------|--------------|---------------|---------------|--|
| Number of in | puts | 8 | 16 | 32 | 64 | 8 | 8 | 8 | |
| Connector type | | | ole terminal | MIL co | MIL connector Removable terminal | | | al block | |
| Input type | | | | | Digital inpu | t | | | |
| Input form | | | | Direct curre | ent (sinking | or sourcing | j) | | |
| Input voltage | / current | 24 | 4 VDC · 5 r | 24 VDC | | | | mA | |
| Input impeda | nce | | 4.7 k Ω | | 7.5k Ω | | 4.7 k Ω | | |
| Action level | OFF→ON | | >15 VDC | | | | | | |
| Action level | ON→OFF | <5 VDC | | | | | | | |
| Response | OFF→ON | < 20 us | | | | | | | |
| time | ON→OFF | < 200 us | | | | | | | |
| Software filte | r 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. Note: CPU scan time also affects the maximum input frequency. | | | | | <u>.</u> . | | |
| Input signal | | Voltage input Sinking: The inputs are NPN transistors whose collectors are open collectors. Sourcing: The inputs are PNP transistors whose collectors are open collectors. | | | | | | | |
| Input Isolation | | 500 VDC | | | | | | | |
| 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 | |

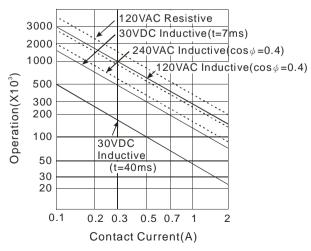
Electrical specifications for the outputs on a digital input/output module

| | 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 | | | | Remova | able term | inal block | < | | |
| Output type | | | | | D | igital out | put | | | |
| Output forn | Output form | | Relay-R | ! | Trans | istor-T (s | inking) | Transistor-P (sourcing) | | |
| Voltage/ current | | 240 | VAC/24 ' | VDC | 5-30 VDC | | 5-30 VDC | | | |
| Leakage cu | Leakage current | | 0uA | | <10uA | | <250uA (@V1.00A0) <10uA (@V1.00A1) | | | |
| | Resistance | 2A/output, 8A/COM | | 0.5A/c | output, 4A | V/COM | 0.5A/c | output, 4A | VCOM | |
| Maximum | Inductance | Life cycle curve*2 | | 12 W (24 VDC) | | 12 W (24 VDC) | | | | |
| load | Bulb | 20 W (24 VDC) 100 W (230 VAC) | | 2 W (24 VDC) | | 2 W (24 VDC) | | | | |
| Maximum | Resistance | | 1 Hz | | | 100 Hz | | | 100 Hz | |

| | 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 |
| output | Inductance | | 0.5 Hz | | | 0.5 Hz | | | 0.5 Hz | |
| frequency*1 | Bulb | 1 Hz | | | 10 Hz | | 10 Hz | | | |
| | OFF→ON | | 10 ms | | | 0.5 ms | | | 0.5 ms | |
| Maximum Response time | ON→OFF | | 10 ms | | | 0.5 ms | | | 0.5 ms | |
| Output Isolation | | | 1350 VAC | | | | 500 | VDC | | |
| Weight | | 120 g | 158 g | 138 g | 100 g | 122 g | 120 g | 100 g | 123 g | 120 g |

| Item | Model | 32AN02T-A | 64AN02T-A | | | | | |
|-----------------|------------|-----------------------|-------------|--|--|--|--|--|
| Number of o | outputs | 32 | 64 | | | | | |
| Connector t | уре | MIL connector | | | | | | |
| Output type | • | Digital output | | | | | | |
| Output form | 1 | Transistor- | T (sinking) | | | | | |
| Output volta | age | 5–30 | VDC | | | | | |
| Leadage cu | rrent | <10uA | | | | | | |
| | Resistance | 0.1A/output, 3.2A/COM | | | | | | |
| Maximum load | Inductance | N/A | | | | | | |
| load | Bulb | N/A | | | | | | |
| Maximum | Resistance | 100 Hz | | | | | | |
| output | Inductance | N/A | | | | | | |
| frequency*1 | Bulb | N/A | | | | | | |
| Maximum | OFF→ON | | | | | | | |
| Response time | ON→OFF | 0.5 ms | | | | | | |
| Output Isola | ation | 500 VDC | | | | | | |
| Weight | | 100 g 142 g | | | | | | |

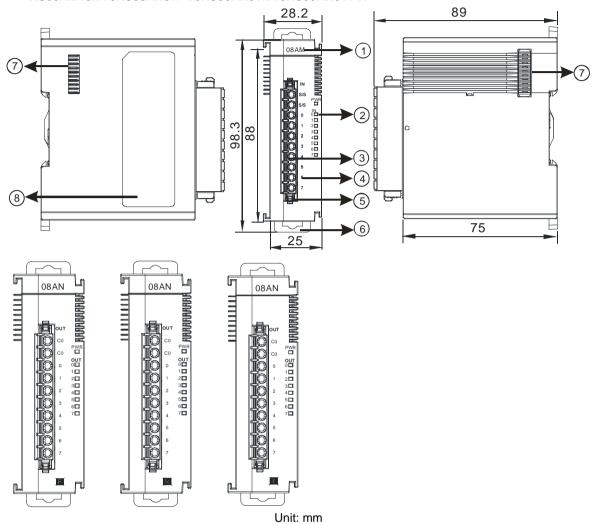
- *1: The scan cycle affects the frequency.
- *2: The life cycle curve is shown below.





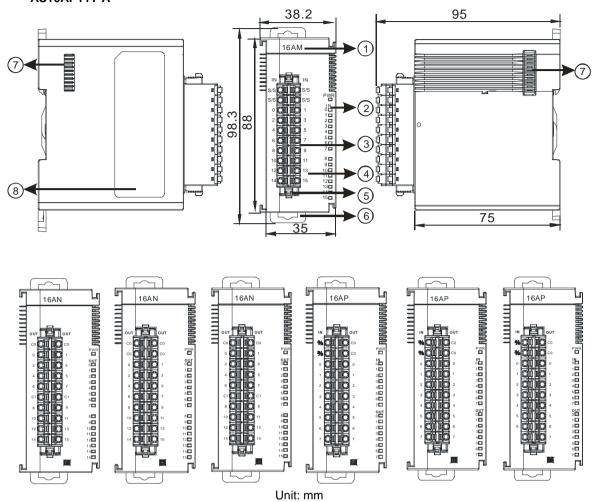
2.1.2 Digital Input/Output Module Profiles

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



| Number | Name | Description |
|--------|---|--|
| 1 | Model name | Model name of the module |
| 2 | Input/output LED indicator | If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON. |
| 3 | Removable terminal block | The inputs are connected to sensors. The outputs are connected to loads 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 |

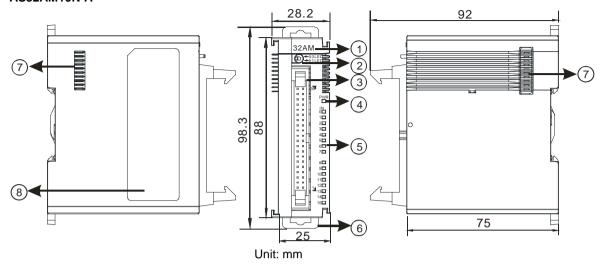
AS16AM10N-A/AS16AN01P-A/AS16AN01R-A/AS16AN01T-A/AS16AP11P-A/AS16AP11R-A/AS16AP11T-A



| Number | Name | Description |
|--------|---|---|
| 1 | Model name | Model name of the module |
| 2 | Input/Output LED indicator | If there is an input signal, the input LED indicator is ON. If there is an output signal, the output LED indicator is ON. |
| 3 | Removable terminal block | The inputs are connected to sensors. The outputs are connected to loads 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 |

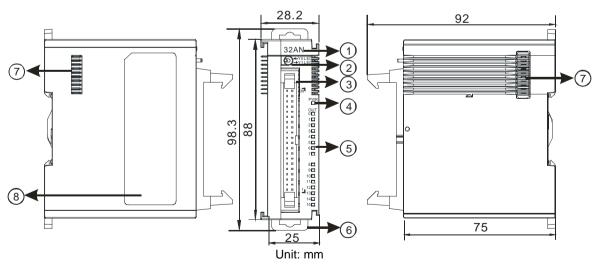


AS32AM10N-A



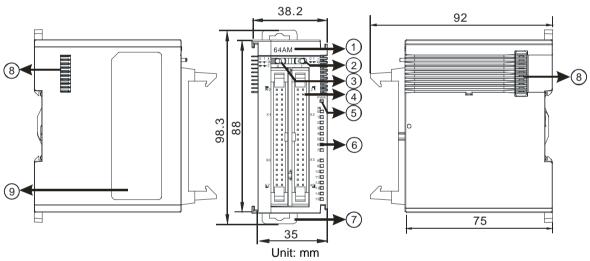
| Number | Name | Description |
|--------|-------------------------------|---|
| 1 | Model name | Model name of the module |
| 2 | X0/X1 LED Indicator switch | Switches the LED indicators to their represented inputs. |
| 3 | ML connector | For the external I/O connecting cables UC-ET010-24B, UC-ET020-24B, 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 |

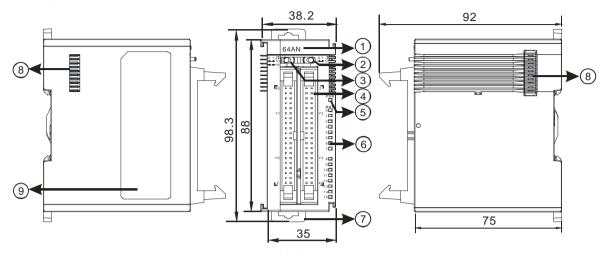
• AS64AM10N-A



| 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

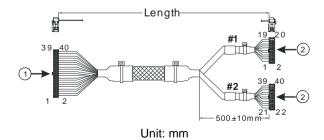


Unit: mm

| 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 |

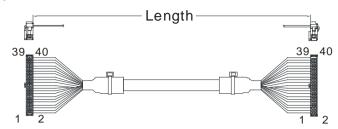
• ML connector, extension cable, and wiring modules

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 |

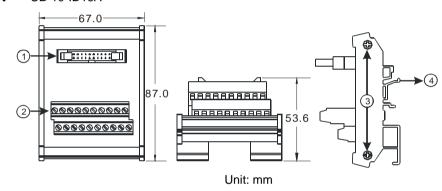
2. I/O connecting cables UC-ET010-24B (1M) / UC-ET020-24B (2M) / UC-ET030-24B (3M)



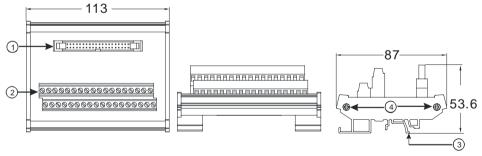
| Number | Name | Description |
|--------|---------------------|---|
| 1 | IDC 40-pin terminal | Connects an external terminal module and a wiring module UB-10-ID32A, and UB-10-OT32A |

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

♦ UB-10-ID16A



♦ UB-10-ID32A

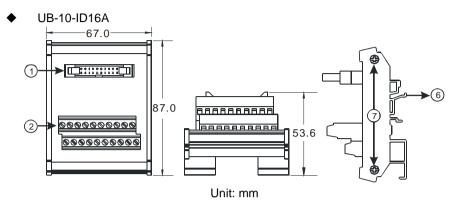


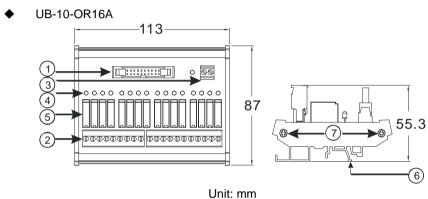
Unit: mm

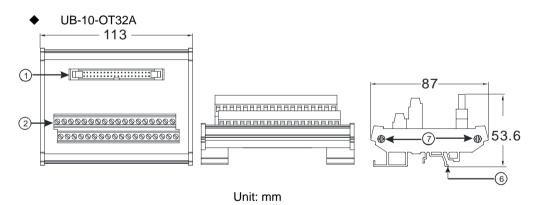
| Number | Name | Description |
|--------|---|---|
| 1 | UB-10-ID16A: 20-pin ML connector UB-10-ID32A: 40-pin ML connector | Connects the external terminal module and a wiring module |
| 2 | Terminals | Input/Output terminals for wiring |
| 3 | Clip | Hangs the external terminal module on a DIN rail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

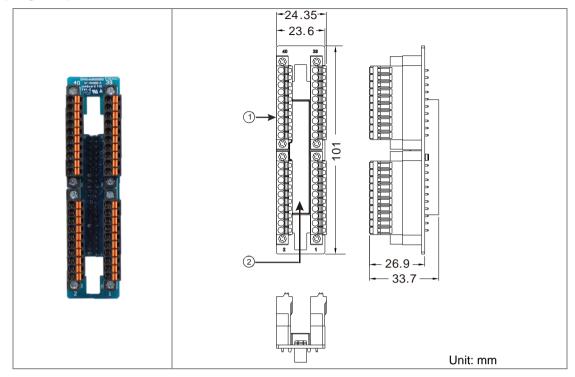






| Number | Name | Description |
|--------|---|---|
| 1 | UB-10- ID16A /OR16A: 20- pin ML connector UB-10-OT32A: 40-pin ML connector | Connects the external terminal module and a wiring module |
| 2 | Terminals | Input/Output terminals for wiring |
| 3 | 2-pin power input terminal | Power input terminal 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 |

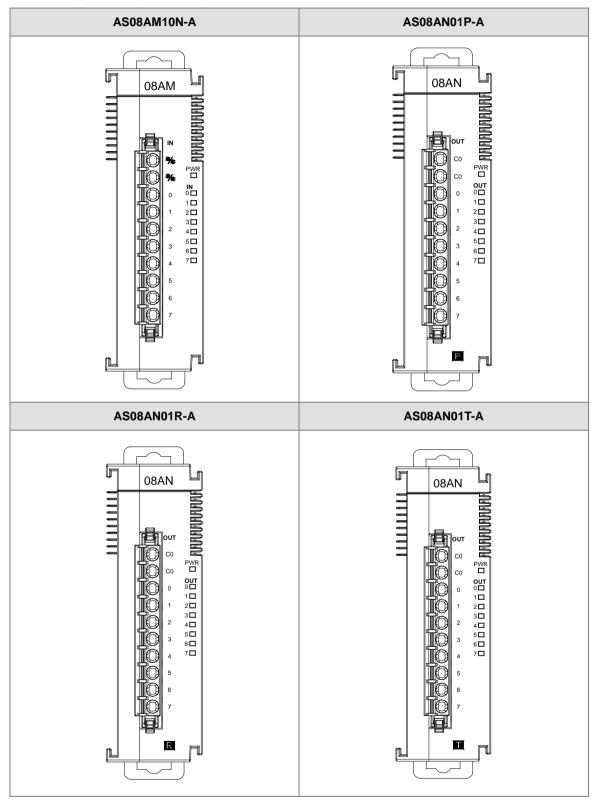
Spring clamp/MIL connector terminal block UB-10-IO32D for AS32AM10N-A/AS32AN02T-A

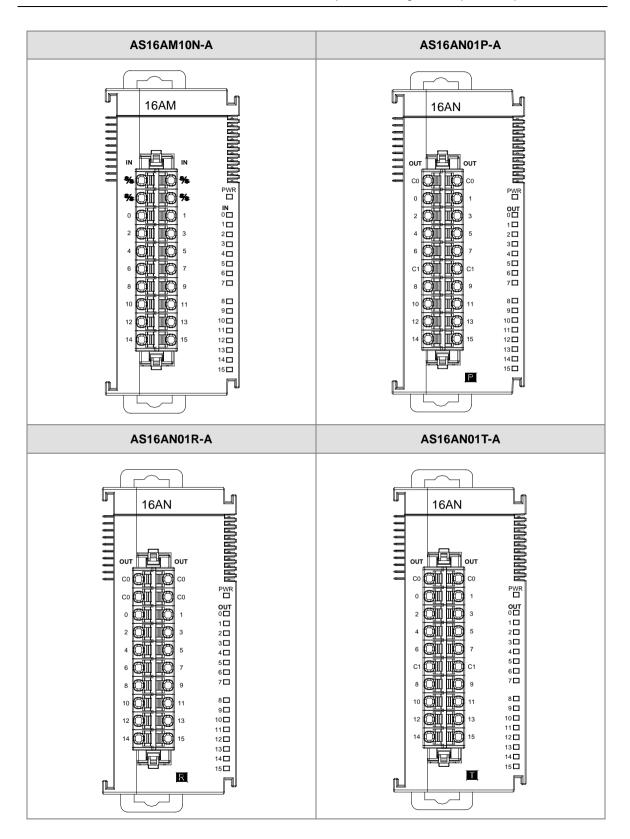


| Number | Name | Description |
|--------|---------------------------|---|
| 1 | Terminal block for output | Terminal block |
| 2 | 40-pin MIL connector | Connects the module and the wiring module |

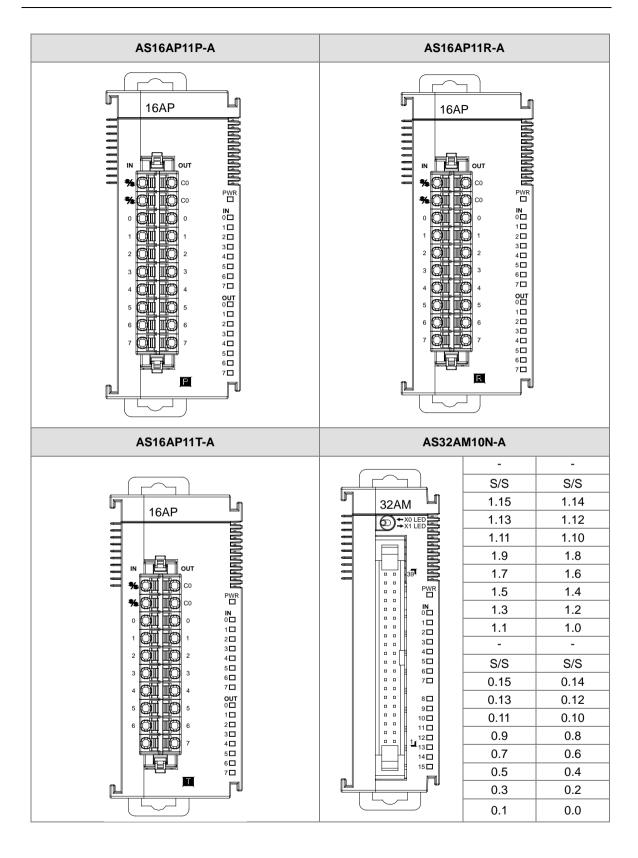


2.1.3 Digital Input/Output Module Terminals









2.1

2.3

2.5

2.7

2.9

2.11

2.13

2.15

S/S

-

3.1

3.3

3.5

3.7

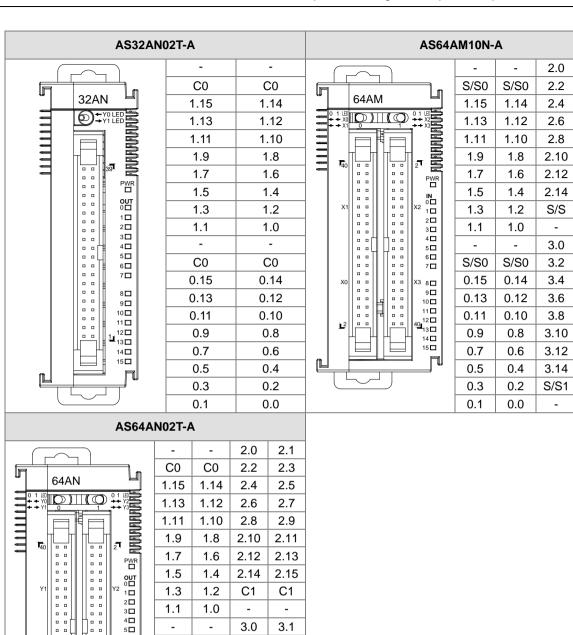
3.9

3.11

3.13

3.15

S/S1



6 **□** 7 **□**

/3 8□ 9□

10 🗖 11 🗖

o₁₂□ 13□

14 🗖 15 🗖 C0

0.15

0.13

0.11

0.9

0.7

0.5

0.3

0.1

C0

0.14

0.12

0.10

8.0

0.6

0.4

0.2

0.0

3.2

3.4

3.6

3.8

3.10

3.12

3.14

C1

3.3

3.5

3.7

3.9

3.11

3.13

3.15

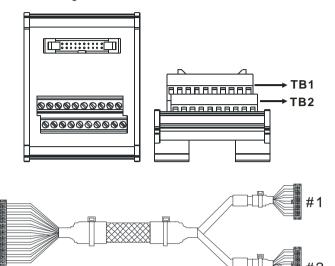
C1



• ML connector and the wiring module

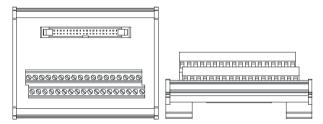
1. AS32AM10N-A/AS64AM10N-A

◆ 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 | - | | | | |
| #2 | 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

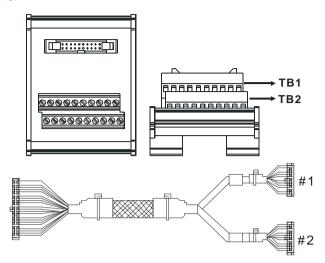


AS series terminals:

| 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 | 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 |

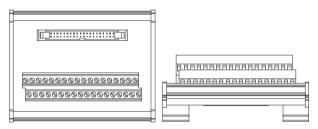
2. AS32AN02T-A/AS64AN02T-A and the wiring modules:

♦ UB-10-ID16A



| | | | | | AS3 | 32T-A | | | | | |
|----|-----|------|------|------|------|-------|-------|-------|-------|----|---|
| #1 | TB1 | Y0.0 | Y0.2 | Y0.4 | Y0.6 | Y0.8 | Y0.10 | Y0.12 | Y0.14 | C0 | - |
| #1 | TB2 | Y0.1 | Y0.3 | Y0.5 | Y0.7 | Y0.9 | Y0.11 | Y0.13 | Y0.15 | C0 | - |

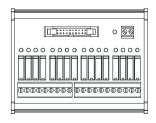
♦ UB-10-OT32A



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 | Y0.1 | Y0.3 | Y0.5 | Y0.7 | Y0.9 | Y0.11 | Y0.13 | Y0.15 | Y1.1 | Y1.3 | Y1.5 | Y1.7 | Y1.9 | Y1.11 | Y1.13 | Y1.15 | C0 | C0 |

♦ UB-10-OR16A





Terminals:

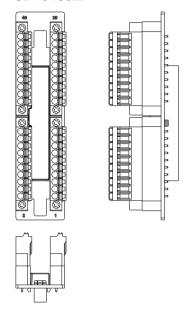
| | | | | | | | | | | | | | | | | | | GND | +24 |
|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|----|-----|-----|-----|-----|
| | | | | | | | | | | | | | | | | | | | V |
| C0 | Y0 | Y1 | Y2 | Y3 | C1 | Y4 | Y5 | Y6 | Y7 | C2 | Y10 | Y11 | Y12 | Y13 | C3 | Y14 | Y15 |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

AS series terminals:

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



- 3. AS32AM10N-A/AS32AN02T-A and the wiring modules:
 - ♦ UB-10-IO32D



Chapter 3 Analog Input Module AS04/08AD

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3.1 Overview

This chapter describes the specifications for analog-to-digital modules, their operation, and their programming. In this chapter, "module" refers to the analog-to-digital modules AS04AD-A, AS08AD-B, and AS08AD-C.

3.1.1 Characteristics

(1) Select a module based on its practical application.

AS04AD-A: Has four channels. A channel can receive either voltage or current input.

AS08AD-B: Has eight channels. A channel can receive voltage input.

AS08AD-C: Has eight channels. A channel can receive current input.

(2) High-speed conversion

Analog signals are converted to digital signals at a rate of 25 ms per channel.

(3) High accuracy

Conversion accuracy: The error range for both voltage input and current input is ±0.2% at ambient temperature of 25° C. The number of voltage/current inputs that are averaged is 100.

(4) Use the utility software to configure the module.

The HWCONFIG utility software is built into ISPSoft. You can set modes and parameters directly in HWCONFIG without spending time writing programs to set registers to manage functions.

3.2 Specifications and Functions

3.2.1 Specifications

• 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 | 2ms/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. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC | | | |
| 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 | K-32000 ~ | K0 ~ | K-32000 ~ | K0 ~ | K0 ~ | |
| Range | K32000 | K32000 | K32000 | K32000 | K32000 | |
| Hardware Input Limit*1 | -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 ~ K32384 | K-384 ~ K32384 | K-32384 ~ K32384 | K-384 ~ K32384 | K-384 ~ K32384 | |
| Error Rate | Room Temperature: ±0.2% ; Full Temperature Range: ±0.5% | | | | | |
| Hardware Resolution | 16 bits | | | | | |
| Input Impedance | 2ΜΩ | | | | | |
| 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.
- *2: 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 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.

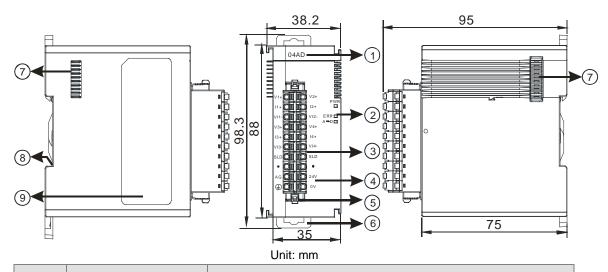
| Analog-to-Digital Conversion | Current Input | | | |
|------------------------------|---|----------------------|----------------------|--|
| Rated Input Range | ±20 mA | 0 mA-20 mA | 4 mA-20 mA | |
| Rated Conversion Range | K-32000 K0 ~ ~ K+2000 K32000 | | K0 ~ K32000 | |
| Hardware Input Limit*1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

- *2: 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 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.

3.2.2 Profile

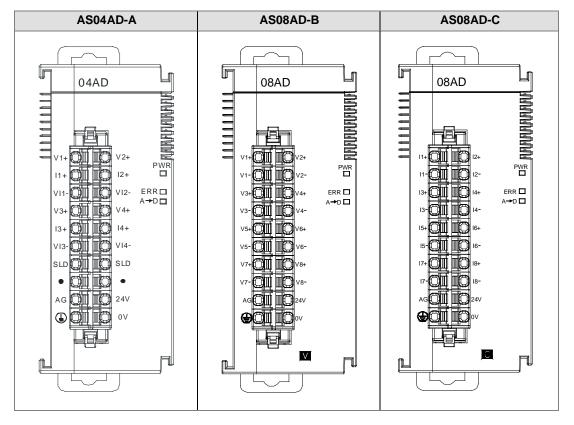
● AS04AD-A



| Number | Name | Description |
|--------|---|---|
| 1 | Model Name | Model name of the module |
| | | Status of the power supply |
| | POWER LED Indicator | ON: the power is on. |
| | | OFF: the power is off. |
| | | Error status of the module |
| 2 | ERROR LED Indicator | ON: a serious error exists in the module. |
| 2 | ERROR LED Indicator | OFF: the module is operating normally. |
| | | Blinking: A minor error exists in the module. |
| | Analog to Digital Conversion Indicator | Analog-to-digital conversion status |
| | | Blinking: conversion is in process. |
| | | OFF: conversion has stopped. |
| 3 | Removable Terminal | Inputs are connected to sensors. |
| 3 | Block | Outputs are connected to loads to be driven. |
| 4 | Arrangement of the | Arrangement of the terminals |
| 4 | Input/Output Terminals | Analigement of the terminals |
| 5 | Terminal Block Clip | For removing 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 |



3.2.3 Arrangement of Terminals



3.2.4 ASO4AD Control Register

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|----------------------|--------------------------|-------|----------|
| 0 | Format Setup | 0: integer format | R | 0 |
| | Format Setup | 1: floating point format | | |
| 1 | Channel 1 mode setup | 0: closed | | |
| | Chamier 1 mode solup | 1: -10 V to +10 V | | |
| 2 | Channel 2 mode setup | 2: 0 V–10 V | | |
| | | 3: -5 V to +5 V | R/W | 1 |
| 3 | Channel 3 mode setup | 4: 0 V–5 V | 10,00 | ' |
| 3 | | 5: 1 V–5 V | | |
| 4 | Channel 4 mode setup | 6: 0 mA-20 mA | | |
| 4 | | 7: 4 mA–20 mA | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------------------|-----------------------------------|-------|----------|
| | | 8: -20 mA to +20 mA | | |
| 5 | Channel 1 offset | | | |
| 6 | Channel 2 offset | Range: -32768 to +32767 | R/W | 0 |
| 7 | Channel 3 offset | Nange32700 to +32707 | IX/VV | |
| 8 | Channel 4 offset | | | |
| 9 | Channel 1 gain | | | |
| 10 | Channel 2 gain | Range: -32768 to +32767 | R/W | 1000 |
| 11 | Channel 3 gain | Nange32700 to +32707 | IX/VV | 1000 |
| 12 | Channel 4 gain | | | |
| 13 | Channel 1 average times | | | |
| 14 | Channel 2 average times | Barrer 4, 400 | R/W | 40 |
| 15 | Channel 3 average times | Range: 1–100 | IV/VV | 10 |
| 16 | Channel 4 average times | | | |
| 17 | Channel 1 filter average percentage | | | |
| 18 | Channel 2 filter average percentage | Range: 0–3 Unit: ±10% | DAM | 4 |
| 19 | Channel 3 filter average percentage | - 1: ±10% 2: ±20% - 3: ±30% | R/W | 1 |
| 20 | Channel 4 filter average percentage | 0. 100 /0 | | |
| | avorago porocinage | 0: 2 ms | | |
| | Channel sampling | 1: 4 ms | | |
| 21 | cycle | 2: 10 ms | R/W | 0 |
| | (sampling/integration | 3: 15 ms | 17/44 | |
| | time) | 4: 20 ms | | |
| | | 5: 30 ms | | |



| CR# | Name | Description | Atr. | Defaults |
|-----|---------------------|---|------|----------|
| | | 6: 40 ms | | |
| | | 7: 50 ms | | |
| | | 8: 60 ms | | |
| | | 9: 70 ms | | |
| | | 10: 80 ms | | |
| | | 11: 90 ms | | |
| | | 12: 100 ms | | |
| | | 0: open channel alarm | | |
| | | 1: close channel alarm | | |
| | | bit0: channel 1 | | |
| | | bit1: channel 2 | | |
| | | bit2: channel 3 | | |
| 22 | Channal Alama Catus | bit3: channel 4 | R/W | 0 |
| 22 | Channel Alarm Setup | | R/VV | 0 |
| | | 0: warning | | |
| | | 1: alarm | | |
| | | bit8: error in the power supply | | |
| | | bit9: error in the module hardware | | |
| | | bit10: error in calibration | | |
| 23 | The minimum scale | When the format is set to integer in HWCONFIG, | | 10.0 |
| 24 | range for channel 1 | the scale range is invalid. | | -10.0 |
| 25 | The minimum scale | For analog-digital modules, it is much more | | -10.0 |
| 26 | range for channel 2 | convenient if the system can convert digital values | | 10.0 |
| 27 | The minimum scale | to floating-point values for earier understanding. | | -10.0 |
| 28 | range for channel 3 | Here you can set the minimum and maximum scale | | |
| 29 | The minimum scale | ranges of corresponding floating-point values for | R | -10.0 |
| 30 | range for channel 4 | channels. | | |
| 31 | The maximum scale | For example, if the scale range for an analog to | | 10.0 |
| 32 | range for channel 1 | digital input channel is ±10.0 V, it indicates the | | |
| 33 | The maximum scale | maximum value is +10.0 V and the minimum value | | 10.0 |
| 34 | range for channel 2 | is -10.0 V. | | |
| 35 | The maximum scale | If the scale range for an analog to digital input channel is 4 mA ~ 20 mA. It indicates the maximum | | 10.0 |
| 36 | range for channel 3 | Gramoris 4 max - 20 max it indicates the maximum | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|---------------------|--|------|----------|
| 37 | | value is 20 mA and the minimum value is 4 mA. | | |
| | The maximum scale | Note: You can use PLC instruction DSCLP | | |
| 38 | range for channel 4 | (API0217) and set SM685 to ON to use floating- | | 10.0 |
| | range for channel 4 | point operations when a conversion range needs to | | |
| | | edit. | | |
| | | Instructions for peak values | | |
| | | 16#0101: record the peak value again for channel | | |
| | | 1 | | |
| | | 16#0102: record the peak value again for channel | | |
| | | 2 | | |
| | | 16#0104: record the peak value again for channel | | |
| | | 3 | | |
| | Instruction Set | 16#0108: record the peak value again for channel | | |
| | | 4 | | |
| | | 16#010F: record the peak values again for | | |
| 004 | | channels 1–4 | \ | |
| 201 | | 16#0201: enable recording for channel 1 | W | 0 |
| | | 16#0202: enable recording for channel 2 | | |
| | | 16#0204: enable recording for channel 3 | | |
| | | 16#0208: enable recording for channel 4 | | |
| | | 16#020F: enable recording for channels 1-4 | | |
| | | 16#0211: disable recording for channel 1 | | |
| | | 16#0212: disable recording for channel 2 | | |
| | | 16#0214: disable recording for channel 3 | | |
| | | 16#0218: disable recording for channel 4 | | |
| | | 16#021F: disable recording for channels 1-4 | | |
| | | 16#0502: restore default settings | | |
| 240 | The maximum peak | | | 0 |
| 210 | value for channel 1 | | | 0 |
| 211 | The maximum peak | Integer format: the maximum pack value for and a | | 0 |
| | value for channel 2 | Integer format; the maximum peak value for analog inputs | R | |
| 212 | The maximum peak | ii pato | | 0 |
| 212 | value for channel 3 | | | 0 |
| 213 | The maximum peak | | | 0 |



| CR# | Name | Description | Atr. | Defaults |
|---------------|--------------------------------------|---|------|----------|
| | value for channel 4 | | | |
| 214 | The minimum peak value for channel 1 | | | 0 |
| 215 | The minimum peak value for channel 2 | Integer format; the minimum peak value for analog | В | 0 |
| 216 | The minimum peak value for channel 3 | inputs | R | 0 |
| 217 | The minimum peak value for channel 4 | | 0 | |
| 222 | The time to record for channel 1 | | R/W | 1 |
| 223 | The time to record for channel 2 | Unit: 10 ms Range: 1–100 | | 1 |
| 224 | The time to record for channel 3 | Time to record the digital value for the channel | | 1 |
| 225 | The time to record for channel 4 | | | 1 |
| 240 | The number of records for channel 1 | | | 0 |
| 241 | The number of records for channel 2 | Dongo, 0, 500, display the oursest records | R | 0 |
| 242 | The number of records for channel 3 | Range: 0–500, display the current records | K | 0 |
| 243 | The number of records for channel 4 | | | 0 |
| 4000~ 4499 | Records for channel 1 | 500 records for channel 1 | R | |
| 4500~ 4999 | Records for channel 2 | 500 records for channel 2 | R | |
| 5000~ 5499 | Records for channel 3 | 500 records for channel 3 | R | |
| 5500~ 5999 | Records for channel 4 | 500 records for channel 4 | R | |

3.2.5 ASO8AD Control Registers

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|----------------------|---|--------------------|----------|
| 0 | Format Setup | 0: integer format 1: floating point format | R | 0 |
| 1 | Channel 1 mode setup | | | |
| 2 | Channel 2 mode setup | AS08AD-B 0: closed | | |
| 3 | Channel 3 mode setup | 1: -10 V to +10 V 2: 0 V–10 V | | |
| 4 | Channel 4 mode setup | 3: -5 V to +5 V 4: 0 V–5 V 5: 1 V–5 V | R/W | 1 |
| 5 | Channel 5 mode setup | AS08AD-C | | · |
| 6 | Channel 6 mode setup | 0: closed 1: -20 mA to +20 mA | | |
| 7 | Channel 7 mode setup | 2: 0 mA-20 mA 3: 4 mA-20 mA | | |
| 8 | Channel 8 mode setup | | | |
| 9 | Channel 1 offset | | | |
| 10 | Channel 2 offset | | | |
| 11 | Channel 3 offset | | | |
| 12 | Channel 4 offset | Pango: 22769 to 122767 | R/W | 0 |
| 13 | Channel 5 offset | Range: -32768 to +32767 | F _V /VV | U |
| 14 | Channel 6 offset | | | |
| 15 | Channel 7 offset | | | |
| 16 | Channel 8 offset | | | |



| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------------------|-------------------------|-------|----------|
| 17 | Channel 1 gain | | | |
| 18 | Channel 2 gain | | | |
| 19 | Channel 3 gain | | | |
| 20 | Channel 4 gain | Range: -32768 to +32767 | R/W | 1000 |
| 21 | Channel 5 gain | 1 tange32700 to +32707 | 10,00 | 1000 |
| 22 | Channel 6 gain | | | |
| 23 | Channel 7 gain | | | |
| 24 | Channel 8 gain | | | |
| 25 | Channel 1 average times | | | |
| 26 | Channel 2 average times | | | |
| 27 | Channel 3 average times | | | |
| 28 | Channel 4 average times | D | DAA | 40 |
| 29 | Channel 5 average times | Range: 1–100 | R/W | 10 |
| 30 | Channel 6 average times | | | |
| 31 | Channel 7 average times | | | |
| 32 | Channel 8 average times | | | |
| 33 | Channel 1 filter average percentage | | | |
| 34 | Channel 2 filter average percentage | | | |
| 35 | Channel 3 filter average percentage | Range: 0–3 | | |
| 36 | Channel 4 filter average percentage | Unit: ±10% 1: ±10% | R/W | 1 |
| 37 | Channel 5 filter average percentage | 2: ±20% 3: ±30% | | |
| 38 | Channel 6 filter average percentage | | | |
| 39 | Channel 7 filter average percentage | | | |
| 40 | Channel 8 filter average | | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|--|---|------|----------|
| | percentage | | | |
| | Channel Sampling Cycle (Sampling/Integration Time) | 0: 2 ms | | 0 |
| | | 1: 4 ms | | |
| | | 2: 10 ms | | |
| | | 3: 15 ms | | |
| | | 4: 20 ms | | |
| | | 5: 30 ms | | |
| 41 | | 6: 40 ms | R/W | |
| | | 7: 50 ms | | |
| | | 8: 60 ms | | |
| | | 9: 70 ms | | |
| | | 10: 80 ms | | |
| | | 11: 90 ms | | |
| | | 12: 100 ms | | |
| | Channel Alarm Setup | 0: open channel alarm | R/W | 0 |
| | | 1: close channel alarm | | |
| | | bit0: channel 1 | | |
| | | bit1: channel 2 | | |
| | | bit2: channel 3 | | |
| | | bit3: channel 4 | | |
| | | bit4: channel 5 | | |
| 42 | | bit5: channel 6 | | |
| | | bit6: channel 7 | | |
| | | bit7: channel 8 | | |
| | | | | |
| | | 0: warning | | |
| | | 1: alarm | | |
| | | bit8: error in the power supply | | |
| | | bit9: error in the module hardware | | |
| | | bit10: error in calibration | | |
| 43 | The minimum scale range | When the format is set to integer in | | |
| 44 | for channel 1 | HWCONFIG, the scale range is invalid. | R | -10.0 |
| 45 | The minimum scale range | For analog-digital modules, it is much more | | |



| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------|---|------|----------|
| 46 | for channel 2 | convenient if the system can convert digital | | |
| 47 | The minimum scale range | values to floating-point values for earier | | |
| 48 | for channel 3 | understanding. Here you can set the minimum | | |
| 49 | The minimum scale range | and maximum scale ranges of corresponding floating-point values for channels. | | |
| 50 | for channel 4 | For example, if the scale range for an analog | | |
| 51 | The minimum scale range | to digital input channel is ±10.0 V, it indicates | | |
| 52 | for channel 5 | the maximum value is +10.0 V and the | | |
| 53 | The minimum scale range | minimum value is -10.0 V. | | |
| 54 | for channel 6 | If the scale range for an analog to digital input | | |
| 55 | The minimum scale range | channel is 4 mA ~ 20 mA. It indicates the | | |
| 56 | for channel 7 | maximum value is 20 mA and the minimum | | |
| 57 | The minimum scale range | value is 4 mA. | | |
| 58 | for channel 8 | Note: Very con use DLC instruction DCCLD | | |
| 59 | The maximum scale range | Note: You can use PLC instruction DSCLP (API0217) and set SM685 to ON to use | | |
| 60 | for channel 1 | floating-point operations when a conversion | | |
| 61 | The maximum scale range | range needs to edit. | | |
| 62 | for channel 2 | | | |
| 63 | The maximum scale range | | | |
| 64 | for channel 3 | | | |
| 65 | The maximum scale range | | | |
| 66 | for channel 4 | | | 40.0 |
| 67 | The maximum scale range | | R | 10.0 |
| 68 | for channel 5 | | | |
| 69 | The maximum scale range | | | |
| 70 | for channel 6 | | | |
| 71 | The maximum scale range | | | |
| 72 | for channel 7 | | | |
| 73 | The maximum scale range | | | |
| 74 | for channel 8 | | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|--------------------------------------|---|------|----------|
| | | Instructions for peak values 16#0101: record the peak value again for | | |
| | | channel 1 | | 0 |
| | | 16#0102: record the peak value again for | | |
| | | channel 2 | | |
| | | 16#0104: record the peak value again for | | |
| | | channel 3 | | |
| | | 16#0108: record the peak value again for | | |
| | | channel 4 | | |
| | | 16#010F: record the peak values again for | | |
| 004 | In admination Cod | channels 1-4 | 10/ | |
| 201 | Instruction Set | 16#0201: enable recording for channel 1 | W | |
| | | 16#0202: enable recording for channel 2 | | |
| | | 16#0204: enable recording for channel 3 | | |
| | | 16#0208: enable recording for channel 4 | | |
| | | 16#020F: enable recording for channels 1-4 | | |
| | | 16#0211: disable recording for channel 1 | | |
| | | 16#0212: disable recording for channel 2 | | |
| | | 16#0214: disable recording for channel 3 | | |
| | | 16#0218: disable recording for channel 4 | | |
| | | 16#021F: disable recording for channels 1–4 | | |
| | | 16#0502: restore default settings | | |
| 210 | The maximum peak value for channel 1 | | | 0 |
| | The maximum peak value | Integer format; the maximum peak value for analog inputs | R | _ |
| 211 | for channel 2 | | | 0 |
| 212 | The maximum peak value | | | 0 |
| 212 | for channel 3 | | | U |
| 213 | The maximum peak value | | | 0 |
| | for channel 4 | | | |
| 214 | The maximum peak value for channel 5 | | | 0 |
| | | | | |
| 215 | The maximum peak value for channel 6 | | | 0 |



| CR# | Name | Description | Atr. | Defaults |
|-----|--------------------------------------|--|------|----------|
| 216 | The maximum peak value for channel 7 | | | 0 |
| 217 | The maximum peak value for channel 8 | | | 0 |
| 218 | The minimum peak value for channel 1 | Integer format; the minimum peak value for analog inputs | R | 0 |
| 219 | The minimum peak value for channel 2 | | | 0 |
| 220 | The minimum peak value for channel 3 | | | 0 |
| 221 | The minimum peak value for channel 4 | | | 0 |
| 222 | The minimum peak value for channel 5 | | | 0 |
| 223 | The minimum peak value for channel 6 | | | 0 |
| 224 | The minimum peak value for channel 7 | | | 0 |
| 225 | The minimum peak value for channel 8 | | | 0 |
| 222 | The time to record for channel 1 | Unit: 10 ms Range: 1–100 Time to record the digital value for the channels | | 1 |
| 223 | The time to record for channel 2 | | P | 1 |
| 224 | The time to record for channel 3 | | K | 1 |
| 225 | The time to record for channel 4 | | | 1 |

3.2.6 Functions

| Item | Function | Description | |
|------|----------------------|--|--|
| 1 | Enable/Disable a | Enable or disable a channel. | |
| 1 | 1 Channel | 2. If a channel is disabled, the total conversion time decreases. | |
| 2 | Calibration | Calibrate a linear curve. | |
| 3 | Average | Conversion values are averaged and filtered. | |
| 4 | Disconnection | Disconnection detection only operates when the analog range is 4 mA- | |
| 4 | Detection | 20 mA or 1 V–5 V. | |
| | Channel Detect and | If an input signal exceeds the range of inputs that the hardware can | |
| 5 | | receive, the module produces an alarm or a warning. You can disable | |
| | | this function. | |
| 6 | The Limit Detections | Save the maximum/minimum values for channels. | |
| | for Channels | | |
| | Records for | | |
| 7 | Channels | Save the analog curves for channels | |
| ' | (Applicable for | Cave the analog curves for charmers | |
| | AS04AD) | | |
| 8 | Scale Range | When the format is floating-point, you can set the scale range. | |

1. Enable/Disable a channel

An analog signal is converted into a digital signal at a rate of 2 ms per channel. The total conversion time is 2 ms X (the number of channels). If a channel is not used, you can disable it to decrease the total conversion time.

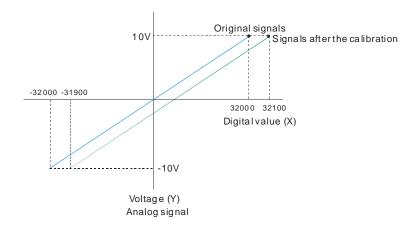
2. Calibration

To make a curve meet specific needs, calibrate the curve by changing the offset and the gain. The calibration range depends on the range of inputs that the hardware can receive. The formula is:

$$Output = \frac{(Input \times Gain)}{1000} + Offset$$

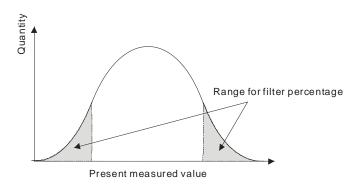
Example:

A channel receives voltage inputs between -10.0 V to +10.0 V. The gain is 1000, and the offset is 0. The corresponding value for the original signal -10.0 V to +10.0 V is -32000 to +32000. If you change the offset to -100, the calibrated value for the original signal -10.0 V to +10.0 V becomes -31900 to +32100.



3. Average

You can set the average value between 1–100. It is a steady value obtained from the sum of the recorded values. If the recorded values include an acute pulse due to unavoidable external factors, however, you may observe violent changes in the average value. Use the filtering function to exclude acute pulses from the sum-up and equalization, so that the computed average value is not affected by the acute recorded values. Set the filter percentage to the range 0–3, where the unit is 10%. If you set the filter range to 0, the system sums up all the recorded values and divides them to obtain the average value, but if you set the filter range to 1, for example, the system excludes the bottom 10% and top 10% of the values and averages only the remaining values to obtain the average value. For instantance, set the average value to 100 and set the filter percentage to 3. When there are 100 pieces of data collected, the system arranges the collected data according to their values from large to small and then excludes the bottom 30% and top 30% of the values (60 pieces of data) and averages only the remaining values (40 pieces of data) to obtain the average value.



4. Disconnection detection

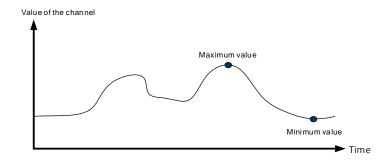
Disconnection detection only operates when the analog range is 4–20 mA or 1–5 V. If a module that can receive inputs between 4–20 mA or from 1–5 V is disconnected, the input signal exceeds the range of allowable inputs, so the module produces an alarm or a warning.

5. Channel detection

If an input signal exceeds the allowable range of inputs, an error message appears. You can disable this function so that the module does not produce an alarm or a warning when the input signal exceeds the input range.

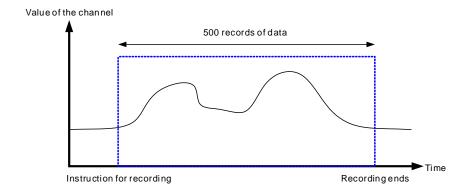
6. Limit detections for channels

This function saves the maximum and minimum values for channels so that you can determine the peak to peak values.



7. Records for channels (applicable for AS04AD)

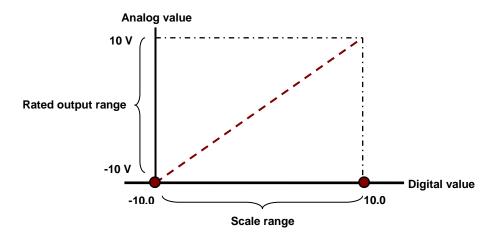
Record the input values of the cyclic sampling for each channel. The system saves up to 500 data points and the recording time is 10 ms.



8. Scale range

You can set the scale range when the format is floating-point. The analog output mode of a channel has a corresponding digital range. Digital values correspond to analog outputs sent by the module. For example, if the analog range is -10 V to +10 V, the digital range is -10.0 to +10.0, the HSP scale is 10.0, and the LSP scale is -10.0. The digital values -10.0 to +10.0 correspond to the analog values -10 V to +10 V, as the example below shows.



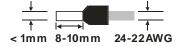


3.2.7 Wiring

Precautions

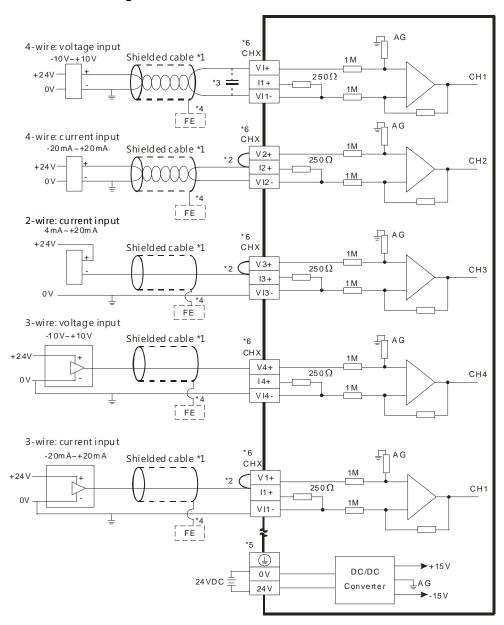
To ensure the analog-to-digital module functions well and reliably, the external wiring must prevent noise. Before you install the cables, follow the precautions below.

- (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 100 ohm.

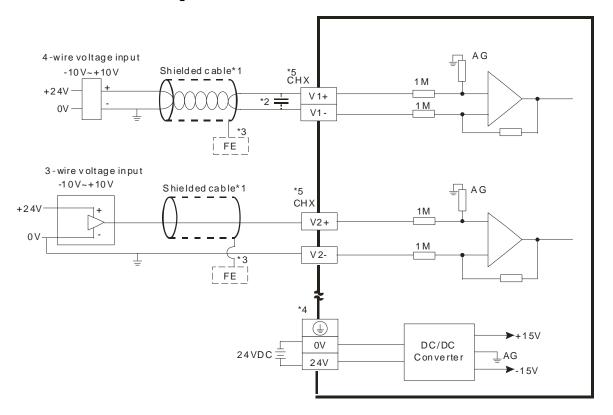
AS04AD-A External wiring



- *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 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 μ F and a working voltage of 25 V.
- *4. Connect the shielded cable to the terminal FE.
- *5. Connect the terminal to the ground terminal.
- *6. Every channel can operate with the wiring presented above.

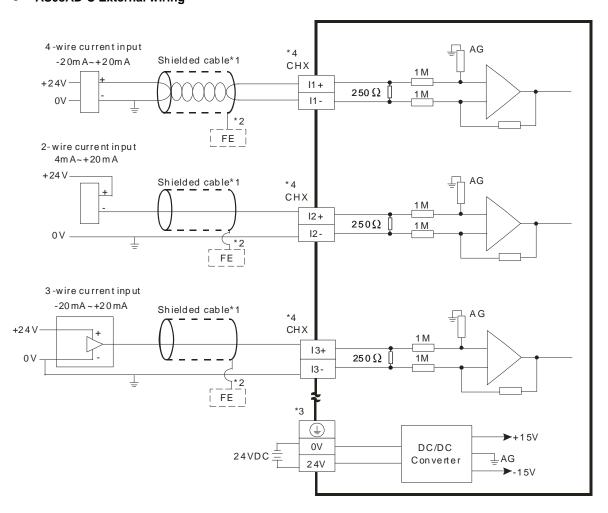


AS08AD-B External wiring



- *1. Use shielded cables to isolate the analog input signal cable from other power cables.
- *2. 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 µF and a working voltage of 25 V.
- *3. Connect the shielded cable to the terminal FE.
- *4. Connect the terminal $\stackrel{\textcircled{}}{=}$ to the ground terminal.
- *5. Every channel can operate with the wiring presented above.

AS08AD-C External wiring



- *1. Use shielded cables to isolate the analog input signal cable from other power cables.
- *2. Connect the shielded cable to the terminal FE.
- *3. Connect the terminal to the ground terminal.
- *4. Every channel can operate with the wiring presented above.



3.2.8 LED Indicators

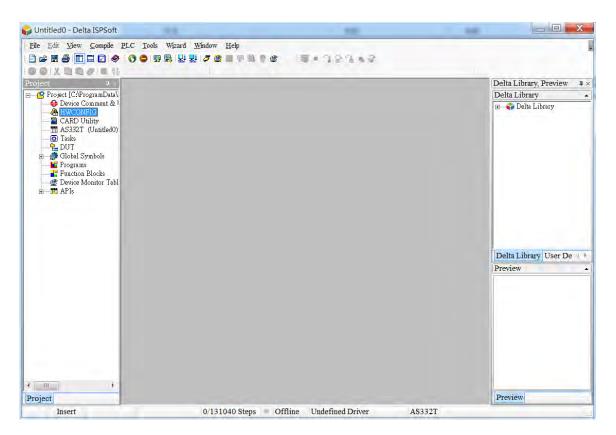
| Number | Name | Description |
|--------|-------------------|--|
| | | Operating status of the module |
| 1 | RUN LED Indicator | ON: the module is running. |
| | | OFF: the module is not running. |
| | | Error status of the module |
| 2 | ERROR LED | ON: a serious error exists in the module. |
| 2 | Indicator | OFF: the module is operating normally. |
| | | Blink: a minor error exists in the module. |
| 3 | Analog to Digital | Analog-to-digital conversion status |
| | Conversion | Blinking: conversion is in process. |
| | Indicator | OFF: conversion has stopped. |

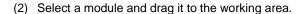
3.3 HWCONFIG in ISPSoft

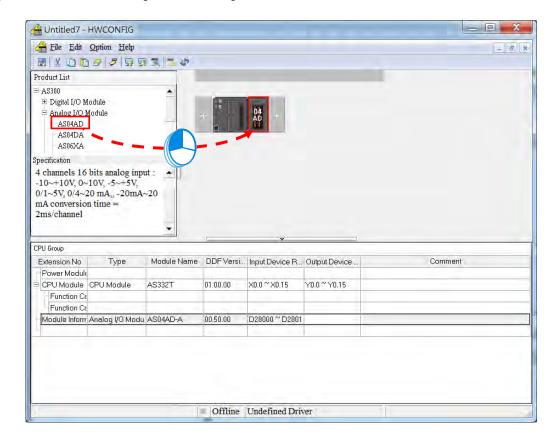
The following example uses the AS04AD-A module.

3.3.1 Initial Setting

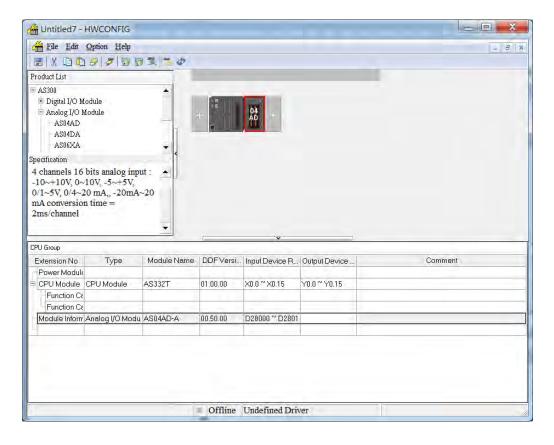
(1) Start ISPSoft and double-click **HWCONFIG**.



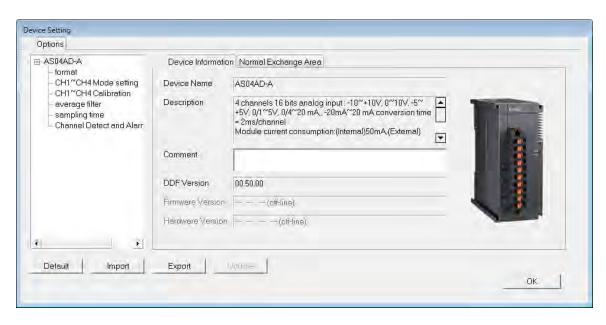




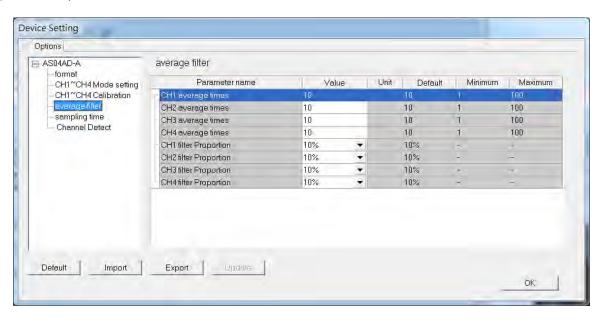
(3) Double-click the module in the working area to open the Device Setting page.



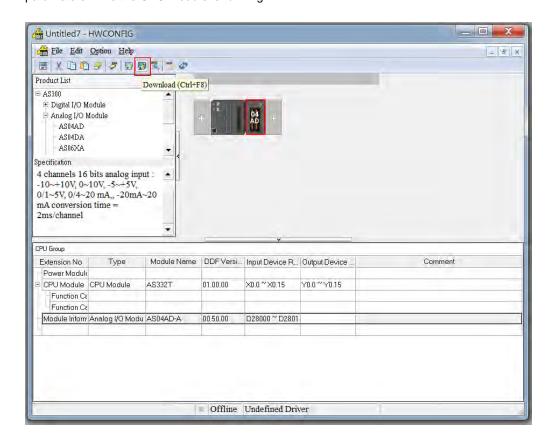




(4) Choose a parameter, set the values, and click **OK**.

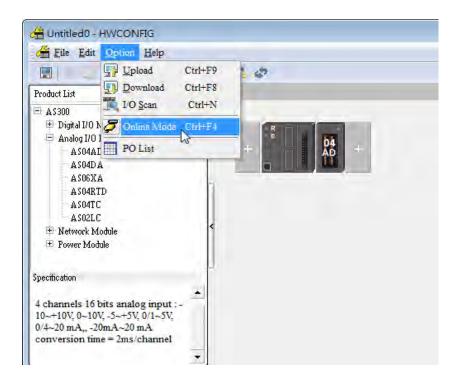


(5) Click **Download** on the toolbar to download the parameters. Note that you cannot download the parameters while the CPU module is running.



3.3.2 Checking the Version of a Module

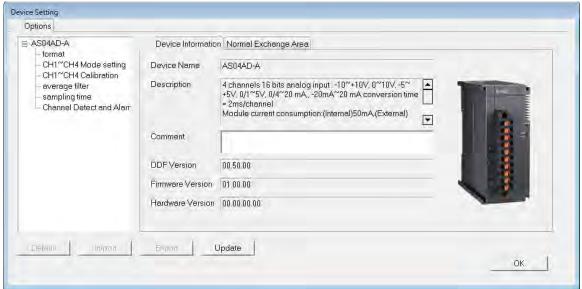
(1) On the Option menu, click Online Mode.





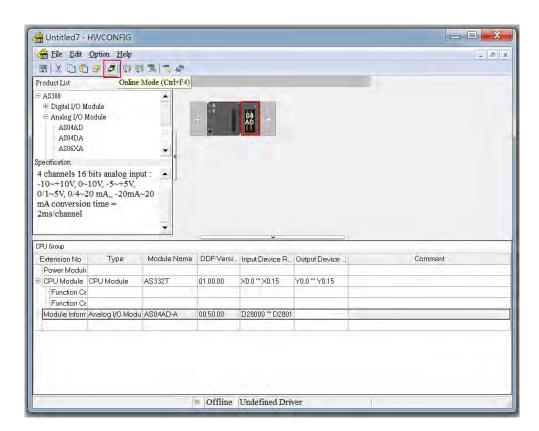
(2) Double-click the module to open the Device Setting page. The versions of both the firmware and the hardware are displayed.



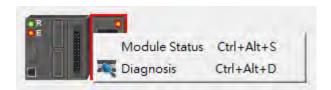


3.3.3 Online Mode

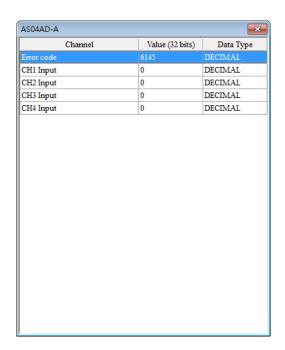
(1) Click Online Mode on the toolbar.



(2) Right-click the module and click Module Status.



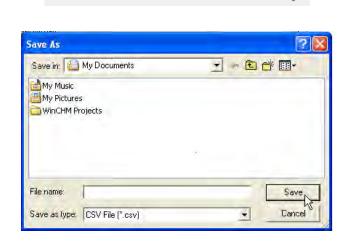
(3) View the module status.



3.3.4 Importing/Exporting a Parameter File

Default

(1) Click **Export** in the Device Settings dialog box to save the current parameters as a CSV file (.csv).



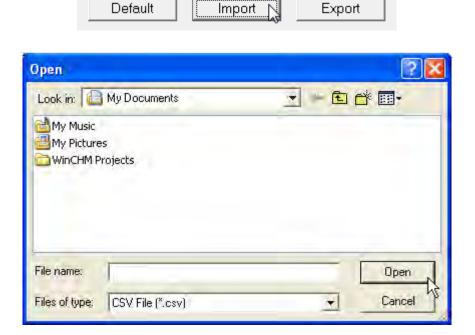
Import

Export |



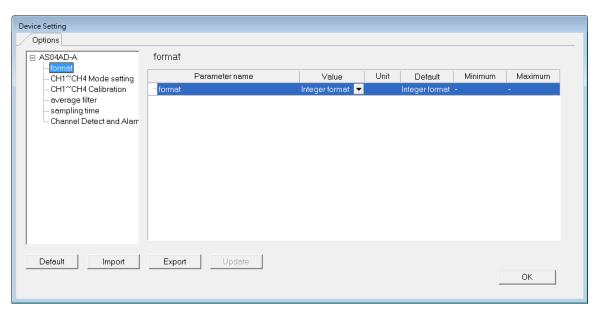


(2) Click Import in the Device Settings dialog box and select a CSV file to import saved parameters.

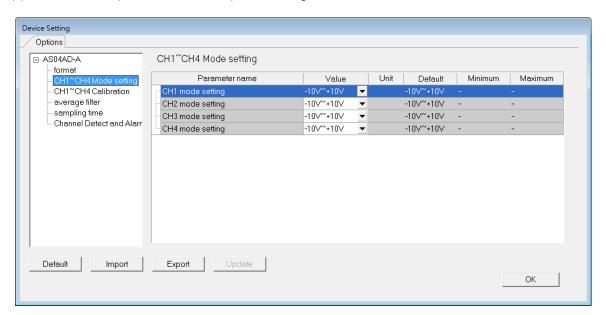


3.3.5 Parameters

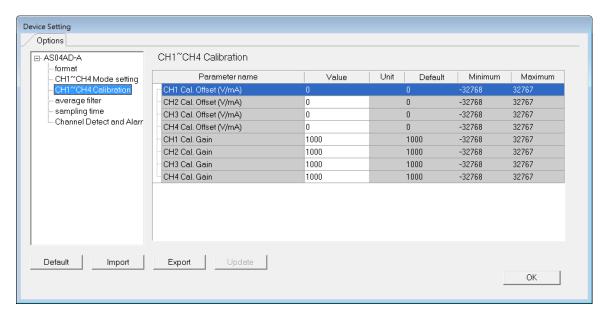
(1) The input formats of the channels



(2) The CH1-CH4 (channel 1-channel 4) mode settings

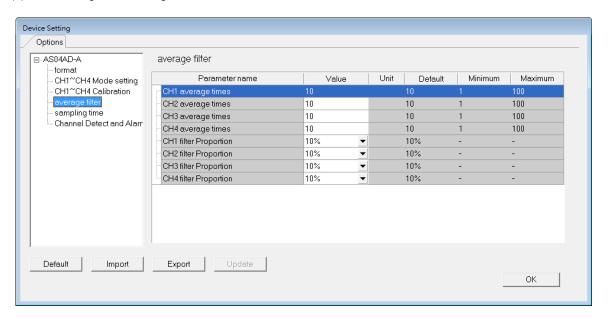


(3) The CH1-CH4 calibration settings

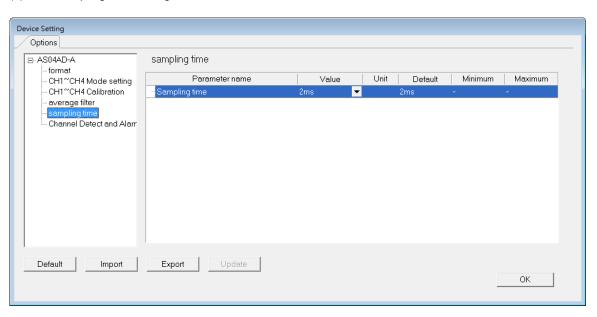




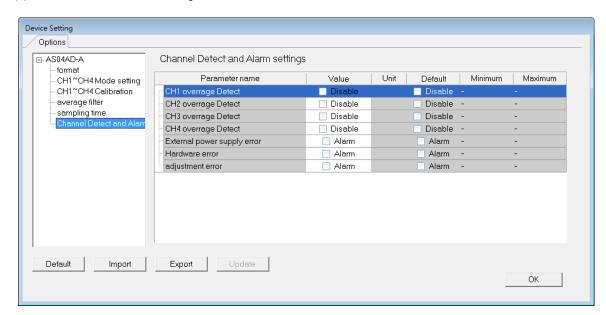
(4) The average filter settings



(5) The sampling time settings



(6) The channel detection settings



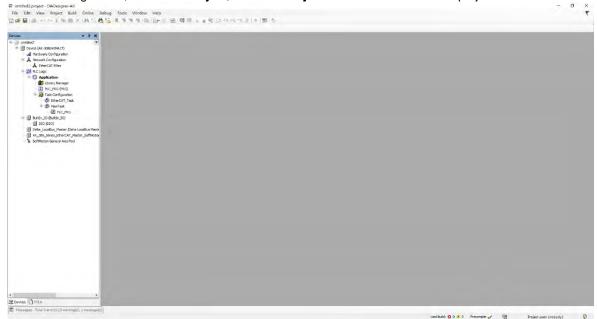


3.4 DIADesigner-AX (Hardware Configuration)

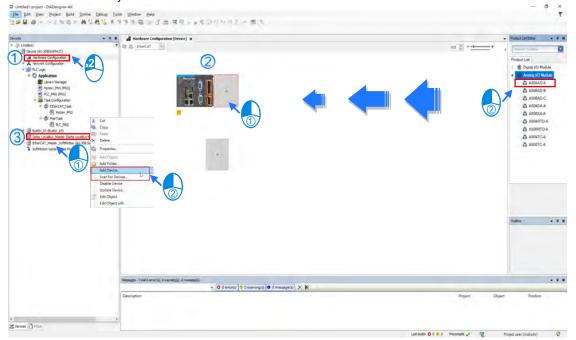
The following example uses AS04AD-A.

3.4.1 Initial Setting

(1) Start DIADesigner-AX, click **New Project**, and then **Project+Device** to create a new project.

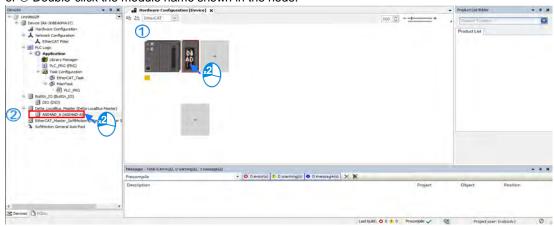


- (2) Add modules in:
 - ① Double-click Hardware Configuration
 - ② Select the **+ section** and drag and drop the module that you want to add from the Product List to the **+** section.
 - or ③ Right-click **Delta_Localbus Master** to see the context meun and then double-click **Add Device** to add devices manually or double-click **Scan for Devices**.

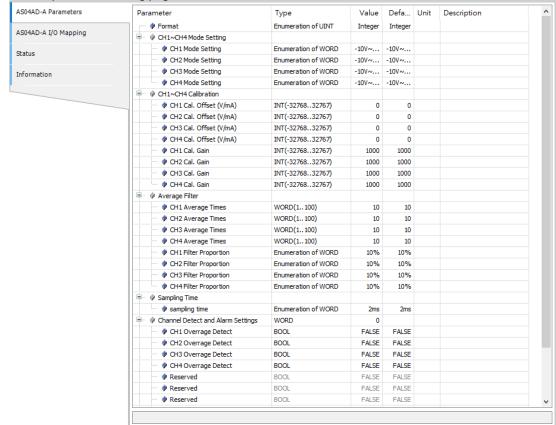


(3) Select modules:

- ① Double-click the module name in the Hardware Configuration area.
- or ② Double-click the module name shown in the node.

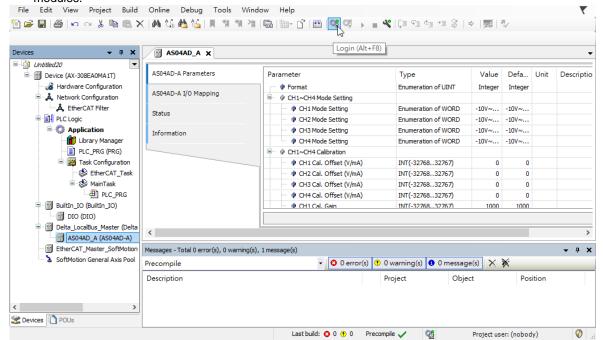


(4) Module parameter setting page:





(5) After setting is complete, select the module and click **Login** on the tool bar to download the settings to the modules

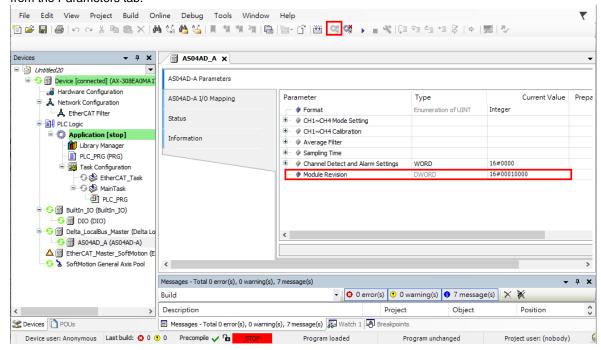


3.4.2 Checking the Version of a Module

(1) Select the module and click the Information tab to see the module information.



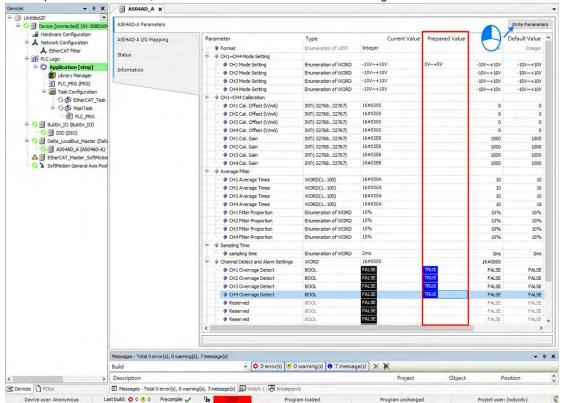
(2) Select the module and click **Login** on the tool bar to go to Online Mode. You can find the Module Revision from the Parameters tab.



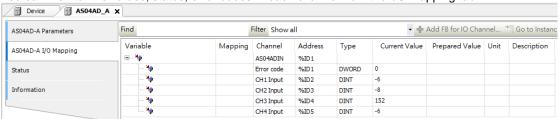


3.4.3 Online Mode

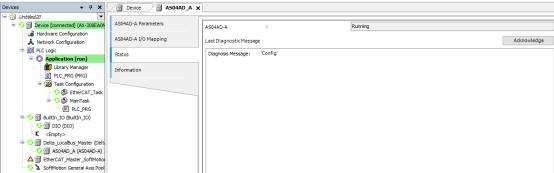
(1) Select the module and click **Login** on the tool bar to go to **Online Mode**. You can monitor all configuration parameters. Vaules in the column of Prepared Value are configurable online. After editing the values in the Prepared Value column, click **Write Parameter** to confirm the change.



(2) You can monitor the values, status, error codes in each channel from the I/O Mapping tab.

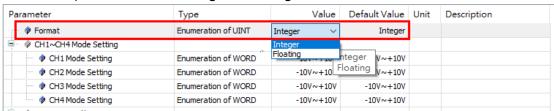


(3) You can monitor the current status and error codes from the Status tab.

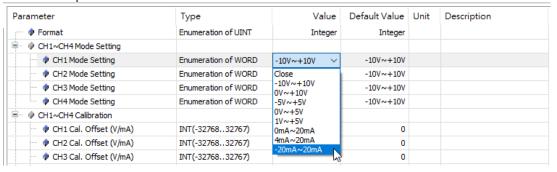


3.4.4 Parameters

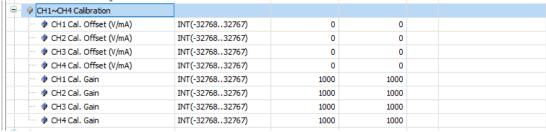
(1) You can set up the value format to Integer or Floating for Channel 1 to 4.



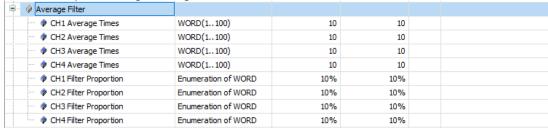
(2) You can set up the values for Channel 1 to 4.



(3) You can set up the calibrations for for Channel 1 to 4.

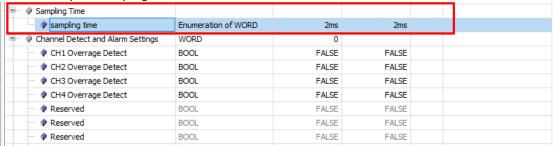


(4) You can set up the average filtering for Channel 1 to 4.





(5) You can set up the sampling time.



(6) You can set up the channel detect and alarm settings.

| Channel Detect and Alarm Settings | WORD | 0 | | |
|-----------------------------------|------|-------|-------|--|
| CH1 Overrage Detect | BOOL | FALSE | FALSE | |
| CH2 Overrage Detect | BOOL | FALSE | FALSE | |
| | BOOL | FALSE | FALSE | |
| CH4 Overrage Detect | BOOL | FALSE | FALSE | |
| ··· | BOOL | FALSE | FALSE | |
| → Preserved | BOOL | FALSE | FALSE | |
| ··· 👂 Reserved | BOOL | FALSE | FALSE | |
| → PReserved | BOOL | FALSE | FALSE | |
| External Power Supply Error | BOOL | FALSE | FALSE | |
| ··· 👂 Hardware Error | BOOL | FALSE | FALSE | |
| Adjustment Error | BOOL | FALSE | FALSE | |

3.5 Troubleshooting

3.5.1 Error Codes

| Error | December | A → D LED | ERROR LED |
|---------|---|---------------|---|
| Code | Description | Indicator | Indicator |
| 16#1605 | Hardware failure | OFF | ON |
| 16#1607 | The external voltage is abnormal. | OFF | ON |
| 16#1608 | The factory calibration is abnormal. | OFF | ON |
| 16#1801 | The external voltage is abnormal. | OFF | Blinking |
| 16#1802 | Hardware failure | OFF | Blinking |
| 16#1804 | The factory calibration is abnormal. | OFF | Blinking |
| 16#1808 | The signal received by channel 1 exceeds the range of inputs that the hardware can receive. | | |
| 16#1809 | The signal received by channel 2 exceeds the range of inputs that the hardware can receive. | | Blinking |
| 16#180A | The signal received by channel 3 exceeds the range of inputs that the hardware can receive. | | |
| 16#180B | The signal received by channel 4 exceeds the range of inputs that the hardware can receive. | Run: blinking | |
| 16#180C | The signal received by channel 5 exceeds the range of inputs that the hardware can receive. | Stop: OFF | |
| 16#180D | The signal received by channel 6 exceeds the range of inputs that the hardware can receive. | | |
| 16#180E | The signal received by channel 7 exceeds the range of inputs that the hardware can receive. | | |
| 16#180F | The signal received by channel 8 exceeds the range of inputs that the hardware can receive. | | |
| - | When power-on, the module is not detected by CPU module. | OFF | Blinking once or twice and after 2 seconds, it blinks repeatedly |



3.5.2 Troubleshooting Procedure

| Description | Procedure |
|--|--|
| The external voltage is abnormal | Ensure the external 24 V power supply to the module is |
| The external voltage is abnormal. | functioning normally. |
| Hardware failure | Return the module to the factory for repair. |
| Internal error | Contact the feeten. |
| The factory calibration is abnormal. | Contact the factory. |
| The signal received by channel 1 exceeds the | Check the signal received by channel 1 |
| range of inputs that the hardware can receive. | Check the signal received by channel 1 |
| The signal received by channel 2 exceeds the | Check the signal received by channel 2. |
| range of inputs that the hardware can receive. | Check the signal received by Ghamilei 2. |
| The signal received by channel 3 exceeds the | Check the signal received by channel 3. |
| range of inputs that the hardware can receive. | |
| The signal received by channel 4 exceeds the | Check the signal received by channel 4. |
| range of inputs that the hardware can receive. | , |
| The signal received by channel 5 exceeds the | Check the signal received by channel 5. |
| range of inputs that the hardware can receive. | · |
| The signal received by channel 6 exceeds the | Check the signal received by channel 6. |
| range of inputs that the hardware can receive. | |
| The signal received by channel 7 exceeds the | Check the signal received by channel 7. |
| range of inputs that the hardware can receive. | |
| The signal received by channel 8 exceeds the | Check the signal received by channel 8. |
| range of inputs that the hardware can receive. | |
| When power-on, the module is not detected by | Check if the connection between module and CPU |
| CPU module. | module is working. If not, connect again. |

Chapter 4 Analog Output Module ASO4DA

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4.1 Overview

An analog output module receives four 12-bit blocks of digital data from a CPU module. The module converts the digital data into analog signals (voltage or current).

4.1.1 Characteristics

(1) Select a module based on its practical application.

AS04DA-A: Has four channels. A channel can send either voltage or current output.

(2) High-speed conversion

Digital signals are converted to analog signals at a rate of 2 ms per channel.

(3) High accuracy

Conversion accuracy: The error range for both voltage output and current output is $\pm 0.2\%$ at ambient temperature of 25° C.

(4) Use the utility software to configure the module.

The HWCONFIG utility software is built into ISPSoft. You can set modes and parameters directly in HWCONFIG without spending time writing programs to set registers to manage functions.

4.2 Specifications and Functions

4.2.1 Specifications

• Electrical specifications

| Module Name | AS04DA-A | |
|------------------------------|---|--|
| Number of Outputs | 4 | |
| Digital-to-Analog Conversion | 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 | |
| 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. Isolation between a digital circuit and a ground: 500 VDC Isolation between an analog circuit and a ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and a ground: 500 VDC | |
| Weight | 145 g | |

Functional specifications

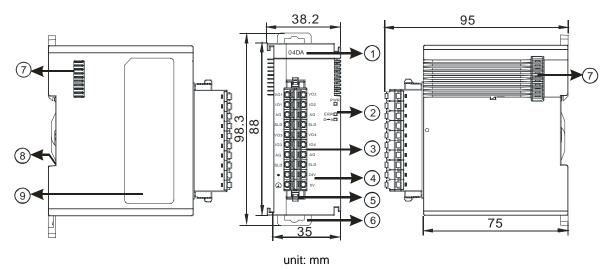
| Digital-to-Analog Conversion | | | Voltage Outpu | t | |
|--|------------------------|-------------|------------------------|-------------------|-------------------|
| Rated Output Range | ±10 V | 0 V~10 V | ±5 V | 0 V~5 V | 1 V~5 V |
| Conversion Range | K-32000 ~ K32000 | K0~K32000 | K-32000 ~ K32000 | K0 ~ K32000 | K0 ~ K32000 |
| Hardware Output Range | -10.1V~10.1V | -0.1V~10.1V | -5.05V~5.05V | -0.05V~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 | | |



| Digital-to-Analog Conversion | Voltage Output | |
|-------------------------------|----------------|--------|
| Output Impedance | ≧1 kΩ | ≧500 Ω |

| Digital-to-Analog Conversion | Current Output | | |
|---|---------------------|----------------|--|
| Rated Output Range | 0 mA-20 mA | 4 mA-20 mA | |
| Conversion Range | 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) | ±0.03% | | |
| Linearity error (Full Temperature Range) | ±0.03% | | |
| Hardware Resolution | 12 bits | | |
| Output Impedance | ≦5 | 50 Ω | |

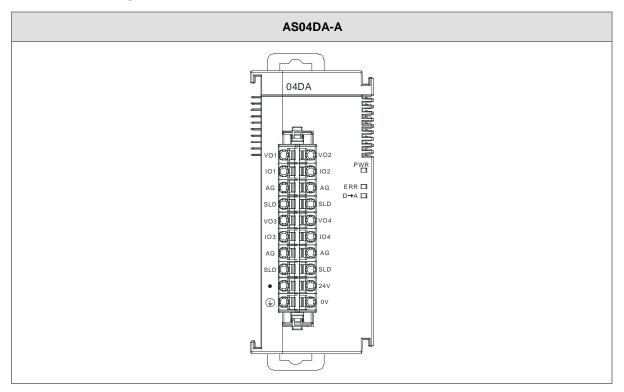
4.2.2 Profile



| Number | Name | Description |
|--------|---|---|
| 1 | Model Name | Model name of the module |
| | | Status of the power supply |
| | POWER LED Indicator | ON: the power is on. |
| | | OFF: the power is off. |
| | | Error status of the module |
| 2 | 2 ERROR LED Indicator Digital-to-Analog conversion Indicator | ON: a serious error exists in the module. |
| | | OFF: the module is operating normally. |
| | | Blinking: a minor error exists in the module. |
| | | Digital-to-Analog conversion status |
| | | Blinking: conversion is in process. |
| | | OFF: conversion has stopped. |
| 3 | Removable Terminal Block | Outputs are connected to loads to be driven. |
| 4 | Arrangement of the Input/Output Terminals | Arrangement of the terminals |
| 5 | Terminal Block Clip | For removing 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 |



4.2.3 Arrangement of Terminals



4.2.4 Control Registers

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|----------------------|--|------|----------|
| 0 | Format Setup | 0: integer format 1: floating-point format | R | 0 |
| 1 | Channel 1 mode setup | 0: closed 1: -10 V to +10 V (default) | R/W | |
| 2 | Channel 2 mode setup | 2: 0 V–10 V 3: -5 V to +5 V | R/W | 1 |
| 3 | Channel 3 mode setup | 4: 0 V–5 V 5: 1 V–5 V | R/W | 1 |
| 4 | Channel 4 mode setup | 6: 0 mA-20 mA 7: 4 mA-20 mA | R/W | |
| 5 | Channel 1 offset | Range: -32768 to +32767 | R/W | 0 |

| CR# | Name | Description | Atr. | Defaults |
|-----|---|--|------|----------|
| 6 | Channel 2 offset | | | |
| 7 | Channel 3 offset | | | |
| 8 | Channel 4 offset | | | |
| 9 | Channel 1 gain | | | |
| 10 | Channel 2 gain | Denger 22769 to 122767 | DAM | 1000 |
| 11 | Channel 3 gain | Range: -32768 to +32767 | R/W | 1000 |
| 12 | Channel 4 gain | | | |
| 13 | Retaining an output sent by channel 1 | | | |
| 14 | Retaining an output sent by channel 2 | is reset to 0. 1: when the PLC stops, the value of the analog output is retained. | DΛΛ | 0 |
| 15 | Retaining an output sent by channel 3 | | 0 | |
| 16 | Retaining an output sent by channel 4 | | | |
| 17 | Refreshing the time for an output sent by channel 1 | | | 0 |
| 18 | Refreshing the time for an output sent by channel 2 | Range: 10–3200 (100 ms–32000 ms) Unit: 10 ms | D.W. | 0 |
| 19 | Refreshing the time for an output sent by channel 3 | Any value less than 10 is processed as 0. Any value larger than 3200 is processed as 3200. Set the value to 0 to disable this function. | R/W | 0 |
| 20 | Refreshing the time for an output sent by channel 4 | | | 0 |
| 21 | The minimum scale | When the format is set to integer in HWCONFIG, the | R | -10.0 |
| 22 | range for channel 1 | scale range is invalid. | R | . 5.0 |
| 23 | The minimum scale | For analog-digital modules, it is much more convenient | R | -10.0 |
| 24 | range for channel 2 | if the system can convert digital values to floating-point | R | |
| 25 | The minimum scale | values for earier understanding. Here you can set the | R | -10.0 |
| 26 | range for channel 3 | minimum and maximum scale ranges of corresponding | R | |
| 27 | The minimum scale | floating-point values for channels. | R | -10.0 |



| CR# | Name | Description | Atr. | Defaults |
|-----|---------------------|---|------|----------|
| 28 | range for channel 4 | For example, if the scale range for an analog to digital | R | |
| 29 | The maximum scale | input channel is ±10.0 V, it indicates the maximum | R | 10.0 |
| 30 | range for channel 1 | value is +10.0 V and the minimum value is -10.0 V. | R | 10.0 |
| 31 | The maximum scale | If the scale range for an analog to digital input channel | R | 40.0 |
| 32 | range for channel 2 | is 4 mA ~ 20 mA. It indicates the maximum value is 20 | R | 10.0 |
| 33 | The maximum scale | mA and the minimum value is 4 mA. | R | 40.0 |
| 34 | range for channel 3 | Note: You can use PLC instruction DSCLP (API0217) | R | 10.0 |
| 35 | The maximum scale | and set SM685 to ON to use floating-point operations | R | 10.0 |
| 36 | range for channel 4 | when a conversion range needs to edit. | R | 10.0 |
| 37 | Channel alarm setup | 0: warning 1: alarm bit0: error in the power supply bit1: error in the module hardware bit2: error in calibration | R/W | 0 |

4.2.5 Functions

| Item | Function | Description |
|------|---|---|
| 1 | Enable/Disable a Channel | Enable or disable a channel. If a channel is disabled, the total conversion time decreases. |
| 2 | Calibration | Calibrate a linear curve. |
| 3 | Retain an Output When a module stops running, the system can retain the signal sent by the module. | |
| 4 | Refresh Time for an Output | Refresh the analog output value according to the value of the fixed slope. |
| 5 | Scale Range | You can set the scale range when the format is floating-point. |

1. Enable/Disable a Channel

An analog signal is converted into a digital signal at a rate of 2 ms per channel. The total conversion time is 2 ms X (the number of channels). If a channel is not used, you can disable it to decrease the total conversion time.

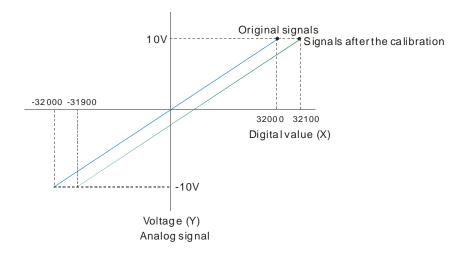
2. Calibration

To make a curve meet specific needs, calibrate the curve by changing the offset and the gain. The calibration range depends on the range of inputs that the hardware can receive. The formula is:

$$Output = \frac{(Input \times Gain)}{1000} + Offset$$

Example:

A channel receives voltage inputs between -10.0 V to +10.0 V. The gain is 1000, and the offset is 0. The corresponding value for the original signal -10.0 V to +10.0 V is -32000 to +32000. If you change the offset to -100, the calibrated value for the original signal -10.0 V to +10.0 V becomes -31900 to +32100.

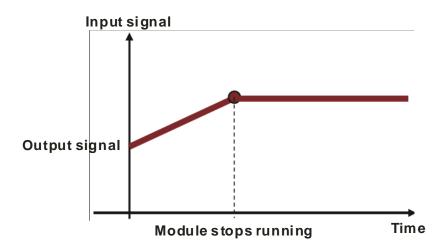




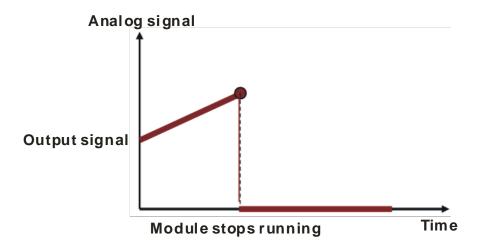
3. Retain an Output

When a module stops running, the system can retain the signal sent by the module.

The output is retained:

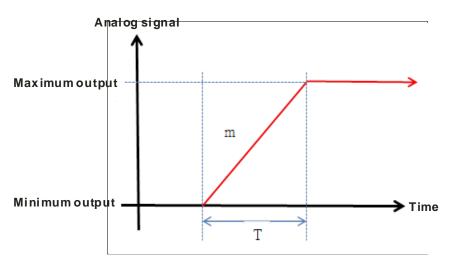


The output is not retained:

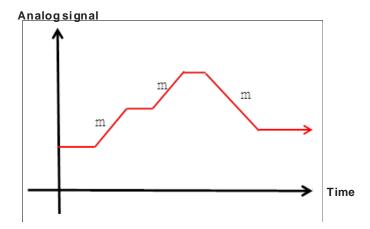


4. Refresh time for an Output

Set the refresh time for an output and the system updates the value of the slope (m) accordingly.



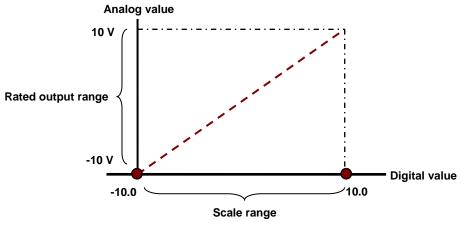
When the analog output signal changes, the system updates the value of the analog output according to the value set in the slope, as shown in the image below.





5. Scale Range

You can set the scale range when the format is floating-point. The analog output mode of a channel has a corresponding digital range. Digital values correspond to analog outputs sent by the module. For example, if the analog range is -10 V to +10 V, the digital range is -10.0 to +10.0, the HSP scale is 10.0, and the LSP scale is -10.0. The digital values -10.0 to +10.0 correspond to the analog values -10 V to +10 V, as the example below shows.

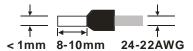


4.2.6 Wiring

Precautions

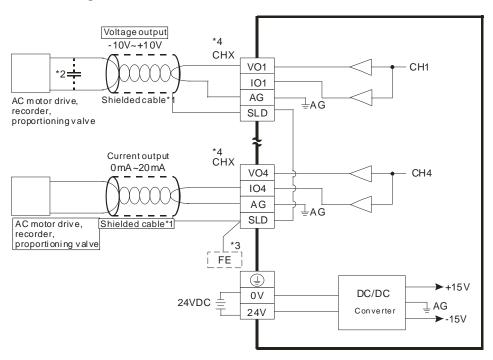
To ensure the digital-to-analog module functions well and reliably, the external wiring must prevent noise.

- (1) To prevent a surge and induction, the AC cable and the output signal cables that are connected to the AS04DA-A must be separate cables.
- (2) Do not install or bound the cable to a main circuit, a high-voltage cable, or a cable connected to a load that 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) Connect 24 to 22 AWG (1 mm) wires to the input/output terminals. The plastic jackets that are removed from the cables should be 8 mm to 10 mm long. The specifications for the terminals and the wiring of the terminals are shown below. Use only copper leads that can resist temperatures above 60° C /75° C.



(6) Note: use cables with the same length (less than 200 m) and use wire resistance of less than 100 ohm.

External wiring



- *1. Use shielded cables to isolate the analog input signal cable from other power cables.
- *2. If variability in the input voltage results in interference within the wiring, connect the module to a capacitor having a capacitance between 0.1–0.47 μ F and a working voltage of 25 V.
- *3. Connect the SLD to FE, and connect both the FE and the terminal to the ground terminal.
- *4. Every channel can operate with the wiring presented above.



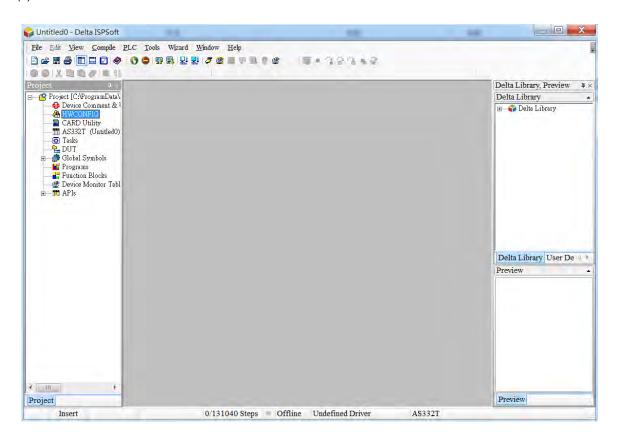
4.2.7 LED Indicators

| Number | Name | Description |
|--------|---|---|
| 1 | RUN LED Indicator | Operating status of the module ON: the module is running. OFF: the module is not running. |
| 2 | ERROR LED Indicator | Error status of the module ON: a serious error exists in the module. OFF: the module is operating normally. Blink: a minor error exists in the module. |
| 3 | Digital to Analog Conversion Indicator | Digital-to-analog conversion status Blinking: conversion is in process. OFF: conversion has stopped. |

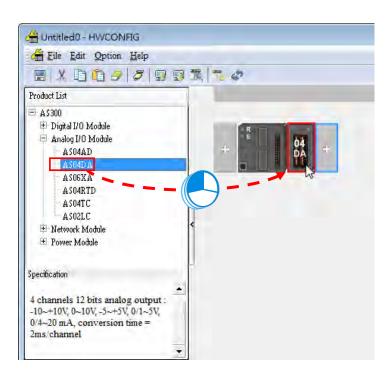
4.3 HWCONFIG in ISPSoft

4.3.1 Initial Setting

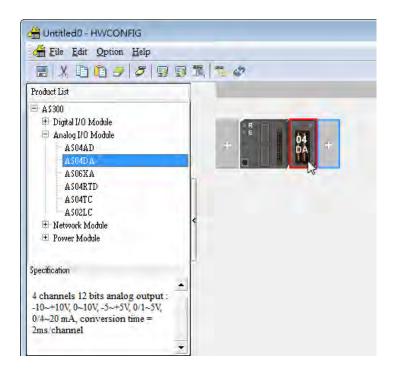
(1) Start ISPSoft and double-click HWCONFIG.



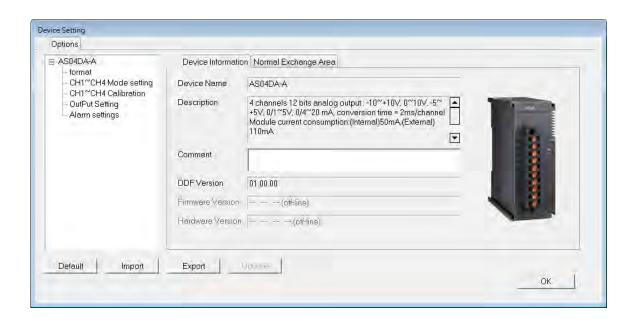
(2) Select a module and drag it to the working area.



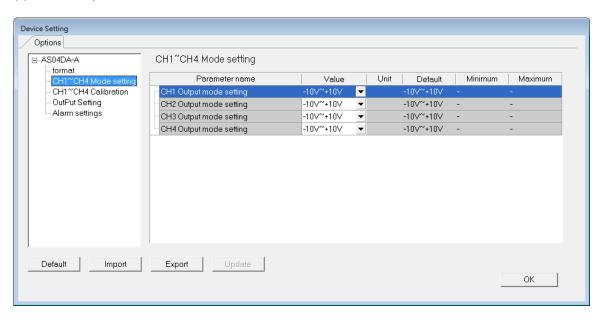
(3) Double-click the module in the working area to open the Device Setting page.



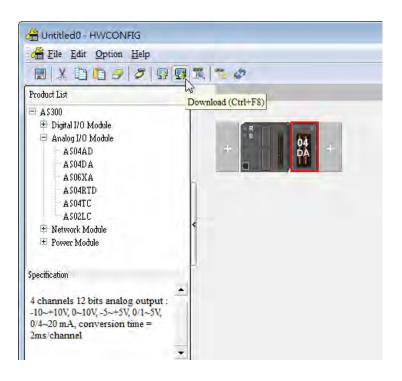




(4) Choose a parameter, set the values, and click **OK**.

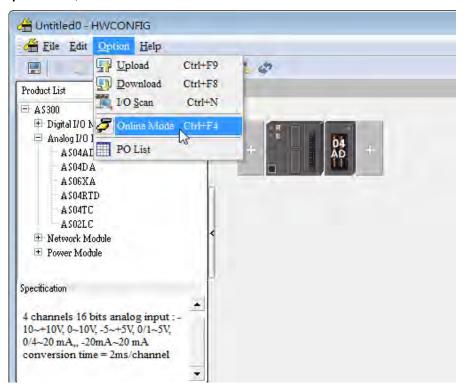


(5) Click **Download** on the toolbar to download the parameters. Note you cannot download the parameters cannot be downloaded.



4.3.2 Checking the Version of a Module

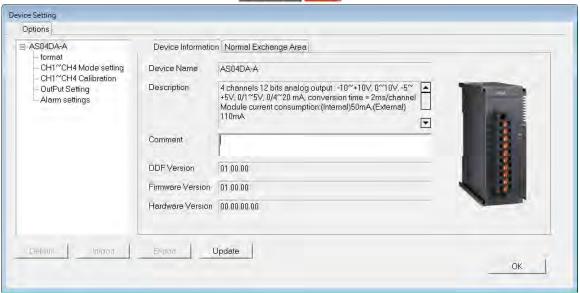
(1) On the Option menu, click Online Mode.





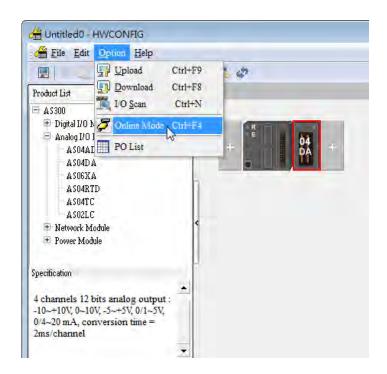
(2) Double-click the module to open the Device Setting page. The versions of both the firmware and the hardware are displayed.



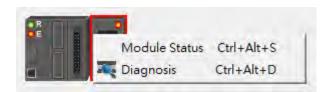


4.3.3 Online Mode

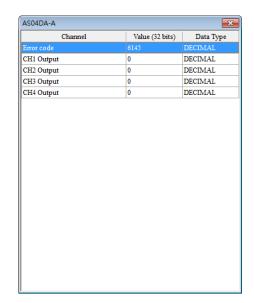
(1) On the Option menu, click Online Mode.



(2) Right-click the module and click on Module Status.



(3) View the module status.

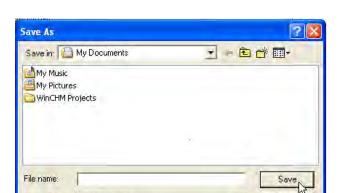


4.3.4 Importing/Exporting a Parameter File

Default

Save as type: CSV File (*.csv)

(1) Click **Export** in the Device Settings dialog box to save the current parameters as a CSV file (.csv).



Import

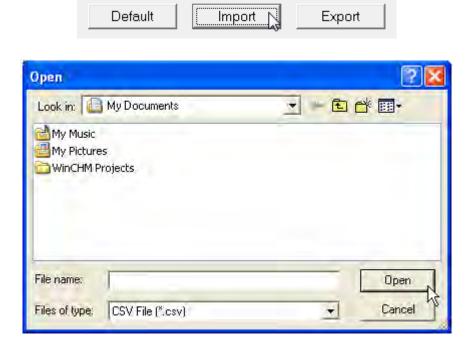
Export N

Cancel



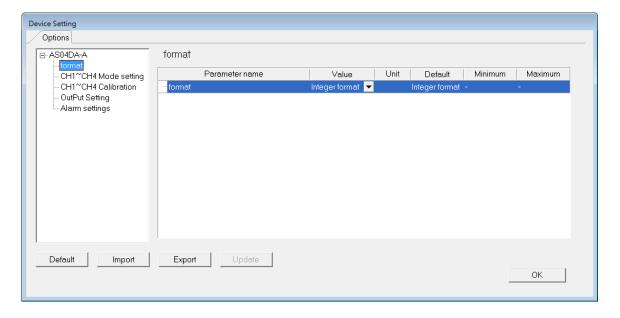


(2) Click **Import** in the Device Settings dialog box and select a CSV file to import save parameters.

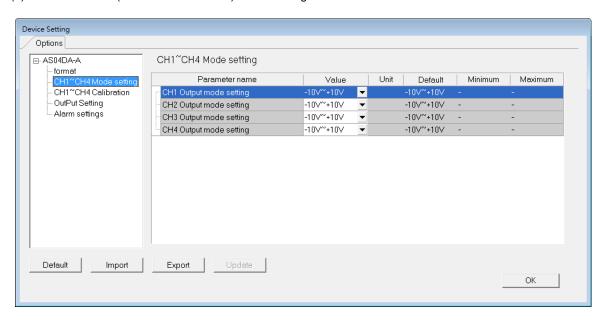


4.3.5 Parameters

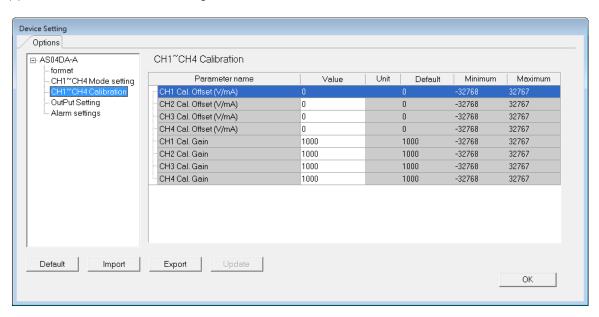
(1) The output formats of the channels



(2) The CH1-CH4 (channel 1-channel 4) mode settings

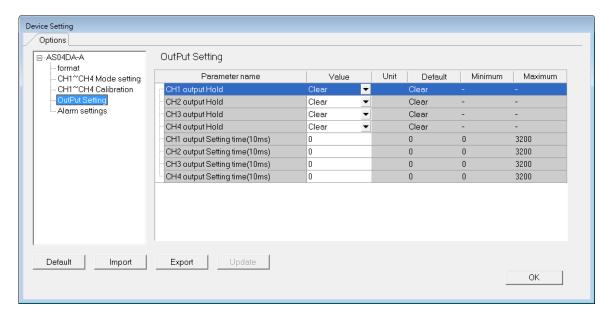


(3) The CH1-CH4 calibration settings

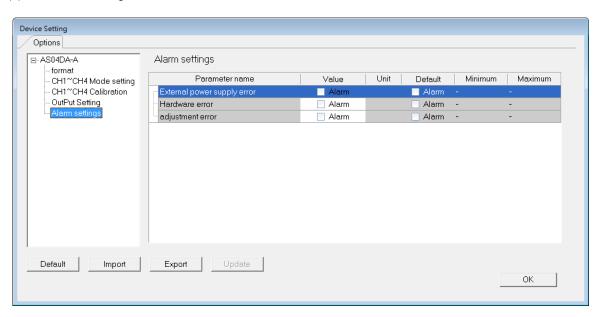




(4) The output settings



(5) The alarm settings

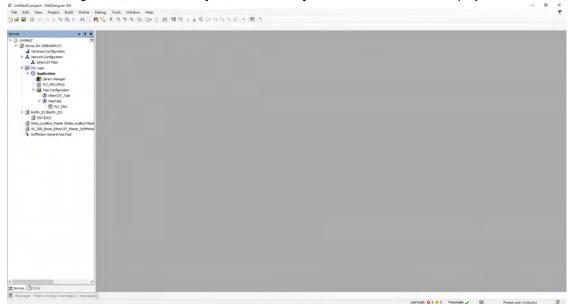


4.4 DIADesigner-AX (Hardware Configuration)

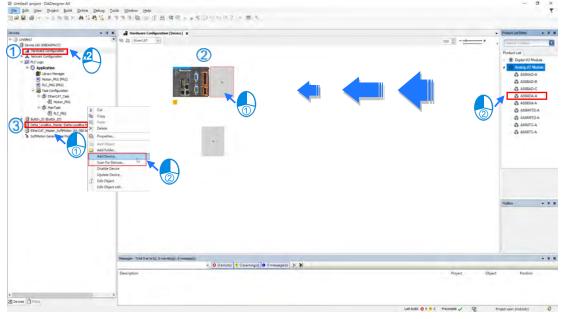
The following example uses AS04DA-A.

4.4.1 Initial Setting

(1) Start DIADesigner-AX, click **New Project**, and then **Project+Device** to create a new project.



- (2) Add modules in:
 - ① Double-click Hardware Configuration
 - ② Select the + section and drag and drop the module that you want to add from the Product List to the + section.
 - or ③ Right-click **Delta_Localbus Master** to see the context meun and then double-click **Add Device** to add devices manually or double-click **Scan for Devices**.

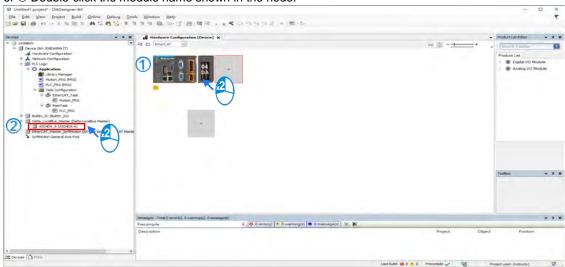




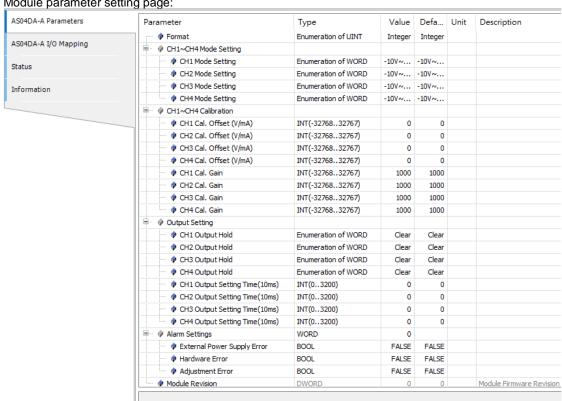
(3) Select modules:

① Double-click the module name in the **Hardware Configuration** area.

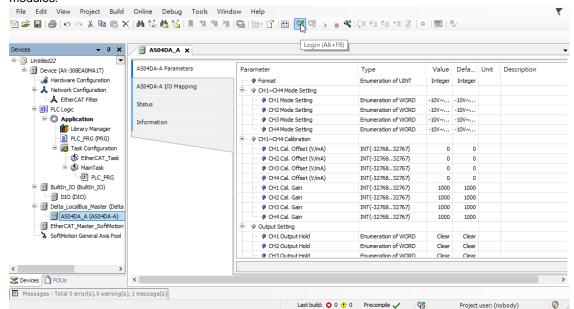
or ② Double-click the module name shown in the node.



(4) Module parameter setting page:



(5) After setting is complete, select the module and click **Login** on the tool bar to download the settings to the modules.



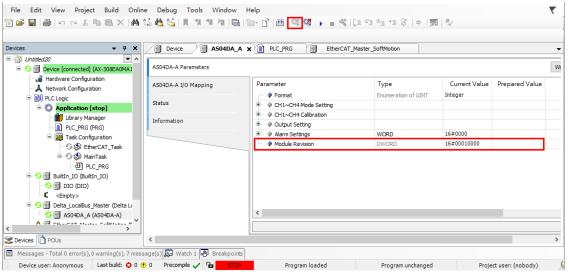


4.4.2 Checking the Version of a Module

(1) Select the module and click the Information tab to see the module information.

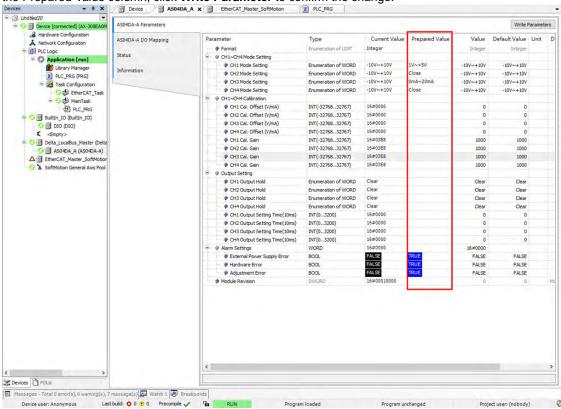


(2) Select the module and click **Login** on the tool bar to go to Online Mode. You can find the Module Revision from the Parameters tab.

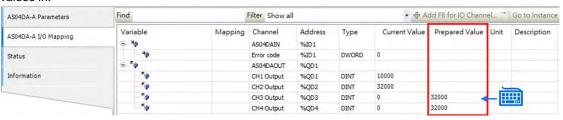


4.4.3 Online Mode

(1) Select the module and click Login on the tool bar to go to Online Mode. You can monitor all configuration parameters. Vaules in the column of Prepared Value are configurable online. After editing the values in the Prepared Value column, click Write Parameter to confirm the change.



(2) You can monitor the values, status, error codes in each channel from the I/O Mapping tab. You can also set a new value in the colum of Prepared Value and press Ctrol+F7 on the keyboard to write the new values in.



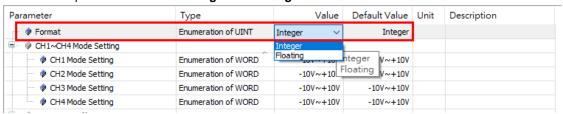
(3) You can monitor the current status and error codes from the Status tab.





4.4.4 Parameters

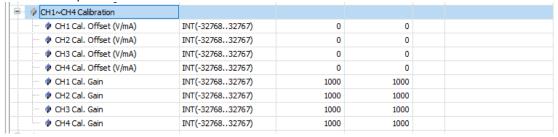
(1) You can set up the value format to Integer or Floating for Channel 1 to 4.



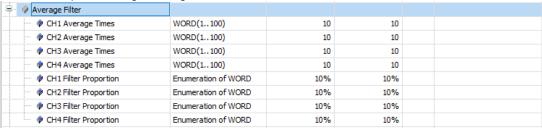
(2) You can set up the values for Channel 1 to 4.

| Parameter | Туре | Value | Default Value | Unit | Description |
|-----------------------------|---------------------|------------------------|---------------|------|-------------|
| · Pormat | Enumeration of UINT | Integer | Integer | | |
| ☐ · Ø CH1~CH4 Mode Setting | | | | | |
| CH1 Mode Setting | Enumeration of WORD | -10V~+10V × | -10V~+10V | | |
| | Enumeration of WORD | Close | -10V~+10V | | |
| CH3 Mode Setting | Enumeration of WORD | -10V~+10V 0V~+10V | -10V~+10V | | |
| CH4 Mode Setting | Enumeration of WORD | -5V~+5V | -10V~+10V | | |
| ☐ ··· CH1~CH4 Calibration | | 0V~+5V 1V~+5V | | | |
| | INT(-3276832767) | 0mA~20mA | 0 | | |
| CH2 Cal. Offset (V/mA) | INT(-3276832767) | 4mA~20mA -20mA~20mA | 0 | | |
| ··· | INT(-3276832767) | -Zoma~Zoma | 0 | | |

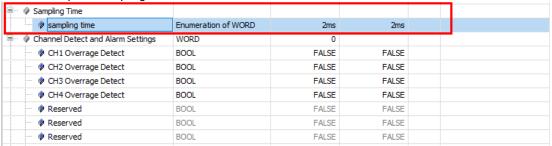
(3) You can set up the calibrations for for Channel 1 to 4.



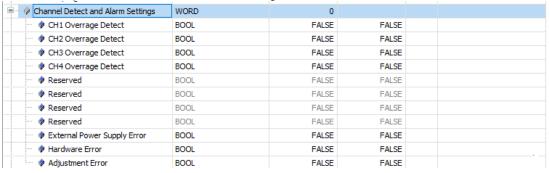
(4) You can set up the average filtering for Channel 1 to 4.



(5) You can set up the sampling time.



(6) You can set up the channel detect and alarm settings.





4.5 Troubleshooting

4.5.1 Error Codes

| Error Code | Description | D → A LED | ERROR LED |
|---------------|--|-----------|---|
| 16#1605 | Hardware failure | OFF | ON |
| 16#1607 | The external voltage is abnormal. | OFF | ON |
| 16#1608 | The factory calibration is abnormal. | OFF | ON |
| 16#1801 | The external voltage is abnormal. | OFF | Blinking |
| 16#1802 | Hardware failure | OFF | Blinking |
| 16#1804 | The factory calibration is abnormal. | OFF | Blinking |
| - | When power-on, the module is not detected by CPU module. | OFF | Blinking once or twice and after 2 seconds, it blinks repeatedly |

4.5.2 Troubleshooting Procedure

| Description | Procedure |
|--|--|
| The external voltage is abnormal. | Ensure the external 24 V power supply to the module is functioning normally. |
| Hardware failure | Return the module to the factory for repair. |
| Internal error The factory calibration is abnormal. | Contact the factory. |
| 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. |

Chapter 5 Analog Input/Output Module

| - | AS06) | (A | • | |
|---|-------|-----------|---|--|
| | | | | |

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5.1 Overview

This chapter describes the specifications for the analog input/output module, its operation, and its programming. On the analog input/output module, four channels receive analog signals (voltage or current), and converts those signals into 16-bit digital signals. In addition, the analog input/output module receives two blocks of 16-bit digital data from a CPU module, and converts the digital data into analog signals (voltage or current). The analog input/output module sends the analog signals by two channels

5.1.1 Characteristics

(1) Use the AS06XA-A analog input/output module, based on its practical application.

CH1-CH4: A channel can receive either voltage or current inputs.

CH5-CH6: A channel can send either voltage or current outputs.

(2) High-speed conversion

The conversion rate is 2 ms per channel.

(3) High accuracy

Conversion accuracy: At ambient temperature of 25° C.

Input: The error range for both voltage and current input is ±0.2%.

Output: The error range for both voltage and current output is ±0.02%.

(4) Use the utility software to configure the module.

The HWCONFIG utility software is built into ISPSoft. You can set modes and parameters directly in HWCONFIG without spending time writing programs to set registers to manage functions.

5.2 Specifications and Functions

5.2.1 Specifications

Electrical specifications

| Module Name | AS06XA-A | |
|---------------------------------|--|--|
| Number of Analog Inputs/Outputs | 4 inputs 2 outputs | |
| Analog-to-Digital Conversion | Voltage input/Current input/Voltage output/Current output | |
| Supply Voltage | 24 VDC (20.4–28.8 VDC) (-15% to +20%) | |
| Connector Type | Removable terminal block | |
| Conversion Time | 2ms/channel | |
| Isolation | An analog circuit is isolated from a digital circuit by a digital integrated circuit/optocoupler, but the analog channels are not isolated from one another. Isolation between a digital circuit and the ground: 500 VDC Isolation between an analog circuit and the ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and the ground: 500 VDC | |
| Weight | 145 g | |

• Functional specifications for the analog-to-digital conversion

| 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 ~ K32000 | K0 ~ K32000 | K-32000 ~ K32000 | K0 ~ K32000 | K0 ~ K32000 |
| Hardware Input Limit*1 | -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 ~ K32384 | K-384 ~ K32384 | K-32384 ~ K32384 | K-384 ~ K32384 | K-384 ~ K32384 |
| Error Rate | Roon | n Temperature: ± | :0.2% ; Full Tem | perature Range: | ±0.5% |
| Hardware Resolution | 16 bits | | | | |
| Input Impedance | 2ΜΩ | | | | |
| 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.
- *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 | K-32000 ~ | K0 ~ | K0 ~ |
| Range | K+2000 | K32000 | K32000 |
| Hardware Input Limit*1 | -20.24 mA ~ 20.24 mA | -0.24 mA ~ 20.24 mA | 3.81 mA ~ 20.19 mA |
| Conversion Limit*2 | K-32384 ~ K32384 | K-384 ~ K32384 | K-384 ~ K32384 |
| Error Rate | Room Temperature: ±0.2% ; Full Temperature Range: ±0.5% | | |
| Hardware Resolution | 16 bits | | |
| Input Impedance | 250Ω | | |
| Absolute Input Range*3 | ±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.
- *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

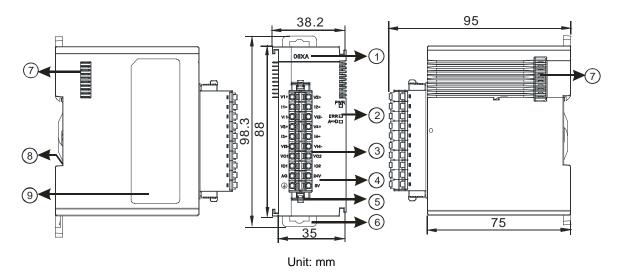
| Digital-to-Analog Conversion | Voltage Output | | | | |
|--|-------------------------|-----------------------|-------------------------|-------------------------|---------------------|
| Rated Output Range | ±10 V | 0 ~ 10 V | ±5 V | 0 ~ 5 V | 1 ~ 5 V |
| Conversion Range | K-32000 ~ K32000 | K0 ~ K32000 | K-32000 ~ K32000 | K0 ~ K32000 | K0 ~ K32000 |
| Hardware Output Range | -10.1 V ~ +10.1 V | -0.1 V ~ 10.1 V | -5.05 V ~ +5.05 V | -0.05 V ~ +5.05 V | 0.95 ~ 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 | ≧1kΩ ≥500Ω | | | | |

| Digital-to-Analog Conversion | Current Output | | |
|--------------------------------------|--------------------|-------------------|--|
| Rated Output Range | 0–20 mA | 4–20 mA | |
| Conversion Range | K0 ~ K32000 | K0 ~ 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 | ±0.10% | | |



| (Full Temperature Range) | |
|----------------------------|---------|
| Hardware Resolution | 12 bits |
| Permissible Load Impedance | ≦550 Ω |

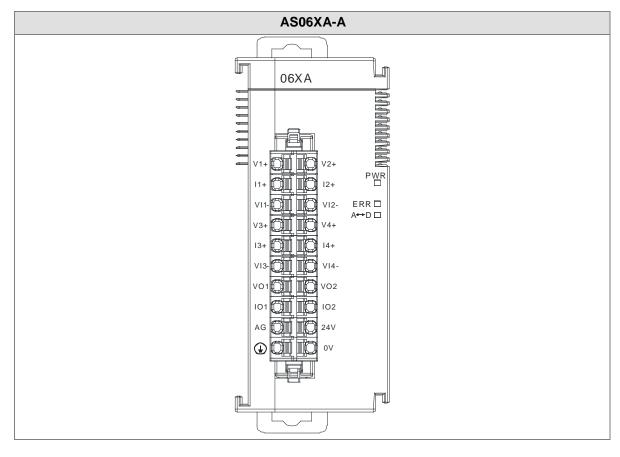
5.2.2 Profile



Number Name Description 1 Model Name Model name of the module Operating status of the module **RUN LED Indicator** ON: the module is running. OFF: the module is not running. Error status of the module ON: a serious error exists in the module. 2 **ERROR LED Indicator** OFF: the module is operating normally. Blink: a minor error exists in the module. Conversion status Analog-to-Digital Blinking: conversion is in process. Conversion Indicator OFF: conversion has stopped. Inputs are connected to transducers. 3 Removable Terminal Block Outputs are connected to loads to be driven. Arrangement of the 4 Arrangement of the terminals Input/Output Terminals

| Number | Name | Description |
|--------|-----------------------|--------------------------------------|
| 5 | Clip | For removing 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 |

5.2.3 Arrangement of Terminals





5.2.4 Control Registers

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------------|---|-------|----------|
| 0 | Format Setup | 0: integer format 1: floating point format | R | 0 |
| 1 | Input channel 1 mode setup | 0: closed 1: -10 V to +10 V (default) | | |
| 2 | Input channel 2 mode setup | 2: 0–10 V 3: -5 to +5 V | DAM | |
| 3 | Input channel 3 mode setup | 4: 0–5 V 5: 1–5 V | R/W | 1 |
| 4 | Input channel 4 mode setup | 6: 0–20 mA 7: 4–20 mA 8: -20 mA to +20 mA | | |
| 5 | Input channel 1 offset | | | |
| 6 | Input channel 2 offset | Range: -32768 to +32767 | R/W | 0 |
| 7 | Input channel 3 offset | Trange. 32700 to 132707 | | |
| 8 | Input channel 4 offset | | | |
| 9 | Input channel 1 gain | | | |
| 10 | Input channel 2 gain | Range: -32768 to +32767 | R/W | 1000 |
| 11 | Input channel 3 gain | Trange32700 to +32707 | 1000 | 1000 |
| 12 | Input channel 4 gain | | | |
| 13 | Input channel 1 average times | | | |
| 14 | Input channel 2 average times | Range: 1–100 | R/W | 10 |
| 15 | Input channel 3 average times | Trange. 1–100 | IN/VV | 10 |
| 16 | Input channel 4 average times | | | |
| 17 | Input channel 1 filter | | R/W | 1 |

| CR# | Name | Description | Atr. | Defaults |
|-----|-----------------------------------|------------------------------------|------|----------|
| | average percentage | | | |
| 18 | Input channel 2 filter | Range: 0–3 | | |
| | average percentage | Unit: ±10% | | |
| 19 | Input channel 3 filter | 1: ±10% | | |
| | average percentage | 2: ±20% | | |
| 20 | Input channel 4 filter | 3: ±30% | | |
| | average percentage | | | |
| | | 0: 2 ms | | |
| | | 1: 4 ms | | |
| | | 2: 10 ms | | |
| | | 3: 15 ms | | |
| | | 4: 20 ms | | |
| | Input channel sampling | 5: 30 ms | | |
| 21 | cycle (sampling/integration time) | 6: 40 ms | R/W | 0 |
| | | 7: 50 ms | | |
| | | 8: 60 ms | | |
| | | 9: 70 ms | | |
| | | 10: 80 ms | | |
| | | 11: 90 ms | | |
| | | 12: 100 ms | | |
| | | 0: open channel alarm | | |
| | | 1: close channel alarm | | |
| | | bit0: channel 1 | | |
| | | bit1: channel 2 | | |
| | | bit2: channel 3 | | |
| 22 | Input channel alarm setup | bit3: channel 4 | R/W | 0 |
| | | | | |
| | | 0: warning | | |
| | | 1: alarm | | |
| | | bit8: error in the power supply | | |
| | | bit9: error in the module hardware | | |
| | | bit10: error in calibration | | |



| CR# | Name | Description | Atr. | Defaults |
|-----|---|--|----------|----------|
| 23 | Output channel 1 mode setup | 0: closed 1: -10 V to +10 V (default) 2: 0–10 V 3: -5 V to +5 V | D | |
| 24 | Output channel 2 mode setup | 4: 0–5 V 5: 1–5 V 6: 0–20 mA 7: 4–20 mA | R/W | 1 |
| 25 | Output channel 1 offset | Range: -32768 to +32767 | R/W | 0 |
| 26 | Output channel 2 offset | Trainge. 02700 to 102707 | | |
| 27 | Output channel 1 gain | Range: -32768 to +32767 | R/W | 1000 |
| 28 | Output channel 2 gain | Trange. 627 66 to 1027 67 | | 1000 |
| 29 | Retain the output sent by channel 1 | 0: When the PLC stops, the value of the analog output is reset to 0. | R/W | 0 |
| 30 | Retain the output sent by channel 2 | 1: When the PLC stops, the value of the analog output is retained. | | |
| 31 | Refresh the time for output sent by channel 1 | Range: 10-3200 (100 ms-32000 ms) Unit: 10 ms | R/W | 0 |
| 32 | Refreshing the time for an output sent by channel 2 | Any value less than 10 is read as 0. Any value larger than 3200 is read as 3200. Set the value to 0 to disable this function. | R/W | 0 |
| 33 | The minimum scale range | When the format is set to integer in | | -10.0 |
| 34 | for input channel 1 | HWCONFIG, the scale range is invalid. | | 10.0 |
| 35 | The minimum scale range | For analog-digital modules, it is much more | | -10.0 |
| 36 | for input channel 2 | convenient if the system can convert digital | | |
| 37 | The minimum scale range | values to floating-point values for earier | | -10.0 |
| 39 | for input channel 3 The minimum scale range | understanding. Here you can set the minimum and maximum scale ranges of corresponding | R | |
| 40 | for input channel 4 | floating-point values for channels. | | -10.0 |
| 41 | The minimum scale range | For example, if the scale range for an analog | | |
| 42 | for output channel 1 | to digital input channel is ±10.0 V, it indicates | | -10.0 |
| 43 | The minimum scale range | the maximum value is +10.0 V and the | | -10.0 |
| 44 | for output channel 2 | minimum value is -10.0 V. | | -10.0 |

| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------|--|------|----------|
| 45 | The maximum scale range | If the scale range for an analog to digital input | | 40.0 |
| 46 | for input channel 1 | channel is 4 mA ~ 20 mA. It indicates the | | 10.0 |
| 47 | The maximum scale range | maximum value is 20 mA and the minimum | | 10.0 |
| 48 | for input channel 2 | value is 4 mA. | | 10.0 |
| 49 | The maximum scale range | Note: You can use PLC instruction DSCLP | | 10.0 |
| 50 | for input channel 3 | (API0217) and set SM685 to ON to use | | 10.0 |
| 51 | The maximum scale range | floating-point operations when a conversion | | 10.0 |
| 52 | for input channel 4 | range needs to edit. | | |
| 53 | The maximum scale range | | | 10.0 |
| 54 | for output channel 1 | | | |
| 55 | The maximum scale range | | | 10.0 |
| 56 | for output channel 2 | | | |
| 201 | Instruction Set | Instructions for peak values 16#0101: record the peak value again for channel 1 16#0102: record the peak value again for channel 2 16#0104: record the peak value again for channel 3 16#0108: record the peak value again for channel 4 16#010F: record the peak values again for channel 4 16#0201: enable recording for channel 1 16#0202: enable recording for channel 2 16#0204: enable recording for channel 3 16#0208: enable recording for channel 4 16#020F: enable recording for channel 1 16#0211: disable recording for channel 1 16#0212: disable recording for channel 3 16#0214: disable recording for channel 3 16#0218: disable recording for channel 4 | W | 0 |



| CR# | Name | Description | Atr. | Defaults |
|---------------|--------------------------------------|--|------|----------|
| 210 | The maximum peak value for channel 1 | | | |
| 211 | The maximum peak value for channel 2 | Integer format; the maximum peak value for | | |
| 212 | The maximum peak value for channel 3 | analog inputs | R | - |
| 213 | The maximum peak value for channel 4 | | | |
| 214 | The minimum peak value for channel 1 | | | |
| 215 | The minimum peak value for channel 2 | Integer format; the minimum peak value for analog inputs | | |
| 216 | The minimum peak value for channel 3 | | | - |
| 217 | The minimum peak value for channel 4 | | | |
| 222 | The time to record for channel 1 | | | |
| 223 | The time to record for channel 2 | Unit: 10 ms Range: 1–100 | R/W | 1 |
| 224 | The time to record for channel 3 | Time to record the digital value for the channels | IVVV | ' |
| 225 | The time to record for channel 4 | | | |
| 240 | The number of records for channel 1 | | | |
| 241 | The number of records for channel 2 | Range: 0–500, display the current records | D | 0 |
| 242 | The number of records for channel 3 | Trainge. 0-500, display the current records | R | 0 |
| 243 | The number of records for channel 4 | | | |
| 4000 ~4499 | Records for channel 1 | 500 records for channel 1 | R | _ |
| 4500 ~4999 | Records for channel 2 | 500 records for channel 2 | | |

| CR# | Name | Description | Atr. | Defaults |
|---------------|-----------------------|---------------------------|------|----------|
| 5000 ~5499 | Records for channel 3 | 500 records for channel 3 | | |
| 5500 ~5999 | Records for channel 4 | 500 records for channel 4 | | |

5.2.5 Functions

Set modes of operation and parameters with HWCONFIG utility software built into ISPSoft.

Analog input

| Item | Function | Description |
|------|-------------------------------|---|
| 1 | Enable/Disable a Channel | Enable or disable a channel. If a channel is disabled, the total conversion time decreases. |
| 2 | Calibration | Calibrate a linear curve. |
| 3 | Average | Conversion values are averaged and filtered. |
| 4 | Disconnection Detection | Disconnection detection only operates when the analog range is 4–20 mA or 1–5 V. |
| 5 | Channel Detect and Alarm | If an input signal exceeds the range of inputs that the hardware can receive, the module produces an alarm or a warning. You can disable this function. |
| 6 | Limit Detections for Channels | Save the maximum/minimum values for channels |
| 7 | Records for Channels | Save the analog curves for channels. |
| 8 | Scale Range | When the format is floating-point, you can set the scale range. |

1. Enable/Disable a Channel

An analog signal is converted into a digital signal at a rate of 2 ms per channel. The total conversion time is 2 ms X (the number of channels). If a channel is not used, you can disable it to decrease the total conversion time.

2. Calibration

To make a curve meet specific needs, calibrate the curve by changing the offset and the gain. The calibration range depends on the range of inputs which can be received by the hardware. The formula is:

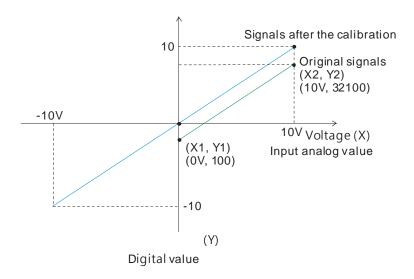
$$Output = \frac{(Input \times Gain)}{1000} + Offset$$



Example:

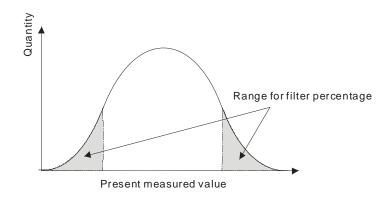
A channel receives voltage inputs between -10.0 V to +10.0 V. The gain is 1000, and the offset is 0. The corresponding value for the original signal -10.0 V to +10.0 V is -32000 to +32000. If you change the offset to -100, the calibrated value for the original signal -10.0 V to +10.0 V becomes -31900 to +32100. When the input voltage is 0 V, the digital value becomes -100. When the input voltage is 10.0 V, the digital value becomes 32100.

Gain = 1000, Offset = -100



3. Average

You can set the average value between 1–100. It is a steady value obtained from the sum of the recorded values. If the recorded values include an acute pulse due to unavoidable external factors, however, you may observe violent changes in the average value. Use the filtering function to exclude acute pulses from the sum-up and equalization, so the computed average value is not affected by the acute recorded values. Set the filter percentage to the range 0–3, where the unit is 10%. If you set the filter range to 0, the system sums up all the recorded values and divides them to obtain the average value, but if you set the filter range to 1, for example, the system excludes the bottom 10% and the top 10% of the values and averages only the remaining values to get the average value. For instantance, set the average value to 100 and set the filter percentage to 3. When there are 100 pieces of data collected, the system arranges the collected data according to their values from large to small and then excludes the bottom 30% and top 30% of the values (60 pieces of data) and averages only the remaining values (40 pieces of data) to obtain the average value.



4. Disconnection detection

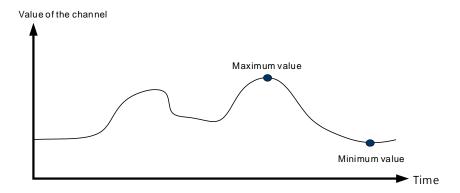
Disconnection detection only operates when the analog range is 4–20 mA or 1–5 V. If a module which can receive inputs between 4–20 mA or between 1–5 V is disconnected, the input signal exceeds the range of allowable inputs, so the module produces an alarm or a warning.

5. Channel Detection

If an input signal exceeds the allowable range of inputs, an error message appears. You can disable this function so that the module does not produce an alarm or a warning when the input signal exceeds the input range.

6. Limit detections for channels

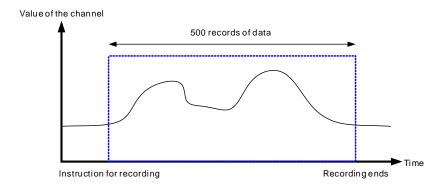
This function saves the maximum and minimum values for channels so that you can determine the peak to peak values.





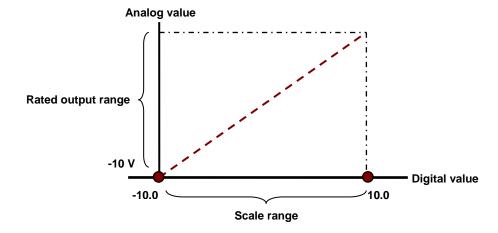
7. Records for Channels

Record the input values of the cyclic sampling for each channel. The system saves up to 500 data points and the recording time is 10 ms.



8. Scale range

When the format is floating-point, you can set the scale range. The analog output mode of a channel has a corresponding digital range. Digital values correspond to analog outputs sent by the module. For example, if the analog range is -10 V to +10 V, the digital range is -10.0 to +10.0, the HSP scale is 10.0, and the LSP scale is -10.0. The digital values -10.0 to +10.0 correspond to the analog values -10 V to +10 V, as the example below shows.



Analog Output

| Item | Function | Description |
|------|---------------------|--|
| 4 | Enable/Disable a | 1. Enable or disable a channel. |
| 1 | Channel | 2. If a channel is disabled, the total conversion time decreases. |
| 2 | Calibration | Calibrate a linear curve. |
| 3 | Retain an Output | When a module stops running, the system retains the signal sent by the module. |
| 4 | Refresh Time for an | Refresh the analog output value according to the value of the fixed slope. |
| 4 | Output | |
| 5 | Scale Range | You can set the scale range when the format is floating-point. |

1. Enable/Disable a Channel

An analog signal is converted into a digital signal at a rate of 2 ms per channel. The total conversion time is 2 ms X (the number of channels). If a channel is not used, you can disable it to decrease the total conversion time.

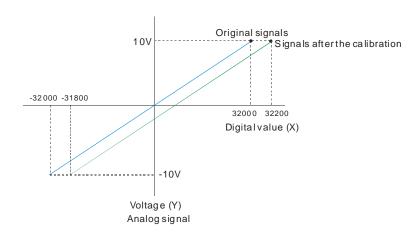
2. Calibration

To make a curve meet specific needs, calibrate the curve by changing the offset and the gain. The calibration range depends on the range of inputs which can be received by the hardware. The formula is:

$$Output = \frac{(Input \times Gain)}{1000} + Offset$$

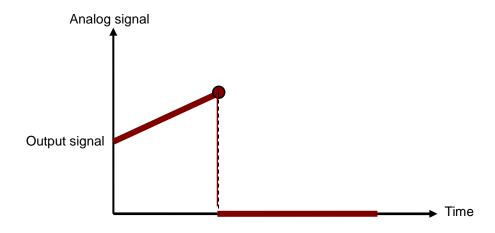
Example:

A channel receives voltage inputs between -10.0 V to +10.0 V. The gain is 1000, and the offset is 0. The corresponding value for the original signal -10.0 V to +10.0 V is -32000 to +32000. If you change the offset to 200 and the gain to 1000, the calibrated value for the original signal -10.0 V to +10.0 V is -31800 to +32200.



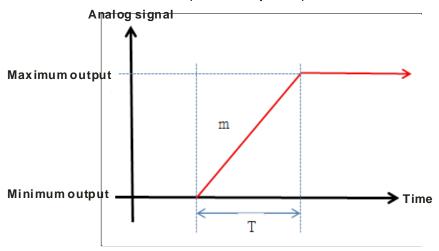
When a module stops running, the system retains the signal sent by the module.

The output is not retained:

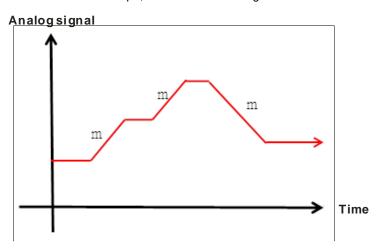


4. Refresh Time for an Output

Set the refresh time for an output and the system updates the value of the slope (m) accordingly.



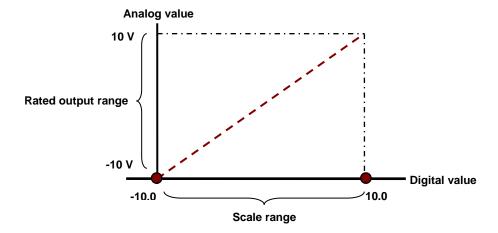
When the analog output signal changes, the system updates the value of the analog output according to the value set in the slope, as shown in the image below.



*The output conversion time and the input channel sampling cycle are the same.

5. Scale Range

You can set the scale range when the format is floating-point. The analog output mode of a channel has a corresponding digital range. Digital values correspond to analog outputs sent by the module. For example, if the analog range is -10 V to +10 V, the digital range is -10.0 to +10.0, the HSP scale is 10.0, and the LSP scale is -10.0. The digital values -10.0 to +10.0 correspond to the analog values -10 V to +10 V, as the example below shows.



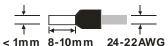


5.2.6 Wiring

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.

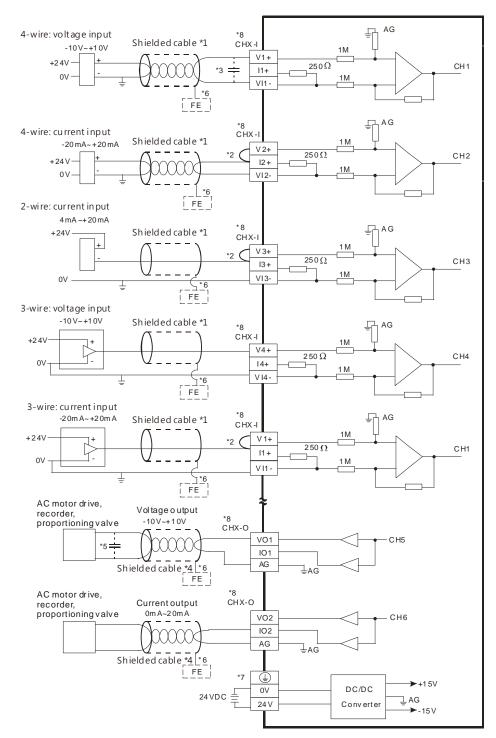
- (1) To prevent a surge and induction, the AC cable and the input signal cables that are connected to the AS06XA-A must be separate cables.
- (2) Do not install the cable near a main circuit, a high-voltage cable, or a cable connected to a load that is not a PLC. In addition, the cable must not be bound 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 with a diameter of 24–22 AWG and with pin-type connectors smaller than 1 mm. Only use copper conducting wires which can withstand temperatures of 60° C /75° C or higher.



- (6) Note: use cables with the same length (less than 200 m) and use wire resistance of less than 100 ohm.
- (7) 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.

External wiring

(1) AS06XA-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 variability in the input voltage results in interference within the wiring, connect the module to a capacitor having a capacitance between 0.1–0.47 µF and a working voltage of 25 V.



- *4. Connect the shielded cable to the terminal FE and to the ground terminal.
- *5. Connect the terminal $\begin{tabular}{l} & & \\ &$
- *6. The wording "CHX-I" indicates that you can use those five wiring methods for every input channel. The wording "CHX-O" indicates that you can use those two wiring methods for every output channel.

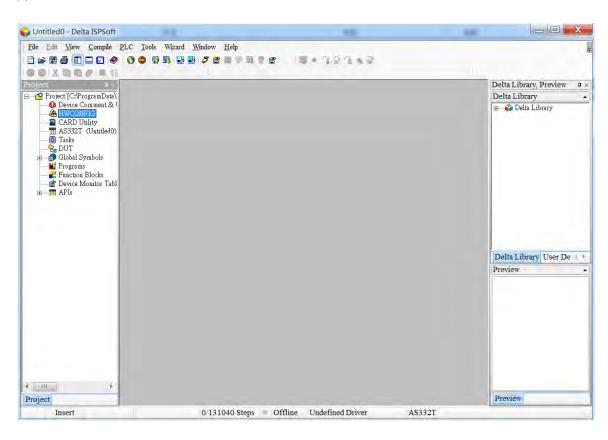
5.2.7 LED Indicators

| Number | Name | Description |
|--------|-------------------|--|
| | | Operating status of the module |
| 1 | RUN LED Indicator | ON: the module is running. |
| | | OFF: the module is not running. |
| | | Error status of the module |
| 2 | ERROR LED | ON: a serious error exists in the module. |
| 2 | Indicator | OFF: the module is operating normally. |
| | | Blink: a minor error exists in the module. |
| | Analog-to-Digital | Conversion status |
| 3 | Conversion | Blinking: conversion is in process. |
| | Indicator | OFF: conversion has stopped. |

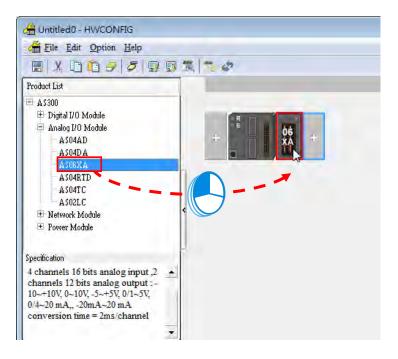
5.3 HWCONFIG in ISPSoft

5.3.1 Initial Setting

(1) Start ISPSoft and double-click **HWCONFIG**.

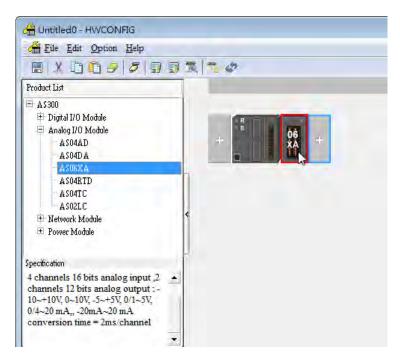


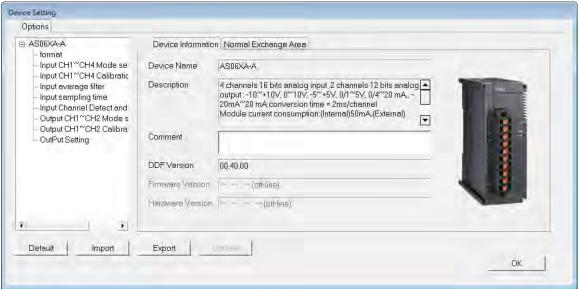
(2) Select a module and drag it to the working area.





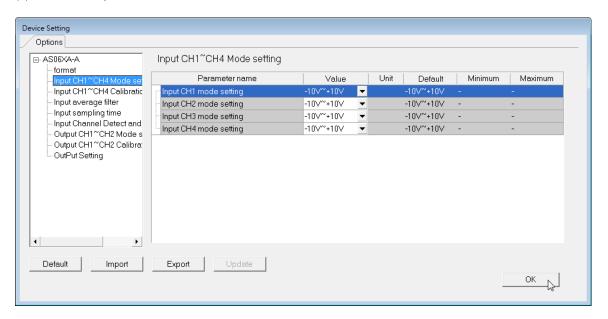
(3) Double-click the module in the working area to open the Device Setting page.



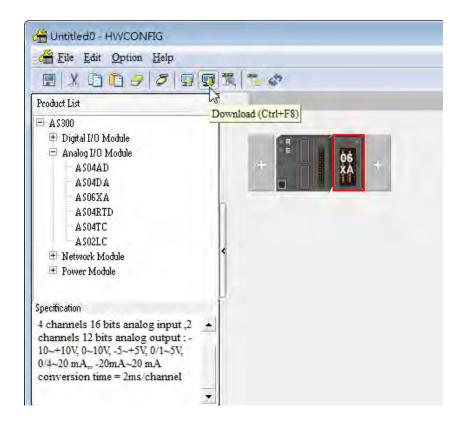


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(4) Choose the parameter, set the values, and click **OK**.



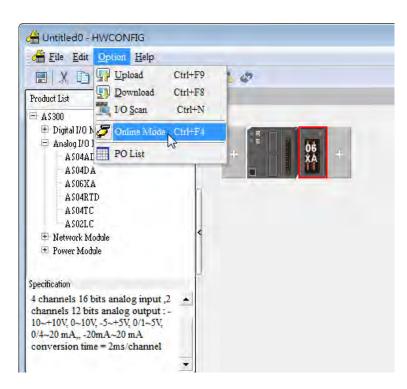
(5) Click **Download** on the toolbar to download the parameters. Note that you cannot download the parameters while the CPU module is running.





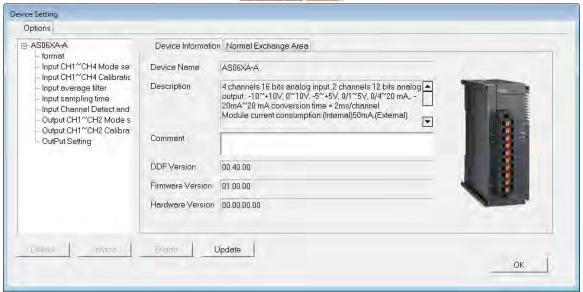
5.3.2 Checking the Version of a Module

(1) On the Option menu, click Online Mode.



(2) Double-click the module to open the Device Setting page. The versions of both the firmware and the hardware are displayed.

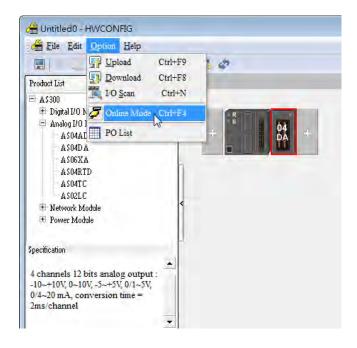




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5.3.3 Online Mode

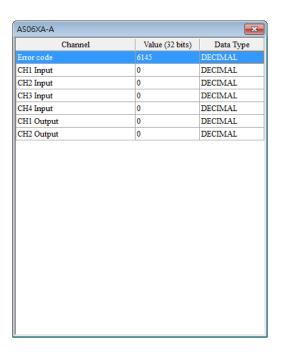
(1) On the Option menu, click Online Mode.



(2) Right-click the module and click Module Status.



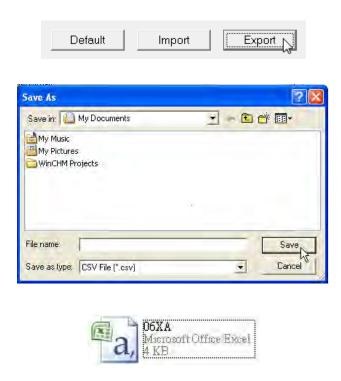
(3) View the module status.



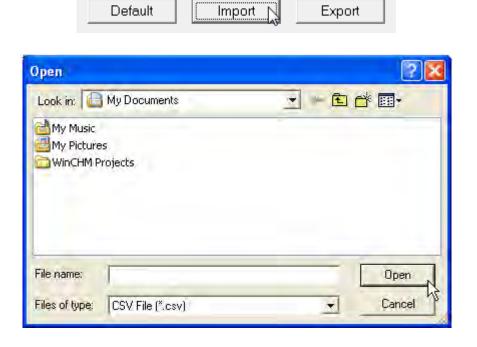


5.3.4 Importing/Exporting a Parameter File

(1) Click **Export** in the Device Settings dialog box to save the current parameters as a CSV file (.csv).



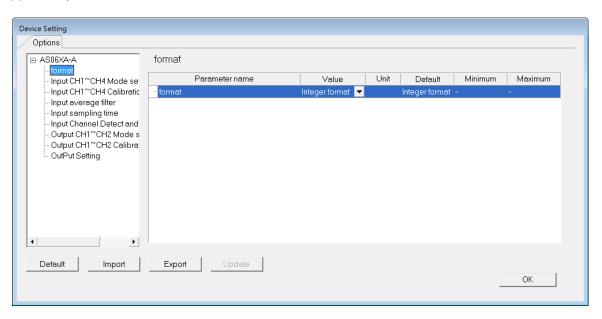
(2) Click Import in the Device Settings dialog box and select a CSV file to import saved parameters.



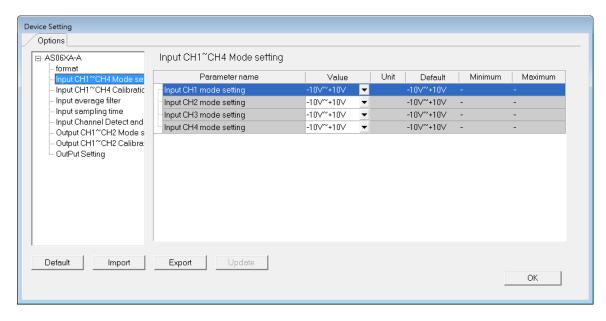
5

5.3.5 Parameters

(1) The input modes of the channels

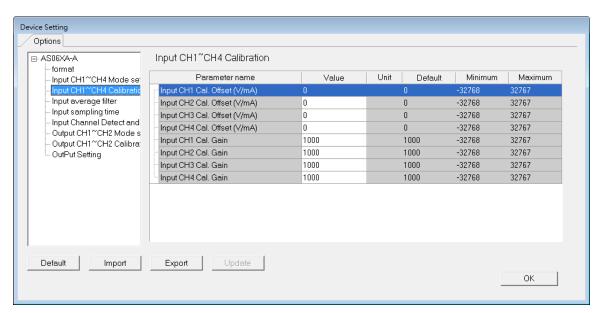


(2) Input CH1-CH4 (channel 1-channel 4) mode settings

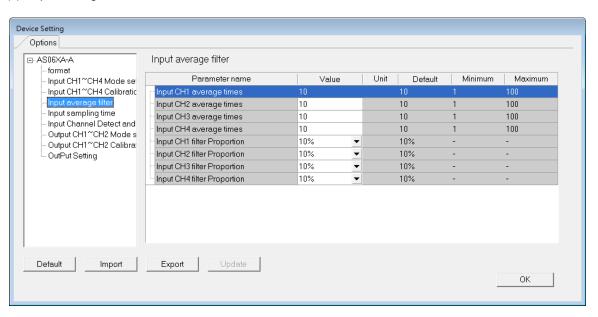




(3) Input CH1-CH4 calibration

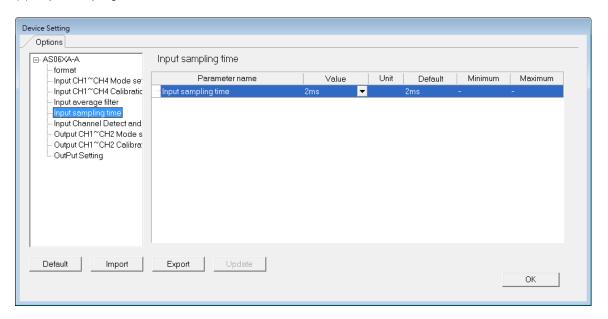


(4) Input average filter

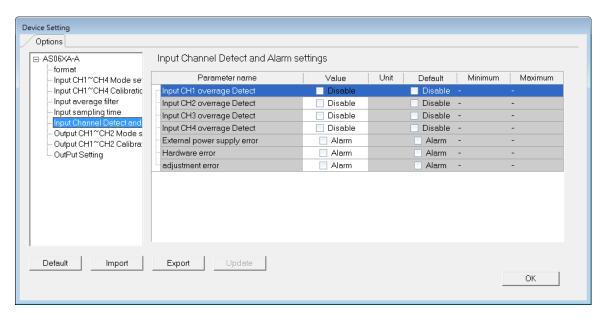


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(5) Input sampling time

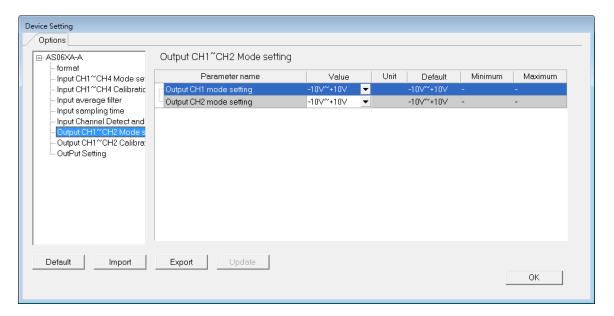


(6) Input channel detection and alarm settings

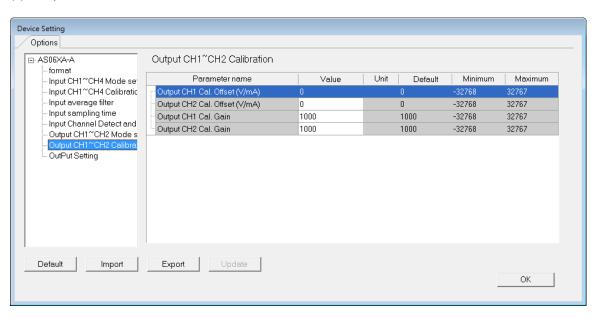




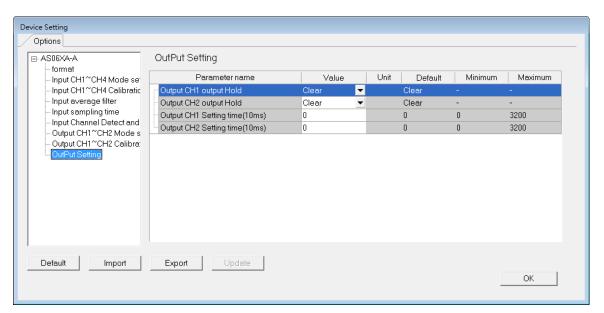
(7) Output CH1-CH2 mode settings



(8) Output CH1-2 calibration



(9) Output Settings



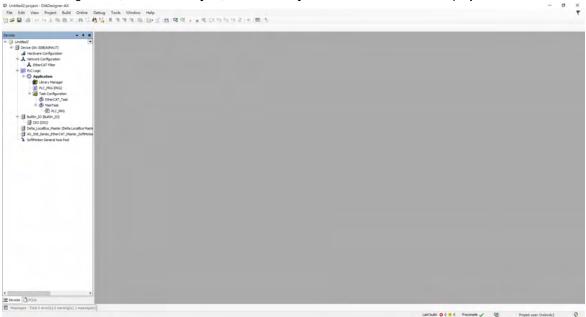


5.4 DIADesigner-AX (Hardware Configuration)

The following example uses AS06XA-A.

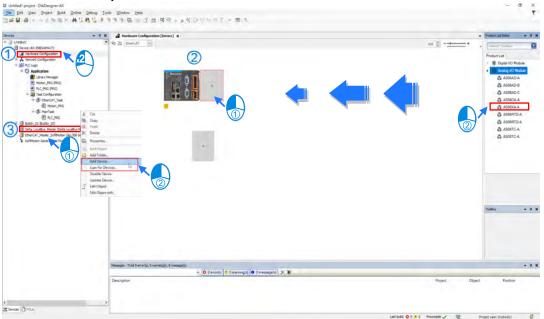
5.4.1 Initial Setting

(1) Start DIADesigner-AX, click **New Project**, and then **Project+Device** to create a new project.



(2) Add modules in:

- ① Double-click Hardware Configuration
- Select the + section and drag and drop the module that you want to add from the Product List to the + section.
- or ③ Right-click **Delta_Localbus Master** to see the context meun and then double-click **Add Device** to add devices manually or double-click **Scan for Devices**.

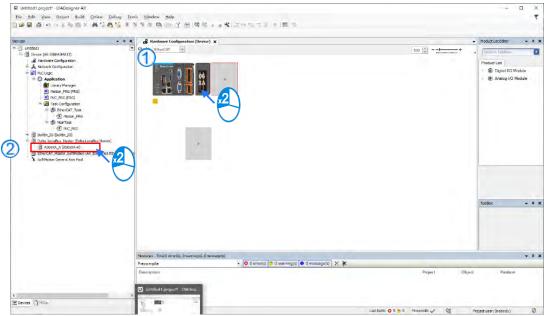


5

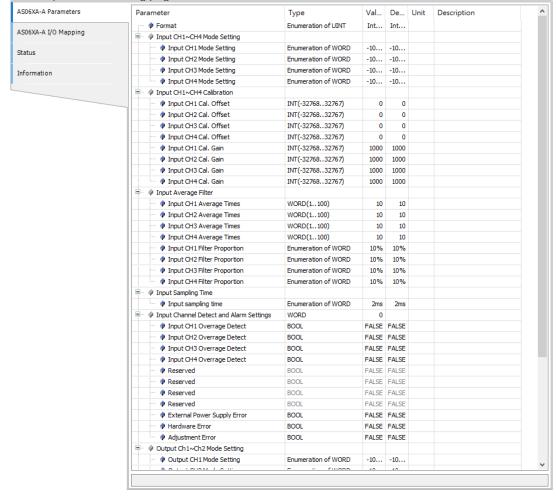
(3) Select modules:

① Double-click the module name in the Hardware Configuration area.

or ② Double-click the module name shown in the node.

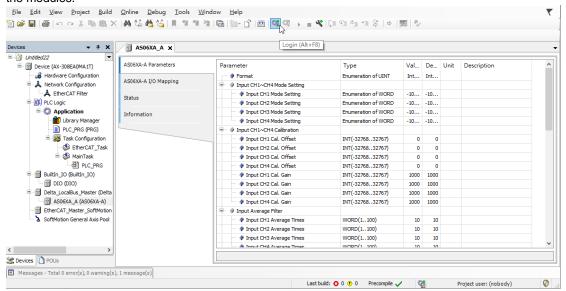


(4) Module parameter setting page:





(5) After setting is complete, select the module and click **Login** on the tool bar to download the settings to the modules.

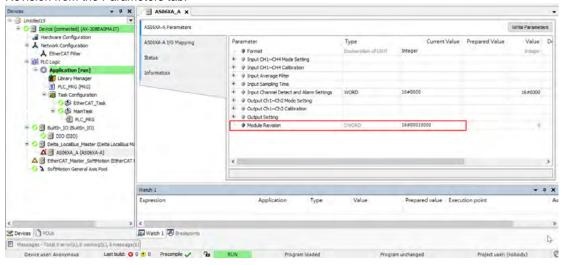


5.4.2 Checking the Version of a Module

(1) Select the module and click the Information tab to see the module information.



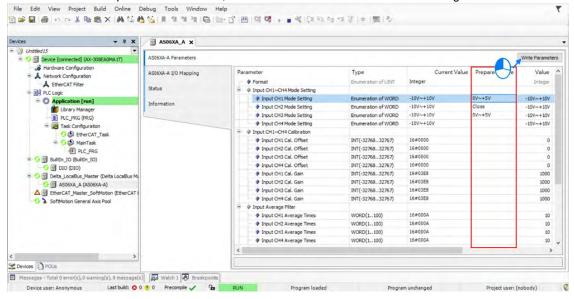
(2) Select the module and click **Login** on the tool bar to go to Online Mode. You can find the Module Revision from the Parameters tab.



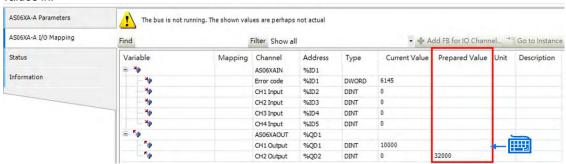


5.4.3 Online Mode

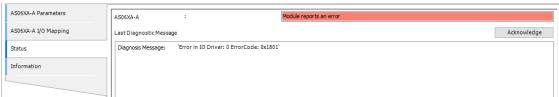
(1) Select the module and click Login on the tool bar to go to Online Mode. You can monitor all configuration parameters. Vaules in the column of Prepared Value are configurable online. After editing the values in the Prepared Value column, click Write Parameter to confirm the change.



(2) You can monitor the values, status, error codes in each channel from the I/O Mapping tab. You can also set a new value in the colum of Prepared Value and press Ctrol+F7 on the keyboard to write the new values in.



(3) You can monitor the current status and error codes from the Status tab.



5.4.4 Parameters

(1) You can set up the value format to Integer or Floating for Channel 1 to 4.

| A | |
|---|--|
| Format Enumeration of UINT Integer VInteger | |
| ☐ Ø CH1~CH4 Mode Setting Integer | |
| CH1 Mode Setting Enumeration of WORD Floating nteger V~+10V | |
| | |
| Ø CH3 Mode Setting Enumeration of WORD -10V∼+10V -10V∼+10V | |
| | |

(2) You can set up the values for Channel 1 to 4.

| Parameter | Туре | Value | Default Value | Unit | Description |
|------------------------------|---------------------|------------------------|---------------|------|-------------|
| Format | Enumeration of UINT | Integer | Integer | | |
| 🖣 · 👂 CH1∼CH4 Mode Setting | | | | | |
| CH1 Mode Setting | Enumeration of WORD | -10V~+10V × | -10V~+10V | | |
| ··· | Enumeration of WORD | Close | -10V~+10V | | |
| | Enumeration of WORD | -10V~+10V 0V~+10V | -10V~+10V | | |
| ··· | Enumeration of WORD | -5V~+5V | -10V~+10V | | |
| ☐ ··· | | 0V~+5V 1V~+5V | | | |
| | INT(-3276832767) | 0mA~20mA | 0 | | |
| OH2 Cal. Offset (V/mA) | INT(-3276832767) | 4mA~20mA -20mA~20mA | 0 | | |
| ··· ♦ CH3 Cal. Offset (V/mA) | INT(-3276832767) | -ZUMA~ZUMA | 0 | | |

(3) You can set up the calibrations for for Channel 1 to 4.

| INT(-3276832767) | 0 | 0 | | |
|------------------|--|--|---|---|
| INT(-3276832767) | 0 | 0 | | |
| INT(-3276832767) | 0 | 0 | | |
| INT(-3276832767) | 0 | 0 | | |
| INT(-3276832767) | 1000 | 1000 | | |
| INT(-3276832767) | 1000 | 1000 | | |
| INT(-3276832767) | 1000 | 1000 | | |
| INT(-3276832767) | 1000 | 1000 | | |
| | INT(-3276832767) INT(-3276832767) INT(-3276832767) INT(-3276832767) INT(-3276832767) INT(-3276832767) | INT(-3276832767) 0 INT(-3276832767) 0 INT(-3276832767) 0 INT(-3276832767) 1000 INT(-3276832767) 1000 INT(-3276832767) 1000 | INT(-3276832767) 0 0 INT(-3276832767) 0 0 INT(-3276832767) 0 0 INT(-3276832767) 1000 1000 INT(-3276832767) 1000 1000 INT(-3276832767) 1000 1000 | INT(-3276832767) 0 0 0 INT(-3276832767) 0 0 0 INT(-3276832767) 0 0 0 INT(-3276832767) 0 0 INT(-3276832767) 1000 1000 INT(-3276832767) 1000 1000 INT(-3276832767) 1000 1000 INT(-3276832767) 1000 1000 |

(4) You can set up the average filtering for Channel 1 to 4.

| | | | 0 | | | | |
|---|---|-----------------------|---|---------------------|-----|-----|--|
| ₽ | | verage Filter | | | | | |
| | | CH1 Average Times | | WORD(1100) | 10 | 10 | |
| | | CH2 Average Times | | WORD(1100) | 10 | 10 | |
| | | CH3 Average Times | | WORD(1100) | 10 | 10 | |
| | | CH4 Average Times | | WORD(1100) | 10 | 10 | |
| | | CH1 Filter Proportion | | Enumeration of WORD | 10% | 10% | |
| | | CH2 Filter Proportion | | Enumeration of WORD | 10% | 10% | |
| | | CH3 Filter Proportion | | Enumeration of WORD | 10% | 10% | |
| | l | CH4 Filter Proportion | | Enumeration of WORD | 10% | 10% | |



(5) You can set up the sampling time.

| - Sampling Time | | | | |
|---|---------------------|-------|-------|--|
| sampling time | Enumeration of WORD | 2ms | 2ms | |
| → ② Channel Detect and Alarm Settings | WORD | 0 | | |
| ··· 👂 CH1 Overrage Detect | BOOL | FALSE | FALSE | |
| CH2 Overrage Detect | BOOL | FALSE | FALSE | |
| → Property CH3 Overrage Detect Output Detect Detect Output Detect D | BOOL | FALSE | FALSE | |
| CH4 Overrage Detect | BOOL | FALSE | FALSE | |
| ··· 🕪 Reserved | BOOL | FALSE | FALSE | |
| ··· | BOOL | FALSE | FALSE | |
| ··· 👂 Reserved | BOOL | FALSE | FALSE | |

(6) You can set up the channel detect and alarm settings.

| Channel Detect and Alarm Settings | WORD | 0 | | |
|---|------|-------|-------|--|
| → P CH1 Overrage Detect Output Description BOOL | FALSE | FALSE | |
| OH2 Overrage Detect | BOOL | FALSE | FALSE | |
| ··· ♦ CH3 Overrage Detect | BOOL | FALSE | FALSE | |
| OH4 Overrage Detect | BOOL | FALSE | FALSE | |
| ··· 👂 Reserved | BOOL | FALSE | FALSE | |
| Reserved | BOOL | FALSE | FALSE | |
| ··· 👂 Reserved | BOOL | FALSE | FALSE | |
| ··· 👂 Reserved | BOOL | FALSE | FALSE | |
| External Power Supply Error | BOOL | FALSE | FALSE | |
| ··· 👂 Hardware Error | BOOL | FALSE | FALSE | |
| Adjustment Error | BOOL | FALSE | FALSE | |

(7) You can set up the output channel mode for Channel 1 and 2.

| <u> </u> | Output Ch1∼Ch2 Mode Setting | | | | |
|----------|---|---------------------|-----------|-----------|--|
| | Output CH1 Mode Setting | Enumeration of WORD | -10V~+10V | -10V~+10V | |
| | Output CH2 Mode Setting | Enumeration of WORD | -10V~+10V | -10V~+10V | |

(8) You can set up the calibrations for output Channel 1 and 2.

| Total data of the title data of the total data of the title and a control o | | | | | | | |
|--|------------------|------|------|--|--|--|--|
| ☐ Ø Output Ch1~Ch2 Calibration | | | | | | | |
| ··· 👂 Output CH1 Cal. Offset | INT(-3276832767) | 0 | 0 | | | | |
| Output CH2 Cal. Offset | INT(-3276832767) | 0 | 0 | | | | |
| Output CH1 Cal. Gain | INT(-3276832767) | 1000 | 1000 | | | | |
| Output CH2 Cal. Gain | INT(-3276832767) | 1000 | 1000 | | | | |

(9) You can set up the output settings for output Channel 1 and 2.

| Output Setting | | | | |
|---|---------------------|-------|-------|--|
| Output CH1 Output Hold | Enumeration of WORD | Clear | Clear | |
| Output CH2 Output Hold | Enumeration of WORD | Clear | Clear | |
| Output CH1 Setting Time(10ms) | INT(03200) | 0 | 0 | |
| Output CH2 Setting Time(10ms) | INT(03200) | 0 | 0 | |

5.5 Troubleshooting

5.5.1 Error Codes

| Error Code | Description | A↔ D LED indicator | ERROR LED indicator |
|---------------|---|--------------------|---------------------|
| 16#1605 | Hardware failure | OFF | ON |
| 16#1607 | The external voltage is abnormal. | OFF | ON |
| 16#1608 | The factory calibration is abnormal. | OFF | ON |
| 16#1801 | The external voltage is abnormal. | OFF | Blinking |
| 16#1802 | Hardware failure | OFF | Blinking |
| 16#1804 | The factory calibration is abnormal. | OFF | Blinking |
| 16#1808 | The signal received by channel 1 exceeds the range of inputs that the hardware can receive. | | |
| 16#1809 | The signal received by channel 2 exceeds the range of inputs that the hardware can receive. | Run: blinking | Blinking |
| 16#180A | The signal received by channel 3 exceeds the range of inputs that the hardware can receive. | Stop: OFF | Similaring |
| 16#180B | The signal received by channel 4 exceeds the range of inputs that | | |
| | the hardware can receive. | | |
| | | | Blinking once |
| | | | or twice and |
| _ | When power-on, the module is not detected by CPU module. | OFF | after 2 |
| | which power-on, the module is not detected by Or O module. | OH | seconds, it |
| | | | blinks |
| | | | repeatedly |



5.5.2 Troubleshooting Procedure

| Description | Procedure |
|--|--|
| The external voltage is abnormal. | Ensure the external 24 V power supply to the module is |
| The external voltage is abnormal. | functioning normally. |
| Hardware failure | Return the module to the factory for repair. |
| Internal error | Contact the feetow. |
| The factory calibration is abnormal. | Contact the factory. |
| The signal received by channel 1 exceeds the | Check the signal received by channel 1 |
| range of inputs that the hardware can receive. | Check the signal received by Charmer 1 |
| The signal received by channel 2 exceeds the | Check the signal received by channel 2. |
| range of inputs that the hardware can receive. | Check the signal received by charmer 2. |
| The signal received by channel 3 exceeds the | Check the signal received by channel 3. |
| range of inputs that the hardware can receive. | Chock the digital received by chainlet c. |
| The signal received by channel 4 exceeds the | Check the signal received by channel 4. |
| range of inputs that the hardware can receive. | Single Signal 10001100 by Glidinion 11 |
| When power-on, the module is not detected by | Check if the connection between module and CPU |
| CPU module. | module is working. If not, connect again. |

Chapter 6 Temperature Measurement Module AS04/06RTD

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This section describes the specifications for temperature measurement modules, their operation, and their programming. The AS04/06RTD is a temperature measurement module that converts the temperatures received from four/six thermocouples into digital signals. You can select either Celsius or Fahrenheit as the unit of measurement.

6.1.1 Characteristics

(1) Select a sensor based on its practical application.

Pt100/Ni100/Pt1000/Ni1000/JPt100/LG-Ni1000/Cu50/Cu100/0-300 Ω/0-3000 Ω sensor

(2) High-speed conversion

Two-wire/Three-wire configuration: 200 ms/channel

(3) High accuracy

Conversion accuracy: The error range of the input is ±0.1% at ambient temperature of 25° ±5° C.)

(4) Disconnection detection

When a sensor is disconnected, the AS04RTD produces an alarm or a warning.

(5) PID control

An object's temperature can be maintained through PID control actions.

(6) Use the utility software to configure the module.

The HWCONFIG utility software is built into ISPSoft. You can set modes and parameters directly in HWCONFIG without spending time writing programs to set registers to manage functions.

6.2 Specifications and Functions

6.2.1 Specifications

• Electrical specifications

| Module | AS04RTD-A | AS06RTD-A | |
|-------------------------|--|--|--|
| Number of Analog Inputs | 4 | 6 | |
| | 2-Wire & 3-Wire Pt100/Ni100/Pt1000/Ni1 300 Ω /0–3000 Ω | 000/JPt100/LG-Ni1000/Cu50/Cu100/0- | |
| | Pt100: DIN 43760-1980 JIS C1604-1989; | 100 Ω 3850 PPM/°C | |
| Appliaghla Canaar | Pt1000: DIN EN60751; 1 kΩ 3850 PPM/° | C | |
| Applicable Sensor | Ni100/Ni1000: DIN 43760 | | |
| | JPt100: JIS C1604-1989 | | |
| | LG-Ni1000 | | |
| | Cu50/Cu100 | | |
| Supply Voltage | 24 VDC (20.4–28.8 VDC) (-15% to +20%) | | |
| Connector Type | Removable terminal block | | |
| | Pt100/Ni100/Pt1000/Ni1000/JPt100 | | |
| | 25° C/77° F: The allowed error range is ±0.1% of full scale. | | |
| Overall Assuracy | -20° C to 60° C/-4° F to 140° F: The allowed error range is ±0.5% of full scale. | | |
| Overall Accuracy | LG-Ni1000; 25° C/77° F: The allowed error range is ±0.1% of full scale. | | |
| | Cu50; 25° C/77° F: The allowed error range is ±4% of full scale. | | |
| | Cu100; 25° C/77° F: The allowed error range is ±2% of full scale. | | |
| Conversion Time | Two-wire/Three-wire configuration: 200 m | s/channel | |
| | An analog circuit is isolated from a digital | circuit by a digital integrated circuit/ | |
| | optocoupler, and the analog channels are isolated from one another by | | |
| | optocouplers. | | |
| Isolation | Isolation between a digital circuit and the ground: 500 VDC | | |
| | Isolation between an analog circuit and the ground: 500 VDC | | |
| | Isolation between an analog circuit and the digital circuit: 500 VDC | | |
| | Isolation between the 24 VDC and the gro | ound: 500 VDC | |
| Weight | 115 g | 125 g | |



| Analog-to-Digital Conversion | Centigrade (°C) | | Input Impedance |
|---------------------------------|---|---|---------------------|
| Rated Measurement Range*1 | Pt100: -180° C to +800° C Ni100: -80° C to +170° C Pt1000: -180° C to +800° C Ni1000: -80° C to +170° C JPt100: -180° C to +500° C LG-Ni1000: -50° C to +180° C Cu50: -50° C to +150° C | Pt100: -292° F to +1,472° F Ni100: -112° F to +338° F Pt1000: -292° F to +1,472° F Ni1000: -112° F to +338° F JPt100: -292° F to +932° F LG-Ni1000: -58° F to +356° F Cu50: -58° F to +302° F | 0–300 Ω 0–3000 Ω |
| Maximum Measurable Range*2 | Cu100: -50° C to +150° C Pt100: -200°C to 850°C Ni100: -100°C to 180°C Pt1000: -200°C to 850°C Ni1000: -100°C to 180°C JPt100: -200°C to 510°C LG-Ni1000: -60°C to 200°C Cu50: -50°C to 150°C Cu100: -50°C to 150°C | Cu100: -58° F to +302° F Pt100: -328° F to 1,562° F Ni100: -148° F to 356° F Pt1000: -328° F to 1,562° F Ni1000: -148° F to 356° F JPt100: -328° F to 950° F LG-Ni1000: -76° F to 392° F Cu50: -58° F to 302° F Cu100: -58° F to 302° F | 0–320 Ω 0–3200 Ω |
| Average function Self-diagnosis | Range: 1-100 Disconnection detection | | |

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

Conversion details

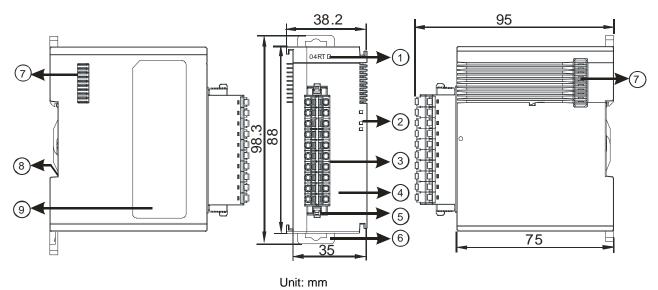
| Centigrade (°C) | | | | |
|-----------------|--------------------|--------------------------|----------------------------|--|
| Sancar tuna | Maximum measurable | Integer value range | Floating point value range | |
| Sensor type | range | after digital conversion | after digital conversion | |
| Pt100 | -200°C ~ 850°C | K-2000 ~ K8500 | -200.0 ~ 850.0 | |
| Ni100 | -100°C ~ 180°C | K-1000 ~ K1800 | -100.0 ~ 180.0 | |
| Pt1000 | -200°C ~ 850°C | K-2000 ~ K8500 | -200.0 ~ 850.0 | |
| Ni1000 | -100°C ~ 180°C | K-1000 ~ K1800 | -100.0 ~ 180.0 | |
| JPt100 | -200°C ~ 510°C | K-2000 ~ K5100 | -200.0 ~ 510.0 | |
| LG-Ni1000 | -60°C ~ 200°C | K-600 ~ K2000 | -60.0 ~ 200.0 | |
| Cu50 | -50°C ~150°C | K-500 ~ K1500 | -50.0 ~ 150.0 | |
| Cu100 | -50°C ~ 150°C | K-500 ~ K1500 | -50.0 ~ 150.0 | |
| 0~300Ω | 0 ~ 320Ω | K0 ~ K32000 | 0.0 ~ 320.00 | |
| 0~3000Ω | 0 ~ 3200Ω | K0 ~ K32000 | 0.0 ~ 3200.0 | |

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

| Fahrenheit (°F) | | | | |
|-----------------|--------------------|--------------------------|----------------------------|--|
| Songer type | Maximum measurable | Integer value range | Floating point value range | |
| Sensor type | range | after digital conversion | after digital conversion | |
| Pt100 | -328°F ~ 1,562°F | K-3280 ~ K15620 | -328.0 ~ 1562.0 | |
| Ni100 | -148°F ~ 356°F | K-1480 ~ K3560 | -148.0 ~ 356.0 | |
| Pt1000 | -328°F ~ 1,562°F | K-3280 ~ K15620 | -328.0 ~ 1562.0 | |
| Ni1000 | -148°F ~ 356°F | K-1480 ~ K3560 | -148.0 ~ 356.0 | |
| JPt100 | -328°F ~ 950°F | K-3280 ~ K9500 | -328.0 ~ 950.0 | |
| LG-Ni1000 | -76°F ~ 392°F | K-760 ~ K3920 | -76.0 ~ 392.0 | |
| Cu50 | -58°F ~ 302°F | K-580 ~ K3020 | -58.0 ~ 302.0 | |
| Cu100 | -58°F ~ 302°F | K-580 ~ K3020 | -58.0 ~ 302.0 | |
| 0 ~ 300Ω | 0 ~ 320Ω | K0 ~ K32000 | 0.0 ~ 320.00 | |
| 0 ~ 3000Ω | 0 ~ 3200Ω | K0 ~ K32000 | 0.0 ~ 3200.0 | |

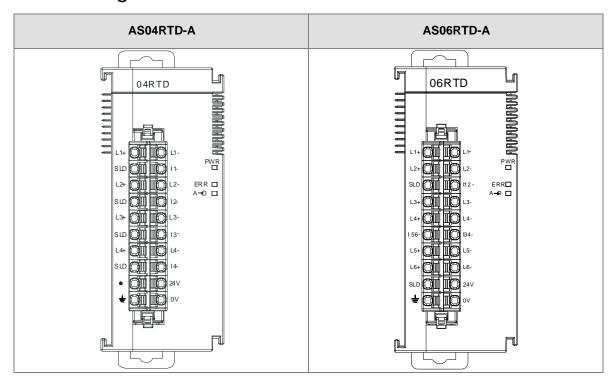


6.2.2 Profile



| Number | Name | Description |
|--------|---|--|
| 1 | Model Name | Model name of the module |
| | | Operating status of the module |
| | RUN LED Indicator | ON: the module is running. |
| | | OFF: the module is not running. |
| | | Error status of the module |
| 2 | 2 ERROR LED Indicator | ON: a serious error exists in the module. |
| | ENTON ELS INGIOACO | OFF: the module is operating normally. |
| | | Blink: a minor error exists in the module. |
| | Analog-to-Digital Conversion Indicator | Conversion status |
| | | Blinking: conversion is in process. |
| | | OFF: conversion has stopped. |
| 3 | Removable Terminal Block | The inputs are connected to transducers. |
| | Tromevable forminal Blook | The outputs are connected to loads to be driven. |
| 4 | Arrangement of the Input/Output Yerminals | Arrangement of the terminals |
| 5 | Clip | For removing 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 | Name plate |

6.2.3 Arrangement of Terminals





6.2.4 ASO4RTD Control Registers

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------------------|--------------------------|-------|----------|
| 0 | Format Setup | 0: integer format | R | 0 |
| O | Format Setup | 1: floating point format | | |
| | | 0: closed | | |
| 1 | 1 Channel 1 mode setup | 1 : 0–300 Ω (default) | | |
| | | 2 : 0–3000 Ω | | |
| 2 | Ohannal Ohannal | 3: Pt100 | | |
| 2 | Channel 2 mode setup | 4 : JPt100 | | |
| | | 5 : Pt1000 | R/W | 1 |
| 3 | Channel 3 mode setup | 6: Ni100 | | |
| | | 7 : Ni1000 | | |
| | | 8 : LG-Ni1000 | | |
| 4 | Channel 4 mode setup | 9 : Cu50 | | |
| | | 10 : Cu100 | | |
| 5 | Channel 1 offset | | | |
| 6 | Channel 2 offset | Panga: 22769 to 122767 | R/W | 0 |
| 7 | Channel 3 offset | Range: -32768 to +32767 | IX/VV | 0 |
| 8 | Channel 4 offset | | | |
| 9 | Channel 1 gain | | | |
| 10 | Channel 2 gain | D 00700 / 00707 | D 444 | 4000 |
| 11 | Channel 3 gain | Range: -32768 to +32767 | R/W | 1000 |
| 12 | Channel 4 gain | | | |
| 13 | Channel 1 average times | | | |
| 14 | Channel 2 average times | | | |
| 15 | Channel 3 average times | Range: 1–100 | R/W | 10 |
| 16 | Channel 4 average times | | | |
| 17 | Channel 1 filter average percentage | Range: 0–3 | DAA | |
| 18 | Channel 2 filter average percentage | Unit: ±10% | R/W | 1 |

| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------------------|------------------------------------|------|----------|
| 19 | Channel 3 filter average percentage | | | |
| 20 | Channel 4 filter average percentage | | | |
| | | 0: Fahrenheit | | |
| 21 | Units of temperature | 1: Celsius | R/W | 0 |
| | | 0: open channel alarm | | |
| | | 1: close channel alarm | | |
| | | bit0: channel 1 | | |
| | | bit1: channel 2 | | |
| | | bit2: channel 3 | | |
| 22 | Channel alarm setup | bit3: channel 4 | R/W | 0 |
| | Chainer diam octup | | 1000 | · · |
| | | 0: warning | | |
| | | 1: alarm | | |
| | | bit8: error in the power supply | | |
| | | bit9: error in the module hardware | | |
| | | bit10: error in calibration | | |
| | | 16#0101: record the peak value | | |
| | | again for channel 1 | | |
| | | 16#0102: record the peak value | | |
| | | again for channel 2 | | |
| | | 16#0104: record the peak value | | |
| | | again for channel 3 | | |
| | | 16#0108: record the peak value | | |
| | | again for channel 4 | | |
| 201 | Instruction set | 16#010F: record the peak values | W | 0 |
| | | again for channels 1-4 | | |
| | | 16#0201: enable recording for | | |
| | | channel 1 | | |
| | | 16#0202: enable recording for | | |
| | | channel 2 | | |
| | | 16#0204: enable recording for | | |
| | | channel 3 | | |
| | | 16#0208: enable recording for | | |



| CR# | Name | Description | Atr. | Defaults |
|-------|--------------------------------------|-----------------------------------|--------|----------|
| | | channel 4 | | |
| | | 16#020F: enable recording for | | |
| | | channels 1-4 | | |
| | | 16#0211: disable recording for | | |
| | | channel 1 | | |
| | | 16#0212: disable recording for | | |
| | | channel 2 | | |
| | | 16#0214: disable recording for | | |
| | | channel 3 | | |
| | | 16#0218: disable recording for | | |
| | | channel 4 | | |
| | | 16#021F: disable recording for | | |
| | | channels 1-4 | | |
| | | 16#0502: restore default settings | | |
| 210 | The maximum peak value for channel 1 | | | _ |
| 211 | The maximum peak value for channel 2 | Integer format; the maximum | R | - |
| 212 | The maximum peak value for channel 3 | peak value for analog inputs | | - |
| 213 | The maximum peak value for channel 4 | | | - |
| 214 | The minimum peak value for channel 1 | | | - |
| 215 | The minimum peak value for channel 2 | Integer format; the minimum peak | | - |
| 216 | The minimum peak value for channel 3 | value for analog inputs | R | - |
| 217 | The minimum peak value for channel 4 | | | - |
| 222 | The time to record for channel 1 | Unit: 10 ms | | 1 |
| 223 | The time to record for channel 2 | Range: 1–100 | R/W | 1 |
| 224 | The time to record for channel 3 | The time to record the digital | I K/VV | 1 |
| 225 | The time to record for channel 4 | value for the channels | | 1 |
| 240 | The number of records for channel 1 | | | 0 |
| 241 | The number of records for channel 2 | Range: 0–500, display the current | В | 0 |
| 242 | The number of records for channel 3 | records | R | 0 |
| 243 | The number of records for channel 4 | | | 0 |
| 4000- | December of the second of | FOO records for the same of the | D | |
| 4499 | Records for channel 1 | 500 records for channel 1 | R | |
| 4500- | Records for channel 2 | 500 records for channel 2 | R | |

Chapter 6 Temperature Measurement Module AS04/06RTD

| CR# | Name | Description | Atr. | Defaults |
|-------|-----------------------|---------------------------|------|----------|
| 4999 | | | | |
| 5000- | Records for channel 3 | FOO records for about 12 | R | |
| 5499 | Records for channel 3 | 500 records for channel 3 | K | |
| 5500- | | 500 | R | |
| 5999 | Records for channel 4 | 500 records for channel 4 | K | |



6.2.5 ASO6RTD Control Registers

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------|--|---------|----------|
| 0 | Format Setup | 0: integer format | R | 0 |
| 1 | Channel 1 mode setup | 1: floating point format 0: closed | | |
| | Chamiler i mode setup | 1 : 0-300 Ω (default) | | |
| 2 | Channel 2 mode setup | 2 : 0–3000 Ω | | |
| | | 3 : Pt100 | | 1 |
| 3 | Channel 3 mode setup | 4 : JPt100 5 : Pt1000 | R/W | |
| 4 | Channel 4 mode setup | 6 : Ni100 | | |
| | | 7 : Ni1000 | | |
| 5 | Channel 5 mode setup | 8 : LG-Ni1000 | | |
| 6 | Ohamada oatus | 9 : Cu50 | | |
| 6 | Channel 6 mode setup | 10 : Cu100 | | |
| 7 | Channel 1 offset | | | |
| 8 | Channel 2 offset | | | |
| 9 | Channel 3 offset | Range: -32768 to +32767 | R/W | 0 |
| 10 | Channel 4 offset | Trange. 02700 to 102707 | 1000 | |
| 11 | Channel 5 offset | | | |
| 12 | Channel 6 offset | | | |
| 13 | Channel 1 gain | | | |
| 14 | Channel 2 gain | | | |
| 15 | Channel 3 gain | Range: -32768 to +32767 | R/W | 1000 |
| 16 | Channel 4 gain | | 1,4,4,4 | |
| 17 | Channel 5gain | | | |
| 18 | Channel 6 gain | | | |
| 19 | Channel 1 average times | Range: 1–100 | R/W | 10 |
| 20 | Channel 2 average times | 95. 1 100 | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------------------|--|------|----------|
| 21 | Channel 3 average times | | | |
| 22 | Channel 4 average times | | | |
| 23 | Channel 5 average times | | | |
| 24 | Channel 6 average times | | | |
| 25 | Channel 1 filter average percentage | | | |
| 26 | Channel 2 filter average percentage | | | |
| 27 | Channel 3 filter average percentage | Range: 0–3 | R/W | 1 |
| 28 | Channel 4 filter average percentage | Unit: ±10% | 1000 | ' |
| 29 | Channel 5 filter average percentage | | | |
| 30 | Channel 6 filter average percentage | | | |
| 31 | Units of temperature | 0: Fahrenheit 1: Celsius | R/W | 0 |
| 32 | Channel alarm setup | 0: open channel alarm 1: close channel alarm bit0: channel 1 bit1: channel 2 bit2: channel 3 bit3: channel 4 bit4: channel 5 bit5: channel 6 0: warning 1: alarm bit8: error in the power supply bit9: error in the module hardware bit10: error in calibration | R/W | 0 |



| CR# | Name | Description | Atr. | Defaults |
|-----|-----------------|--|------|----------|
| | | 16#0101: record the peak value again for | | 0 |
| | | channel 1 | | |
| | | 16#0102: record the peak value again for | | |
| | | channel 2 | | |
| | | 16#0104: record the peak value again for | | |
| | | channel 3 | | |
| | | 16#0108: record the peak value again for | | |
| | | channel 4 | | |
| | | 16#110: record the peak values again for | | |
| | | channels 5 | | |
| | | 16#120: record the peak values again for | | |
| | | channels 6 | | |
| | | 16#013: record the peak values again for | | |
| | | channels 1-6 | | |
| | Instruction set | 16#0201: enable recording for channel 1 | W | |
| | | 16#0202: enable recording for channel 2 | | |
| 201 | | 16#0204: enable recording for channel 3 | | |
| | | 16#0208: enable recording for channel 4 | | |
| | | 16#0210: enable recording for channels 5 | | |
| | | 16#0220: enable recording for channels 6 | | |
| | | 16#023F: enable recording for channels 1-6 | | |
| | | | | |
| | | 16#0301: disable recording for channel 1 | | |
| | | 16#0302: disable recording for channel 2 | | |
| | | 16#0304: disable recording for channel 3 | | |
| | | 16#0308: disable recording for channel 4 | | |
| | | 16#0310: disable recording for channel 5 | | |
| | | 16#0320: disable recording for channel 6 | | |
| | | 16#033F: disable recording for channel1-6 | | |
| | | 16#0501: restore default settings, clear | | |
| | | setting values in the Flash | | |
| | | 16#0502: restore default settings, do not | | |
| | | clear setting values in the Flash | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|--------------------------------------|--|------|----------|
| 210 | The maximum peak value for channel 1 | Integer format; the maximum peak value for analog inputs | | - |
| 211 | The maximum peak value for channel 2 | | | - |
| 212 | The maximum peak value for channel 3 | | R | - |
| 213 | The maximum peak value for channel 4 | | | - |
| 214 | The maximum peak value for channel 5 | | | - |
| 215 | The maximum peak value for channel 6 | | | - |
| 216 | The minimum peak value for channel 1 | Integer format; the minimum peak value for analog inputs | R | - |
| 217 | The minimum peak value for channel 2 | | | - |
| 218 | The minimum peak value for channel 3 | | | - |
| 219 | The minimum peak value for channel 4 | | | - |
| 220 | The minimum peak value for channel 5 | | | - |
| 221 | The minimum peak value for channel 6 | | | - |
| 222 | The time to record for channel 1 | | R/W | 1 |
| 223 | The time to record for channel 2 | Unit: 100 ms | | 1 |
| 224 | The time to record for channel 3 | Range: 1–100 | | 1 |
| 225 | The time to record for channel 4 | The time to record the digital value for the | | 1 |
| 226 | The time to record for channel 5 | channels | | 1 |
| 227 | The time to record for channel 6 | | | 1 |
| 240 | The number of records for channel 1 | Range: 0–200, display the current records | R - | 0 |
| 241 | The number of records for channel 2 | | | 0 |



| CR# | Name | Description | Atr. | Defaults |
|------|---------------------------|---------------------------|------|----------|
| 242 | The number of records for | | | 0 |
| 242 | channel 3 | | | 0 |
| 243 | The number of records for | | | 0 |
| 240 | channel 4 | | | |
| 244 | The number of records for | | | 0 |
| | channel 5 | | | |
| 245 | The number of records for | | | 0 |
| | channel 6 | | | |
| 4000 | | | | |
| - | Records for channel 1 | 200 records for channel 1 | R | - |
| 4199 | | | | |
| 4500 | | | | |
| - | Records for channel 2 | 200 records for channel 2 | R | - |
| 4699 | | | | |
| 5000 | | | | |
| - | Records for channel 3 | 200 records for channel 3 | R | - |
| 5199 | | | | |
| 5500 | | | | |
| - | Records for channel 4 | 200 records for channel 4 | R | - |
| 5699 | | | | |
| 6000 | | | | |
| - | Records for channel 4 | 200 records for channel 5 | R | - |
| 6199 | | | | |
| 6500 | | | | |
| - | Records for channel 4 | 200 records for channel 6 | R | _ |
| 6699 | | | | |

6.2.6 Functions

Use the HWCONFIG utility software built into ISPSoft to set modes of operation and parameters.

Analog input

| Item | Function | Description |
|------|-------------------------------|---|
| 1 | Enable/Disable a | Enable or disable a channel. |
| | Channel | 2. If a channel is disabled, the total conversion time decreases. |
| 2 | Unit of Measurement | Select the unit of measurement: Fahrenheit or Celsius. |
| 3 | Calibration | Calibrate a linear curve. |
| 4 | Average | Conversion values are averaged and filtered. |
| 5 | Disconnection Detection | If the channel is open, the module can detect when it is disconnected. If the input is open-circuited, the module produces an alarm or a warning. |
| 6 | Channel Detection and Alarm | If an input signal exceeds the range of inputs that the hardware can receive, the module produces an alarm or a warning. You can disable this function. |
| 7 | Limit Detections for Channels | Save the maximum/minimum values for channels. |
| 8 | Records for Channels | Save the analog curves for channels. |
| 9 | PID Algorithm | PID control modes |

1. Enable/Disable a Channel

An analog signal is converted into a digital signal at a rate of 200 ms per channel. If a channel is not used, you can disable it to decrease the total conversion time.

2. Unit of Measurement

Select the unit of measurement, Fahrenheit or Celsius, according to your needs.

3. Calibration

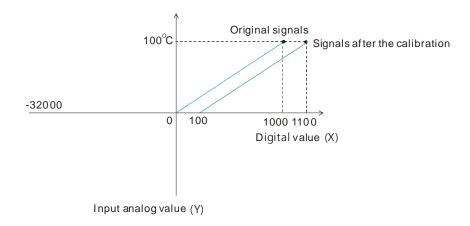
• To make a curve meet specific needs, calibrate the curve by changing the offset and the gain. The calibration range depends on the range of inputs that the hardware can receive. The formula is:

$$Output = \frac{(Input \times Gain)}{1000} + Offset$$



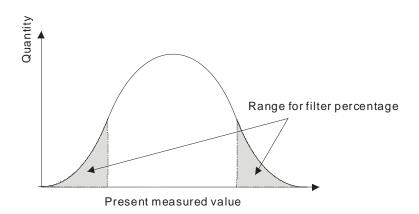
Example:

If the gain is 1000 and the offset is 0, the corresponding value for the original signal 0° C to 100° C is 0–1000. If you change the offset to 100, the calibrated value for the original signal 0° C to 100° C becomes 100–1100.



4. Average

You can set the average value between 1–100. It is a steady value obtained from the sum of the recorded values. If the recorded values include an acute pulse due to unavoidable external factors, however, you may observe violent changes in the average value. Use the filtering function to exclude the acute pulses from the sum-up and equalization, so the computed average value is not affected by the acute recorded values. Set the filter percentage to the range 0–3, where the unit is 10%. If you set the filter range to 0, the system sums up all the recorded values and divides them to obtain the average value, but if you set the filter range to 1, for example, the system excludes the bottom 10% and the top 10% of the values and averages only the remaining values to obtain the average value.



5. Disconnection Detection

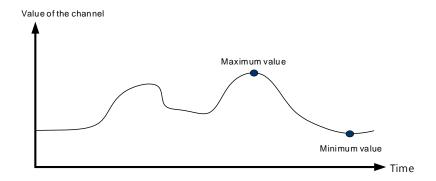
If the channel is open, the module can detect when it is disconnected. If the input is open-circuited, the module produces an alarm or a warning.

6. Channel Detection

If an input signal exceeds the allowable range of inputs, an error message appears. You can disable this function so that the module does not produce an alarm or a warning when the input signal exceeds the input range.

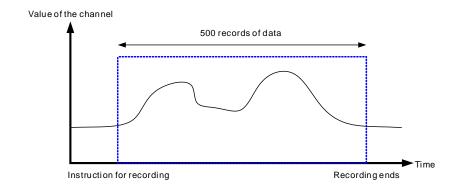
7. Limit Detections for Channels

This function saves the maximum and minimum values for channels so that you can determine the peak to peak values.



8. Records for Channels

Record the input values of the cyclic sampling for each channel. The system saves up to 500 data points for AS04RTD-A and up to 200 data points for AS06RTD-A and the recording time is 100 ms. The following uses AS04RTD-A as an example to demonstrate.



9. PID control

PID algorithm is available for every channel. With its auto tuning function, parameters such as Kp, Ki, Kd and more can be calculated and therefore temperature control can be achieved. You can also use DMPID instruction to calculate relative parameters by entering the parameters in the endpoints of corresponding instruction image and you can then obtain the output values from the output endpoints. Note: DMPID instruction is availbe for AS04RTD-A (V1.04 or later), AS06RTD-A (V1.00 or later), AS Series PLC (V1.06 or later) and AS-SCM (V2.04 or later).



6.2.7 Control Mode

- 1. Refer to section 7.2.7 for more details on how to use DMPID instruction.
- 2. When using PID parameters to set up control registers: PID control registers of AS04RTD-A are retainable; however PID control registers of AS06RTD-A are not retainable.

6.2.8 Wiring

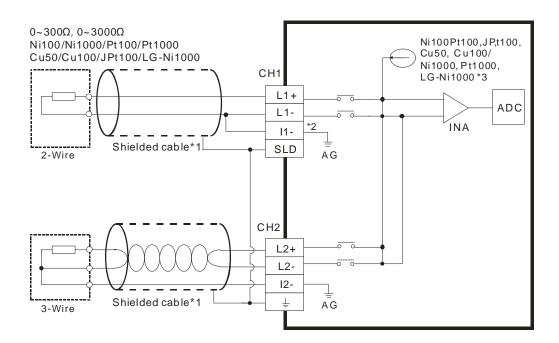
Precautions

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 ASRTD Series 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 which 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) Note: use cables with the same length (less than 200 m) and use wire resistance of less than 20 ohm.

External wiring

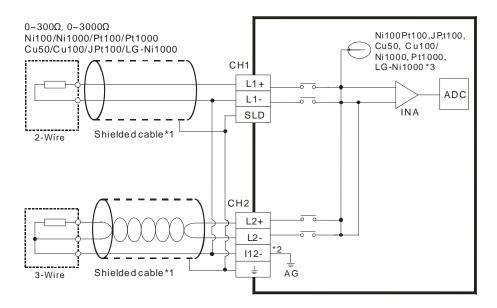
(1) AS04RTD-A



- *1. Use shielded twisted pair cables for temperature sensors, and keep them away from power cables and other cables that generate noise.
- *2. If using two-wire temperature sensors, Ln- and In- must be short-circuited (where n is between 1-4).
- *3. There are two different internal excitation currents. If you are using a Ni100 temperature sensor, a Pt100 sensor, a JPt100, a Cu50/Cu100, or a 0~300 Ω resistance sensor, the internal excitation current is 1.5 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: When using a three-wire temperature sensor, the cables should be the same length (less than 200 meter) and with a resistor less than 20 ohm.

(2) 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 a Ni100 temperature sensor, a Pt100 sensor, a JPt100, a Cu50/Cu100, or a $0\sim300~\Omega$ 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 $0\sim3000~\Omega$ resistance sensor, the internal excitation current is 0.2 mA.

Note: When using a three-wire temperature sensor, the cables should be the same length (less than 200 meter) and with a resistor less than 20 ohm.



6.2.9 LED Indicators

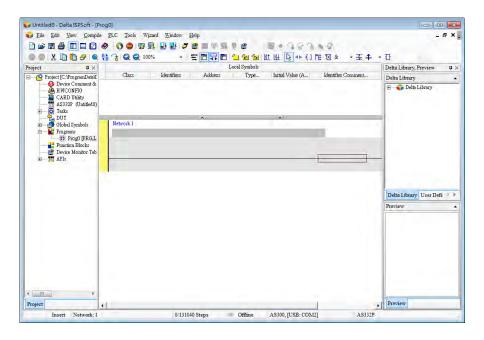
| Number | Name | Description |
|--------|-------------------|--|
| | | Operating status of the module |
| 1 | RUN LED Indicator | ON: the module is running. |
| | | OFF: the module is not running. |
| | | Error status of the module |
| 2 | ERROR LED | ON: a serious error exists in the module. |
| 2 | Indicator | OFF: the module is operating normally. |
| | | Blink: a minor error exists in the module. |
| | Analog-to-Digital | Conversion status |
| 3 | Conversion | Blinking: conversion is in process. |
| | Indicator | OFF: conversion has stopped. |

6.3. HWCONFIG in ISPSoft

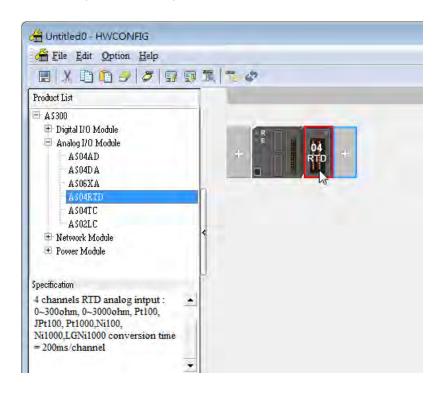
6.3.1 Initial Setting

The following users AS04RTD-A as an example to demonstrate.

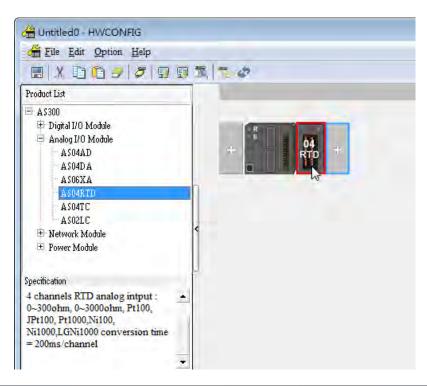
(1) Start ISPSoft and double-click HWCONFIG.

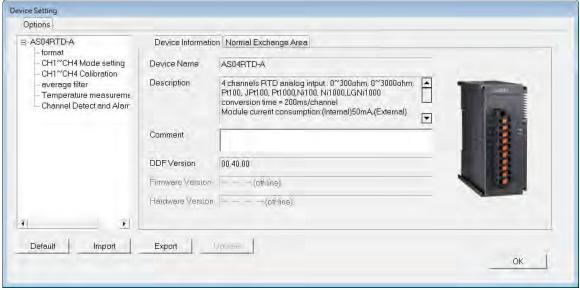


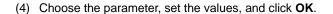
(2) Select a module and drag it to the working area.

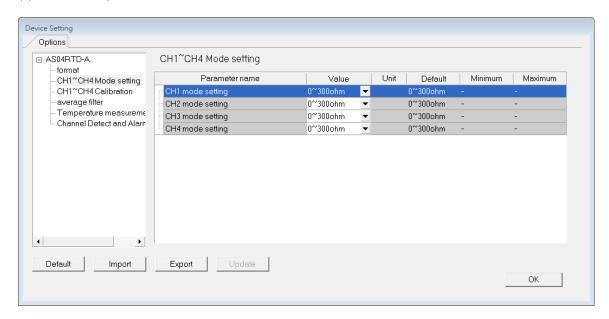


(3) Double-click the module in the working area to open the Device Setting page.

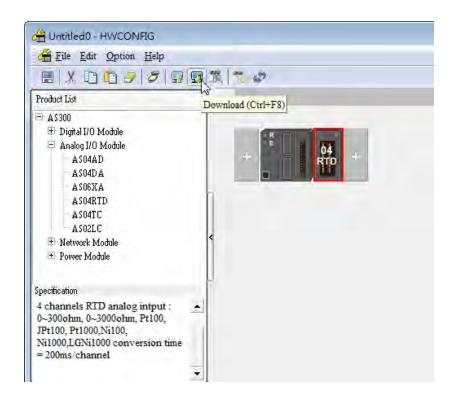








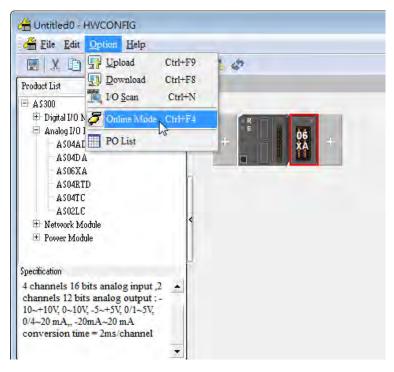
(5) Click **Download** on the toolbar to download the parameters. Note that you cannot download the parameters while the CPU module is running.





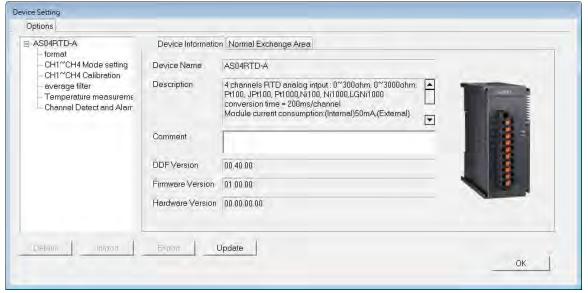
6.3.2 Checking the Version of a Module

(1) On the Option menu, click Online Mode.



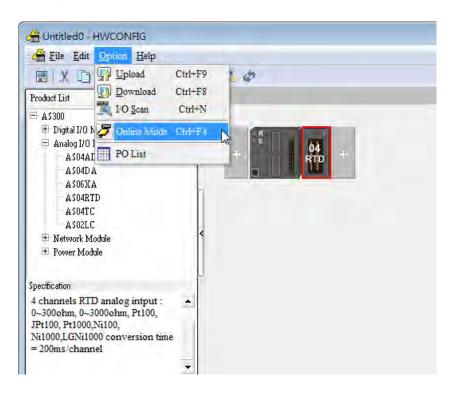
(2) Double-click the module to open the Device Setting page. The versions of both the firmware and the hardware are displayed.



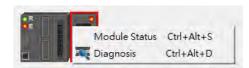


6.3.3 Online Mode

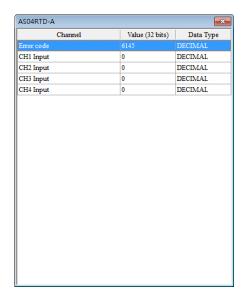
(1) On the Option menu, click Online Mode.



(2) Right-click the module and click **Module Status**.



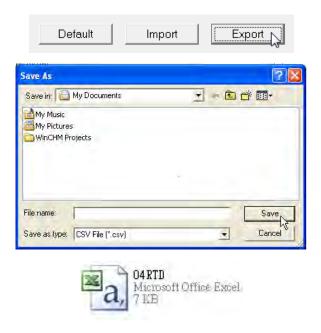
(3) View the module status.





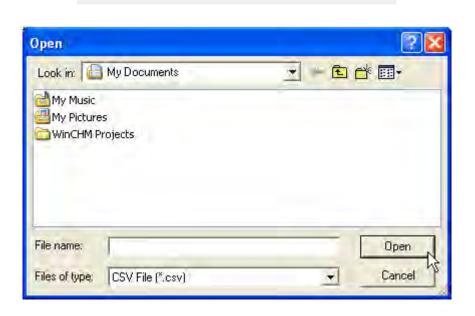
6.3.4 Importing/Exporting a Parameter File

(1) Click **Export** in the Device Setting dialog box to save the current parameters as a CSV file (.csv).



(2) Click **Import** in the Device Setting dialog box and select a CSV file to import saved parameters.

Default

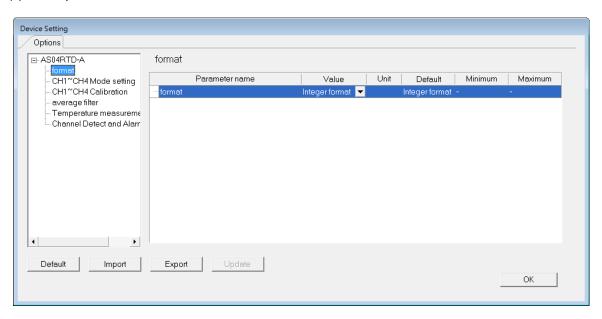


Import

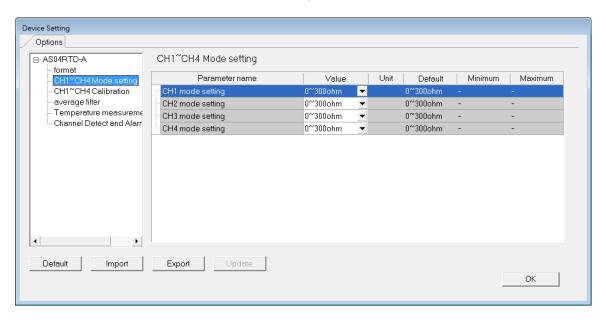
Export

6.3.5 Parameters

(1) The input modes of the channels

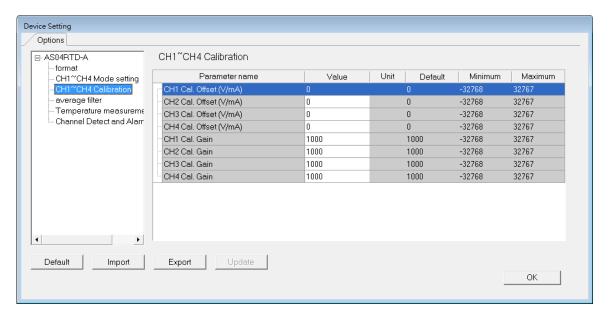


(2) Input CH1-CH4 (channel 1-channel 4) mode settings

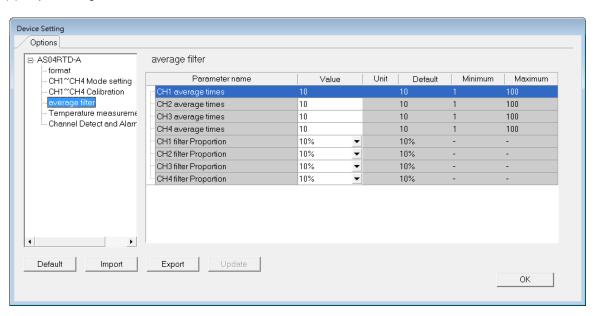




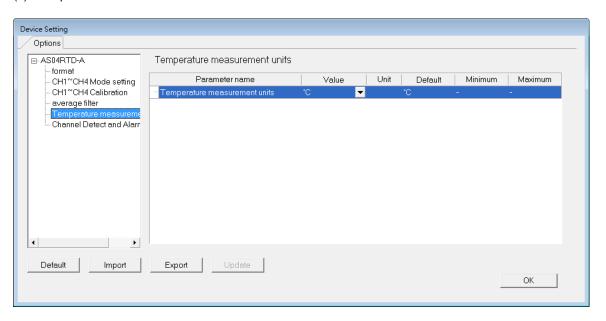
(3) Input CH1-CH4 calibration



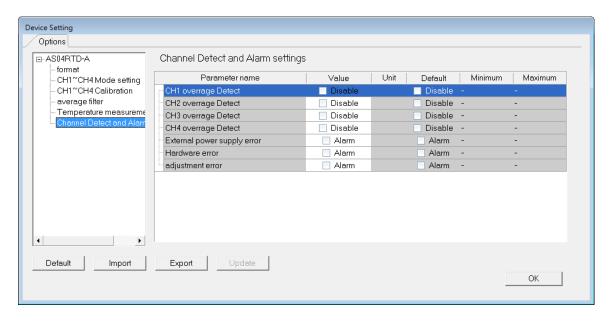
(4) Input average filter



(5) Temperature measurement



(6) Input channel detection and alarm settings

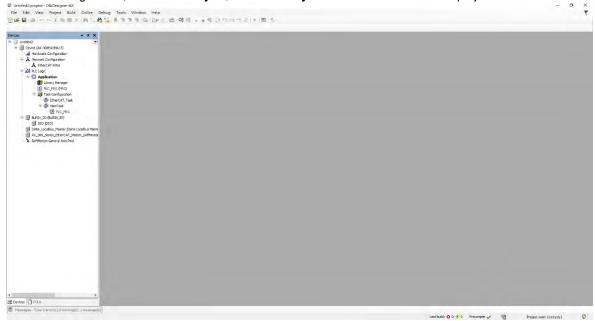




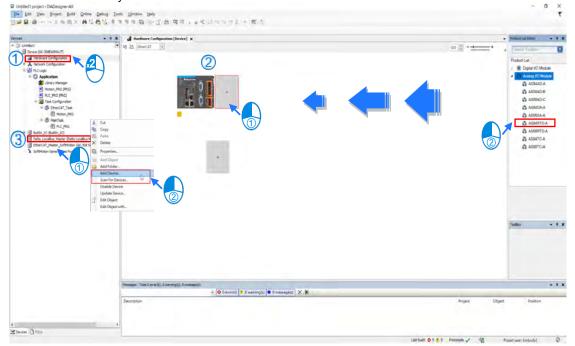
The following example uses AS04DTD-A.

6.4.1 Initial Setting

(1) Start DIADesigner-AX, click **New Project**, and then **Project+Device** to create a new project.

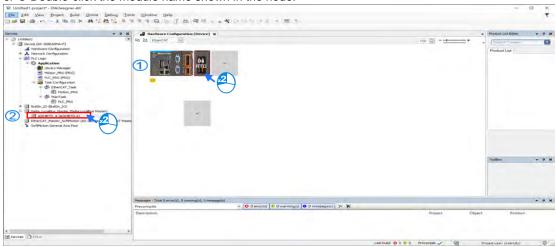


- (2) Add modules in:
 - ① Double-click Hardware Configuration
 - ② Select the **+ section** and drag and drop the module that you want to add from the Product List to the **+** section.
 - or ③ Right-click **Delta_Localbus Master** to see the context meun and then double-click **Add Device** to add devices manually or double-click **Scan for Devices**.

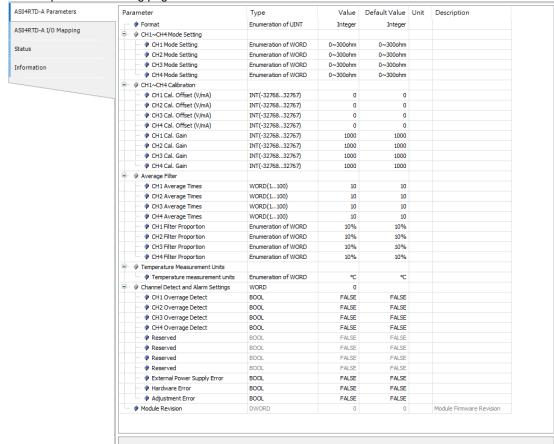


(3) Select modules:

- ① Double-click the module name in the Hardware Configuration area.
- or ② Double-click the module name shown in the node.

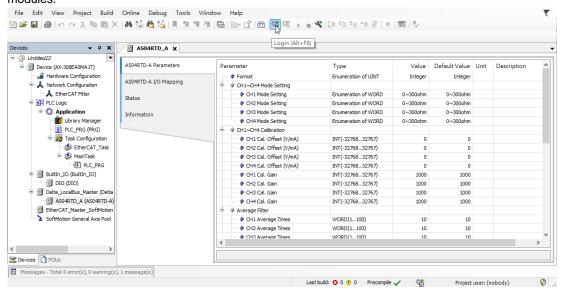


(4) Module parameter setting page:





(5) After setting is complete, select the module and click **Login** on the tool bar to download the settings to the modules.

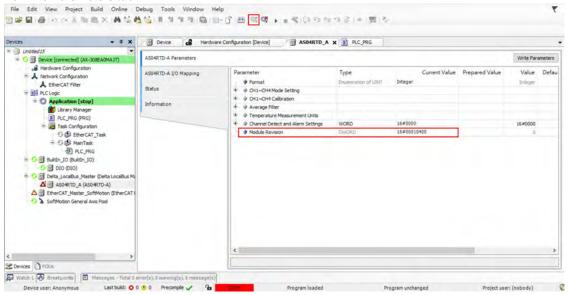


6.4.2 Checking the Version of a Module

(1) Select the module and click the Information tab to see the module information.

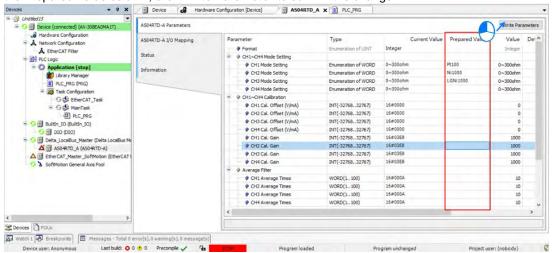


(2) Select the module and click **Login** on the tool bar to go to Online Mode. You can find the Module Revision from the Parameters tab.

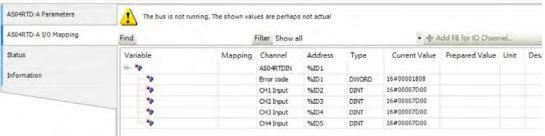


6.4.3 Online Mode

(1) Select the module and click Login on the tool bar to go to Online Mode. You can monitor all configuration parameters. Vaules in the column of Prepared Value are configurable online. After editing the values in the Prepared Value column, click Write Parameter to confirm the change.



(2) You can monitor the values, status, error codes in each channel from the I/O Mapping tab.



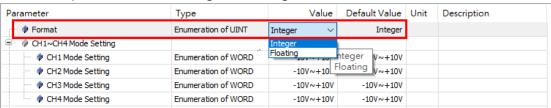
(3) You can monitor the current status and error codes from the Status tab.



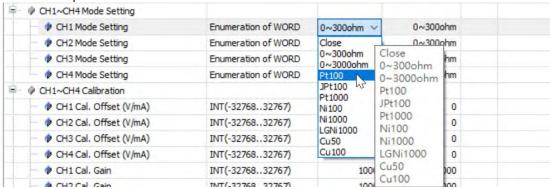


6.4.4 Parameters

(1) You can set up the value format to Integer or Floating for Channel 1 to 4.



(2) You can set up the values for Channel 1 to 4.



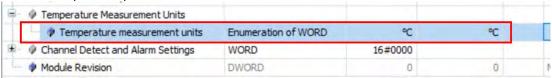
(3) You can set up the calibrations for for Channel 1 to 4.

| ··· | | | | |
|------------------------------|------------------|------|------|--|
| ··· ♦ CH1 Cal. Offset (V/mA) | INT(-3276832767) | 0 | 0 | |
| CH2 Cal. Offset (V/mA) | INT(-3276832767) | 0 | 0 | |
| | INT(-3276832767) | 0 | 0 | |
| CH4 Cal. Offset (V/mA) | INT(-3276832767) | 0 | 0 | |
| ··· 🕪 CH1 Cal. Gain | INT(-3276832767) | 1000 | 1000 | |
| P CH2 Cal. Gain | INT(-3276832767) | 1000 | 1000 | |
| ··· 🕪 CH3 Cal. Gain | INT(-3276832767) | 1000 | 1000 | |
| ···· | INT(-3276832767) | 1000 | 1000 | |

(4) You can set up the average filtering for Channel 1 to 4.

| - | Average Filter | | | | |
|----------|---|---------------------|-----|-----|--|
| | CH1 Average Times | WORD(1100) | 10 | 10 | |
| | ··· 🖗 CH2 Average Times | WORD(1100) | 10 | 10 | |
| | CH3 Average Times | WORD(1100) | 10 | 10 | |
| | → Property CH4 Average Times Output Description: The property of the pr | WORD(1100) | 10 | 10 | |
| | Proportion | Enumeration of WORD | 10% | 10% | |
| | ··· 🖗 CH2 Filter Proportion | Enumeration of WORD | 10% | 10% | |
| | CH3 Filter Proportion | Enumeration of WORD | 10% | 10% | |
| | | Enumeration of WORD | 10% | 10% | |
| | | | | | |

(5) You can set up the temperature measurement units.



(6) You can set up the channel detect and alarm settings.

| · - | | | | |
|-----------------------------------|------|-------|-------|--|
| Channel Detect and Alarm Settings | WORD | 0 | | |
| CH1 Overrage Detect | BOOL | FALSE | FALSE | |
| CH2 Overrage Detect | BOOL | FALSE | FALSE | |
| ··· | BOOL | FALSE | FALSE | |
| CH4 Overrage Detect | BOOL | FALSE | FALSE | |
| ··· 👂 Reserved | BOOL | FALSE | FALSE | |
| Reserved | BOOL | FALSE | FALSE | |
| ··· 🕪 Reserved | BOOL | FALSE | FALSE | |
| ··· 💗 Reserved | BOOL | FALSE | FALSE | |
| External Power Supply Error | BOOL | FALSE | FALSE | |
| ··· 👂 Hardware Error | BOOL | FALSE | FALSE | |
| Adjustment Error | BOOL | FALSE | FALSE | |



6.5 Troubleshooting

6.5.1 Error Codes

| Error Code | Description | A↔ D LED | ERROR LED |
|---------------|---|---------------|---|
| 16#1605 | Hardware failure | OFF | ON |
| 16#1607 | The external voltage is abnormal. | OFF | ON |
| 16#1608 | The factory calibration is abnormal. | OFF | ON |
| 16#1801 | The external voltage is abnormal. | OFF | Blinking |
| 16#1802 | Hardware failure | OFF | Blinking |
| 16#1804 | The factory calibration is abnormal. | OFF | Blinking |
| 16#1808 | The signal received by channel 1 exceeds the range of inputs that the hardware can receive. | | Blinking |
| 16#1809 | The signal received by channel 2 exceeds the range of inputs that the hardware can receive. | | |
| 16#180A | The signal received by channel 3 exceeds the range of inputs that the hardware can receive. | Run: blinking | |
| 16#180B | The signal received by channel 4 exceeds the range of inputs that the hardware can receive. | Stop: OFF | |
| 16#180C | The signal received by channel 5 exceeds the range of inputs that the hardware can receive. | | |
| 16#180D | The signal received by channel 6 exceeds the range of inputs that the hardware can receive. | | |
| - | When power-on, the module is not detected by CPU module. | OFF | Blinking once or twice and after 2 seconds, it blinks repeatedly |

6.5.2 Troubleshooting Procedure

| Description | Procedure |
|---|--|
| The external voltage is abnormal. | Ensure the external 24 V power supply to the module is functioning normally. |
| Hardware failure | Return the module to the factory for repair. |
| Internal error The factory calibration is abnormal. | Contact the factory. |
| The signal received by channel 1 exceeds the range of inputs that the hardware can receive. | Check the signal received by channel 1. |
| The signal received by channel 2 exceeds the range of inputs that the hardware can receive. | Check the signal received by channel 2. |
| The signal received by channel 3 exceeds the range of inputs that the hardware can receive. | Check the signal received by channel 3. |
| The signal received by channel 4 exceeds the range of inputs that the hardware can receive. | Check the signal received by channel 4. |
| The signal received by channel 5 exceeds the range of inputs that the hardware can receive. | Check the signal received by channel 5. |
| The signal received by channel 6 exceeds the range of inputs that the hardware can receive. | Check the signal received by channel 6. |
| 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. |



6.5.3 State of the Connection

| State of connection | | ion | Oh ann al salva | |
|---------------------|----|-----|---------------------------------|--|
| L+ | L- | I- | Channel value | |
| • | • | • | Maximum value for the channel | |
| • | • | | Maximum value for the channel | |
| • | | • | Maximum value for the channel | |
| • | | | Maximum value for the channel | |
| | • | • | Maximum value for the channel | |
| | • | | Maximum value for the channel | |
| | | • | Minimum value for the channel*1 | |

^{•:} Disconnection

^{*1:} for AS06RTD Series: in the modes of $0-300\Omega$ and $0-3000\Omega$, it cannot detect I- state of connection.

Chapter 7 Temperature Measurement Module AS04/08TC

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7.1 Overview

This chapter describes the specifications for the ASTC-A module, its operation, and its programming. The AS04TC-A is a temperature measurement module that converts temperatures received from thermocouples (type J, K, R, S, T, E, N, B, C, U, L, or TXK with ±100 mV voltage inputs) into digital signals. You can select either Celsius (resolution: 0.1° C) or Fahrenheit (resolution: 0.1° F) as the unit of measurement.

An introduction to thermocouples

A thermocouple uses the Seebeck effect to measure differences in temperature. Generally speaking, a thermocouple consists of two conductors of different materials that produce a voltage at the point where the two conductors contact. The voltage produced depends on the difference of temperature between the junctions with other parts of those conductors, and it ranges from several dozen microvolts to several thousand microvolts. Because the voltage is so low, it needs to be amplified.

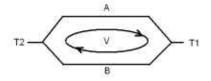
Differential operations are used to eliminate external noise. Thermocouples are more stable than thermistors, resistance thermometers, and thermal resistors, so thermocouples are widely used in industrial applications.

A thermocouple consists of a circuit having two wires of different metals or metal alloys welded together or joined at both ends. One of the junctions—normally the cold junction—is maintained at a known reference temperature, and the other junction is at the temperature to be sensed. A temperature gradient across the junction of the wires gives rise to an electric potential according to the Seebeck effect. The voltage produced is proportional to the difference of temperature between the junctions with other parts of those conductors.

The voltage can be derived from the following equation.

$$V = \int_{T_1}^{T_2} (Q_A - Q_B) dT \tag{A}$$

where Q_A and Q_B are the thermopowers (Seebeck coefficient) of the metals A and B, and T_1 and T_2 are the temperatures of the two junctions.



Principle of operation

Because Q_A and Q_B are almost unrelated to temperature, formula (A) above can be approximated as in equation (B).

$$V=\alpha(T_2-T_1) \qquad (B)$$

There are two types of thermocouple thermometers: wrapped thermocouples and bare thermocouples. A wrapped thermocouple is wrapped in protective metal, and is similar to an electric spoon in appearance. Wrapped thermocouples are used to measure temperature of liquid, and bare thermocouples are used to measure temperature of gas.

7.1.1 Characteristics

(1) Select a sensor based on its practical application.

Type J, K, R, S, T, E, N, B, C, U, L, or TXK thermocouples, with ±100 mV voltage inputs.

(2) Select a module based on its practical application.

AS04TC-A: Has four channels. Inputs received by a channel are temperatures.

AS08TC-A: Has eight channels. Inputs received by a channel are temperatures.

(3) High-speed conversion

A temperature is converted into a digital signal at a speed of 200 ms per channel.

(4) High accuracy

Conversion accuracy: the error range is ±0.5% of the input at ambient temperature of 25° C ±5° C.

(5) Disconnection detection

When a sensor is disconnected, the module produces an alarm or a warning.

(6) PID control

An object's temperature can be maintained through PID control actions.

(7) Use the utility software to configure the module.

The HWCONFIG software is built into ISPSoft. You can set modes and parameters directly in HWCONFIG without spending time writing programs to set registers to manage functions.



7.2 Specifications and Functions

7.2.1 Specifications

Electrical specifications

| Module Name | AS04TC-A | AS08TC-A | | |
|-------------------------|---|----------|--|--|
| Number of Analog Inputs | 4 | 8 | | |
| Applicable Sensor | XK with ±100 mV voltage inputs | | | |
| Supply Voltage | 24 VDC (20.4–28.8 VDC) (-15% to +20%) | | | |
| Connector Type | Removable terminal block | | | |
| Overall Accuracy | 25° C/77° F: The error range allowed is ±0.5% of full scale20° C to +60° C/-4° F to +140° F: the error range allowed is ±1% of full s | | | |
| Conversion Time | 200 ms/channel | | | |
| Isolation | An analog circuit is isolated from a digital circuit by a digital integrated circuit/ optocoupler, and the analog channels are isolated from one another by optocouplers. Isolation between a digital circuit and the ground: 500 VDC Isolation between an analog circuit and the ground: 500 VDC Isolation between an analog circuit and a digital circuit: 500 VDC Isolation between the 24 VDC and the ground: 500 VDC Isolation between analog channels: 120 VAC | | | |
| Weight | 115g 125g | | | |

Functional specifications

| Analog-to-Digital Conversion | Centigrade (°C) | Fahrenheit (°F) | Voltage Input |
|---------------------------------|--|---|---------------|
| Rated Input Range ^{*1} | Type J: -100° C to +1,200° C Type K: -100° C to +1,350° C Type R: 0° C to 1,750° C Type S: 0° C to 1,750° C Type T: -150° C to +400° C Type E: -150° C to +980° C Type N: -150° C to +1,300° C Type B: 200° C to +1,800° C Type C: 0°C to 2,320° C Type U: -200° C to 600° C Type L: -200° C to 900° C Type TXK: -200° C~800° C | Type J: -148° F to +2,192° F Type K: -148° F to +2,462° F Type R: 32° F to 3,182° F Type S: 32° F to 3,182° F Type T: -238° F to +734° F Type E: -238° F to +1,796° F Type N: -238° F to +2,372° F Type B: 392° F to 3,272° F Type C: NA Type U: -328° F~1,112° F Type L: -328° F~1,652° F Type TXK: -328° F~1,472° F | ±100 mV |
| Average Function Range: 1-100 | | | |
| Self-Diagnosis | Disconnection detection | | |

^{*1} If the measured temperature exceeds the upper limit, it only shows the maximum value. If the measured temperature is below the lower limit, it only shows the minimum value.

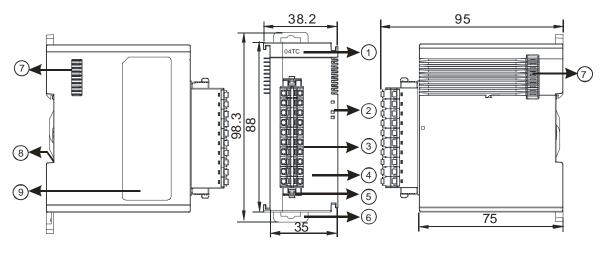
Conversion details

| Centigrade (°C) | | | | | |
|-----------------|-------------------|--------------------------|----------------------------|--|--|
| Sensor | Dated input yours | Integer value range | Floating point value range | | |
| type | Rated input range | after digital conversion | after digital conversion | | |
| J | -100°C ~ 1200°C | K-1000 ~ K12000 | -100.0 ~ 1200.0 | | |
| K | -100°C ~ 1,350°C | K-1000 ~ K13500 | -100.0 ~ 1350.0 | | |
| R | 0°C ~ 1,750°C | K0 ~ K17500 | 0.0 ~ 1750.0 | | |
| S | 0°C ~ 1,750°C | K0 ~ K17500 | 0.0 ~ 1750.0 | | |
| Т | -150°C ~ 400°C | K-1500 ~ K4000 | -150.0 ~ 400.0 | | |
| Е | -150°C ~ 980°C | K-1500 ~ K9800 | -150.0 ~ 980.0 | | |
| N | -150°C ~ 1,300°C | K-1500 ~ K13000 | -150.0 ~ 1300.0 | | |
| В | 200°C ~ 1,800°C | K2000 ~ K18000 | 200.0 ~ 1800.0 | | |
| С | 0°C ~ 2320°C | K0 ~ K23200 | 0.0 ~ 2320.0 | | |
| U | -200°C ~ 600°C | K-2000 ~ K6000 | -200.0 ~ 600.0 | | |
| L | -200°C ~ 900°C | K-2000 ~ K9000 | -200.0 ~ 900.0 | | |
| TXK | -200°C ~ 800°C | K-2000 ~ K8000 | -200.0 ~ 800.0 | | |
| ±100mV | -100mV ~ 100mV | K-10000 ~ K10000 | -100.00 ~ 100.00 | | |

| Fahrenheit (°F) | | | | | |
|-----------------|---------------------|--------------------------|----------------------------|--|--|
| Sensor | Date diament non no | Integer value range | Floating point value range | | |
| type | Rated input range | after digital conversion | after digital conversion | | |
| J | -148°F ~ 2,192°F | K-1480 ~ K21920 | -148.0 ~ 2192.0 | | |
| K | -148°F ~ 2,462°F | K-1480 ~ K24620 | -148.0 ~ 2462.0 | | |
| R | 32°F ~ 3,182°F | K320 ~ K31820 | 32.0 ~ 3182.0 | | |
| S | 32°F ~ 3,182°F | K320 ~ K31820 | 32.0 ~ 3182.0 | | |
| Т | -238°F ~ 752°F | K-2380 ~ K7520 | -238.0 ~ 752.0 | | |
| Е | -238°F ~ 1,796°F | K-2380 ~ K17960 | -238.0 ~ 1796.0 | | |
| N | -238°F ~ 2,372°F | K-2380 ~ K23720 | -238.0 ~ 2372.0 | | |
| В | 392°F ~ 3,272°F | K3920 ~ K32720 | 392.0 ~ 3272.0 | | |
| С | NA | NA | NA | | |
| U | -328°F ~ 1112°F | K-3280 ~ K11120 | -328.0 ~ 1112.0 | | |
| L | -328°F ~ 1652°F | K-3280 ~ K16520 | -328.0 ~ 1652.0 | | |
| TXK | -328°F ~ 1472°F | K-3280 ~ K14720 | -328.0 ~ 1472.0 | | |
| ±100mV | -100mV ~ 100mV | K-10000 ~ K10000 | -100.00 ~ 100.00 | | |



7.2.2 Profile



Unit: mm

| Number | Name | Description |
|--------|---|---|
| 1 | Model Name | Model name of the module |
| | RUN LED Indicator | Operating status of the module ON: the module is running. OFF: the module is not running. |
| 2 | ERROR LED Indicator | Error status of the module ON: a serious error exists in the module. OFF: the module is operating normally. Blink: a minor error exists in the module. |
| | Analog-to-Digital Conversion Indicator | Conversion status Blinking: conversion is in process. OFF: conversion has stopped. |
| 3 | Removable Terminal Block | The inputs are connected to transducers. The outputs are connected to loads to be driven. |
| 4 | Arrangement of the Input/Output Terminals | Arrangement of the terminals |
| 5 | Clip | For removing 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 |

ASO4TC-A ASO8TC-A 04TC 08TC
7.2.3 Arrangement of Terminals

7.2.4 ASO4TC Control Registers

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|--|--------------------------|------|----------|
| 0 | Format Catur | 0: integer format | R | 0 |
| U | Format Setup | 1: floating point format | K | |
| | | 0: closed | | |
| 1 | Channel 1 mode setup | 1: -100 mV to +100 mV | | |
| | | 2: J-Type | | |
| 2 | Channel 2 mode setup | 3: К-Туре | | |
| _ | | 4: R-Type | | |
| | Channel 3 mode setup Channel 4 mode setup | 5: S-Type | | |
| 3 | | 6: T-Type | R/W | 1 |
| | | 7: E-Type | | ' |
| | | 8: N-Type | | |
| | | 9: B-Type | | |
| 4 | | 10: C-Type | | |
| | | 11: U-Type | | |
| | | 12: L-Type | | |
| | | 13: TXK-Type | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|-------------------------------------|--|------|----------|
| 5 | Channel 1 offset | | | |
| 6 | Channel 2 offset | Danier 20700 to 120707 | D AA | |
| 7 | Channel 3 offset | Range: -32768 to +32767 | R/W | 0 |
| 8 | Channel 4 offset | | | |
| 9 | Channel 1 gain | | R/W | |
| 10 | Channel 2 gain | Range: -32768 to +32767 | R/W | 1000 |
| 11 | Channel 3 gain | | R/W | |
| 12 | Channel 4 gain | | R/W | |
| 13 | Channel 1 average times | | | |
| 14 | Channel 2 average times | Range: 1–100 | R/W | 10 |
| 15 | Channel 3 average times | realige. 1–100 | IVV | 10 |
| 16 | Channel 4 average times | | | |
| 17 | Channel 1 filter average percentage | | | |
| 18 | Channel 2 filter average percentage | Range: 0–3 | | |
| 19 | Channel 3 filter average percentage | Unit: ±10% | R/W | 1 |
| | Channel 4 filter average | | | |
| 20 | percentage | | | |
| 21 | Units of temperature | 0: Fahrenheit 1: Celsius | R/W | 0 |
| 22 | Channel alarm setup | 0: open channel alarm 1: close channel alarm bit0: channel 1 bit1: channel 2 bit2: channel 3 bit3: channel 4 | R/W | 0 |
| | | 0: warning | | |
| | | 1: alarm | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|---------------------|---|------|----------|
| | | bit8: error in the power supply | | |
| | | bit9: error in the module hardware | | |
| | | bit10: error in calibration | | |
| | | bit11: error in CJC temperature | | |
| | | 16#0101: record the peak value again for | | |
| | | channel 1 | | |
| | | 16#0102: record the peak value again for | | |
| | | channel 2 | | |
| | | 16#0104: record the peak value again for | | |
| | | channel 3 | | |
| | | 16#0108: record the peak value again for | | |
| | | channel 4 | | |
| | | 16#010F: record the peak values again for | | |
| | | channels 1-4 | W | |
| 201 | Instruction set | 16#0201: enable recording for channel 1 | | 0 |
| | | 16#0202: enable recording for channel 2 | | |
| | | 16#0204: enable recording for channel 3 | | |
| | | 16#0208: enable recording for channel 4 | | |
| | | 16#020F: enable recording for channels 1-4 | | |
| | | 16#0211: disable recording for channel 1 | | |
| | | 16#0212: disable recording for channel 2 | | |
| | | 16#0214: disable recording for channel 3 | | |
| | | 16#0218: disable recording for channel 4 | | |
| | | 16#021F: disable recording for channels 1–4 | | |
| | | 16#0502: restore default settings | | |
| 210 | The maximum peak | | | _ |
| | value for channel 1 | | | |
| 211 | The maximum peak | | | _ |
| | value for channel 2 | Integer format; the maximum peak value for | R | |
| 212 | The maximum peak | analog inputs | | _ |
| | value for channel 3 | | | |
| 213 | The maximum peak | | | _ |
| | value for channel 4 | | | |
| 214 | The minimum peak | Integer format; the minimum peak value for | | _ |
| | value for channel 1 | analog inputs | R | |
| 215 | The minimum peak | | | - |



| CR# | Name | Description | Atr. | Defaults |
|-------|--------------------------|--|-------|----------|
| | value for channel 2 | | | |
| 216 | The minimum peak | | | |
| 210 | value for channel 3 | | | - |
| 217 | The minimum peak | | | _ |
| 217 | value for channel 4 | | | - |
| 222 | The time to record for | | | 1 |
| 222 | channel 1 | | | ' |
| 223 | The time to record for | Unit: 100 ms | | 1 |
| 223 | channel 2 | Range: 1–100 | R/W | ' |
| 224 | The time to record for | The time to record the digital value for the | 10,00 | 1 |
| 227 | channel 3 | channels | | ' |
| 225 | The time to record for | | | 1 |
| 223 | channel 4 | | | ' |
| 240 | The number of records | Range: 0-500, display the current records | R | 0 |
| 240 | for channel 1 | | | |
| 241 | The number of records | | | 0 |
| 241 | for channel 2 | | | |
| 242 | The number of records | | | 0 |
| 242 | for channel 3 | | | |
| 243 | The number of records | | | 0 |
| 240 | for channel 4 | | | |
| 4000 | Records for channel 1 | 500 records for channel 1 | R | _ |
| ~4499 | records for charmer r | 300 records for charmer 1 | IX. | _ |
| 4500 | Records for channel 2 | 500 records for channel 2 | R | _ |
| ~4999 | Trecords for Gridinier 2 | 500 records for charmer 2 | | |
| 5000 | Records for channel 3 | 500 records for channel 3 | R | _ |
| ~5499 | 1.0001d5 for Gridinier 5 | Coo reserve for charmer o | Γ. | - |
| 5500 | Records for channel 4 | 500 records for channel 4 | P | _ |
| ~5999 | 11000103 IOI GHAIIHEI 4 | 300 1000103 for charmer 4 | R | _ |

7.2.5 ASO8TC Control Registers

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|-----------------------------------|--------------------------|------|----------|
| 0 | Format Setup | 0: integer format | R | 0 |
| U | Format Setup | 1: floating point format | K | |
| 1 | Channel 1 mode setup | 0: closed | | |
| 2 | Channel 2 mode setup | 1: -100 mV to +100 mV | | |
| | | 2: J-Type | | |
| 3 | Channel 3 mode setup | 3: K-Type | | |
| 4 | Channel 4 mode setup | 4: R-Type | | |
| 5 | Channel 5 mode setup | 5: S-Type | | |
| 6 | Channel 6 mode setup | 6: T-Type | R/W | 1 |
| | | 7: E-Type | | |
| 7 | Channel 7 mode setup | 8: N-Type | | |
| | Channel 8 mode setup | 9: B-Type | | |
| | | 10: C-Type | | |
| 8 | | 11: U-Type | | |
| | | 12: L-Type | | |
| | Charrel 4 offers | 13: TXK-Type | | |
| 9 | Channel 1 offset Channel 2 offset | | | |
| 10 | Channel 3 offset | | | |
| | Channel 4 offset | | | |
| 12 | Channel 5 offset | Range: -32768 to +32767 | R/W | 0 |
| 14 | Channel 6 offset | | | |
| 15 | Channel 7 offset | | | |
| 16 | Channel 8 offset | | | |
| 17 | Channel 1 gain | | | |
| 18 | Channel 2 gain | | | |
| 19 | Channel 3 gain | Range: -32768 to +32767 | | |
| 20 | Channel 4 gain | | R/W | 1000 |
| 21 | Channel 5 gain | | | |
| 22 | Channel 6 gain | | | |
| | Chaille o gaill | | | |



| CR# | Name | Description | Atr. | Defaults |
|-----|--------------------------|------------------------|---------|----------|
| 23 | Channel 7 gain | | | |
| 24 | Channel 8 gain | | | |
| 25 | Channel 1 average times | | | |
| 26 | Channel 2 average times | | | |
| 27 | Channel 3 average times | | | |
| 28 | Channel 4 average times | Pongo, 1, 100 | R/W | 10 |
| 29 | Channel 5 average times | Range: 1–100 | R/VV | 10 |
| 30 | Channel 6 average times | | | |
| 31 | Channel 7 average times | | | |
| 32 | Channel 8 average times | | | |
| 33 | Channel 1 filter average | | R/W | |
| | percentage | | IN/ V V | |
| 34 | Channel 2 filter average | | R/W | |
| 34 | percentage | | IX/VV | |
| 35 | Channel 3 filter average | | R/W | |
| | percentage | | 10,00 | |
| 36 | Channel 4 filter average | | R/W | |
| | percentage | Range: 0–3 | | 1 |
| 37 | Channel 5 filter average | Unit: ±10% | R/W | |
| | percentage | | | |
| 38 | Channel 6 filter average | | R/W | |
| | percentage | | | |
| 39 | Channel 7 filter average | | R/W | |
| | percentage | | | |
| 40 | Channel 8 filter average | | R/W | |
| | percentage | | | |
| 41 | Units of temperature | 0: Fahrenheit | R/W | 0 |
| | | 1: Celsius | | |
| | | 0: open channel alarm | | |
| | | 1: close channel alarm | | |
| | | bit0: channel 1 | R/W | |
| 42 | Channel alarm setup | bit1: channel 2 | | 0 |
| | | bit2: channel 3 | | Ç |
| | | bit3: channel 4 | | |
| | | bit4: channel 5 | | |
| | | bit5: channel 6 | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|-----------------|--|------|----------|
| | | bit6: channel 7 | | |
| | | bit7: channel 8 | | |
| | | | | |
| | | 0: warning | | |
| | | 1: alarm | | |
| | | bit8: error in the power supply | | |
| | | bit9: error in the module hardware | | |
| | | bit10: error in calibration | | |
| | | bit11: error in CJC temperature | | |
| | | 16#0101: record the peak value again for | | |
| | | channel 1 | | |
| | | 16#0102: record the peak value again for | | |
| | | channel 2 | | |
| | | 16#0104: record the peak value again for | | |
| | | channel 3 | | |
| | | 16#0108: record the peak value again for | | |
| | | channel 4 | | |
| | | 16#0110: record the peak value again for | | |
| | | channel 5 | | |
| | | 16#0120: record the peak value again for | | |
| | | channel 6 | | |
| | | 16#0140: record the peak value again for | | |
| 201 | Instruction set | channel 7 | W | 0 |
| | | 16#0180: record the peak value again for | | |
| | | channel 8 | | |
| | | 16#01FF: record the peak value again for | | |
| | | channels 1-8 | | |
| | | | | |
| | | 16#0201: enable recording for channel 1 | | |
| | | 16#0202: enable recording for channel 2 | | |
| | | 16#0204: enable recording for channel 3 | | |
| | | 16#0208: enable recording for channel 4 | | |
| | | 16#0210: enable recording for channel 5 | | |
| | | 16#0220: enable recording for channel 6 | | |
| | | 16#0240: enable recording for channel 7 | | |
| | | 16#0280: enable recording for channel 8 | | |



| CR# | Name | Description | Atr. | Defaults |
|-----|------------------------|--|------|----------|
| | | 16#02FF: enable recording for channels 1-8 | | |
| | | | | |
| | | 16#0301: disable recording for channel 1 | | |
| | | 16#0302: disable recording for channel 2 | | |
| | | 16#0304: disable recording for channel 3 | | |
| | | 16#0308: disable recording for channel 4 | | |
| | | 16#0310: disable recording for channel 5 | | |
| | | 16#0320: disable recording for channel 6 | | |
| | | 16#0340: disable recording for channel 7 | | |
| | | 16#0380: disable recording for channel 8 | | |
| | | 16#03FF: disable recording for channels 1-8 | | |
| | | | | |
| | | 16#0501: restore default settings, clear setting | | |
| | | values in the Flash | | |
| | | 16#0502: restore default settings, do not clear | | |
| | | setting values in the Flash | | |
| 210 | The maximum peak value | | | _ |
| | for channel 1 | | | |
| 211 | The maximum peak value | | | _ |
| | for channel 2 | | | |
| 212 | The maximum peak value | | | _ |
| | for channel 3 | | | |
| 213 | The maximum peak value | | | _ |
| | for channel 4 | Integer format; the maximum peak value for | R | |
| 214 | The maximum peak value | analog inputs | | _ |
| | for channel 5 | | | |
| 215 | The maximum peak value | | | _ |
| | for channel 6 | | | |
| 216 | The maximum peak value | | | _ |
| | for channel 7 | | | |
| 217 | The maximum peak value | | | _ |
| | for channel 8 | | | |
| 218 | The minimum peak value | Integer format; the minimum peak value for | | _ |
| | for channel 1 | | R | |
| 219 | The minimum peak value | analog inputs | | _ |
| | for channel 2 | | | |

| CR# | Name | Description | Atr. | Defaults |
|-----|---------------------------|--|------|----------|
| 220 | The minimum peak value | | | |
| 220 | for channel 3 | | | - |
| 221 | The minimum peak value | | | |
| 221 | for channel 4 | | | - |
| 222 | The minimum peak value | | | |
| 222 | for channel 5 | | | |
| 223 | The minimum peak value | | | _ |
| 223 | for channel 6 | | | |
| 224 | The minimum peak value | | | _ |
| | for channel 7 | | | |
| 225 | The minimum peak value | | | _ |
| | for channel 8 | | | |
| 226 | The time to record for | | R/W | 1 |
| | channel 1 | | | |
| 227 | The time to record for | | R/W | 1 |
| | channel 2 | | | - |
| 228 | The time to record for | | R/W | 1 |
| | channel 3 | | - | |
| 229 | The time to record for | Unit: 100 ms | R/W | 1 |
| | channel 4 | Range: 1–100 | | |
| 230 | The time to record for | The time to record the digital value for the | R/W | 1 |
| | channel 5 | channels | | |
| 231 | The time to record for | | R/W | 1 |
| | channel 6 | | | |
| 232 | The time to record for | | R/W | 1 |
| | channel 7 | | | |
| 233 | The time to record for | | R/W | 1 |
| | channel 8 | | | |
| 240 | The number of records for | | | |
| | channel 1 | | | |
| 241 | The number of records for | | | |
| | channel 2 | Range: 0-100, display the current records | R | 0 |
| 242 | The number of records for | | | |
| | channel 3 | | | |
| 243 | The number of records for | | | |
| | channel 4 | | | |



| CR# | Name | Description | Atr. | Defaults |
|-------|---------------------------|---------------------------|------|----------|
| 244 | The number of records for | | | |
| 244 | channel 5 | | | |
| 245 | The number of records for | | | |
| 240 | channel 6 | | | |
| 246 | The number of records for | | | |
| 240 | channel 7 | | | |
| 247 | The number of records for | | | |
| 241 | channel 8 | | | |
| 4000 | Records for channel 1 | 100 records for channel 1 | R | _ |
| ~4099 | Trecords for charmer 1 | 100 records for charmer 1 | | |
| 4500 | Records for channel 2 | 100 records for channel 2 | R | _ |
| ~4599 | Troopido foi ofidimor 2 | 100 1000 101 010111101 2 | | |
| 5000 | Records for channel 3 | 100 records for channel 3 | R | _ |
| ~5099 | 7.000.00 | | | |
| 5500 | Records for channel 4 | 100 records for channel 4 | R | _ |
| ~5599 | | | | |
| 6000 | Records for channel 5 | 100 records for channel 5 | R | _ |
| ~6099 | | | | |
| 6500 | Records for channel 6 | 100 records for channel 6 | R | _ |
| ~6599 | | | | |
| 7000 | Records for channel 7 | 100 records for channel 7 | R | _ |
| ~7099 | | | | |
| 7500 | Records for channel 8 | 100 records for channel 8 | R | _ |
| ~7599 | | | | |

7.2.6 Functions

| Item | Function | Description |
|------|-------------------------------|---|
| 1 | Enable/Disable a Channel | Enable or disable a channel. If a channel is disabled, the total conversion time decreases. |
| 2 | Unit of Measurement | Select the unit of measurement: Fahrenheit or Celsius. |
| 3 | Calibration | Calibrate a linear curve. |
| 4 | Average | Conversion values are averaged and filtered. |
| 5 | Disconnection Detection | If the channel is open, the module can detect when it is disconnected. If the input is open-circuited, the module produces an alarm or a warning. |
| 6 | Channel Detection and Alarm | If an input signal exceeds the range of inputs that the hardware can receive, the module produces an alarm or a warning. You can disable this function. |
| 7 | Limit Detections for Channels | Save the maximum/minimum values for channels. |
| 8 | Records for Channels | Save the analog curves for channels. |
| 9 | PID Algorithm | PID control modes |

1. Enable/Disable a Channel

An analog signal is converted into a digital signal at a rate of 200 ms per channel. If a channel is not used, you can disable it to decrease the total conversion time.

2. Unit of Measurement

Select the unit of measurement, Fahrenheit or Celsius, according to your needs.

3. Calibration

To make a curve meet specific needs, calibrate the curve by changing the offset and the gain. The calibration range depends on the range of inputs that the hardware can receive. The formula is:

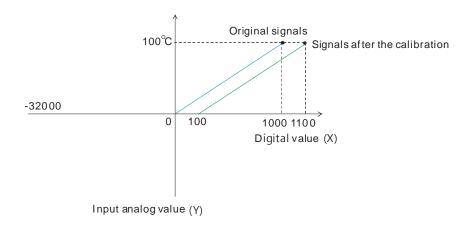
$$Output = \frac{(Input \times Gain)}{1000} + Offset$$



Example:

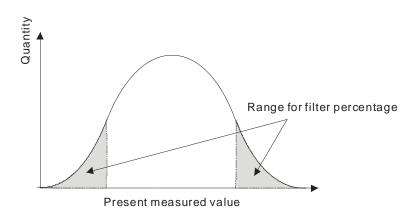
If the gain is 1000 and the offset is 0, the corresponding value for the original signal 0° C to 100° C is 0–1000. If you change the offset to 100, the calibrated value for the original signal 0° C to 100° C becomes 100–1100.

Gain = 1000, Offset = 0



4. Average

You can set the average value between 1–100. It is a steady value obtained from the sum of the recorded values. If the recorded values include an acute pulse due to unavoidable external factors, however, you may observe violent changes in the average value. Use the filtering function to exclude the acute pulses from the sum-up and equalization, so the computed average value is not affected by the acute recorded values. Set the filter percentage to the range of 0–3, where the unit is 10%. If you set the filter range to 0, for example, the system sums up all the recorded values and divides them to obtain the average value, but if you set the filter range to 1, the system excludes the bottom 10% and the top 10% of the values and averages only the remaining values to obtain the average value.



5. Disconnection Detection

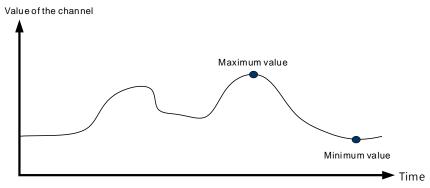
If the channel is open, the module can detect when it is disconnected. If the input is open-circuited, the module produces an alarm or a warning.

6. Channel Detection

If an input signal exceeds the allowable range of inputs that the hardware can receive, an error message appears and the Error LED blinks. You can disable this function so that the module does not produce an alarm or warning and the Error LED also does not blink when the input signal exceeds the input range.

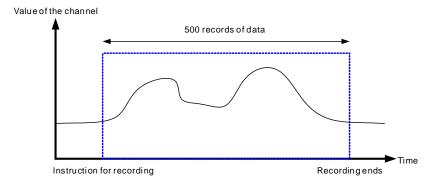
7. Limit Detections for Channels

This function saves the maximum and minimum values for channels so that you can determine the peak to peak values.



8. Records for channels

Record the input values of the cyclic sampling for each channel. For AS04TC-A, the system saves up to 500 data points and the recording time is 10 ms. For example, if the conversion time is 2 ms and 4 channels are open, the recording time is 8 ms x 500 data points = 4 seconds in total. And the system saves up to 100 data points for AS08TC-A and the recording time is 100 ms. The following uses AS04TC-A as an example to demonstrate.



9. PID control

PID algorithm is available for every channel. With its auto tuning function, parameters such as Kp, Ki, Kd and more can be calculated and therefore temperature control can be achieved. You can also use DMPID instruction to calculate relative parameters by entering the parameters in the endpoints of the corresponding instruction image and then you can then obtain the output values from the output endpoints. Note: DMPID instruction is available for AS04TC-A (V1.04 or later), AS08TC-A (V1.00 or later), AS Series PLC (V1.06 or later) and AS-SCM (V2.04 or later).



7.2.7 Control Mode

- You can use DMPID (API1417) to execute PID control. The applicable models and FW are AS04TC-A (V1.04 or later), AS08TC-A (V1.00 or later), AS Series PLC (V1.06 or later) and AS-SCM (V2.04 or later). Refer to AS Series Programming Manual for more details.
- 2. If the device you have does NOT support DMPID instruction, you can use the following PID parameter to execute PID control.

Use PID parameters

| | | | CI | R# | | | | Operand | Famotian | D | Defection |
|-----|-----|-----|-----|-----|-----|-----|-----|----------|--------------------------|--|-----------|
| CH1 | CH2 | СНЗ | CH4 | СН5 | СН6 | СН7 | СН8 | Operand | Function | Description | Defaults |
| 600 | 630 | 660 | 690 | 720 | 750 | 780 | 810 | PID_RUN | Enable the PID algorithm | 1: the PID algorithm is implemented.0: the output value (MV) is reset to 0, and the PID algorithm is not implemented. | 0 |
| 601 | 631 | 661 | 691 | 721 | 751 | 781 | 811 | SV | SV | Target value | 0 |
| 602 | 632 | 662 | 692 | 722 | 752 | 782 | 812 | PID_MODE | PID control mode | O: automatic control When PID_MAN is switched from 1 to 0, the output value (MV) is included in the automatic algorithm. 1: the parameters are tuned automatically for the temperature control. When the tuning is | 0 |

| | | | CI | ₹# | | | | | | | Defection |
|-----|-----|-----|-----|-----|-----|-----|-----|-----------|-------------------------------------|---|-----------|
| CH1 | CH2 | СНЗ | СН4 | СН5 | СН6 | СН7 | СН8 | Operand | Function | Description | Defaults |
| | | | | | | | | | | complete, the device is automatically reset to 0, and the parameters Kc_Kp, Ti_Ki, Td_Kd, and Tf are set appropriately. | |
| 603 | 633 | 663 | 693 | 723 | 753 | 783 | 813 | PID_MAN | PID A/M mode | O: auto; the MV is output based on the PID algorithm. 1: manual; the MV is output based on the MOUT. When PID_MODE is also set to 1, this setting is ineffective. | 0 |
| 604 | 634 | 664 | 694 | 724 | 754 | 784 | 814 | MOUT_AUTO | MOUT automatic change mode | 0: normal; the MOUT does not vary with the MV. 1: auto; the MOUT varies with the MV. | 0 |
| 605 | 635 | 665 | 695 | 725 | 755 | 785 | 815 | Auto DBWA | Auto tuning non-action zone | Range: 0–32000, used when SV is in the ±dead band in auto tuning mode. | 0 |



| | | | CI | R# | | | | 0 | F | D | Defection |
|------------|------------|------------|------------|------------|------------|------------|------------|---------|--|--|-----------|
| CH1 | CH2 | СНЗ | СН4 | СН5 | СН6 | СН7 | СН8 | Operand | Function | Description | Defaults |
| 606 607 | 636 637 | 666 667 | 696 697 | 726 727 | 756 757 | 786 787 | 816 817 | Кс_Кр | Calculated proportional coefficient (Kc or Kp) | Kc_Kp are floating-point numbers. If the P coefficient is less than 0, the Kc_Kp is 0. Independently, if Kc_Kp is 0, it is not controlled by P. | 3.846 |
| 608 609 | 638 639 | 668 669 | 698 699 | 728 729 | 758 759 | 788 789 | 818 819 | Ti_Ki | Integral coefficient (Ti or Ki) | Ti_Ki are floating- point numbers. If the calculated coefficient I is less than 0, Ti_Ki is 0. If Ti_Ki is 0, it is not controlled by I. | 0.013 |
| 610 611 | 640 641 | 670 671 | 700 701 | 730 731 | 760 761 | 790 791 | 820 821 | Td_Kd | Derivative coefficient (Td or K _d) | Td_Kd are floating-point numbers. If the calculated coefficient D is less than 0, Td_Kd is 0. If Ti_Ki is 0, it is not controlled by D. | 190.078 |
| 612 613 | | | 702 703 | 732 733 | | 792 793 | | Tf | Derivate-action time constant | If the derivate- action time constant is less than 0, Tf is 0 and it is not controlled by the derivate- action time constant. | 4.941 |

| | | | CI | ₹# | | | | Ou | Formation | Description | Defection |
|-----|-----|-----|-----|-----|-----|-----|-----|---------|--|--|-----------|
| CH1 | CH2 | СНЗ | СН4 | СН5 | СН6 | СН7 | СН8 | Operand | Function | Description | Defaults |
| 614 | 644 | 674 | 704 | 734 | 764 | 794 | 824 | PID_EQ | PID formula types | 0: independent formula 1: dependent formula | 0 |
| 615 | 645 | 675 | 705 | 735 | 765 | 795 | 825 | PID_DE | The calculation of the PID derivative error | O: use the variations in the error (E) to calculate the control value of the derivative (derivative of E). 1: use the variations in the PV to calculate the control value of the derivative (derivative of PV). | 0 |
| 616 | 646 | 676 | 706 | 736 | 766 | 796 | 826 | PID_DIR | PID forward/ reverse direction | 0: heating action (E=SV-PV) 1: cooling action (E=PV-SV) | 0 |
| 617 | 647 | 677 | 707 | 737 | 767 | 797 | 827 | ERR_DBW | Range within which the error value is counted as 0 | The error value (E) is the difference between the SV and the PV. When this setting is 0, the function is not enabled. When this setting is enabled, the CPU module checks | 0 |



| | | | CI | R # | | | | | | | |
|-----|-----|-----|-----|------------|-----|-----|-----|---------|----------------------------------|--|----------|
| CH1 | CH2 | СНЗ | CH4 | CH5 | СН6 | СН7 | СН8 | Operand | Function | Description | Defaults |
| | | | | | | | | | | whether the present difference is less than the absolute value of ERR_DBW, and it checks whether the present difference meets the cross status condition. If the present difference is less than the absolute value of ERR_DBW and it meets the cross status condition, the present error is counted as 0, and the PID algorithm is implemented. Otherwise the present error is brought into the PID algorithm normally. | |
| 618 | 648 | 678 | 708 | 738 | 768 | 798 | 828 | α value | Integral sum | Range: 0–100 | 31 |
| 619 | 649 | 679 | 709 | 739 | 769 | 799 | 829 | β value | Integral sum | Unit: 0.01 | 0 |
| 620 | 650 | 680 | 710 | 740 | 770 | 800 | 830 | MOUT | Manual output value (MOUT) | When PID_MAN is set to 1, the MV value is output as this manual MOUT value, between MV_MAX and MV_MIN. | 0 |

| | | | CI | ₹# | | | | | | | |
|------------|------------|-----|------------|-----|------------|------------|------------|---------|------------------------------------|--|----------|
| CH1 | CH2 | СНЗ | СН4 | СН5 | СН6 | СН7 | СН8 | Operand | Function | Description | Defaults |
| | | | | | | | | | | Range: 0–1000 (0%–100%) | |
| 621 | 651 | 681 | 711 | 741 | 771 | 801 | 831 | BIAS | Feedforward output value | Feedforward output value, used for the PID feedforward | 0 |
| | 652 653 | | 712 713 | | | | 832 833 | MV | Output value (MV) | A floating-point number Range: 0–100 Unit: % | |
| 624 625 | 654 655 | | 714 715 | | 774 775 | 804 805 | | I_MV | Accumulated integral value | Floating-point format. The accumulated integral value is temporarily stored for reference. When the MV is out of the range 0%–100%, the accumulated integral value in I_MV is unchanged. | |
| 626 | 656 | 686 | 716 | 746 | 776 | 806 | 836 | CYCLE | Sampling time (T _S) | When this instruction is read, the PID algorithm is implemented according to the sampling time, and the MV is refreshed. If Ts is less than 1, it is read as 1. If Ts is larger than | 1 |



| | CR# | | | | | | | Operand | Function | Description | Defaulte |
|-----|-----|-----|-----|-----|-----|-----|-----|---------|----------|----------------------|----------|
| CH1 | CH2 | СНЗ | CH4 | CH5 | СН6 | СН7 | СН8 | Operand | Function | Description | Defaults |
| | | | | | | | | | | 1,000, it is read as | |
| | | | | | | | | | | 1,000. | |
| | | | | | | | | | | Unit: 100 ms | |

Note: PID control registers of AS04TC-A and RTD-A are retainable; however PID control registers of AS06RTD-A and AS08TC-A are not retainable. But you can use the data registers that are retainable to store the set PID parameters so that the PID parameters can be retainable.

PID formula:

- 1. When the PID_MODE is set to 0, the mode is set to auto:
 - Independent Formula & Derivative of E (PID EQ=False & PID DE=False)

$$MV = K_P E + Ki \int_0^t E dt + K_d * \frac{dE}{dt} + BIAS$$
 ($E = SV - PV$ or $E = PV - SV$)

Independent Formula & Derivative of PV (PID EQ=False & PID DE=True)

$$MV = K_P E + Ki \int_0^t E dt - K_d * \frac{dPV}{dt} + BIAS \quad (E = SV - PV)$$

$$Or$$

$$MV = K_P E + Ki \int_0^t E dt + K_d * \frac{dPV}{dt} + BIAS \quad (E = PV - SV)$$

• Dependent Formula & Derivative of E (PID_EQ=True & PID_DE=False)

$$MV = K_c \left[E + \frac{1}{T_i} \int_0^t E dt + T_d * \frac{dE}{dt} \right] + BIAS$$
 ($E = SV - PV$ or $E = PV - SV$)

• Dependent Formula & Derivative of PV (PID EQ=True & PID DE=True)

$$MV = K_c \left[E + \frac{1}{T_i} \int_0^t E dt - T_d * \frac{dE}{dt} \right] + BIAS \quad (E = SV - PV)$$

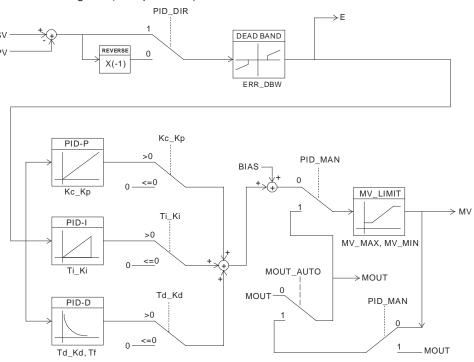
$$Or$$

$$MV = K_c \left[E + \frac{1}{T_i} \int_0^t E dt + T_d * \frac{dE}{dt} \right] + BIAS \quad (E = PV - SV)$$

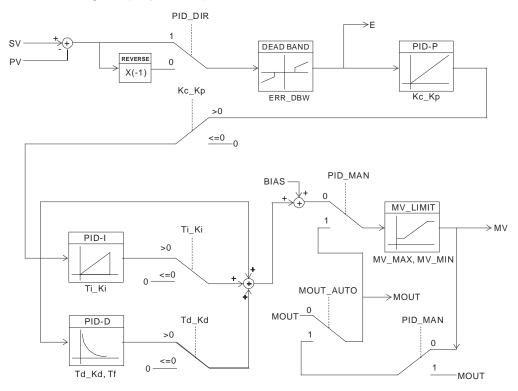
2. When you set the PID_MODE to 1, auto tuning mode is enabled. When auto tuning is complete, the value becomes 0 and switches off the auto tuning mode automatically.

PID Control Block Diagram:

PID Block Diagram (Independent)



PID Block Diagram (Dependent)

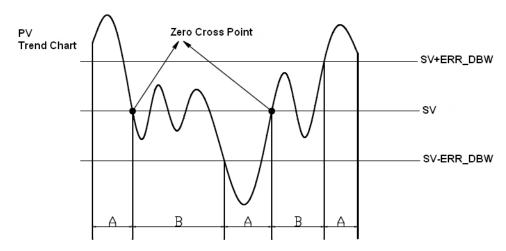




the PID algorithm in the section B.

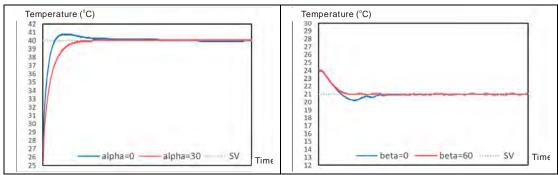
into the PID algorithm according to the normal processing, and then the CPU module checks whether the present error meets the cross status condition: PV (present value) goes beyond the SV (target value). Once the condition is met, the present error is counted as 0 when applying the PID algorithm. After the PV (present value) is out of the **ERR_DBW** range, the present error is brought into the PID algorithm again. If PID_DE is true, that means it uses the variations in the PV to calculate the control value of the derivative, and after the cross status condition is met, the PLC treats Δ **PV** as 0 to apply the PID algorithm. (Δ **PV**= current **PV** – previous **PV**). In the following example, the present error is brought into the PID algorithm according to the normal processing in section A ,and the present error or Δ **PV** is counted as 0 to apply

When the PV (present value) is in the range of ERR_DBW, at the beginning, the present error is brought



$\alpha \cdot \beta$ Value

To reduce overshoot, you can use parameters of ALPHA or BETA in the beginning of the PID operation or while SV (target value) varies to compensate initial value of integral calculus (for heating up or cooling down). See the images below. Use ALPHA parameter to reduce overshoot while the temperature is climbing up. Use BETA parameter to reduce overshoot while the temperature is dropping.



Formula of the output cycle:

Pulse output width = MV (%) x output cycle

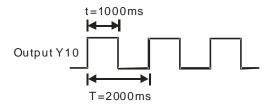
Execute the general pulse with modulation instruction (GPWM) to set pulse output width and output cycle sampling time to manage the cycle.

Example:

If the output cycle is 2000 ms, then the output value is 50% after the PID algorithm is implemented.

 \triangleright Pulse output width = 50% x 2000 ms = 1000 ms

In other words, the GWPM instruction can be set to pulse output width = 1000 and output cycle = 2000.



Note:

- 1. When tuning the parameters Kc_Kp, Ti_Ki, and Td_Kd (PID_MODE=0), set the Kc_Kp value first, and then set the Ti_Ki and Td_Kd values to 0. In a controlled environment, you can increase the values of Ti_Ki (from smaller to bigger) and Td_Kd (from bigger to smaller). When the value of Kc_Kp is 1, the proportional gain is 100%. That is, the error values increase by a factor of one. When the proportional gain is less than 100%, the error values decrease. When the proportional gain is greater than 100%, the error values increase.
- The parameters which have been automatically tuned are not necessarily suitable for every controlled environment. You can, therefore, further modify the automatically-tuned parameters, but it is recommended that you only modify the values of Ti_Ki or Td_Kd.
- 3. The operand CYCLE is to set the sampling time to use the PID algorithm and refresh MV.
- 4. When the number of the channel for measurement is changed, the time to refresh the measured value also changes. For example, the measured value is refreshed every 200 ms when there is only 1 channel for measurement. The measured value is refreshed every 800 ms when there are 4 channels for measurement. The Kc_Kp, Ti_Ki, Td_Kd parameters may differ when the number of channel for measure is different.



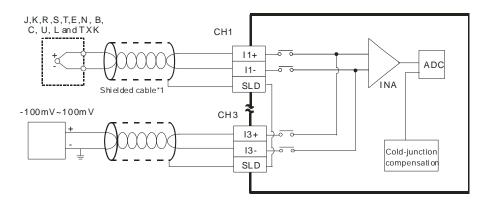
7.2.8 Wiring

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 ASTC-A Series 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 which 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) Note1: do not wire empty terminals.
- (6) Note2: only use copper conducting wires with a temperature rating of 60/75°C and the length must be less than 50 m.
- (7) Note3: TC modules must run for 30 minutes before they start to take any temperature measurement.

External wiring



*1. Use shielded twisted pair cables for Type J, K, R, S, T, E, N, B, C, U, L and TXK thermocouples, and keep them separate from power cables and other cables which generate noise.

7.2.9 LED Indicators

| Number | Name | Description |
|--------|-------------------|--|
| | | Operating status of the module |
| 1 | RUN LED Indicator | ON: the module is running. |
| | | OFF: the module is not running. |
| | | Error status of the module |
| 2 | ERROR LED | ON: a serious error exists in the module. |
| 2 | Indicator | OFF: the module is operating normally. |
| | | Blink: a minor error exists in the module. |
| | Analog-to-Digital | Conversion status |
| 3 | Conversion | Blinking: conversion is in process. |
| | Indicator | OFF: conversion has stopped. |

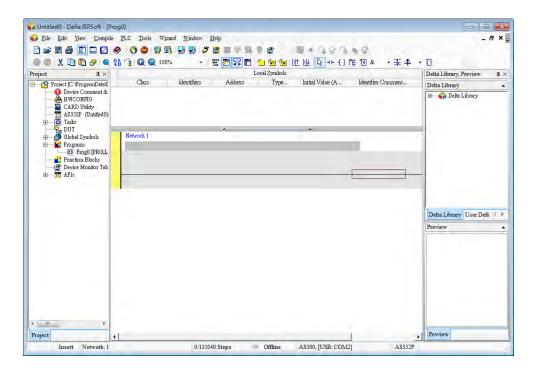


7.3 HWCONFIG in ISPSoft

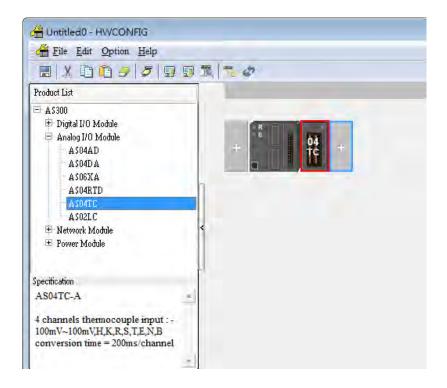
7.3.1 Initial Setting

The following uses AS04TC-A as an example to demonstrate.

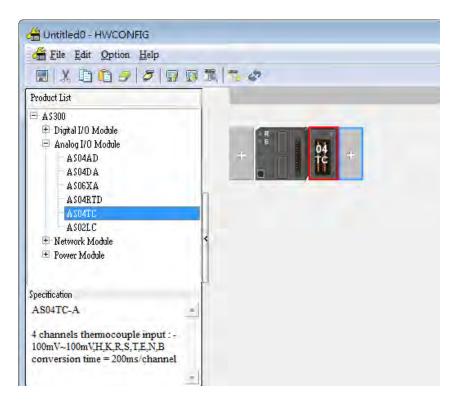
(1) Start ISPSoft and double-click HWCONFIG.

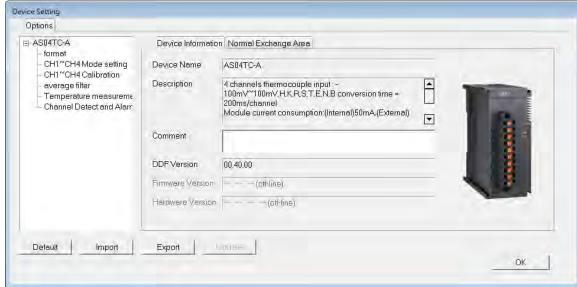


(2) Select a module and drag it to the working area.



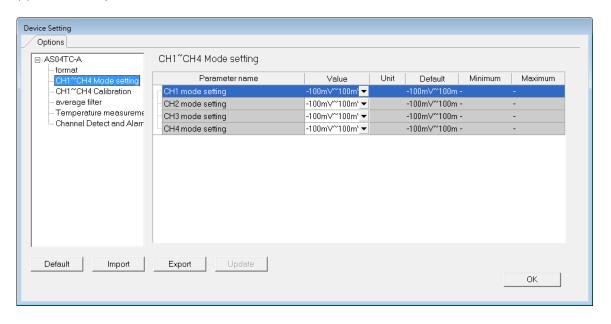
(3) Double-click the module in the working area to open the Device Setting page.



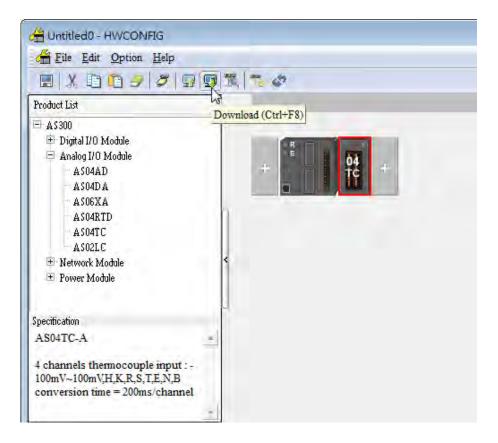




(4) Choose the parameter, set the values, and click **OK**.

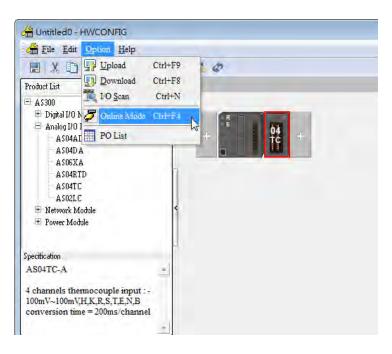


(5) Click **Download** on the toolbar to download the parameters. Note that you cannot download the parameters while the CPU module is running.



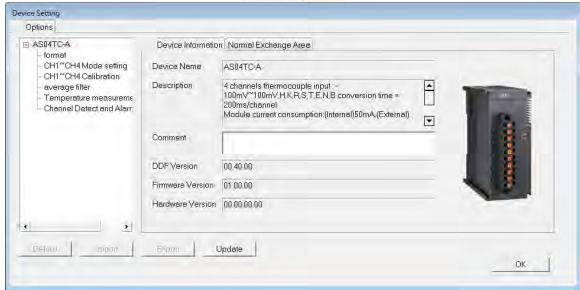
7.3.2 Checking the Version of a Module

(1) On the Option menu, click Online Mode.



(2) Double-click the module to open the Device Setting page. The versions of both the firmware and the hardware are displayed.

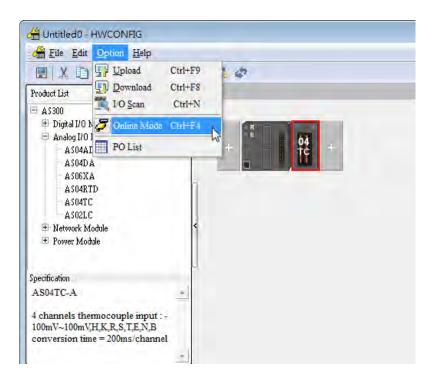






7.3.3 Online Mode

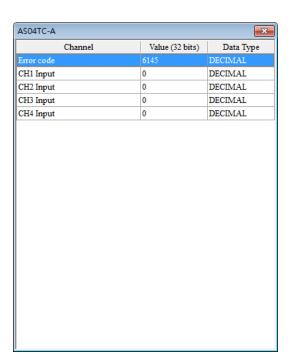
(1) On the Option menu, click Online Mode.



(2) Right-click the module and click **Module Status**.

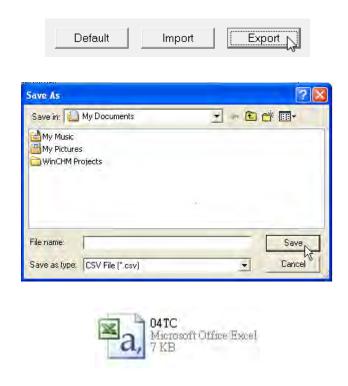


(3) View the module status.



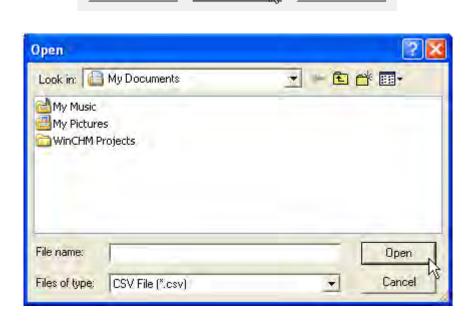
7.3.4 Importing/Exporting a Parameter File

(1) Click **Export** in the Device Setting dialog box to save the current parameters as a CSV file (.csv).



(2) Click Import in the Device Setting dialog box, and select a CSV file to import saved parameters.

Default



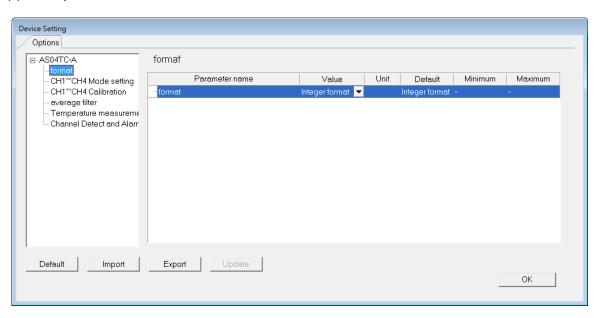
Import

Export

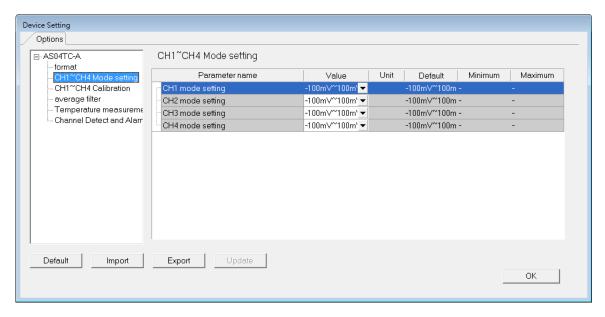


7.3.5 Parameters

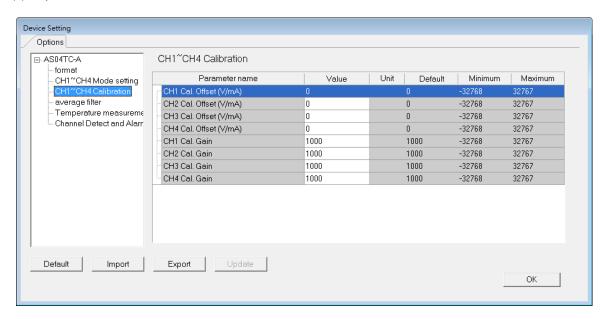
(1) The input modes of the channels



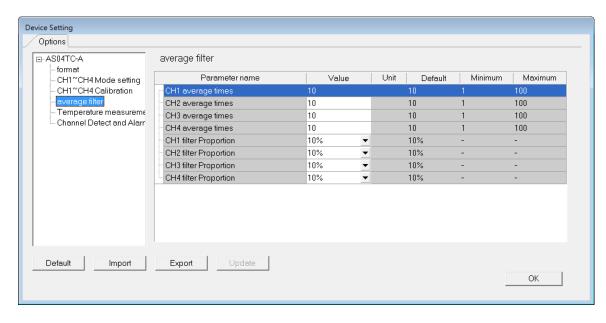
(2) Input CH1-CH4 (channel 1-channel 4) mode settings



(3) Input CH1-CH4 calibration

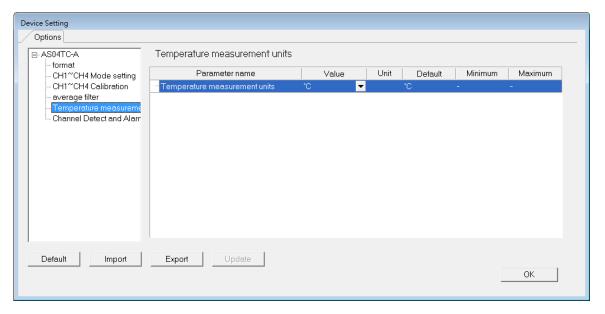


(4) Input average filter

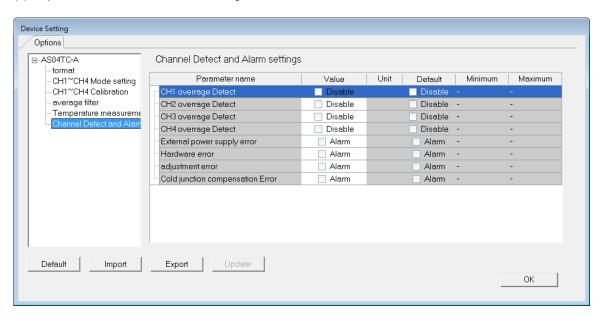




(5) Temperature measurement



(6) Input channel detect and alarm settings

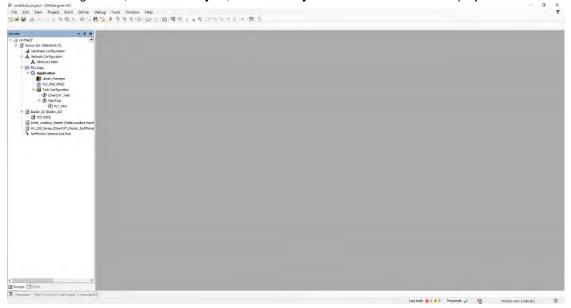


7.4 DIADesigner-AX (Hardware Configuration)

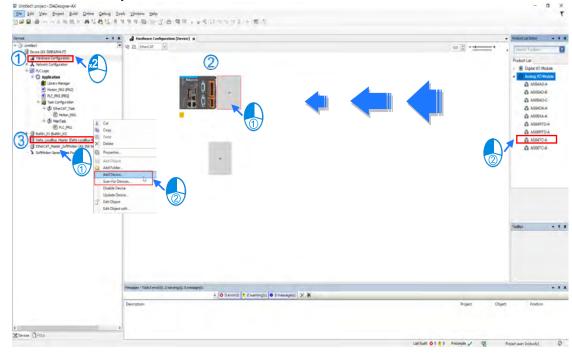
The following example uses AS04TC-A.

7.4.1 Initial Setting

(1) Start DIADesigner-AX, click New Project, and then Project+Device to create a new project.



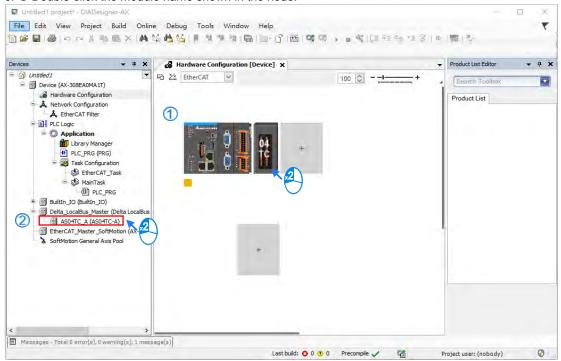
- (2) Add modules in:
 - ① Double-click Hardware Configuration
 - ② Select the **+ section** and drag and drop the module that you want to add from the Product List to the **+** section.
 - or ③ Right-click **Delta_Localbus Master** to see the context meun and then double-click **Add Device** to add devices manually or double-click **Scan for Devices**.



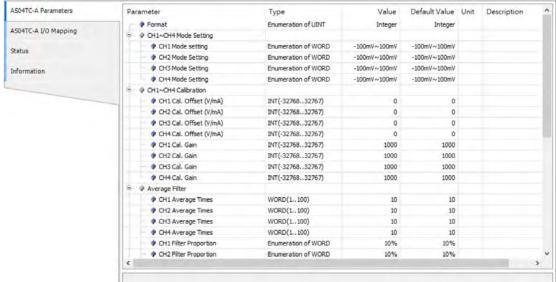


(3) Select modules:

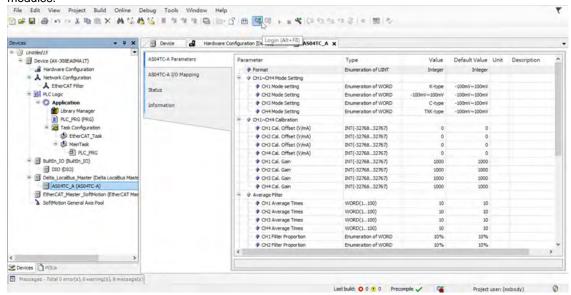
- ① Double-click the module name in the Hardware Configuration area.
- or ② Double-click the module name shown in the node.



(4) Module parameter setting page:



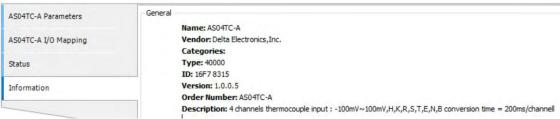
(5) After setting is complete, select the module and click **Login** on the tool bar to download the settings to the modules.



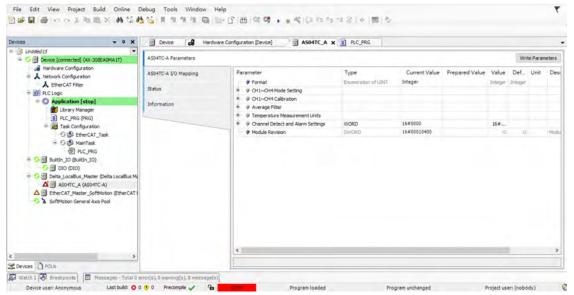


7.4.2 Checking the Version of a Module

(1) Select the module and click the Information tab to see the module information.

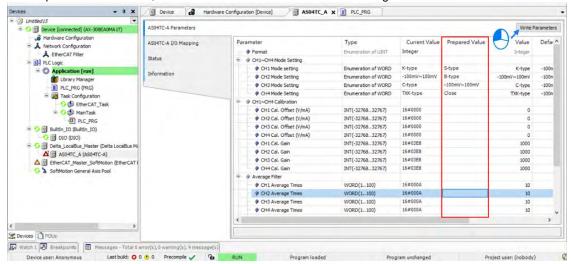


(2) Select the module and click **Login** on the tool bar to go to Online Mode. You can find the Module Revision from the Parameters tab.

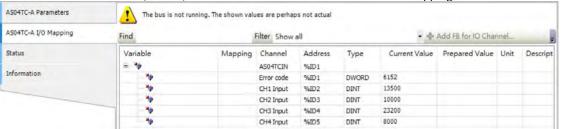


7.4.3 Online Mode

(1) Select the module and click **Login** on the tool bar to go to **Online Mode**. You can monitor all configuration parameters. Vaules in the column of Prepared Value are configurable online. After editing the values in the Prepared Value column, click **Write Parameter** to confirm the change.



(2) You can monitor the values, status, error codes in each channel from the I/O Mapping tab.



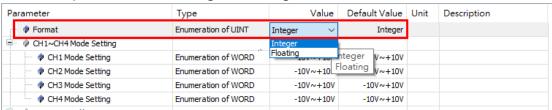
(3) You can monitor the current status and error codes from the Status tab.





7.4.4 Parameters

(1) You can set up the value format to Integer or Floating for Channel 1 to 4.



(2) You can set up the values for Channel 1 to 4.

| Parameter | Туре | Value | Default Value | Unit | Description |
|--|---------------------|------------------------|---------------|------|-------------|
| Format F | Enumeration of UINT | Integer | Integer | | |
| CH1~CH4 Mode Setting | | | | | |
| CH1 Mode setting | Enumeration of WORD | K-type ~ | -100mV~100mV | | |
| ··· ♦ CH2 Mode Setting | Enumeration of WORD | Close | -100mV~100mV | | |
| CH3 Mode Setting | Enumeration of WORD | -100mV~100mV J-type | -100mV~100mV | | |
| CH4 Mode Setting | Enumeration of WORD | K-type | -100mV~100mV | | |
| CH1~CH4 Calibration | | R-type S-type | | | |
| OH1 Cal. Offset (V/mA) | INT(-3276832767) | T-type | 0 | | |
| OH2 Cal. Offset (V/mA) | INT(-3276832767) | E-type | 0 | | |
| → P CH3 Cal. Offset (V/mA) | INT(-3276832767) | N-type B-type | 0 | | |
| OH4 Cal. Offset (V/mA) | INT(-3276832767) | C-type | 0 | | |
| ··· 👂 CH1 Cal. Gain | INT(-3276832767) | U-type L-type | 1000 | | |
| CH2 Cal. Gain | INT(-3276832767) | TXK-type | 1000 | | |

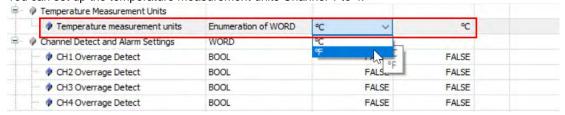
(3) You can set up the calibrations for for Channel 1 to 4.

| <u> </u> | | | | |
|-----------------------------|------------------|------|------|--|
| ☐ ··· CH1~CH4 Calibration | | | | |
| | INT(-3276832767) | 0 | 0 | |
| | INT(-3276832767) | 0 | 0 | |
| | INT(-3276832767) | 0 | 0 | |
| | INT(-3276832767) | 0 | 0 | |
| ··· | INT(-3276832767) | 1000 | 1000 | |
| → P CH2 Cal. Gain | INT(-3276832767) | 1000 | 1000 | |
| ··· | INT(-3276832767) | 1000 | 1000 | |
| P CH4 Cal. Gain | INT(-3276832767) | 1000 | 1000 | |
| | | | | |

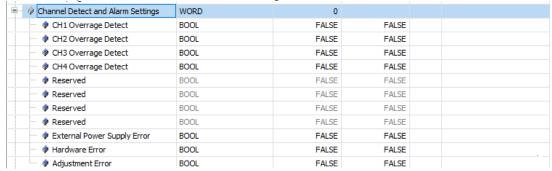
(4) You can set up the average filtering for Channel 1 to 4.

| Tod carroot up the average intering for charmor to 1. | | | | | | | | |
|---|---|---------------------|-----|-----|--|--|--|--|
| =- | | | | | | | | |
| | ··· | WORD(1100) | 10 | 10 | | | | |
| | ··· 👂 CH2 Average Times | WORD(1100) | 10 | 10 | | | | |
| | CH3 Average Times | WORD(1100) | 10 | 10 | | | | |
| | → Property CH4 Average Times → | WORD(1100) | 10 | 10 | | | | |
| | CH1 Filter Proportion | Enumeration of WORD | 10% | 10% | | | | |
| | PCH2 Filter Proportion | Enumeration of WORD | 10% | 10% | | | | |
| | CH3 Filter Proportion | Enumeration of WORD | 10% | 10% | | | | |
| | CH4 Filter Proportion | Enumeration of WORD | 10% | 10% | | | | |

(5) You can set up the temperature measurement units Channel 1 to 4.



(6) You can set up the channel detect and alarm settings.





7.5 Troubleshooting

7.5.1 Error Codes

| Error | Docarintian | A↔ D LED | ERROR LED | |
|---------|---|---------------|---|--|
| Code | Description | Indicator | Indicator | |
| 16#1605 | Hardware failure | OFF | ON | |
| 16#1607 | The external voltage is abnormal. | OFF | ON | |
| 16#1608 | The factory calibration is abnormal. | OFF | ON | |
| 16#1801 | The external voltage is abnormal. | OFF | Blinking | |
| 16#1802 | Hardware failure | OFF | Blinking | |
| 16#1804 | The factory calibration is abnormal. | OFF | Blinking | |
| 16#1808 | The signal received by channel 1 exceeds the range of inputs that the hardware can receive. | | Blinking | |
| 16#1809 | The signal received by channel 2 exceeds the range of inputs that the hardware can receive. | | | |
| 16#180A | The signal received by channel 3 exceeds the range of inputs that the hardware can receive. | | | |
| 16#180B | The signal received by channel 4 exceeds the range of inputs that the hardware can receive. | Run: blinking | | |
| 16#180C | The signal received by channel 5 exceeds the range of inputs that the hardware can receive. | Stop: OFF | | |
| 16#180D | The signal received by channel 6 exceeds the range of inputs that the hardware can receive. | | | |
| 16#180E | The signal received by channel 7 exceeds the range of inputs that the hardware can receive. | | | |
| 16#180F | The signal received by channel 8 exceeds the range of inputs that the hardware can receive. | | | |
| - | When power-on, the module is not detected by CPU module. | OFF | Blinking once or twice and after 2 seconds, it blinks repeatedly | |

7.5.2 Troubleshooting Procedure

| Description | Procedure | | |
|--|--|--|--|
| The external voltage is abnormal. | Ensure the external 24 V power supply to the module is | | |
| The external voltage is abnormal. | functioning normally. | | |
| Hardware failure | Return the module to the factory for repair. | | |
| Internal error | Contact the factory | | |
| The factory calibration is abnormal. | Contact the factory. | | |
| The signal received by channel 1 exceeds the | Check the signal received by channel 1. | | |
| range of inputs that the hardware can receive. | Check the signal received by Charmer 1. | | |
| The signal received by channel 2 exceeds the | Check the signal received by channel 2. | | |
| range of inputs that the hardware can receive. | Check the signal received by Chaillet 2. | | |
| The signal received by channel 3 exceeds the | Check the signal received by channel 3. | | |
| range of inputs that the hardware can receive. | Official received by charmer 5. | | |
| The signal received by channel 4 exceeds the | Check the signal received by channel 4. | | |
| range of inputs that the hardware can receive. | Check the signal received by channel 4. | | |
| The signal received by channel 5 exceeds the | Check the signal received by channel 5. | | |
| range of inputs that the hardware can receive. | | | |
| The signal received by channel 6 exceeds the | Check the signal received by channel 6. | | |
| range of inputs that the hardware can receive. | | | |
| The signal received by channel 7 exceeds the | Check the signal received by channel 7. | | |
| range of inputs that the hardware can receive. | 2 3.g.ra. 1999.rou 2, shaimer . | | |
| The signal received by channel 8 exceeds the | Check the signal received by channel 8. | | |
| range of inputs that the hardware can receive. | | | |
| When power-on, the module is not detected by | Check if the connection between module and CPU | | |
| CPU module. | module is working. If not, connect again. | | |



MEMO



Chapter 8 Load Cell Module ASO2LC

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8.1 Overview

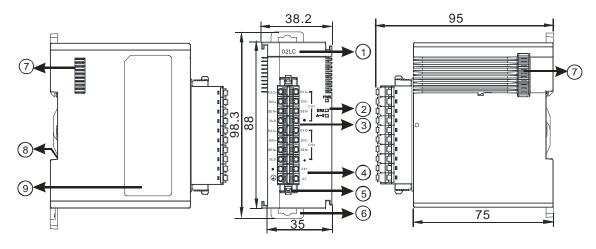
This chapter describes the specifications for load cell modules, their operation, and their programming. You can use the AS02LC load cell module with four-wire or six-wire load cells with various eigenvalues, so you can adjust its response time according to your requirements. In addition, the AS02LC-A can read and write data via the AS Series PLC units using the FROM/TO instructions. To ensure that the product is correctly installed and operated, read the manual carefully before use. This manual provides functional specifications, and it also introduces installation, basic operation, and settings. Refer to load cell related literature for more details on the principles of operating load cells.

8.2 Specifications

8.2.1 Specifications

| Item | Description | | |
|--|--|--|--|
| Rated Supply Voltage/Power Consumption | 24 VDC (-15% to +20%) / 3 W | | |
| Minimum/Maximum Voltage | 18–31.2 VDC | | |
| Maximum Current Consumption | 150 mA | | |
| Input Signal Range | ±40 mVDC | | |
| Sensibility | +5 VDC +/-10% | | |
| Highest Accuracy | 0.04 % of full scale | | |
| Communication Interface | RS-232, RS-485 | | |
| Applicable Sensor Type | 4-wire or 6-wire load cell | | |
| Expanding a Temperature Coefficient | ≤ ±50 ppm/K v. E | | |
| Reducing a Temperature Coefficient to Zero | ≤ ±0.4 µV/K | | |
| Linearity Error | ≤0.02% | | |
| Response Time | 2.5, 10, 16, 20, 50, 60, 100, 200, and 400 ms | | |
| 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 x 160 mA | | |
| Allowable Load | 40–4010 Ω | | |
| Common-mode Rejection Ratio (CMRR @50/60 Hz) | ≥100 dB | | |
| Dynamic Filter | K1–K5 | | |
| Average Weights | K1–K100 | | |
| Isolation | Between a digital circuit and the ground: 500 VAC Between an analog circuit and the ground: 500 VAC Between an analog circuit and a digital circuit: 500 VAC | | |
| Weight | 147 g | | |

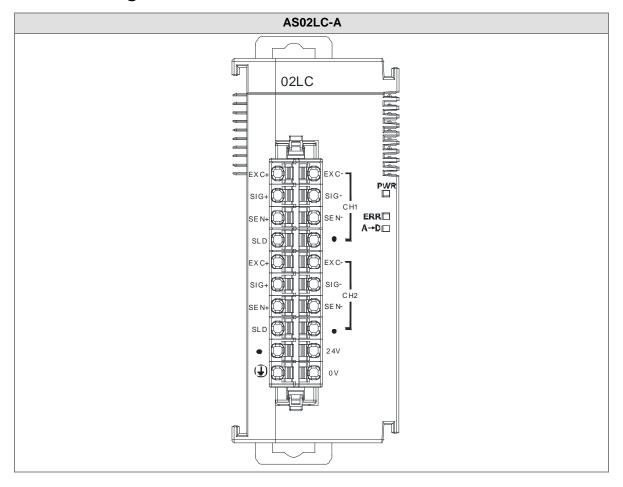
8.2.2 Profile



Unit: mm

| Number | Name | Description | | |
|--------|---|---|--|--|
| 1 | Model Name | Model name of the module | | |
| | RUN LED Indicator | Operating status of the module ON: the module is running. OFF: the module is not running. | | |
| 2 | ERROR LED Indicator | Error status of the module ON: a serious error exists in the module. OFF: the module is operating normally. Blink: a minor error exists in the module. | | |
| | Analog-to-Digital Conversion Indicator | Conversion status Blinking: conversion is in process. OFF: conversion has stopped. | | |
| 3 | Removable Terminal Block | The inputs are connected to transducers. The outputs are connected to loads to be driven. | | |
| 4 | Arrangement of the Input/Output Terminals | Arrangement of the terminals | | |
| 5 | Clip | For removing 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 | | |





8.2.4 Control Registers

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Att. | Default | | | |
|-----|----------------------------|------------------------------------|------|---------|--|--|--|
| | | 0: disabled | | | | | |
| 0 | Display options for | 1: gross weight | R/W | 1 | | | |
| | CH1 | 2: net weight | | | | | |
| | | 3: raw data | | | | | |
| | | 0: 1 mV/V | | | | | |
| | | 1: 2 mV/V | | | | | |
| | | 2: 4 mV/V | | | | | |
| 1 | Eigenvalue for CH1 | 3: 6 mV/V | R/W | 1 | | | |
| | | 4: 20 mV/V | | | | | |
| | | 5: 40 mV/V | | | | | |
| | | 6: 80 mV/V | | | | | |
| | | 0: 2.5ms | | | | | |
| | | 1: 10ms | | | | | |
| | Sampling cycle for CH1 | 2: 16ms | | | | | |
| | | 3: 20ms | | | | | |
| 2 | | 4: 50ms | R/W | 4 | | | |
| | | 5: 60ms | | | | | |
| | | 6: 100ms | | | | | |
| | | 7: 200ms | | | | | |
| | | 8: 400ms | | | | | |
| 3 | Weight measured times in a | Pango: K1 KE00 | R/W | 5 | | | |
| 3 | stability range for CH1 | Range: K1–K500 | K/VV | 5 | | | |
| 4 | Stability range for CU1 | Floating-point format | R/W | 10 | | | |
| 5 | Stability range for CH1 | Range: 0–100000 | | 10 | | | |
| | | Floating-point format | | | | | |
| 6 | Maximum weight for CH1 | Maximum measuring weight; when the | R/W | 100,000 | | | |
| | | | | | | | |



| CR# | Name | Description | Att. | Default |
|-------|--------------------------------|--|-------|---------|
| | | weight measured exceeds the limit, an | | |
| 7 | | alarm is triggered. The value should be | | |
| | | greater than 1. | | |
| | | 0: no filter (default) | | |
| 8 | Filter mode for CH1 | 1: maximum filter mode | R/W | 0 |
| | | 2: average filter mode | | |
| | | Range: 0–8; the bigger the number the | | |
| 9 | Maximum filter for CH1 | stronger the filter | R/W | 1 |
| | | <u> </u> | | |
| 40 | Average weight measured | Range: 1–100 | D 444 | 4.0 |
| 10 | times for CH1 | (for FW V1.04: 1–400 is available) | R/W | 10 |
| | | | | |
| 11 | Upper limit of the zero return | Floating-point format | R/W | 10 |
| 12 | for CH1 | Determines the current weight as the zero point in the upper/lower range; when the | | 10 |
| 40 | | lower range is larger than the upper range, | | |
| 13 | Lower limit of the zero return | the lower range is read as the upper range | R/W | -10 |
| 14 | for CH1 | and vice versa. | | |
| | Zero point tracking time for | Range: 5–500 | | |
| 15 | CH1 | Unit: 100 ms | | 10 |
| 16 | Zero point tracking range for | Floating-point format | | |
| 17 | CH1 | Range: 0–10000; 0: disabled | | 0 |
| 18 | Calibration points for CH1 | Range: 2–20 | R/W | 2 |
| | | Floating-point format | | |
| 19–58 | Calibrated weight for CH1 | Calibrated weight of the calibration points | R/W | - |
| | | 1–20 | | |
| | | 0: disabled | | |
| 50 | Disales estima (es OHO | 1: gross weight | R/W | 4 |
| 59 | Display options for CH2 | 2: net weight | R/VV | 1 |
| | | 3: raw data | | |
| | | 0 : 1 mV/V | | |
| 60 | Eigenvalue for CH2 | 1 : 2 mV/V | R/W | 1 |
| | | 2:4 mV/V | | |

| CR# | Name | Description | Att. | Default |
|-----|--------------------------------|---|--------|---------|
| | | 3:6 mV/V | | |
| | | 4 : 20 mV/V | | |
| | | 5 : 40 mV/V | | |
| | | 6:80 mV/V | | |
| | | 0 : 2.5 ms | | |
| | | 1 : 10 ms | | |
| | | 2 : 16 ms | | |
| | | 3 : 20 ms | | |
| 61 | Sampling cycle for CH2 | 4 : 50 ms | R/W | 4 |
| | | 5 : 60 ms | | |
| | | 6 : 100 ms | | |
| | | 7 : 200 ms | | |
| | | 8 : 400 ms | | |
| 62 | Weight measured times in a | Panasi K4 KE00 | R/W | 5 |
| 02 | stability range for CH2 | Range: K1–K500 | I K/VV | 5 |
| 63 | Stability range for CU2 | Floating-point format | R/W | 10 |
| 64 | Stability range for CH2 | Range: 0–100000 | I K/VV | 10 |
| | | Floating-point format | | |
| 65 | | Maximum measuring weight; when the | | |
| | Maximum weight for CH2 | weight measured exceeds the limit, an | R/W | 100,000 |
| 66 | | alarm is triggered. The value should be | | |
| | | greater than 1. | | |
| | | 0: no filter (default) | | |
| 67 | Filter mode for CH2 | 1: maximum filter mode | R/W | 0 |
| | | 2: average filter mode | | |
| 68 | Maximum filter for CH2 | Range: 0–8; the bigger the number the | R/W | 1 |
| | | stronger the filter | | |
| 69 | Average weight measured | Range: 1–100 | R/W | 10 |
| | times for CH2 | (for FW V1.04: 1–400 is available) | | |
| 70 | Upper limit of the zero return | Floating-point format | R/W | 10 |
| 71 | for CH2 | Determines the current weight as the zero | | - |
| 72 | Lower limit of the zero return | point in the upper/lower range; when the | R/W | -10 |
| 73 | for CH2 | lower range is larger than the upper range, | | |



| CR# | Name | Description | Att. | Default |
|--------|--|---|-------|---------|
| | | the lower range is read as the upper range | | |
| | | and vice versa. | | |
| 74 | Zero point tracking time for | Range: 5–500 | R/W | 40 |
| 74 | CH2 | Unit: 100 ms | IX/VV | 10 |
| 75 | Zero point tracking range for | Floating-point format | R/W | 0 |
| 76 | CH2 Range: 0–10000; 0: disabled | | K/VV | 0 |
| 77 | Calibration points for CH2 | Range: 2–20 | R/W | 2 |
| | | Floating-point format | | |
| 78–117 | Calibrated weight for CH2 | Calibrated weight of the calibration points | R/W | - |
| | | 1–20 | | |
| 118 | Decimal place for CH1 | Range: 0–4 | R/W | 1 |
| 119 | Decimal place for CH2 | Range: 0–4 | R/W | 1 |
| | | 0: warning | | 1 |
| | Alarm | 1: alarm | | |
| 120 | | Bit0: error in the power supply | R/W | |
| | | Bit1: error in the module hardware | | |
| | | Bit2: error in the driver board | | |
| 200 | State register | Refer to the explanation below. | R/W | - |
| 201 | Command set | Refer to the explanation below. | W | 0 |
| 210 | The maximum peak value for | Floating-point format | | - |
| 211 | CH1 | Maximum peak value for CH1 | R | - |
| 212 | The maximum peak value for | Floating-point format | _ | - |
| 213 | CH2 | Maximum peak value for CH2 | R | - |
| 214 | The minimum peak value for | Floating-point format | _ | - |
| 215 | CH1 | Minimum peak value for CH1 | R | - |
| 216 | The minimum peak value for Floating-point format | | | - |
| 217 | CH2 Minimum peak value for CH2 | | K | - |
| 222 | The time to record for CH1 | record for CH1 Unit: 1 ms | | 50 |
| | | Range: 1–100 (1 ms–1 s) | R/W | |
| 223 | The time to record for CH2 | Time to record the digital value for the | IT/VV | 50 |
| | | channels | | |
| 240 | The number of records for CH1 | Range: 0–500; display the current records | R | - |

| CR# | Name | Description | Att. | Default |
|-------------|-------------------------------------|---|------|---------|
| 241 | The number of records for CH2 | | | - |
| 400~ 439 | Calibration of the raw data for CH1 | Here displays the 20 piece of raw data in DWORD format for channel 1 and 2; the values will be loaded automatically during calibration. You can copy the values to other load cell modules of the same model number and with similar parameter settings | R/W | |
| 440~ 479 | Calibration of the raw data for CH2 | for a quick commioning without calibration. Note: By copying the calibration of the raw data to other modules, some errors or deviation may occur in in the weighted values for different applications. | R/W | - |
| 604 | Tare weight measured by CH1 | Display the tare weight measured by CH1 | R/W | - |
| 605 | Tale weight measured by CHT | Display the tale weight measured by CITI | | - |
| 606 | Tare weight measured by CH2 | Display the tare weight measured by CH2 | | - |
| 607 | Tare weight measured by Oriz | | | - |
| 700- | Theoretical calibration for CH1 | Floating-point format | R/W | 0 |
| 739 | THOUSENED CONTROL OF THE | Output voltage unit: mV | | |
| 740– | Theoretical calibration for CH2 | Floating-point format | R/W | 0 |
| 779 | | Output voltage unit: mV | | |
| 4000 | Records for CH1 | Floating-point format | R | _ |
| -4999 | | 500 records for CH1 | | |
| 5000 | Records for CH2 | Floating-point format | R | _ |
| -5999 | | 500 records for CH2 | | |

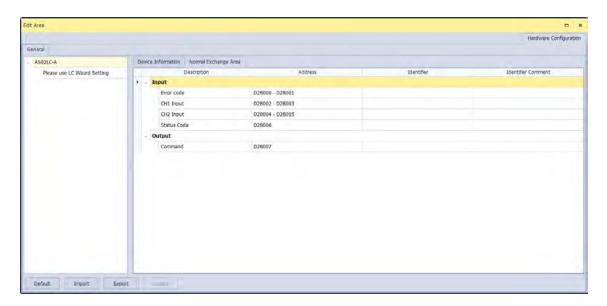


8

Normal Exchange Area

Explanation

You can view the error code, the channel value, and the state code, as well as the data registers that correspond to their commands under the Normal Exchange Area tab of the Device Setting dialog box in the HWCONFIG utility in ISPSoft.



CR#200: Codes for the state register

Explanation

| Bit | Code | Definition | Bit | Code | Definition |
|-----|---------|---|-----|---------|---|
| b0 | 16#0001 | Error exists in the power supply. | b1 | 16#0002 | Error exists in the module hardware. |
| b2 | 16#0004 | Error exists in the driver board. | b3 | 16#0008 | Calibration disabled |
| b4 | 16#0010 | Reserved | b5 | 16#0020 | Reserved |
| b6 | 16#0040 | The weight measured by CH1 exceeds the maximum weight that can be measured, or the voltage of SEN is incorrect. | b7 | 16#0080 | The weight measured by CH2 exceeds the maximum weight that can be measured, or the voltage of SEN is incorrect. |
| b8 | 16#0100 | The weight measured by CH1 exceeds the maximum weight that can be measured. | b9 | 16#0200 | The weight measured by CH2 exceeds the maximum weight that can be measured. |
| b10 | 16#0400 | CH1 has been adjusted incorrectly. | b11 | 16#0800 | CH2 has been adjusted incorrectly. |
| b12 | 16#1000 | CH1 is not measuring any weight. | b13 | 16#2000 | CH2 is not measuring any weight. |
| b14 | 16#4000 | The weight measured by CH1 is in | b15 | 16#8000 | The weight measured by CH2 is in |

| Bit | Code | Definition | Bit | Code | Definition |
|-----|--------------------------------|------------|-----|------|--------------------------------|
| | the stability range specified. | | | | the stability range specified. |

Note: The state is determined by the corresponding bit and it is possible to have more than 2 states at the same time.

CR#201: Command set

Explanation

| Input value | Description | Input value | Description |
|----------------|---|-------------|--|
| 0 | No action | 16#0101 | Start a new recording of the peak value for CH1. |
| 1–20 | Commands for calibrating the calibration points 1–20 on CH1 | 16#0102 | Start a new recording of the peak value for CH2. |
| 21–40 | Commands for calibrating the calibration points 1–20 on CH2 | 16#010F | Start a new recording of the peak value for CH1 - CH2. |
| 98 | Activate the weight calibration. | 16#0201 | Start a new recording for CH1. |
| 99 | Deactivate the weight calibration. | 16#0202 | Start a new recording for CH2. |
| 100 | Subtract the weight on CH1. Use the subtracted weight as the tare weight and store it in CR604 and CR605 (DWORD). | 16#020F | Start a new recording for CH1 - CH2. |
| 101 | Restore the tare weight stored in CR604 and CR605 to CH1. | 16#0211 | Stop recording for CH1. |
| 102 | Clear the weight measured by CH1 to zero. You might need to execute this command after each power-off. | 16#0212 | Stop recording for CH2. |
| 103 | Subtract the weight on CH2. Use the subtracted weight as the tare weight and store it in CR606 and CR607 (DWORD). | 16#021F | Stop recording for CH1 - CH2. |
| 104 | Restore the tare weight stored in CR606 and CR607 to CH2. | 16#0301 | Start a theoretical calibration for CH1. |
| 105 | Clear the weight measured by CH2 to zero. You might need to execute this | 16#0302 | Start a theoretical calibration for CH2. |



| Input value | Description | Input value | Description |
|----------------|---|-------------|---|
| | command after each power-off. | | |
| 16#030F | Start a theoretical calibration for CH1 - CH2. | 16#0501 | Restore default settings and clear settings in Flash. |
| 16#0502 | Restore default settings and settings in Flash stay intact. | 16#6000 | Read the current settings from Flash |
| 16#6001 | Write the current settings into Flash | | |

8.2.5 Functions

| Item | Function | Description |
|------|-------------------------------|---|
| 1 | Measuring net weight | Various measuring modes to choose from |
| 2 | Stability check | When an object is put on a load cell, you can check whether the present weight of the object is in a specified stability range. |
| 3 | Determining zero point | If an object is removed from the load cell, no weight is measured. |
| 4 | Filter out weights | Filter out the maximum or minimum weight measured or use an average weight for a more accurate value. |
| 5 | Multi-point adjustment | There are as many as 20 points for adjustment |
| 6 | Theoretical calibration | Calibration based on the output value of the sensor instead of the real weight calibration |
| 7 | Zero point tracking | Zero point tracking |
| 8 | Limit detections for channels | Save the maximum and minimum values for channels. |
| 9 | Records for channels | Save the analog curves for channels. |

1. Measuring net weight

You can choose to measure either the net weight or the gross weight of an object. Net weight is the actual weight of a product without its package. The weight of a package is the tare weight. Gross weight is the total weight: net weight plus tare weight.

- Tare weight: the weight of a package
- Net weight: the weight of a product, that is, the actual weight of a product without its package
- Gross weight: the total weight, that is, the net weight of a product plus the tare weight of its package
- Gross weight=Net weight+Tare weight

Example: a product weighs 10 kg, and the carton in which the product is packed weighs 0.2 kg. The gross weight is 10.2 kg.

Net weight = 10 kg

Tare weight = 0.2 kg

Gross weight = 10.2 kg

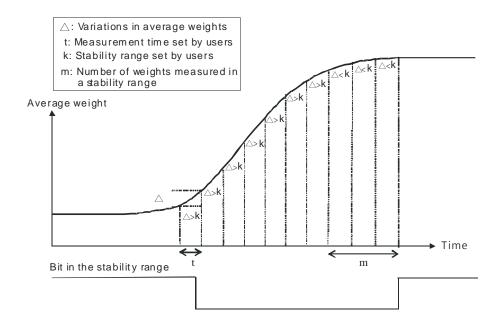


2. Checking stability

When an object is placed on a load cell, you can check whether the present weight of the object is in a specified stability range.

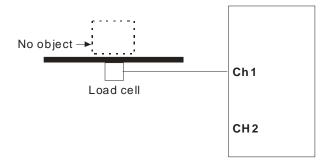
- If the weight measured is in the specified stability range, the corresponding bit is set to 1.
- If the weight measured exceeds the specified stability range, the corresponding bit is set to 0 until the number of objects weighed in the stability range reaches the setting.

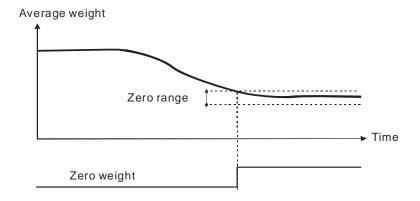
Example: the measurement time set is 10 ms, the number of weights measured in a stability range is 10, and the stability range is 1000 g. If a variation exceeds 1000 g, the corresponding bit is set to 0. If the variations within 100 ms (10×10 ms) are within 1000 g, the corresponding bit is set to 1. You should determine whether the present weight measured is in the stability range before you perform control actions.



3. Determining zero point

If an object is removed from the load cell, the corresponding bit is set to 1, and you can perform the next control action. If a weight measured is in the specified zero range, the corresponding bit is also set to 1.





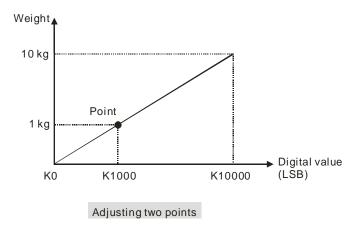
4. Filtering out weights

There are two ways to filter out weights.

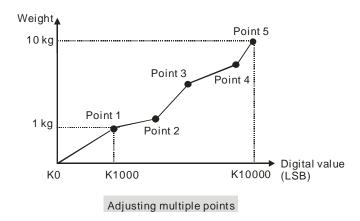
- Filtering out the maximum/minimum weight measured: If there is a maximum weight or a minimum weight, you can filter out the maximum weight or the minimum weight. The larger the value, the more weights are filtered out. Range: K0–K8
- Averaging weights: The values recorded are averaged so that a steady value is obtained. There may be
 peak values due to unavoidable external factors, and the average value obtained may change
 accordingly. A maximum of 100 values can be averaged.

5. Making multi-point adjustments

Make adjustments to get the weight measured by a cell to correspond to the digital value displayed by the load cell module. Generally, two points are adjusted. After a system is set up, put no load on the scale. The weight measured is 0 grams when there is no load. Then place an object of a given weight on the scale, and set a digital value corresponding to the weight. At that point, two points have been adjusted. For example, if you have a load cell sensor which can measure a maximum weight of 10 kg, and if 1 kg corresponds to K1000, the curve is like the one shown below.





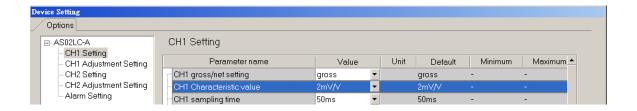


6. Determining theoretical calibration

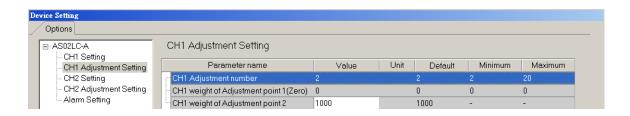
Theoretical calibration is determined according to the sensor specification in order to input the voltage values corresponding to various weights. The registers for storing the voltage values are CR#700–739 for CH1 and CR#740–779 for CH2. After entering the voltage values into the registers, you can use the command set 16#301–302 to execute the calibration.

Example: the sensor specification is 10 kg and its eigenvalue is 2 mV/V. When the sensor is loaded with a 10 kg weight, the output is 10 mV. The theoretical calibration steps are:

Step 1: set the eigenvalue.



Step 2: set the 2-point adjustment; when the sensor is loaded with a 1 kg weight, set the value to 1000.



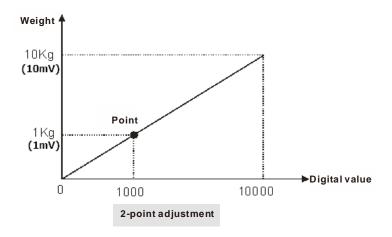
Step 3: set the voltage calibration for the zero point to 0 (0 mV) in the CR#700/701 registers, and to 1.0 (1 mV) in the CR702/703 registers.

Step 4: enable the calibration function and enter 98 into the command set CR#201.

Step 5: enter 16#0301 into the command set CR#201 to execute a theoretical calibration for channels 1.

Step 6: do not put any load on the sensor and enter 16#102 into the command set CR#201 to reset the value to 0 for CH1.

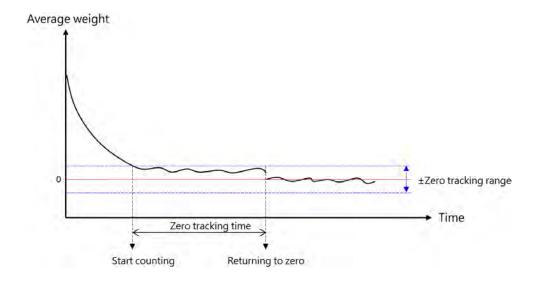
Step 7: disable the calibration function to prevent inappropriate changes. To complete the theoretical calibration, enter 99 into the command set CR#201. Put a 1 kg weight on the sensor and the load cell should show 1000.



Step 8: write 16#6001 in CR#201 to disable the calibration function to write the current settings into Flash and have the settings in the latched area.

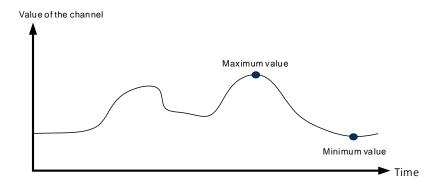
7. Zero point tracking

Zero point tracking refers to resetting the current value to 0. You can reset the value to 0 within a certain duration or at a certain weight. This is especially useful when the sensor is no longer as accurate as it was before.



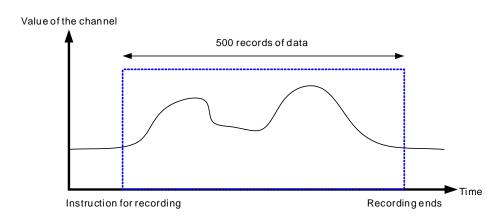


Save the maximum and minimum values for channels so you can determine the peak to peak values.



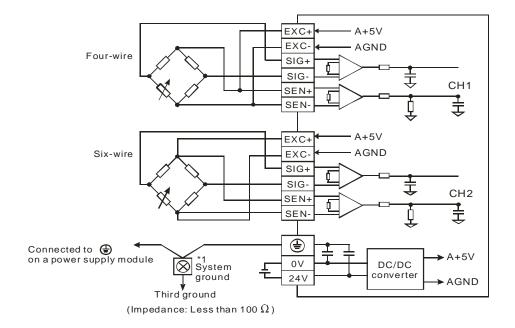
9. Recording channels

Record the input values of the cyclic sampling for each channel. The system saves up to 500 data points and the recording time is 10 ms.

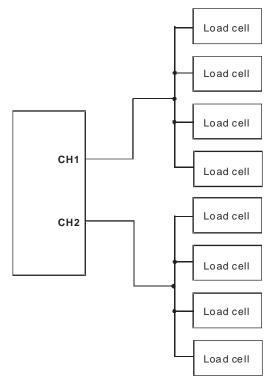


8.2.6 Wiring

External wiring







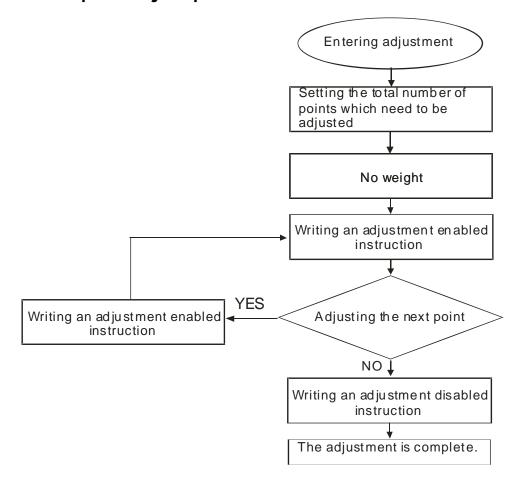
Note 1: Please connect on the power supply module and on the load cell module to a system ground, and then ground the system ground or connect the system ground to a distribution box.

Note 2: If multiple load cells are connected in parallel, the total impedance should be greater than 40 Ω .

8.3 Making Adjustments

Make adjustments to get the weight measured by a cell to correspond to the digital value displayed by the load cell module. You can make adjustments by following the commands below or by setting up the theoretical calibration (refer to section 8.2.5 for more details).

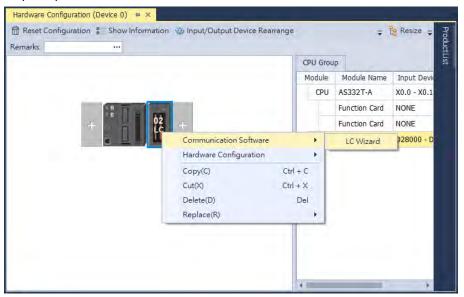
8.3.1 Steps to adjust points



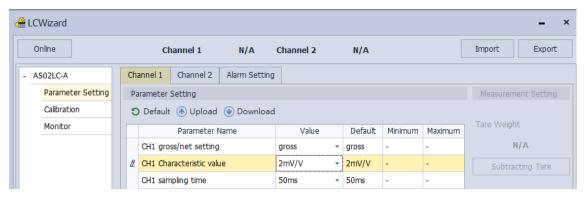


8.3.2 Parameter settings in LC Wizard

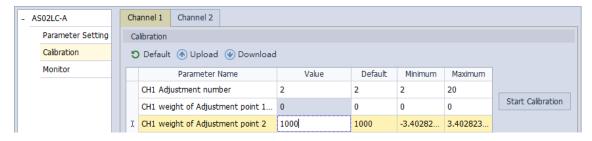
Step 1: Open LC Wizard from HWCONFIG.



Step 2: Set the eigenvalue.

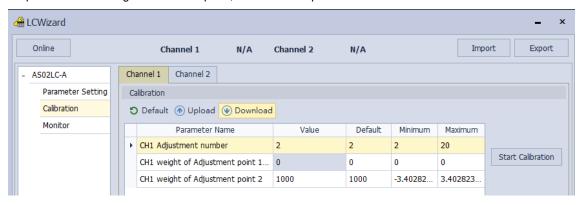


Step 3: Set the number of adjustments and their corresponding values. The example below shows a 2-point adjustment in which point 1 = 0 and point 2 = 1000, corresponding to 1 kg.

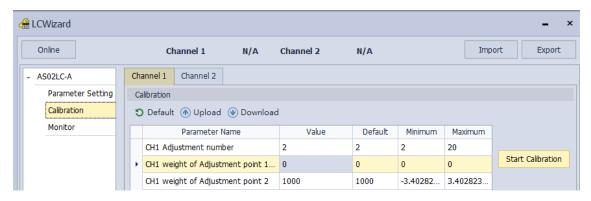


_

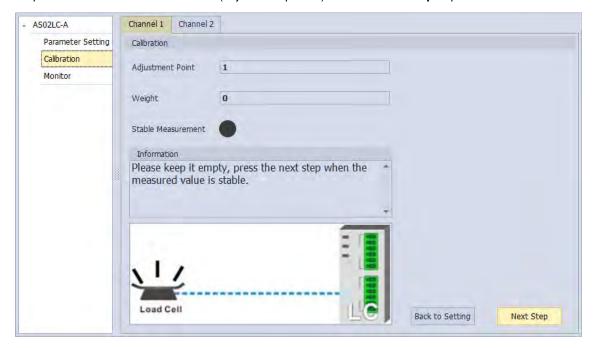
Step 4: After the configuration is complete, download the parameters to the module.



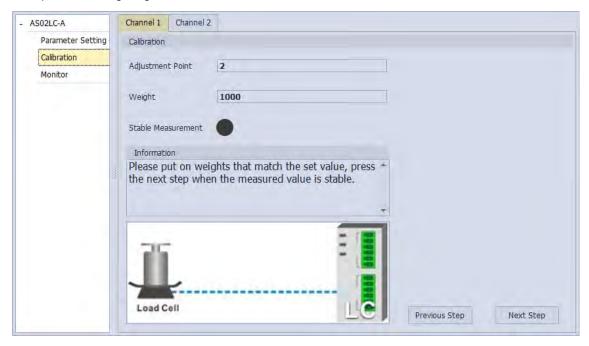
Step 5: Start calibration.



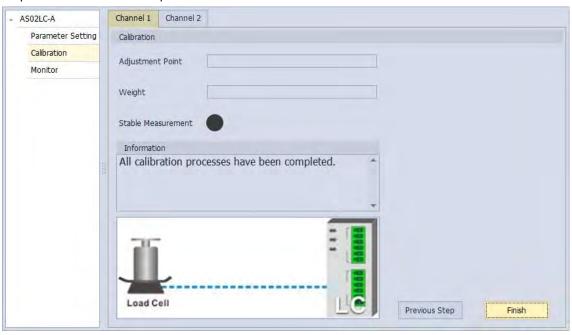
Step 6: Leave no load on the load cell (adjustment point 1) and click Next Step to proceed.



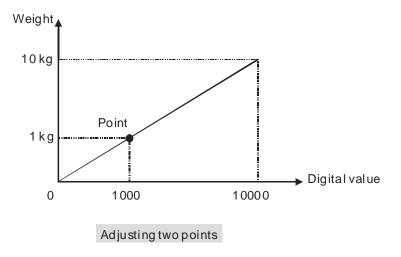




Step 8: The calibration is complete.

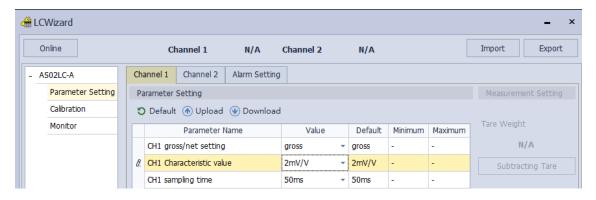


A characteristic curve is shown below.

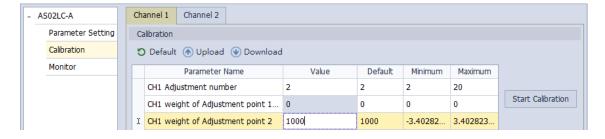


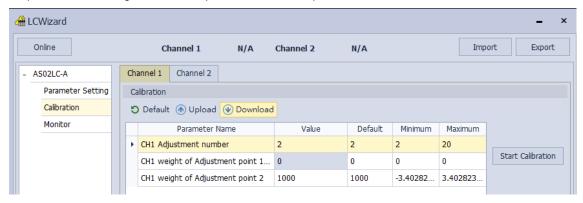
8.3.3 Adjustment Settings / Calibrational Commands

Step 1: Set the eigenvalue in LCWizard.



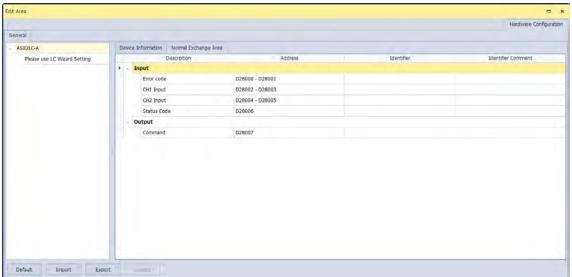
Step 2: Set the number of adjustments and their corresponding values. The example below shows a 2-point adjustment where point 1 = 0 and point 2 = 1000, corresponding to 1 kg.



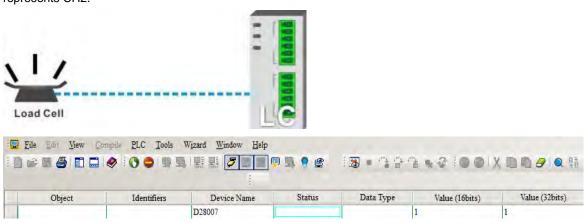


Step 4: Double-click on the module to see the settings and verify that the corresponding address the command is D28007 in the Normal Exchange Area.

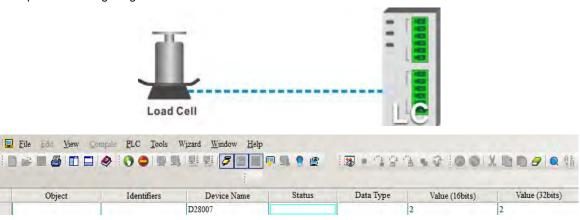




Step 6: Leave no load on the load cell (adjustment point 1) and enter 1 into D28007. 1 represents CH1 and 2 represents CH2.

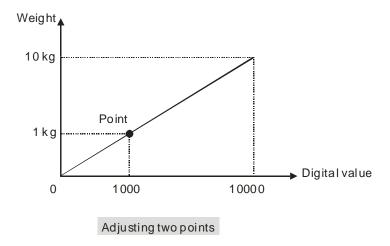


Step 7: Put a load on the load cell (adjustment point 2). For multi-point adjustment, repeat this step. This example uses a 1 kg weight.



Step 8: to complete the adjustment, enter the command for deactivating the weight calibration 99 into D28007.

A characteristic curve is shown below.





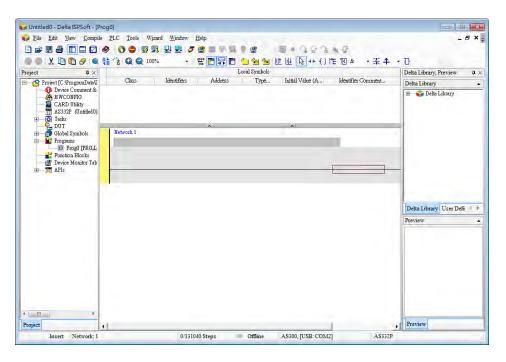
8.3.4 LED Indicators

| Number | Name | Description |
|--------|-------------------|--|
| 1 | | Operating status of the module |
| | RUN LED Indicator | ON: the module is running. |
| | | OFF: the module is not running. |
| 2 | | Error status of the module |
| | ERROR LED | ON: a serious error exists in the module. |
| | Indicator | OFF: the module is operating normally. |
| | | Blink: a minor error exists in the module. |
| 3 | Analog-to-Digital | Conversion status |
| | Conversion | Blinking: conversion is in process. |
| | Indicator | OFF: conversion has stopped. |

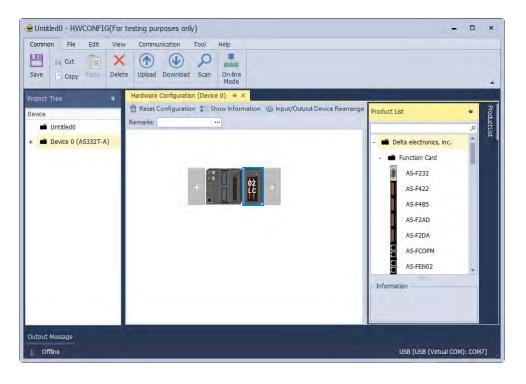
8.4 HWCONFIG in ISPSoft

8.4.1 Initial Setting

(1) Start ISPSoft and double-click HWCONFIG.

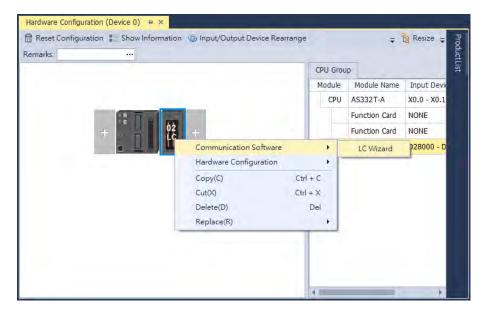


(2) Select a module and drag it to the working area.

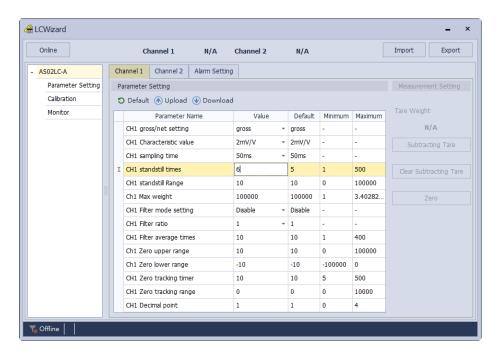




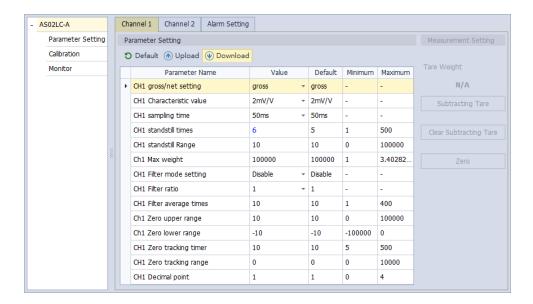
(3) Right-click on the module and then click LC Wizard to go to the settting page.



(4) Set the setting values.



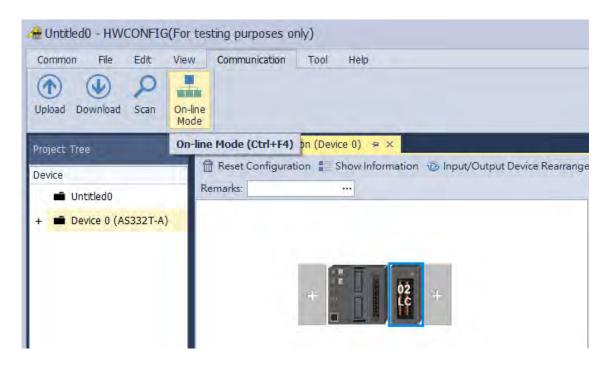
(5) Click **Download** on the toolbar to download the parameters in HWCONFIG. Note that you cannot download the parameters while the CPU module is running.)





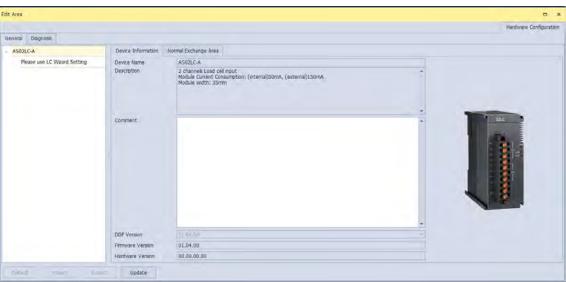
8.4.2 Checking the Version of a Module

(1) Click On-line Mode.



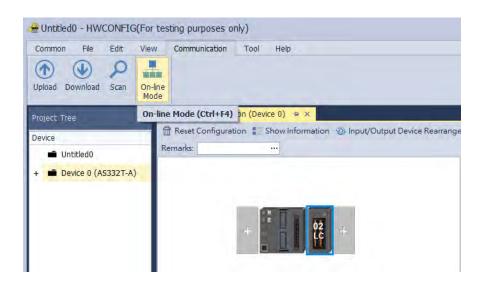
(2) Double-click the module to open the Device Setting page. The versions of both the firmware and the hardware are displayed.





8.4.3 Online Mode

(1) In the On-line Mode.



(2) Right-click the module and click **Module Status**.



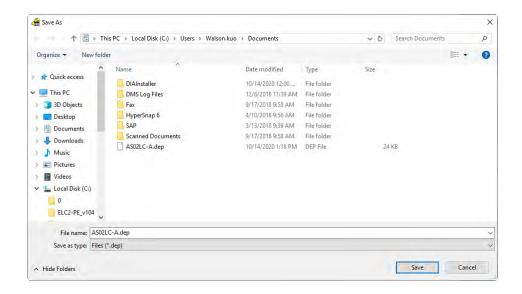
(3) View the module state.



8.4.4 Importing/Exporting a Parameter File

(1) Click **Export** in the Device Settings dialog box to save the current parameters as a dep file (.dep).

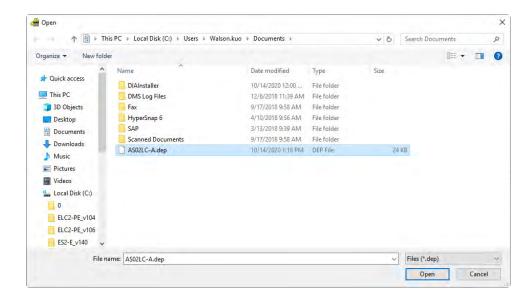






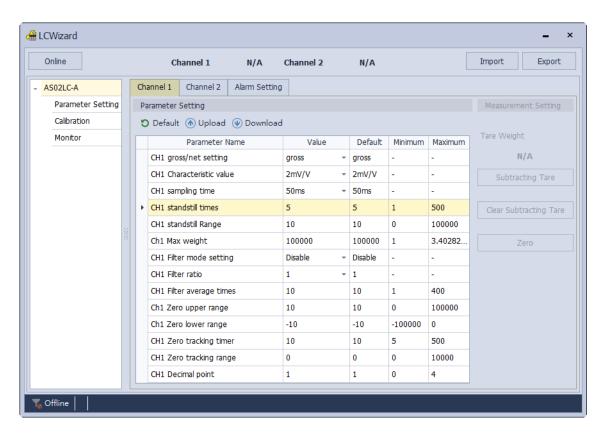
(2) Click Import in the Device Settings dialog box and select a dep file to import saved parameters.



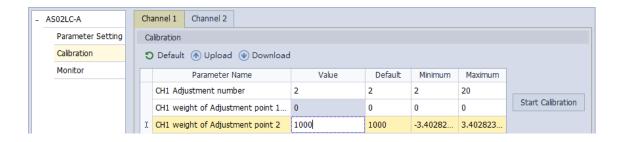


8.4.5 Parameters

(1) Settings for CH1

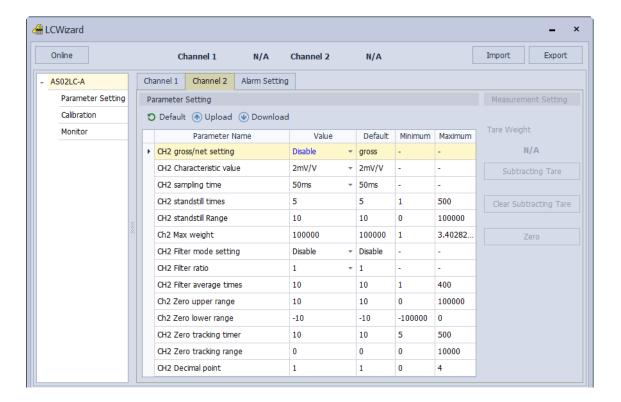


(2) Adjustment for CH1

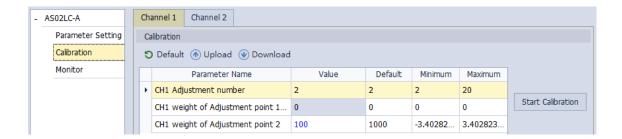




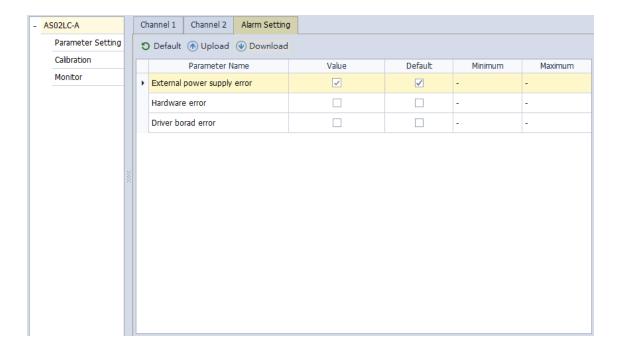
(3) Settings for CH2



(4) Adjustment for CH2



(5) Alarm settings



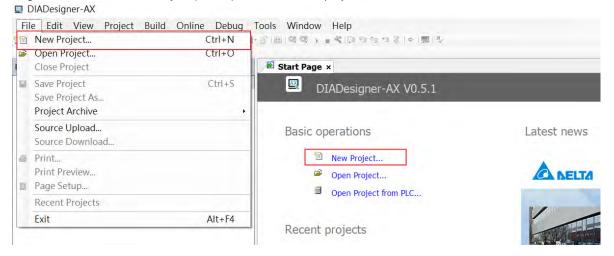


8.5 Basic Operation on DIADesigner-AX

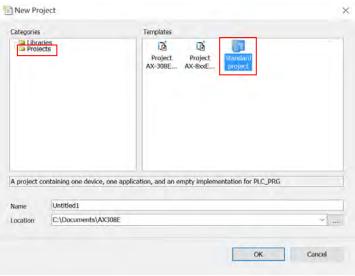
DIADesigner-AX is an open platform for PLC development system and industrial automation. The adaptable DIADesigner-AX provides an easy way to create professional engineering of IEC 61131-3 automation projects. Based on the IEC 61131-3 data structure and the high-level language programming, DIADesigner-AX is strong in functionality, easy to develop, reliable, extendable and open for development. Integrated with components such as visualization and Safety solution, DIADesigner-AX offers a variety of user-friendly engineering functions for your professional applications in controller development system sectors including PLC and motion control. In DIADesigner-AX, you can customize the user interface by arranging the window layout and the appearance of menus, toolbars and commands according to your requirements.

8.5.1 Creating a New Project

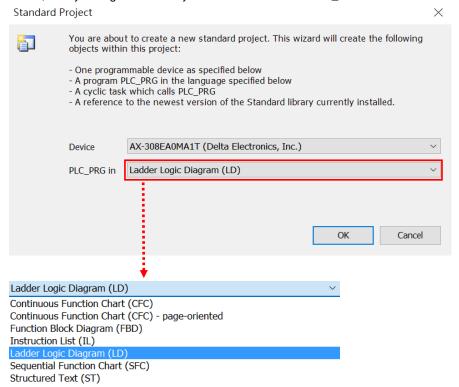
Double-click the DIADesigner-AX icon to open DIADesigner-AX. Click **New Project** on the Start Page or select *File > New Project (Ctrl+N)* to create a new project.



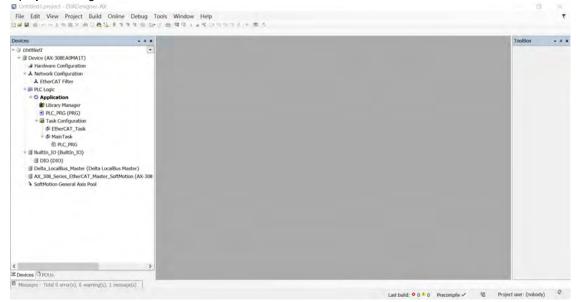
Next you will see a window with two sections, Categories and Templates. Click **Projects** in the Categories section and click **Standard project** in the Templates section. After that create a Name and specify a location for the project and then click **OK**.



And a Standard Project dialog appears. You can select the device and the programming language from the drop-down list. Click **OK**, the system generates a cyclic task with a default PLC_PRG.



After a new project is successfully created, you can see a project management area in the left side of the window. All the options are listed in nodes. *Click View -> Devices (Alt+0)* on the tool bar, if nothing appears in the project management area.

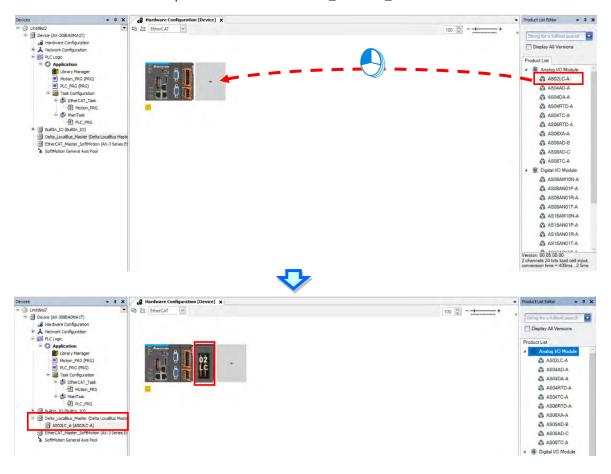




8.5.2 Adding a Module

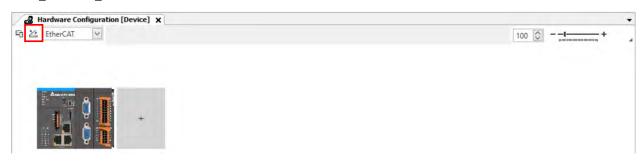
Method 1

With AX-3 Series PLC backplaneless design, the extension module can install on the right-side of AX-3 Series PLC directly. Double-click or drag and drop the extension module that you'd like to add from the Product List. Newly added extension modules will appear on the right-side of the AX-3 Series PLC. And the device names will also show up on the left-side under Delta_LocalBus_Master.

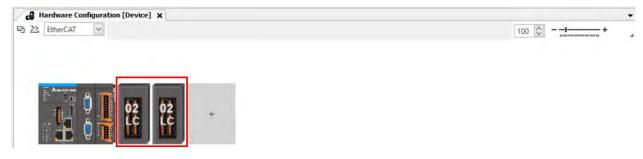


Method 2

If the AX-3 Series PLC and its connected extension module are powered on and the gateway is correctly set, you can use the icon to scan and add the modules in. Newly added extension modules will apper on the right-side of the AX-3 Series PLC. And the device names will also show up on the left-side under Delta_LocalBus_Master.









8.5.3 Parameters - Configuring the Module

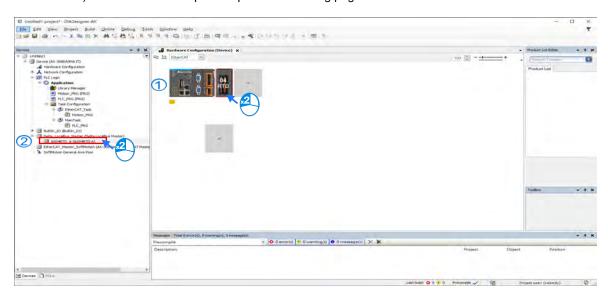
Two methods to open the parameter setting page.

Method 1

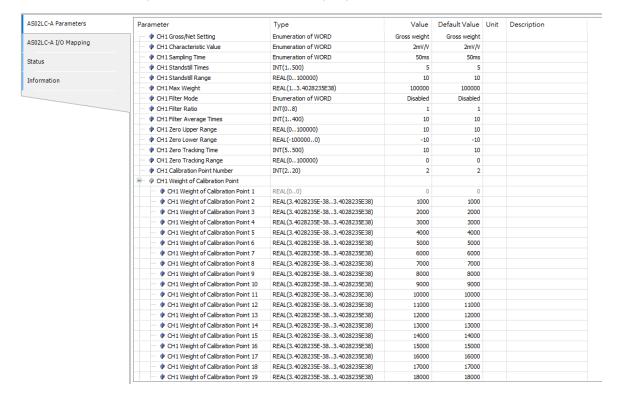
Find and double-click **Hardwre Configuration** in the tree view to open the Hardware Configuration. Double-click the image of the module you'd like to configure to open the parameter setting page.

Method 2

Find and double-click the module you'd like to configure under Delta_LocalBus_Master (Delta LocalBus Master) in the tree view to open the parameter setting page.



Check and set the configurations on the parameter setting page.



8.5.3.1 Channel 1 and Channel 2 Settings

You can set up Gross/Net setting, Characteristic Value, Sampling Time, Standstill Times, Standstill Range, Max Weight, Filter Mode, Filter Ratio, Filter Average Times, Zero Upper Range, Zero Lower Range, Zero Tracking Time and Zero Tracking Range for channel 1 and channel 2.

Channel 1:

| Parameter | Туре | Value | Default V | Unit | Description |
|--------------------------------|---------------------|--------------|--------------|------|-------------|
| CH1 Gross/Net Setting | Enumeration of WORD | Gross weight | Gross weight | | |
| ··· 👂 CH1 Characteristic Value | Enumeration of WORD | 2mV/V | 2mV/V | | |
| CH1 Sampling Time | Enumeration of WORD | 50ms | 50ms | | |
| ··· 👂 CH1 Standstill Times | INT(1500) | 5 | 5 | | |
| ··· 👂 CH1 Standstill Range | REAL(0100000) | 10 | 10 | | |
| ··· | REAL(13.4028235E38) | 100000 | 100000 | | |
| P CH1 Filter Mode | Enumeration of WORD | Disabled | Disabled | | |
| ··· 👂 CH1 Filter Ratio | INT(08) | 1 | 1 | | |
| CH1 Filter Average Times | INT(1400) | 10 | 10 | | |
| ··· | REAL(0100000) | 10 | 10 | | |
| P CH1 Zero Lower Range | REAL(-1000000) | -10 | -10 | | |
| ··· 👂 CH1 Zero Tracking Time | INT(5500) | 10 | 10 | | |
| ··· | REAL(0100000) | 0 | 0 | | |

Channel 2:

| Parameter | Туре | Value | Default V | Unit | Description |
|--------------------------------|---------------------|--------------|--------------|------|-------------|
| ··· | Enumeration of WORD | Gross weight | Gross weight | | |
| CH2 Characteristic Value | Enumeration of WORD | 2mV/V | 2mV/V | | |
| CH2 Sampling Time | Enumeration of WORD | 50ms | 50ms | | |
| P CH2 Standstill Times | INT(1500) | 5 | 5 | | |
| ··· | REAL(0100000) | 10 | 10 | | |
| ··· 👂 CH2 Max Weight | REAL(13.4028235E38) | 100000 | 100000 | | |
| P CH2 Filter Mode | Enumeration of WORD | Disabled | Disabled | | |
| ··· 👂 CH2 Filter Ratio | INT(08) | 1 | 1 | | |
| ··· 👂 CH2 Filter Average Times | INT(1400) | 10 | 10 | | |
| ··· 👂 CH2 Zero Upper Range | REAL(0100000) | 10 | 10 | | |
| P CH2 Zero Lower Range | REAL(-1000000) | -10 | -10 | | |
| ··· 👂 CH2 Zero Tracking Time | INT(5500) | 10 | 10 | | |
| ··· | REAL(0100000) | 0 | 0 | | |
| | | | | | |



8.5.3.2 Channel Calibration Settings

You can set up Weight of Calibration Points for channel 1 and channel 2.

Channel 1:

| Parameter | Туре | Value | Default V | Unit | Description |
|---|---------------------------------|-------|-----------|------|-------------|
| CH1 Calibration Point Number | INT(220) | 2 | 2 | | |
| CH1 Weight of Calibration Point | | | | | |
| CH1 Weight of Calibration Point 1 | REAL(00) | 0 | 0 | | |
| → P CH1 Weight of Calibration Point 2 | REAL(3.4028235E-383.4028235E38) | 1000 | 1000 | | |
| ··· ♦ CH1 Weight of Calibration Point 3 | REAL(3.4028235E-383.4028235E38) | 2000 | 2000 | | |
| OH1 Weight of Calibration Point 4 | REAL(3.4028235E-383.4028235E38) | 3000 | 3000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 4000 | 4000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 5000 | 5000 | | |
| CH1 Weight of Calibration Point 7 | REAL(3.4028235E-383.4028235E38) | 6000 | 6000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 7000 | 7000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 8000 | 8000 | | |
| → P CH1 Weight of Calibration Point 10 | REAL(3.4028235E-383.4028235E38) | 9000 | 9000 | | |
| Pint 11 Pint Point 11 | REAL(3.4028235E-383.4028235E38) | 10000 | 10000 | | |
| CH1 Weight of Calibration Point 12 | REAL(3.4028235E-383.4028235E38) | 11000 | 11000 | | |
| OH1 Weight of Calibration Point 13 | REAL(3.4028235E-383.4028235E38) | 12000 | 12000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 13000 | 13000 | | |
| → P CH1 Weight of Calibration Point 15 | REAL(3.4028235E-383.4028235E38) | 14000 | 14000 | | |
| CH1 Weight of Calibration Point 16 | REAL(3.4028235E-383.4028235E38) | 15000 | 15000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 16000 | 16000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 17000 | 17000 | | |
| CH1 Weight of Calibration Point 19 | REAL(3.4028235E-383.4028235E38) | 18000 | 18000 | | |
| CH1 Weight of Calibration Point 20 | REAL(3.4028235E-383.4028235E38) | 19000 | 19000 | | |

Channel 2:

| Parameter | Туре | Value | Default V | Unit | Description |
|---|---------------------------------|-------|-----------|------|-------------|
| CH2 Calibration Point Number | INT(220) | 2 | 2 | | |
| ··· | | | | | |
| ··· 👂 CH2 Weight of Calibration Point 1 | REAL(00) | 0 | 0 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 1000 | 1000 | | |
| ··· 🖗 CH2 Weight of Calibration Point 3 | REAL(3.4028235E-383.4028235E38) | 2000 | 2000 | | |
| ··· 💗 CH2 Weight of Calibration Point 4 | REAL(3.4028235E-383.4028235E38) | 3000 | 3000 | | |
| CH2 Weight of Calibration Point 5 | REAL(3.4028235E-383.4028235E38) | 4000 | 4000 | | |
| CH2 Weight of Calibration Point 6 | REAL(3.4028235E-383.4028235E38) | 5000 | 5000 | | |
| CH2 Weight of Calibration Point 7 | REAL(3.4028235E-383.4028235E38) | 6000 | 6000 | | |
| → P CH2 Weight of Calibration Point 8 | REAL(3.4028235E-383.4028235E38) | 7000 | 7000 | | |
| CH2 Weight of Calibration Point 9 | REAL(3.4028235E-383.4028235E38) | 8000 | 8000 | | |
| CH2 Weight of Calibration Point 10 | REAL(3.4028235E-383.4028235E38) | 9000 | 9000 | | |
| | REAL(3.4028235E-383.4028235E38) | 10000 | 10000 | | |
| CH2 Weight of Calibration Point 12 | REAL(3.4028235E-383.4028235E38) | 11000 | 11000 | | |
| → P CH2 Weight of Calibration Point 13 | REAL(3.4028235E-383.4028235E38) | 12000 | 12000 | | |
| → P CH2 Weight of Calibration Point 14 | REAL(3.4028235E-383.4028235E38) | 13000 | 13000 | | |
| CH2 Weight of Calibration Point 15 | REAL(3.4028235E-383.4028235E38) | 14000 | 14000 | | |
| CH2 Weight of Calibration Point 16 | REAL(3.4028235E-383.4028235E38) | 15000 | 15000 | | |
| CH2 Weight of Calibration Point 17 | REAL(3.4028235E-383.4028235E38) | 16000 | 16000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 17000 | 17000 | | |
| ··· | REAL(3.4028235E-383.4028235E38) | 18000 | 18000 | | |
| CH2 Weight of Calibration Point 20 | REAL(3.4028235E-383.4028235E38) | 19000 | 19000 | | |

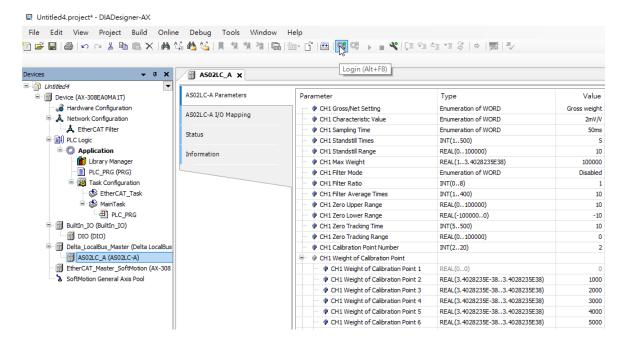
8.5.3.3 Alarm Settings

You can set up alarm settings for External Power Supply Error, Hardware Error and Driver Board Error.



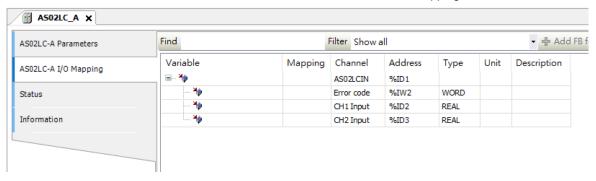
8.5.3.4 Online Mode

After the configuration is complete, click the **Login** button on the toolbar to go to the Online Mode and also download the parameter to the PLC module. You can read the parameter status and the Module Revsion under the Parameter Tab when the system is in the Online Mode, but editing is NOT accessible in the Online Mode.



8.5.4 I/O Mapping

You can read/write values, status, error codes of each channel under the I/O Mapping Tab.





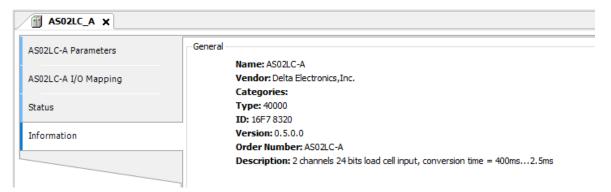
8.5.5 Status

You can monitor the status and error message of the module under the Status Tab.



8.5.6 Information

You can check the module information, including Name, Vendoro, Categories, Type, ID, Version, Order Number and Description under the Information Tab.



8.6 Troubleshooting

8.6.1 Error Codes

| Error Code | Description | A↔ D LED indicator | ERROR LED indicator | |
|---------------|---|--------------------|---------------------|--|
| 16#1605 | Hardware failure | OFF | ON | |
| 16#1607 | The external voltage is abnormal. | OFF | ON | |
| 16#1801 | The external voltage is abnormal. | OFF | Blinking | |
| 16#1802 | Hardware failure | OFF | Blinking | |
| 16#1807 | 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. | | Blinking | |
| 16#1809 | The signal received by channel 1 exceeds the weight limit. | | | |
| 16#180A | The factory calibration in channel 1 is incorrect. | Run: blinking | | |
| 16#180B | The signal received by channel 2 exceeds the range of analog inputs or the SEN voltage is abnormal. | Stop: OFF | | |
| 16#180C | The signal received by channel 2 exceeds the weight limit. | | | |
| 16#180D | The factory calibration in channel 2 is incorrect. | | | |
| | | | Blinking once | |
| | | | or twice and | |
| _ | Upon power-on, the module does NOT receive any detecting | OFF | after 2 | |
| | request from the PLC CPU. | | seconds, it | |
| | | | blinks | |
| | | | repeatedly | |



8

8.6.2 Troubleshooting Procedure

| Description | Procedure |
|---|---|
| The external voltage is abnormal. | Check the power supply. |
| Hardware failure | If the problem persists, contact the local authorized distributors. |
| Diver board failure | Check if the terminals is affected by any interference or is short-circuit (check EXC+ and EXC-). If the problem persists, contact the local authorized distributors. |
| 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. |
| The signal received by channel 1 exceeds the weight limit. | Check the value input to channel 1 and the maximum weight setting. |
| The factory calibration in channel 1 is incorrect. | Check the weight calibration in channel 1. |
| 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. |
| The signal received by channel 2 exceeds the weight limit. | Check the value input to channel 2 and the maximum weight setting. |
| The factory calibration in channel 2 is incorrect. | Check the weight calibration in channel 1. |
| Upon power-on, the module does NOT receive any detecting request from the PLC CPU. | Check the connection between the CPU and the module or reconnect them again. |

Chapter 9 Serial Communication Module AS00SCM

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9.1 Introduction

Thank you for using the AS00SCM-A, a serial communication module. To ensure that your AS00SCM-A is installed and operated correctly, read this manual carefully before using the module.

The AS00SCM-A is a serial communication module, supporting AS series communication extension modules (COM) as well as the remote modules (RTU) and the followings:

- COM mode (AS series communication extension modules installed on the right side of the AS CPU and no external power supply)
 - Serial communication cards: AS-F232, AS-F422, and AS-F485 support Modbus and UD Link (user-defined format).
 - AS00SCM-A with serial communication card installed can be used only in COM mode.
 - AS00SCM-A with CANopen communication card (AS-FCOPM) installed can be used in COM mode.
- RTU mode (remote modules, independent power supply)
 - CANopen communication card (AS-FCOPM) supports AS remote mode and CANopen DS301 (Slave).
 - AS00SCM-A with CANopen communication card (AS-FCOPM) installed can be used in RTU mode (without connecting to AS CPU).
 - Ethernet communication card (AS-FEN02) supports EtherNet/IP Adapter.
 - AS00SCM-A with Ethernet communication card (AS-FEN02) installed ca be used only in RTU mode.
 - PROFINET communication card (AS-FPFN02) supports PROFINET devices.
 - AS00SCM-A with PROFINET communication card (AS-FPFN02) installed ca be used only in RTU mode. Refer to Chapter 10 of AS Module Manual for more information.

| AS00SCM | COM | Mode | | RTU Mo | de | |
|--------------------------------------|-------------------------------|-----------------------------|---|-----------------------------|---------------------------------|-------------------------------------|
| Version and its supporting functions | MODBUS UD Link | CANopen DS301 (Slave) | AS Remote Communication, Delta Special Driver & AS Remote Mode | CANopen DS301 (Slave) | EtherNet/IP Adapter | PROFINET Device |
| Card | AS-F232 AS-F485 AS-F422 | AS-FCOPM | AS-FCOPN | Л | AF-FEN02 (V1.02 or later) | AS- FPFN02 (V2.00 or later |
| Card Slot | Card 1 / Card 2 | Card 2 | Card 2 | | Card 1 and Card 2 | |
| V1.00 | V | - | - | - | - | - |
| V2.00 | V | V | V | - | - | - |
| V2.02 | V | V | V | V | V | - |
| V2.06 | V | V | V | V | V | V |

When AS00SCM-A is used as a remote module, its right side supports the followings AS Series IO modules.

| When AS00SCM-A acts as a CANopen remote module, the followings are supported. | | |
|---|--|--|
| | AS08AM10N-A, AS16AM10N-A, AS32AM10N-A, AS64AM10N-A, AS08AN01P-A, | |
| Digital Module | AS08AN01R-A, AS08AN01T-A, AS16AN01P-A, AS16AN01R-A, AS16AN01T-A, | |
| | AS32AN02T-A , AS64AN02T-A , AS16AP11P-A, AS16AP11R-A, AS16AP11T-A | |
| Analog Madula | AS04AD-A, AS08AD-B, AS08AD-C, AS02ADH-A, AS04RTD-A, AS06RTD-A, AS04TC-A, | |
| Analog Module | AS08TC-A, AS04DA-A, AS06XA-A, AS02LC-A | |
| Network Module | AS04SIL-A (for AS00SCM-A FW V2.06 or later) | |

| When AS00SCM-A acts as an EtherNet/IP remote module, the followings are supported. | | | |
|--|--|--|--|
| | AS08AM10N-A, AS16AM10N-A, AS32AM10N-A, AS64AM10N-A, AS08AN01P-A, | | |
| Digital Module | AS08AN01R-A, AS08AN01T-A, AS16AN01P-A, AS16AN01R-A, AS16AN01T-A, | | |
| | AS32AN02T-A , AS64AN02T-A , AS16AP11P-A, AS16AP11R-A, AS16AP11T-A | | |
| A 1 M | AS04AD-A, AS08AD-B, AS08AD-C, AS02ADH-A, AS04RTD-A, AS06RTD-A, AS04TC-A, | | |
| Analog Module | AS08TC-A, AS04DA-A, AS06XA-A, AS02LC-A | | |

| When AS00SCM-A acts as a PROFINET remote module, the followings are supported. | | |
|--|---|--|
| | AS08AM10N-A, AS16AM10N-A, AS32AM10N-A, AS64AM10N-A, AS08AN01P-A, | |
| Digital Module | AS08AN01R-A, AS08AN01T-A, AS16AN01P-A, AS16AN01R-A, AS16AN01T-A, | |
| | AS32AN02T-A , AS64AN02T-A , AS16AP11P-A, AS16AP11R-A, AS16AP11T-A | |
| Analog Madula | AS04AD-A, AS08AD-B, AS08AD-C, AS04RTD-A, AS06RTD-A, AS04TC-A, AS08TC-A, | |
| Analog Module | AS04DA-A, AS06XA-A | |

- When AS00SCM-A acts as a serial communication extension module or a CANopen remote module, it should work with AS PLC CPU for configuration. Download ISPSoft V3.13 or later versions from Delta's official website to configure AS00SCM-A.
- If you use UD Link, configure it through SCMSoft, which is embedded in HWCONFIG of DCISoft. Download DCISoft V1.24 or later from Delta's official website.
- When AS00SCM-A acts as an Ethernet remote module, you can set up the EtherNet/IP via EIP Builder and HWCONFIG of ISPSoft. Download ISPSoft V3.13 or later versions and EIP Builder V1.08 or later from Delta's official website.

9.2 Specification, Function and Wiring

9.2.1 The functional specifications

■ RS-485/RS-422 communication interface

| Item | Specifications |
|------------------------|--|
| Connector type | 5- pin European-style terminal block, spring-clip connector |
| Transmission speed | 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800 115200 and 230400 bps |
| Communication format | Stop bit: 1 bit and 2 bits Parity bit: none, an odd parity bit, and an even parity bit Data bit: 7 bits and 8 bits |
| Communication protocol | Modbus ASCII/RTU UD Link |

■ CANopen communication interface

| Item | Specifications |
|--------------------|--|
| Connector type | RJ45*2 |
| Transmission speed | 10k, 20k, 50k, 125k, 250k, 500k, and 1000k bps |
| Communication | AS remote mode (RTU mode) |
| protocol | CANopen (firmware V2.00 or later) |

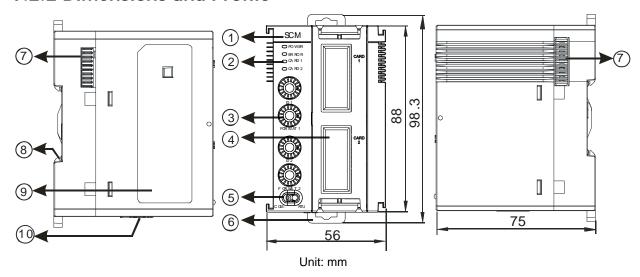
■ Ethernet communication interface

| Item | Specifications |
|------------------------|---|
| Connector type | RJ45*2 |
| Transmission speed | 10M, 100Mbps |
| Communication protocol | EtherNet/IP (firmware V2.02 or later), PROFINET (firmware V2.06 or later) |

■ Electrical specifications

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

9.2.2 Dimensions and Profile



| Number | Name | Description | |
|--------|---------------------------------|--|--|
| 1 | Model Name | Model name of the module | |
| | | Operating status of the module | |
| | RUN LED Indicator (blue) | ON: the module is running. | |
| | | OFF: the module has low voltage or no power. | |
| | | Error status of the module | |
| | | ON: there is a hardware error. | |
| 2 | ERROR LED Indicator (red) | OFF: the module is operating normally. | |
| | | Blink: an error has occurred or occurs on the module; refer to section 9.7 for more information. | |
| | Function card 1 Indicator | Blink: data is being transmitted to function card 1. | |
| | (orange) | OFF: there is no data transmission to function card 1. | |
| | Function card 2 Indicator | Blink: data is being transmitted to function card 2. | |
| | (orange) | OFF: there is no data transmission to function card 2. | |
| 3 | Knob for the Node ID and Format | 2 sets, one for function card 1 and the other for function card 2 | |
| | Function Card 1 Slot | COM Mode: for AS-F232, AS-F422, AS-F485 | |
| 4 | Function Cond 2 Clat | COM Mode: for AS-F232, AS-F422, AS-F485, AS-FCOPM | |
| | Function Card 2 Slot | RTU Mode: for AS-FCOPM, AS-FEN02, AS-FPFN02 | |
| 5 | Knob for the Work Mode | COM Mode: serial communication extension mode | |
| 5 | KIIOD IOI tile Work Wode | RTU Mode: 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 | RTU Power Input | Supplies power to the RTU module for RTU Mode only | |

9.2.3 Knob Functions

9.2.3.1 Restore Default Settings

For all communication cards and work mode, you can cut the device power off and turn the knobs to the position F, and resupply the power. The AS00SCM-A module restores back to default settings once it is resupplied with power. Cut the power off again and turn the knobs to set the new values and then resupply the power. After that the ASSCCM00-A is set with new settings.

9.2.3.2 Modbus Parameter Settings (AS-F232/AS-F422/AS-F485)

Modbus communication (AS-F232/AS-F422/AS-F485) can be installed in Card 1 and Card 2 (in COM mode only).

- 1. When the setting range is 0x01–0x0F, you can use the knob to set the node ID1 and ID2. (The settings in the ISPSoft is ignored here.)
- When the setting range is NOT between 0x01–0x0F, you can turn the knob to 0 and use ISPSoft (HWCONFIG) to set up the node ID. Follow the descriptions shown on the HWCONFIG for node ID setting range.

| COM. RTU | | | | | |
|----------|---|------------|----------------|--|--|
| | ID Setup (AS-F232/AS-F | 422/AS-F48 | 5) in COM mode | | |
| ID1/ID2 | ID1/ID2 Node ID Setup ID1/ID2 Node ID Setup | | | | |
| 0 | Use ISPSoft (HWCONFIG) | 1-F | Manual Setting | | |

- 3. When the FORMAT knob is NOT set to 0, use the FORMAT1 AND FORMAT2 knobs to set the communication mode. Refer to the following table. (The settings in the ISPSoft is ignored here.)
- When the FORMAT knob is set to 0, you can use ISPSoft (HWCONFIG) to set up the communication mode.

| | Modbus (AS-F232/AS-F422/AS-F485) in COM mode | | | | | | | | | | |
|---------------|--|-----|-----------|------|-------|---------------|-----------------------|----------------|--------|----------------|---------------|
| FORMAT 1/2 | MAT Baud Data Parity Stop ASCII/ | | | | | FORMAT 1/2 | Baud rate (bps) | Data (bits) | Parity | Stop (bits) | ASCII/ RTU |
| 0 | | Sof | tware set | ting | | 8 | 38400 | 8 | None | 2 | RTU |
| 1 | 9600 | 7 | Even | 1 | ASCII | 9 | 38400 | 8 | None | 1 | RTU |
| 2 | 9600 | 8 | Even | 1 | RTU | Α | 38400 | 7 | Even | 1 | ASCII |
| 3 | 9600 | 7 | None | 2 | ASCII | В | 57600 | 8 | None | 1 | ASCII |
| 4 | 9600 | 8 | None | 1 | RTU | С | 76800 | 8 | None | 1 | RTU |
| 5 | 19200 | 7 | Even | 1 | ASCII | D | 115200 | 7 | None | 1 | ASCII |
| 6 | 19200 | 8 | None | 1 | RTU | Е | 115200 | 8 | Even | 1 | RTU |
| 7 | 19200 | 8 | Odd | 2 | RTU | F | 115200 | 7 | None | 2 | ASCII |

For UD Link function, you can turn the FORMAT knob to 0 and use ISPSoft (HWCONFIG) to set up the communication mode. Refer to section 9.3.2 for more details.

9.2.3.3 CANopen Parameter Settings (AS-FCOPM)

CANopen (AS-FCOPM) can only be installed in Card 2 for COM mode or RTU mode.

- 1. When the setting range is 0x01–0x0F, you can use the knob to set the node ID1 and ID2. (The settings in the ISPSoft is ignored here.)
- When the setting range is NOT between 0x01–0x0F, you can turn the knob to 0 and use ISPSoft
 (HWCONFIG) to set up the node ID. Follow the descriptions shown on the HWCONFIG for node ID setting
 range.
- 3. When in RTU mode, the setting varies according to different CANopen communication mode; refer to section 9.4.1 for more details.

| | ID Setup (AS-FCOPM in COM mode) in COM mode | | | | |
|-----|---|-----|----------------|--|--|
| ID2 | | | | | |
| 0 | Use ISPSoft (HWCONFIG) | 1-F | Manual Setting | | |

4. COM and RTU Mode:

Refer to the following table and use FORMAT 2 knob to set up the communication. You can NOT use ISPSoft (HWCONFIG) to set up the communication mode in this format.

| CANopen (AS-FCOPM) in COM Mode and RTU Mode | | | | | | | | |
|---|------|------|------|------|------|------|-------|-----|
| FORMAT 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8-F |
| Bit rates (bps) | 10K | 20K | 50K | 125K | 250K | 500K | 1000K | NA |
| Distance (m) | 5000 | 2500 | 1000 | 500 | 250 | 100 | 25 | NA |

9.2.3.4 EtherNet/IP (AS-FEN02)

EtherNet/IP (AS-FEN02) can only be installed in Card 2 and both slots of Card 1 and Card 2 will be used for RTU mode.

When using the communication card AS-FEN02, you need to set ID1 and FORMAT1 to 0. Refer to the following methods to edit the IP address and settings of AS-FEN02.

- When both knobs ID2 and FORMAT 2 are set to 0, IP address is set through EIP Builder (ISPSoft -> HWCONFIG).
 - Open EIP Builder and add AS00SCM (RTU) + AS-FEN02 to your network. Double-click HWCONFIG to set up.
 - Open EIP Builder and select IP Setting Tool from the Tool on the tool bar to scan for the device IP address for setup.
- 2. When both ID2 and FORMAT 2 are set to F, IP setting mode is in DHCP mode. After setting is complete, you need to turn the power OFF and then ON to make sure the modules are sending DHCP requests. Check the sticker on the AS-FEN02 communication card for the MAC address. After that open EIP Builder and select IP Manager from the Tool on the tool bar and click Start the Server to set up the correspondences between MAC address and IP address.
- 3. When either ID2 or FORMAT 2 is Neither 0 nor F, IP address is set by knobs ID2 and FORMAT 2. Hexadecimal format is used and ID2 corresponds to $x16^1$ and FORMAT 2 to $x16^0$. The possible IP address is 192.168.1.x, $x=1\sim$ FE ($1\sim$ 254).



| IP Address Setup (AS-FEN02) in RTU Mode | | | | | | |
|---|-------------|------------|--------------------------------|------------------|--|--|
| ID1 | | | 0 | | | |
| FORMAT 1 | 0 | | | | | |
| ID2 | 0 | F | Other combination | x16 ¹ | | |
| FORMAT 2 | 0 | F | Other combination | x16 ⁰ | | |
| IP Address | Use ISPSoft | IP Address | | | | |
| Setup | (HWCONFIG) | DHCP | 192.168.1.x · x=1~FE (1~254) | | | |

Note: The parameters of AS-FEN02 are stored in AS300 PLC or AS00SCM-A. Thus you need to use the knobs to set up the IP address for AS-FEN02 or use COMMGR or IP Setup tool to scan and check for the IP address of AS-FEN02. Refer to section 9.4.2 for more information.

9.2.3.5 PROFINET (AS-FPFN02)

You can use the knob to restore back to default settings.

9.2.4 Wiring

9.2.4.1 ASOOSCM-A Power Wiring

COM mode: Serial communication extension mode

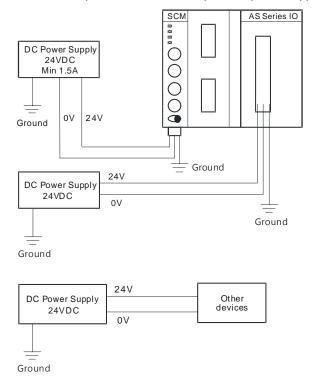
Turn the work mode to COM. Install the module on the right hand side of the AS Series CPU. To avoid problems, do not use an external power supply for AS00SCM-A.

RTU mode: Remote module mode

Turn the work mode to RTU. This module is equipped with an independent DC power connecter.

To ensure the serial communication module functions well and reliably, the external wiring must prevent noise. Before you install cables, follow the precautions below.

(1) To prevent a surge and induction, the DC cable and other power cables that are connected to the AS00SCM-A must be separate cables. An independent power supply is recommended for the AS00SCM-A.



- (2) The 24 VDC cable should be twisted pair, and the shorter end should be connected to the module.
- (3) The cable (110 VAC, 220 VAC, and 24 VDC) must not be installed 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 that is not a PLC. All the cables should be wired at least 100 mm apart.
- (4) Ground the power supply using a 14 AWG wire.
- (5) Connect 20–14 AWG (1 mm) wires to the input/output terminals. Use only copper leads that can resist temperatures above 60° C /75° C.



9.2.4.2 ASOOSCM-A Communication Interface

COM mode: Serial communication extension mode

This module comes with two function card slots, supporting AS-F232, AS-F422, and AS-F485 communication cards. The Card 2 slot also supports the AS-FCOPM communication card (firmware V2.00 or later). Refer to Chapter 10 for more information on wiring the cards.

RTU mode: Remote module mode

The Card 2 slot supports the AS-FCOPM communication card (firmware V2.00 or later), AS-FEN02 (firmware V2.02 or later) and AS-FPFN02 (firmware V2.06 or later). Refer to Chapter 10 for more information on wiring the cards.

9.3 COM mode

This section introduces communication modes of AS00SCM-A module (firmware V2.00) when the communication protocol is Modbus, UD Link or CANopen.

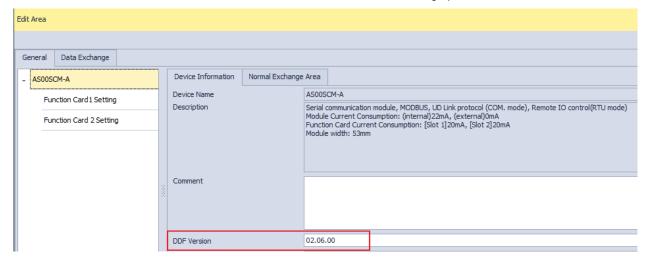
9.3.1 Modbus

The AS00SCM-A supports standard communication protocols such as Modbus RS232, RS422, and RS485. Once you create a data exchange table, you can exchange data with slave modules.

- You can set up communication format and node ID via HWCONFIG. Refer to section 9.2.3 for more details.
- Refer to section 9.6.1 for more details on operational examples.

9.3.1.1 Modbus Master

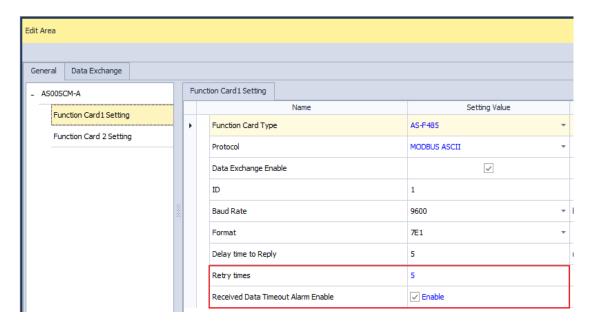
 When AS00SCM-A acts as scanner/master, you can create a data exchange table and exchange data with slave modules. To initialize Modbus communication: Open ISPSoft. -> HWCONFIG -> AS00SCM-A. Be sure to check if the DDF version is the same as the actual firmware before setting up.



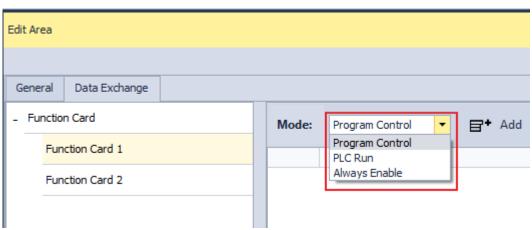


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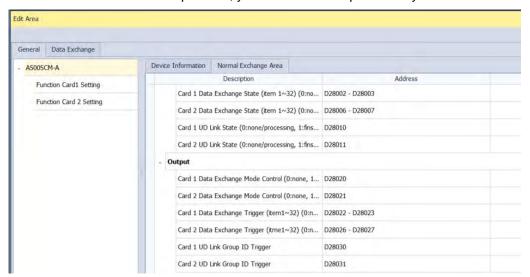
- Set up the node ID and communication format. Go to Edit Area -> Function Card1 / Card 2 Setting.
 - Retry times: set the times for the AS00SCM to retry communication. If no response after the set retry times, a slave timeout alarm will be triggered.
 - Received Data Timeout Alarm Enable: available for FW V2.06 or later, you can enable this function so that if a timeout occurs, an alarm will be triggered. Default: disable.



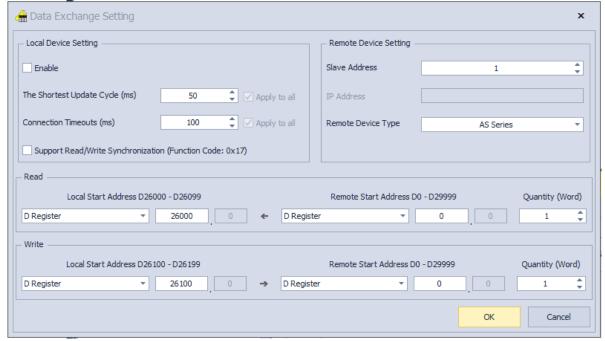
 Select a mode to start. Go to Data Exchange -> Function Card1 / Function Card 2 -> Mode (Program Control, PLC Run, or Always Enable)



Program Control: PLC decides whether the set data exchange is performed. Function Card 1 and Function Card 2 are independent; you can set them up differently.



- 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.
- Always Enable: The data exchange will be executed constantly after PLC is powered on.
- Create a Data Exchange table: Tick the option Enable first.



- Select the Slave Address and the Remote Device Type from their drop-down list.
- The Shortest Update Cycle (ms): You can set the shortest update cycle in ms. If a timeout error occurs too often, you can increase the value here, 10 ms as a unit to find out the best setting value.
- Connection Timeouts (ms): You can set the connection timeout time in ms. If for a period of time that you have set, there is no response from the slave device, this is considered as a timeout. The value here cannot be set too large, otherwise the PLC will need to wait for the time set for the slave device to



respond, and this will affect and prolong the data exchange time.

- Support Read/Write Synchronization (Function Code: 0x17): the master PLC CPU can use MODBUS function code to complete read and write synchronization at one operation. 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.
- After the setting is done, click Download. And you can find the Address of Card 1 / 2 Data Exchange
 State under the tab of Normal Exchange Area. If the address value is 1 here, it indicates the data
 exchange is a success one.
- Note: When you use HWCONFIG to scan the modules, the data exchange table of AS00SCM-A can NOT be
 copied back to HWCONIG. If you need the data exchange table of AS00SCM-A, you can use Upload on the
 tool bar to send the data exchange table of AS00SCM-A back to HWCONFIG.

9.3.1.2 Modbus Slave

When AS00SCM acts as adapter/slave, it provides a communication channel for AS series PLC to read and write.

Addresses and corresponding registers for function card 1/2

| Funciton cards | Address for data to be written | Length (character) | Address for data to be read | Length (character) |
|-----------------|--------------------------------|--------------------|-----------------------------|--------------------|
| Function card 1 | 16#0000 | 100 | 16#0100 | 100 |
| Function card 2 | 16#0200 | 100 | 16#0300 | 100 |

You can find the corresponding registers in HWCONFIG, after setting up AS00SCM-A as the right-side module of AS CPU. As the image shown below, you can see the input device range (to write) for Card 1 is from D26000 to D26099 and the output device range (to read) is from D26100 to D26199.

| C | CPU Group | | | | |
|---|-----------|---|-------------|--------------------|---------------------|
| 1 | Module | | Module Name | Input Device Range | Output Device Range |
| | CPU | | AS332T-A | X0.0 - X0.15 | Y0.0 - Y0.15 |
| | | | AS-F485 | NONE | NONE |
| | | | AS-F485 | NONE | NONE |
| | | 1 | AS00SCM-A | D28000 - D28019 | D28020 - D28039 |
| | | | AS-F485 | D26000 - D26099 | D26100 - D26199 |
| | | | AS-F485 | D26200 - D26299 | D26300 - D26399 |

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Supporting function codes and addresses are shown below.

| Function Code | Attribute | Supporting addresses |
|---------------|-----------|----------------------|
| | | 16#0000~16#0063 |
| 0x03 | Read | 16#0100~16#0163 |
| 0x04 | Neau | 16#0200~16#0263 |
| | | 16#0300~16#0363 |
| 0x06 | Write | 16#0000~16#0063 |
| 0x10 | vviite | 16#0200~16#0263 |
| | | 16#0000~16#0063 |
| | Read | 16#0100~16#0163 |
| 0x17 | Reau | 16#0200~16#0263 |
| UX17 | | 16#0300~16#0363 |
| | Write | 16#0000~16#0063 |
| | vviite | 16#0200~16#0263 |



9.3.2 UD Link

The UD Link provides communications with devices that communicate via RS232, RS422 or RS485. You can edit a packet according to its communication format to send and receive packets. This section introduces the use of UD Link communications in COM mode.

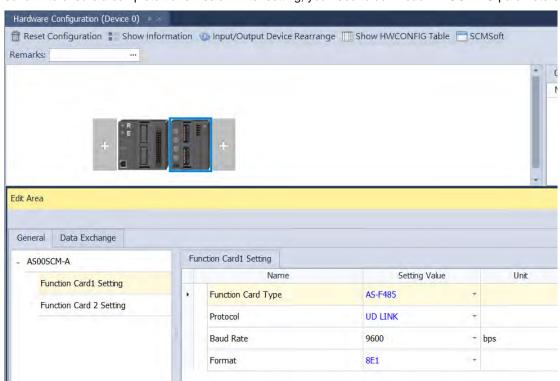
Notes:

- 1. Make sure the knob of SCM module is turned to 0 before operation.
- 2. SCMSoft is embedded in DCISoft. Go to www.deltaww.com to download the last version of DCISoft.
- 3. Make sure you are using the last version of COMMGR.
- 4. Make sure you are an administrator to run ISPSoft.

9.3.2.1 Steps to Create an UD Link Protocol Communication

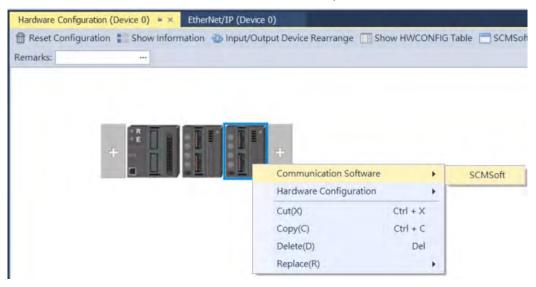
1. Setting up in HWCONFIG

Set up the function card. -> Set the communication protocol to UD Link. -> Set up the communication format and baud rate. -> Download to HWCONFIG. -> Use data length 8 byte as the communication format, 8E1, 8N1, 8O2 and so forth to ensure a complete transmission. After setting, you need to download HWCONFIG parameters.



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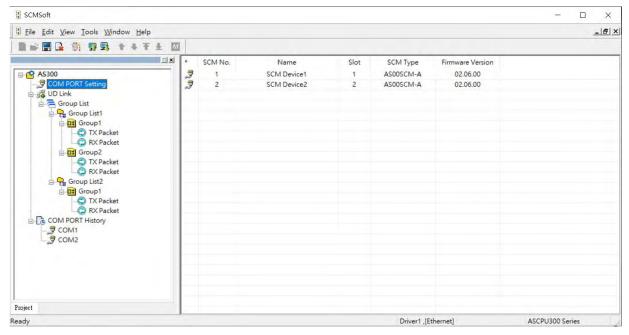
Right-click any AS00SCM module if there is more than one AS00SCM module to see the context menu, click Communication Software and then double-click SCMSoft to open it.



AS00SCM modules can upload UD Link parameters through SCMSoft. Select one slot as one SCM module and one AS00SCM module at one time.

9.3.2.2 SCMSoft

COM PORT Settings: Here is the parameters set in HWCONFIG and it is a read-only page. If you need to edit the parameters, close SCMSoft first and then go to HWCONFIG to edit.

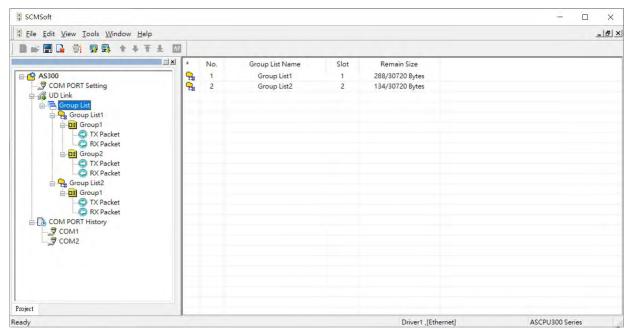


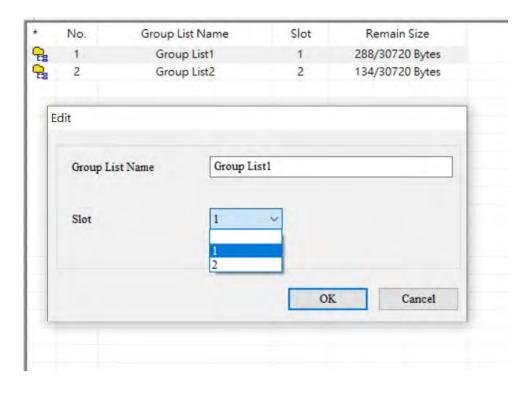


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Upload the module parameters to UD Link. -> Right-click Group List to create a group list. -> Double-click the Group List 1 to set up the slot number on the editing window on the right -> Right-click the created group list on the node to create groups for data mapping. -> Define the Group ID and Group Name on the editing window on the right.

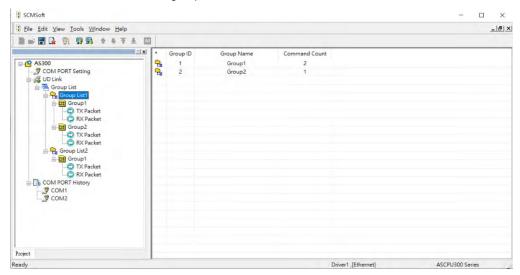
Group List: One group list corresponds to one slot, do NOT use the same group list on other slots repeatedly. The slot number in the group list is the actual placement order of AS00SCM-A on the right-side of the PLC. For example, the slot number 2 in the group list corresponds to the second module on the right-side of the PLC. Once the group list is assigned to a certain slot, the CARD 1 and CARD 2 of its corresponding module can trigger the group list of the selected slot.



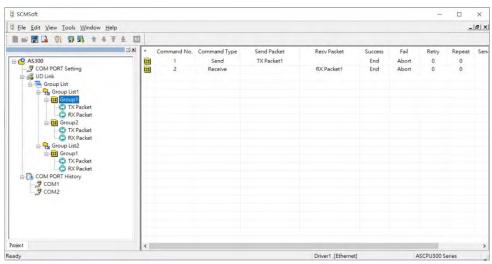




Group List under the Group List: Every group has its Group ID and this number will be used in PLC program as AS00SCM uses to call for the group to take orders.



Group: Right-click anywhere on the blank area of the Group to create commands. When the Group ID is called, AS00SCM executes the commands in their numerical order of the called Group ID.



After the group list is created, you can edit packets for transmission.

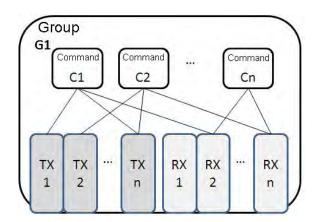
■ Send packet / Receive packet: use the packets to be sent or to be received but they can only be used in the group where they belong. Commands can be used to execute all kinds of packets.

Send: to send packets **Receive:** to receive packets

Send & Receive: to send packets and to receive packets

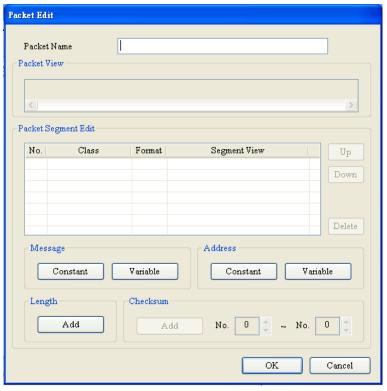
COM PORT History: Right-click this node to upload the COM Port History. You can obtain the data stored in the
communication port by selecting the slot (CARD 1 indicating COM 1 and CARD 2 indicating COM2). The data
here include TX and RX packets and the data is included not only AS00SCM data but also other kinds of data as
long as they are from the same communication port.

Refer to the next section for the settings on packets and commands. After the setting is done, download the parameters from SCMSoft to PLC. And once a group number is trigger, the function card starts to send and receive packets according to the command order. Make sure you add the group number in the UD Link group address in the Normal Exchange area. Refer to section 9.6.2 for more details on operation.



9.3.2.3 TX Packets and RX Packets

You can create several TX and RX packets in a group. A packet includes messages, an address, a length, and a checksum.





- Packet Name: enter the packet name.
- Packet View: shows the packet contents.
- Packet Segment Edit: adjust the sequence of segments and add or delete segments.

No.: the segment number. You can create no more than 64 segments.



Class: the segment class. The available classes are Message, Address, Length, and Checksum.

Format: the data format of the segment. The available data formats are Hex (hexadecimal), ASCII, and Code.

Segment View: the contents of the segment

- **Message**: a message may be either Constant or Variable. Messages can be applied to a header segment, a start bit segment, an end bit segment, and a data segment. There can be several messages in a packet.
- Address: an address may be either Constant or Variable. There can be only one address segment in a packet.
- Length: enter the length of a packet. There can be only one length segment in a packet.

Class: 1 byte or 2 byes

Format: select a format for the length, Hex or ASCII

Value: enter a value for the length according to the format; unit: byte

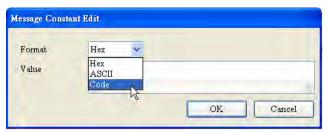
Checksum: edit the checksum. There can be only one checksum segment in a packet.

Class: select a Class.

Format: select the Format for the checksum.

Initial value: set the initial value for the checksum.

Reverse: the high byte of a one-word checksum is calculated, and the high byte (word) and low byte (byte) of the checksum are reversed.

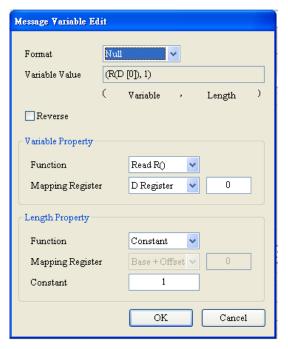


• Constant: enter a constant.

Format: Select Hex, ASCII, or Code in the Format box. If you select Code, the data is a control code.

Value: enter a constant .





- Variable: a variable data to read or write. Specify either an internal register in AH10SCM-A or a register in a CPU module.
- Format: select the format for the data.

Null: data is not processed.

Hex: ASCII data is converted into hexadecimal data. ASCII data that cannot be converted into hexadecimal data is converted into 0.

ASCII: Hexadecimal data is converted into ASCII data. Hexadecimal data that cannot be converted into ASCII data is converted into 0.

 Reverse: the high byte of a one-word checksum which is calculated, and the low byte of the checksum are reversed.

Variable Property:

Function: for a TX packet, select Read R() for the Function. For an RX packet, select Read R(), Write W(), or * for the Function.

Mapping Register: select a register in the PLC.

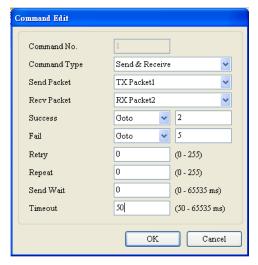
Length Property:

Function: It is suggested to select to determine the length (*) automatically. The data length can be specified between the packet interval (around 4 character time length) and should receive all data. Select Read R () for a variable. And then you can select its corresponding register. The value here is the length. Select Constant and then you can define the data length.

For a TX packet, you can select the variable and the constant length. For a RX packet, you can select a variable, constant and determine the length (*) automatically.

9.3.2.4 Command

After creating several TX and RX packets, create commands to select packets to be sent and packets to be received. Also create a sequence to execute the commands.

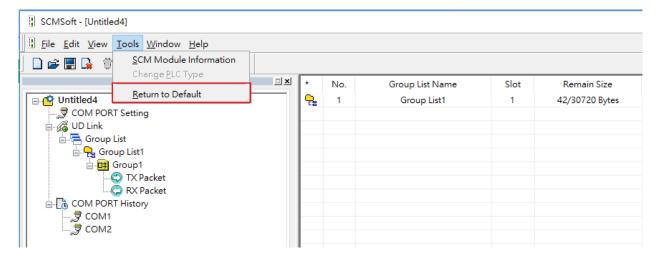


- **Command No.**: every command has a number. The Command Number indicates the execution order. You can also use this Command Number to appoint a certain packet for transmission when using Goto function.
- Command Type: select Send, Receive, or Send & Receive for the Command Type. Once the type Send is
 selected, when the packet is sent, the transmission is considered successful. Once the type Send & Receive is
 selected, AS00SCM-A checks if the received data met the definition of RX packet. When they are matched, the
 transmission is considered successful.
- Send Packet: select a packet to send.
- Receive Packet: select a packet to receive.
- Success: specify the action to follow the successful execution of the command: Next, Goto, or End.
 - **Next**: the next command is executed based on Command Number. If the command that is being executed is command 1, the next command that will be executed is command 2.
 - Goto: specify a later command to be executed based on its Command Number.
 - End: end the sequence of commands.
- Fail: specify the action to follow the failure of the command: Next, Goto, or Abort.
 - Next: the next command is executed based on Command Number. If the command that is being executed is command 1, the next command that will be executed is command 2.
 - Goto: specify a later command to be executed based on its Command Number.
 - **Abort**: end the sequence of commands.
- Retry: set the number of times the command will be retried after a failure.
- Repeat: set the number of times the command will be repeated after successful execution.
- Send Wait: set an interval in milliseconds for the sequence to wait between commands. The default is 0 milliseconds, which causes the next command to be executed immediately after a reply is received.
- Timeout: set the amount of time in milliseconds for the system to wait for the command to be executed before
 the system reports a communication timeout. The default is 50 milliseconds. When it is set to 0, there
 is no timeout message and the module is at the status of waiting to receive.



9.3.2.5 Return to Default

Select **Tools** in SCMSoft and select **Return to Default**. Select the slot (module) you need to reset and clear all the saved settings in UD Link mode. After that turn off and then turn on AS00SCM-A so that UD Link mode can work again.



9.3.3 CANopen Mode

The installed on the right side of AS Series PLC CPU, AS00SCM-A (firmware V2.00 or later) can be connected to an AS-FCOPM module through the Card 2 slot. It can then be used as a slave for other modules in the CANopen network environment.

9.3.3.1 Features

When using the AS00SCM-A as a slave module, it has the following features:

- Complies with CANopen DS301 V4.02
- Supports NMT Slave
- Error-controlled; supports Heartbeat and Node-Guarding Protocols
- Supports PDO; up to 8 TxPDO and 8 RxPDO can be configured for every slave.
- Supports SDO:

Server: 1 User: 0

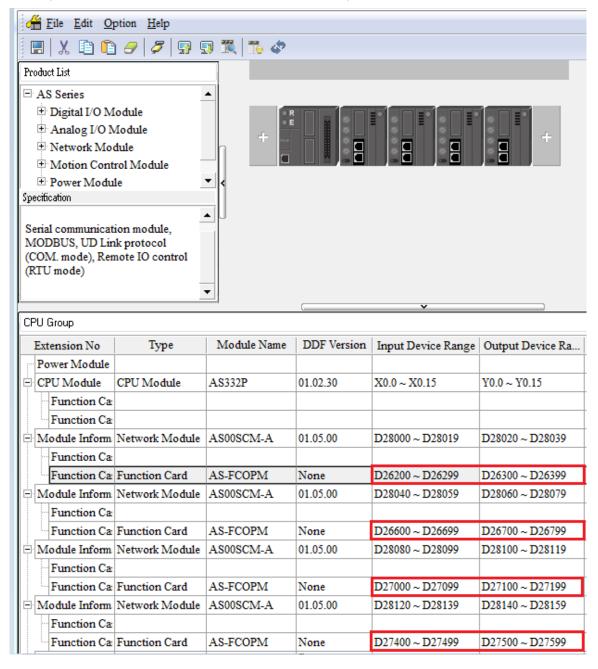
Supports SDO (expedited SDO) transmission mode

Supports Emergency Protocol



9.3.3.2 Corresponding Input / Output Device Range

When the AS00SCM-A module acts as a CANopen slave, the CPU PLC assigns the input/output device ranges according to the placement of the AS00SCM-A. The corresponding input/output device ranges from the right hand side of the CPU PLC are shown in the example below from the HWCONFIG utility. The red box below is the data exchange section for AS00SCM-A, when the AS00SCM-A acting as a CANopen slave.





9.4 RTU Mode

Here you can find the introductions on the communication through CANopen and EtherNet/IP remote mode. For PROFINET remote mode, refer to Chapter 10.

9.4.1 CANopen Mode (AS-FCOPM)

When the function card AS-FCOPM works with an AS series PLC, it supports three kinds of RTU modes, including AS Remote Communication, CANopen DS301 Mode and Delta Special Driver & AS Remote Mode. Use the knob FORMAT 1 to turn among three RTU modes.

A. RTU Communication Mode Setup Knob "FORMAT 1"

| FORMAT1 | Description |
|---------|---------------------------------------|
| 0 | AS Remote Communication |
| 4 | CANopen DS301 |
| 8 | Delta Special Driver & AS Remote Mode |

- B. Node ID Setup Knob "ID1/ID2"
 - ID1: 0 (recommended)
 - ID2: 0 (the knob is no function; set up through ISPSoft); see the table below for the knob setting range.

| RTU mode | ID2 setting range |
|---------------------------------------|---|
| AS Remote Communication | 1~F (by the number of slaves) |
| Delta Special Driver & AS Remote Mode | 1~F (by the number of slaves) |
| CANopen DS301 | 1~F (if the knob is at 0, the setting range is set by HWCONFIG) |

C. RTU Communication Speed Setup Knob "FORMAT 2"

Use the knob for setting. You cannot use ISPSoft (HWCONFIG) to set up the communication mode in this format.

| FORMAT2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8-F |
|--------------|------|------|------|------|------|------|-------|-----|
| Byte (bps) | 10K | 20K | 50K | 125K | 250K | 500K | 1000K | NA |
| Distance (m) | 5000 | 2500 | 1000 | 500 | 250 | 100 | 25 | NA |

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Double-click the AS Series PLC, then in Device Setting click Function Card 2 Setting and set the function card 2 to AS-FCOPM, set to working mode to AS Remote Communication Mode, enter the number of the AS remote module and set up the baud rate. After the setting is done, download the parameters.

| Parameter name | Value | Unit | Default | Minimum | Maximum_ |
|------------------------------------|---------------------|--------------|--------------|---------|----------|
| Card 2 Detect mode | Manual | ▼ | Auto Detect | - | - |
| Manual Select Card | AS-FCOPM Ca | , ▼ | None | - | - |
| Card 2 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 | E∨en | ▼ | 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 | 0~10∨ | ▼ | 0~10V | - | |
| F2DA Analog Output mode | 0~10∨ | ▼ | 0~10V | - | - |
| F2AD Sampling Time | 3 | ms | 3 | 3 | 15 |
| F2AD Average Times | 10 | | 10 | 1 | 15 |
| AS-FCOPM Working mode | AS Remote Co | ▼ | AS Remote 0 | Cc - | - |
| AS-FCOPM node ID | 1 | | 1 | 1 | 254 |
| AS Remote module No. | 1 | unit | 1 | 1 | 15 |
| Select Run mode after detect remot | te mc Run connected | ▼ | Run connecte | 9(- | - |

Turn the FORMAT1 knob to 0 and it is in AS Remote Communication Mode. In AS Remote Communication mode, an AS series CPU PLC can connect to as many as 15 AS00SCM-A modules, as long as they are all in RTU mode. The RTU station number should be set from 1 to 15 in numerical order. RTU mode and baud rate cannot be set via ISPSoft (HWCONFIG). Use the knob ID2 to set up Node ID and use the knob FORMAT2 to set up the baud rate. (The baud rate should be the same as the PLC's baud rate.)



FORMAT1: $0 \times 0_h$ ID2: $0 \times 1_h \sim 0 \times F_h$

FORMAT2: $0x1_h \sim 0x7_h$



Steps for a quick setup

- 1. Set up the PLC: AS Remote Communication mode, number of the device: 1; baud rate: 1000kbps; download the parameters.
- 2. Set up AS00SCM-A; set the ID1 knob to 0 and FORMAT1 to 0; ID2 knob to 1 and FORMAT2 to 7.
- 3. Supply power to AS00SCM-A and connect AS00SCM-A to the PLC with a CANopen cable.
- 4. Resupply power to the PLC and the indicator of CARD2 should keep blinking. That indicates AS00SCM-A and the PLC are connected. The PLC error indicator should be blinking too, since the setting is not done yet.
- 5. Use HWCONFIG to scan the connected devices to see if AS00SCM-A is connected.
- 6. Download the parameters and check if the PLC error indicator has stopped blinking. Then the setting of one RTU device is complete.

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 Double-click the AS Series PLC, then in Device Setting click Function Card 2 Setting and set the function card 2 to AS-FCOPM, set to working mode to Delta Special Driver & AS Remote Mode and enter the number of the AS remote module and set up the baud rate. After the setting is done, download the parameters.

| Parameter name | Value | Unit | Default | Minimum | Maximum |
|--|-------------------|----------|----------------|---------|---------|
| Card 2 Detect mode | Manual | ₹ | Auto Detect | - | - |
| Manual Select Card | AS-FCOPM Care | ₹ | None | - | - |
| Card 2 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 |
| AS-FCOPM Working mode | Delta Special Dri | ₹ | AS Remote Com | 1 - | - |
| AS-FCOPM node ID | 1 | | 1 | 1 | 254 |
| Number of remote module for ASDA | 1 | | 0 | 0 | 7 |
| Select Run mode after detect remote module | Run connected r | ▼ | Run connected | : - | - |
| AS CPU module keep or Stop when slave no | Only Show Error | ▼ | Only Show Erro | : - | - |
| Remote 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 | 1000k | ▼ bps | 125k | - | - |

Turn the FORMAT1 knob to 8, and it is in Delta Special Driver & AS Remote Mode. In this mode, an AS series CPU PLC can connect to as many as 7 AS00SCM-A modules, as long as they are all in RTU mode. The RTU station number should be set from 9 to 15 in numerical order. RTU mode and baud rate cannot be set via ISPSoft (HWCONFIG). Use the knob ID2 to set up Node ID and use the knob FORMAT2 to set up the baud rate. (The baud rate should be the same as the PLC's baud rate.)



FORMAT1: 0x8_h

ID2: $0x9_h \sim 0xF_h$

FORMAT2: $0x1_h \sim 0x7_h$



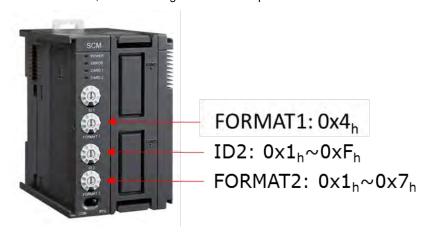
Steps for a quick setup

- 1. Set up the PLC: Delta Special Driver & AS Remote Modem mode, number of the device: 1; baud rate: 1000kbps; download the parameters.
- 2. Set up AS00SCM-A; set the ID1 knob to 0 and FORMAT1 to 8; ID2 knob to 9 and FORMAT2 to 7.
- 3. Supply power to AS00SCM-A and connect AS00SCM-A to the PLC with a CANopen cable.
- 4. Resupply power to the PLC and the indicator of CARD2 should keep blinking. That indicates AS00SCM-A and the PLC are connected. The PLC error indicator should be blinking too, since the setting is not done yet.
- 5. Use HWCONFIG to scan the connected devices to see if AS00SCM-A is connected.
- 6. Download the parameters and check if the PLC error indicator has stopped blinking. Then the setting of one RTU device is complete.

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9.4.1.3 CANopen DS301 Mode

- This mode supports AS Series PLC acts as the CPU and the 3rd party CANopen DS301 devices (non-AS series devices and non-Delta PLC). When using Delta PLC as the CPU, you need to use CANopen Builder to set up.
- Before using a 3rd party PLC, use AS Series PLC as the CPU and select the AS Remote Communication Mode.
- Before connecting to CANopen DS301, turn the AS00SCM-A FORMAT1 knob to 4, and the adjustable range for station knob ID2 becomes 0x1h~0xFh. This mode is used to communicate with a Master PLC from other brand.
 See the detail in section 9.6.3. when the PDO data is mapped, AS00SCM-A can control the IO modules from its right side.
- Double-click the AS Series PLC, then in Device Setting click Function Card 2 Setting and set the function card 2 to AS-FCOPM, set to working mode to CANopen DS301.



Steps for a quick setup

- 1. Set up the PLC: in AS Remote Communication Mode, connect AS series PLC to AS00SCM-A, refer to section 9.4.1.1 for more details.
- Use AS series PLC to scan the I/O modules installed on the right-side of AS00SCM-A and download the parameters.
- 3. If using HWCONFIG to set up the node ID, you can use COM mode to connect AS00SCM-A to the right-side of AS series PLC directly and no I/O module behind it. Use AS series PLC's HWCONFIG to scan and add AS00SCM-A in and then double-click the module to set up its node ID and then download the parameters. After that, knob ID2 to 0.
- 4. Install the I/O module to the right side of AS00SCM-A and turn the working mode to RTU.
- 5. Turn FORMAT1 to 4 and use the CANopen cable to connect to the PLC, and then supply power to AS series PLC.
- 6. Follow master's CANopen setting method to install the slaves.

Refer to section 9.6.3 PDO examples, if you are using AH10COPM-5A as the CPU.



9.4.2 EtherNet/IP Mode

AS-FEN02 can be installed on AS00SCM-A (firmware V2.02 or later). However AS00SCM-A+AS-FEN02 can only be used in RTU mode. That means this set can NOT be installed on the right-side of AS/AH PLC CPU; AS00SCM-A+AS-FEN02 can connect to AS PLC CPU via internet connection. You can use Delta PLC or the 3rd party EtherNet/IP device to control the right-side modules of the AS00SCM-A.

| | AS-FEN02 | AS00SCM-A |
|------------------------------|----------|-----------|
| | V1.00 | V2.02 |
| Compatible firmware versions | V1.02 | V2.04 |
| | V1.03 | V2.06 |

It is suggested to use ISPSoft V3.13 or later versions when AS00SCM-A+AS-FEN02 is used in remote mode with AS or AH PLC CPU. Use HWCONFIG V4.0 to set up EtherNet/IP for AS PLC CPU and use EIP Builder to set up EtherNet/IP for AH PLC CPU.

When AS00SCM-A+AS-FEN02 is used with the 3rd party EtherNet/IP Scanner, you need to set up the remote IO modules in EIP Builder (V1.06 or later). Go to Delta Official Website Delta | Download Center (deltaww.com) (steps: Select Product Category: Industrial Automation; Select Product Sub-Category: PLC- Programmable Logic Controllers; Select Series: AS Series; Filter: Electrical Parameter and click Submit and then find the EtherNet/IP EDS File: AS00SCM-RTU (AS-FEN02)) to download the EDS file and then install the downloaded EDS file in the EtherNet/IP software. Refer to the user manual of the 3rd party EtherNet/IP Scanner for more information.

Refer to section 10.2.7 for more details on the operations of AS-FEN02 installed on AS Series PLC.

9.4.2.1 LED Indicators

AS00SCM-A acting as a remote module

| LED Indicator | Description |
|---------------------------|--|
| CARD 1 LED indicator | Orange light blinking: when AS-FEN02 sends data to AS00SCM-A |
| CARD 2 LED indicator | Orange light blinking: when AS00SCM-A sends data to AS-FEN02 |
| Error LED indicator (red) | Indicates if there is any error on the module OFF: the module is operating normally Blinking: an error has occurred or occurs on the module; refer to section 9.7 for more information. |

AS-FEN02 installed on AS00SCM-A

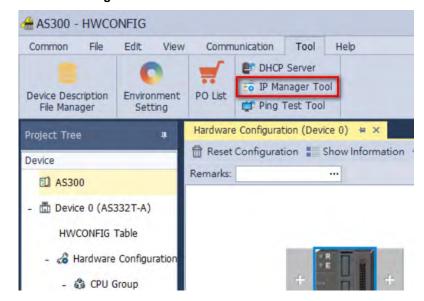
| LED Indicator | Description |
|----------------|--|
| | Indicates the status of the communication card |
| | Green light ON: the operation is normal |
| MS indicator | Green light Blinking: the setting is not complete |
| IVIS Indicator | Red light ON: internal communication failure, NOT being able to recover |
| | Red light Blinking: internal communication timeout |
| | OFF: no power |
| | Indicates the status of Ethernet connection |
| | Green light ON: a CIP connection is established |
| NS indicator | Green light Blinking: a CIP connection is not established |
| | Red light ON: duplicated IP address, after fixing this issue, resupply the |
| | power |

| LED Indicator | Description |
|----------------------|---|
| | Red light Blinking: communication timeout / CIP connection is established |
| | after power-on / IP address change |
| | OFF: no power / network cable is not connected |
| | Indicates the status of Ethernet connection |
| LINK indicator X1/X2 | Green light ON: a network connection is established |
| | OFF: a network connection is not established |
| | Indicates the status of Ethernet communication |
| ACT indicator X1/X2 | Orange BLINKING: data transmission |
| | OFF: no data transmission |

9.4.2.2 IP Setting Tool

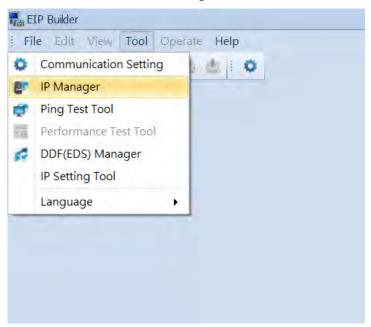
AS-FEN02 can be installed on AS00SCM-A (firmware V2.02 or later) so that AS00SCM-A can act as a remote module. When the knob is set to 0, the IP address is 192.168.1.3 by default. If there are more than one AS00SCM-A in the system, you need to set up the IP addresses for them. Three methods for you to set up the IP addresses for AS-FEN02 installed on AS00SCM-A.

- Using knobs: Highly suggested. You can use ID2 and FORMAT2 knobs to set up the IP address. Hexadecimal format is used and ID2 corresponds to x16¹ and FORMAT 2 to x16⁰. The possible IP address is 192.168.1.x, x=1~FE (1~254).
- Using IP Manager Tool: You can find IP Manager Tool in HWCONFIG (V4.0 or later). If you need to use an IP address that is NOT part of 192.168.1.x, you can use IP Manager Tool to set up the IP address. This tool uses MAC address to recognize the identities of different devices and thus the IP duplication is allowed. It is very useful when you need to edit the IP addresses of multiple devices at the same time, as long as you know the MAC address of each device. Check the sticker on the AS-FEN02 communication card for the MAC address.
 - 1. Open EIP Builder and add AS00SCM (RTU) + AS-FEN02 to your network. Make sure all four knobs on the AS00SCM-A (remote module) are turned to 0. And then connect to your computer via Ethernet.
 - 2. AS-FEN02 (FW V1.02.40 or later) supports IP Manager Tool from the Tool on the tool bar to scan for the device for IP address setup. You can also edit the devices in different network segments. For example, the IP address of the device by default is 192.168.1.3 but the IP address of the computer is 192.168.10.5. You can use IP Setting Tool to edit the device IP address.

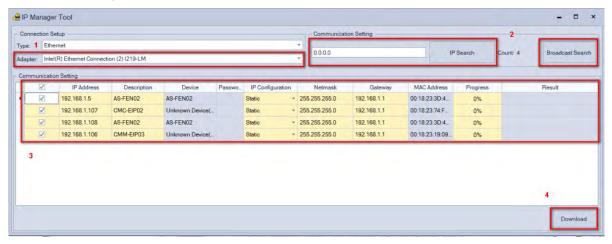




3. If you are using a non Delta EtherNet/IP device as a scanner (master), you need to use EIP Builder. Open EIP Builder and select **IP Manager** from the **Tool** on the tool bar.



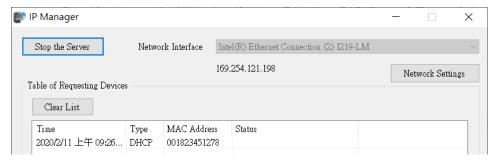
4. Select the adapter type and click **IP Search** or **Broadcast Search** and then you can edit the parameters. After the editing is complete, select the device you'd like to download and then click **Download**.



 Using IP Setting Tool to change the IP setting mode to DHCP. And after that you can go to IP Manager to set up the correspondences between the specific MAC address and specific IP address. Follow the steps below for DHCP setup.

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- Using DHCP: Besides using IP Manager Tool to set the IP setting mode to DHCP mode, you can also use knob
 to set the mode to DHCP.
 - 1. When both ID1 and FORMAT 1 are set to 0 and both ID2 and FORMAT 2 are set to F, IP setting mode is in DHCP mode. And then use Ethernet to connect to your computer.
 - 2. Open EIP Builder and select IP Manager from the Tool on the tool bar.
 - Click Stop the Server and then select a suitable Network Interface. Click Start the Server to complete
 the setting. After that, you need to turn the power OFF and then ON so that the devices will send DHCP
 requests to the computer.



4. Check the device in the DHCP request form to assign the IP address to its corresponding MAC address. You can also export the corresponding table. After the assignment is complete, you can see the result in the status section.

| Туре | MAC Address | Status |
|------|--------------|--------------------------------|
| DHCP | 001823451278 | IP assign success, IP: 192.168 |
| | | |

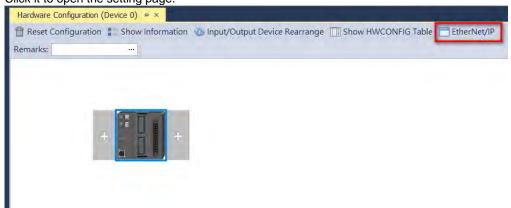
5. After IP setting is complete, you can decide whether to disable DHCP function or not. If the system is in the absence of a DHCP server (or use IP Setting Tool only for once), it is suggested to use IP Setting Tool to change the IP setting mode to static mode. If the system includes a DHCP server, it is suggested to keep the IP setting mode in DHCP mode. Whenever the power of the remote module is OFF, the system clears all the IP parameters and sends DHCP request out whenever the power of the remote module is ON to make sure the DHCP server is working.



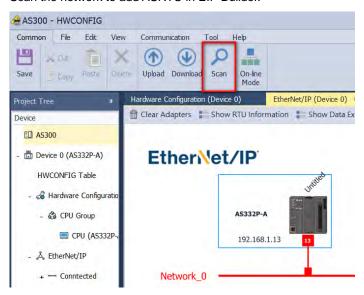
9.4.2.3 Connecting to Delta PLC Scanner through ISPSoft

Through EIP Builder, an AS Series PLC (when acting as a scanner) can create an EtherNet/IP connection to AS00SCM-A when AS-FEN02 is installed (AS00SCM-A + AS-FEN02 = ASRTU). Below shows an example of AS Series PLC acting as a scanner to create an EIP connection via ISPSoft V3.13. It is suggested to use ISPSoft V3.13 or later or you can use EIP Builder to set up. Refer to section 9.6.4 for more information on Remote IO Applications (AS-FEN02).

- 1. Connect your AS PLC CPU, ASRTU and computer through EtherNet/IP. Set up the IP addresses for AS PLC CPU and ASRTU and make sure they are in the same network.
- 2. Open Project: Open HWCONFIG through ISPSoft and click AS PLC CPU to see the EtherNet/IP setting option. Click it to open the setting page.

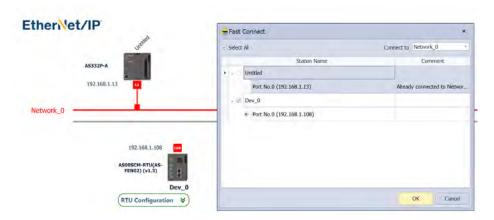


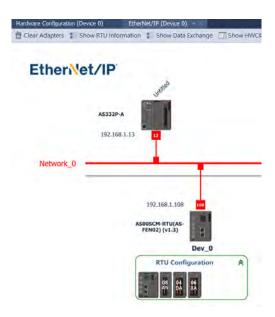
3. Scan the network to add ASRTU in EIP Builder.



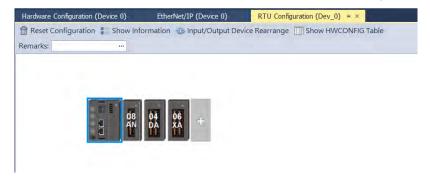
9-36

4. Establish a connection: Right-click anywhere on the blank area to see the Fast Connect option and then click it to open the setting page. Click OK to connect. When ASRTU is connected to AS PLC CPU, its right side IO modules are also connected.



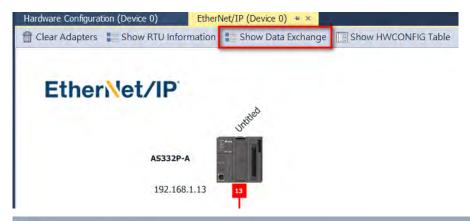


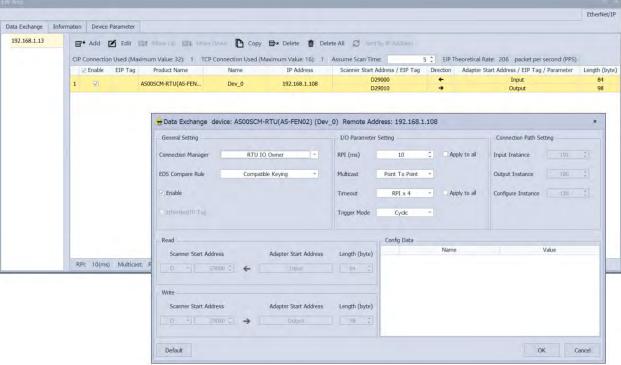
5. Set up module: Go back to HWCONFIG and Click ASRTU to see the RTU Configuration (Dev_0) option and then click it to open the setting page for the right-side modules, ASRTU and the handlings after the connection lost. Refer to section 9.4.3 for more information on Remote Module Setting.



6. Data Exchange: Go to EtherNet/IP setting page and click Show Data Exchange option to see the setting page.

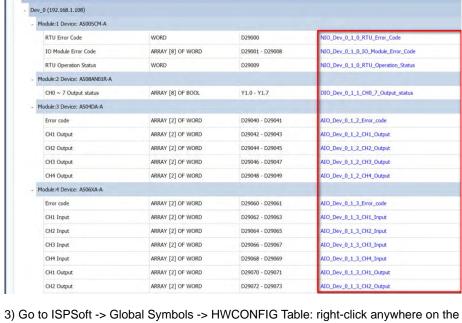






- 7. Download: Use the function button **Download** under the **Communication** tab in EtherNet/IP setting page to download the EtherNet/IP parameters. Make sure you are in the setting page of EtherNet/IP.
- Check the connection: Click the function button On-line Mode under the Communication tab in EtherNet/IP setting to check the EtherNet/IP connection status.
- HWCONFIG Table Synchronization: After setting is complete, you can synchronize the devices used by ASRTU with ISPSoft.
 - 1) Open HWCONfIG Table.
 - 2) You can edit the identifier one by one or click **Set All Identifiers** to set all identifiers at one time.





Device 0 (AS332P-A) HWCONFIG Table =

Clear All Identifiers
Description

Hardware Configuration
+ CPU Group
EtherNet/IP

3) Go to ISPSoft -> Global Symbols -> HWCONFIG Table: right-click anywhere on the blank area to see and click the option **Synchronize with HWCONFIG**. After the synchronization is complete, ASRTU devices are shown in array and available to be used in PLC program.

9.4.2.4 Parameters Used in Data Exchange

You can use parameters including RPI and Timeout to ensure a stabilized communication.

- RPI (Requested Packet Interval): The value here is to set how often to renew the data between the Scanner and Adapter cyclically and thus increase the value here can lower the risk of EtherNet/IP Scanner network overload. Whenever a connection lost error occurs, you can edit the setting here to troubleshoot.
- Timeout: Set the timeout time according to the RPI or the multiple of RPI (RPI*X). This is used to determine if the connection between the scanner/adapter and the remote device is lost. Increase the value here can longer the waiting time for the remote device to respond. It is useful when the remote device is busy. But by increasing the value here can NOT solve the problem of network overload.



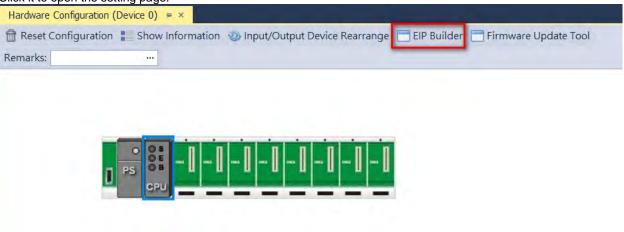
9-39



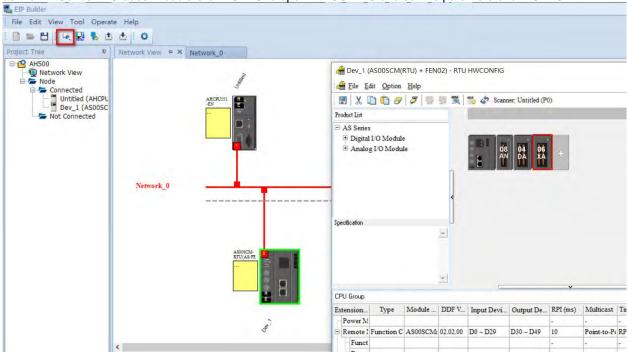
9.4.2.5 Connecting to Delta AH PLC Scanner through ISPSoft

Through EIP Builder, an AH Series PLC (when acting as a scanner) can create an EtherNet/IP connection to AS00SCM-A when AS-FEN02 is installed (AS00SCM-A + AS-FEN02 = ASRTU). Below shows an example of AH Series PLC acting as a scanner to create an EIP connection via ISPSoft V3.13. It is suggested to use ISPSoft V3.13 or later or you can use EIP Builder to set up. Refer to section 9.6.4 for more information on Remote IO Applications (AS-FEN02).

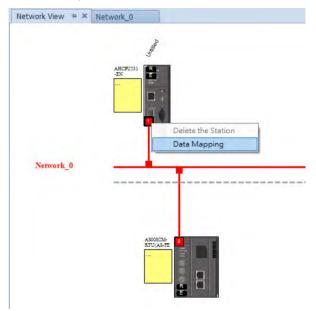
- 1. Connect your AH PLC CPU, ASRTU and computer through EtherNet/IP. Set up the IP addresses for AH PLC CPU and ASRTU and make sure they are in the same network.
- Open Project: Open HWCONFIG through ISPSoft and click AH PLC CPU to see the EtherNet/IP setting option. Click it to open the setting page.



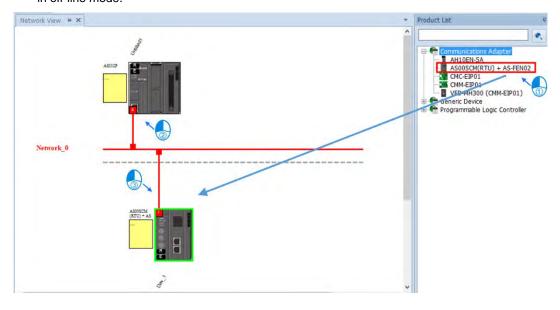
3. Scan the network to add ASRTU in EIP Builder. Drag the red block and drag it to the same network (Network_0) as the AH Series PLC does. Double-click ASRTU to open HWCONFIG and set the parameters for ASRTU.



4. Data Mapping

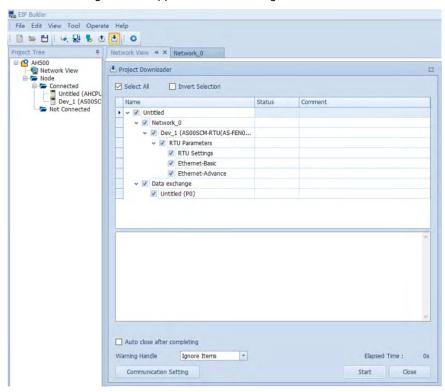


5. You can drag and drop ASRTU from the Product List on the right to add it into the Network View even when it is in off-line mode.





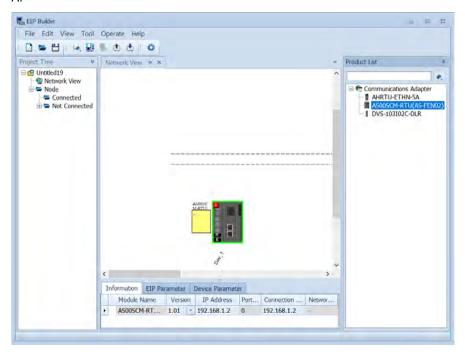
- 6. After the settings are complete, click the **Downloader** icon and then select the parameters that you'd like to download. Parameters include:
- RTU parameters: all the parameters set in RTU-HWCONFIG in the previous step
- Data Exchange: data mapped from the RTU right-side modules of AS00SCM-A to the PLC

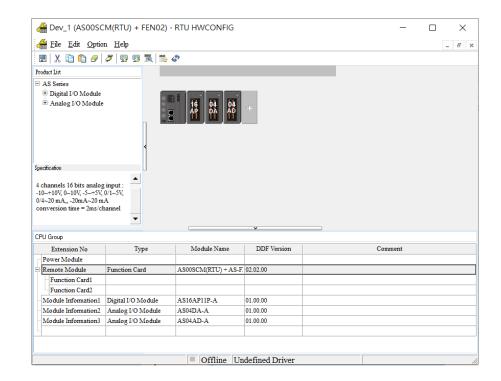


9.4.2.6 Connecting to 3rd Party PLC Scanner through EIP Builder

Through EIP Builder, a 3rd party PLC (when acting as a scanner) can create an EtherNet/IP connection to AS00SCM-A (when AS-FEN02 is installed). Use the 3rd party PLC to connect to the computer and open EIP Builder to edit the right side modules of AS00SCM-A.

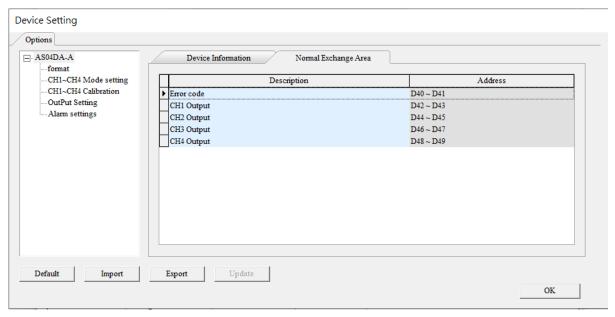
- Editing via EIP Builder:
- You can manually or scan the network to add the AS00SCM (RTU) + AS-FEN02 to the network. Click the remote
 module to open RTU-HWCONFIG to scan and download the parameters of the right side modules of AS00SCMA.







Write down the information in Normal Exchange Area. This is the working order for the 3rd party device to perform the data exchange. Use AS04DA-A as an example, the first input value is the error code. (all of the module error codes are the input values; the exchange direction is from remote module inputs to scanner) the 1st value is the value in channel 1; the 2nd value is the value in channel 2 and so forth. The unit is the length of 2 words.



- Before you begin, you need to go to www.deltaww.com to download EDS file.
 - 1. Use EDS Hardware Installation Tool to install the EDS file of ASCPU (AS-FEN02).
 - Right-click Ethernet to see the context menu and click New Module to add a new device in. After that, you
 can set up the parameters, including instance for input and output, data length and more. For AS-FEN02
 with firmware V1.03 or later, you can open the ASRTU webpage to check the data.



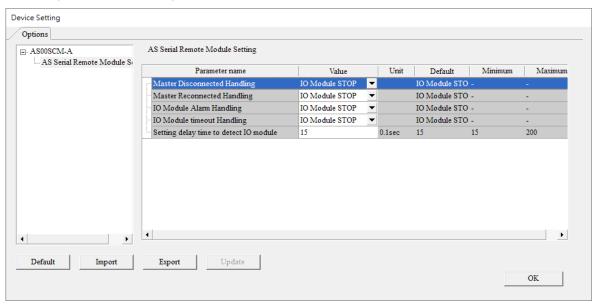
3. After the setting is complete, you can use the module data according to the offset values shown in the webpage. Input data 0-29 and output data 0-19 are the parameters of AS00SCM-A. Refer to the Normal Data Exchange area from RTU-HWCONFIG for more corresponding data information.

9.4.2.7 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.

9.4.3 Remote Module Setting

- 1. Double-click AS00SCM-A -> AS remote module in Device Setting and click **AS Serial Remote Module**. To set up the remote module in RTU mode, set the function card type 2 to AS-FCOPM, AS-FEN02 or AS-FPFN02.
- 2. For AS00SCM-A with firmware V2.04 or previous versions, parameter-downloading for ASRTU is connection lost. If the handling of lost connection is all the I/O modules stop running (default), you need to turn the power off and then on again after downloading is complete.



For the following four situations, you can either stop I/O module (all I/O modules stop running) or keep I/O module running (all I/O modules keep the same state).

- 1) When a Scanner (Master) connection is lost
 - I/O modules stop running: all I/O modules stop running
 - I/O modules keep the same state: all modules keep running
- 2) When a Scanner has reconnected after the connection lost
 - I/O modules stop running: all I/O modules stop running
 - I/O modules keep the same state: all modules keep running
- 3) When an alarm occurs in an I/O module
 - I/O modules stop running: all I/O modules stop running (after resupply power to resume running)
 - I/O modules keep the same state: all modules keep running
- 4) When an I/O connection is lost
 - I/O modules stop running: all I/O modules stop running (after resupply power to resume running)
 - I/O modules keep the same state: all modules keep running

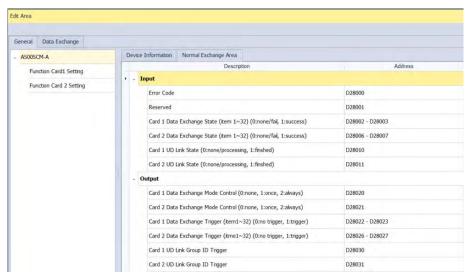


| Procedure | Settings (RTU) | Digital & Analog Input Modules | | | put Module e Settings) |
|--------------------------------------|------------------------------------|---|---|-------------------------------------|-------------------------------|
| | input modules | | Modules | Clear | Keep |
| Master connection | I/O module stops running | Cannot update data on the master | Output value = 0 | Output value = 0 | No change to the output value |
| lost | I/O module keeps the same state | | No chan | ge to the output | /alue |
| Master has reconnected after | I/O module stops running | Keep updating data on the master | Output value = 0 | Output value = 0 | No change to the output value |
| connection lost. | I/O module keeps the same state | | Output value = output value of the master | | the master |
| Alarm in I/O | I/O module stops running | No change to the output value | Output value = 0 | Output value = 0 | No change to the output value |
| (Ex. module is broken) | I/O module keeps the same state | Other functional modules: keep updating data on the master | | functional modul output value of | |
| I/O connection | I/O module stops running | No change to the output value | Output value = 0 | Output value = 0 | No change to the output value |
| lost (Ex. unstable connection) | I/O module keeps the same state | Other functional modules: keep updating data on the master | | functional modul output value of | |

- Module configurations: refer to Section 9.1.2 in the AS Series Operation Manual.
- Module setups: refer to other chapters in the AS Series Module Manual.

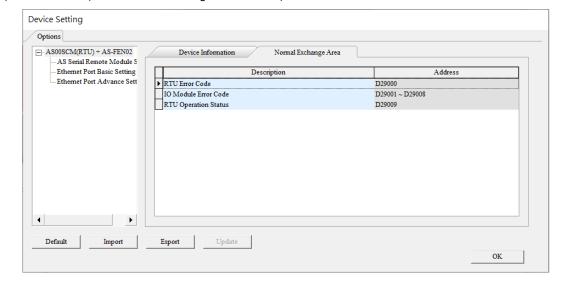
9.5 Normal Exchange Area

1) COM mode



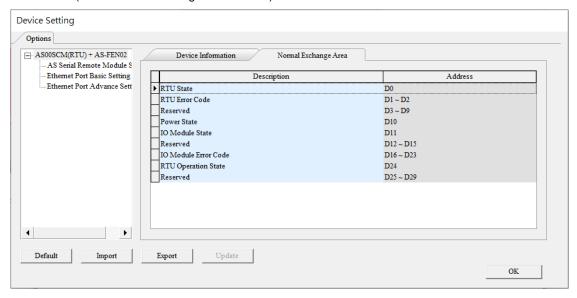
The examples above shows that AS00SCM-A is installed as the first module on the right side of AS PLC CPU; note that the Normal Exchange Area shows the corresponding data registers of the module and the PLC.

- Module Status: 0 = stop, 1 = run
- Error Code: refer to Section 9.7 for more information.
- Card 1 & Card 2 Data Exchange State: occupies 4 data registers (32-bit data); each bit 1–32 represents the state of the corresponding data point 1–32 to be exchanged: 0 = none/fail, 1 = success.
- Card 1 & Card 2 Data Exchange Mode Control: set the data register to 0: none, 1: once, 2: always.
- Card 1 & Card 2 Data Exchange Trigger: occupies 4 data registers; each bit 1–32 represents the state of the corresponding data point 1–32 to be exchanged: 0 = no trigger, 1 = trigger.
- Card 1 & Card 2 UD Link Group ID Trigger: set the group ID to be triggered.
- 2) RTU Mode: (AS Series PLC acting as a Scanner)





- RTU Error Code: refer to Section 9.7 for more information.
- I/O Module Error Code: refer to the I/O module manual for more information.
- RTU Operation Status: 0 = communication module stop, 1 = communication module run
- 3) RTU Mode: (AH Series PLC acting as a Scanner)



- RTU State: 0 = communication module is working fine, 1 = communication module is NOT working fine.
- RTU Error Code: refer to Section 9.7 for more information.
- Power State: 0 = power error, 1 = power normal
- I/O Module State: each I/O module uses 1 bit to show its status (0 = normal, 1 = not running normally)
- I/O Module Error Code: refer to the I/O module manual for more information.
- RTU Operation State: 0 = communication module stop, 1 = communication module run

9.6 Application

9.6.1 Modbus

This section introduces how to use the Modbus protocol to connect the AS00SCM-A to other Delta industrial products such as human-machine interfaces, temperature controllers, programmable logic controllers, AC motor drives, and servo motors.

9.6.1.1 Modbus Slave - Connection to Delta Products

The following table shows the slave station supports the following function codes and their corresponding addresses.

| Function Code | Attribute | Addresses Supported |
|---------------|-----------|---------------------|
| | | 16#0000–16#0063 |
| 0x03 | | 16#0100–16#0163 |
| 0x04 | Read | 16#0200–16#0263 |
| | | 16#0300–16#0363 |
| 0x06 | 147.5 | 16#0000–16#0063 |
| 0x10 | Write | 16#0200–16#0263 |
| | | 16#0000–16#0063 |
| | . | 16#0100–16#0163 |
| | Read | 16#0200–16#0263 |
| 0x17 | | 16#0300–16#0363 |
| | | 16#0000–16#0063 |
| | Write | 16#0200–16#0263 |

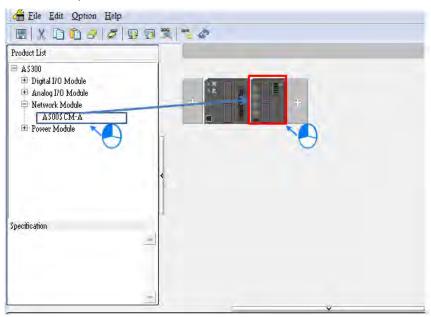
The structures:

Example of a slave structure: HMI (master station) → AS-F485 + AS00SCM-A COM1 (slave station)

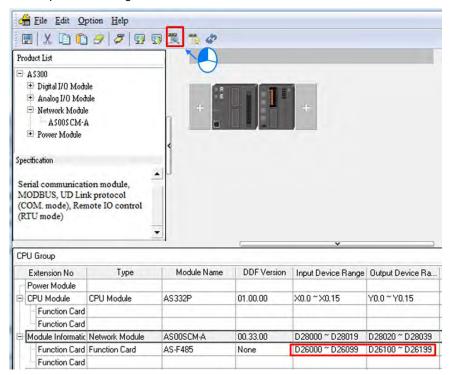
| Product | Slave ID | Communication protocol | Device from which data is read | Register in the CPU module | Device into which data is written | Register in the CPU module |
|---------|-------------|------------------------|--------------------------------|----------------------------------|---|----------------------------------|
| HMI | 5 | 9600, RTU, 8, E, 1 | 16#0100 | D26100 | 16#0000 | D26000 |

If the AS00SCM-A functions as a Modbus slave, you need to set a slave ID and baud rate.

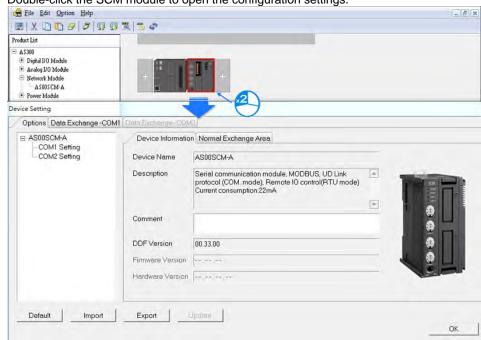
1) Drag to add AS00SCM-A in the system configuration area. Make sure the knob of AS00SCM-A is turned to COM mode and no power connected to it.



2) Click the I/O Scan button to make the system read the module's current configuration. The PLC assigns the input and output device ranges.

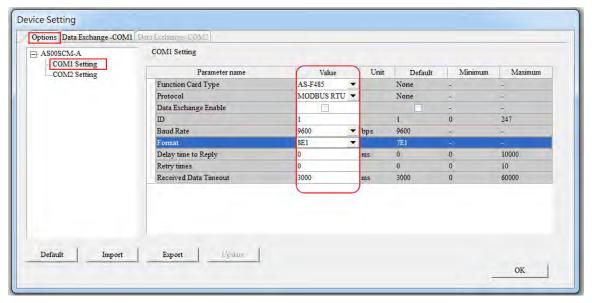


| Function card | Device from which data is read | Register in the CPU module | Device into which data is written | Register in the CPU module |
|-----------------|--------------------------------|----------------------------|-----------------------------------|----------------------------|
| Function card 1 | 16#0000 | D26000 | 16#0100 | D26100 |
| Function card 2 | 16#0200 | D26200 | 16#0300 | D26300 |



3) Double-click the SCM module to open the configuration settings.

4) Set the communication protocol values for COM1 using the HMI settings.



5) Click the Download button to download the parameters to the AS00SCM-A.



NOTE: Double-click the module to open the Device Setting dialog box to configure the parameters.



9.6.1.2 Modbus Master - Connection to Delta Products

This section introduces how to use COM2 to connect the AS00SCM-A to other Delta industrial products such as programmable logic controllers, AC motor drives, and servo motors.

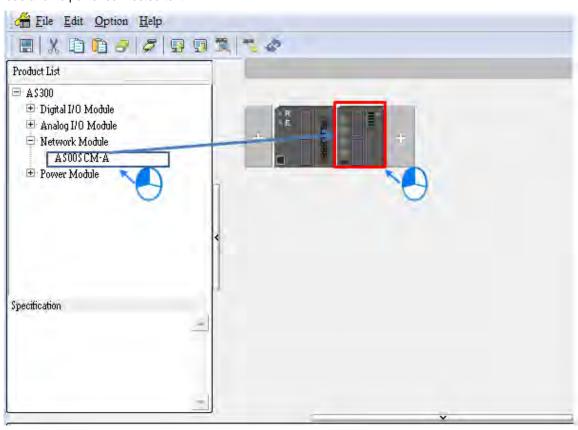
The structures:

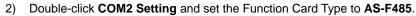
Example of a master structure: AS-F485 + AS00SCM-A COM2 (master station) → VFD, ASDA, and DVP series PLC

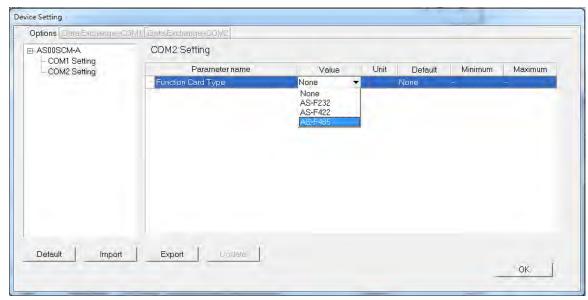
| Product | Slave ID | Communication protocol | Device from which data is read | Register in the CPU module | Device into which data is written | Register in the CPU module |
|---------|-------------|------------------------|--------------------------------|----------------------------------|---|----------------------------|
| VFD | 10 | 38400, ASCII, 7, E, 1 | 16#2103 | 16#2103 D26200 | 16#2000 16#2001 | D26300- D26301 |
| ASDA | 11 | 38400, ASCII, 7, E, 1 | 16#0101 | D26210 | 16#0101 | D26310 |
| PLC | 12 | 38400, ASCII, 7, E, 1 | D100-D109 | D26220- D26229 | D200-D204 | D26320- D26324 |

If the AS00SCM-A is functioning as a Modbus master, you need to set a slave ID and baud rate.

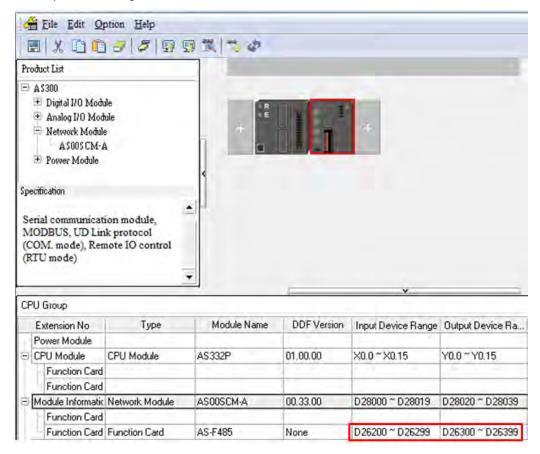
1) Drag to add AS00SCM-A in the system configuration area. Make sure the knob of AS00SCM-A is turned to COM mode and no power connected to it.





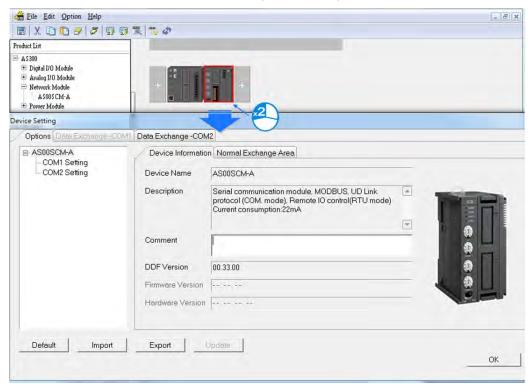


3) Click the I/O Scan button to make the system read the module's current configuration. The PLC assigns the input and output device ranges.

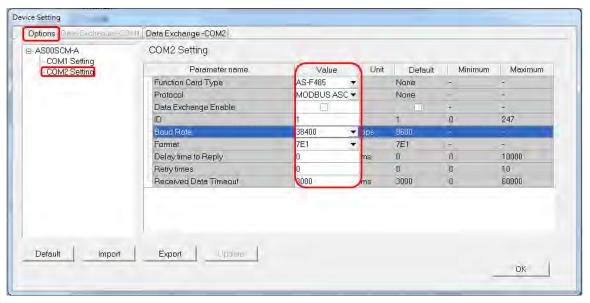




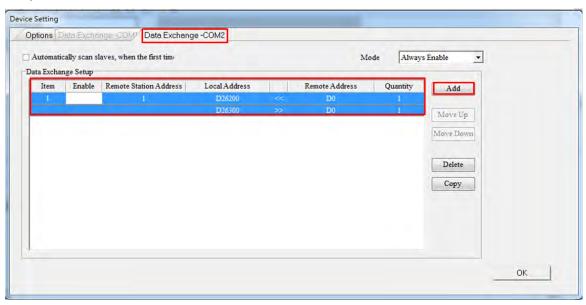
4) Double-click the SCM module to open the configuration settings.



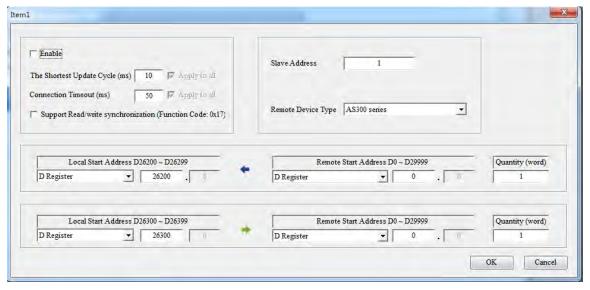
5) Set the communication protocol values for COM2:



6) Set up the data exchange table: select **Data Exchange – COM2** and click **Add** to create a new Data Exchange Setup table.

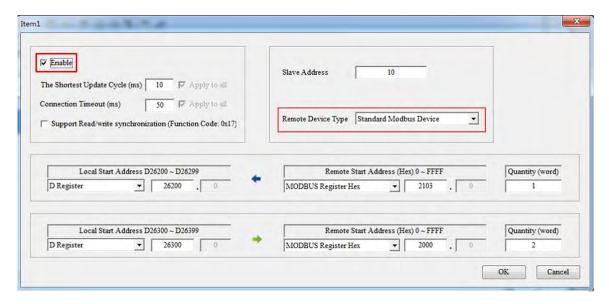


7) In the Data Exchange Setup table double-click an item to edit its settings.



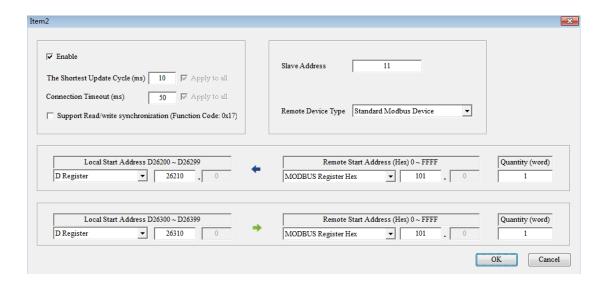
• Select **Standard Modbus Device** as the **Remote Device Type**, enter the parameters, and check **Enable**.

| Product | Slave ID | Communication protocol | Device from which data is read | Register in the CPU module | Device into which data is written | Register in the CPU module |
|---------|-------------|------------------------|--------------------------------|----------------------------------|---|----------------------------|
| VFD | 10 | 38400, ASCII, 7, E, 1 | 16#2103 | D26200 | 16#2000 16#2001 | D26300- D26301 |



 Select Standard Modbus Device as the Remote Device Type, enter the ASDA parameters, and check Enable.

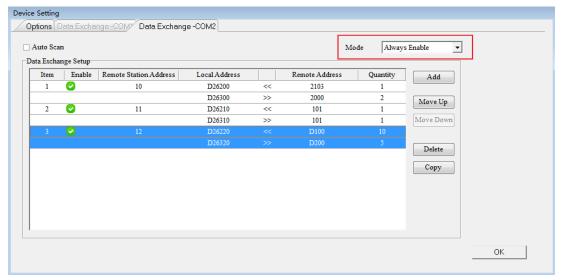
| Product | Slave ID | Communication protocol | Device from which data is read | Register in the CPU module | Device into which data is written | Register in the CPU module |
|---------|-------------|------------------------|--------------------------------|----------------------------------|---|----------------------------------|
| ASDA | 11 | 38400, ASCII, 7, E, 1 | 16#0101 | D26210 | 16#0101 | D26310 |



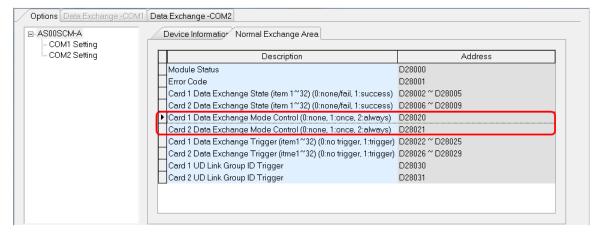
Select PLC devices as the Remote Device Type, enter the PLC parameters, and check Enable.

| Product | Slave ID | Communication protocol | Device from which data is read | Register in the CPU module | Device into which data is written | Register in the CPU module |
|---------|-------------|------------------------|--------------------------------|----------------------------------|---|----------------------------------|
| PLC | 12 | 38400, ASCII, 7, E, 1 | D100-D109 | D26220- D26229 | D200-D204 | D26320- D26324 |

8) Select Always Enable in the Mode.

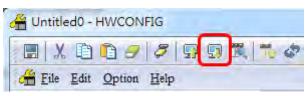


NOTE: If the Data Exchange Mode Control is set by the program, you can check and control the register address on the Normal Exchange Area page. The following example shows when writing "2: always" to D28021, it indicates Card 2 is always the one to perform data mapping.



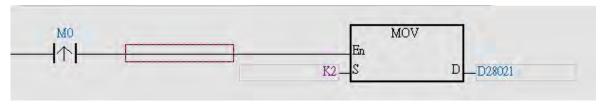


9) Download the parameters to the AS00SCM-A.



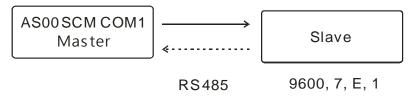
If you set Mode to Always Enable, the data exchange begins immediately after downloading the parameters.

If you set Mode to Program Control, the program starts the data exchange after downloading the parameters.



9.6.2 UD Link

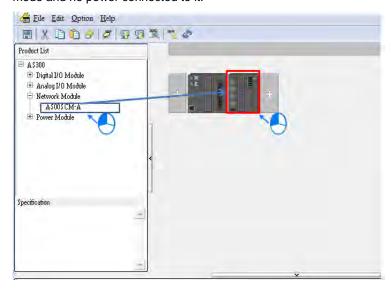
This section introduces how to use a non-Modbus RS485 communication port on the AS00SCM-A to connect to other industrial products.



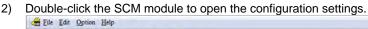
Communication with a slave

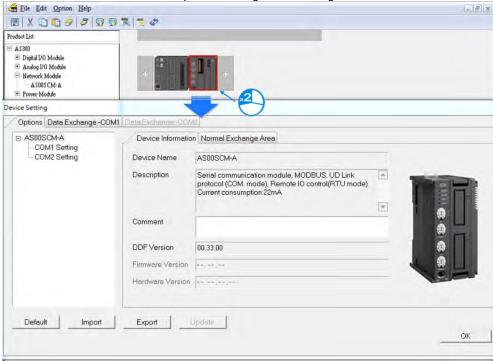
| Packet to Send (→) | Packet to Receive (←) | Description | | |
|-----------------------|--------------------------|-------------------------------------|--|--|
| POS, xxx, yyy | POS, ACT | xxx and yyy are coordinates (0–999) | | |

1) Drag to add AS00SCM-A in the system configuration area. Make sure the knob of AS00SCM-A is turned to COM mode and no power connected to it.

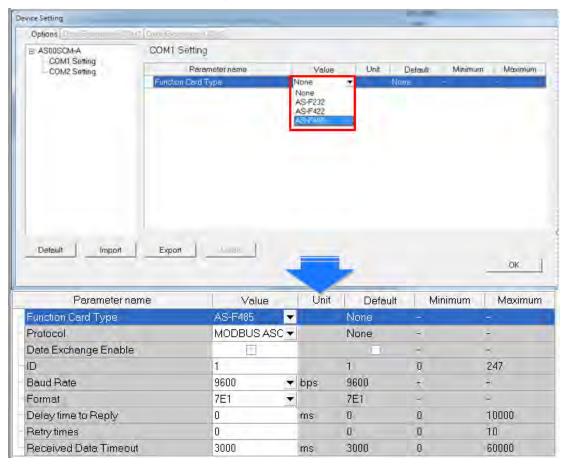








Select AS-F485 as the Function Card Type for COM1.

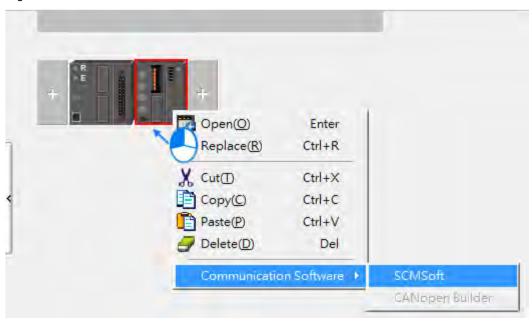


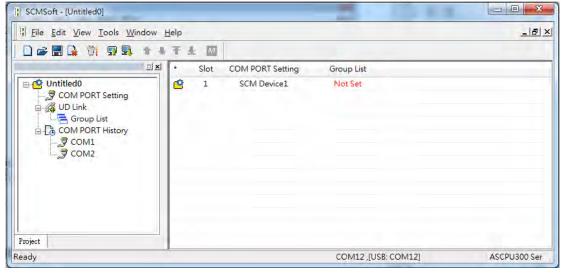


4) Select UD Link as the Protocol, set the Baud Rate and Format, and click OK.

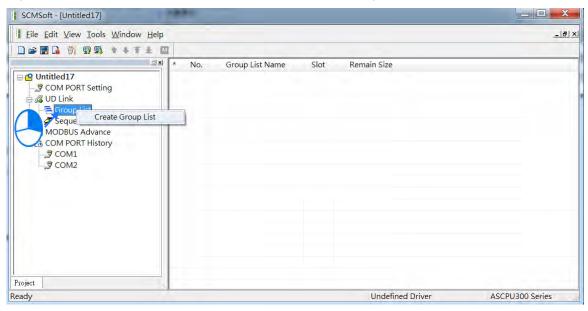
| Parameter name | Value | Unit | Default | Minimum | Maximum |
|--------------------|---------|--------------|---------|---------|---------|
| Function Card Type | AS-F485 | ▼ | None | - | - |
| - Protocol | UD LINK | ▼ | None | | |
| Baud Rate | 9600 | ▼ bps | 9600 | - | - |
| Format | 7E1 | ▼ | 7E1 | - | - |

5) Right-click the AS00SCM-A and click Communication Software and then click SCMSoft.

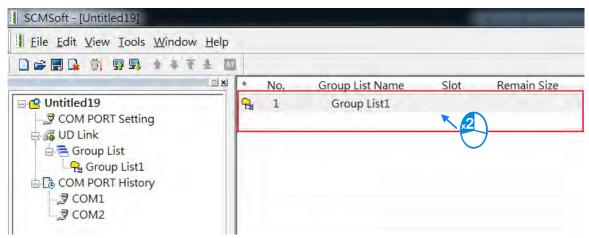




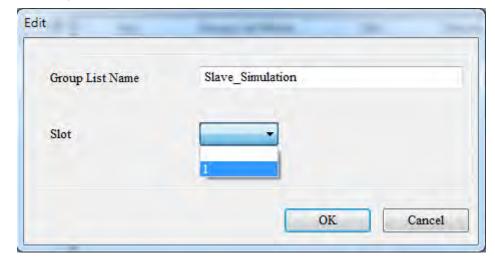
6) Right-click Group List and then click Create Group List to create a group list.



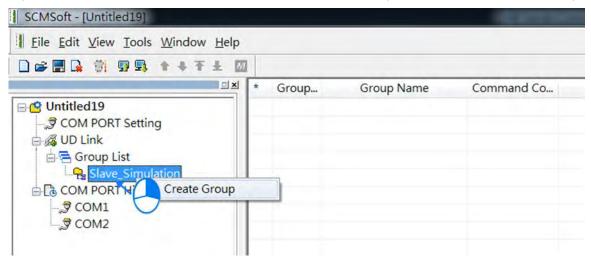
7) You can find a created Group List1. Double-click it to open an editing window to edit the Group List Name and the Slot.



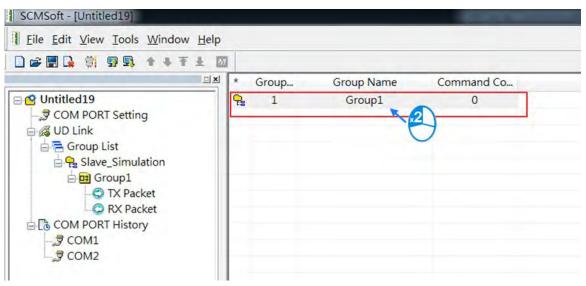
Give the group list a Name (this example uses "Slave_Simulation") and select 1 (COM1) as the Slot number.



8) Right-click Slave_Simulation and click Create Group List to create a group list for the Slave_Simulation group.



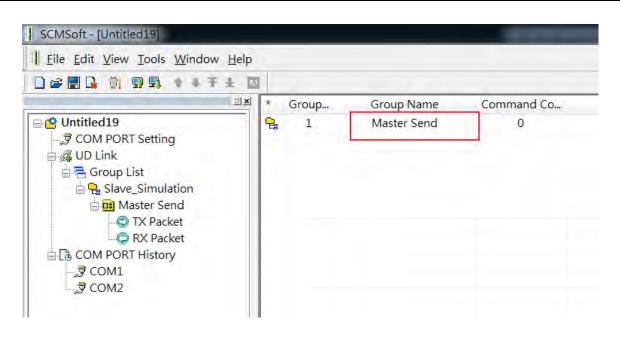
9) You can find a created Group List1. Double-click it to open an editing window to edit the Group List Name and the Slot.



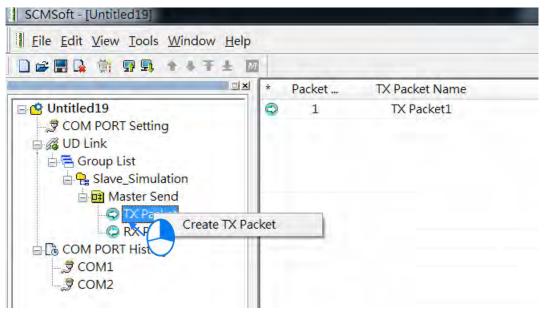
Create a group and name it "Master Send".







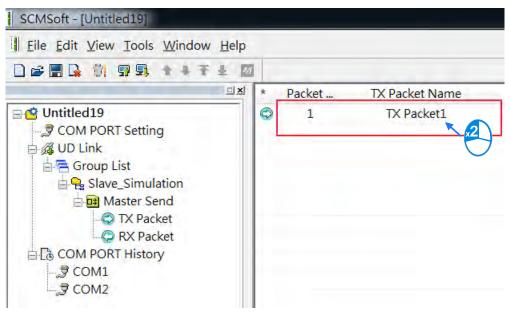
10) Right-click TX Packet and click TX Packet to create a TX Packet1.







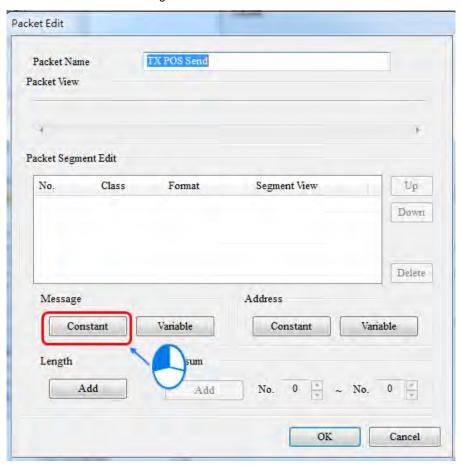
11) Double-click TX Packet1 to open the Packet Edit form.



12) Give the Packet a Name (This example uses "TX POS Send")



- 13) Edit the TX packet, "POS, xxx, yyy" (The example below uses POS, 123, 123)
- 14) Click Constant in the Message area.

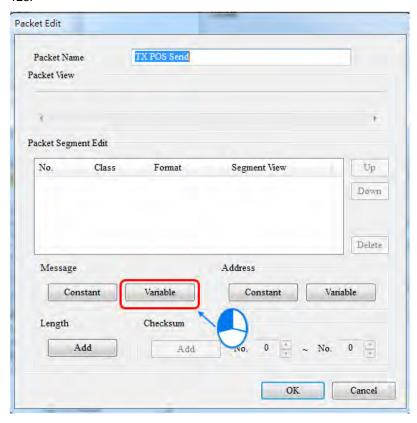


Enter "POS" in the Value area. Click **OK** and verify the packet contents in the Packet View.





15) [xxx] is a variable, so click **Variable** in the Message area to edit it. Use ISPSoft to get the value from data registers D26100–D26101. The example below uses D26100: 16#3132 and D26101: 16#3300 and the value is 123.



16) Enter the data register that contains the value you want to find. The example below uses D26100 and the value returned is 3. Use ISPSoft to get the value from data registers D26100–D26199.

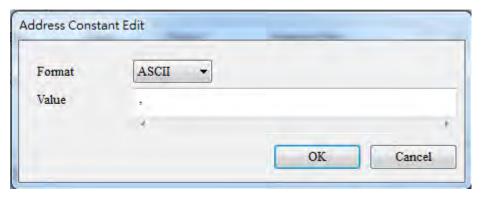
| Format | Nu | 11 🔻 | | | |
|--------------------------------------|------|------------|----|--------|--|
| Variable Value (R(D Register [26100] | | 00]), 3) | 3) | | |
| | (| Variable | | Length | |
| Reverse | | | | | |
| Variable Propert | y | | | | |
| Function | | Read R() | * | | |
| Mapping Regi | ster | D Register | | 26100 | |
| Length Property | , | | | | |
| Function | | Constant | | | |
| Mapping Regi | ster | D Register | - | 0 | |
| Constant | | 3 | | | |

Click OK and verify the values ("POS,"+ (R (D Register [26100], 3)) in the Packet View.

```
Packet View

"POS," + (R(D Register [26100]), 3)
```

17) [·]: Use Address Constant to enter this Value and set the Format to ASCII.

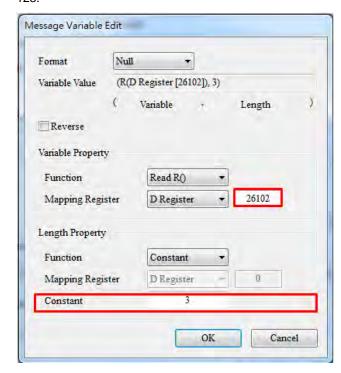


Click OK and verify the values ("POS,"+ (R (D Register [26100], 3)) in the Packet View.

```
Packet View

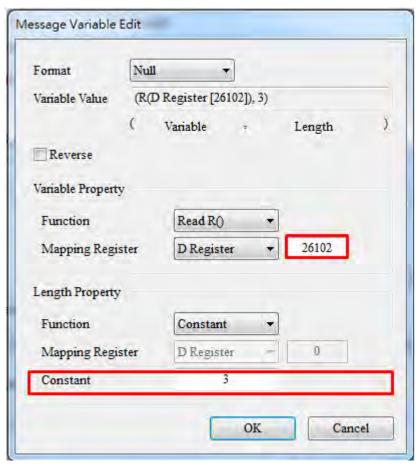
"POS," + (R(D Register [26100]), 3) + ","
```

18) [yyy] is a variable, so click **Variable** in the Message area to edit it. Use ISPSoft to get the value from data registers D26102–D26103. The example below uses D26102: 16#3132 and D26103: 16#3300 and the value is 123.





19) Enter the data register that contains the value you want to find. The example below uses D26102 and the value returned is 3. Use ISPSoft to get the value from the data registers D26100–D26199.

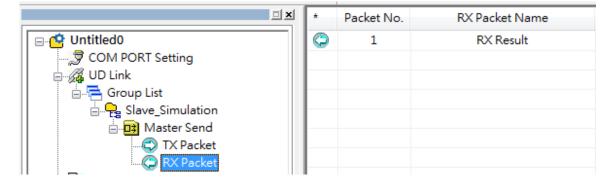


Click **OK** and verify the values ("POS,"+ (R (D Register [26102], 3)) in the Packet View.

```
Packet View

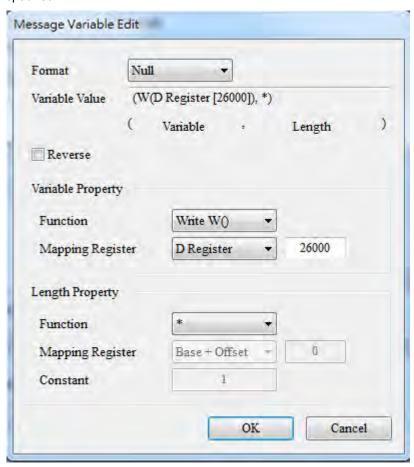
"POS," + (R(D Register [26100]), 3) + "," + (R(D Register [26102]), 3)
```

20) Edit the packet: Create a packet and name it "RX Result". Double-click it to open the editing window.





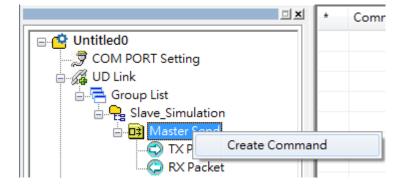
Enter the sending packet into the D26000 register of the AS300 CPU. "*" indicates that the length is not specified.



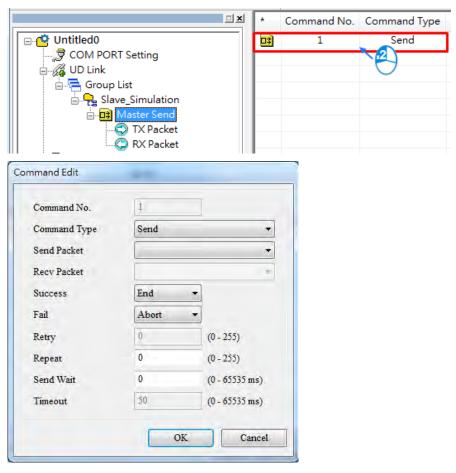
The packet should look like the example below.



21) Create a command: Right-click Master Send and click the Create Command.



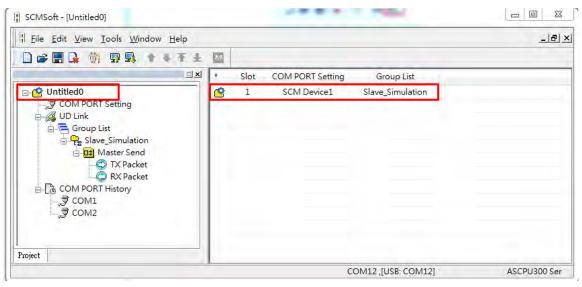
22) Double-click the new command on the list to open the Command Edit window.



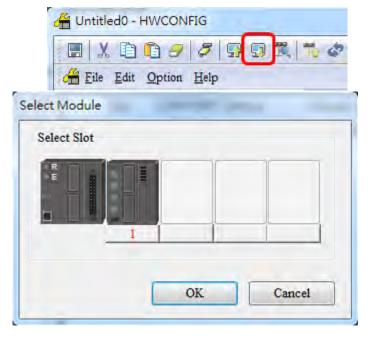
23) Set Send Packet to "TX POS Send" and set Recv Packet (received contents) to "RX Result".



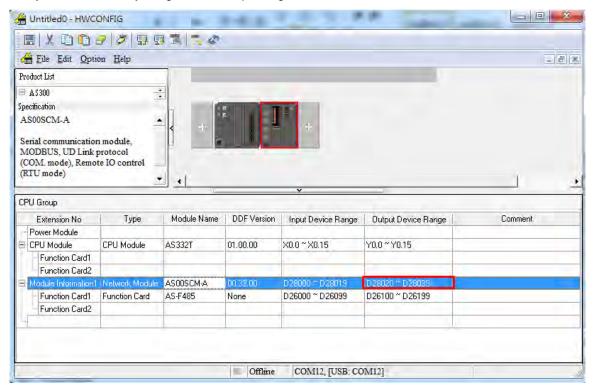
24) Make sure the Group is in slot 1 (COM1).



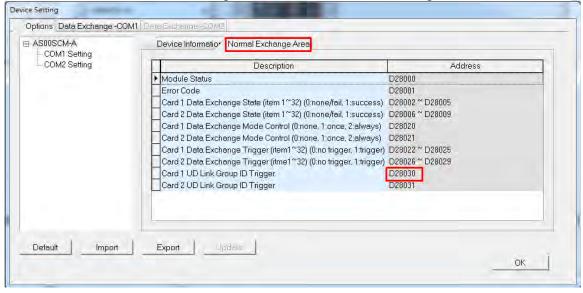
25) Click the Download button to download the parameters to the AS00SCM.



26) Set up the devices for the UD Link Group ID Trigger in HWCONFIG. Once you create the AS00SCM-A module, the system automatically assigns the corresponding addresses.

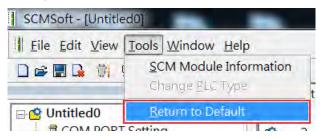


27) Double-click AS00SCM-A to open the Device Setting page. Verify that the Card 1 UD Link Group ID Trigger is set to D28030. Use ISPSoft to enter 1 into register D28030 to start the data exchange.



| D26100 | | | 12 | 123* | 0.000 | ASCII | ~ |
|--------|--------|----|----|------|-------------------|-------|---|
| D26101 | | | 3* | 3*12 | 0.000 | ASCII | • |
| D26102 | Send | 1 | 12 | 123* | 0.000 | ASCII | • |
| D26103 | | | 3* | 3*** | 0.000 | ASCII | • |
| D26000 | | | PO | POS, | 740081729536.000 | ASCII | • |
| D26001 | Recei | 10 | S, | S,AC | 12.207 | ASCII | • |
| D26002 | Receiv | ve | AC | ACT* | 2203402895360,000 | ASCII | • |
| D26003 | | | T* | T*** | 0.000 | ASCII | • |

- 29) In SCMSoft, right-click the item COM PORT History on the left and click the option "Upload COM History Data" to see the transmission history of COM1 and COM2 respectively. Under the item COM1 and COM2, you can view recent transmission history; however the shown recent history cannot be deleted or saved.
- 30) Select *Tools -> Return to Default* to clear the previous settings and have all the settings back to defaults. After this, turn the power off and on again.

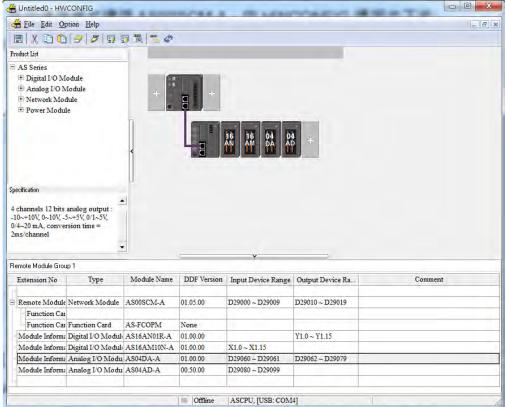


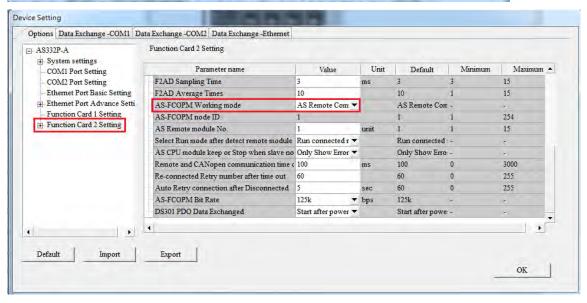
9.6.3 Remote IO Application (AS-FCOPM)

This example shows other series PLC, AH10COPM-5A, as a CANopen Master that controls four IO modules on the right side of AS00SCM-A that acts as a CANopen Slave. (You can use this method to connect to a 3rd party PLC.)

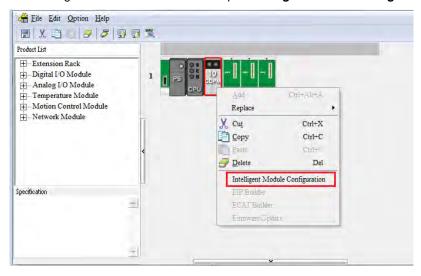
| Device | Function |
|---------------------------|---|
| AS300 | Scan and download AS00SCM-A (RTU mode), |
| A3300 | right side module configurations |
| AS00SCM-A + AS-FCOPM | CANopen Slave |
| AHCPU530-EN + AH10COPM-5A | CANopen Master |
| AS16AN10R-A | 16 Digital outputs |
| AS16AM01N-A | 16 Digital inputs |
| AS04DA-A | 4 Analog channels for output |
| AS04AD-A | 4 Analog channels for input |

Use AS300 to connect to AS00SCM-A through AS Remote Communication (RTU mode) and then use HWCONFIG to scan and download the parameters. If the Card 2 LED is blinking normally, with no error messages, and no need to download the PLC programs, the device power can be turned off. Refer to Section 9.4.1.1 for reference.





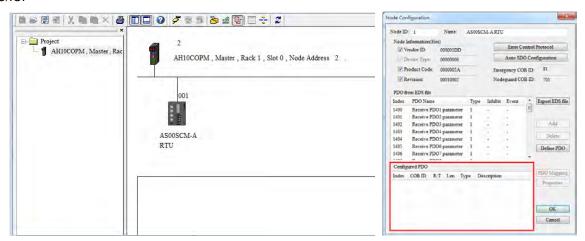
Turn the Format 1 of AS00SCM-A to 4 (using CANopen DS301 mode) and turn Format 2 to 7 (setting the bit rate to 1000kbps) and then turn the power off and on again. After that wiring AH10COPM-5A and set the node ID to 2 and set the bit rate to 1000kbps. Use ISPSoft (V3.04 or later) and HWCONFIG to scan and download the parameters to AH500. Right click AH10COPM-5A and open **Intelligent Module Configuration** (CANopen Builder) from the menu.



Step 3

Use CANopen Builder to scan the network. You should find Node ID 1 and its name to be AS00SCM-A RTU.

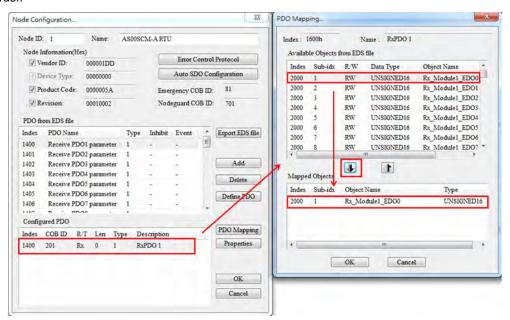
If not, check if you follow the first two steps right. And repeat the previous steps. Recommended to set the value in cycle period to 50 ms to ensure a more complete module functions. Double click the module to open the **Node**Configuration window and set up the PDO manually. RPDO is for DO/AO and TPDO is for DI/AI and error codes of RTU/IO.



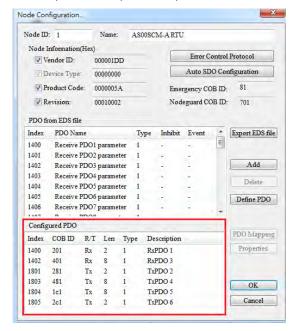


Here uses a first right side digital output module (16 points) as an example.

- Since it is the first one, here it corresponds to Receive PDO1 (index: 1400), indicating RTU receives data from Master through CANopen communication. (If this is an input module, it sends data to Master through CANopen communication.) Double click to add it in the table. Double click the table to open the PDO setting window.
- Since it is the first one, here it corresponds to Rx_Module 1. It is a 16-point digital output module so that only the object of one word Rx_Module1_EDO0 (Index: 2000) should be selected. Click the arrow to add it into the data mapping parameter table and you have set up a PDO for the first module. If t is a 32-point digital output module, objects of 2 words Rx_Module1_EDO0 and Rx_Module1_EDO1 should be selected in numerical order.



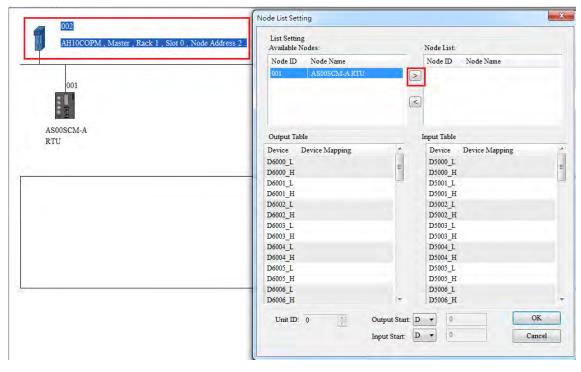
3. Follow the previous steps to set up more modules.



| Device | Function | PDO | PDO Mapping | Mapping Registers |
|-------------------------|--|--------|---|----------------------------------|
| AS16AN01R-A | 16 digital outputs | RxPDO1 | Rx_Module1_EDO0 | D6000 |
| AS16AM01N-A | 16 digital inputs | TxPDO2 | Tx_Module2_EDI0 | D5000 |
| AS04DA-A | 4 Analog channels for output (Integer format)* | RxPDO3 | Rx_Module3_EDO0 Rx_Module3_EDO1 Rx_Module3_EDO2 Rx_Module3_EDO3 | D6001 D6002 D6003 D6004 |
| AS04AD-A | 4 Analog channels for input (Integer format)* | TxPDO4 | Tx_Module4_EDI0 Tx_Module4_EDI1 Tx_Module4_EDI2 Tx_Module4_EDI3 | D5001 D5002 D5003 D5004 |
| IO Module Error Code | - | TxPDO5 | Tx_Module1_error_code Tx_Module2_error_code Tx_Module3_error_code Tx_Module4_error_code | D5005 D5006 D5007 D5008 |
| RTU Error Code | - | TxPDO6 | Tx_RTU_error_code | D5009 |

^{*} Here the analog module uses integer format; if you need to use floating point format, two PDOs will be used per channel.

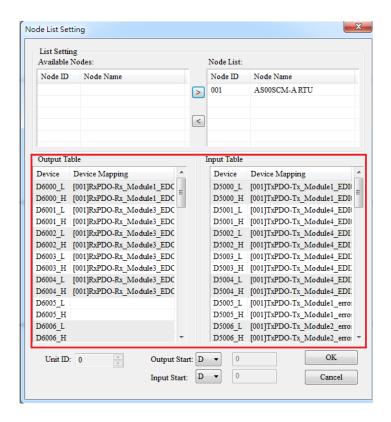
Double click the PLC icon and select Node ID 001 from the available nodes and then use the **Right** arrow to add the selected one into the Node List. Output and Input tables are mapping registers for PDOs.



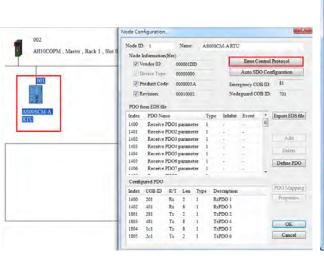


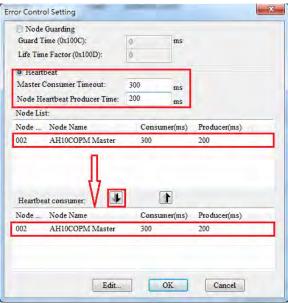
^{*} Index 2002 to Index 200d are for system internal use only. Avoid using this range, when PDO is used.

^{*} Only synchronization cycle is supported.



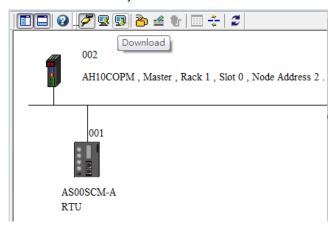
Double click the module icon and the **Node Configuration** window appears. Click **Error Control Protocol** and then Error Control Setting windows appears. Select **Heartbeat** and set values for the **Master Consumer Timeout** and **Node Heartbeat Producer Timer**. Select AH10COPM Master from the Node List and click the **Down** arrow to add it to the list of Heart Consumer and then disconnection detection is now available for AS00SCM-A (RTU mode).





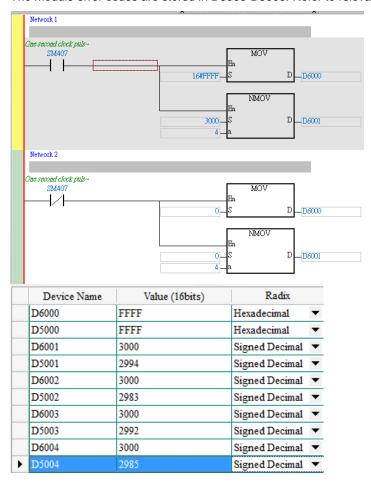
9

Click OK to confirm the setting. Download the parameters to the PLC. And then PLC can control the input/output of the IO module remotely.



An example of using PLC to control the input/output of the IO module remotely:

Start ISPSoft and download the program from AH series PLC. Switch digital output module between 1 and 0 in every 0.5 seconds; change output values of the analog output module. Wire DI/DO modules to AI/AO modules and then you can see the changes of D6000 from D5000 and D6001-D6004 from D5001-D5004 as the example below shown. The module error codes are stored in D5005-D5009. Refer to relevant module manuals for error code definitions.





9.6.4 Remote IO Application (AS-FEN02) Through EIP Builder

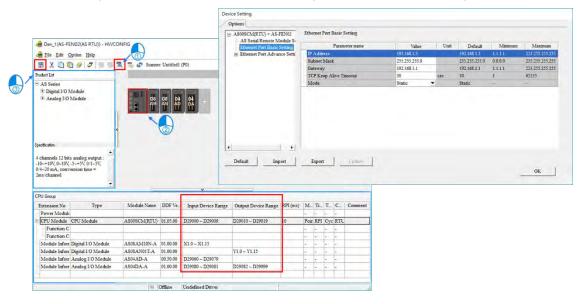
When the firmware is V2.02 or later, AS-FEN02 can be installed on AS00SCM-A (RTU mode) and then PLC can monitor right side IO modules remotely.

Here use EIP Builder to demonstrate. For ISPSoft V3.13 or later, there is no need to use EIP Builder, you can complete the settings in HWCONFIG. Refer to section 9.4.2.3 for more information.

| Device | Function | IP Address / Location | Data Mapping Range |
|----------------------|--------------------|-------------------------|--------------------|
| AS300 | EtherNet/IP Master | 192.168.1.5 | D20000 D20040 |
| AS00SCM-A + AS-FEN02 | EtherNet/IP Slave | 192.168.1.3 | D29000~D29019 |
| AS08AM10N | Digital Input | right side of AS00SCM-A | X1.0~X1.15 |
| AS08AN01T | Digital Output | right side of AS00SCM-A | Y1.0~Y1.15 |
| AS04AD-A | Analog Input | right side of AS00SCM-A | D29060~D29079 |
| AS04DA-A | Analog Output | right side of AS00SCM-A | D29080~D29099 |

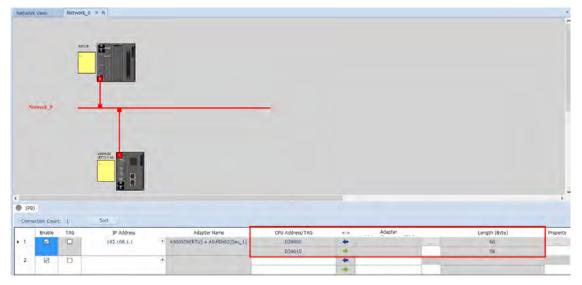
Step 1

After setting up AS300 in ISPSoft and HWCONFIG. Open EIP Builder and scan the network to add AS00SCM-A (RTU) + AS-FEN02 to the Network. Double-click RTU module to open HWCONFIG and scan to obtain the configuration and mapped register addresses of the I/O module on the right side of AS00SCM-A. You can also edit the module configurations and write down the mapped register addresses. After saving, close HWCONFIG.



9-80

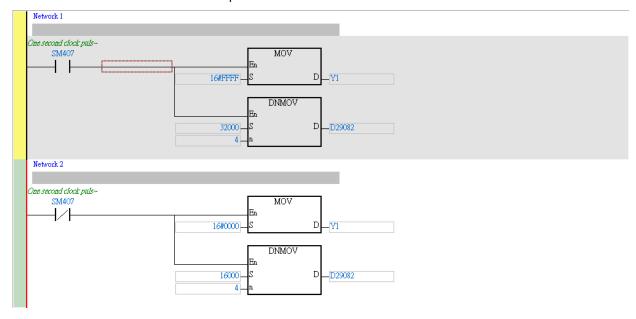
You can see the IP address and the data length from the data mapping table in EIP Builder. The data mapping table can be downloaded and upload the mapped data to the device.



Step 3

An example of using PLC to control the input/output of the IO module remotely:

Start ISPSoft and switch digital output module between 1 and 0 in every 0.5 seconds and shift output values of the analog output module between 10 V and 5V. Wire DI/DO modules to AI/AO modules. Refer to Chapter 2, 3 and 4 in this manual for more details on module operation.





9.6.5 Remote IO Application (Multiple AS-FEN02)

When AS-FEN02 is installed on AS Series PLC, it can be used as the Ethernet port of the CPU.

The following example shows how to add multiple AS00SCM-A (RTU) + AS-FEN02 (hereafter referred to as the "RTU") to an AS Series PLC in EIP connection. All IP addresses of RTU are set by the software.

| Device | Function | IP Address | Data Mapping Area |
|----------------------|----------------------------|-----------------------|-------------------|
| AS200 | EtherNet/IP master/scanner | 192.168.1.5 | |
| AS00SCM-A + AS-FEN02 | EtherNet/IP slave/adapter | 192.168.1.30 | D29540~D29559 |
| AS00SCM-A + AS-FEN02 | EtherNet/IP slave/adapter | 192.168.1.31 | D29180~D29199 |
| AS00SCM-A + AS-FEN02 | EtherNet/IP slave/adapter | 192.168.1.32 | D29360~D29379 |
| AS08AN01T | Digital output | The right side of RTU | Y1.0~Y1.15 |
| AS16AM10N-A | Digital input | The right side of RTU | X1.0~X1.15 |
| AS08AM10N-A | Digital input | The right side of RTU | X2.0~X2.15 |

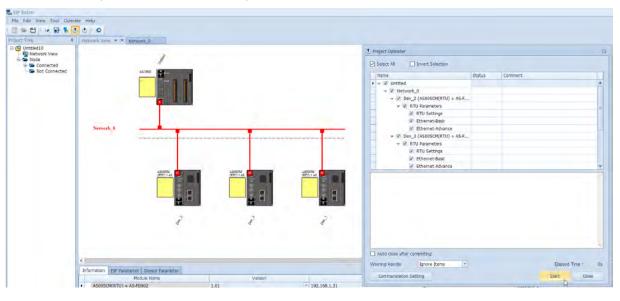
Step 1 Set up an IP address for the RTU

Turn all the knobs of the FORMAT 2 of the 3 new RTUs to 0. The default IP addresses are 192.168.1.3. Refer to section 9.4.2.2 for more information on using **IP Setting Tool** to set up the IP address.

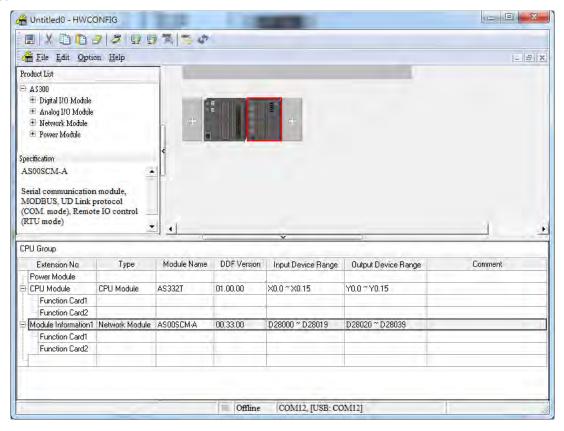
Step 2

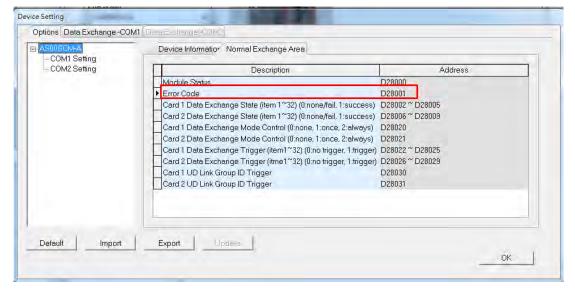
After the IP addresses of the 3 new RTUs are set, you can scan and add them in the network and connect to the AS Series PLC. Do not download the project before uploading the already set RTU values to the network.

Now you can set up the right-side module of RTU. Refer to section 9.6.4 for more details. Scan all the RTU and save the parameters. Make sure the data mapping table is updated and then download the project, including the parameters, configurations, and data mapping table to the AS Series PLC and the RTUs.



The error flags and the UD Link status codes are stored in data registers. You can modify the input device range as needed.





9.7.1 Troubleshooting for Module AS00SCM-A as a Communication Module

9.7.1.1 ERROR LED Indicators are ON

The following error codes indicate possible errors when the AS00SCM-A module is installed on the right side of the CPU module and is acting as a communication module.

| Error Code | Description | Solution |
|---------------|---|---|
| 16#1605 | Hardware failure | Check that the module is securely installed. Install a new AS00SCM-A or contact the factory. |
| 16#1606 | The function card setting is incorrect. | Check if the function card is securely installed. Install a new function card or contact the factory. Check if the setting in HWCONFIG is consistent with the function card setting. Install a new AS00SCM-A or contact the factory. |

9.7.1.2 ERROR LED Indicators Blinking Every 0.5 Seconds

The following error codes identify possible errors when the AS00SCM-A 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 | Check whether the communication cable is properly connected. Check if the station number and the communication format are correctly set. Check if the connection with the function card is working correctly. |
| 16#1804 | The UD Link setting is incorrect. | Check the settings of the UD Link. Check the warning settings in the PLC. |

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. |
| 16#0301 | Function card 1 communication timeout | Check if the station number and the communication format are correctly set. Check if the connection with the function card is working correctly. |

| Error Code | Description | Solution |
|---------------|--|--|
| 16#0302 | Function card 2 communication timeout | Check if the station number and the communication format are correctly set. Check if the connection with the function card is working correctly. |
| 16#0400 | Invalid UD Link Group ID for function card | Check the UD Link settings. Check the warning settings in the PLC. |
| 16#0401 | Invalid UD Link Group ID for function card 2 | Check the UD Link settings. Check the warning settings in the PLC. |
| 16#0402 | Invalid UD Link Command for function card 1 | Check the UD Link settings. Check the warning settings in the PLC. |
| 16#0403 | Invalid UD Link Command for function card 1 | Check the UD Link settings. Check the warning settings in the PLC. |

9.7.2 Troubleshooting for Module ASOOSCM-A 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.

9.7.2.1 ERROR LED Indicators Are ON

Error codes:

| Error Code | Description | Solution |
|---------------|---|---|
| 16#1301 | Hardware failure | Check if the module is securely installed. Change and install a new AS00SCM-A or contact the factory. |
| 16#1302 | The function card setting is incorrect. | Check if the function card is securely installed with the AS-FCOPM card. Change and install a new function card or contact the factory. Check if the setting in HWCONFIG is consistent with the function card setting. Install a new AS00SCM-A or contact the factory. |
| 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). |

9.7.2.2 ERROR LED Indicators Blinking Every 1 Seconds

| Error Code | Description | Solution |
|---------------|---|---|
| 16#1506 | Remote module had been stopped. (available for firmware V2.06 or later) | 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. |

9.7.2.3 ERROR LED Indicators Blinking Every 0.5 Seconds

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. Or use the knob to restore the modules to the default settings. |
| 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 | Make sure the module is properly connected to the CPU module and turn the modules on again. If the problem persists, contact the local authorized distributors. |

9.7.2.4 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 had not been sufficient before and then recovered from low-voltage that was less than 10 ms. | Check whether the 24 V power supply to the module is normal. |

Chapter 10 Function Cards

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10.1 Introduction

Function cards are extension cards such as analog input/output (Al/AO) and communication cards for the AS Series PLC.

10.2 Specification and Function

10.2.1 AS-F232

The AS Series PLC is built with COM1 (RS-485) and COM2 (RS-485) ports. You can use the AS-F232 extension card for communication other interfaces such as RS-232, PC, and so on. Except for the communication interface, however, the communication functions are the same as the built-in ones. You can set up the communication port as either a slave or a master node. After installing the extension card, use HWCONFIG in ISPSoft to configure the communication.

■ Wiring example

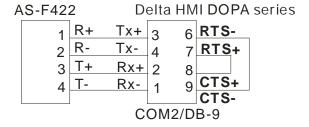


DB9 male to DB9 female (standard cable)

10.2.2 AS-F422

Use the AS-F422 extension card to communicate with Delta HMI devices or other devices that use an RS-422 communication port. Other than the different communication interface, the communication functions remain the same as the built-in ones. You can set the communication port as either a slave or a master node. After installing the extension card, use HWCONFIG in ISPSoft to configure the communication.

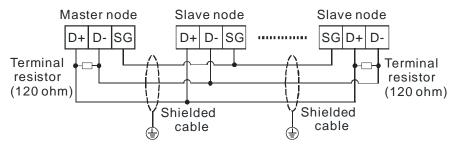
■ Wiring example for communication with Delta HMI DOPA series via COM2



10.2.3 AS-F485

With its own standalone communication port, the AS-F485 card can work independently and can be either a slave or a master node. After installing the extension card, use HWCONFIG in ISPSoft to configure the communication.

■ Wiring example



10.2.4 AS-F2AD

2 DC analog signal input channels:

| Item | Voltage Input | Current Input | | |
|----------------------------|--|--|--|--|
| Rated Input Range | 0 V - 10 V | 4 mA - 20 mA | | |
| Resolution | 12-bit | 11-bit | | |
| Digital Conversion Range | 0 - 4000 | 0 - 2000 | | |
| Hardware Input Limit*1 | 0V ~ +10.24V | 4mA ~ 20.37mA (FW V1.00) 3.63mA ~ 20.37mA (FW V1.20 or later) | | |
| Digital Conversion Limit*2 | 0 ~ 2047 (FW V1.00) - 48 ~ 2047(FW V1.20 or | | | |
| Error Rate | room temperature: $\pm 0.5\%$; for | ıll temperature range: ±1.0% | | |
| Input Impedance | 2 ΜΩ 250 Ω | | | |
| Conversion Time*3 | 3 ms / CH | | | |
| Characteristic Curve | Oltage input | 2000 Digital Value Output 4 20mA Current input | | |
| Digital Value Output*4 | Card 1 Card 2 | SR168 (CH1), SR169 (CH2) SR170 (CH1), SR171 (CH2) | | |

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

Refer to section 2.2.16 from AS Programming Manual for more information on SM27 and SR27.



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^{*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.

10.2.5 AS-F2DA

2 DC analog signal output channels:

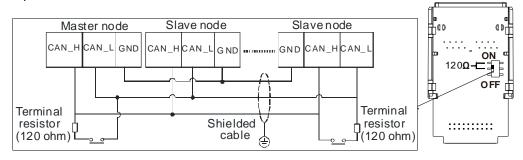
| Item | Voltage Outpu | t Current Output | | | | | | |
|-----------------------------|----------------------|------------------|---------------------------------|--------------|--|--|--|--|
| Analog Signal | 0 V - 10 V | | 4 mA - 20 mA | | | | | |
| Resolution | 12-bit | | | 12-bit | | | | |
| Digital Conversion Limit | 0 - 4000 | | 0 - 4000 | | | | | |
| Error Rate | room temp | erature: ±0.5%; | full temperature | range: ±1.0% | | | | |
| Impedance Allowance | ≥1 kΩ | ≤500 Ω | | | | | | |
| Conversion Time*1 | | 2ms | s / CH | | | | | |
| Characteristic Curve | No pi gital Value In | 100 put | 20mA 4000 Digital Value Input | | | | | |
| District Value Out. 12 | Card 1 | SR172 | (CH1) | SR173 (CH2) | | | | |
| Digital Value Output*2 | 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.

10.2.6 AS-FCOPM

With its own standalone communication port, the AS-FCOPM card can work independently and can be either a slave or a master node. After installing the extension card, use HWCONFIG in ISPSoft to configure the communication.

■ Wiring example

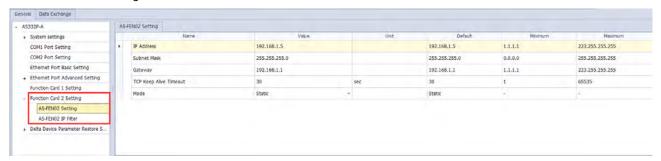


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^{*2:} Use the MOV instruction to move the value to the SR to obtain the corresponding voltage output value.

10.2.7 AS-FEN02

This communication card can work independently and does NOT occupy the communication port of PLC CPU. It can act as Modbus TCP Server or Client and EtherNet/IP Adapter. After AS-FEN02 is installed, you can go to HWCONFIG from ISPSoft to do the editing in the Function Card 2 section.



All the AS-FEN02 parameters are stored in AS300 PLC CPU or AS00SCM-A. If you need the IP address of AS-FEN02, you need to go to HWCONFIG from ISPSoft to check its IP address in the Function Card 2 section. You can also use COMMGR to see the IP address of this device.

10.2.7.1 Supported Software and Firmware Versions

- The firmware of AS300 Series PLC should be V1.06 or later for AS-FEN02 to be installed on it. Use ISPSoft V3.06 or later as the PLC editing software.
- The firmware of AS00SCM-A module should be V2.02 or later for AS-FEN02 to be installed on it. AS00SCM should be in RTU mode only, not supported when installed on the right-side of the AS PLC CPU.

| | AS-FEN02 | AS00SCM-A |
|------------------------------|----------|-----------|
| Compatible firmware versions | V1.00 | V2.02 |
| | V1.02 | V2.04 |
| | V1.03 | V2.06 |

- If using Delta AS/AH PLC CPU in RTU mode, it is suggested to use ISPSoft V3.13 or later. Use HWCPNFIG V4.0 to set up EtherNet/IP for AS PLC CPU and use EIP Builder to set up EtherNet/IP for AH PLC CPU.
- If using the 3rd party EtherNet/IP Scanner in RTU mode, it is suggested to use EIP Builder V1.06 or later to set up the remote IO modules.

10.2.7.2 Features

- AS-FEN02 can be installed on AS300 Series PLC and AS00SCM-A (in RTU mode). But the firmware of AS00SCM-A module should be V2.02 or later for AS-FEN02 to be installed on it. AS00SCM should be in RTU mode only, not supported when installed on the right-side of the AS PLC CPU.
- This section introduces the operations when it is installed on AS300 Series PLC. For the operations when it is installed on AS00SCM-A, refer to Chapter 9 for more details.
- When AS-FEN02 is installed on AS300 Series PLC, it acts as a Scanner or an Adapter for Modbus TCP connection. Go to HWCONFIG and click AS300 PLC CPU. Select Data Exchange in the editing area and if the AS-FEN02 is installed, you can find FEN02 in the function card section. Click it to edit the data exchange table. The rest is the same as using the built-in connection port for communication. Refer to Chapter 8 from AS Series Hardware and Operation Manual for more details.



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- When AS-FEN02 is installed on AS300 Series PLC, it acts as an EthernNet/IP Adapter but not EtherNet/IP Scanner for EtherNet/IP connection. When using Delta PLC CPU, you can use EtherNet/IP software to scan and add the device in.
- When AS00SCM-A+AS-FEN02 is used with the 3rd party EtherNet/IP Scanner, you need to set up the remote IO modules in EIP Builder (V1.06 or later). Go to Delta Official Website Delta | Download Center (deltaww.com) (steps: Select Product Category: Industrial Automation; Select Product Sub-Category: PLC-Programmable Logic Controllers; Select Series: AS Series; Filter: Electrical Parameter and click Submit and then find the EtherNet/IP EDS File: AS00SCM-RTU (AS-FEN02)) to download the EDS file and then install the downloaded EDS file in the EtherNet/IP software. Refer to the user manual of the 3rd party EtherNet/IP Scanner for more information.

10.2.7.3 Specifications

System Specifications

| Item | | Specification | | | | | |
|---------|------------------------|--|--|--|--|--|--|
| | Device type | Scanner, Adapter, and RTU communication interface | | | | | |
| | Topology | Star and linear topologies are supported. | | | | | |
| General | IP Settings | When installed on AS300 PLC CPU, you can only use HWCONFIG from ISPSoft for editing. When installed on AS00SCM-A and used for RTU application, you can edit via software or hardware. Software: Set the ID2 and FORMAT2 to 0x000 and use HWCONFIG from EIP Builder for editing. Hardware: Use the ID2 and FORMAT2 to set IP address to 192.168.1.X (X=1~254) or turn ID2 and FORMAT2 to 0xFF to make it in DHCP mode. | | | | | |
| | Availability | AS300 Series PLC AS00SCM-A (available only for RTU mode; NOT supported when installed on the right-side of the AS PLC CPU.) | | | | | |
| | Max. connection number | 8 | | | | | |
| Web | Functions | View device information Account management AS-FEN02 firmware update When installed in AS00SCM-A and in RTU mode, the module monitoring is supported. | | | | | |

MODBUS TCP Specifications (only available for CPU modules)

| | Item | Specification | | |
|---|-----------------------------------|----------------|--|--|
| General | Device type | Server, Client | | |
| MODBUS TCP | Max. connection number | 8 | | |
| Server | Max. data length/per transmission | 200 words | | |
| MODBUS TCP | Max. connection number | 8 | | |
| Client | Max. data length/per transmission | 200 words | | |
| Note: The connection numbers of Server and Client are counted separately. | | | | |

• EtherNet/IP Specifications

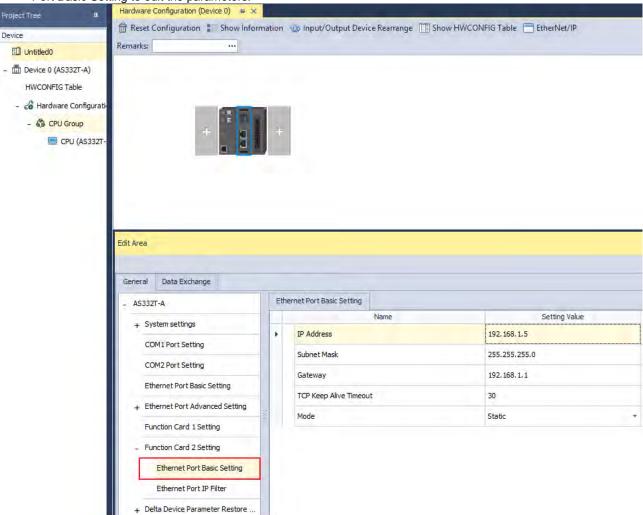
| | Item | Specification |
|----------------------------|-----------------------------------|---------------------------------------|
| General | Device type | Adapter |
| | CIP connection number | 8 |
| | TCP connection number | 8 (Servers) |
| CIP Network I/O Connection | Requested Packet Interval (RPI) | 1 ms~1000ms |
| Connection | Max. Transmission Speed | 10,000 pps |
| | Max. data length/per transmission | 200 bytes |
| | Class 3 | |
| | (Connected Type) | Total 8 (Servers) |
| | UCMM | (for both class 3 and UCMM connection |
| | (Non-Connected Type, only uses | types) |
| | TCP connections) | |
| CIP Network | | Identity Object (16#01) |
| Explicit Message | | Message Router Object (16#02) |
| =xpnon moodage | | Assembly Object (16#04) |
| | CIP Objects | Connection Manager Object (16#06) |
| | CIP Objects | Port Object (16#F4) |
| | | TCP/IP Interface Object (16#F5) |
| | | Ethernet Link Object (16#F6) |
| | | Not supporting self-defined objects |



10.2.7.4 IP Setting

The IP address of AS-FEN02 is not stored on the function card. When you install AS-FEN02 onto AS300 PLC CPU
or AS00SCM-A, the IP settings of AS-FEN02 will be obtained automatically.

When installed on AS300 PLC CPU, you can go to ISPSoft -> HWXONFIG -> Function Card 2 Setting -> Ethernet Port Basic Setting to edit the parameters.



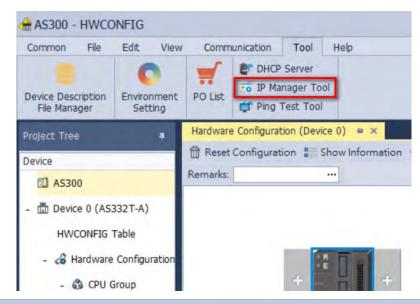
- AS-FEN02 can be installed on AS00SCM-A (firmware V2.02 or later) so that AS00SCM-A can act as a remote
 module. When the knob is set to 0, the IP address is 192.168.1.3 by default. Before setting up the remote IO
 module, you need to set up the IP settings. Two methods for you to set up the IP addresses for AS-FEN02 installed
 on AS00SCM-A.
 - Using knobs: Highly suggested. You can use ID2 and FORMAT2 knobs to set up the IP address. Hexadecimal format is used and ID2 corresponds to x16¹ and FORMAT 2 to x16⁰. The possible IP address is 192.168.1.x, x=1~FE (1~254). (DHCP mode)
 - Using **IP Manager Tool**: You can find IP Manager Tool in HWCONFIG (V4.0 or later). If you need to use an IP address that is NOT part of 192.168.1.x, you can use **IP Manager Tool** to set up the IP address.
 - 1. Open EIP Builder and add AS00SCM (RTU) + AS-FEN02 to your network. Make sure all four knobs on the AS00SCM-A (remote module) are turned to 0. And then connect to your computer via Ethernet.
 - 2. AS-FEN02 (FW V1.02.40 or later) supports **IP Manager Tool** from the **Tool** on the tool bar to scan for the device for IP address setup. You can use IP Search to search for one specific **IP Search** or use **Broadcast**

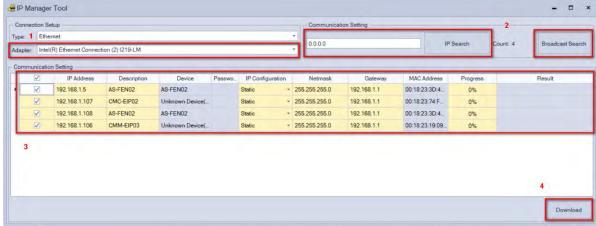
Search to scan all the AS-FEN02 in the network. This tool can be used when there is IP duplications, the IP addresses are in various network segments, or you need to edit the IP addresses of multiple devices at the same time.

3. Steps:

- 1) Select an Adapter.
- 2) Search for the function card you'd like to add through IP Search or Broadcast Search.
- 3) This tool uses MAC address to recognize the identities of different devices and you can use the MAC address of each device to edit the IP addresses of multiple devices at the same time.
- 4) Select one or multiple devices at the same time and click **Download**. After downloading, you can scan the devices again to check if the parameters are correct.

Note: You can use **IP Manager Tool,** when AS-FEN02 is installed on AS300 PLC CPU, but do not use it to set up the IP address to avoid conflicts with the parameters of AS300 PLC CPU project.







10.2.7.5 SM/SR

Special Auxiliary Relays (SM)

| Орсс | Special Auxiliary Relays (Sivi) | | | | | | | | |
|--------|---|--------------|--------------|----------------|-------------|------------------|---------|-----------|---------|
| SM | Function | AS300 Series | AS200 Series | OFF ↓ ON | STOP RUN | RUN ↓ STOP | Latched | Attribute | Default |
| SM1006 | Data exchange through AS-FEN02 enabled by ISPSoft. | 0 | _ | OFF | _ | OFF | N | R/W | OFF |
| SM1008 | Connection 1 for data exchange through AS-FEN02 started | 0 | - | OFF | _ | _ | N | R/W | OFF |
| SM1009 | Connection 2 for data exchange through AS-FEN02 started | 0 | _ | OFF | _ | _ | N | R/W | OFF |
| SM1010 | Connection 3 for data exchange through AS-FEN02 started | 0 | _ | OFF | _ | _ | N | R/W | OFF |
| SM1011 | Connection 4 for data exchange through AS-FEN02 started | 0 | _ | OFF | _ | _ | N | R/W | OFF |
| SM1012 | Connection 5 for data exchange through AS-FEN02 started | 0 | _ | OFF | _ | _ | N | R/W | OFF |
| SM1013 | Connection 6 for data exchange through AS-FEN02 started | 0 | _ | OFF | _ | _ | N | R/W | OFF |
| SM1014 | Connection 7 for data exchange through AS-FEN02 started | 0 | _ | OFF | _ | _ | N | R/W | OFF |
| SM1015 | Connection 8 for data exchange through AS-FEN02 started | 0 | _ | OFF | _ | _ | N | R/W | OFF |
| SM1016 | Successful data exchange connection 1 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1017 | Successful data exchange connection 2 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1018 | Successful data exchange connection 3 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1019 | Successful data exchange connection 4 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1020 | Successful data exchange connection 5 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1021 | Successful data exchange connection 6 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1022 | Successful data exchange connection 7 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1023 | Successful data exchange connection 8 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1024 | Error in data exchange connection 1 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1025 | Error in data exchange connection 2 through AS-FEN02 | 0 | - | OFF | _ | _ | N | R | OFF |
| SM1026 | Error in data exchange connection 3 through AS-FEN02 | 0 | - | OFF | _ | _ | N | R | OFF |
| SM1027 | Error in data exchange connection 4 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1028 | Error in data exchange connection 5 through AS-FEN02 | 0 | - | OFF | _ | _ | N | R | OFF |
| SM1029 | Error in data exchange connection 6 through AS-FEN02 | 0 | - | OFF | _ | _ | N | R | OFF |

| SM | Function | AS300 Series | AS200 Series | OFF ↓ ON | STOP RUN | RUN | Latched | Attribute | Default |
|--------|--|--------------|--------------|----------------|-------------|-----|---------|-----------|---------|
| SM1030 | Error in data exchange connection 7 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |
| SM1031 | Error in data exchange connection 8 through AS-FEN02 | 0 | _ | OFF | _ | _ | N | R | OFF |

| Special auxiliary relay | Refresh time |
|-------------------------|--|
| SM1006 | After the parameters of data exchange are downloaded, you set the flag to ON or OFF. |
| SM1008~SM1015 | After the parameters of data exchange are downloaded, you set the flag to ON or OFF. |
| SM1016~SM1031 | The flag is ON, when the system is refreshed automatically. |

Special Data Registers (SR)

| SR | Function | AS300 Series | AS200 Series | OFF ↓ ON | STOP RUN | RUN ↓ STOP | Latched | Attribute | Default |
|--------|--|-----------------|-----------------|----------------|-------------|------------------|---------|-----------|---------|
| SR1520 | Actual connection time for data exchange through the AS-FEN02 connection 1 | 0 | _ | 0 | - | _ | N | R | 0 |
| SR1521 | Actual connection time for data exchange through the AS-FEN02 connection 2 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1522 | Actual connection time for data exchange through the AS-FEN02 connection 3 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1523 | Actual connection time for data exchange through the AS-FEN02 connection 4 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1524 | Actual connection time for data exchange through the AS-FEN02 connection 5 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1525 | Actual connection time for data exchange through the AS-FEN02 connection 6 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1526 | Actual connection time for data exchange through the AS-FEN02 connection 7 | 0 | _ | 0 | _ | _ | Ν | R | 0 |
| SR1527 | Actual connection time for data exchange through the AS-FEN02 connection 8 | 0 | _ | 0 | _ | _ | Ν | R | 0 |
| SR1528 | The error code for data exchange through the AS-FEN02 connection 1 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1529 | The error code for data exchange through the AS-FEN02 connection 2 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1530 | The error code for data exchange through the AS-FEN02 connection 3 | 0 | - | 0 | _ | - | N | R | 0 |
| SR1531 | The error code for data exchange through the AS-FEN02 connection 4 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1532 | The error code for data exchange through the AS-FEN02 connection 5 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1533 | The error code for data exchange through the AS-FEN02 connection 6 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1534 | The error code for data exchange through the AS-FEN02 connection 7 | 0 | _ | 0 | _ | _ | N | R | 0 |

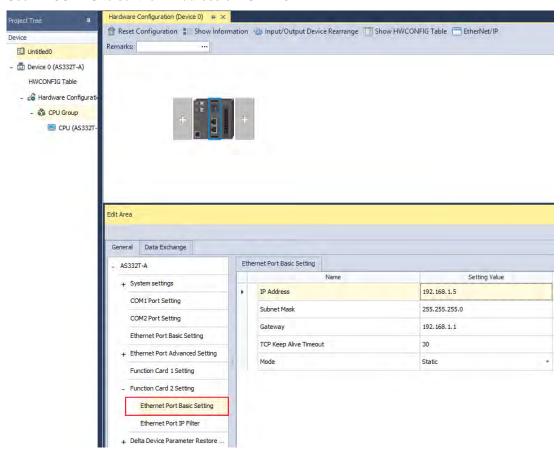
| SR | Function | AS300 Series | AS200 Series | OFF ↓ ON | STOP RUN | Û | Latched | Attribute | Default |
|--------|--|-----------------|-----------------|----------------|-------------|---|---------|-----------|---------|
| SR1535 | The error code for data exchange through the AS-FEN02 connection 8 | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1536 | AS-FEN02/FOPC02 TCP current connection number | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1537 | AS-FEN02 MODBUS/TCP Server connection number | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1538 | AS-FEN02 MODBUS/TCP Client connection number | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1539 | AS-FEN02/FOPC02 EtherNet/IP Adapter connection number | 0 | _ | 0 | _ | _ | N | R | 0 |

| Special data register | Refresh time | |
|-----------------------|---|--|
| SR1520~SR1535 | Refresh after AS-FEN02 communication is done. | |
| SR1536~SR1539 | The flag is ON, when the system is refreshed automatically. | |

10.2.7.6 Data Mapping through EtherNet/IP Adapter

When AS-FEN02 is installed on AS Series PLC, it can act as an EtherNet/IP adapter.

Use HWCONFIG to set the IP Address of AS-FEN02.

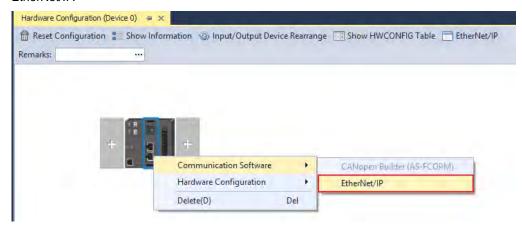


The below example uses PLC 1 and PLC 2 (with AS-FEN02) to connect to each other and perform data mapping through EtherNet/IP connection. When AS PLC CPU acts as a Scanner, you need to set the network to EtherNet/IP in ISPSoft. Refer to Chapter 9 in AS Series Hardware and Operation Manual for more details on AS Series PLC acting as EtherNet/IP Scanner.

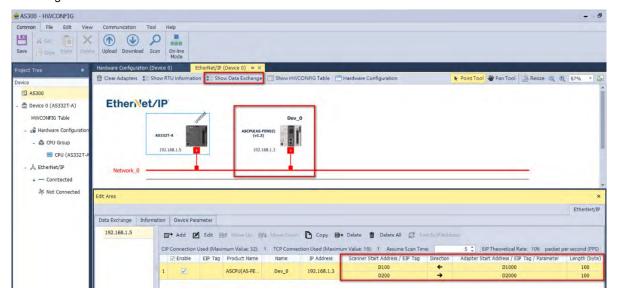
| Device | Function | IP Address | Data Mapping Area |
|--------|---------------------|-------------|-------------------|
| PLC 1 | EtherNet/IP Scanner | 192.168.1.5 | D100, D200 |
| PLC 2 | EtherNet/IP Adapter | 192.168.1.3 | D1000, D2000 |

Steps

(1) Right-click AS PLC CPU of the PLC1 project in HWCONFIG and then select Communication Software -> EtherNet/IP.



(2) Scan the network or to add ASCPU(ASFEN02) (the latest version) manually. After adding the function card in, drag and drop it to the red dot of Network_0 to add it to the same network as the scanner's. Click Data Exchange tab to open the data exchange table and to edit the data mapping table, including Scanner Start Address, Adapter Starter Address, and Length for data mapping between the scanner and adapter; the unit for data length is word.



(3) Click the **Download** on the tool bar and then start data exchange. Click the **On-line Mode** to check the connection status.



10.2.7.7 Example of Connecting to 3rd Party PLC Scanner through EIP Builder

A 3rd party PLC (when acting as a scanner) can create an EtherNet/IP connection to AS300 Series PLC (when AS-FEN02 is installed). Before you begin, you need to go to www.deltaww.com to download EDS file. Go to Delta Official Website Delta | Download Center (deltaww.com) (steps: Select Product Category: Industrial Automation; Select Product Sub-Category: PLC- Programmable Logic Controllers; Select Series: AS Series; Filter: Electrical Parameter and click Submit and then find the EtherNet/IP EDS File: AS00SCM-RTU (AS-FEN02)) to download the EDS file and then install the downloaded EDS file in the EtherNet/IP software. Refer to the user manual of the 3rd party EtherNet/IP Scanner for more information. The following uses EtherNet/IP Scanner from manufacturer A as an example.

- (1) Right-click Ethernet to see the context menu and click New Module to add a new device in.
- (2) Set up the parameters including device name, IP address and many more. For basic operation, you can use the default EDS file directly. No need to edit the EDS file. But you should change the data type to meet the system format. Click **Change** in the section of Module Definition on the General tab to change the data type according to your needs. Here the data type is INT, meaning when monitoring, data in each deice is shown in one word (a D device).
- (3) Setting up the data mapping table
 - I: Input data (T_D), The Scanner reads data from the Adapter. Ex. Connection 1 is corresponding to PLC D3000~D3099.
 - O: Output data (O□Γ), The Scanner writes data in the Adapter. Ex. Connection 1 is corresponding to PLC D2000~D2099.
 - C: here corresponds to the configurations. You can edit the corresponding PLC addresses of input and output. After editing, you need to download the parameters to the 3rd party PLC and establish a connection to make the changes become effective.

| | I/O Message Connection | | | |
|----------------|------------------------|-----------------------|-----------|--------------------------|
| Connection No. | Function | Instance Attribute | Length | Defaults |
| | Input (T->O) | 0x65 | 100 words | D3000~D3099 |
| Connection 1 | Output (O->T) | 0x64 | 100 words | D2000~D2099 |
| | Configuration | 0x80 | 8 words | Refer to the table below |
| | Input (T->O) | 0x67 | 100 words | D3100~D3199 |
| Connection 2 | Output (O->T) | 0x66 | 100 words | D2100~D2199 |
| | Configuration | 0x81 | 8 words | Refer to the table below |
| | Input (T->O) | 0x69 | 100 words | D3200~D3299 |
| Connection 3 | Output (O->T) | 0x68 | 100 words | D2200~D2299 |
| | Configuration | 0x82 | 8 words | Refer to the table below |
| | Input (T->O) | 0x6B | 100 words | D3300~D3399 |
| Connection 4 | Output (O->T) | 0x6A | 100 words | D2300~D2399 |
| | Configuration | 0x83 | 8 words | Refer to the table below |
| Connection 5 | Input (T->O) | 0x6D | 100 words | D3400~D3499 |
| | Output (O->T) | 0x6C | 100 words | D2400~D2499 |
| | Configuration | 0x84 | 8 words | Refer to the table below |

| | Input (T->O) | 0x6F | 100 words | D3500~D3599 |
|--------------|---------------|------|-----------|--------------------------|
| Connection 6 | Output (O->T) | 0x6E | 100 words | D2500~D2599 |
| | Configuration | 0x85 | 8 words | Refer to the table below |
| | Input (T->O) | 0x71 | 100 words | D3600~D3699 |
| Connection 7 | Output (O->T) | 0x70 | 100 words | D2600~D2699 |
| | Configuration | 0x86 | 8 words | Refer to the table below |
| | Input (T->O) | 0x73 | 100 words | D3700~D3799 |
| Connection 8 | Output (O->T) | 0x72 | 100 words | D2700~D2799 |
| | Configuration | 0x87 | 8 words | Refer to the table below |

10.2.7.8 Data Mapping through Modbus TCP

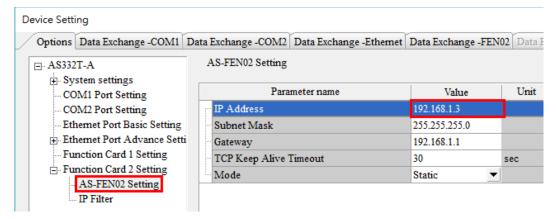
When AS-FEN02 is installed on AS Series PLC, you can create a connection by configuring the IP address and some relevant parameters to make it act as a Modbus TCP Slave device.

The following example shows two AS Series PLCs (one with AS-FEN02) to connect each other and one as Master and the other as Slave (AS-FEN02) to perform data mapping through the Modbus TCP connection. For the support function codes and corresponding addresses, refer to AS Series Operation Manual for more details.

| Device | Function | IP Address | Data Mapping Area |
|-----------------|-------------------|-------------|-------------------|
| AS300 | Modbus TCP Master | 192.168.1.5 | D100, D200 |
| AS300+ AS-FEN02 | Modbus TCP Slave | 192.168.1.3 | D200, D300 |

Step 1

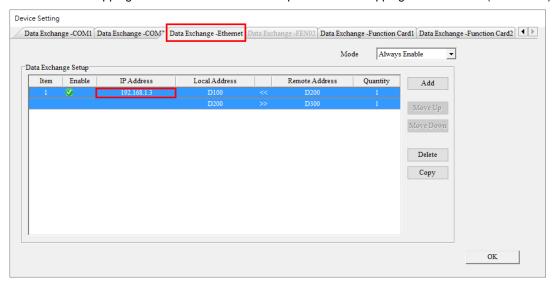
Double click AS Series PLC in HWCONFIG and the **Device Setting** window appears. Set up the IP Address of the A to 192.168.1.3 and then connect Master and Slave AS-FEN02.





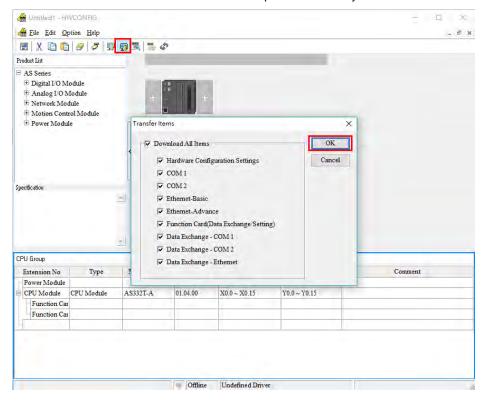
Step 2

Create a data mapping table in the Master and then perform data mapping with the Slave (AS-FEN02).



Step 3

Click the **Downloader** icon and then select the parameters that you'd like to download.



10.2.7.9 Web Server

When AS-FEN02 is installed on AS300 Series PLC or AS00SCM-A (RTU mode), you can enter AS-FEN02 IP address in the search bar of your browser to connect to your device. After that you can set up, update firmware and monitor AS-FEN02. The webpage displays differently, when AS-FEN02 is installed on AS300 Series PLC or AS00SCM-A (RTU mode). They will be explained in different sections.

List of browsers that support AS-FEN02 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 |

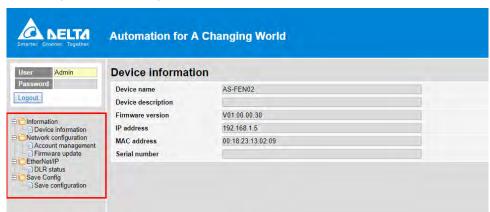
When AS-FEN02 is installed on AS300 Series PLC

a. After the setting IP address in HWCONFIG of ISPSoft. Open your browser and enter AS-FEN02 IP address in the search bar to connect to AS-FEN02. 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.





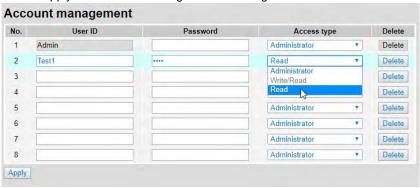
b. After login, you can setting items on the left section.



c. The menu shows data based on the permission of the current user.

| Nodes | Permission | | |
|--------------------|---------------|------|--|
| Nodes | Administrator | Read | |
| Device information | V | V | |
| Account management | V | Х | |
| Firmware update | V | Х | |
| Save configuration | V | Х | |

d. Account Management: You can set 2 kinds of access types, Administrator and Read. After the setting is done, click Apply and save the settings in Save configuration.



- e. Firmware Update: You can update the firmware of AS-FEN02 via the webpage.
- f. Save Configuration: After any setting is done, save the settings in Save Configuration to reflect the changes.

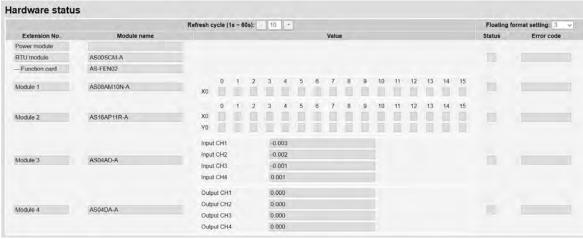
When AS-FEN02 is installed on AS00SCM-A

- a. Use the switches on AS00SCM-A to set the AS-FEN02 IP address. Open your browser and enter AS-FEN02 IP address in the search bar to connect to AS-FEN02. 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.
- b. The menu shows data based on the permission of the current user. When it is installed on AS00SCM-A, you can monitor the right-side module (Hardware Status) and check the EtherNet/IP connection information.

| Nodes | Permission | | |
|---------------------------|---------------|------|--|
| Nodes | Administrator | Read | |
| Device information | V | ٧ | |
| Account management | V | Х | |
| Firmware update | V | Х | |
| Hardware status* | V | V | |
| EtherNet/IP information** | V | V | |
| Save configuration | V | Х | |

Note:

c. Hardware Status: you can monitor the connected right-side I/O modules, including their module names, the current values, statuses and error codes. You can edit the values in the Refresh Cycle to update the cycle.



d. EtherNet/IP Information: when using a 3rd party device as an EtherNet/IP Scanner, you can check this page for more information on connection parameters. Refer to Chapter 9 for more information on AS00SCM-A.



10.2.7.10 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.



^{*} AS00SCM-A is recognizable for AS-FEN02 FW V1.13 or later, AS00SCM-A FW V2.06 or later.

^{**} AS-FEN02 firmware V1.13 supports webpage monitoring function.

10.2.8 AS-FPFN02

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). When AS-FPFN02 is installed on AS00SCM-A, Delta AS Series I/O modules can be used remotely, and only available in RTU mode; NOT supported when installed on the right-side of the AS PLC CPU). Delta software does NOT support PN network configuration, you can use software from the PN scanner for editing the PN parameters. After editing, you need to download the updated parameters to the scanner and then the scanner transfers the settings to AS-FPFN02.

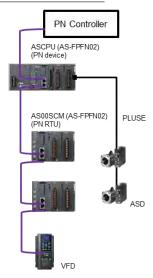
10.2.8.1 Supported Firmware Versions

- When installed on AS300 series PLC CPU, it can be a PROFINET remote device:
 The firmware of AS300 Series PLC should be V1.08 or later.
 - The firmware of AS-FPFN02 should be V1.00 or later.
- When installed on AS00SCM-A, it can be a PROFINET remote IO module: The firmware of AS00SCM should be V2.06 or later.
 The firmware of AS-FPFN02 should be V2.00 or later.
- It can work with Siemens PLC CPU: S7-1500, S7-1200, S7-300 and so forth. (TIA Portal V15.1 or later)
- To upgrade the hardware of AS-FPFN02 to version 2.00 is not supported.

10.2.8.2 Features

- When AS-FPFN02 is installed on AS300 PLC CPU or AS00SCM-A in RTU mode, it acts as a PROFINET device and exchanges data with PROFINET (PN) Controller. But AS00SCM-A that can be installed on the right-side of AS PLC CPU is not supported.
- Architecture: you can use software from the PN scanner for editing the PN parameters. After editing, you
 need to download the updated parameters to the scanner and then the scanner transfers the settings to ASFPFN02.

PROFINET Solution



10.2.8.3 Specifications

| ltem | Specification | | |
|---|---|----------------|--|
| Installed on PLC | AS300 AS00SCM-A | | |
| Communication Protocol | PROFINET RT | | |
| EtherNet/IP Interface | 100 Mbit with 2 x RJ45 | | |
| Fieldbus | PROFINET Devices | | |
| Network Cable Length | 100 meter | | |
| Error Indicator | System Fail (SF): Red; Bus Fail (BF): Red | | |
| Max. IO Slot Supported | 17 | 9 | |
| Devices to Read and Write | AS300 series data registers | RTU IO modules | |
| Minimum Time for Data Exchange to Operate | 10 ms | | |
| Maximum Data Length/Per Transmission | Input: 250 words Output: 250 words (Data of the module information is included, see the section below.) | | |
| PROFINET Configuration | Download PROFINET Configurations from PN Controller | | |

10.2.8.4 Configuring the Data Length for I/O Module (Works with AS300)

The module and IO module mentioned in here and later sections indicates a unit of PN controller and AS300 for data exchange. When AS-FPFN02 communication card is installed on AS300 Series PLC, up to 500/500 bytes of I/O address area are available. From the following table you can create various kinds of data exchanges – different data length and functions (e.g. 32 word in- and output) and to set up the corresponding I/O module addresses to the AS300 data register addresses. Refer to Section 10.2.8.8 for more reference.

| Data Length (word) | 1, 2, 4, 8, 10, 16, 32, 64, 100 |
|--------------------|---------------------------------|
| Data Type | Input, Output, In- and Output |

The total data size and the number of modules used are relevant. The total usage of I/O address area should also include IO Production Status (IOPS), IO Consumption Status (IOCS) of each module, also Device Access Point (DAP) and the bytes for information.

| Module Type (for both DIO and AIO modules) | Additional Data Length (IOPS & IOCS) |
|---|--------------------------------------|
| Slot 0 (DAP) | 4 bytes |
| Input module | 1 byte |
| Output module | 1 byte |
| I/O module | 2 bytes |



From the following table, you can see that users need to count the module information in, otherwise, if exceeding the

total size, PLC editing software would prompt an error message while compiling.

| | | | In (byte) | | | Out (byte) | Out (byte) | | |
|------|---------------------------|-----------|-------------|-------|-----------|-------------|------------|--|--|
| Slot | Module | Data Size | IOPS & IOCS | Total | Data Size | IOPS & IOCS | Total | | |
| 0 | AS300-CPU (DAP)* | 0 | 4 | 4 | 0 | 4 | 4 | | |
| 1 | Status Register** | 8 | 1 | 9 | 0 | 0 | 0 | | |
| 2 | 100 Word In- and Output_1 | 200 | 2 | 202 | 200 | 2 | 202 | | |
| 3 | 100 Word In- and Output_2 | 200 | 2 | 202 | 200 | 2 | 202 | | |
| 4 | 16 Word In- and Output_1 | 32 | 2 | 34 | 32 | 2 | 34 | | |
| 5 | 16 Word In- and Output_2 | 32 | 2 | 34 | 32 | 2 | 34 | | |
| 6 | 04 Word Output | 0 | 0 | 0 | 8 | 1 | 9 | | |
| | Total Size | | | 485 | | · | 485 | | |

Note:

10.2.8.5 Status Register (Works with AS300)

When AS-FPFN02 is installed on AS300 Series PLC, and Slot 1 is used as status register to show the communication card status. Up to 8 bytes of status registers can be used for displaying the status of PN Device.

| Status Register (Siemens S7-1500) | Name | Description |
|--|-------------------------|--|
| %10.0 | Input Data Available | If the value is TRUE, the input data to be sent to PN Controller is valid. If the value is 0, the input data to be sent to PN Controller is invalid. |
| %I4.0 - %I4.7 | Connection | Indicates PN connection status of Slot 2 ~ Slot 9. If the value is TRUE, the Slot is with a working PN connection (with IO module) If the value is FALSE, the Slot is without a working PN connection. |
| %I5.0 - %I5.7 | Status | Indicates PN connection status of Slot 10 ~ Slot 17. If the value is TRUE, the Slot is with a working PN connection (with IO module) If the value is FALSE, the Slot is without a working PN connection. |

Determine whether the input data is valid.

You can check the first bit of the bytes %I0.0 (device register) to see if the data exchange is started; this can be used when the PN device starts to work. You can determine if the input data is valid by checking %I0.0 (device register); if it says TRUE, the input data is valid and data exchange can begin.

Determine if the Slot is with a working PN connection.

You can check the corresponding registers %I4.0~%I4.7 and %I5.0~%I5.7 to see if the Slot 2~17 is with a working PN connection.

The following example shows the values in the corresponding registers %I4.0~14.22 are TRUE and that indicates Slot 2~4 are with PN connections respectively.

^{*} DAP should be counted in the data of input and output module.

^{**} Status Register is counted as the data of input module.

10.2.8.6 I/O Module Selection (Works with ASOOSCM-A)

When AS-FPFN02 communication card is installed on AS00SCM-A, you can use PN Controller's Software to configure the modules. You can drag and drop the I/O modules to Slot $2 \sim 9$. And then you can double-click the module to open the setting page and configure the module parameters.

| | Available for the following modules | | | | |
|-----------------|---|--|--|--|--|
| | AS08AM10N-A, AS16AM10N-A, AS32AM10N-A, AS64AM10N-A, AS08AN01P-A, AS08AN01R-A, | | | | |
| Digital modules | AS08AN01T-A, AS16AN01P-A, AS16AN01R-A, AS16AN01T-A, AS32AN02T-A, AS64AN02T-A , | | | | |
| | AS16AP11P-A, AS16AP11R-A, AS16AP11T-A | | | | |
| A | AS04AD-A, AS08AD-B, AS08AD-C, AS04RTD-A, AS06RTD-A, AS04TC-A, AS08TC-A, AS04DA-A, | | | | |
| Analog modules | AS06XA-A | | | | |

Digital module addresses

| T | | Length to b | e used (bit) | Length is being used (bit) | | |
|--|-------------|-------------|---|----------------------------|---------|--|
| Туре | Module Name | In (I) | Out (Q) | In (I) | Out (Q) | |
| | AS08AM10N-A | 16 | 0 | 8 | 0 | |
| Digital input | AS16AM10N-A | 16 | 0 | 16 | 0 | |
| Digital Input | AS32AM10N-A | 32 | 0 | 32 | 0 | |
| | AS64AM10N-A | 64 | 0 | 64 | 0 | |
| | AS08AN01P-A | | | | | |
| | AS08AN01R-A | 0 | 16 | 0 | 8 | |
| | AS08AN01T-A | | | | | |
| Digital autnut | AS16AN01P-A | | | | | |
| Digital output | AS16AN01R-A | 0 | 16 | 0 | 16 | |
| | AS16AN01T-A | | 16 0 8 0 16 0 16 0 32 0 32 0 64 0 64 0 0 16 0 8 | | | |
| | AS32AN02T-A | 0 | 32 | 0 | 32 | |
| | AS64AN02T-A | 0 | 64 | 0 | 64 | |
| AS16AN01T AS32AN02T AS64AN02T AS16AP11P | AS16AP11P-A | | | | | |
| | AS16AP11R-A | 16 | 16 | 16 | 16 | |
| inputoutput | AS16AP11T-A | | | | | |

Analog module addresses

(1) The first two words of the input data head is the error code for the module.

(2) Each channel takes two words of length, starting from channel 1, in numerical order.

| | | Length to be used (word) | | Length is being used (word) | | | | |
|---------------------|-----------------------------------|--------------------------|---------|-----------------------------|-----------------|-----------------|--|--|
| Туре | Module Name | | | In | (I) | Out (Q) | | |
| | | In (I) | Out (Q) | Error code | Data in channel | Data in channel | | |
| | AS04AD-A AS04RTD-A AS04TC-A | 20 | 0 | 2 | 8 | 0 | | |
| Analog input | AS06RTD-A | 20 | 0 | 2 | 12 | 0 | | |
| | AS08AD-B AS08AD-C AS08TC-A | 20 | 0 | 2 | 16 | 0 | | |
| Analog output | AS04DA-A | 2 | 18 | 2 | 0 | 8 | | |
| Analog input/output | AS06XA-A | 10 | 10 | 2 | 8 | 4 | | |



Example

Use S7-1500 as a Scanner and AS remote module as the 1st Adapter. The address starts from 0. The actual used address for the module is from the starting address of each module shown on the software. For those unused addresses are reserved by the system. The unit is byte. For example, 20 to 21 is seen as a word and for the next word, it will be 22 to 23. The image shown below is the grouped module.



| Slot | Module Name | | gement shown on Device num he software program | | | Explanation |
|------|--------------------------|-------|---|-----------|-----------|--|
| | | I | Q | I | Q | • |
| 1 | AS00SCM-A (AS-FPFN02) | 0~19 | 0~19 | 0~13 | | Status register Refer to the next section for more details |
| 2 | AS08AM10N-A | 20~21 | | 20.0~20.7 | | 8 input points |
| 3 | AS16AM10N-A | 22~23 | | 22.0~23.7 | | 16 input points |
| 4 | AS08AN01P-A | | 20~21 | | 20.0~20.7 | 8 input points |
| 5 | AS16AP11P-A | 24~25 | 22~23 | 24.0~24.7 | 22.0~22.7 | 8 input points, 8 point output |
| | | | | 26~29 | | Module error code |
| | | | | 30~33 | | Channel 1 |
| 6 | AS04AD-A | 26~65 | | 34~37 |] | Channel 2 |
| | | | | 38~41 | | Channel 3 |
| | | | | 42~45 | | Channel 4 |

10.2.8.7 Status Register (Works with ASOOSCM-A)

When AS-FPFN02 is installed on AS00SCM-A, and Slot 1 is used as status register. The input data length of I address is 10 words for storing the current status of AS00SCM-A. Q address occupies 10 words and reserves for output data.

| Status Register (Siemens S7-1500) | Name | Description | | | | |
|-----------------------------------|------------------|---|--|--|--|--|
| %IW0 | Operation Status | 0: STOP 1: RUN | | | | |
| %IW2 | Funcia Codo | For AS00SCM-A; refer to AS00SCM-A for more information | | | | |
| %IW4 - %IW18 | Error Code | For Slot 2 to slot 9; refer to its corresponding module chapter | | | | |

The unit for the address series is byte. The data size for each status register is one word; %IW0 indicates from the address of 0 byte to read a length of word (%IB0 & %IB1) and the next word is %IW2 (%IB2 & %IB3) and so forth.

Select Slot 1 to set up when to Stop I/O module remotely. Double-click AS00SCM-A -> AS remote module in Device Setting and click **AS Serial Remote Module** in HWCONFIG. Refer to Section 9.4.3 from AS Module Manual for more information.

When the extension module is disconnected, the error code shown on AS00SCM-A is 16#1503. The address of the extension module that is disconnected from the AS00SCMA is shown 16#1604.

10.2.8.8 PROFINET Device Example (Adapter)

This section shows using Manufacturer S software to create a PROFINET IO from S7-15XX and PLC and uses the function card AS-FPFN02 to read data registers in Delta AS300 Series PLC.

- The connection is established by Ethernet communication. The IP addresses of your PC and PN controller (S7-15XX) should be in the same network segment. The IP address of S7-15XX can be edited by its panel. The IP address of your PN device (AS-FPFN02) can be edited by PN Controller; see the steps below.
- 2. Create a new project.
- Add a new device
- Select a PN Controller Model
- Select the Project View or click **Device & Network** to enter the Project View.
- 3. Install the GSDML file and add the device in.
- Go to Delta Official Website Delta | Download Center (<u>Delta | Download Center (deltaww.com</u>)) (steps: Select Product Category: Industrial Automation; Select Product Sub-Category: PLC- Programmable Logic Controllers; Select Series: AS Series; Filter: Electrical Parameter and click **Submit** and then find the **AS-FPFN02 (CPU)** GSDML file. Or if AS-FPFN02 is installed on the AS00SCM-A in RTU mode, find the **AS-FPFN02 (RTU) GSDML** file.
- Download the GSDML file and then install the downloaded GSDML file in the Manufacturer S software.
- After the installation is complete, go to Project tree -> Device Configuration -> Network View.
- Find and select the just-installed device from the **Hardware Catalog** on the right and drag and drop the selected device to **Device View** on the left.
 - * ASCPU (AS-FPFN02): Other field devices-> PROFINET IO-> PLCs & CPs-> Delta Electronics, Inc.-> PLC * AS00SCM-RTU (AS-FPFN02): Other field devices-> PROFINET IO-> I/O-> Delta Electronics, Inc.-> RTU
- Drag the green block of S7-15XX to connect AS-FPFN02 together. Click AS-FPFN02 image to open the setting
 page and edit its IP address. Properties-> General-> PROFINET interface-> Ethernet address. The IP addresses
 of your PC and PN controller (S7-15XX) should be in the same network segment.
- 4. Define PN Device Name
- Go to Project tree-> Online access, find the name of the function card and that is the PROFINET device name. The name for AS-FPFN02 is as it was saved from the last use. The default name is as-fpfn02.
- Click **Online & diagnostics** and select **Assign PROFINET device name**. You can enter a new PROFINET device name and after that click **Assign name** to save the change.
- Go back to the Network View and click the AS-FPFN02 image to enter the setting page to edit the device name to have it the same as you have set in the last step. Properties -> General -> Name.
- 5. Establish a connection

Click the S7-15XX image and go to Online-> Download to device. The IP address of AS-FPFN02 will be set as what you have set in the previous step. Compile and download the project.

6. Check the connection status

Go to Online-> Go Online, to check the connection status in the Project tree. If the project is downloaded successfully, the operation is normal and the basic configurations are complete, you can the check signs in Local modules and Distribute I/O. You can also check the communication status of AS-FPFN02, if the indicators of SF and BF are OFF, the communication is normal.



7. Data Exchange

The range of data registers in AS300 PLC CPU that an AS-FPFN02 can read/write is between D0 and D29999. The data to be outputted is from PN controller to PN device. The data to be inputted is from PN device to PN controller.

- 8. Configuring the data length for I/O module
 - Select a right-side module and then configure the data length for it. Up to 250 bytes of data length is available for input and output respectively. Double click to add in order or drag and place it to the preferable position to add. If exceeding the limit, the parameters cannot be used. Refer to Section 10.2.8.4 for more details.
- 9. Setting up the starting address of the data register to exchange data.
 - Select an added module and enter the starting address in Module Parameters for data exchange. For example set the value "08 Word In- and Output_1" in Slot 2 and click the name in the Module to set the starting register address of the corresponding AS300: Properties -> General-> Module parameters-> IO Address.
 - When entering 100 in Input D Register and 200 in Output D Register and using a 8 Word In/Out module, the PN Controller reads values starting from D100 to D107 and writes the values in the data register starting from D200 to D207.
- PN Controller transmits 8 Words of data (Q0~Q15) to the data register D200~D207 in AS300 PLC CPU.
- AS-FPFN02 transmits 8 Words of data (D100~D107) to the data register I8~I23 in S7-15XX.
- The data exchange can only begin when the Bit Input Data Available is TRUE. Refer to Section 10.2.8.5 for more details.
- Apply the same setting procedure when AS-FPFN02 is installed in AS00SCM-A in RTU mode. But you need to pay
 attention on the IO modules in the software that should be consistent to the actual placement of the right-side of
 AS00SCM-A in RTU.

10.2.8.9 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.

10.2.9 AS-FOPC02

AS-FOPC02 can be installed on AS300 PLC CPU. Communication can be done independently and that does NOT occupy the communication port of PLC CPU. It can act as an OPC UA Server. After AS-FOPC02 is installed, you can go to HWCONFIG from ISPSoft to do the editing in Ethernet Port Basic Setting and Ethernet Port IP Filter.

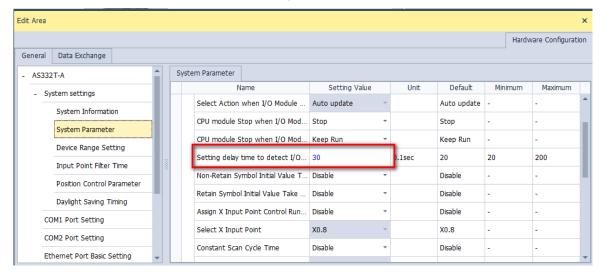
All the AS-FOPC02 parameters are stored in AS300 PLC CPU. Go to HWCONFIG from ISPSoft to check AS-FOPC02 IP address in the Function Card 2 section. You can also use COMMGR to see the IP address of this device.

10.2.9.1 Supported Firmware Versions

- The firmware of AS300 Series PLC should be V1.10.00 or later for AS-FOPC02 to be installed on it.
- AS00SCM-A does NOT support AS-FOPC02. You can NOT install AS-FOPC02 on AS00SCM-A.
- ISPSoft version should be V3.13 or later.

10.2.9.2 Features

- When AS-FOPC02 is installed on AS300 Series PLC, it can act as OPC UA Server. The tag settings are the same as the network communication settings for AS Series; refer to Chapter 9 from AS Series Hardware and Operation Manual for more information.
- Before scanning to add AS-FOPC02 in, remerber to change the setting "Setting delay time to detect I/O Module" to 3 seconds and then download the settings to PLC CPU.





10.2.9.3 Specifications

System Specifications

| | Item | Specification | | | | |
|---------|------------------------|--|--|--|--|--|
| | Device type | Slave | | | | |
| | Topology | Star and linear topologies are supported. | | | | |
| General | IP Settings | When installed on AS300 PLC CPU, you can use HWCONFIG from ISPSoft for editing | | | | |
| | Availability | AS300 Series PLC | | | | |
| | Max. connection number | 8 | | | | |
| Web | | View device information | | | | |
| vven | Functions | Account management | | | | |
| | | AS-FOPC02 firmware update | | | | |

Modbus TCP Specifications

| meabae rer epeemeat | ioubuo i ei epeemieumene | | | | |
|---------------------|--------------------------|------------------------|--|--|--|
| Item | | Specification | | | |
| General | Device type | Server (TCP port: 502) | | | |
| Madhar TOD Camar | Max. connection number | 8 | | | |
| Modbus TCP Server | Max. data length | 200 words | | | |

OPC UA Specifications

| Ite | em | | | Specification | | | | |
|------------------|--|---|--|-------------------------|------------------|--|--|--|
| General | Device type | Serv | Server (TCP port: 4840) 6 (Clients) | | | | | |
| OPC UA | Max. sessions | 6 (C | lients) | | | | | |
| Server | Max. tags | 100 | 0 | | | | | |
| Security policy | | Non | None | | | | | |
| Authentication | | Ano | nymous | | | | | |
| Default endpoir | nt/port | орс. | tcp://192.168.1.5:484 | 0/ | | | | |
| Transport proto | col / encoding | орс. | tcp / binary | | | | | |
| Supported profi | les | UA١ | v1.03 Nano Embedde | d Device Server Profile | e | | | |
| Sampling rate (| ms) | 100 | , 200, 300(default), 40 | 0, 500, 60050000 | | | | |
| Publish interval | (ms) | 100 | , 200, 300, 400, 500(c | lefault), 60050000 | | | | |
| Supported data | type | Int1 | 6, Uint16, Int32, Uint3 | 2, Float, Boolean | | | | |
| Max. subscripti | on per session | 2 | | | | | | |
| Max. monitored | lax. monitored items 3000 (including all sessions) | | | | | | | |
| Session timeou | t (ms) | 5000 ~ 30000 | | | | | | |
| Subscription ke | ep alive count | 1~1 | 000ms | | | | | |
| | | 1) Maximum data size of monitor items for all sessions < 50000bytes | | | | | | |
| | | | Monitor Items | Total Data size of | Sampling and | | | |
| | | | | monitor items | Publish interval | | | |
| | | | | (Bytes) | time (second) | | | |
| | | | 1~500 | 1~10000 | 1 | | | |
| | | | | 10001~20000 | 2 | | | |
| Restrictions | | | | 20001~30000 | 3 | | | |
| Restrictions | | | | 30001~40000 | 4 | | | |
| | | | | 40001~50000 | 5 | | | |
| | | | 501~1000 | 1~10000 | 2 | | | |
| | | | | 10001~20000 | 3 | | | |
| | | | | 20001~30000 | 4 | | | |
| | | | | 30001~40000 | 5 | | | |
| | | | | 40001~50000 | 6 | | | |

| Item | | Specification | | | | | | |
|------|---------------------|--|----|--|--|--|--|--|
| | 1001~1500 | 1~10000 | 3 | | | | | |
| | | 10001~20000 | 4 | | | | | |
| | | 20001~30000 | 5 | | | | | |
| | | 30001~40000 | 6 | | | | | |
| | | 40001~50000 | 7 | | | | | |
| | 1501~2000 | 1~10000 | 4 | | | | | |
| | | 10001~20000 | 5 | | | | | |
| | | 20001~30000 | 6 | | | | | |
| | | 30001~40000 | 7 | | | | | |
| | | 40001~50000 | 8 | | | | | |
| | 2001~2500 | 1~10000 | 5 | | | | | |
| | | 10001~20000 | 6 | | | | | |
| | | 20001~30000 | 7 | | | | | |
| | | 30001~40000 | 8 | | | | | |
| | | 40001~50000 | 9 | | | | | |
| | 2501~3000 | 1~10000 | 6 | | | | | |
| | | 10001~20000 | 7 | | | | | |
| | | 20001~30000 | 8 | | | | | |
| | | 30001~40000 | 9 | | | | | |
| | | 40001~50000 | 10 | | | | | |
| | 2) Maximum tag arra | Maximum tag array elements = 512 or data size < 400Bytes | | | | | | |
| | 3) Maximum tag nan | ne length = 40bytes | | | | | | |

10.2.9.4 Special Data Registers (SR) for AS300 Series Only

| SR | Function | AS300 Series | AS200 Series | OFF ↓ ON | STOP RUN | RUN ↓ STOP | Latched | Attribute | Default |
|--------|--|-----------------|-----------------|----------------|-------------|------------------|---------|-----------|---------|
| SR913 | Total data of ASFOPC02 monitor items; unit: bytes; low word | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR914 | Total data of ASFOPC02 monitor items; unit: bytes; high word | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1430 | Connection number of AS-FOPC02 OPC UA Server | 0 | _ | 0 | _ | _ | N | R | 0 |
| SR1537 | Connection number of AS-FOPC02 Modbus/TCP Server | 0 | _ | 0 | _ | _ | N | R | 0 |

| Special data register | Refresh time |
|---------------------------------|---|
| SR913, SR914, SR1430, SR1537 | The flag is ON, when the system is refreshed automatically. |

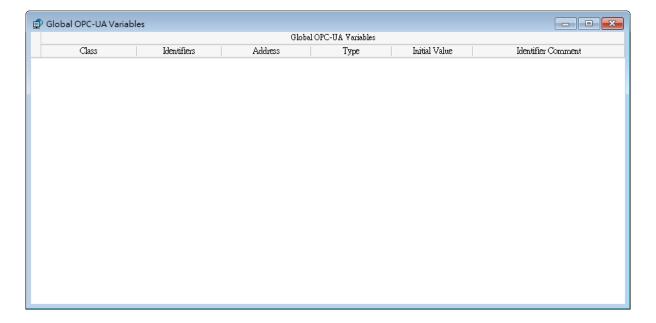


10.2.9.5 OPC UA Client

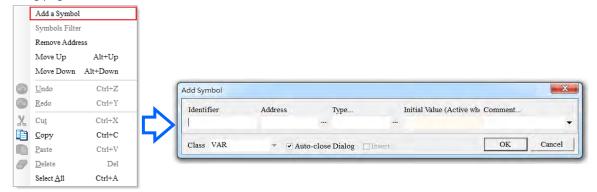
When AS-FOPC02 is installed on AS300 Series PLC, it can act as an OPC UA Client. Follow the steps below to create Tags on AS300 Series PLC via OPC UA variables.

(1) Open ISPSoft and create a new project and then double-click **Global OPC UA Variables** under the **Global Symbols** node to open the **Global OPC UA Variables** setting table.

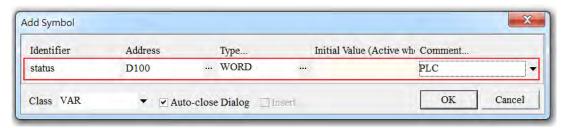




(2) Right-click on the **Global OPC UA Variables** setting table to see the context menu. Click **Add a Symbol** to open the setting page.



(3) Set up the OPC UA tag. See the following example for reference.
Supported data types are: WORD, DWORD, INT, DINT, REAL, and ARRAY; supported data types in ARRAY are BOOL, WORD, DWORD, INT, DINT, and REAL.



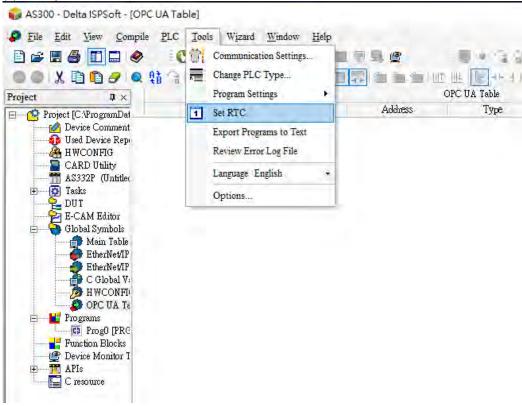
(4) After the settings are complete, download the settings to PLC. After that devices can read/write the Tag. The way to connect to the Tags varies in different brands. Refer to the specific device manual for more information on using tags to connect.

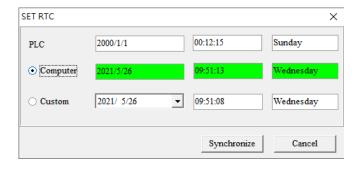


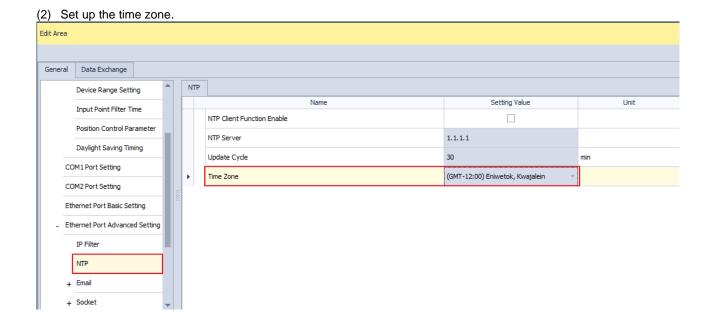
10.2.9.6 Setting UTC Time in OPC UA Client

When AS-FOPC02 is installed on AS300 PLC CPU. You can create a connection through OPC UA and then the AS300 PLC CPU can be an OPC UA Client. Follow the steps below to set up the RTC and the time zone of OPC UA UTC.

(1) Set up the AS300 RTC







10.2.9.7 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.

10.2.9.8 The copyright information about the Used External Software Sources

IwIP TCP/IP stack
 Copyright (c) 2001-2004 Swedish Institute of Computer Science.
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10.2.10 AS-FFTP01

AS-FFTP01 can only be installed on AS300 PLC CPU. Communication can be done independently and that does NOT occupy the communication port of PLC CPU. It supports IIoT related protocols. After AS-FFTP01 is installed, you can go to HWCONFIG from ISPSoft to do the editing.

For the AS-FFTP01 basic parameters (IP address and other parameters) are stored in AS300 PLC CPU. IIoT related parameters are stored in the communication card (AS-FFTP01). After AS-FFTP01 is installed on AS300 PLC CPU, you can use the following steps to obtain and make sure the IP address of AS-FFTP01 is correct.

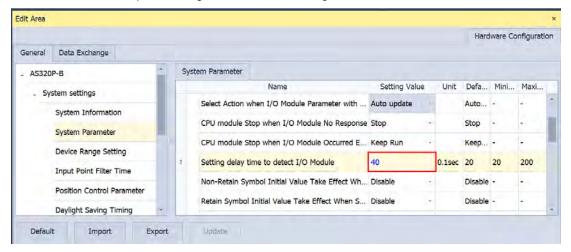
- 1. Go to HWCONFIG from ISPSoft to upload the AS300 parameters to obtain the IP address of AS-FFTP01.
- 2. Use COMMGR to scan and check the IP address of this device.

10.2.10.1 Supported Firmware Versions

- The firmware of AS300 Series PLC should be V1.12.00 or later for AS-FFTP01 to be installed on it.
- AS00SCM-A does NOT support AS-FFTP01. You can NOT install AS-FFTP01 on AS00SCM-A.
- ISPSoft version should be V3.15 or later.

10.2.10.2 Before You Begin

Before scanning to add AS-FFTP01 in, remerber to change the setting "Setting delay time to detect I/O
Module" to 4 seconds and then download the settings to PLC CPU. After downloading is complete, power off
the PLC CPU and then power on again. After that, scanning to add AS-FFTP01 in.



10.2.10.3 Specifications

System Specifications

| Item | Specification |
|--------------|--|
| Device type | IIoT module |
| Availability | AS300 Series PLC |
| Topology | Star and linear (end point) topologies are supported. |
| IP Settings | When installed on AS300 PLC CPU, you can use HWCONFIG from ISPSoft for editing |

Supported Protocols

| Name | Description |
|-------------------|---|
| OPC UA Server | It can act as an OPC UA Client. AS-FFTP01 and AS-FOPC02 share the same OPC UA symbols table in ISPSoft. |
| FTP Server | File Transfer Protocol (FTP); enter the IP address or the network name and the port number (default 21) in FTP Client and then enter username and password to log in. The read/write permission varies according to different users. You can set up the parameters and the user permission in HWCONFIG. |
| Data Log | You can save data in .csv file format, save user-defined contents in a table, and design triggering conditions. The data log will be saved in the SD card on AS-FFTP01 and which can be retrieved from the SD card or obtained through FTP Server. |
| MQTT Client | You can create a connection with Amazon Web Services (AWS) through API of PLC to publish and subscribe messages. |
| Web Server | Web page function is supported. (AS300 PLC CPU has its own independent web page.) You can monitor the communication card and Nod-RED Dashboard through the webpage. Read/write data from the AS300 registers are also available on the web page. |
| Modbus TCP Server | It can act as the slave of the Modbus TCP communication; up to 8 connections are supported. |



10.2.10.4 OPC UA Server

When AS-FFTP01 is installed on AS300 PLC CPU, you can create a connection through OPC UA and then the AS300 PLC CPU can be an OPC UA Client. AS-FFTP01 supports OPC UA, you can set it up in HWCONFIG. Refer to section 10.2.9.5 and 10.2.9.6 to create Tags on AS300 Series PLC via OPC UA variables.

| OPC UA Specifications Item | Specification | | | |
|---|--|---|---|-------------------------------|
| Device Type | OP | C UA Server | • | |
| TCP Port | 484 | 4840 | | |
| Maximum Sessions | 6 (0 | Clients) | | |
| Maximum Tags | 100 | 0 | | |
| | Nor | ne, | | |
| | Basic128Rsa15 – Sign, | | | |
| Security policy | Basic128Rsa15 - Sign & Encrypt | | | |
| | | sic256 – Sign | | |
| | | sic256 - Sign & Encryp | t | |
| Authentication | | onymous | | |
| Default and point/port | Sigi | | 0/ | |
| Default endpoint/port Transport protocol / encoding | | .tcp://192.168.1.5:484 .tcp / binary | U/ | |
| Supported profiles | | | d Device Server Profile | <u> </u> |
| Sampling rate (ms) | | , 200, 300(default), 40 | | • |
| Publish interval (ms) | | , 200, 300, 400, 500(c | · · · · · · · · · · · · · · · · · · · | |
| Supported data type | | | | |
| Max. subscription per session | Int16, Uint16, Int32, Uint32, Float, Boolean 2 | | | |
| Max. monitored items | 3000 (including all sessions) | | | |
| Session timeout (ms) | 5000 ~ 30000 | | | |
| Subscription keep alive count | 1~1000ms | | | |
| | • | Maximum data size 50000bytes Monitor Items | of monitor items for al Total Data size of monitor items | Sampling and Publish interval |
| | | | (Bytes) | time (second) |
| | | | 1~10000 | 1 |
| | | | 10001~20000 | 2 |
| | | 1~500 | 20001~30000 | 3 |
| | | | 30001~40000 | 4 |
| | | | 40001~50000 | 5 |
| | | | 1~10000 | 2 |
| Restrictions | | 504 4000 | 10001~20000 | 3 |
| Nosin Guono | | 501~1000 | 20001~30000 | 4 |
| | | | 30001~40000 | 5 |
| | | | 40001~50000 | 6 |
| | | | 1~10000 | 3 |
| | | | 10001~20000 | 4 |
| | | 1001~1500 | 20001~30000 30001~40000 | 5 6 |
| | | | | |
| | | | 40001~50000 | 7 |
| | | | 1~10000 | 4 |
| | | 1501~2000 | 10001~20000 | 5 |
| | | | | |
| | | 1001 2000 | 20001~30000 30001~40000 | 6 7 |

| Item | Specification | | | |
|------|---------------|-------------------|-----------------------|-------------------|
| | | | 40001~50000 | 8 |
| | | | 1~10000 | 5 |
| | | | 10001~20000 | 6 |
| | | 2001~2500 | 20001~30000 | 7 |
| | | | 30001~40000 | 8 |
| | | | 40001~50000 | 9 |
| | | | 1~10000 | 6 |
| | | | 10001~20000 | 7 |
| | | 2501~3000 | 20001~30000 | 8 |
| | | | 30001~40000 | 9 |
| | | | 40001~50000 | 10 |
| | • | Maximum tag array | elements = 512 or dat | a size < 400Bytes |
| | • | Maximum tag name | length = 40bytes | |

10.2.10.5 FTP Server

Before connecting to AS-FFTP01 through FTP, you need to set up the followings in HWCONFIG.

- 1. Set up the IP address of AS-FFTP01.
- 2. Make sure the port that FTP is going to use. (default: 21; no need to change it if there is no other concern)
- 3. Set up the network name if needed.
- 4. Set up the user account and password for users to log in to FTP Server. Up to 4 users can be set. The permission for users are Read-only and Read/Write.

Use FTP Client from your computer to connect to AS-FFTP01 and upload/download data on the SD card. Enter the followings:

- · IP address of the communication or the network name
- Port number (default: 21)
- User account and password

• FTP Specifications

| - I'll epochications | | | |
|---------------------------|----------------|--|--|
| Item | Specifications | | |
| Device type | FTP Server | | |
| Communication port | 21 | | |
| Maximum connection number | 1 | | |
| Maximum user accounts | 4 | | |
| Data storage | SD card | | |



10.2.10.6 MQTT Client

AS-FFTP01 V1.00 is only available for **MQTT support by Amazon AWS IoT Core**. You can use the MQTT feature **Publish** to publish messages to the specific topic on the cloud where the MQTT Broker designed. For example, you can also update the status of the PLC registers to the specific topic on the cloud. For users, they can use the MQTT feature **Subscribe** to scribe the specific topic so that they can receive the published messages, e.g. the status of the PLC registers.

Set up your AWS account before establishing a connection.

- 1. Cloud: Select AWS.
- 2. MQTT Server Mode: Select Domain Name.
- 3. MQTT Server: Enter AWS IoT device data endpoints from the Settings.
- 4. Port number: 8883
- 5. Import the AWS provided RootCA, Certification and Private Key file.

After the connection is established, you can use the PLC APIs, including, MQTT_Connect, MQTT_Publish and MQTT_Subscribe to manage MQTT for IoT messaging. Refer to AS Programming Manual for more details.

MQTT Specifications

| Item | Specifications |
|----------------------------------|--------------------|
| Device type | MQTT Client |
| Supported platform | Amazon Web Service |
| Communication port | 8883 |
| Maximum connection number | 1 |
| Maximum connection number to be | 1 |
| recorded | <u>'</u> |
| Quality of Service (QoS)* | 0, 1 |
| Section to be read | D Register |
| Maximum data length in Publish | 1000 words |
| Maximum data length in Subscribe | 1000 words |
| | MQTT_Connect |
| Application command | MQTT_Publish |
| | MQTT_Subscribe |

*Note: QoS levels in MQTT:

QoS=0, at most once: No guarantee of delivery.

QoS=1, at least once: It guarantees that a message is delivered at least one time to the receiver. If no confirmation is received or the packet went missing, the message will be resent until it receives a confirmation.

10.2.10.7 Web Server

When AS-FFTP01 is installed on AS300 Series PLC, you can enter AS-FFTP01 IP address in the search bar of your browser to connect to your device. After that you can monitor the operation and set up the Node-RED.

Web Specifications

| Item | | Specification |
|---------------------------|--------------------|---------------------------------------|
| Communication port | | 80 |
| Maximum connection number | | 8 |
| Function | | Check the device information |
| | | Management on the permission of users |
| | | Built-in Node-RED |
| Version | | V0.18.5 |
| Node-RED | Communication port | 1880 |

List of browsers that support AS-FFTP01 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 |

1. After the setting IP address in HWCONFIG of ISPSoft. Open your browser and enter AS-FFTP01 IP address in the search bar to connect to AS-FFTP01. 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.

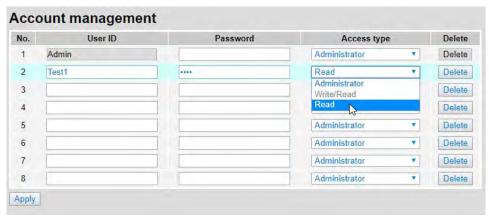




2. The menu shows data based on the permission of the current user.

| Nodes | Permission | | |
|--------------------|---------------|------|--|
| Nodes | Administrator | Read | |
| Device information | V | V | |
| Account management | V | Х | |
| Save configuration | V | Х | |
| Node-Red editor | V | Х | |
| Node-Red dashboard | V | Х | |

3. Account Management: You can set 2 kinds of access types, Administrator and Read. After the setting is done, click Apply and save the settings in Save configuration.



- 4. Save Configuration: After any setting is done, save the settings in Save Configuration to reflect the changes.
- 5. Node-RED editor: click to open a new webpage to add nodes and save PLC registers in this browser-based flow editor.
- 6. Node-RED dashboard: click to open a new webpage to see the visualized data in a dashboard created through Node-RED editor.

10.2.10.8 Data Log

You can save data in .csv file and save the data on the SD card that is installed on AS-FFTP01. Up to four groups of logs (Log1 to Log4) can be set. Each group of log can set its own trigger condition. You can retrieve data from the SD card or through FTP to download data.

1. Log Setting

On the Log Setting page, click **+Add** to create a row in the .csv file and up to 60 rows can be added. One row is corresponding to one register. The following parameters can be set here on the Log Setting page.

- Name: user-defined, the maximum length is 64 characters.
- Register Type: Register D and M
- Register Address: Register number
- Data Type: INT16, UINT16, INT32, UINT32, Float, INT64, UINT64, and Double Float can be used. After the file
 is saved in the log, the corresponding data type and acceptable data length will be applied.
- Decimal Places: Up to 5 decimal places can be used for the use of floating-point data type.

2. Log Trigger Setting

Click the tab of **Log Trigger Setting** on the Log Setting page to open the Log Trigger Setting page. There are three groups of settings can be made, Trigger Setting, Archive Settings and Register Status Settings.

A. Trigger Settings

- (1) Active Mode
 - Disable: Not using this log function
 - Program Control: Work with register; the execution of instruction is used for PLC to control the register M to enable or disable the log function.
 - PLC Run: When PLC starts running, the log function is enabled. When PLC stops running, the log function is disabled.
 - Always Enable: Once PLC starts running, the log function is enabled. The log function is enabled, even if the PLC stops running.

(2) Start Up Register M

• It is used when the log function to be enabled or disabled is by the execution of instruction. You can designate any register M to enable (ON) or disable (OFF) the log function.

(3) Execute Frequency

- 0: Once the log function is enabled, the log function is executed for one time.
- Other values: The interval unit is 0.1 second. This value is set for the recording interval in the log.
 And this setting will affect the accuracy and system workload. If you need higher accuracy, you can increase the frequency.

B. Archive Settings

- Path Log Path Setting
 - Data log can only be saved on the SD card. You can define the directory and the file name. If
 Date or Date + Time is selected, the date or date + time will be added right after your set
 filename. Make sure you have set up the real time setting correctly in AS300 PLC CPU before
 selecting Date or Date + Time option.

(2) Directory Creating Timing

- Do not create a new directory: When selecting this option, the system will NOT create a new directory but to save the data in the original directory when the saving condition is met.
- Daily, Weekly, or Monthly: When selecting the cycle unit, the system will create a new directory and save the data in the new directory when the saving condition is met.



(3) File Creating Timing

- Do not create a new file: When selecting this option, the system will NOT create a new file but to save the data in the same file when the saving condition is met.
- Minute, Hourly, or Daily: When selecting the cycle unit, the system will create a new file and save
 the data in the new file by minute, by hour or by day, when the saving condition is met. Up to 65535
 pieces of data can be saved; if exceeding the limit, the system will create a new file for recording.
- Set maximum records of created file: You can set a maximum number for records in a file. Up to
 the set maximum of records can be saved, if exceeding the limit, the system will create a new file
 for recording.

(4) File Writing Timing

Count or second: To prevent data loss caused by accidents, when the condition is met, the system
saves data from the register to the files in the SD card by counts or by seconds. When the setting
value is set to 0 or less than the recording cycle, the system saves data automatically. When the
data in the register is more than 60% full, the system saves data to the SD card immediately.

C. Register Status Settings

- (1) Record Full Flag M
 - You can designate any register M to indicate if the log is full. ON: Full. Users need to clear this fag afterwards.
- (2) Error Flag M
 - You can designate ay register M to indicate an error and the log can NOT be recorded. ON: ERROR. Users need to clear this fag afterwards.
- (3) Error Code Register D
 - You can designate any register D to store the error code. When the error flag M is ON, the corresponding error code will be stored in the register D you have designated.

10.2.10.9 Modbus TCP

Modbus TCP Specifications

| Item | Specification |
|---------------------------|-------------------|
| Device type | Modbus TCP Server |
| Communication port | 502 |
| Maximum connection number | 8 |
| Maximum data length | 200 words |

• Standard Modbus device address

| Device | Туре | Format | Range | Modbus address (Dec) | AS Series Address (Hex) |
|--------|-------|--------|-------------|-------------------------|----------------------------|
| 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 |
| Y | Word | DD | Y0~Y63 | 440961~441024 | A000~A03F |
| М | 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 |
| _ | Bit | DDD | T0~T511 | 057345~057856 | E000~E1FF |
| T | Word | DDD | T0~T511 | 457345~457856 | E000~E1FF |
| | Bit | DDD | C0~C511 | 061441~061952 | F000~F1FF |
| С | Word | DDD | C0~C511 | 461441~461952 | F000~F1FF |
| 110 | Bit | DDD | HC0~HC255 | 064513~064768 | FC00~FCFF |
| HC | DWord | DDD | HC0~HC255 | 464513~464768 | FC00~FCFF |
| Е | Word | DD | E0~E9 | 465025~465039 | FE00~FE09 |



• Standard Modbus function codes and range

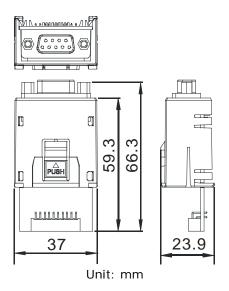
| Function code | Description | Applicable to devices | Supported device range |
|---------------|---|--------------------------|-------------------------|
| 01 | Read multiple bit devices | X, Y, M, SM, S, T, C, HC | 1~1600 |
| 02 | Read multiple bit devices | X, Y, M, SM, S, T, C, HC | 1~1600 |
| 03 | Read multiple word devices | X, Y, SR, D, T, C, HC, E | 1~100, but for HC: 1~50 |
| 04 | Read multiple word devices | Χ | 1~100 |
| 05 | Write the status in a single bit device | Y, M, SM, S, T, C, HC | 1 |
| 06 | Write data in a single word device | Y, SR, D, T, C, HC, E | 1 |
| 0F | Write the status in multiple bit devices | Y, M, SM, S, T, C, HC | 1~1600 |
| 10 | Write the status in multiple word devices | Y, SR, D, T, C, HC, E | 1~100, but for HC: 1~50 |
| 17 | Read/write the status from/in multiple word devices | Y, SR, D, T, C, HC, E | 1~100, but for HC: 1~50 |

10.2.10.10 Network Security

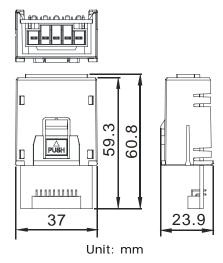
To enhance security and performance of the system, it is suggested to use closed network or LAN with firewall protection to prevent cyber-attacks.

10.3 Profiles and Dimensions

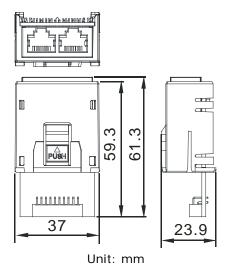
10.3.1 AS-F232



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

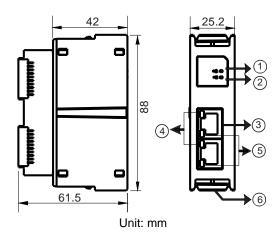


10.3.3 AS-FCOPM





10.3.4 AS-FEN02

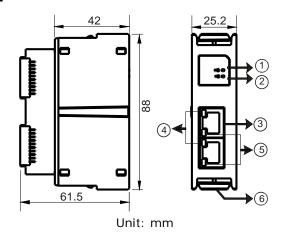


| Number | Name | Description | |
|--------|----------------------|--|--|
| 1 | MS indicator | Indicates the status of the communication card Green light ON: the operation is working normal Green light BLINKING: the setting is not complete Red light ON: internal communication fail, can NOT be recovered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

RJ-45 Pin Definition

| NO-43 FIII Dellilition | | | | | |
|------------------------|-------|-----|--|--|--|
| Pin No. | RJ-45 | | | | |
| 1 | TX+ | | | | |
| 2 | TX- | | | | |
| 3 | RX+ | | | | |
| 4 | N/C | | | | |
| 5 | N/C | 8 1 | | | |
| 6 | RX- | | | | |
| 7 | N/C | | | | |
| 8 | N/C | | | | |

10.3.5 AS-FPFN02



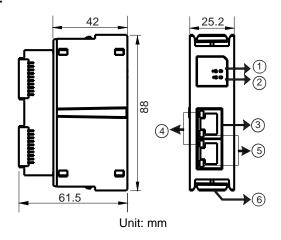
| Number | Name | Description |
|--------|----------------------|--|
| | | System Fault Indicator |
| 1 | SF indicator | Red light ON: an error occurs in the topology or RTU module |
| | | OFF: no system error |
| 2 | BF indicator | Bus Fault Indicator |
| | | Red light ON: no PROFINET connection |
|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

RJ-45 Pin Definition

| NO 40 I III Definition | | | | | |
|------------------------|-------|-----|--|--|--|
| Pin No. | RJ-45 | | | | |
| 1 | TX+ | | | | |
| 2 | TX- | | | | |
| 3 | RX+ | | | | |
| 4 | N/C | | | | |
| 5 | N/C | 8-1 | | | |
| 6 | RX- | | | | |
| 7 | N/C | | | | |
| 8 | N/C | | | | |



10.3.6 AS-FOPC02

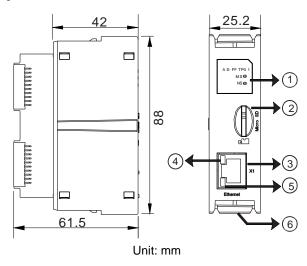


| Number | Name | Description | |
|--------|----------------------|---|--|
| 1 | MS indicator | Indicates the status of the communication card Green light ON: the operation is working normal Green light BLINKING: the setting is not complete Red light ON: internal communication fail, can NOT be recovered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

RJ-45 Pin Definition

| Pin No. | RJ-45 | |
|---------|-------|-----|
| 1 | TX+ | |
| 2 | TX- | |
| 3 | RX+ | |
| 4 | N/C | |
| 5 | N/C | 8 1 |
| 6 | RX- | |
| 7 | N/C | |
| 8 | N/C | |

10.3.7 AS-FFTP01



| Number | Name | Description | | |
|--|---|---|--|--|
| 1 | Indicates the status of the communication card Green light ON: the operation is working normal Green light BLINKING: the setting is not complete Red light ON: internal communication fail, can NOT be Red light BLINKING: internal communication timeout OFF: no power | | | |
| | NS indicator | Reserved | | |
| 2 | Micro SD card slot | For Micro SD card | | |
| 3 RJ-45 port For network connections | | For network connections | | |
| 4 LINK indicator Green light ON: a network connection is | | Indicate the status of Ethernet connection Green light ON: a network connection is established OFF: a network connection is not established | | |
| 5 | ACT indicator | Indicate the status of Ethernet communication Orange BLINKING: data transmission OFF: no data transmission | | |
| 6 | Clip ring | Secures AS series | | |

RJ-45 Pin Definition

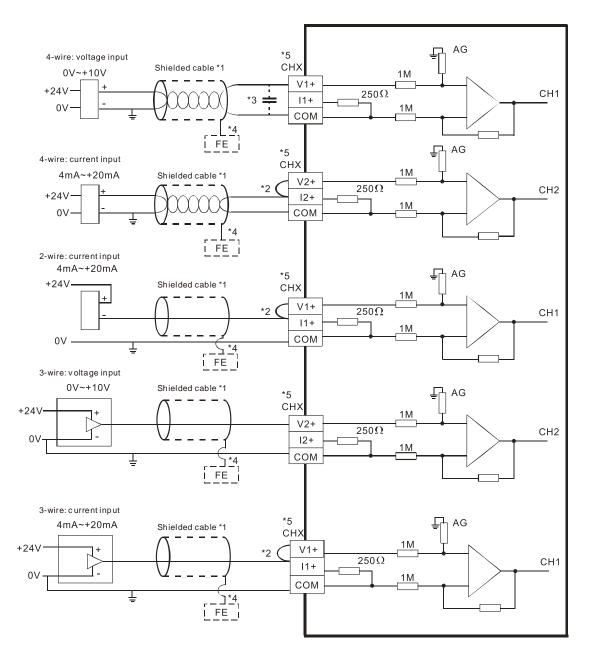
| Pin No. | RJ-45 | |
|---------|-------|-----|
| 1 | TX+ | |
| 2 | TX- | |
| 3 | RX+ | |
| 4 | N/C | |
| 5 | N/C | 8 1 |
| 6 | RX- | |
| 7 | N/C | |
| 8 | N/C | |



10

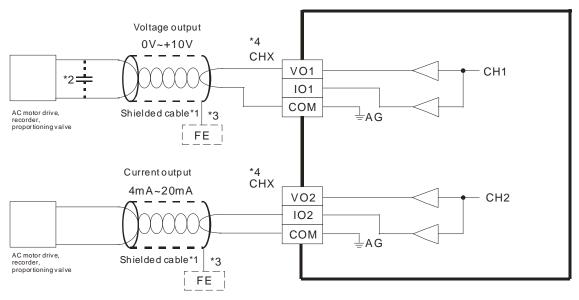
10.4 Wiring

10.4.1 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 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 having a capacitance in the range of $0.1-0.47 \mu F$ and a working voltage of 25 V.
- *4. Connect the shielded cable to the terminal FE.
- *5. The wording "CHX" indicates that you can use the five wiring methods listed above for every input channel.

10.4.2 AS-F2DA



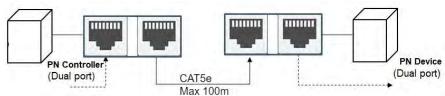
- *1. Use shielded cables to isolate the analog input signal cable from other power cables.
- *2. If variability in the input voltage results in interference within the wiring, connect the module to a capacitor having a capacitance in the range of $0.1-0.47~\mu F$ and a working voltage of 25~V.
- *3. Connect the shielded cable to the terminal FE.
- *4. The wording "CHX" indicates that you can use the two wiring methods listed above for every input channel.



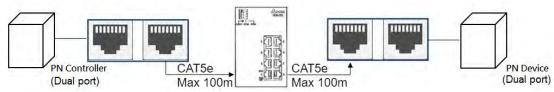
10

10.4.3 Topology of AS-FEN02, AS-FOPC02 and AS-FPFN02

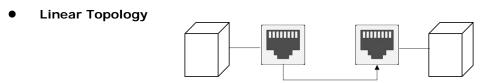
Linear Topology

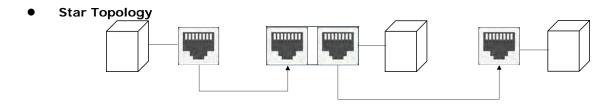


Star Topology



10.4.4 Topology of AS-FFTP01

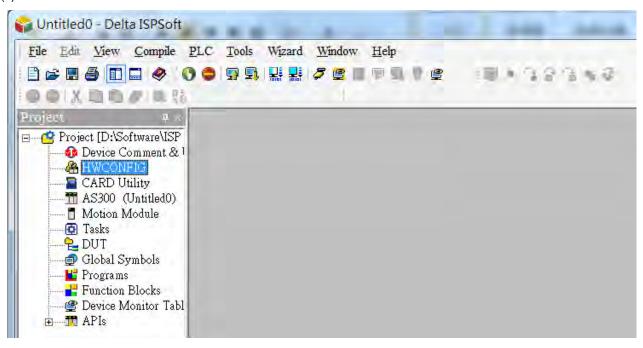




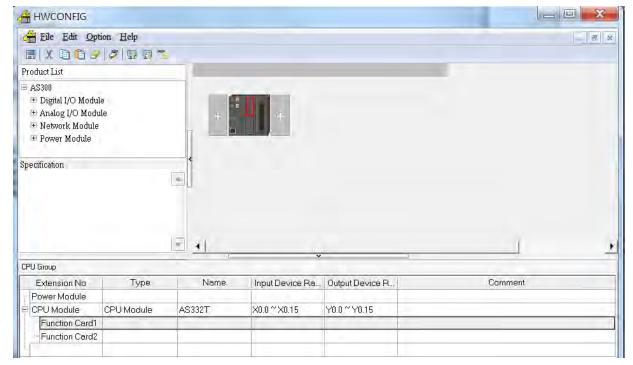
10.5 HWCONFIG in ISPSoft

10.5.1 Initial Setting

(1) Start ISPSoft and double-click HWCONFIG.



(2) Select a function card on the module.



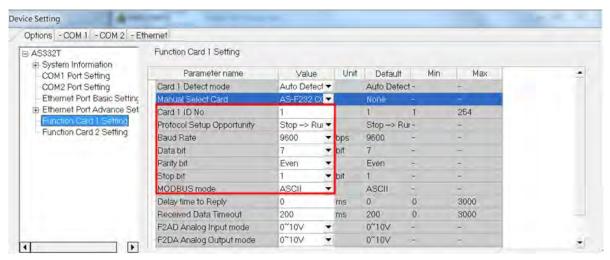


(3) Double-click the function card to open the Device Setting page.

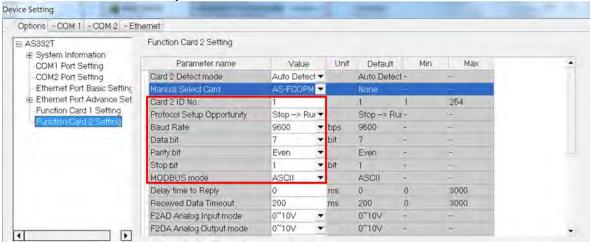
Card1 Detect mode: select Auto Detect or choose the function card model.



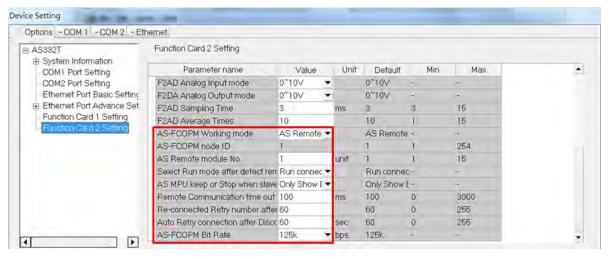
(a) When the function card is an AS-F232, AS-F422, or AS-F485, configure the communication settings in the red box.



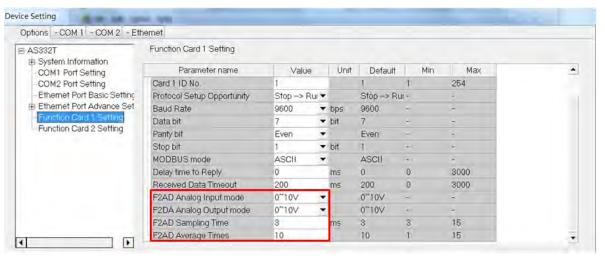
(b) Function card AS-FCOM can only be installed in function card slot 2.



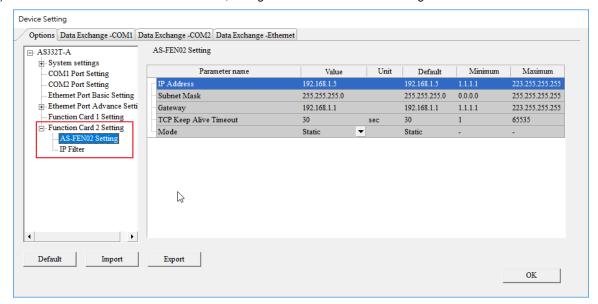
(c) Configure the communication settings in the red box.



(d) When the function card is an AS-F2AD or AS-F2DA, configure the communication settings in the red box.



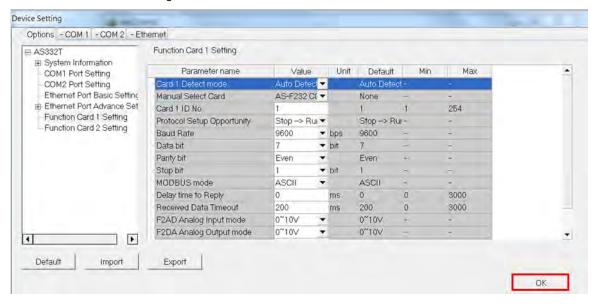
(e) When the function card is an AS-FEN02, configure the communication settings in the red box.



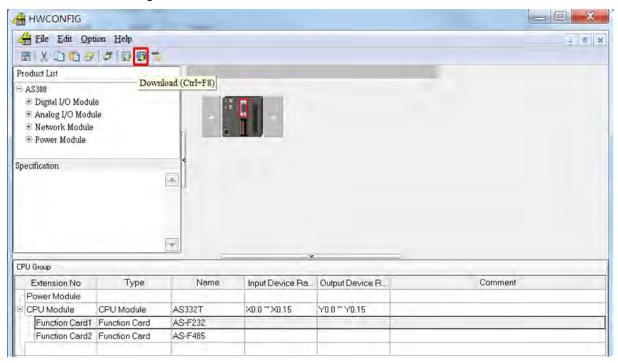


10

(f) Click **OK** to confirm the settings.



(4) Click **Download** on the toolbar to download the parameters. Note that you cannot download the parameters while the CPU module is running.





Chapter 11 DeviceNet Master Scanner Module AS01DNET-A

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11

11.1 Introduction of ASO1DNET-A

- Thank you for choosing Delta AS01DNET-A. Please read this chapter carefully before use so as to ensure correct installation and operation of AS01DNET-A.
- The instruction is simply a guideline for operation of the product and the details on the DeviceNet protocol is excluded here. Please refer to relevant articles and literatures for more details on the DeviceNet protocol.
- AS01DNET-A, a DeviceNet network module can work in two modes: master /slave and RTU. The RTU-Master/Slave switch is used for selecting one of the two modes. When AS01DNET-A works in master/slave mode, it makes up the DeviceNet master or slave with AS-series PLC together. When working in RTU mode, AS01DNET-A needs an external 24VDC power supply and can connect AS-series I/O modules onits right side.

Refer to Section 11.4 and 11.5 for details about master/slave mode and RTU mode.

11.1.1 Feature

- Supports the Group 2 server slave and Group 2 only servers.
- Supports the explicit connection in the predefined master/slave connection and I/O polling connection.
- Able to work as a DeviceNet master or slave as well as a remote RTU connecting AS series I/O modules.
- The network configuration software DeviceNet Builder offers the graphical configuration interface.
- Supports the EDS file configuration in the DeviceNet network configuration tool.

11.1.2 Specifications

DeviceNet Connector

| Item | Specifications | | |
|----------------------|--|--|--|
| Transmission method | CAN | | |
| Electrical isolation | DC500V | | |
| Connector type | Removable terminal block with screws (5.08mm) | | |
| Communication cable | 2 communication wires, 2 power wires and 1 shielded wire included. | | |

DeviceNet Communication

| Item | Specifications | | |
|--------------|---|--|--|
| Message type | I/O polling connection, explicit connection | | |
| | Standard: 125 kbps, 250 kbps and 500 kbps | | |
| Baud rate | Extension: 10 kbps, 20 kbps, 50 kbps, 125 kbps, 250 kbps, 500 kbps, | | |
| | 800kbps and 1M bps. | | |

Electrical Specification

| Item | Specifications |
|---------|---|
| Voltage | The power wires of the communication cable provide 11 ~ 25 VDC. |
| Current | 28mA (typical value), 125mA impulse current (24 VDC) |

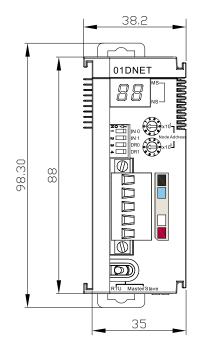


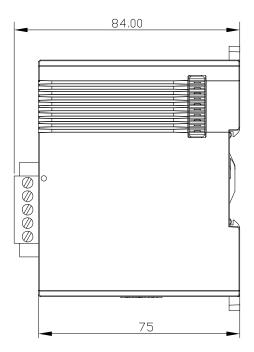
Environment

| Item | Specifications | | |
|----------------------------|---|--|--|
| Noise immunity | ESD (IEC 61131-2, IEC 61000-4-2): 8KV Air Discharge EFT (IEC 61131-2, IEC 61000-4-4): Power Line: 2KV, Digital I/O: 1KV Analog & Communication I/O: 1KV Damped-Oscillatory Wave: Power Line: 1KV, Digital I/O: 1KV RS (IEC 61131-2, IEC 61000-4-3): 26MHz ~ 1GHz, 10V/m | | |
| Operating Environment | -20°C ~ 60°C (Temperature); 5 ~ 95% (Humidity), no condensation; pollution degree: 2 | | |
| Storage Environment | -40°C ~ 80°C (Temperature); 5~95% (Humidity), no condensation | | |
| Vibration/Shock resistance | International standard IEC 61131-2, IEC 68-2-6 (TEST Fc)/IEC 61131-2 & IEC 68-2-27 (TEST Ea) | | |
| Safety | Conforms to IEC 61131-2, UL508 | | |
| Weight | 128 g | | |

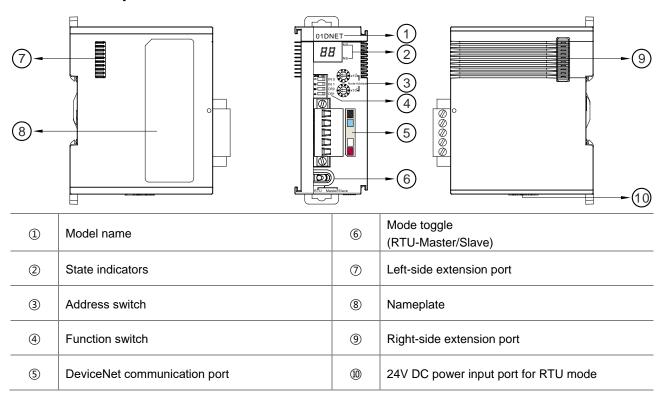
11.2 Components of AS01DNET-A

11.2.1 Profile and Dimensions





11.2.2 Components



Note:

The power input port of the network module is required to connect an external 24VDC power supply only when the toggle (RTU- Master/Slave) is switched to RTU mode. Otherwise, the port does not need an external 24VDC power supply connected when the toggle (RTU- Master/Slave) is switched to Master/Slave mode.

11.2.3 Mode Toggle (RTU- Master/Slave)

| Mode Selection | Description | |
|----------------|---|---------------|
| Master/Slave | Works in master or slave mode and constitutes a DeviceNet master or slave without external power supply. | |
| RTU | When working in remote (RTU) mode, AS01DNET-A is required to connect the external DC 24V power supply and can have AS series I/O modules connected on its right side. | RTU Master/SI |

11.2.4 DeviceNet Connector

The connector is used for the connection to DeviceNet. Wire by using the connector enclosed with AS01DNET -A.

| Pin | Signal | Color | Description | |
|-----|--------|-------|---------------|--|
| 1 | V- | Black | 0 VDC | |
| 2 | CAN_L | Blue | Signal- | |
| 3 | SHIELD | - | Shielded wire | |
| 4 | CAN_H | White | Signal+ | |
| 5 | V+ | Red | 24 VDC | |



11.2.5 Address Switch

The switch is used for setting up the node address of AS01DNET-A in DeviceNet network. Range: 00~63 (64~99 are forbidden.)

| Switch setting | Description | 2 3 y x 10 1 n |
|----------------|--------------------------------|----------------|
| 0 63 | Valid DeviceNet node address | Node Address |
| 6499 | Invalid DeviceNet node address | (|

Example: If users need to set the node address of AS01DNET-A to 26, simply switch the corresponding switch of x101 to 2 and the corresponding switch of x100 to 6.

Note:

- ✓ After the setup is completed, repower AS01DNET-A.
- ✓ While AS01DNET-A is working, changing the setting of the node address is invalid.
- ✓ Rotate the switch carefully with a slotted screwdriver to prevent damage to the switch.

11.2.6 Function Switch

- The function switches are used for:
 - Setting up the work mode (IN0)
 - Setting up the baud rate of DeviceNet network (DR0~DR1)

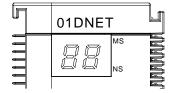
| DR1 | DR0 | Baud Rate | | |
|------|----------|--|--------------|------|
| OFF | OFF | 125 Kbps | ZO <⊨ | 1 |
| OFF | ON | 250 Kbps | | IN 0 |
| ON | OFF | 500 Kbps | N | IN 1 |
| ON | ON | Entering the mode of extended baud rate | ω 📖 | DR0 |
| IN0 | ON | When the slave is off-line, the I/O data in the buffer area will be held. | | DR1 |
| 1140 | OFF | When the slave is off-line, the I/O data in the buffer area will be cleared. | |] |
| IN1 | Reserved | i | | |

Note:

- ✓ After the setup of the function switch is completed during power off, repower AS01DNET-A.
- ✓ While AS01DNET-A is working, changing the setting of the node address is invalid.
- ✓ Adjust the DIP switch carefully with a slotted screwdriver to prevent any damage to the switch.

11.2.7 Digital Displayer

- The digital displayer provides following functions:
 - Showing the node address of AS01DNET-A and error ID
 - Showing the error information about a slave





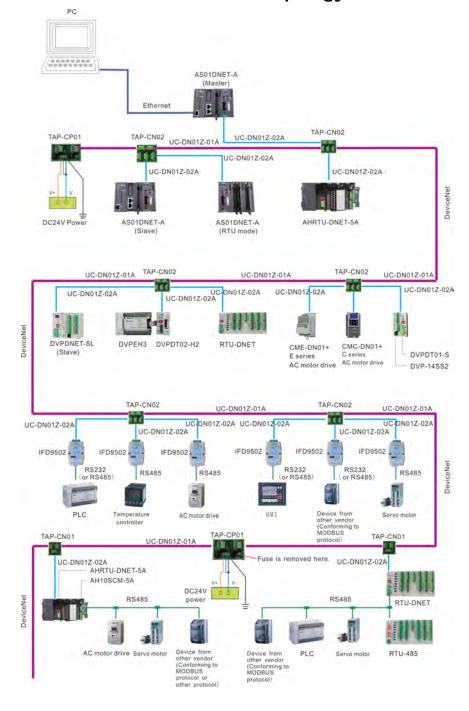
11.3 DeviceNet Network Communication

11.3.1 Relationship between Transmission Distance and Baud Rate

The transmission distance of a DeivceNet network is determined by the baud rate. The following table shows the corresponding maximum communication distance at different baud rates.

| Baud rate (bits/s) | 10K | 20K | 50K | 125K | 250K | 500K | 800K | 1M |
|--------------------------------|------|------|------|------|------|------|------|----|
| Max. transmission distance (M) | 5000 | 2500 | 1000 | 500 | 250 | 100 | 50 | 25 |

11.3.2 DeivceNet Network Topology Structure





List of Delta DeviceNet Fieldbus Network Products:

| Product picture | Model | Function |
|--|---------------|--|
| OIDNET S. S. J. | AS01DNET-A | AS01DNET-A, a DeviceNet module running on the right of AS PLC can work as a DeviceNet master or slave. AS01DNET-A can also be used as AS series remote IO module for connecting AS series DI/DO modules and AI/AO modules to DeviceNet network. |
| 100NET - | AH10DNET-5A | AH10DNET-5A, a DeviceNet module, running on the right of AH500 series PLC can work as a DeviceNet master or slave. |
| RTU-ONET | AHRTU-DNET-5A | AHRTU-DNET-5A, a remote I/O module of AH series, is used for connecting AH500 series DI/DO module, AI/AO module and 10SCM module to DeviceNet network. |
| Complete Com | DVPDNET-SL | DVPDNET-SL, a DeviceNet module, running on the left of S series PLC can work as a DeviceNet master or slave. |
| RPU-ONET | RTU-DNET | RTU-DNET, a remote I/O module of S series, is used for connecting S-series DI/DO module, AI/AO module and other device to DeviceNet network. |



| Product picture | Model | Function |
|--|-------------------------|--|
| TANKS TA | IFD9502 | Used for connection of the DeviceNet network and electromechanical equipment such as AC motor drive, PLC, temperature controller, servo drive, HMI, user-defined device. |
| | IFD6503 | A fieldbus data analysis tool, with one end: CAN interface and the other end: USB interface can be used for getting the CAN data or sending the data to the CAN node. It is used with the Netview Builder software together. |
| | E-series AC motor drive | Used for connecting AC motor drive to DeviceNet network via CME-DN01 card. |
| | CMC-DN01 | Used for connecting C2000 series AC motor drive to the DeviceNet network. |
| | DN-02 | Used for the connection of DeviceNet network and AC motor drive. |
| DVR-G-TOT | DVPDT01-S | Used for the connection of DeviceNet network and S series PLC. |





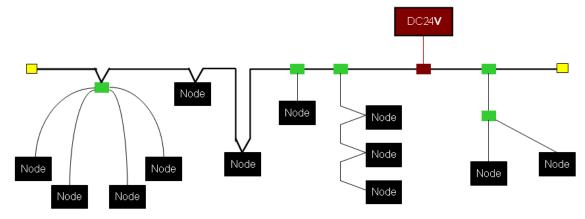
| Product picture | Model | Function |
|---|--------------|---|
| DT02 | DVPDT02-H2 | Used for the connection of DeviceNet network and DVP-EH2 series PLC. |
| Marie Company of the | TAP-CP01 | The distribution box for CAN topology, with the 120 ohm resistor enclosed which is controlled to take effect or not via its switch. |
| | TAP-CN01 | The distribution box for CAN topology, with the 120 ohm resistor enclosed which is controlled to take effect or not via its switch. |
| | TAP-CN02 | The distribution box for CAN topology, with the 120 ohm resistor enclosed which is controlled to take effect or not via its switch. |
| | UC-DN01Z-01A | UC-DN01Z-01A: DeviceNet trunk cable. |
| | UC-DN01Z-02A | UC-DN01Z-02A: DeviceNet branch cable. |

11.3.3 Choice and Purpose of a DeviceNet Terminal Resistor

Choice of a DeviceNet Terminal Resistor

A DeviceNet network requires two terminal resistors of 121 Ω connected at both ends of the trunk cable respectively.

The thick cable represents the trunk cable, the thin cable represents the branch cable and the yellow boxes at the two ends are terminal resistors in the following figure.



Purpose of a DeviceNet Terminal Resistor

The terminal resistor is used for eliminating the signal reflection in the communication cable.

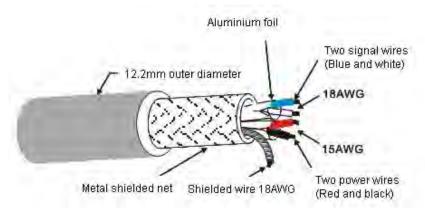
All signal transmission cables have the characteristic impedance. The characteristic impedance of Delta DeviceNet communication cable is about 121Ω .

When being transmitted to the end of the communication cable, because the impedance of the end is different from the characteristic impedance, the signal will be reflected, which will interfere with the new signal and the signal wave form distortion will happen.

The phenomenon of the signal wave form distortion is not obvious in the short-distance transmission. But the wave form distortion will become severer in the increasingly long communication cable. Therefore, the two ends of the trunk cable must be installed with the terminal resistors respectively.

Installation Position of Terminal Resistors

The DeviceNet communication cable consists of five wires such as red wire, blue wire, white wire, black wire and shielded wire as below.



The terminal resistors must be installed to the two ends of the trunk cable only. Since the blue wire and white wire are for signal transmission, both of the terminal resistors must be installed between blue wire and white wire at the two ends of the main cable.



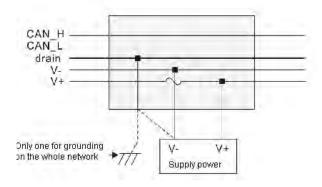
11.3.4 DeviceNet Network Supply Power

The network requires one or multiple supply powers to supply the power to each piece of network equipment via the bus cable.

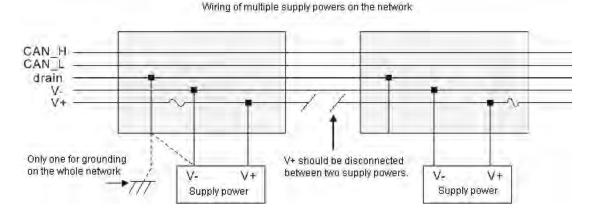
Delta DeviceNet communication cable consists of five wires, among which the power cable and signal cable occupy two wires respectively and the one on the left is the shielded wire as the above figure shows.

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



11.4 Master /Slave Mode

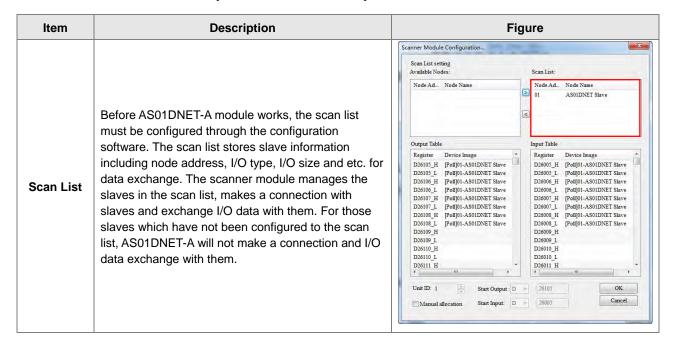
11.4.1 Introduction of Master/Slave Mode

AS01DNET-A can work as a DeviceNet master as well as slave with at most 4 AS01DNET modules connectable to the right side of AS PLC. Running on the right of AS-series PLC, AS01DNET-A with AS-series PLC together constitutes the DeviceNet master or slave. When working in Master/Slave mode, AS01DNET-A is required to switch the function toggle (RTU- Master/Slave) to Master/Slave mode and the DeviceNet Builder of version 2.04 and above is used for the setup.

For details about the setup, refer to Section 11.4.10.

- As a master, AS01DNET-A can provide the following function.
 - Supporting the Client function of Explicit message;
 - Supporting IO polling connection with slaves;
 - The network configuration software DeviceNet Builder provides graphic configuration interface.
 - Sending explicit messages to read and write the data in slave through the explicit message instruction DNETRW.
 - Automatically performing data exchange with the PLC module; users just need write a program for D register in the PLC without using FROM/TO instructions.
 - Offering 190 bytes of output data area and 190 bytes of input data area for exchanging data with the master.
- As a slave, AS01DNET-A can provide the following function.
 - Explicit message Server and Group 2 only server connection mode;
 - Polling connection;
 - Offering 200 bytes of input data area and 200 bytes of output data area for exchanging data with master;
 - Automatically exchanging data with the PLC. The user just need to write a program for D register in the PLC without using FROM/TO instruction.

11.4.1.1. Scan List, Input Table and Output Table

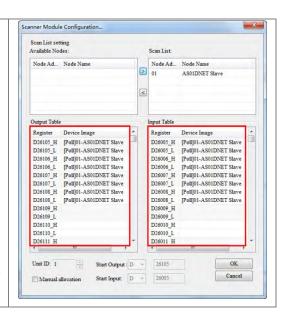






Input/output Table

The scanner module provides an input table of total size: 190 bytes and an output table of total size: 190 bytes for data exchange with slaves. When one slave is configured to the scan list, the configuration software will automatically assign corresponding size of I/O data exchange area to the slave. Input Table and Output Table are the interface for data exchange between the PLC of the master and slaves and show the mapping relationships between the D registers in the PLC of the master and the I/O data of slaves. After the configuration is finished, download the configuration data to the scanner module. Then the module will exchange I/O data with corresponding slaves according to the configuration. The data in the output table will be transmitted to slaves and the data returned from slaves will be filled in the input table.



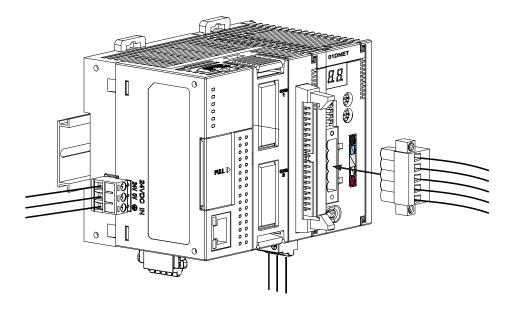
11.4.2 Installation

11.4.2.1. Connecting ASO1DNET-A Module to AS series PLC

For the details on how AS01DNET-A (in Master/slave mode) is connected to AS series PLC, refer to Section 1.3.1 Installing a Module in AS Series Module Manual.

11.4.2.2. Connecting the DeviceNet Communication Connector

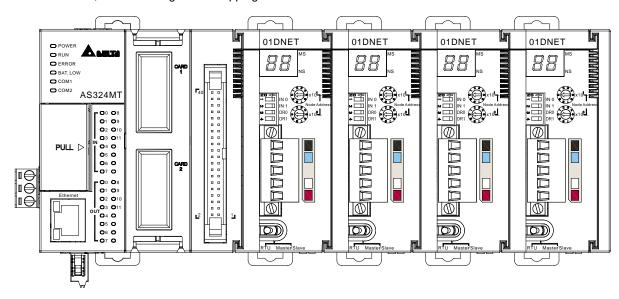
- Make sure that the color marks for the PINs of the DeviceNet connection port match the colors of the connection cables and the cable should be connected to the right PIN.
- Delta's power module is recommended as the power module in the communication.



11.4.3 IO Mapping for ASO1DNET in AS PLC

11.4.3.1. Data Mapping between Modules and AS PLC

Up to four AS01DENT modules can be connected to the right side of AS PLC at most. After AS01DNET modules and PLC are connected, PLC will assign data mapping areas to each module.

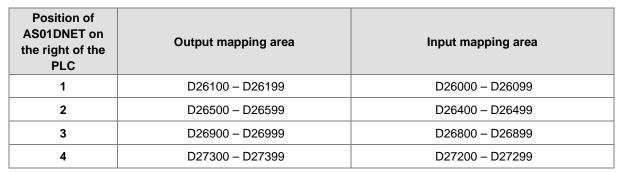


AS01DNET modules are connected to the right of the PLC. The position of the first module on the right of AS PLC is 1, the second module is 2, the third module is 3 and the fourth module is 4. The position is only defined for network modules such as AS01DNET and AS00SCM, instead of digital modules, analog modules, temperature modules, and weight-measurement modules. The positions of AS01DNET modules on the right of the PLC are shown in the following table where there are two arrangement ways of module connections.

| Exan | nple 1 | Example 2 | | |
|---|----------|--|---|--|
| Position of AS01DNET on the right of the PLC Arrangement order of AS PLC and modules on the right of the PLC | | Position of AS01DNET on the right of the PLC | Arrangement order of AS PLC and modules on the right of the PLC | |
| | AS PLC | | AS PLC | |
| 1 | AS01DNET | 1 | AS01DNET | |
| | AS04AD | | AS04AD | |
| 2 | AS01DNET | | AS00SCM | |
| | | 3 | AS01DNET | |



When AS01DNET is at different positions of the right of the PLC, the input and output mapping areas for the AS01DNET module in AS PLC are listed in the following table.



11.4.3.2. Tables of Input Mapping and Output Mapping areas

When AS01DNET works in master mode, the input and output mapping areas for AS01DNET at different
positions of the right of AS PLC are listed in the following table.

| Position of AS01DNET | Output mapping a | rea (for sending o | data to | Input mapping area (for receiving data from the slave) | | |
|-------------------------|------------------|----------------------------------|--------------|--|---------------------------------------|--------------|
| on the right of the PLC | D register | Mapping area | Data size | D register | Mapping area | Data size |
| | D26100~D26103 | Bit-strobe command area | 4 words | D26000~D26003 | Scan-list node status indication area | 4 words |
| 1 | D26104 | Reserved | 1word | D26004 | Module status indication area | 1 word |
| | D26105~D26199 | DeviceNet output data area | 95 words | D26005~D26099 | DeviceNet input data area | 95 words |
| | D26500~D26503 | Bit-strobe command area | 4 words | D26400~D26403 | Scan-list node status indication area | 4 words |
| 2 | D26504 | Reserved | 1word | D26404 | Module status indication area | 1 word |
| | D26505~D26599 | DeviceNet output data area | 95 words | D26405~D26499 | DeviceNet input data area | 95 words |
| | D26900~D26903 | Bit-strobe command area | 4 words | D26800~D26803 | Scan-list node status indication area | 4 words |
| 3 | D26904 | Reserved | 1word | D26804 | Module status indication area | 1 word |
| | D26905~D26999 | DeviceNet output data area | 95 words | D26805~D26899 | DeviceNet input data area | 95 words |
| | D27300~D27303 | Bit-strobe command area | 4 words | D27200~D27203 | Scan-list node status indication area | 4 words |
| 4 | D27304 | Reserved | 1word | D27204 | Module status indication area | 1 word |
| | D27305~D27399 | DeviceNet | 95 | D27205~D27299 | DeviceNet input | 95 |

| Position of AS01DNET | Output mapping a | rea (for sending o | data to | Input mapping area (for receiving data from the slave) | | | |
|-------------------------|------------------|--------------------|--------------|--|--------------|--------------|--|
| on the right of the PLC | D register | Mapping area | Data size | D register | Mapping area | Data size | |
| | | output data | words | | data area | words | |
| | | area | | | | | |

Note: See Section 11.4.5 for further explanation of scan-list node status indication areas and module status indication areas. The input and output mentioned here are defined in the perspective of the master of the entire fieldbus system.

When AS01DNET works in slave mode, the input and output mapping areas for AS01DNET at different positions
of the right of AS PLC are listed in the following table.

| Position of AS01DNET on | Area for sending d | ata to the master | Area for receiving data from the master | | |
|-------------------------|--------------------|-------------------|---|-------------|--|
| the right of the PLC | D register | Data length | D register | Data length | |
| 1 | D26100~D26199 | 100 words | D26000~D26099 | 100 words | |
| 2 | D26500 - D26599 | 100 words | D26400 - D26499 | 100 words | |
| 3 | D26900 - D26999 | 100 words | D26800 - D26899 | 100 words | |
| 4 | D27300 – D27399 | 100 words | D27200 – D27299 | 100 words | |

11.4.4 Bit-strobe Command

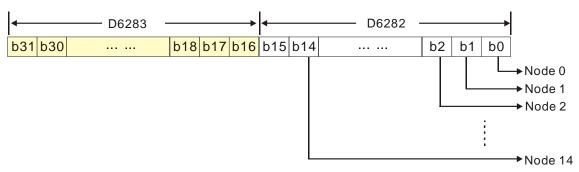
11.4.4.1. Bit-strobe Work Principle

Bit strobe is one of the standard DeviceNet I/O transmission methods. The command length is fixed to 8 bytes, i.e. 64 bits. (Maximum 64 stations exist in a DeviceNet network.) One bit corresponds to one node. The following table takes the first AS01DNET on the right of AS PLC for example.

| Bit-strobe | e Corresponding network node | | | | | | |
|------------|------------------------------|---------|---------|--|---------|---------|--|
| register | b15 | b14 | b13 | | b1 | b0 | |
| D26100 | Node 15 | Node 14 | Node 13 | | Node 1 | Node 0 | |
| D26101 | Node 31 | Node 30 | Node 29 | | Node 17 | Node 16 | |
| D26102 | Node 47 | Node 46 | Node 45 | | Node 33 | Node 32 | |
| D26103 | Node 63 | Node 62 | Node 61 | | Node 49 | Node 48 | |

When the value of bit0 of D26100 is 0, node 0 is selected and need return data to the master.

When the values of bit0 and bit1 of D26100 are both 0, node 0 and node 1 are selected and they need return data to the master.



In the bit-strobe method, the master does not send control data to the slave node. However, the slave node need return I/O data to the master if the corresponding bit is set to 0. If the corresponding bit is set to 1, the slave node does not need to return I/O data to the master.



11.4.5 Network Node Status Display

11.4.5.1. Scan-List Node Status Indication

The following table takes the first AS01DNET on the right of AS PLC for example. AS01DNET master can monitor whether the configured slave is online or not in real time and have the status of the configured slave mapped to one bit. Users can get the status of network nodes by monitoring the contents in D26000~D26003. The corresponding relationships between devices in the PLC and network nodes are shown in the following table. If the node in Scan List is normal, the corresponding bit is OFF. If the node in Scan List is abnormal, the corresponding bit is ON.

| Register in | Corresponding network node | | | | | | | |
|-------------|----------------------------|---------|---------|--|---------|---------|--|--|
| the PLC | b15 | b14 | b13 | | b1 | b0 | | |
| D26000 | Node15 | Node 14 | Node 13 | | Node 1 | Node 0 | | |
| D26001 | Node 31 | Node 30 | Node 29 | | Node 17 | Node 16 | | |
| D26002 | Node 47 | Node 46 | Node 45 | | Node 33 | Node 32 | | |
| D26003 | Node 63 | Node 62 | Node 61 | | Node 49 | Node 48 | | |

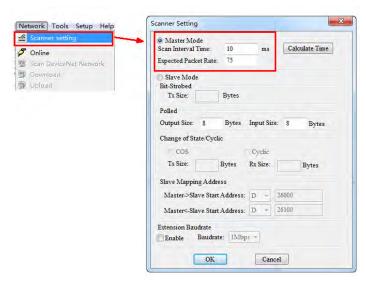
11.4.5.2. Module Status Indication

The following table takes the first AS01DNET on the right of AS PLC for example. Users can get the status of the network node by monitoring the content in D26004. When the module works normally, the content in D26004 is 0. When the module is initializing, the content in the high byte of D26004 is 1 and the content in the low byte is 0. When an error occurs in the module, the content in the high byte of D26004 is 2 and the content in the low byte is an error code. For details on error codes, see Digital Displayer.

| Register in | Description | | | | | | | | | | | | | | | |
|-------------|--|-----|-----|-----|-----|-----|----|--------------------------|----|----|----|----|----|----|----|----|
| the PLC | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
| D26004 | Module status | | | | | | | Error code in the module | | | | | | | | |
| D20004 | (0: Normal, 1: Initializing, 2: error) | | | | | | | | | | | | | | | |

11.4.6 Setting the Time for Data Exchange between Master and Slaves

When AS01DNET works in master mode, the period of time for a data exchange between master and all slaves need be set. Master and all salves will periodically perform the data exchange based on the set time. See the following explanation for details. Click menu **Network** >> **Scanner Setting** on the DeviceNet Builder software page. The **Scanner Setting** window appears as below.





11

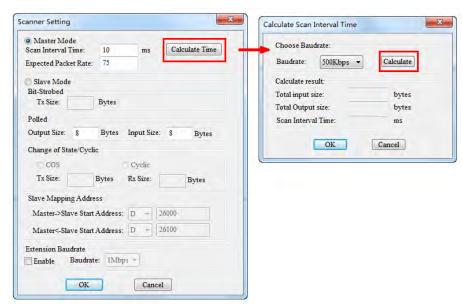
The explanation of Scan Interval Time and Expected Packet Rate is shown in the following table.

| Scan Interval Time | The period of time needed for a data exchange between master and all slaves. Master and all salves will periodically exchange data based on the set interval time. |
|----------------------------|--|
| Expected Packet Rate (EPR) | Sets the timeout time for connection of master and slaves. The calculation method: 4 X EPR with the unit: ms. The default EPR is 75. The EPR for the connection of master and slaves is 4 X 75 = 300ms. The value indicates that the IO data exchange should be achieved once at least within 300 ms. Otherwise, the connection will fail due to communication timeout and then the connection will have to be re-made so that the IO data exchange can proceed. |

Since most DeviceNet slaves only support polled IO data exchange, the EPR value is related to the value of **Scan Interval Time**. Make sure that the actual setting must meet the following condition.

We suggest users refer to the following condition while setting the value of Scan Interval Time.

Click the **Calculate Time** button. The **Calculate Scan Interval Time** dialog box comes out. Clicking the **Calculate** button, the values of **Total input size**, **Total output size** and **Scan Interval Time** are calculated. The value of **Scan Interval Time** is a value in theory. We suggest users should set the scan interval time to a value slightly greater than the actually calculated time. The scan interval time calculated here will not be filled in the **Scan Interval Time** box automatically and so users need enter the value manually.



11.4.7 Application Example

To explain how to configure a DeviceNet network through an application example

Control requirement: AS PLC remotely monitors D26105~D26108 and D26005~D26008 in AS module through DeviceNet network to achieve the data exchange as AS01DNET-A works as master and slave respectively.

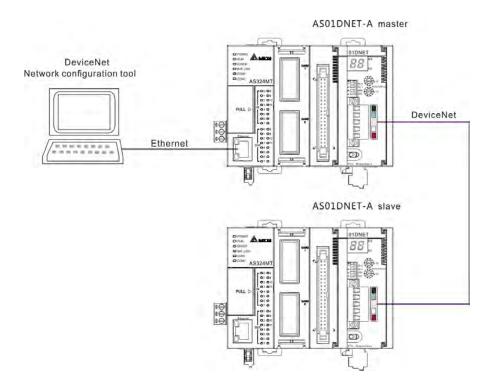


11.4.7.1. Constructing One DeviceNet Network

This section describes how to construct a DeviceNet network configuration through an application example. Before constructing a DeviceNet network, users should understand the control requirement of the network; plan the data for exchange in advance such as maximum communication distance, slaves, total data length for exchange as well as the requreiment for response time during data exchange.

The information above will determine whether the constructed network is reasonable and able to meet the demand. Even it will directly affect the future maintenance and convenience of network capacity expansion and upgrade.

Connection Figure



Note: Both of the ends of the DeviceNet Bus cable must connect one 121Ω terminal resistor respectively. The terminal resistor is connected between CAN_H and CAN_L.

Modules Setting

Prepare two AS PLCs and two AS01DNET-A modules for constructing one DeviceNet network. The setups for two AS01DNET-A modules are shown in the following table.

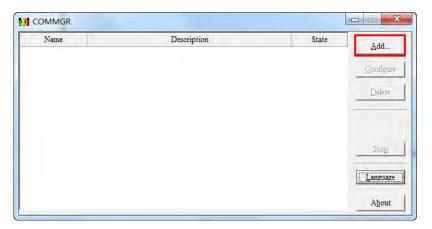
| DeviceNet network module | Node address | Baud rate |
|--------------------------|--------------|-----------|
| AS01DNET-A (Master) | 0 | 500kbps |
| AS01DNET-A (Slave) | 1 | 500kbps |

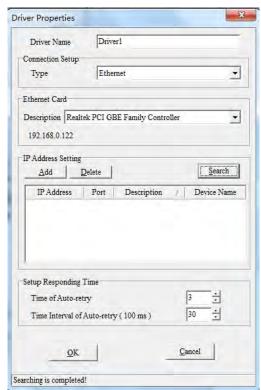


11.4.7.2. Using DeviceNet Builder to Configure a DeviceNet Network

Configuring DeviceNet slave

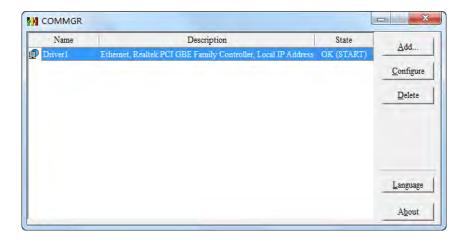
Set the driver for the connection of AS PLC and PC. Clicking **Add**, the **Driver Properties** dialog box appears. Select the connection type for AS PLC and PC in the **Type** field. In this example, select Ethernet as the connection type. Click **Search** to search the PLC and then click **OK** after searching is finished.



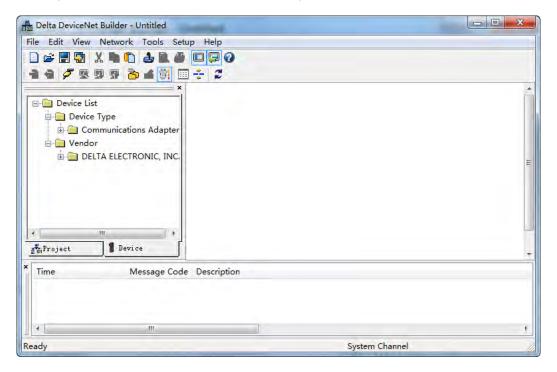




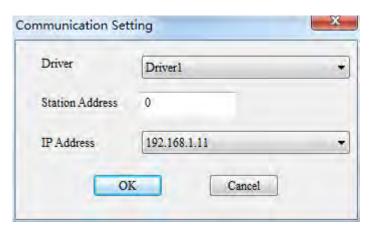




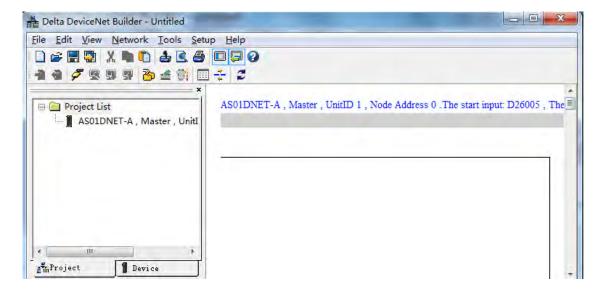
2. Opening the DeviceNet Builder software, the following window appears.



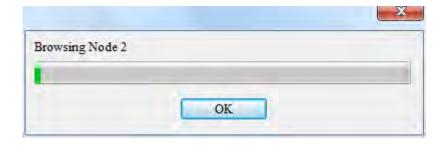
3. Selecting **Setup>> Communication Setting**, the following dialog box appears. Select the driver for connection of AS PLC and PC as below. Click **OK** to finish the selection of Driver.



4. Click **Network** >> **Online** to scan the connected master.

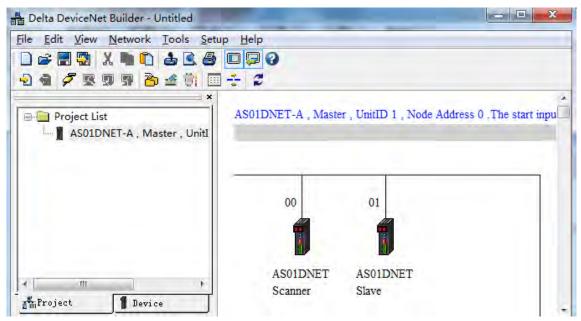


5. Click Network>> Scan DeviceNet Network.

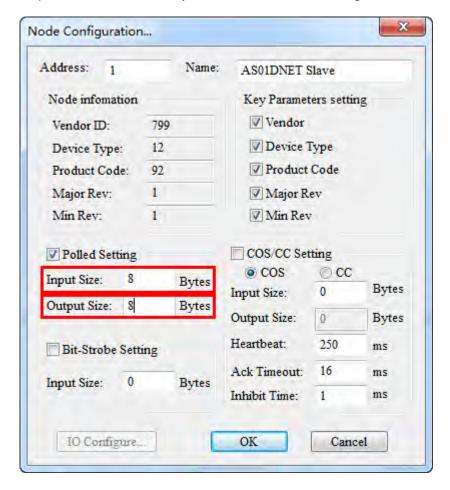




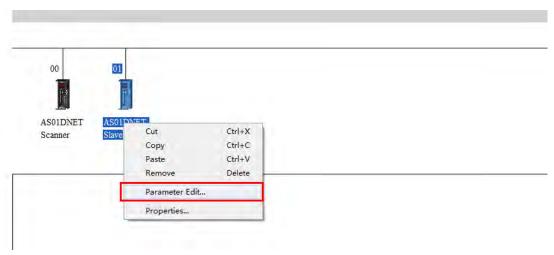
6. After scanning is finished, all node icons and device names which have been scanned in the network will appear on the following interface. The node address of AS01DNET-A is 00 in this example.

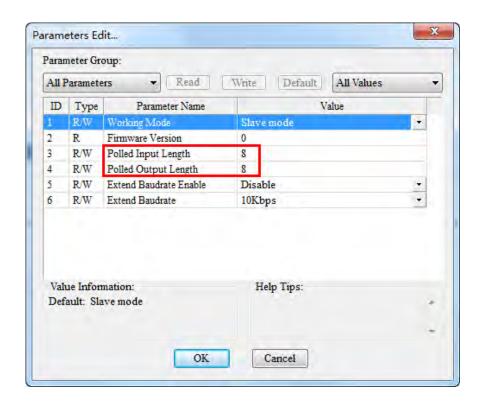


7. Double click the icon of AS01DNET Slave. Then the **Node Configuration...** dialogue box appears. Input Size and Output Size are both set to 8 bytes. Click OK to finish the setting.



8. Right click the icon of AS01DNET Slave and click Parameter Edit... on the drop-down menu. The Parameters Edit... dialog box appears and Polled Input Length and Polled Output Length are both set to 8 bytes as shown in the following red box. Then click Write button. Click OK after writing is finished. Afterwards, repower AS01DNETSlave.

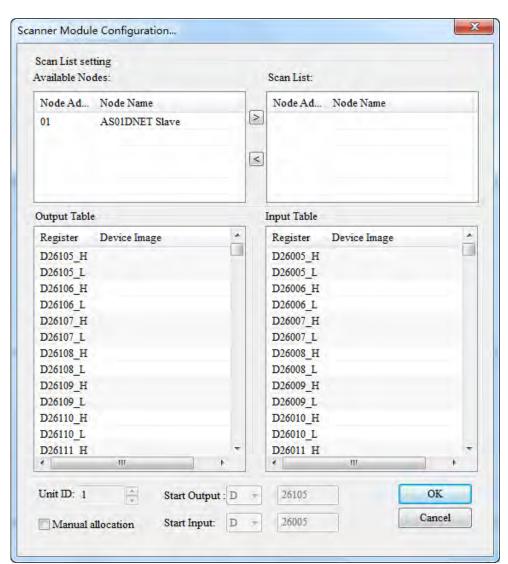






Configuring AS01DNET-A

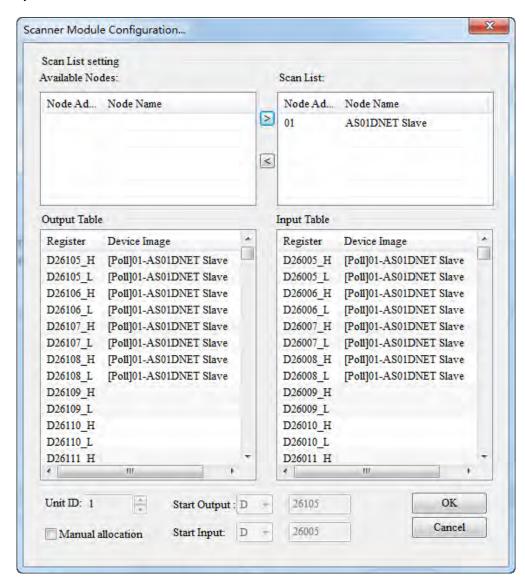
 Double click the icon of AS01DNET Scanner (node 0). The Scanner Module Configuration... dialog box appears. The left list shows the current available node AS01DNET Slave and the right Scan List is empty as below.



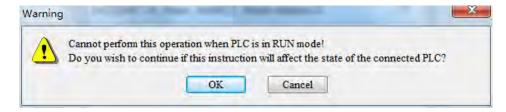


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2. Move the DeviceNet slaves from the left list to Scan List of the right side. Follows the steps: Select one DeviceNet slave node and then click. Then the DeviceNet slave nodes are moved to the Scan List one by one.



 Click OK to finish the configuration above. Then download the configuration data to AS01DNET-A. During the download, the Warning dialog box will pop out if AS PLC is in RUN mode. Click OK to continue the download.





- Configure the DeviceNet network by following the steps above. The IO data mappings between AS01DNET-A and the slave are shown in the following tables.
 - AS01DNET-A → Slave

| AS PLC | AS01DNET(Master) | AS01DNET(Slave) | AS PLC |
|--------|------------------|-----------------|--------|
| D26105 | | | D26000 |
| D26106 | | | D26001 |
| D26107 | | | D26002 |
| D26108 | | | D26003 |

■ Slave → AS01DNET-A

| AS PLC | AS01DNET(Master) | AS01DNET(Slave) | AS PLC |
|--------|------------------|-----------------|--------|
| D26005 | | | D26100 |
| D26006 | | | D26101 |
| D26007 | | | D26102 |
| D26008 | | | D26103 |

Saving configuration data

Select **File>> Save** to save current network configuration.

11.4.7.3. DeviceNet Network Control

This section describes how to write a ladder program to achieve the control requirement of the DeviceNet network.

PLC Programs

■ The program in the PLC connecting AS01DNET slave:



Program Explanation:

The contents in D26000~D26003 are the data received from the master and the contents in D26100~D26103 are the data transmitted to the master. SM400 is a normally open contact. The program above can make the contents in D26000~D26003 move to D26100~D26103.

■ The program in the PLC connecting AS01DNET master:







Program Explanation:

- 1. When M0 changes to ON, the value 16#5555 is written to D26105~D26108 in AS PLC. The data are transmitted to the slave cyclically via DeviceNet Bus.
- 2. The contents in D26005~D26008 are the data which the master receives from the slave via DeviceNet Bus. When M1 changes to ON, the data in D26005~D26008 are moved to D0, D1, D2 and D3.

11.4.8 Sending Explicit Message through Ladder Diagram

AS01DNET-A supports the sending of explicit messages via DNETRW instruction.

11.4.8.1. Principle of Explicit Message Transmission

- 1. AS PLC transmits the explicit request message to AS01DNET-A master according to the user program.
- 2. AS01DNET-A transmits the explicit request message to the slave according to the user program.
- 3. The slave sends back the response message to AS01DNET-A master after handling data.
- 4. AS PLC gets back the response message from AS01DNET-A master. Then the explicit message transmission of this time is finished.



11.4.8.2. Explicit Message Transmission Instruction DNETRW

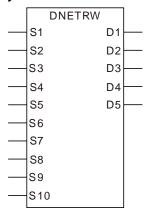
• DNETRW instruction:

| API | Ir | struct | ion co | Operand | | | | | Fu | ınctior | 1 | | | | | |
|-----------------------|----|--------|--------|---------|--------------------|---|---|---|----|---------|----|---|---|---------------------|------|----|
| 1818 | | DNE | TRW | | S ₁ · S | | S ₄ · S D ₁ · D ₂ | | | | • | | | write D nication | | et |
| Device | Х | Υ | М | S | Т | С | НС | D | FR | SM | SR | Е | K | 16# | "\$" | F |
| S ₁ | | | | | | | | • | • | | | | 0 | 0 | | |
| S ₂ | | | | | | | | • | • | | | | 0 | 0 | | |
| S ₃ | | | | | | | | • | • | | | | 0 | 0 | | |
| S ₄ | | | | | | | | • | • | | | | 0 | 0 | | |
| S ₅ | | | | | | | | • | • | | | | 0 | 0 | | |
| S ₆ | | | | | | | | • | • | | | | 0 | 0 | | |
| S ₇ | | | | | | | | • | • | | | | 0 | 0 | | |
| S ₈ | | | | | | | | • | | | | | | | | |
| S ₉ | | | | | | | | • | • | | | | 0 | 0 | | |
| S ₁₀ | | | | | | | | • | • | | | | 0 | 0 | | |
| D ₁ | | • | • | • | | | | | | | | | | | | |
| D ₂ | | • | • | • | | | | | | | | | | | | |
| D ₃ | | | | | | | | • | | | | | | | | |
| D ₄ | | | | | | | | • | | | | | | | | |
| D ₅ | | | | | | | | • | | | | | | | | |

| Data type | BOOL | WORD | DWORD | LWORD | UINT | IN T | DINT | LINT | REAL | LREAL | TMR | CNT | STRING |
|-----------------------|------|------|-------|-------|------|------|------|------|------|-------|-----|-----|--------|
| S ₁ | | • | | | • | • | | | | | | | |
| S ₂ | | • | | | • | • | | | | | | | |
| S ₃ | | • | | | • | • | | | | | | | |
| S ₄ | | • | | | • | • | | | | | | | |
| S ₅ | | • | | | • | • | | | | | | | |
| S ₆ | | • | | | • | • | | | | | | | |
| S ₇ | | • | | | • | • | | | | | | | |
| S ₈ | | • | | | • | • | | | | | | | |
| S ₉ | | • | | | • | • | | | | | | | |
| S ₁₀ | | • | | | • | • | | | | | | | |
| D ₁ | • | | | | | | | | | | | | |
| D ₂ | • | | | | | | | | | | | | |
| D ₃ | | • | | | • | • | | | | | | | |
| D ₄ | | • | | | • | • | | | | | | | |
| D ₅ | | • | | | • | • | | | | | | | |

| Pulse Instruction | 16-bit instruction | 32-bit instruction |
|-------------------|--------------------|--------------------|
| - | AS | AS |

Symbol:



| S1 | The sequence number of the DeviceNet communication module |
|------------|---|
| S 2 | DeviceNet node address (MAC ID) |
| S 3 | Service Code |
| S 4 | Class ID |
| S 5 | Instance ID |
| S6 | Attribute ID |
| S 7 | Written-data size |
| S8 | The start device where written data are stored |
| S 9 | Communication timeout time |
| S10 | Times of re-transmission |
| D1 | Completion flag |
| D2 | Error flag |
| D3 | Error code |
| D4 | Read-data size |
| D5 | The start device where read data are stored |

Explanation:

- **S1** is the sequence number of the module on the right of the PLC. The number of the first module is 1; the second module is 2 and so on. Any type of module need be numbered within the range of 1~32. If the number is out of the range, the instruction will take the minimum (1) or maximum (32) for operation.
- S2 is a DeviceNet node address within the range of 0~63. Users can specify the node address of a slave which the master is to read and write. It also can be the node address of the master, which means to read and write the data in the master.



■ **\$3** is DeviceNet service code:

| Service code | Explanation | | |
|--|-------------|--|--|
| Ox01 Get all attributes (Get_Attribute_All) | | | |
| 0x02 Set all attributes (Set_Attribute_All) | | | |
| 0x0E Get one single attribute (Get_Attribute_Single) | | | |
| 0x10 Set one single attribute (Set_Attribute_Single) | | | |

- **S4**, **S5** and **S6** represent Class ID, Instance ID and Attribute ID respectively.
- **S7** is the written-data size with the unit: Byte.
- S8 is the start device where written data are stored. The data are arranged in the order from low byte to high byte.
- S9 is the communication timeout time within the range: 1~100 and with the unit: 0.1 second.
- **S10** is the times of re-transmission within the range: 0~3. When communication timeout occurs, the communication will be resent
- **D3** represents the error codes to read and write.

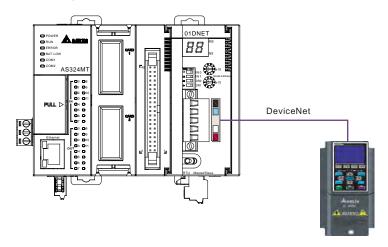
| Error | Code | Funlanation |
|--------------------|-------------------|--|
| Code 1 (High Byte) | Code 2 (Low Byte) | Explanation |
| XX | FF | Not conform to the DeviceNet standard |
| 20 | 01 | The target slave does not exist. |
| 20 | 02 | Unable to make the connection with the slave |
| 20 | 03 | Sending explicit message failed. |
| 16 | 00 | Explicit message response timeout. |

- **D4** is the read-data size with the unit: Byte.
- **D5** is the start device where read data are stored. The data are arranged in the order from low byte to high byte.
- D1 and D2 are communication completion flag and error flag respectively.

Application Example 1

Control requirement: when M0=ON, read the data of class1>>instance1>>attribute1 of the DeviceNet function card CMC-DN01.

■ Connection Figure



■ Parameters Setting and Device Explanation

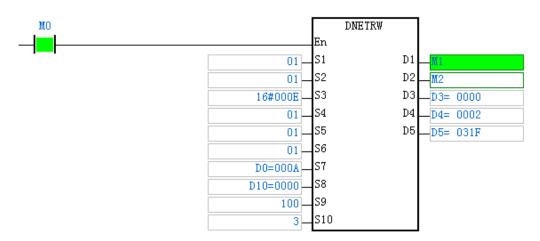
Setup for AS01DNET-A

| Parameter | Setting value | Description | |
|-----------|---------------|--|--|
| Node ID | 00 | Set the node ID of AS01DNET-A to 00. | |
| Baud rate | 500 kbps | Set the baud rate of AS01DNET-A to 500 kbps. | |

> Setup for VFD-C2000

| Parameter | Setting value | Description | | | |
|-----------|---------------|-------------------------------|--|--|--|
| 00-20 | 80 | Frequency command source | | | |
| 00-21 | 05 | peration command source | | | |
| 09-30 | 0 | Communication decoding method | | | |
| 09-70 | 01 | Node ID of AC motor drive | | | |
| 09-71 | 02 | Baud rate: 500Kbps | | | |

■ PLC Program



- > S1: The number of the module sending DeviceNet communication. The first one of the right side is 01.
- > S2 : DeviceNet node ID (MAC ID); Node ID of VFD-C2000: 01.
- > S3 : Service code; 0X0E: read one single attribute content.
- > S4: Class ID; Class ID of CMC-DN01: 01;
- > S5 : Instance ID; Instance ID of CMC-DN01: 01;
- ➤ S6: Attribute ID; Attribute ID of CMC-DN01: 01;
- > S7: Write data size. When DNETRW instruction is used to read data, the value in S7 can be set to any data.
- > S8: The start device where the written data are stored. When DNETRW instruction is used to read data, the value in S8 can be set to any data.
- S9 : Communication timeout time
- > S10 :Times of re-transmission. Times of re-sending communication when communication timeout occurs.
- > D1 : Completion flag

D2 : Error flag

> D3 : Error code

> D4 : Read data size

D5: The start device where data are read.

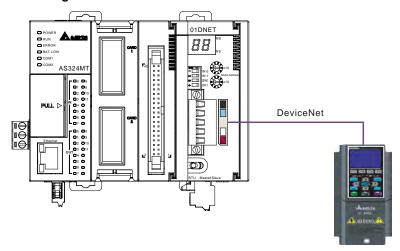
■ Program Explanation

- When M0 changes to ON, execute the explicit message instruction DNETRW to read Class 1 >> Instance 1 >> Attribute 1 of the target equipment with node ID: 01. If the explicit message communication succeeds, the completion flag M1 changes to ON.
- When M0 changes to ON, AS01DNET-A sends out the request message only once. If the request message is to be resent, the instruction DNETRW need be re-triggered.
- If the data reading succeeds, the content of Class 1>> Instance1 >> Attribute 1 of CMC-DN01 will be stored in D5. In this example, the content in D5 should be 031FHex.

Application Example 2

Control requirement: When M1 changes to ON, set the content of Class ID: 0x05>> Instance 1>>Attribute ID: 09 of CMC-DN01 to 000AHex.

■ Connection figure



■ Parameters Setting and Device Explanation

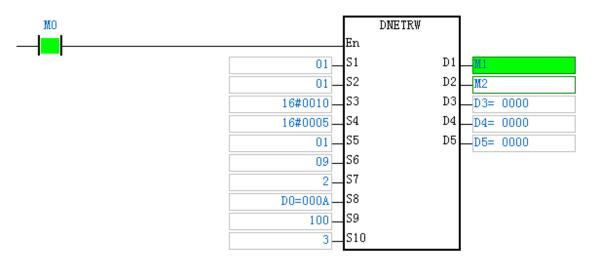
> Setup for AS01DNET-A

| Parameter | Setting value | Description | |
|-----------|---------------|---|--|
| Node ID | 00 | Set the node ID of AS01DNET-A to 00. | |
| Baud rate | 500 kbps | 0 kbps Set the baud rate of AS01DNET-A to 500 kbps. | |

Setup for VFD-C2000

| Parameter | Setting value | Description | |
|-----------|---------------|-------------------------------|--|
| 00-20 | 08 | Frequency command source | |
| 00-21 | 05 | Operation command source | |
| 09-30 | 0 | Communication decoding method | |
| 09-70 | 01 | Node ID of AC motor drive | |
| 09-71 | 02 | Baud rate: 500Kbps | |

■ PLC Program



- > S1: The number of the module sending DeviceNet communication. The first one of the right side is 01.
- > S2 : DeviceNet node ID (MAC ID); Node ID of VFD-C2000: 00.
- > S3 : Service code; 0X10: read one single attribute content.
- > S4: Class ID; Class ID of CMC-DN01: 05.
- S5 : Instance ID; Instance ID of CMC-DN01: 01.
- > S6: Attribute ID; Attribute ID of CMC-DN01: 09.
- > S7: Write data size with the unit: Byte. The written-data size is 2 in this example.
- > S8: The start device where the written data are stored.
- > S9 : Communication timeout time.
- > S10 :Times of re-transmission. Times of re-sending communication when communication timeout occurs.
- D1 : Completion flag.
- D2 : Error flag.
- > D3 : Error code.
- D4 : Read data size. When DNETRW instruction is used to write data, the value in D4 can be set to any data.
- > D5: The start device where read data are stored. When DNETRW instruction is used to write data, the value in D5 can be set to any data.

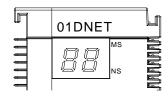


■ Program Explanation

- When M0 changes to ON, AS01DNET-A sends the request message and 000AHex is written to Class ID: 05>> Instance 1 >> Attribute ID: 09 of the target equipment with node ID: 01. If explicit message communication succeeds, the completion flag M1 changes to ON.
- When M0 changes to ON, AS01DNET-A sends out the request message only once. If the request message is to be resent, the instruction DNETRW need be re-triggered.

11.4.9 LED Indicators and Troubleshooting

AS01DNET-A has two LED indicators and one digital displayer. NS LED and MS LED display the connection status of AS01DNET-A. The digital displayer shows the node address and error information of AS01DNET-A as well as error information of the slave.



11.4.9.1. NS LED

| LED status | Indication | Correction |
|--|--|--|
| OFF | No power; Or duplicate ID check has not been completed. | Check if AS01DNET-A is powered and the connection is normal. Make sure that at least one node can communicate normally. |
| Green light blinking (ON:0.5s and OFF: 0.5s alternately) | The connection to the DeviceNet network failed. | No correction; Refer to Digital Displayer for troubleshooting. |
| Green light ON | Online; The connection to the DeviceNet network is normal. | No correction |
| Red light blinking (ON:0.5s and OFF: 0.5s alternately) | Communication error | Refer to Digital Displayer for troubleshooting. |
| Red light ON | Network trouble, duplicate node ID, no network power or Bus-OFF. | Make sure that all the devices in the network have their unique node addresses. Check if the network installation is correct. Check if the baud rates of the master and slave are same. Check if the network power is normal. |



11.4.9.2. MS LED

| LED status | Indication | Correction |
|--|--------------------------|--|
| OFF | No power | Make sure that the power supply for AS01DNET-A is normal and the connection is proper. |
| Green light blinking (ON:0.5s and OFF: 0.5s alternately) | No module is configured. | Configure the scan list and then download the configuration to AS01DNET. |
| Green light ON Input and output data are normal. | | |
| Red light blinking When AS01DNET works as the master, the slave in Scan List can not work normally. OFF: 0.5s When AS01DNET works as the slave, an error occurs in the configuration. | | Refer to Digital Displayer. Make sure that the slave information in Scan List matches that of the actually connected slave. |
| Red light ON An error inside AS01DNET | | Check if the configuration is correct. Return the module to factory for repair if the error still exists after repower ON. |

11.4.9.3. Combination of MS LED and NS LED

| LED status | | la dia atia a | | |
|-----------------------------|--|--|---|--|
| NS LED | MS LED | Indication | Correction | |
| OFF | OFF | No power | Check if the power supply for AS01DNET-A is normal. | |
| OFF | Green light ON | Duplicate ID check has not been completed. | Make sure that the baud rate of at least one node in the network is the same as that of the module and their communication is normal. | |
| Red light ON Green light ON | | Duplicate ID check failed or Bus-OFF. | 1. Ensure that the node ID of AS01DNET is unique.2. Repower the module. | |
| Red light ON | Red light blinking (ON:0.5s and OFF: 0.5s alternately) | No network power | Check if the network cable connection is proper. Check if the network power supply is normal. | |
| Red light ON | Red light ON | Hardware error | Return the module to the factory for repair. | |

11.4.9.4. Digital Displayer

| 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. | Ensure that the node address of AS01DNET is unique. Re-power AS01DNET. | |
| F1 | No slave is configured 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. | |
| F3 | AS01DNET enters the test mode | Switch the function switch IN1 from On to Off and re-power AS01DNET-A. | |





| Code | Explanation | Correction |
|------------|---|---|
| F4 | BUS-OFF | Check if the network cable is normal and the shielded cable is grounded. Check if the baud rates of all nodes in the network are same. Check if the start and end of the network cable are both connected with a 121Ω terminal resistor. Re-power AS01DNET-A. |
| F5 | No network power | Check if the network cable is normal. Ensure that the network power is normal. |
| F6 | Internal error; Flash or RAM check error | If the error still exists after re-power, send AS01DNET-A back to the factory for repair. |
| F8 | Error produced in factory manufacturing | If the error still exists after re-power, send AS01DNET-A back to the factory for repair. |
| F9 | Internal error; EEPROM access failure | If the error still exists after re-power, send AS01DNET-A back to the factory for repair. |
| FA | Invalid configuration data | Configure the network correctly and re-download it to AS01DNET-A. Check if the node address of one slave in the scan list is the same as that of AS01DNET-A. |
| E0 | Identification parameters returned from the slave do not match the configuration data. | Check if there is any change in node ID of the slave in the network. Check if some node device in the network is replaced. Re-configure the network. |
| 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 | The slave device in the scan list does not exist or is offline when AS01DNET-A is in master mode. The I/O connection between the slave AS01DNET-A and the master is broken when AS01DNET-A is in slave mode. | Check if there is a change in the node address of the slave. Check if the communication cable is disconnected or connected loosely. Check if the bus cable length exceeds the maximum transmission distance. If so, the system may not be stable. |
| E3 | AS01DNET-A fails to transmit data. | Make sure that the connection between AS01DNET-A and the network is normal. Check if the baud rate of AS01DNET-A is the same as that of other node in the network. |
| E4 | Error detected in sequence of fragmented I/O data from the slave device. | Check if the slave is operating normally. |
| E 5 | 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. Make sure that at least two nodes work normally in the network. Check if either end of the network is connected with the terminal resistor of 121Ω. Check if the baud rates of the node devices in the network are |

| Code | Explanation | Correction |
|------|-------------|---|
| | | same.4. Check if the communication cable is normal so as to avoid that the cable is disconnected or connected loosely. |
| | | 5. Check if the bus cable length exceeds the maximum transmission distance. If so, the system may not be stable. |
| | | 6. Check if the shielded wire of the network cable is grounded. |
| | | 7. Re-power AS01DNET-A scanner module. |

11.4.10 Master-Slave Mode Switch and 8 Baud Rates Setting via Software

AS01DNET-A can serve as a DeviceNet master or slave by modifying its mode. When the AS01DNET-A module works as a slave, the input and output data sizes are both 8 Bytes by default. The maximum input and output data sizes are both 200 Bytes.

Under standard mode, AS01DNET-A supports three baud rates: 125K, 250K and 500K. Under non-standard mode, AS01DNET-A supports eight baud rates: 10K, 20K, 50K, 125K, 250K, 500K, 800K and1M.

11.4.10.1. Setting ASO1DNET-A to Slave Mode

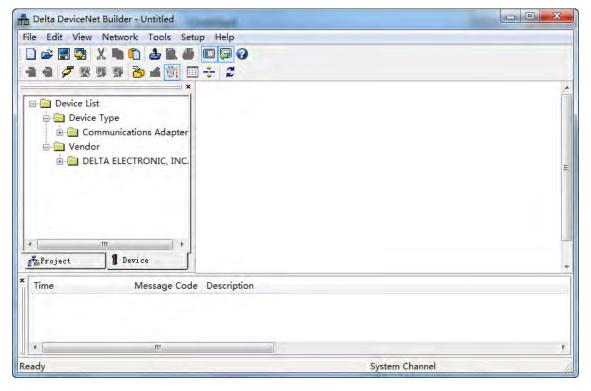
1. Build a driver through the COMMGR software.

Refer to Section 2.4 Communication Setting in the ISPSoft User Manual for more details.

2. Call the DeviceNet Builder software through the ISPSoft software.

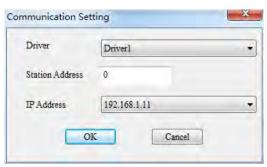
Refer to Section 11.6 in this manual for details on how to operate.

The called DeviceNet Builder software interface is shown as below.

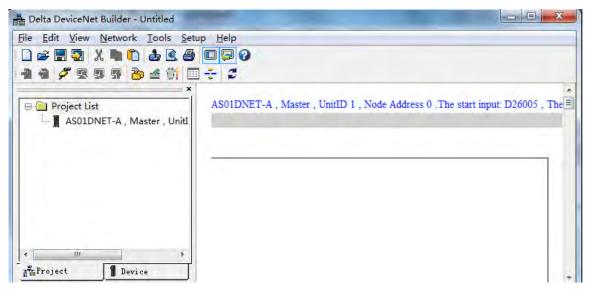




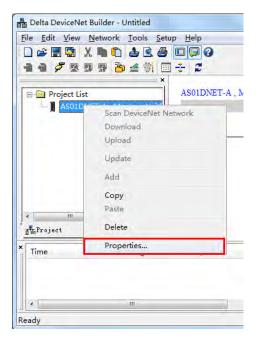
4. Selecting **Setup>> Communication Setting**, the following dialog box appears. Select the driver for connection of AS PLC and PC as below. Click **OK** to finish the selection of Driver.

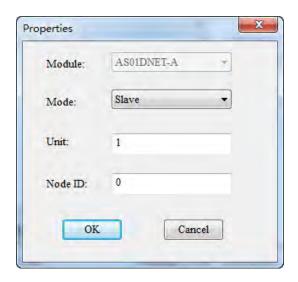


5. Click **Network** >> **Online** to scan the connected master.

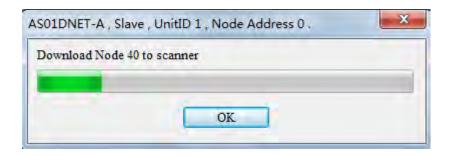


6. Click Project List>>Properties. Then the Properties dialog box appears. Select Slave mode and then click OK.

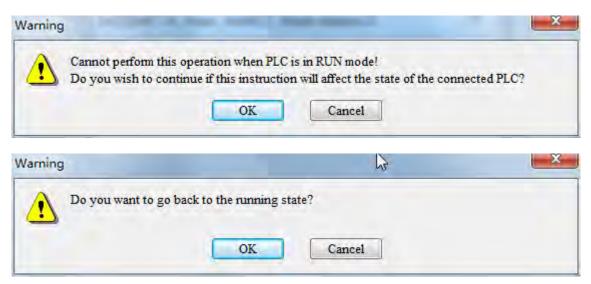




Click Network >> Download. If the PLC is in STOP state, the following dialog box will exist during the download.
The dialog box will disappear automatically after the download is finished. AS01DNET-A will be in slave mode after repower ON.



8. If the PLC is in RUN state, the **Warning** dialog boxes will pop out before and after the download. Users can click **OK** or **Cancel** according to actual situation.





11.4.10.2. Setting ASO1DNET-A to Master Mode

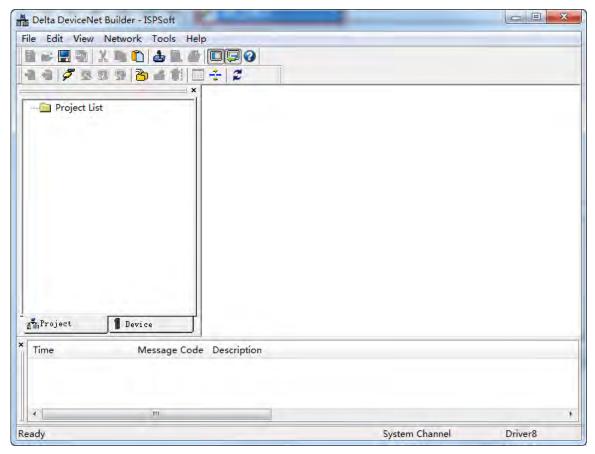
1. Build a driver through the COMMGR software.

Refer to Section 2.4 Communication Setting in the ISPSoft User Manual for more details.

2. Call the DeviceNet Builder software through the ISPSoft software.

Refer to Section 11.6 in this manual for details on how to operate.

3. The called DeviceNet Builder software interface is shown as below.



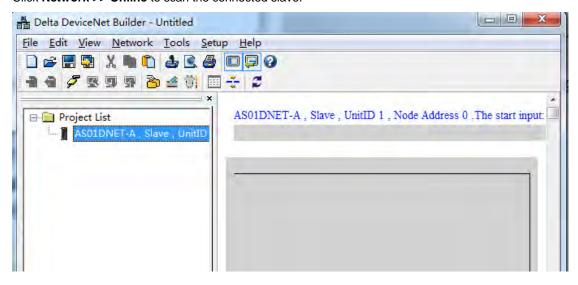
4. Selecting **Setup>> Communication Setting**, the following dialog box appears. Select the driver for connection of AS PLC and PC as below. Click **OK** to finish the selection of Driver.



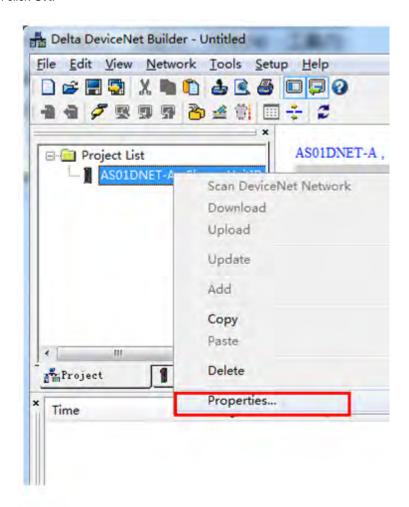


11

5. Click **Network** >> **Online** to scan the connected slave.

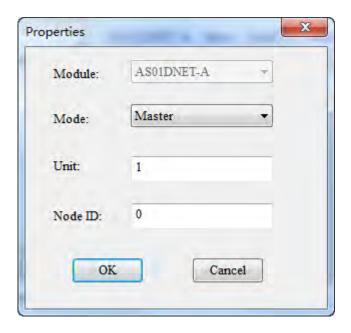


6. Click **Project List>>Properties** as below. Then the **Properties** dialog box appears. Select **Master** mode and then click **OK**.

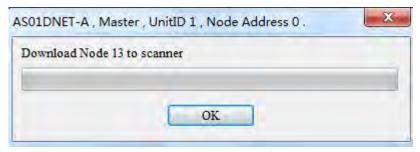




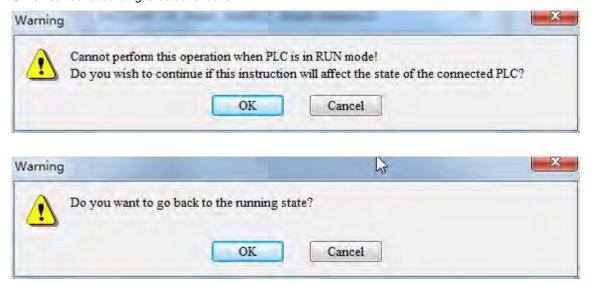




Click Network >> Download. If the PLC is in STOP state, the following dialog box will exist during the download.
The dialog box will disappear automatically after the download is finished. AS01DNET-A will be in master mode after repower ON.

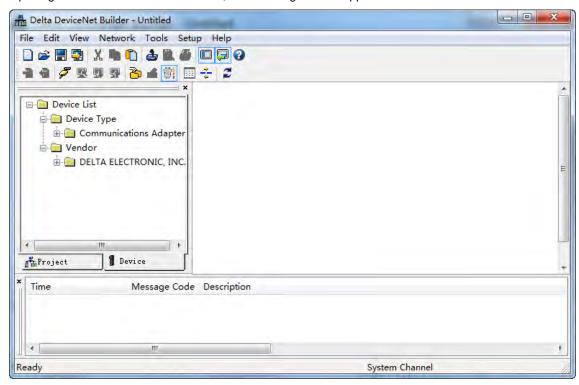


8. If the PLC is in RUN state, the **Warning** dialog boxes will pop out before and after the download. Users can click **OK** or **Cancel** according to actual situation.

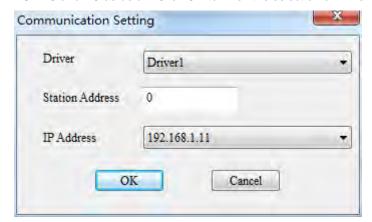


11.4.10.3. Baud Rate Setting of When ASO1DNET-A is in Slave Mode

1. Opening the DeviceNet Builder software, the following window appears.

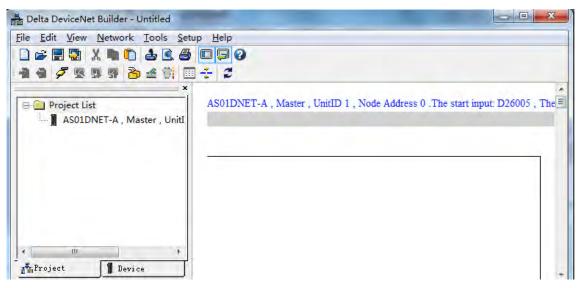


2. Selecting **Setup>> Communication Setting**, the following dialog box appears. Select the driver for connection of AS PLC and PC as below. Click **OK** to finish the selection of Driver.

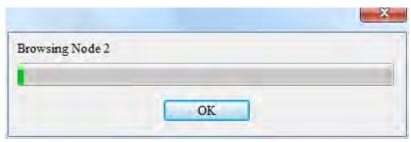




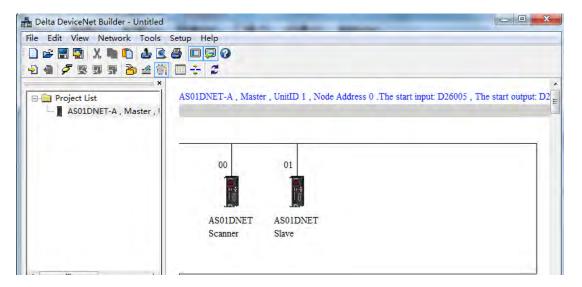
3. Click **Network** >> **Online** to scan the connected master.



4. Clicking Network>> Scan DeviceNet Network, the DeviceNet Builder software starts to scan the whole network.

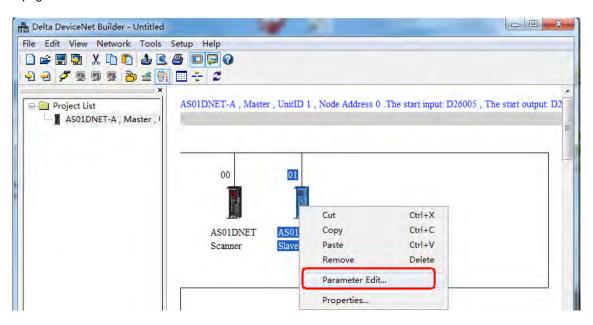


5. After scanning is finished, all node icons and device names which have been scanned in the network will appear on the following interface. The node address of AS01DNET-A is 01 in this example.

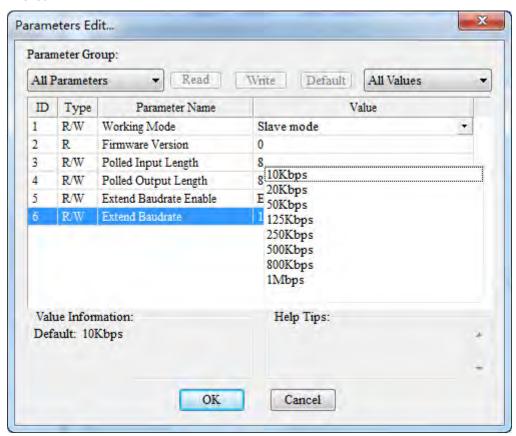


11

6. Right-click AS01DNET(Slave), select **Parameter Edit...** on the drop-down menu to enter the **Parameter Edit** page.



 Set Extend Baudrate Enable to Enable and then select the desired baud rate. Click Write button after setting is finished.

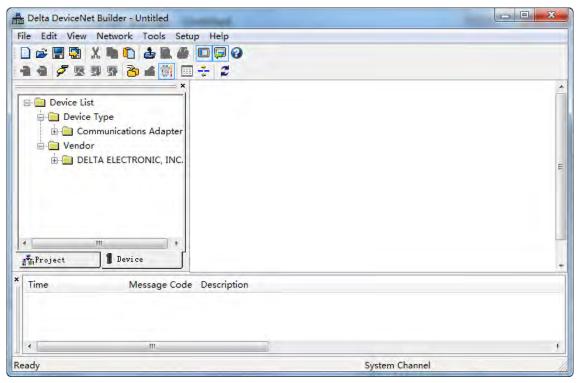


8. After the download is completed, switch DR0 and DR1 of AS01DNET to ON. Finally, repower AS01DNET-A.

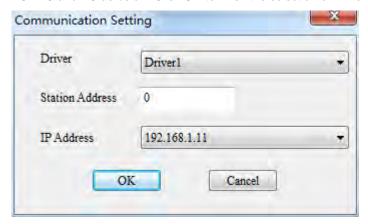


11.4.10.4. Baud Rate Setting of When ASO1DNET-A is in Master Mode

1. Opening the DeviceNet Builder software, the following window appears.



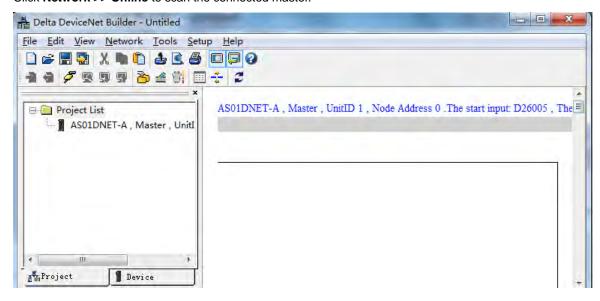
2. Selecting **Setup>> Communication Setting**, the following dialog box appears. Select the driver for connection of AS PLC and PC as below. Click **OK** to finish the selection of Driver.



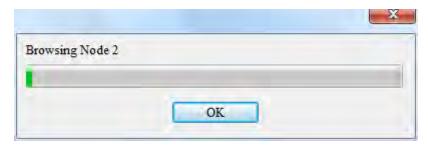


<u>11</u>

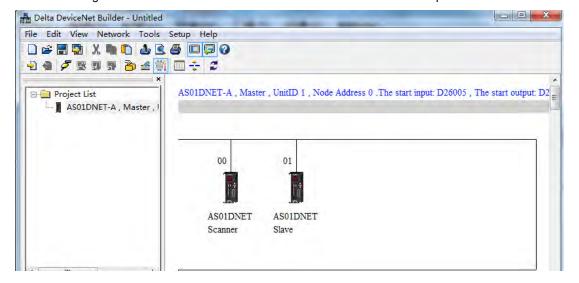
3. Click **Network** >> **Online** to scan the connected master.



4. Clicking Network>> Scan DeviceNet Network, the DeviceNet Builder software starts to scan the whole network.

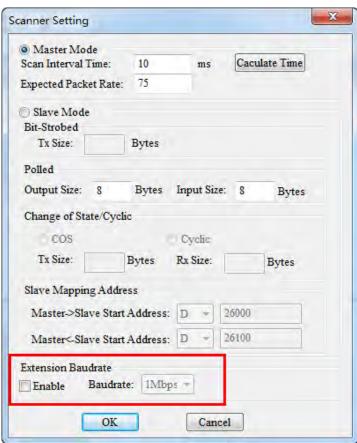


5. After scanning is finished, all node icons and device names which have been scanned in the network will appear on the following interface. The node address of AS01DNET-A is 00 in this example.





6. Click **Network** >> **Scanner Setting**. The **Scanner Setting** dialog box appears. Select **Enable** under **Extension Baudrate** and the desired baud rate as below. Click **OK** after the setting is finished.



7. Click **Network** >> **Download** to download the extension baud rate setting to the master. After the download is completed, switch DR0 and DR1 of AS01DNET-A to ON. Finally, repower AS01DNET-A.

1 1

11.5 RTU Mode

11.5.1 Introduction of ASO1DNET (in RTU Mode)

- As DeviceNet slave, AS01DNET-A supports standard DeviceNet communication protocol.
- Supports explicit connection in the predefined master/slave connection and I/O polling connection.
- The network configuration software DeviceNet Builder provides graphic configuration interface, and supports auto scan and recognition of I/O modules, free mapping of special module parameters as I/O exchange data as well as the setting of exception handling and diagnosis of module error states.
- Users can choose to retain the data in registers or not when the network is disconnected according to actual need.
- AS01DNET (in RTU mode) can connect max. 8 AS-series extension modules including digital modules, analog
 modules, temperature modules and etc. The mapping length of digital modules is determined by number of
 digital points. The max. length of mapping parameters for input of other module is 20 words and the max.
 length of mapping parameters for output of other module is 20 words.
- Max lengths for output data and input data of AS01DNET (in RTU mode) are both 100 bytes.
- AS01DNET (in RTU mode) needs the external 24VDC power supply.



11.5.2 AS-Series Extension Modules Connectable to ASO1DNET (RTU)

The model and specification of AS-series digital modules connectable to AS01DNET (in RTU mode):

| | Length of I/O mapping data (Unit: words) | | |
|--------------------------|--|---------------------|--|
| Digital I/O module model | (Master→AS01DNET) | (AS01DNET→Master) | |
| AS08AM10N-A | None | 1 | |
| AS16AM10N-A | None | 1 | |
| AS32AM10N-A | None | 2 | |
| AS64AM10N-A | None | 4 | |
| AS08AN01T-A | 1 | None | |
| AS08AN01R-A | 1 | None | |
| AS08AN01P-A | 1 | None | |
| AS16AN01T-A | 1 | None | |
| AS16AN01R-A | 1 | None | |
| AS16AN01P-A | 1 | None | |
| AS32AN02T-A | 2 | None | |
| AS64AN02T-A | 4 | None | |
| AS16AP11T-A | 1 | 1 | |
| AS16AP11R-A | 1 | 1 | |
| AS16AP11P-A | 1 | 1 | |

The model and specification of AS-series special modules connectable to AS01DNET (in RTU mode):

| | Length of I/O mapping data (Unit: words) | | | |
|----------------------|--|-------------------------|--|--|
| Special module model | DeviceNet→AS01DNET(RTU) | AS01DNET(RTU)→DeviceNet | | |
| AS04AD-A | 6 | None | | |
| AS04DA-A | 2 | 4 | | |
| AS06XA-A | 10 | 4 | | |
| AS02LC-A | 7 | 1 | | |
| AS04RTD-A | 10 | None | | |
| AS06RTD-A | 14 | None | | |
| AS04TC-A | 10 | None | | |
| AS08TC-A | 18 | None | | |
| AS08AD-B | 18 | None | | |
| AS08AD-C | 18 | None | | |

Note:

The length of mapping data of the I/O modules connected to AS01DNET (in RTU mode) is fixed. The default mapping parameters of special modules must be chosen.

Besides default mapping parameter configuration, you can also choose other parameters for I/O mapping according to need when special modules are connected to AS01DNET (RTU). The max. input length and max. output length of default parameters and user-added mapping parameters of each special module are both 20 words.



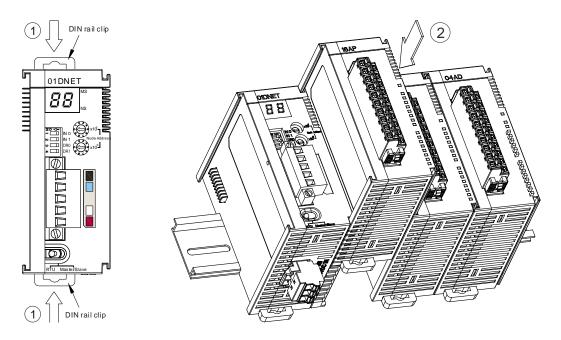
11

11.5.3 Installation

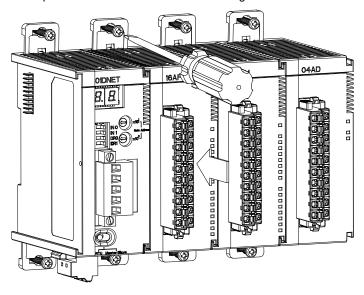
11.5.3.1. Installing ASO1DNET (in RTU Mode)

11.5.3.1.1. Connecting ASO1DNET-A (in RTU Mode) and Extension Module on DIN Rail

- Please push the clips of AS01DNET-A (RTU) in the directions indicated by arrow ① until hearing a click. That
 means the DIN clips are interlocked each other. Then insert the module hooks at the bottom into the DIN rail
 mounting slot until hearing a click. That means AS01DNET-A (RTU) is connected to the DIN rail.
- To install the second module AS16AP11T, push the clips of AS16AP11T in the direction indicated by arrow ①. Then aim the left-side slot of AS16AP11T at the right-side slot of AS01DNET-A (RTU) and push AS16AP11T in the direction as illustrated by arrow ② until hearing a click. That means the module is on the DIN rail and is connected to AS01DNET-A (RTU). In the same way, install more IO modules on the right side of AS01DNET-A (RTU) and DIN rail one by one.



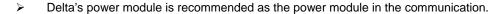
Tighten the screws on the top of the module at the end of installing.

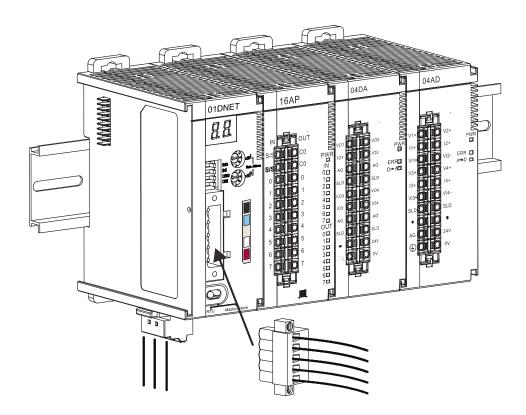




11.5.3.1.2. Connecting the DeviceNet Communication Connector

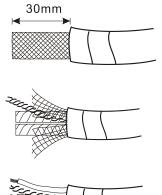
The color marks on the communication connector match the colors of the connection cables. During the wiring, please check whether the colors of the connection cable and the color mark are same.





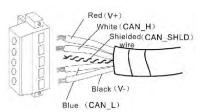
11.5.3.2. Connecting the Cable to DeviceNet Connector

- Use an efficient tool to peel the communication cable for approx. 30mm. DO NOT damage the shielded cable during the peeling.
- Peel off the metallic shielded net and foil, and you will see 2 power cables (red and black), 2 signal cables (blue and white) and 1 shielded cable.
- Peel off the exterior metallic shielded net, foil and the plastic cover of the power cable and signal cable for appropriate length.

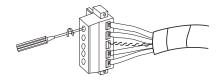




 Insert the peeled communication cables into the holes in the connector in correct order.



 Tighten the screws on the connector by a slotted screwdriver and fix the communication cables in the holes in the connector.



11.5.4 Configuring ASO1DNET (in RTU mode)

As DeviceNet slave, AS01DNET (RTU) mainly achieves the data exchange between the master and AS-series I/O modules connected to AS01DNET.

- Transmits output data of DeviceNet master to I/O modules.
- Transmits input data from I/O modules to DeviceNet master.

11.5.4.1. Terms

| No. | Name | Unit | Description |
|-----|---------------------------------|------|---|
| 1 | Control word | WORD | The first WORD for output data that the master assigns to AS01DNET is the control word of AS01DNET for setting the work mode of AS01DNET. When the content in the control word is set to 2, AS01DNET is in STOP mode. When the content in the control word is set to 1, AS01DNET is in RUN mode. |
| 2 | Status word | WORD | The first WORD for input data that the master assigns to AS01DNET is the status word of AS01DNET for displaying the operation state of AS01DNET. Refer to section 11.5.4.3.4 for more about status word. |
| 5 | Range of input data in modules | WORD | Determined by start input address and input mapping parameter length of each module. |
| 6 | Range of output data in modules | WORD | Determined by start output address and output mapping parameter length of each module. |
| 7 | Input data size | WORD | The sum of the size of status word of AS01DNET and the size of input data of the modules connected to it. The status word occupies one word. Digital input module takes 16 bits as one word. The input data length of analog I/O modules and temperature modules are determined by the default mapping parameter length and user-added parameter length, no more than 20 words. |
| 8 | Output data size | WORD | The sum of the size of control word of AS01DNET and the size of output data of the modules connected to it. The control word occupies one word. Digital output module takes 16 bits as one word. The output data length |





| No | o. | Name | Unit | Description |
|----|----|------|------|---|
| | | | | of analog I/O modules and temperature modules are determined by the default mapping parameter length and user-added parameter length together, no more than 20 words. |

11.5.4.2. Introduction of Software

Before the new version of DeviceNet Builder software is used for making a connection with PLC, make sure that the communication manager COMMGR has been installed.

(Refer to ISPSoft user manual for details on COMMGR usage.)

11.5.4.2.1. Making a connection between DeviceNet Builder and PLC

Before making a normal connection between DeviceNet Builder and PLC, you have to do relevant setup for COMMGR software.

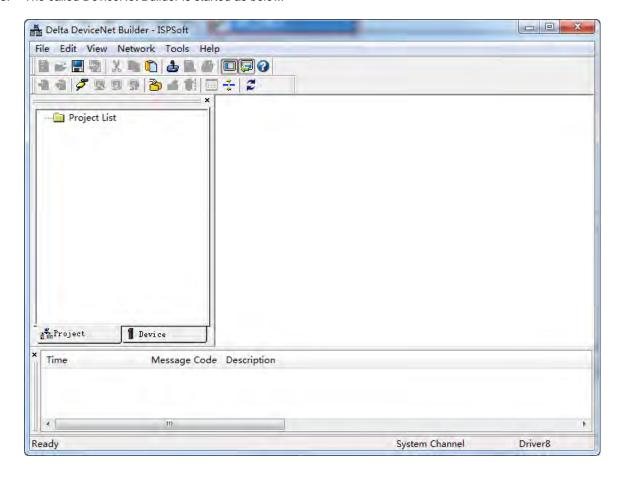
1. Build a driver through the COMMGR software.

Refer to Section 2.4 Communication Setting in the ISPSoft User Manual for more details.

2. Call DeviceNet Builder via ISPSoft

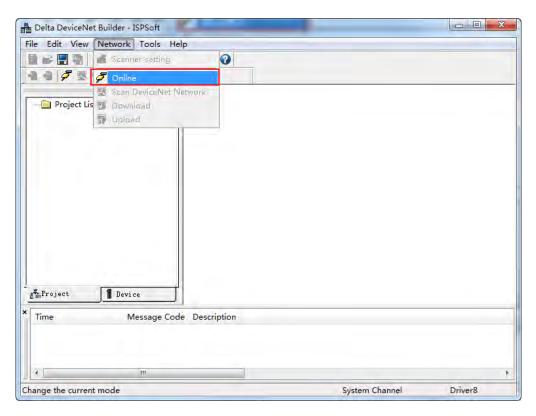
Refer to Section 11.6 for details on how to operate.

3. The called DeviceNet Builder is started as below.

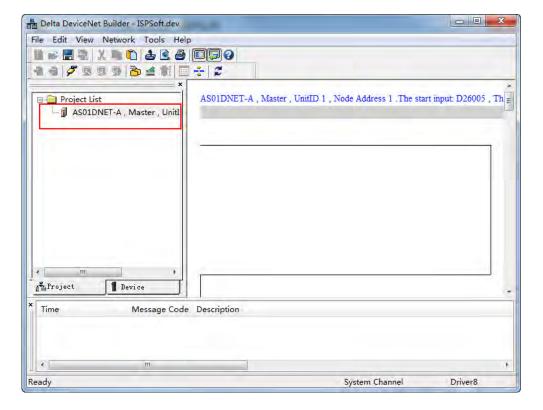


11

4. Click menu Network>> Online.

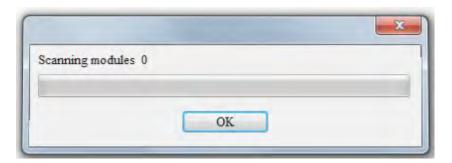


5. The master module AS01DNET-A which has been scanned is shown in the left-side Project List.

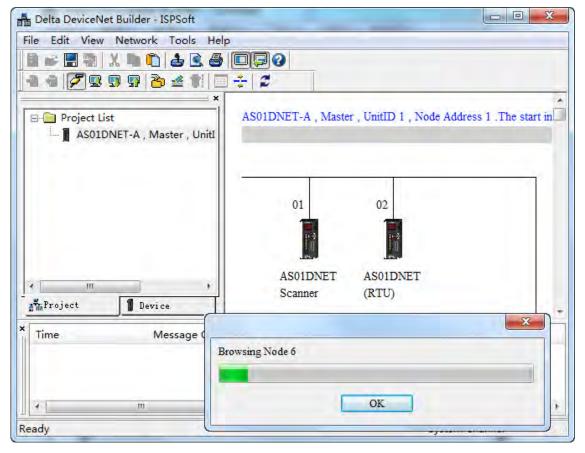




6. Click Network >> Scan DeviceNet Network.



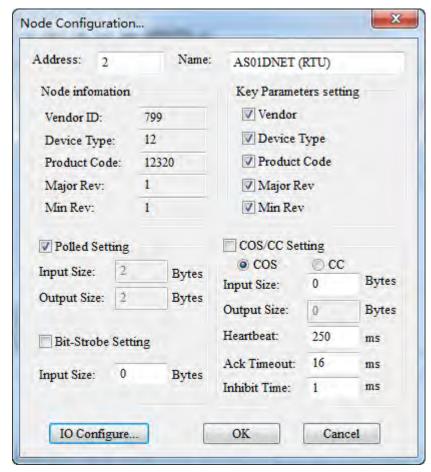
7. After online is implemented, click the **Scan DeviceNet Network** button to start scanning the nodes in the network.



11.5.4.2.2. Main Configuration Page of AS01DNET (RTU)

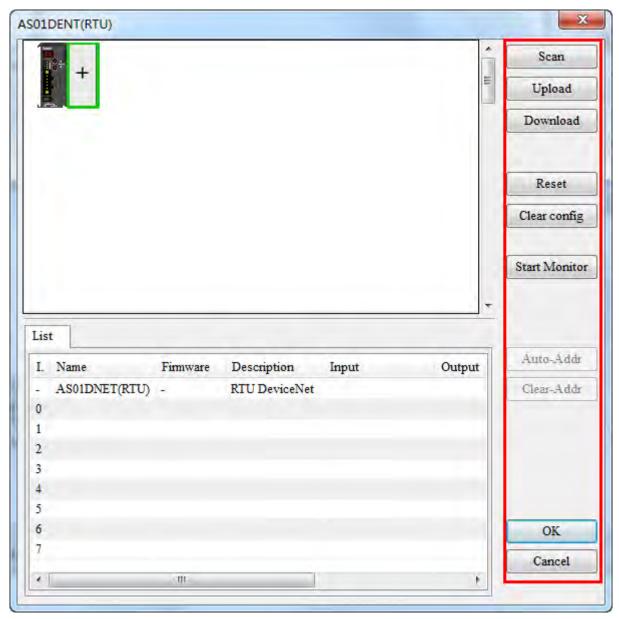
After scanning is finished, double click the AS01DNET (RTU) node in the network. Then the Node Configuration...
window comes out. The polled transmission is supported with default input data size of 2 bytes and output data size of
2 bytes which are mapping address lengths of control word and status word of AS01DNET (RTU) respectively.

Input Size and **Output Size** under **Polled Setting** mean the lengths of AS01DNET (RTU) parameters which are mapped in the master.





2. Click the **I/O Configure...** button in the **Node Configuration...** window. Then the main configuration page appears as below.

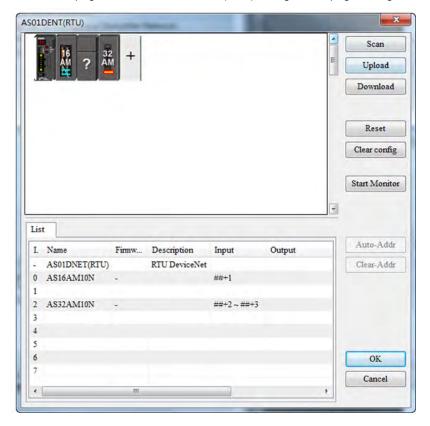


Explanation of parameters on the AS01DNET (RTU) configuration page

| Item | Description | |
|--------------|--|--|
| Scan | All I/O modules currently connected to the right side of AS01DNET (RTU) are scanned. The existing modules in the software will be compared with the actually connected I/O module. The mismatched one will be displayed in an abnormal icon. | |
| Upload | Upload and show the configuration data including I/O list, I/O configuration, parameter mapping and basic control information in AS01DNET (RTU) in the software. | |
| Download | Download current AS01DNET (RTU) configuration including I/O list, I/O configuration, paramet mapping and basic control information to AS01DNET (RTU), which is retained when the power turned off. | |
| Reset | Make the connected AS01DNET (RTU) restart. | |
| Clear config | Clear the configuration data stored in the latched area and automatically reset the configuration. Then the indicator displays F1. | |

| Item | Description |
|------------------|---|
| Start Monitor | Watch and set in real time the configured exchange data in current system; change output data, watch input data and use control word to control the operation state of AS01DNET (RTU) in real time. |
| Name | Name of each module |
| Firmware | Firmware version of each module. Choosing corresponding version of firmware, download the module parameter information which matches the firmware version. |
| Description | The description of basic information of each module. |
| Input | The mapping range of input data of each module, determined by start address offset of mapping input data and the size. |
| Output | The mapping range of output data of each module, determined by start address offset of mapping output data and the size. |
| Comment | Add a comment for each I/O modules |
| ОК | The current configuration data will not be saved until you click the OK button to finish the configuration. |
| Cancel | Clicking the Cancel button to exit AS01DNET (RTU) configuration page, current configuration data will not be saved. |

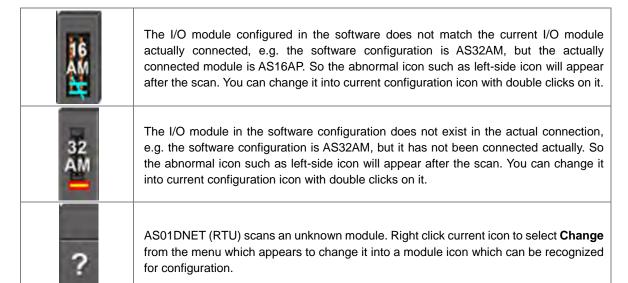
3. Clicking the **Scan** button on the page, the main AS01DNET (RTU) configuration page changes as below.





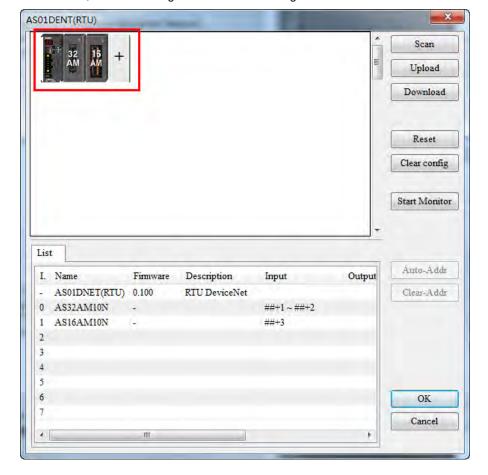
After the I/O modules connected to AS01DNET (RTU) are scanned, abnormal icons may appear.

Here is the list of abnormal icons.



11.5.4.2.3. ASO1DNET (RTU) Parameters Setup Page

After I/O modules are scanned, the main configuration interface changes as follows.





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Double click **AS01DNET (RTU)** icon on the far left of the configuration page. Then the parameter setting interface of AS01DNET (RTU) comes out for setting the error handling method as follows.



Explanation of AS01DNET (RTU) parameter setup:

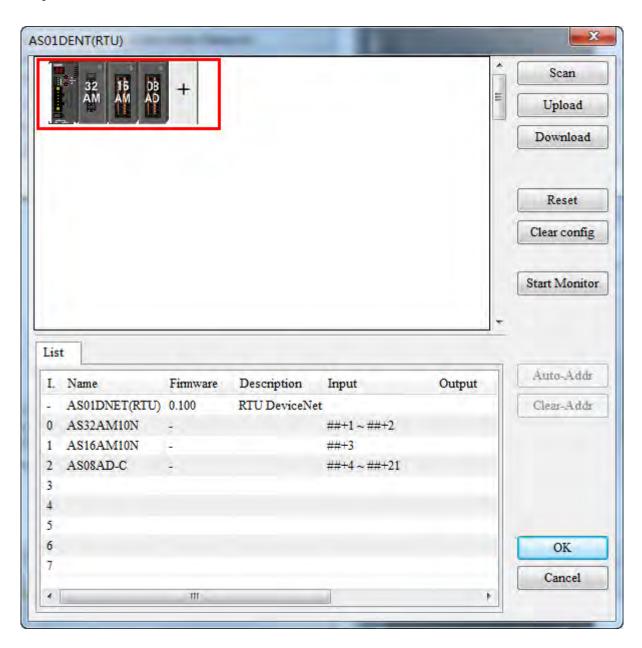
| Item | Description | Default |
|----------------------------------|--|------------------------|
| Output start address | The start output address of AS01DNET (RTU), occupying one word. | None |
| Input start address | The start input address of AS01DNET (RTU), occupying one word. | None |
| When loses DeviceNet connection | AS01DNET (RTU)'s error handling method when AS01DNET (RTU) and DeviceNet master are disconnected. "RTU keep running" and "RTU stop" are for option. | RTU keep running |
| When IO module error or no reply | AS01DNET (RTU)'s error handling method when an error occurs in any one of I/O modules connected to the right side of AS01DNET (RTU). "RTU keep running" and "RTU stop" are for option. | RTU keep running |
| Software baud rate | Chooses the extension baud rate of AS01DNET (RTU) after ticking the checkbox of it. The selected baud rate is stored in AS01DNET (RTU) after the download and it will not take effect until the hardware switch of AS01DNET (RTU): DR1 and DR0 are both ON. Refer to Section 11.2.6 for details on function switch. | None |
| Firmware version | Displays the firmware version of AS01DNET (RTU). | None |



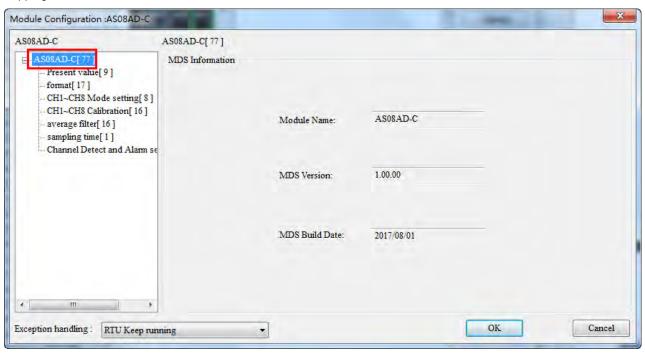
11.5.4.2.4. I/O Module Configuration Page

The mapping parameters of each module can be set through double clicks on the selected I/O module icon on the following interface.





Double click the 08AD icon. Then the AS08AD-C configuration interface appears as below for configuration of parameter mapping of AS08AD-C module.



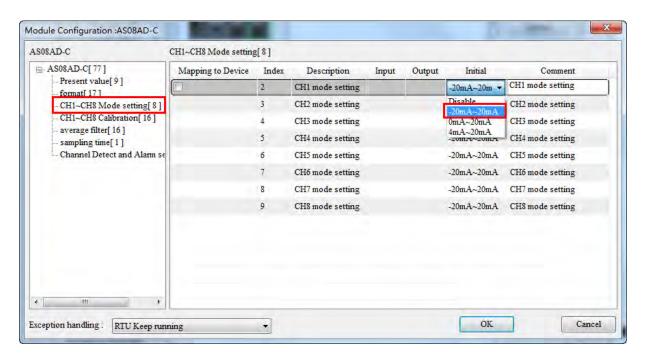
Explanation of I/O module configuration interface:

| Item | Description |
|--------------------|--|
| MDS information | Displays module name, MDS version and creation date. The module parameters will be shown in the left-side window based on the MDS file. For explanation of module parameters, refer to the relevant module manual. |
| I/O parameter list | Displays all module parameters read from the MDS file of the module. Set up these parameters to control the operation of the module. |
| Exception handling | The error handling of AS01DNET (RTU) when AS01DNET (RTU) detects that an error occurs in the module. "RTU keep running" or "RTU stop" can be selected as the solution to the error. |

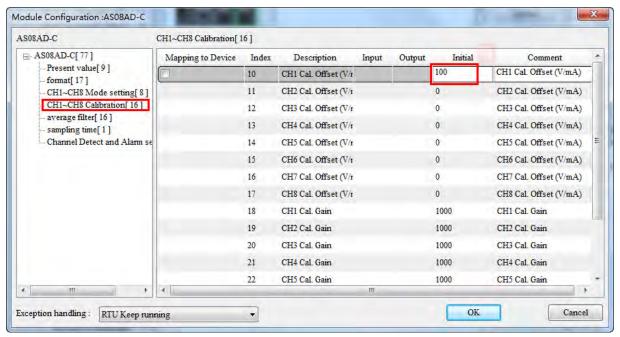


Generally, the settings for I/O module parameters and device mappings can be made in the following three cases.

Case 1: Select one appropriate parameter value from the drop-down list in the **Initial** column, e.g. select -20Ma~+20mA as channel 1 input mode of AS08AD-C.

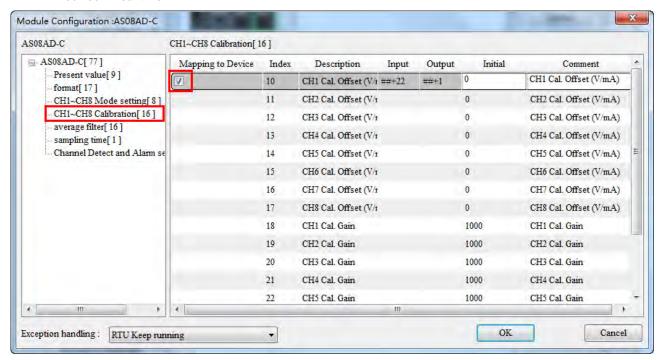


Case 2: Manually enter the value for the parameter to change in the Initial column, e.g. write 100 for CH1 Cal.Offset of AS08AD-C).



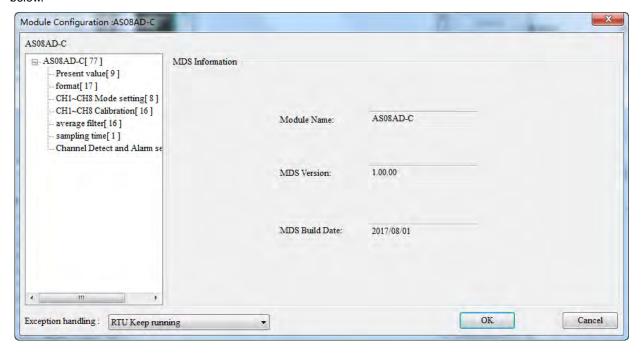


Case 3: For the module parameter which need be monitored in real time or need be modified in its value, tick the desired parameter in the **Mapping to Device** column and then the corresponding value of the parameter will map to the bus data for exchange i.e. the D registers in PLC. After the values of the ticked parameters in the **Mapping to**Device column go to the software monitor page, the current values of parameters can be monitored and modified in real time.



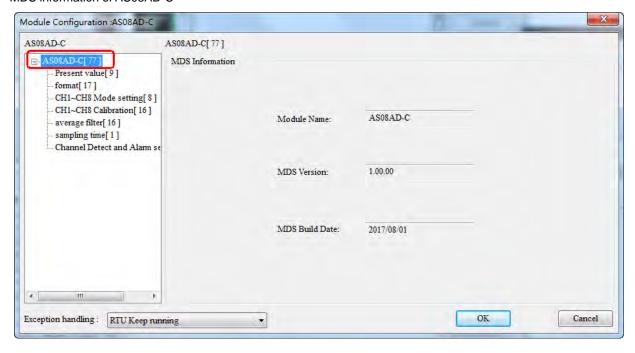
Explanation of IO module parameters

Double click the icon of AS08AD-C module. Then the **Module Configuration: AS08AD-C** dialog box comes out as below.

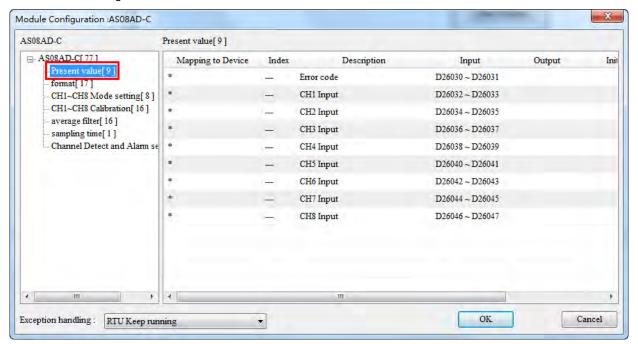




MDS information of AS08AD-C

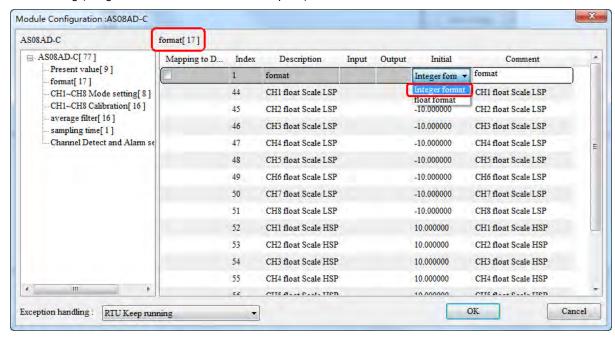


Present value setting

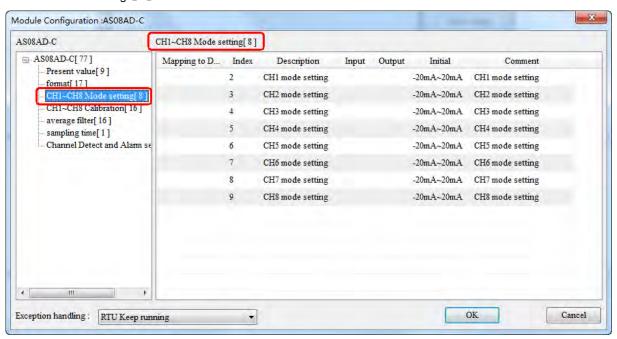




Format setting (Integer format and Float format for option)

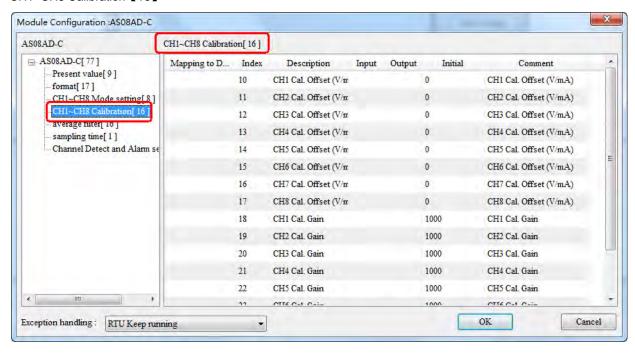


CH1~CH8 Mode setting 【8】

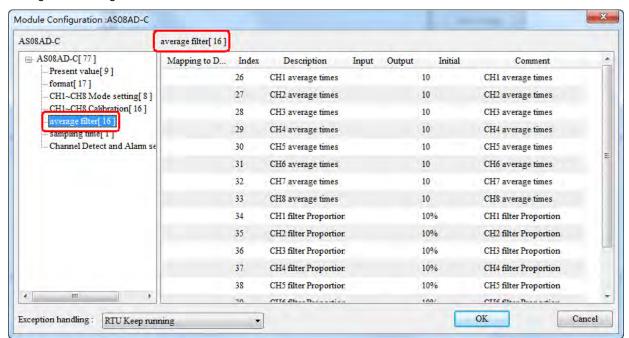




CH1~CH8 Calibration 【16】

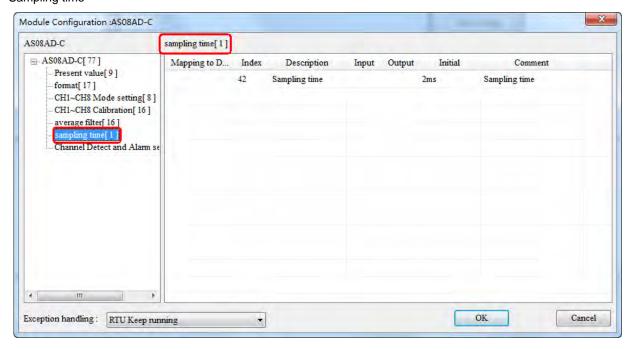


Average filter setting [16]

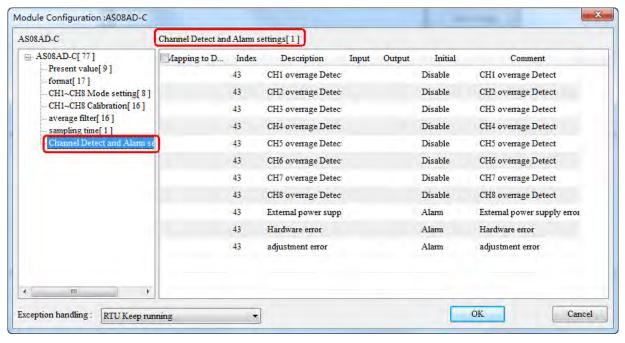




Sampling time



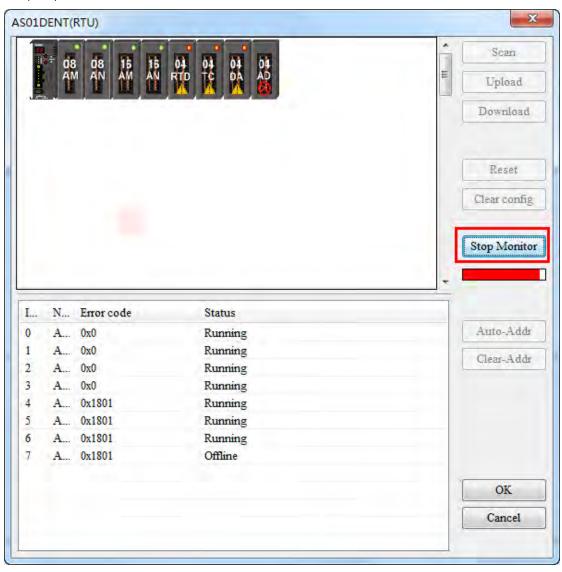
Channel Detect and Alarm settings





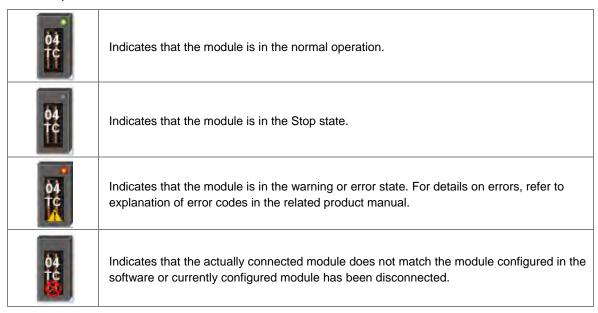
11.5.4.2.5. Monitor Function of the Software

When the software is in online mode and current configuration in AS01DNET (RTU) is the same as that stored in the software, click the **Start Monitor** button to enter the monitor interface and start to monitor the operation states of AS01DNET (RTU) and I/O modules in real time.

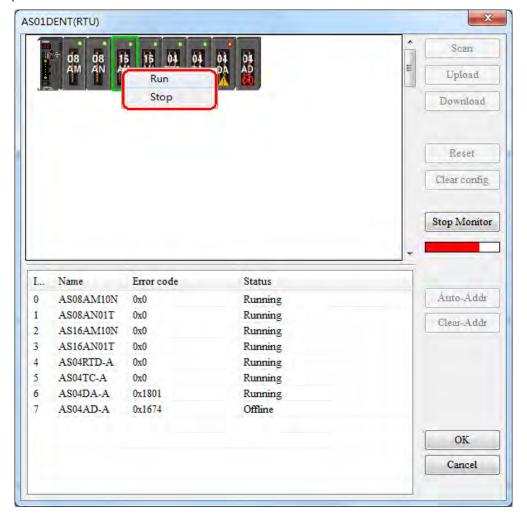




The list of operation state of modules:



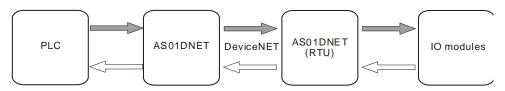
On the following interface, right click the selected module icon and select RUN or Stop from the drop-down box to change the operation state of the I/O module.





11.5.4.3. DeviceNet Mapping Data

The model of the entire mapping data exchange is displayed below and eventually data will map to the registers in the PLC of the master.



Note: All mapping addresses mentioned below means the D registers in the PLC.

The start input address and start output address of AS01DNET (RTU) are assigned automatically by the master when AS01DNET (RTU) is added to the master. The input mapping address length and output mapping address length of AS01DNET (RTU) are determined by the configuration of modules connected to AS01DNET (RTU).

The start input and output mapping addresses of one I/O module are assigned automatically by the software. Its input mapping address length and output mapping address length are determined by the configuration of the module. The range of input / output mapping address is limited by the input / output mapping address range of AS01DNET (RTU).

Scanner Module Configuration... Scan List setting Available Nodes: Scan List: Node Name Node Ad... Node Name Node Ad > AS01DNET(RTU) 03 < Output Table Input Table Register Device Image Register Device Image D26105 H D26005_H D26105 L D26005 L D26106 H D26006 H D26106_L D26006_L D26107_H D26007_H D26107 L D26007 L D26108 H D26008 H D26108 L D26008 L D26109 H D26009 H D26109_L D26009_L D26110 H D26010 H D26110 L D26010 L D26111 H D26011 H OK Unit ID: 1 26105 Start Output : D Cancel 26005 Start Input: D Manual allocation

11.5.4.3.1. The Rule for Assignment of Mapping Addresses by ASO1DNET Master

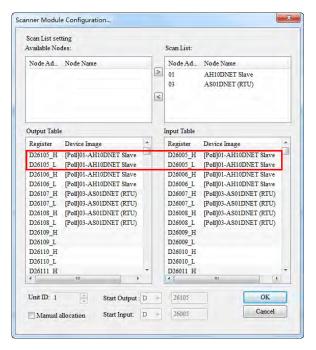
Data mapping areas are assigned according to the following table.

| Input area: Slave ⇒ Master | | | Output area: Master ⇒ Slave | | |
|----------------------------|--|-----------|-----------------------------|--|-----------|
| Register in AS PLC | Purpose | Data size | Register in AS PLC | Purpose | Data size |
| D26000~D26003 | Scan-list node state indication area | 4 words | D26100~D26103 | Bit-strobe command area | 4 words |
| D26004 | Scanner module state indication area | 1 word | D26104 | Reserved | 1 word |
| D26005~D26099 | DeviceNet input data area; for receiving state data back from slaves | 95words | D26105~D26199 | DeviceNet output area; the data in the registers will be sent to slaves as control data. | 95 words |

11.5.4.3.2. The Rule for Assignment of Mapping Addresses for ASO1DNET (RTU)

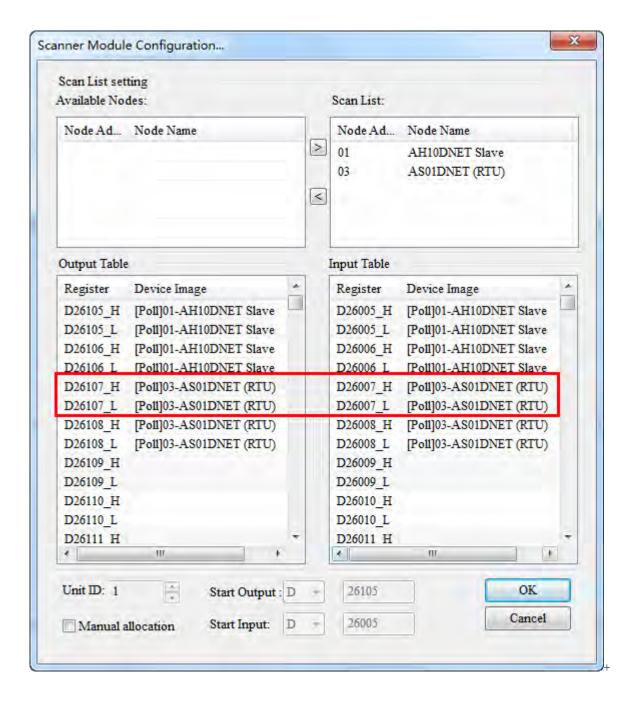
The start input and start output mapping addresses of AS01DNET (RTU) are assigned automatically by the master when AS01DNET (RTU) is added to the master. The master assigns mapping addresses of AS01DNET (RTU) according to input mapping address length and output mapping address length. Input mapping address length and output mapping address length are determined by the configuration parameters of all modules connected to AS01DNET (RTU). The start addresses of AS01DNET (RTU) will not be assigned until AS01DNET (RTU) is added to the master and they are related to the order of adding slaves to the master.

When there are two slaves of AH10DNET and AS01DNET (RTU), the input size and output size of AH10DNET are both 4 bytes and the input size and output size of AS01DNET (RTU) are both 4 bytes. If AS01DNET (RTU) is added to the master before AH10DNET is added to the master, then the input mapping addresses and output mapping addresses of AS01DNET (RTU) are respectively D26005~D26006 and D26105~D26106 as below. D26005 and D26105 are respectively the start input mapping address and start output mapping address, i.e. status word and control word of AS01DNET (RTU). The registers after start input mapping address and start output mapping address are for mapping the configuration parameters of I/O modules.





If AS01DNET (RTU) is added to the master after AH10DNET is added to the master, then the input mapping addresses and output mapping addresses of AS01DNET (RTU) are respectively D26007~D26008 and D26107~D26108 as below. D26007 and D26107 are respectively the start input mapping address and start output mapping address, i.e. status word and control word of AS01DNET (RTU). The registers after start input mapping address and start output mapping address are for mapping the configuration parameters of I/O modules.



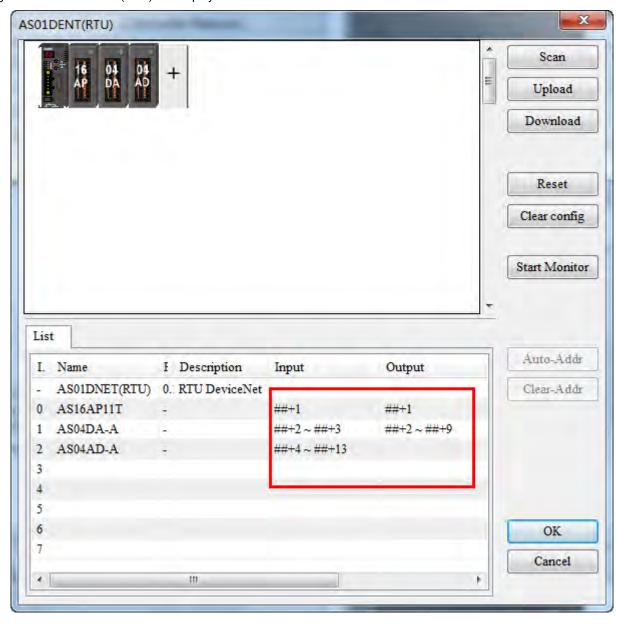


11.5.4.3.3. The Rule for Assignment of Mapping Addresses for I/O Modules

Each module has two forms of data mapping. When DeviceNet master has not assigned the start input mapping address and start output mapping address to AS01DNET (RTU), the contents in **Input** and **Output** in the following figure represent offsets based on start input or start output mapping address of AS01DNET (RTU). After DeviceNet master has assigned the start input mapping address and start output mapping address to AS01DNET (RTU), the contents in **Input** and **Output** in the following figure represent mapping addresses of parameters in the modules on the right of AS01DNET (RTU).

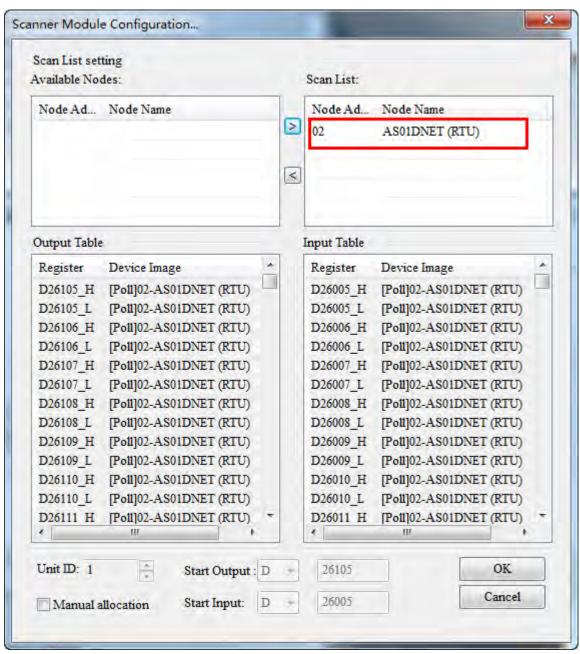
When AS01DNET (RTU) is added to **Scan List** on the page of **Scanner Module Configuration...**, DeviceNet master assigns start input and output mapping addresses to AS01DNET (RTU). When AS01DNET (RTU) is removed from **Scan List** on the page of **Scanner Module Configuration...**, the start input and start output mapping addresses of AS01DNET (RTU) are unknown.

Before the master assigns mapping addresses to AS01DNET (RTU), the device mappings of modules connected to the right side of AS01DNET (RTU) are displayed as below.



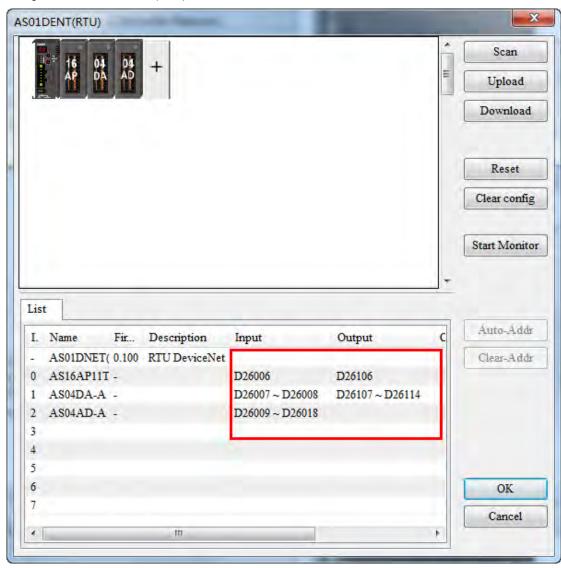


After AS01DNET (RTU) is pulled into **Scan List**, the mapping addresses that the master assigns to AS01DNET (RTU) are shown as below.



<u>11</u>

After the master assigns mapping addresses to AS01DNET (RTU), the mapping devices of the modules connected to the right side of AS01DNET (RTU) are shown as below.



The software automatically assigns mapping addresses of module parameters in the arrangement order of modules connected to the right side of AS01DNET (RTU) from left to right.

Below is the table of configuration of one master AS01DNET and one slave AS01DNET (RTU) and mapping addresses that the software automatically assigns to each module. D26005 and D26105 are the control word and status word of AS01DNET (RTU). The input mapping address and output mapping address of AS16AP are D26006 and D26106 respectively. The input mapping addresses and output mapping addresses of AS04DA are D26007~D26008 and D26107~D26114 respectively. The input mapping addresses of AS04AD are D26009~D26018.

| Auto Assignment | Input | Output |
|-----------------|--------------------|---------------------|
| AS01DNET(RTU) | D26005 status word | D26105 control word |
| AS16AP | D26006 | D26106 |
| AS04DA | D26007~D26008 | D26107~D26114 |
| AS04AD | D26009~D26018 | |

The input and output mapping addresses of AS01DNET (RTU) are D26005~D26018 and D26105~D26114.



11.5.4.3.4. Status Word and Control Word of ASO1DNET (RTU)

The start input address and start output address in the mapping areas of AS01DNET (RTU) are used as the status word and control word of AS01DNET (RTU) respectively with the detailed explanation in the following table.

1

Control word of AS01DNET(RTU)

| Bit | Status value | Description |
|-----------|--------------|--|
| | 000 | Make no control setting for the operation of AS01DNET(RTU) |
| bit0 | 001 | Set AS01DNET(RTU) to RUN mode |
| ~ bit2 | 010 | Set AS01DNET(RTU) to STOP mode |
| DILZ | Other | Reserved |
| h:40 | 0 | Reserved |
| bit3 | 1 | Restart AS01DNET (RTU) |
| bit4 | 0/1 | Reserved |
| bit5 | 0/1 | Reserved |
| bit6 | 0/1 | Reserved |
| bit7 | 0/1 | Reserved |
| bit8 | 0/1 | Reserved |
| bit9 | 0/1 | Reserved |
| bit10 | 0/1 | Reserved |
| bit11 | 0/1 | Reserved |
| bit12 | 0/1 | Reserved |
| bit13 | 0/1 | Reserved |
| bit14 | 0/1 | Reserved |
| bit15 | 0/1 | Reserved |

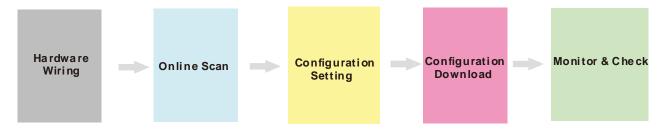
Status word of AS01DNET(RTU)

| Bit | Status value | Description |
|-------|--------------|--|
| | 0 | AS01DNET (RTU) in RUN state |
| bit0 | 1 | AS01DNET (RTU) stops. |
| bit1 | 0/1 | Reserved |
| | 0 | No error occurs in I/O modules. |
| bit2 | 1 | An error occurs in I/O modules. |
| bit3 | 0/1 | Reserved |
| | 0 | Current connection matches the configuration. |
| bit4 | 1 | Current connection is inconsistent with the configuration. |
| | 0 | AS01DNET (RTU) works normally. |
| bit5 | 1 | The voltage of the power supply for AS01DNET (RTU) is too low. |
| bit6 | 0/1 | Reserved |
| L:47 | 0 | AS01DNET (RTU) works normally. |
| bit7 | 1 | The number of points/ modules exceeds allowed range. |
| bit8 | 0/1 | Reserved |
| bit9 | 0/1 | Reserved |
| bit10 | 0/1 | Reserved |
| bit11 | 0/1 | Reserved |
| bit12 | 0/1 | Reserved |

| Bit | Status value | Description |
|-------|--------------|-------------|
| bit13 | 0/1 | Reserved |
| bit14 | 0/1 | Reserved |
| bit15 | 0/1 | Reserved |

11.5.4.4. Connecting ASO1DNET (RTU) to the Network

To configure AS01DNET (RTU) successfully and make it work normally in the network, the following steps should be taken for the setup.



Hardware wiring

During hardware wiring, notice that the standard cable should be used and two terminal resistors of 121Ω should be connected respectively to the two ends of the main line in the DeviceNet network. The node IDs of all nodes in the network bus can not be repeated and their baud rates should be consistent.

Online scan

The online scan consists of two parts: scanning online network nodes and scanning I/O modules of AS01DNET (RTU). Before the scan, make sure that the communication channel selected is proper and the communication setup is normal in the communication manager COMMGR.

Configuration setting

The configuration setting includes the master configuration and AS01DNET (RTU) configuration settings. The master configuration contains the master scanner module setting (configuration of master) and the scan list configuration setting. AS01DNET (RTU) configuration contains AS01DNET (RTU) setting and other I/O modules setting.

Configuration Download

Configuration download consists of master configuration download and AS01DNET (RTU) configuration download. During the master configuration download, the seven-segment displayer of AS01DNET (RTU) shows 80 and its node ID alternately. During the AS01DNET (RTU) configuration download, the seven-segment displayer of AS01DNET (RTU) shows 83 and its node ID alternately.

Monitor and Check

After the configuration is downloaded, check if AS01DNET (RTU) works normally. If AS01DNET (RTU) works normally, the digital displayers of the master and AS01DNET (RTU) show their own node IDs and MS and NS indicators are ON in green.



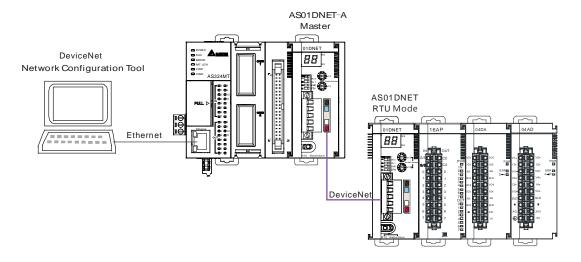
11.5.5 Application Example

This section describes how to configure AS01DNET (RTU) and its right-side I/O module parameters in the DeviceNet Builder software through an application example. And how the parameters of the I/O modules connected to the right side of AS01DNET (RTU) are controlled and accessed through AS01DNET master is illustrated as well.

Control Requirement:

- 1. Connect the output point of AS16AP to the input point; turn on the output point to make the input point ON.
- 2. Write one value for channel 1 of AS04DA to change into analog signal and then convert the analog signal to digital signal to output via AS04AD.

11.5.5.1. Network Structure



Note:

- 1. During the wiring, connect the voltage output of channel 1 of AS04DA to the voltage input of channel 1 of AS04AD. And add the 24 V power to AS04DA and AS04AD respectively.
- 2. Make sure that the baud rates of AS01DNET and AS01DNET (RTU) match.

| Module | Node ID | Baud rate |
|---------------|---------|-----------|
| AS01DNET | 0 | 500Kbps |
| AS01DNET(RTU) | 2 | 500Kbps |

3. Connect the 24V network power module between V+ and V- and a terminal resistor of 121Ω between CAN_H and CAN_L.

11.5.5.2. Using DeviceNet Builder to Configure the Network

11.5.5.2.1. Building and Starting up Driver1 via COMMGR

Build driver1 in the COMMGR software.

Refer to Section 2.4 Communication Setting in the ISPSoft User Manual for more details.

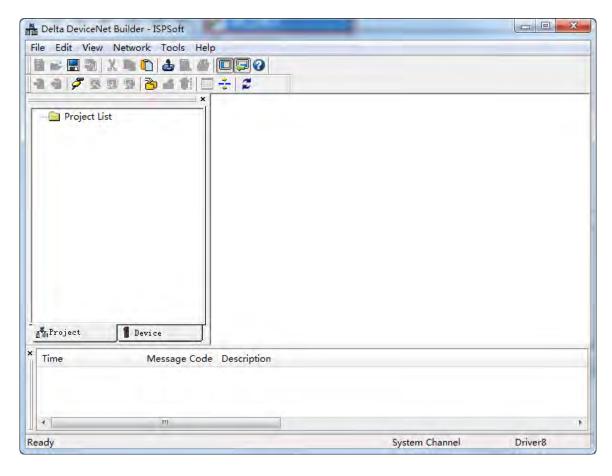


11.5.5.2.2. Configuring AS01DNET (RTU)

1. Call DeviceNet Builder via ISPSoft.

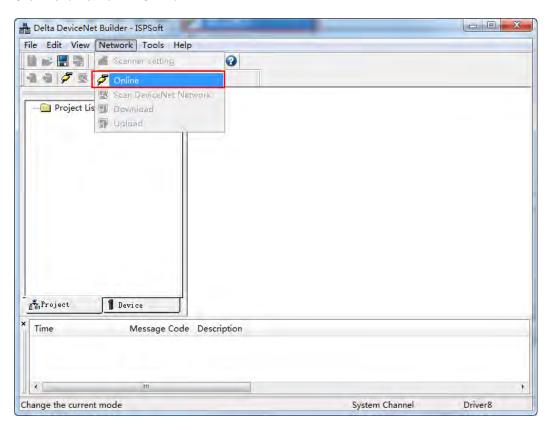
Refer to Section 11.6 for details on the operation.

2. The called DeviceNet Builder is started as below.

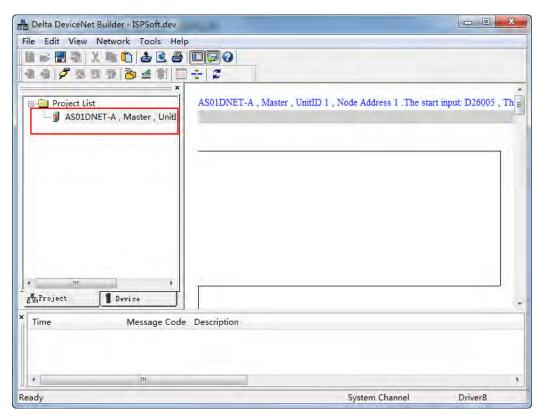




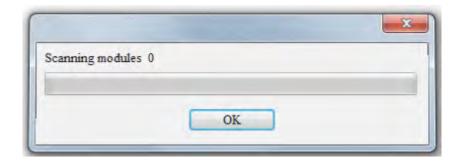
3. Click menu Network>> Online.



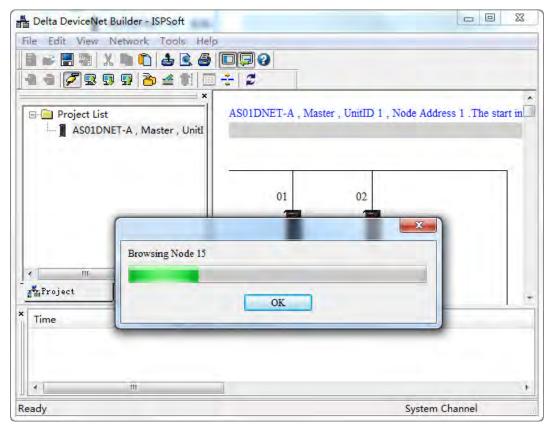
The AS01DNET-A master module which has been scanned is shown in the left-side Project List.



4. Click menu Network >> Scan DeviceNet Network.

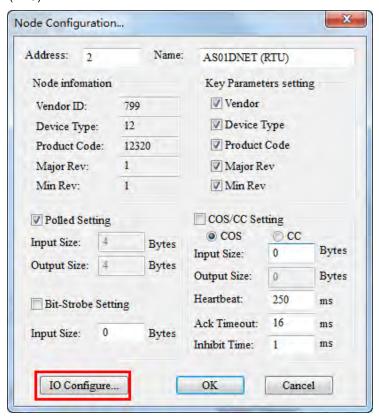


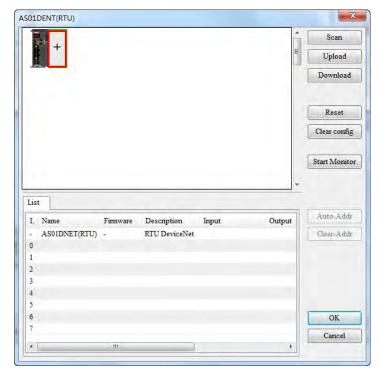
5. The RTU slave in the DeviceNet network is scanned as follows.



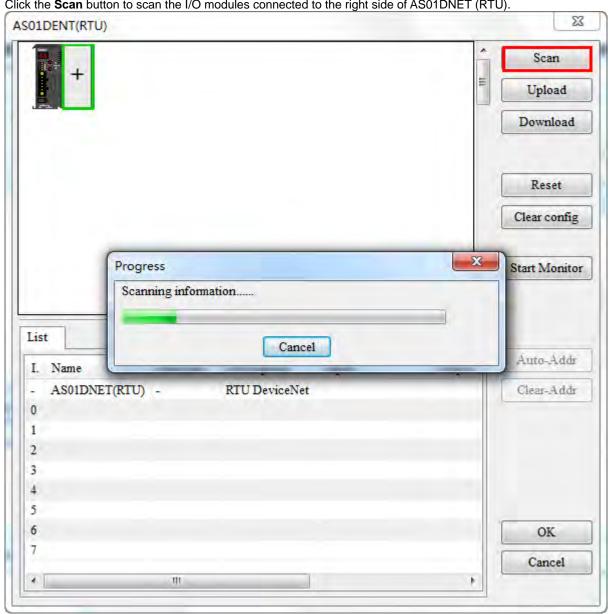


6. Double click AS01DNET (RTU). Then the **Node Configuration...** dialog box appears. Click the **IO Configure...** button to make the **AS01RTU-DNET** interface appear, where to configure the modules connected to AS01DNET (RTU).



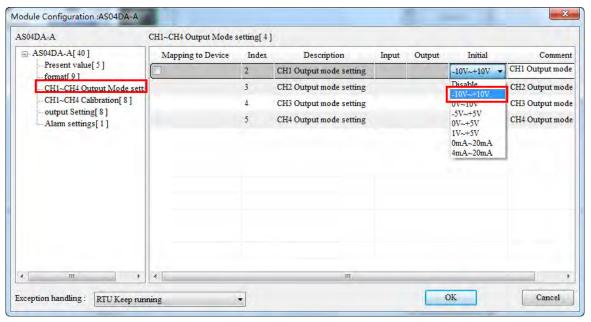


7. Click the Scan button to scan the I/O modules connected to the right side of AS01DNET (RTU).

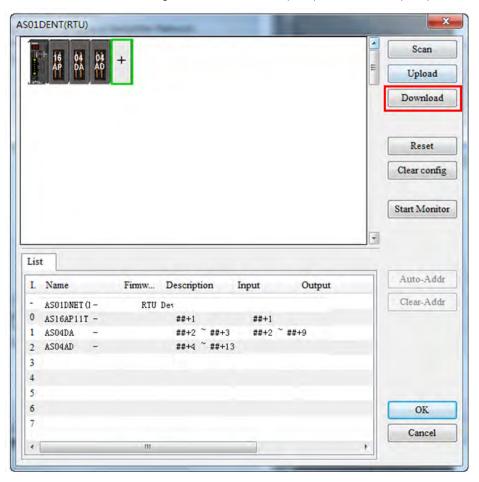




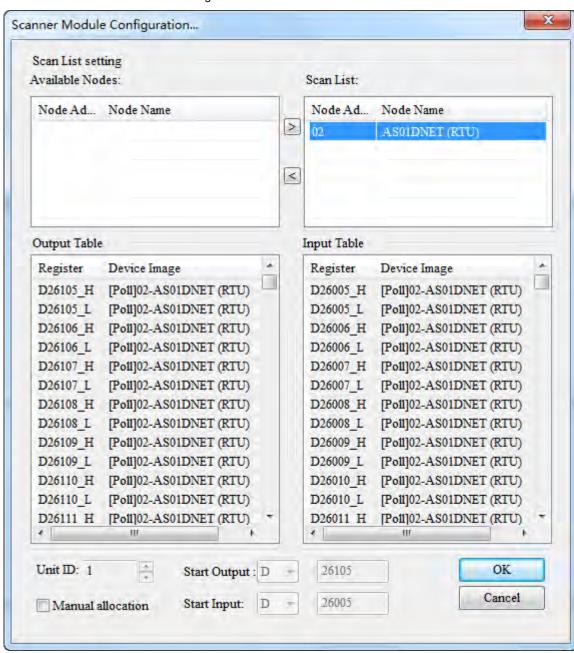
 After the module is scanned, configure module parameters. Double click AS04DA module and select "-10V~+10V" for channel 1 mode setting. Click the **OK** button to finish the setting. Use the same setting way for channel 1 mode setting of AS04AD and set it to "-10V~+10V" as well.



After the configuration of modules is finished, click the **Download** button to download the configuration of I/O
modules connected to the right side of AS01DNET (RTU) to AS01DNET (RTU).



10. After the download, click the OK button to go back to the main page of the software. Double click AS01DNETScanner icon and then move the slave in Available Nodes to Scan List on the Scanner Module Configuration dialog box. Click the OK button to finish the setting.





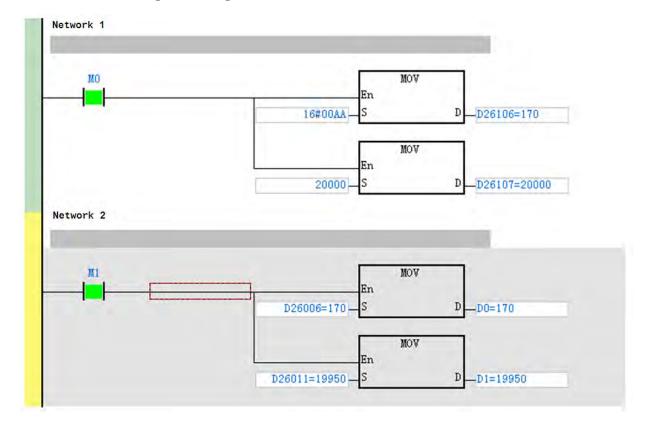
11. Click menu **Network >> Download** to download AS01DNET (RTU) configuration to the master.

The input mapping address D26005~D26018 and output mapping address D26105~D26114 are for AS01DNET (RTU). The start input address D26005 and start output address D26105 are respectively used as the status word and control word of AS01DNET (RTU). The parameter mappings of all modules connected to AS01DNET (RTU) are displayed below.

| I | Name | Firmware | Desc | Input | Output |
|---|---------------|----------|---------|-----------------|-----------------|
| - | AS01DNET(RTU) | 0.100 | RTU Des | | |
| 0 | AS16AP11T | - | | D26006 | D26106 |
| 1 | AS04DA-A | ÷ | | D26007 ~ D26008 | D26107 ~ D26114 |
| 2 | AS04AD-A | - | | D26009 ~ D26018 | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| | | m | | | |

| | I/O Module | Input | Output |
|--------|------------------------|---------------|---------------|
| AS16AP | | D26006 | D26106- |
| | Status | D26007~D26008 | |
| | Channel 1 output value | | D26107~D26108 |
| AS04DA | Channel 2 output value | - | D26109~D26110 |
| | Channel 3 output value | - | D26111~D26112 |
| | Channel 4 output value | - | D26113~D26114 |
| | Status | D2609~D26010 | |
| | Channel 1 input value | D26011~D26012 | |
| AS04AD | Channel 2 input value | D26013~D26014 | |
| | Channel 3 input value | D26015~D26016 | |
| | Channel 4 input value | D26017~D26018 | |

11.5.5.3. Using LD Program to Control the Entire Network



Program Explanation:

- 1. In network 1, write a value for the output of AS16AP and for the output of channel 1 of AS04DA when M0 changes to ON.
- 2. In network 2, move the input value of AS16AP to D0 and the input value of channel 1 of AS04AD to D1 when M1 changes to ON.

11.5.6 Error Diagnosis and Trouble Shooting

AS01DNET (RTU) provides four diagnosis methods such as LED indicator, seven-segment displayer, status word diagnosis and software diagnosis.



11.5.6.1. Indicator Diagnosis

NS indicator

| LED state |
|-----------|
| |
| 055 |

| LED status | Indication | How to deal with |
|--|--|---|
| OFF | No power supply; Or the repeated node ID detection has not been completed. | Check the power supply for AS01DNET (RTU) and the connection are normal. Make sure that the baud rates of AS01DNET (RTU) and the master match. |
| Green light blinking (ON:0.5s and OFF: 0.5s alternately) | No connection between AS01DNET (RTU) and its right-side modules | Configure AS01DNET (RTU) in the DeviceNet software and download the configuration correctly. |
| Green light ON | Normal I/O data transmission between AS01DNET (RTU) and DeviceNet master | No correction needed |
| Red light blinking (ON:0.5s and OFF: 0.5s alternately) | I/O connection timeout between AS01DNET (RTU) and DeviceNet master | Refer to the error shooting in Codes in Seven-Segment Displayer below. |
| Red light ON | Network trouble; Repeated node ID; No network power; Or BUS-OFF. | Ensure that the IDs of all nodes are unique on the bus. Check if the network installation is normal. Check if the baud rate of AS01DNET (RTU) is the same as that of the bus. Check if the node ID of AS01DNET (RTU) is valid. Check if the network power supply is normal. |

MS indicator

| LED status | Indication | How to deal with |
|--|---|--|
| OFF | No power | Check if the power supply for AS01DNET (RTU) and connection are normal. |
| Green light blinking (ON:0.5s and OFF: 0.5s alternately) | AS01DNET (RTU) is waiting for the I/O data from DeviceNet master. No I/O data transmission between AS01DNET(RTU) and DeviceNet master The PLC connected to DeviceNet master is in STOP state. | Configure AS01DNET (RTU) in the DeviceNet software and download the configuration correctly. Switch the PLC to RUN state |
| Green light ON | Normal transmission of I/O data between AS01DNET (RTU) and DeviceNet master | No correction needed |

| LED status | Indication | How to deal with |
|--|--|---|
| Red light blinking (ON:0.5s and OFF: 0.5s alternately) | No network power supply; Configuration error; Module alarms. | Check if the network power supply is normal; Reset the internal parameters in AS01DNET (RTU); Check if there is an error or alarm in the I/O modules connected to the right side of AS01DNET (RTU). |
| Red light ON | Hardware error | Return the product to factory for repair if the error still exists after re-power on. |

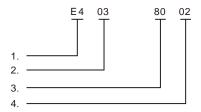
11.5.6.2. Codes in Seven-Segment Displayer

| 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. | Ensure that the node ID of AS01DNET (RTU) is unique in the DeviceNet network within the range of 0~63. Repower it on after changing the node ID. |
| 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. | Check if the network communication cable is normal and the shielded cable is grounded. Ensure the baud rates of all network nodes are same. Check if the two ends of the network are both connected with a 120Ω terminal resistor. Repower the scanner module. |
| F5 | No network power supply for AS01DNET(RTU) | 1. Check if the network cable is normal. 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) .) |
| F6 | Internal error; An error in the internal storage units of AS01DNET (RTU) | Return the product to factory for repair if the error still exists after re-power on. |
| F7 | Internal error; An error in the data exchange units of AS01DNET (RTU) | Return the product to factory for repair if the error still exists after re-power on. |
| F8 | Manufacture error | Return the product to factory for repair if the error still exists after re-power on. |



| Code | Indication | How to deal with |
|------------|--|---|
| F9 | Internal error; An error in the access of the Flash of AS01DNET (RTU) | Return the product to factory 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); Check if the module exists; Check if current module matches that configured in the software; Check if the unconfigured module is added. |
| E 7 | Repeated node ID detection | If the code has emerged for a long time, please shoot troubles in the methods below. Ensure that there are at least two nodes working normally in the network. Check if the two ends of the network are both connected with a 121Ω terminal resistor. Ensure that the baud rates of all network nodes are same. Check if the network cable has a problem such as being disconnected and loosened. Check if the bus communication cable length exceeds maximum transmission distance. If the maximum transmission distance. If the maximum transmission distance is exceeded, the stability of the system can not be ensured. Check if the shielded wire of the network communication cable is grounded. Turn on the power of AS01DNET (RTU) again. |
| E 9 | 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. | Check if the RUN/STOP switch of the PLC connected to the DeviceNet master is turned to RUN. 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. |

When multiple errors exist, the seven-segment displayer of AS01DNET (RTU) will display error codes cyclically. For example, the error codes: E4 03 80 02 are displayed cyclically. See the detailed meaning as below.



- ♦ E4 indicates a module error or offline. For details, see the explanation of codes above.
- ◆ 03 indicates the position of the module where an error occurs. The position of the first module connected to the right side of AS01DNET (RTU) is 1 and that of the second module is 2. Maximum 8 I/O modules are connectable to AS01DNET (RTU) within the range of 1~8.

- ♦ 80 means AS01DNET (RTU) is in STOP state.
- ◆ 02 is the node ID: 2 of AS01DNET (RTU).

11.5.6.3. Status Word Diagnosis

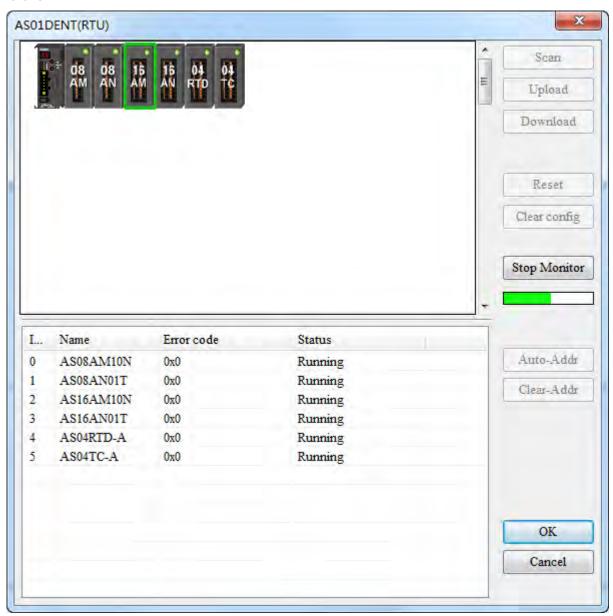
The status word of AS01DNET (RTU) shows the operation states of special modules and digital I/O modules. See the following table for status word diagnosis and disposal.

| Bit | Status value | Description | Disposal |
|-------|-----------------|--|--|
| h:40 | 0 | AS01DNET (RTU) is in RUN state | No correction needed |
| bit0 | 1 | AS01DNET (RTU) is in STOP state. | Restart AS01DNET(RTU) |
| | 0 | Valid configuration data in AS01DNET(RTU) | No correction needed |
| bit1 | 1 | Invalid configuration data in AS01DNET (RTU) | Re-download the configuration data to AS01DNET (RTU) by using the DeviceNet Builder software. |
| bit2 | Reserved | | |
| bit3 | Reserved | | |
| | 0 | Currently connected module matches the configuration in the software. | No correction needed |
| bit4 | 1 | Currently connected module is inconsistent with the configuration in the software. | Check if currently connected module is consistent with the configuration in the software. Change current module to match the configuration in the software or change the configuration in the software to match currently connected module. |
| | 0 | AS01DNET(RTU) in normal operation | No correction needed |
| bit5 | 1 | AS01DNET(RTU) in low voltage | Check if the power supply for AS01DNET (RTU) is normal. |
| bit6 | Reserved | | |
| bit7 | 0 | AS01DNET(RTU) in normal operation | No correction needed |
| Dit | Reserved | | |
| bit8 | Reserved | | |
| bit9 | Reserved | | <u> </u> |
| bit10 | Reserved | | <u> </u> |
| bit11 | Reserved | | |
| bit12 | Reserved | | |
| bit13 | Reserved | | |
| bit14 | Reserved | | |
| bit15 | Reserved | | |



11.5.6.4. Software Diagnosis

Click the **Start Monitor** button on the AS01DNET (RTU) interface. The **Error code** column will show relevant contents as follows.



| Error No. | Explanation | Solution |
|-----------|--|---|
| 0x8001 | AS01DNET (RTU) can not detect the configured module. | Check if the module is disconnected. Check if the module is damaged. |
| 0x8002 | Current module is not consistent with the configured module. | Ensure that the actually connected module is the same as that configured in the software. |

Note: For details on more error codes, refer to the explanation of Error ID in AS-series product manual.

Remark:

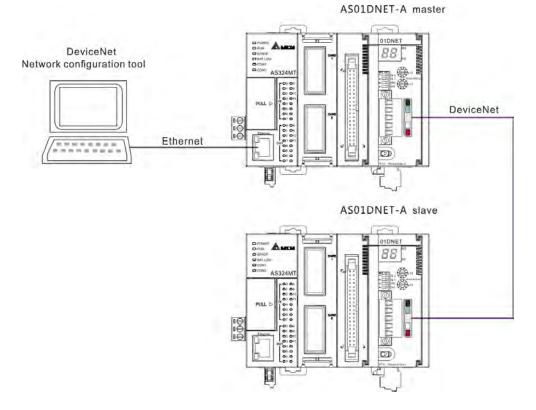
> The software diagnosis function can not be enabled until the DeviceNet Builder software is online.



11.6 How to Call DeviceNet Builder through ISPSoft (ASSeries PLC)

Network structure

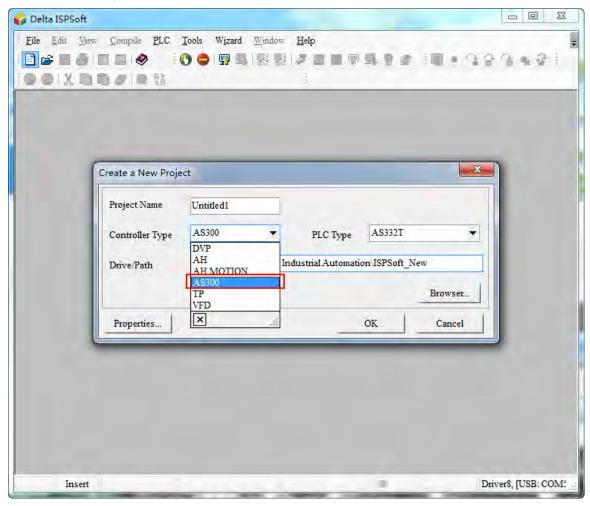
 $\label{lem:connect} \text{Connect the devices according to the following figure. PC accesses AS-series PLC through Ethernet.}$





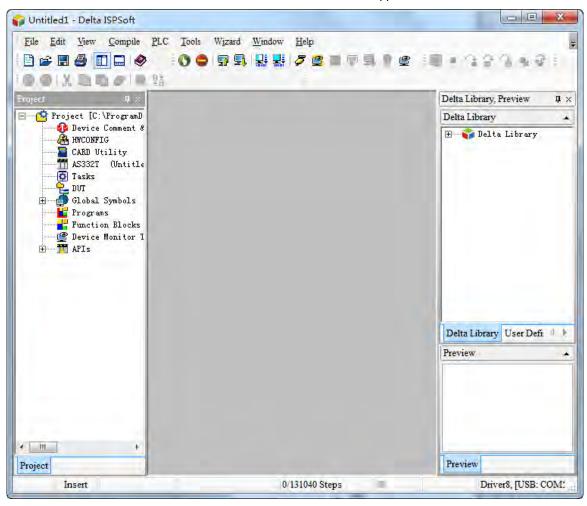
Operation of Software

1. Open the ISPSoft software and then select menu **File>> New>> New**. In the following dialog box which appears, select corresponding PLC type **AS** marked in the red box below.



 $\textbf{Note} \hbox{: The PLC type used in this section is AS332T-A}.$

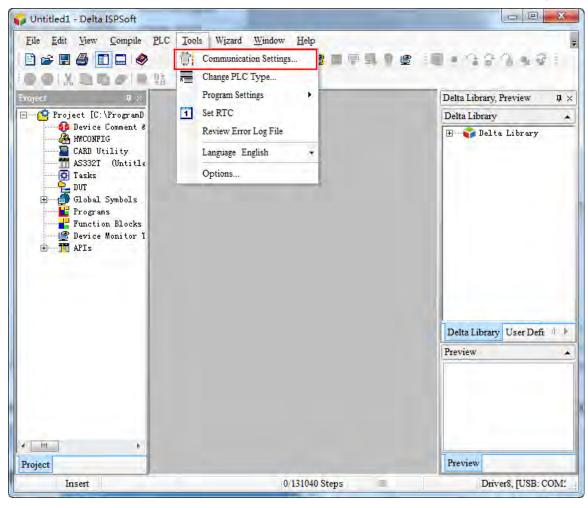
2. Click the **OK** button. Then the main interface of the ISPSoft software appears as below.



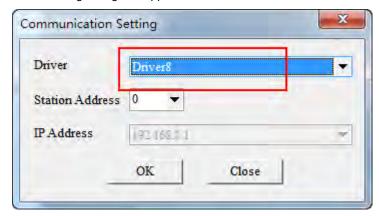
Set up COMMGR communication. Refer to Section 2.4 Communication Setting in the ISPSoft User Manual for more details.



4. After the setup of COMMGR communication is finished, select menu Tools>> Communication settings...

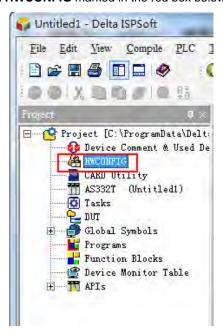


5. The following dialog box appears. Select one desired driver which has been created and then click the **OK** button.

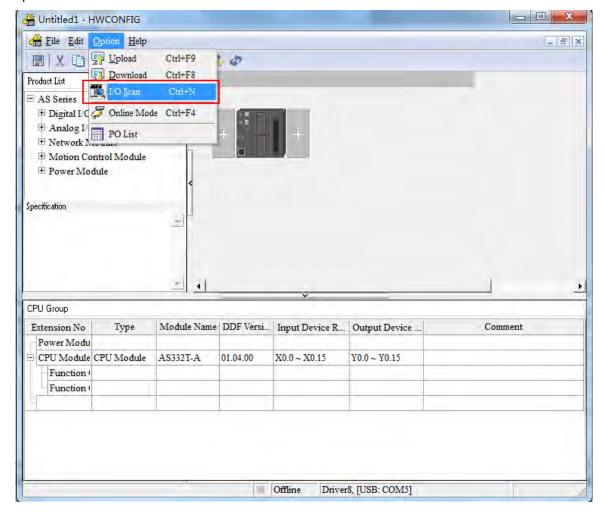


11

6. Double click **HWCONFIG** marked in the red box below.

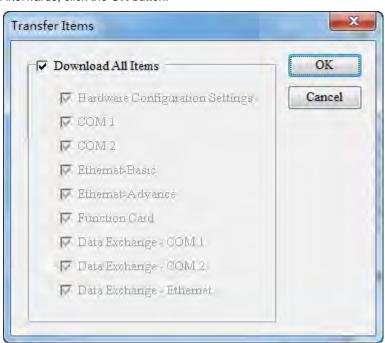


7. Select menu **Option>> I/O Scan** in the following window which pops up. Then the AS01DNET-5A icon will show up.

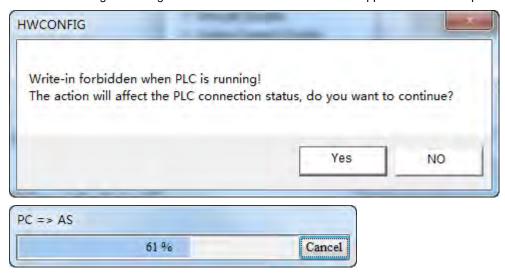




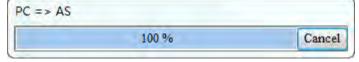
8. Select menu **Option>> Download** in the HWCONFIG window. Then the following dialog box appears. Select the checkbox of **Download All Items** or select the checkboxes of the items which are needed for download. Afterwards, click the **OK** button.



9. Then the following two dialog boxes of **HWCONFIG** and **PC=>AS** appear. Click **Yes** to perform the PC=>AS status.

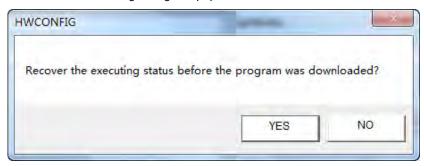


10. When the download is finished, the progress bar is shown as below.



11

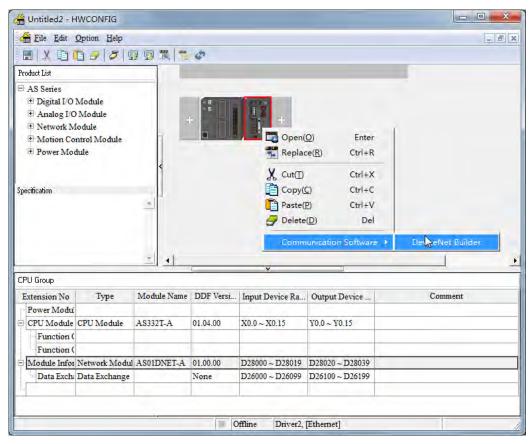
Meanwhile the following dialog box pops out. Click the Yes button.



11. The following dialog box appears to show that the download has been finished.

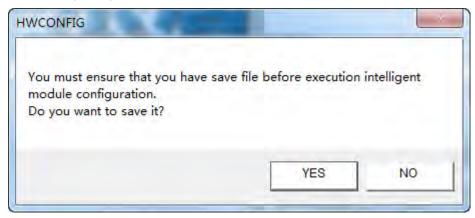


12. Return to the HWCONFIG window and right-click AS01DNET module to make the drop-down menu pop out. Select **Communication Software >> DeviceNet Builder** from the menu.

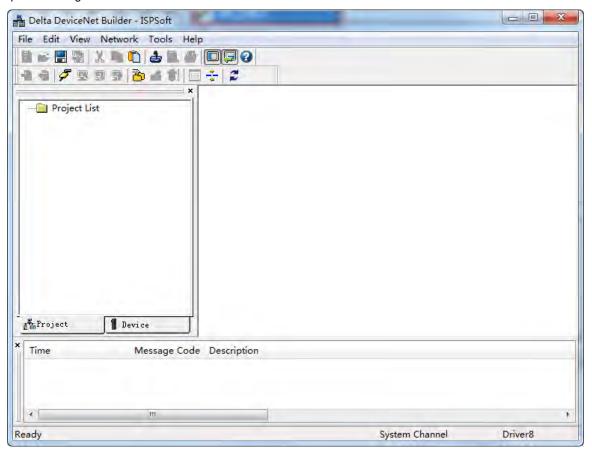




13. The following dialog box pops out. Click the **Yes** button there.

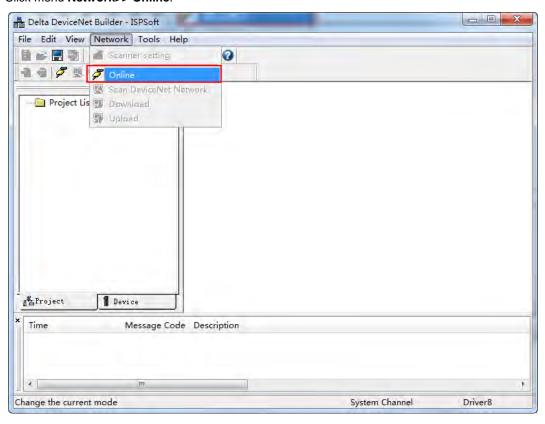


14. The DeviceNet Builder software is opened as below, which means the DeviceNet Builder software has been opened through the ISPSoft software.

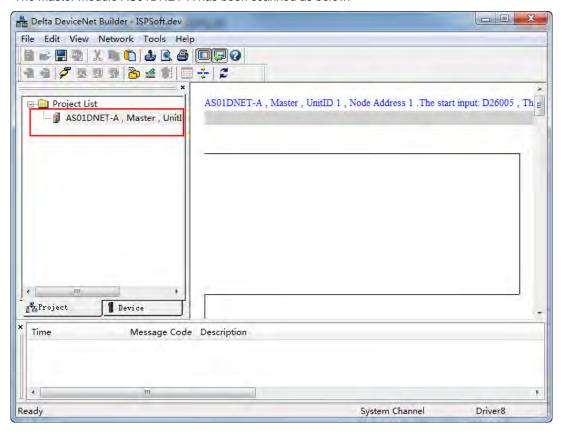


11

15. Click menu Network>> Online.

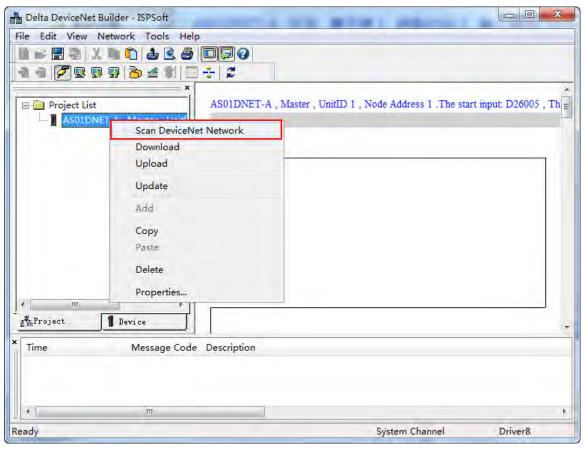


16. The master module AS01DNET-A has been scanned as below.

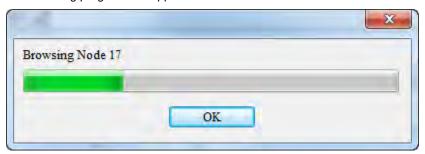




17. Right-click the master module AS01DNET-A under the left-side Project List. Then a drop-down list pops up. Click the option **Scan DeviceNet Network** from the list.

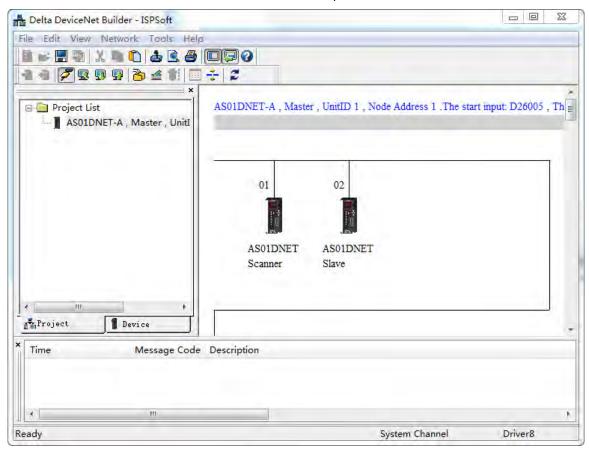


18. The following progress bar appears then.



11

19. The master and slave which have been scanned both show up in the network.





MEMO



Chapter 12 Positioning Module AS02/04

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12.1 Overview

This chapter describes the specifications for the positioning module, its operation, and its programming. On the analog input/output module, four channels receive analog signals (voltage or current), and converts those signals into 16-bit digital signals. In addition, the analog input/output module receives two blocks of 16-bit digital data from a CPU module, and converts the digital data into analog signals (voltage or current). The analog input/output module sends the analog signals by two channels

12.1.1. Characteristics

(1) Use the AS02/04 PU-A module, based on its practical application.

AS02PU-A: 2-axis differential output, 1 encoder

AS04PU-A: 4-axis NPN transistor (sinking) output

(2) High-speed input/output

AS02PU-A: high speed output frequency at 200 k Hz (A/B/Z phase) and 2-axis 200 k HZ differential output

AS04PU: 4-axis NPN transistor (sinking) output at 100 k Hz

(3) Input/output

AS02PU-A: 5 direct current input points (sinking or souring)

AS04PU-A: 6 direct current input points (sinking or souring)

(4) Use the utility software to configure the module.

The HWCONFIG utility software is built into ISPSoft. You can set modes and parameters directly in HWCONFIG without spending time writing programs to set registers to manage functions.

(5) Specially designed instructions for the module

You can use specially designed instructions to control the modules without spending too much time to figure out how to achieve the required applications.

12.2 Specifications and Functions

12.2.1. Specifications

Electrical specifications for the inputs

| Module Name | | AS02PU-A | | AS04PU-A | |
|-------------------------|------------------|--|---|---|--|
| Input | | High speed | Standard | Standard | |
| Number of Input Points | | 3 (A+/A-, B+/B-, Z+/Z-) | 5 (X0.0-X0.4) Removable terminal bloc | 6 k | |
| Input Form | | Differential input | Direct current (sinking or sourcing) | Direct current (sinking or sourcing) Sinking: The inputs are NPN transistors whose collectors are open collectors. Sourcing: The inputs are PNP transistors whose collectors are open collectors are open | |
| Input Curren | t | 5-24 VDC, 5 mA | 24 VDC, 5 mA | 24 VDC, 5 mA | |
| Action Level | OFF→ON ON→OFF | >3 VDC <1.5 VDC | >15 VDC <5 VDC | >15 VDC <5 VDC | |
| Response tin | ne | <2.5 µs | <0.5 ms | <0.5 ms | |
| Maximum input frequency | | 200 k Hz (A+/A-, B+/B-, Z+/Z-) | 10 k Hz | 10 k Hz | |
| Input impedance | | 4.7kΩ | | | |
| Input isolation | | 500 VDC | | | |
| Input display | | When the optocoupler is driven, the input LED indicator is ON. | | | |
| Weight | | 120 g | | | |

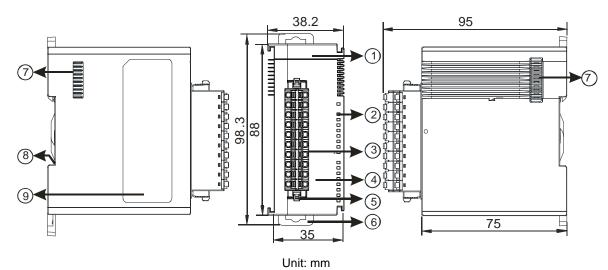


• Electrical specifications for the outputs

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

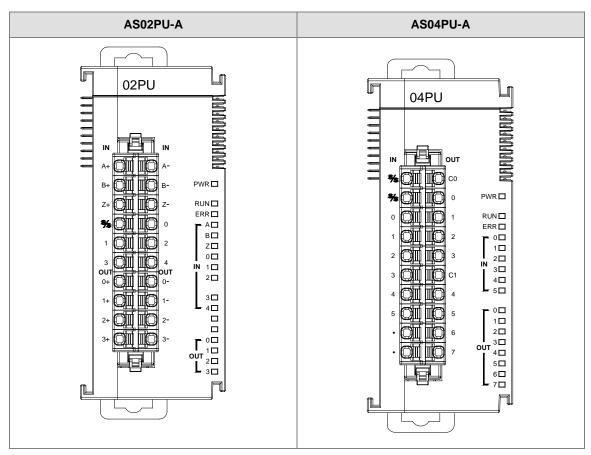
^{*1:} Acutal output: 4 VDC (high input impedance) to 3.3 VDC (10 mA)/output

12.2.2. Profile



| Number | Name | Description |
|--------|---|--|
| 1 | Model name | Model name of the module |
| | POWER LED indicator (Blue) | Indicates the status of the power supply ON: the power is on OFF: no power |
| | Run LED indicator (Green) | Operating status of the module ON: the module is running and ready to accept instructions. OFF: the module is stopped and can NOT accept instrucitons. |
| 2 | Error LED indicator (Red) | Error status of the module OFF: the module is normal. 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 OFF: Receives no input signal |
| | Output LED indicator (Red) | ON: Receives an output signal OFF: Receives no output signal |
| 3 | Removable terminal block | The inputs are connected to sensors. 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 |

12.2.3. Arrangement of Terminals



AS02PU-A AS04PU-A

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

| Manual | Terminal lanual Block | | Terminal Block | |
|--------|-----------------------|-------|-------------------|--|
| | (left) | | (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- | |

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

| | Terminal | | Terminal |
|--------|----------|--------|----------|
| Manual | Block | Manual | Block |
| | (left) | | (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 |



12.2.4. Special Features

The following special instructions (API 14) are designed for AS Positioning Modules, for example, setting output control parameters, reading output status, pulse output (no acceleration), relative position output (with acceleration and deceleration), absolute addressing output (with acceleration and deceleration), homing, jog output, MPG output, and high-speed counter function. Refer to section 6.15 (API 14) in AS Programming Manual for more information.

12.2.5. Wiring

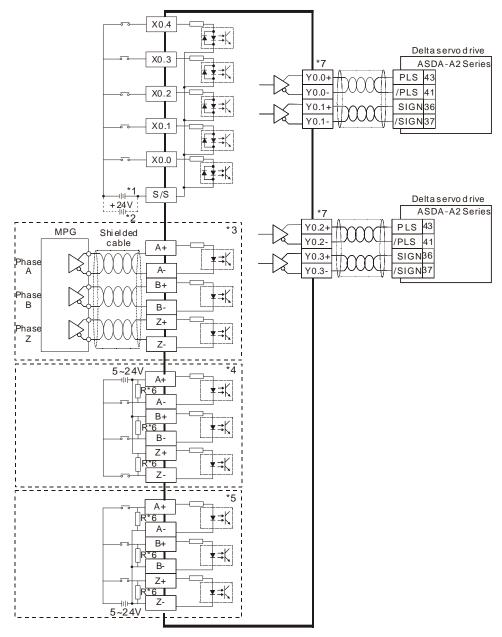
Precautions

To ensure the positioning 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 AS02/04PU-A 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 with a diameter of 24–22 AWG and with pin-type connectors smaller than 1 mm. The plastic jackets that are removed from the cables should be 8 mm to 10 mm long. Only use copper conducting wires which can withstand temperatures of 60° C /75° C or higher.
- (6) Note: use cables with the same length (less than 200 m) and use wire resistance of less than 100 ohm.
- (7) 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.

External wiring

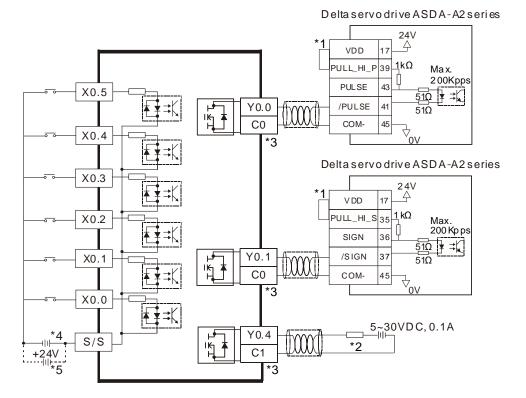
(1) AS02PU-A



- *1. Sinking
- *2. Souring
- *3. Differential input
- *4. Open collector sinking
- *5. Open collector sourcing
- *6. Open collector sinking/sourcing to conncet to phase A/B/Z and if the input frequenct 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.



(2) AS04PU-A

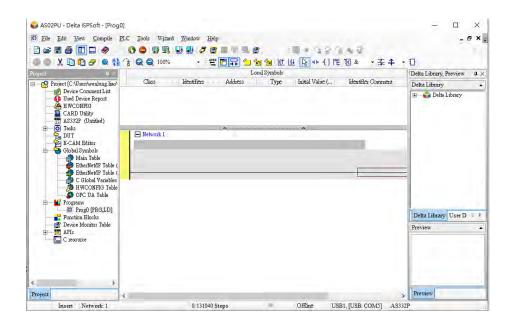


- *1. VDD and COM are seen as a group and its power is provided by Delta servo drive.
- *2. It is a load or an input point.
- *3. Use the same power supply for the same COM group.
- *4. Sinking
- *5. Sourcing

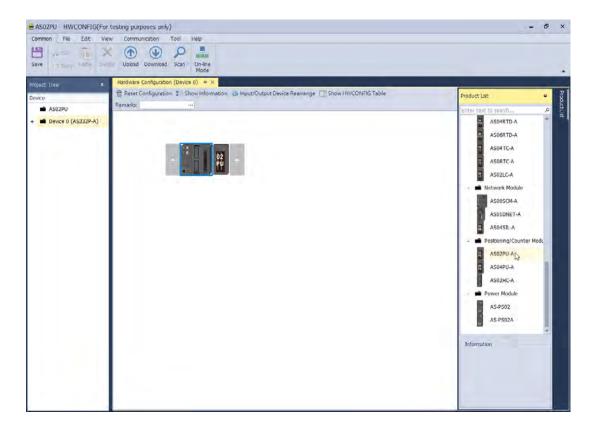
12.3 HWCONFIG in ISPSoft

12.3.1. Initial Setting

(1) Start ISPSoft and double-click HWCONFIG.

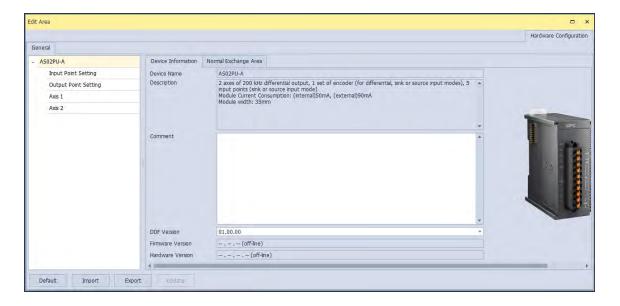


(2) Select a module and drag it to the working area.

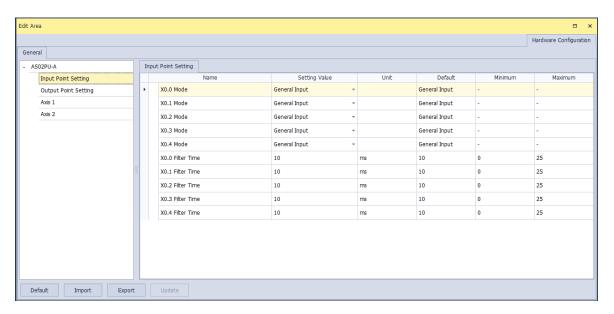




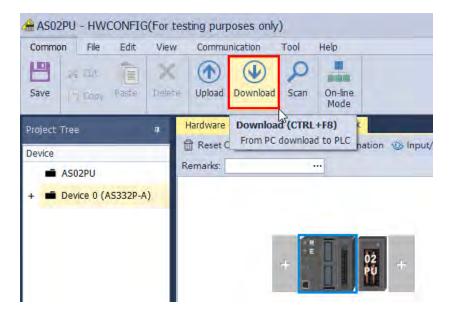
(3) Double-click the module in the working area to open the Setting page.



(4) Choose the parameter, set the values, and close the setting page.

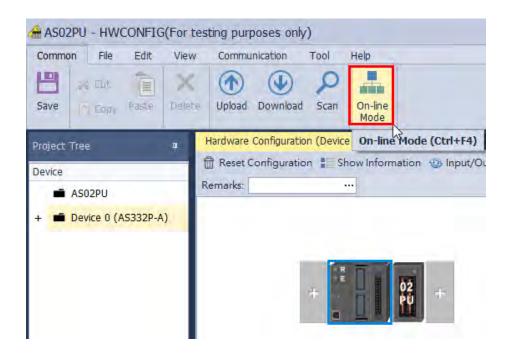


(5) Click **Download** on the toolbar to download the parameters. Note that you cannot download the parameters while the CPU module is running.



12.3.2. Checking the Version of a Module

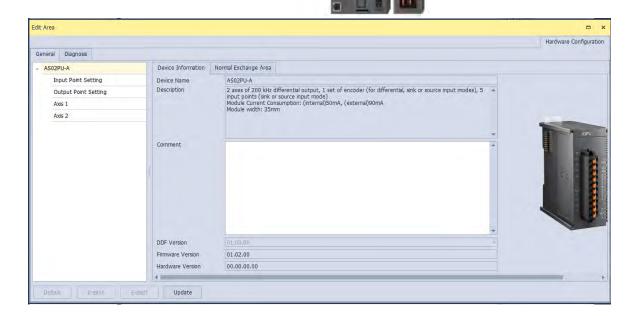
(1) On the Common menu, click On-line Mode.





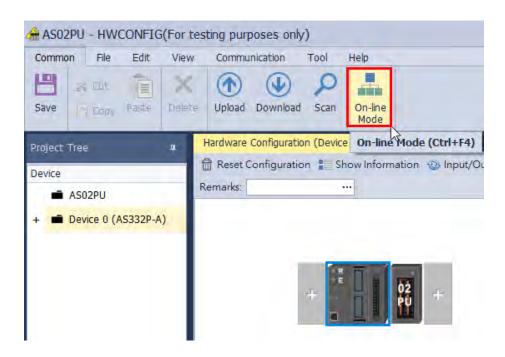
(2) Double-click the module to open the Setting page. The versions of both the firmware and the hardware are displayed.





12.3.3. Online Mode

(1) On the Option menu, click Online Mode.

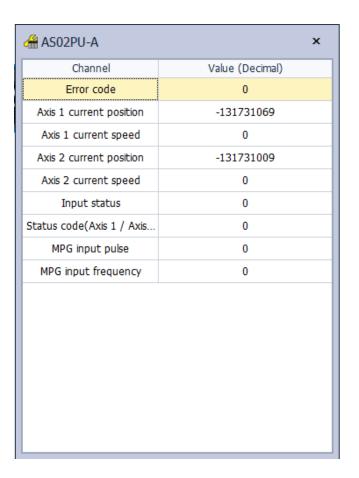


(2) Right-click the module and click Module Status.





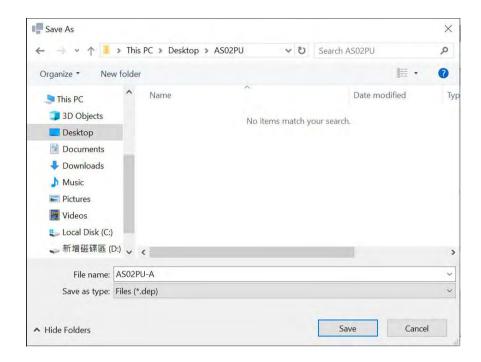
(3) View the module status.



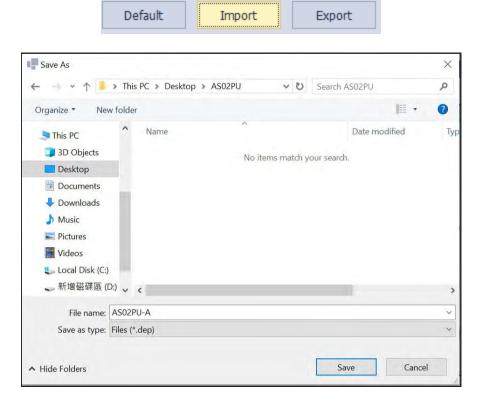
12.3.4. Importing/Exporting a Parameter File

(1) Click **Export** in the Device Settings dialog box to save the current parameters as a dep file (.dep).





(2) Click Import in the Device Settings dialog box and select a .dep file to import saved parameters.

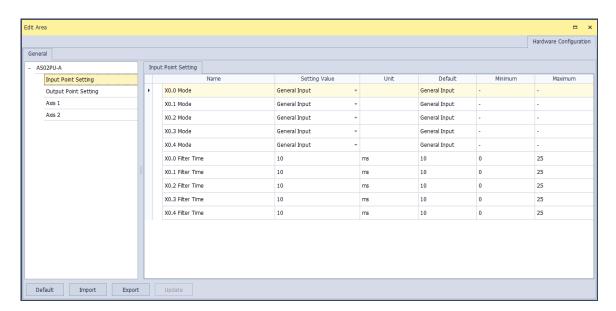




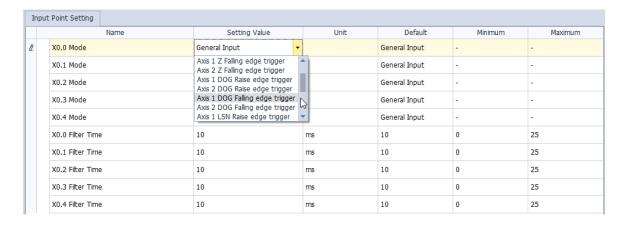
12.3.5. Parameters

The input point settings

You can set values in the input points as the triggering conditions (phase Z, DOG, LSN, LSP) for the axis1 and axis 2 to position. Rising-edge and falling-edge can also be specified in the triggering conditions.



The example shows X0.0 is Axis 1 DOG falling edge triggered.

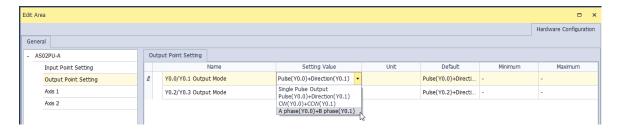


Filter time settings

The default setting is 10 ms; the system filters out distortion and noises in a pulse width modulated transmission that is below 10 ms.

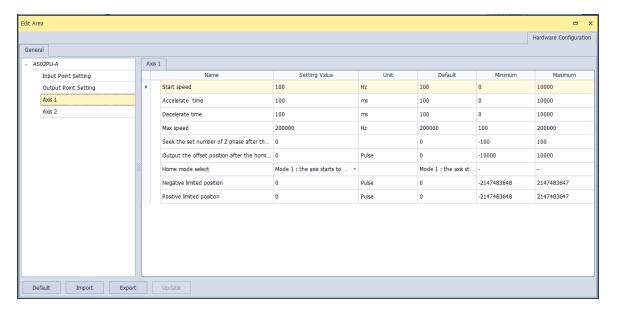
The output point settings

You can set values in the output points (single pulse output, pulse + direction, CW+CCW, A phase + B phase). Refer to API1402 in AS Series Programming Manual for more information on output modes.



Axis settings

You can set up the axis in HWCONFIG or through positioning instructions. Use API1402 to set up the followings starting speed, accelation time, deceleration time, max. speed, seeking the set number of Z phase after homing, output the offset position after homing. Use API1407 to setup homing mode. Refer to API1402 – 1410 in AS Series Programming Manual for more information on the settings of axis.

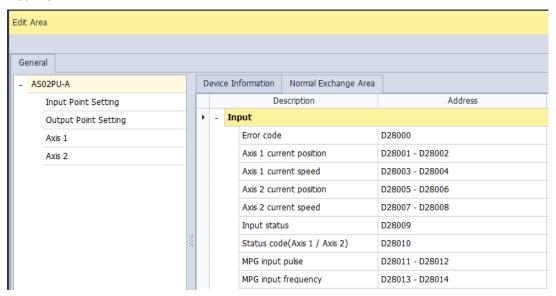




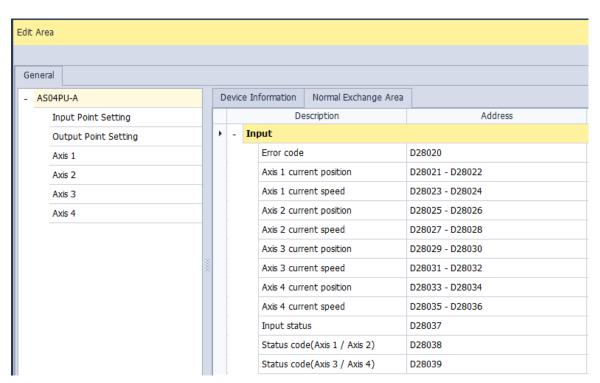
12.3.6. Normal Exchange Area

For data exchange among the CPU module and the modules, the system assign special devices for specified parameters.

AS02PU-A



AS04PU-A



12.4 Troubleshooting

12.4.1. Error Codes

| Error Code | Description | A↔ D LED indicator | ERROR LED indicator |
|---------------|------------------|--------------------|---------------------|
| 16#1802 | Hardware failure | OFF | Blinking |

12.4.2. Troubleshooting Procedure

| Description | Procedure |
|------------------|--|
| Hardware failure | Return the module to the factory for repair. |

12.4.3. State Codes (Axis 1 - 4)

| State Code Byte # | Description | Axis | Axis 3-4 |
|--|---|----------|-------------|
| 0 | Error flag | | |
| 1 | The output is active. | | |
| 2 | 2 The output has stopped working. | | |
| 3 | The instruction execution is complete. | | A: - O |
| 4 | Pulse in positive direction not allowed | Axis 1 | Axis 3 |
| 5 | 5 Pulse in negative direction not allowed | | |
| 6 Current position value overflow | | | |
| 7 Pulse direction (positive or negative) | | | |
| 8 | 8 Error flag | | |
| 9 The output is active. | | | |
| 10 | The output has stopped working. | | |
| 11 | The instruction execution is complete. | A | Axis 4 |
| 12 | Pulse in positive direction not allowed | AXIS 2 | AXIS 4 |
| Pulse in negative direction not allowed | | | |
| 14 | 14 Current position value overflow | | |
| 15 | 15 Pulse direction (positive or negative) | | |



MEMO

Chapter 13 IO-Link Communication Module AS04SIL

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13.1 Overview

Thank you for using the IO-Link master module AS04SIL-A. To ensure that your AS04SIL-A is installed and operated correctly, read this manual carefully before using the module.

The AS04SIL-A module is an AS series IO-Link communication module (hereafter referred to as "SIL" module) connected on the right side of AS CPU module or AS00SCM-A (RTU mode). When the communication card AS-FCOPM is being used together, they serve as a CAN remote device. SIL provides 4 channels, which can be separately configured in IO-Link master or standard I/O (SIO) mode. IO-Link master can freely connect with IO-Link devices and supports the hybrid use of IO-Link sensors and traditional sensors. Digital I/O of the SIL module can be extended with IO-Link hubs so that the sensors which do not support IO-Link can be connected to. Therefore it is pretty flexible to use the SIL module.

The setup software for AS04SIL-A is HWCONFIG 4.0 which is built in ISPSoft. Go to Delta official website to download and install ISPSoft.

13.1.1 Firmware and Software Versions

| Firmware | | | |
|----------------------------|--|-----------------|-----------------|
| Model AS series CPU | | AS00SCM-A | AS04SIL-A |
| Version V1.08.50 and later | | V2.06 and later | V1.00 and later |

| Software | | | |
|----------|-----------------|-----------------|---|
| Model | ISPSoft | HWCONFIG 4.0 | AS00SCM-A CANopen EDS file (Remote DS301 Mode) |
| Version | V3.12 and later | V4.02 and later | V2.06 and later |

13.2 Specification and Wiring

13.2.1 Specifications

Unit Specification

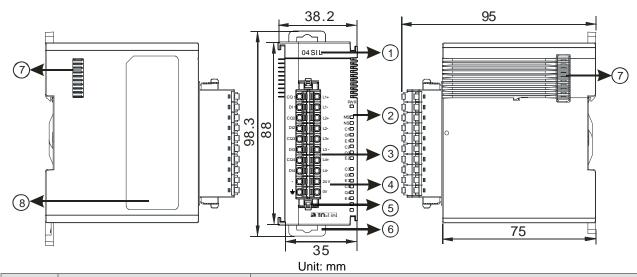
| Item | | Specifications |
|--|--------------------------------------|--|
| Module type | | IO-Link master |
| Model name | | AS04SIL-A |
| Number of IO-Link ports | | 4 |
| Communication | Baud rate | 4.8kbps, 38.4kbps,230.4kbps |
| | Topology | 1:1 |
| | Compliant | IO-Link Interface and System Specification Version 1.1.2 |
| | standards | IO-Link Tester Specification Version 1.1.2 |
| | IO-Link | Yes |
| Mode | SIO (DI) | Yes |
| | SIO (DO) | Yes, up to 100 mA / channel |
| Cyclic communication | าร | Min. 2 ms; dynamic, according to the valid data length |
| Input: data size in each communication port | | Max. 32 bytes |
| Output: data size in each communication port | | Max. 32 bytes |
| Input: data size in each module | | Max. 128 bytes |
| Output: data size in each module | | Max. 128 bytes |
| Input PDO data size | | Max. 100 words |
| Output PDO data size | | Max. 100 words |
| Backup | | Yes |
| Cable specification | Туре | Unshielded (can also apply to shielded ones) |
| | Length | Max. 20 m |
| | Electrostatic capacity between lines | Max. 3 nF |
| | Loop resistance | Max. 6 Ω |
| External connection terminals | | Removable terminal block, clamping connector |



Electrical Specifications

| Item | | Specifications |
|--|----------------------------|--------------------------------------|
| Power supply to device in IO-Link mode or SIO (DI) mode | Rated voltage | 24VDC (20.4VDC~ 28.8VDC) (-15%~+20%) |
| | Max. load current | 0.2A/port |
| | Short-circuit protection | Yes |
| Digital inputs in SIO (DI) mode | Internal I/O common | NPN, PNP |
| | Input voltage/ current | 24VDC, 5mA |
| | ON voltage | >15VDC |
| | OFF voltage | <5VDC |
| | Filter time | 0~65 ms (0: no filter) |
| Digital outputs in SIO (DO) mode | Internal I/O common | NPN, PNP |
| | Output voltage/ current | 24VDC (20.4VDC~ 28.8VDC),0.1A/port |
| | Short-circuit protection | Yes |
| | Leakage current | <0.1mA |
| | Residual voltage | <1.5VDC |
| Digital inputs for Pin2 in IO-Link mode | Internal I/O common | NPN, PNP |
| | Input voltage/ current | 24 VDC, 2mA |
| | ON voltage | >15VDC |
| | OFF voltage | <5VDC |
| | Filter time | 0~65 ms (0: no filter) |
| Power consumption | | 0.8W |
| Weight | | 133g |

13.2.2 Profile



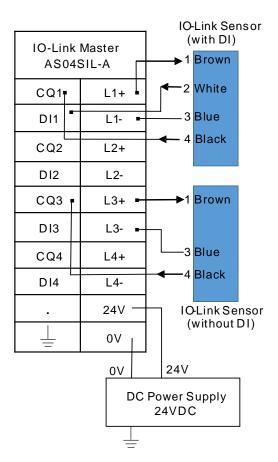
| Number | Name | Description |
|---------|--|---|
| 1 | Model name | Model name of the module |
| 2 C (() | POWER LED indicator (Blue) | Indicates the status of the power supply ON: the power is on OFF: no power or the power voltage is too low |
| | Module LED indicator (Red) | Error status of the module OFF: The module is normal. ON: The communication with its left-side PLC or RTU module fails. Blinking: 1. Module setting or communication error (blinks every 1 second) 2. Hardware or low voltage error (blinks every 0.2 second) |
| | Network LED indicator (Orange) | Error status of the network ON: No external power supply Blinking: Scanning is ongoing or the module is already configured and the diagnosis is done. OFF: The module has been configured but the diagnosis has not done yet. |
| | C1, C2, C3, C4 LED indicator (Orange) | IO-Link connection status of each communication port ON: The communication port is in IO-Link mode and a device is connected. Blinking: The communication port is in IO-Link mode but no device is connected or the device connected is not configured. 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 ON: The input/output is working in SIO mode. 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 each communication port of the IO-Link connection. Blinking: A warning or an error occurs OFF: No warnings or errors |
| 3 | Removable terminal block | IO-Link |

13.2.3 Wiring

13.2.3.1 **IO-Link Mode Wiring for Power and Communication**

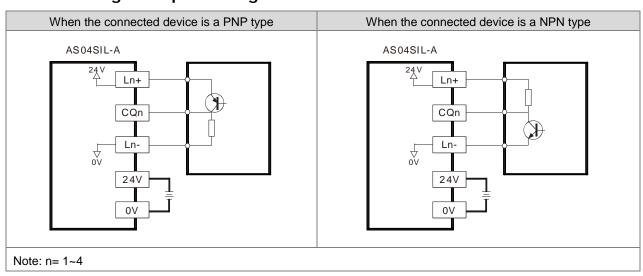
Precautions:

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.

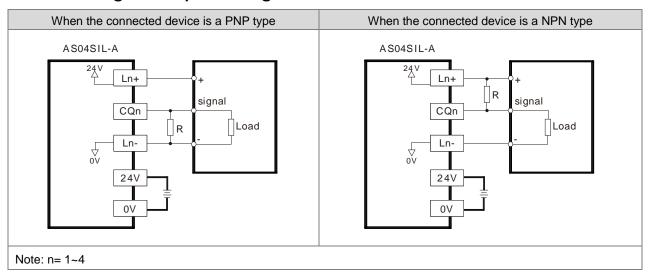


- 2. The 24 VDC cable should be twisted and connected to a module within a short distance.
- 3. Do not bundle 110 VAC cable, 220 VAC cable, 24 VDC cable, the (high-voltage high-current) main circuit, and the I/O signal cable together and keep the power cables away from the earth cable. It is suggested that 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.

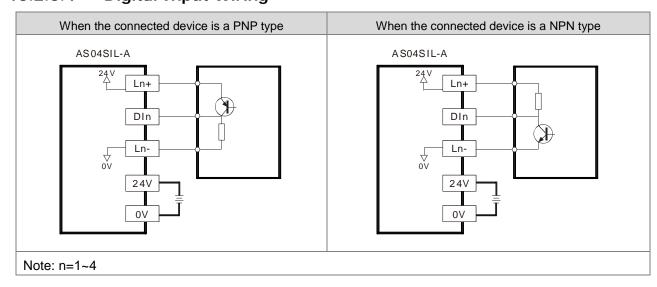
13.2.3.2 Digital Input Wiring in SIO Mode



13.2.3.3 Digital Output Wiring in SIO Mode



13.2.3.4 Digital Input Wiring





13.3 Functions

AS04SIL-A supports the IO-Link devices when it works as the IO-Link master. Between the master and the devices is the point-to-point connection adopting the reliable 3-wire technology and the unshielded standard cable to connect intelligent sensors/actuators which function as IO-Link devices. AS04SIL-A is compatible with traditional digital sensors/actuators. The designs for circuit status and data channels are both based on the reliable 24VDC technology.

13.3.1 Basic Functions

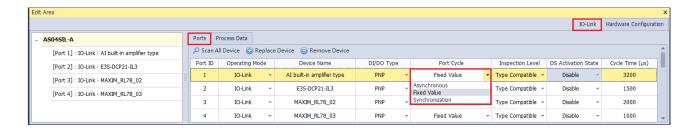
13.3.1.1 Cyclic Communication Function

I/O data (process data) in the IO/Link devices is cyclically exchanged with the IO-Link master module which operates as the IO-Link communication master. Meanwhile as the extension module of the upper device, AS04SIL-A can cyclically update the device data and status of the IO-Link master to the upper device.

For example, users can use cyclic communications to check the amount of incident light for photoelectric sensors, stability detection margins, and excessive proximity for proximity sensors, etc. as well as detect the amount of performance deterioration in devices and changes in usage conditions.

There are three modes for cyclic communications:

- (1) Asynchronous: AS04SIL-A and IO-Link device defines the cycle time for each port and uses the shortest update cycle time.
- (2) Fixed Value: the system uses what you have set for the update cycle time here. The value here should be within the cycle time range of the connected device and the minimum value should be a number bigger than the shortest cycle time that the connected device supports.
- (3) Synchronization: AS04SIL-A defines the update cycle time for all the selected communication ports synchronously. (You need to select at least two ports.) Since different device supports different update cycle time, the system uses the biggest time among all the shortest cycle times to have every device covered.

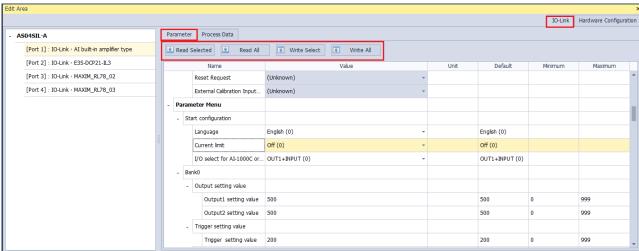


13.3.1.2 Message Communication Funciton

AS04SIL-A receives messages (non-cyclic) from PLC or ISPSoft, sends the data to IO-Link devices and sends back the response from IO-Link devices to AS04SIL-A. Non-cyclic data, including device parameters and events, uses specific index and sub-index for searching and data mapping. AS04SIL-A uses explicit message to read and write these data. It is very useful to use index or sub-index in reading and writing data.

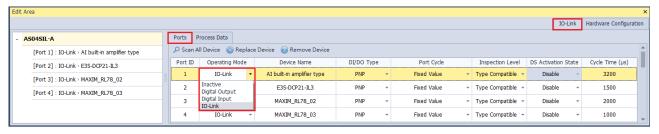
For example, during operation you can use fuction blocks to change and adjust device parameters, such as threshold settings, execution tuning, and ON-delay time from a program as well as check the internal status, such as the operating time of devices. Refer to section 13.3.2.5 for more information.

You can select the data or parameter type, select one or all parameters to read or to write. See the setting image shown below for reference.



13.3.1.3 Communication Mode Setting

You can select one operating mode among the modes of **Inactive**, **SIO** (**Digital Output**, **Digital Input**) and **IO-Link** for each communication port on the following software page.

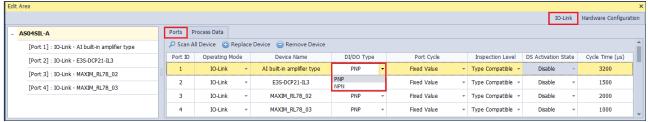


A mixture of IO-Link communication and digital I/O can apply to the same AS04SIL-A module.



Digital Input and Digital Output Function (SIO) 13.3.1.4

CQ1-CQ4 of AS04SIL-A can be used independently as the standard input or output. The DI/DO types of PNP and NPN are supported and can be set up separately on the IO-Link page.

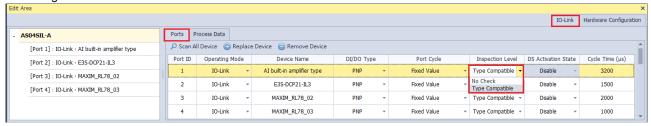


13.3.1.5 Automatic IO-Link Baud Rate Setting

AS04SIL-A can automatically match one of existing baud rates (4.8kbps, 38.4kbps and 230.4kbps) of IO-Link devices and communicate with them. Thus there is no need to set the baud rate at communication ports for connected devices.

13.3.1.6 Connected Device Verification

As long as the Type Compatible option under Inspection Level is enabled and the setting is downloaded, AS04SIL-A will check if the IO-Link device actually connected matches the product model of the configured device. If not matched, the status code of the communication port will show 16#8CA2 which indicates that the connected device is inconsistent with the configured one.



DI (Digital Input) Function of IO-Link Pin2 13.3.1.7

The IO-Link system may not respond fast enough for high-speed applications. When the connected IO-Link sensor supports the second output, connect the sensor's pin2 to DI of the port of AS04SIL-A. At this moment, the sensor can still be watched and set up via the sensor's pin4.

The real-time data can be monitored through Port 1- 4 Pin2 value of Normal Exchange Area. See the following figure as an example.



The mapped register for **Port 1- 4 Pin2 value** of **Normal Exchange Area** is D29029. For the pin2 input value, the addresses D29029.0~ D29029.3 correspond to port 1~ port 4 respectively.

| Communication Port | Address |
|--------------------|----------|
| Port 1 | D29029.0 |
| Port 2 | D29029.1 |
| Port 3 | D29029.2 |
| Port 4 | D29029.3 |

DI1-DI4 of AS04SIL-A can also be used separately as standard inputs.

13.3.1.8 IO-Link Communications Error Detection

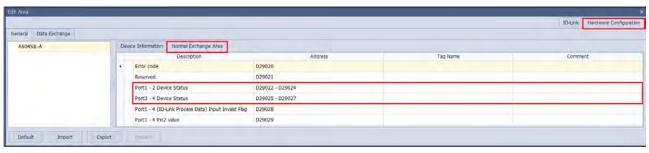
This function detects I/O-Link cable breaks, disconnections from IO-Link device ports, error-level device events, device configuration verification errors, and IO-Link device malfunctions. See section 13.5 for IO-Link event codes.

13.3.1.9 Detection of Short-Circuits in I/O Cables

This function detects short-circuits in I/O cables. The status code for communication ports will show 16#8CA4 if an error occurs.

13.3.1.10 Event Log

The IO-Link event codes listed in section 13.5 are refreshed in the mapped devices for ports in the **Normal Exchange Area** section as below.



The device status for each port should be set to 3 bytes in length. See the following table of above device addresses corresponding to ports in order.

| Description | Address |
|-------------|------------------------------|
| Port 1 | D29022_H, D29022_L, D29023_H |
| Port 2 | D29023_L, D29024_H, D29024_L |
| Port 3 | D29025_H, D29025_L, D29026_H |
| Port 4 | D29026_L, D29027_H, D29027_L |

Device status consists of Event qualifier and Event Code as follows.

For event codes, see section 13.5.

| Event Qualifier | Event Code | |
|-----------------|------------|--------|
| Byte 0 | Byte 1 | Byte 2 |

The data frame of Event Qualifier:

| МС | DDE | TYPE | | SOURCE | | | |
|-------|-------|-------|-------|--------|-------|-------|-------|
| Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |



Bit 0~ Bit 2: INSTANCE

| Value | Definition |
|-------|-------------|
| 0 | Unknown |
| 1-3 | Reserved |
| 4 | Application |
| 5-7 | Reserved |

Bit 3: SOURCE

| Value | Definition | |
|-------|-----------------|--|
| 0 | Device (Remote) | |
| 1 | Master (Local) | |

Bit 4~ Bit 5: TYPE

| Value | Definition |
|-------|--------------|
| 0 | Reserved |
| 1 | Notification |
| 2 | Warning |
| 3 | Error |

Bit 6~ Bit 7: MODE

| Value | Definition |
|-------|-------------------|
| 0 | Reserved |
| 1 | Event single shot |
| 2 | Event disappears |
| 3 | Event appears |

13.3.1.11 Notification of Input Data Invalidity

Input Invalid Flag is used to determine whether the process input data in the upper device is invalid for the IO-Link communication or not.

Whether the input data is invalid or not can be monitored by **Port1 – 4(IO-Link Process Data) Input Invalid Flag** of the **Normal Exchange Area** section. If the flag is 1, then the input data is invalid. If it is 0, the input data is valid. See the example in the following figure.

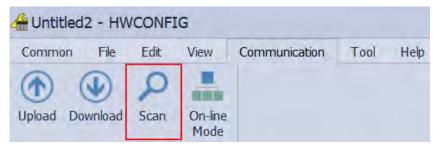
The mapped register for Port1 – 4(IO-Link Process Data) Input Invalid Flag is D29028 and for the input invalid flag, D29028.0~ D29028.3 correspond to Port 1~Port 4 respectively as shown in the following table.

| Communication Port | Address |
|--------------------|----------|
| Port 1 | D29028.0 |
| Port 2 | D29028.1 |
| Port 3 | D29028.2 |
| Port 4 | D29028.3 |

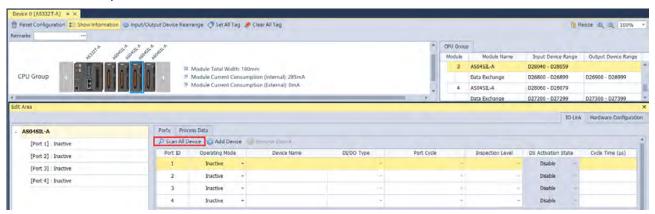


13.3.1.12 IO-Link Device Scan Function

HWCONFIG 4.0 can enable AS04SIL-A to auto-identify all IO-Link devices at its communication ports via a click on **Scan** button.



You can also select any AS04SIL-A module and then click **Scan All Device** to scan all the IO-Link devices connected to the communication port of AS04SIL-A.



While SIL is auto-identifying devices, all IO-Link devices connected to IO-Link master need be restarted and therefore the devices will probably stop running for a short time.



13.3.2 Application Functions

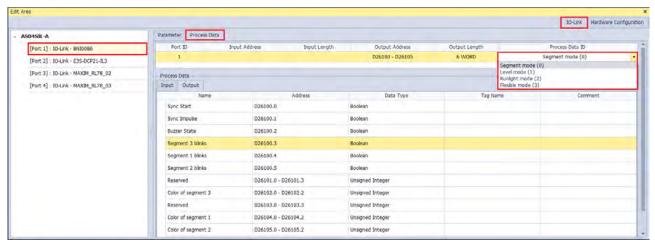
13.3.2.1 Load Rejection for Upper Device Stop or Communication Error

When the upper device enters STOP state or the communication with the upper device fails in IO-Link or SIO mode, the output function of AS04SIL-A is disabled and all process data outputs are 0. This function is used to prevent the incorrect output from the upper device as a communications error occurs.

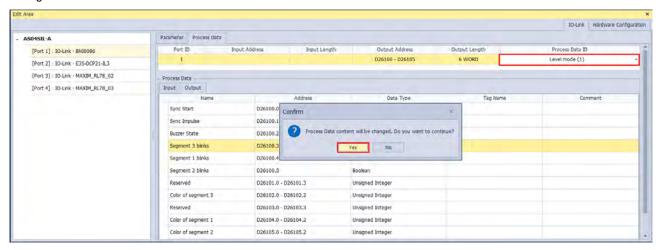
13.3.2.2 The Switch among Process Data Parameter Sets

IODD file allows IO-Link devices support several work modes, each of which corresponds to different Process Data parameter sets. Therefore SIL supports the switch among Process Data parameter sets if the IODD file of the configured device supports more than two work modes. However, the Process Data parameter set can not be changed if the IODD file of the configured device supports only one work mode.

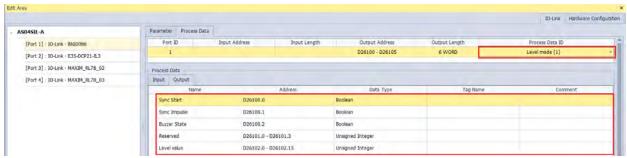
For example, the IO-Link device configured for Port 1 supports four work modes in the following figure. The default work mode is Segment mode (0).



When Level mode (1) is switched to, a **Confirm** dialog box will appear to alert that the Process Data content will be changed.



Clicking **Yes** button, the Process Data content will be refreshed in the software.

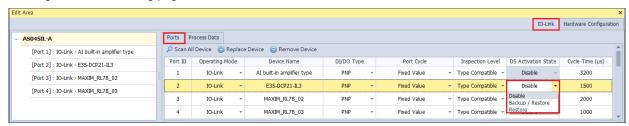


Click menu **Communication** > **Download**. The switch is completed once the download is done.

13.3.2.3 Backup and Restoration of Parameter Setup in IO-Link Devices

The V1.1 IO-Link devices support the Backup and Restore functions which are not necessary functions and are determined by their IODD files.

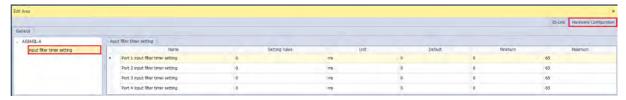
IO-Link device parameter settings are backed up to the IO-Link master or restored to IO-Link devices. When IO-Link devices are replaced, the communication can be resumed according to original settings instead of setting parameters once again. See the setting page below.



| Option | Description |
|----------------|--|
| Disable | The backup function is disabled and the backed up process data is cleared. |
| Backup/Restore | The backup file is empty if no data exists. It is allowed to back up the parameters read from the connected device to the master and write the parameters to the connected device. |
| Restore | To write parameters to the connected device is allowed. |

13.3.2.4 Digital Input Filter

You can use any DI or any CQ of the operation mode SIO (DI) as the standard input and use the input filter function to filter out noises. The filtering time of each channel can be set between $0 \sim 65$ ms. 0 indicates no filtering. The setting page is as shown below.



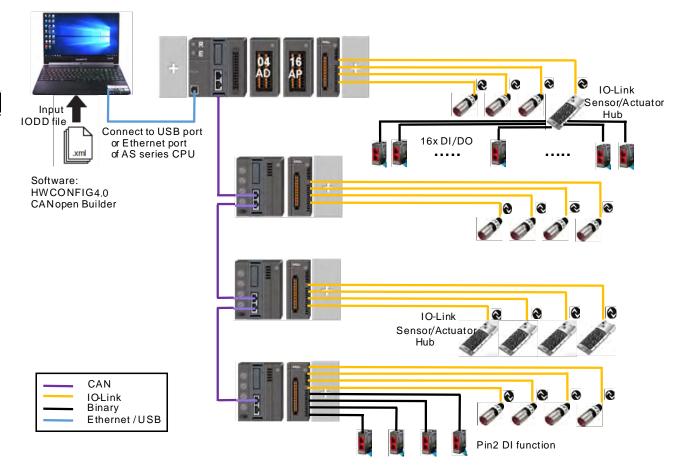
13.3.2.5 Application-specific API for Communications of IO-Link Devices

Once you complete the configurations for IO-Link devices via HWCONFIG. You can use ISPSoft as well as specific API to read/write data from IO-Link devices to AS04SIL-A. Refer to the device manual or the IODD file for the index number, data type, data size of the parameters. And refer to AS Series Programming Manual for the detailed operation of API 14 instructions.



13.4.1 Using AS Series CPU as Upper Device

The AS04SIL-A module can be connected on the right side of AS series CPU or AS00SCM-A (RTU mode). If AS04SIL-A is placed on the right of AS00SCM-A (RTU mode), the AS-FCOPM communication card need be added to AS00SCM-A. AS04SIL-A supports three remote communication modes and communicates with the upper device via CAN port. When the upper device is an AS series CPU, the application situation is as illustrated in the following figure.



An AS04SIL-A module can connect with 4 IO-Link devices at most. If the hybrid use of the IO-Link devices and multiple traditional sensors (binary sensors) is needed, there are two connection methods based on the number of traditional sensors on site.

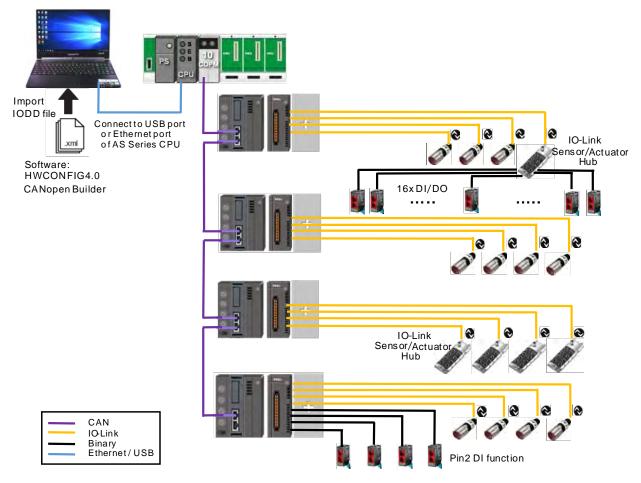
- 1. If there is only a small number of traditional sensors to be connected, each of AS04SIL-A module's ports can connect with one traditional sensor by using the DI function of Pin2 for each port.
- If there are many traditional sensors to be connected, use the IO-Link hub from other brand to extend the connectable digital I/O devices.

There are three communication modes for AS00SCM-A plus AS-FCOPM.

| Work mode | Description |
|--|---|
| AS Special Remote Mode | The AS04SIL-A module is a NIO module. The number of configurable modules is limited to AS series CPU including remote modules. 4 NIO modules can be |
| Delta Special Driver & AS Remote Mode | configured at most. All SIL modules and IO-Link devices can be configured in HWCONFIG 4.0. and can be monitored online by the software. |
| CANopen DS301 Mode | Here AS CPU is a CANopen master and AS00SCM-A is a CANopen slave. Up to 4 SIL modules can be configured on the right side of the slave AS00SCM-A (RTU). As many as 64 slaves can be connected to the AS CPU. CANopen Builder does not support the configuration of extension modules on the right side of AS00SCM-A and connected IO-Link devices. First make the connection in AS special remote mode, complete the configuration of all extension modules and IO-Link devices in HWCONFIG 4.0 and then switch the mode back to CANopen DS301 mode. Open CANopen Builder and configure PDO mapping according to the EDS file of AS00SCM-A with V2.06 or later. For details on operation, see section 13.4.5. |

13.4.2 Using AH Series CPU or Non-Delta Master PLC as Upper Device

As CANopen master, AH series CPU need be used together with AH10COPM-5A module to communicate with the CANopen slave AS00SCM-A. See the application situation as illustrated in the following figure.





13

According to the description on CANopen DS301 Mode in section 13.4.1, connect the AS00SCM-A module to AS CPU in AS special remote mode, configure all extension modules and IO-Link devices in HWCONFIG 4.0 and then switch the mode back to the CANopen DS301 mode.

If the upper device is an AH series CPU, the CANopen Builder software can be opened. Configure the PDO mapping list according to the EDS file of the AS00SCM-A module. See the details in section 13.4.5.

If the upper device is a master PLC from other brand, use the software from the brand to configure the CANopen slaves and PDO mapping.

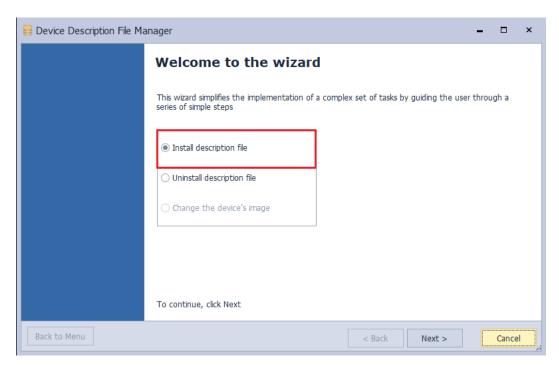
13.4.3 Application of AS Special Remote Mode

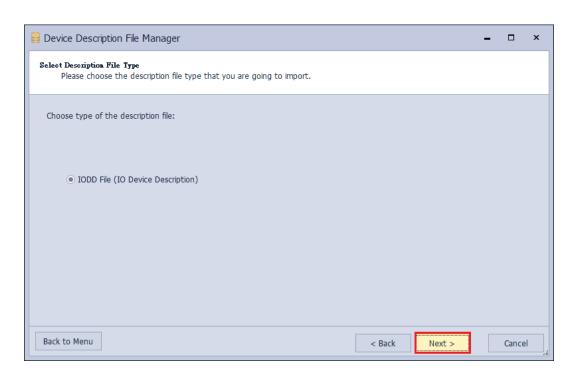
See the following table of devices used in the application example:

| Model name | Device type |
|---------------|--------------------------------|
| AS332T-A | PLC |
| AS00SCM-A | RTU |
| AS04SIL-A | IO-Link Master |
| AI-B100 | 3 rd IO-Link Device |
| E3S-DCP21-IL3 | 3 rd IO-Link Device |
| MAXREFDES27# | 3 rd IO-Link Device |
| MAXREFDES36# | 3 rd IO-Link Device |

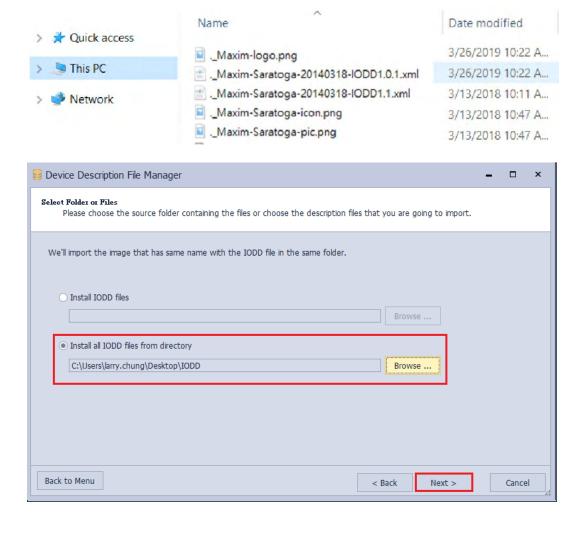
First of all, open the HWCONFIG 4.0 software and import the IODD files of IO-Link devices which can be downloaded from vendors' official websites. Follow the steps here to import the IODD files through the **Device Description File Manager** tool.



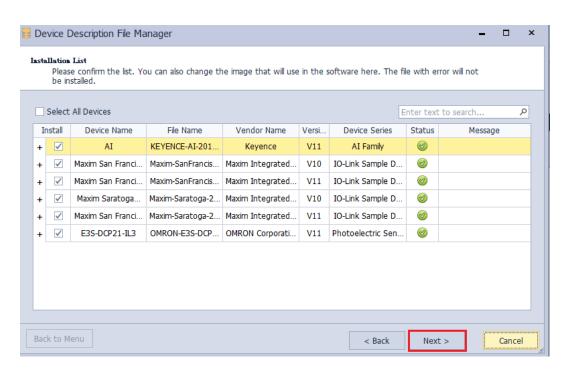


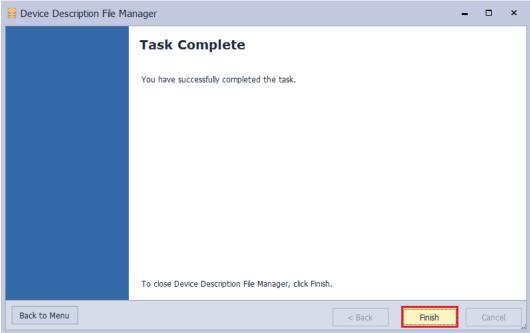


Put all IODD files in the same folder so as to import multiple IODD files at a time.







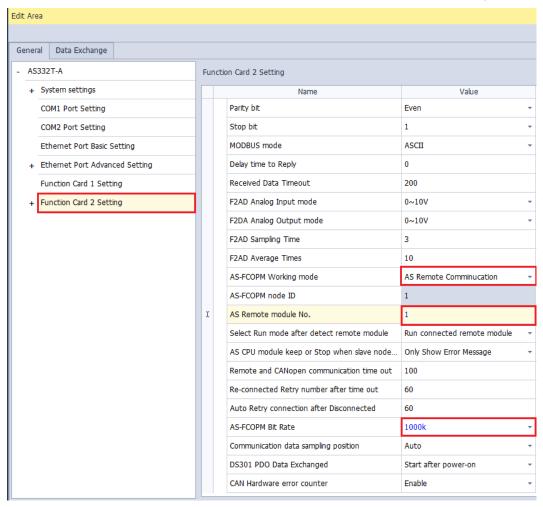


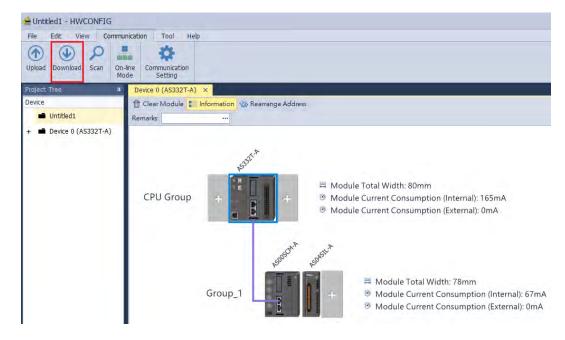
Check the following setups before the AS00SCM-A module is powered on.

- 1. The AS-FCOPM card is inserted to AS00SCM-A via Card 2. (The 120Ω terminal resistor is enabled.)
- 2. Use Delta standard cables to connect to AS CPU and the mode switch is turned to RTU mode.
- 3. Four switches are set to ID1: 0/ FORMAT1: 0/ ID2: 1/ FORMAT2: 7 and the status is set to AS Remote Communication, node ID 1 and baud rate 1Mbps.
- 4. AS04SIL-A is connected on the right side of AS00SCM (RTU). Ensure that IO-Link devices are connected to the four ports according to the wiring in section 13.2.3.

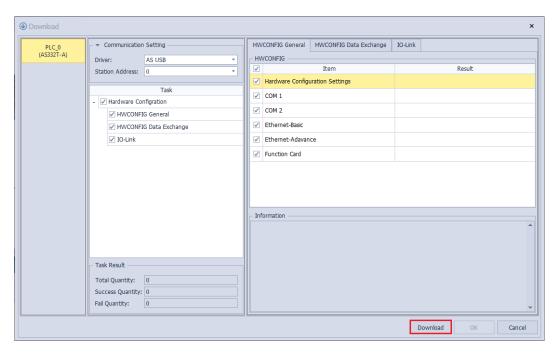


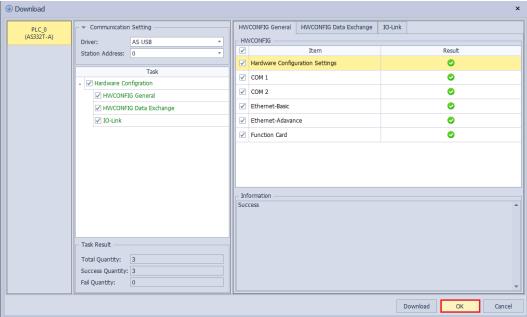
Switch the power on after the AS-FCOPM card is inserted to AS332T-A via Card 2. (The 120Ω terminal resistor is enabled.) Open the HWCONFIG 4.0 software, set up function card 2 for AS CPU and then download the settings as follows.







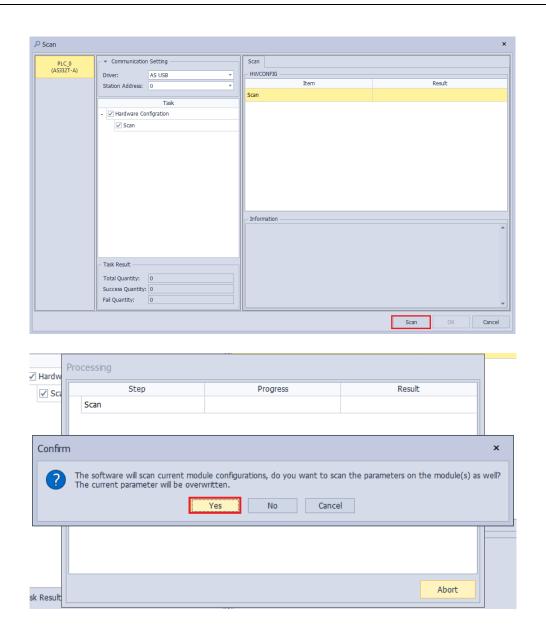




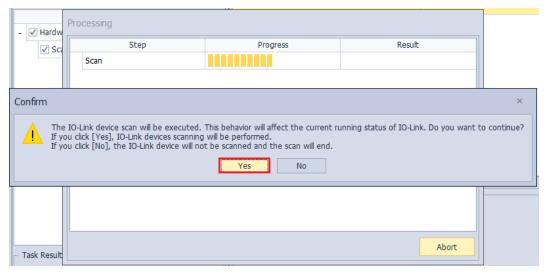
Ensure that the CANopen cables are connected properly and the AS00SCM-A module is already powered on. Check if the Card2 LED indicator of AS00SCM-A keeps blinking after the configuration of AS332T-A is downloaded so as to make sure the communication works normally.

Click Scan button.



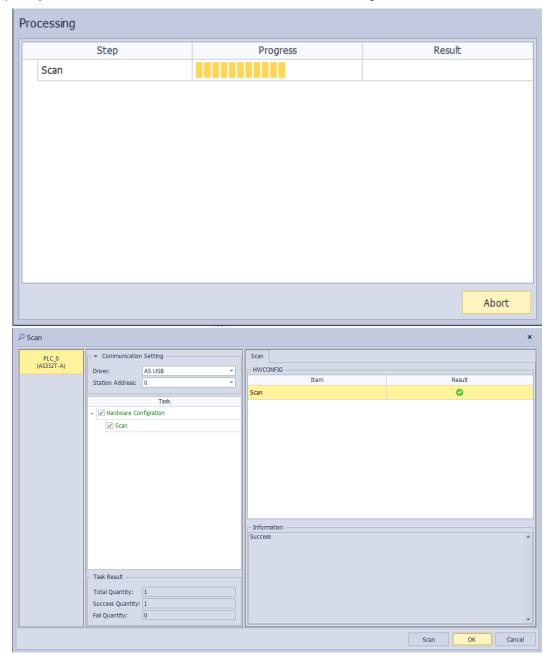


Once any AS04SIL-A module is detected through the software scan, the software will ask whether to scan the connected IO-Link device.



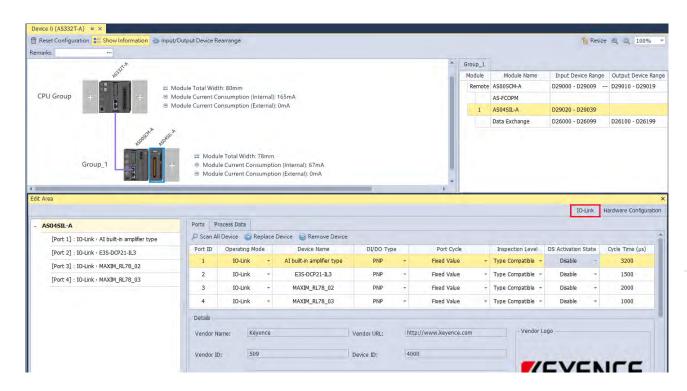


Perform the scan of IO-Link devices. If some configured devices are in communication during the scan, they will fail to be used temporarily. Restart the devices after the scan is over and restore the original work mode.



Click the IO-Link module and then select the **IO-Link** page where each device model and related information are can be seen and the parameters to be set up are all default values.

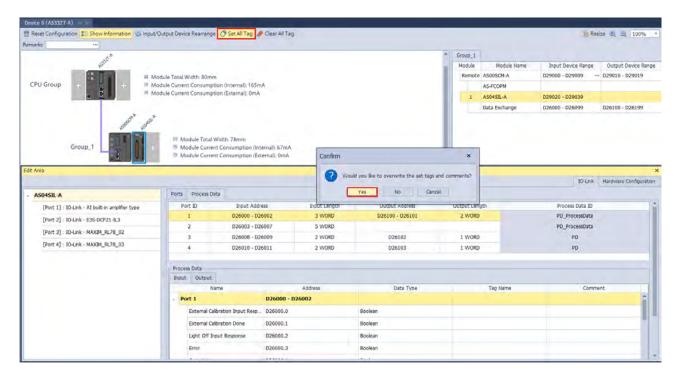
If no matched IODD file can be found out for the scanned device, **Unknown Device** will be shown in the device name field. Users need download the IODD file of the device from the coporate website of the device product according to the scanned device details such as Vendor Name, Vendor ID, Device ID and Device Name and then import the file into the HWCONFIG software.



Under the Process Data tab, you can find the supported register addresses of each port. Since ISPSoft V3.11 supports using tags in PLC programming, it is very useful to set up the tags and its corresponding register addresses. Follow the steps 1~3 below to set up the tabs.

Step 1: Click Set All Tag

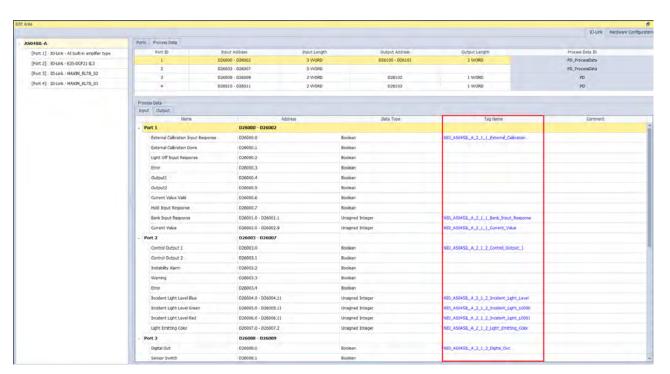
Step 2: A confirmation shows up asking you if you want to overwrite the set tags and comments. Click Yes to proceed.

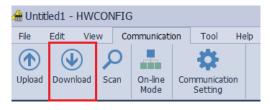


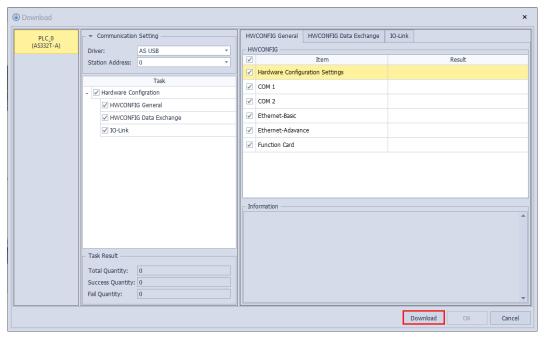


Step 3: All the editable tags show up. Double-click the tags in blue to edit if you need to use a different name other than the default ones.

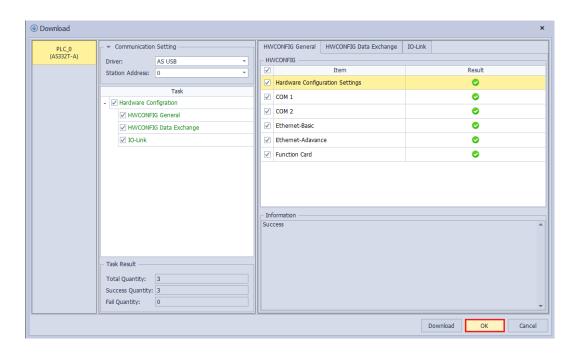
Note: One register address coresponds to one tag, and it shows on the first group of address.

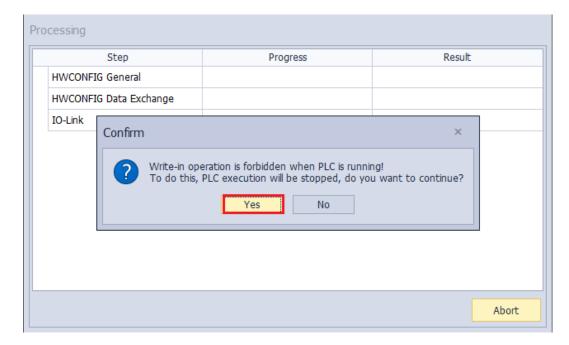




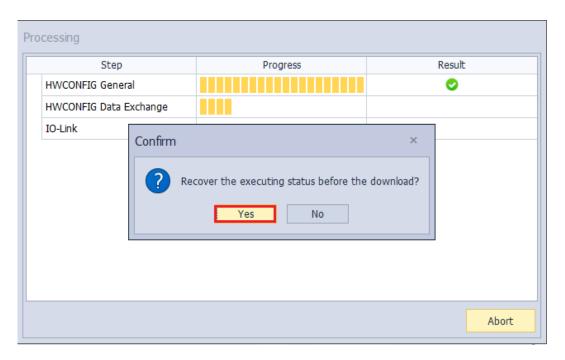


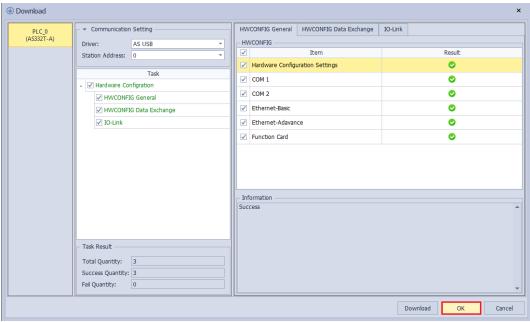






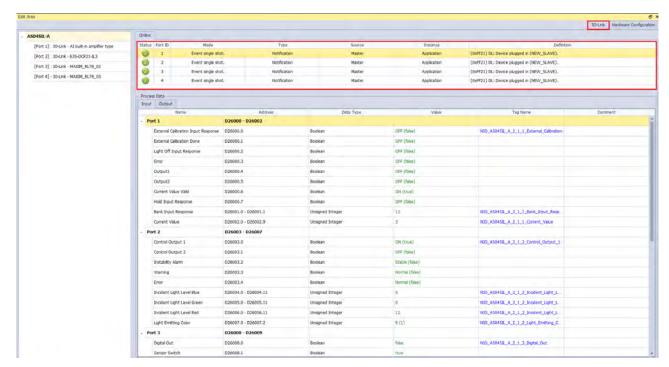




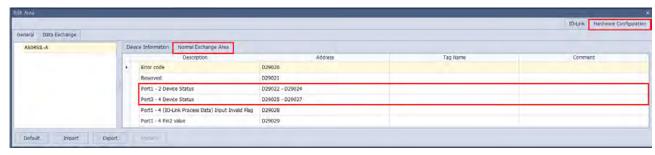


Click the **On-line Mode** button on the IO-Link page and then see the connection status of all devices and the real time monitored values of input and output process data.





The **Status** of Port 1~ Port 4 above can also be known through the parsing in the **Normal Exchange Area** of the AS04SIL-A module below.





With a click on any device, only the input and output process data of the clicked single device will be displayed.



13.4.4 Application of Delta Special Driver & AS Remote Mode

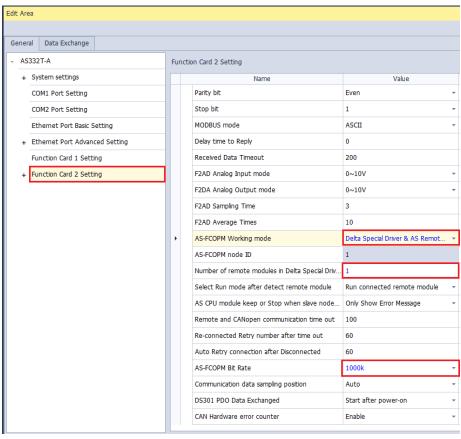
The device list in the following example is the same as that in section 12.4.3.

| Model name | Device type |
|---------------|--------------------------------|
| AS332T-A | PLC |
| AS00SCM-A | RTU |
| AS04SIL-A | IO-Link Master |
| AI-B100 | 3 rd IO-Link Device |
| E3S-DCP21-IL3 | 3 rd IO-Link Device |
| MAXREFDES27# | 3 rd IO-Link Device |
| MAXREFDES36# | 3 rd IO-Link Device |

Complete the following setups before the AS00SCM-A module is powered on.

- 1. The AS-FCOPM card is inserted to AS00SCM-A via Card 2. (The 120Ω terminal resistor is enabled.)
- 2. Use Delta standard cable to connect to AS CPU and the mode switch is turned to RTU mode.
- 3. Four switches are set to ID1: 0 / FORMAT1: 8 / ID2: 9 / FORMAT2: 7 and the status is set to **Delta Special Driver & AS Remote Communication**, node ID 9 and baud rate 1Mbps.
- 4. AS04SIL-A is connected on the right side of AS00SCM (RTU). Ensure that IO-Link devices are connected to the four ports according to the wiring in section 13.2.3.

Switch the power on after the AS-FCOPM card is inserted to AS332T-A via Card 2. (The 120Ω terminal resistor is enabled.) Open the HWCONFIG 4.0 software, set up function card 2 for AS CPU and then download the settings as follows.



The following steps are the same as the operation in section 13.4.3.



13.4.5 Application of CANopen DS301 Mode

In this example, the AS00SCM-A RTU module works with EDS V2.06. Please download the EDS from Delta official website and import the CANopen Builder software.

The device list in the following example is the same as that in section 12.4.3.

| Model name | Device type | | |
|---------------|--------------------------------|--|--|
| AS332T-A | PLC | | |
| AS00SCM-A | RTU | | |
| AS04SIL-A | IO-Link Master | | |
| AI-B100 | 3 rd IO-Link Device | | |
| E3S-DCP21-IL3 | 3 rd IO-Link Device | | |
| MAXREFDES27# | 3 rd IO-Link Device | | |
| MAXREFDES36# | 3 rd IO-Link Device | | |

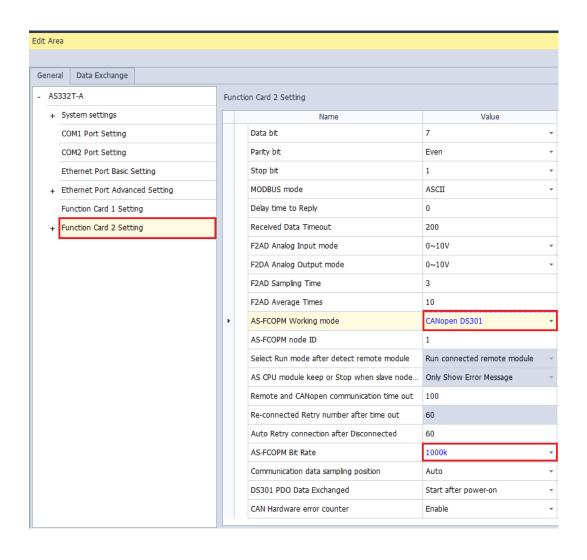
The CANopen Builder does not support the configuration of extension modules on the right of the AS00SCM-A module and connected IO-Link devices.

First make the connection in **AS Special Remote** mode, configure all extension modules and IO-Link devices in the HWCONFIG 4.0 software (see the example in section 13.4.3) and then switch back to the **CANopen DS301** mode.

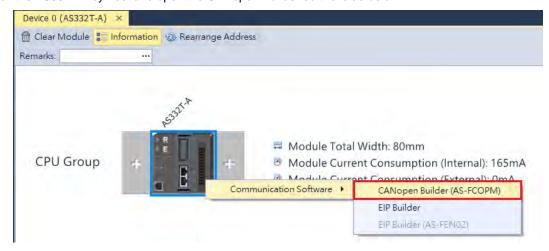
Please complete the following setups before the AS00SCM-A module is powered on.

- 1. The AS-FCOPM card is inserted to AS00SCM-A via Card 2. (The 120Ω terminal resistor is enabled.)
- 2. Use Delta standard cables to connect to AS CPU and the mode switch is turned to RTU mode.
- Four switches are set to ID1: 0 / FORMAT1: 4 / ID2: 2 / FORMAT2: 7 and the status is set to CANopen DS301, node
 ID 2 and baud rate 1Mbps.
- 4. AS04SIL-A is connected on the right side of AS00SCM (RTU). Ensure that IO-Link devices are connected to the four ports according to the wiring in section 13.2.3.

Switch the power on after the AS-FCOPM card is inserted to AS332T-A via Card 2. (The 120Ω terminal resistor is enabled.) Open the HWCONFIG 4.0 software, set up function card 2 for AS CPU and then download the settings as follows.

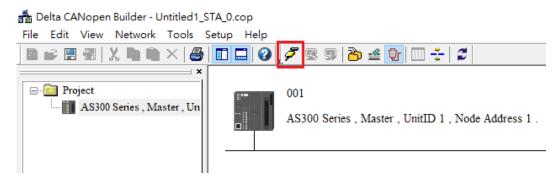


Right-click the AS332T-A symbol and open the CANopen Builder software as below.

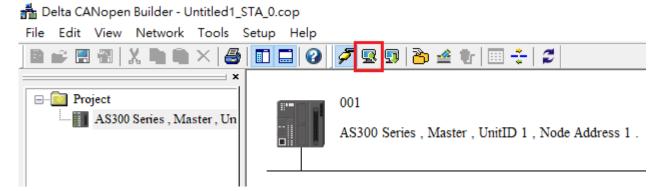


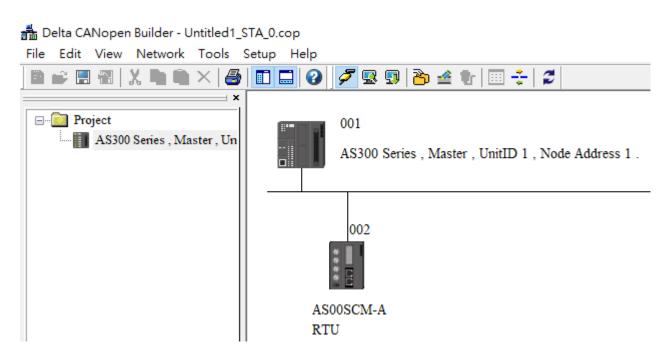


Click the Online button.

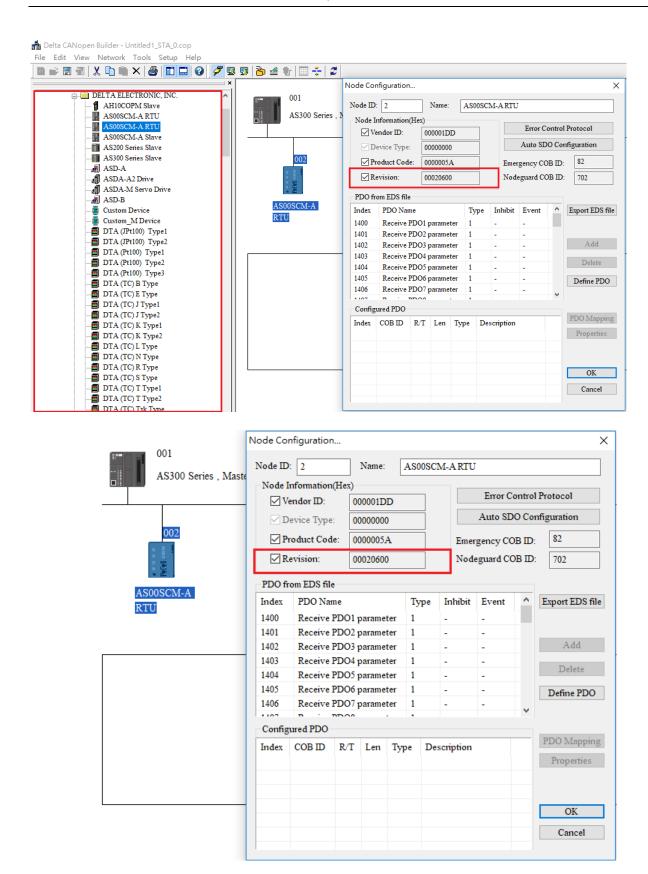


Click the Scan button. Then the AS00SCM-A RTU module can be detected.





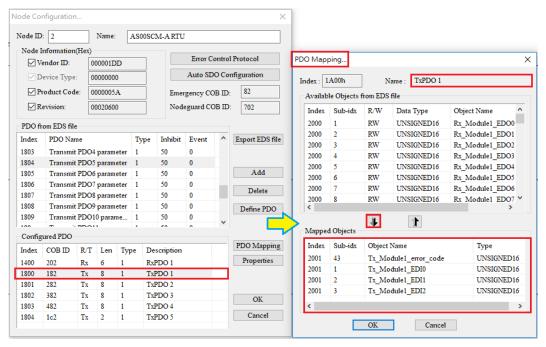
Double-click the detected AS00SCM-A RTU module and ensure that it is with EDS file V2.06 or later. If the EDS file is not matched, check if the V2.06 EDS file has been imported to the left-side device list and the firmware of AS00SCM-A is V2.06 or later.





Each object in the EDS file is 1 word (2 bytes) in size and thus one PDO corresponds to one mapped register. Assign all input parameters to available TxPDOs according to the parameters in the **Normal Exchange Area** of AS04SIL-A in section 13.4.3. The mapped PDO object of the input process data is Tx_ModuleX_EDIY (Exchanging Data Input which is referred to as EDI).

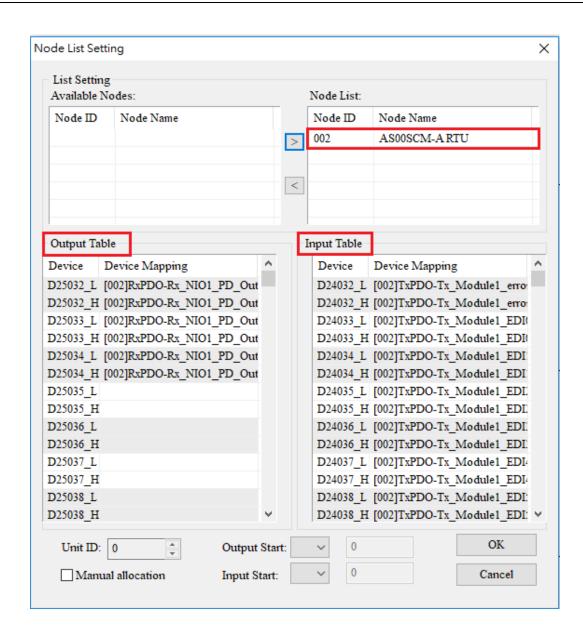
In this example, the AS04SIL-A module is the first one on the right of the RTU module. Therefore the value of X is 1 and the PDO mapped object for error codes is Tx_Module1_error_code. The corresponding objects starts from Tx_Module1_EDI0 as below.



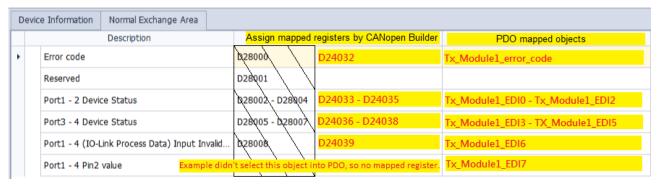
Based on all communication port address information in the HWCONFIG 4.0 software in section 13.4.3, assign all input process data to available TxPDOs, which corresponds to the mapped object Tx_NIOX_PD_InputZ and assign all output process data to available RxPDOs, which corresponds to the mapped object Rx_NIOX_PD_OutputY.

In this example, the AS04SIL-A module is the first one on the right of the RTU module. Therefore the value of X is 1, the input objects starting from Tx_NIO1_PD_Input0 correspond to IO-Link Port1~ Port4 in **Process Data- Input** respectively and the output objects starting from Rx_NIO1_PD_Output0 correspond to IO-Link Port1~ Port4 in **Process Data- Output** respectively.

Configure all parameters which need to be updated continuously (which are called objects in CANopen Builder) to one TxPDO or RxPDO according to the steps described above. Add AS00SCM-A RTU to the slave list (Node List) and then the real addresses of mapped registers in AS CPU show up immediately as below.



According to the **Normal Exchange Area** page in HWCONFIG in section 13.4.3, the PDO mapped objects correspond to the mapped registers assigned by CANopen Builder as follows.





| Parameter | Configured PDO | PDO mapped object | Mapped register in AS CPU |
|---|----------------------|-----------------------------|-----------------------------|
| Error code | Tx_Module_error_code | | D24032 |
| | T 5504 | Tx_Module1_EDI0 | D24033 |
| Port 1-2 Device Status | TxPDO1 | Tx_Module1_EDI1 | D24034 |
| Status | | Tx_Module1_EDI2 | D24035 |
| Dowt 2.4 Davids | | Tx_Module1_EDI3 | D24036 |
| Port 3-4 Device Status | | Tx_Module1_EDI4 | D24037 |
| Status | TxPDO2 | Tx_Module1_EDI5 | D24038 |
| Port1-4 (IO-Link Process Data) Input Invalid Flag | TAP DO2 | Tx_Module1_EDI6 | D24039 |
| | | Tx_NIO1_PD_Input0 | D24040 |
| Port 1 Process | T DD00 | Tx_NIO1_PD_Input1 | D24041 |
| Data- Input | TxPDO3 | Tx_NIO1_PD_Input2 | D24042 |
| Port 2 Process | | Tx_NIO1_PD_Input3 | D24043 |
| Data- Input | | Tx_NIO1_PD_Input4 | D24044 |
| | T. DDO4 | Tx_NIO1_PD_Input5 | D24045 |
| | TxPDO4 | Tx_NIO1_PD_Input6 | D24046 |
| | | Tx_NIO1_PD_Input7 | D24047 |
| Port 3 Process | | Tx_NIO1_PD_Input8 | D24048 |
| Data- Input | TxPDO5 | Tx_NIO1_PD_Input9 | D24049 |
| Port 4 Process | TXFDO3 | Tx_NIO1_PD_Input10 | D24050 |
| Data- Input | | Tx_NIO1_PD_Input11 | D24051 |
| Port 1 Process | | Rx_NIO1_PD_Output0 | D25032 |
| Data- Output | | Rx_NIO1_PD_Output1 | D25033 |
| Port 2 Process Data- Output | RxPDO1 | No parameter need be output | No parameter need be output |
| Port 3 Process Data- Output | IXI DOT | Rx_NIO1_PD_Output2 | D25034 |
| Port 4 Process Data- Output | | Rx_NIO1_PD_Output3 | D25035 |

13.5 IO-Link Event Code Table

Here is the table of IO-Link event codes which are recorded in **Port1-4 Device Status** of the **Normal Exchange Area** page. If the sources of events are IO-Link devices, please also refer to the IO-Link device operation manual.

| IO-Link | IO-Link Type | | | | Source | | |
|-------------------------------|--------------|-------|-------------------|---|--|-------------------|-------------------|
| Event Codes | Warning | Error | Notifica- tion | Event | Solution | 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 |
| 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 16#8CAD 16#8CAE | | 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 | |



| IO-Link | IO-Link Type | | | | Source | | |
|----------------|--------------|-------|---|--|---|-------------------|-------------------|
| Event Codes | Warning | Error | Notifica- tion | Event | Solution | IO-Link Master | IO-Link Device |
| 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 | 16#8CAA V | | HWCONFIG configured process data exceeding the IO-Link process data range | Check device specifications | V | | |
| 16#8CAB | V | | | IO-Link process data exceeding HWCONFIG configured process data range | Scan the device and download the configuration again | V | |
| 16#8CAC | | V | | Data storage error | Contact the factory | 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 | |

13.6 Module Status Codes

The following error codes identify possible errors when the AS04SIL module as a communication module is installed on the right side of the CPU module or RTU module.

| Error Code | Description | Solution |
|---------------|---|--|
| 16#1605 | Hardware failure | Install a new AS04SIL or contact the factory. |
| 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. |

| Error Code | Description | Solution | | |
|---------------|--|---|--|--|
| 16#1800 | Error occurs in IO-Link Master | See section 13.5 for more information. | | |
| 16#1801 | Error occurs in IO-Link device | See section 13.5 for more information. | | |
| 16#1802 | No external power supply | Check the external power supply | | |
| 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 connected device is the same as that configured in the software. | | |
| 16#1805 | Error occurs in the communication port 1 of IO-Link connection | | | |
| 16#1806 | Error occurs in the communication port 2 of IO-Link connection | Cut the external power off for 3 seconds and power-on again | | |
| 16#1807 | Error occurs in the communication port 3 of IO-Link connection | Download the configurations again | | |
| 16#1808 | Error occurs in the communication port 4 of IO-Link connection | | | |
| 16#1809 | Error occurs in scan device and force to stop scanning | Cut the external power off for 3 seconds and power-on again Scan all devices again | | |



Chapter 14 High Speed Counter Module AS02HC

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14.1 Overview

The AS02HC-A module is a high-speed counter module with two built-in channels. It performs counting through receiving the pulse signal input or SSI encoder signal input. It is only connected to the right side of AS series CPU modules. Configuring it to the right side of the remote modules is not allowed. This chapter mainly introduces the specifications, functions and operation of the module.

14.1.1 Characteristics

1. Pulse signal / SSI signal input interface selection

Pulse input: Supports single-phase pulse input, two-phase pulse input (multiplication x2/4) and CW / CCW pulse input, 5V differential signal and 5-24VDC single-ended signal. The counting speed can reach up to 200kHz (for single-phase input).

SSI input: The data transmission frequency can reach up to 1.25 MHz; the received data length can be up to 32 bits; supports multi-turn and single-turn SSI encoders as well as the conversion of gray and binary codes.

2. 32-bit counter

The two channels of AS02HC-A are both 32-bit counters with the counting range of -2147483648 to 2147483647.

3. Counter type setting

Ring counter: cyclical counting between -2147483648 and 2147483647.

Linear counter: The upper and lower limit values need be set. When the counter value is out of the allowed range, the module can detect that the upper or lower limit is exceeded.

4. High-speed comparison

Preset a comparison value and compare it with the present value of the counter. When they are equal, the external output point actions can be controlled, the interrupt program can be executed or the counter value can be cleared at the same time.

5. Phase-Z function selection

Each of the two channels is configured with a phase Z which can be used as the external input point for Reset, Capture or Gate control.

6. External output points

Four external output points. They can be controlled individually or be used for the output together with high-speed comparison function.

7. Counter value capture

The counting value is captured through a phase Z input trigger or channel comparison-matched trigger.

8. Pulse rate and rotation rate (RPM) measurement

The function measures the input pulse rate and position change rate of the SSI encoder. And the rotation speed (RPM) can be calculated automatically.

9. Use the tool software for easy settings

HWCONFIG built in ISPSoft can be used to create the hardware module configuration so that users can directly select the mode and parameters without spending time programming to set up the registers corresponding to a variety of functions.

10. Miscellaneous API instructions

The functions such as counter control, counter value capture, high-speed comparison output and measurement can be achieved via dedicated API instructions.

14.2 Specifications and Functions

14.2.1 Specifications

Functional specification

| Functional specific | ation | | |
|---------------------|---------------------------------------|--|--|
| ltem | | Description | |
| Number of channels | | 2 | |
| | Input type | Phase A/B differential pulse input (multiplication x2/4), CW/CCW pulse inputs and pulse + direction inputs | |
| Pulse Input | Max. counting frequency | 200 kHz | |
| · | Max. transmission distance | 200 kHz → 30 m | |
| | Counter type | Ring counter, linear counter | |
| | Max. data length | 32-bit (The single-turn, multi-turn and status data length can be set.) | |
| | Coding method | binary code, gray code | |
| | Transmission frequency | 250 kHz, 500 kHz, 625 kHz, 1 MHz, 1.25 MHz | |
| SSI Input | Max. transmission distance | 250 kHz \rightarrow 150 m 500 kHz \rightarrow 50 m 625 kHz \rightarrow 40 m 1 MHz \rightarrow 20 m 1.25 MHz \rightarrow 10 m | |
| | Parity check | None, odd parity, even parity | |
| | Counter type | Absolute counter and ring counter | |
| | Counting range | -2147483648 ~ 2147483647 (32-bit counter) | |
| Countan | Counter control | Reset, preset, gate, capture offset correction for absolute position | |
| Counter | State check | Count direction, 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 | |
| | Input point number | 2 (one point per channel) | |
| External input | Function | Counter reset, gate control, counting value capture | |
| point (phase Z) | Digital filtering | Disabled, 100 us, 200 us20 ms | |
| | Min. software interrupt response time | 20 us (hardware response time included) | |
| External output | Output point number | 4 | |
| p • | Output type | NPN transistor (sinking) | |
| Comparison | Instruction | General comparison output instruction, table comparison output instruction | |
| function | Interrupt | Using comparison to achieve the interrupt function | |
| Measurement | Measured item | Pulse rate and rotation rate (RPM) | |
| function | Average times | 1 ~ 10 times | |



Electrical specifications for the inputs

| | - Ioon four opposition for the inputs | | | | | |
|-------------------------|---------------------------------------|---|----------------|--|--|--|
| Item | Model | Pulse input | External input | | | |
| | r of inputs | 4 (A+/B+/A-/B-) | 2 (Z+/Z-) | | | |
| Connec | tor type | D-sub15 | | | | |
| Input voltage / current | | 5~24 VDC, 6~15 mA | | | | |
| Action | OFF→ON | 3 V | | | | |
| level | ON→OFF | 1 V | | | | |
| Maximu frequer | im input ncy | 200 kHz 20 kHz | | | | |
| Input in | npedance | 4.7 kΩ | | | | |
| Input signal | | Single-ended signal: 5 ~ 24 VDC (sinking or sourcing); differential signal: 5 V | | | | |
| Electrical isolation | | 500 VDC | | | | |
| Input display | | When the optocoupler is driven, the input LED indicator is ON. | | | | |
| Weight | | 138 g | | | | |

Electrical specifications for the SSI input and output

| Item | Model | SSI input | SSI output | |
|----------------------------|-----------|--|---------------|--|
| Number of inputs / outputs | | 2 (DATA+/DATA-) | 2 (CLK+/CLK-) | |
| Connec | tor type | D-sub15 | | |
| Voltage | / Current | 5 VDC, 1 mA 5 VDC, ±60 mA (Max) | | |
| Action | OFF→ON | $V_{ID}^{*1} \ge 0.2 \text{ V}$ | - | |
| level | ON→OFF | V _{ID} ≦ -0.2 V | - | |
| Maximu frequer | | 1.25 MHz | | |
| Impeda | nce | 12 kΩ (terminal resistor 120 Ω) - | | |
| Signal | | RS-422 | | |
| Electrical isolation | | 500 VDC | | |
| Input / output display | | When the optocoupler is driven, the LED indicator is ON. | | |

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

Electrical specifications for the external outputs

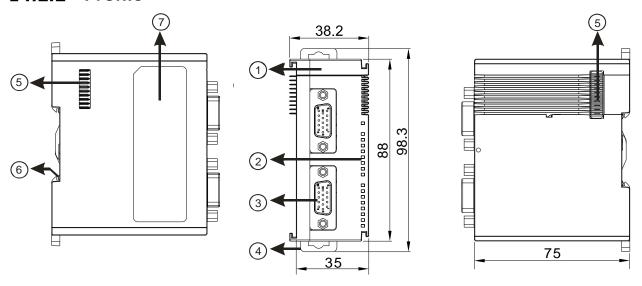
| | Model | AS02HC-A |
|-----------------------------|------------|--------------------------|
| Item | | AGEIG A |
| Number of c | outputs | 4 |
| Connector t | уре | D-sub15 |
| Output type | | NPN transistor (sinking) |
| Voltage / Cu | rrent | 5~30 VDC, 0.1 A |
| | Resistance | 0.1 A |
| Maximum load | Inductance | - |
| | Bulb | - |
| Maximum | Resistance | 10 kHz |
| output | Inductance | - |
| frequency | Bulb | - |
| Maximum Response time | OFF→ON | 25 us |
| Electrical isolation | | 500 VDC |

Electrical specifications for the +5 V encoder power supply

| Model | AS02HC-A |
|-------------------|---------------------------|
| Number of outputs | 2 (+5VO/GND) |
| Connector type | D-sub15 |
| Voltage / Current | 5 VDC (±5%), 100 mA (Max) |



14.2.2 Profile



| Number | Name | Description | |
|--------|---|--|--|
| 1 | Model name | Model name of the module | |
| | POWER LED indicator | Indicates the status of the power supply ON: The power is on. OFF: No power | |
| | Error LED indicator | Error status of the module ON: A major error occurs in the module. OFF: The module is normal. Blinking: A minor error occurs in the module. | |
| 2 | Counter LED indicator for Ch1 Act. & Ch2 Act. | Counting status of the module (Green) OFF: The counter is disabled. When the pulse input takes place: ON: The counter is enabled but the result of counting is not changed. Blinking: The result of counting is updating. When the SSI input takes place: Blinking: The counter is enabled and the position value is updating. | |
| | Input / output LED indicator | ON: Receives an input / output signal OFF: Receives no input / output signal Refer to section 14.2.8 for details. | |
| 3 | D-sub15 | Input: Connected for pulse input and encoder Output: Connected to loads to be driven Power: Providing external encoder +5 VDC | |
| 4 | DIN rail clip | Secures the module onto the DIN rail | |
| 5 | Extension module port | Connects extension modules | |
| 6 | Ground clip | For Grounding | |
| 7 | Label | Nameplate | |

14.2.3 Terminals

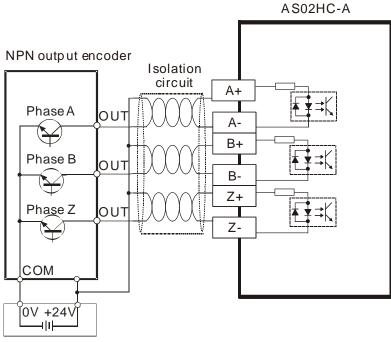
| | Pin No. | CH1 | CH2 |
|--|---------|--------|--------|
| 02HC | 8 | A1+ | A2+ |
| | 3 | A1- | A2- |
| PWR ERR | 7 | B1+ | B2+ |
| CH1 Act. CH1 A CH1 B CH1 B CH2 CH1 Z | 2 | B1- | B2- |
| CH2 CH1 Z | 6 | Z1+ | Z2+ |
| 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 1 | Z1- | Z2- |
| Y0.3 📙 | 10 | CLK1+ | CLK2+ |
| | 5 | CLK1- | CLK2- |
| | 9 | DATA1+ | DATA2+ |
| D-sub15 pin | 4 | DATA1- | DATA2- |
| | 14 | +5VO1 | +5VO2 |
| 10 000 | 15 | GND1 | GND2 |
| | 12 | Y0.0 | Y0.2 |
| | 11 | Y0.1 | Y0.3 |
| | 13 | СОМО | COM1 |



14.2.4 Wiring

14.2.4.1 Pulse Input

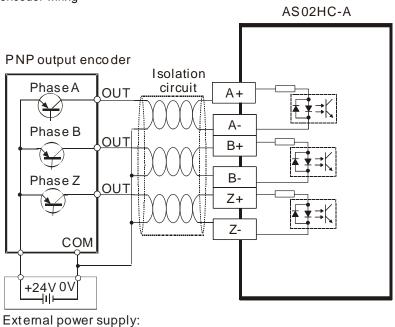
• The NPN output encoder wiring



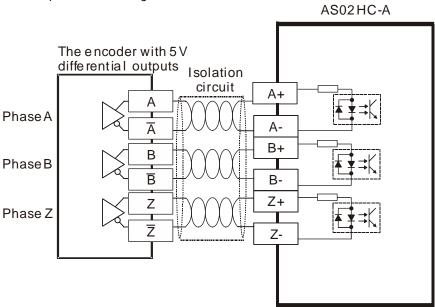
External power supply: 5V, 12V, 24VDC

5V, 12V, 24VDC

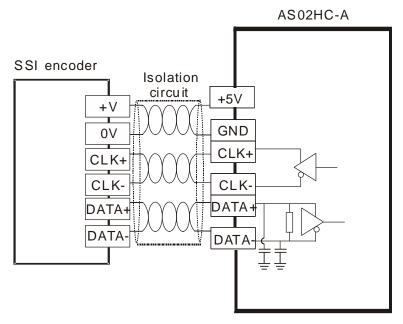
• The PNP output encoder wiring



The 5V differential output encoder wiring



14.2.4.2 SSI Input and Output

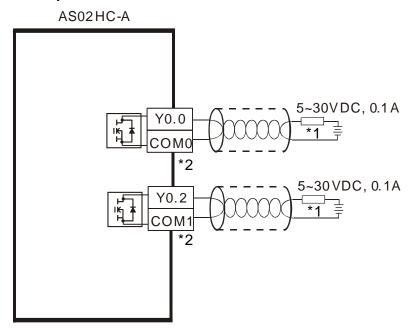


Note:

If the power supply to the SSI encoder is non-5 VDC power supply, please supply corresponding external power based on SSI encoder specifications of different vendors.



14.2.4.3 External Output



*1 : Loads or input points

*2 : Use one single power supply for each COM port.

14.2.5 LED Indicators

| Indicator | Color | Name | Description | | |
|-----------|-------|-----------------------------------|---|--|--|
| PWR | Blue | Power indicator | ON: The power supply is normal. | | |
| ERR | Red | Error indicator | OFF: No power supply ON: A major error occurs in the module. OFF: The module is operating normally. Blinking: A minor error occurs in the module (Blinks every 0.5 seconds.) | | |
| CH1 Act. | Green | Ch1 counter state indicator | OFF: The counter is disabled. Pulse Input - ON: The counter is enabled but there is no change in the counter value. Blinking: The counter value is changing. (Blinks every 0.5 seconds.) SSI Input - Blinking: The counter is enabled and the position value is being updated. (Blinks every 0.5 seconds.) | | |
| CH1 A | Red | Ch1 phase-A input indicator | ON: The phase-A input for channel 1 is active. OFF: The phase-A input for channel 1 is not active. | | |
| СН1 В | Red | Ch1 phase-B input indicator | ON: The phase-B input for channel 1 is active. OFF: The phase-B input for channel 1 is not active. | | |
| CH1 Z | Red | Ch1 phase-Z or DI input indicator | ON: The phase-Z input for channel 1 is active. OFF: The phase-Z input for channel 1 is not active. | | |
| Y0.0 | Red | Y0.0 output status indicator | ON: The Y0.0 output is active. OFF: The Y0.0 output is not active. | | |
| Y0.1 | Red | Y0.1 output status indicator | ON: The Y0.1 output is active OFF: The Y0.1 output is not active. | | |
| CH2 Act. | Green | Ch2 counter state indicator | OFF: The counter is disabled. Pulse Input - ON: The counter is enabled but there is no change in the counter value. Blinking: The counter value is changing. (Blinks every 0.5 seconds.) SSI Input - Blinking: The counter is enabled and the position value is being updated. (Blinks every 0.5 seconds.) | | |
| CH2 A | Red | Ch2 phase-A input indicator | ON: The phase-A input for channel 2 is active. OFF: The phase-A input for channel 2 is not active. | | |
| CH2 B | Red | Ch2 phase-B input indicator | ON: The phase-B input for channel 2 is active. OFF: The phase-B input for channel 2 is not active. | | |
| CH2 Z | Red | Ch2 phase-Z or DI input indicator | ON: The phase-Z input for channel 2 is active. OFF: The phase-Z input for channel 2 is not active. | | |
| Y0.2 | Red | Y0.2 output status indicator | ON: The Y0.2 output is active OFF: The Y0.2 output is not active. | | |
| Y0.3 | Red | Y0.3 output status indicator | ON: The Y0.3 output is active OFF: The Y0.3 output is not active. | | |



14.3 Operation

14.3.1 Parameter Settings

Before using AS02HC-A to count, you need to set the following shown settings in ISPSoft-HWCONFIG. Set the parameters and download the settings to AS02HC-A. Refer to section 14.4. for detailed ISPSoft-HWCONFIG operations.

| Tab | Input Interface | Setting Value | Setting Option |
|--------------|---------------------------------|--------------------------|---|
| | | Pulse Type | A / B Phase (2x) (default) A / B Phase (4x) CW / CWW Pulse + Direction |
| | Pulse Input | Counter Type | Absolute Position (default) Ring Counter |
| | | Maximum | 0 ~ 2147483647 (H0 ~ H7FFFFFF) (default: H7FFFFFFF) |
| | | Minimum | -2147483648 ~ 0 (H80000000 ~ H0) (default: H80000000) |
| | | Ecoder Coding Method | Binary Code (default) Gray Code |
| | | Clock Rate | 250 KHz500 KHz625 KHz1 MHz (default)1.25 MHz |
| CH 1 Setting | | Data Length | 7 ~ 32 (default: 5) |
| | | Multi-Turn Length | 0 ~ 32 (default: 12) |
| | | Multi-Turn MSB Location | b0 ~ b31 (default: b24) |
| | | Single-Turn Length | 1 ~ 32 (default: 13) |
| | | Single-Turn MSB Location | b0 ~ b31 (default: b12) |
| | SSI Input | Status Length | 0 ~ 15 (default: 0) |
| | | Status MSB Location | b0 ~ b31 (default: b0) |
| | | Parity Check | None (default)Even Parity CheckOdd Parity Check |
| | | Parity Bit Locaiton | b0 ~ b31 (default: b0) |
| | | Parity Check Start | b0 ~ b31 (default: b0) |
| | | Parity Check Length | 0 ~ 31 (default: 0) |
| | | Counter Type | Absolute Position (default) Ring Counter |
| | | Monoflop Time | 4 ~ 2500; unit: 16us (default: 4) |
| | | Maximum Variation Limit | 0 ~ 2147483647 (default: 0, disabled) |
| CH 2 Setting | Same as settings in CH1 Setting | | |

| Tab | Input Interface | Setting Value | Setting Option |
|--------------------------------|--------------------|--|---|
| Z-Phase Function Setting | | CH1 Z-Phase Function | Reset Counter (default) Reset Counter + clear Yno (Reset the current counter value and the assigned Y output points from DHCCMP and DHCCMPT instructions.) Capture Gate Control |
| | | CH2 Z-Phase Function | Same as CH1 Z-Phase Function |
| | | Filter Time | 0 ~ 200; unit: 100us; default: 0 |
| | | CH1 Ring Counter Overflow / Underflow Detect | Default: disabled |
| Alarm Satting | | CH1 SSI Zero Crossing Detect | Default: disabled |
| Alarm Setting | | CH2 Ring Counter Overflow / Underflow Detect | Default: disabled |
| | | CH2 SSI Zero Crossing Detect | Default: disabled |

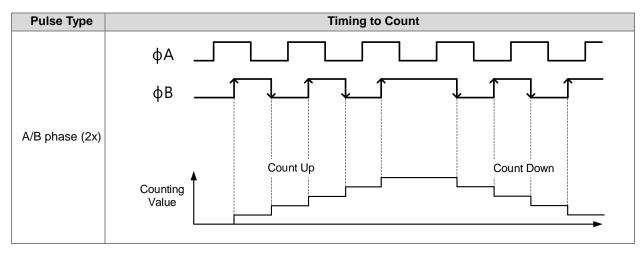
14.3.2 Pulse Input Counting

To perform the pulse-input counting, first set the configuration of channels, which includes pulse type and counter type selection in HWCONFIG. If the counter type is set to the linear counter, the maximum counting value and minimum counting value need be set. After the configuration setting is completed, use the API instruction DHCCNT which is special for AS02HC-A in a program to obtain the counting value, achieve the counter control as well as get the real time counter state.

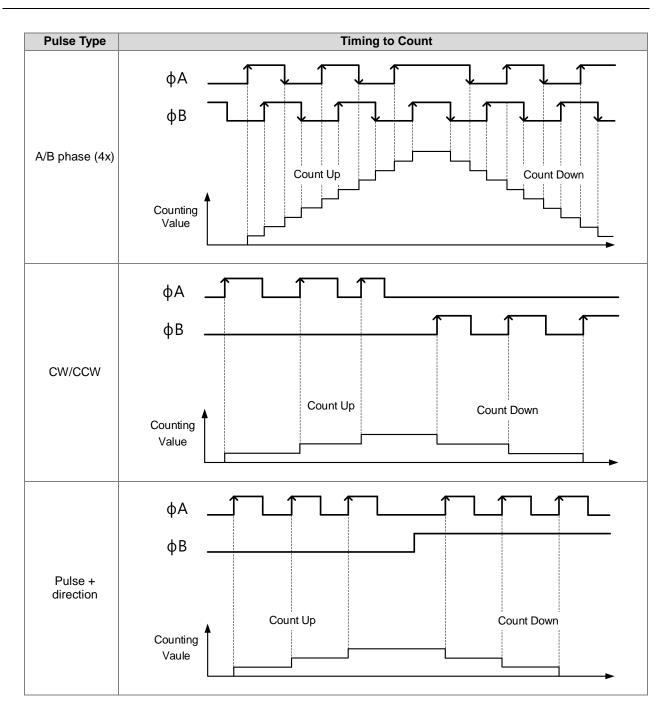
1. Pulse Type

Specify the pulse input type which can be A/B phase (2x), A/B phase (4x), CW/CCW or pulse + direction.

| Parameter | Setting | Unit | Default |
|------------|---|------|----------------|
| Pulse Type | A/B phase (2x), A/B phase (4x), CW/CCW, Pulse + direction | - | A/B phase (2x) |

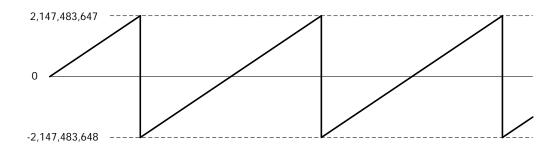






2. Using the ring counter

The ring counter value is cyclical in the range of -2,147,483,648 to 2,147,483,647. When it is greater than 2,147,483,647, the count value changes to -2,147,483,648 and then the counting continues. When it is less than -2,147,483,648, the count value changes to 2,147,483,647 and then the counting continues.



3. Using the linear counter

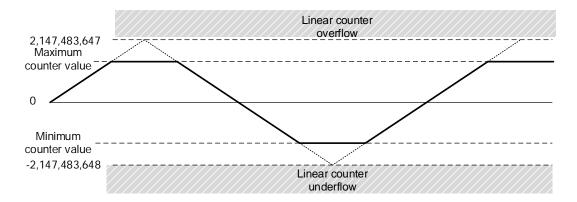
The maximum and minimum counter values must be set up. The counter counts up and down between the two limit counter value. When the count value exceeds the maximum value, the counter state will show the warning of "The value exceeds the range!" and the count value will be fixed at the maximum counter value. When the count value is below the minimum value, the counter state will show the warning of "The value exceeds the range!" and the count value will be fixed at the minimum counter value.

When the count value is beyond the allowed range, the counting persists internally in the hardware. The counter returns to normal and the count value is refreshed when the internal count value comes back within the valid range.

But when the internal count value in the hardware is beyond the valid range of -2,147,483,648 to 2,147,483,647, the counter state shows linear counter overflow or linear counter underflow, the counting stops and the internal count value stops at 2,147,483,647 or -2,147,483,648. The counting can not continue until the count value overflow state of the counter is cleared.

The methods to clear the states include resetting the counter through phase-Z inputs, executing Reset/Preset via DHCCNT instruction, disabling DHCCNT instruction or changing the CPU from RUN to STOP.

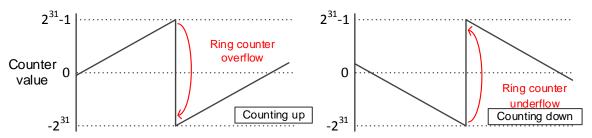
| Parameter | Setting | Unit | Default |
|---|-----------------|------|-------------|
| Max. counter value 0 ~ 2147483647 (upper limit) | | - | 2147483647 |
| Min. counter value (lower limit) | -2147483648 ~ 0 | - | -2147483648 |





4. Ring counter overflow/underflow detection

Enable the **Ring Counter Overflow/Underflow Detect** function in the Alarm Setting of HWCONFIG. When the overflow or underflow occurs, the alarm will appear.



14.3.3 SSI Input Counting

To perform the SSI input counting, first set the configuration of channels in HWCONFIG which includes encoder coding method, clock rate, SSI data format, monoflop time and maximum variation limit. After the configuration setting is completed, use the API instruction DHCCNT which is special for AS02HC-A in a program to obtain the counting value, achieve the counter control as well as get the real time counter state.

1. Encoder Coding Method

There are two coding methods, Binary Code and Gray Code for SSI absolute encoder. The Binary Code is the default coding method. If the Gray Code is selected, the gray-code position data (multi-turn and single-turn data) transmitted back from the SSI encoder will be converted into the binary-code position data.

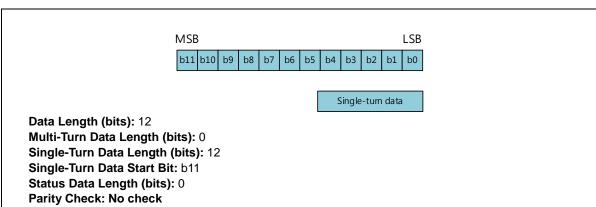
2. Clock Rate

The HWCONFIG software provides 5 clock rates for option including 250 kHz, 500 kHz, 625 kHz, 1 MHz and 1.25 MHz. Default: 1 MHz.

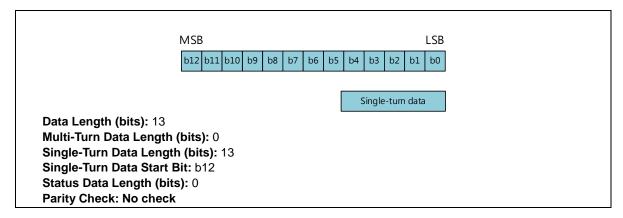
3. SSI Data Format

Set Multi-turn, Single-turn and Status Data start bit & length as well as Parity Check based on the specifications of the used SSI absolute encoder. For SSI data format, 12ST, 13ST, 12 MT+13ST and User-Defined are provided for option. See the descriptions as below for details.

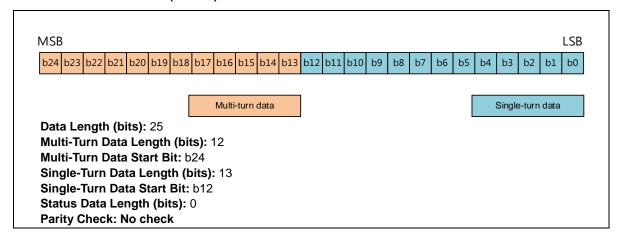
Data Format - 12ST:



Data Format - 13ST:

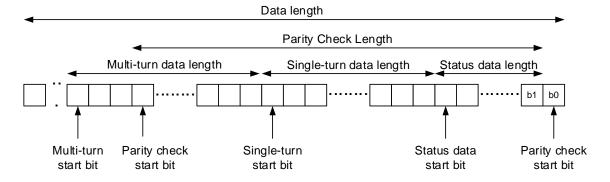


Data Format - 12MT+13ST (Default):



Data Format - User-Defined:

Users can define all parameters based on the illustration in the following diagram.

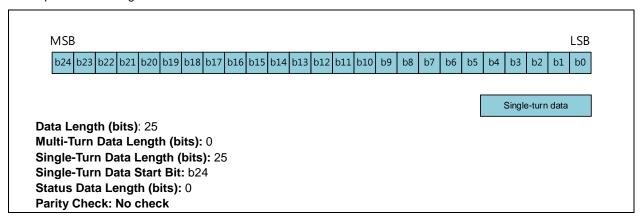




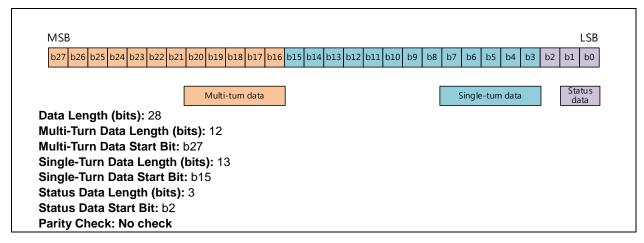
Note: For a multi-turn encoder, the multi-turn data and single-turn data should be next to each other without additional data placed between them.

| Item | Setting | Default |
|--------------------------------|---|----------|
| Data Length (bits) | 7 ~ 31 | 25 |
| Multi-Turn Data Length (bits) | 0 ~ 31 | 12 |
| Multi-Turn Data Start Bit | B0 ~ b30 | B24 |
| Single-Turn Data Length (bits) | 1 ~ 31 | 13 |
| Single-Turn Data Start Bit | B0 ~ b30 | B12 |
| Status Data Length (bits) | 0 ~ 15 | 0 |
| Status Data Start Bit | B0 ~ b30 | В0 |
| Parity Check | No check, odd parity check, even parity check | No check |
| Parity Check Bit | B0 ~ b30 | В0 |
| Parity Check Start Bit | B0 ~ b30 | В0 |
| Parity Check Length (bits) | 0 ~ 30 | 0 |

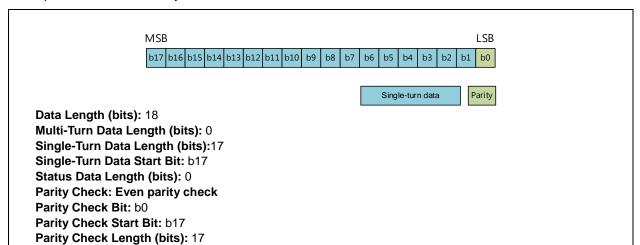
Example 1: 25-bit Single-Turn Encoder



Example 2: Encoder with Status Data

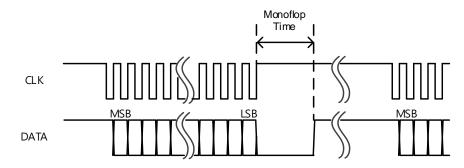


Example 3: Encoder with Parity Check



4. Monoflop Time

The Monoflop Time parameter determines the interval time between two SSI data frames. The correct position data can be received as long as the setting value is greater than that specified for the connected encoder. The range is set as follows.



| Parameter | Setting | Unit | Default |
|---------------|----------|------|---------|
| Monoflop time | 4 ~ 2500 | 16us | 4 |

5. Maximum Variation Limit

The parameter is used to prevent sudden errors occurring in reading absolute position values due to noise interference. You can set the limit value for the variation between two consecutive SSI positions.

When the position change exceeds the set limit, the read position value is discarded, the present count value is not refreshed and the error code is displayed in the counter status. When the position change is back within the set range, the counting returns to normal and the error code is cleared.

When the maximum position variation limit is set to 0, the function is disabled and no check on the position change will be done.

| Parameter | Setting | Unit | Default |
|----------------------------|----------------|------|--------------|
| Maximum Variation Limit | 0 ~ 2147483647 | - | 0 (Disabled) |



6. Absolute Position

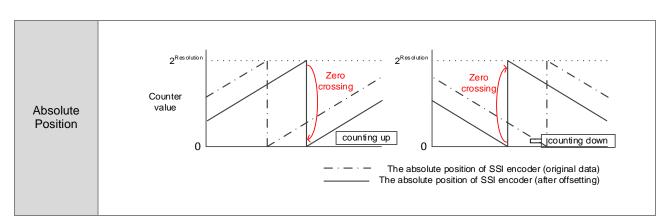
When the **Absolute Position** option is selected as the counter type, the counter value will show the absolute position of the SSI absolute encoder within the range of 0 to 2^{resolution}. The data information including single-turn data, multiturn data status, data and counting direction can be displayed independently based on the set data format. The offset setting of the SSI absolute encoder can be modified as well. Refer to DHCCNT instruction for more.

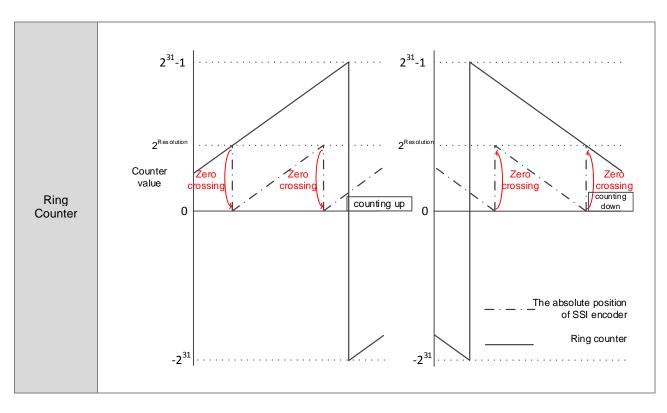
7. Ring Counter

When **Ring Counter** is chosen as the counter type, AS02HC-A is used as a 32-bit ring counter by making two read absolute position variations added up and the count value is changing cyclically in the range of -2147483648 to 2147483647. The counting value changes cyclically within the range of -2147483648 to 2147483647. The ring counter value can be cleared to zero through phase Z. The DHCCNT instruction can also be used to clear and preset the counter value. Refer to DHCCNT instruction for details.

8. Zero Crossing Detection

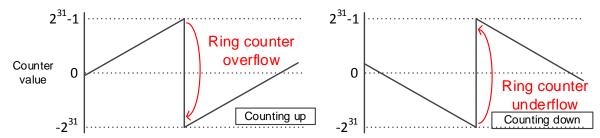
The **SSI Zero Crossing Detect** function is enabled on the Alarm Setting tab page of the HWCONFIG software. The alarm will appear if the absolute position of the SSI encoder crosses the zero position. The detection function can be used for both the absolute position and ring counters. The timing for the zero crossing is illustrated in the following table.





9. Ring Counter Overflow / Underflow Detection

The **Ring Counter Overflow/Underflow Detection** function is enabled on the Alarm Setting tab page of the HWCONFIG software. The alarm will appear as the counter value overflow/underflow occurs.



10. SSI Encoder Rotation Rate Restriction

For the SSI input counting, the rotation rate restriction is influenced by the SSI encoder resolution and monoflop time. Use the corresponding formula in the following table to calculate the rotation speed of the SSI encoder.

| Encoder type | Rotation rate (RPM) | |
|---------------------|--|--|
| Single-turn encoder | $\pm \frac{60}{2 \times \text{tp} \times 10^{-6}}$ (tp: monoflop time, unit: us) | |
| Multi-turn encoder | 60×2MT data length | |



See the reference values for the formula above in the following table.

| Monoflop time (us) | Max. rotation rate of single-turn encoders (RPM) | Max. rotation rate of multi-turn encoders (RPM) |
|-----------------------|--|---|
| 64 | 468750 | $468750 	imes 2^{	ext{MT data length}}$ |
| 4000 | 7500 | 7500 $	imes$ 2 ^{MT data length} |
| 8000 | 3750 | 3750 $	imes$ 2 ^{MT data length} |
| 12000 | 2500 | 2500 $	imes$ 2 ^{MT data length} |
| 16000 | 1875 | 1875 $	imes$ 2 ^{MT data length} |
| 20000 | 1500 | 1500 $	imes$ 2 ^{MT data length} |
| 24000 | 1250 | 1250 $	imes$ 2 ^{MT data length} |
| 28000 | 1071 | 1071 $	imes$ 2 ^{MT data length} |
| 32000 | 938 | 938 $	imes$ 2 ^{MT data length} |
| 36000 | 833 | $833	imes 2^{	ext{MT}}$ data length |
| 40000 | 750 | 750 $	imes$ 2 ^{MT data length} |

14.3.4 Z-Phase Function Setting

AS02HC-A's two channels which are with one input point CH1 Z and CH2 Z respectively should be configured in function by HWCONFIG before they are used to achieve the functions of counter reset, gate control, counter value capture and digital filtering.

| Item name | Setting | Unit | Default |
|---|---|--|-------------------------|
| Phase-Z Function Setting | Counter Reset, Counter Reset +Yno, Gate Control and Capture | - | Counter Reset |
| Phase-Z Function | Description | Remark | |
| Counter Reset (Default) The counter is cleared (the counter value is reset to 0 and the counter status is cleared.) | | The counter value can not be cleared if the SSI input and the absolute-position counter type are selected. | |
| Counter Reset +Yno Same to Counter Reset above. Also clears the output points that are set by the DHCCMP comparison instruction or table comparison instruction DHCCMPT. | | The DHCCMP or DHCCMPT instruction is used. | |
| The counter value capture is triggered through the rising edge and falling edge of phase Z. | | The DHCCA | P instruction is used. |
| Gate control | When phase Z is at low level, the counter's counting pauses. When phase Z is at high level, the counter's counting continues. | Applicable to | o the pulse input only. |

| Item name | Setting | Unit | Default |
|-------------|---------|--------|--------------|
| Filter time | 0 ~ 200 | 100 us | 0 (Disabled) |

14.3.5 List of Dedicated API Instructions

The operation of AS02HC-A is realized via dedicated API instructions in HWCONFIG after the counter configuration setting is done. The dedicated API instructions for AS02HC-A include DHCCNT, DHCCAP, HCDO, DHCCMP, DHCCMPT and DHCMEAS. For details on these instructions and application examples, refer to **AS Series Programming Manual**.

| Instruction | Symbol | Function | |
|------------------------------------|--|--|--|
| DHCCNT (Counter control) | DHCCNT En Module CurCnt ChNo ST Update MT Action AStat Value RefCnt Dir CntStat Error ErrCode | Enable/ disable the counter Change the count value Clear the counter Preset the counter Show current counter value Show the counting direction Show the counter state Correct SSI offset Show SSI data | |
| DHCCAP (Count vlaue capture) | DHCCAP En Module Capt1 — ChNo Cmplt1 — TrgSel Capt2 — Cmplt2 — Error — ErrCode — | Set a capture method Show captured count values | |
| HCDO (Output point control) | HCDO _En _Module DostateUpdate ErrorDodata ErrCode_ | Control output points Show output-point state | |
| DHCCMP (Comparison output) | DHCCMP —En —Module Match1 — —ChNo Match2 — —Update Error — —Comp1 ErrCode — —Action1 —Yno1 —Comp2 —Action2 —Yno2 | Enable/disable comparison output function Set two point comparison values Set comparison-matched actions Show comparison-matched status | |



| Instruction | Symbol | Function |
|---|---|---|
| DHCCMPT (Table comparison output) | DHCCMPT En Module CurNo ChNo Error Update ErrCode CmpLen CompS ActionS YnoS Inos | Enable/disable table comparison output function Set comparison values for up to ten points Set comparison-matched action Show comparison-matched status |
| DHCMEAS (Rotation rate measurement) | DHCMEAS En Module Freq ChNo RPM Update Error Cnt/Rev ErrCode Smpl Avg | Enable/disable measurement function Set average times Show measured frequency Show measured rotations per minute |

14.3.6 The impact of AS CPU Status on AS02HC-A

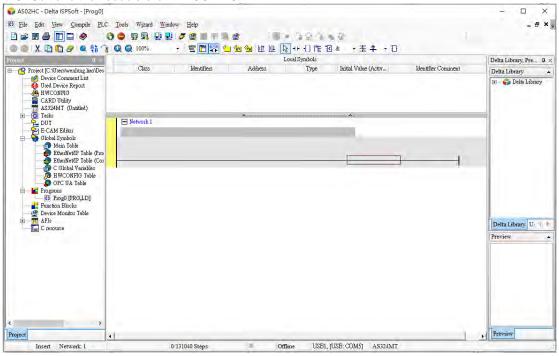
The following table lists the module execution states corresponding to AS CPU operation states of poweroff, and Run -> Stop. After the AS CPU state switches from Stop to Run, the operation state of AS02HC-A module is controlled by the PLC program.

| Item | Poweroff, CPU Run -> Stop | | |
|-----------|--|--|--|
| | Toweron, or or team 2 dop | | |
| Y0.0~Y0.3 | Reset to OFF | | |
| Phase Z | Disabled | | |
| Counter | The counting stops and counter state is cleared. | | |
| DHCCNT | The instruction is disabled. | | |
| HCDO | The instruction is disabled. | | |
| DHCCAP | DHCCAP The instruction is disabled. | | |
| DHCCMP | DHCCMP The instruction is disabled; MATCH1 and MATCH2 are cleared. | | |
| DHCCMPT | The instruction is disabled and CurNo is cleared. | | |
| DHCMEAS | The instruction is disabled. | | |

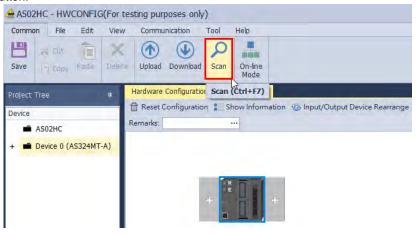
14.4 Hardware Configuration via HWCONFIG in ISPSoft

14.4.1 Initial Setting

1. Start ISPSoft and then double-click HWCONFIG.

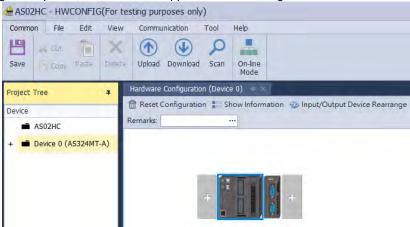


2. Click the Scan button.

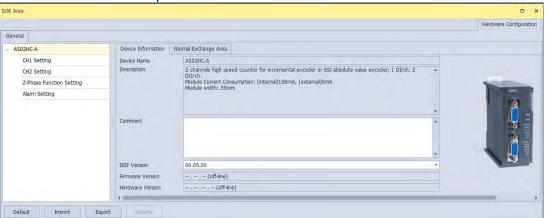




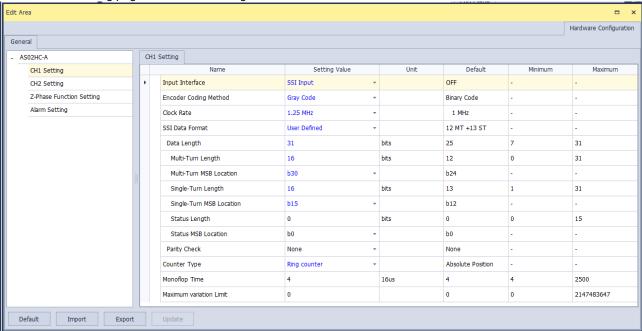
3. After the scanning is completed, AS02HC-A will appear in the following window.



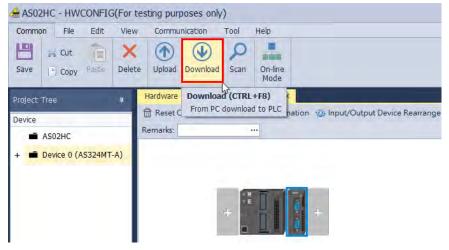
4. Select AS02HC-A and set module parameters.







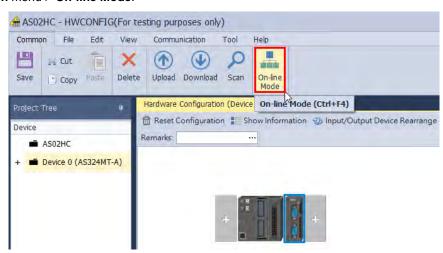
6. Click **Download** to download the configuration data. (The download can not be performed if the CPU is in RUN state)





14.4.2 Checking the Module Version

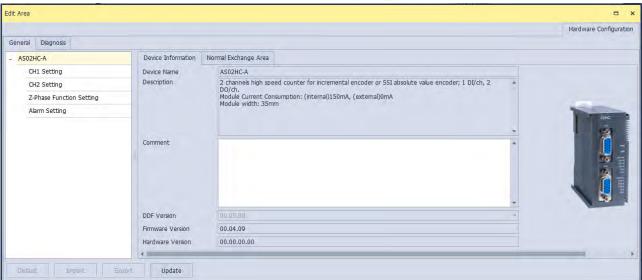
1. Click Common menu > On-line Mode.



2. Double-click AS02HC module to check the firmware version and hardware version.



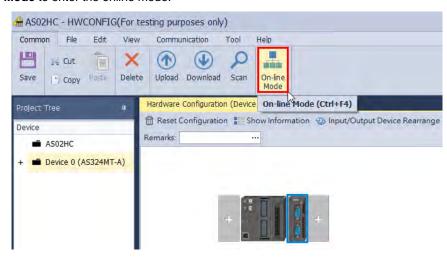




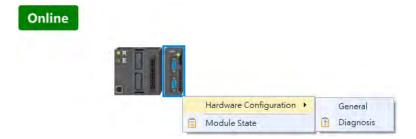
14

14.4.3 Online Mode

1. Click On-line Mode to enter the online mode.



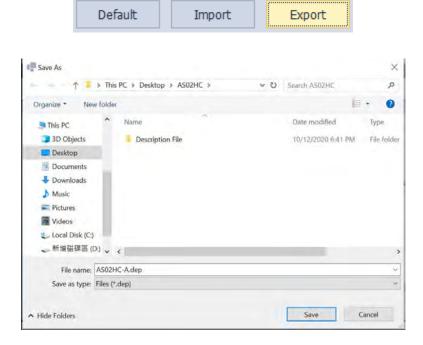
Right-click AS02HC module and select Hardware Configuration or Module State from the context menu. Then the
error code information can be seen in the module state window and module error log can be seen in the diagnosis
area.





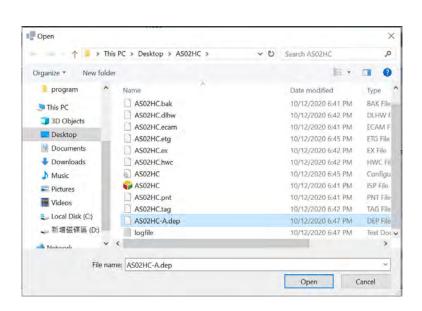
14.4.4 Import and Export a Parameter File

1. Click **Export** in the dialog box to save the current parameters as a dep file (.dep).



2. Click **Import** in the dialog box and select a dep file to save parameters.

Default

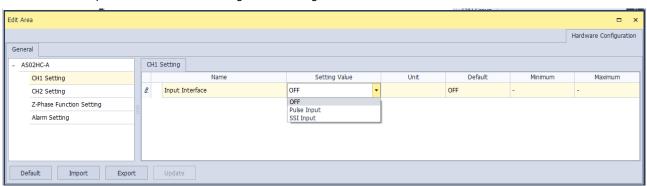


Import

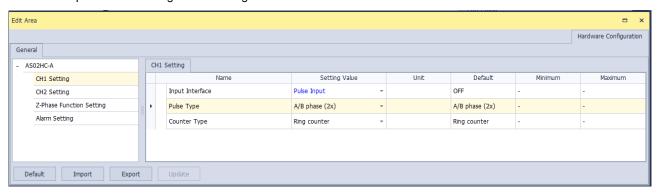
Export

14.4.5 Parameters

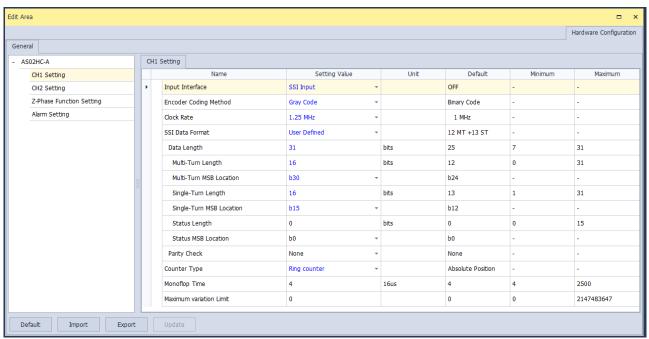
1. Select one input interface in CH1 Setting / CH2 Setting.



2. Pulse Input in CH1 Setting / CH2 Setting.

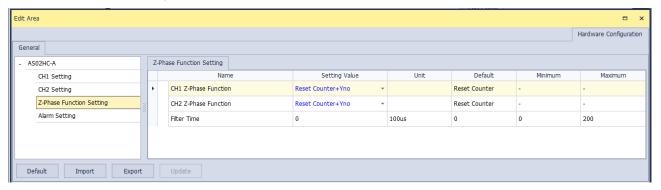


3. SSI Input in CH1 Setting / CH2 Setting

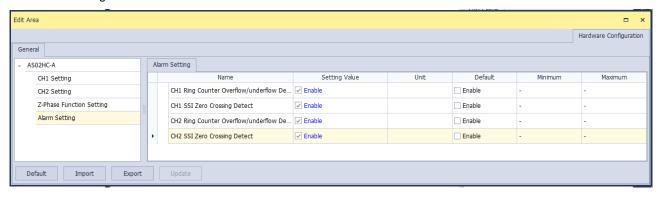




4. Z-Phase Function Setting

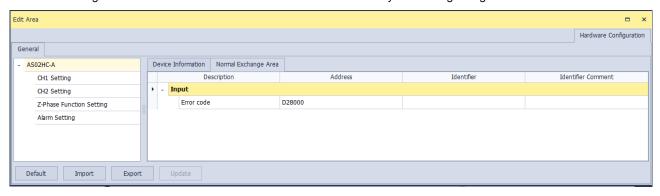


5. Alarm Setting



14.4.6 Normal Exchange Area

The data exchange area between the CPU and a module is in the Device Setting dialog box. The normal exchange areas for modules are different from one another. Special D registers are corresponded to automatically based on the configuration data for the convenience of directly reading the values. The error codes of AS02HC-A are configured in the Normal Exchange Area. The error codes of the module can be known by monitoring D registers.



14.5 Troubleshooting

14.5.1 Error Codes

| Error code | Description | ERR LED | Counter action | Remark |
|------------|---|------------|--|---|
| 16#1605 | Counted result in the latched area is not retainable (major error) | | The counter module stops operating and counting | The error alarm makes the CPU stop the system. (The module need be set to keep counting or stop for when an error occurs in the module:) |
| 16#1606 | Module settings in the latched area is not retainable. (major error) | ON | | |
| 16#1607 | Module setting error (major error) | | | , |
| 16#1800 | Counter overflow / underflow on CH1 | Blinking | Linear counter: Counting stops. Ring counter: Counting continues. | Linear counter: Counter value overflow inside the hardware Ring counter: After the Ring Counter |
| 16#1801 | Counter overflow / underflow on CH2 | , c | | Overflow/Underflow Detect function is enabled in the Alarm Setting of HWCONFIG, the alarm will appear when the overflow or underflow occurs. |
| 16#1802 | Linear count exceeding the set upper/lower limit on CH1 | Dlinking | The counting value is fixed at the set max. counter value or the set min. counter value. | The counting inside the hardware persists. When the internal counter value is back within the valid range, the counter returns to normal and the counting value is refreshed. The variation between two consecutive SSI positions exceeds the setting value. |
| 16#1803 | Linear count exceeding the set upper/lower limit on CH2 | Diriking | | |
| 16#1804 | The variation in relation to an SSI encoder position exceeding the limit on CH1 | Plinking | The counting value is fixed at the most recent correct count value. | |
| 16#1805 | The variation in relation to an SSI encoder position exceeding the limit on CH2 | Dillikilig | | |
| 16#1806 | Abnormal SSI communication on CH1 | | The counting value is fixed at the most | Encoder disconnection/ wiring error/no power supply to the encoder/ data format error/parity |
| 16#1807 | Abnormal SSI communication on CH2 | Blinking | recent correct count value. | check setting error (Error log will not appear unless five consecutive abnormal situations occur.) |
| 16#1808 | SSI absolute position cross zero point on CH1 | | Counting continues. | After the SSI Zero Crossing Detect function is enabled on the Alarm Setting tab page of the HWCONFIG software, the alarm will appear as the absolute position of the SSI encoder crosses the zero position. |
| 16#1809 | SSI absolute position cross zero point on CH2 | Blinking | | |



14.5.2 Troubleshooting Procedure

| Description | Solution |
|--|---|
| 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. Contact the factory if the problem persists. |
| 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. Contact the factory if the problem persists. |
| Module setting error (major error) | Check if the setting in HWCONFIG is consistent with the actual placement. Contact the factory if the problem persists. |
| 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. |
| Counter overflow / underflow on CH2 | |
| 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 back within the range of the maximum to the minimum, the error code will be cleared. |
| Linear count exceeding the set upper/lower limit on CH2 | |
| 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. |
| The variation in relation to a SSI encoder position exceeding the limit on CH2 | |
| Abnormal SSI communication on CH1 | Check the execution of DHCCNT instruction. If it is parity check, check if 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. |
| Abnormal SSI communication on CH2 | |
| 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. |
| SSI absolute position cross zero point on CH2 | |

Chapter 15 High-Speed Analog Input Module AS02ADH

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15.1 Overview

The AS02ADH module is a high-speed analog-to-digital module with two built-in channels. The conversion rate of analog to digital signals can be as fast as 20 µs per channel. Its two built-in channels are capable of sampling simultanelously. The channels are designed as isolated to reduce interferences and ensure the accuracy of the measured results. This chapter mainly introduces the specifications, functions and operation of the module.

15.1.1 Characteristics

(1) High-speed conversion

The conversion rate of analog to digital signals can be as fast as 20 µs per sampling cycle for two channels simulanelously.

(2) High accuracy

Conversion accuracy: The error range for both voltage input and current input is ±0.1% at ambient temperature of 25° C.

(3) Fully insulation (insulation between channels included)

Apart from the design of separating the digital and analog signals, the insulation between channels is included to reduce interferences between channels and ensure stability.

(4) External input points triggering

By triggering the external input points to achieve recording the log in real time.

(5) Record function

At the speed of 20 µs, high-speed recording works with external input points triggering to activate recording the log continuously or just the execution points in real time.

(6) Use the tool software for easy settings

ISPSoft with built-in HWCONFIG can be used to create the hardware module configuration so that users can directly select the mode and parameters without spending time programming to set up the registers corresponding to a variety of functions to use.

(7) Miscellaneous API instructions

The functions including recording log and peak value can be achieved through dedicated API instructions.

15.2 Specifications and Functions

15.2.1 Specifications

• Functional specifications

| Module Name | AS02ADH-A | |
|---------------------------------|--|--|
| Number of input channels | 2 | |
| Analog input | 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 Current: -20 mA to 20 mA, 0 mA to 20 mA, 4 mA to 20 mA | |
| Digital output | 16-bit integer 32-bit floating point | |
| Error rate | Room temperature: ±0.1%; full temperature range: ±0.2% | |
| Hardware resolution | 16 bits | |
| Input resistance value | Voltage: ≧2 MΩ | |
| input resistance value | Current: 250 Ω | |
| Absolute input range*1 | Voltage: ±15 V | |
| Absolute input range | Current: ±32 mA | |
| Channel sampling | | |
| Cycle*2 | 20 μs, 40 μs and 80 μs | |
| Bandwidth of analog input | 20 kHz | |
| signal | ZU KTIZ | |
| Average function | Time average, moving average: 1 to 1000 times | |
| Digital filtering | Low-pass filter, band-pass filter | |
| Logging function*3 | Digital output value (2000 per channel), peak value | |
| Digital calibration | Maximum / minimum digital output value clipping, gain, offset | |
| Abnoraml input signal detection | Limit-exceeding detection, disconnection detection#4 | |
| External input triggering | 2 points (1 point / channel), rising-edge or falling-edge triggered | |
| Maximum frequency of | | |
| external input point | 10 kHz | |
| triggering | | |

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



^{*2:} Two channels are in A/D conversion simulanelously.

^{*3:} Logging function should be used with API instructions.

^{*4:} Disconnecton detecton can only be used in the modes of 4 mA to 20 mA and 1V to 5 V.

Conversion characteristics - Voltage

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

Conversion characteristics - Current

| Analog-to-Digital Conversion | Current Input | | | |
|---------------------------------------|-------------------------|-----------------------|-----------------------|--|
| Rated Input Range | ±20 mA | 0 mA to 20 mA | 4 mA to 20 mA | |
| Rated Conversion Range | K-32000 to K+2000 | K0 to K32000 | K0 to K32000 | |
| Hardware Input Limit* ¹ | -20.24 mA to 20.24 mA | -0.24 mA to 20.24 mA | 3.81 mA to 20.19 mA | |
| Conversion Limit*2 | K-32384 to K32384 | K-384 to K32384 | K-384 to 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.

^{*2:} 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 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.

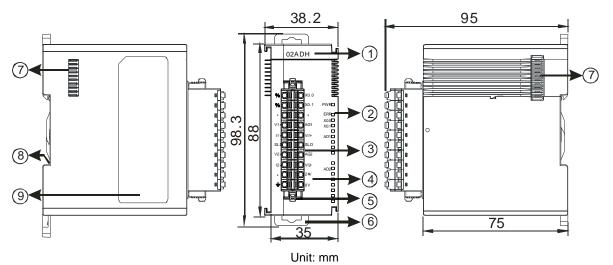
^{*2:} If the input signal exceeds the hardware input limit, it also exceeds the digital conversion limit and a conversion limit error appears. For example in the voltage input mode (4 mA to 20 mA), when the input signal is 0 mA, exceeding the hardware upper limit, it also exceeds the conversion upper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

• Electrical specifications

| Module Name | AS02ADH-A |
|------------------------|---|
| Supply Voltage | 24 VDC (20.4 VDC to 28.8 VDC) (-15% to +20%) |
| Connector Type | Removable terminal block |
| | An analog circuit is isolated from a digital circuit. The analog channels are |
| | isolated from one another. |
| Isolation | Isolation between a digital circuit and a ground: 500 VDC |
| isolation | Isolation between an analog circuit and a ground: 500 VDC |
| | Isolation between an analog circuit and a digital circuit: 500 VDC |
| | Isolation between the 24 VDC and a ground: 500 VDC |
| Rated voltage of | 24.VDC |
| external input point | 24 VDC |
| Rated currentof | F 0 |
| external input point | 5 mA |
| Resistance value of | 3.9 kΩ |
| external input point | 3.9 KIZ |
| Hardware response | |
| time of external input | 5 μs |
| point OFF -> ON | |
| Hardware response | |
| time of external input | 5 μs |
| point ON -> OFF | |
| Weight | 154g |

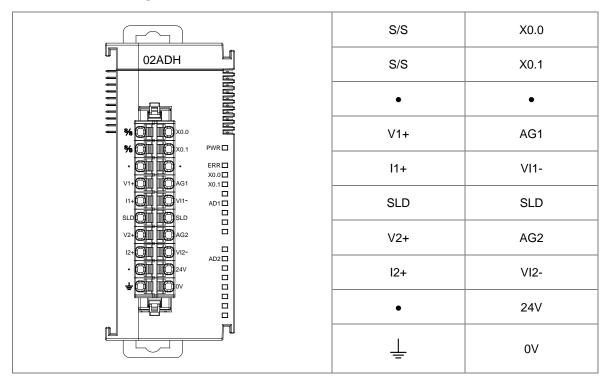


15.2.2 Profile



| Number | Name | Description |
|--------|---|---|
| 1 | Model Name | Model name of the module |
| | | Status of the power supply |
| | POWER LED Indicator | ON: the power is on. |
| | | OFF: the power is off. |
| | | Error status of the module |
| | ERROR LED Indicator | ON: a serious error exists in the module. |
| | ENNON ELD IIIdicator | OFF: the module is operating normally. |
| 2 | | Blinking: A minor error exists in the module. |
| | | Input point status of the module |
| | Input Point Status Indicator | ON: the input point is functioning |
| | | OFF: the input point is not functioning |
| | | Analog-to-digital conversion status |
| | Analog to Digital Conversion Indicator | Blinking: conversion is in process. |
| | | OFF: conversion has stopped. |
| 3 | Removable Terminal Block | Inputs are connected to sensors. |
| 4 | Arrangement of the Input/Output Terminals | Arrangement of the terminals |
| 5 | Terminal Block Clip | For removing 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 |

15.2.3 Arrangement of Terminals





15.2.4 ASO2ADH Control Register

*If you use HWCONFIG to set values in CRs, once the set value is downloaded, the values can be retained in the module; however if you use TO instruction to write data into CRs, the values CANNOT be retained, after power failure or after transition of the CPU from STOP to RUN.

Note: The attribute of the CR must be W (write) to use TO instruction.

| CR# | Name | Description | Atr. | Defaults |
|-----|--|--|------|----------|
| 0 | Format Setup | 0: integer format 1: floating point format | R | 0 |
| 2 | Channel 1 mode setup Channel 2 mode setup | 0: closed 1: -10 V to +10 V 2: 0 V to 10 V 3: -5 V to +5 V 4: 0 V to 5 V 5: 1 V to 5 V 6: 0 mA to 20 mA 7: 4 mA to 20 mA 8: -20 mA to +20 mA Note: when the format is set as floating point format, you can NOT change the mode through | R/W | 1 |
| | | TO instruction. | | |
| 3 | Channel 1 offset Channel 2 offset | Range: -32768 to +32767 | R/W | 0 |
| 5 | Channel 1 gain | | | |
| 6 | Channel 2 gain | Range: -32768 to +32767 | R/W | 1000 |
| 7 | Channel 1 filtering method | 0: moving average 1: time average 2: 50 Hz low-pass filter | | |
| 8 | Channel filtering method | 3: 60 Hz low-pass filter 4: 1 kHz low-pass filter (for sampling cycle 40 μs and 80 μs only) 5: 3 kHz low-pass filter (for sampling cycle 40 μs and 80 μs only) 6: 5 kHz low-pass filter (for sampling cycle 40 μs and 80 μs only) 7: 7 kHz low-pass filter (for sampling cycle 40 μs only) 8: 9 kHz low-pass filter (for sampling cycle 40 μs only) | R/W | 0 |

| CR# | Name | Description | Atr. | Defaults |
|-----|---|---|-------|----------|
| 9 | Channel 1 average times | 9: 11 kHz low-pass filter (for sampling cycle 40 μs only) 10: 1.5 to 3 kHz band-pass filter (for sampling cycle 40 μs and 80 μs only) 11: 3 to 5.5 kHz band-pass filter (for sampling cycle 40 μs and 80 μs only) 12: 5.5 to 8 kHz band-pass filter (for sampling cycle 40 μs only) 13: 8 to 10.5 kHz band-pass filter (for sampling cycle 40 μs only) Time average, moving average: 1 to 1000 | R/W | 10 |
| 10 | Channel 2 average times | times | IX/VV | 10 |
| 11 | Channel sampling cycle | 0: 20 μs 1: 40 μs 2: 80 μs | R/W | 0 |
| 12 | Channel 1 maximum digital output value Channel 2 maximum digital | When the digital output value is out of the range (-32384 to 32384), the digital clipping is used to fix the exceeding value to the | R/W | 32384 |
| 13 | output value | maximum digital output value. | | |
| 14 | Channel 1 minimum digital output value | When the digital output value is out of the range (-32384 to 32384), the digital clipping is | R/W | -32384 |
| 15 | Channel 2 minimum digital output value | used to fix the exceeding value to the minimium digital output value. | | |
| 16 | Trigger method of the external input point X0.0 | 0: rising-edge trigger | R/W | 0 |
| 17 | Trigger method of the external input point X0.1 | 1: falling-edge trigger | | |
| 18 | Digital filtering time of the external input point X0.0 | 0: OFF 1: 100 μs | R/W | 0 |
| 19 | Digital filtering time of the external input point X0.1 | 2: 200 μs 3: 500 μs | 10,00 | J |
| 20 | Channel Alarm Setup | O: enable channel alarm 1: disable channel alarm bit0: channel 1 analog input value exceeding the range detection bit1: channel 2 analog input value exceeding | R/W | 3 |



| CR# | Name | Description | Atr. | Defaults |
|-----|---------------------------------------|---|------|----------|
| | | the range detection | | |
| | | | | |
| | | 0: warning (minor error) | | |
| | | 1: alarm (major error) | | |
| | | bit8: error in the external power supply | | |
| | | bit9: error in the module hardware | | |
| | | bit10: error in calibration | | |
| 21 | | When the format is set to integer in | | |
| 21 | The minimum scale range | HWCONFIG, the scale range is invalid. When | | |
| | for channel 1 | the format is set to floating-point, the values | | -10.0 |
| 22 | | are shown in HWCONFIG. | | |
| | | Here you can set the minimum and maximum | | |
| 23 | | scale ranges of corresponding floating-point | | |
| | The minimum scale range | values for channels. | | -10.0 |
| 0.4 | for channel 2 | For example, if the scale range for an analog to | | 10.0 |
| 24 | | digital input channel is ±10.0 V, it indicates the | | |
| | | maximum value is +10.0 V and the minimum | R | |
| 25 | | value is -10.0 V. | | |
| | The maximum scale range | If the scale range for an analog to digital input | | 10.0 |
| 26 | for channel 1 | channel is 4 mA to 20 mA. It indicates the | | |
| | | maximum value is 20 mA and the minimum value is 4 mA. | | |
| _ | | Note: You can use PLC instruction DSCLP | | |
| 27 | The maximum and reserve | (API0217) and set SM685 to ON to use | | |
| | The maximum scale range for channel 2 | floating-point operations when the conversion | | 10.0 |
| 28 | | range needs to edit. | | |
| | | | | |

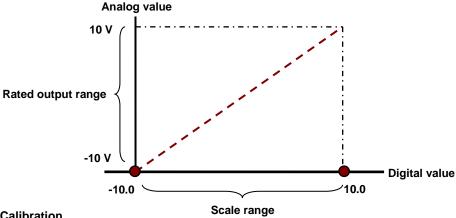
15.2.5 Functions

| Item | Function | Description |
|------|--|---|
| 1 | Digital output format | Integer and floating point formats |
| 2 | Calibration | Calibrate a linear curve. |
| 3 | Average function | Conversion values are averaged and filtered for each channel. |
| 4 | Digital filtering | Low-pass filtering and band-pass filtering: to screen out unwanted frequency |
| 5 | Sampling cycle | The conversion rate of analog to digital signals can be set to 20 μs, 40 μs or 80 μs per sampling cycle for two channels simultaneously. |
| 6 | External input point trigger for digital filtering | Input point filtering is available to reduce the chance of being triggered by mistake. |
| 7 | Digital output value range | When the digital output value is out of the range (-32384 to 32384), the digital clipping is used to fix the exceeding value to the maximum / minimum digital output value. |
| 8 | Channel detection and alarm | If an input signal exceeds the input hardware range, the module produces an alarm or a warning. You can disable this function. |
| 9 | Logging function | Used with instruction ADLOG and DADLOG (API 1424) to save the analog curves for channels. |
| 10 | Peak records for channels | Used with instruction ADPEAK and DADPEAK (API 1425) to save the maximum and minimum value for channels. |
| 11 | Disconnection Detection | Disconnection detection only operates when the analog range is 4 mA–20 mA or 1 V–5 V. |



1. Digital output format

You can choose integer (16-bits, binary format) or floating-point format for the digital output format. If you set the format to floating-point, you can set the scale range. The analog output mode of a channel has a corresponding digital range. Digital values correspond to analog outputs sent by the module. For example, if the analog range is -10 V to +10 V, the digital range is -10.0 to +10.0, the HSP scale is 10.0, and the LSP scale is -10.0. The digital values -10.0 to +10.0 correspond to the analog values -10 V to +10 V, as the example below shows.



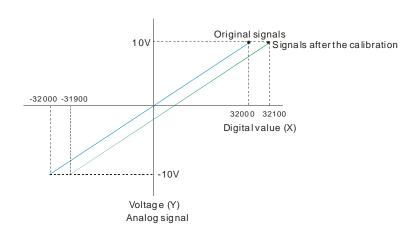
2. Calibration

To make a curve meet specific needs, calibrate the curve by changing the offset and the gain. The calibration range depends on the range of inputs that the hardware can receive. The formula is:

$$Output = \frac{(Input \times Gain)}{1000} + Offset$$

Example:

A channel receives voltage inputs between -10.0 V to +10.0 V. The gain is 1000, and the offset is 0. The corresponding value for the original signal -10.0 V to +10.0 V is -32000 to +32000. If you change the offset to -100, the calibrated value for the original signal -10.0 V to +10.0 V becomes -31900 to +32100.



3. Average function

There are two kinds of averages, including moving average and time average; the setting range is 1 to 1000. When the setting value (sampling value) is 1, averaging is not executed. Moving average is to use the lastest N number of read values to perform averaging and thus the latest digital output values can be obtained. Thus in moving average, digital value updating cycle = sampling cycle. For time average, it is to accumulate sampling cycle for a time set and then perform averaging on the total value. Thus in time average, digital value updating cycle = sampling cycle is 20 μ s and set the time to 1000, the digital value updating cycle is 200 ms (20 μ s x 1000).

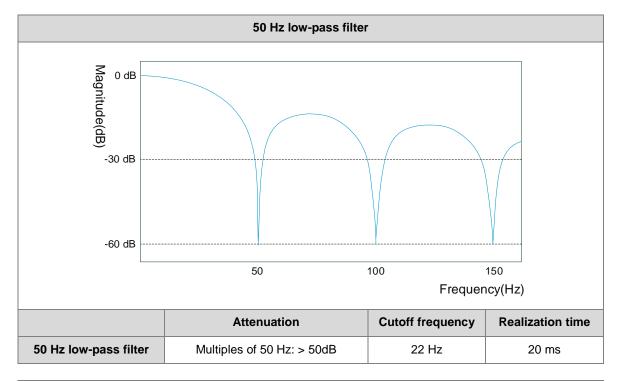
| Average | Setting range | Digital value updating cycle |
|----------------|---------------|------------------------------|
| Moving average | 4 4000 | Sampling cycle |
| Time average | 1~1000 | Sampling cycle × times |

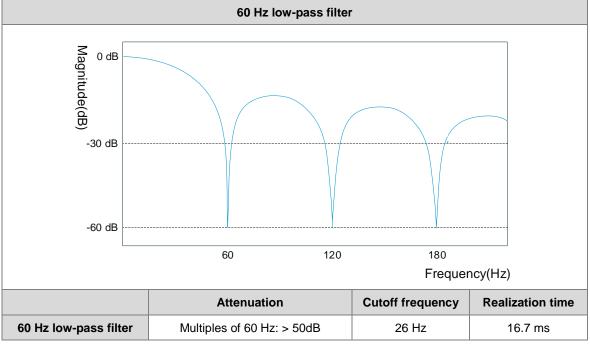
4. Digital filtering

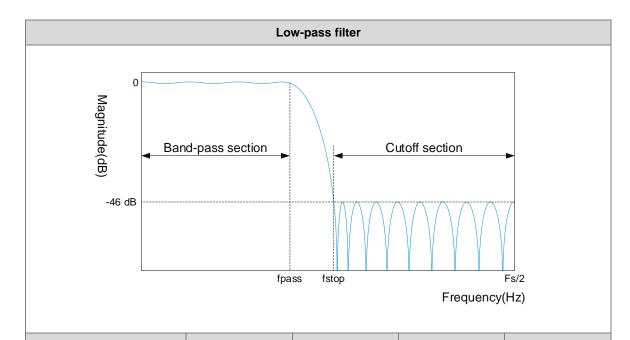
AS02ADH-A comes with various digital filters. You can use low-pass filter to screen out some specific frequency or use band-pass filter to perform filtering on some specific range of frequency. According to the sampling cycle, you choose an apportate digital filter; refer the table below.

| Sampling cycle Filter | 20 µs | 40 µs | 80 µs |
|-----------------------------|-------|-------|-------|
| 50 Hz low-pass filter | • | • | • |
| 60 Hz low-pass filter | • | • | • |
| 1 kHz low-pass filter | - | • | • |
| 3 kHz low-pass filter | - | • | • |
| 5 kHz low-pass filter | - | • | • |
| 7 kHz low-pass filter | - | • | - |
| 9 kHz low-pass filter | - | • | - |
| 11 kHz low-pass filter | - | • | - |
| 1.5~3 kHz band-pass filter | - | • | • |
| 3~5.5 kHz band-pass filter | - | • | • |
| 5.5~8 kHz band-pass filter | - | • | - |
| 8~10.5 kHz band-pass filter | - | • | - |



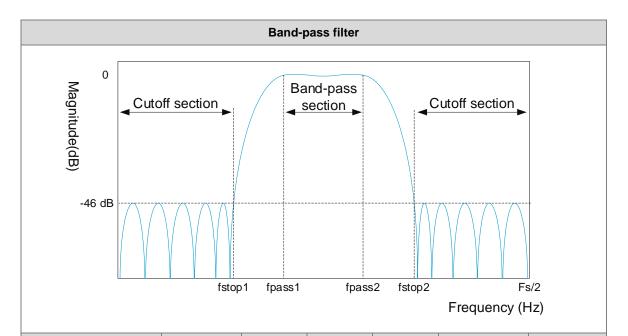






| | Sampling cycle | fpass | fstop | Realization time |
|-------------------------|----------------|--------|----------|------------------|
| 1 kHz low-pass filter | 40 µs | 1 kHz | 2.5 kHz | 1.28 ms |
| i knz iow-pass iiitei | 80 µs | 1 kHz | 1.75 kHz | 2.56 ms |
| 2 kHz low poor filter | 40 µs | 3 kHz | 4.5 kHz | 1.28 ms |
| 3 kHz low-pass filter | 80 µs | 3 kHz | 3.75 kHz | 2.56 ms |
| E kille law page filter | 40 µs | 5 kHz | 6.5 kHz | 1.28 ms |
| 5 kHz low-pass filter | 80 µs | 5 kHz | 5.75 kHz | 2.56 ms |
| 7 kH= law page filter | 40 µs | 7 kHz | 8.5 kHz | 1.28 ms |
| 7 kHz low-pass filter | 80 µs | - | _ | _ |
| O kHe law page filter | 40 µs | 9 kHz | 10.5 kHz | 1.28 ms |
| 9 kHz low-pass filter | 80 µs | _ | _ | _ |
| 11 kHz low page filter | 40 µs | 11 kHz | 12.5 kHz | 1.28 ms |
| 11 kHz low-pass filter | 80 µs | - | _ | _ |

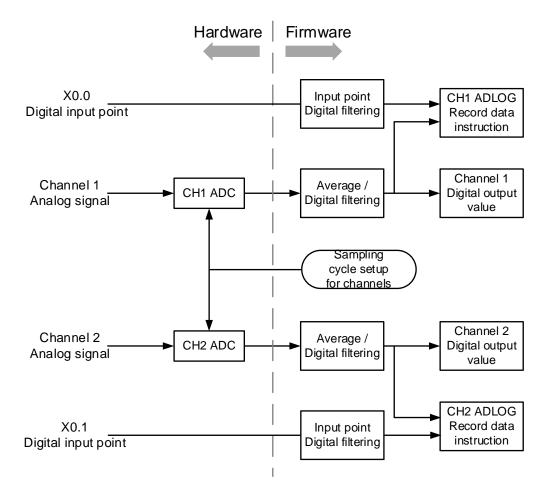




| | Sampling | fstop1 | fpass1 | fpass2 | feton? | Realization |
|------------------|----------|----------|---------|----------|----------|-------------|
| | cycle | istopi | ipassi | 1µa552 | fstop2 | time |
| 1.5~3 kHz | 40 µs | 0 | 1.5 kHz | 3 kHz | 4.5 kHz | 1.28 ms |
| band-pass filter | 80 µs | 0.75 kHz | 1.5 kHz | 3 kHz | 3.75 kHz | 2.56 ms |
| 3~5.5 kHz | 40 µs | 1.5 kHz | 3 kHz | 5.5 kHz | 7 kHz | 1.28 ms |
| band-pass filter | 80 µs | 2.25 kHz | 3 kHz | 5.5 kHz | 6.25 kHz | 2.56 ms |
| 5.5~8 kHz | 40 µs | 4 kHz | 5.5 kHz | 8 kHz | 9.5 kHz | 1.28 ms |
| band-pass filter | 80 µs | _ | _ | _ | - | _ |
| 8~10.5 kHz | 40 µs | 6.5 kHz | 8 kHz | 10.5 kHz | 12 kHz | 1.28 ms |
| band-pass filter | 80 µs | _ | _ | _ | _ | _ |

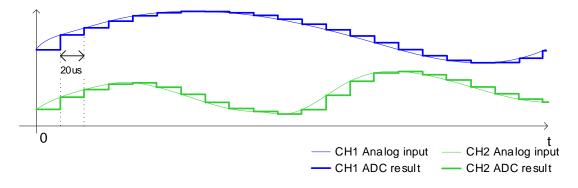
5. Sampling cycle

The conversion rate of analog to digital signals can be set to 20 μ s, 40 μ s or 80 μ s per sampling cycle for two channels simultaneously. See the framework below.



Example:

The conversion rate of analog to digital signals used in this example is 20 µs per sampling cycle for two channels simultaneously.

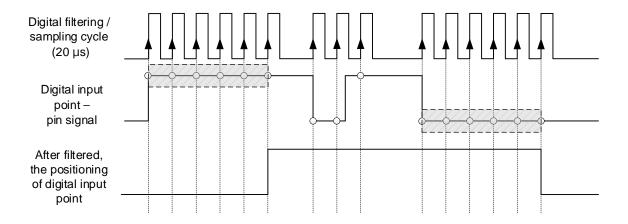




6. External input point trigger for digital filtering

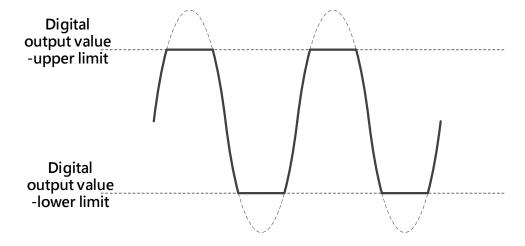
Input point filtering is available to reduce the chance of being triggered by mistake or interferences: you can set the digital filtering cycle to 0 (disabled), $100 \mu s$, $200 \mu s$, $500 \mu s$ according to your requirement.

The filtering cycle used in this example is 100 µs.



7. Digital output range

When the digital output value is out of the range (-32384 to 32384), the digital clipping is used to fix the exceeding value to the maximum / minimum digital output value.



8. Channel detection and alarm

If an input signal exceeds the allowable hardware input range, an error message appears and error LED starts to blink. You can disable this function in the setting of Channel Detect and Alarm so that the module does not produce an alarm or a warning when the input signal exceeds the input range.

9. Logging function

AS02ADH can record 10000 piece of data, if used with instructions ADLOG and DADLOG (API 1424), you can set up the parameters, enable or disable recording for channels. Refer to section 6.15 (API14 Module Instructions) from AS Series Programming Manual for more information.

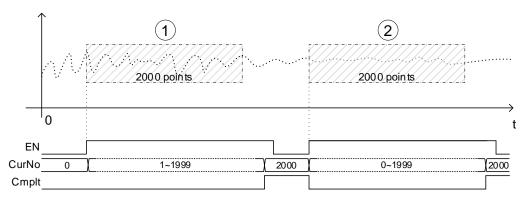
| Instruction | Symbol | Functions |
|--------------------|---|--|
| ADLOG (16-bit) | ADLOG En Group Datalog — Module CurNo — ChNo Cmplt — Mode Error — Period ErrCode — Points Postrig | Enable / disable recording Record mode: Fixed period, Fixed period + Trigger start, Point logging, Fixed period + Trigger position assign Recording cycle: multiples of 1~32000 Total number of all records: 1~2000 The number of records before/after being triggered: 0~2000 |
| DADLOG (32-bit) | DADLOG En Group Datalog Module CurNo ChNo Cmplt Mode Error Period ErrCode Points Postrig | When the output value is in floating-point format, you need to use this 32-bit instruction. The fuctions for 32-bit instruction are the same as they are stated for 16-bit instruction above. |

AS02ADH-A can record the shortest time (20 μ s) of data and the longest time (2.56 s) of data. It can also record by external input point triggering or as every single log recording. Up to 2000 pieces of data can be recorded. And there are four recording modes are available.

(1) Fixed period mode: Set **Mode**=0, the data recording would be performed according to the pre-defined record period when **EN** switches to ON. After the recording of a specified number of log points is complete, the **Cmplt** flag would be set to High automatically.

Example:

Set Points = 2000



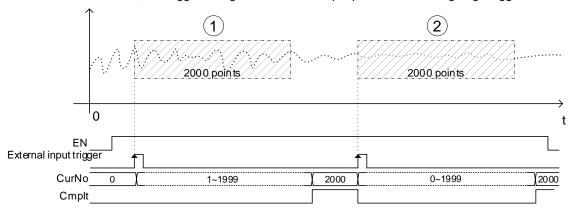


(2) Fixed period + Trigger start mode: Set Mode=1 and switch instruction EN to ON before the recording starts. When a trigger signal is detected at the external input point, start recording based on the predefined record period. And the Cmplt flag is set to High automatically when completed. Before the recording is complete, any operation at the external input points does NOT affect the proceeding of record. When the recording of log points is complete and the Cmplt flag is High, trigger the external input points again to start a new cycle of recording; the instruction EN does NOT required to be turned OFF and then ON again to start another new recording.

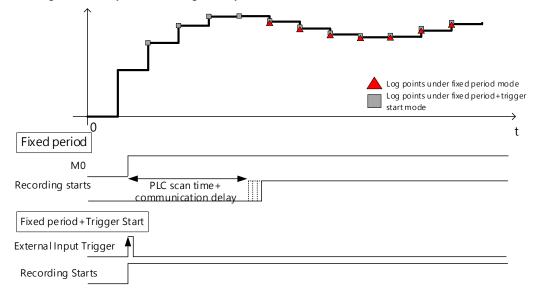
| Record | The signal source corresponding to the external input points | |
|-----------|--|--|
| Channel | (Set the timing for external input trigger in HWCONFIG) | |
| Channel 1 | X0.0 rising-edge or falling-edge triggered | |
| Channel 2 | X0.1 rising-edge or falling-edge triggered | |

Example:

Set Points = 2000, the trigger timing for the external input point is set to rising-edge triggered.



The feature of Fixed period + Trigger Start is similar to Fixed period. But the start timing of recording in Fixed period mode would be delayed as a result of PLC scan time and module communication time, which is shown in the following illustration. It is assumed that M0 is the device to control EN of ADLOG instruction. We can see when M0 switches from OFF to ON, the module does not start recording immediately but with a slight delay.

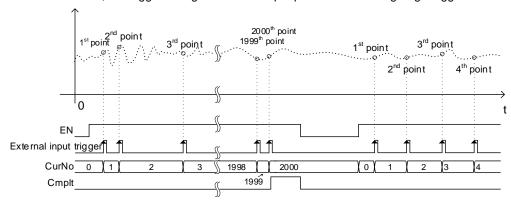


(3) Point Logging mode: Set **Mode**=2, turn the instruction EN to ON before the recording starts. One log point would be recorded for each triggering at external input point until it reaches the pre-defined point number, **Cmplt** flag would set to High automatically. If you need to the recording to be continued after the **Cmplt** flag is set to High, execute the instruction again.

| Record | The signal source corresponding to the external input points | |
|-----------|--|--|
| Channel | (Set the timing for external input trigger in HWCONFIG) | |
| Channel 1 | X0.0 rising-edge or falling-edge triggered | |
| Channel 2 | X0.1 rising-edge or falling-edge triggered | |

Example:

Set **Points** = 2000, the trigger timing for external input point is set to rising-edge triggered.



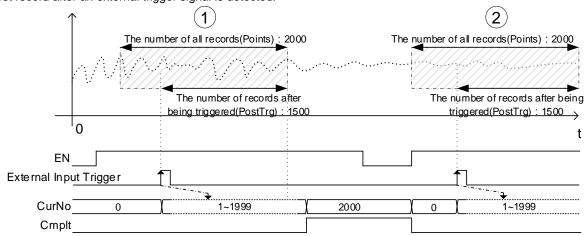
(4) Fixed period + Trigger position Assign mode: Set **Mode**=3 and set parameters **Points** and **PostTrg** according to your requirements. This mode is to trigger at the external input point and record the predefined number of log points before and after the triggering occurs. When using EN to turn on this mode, AS02ADH-A would start waiting for signals to be triggered at external input. And the sampling would start right after, until it reaches the pre-defined point number, and then **Cmplt** flag would set to High automatically. The value in **CurNo** is 0 before triggered, and after triggered, the modules start to send the before-triggered data log to the PLC CPU . Therefore the value of **CurNo** would catch up to the number of accumulated log points.

| Record | The signal source corresponding to the external input points | |
|-----------|--|--|
| Channel | (Set the timing for external input trigger in HWCONFIG) | |
| Channel 1 | X0.0 rising-edge or falling-edge triggered | |
| Channel 2 | X0.1 rising-edge or falling-edge triggered | |



Example

Set **Mode**=3, **Points** = 2000, and **PostTrg** = 1500 so the position of point 501 (**Points** – **PostTrg**) would be the first record after an external trigger signal is detected.



10. Peak records for channels

AS02ADH can record 10000 piece of data, if used with instructions ADPEAK and DADPEAK (API 1425) to save the maximum and minimum value for channels. Refer to section 6.15 (API14 Module Instructions) from AS Series Programming Manual for more information.

| Instruction | Symbol | Functions |
|---------------------|---|--|
| ADPEAK (16-bit) | ADPEAK En Group MAX Module MIN ChNo Error ErrCode | Enable / disable peak data recording |
| DADPEAK (32-bit) | DADPEAK En Group MAX Module MIN ChNo Error ErrCode | When the output value is in floating-point format, you need to use this 32-bit instruction. The fuctions for 32-bit instruction are the same as they are stated for 16-bit instruction above. |

11. Disconnection detection

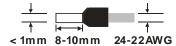
Disconnection detection only operates when the analog range is 4–20 mA or 1–5 V. If a module that can receive inputs between 4–20 mA or from 1–5 V is disconnected, the input signal exceeds the range of allowable inputs, so the module produces an alarm or a warning.

15.2.6 Wiring

Precautions

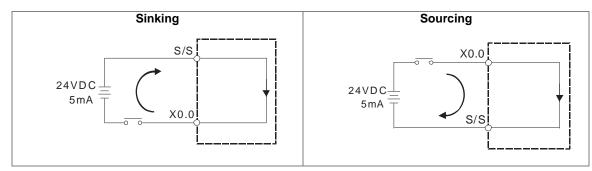
To ensure the analog-to-digital module functions well and reliably, the external wiring must prevent noise. Before you install the cables, follow the precautions below.

- (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 100 ohm.

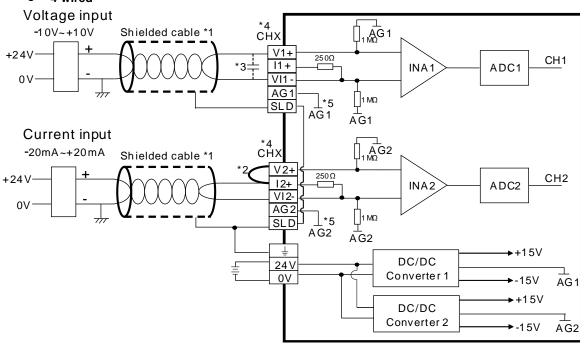
15.2.6.1 Digital Input Wiring





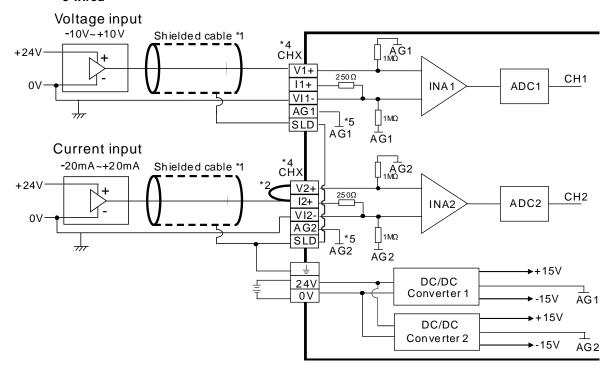
15.2.6.2 Analog Input Wiring

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 μ 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.

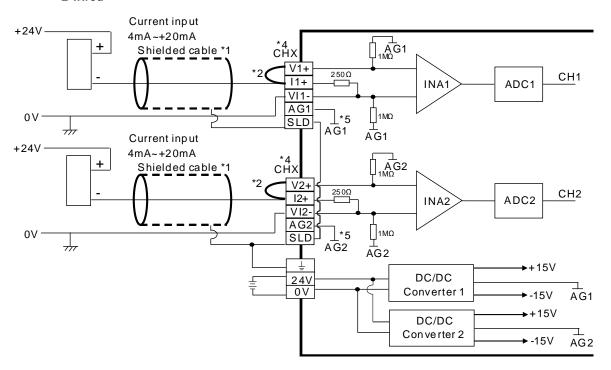
• 3-wired



- *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 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 μF 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.



• 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 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.

15.2.7 LED Indicators

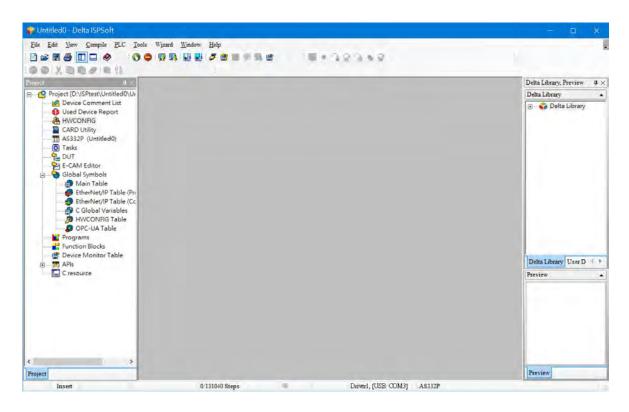
| Printed as | Function | Description |
|------------|--|---|
| PWR | Power indicator | Power status of the module ON: The power supply is normal. OFF: No power supply |
| ERR | ERROR indicator | Error status of the module ON: a major error occurs in the module. OFF: the module is operating normally. Blink: a minor error occurs in the module. |
| X0.0 | X0.0 input status indicator | ON: The X0.0 input is active. OFF: The X0.0 input is not active. |
| X0.1 | X0.1 input status indicator | ON: The X0.1 input is active. OFF: The X0.1 input is not active. |
| AD1 | CH1 analog to digital conversion indicator | Analog-to-digital conversion status Blinking: conversion is in process. |
| AD2 | CH2 analog to digital conversion indicator | OFF: conversion has stopped. |



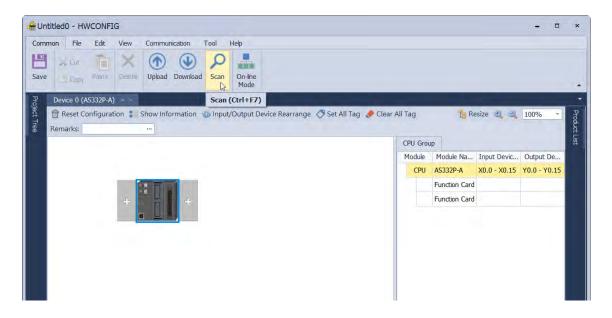
15.3HWCONFIG in ISPSoft

15.3.1 Initial Setting

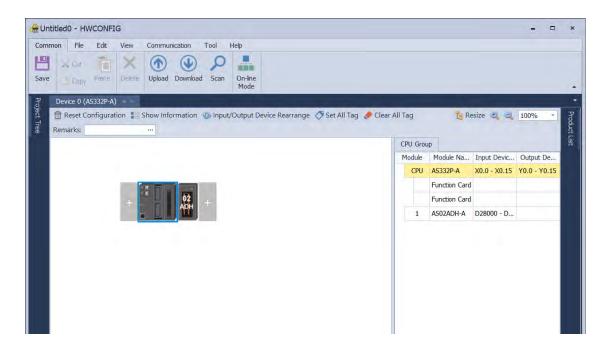
(1) Start ISPSoft and double-click HWCONFIG.



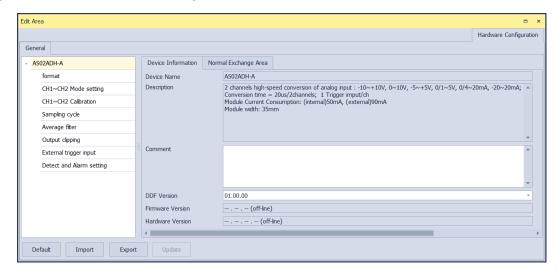
(2) Click Scan to see the available devices.



(3) After the scanning is completed, AS02ADH will appear in the following window.

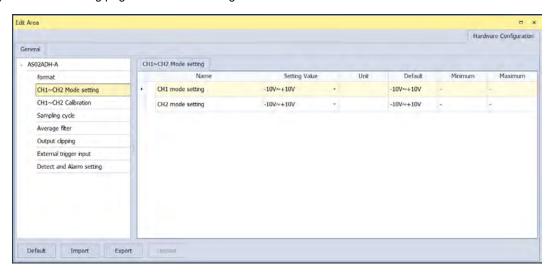


(4) Select AS02ADH and set module parameters.

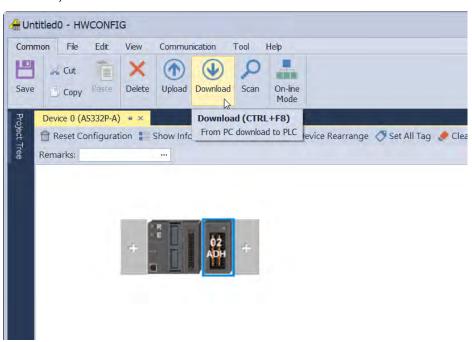




(5) Close the setting page to finish the setting.

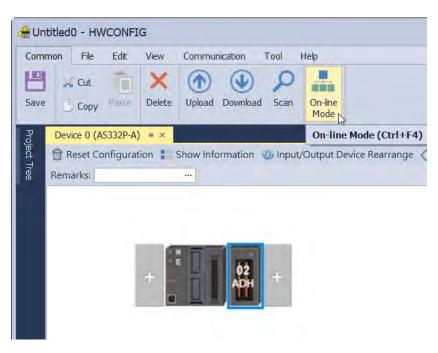


(6) Click **Download** to download the configuration data. (The download can not be performed if the CPU is in RUN state)



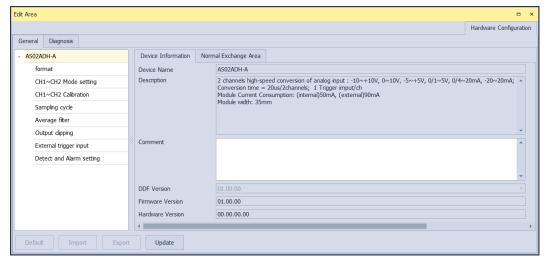
15.3.2 Checking the Version of a Module

(1) Click Common menu > On-line Mode.



(2) Double-click AS02ADH module to check the firmware version and hardware version.

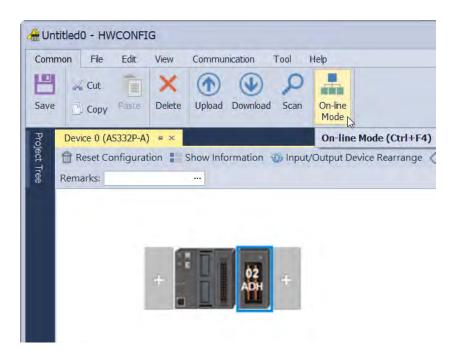






15.3.3 Online Mode

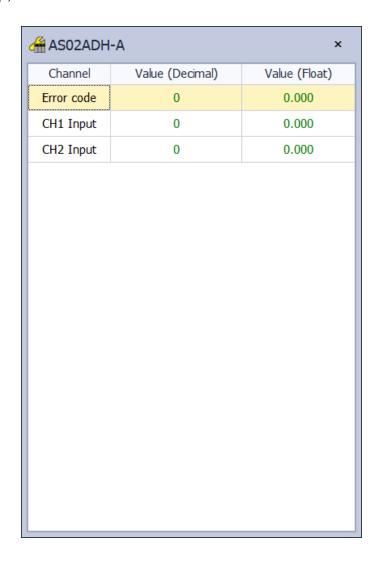
(1) Click On-line Mode to enter the online mode.



(2) Right-click the module and click **Module State** or **Diagnosis**. You can find digital output value and error codes in **Module State** and the error log can be found in **Diagnosis**.



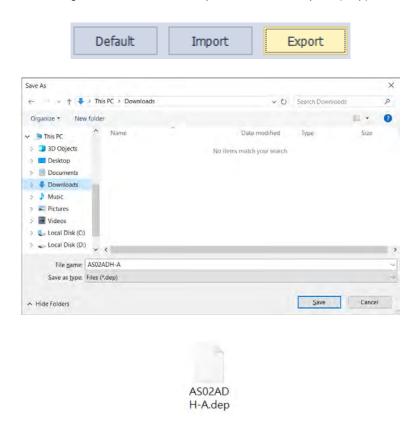
(1) View the module state.



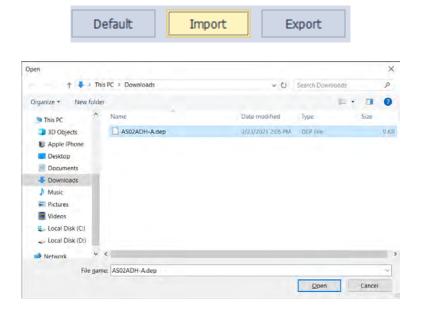


15.3.4 Importing/Exporting a Parameter File

(1) Click **Export** in the dialog box to save the current parameters as a dep file (.dep).

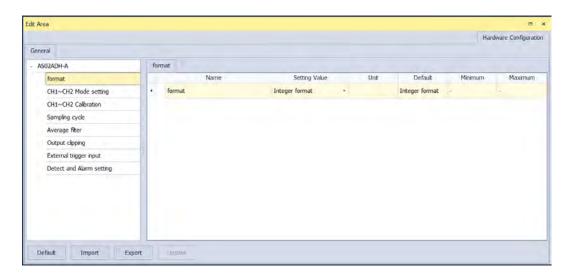


(2) Click **Import** in the dialog box and select a dep file to save parameters.

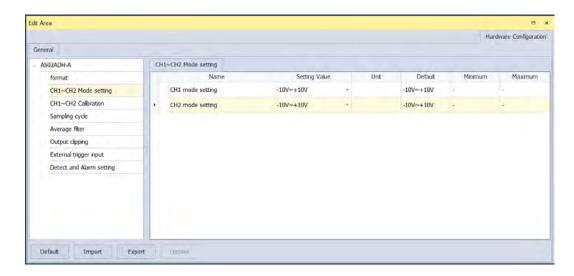


15.3.5 Parameters

(1) Set up the parameters.

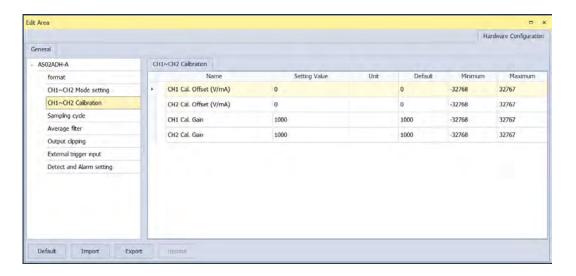


(2) The CH1-CH2 (channel 1-channel 2) mode settings

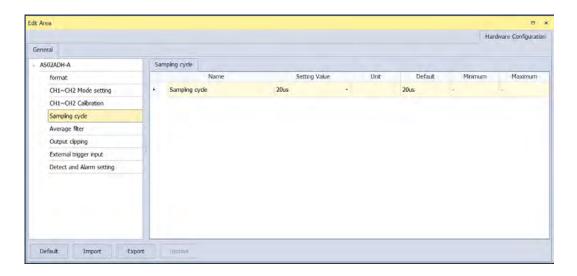




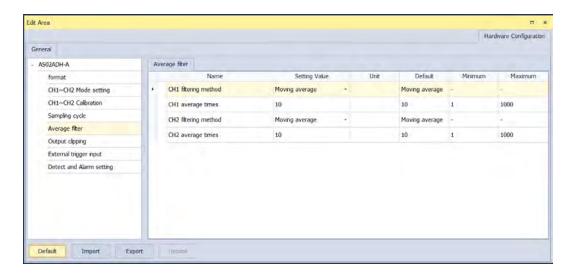
(3) The CH1-CH2 calibration settings



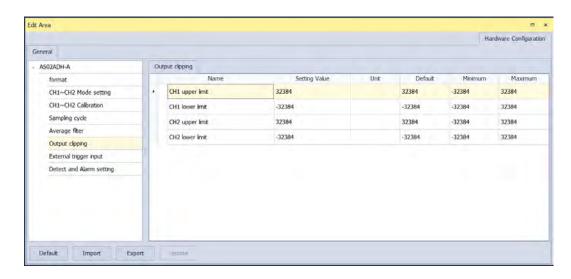
(4) The sampling cycle settings



(5) The average filter settings



(6) The output clipping settings

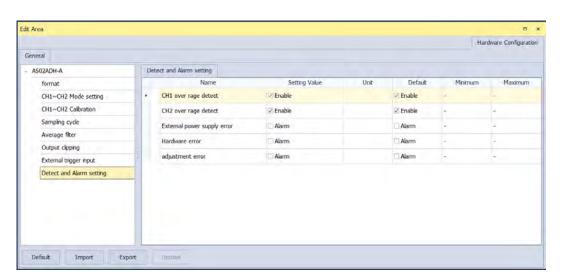




(7) The external trigger input settings



(8) The detect and alarm settings



15.4 Troubleshooting

15.4.1 Error Codes

| Error | Description | A → D LED | ERROR LED |
|----------|--|----------------------------|---------------|
| Code | Description | Indicator | Indicator |
| 16#1605 | Hardware feilure | Run: Blinking | ON |
| | Hardware failure | Stop: OFF | |
| 40#4000 | | Run: Blinking | ON |
| 16#1606 | The parameter setting is not consistent. (alarm) | Stop: OFF | |
| 16#1607 | The external voltage is abnormal. (alarm) | OFF | ON |
| 16#1609 | The feetening libraries is also associated by | Run: Blinking | ON |
| 16#1608 | The factory calibration is abnormal. (alarm) | Stop: OFF | |
| 16#1801 | The external voltage is abnormal. | OFF | Blinking |
| 40//4000 | | Run: Blinking | Blinking |
| 16#1802 | Hardware failure | Stop: OFF | |
| 16#1904 | The feetening liberties in the course | Run: Blinking | Blinking |
| 16#1804 | The factory calibration is abnormal. | Stop: OFF | |
| 16#1808 | The signal received by channel 1 exceeds the range of inputs | | |
| 10#1000 | that the hardware can receive. | Run: Blinking Stop: OFF | Blinking |
| 16#1809 | The signal received by channel 2 exceeds the range of inputs | | |
| 16#1809 | that the hardware can receive. | | |
| | When power-on, the module is not detected by CPU module. | OFF | Blinking once |
| - | | | or twice and |
| | | | after 2 |
| | | | seconds, it |
| | | | blinks |
| | | | repeatedly |



15.4.2 Troubleshooting Procedure

| Description | Procedure |
|---|--|
| The external voltage is abnormal. | Make sure the external 24 V power supply to the module is functioning normally. |
| Hardware failure | Return the module to the factory for repair. |
| Internal error The factory calibration is abnormal. | Contact the factory. |
| The signal received by channel 1 exceeds the range of inputs that the hardware can receive. | Check the signal received by channel 1 |
| The signal received by channel 2 exceeds the range of inputs that the hardware can receive. | Check the signal received by channel 2. |
| 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. |