ADAM-200PN
User Manual

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Chapter 0 Legal Information

Copyright

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Product Warranty

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of- warranty repairs, customers will be billed according to the cost of replacement mate- rials, service time, and freight. Please consult your dealer for more details.

If you believe your product is defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the prob- lem occurs.

2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.

3. If your product is diagnosed as defective, obtain a return merchandise authori- zation (RMA) number from your dealer. This allows us to process your return more quickly.

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4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of pur- chase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the pack- age prepaid to your dealer.

Part No. 2003200P00
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Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This type of cable is available from Advantech. Please contact your local supplier for ordering information.

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electro- static discharge (ESD) and EMI leakage, we strongly recommend the use of CE- compliant industrial enclosure products.

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A dig- ital device, pursuant to part 15 of the FCC Rules. These limits are designed to pro- vide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Opera- tion of this equipment in a residential area is likely to cause harmful interference. In this event, users are required to correct the interference at their own expense.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.

2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:

  – Product name and serial number
  – Description of your peripheral attachments
  – Description of your software (operating system, version, application software, etc.)
  – A complete description of the problem
  – The exact wording of any error messages

Safety Instructions

1. Read these safety instructions carefully.

2. Retain this user manual for future reference.

3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.

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4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.

5. Protect the equipment from humidity.

6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.

7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.

8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.

9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.

10. All cautions and warnings on the equipment should be noted.

11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.

12. Although this product is IP67 level, even with M12 waterproof cover/sealing cap covered, besides the normal usage, never maliciously pour or powerfully inject liquid into an opening. This may cause fire or electrical shock.

13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.

14. If one of the following occurs, have the equipment checked by service person:
– The power cord or plug is damaged.
– Liquid has penetrated the equipment.
– The equipment without M12 waterproof cover/sealing cap covered has been exposed to environment that exceed IP67 protection level.
– The equipment is malfunctioning, or does not operate according to the user manual.
– The equipment has been dropped and damaged.
– The equipment shows obvious signs of breakage.

15. Do not leave the equipment in an environment with a storage or operation temperature of below -40 °C (-40 °F) or above 60 °C (140 °F) as this may damage the components. The equipment should be kept in a controlled environment.

16. CAUTION: There's no lithium battery just with EDLC (5.5V/0.33F super capacitor) on the PCBA inside the product, there's at risk of burning if incorrectly replaced. It's suggested that don't replace the capacitor by yourself, please contact manufacturer for replacement, and replacement only with the same or equivalent type as recommended by the manufacturer. Discard used capacitors according to the manufacturer's instructions.

17. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all

responsibility for the accuracy of any statements contained herein.

18. Equipment is intended for installation in Restricted Access Area.

19. This product is intended to be supplied by a UL listed (Certificate) power supply, output rated $24V_{DC}$, 12Ax2 minimum, T_{ma} 60 °C (140 °F) minimum and altitude 2000m, if need further assistance, please contact Advantech or UL file owner or brand owner for further information.

20. The external devices connected to the highlighted I/O ports below must be Advantech-specified devices and comply with the fire enclosure standard:
     - X1~X8 ports

21. The power outlet socket should have grounded connection.

Instructions de sécurité - Français (Canada)

1. Lisez attentivement ces consignes de sécurité.

2. Conservez ce manuel d'utilisation pour référence ultérieure.

3. Débranchez l'appareil de toutes les prises de courant avant de le nettoyer. Utilisez seulement un linge humide pour le nettoyage. N'utilisez pas de détergents liquides ou en spray.

4. Pour les appareils enfichables, la prise de courant doit être située près de l'appareil et facilement accessible.

5. Protégez l'appareil de l'humidité.

6. Placez l'appareil sur une surface stable pendant l'installation. Une chute ou un contact avec l'appareil peut l'endommager.

7. Les ouvertures du boîtier permettent la convection d'air. Protégez l'appareil de la surchauffe. Ne les couvrez pas.

8. Assurez-vous que la tension de la source d'alimentation est correcte avant de brancher l'appareil dans une prise secteur.

9. Éloignez le cordon d'alimentation des zones à fort passage. Ne rien mettre dessus.

10. Veuillez lire attentivement tous les avertissements et mises en garde sur l'appareil.

11. Si l'appareil n'est pas utilisé pendant une longue période, débranchez-le de la source d'alimentation afin d'éviter tout dommage dû à une surtension transitoire.

12. Bien que ce produit soit conforme à la norme IP67, même avec un couvercle/capuchon d'étanchéité M12, en dehors d'une utilisation normale, ne versez jamais de liquide par mégarde ou par injection puissante dans une ouverture. Ça pourrait causer un incendie ou une électrocution.

13. N'ouvrez jamais l'appareil. Pour des raisons de sécurité, l'ouverture de l'appareil doit être effectuée uniquement par un technicien qualifié.

14. Si l'un des événements suivants se produit, faites vérifier l'appareil par un technicien :

– Le cordon d'alimentation ou la prise est endommagé.

– Du liquide a pénétré dans l'appareil.

   – L'appareil sans couvercle/capuchon d'étanchéité M12 a été exposé à un environnement dépassant la norme IP67.

   – L'appareil fonctionne mal ou ne fonctionne pas conformément au manuel d'utilisation.

   – L'appareil est tombé et a été endommagé.

   – L'appareil montre des signes évidents de casse.

15. Ne laissez pas l'équipement dans un environnement dont la température d'entreposage ou de fonctionnement est inférieure à -40 °C (-40 °F) ou supérieure à 60 °C (140 °F), car cela pourrait endommager les composants. L'équipement doit être conservé dans un environnement contrôlé.

16. ATTENTION : Le produit ne contient pas de batterie au lithium, mais un supercondensateur EDLC (5,5 V/0,33 F) sur le circuit imprimé. Un remplacement incorrect comporte un risque de brûlure. Il est déconseillé de remplacer le condensateur vous-même. Veuillez contacter le fabricant pour obtenir un remplacement et utilisez seulement un condensateur de type identique ou équivalent, conformément aux recommandations du fabricant. Débarrassez-vous des condensateurs usagés conformément aux instructions du fabricant.

17. Conformément à la norme CEI 704-1:1982, le niveau de pression acoustique au poste de l'opérateur ne doit pas dépasser 70 dB(A).

AVERTISSEMENT : Ces instructions sont fournies conformément à la norme CEI 704-1. Advantech décline toute responsabilité quant à l'exactitude des déclarations contenues dans le présent document.

18. L'équipement est destiné à être installé dans une zone d'accès restreint.

19. Ce produit est conçu pour être alimenté par une alimentation homologuée UL (certifiée), d'une puissance nominale de sortie de 24 V_{DC}, 12 Ax2 minimum, une température ambiante de 60 °C (140 °F) minimum et une altitude de 2 000 m. Pour toute assistance, veuillez contacter Advantech, le propriétaire du fichier UL ou le propriétaire de la marque.

20. Les périphériques externes connectés aux ports d'E/S indiqués ci-dessous doivent être des périphériques spécifiés par Advantech et conformes à la norme relative aux enceintes coupe-feu :
    - Ports X1 à X8

21. La prise de courant doit être mise à la terre

Chapter 1 Product Overview

1.1 Product Positioning

The ADAM-200PN series is a line of Ethernet-based data acquisition and control (DA&C) modules that integrate I/O functions, network connectivity, and real-time data transmission into a compact, rugged design. By combining I/O data collection, acquisition logic, and industrial Ethernet communication in a single module, the ADAM-200PN series enables the construction of cost-effective and scalable machine mount distributed monitoring and control systems.

Through a standard Ethernet infrastructure—whether LAN, intranet, or public Internet—these modules can acquire I/O signals from field devices or sensors and publish them in real time to connected control systems or cloud-based applications. The built-in support for PROFINET, Modbus/TCP or extensible IoT protocols ensures seamless integration into both IT and OT environments.

All ADAM-200PN modules are designed with IP67-rated enclosures and compliance with EN 50155, capable of operating in wide temperature ranges and resisting high levels of electromagnetic interference (EMI), vibration, and mechanical shock. This industrial-grade durability allows for direct installation on long and heavy machinery, outdoor facilities, or flexible walls or surface without requiring protective control cabinets.

With their compact form factor and robust reliability, the ADAM-200PN series is well-suited for diverse applications including:
➢ Railway or transportation surrounding facilities automation
➢ Harbor crane
➢ Mining conveyors, loaders, crushers, drills, etc.
➢ Oil and gas pipeline, drilling and tank
➢ Wind tower nacelle and energy infrastructure utilities
➢ Automotive robotic assembly and testing systems
➢ Food and beverage, chemical production lines

These features make ADAM-200PN modules ideal for both centralized control systems and distributed field-level data collection in demanding industrial environments.

Mounting position

ADAM-200PN series is design You can mount the ADAM-200PN distributed I/O devices in any cabinet and cabinet-free mounting position, no matter indoor or outdoor.

Minimum clearances

Please make sure that the I/O devices are installed with a minimum clearance of 2 cm up to max. 60 °C

ambient temperature. If the installation distance to other devices or objects is less than 2 cm, the ambient temperature must be reduced by 5 K (for example, 60 °C ⇒ 55 °C).

Simple installation

The ADAM-200PN IP67 machine mount distributed remote I/O devices are designed for easy installation.

➢ The I/O device should be mounted on a level solid surface.

➢ The I/O device can be pre-wired

➢ The I/O device can be direct machine mount, near the sensors, actuators, PLC, etc. with minimum wiring.

➢ The I/O device supports ethernet and power daisy-chain and power supply for sensor/actuators/encoders

Mounting rules

When mounting the I/O device, you do not need to following any special rules.

Mounting of the I/O devices

Install the ADAM-200PN M12 distributed I/O devices only with disconnected supply and load voltages.

1.2 Product Properties

The ADAM-200PN series I/O device has the following technical properties:

➢ Using the MultiFieldbus function, it connects ADAM-200PN distributed I/O system with one of the bus protocols such as PROFINET or Modbus/TCP, enough hardware resources are reserved for IoT protocols and function expansion

➢ Enables both cabinet and cabinet-free installation with flexible front and side wall/machine mounting

➢ Integrated switch with 2 ports, offers power/ethernet daisy chain and configurable IO ports

➢ Support I/O and power diagnostic functions

➢ Support complete LED indicator with clear system/network/diagnostic/power status reading

➢ Support both screw lock and push-pull fast-locking M12 connector for connection of sensors or actuators

➢ Rugged and IP67 design withstands strong EMI, vibration, dust, oil, and humidity atmospheres—ideal for outdoor and hazardous applications

➢ A-code M12 built in output current : For sensor/actuator/encoder power supply

➢ Support printable marking label installation

➢ Upper 4 ports M12 signals connected to Us (1L+) (non-switched) and lower 4 ports M12 signals connected to U_A (2L+) (switched)

➢ 24 V_{DC} supply voltage

➢ Configurable diagnostics can be set for each channel

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- Configurable hardware interrupt can be set for each channel
- Suitable for switches and proximity switches
- Rated load voltage 24 V$_{DC}$
- Dimensions 200 x 60 x 31.5 mm

1.3 Features Highlights

1.3.1 Easier Installation and Deployment

Daisy Chain connection for both power and ethernet ports
ADAM-200PN module has built in Ethernet switches to allow daisy chain connections in an Ethernet network, making it easier to deploy, and helping improve scalability. The two Ethernet ports are fully compliant with IEEE 802.3u 100Mbpst through standard RJ-45 connectors
Although daisy chain topology brings attractive benefits for users, it still comes with the risk that once any device in the daisy-chain network suffers power outage, it will cause the disconnection of all devices downstream..

1.3.2 Automation application with supported protocols

The ADAM-200PN series supports the PROFINET protocol with full compliance to real-time communication requirements. It includes advanced features such as:
1. RT (Real-Time) Class B communication with deterministic 1 ms update cycles
2. LLDP (Link Layer Discovery Protocol) :
ADAM-200PN supports the LLDP protocol based on IEEE 802.1AB. This feature enables automatic topology detection and simplifies device commissioning in PROFINET networks.
Benefits:
- Automatically detects neighboring devices and network topology
- Simplifies replacement of I/O modules without reconfiguration
- Provides better error localization and faster troubleshooting
- Enables engineering tools to visualize network connections
When LLDP is enabled, the module exchanges device and connection information with adjacent PROFINET nodes, which can be displayed in topology or diagnostic views within the engineering software.
3. I&M Data (I&M0–I&M4) for asset identification, maintenance traceability, and device diagnostics
4. MRP (Media Redundancy Protocol) Client support for network redundancy and system reliability.
ADAM-200PN supports the MRP Client function, ensuring uninterrupted communication when operating in a redundant ring topology. In the event of a single cable failure, network recovery typically

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occurs within a few milliseconds, maintaining continuous I/O data exchange between controllers and field devices.

5. Fast Start-Up (FSU) enabling system boot-up and communication in under 500ms. The feature enables extremely short boot-up and reconnection times. This is particularly useful for tool-change or modular production lines where devices need to be powered and ready for communication almost instantly.

<Note> Auto-negotiation and auto-crossing should be disabled when enabling FSU in the engineering software.

6. SNMP (Simple Network Management Protocol) for integration into IT-level device monitoring and network management systems. ADAM-200PN allows network administrators to monitor device status and interface health through standard SNMP tools or network management systems (NMS).

In addition to PROFINET, the ADAM-200PN also supports Modbus/TCP protocol, providing flexible connectivity with legacy and modern control systems simultaneously. And there're also optional MQTT and IoT features that can be built in. These multiple protocol capabilities enhances its adaptability across industrial and infrastructure applications.

1.3.3 Rugged design for hazardous environment applications

ADAM-200PN are designed to fulfill different kind of outdoor environments and mounting on operating machine/equipment/facilities.

IP67 protection for outdoor, wet and dusty environment

Wide Operating Temperature
The ADAM-200PN series supports a broad operating temperature range of -40 to 60°C.

High level industrial EMC
To counteract noise that can occur in particular environments, ADAM-200PN modules provide additional protection for surge input, EFT, and ESD protection.

Wide Power Input Range
The ADAM-200PN series modules are designed to operate with an unregulated 24 V_{DC} power input, supporting a wide voltage range from +18 V_{DC} to +30 V_{DC}. This flexibility allows for early detection of abnormal power conditions. The modules also feature reverse polarity protection and support hot-swapping, enabling safe connection or disconnection without interrupting the running PROFINET network.

Strong shock and vibration endurance

The ADAM-200PN series is fully compliant with EN 50155 and has successfully passed the IEC 61373 vibration and shock testing for railway applications (Body Mount Class B).

In addition, it exceeds standard industrial requirements by passing the rigorous EN/IEC 60068-2-6 (vibration) and EN/IEC 60068-2-27 (shock) tests, ensuring robust mechanical reliability in harsh environments. These make the ADAM-200PN ideal for use in railways and high-vibration industrial applications such as machine tools and automated production lines.

1.4 ADAM-200PN Series Family

ADAM-250PN-A is the first product from ADAM-200PN Series, 16-channel configurable DIO rugged remote IO module, we'll release more products afterwards, including analog input/output, thermal couple/RTD, etc. modules.

1.5 Mechanical Design and Dimensions

1.5.1 Dimensions
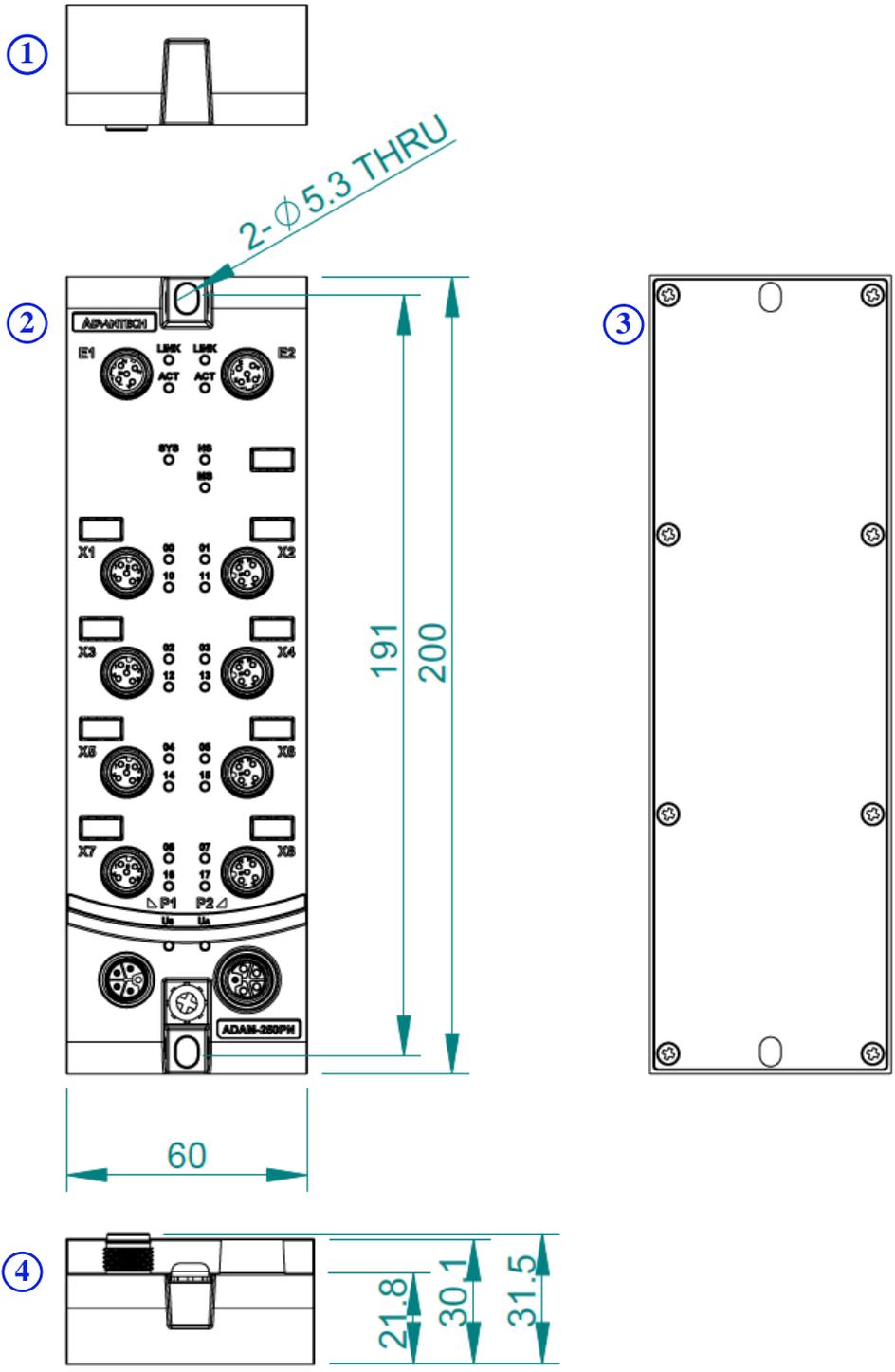
(1) Top (2) Front (3) Back (4) Bottom View

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2-⌀6 THRU
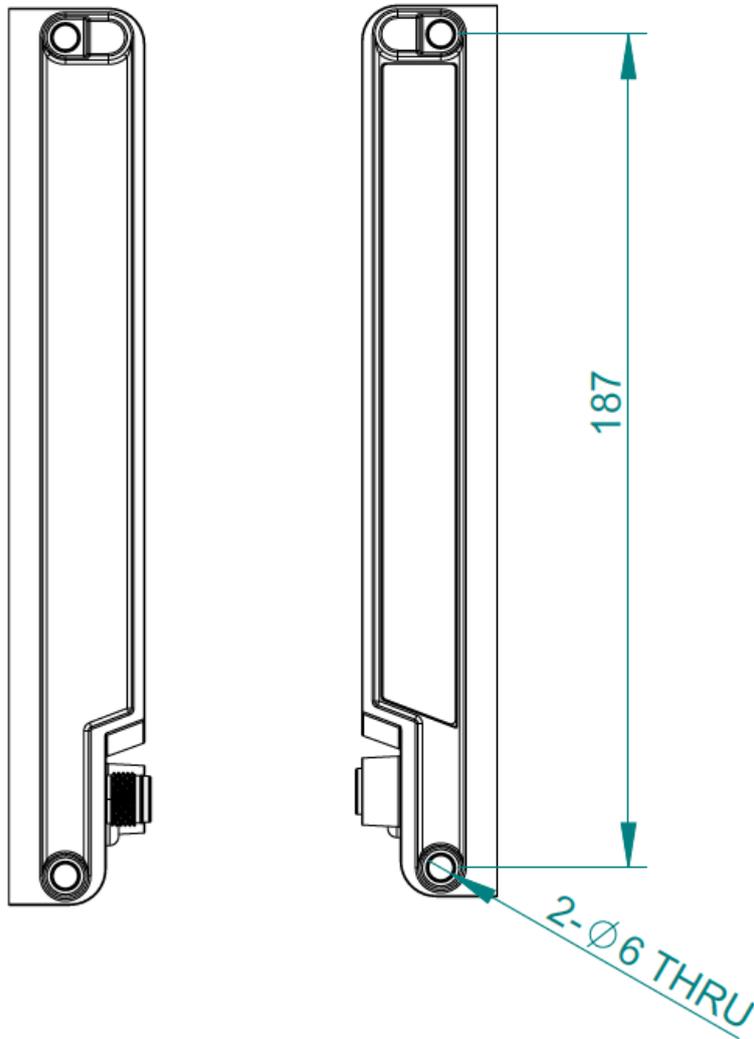
Side View: Left and Right

1.5.2 Appearance and M12 Connectors
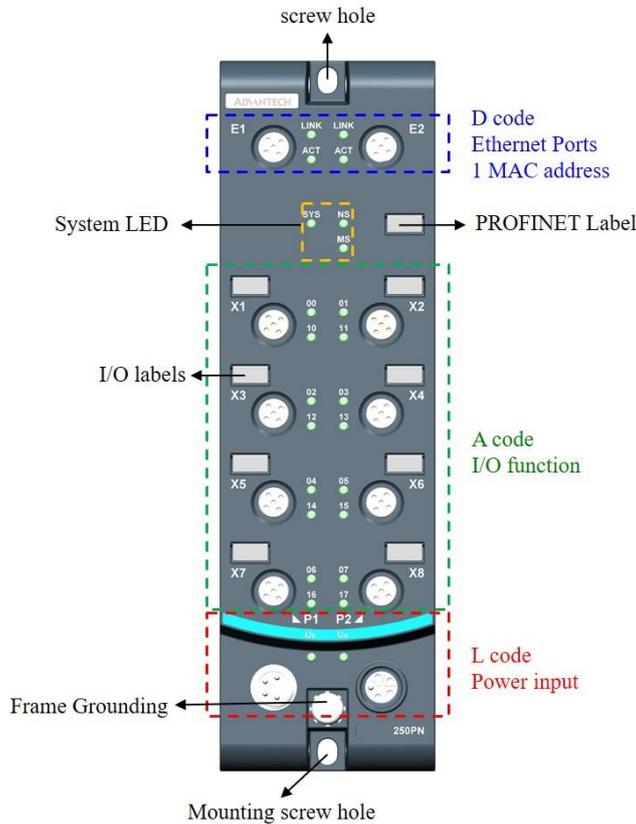
The figure below shows the appearance of the ADAM-250PN module and the location of all ports. Please refer to the table to prepare the correct M12 cable for each connection. All female ports support both push-pull fast-lock design for quick installation (IEC 61076-2-010) and screw locking (IEC 61076-2-101).

You can prepare the cables by yourself or contact Advantech/distributors to buy.

M12 Connector Port on ADAM-200PN

Area	Port	M12 Cable Type
Ethernet	E1~E2	D-code Female 4-pin
I/O	X1~X8	A-code Female 5-pin
Power Input	P1	L-code Male 5-pin
Power Output	P2	L-code Female 5-pin

Cable Type that can be used

Area	Port	M12 Cable Type
Ethernet	E1~E2	D-code Male 4-pin

I/O	X1~X8	A-code Male 5-pin
Power Input	P1	L-code Female 5-pin
Power Output	P2	L-code Male 5-pin

1.6 Property Overview
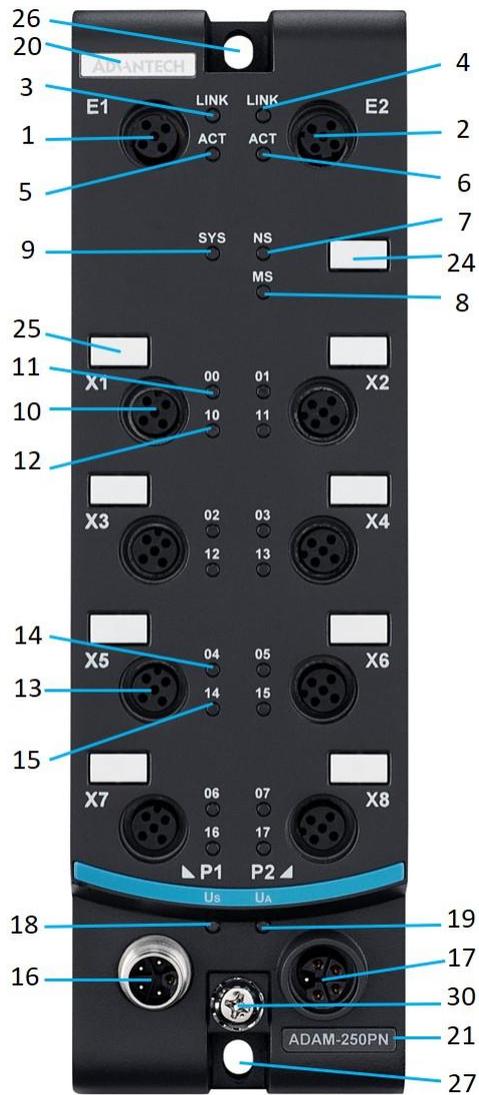
Function	Position	Designation	Description
Ethernet	1	E1	Ethernet Port 1, M12, D-coded, Female, 4-pin
	2	E2	Ethernet Port 2, M12, D-coded, Female, 4-pin
	3	LINK (E1)	Link LED for E1
	4	LINK (E2)	Link LED for E2
	5	ACT (E1)	Activity LED for E1
	6	ACT (E2)	Activity LED for E2
Indicators	7	NS	Network Status LED
	8	MS	Module Status LED
	9	SYS	System LED
Inputs/Outputs	10	X1, X2, X3, X4	ADAM-250PN: (U_S/1L+ powered) Digital Inputs/outputs, ports X1 ... X4, 2-channel, M12, A-code female 5-pin
	11	00, 01, 02, 03	Port LEDs for ports X1 ... X4, Channel (Pin 4)
	12	10, 11, 12, 13	Port LEDs for ports X1 ... X4, Channel (Pin 2)
Inputs/Outputs	13	X5, X6, X7, X8	ADAM-250PN: (U_A/2L+ powered) Digital Inputs/outputs, ports X5 ... X8, 2-channel, M12, A-code female 5-pin

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	14	04, 05, 06, 07	Port LEDs for ports X5 ... X8, Channel (Pin 4)
	15	14, 15, 16, 17	Port LEDs for ports X5 ... X8, Channel (Pin 2)
Power Supply	16	P1	Power supply input (Power In)
	17	P2	Power supply output (Power Out)
	18	U_S	U_S (1L+) power supply LED (24 V_{DC})
	19	U_A	U_A (2L+) power supply LED (24 V_{DC})
Identification	20	-	Advantech Logo
	21	-	Model Name Plate
	22	-	MAC Label and Serial Number Label
	23	-	Product Label
Marking	24	-	Module marking (printable marking label)
	25	-	Port marking (printable marking label)
Installation	26	-	Mounting hole for front mounting (upper hole)
	27	-	Mounting hole for front mounting (lower hole)
	28	-	Mounting hole for side mounting (upper hole)
	29	-	Mounting hole for side mounting (lower hole)
Frame Ground	30	-	Frame Grounding Screw

1.7 Labels
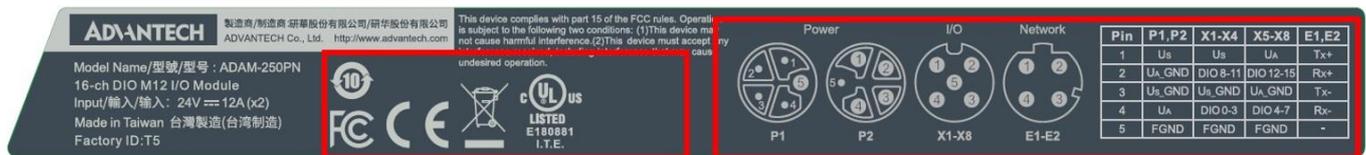
Certification mark area   M12 connector pin define

The product label is on right side of product, including product model name, product description, power information, warning tips, manufacturing country, certification mark area and M12 connector pin define description.

The MAC and Serial Number (SN) label are on the left side of the product, each product has own

specific MAC and Serial Number (SN).

1.8 Certification and Safety Standard

■ CE

- EN 55011 (Class A, Group 1)

- EN 55032 (Class A)

- EN 61000-6-4

- EN 55035

- EN 61000-6-2

- IEC 61000-4-2

- IEC 61000-4-3

- IEC 61000-4-4

- IEC 61000-4-5

- IEC 61000-4-6

- IEC 61000-4-8

■ FCC

- FCC 47 CFR PART 15 (Class A)

- ANSI C63.4 / ANSI C63.4a

■ IC ICES-003

■ REACH

■ China RoHS

■ UL 62368-1, ed. 3rd; E180881-Vol. 5

1.9 Package Information

The package of ADAM-200PN series module will contain the following items:

1. ADAM-200PN module x 1

2. ADAM-200PN Startup Manual x 1

3. Electronic information for pollution (only for China) x 1

4. Front wall mount screws x 2

5. Side wall mount screws x 2

6. Marking label cap x 10

7. M12 Plastic waterproof cover (for Female M12 port) x 9

<Note> Please check and feel free to contact us if any part missing or damaged after purchasing

ADAM-200PN product

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1.10 Accessories

Component	Function	Figure
Front wall mount screws (Default 2pcs in Product Box)	Suitable screw for "front" wall mounting the I/O device on the flat surface M5*20(L), 8.8(D)*3.5(H)	
Side wall mount screws (Default 2pcs in Product Box)	Suitable screw for "side" wall mounting the I/O device on the flat surface M5*60(L), 9(D)*3.45(H)	
Printable Marking Labels (Default 1 set in Product Box)	- Marking label supports Murrplastik ACS Labeling System (KS 5/10). Users can print on related information with a compatible printer. - 10pcs per set	
Waterproof Cover / Sealing Cap (Default 9pcs in Product Box)	If you require IP67, please put it on un-used Female M12 port for protection.	
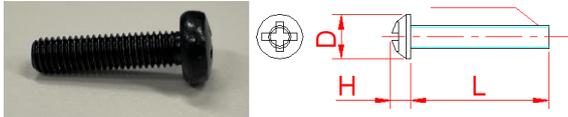
IO M12 cable (A-code, Male, 5-pin)	- From male to free-end - Screw and push-pull - Contact us for proper length demand - We have default 2m screw-locking type for order: 1. OPT1-M12C-5MA-200 (to free-end)	
Ethernet M12 cable (D-code, Male, 5-pin)	- From male to RJ45 - From male to male (daisy chain) - Screw and push-pull - Contact us for proper length demand - We have default screw-locking type 2m for order: 1. OPT1-M12C-4MDR-200 (to RJ45) 2. OPT1-M12C-4MDM-200 (to male)	
Power M12 cable (L-code, Female, 5-pin)	- From female to free-end - From male to female (daisy chain) - Screw and push-pull - Contact us for proper length demand - We have default 2m screw-locking type for order: 1. OPT1-M12C-5FL-200 (to free-end) 2. OPT1-M12C-5MLF-200 (to male)	

Chapter 2 Product Specification

2.1 General Specification

Item	Description
Ethernet	2-port 100Base-T(X) (with Daisy Chain and integrated switch)
Protocol	PROFINET (RT, SNMP, LLDP, MRP client, DCP, I&M data, FSU) Modbus/TCP, TCP/IP
PROFINET	Conformal Class: B (RT), 1ms I&M Data: I&M0 - I&M4 Fast Start Up (FSU): <500ms
LED Indicators	LINK(E1/E2), ACT(E1/E2), SYS, MS, NS, Channels (00-07, 10-17), U_S (P1/P2), U_A (P1/P2)
Connector	M12, Push-pull fast connection according to IEC 61076-2-010 or screw connection according to IEC 61076-2-101 <table><tr><td>Area</td><td>Port</td><td>M12 Cable Type</td></tr><tr><td>Ethernet</td><td>E1~E2</td><td>D-code Male 4-pin</td></tr><tr><td>I/O</td><td>X1~X8</td><td>A-code Male 5-pin</td></tr><tr><td>Power Input</td><td>P1</td><td>L-code Female 5-pin</td></tr><tr><td>Power Output</td><td>P2</td><td>L-code Male 5-pin</td></tr></table>
Power Input	Unregulated 24 V_{DC} ±20%
Input Current	Max. 12 A ±20% (X1~X4, U_S) and 12 A ±20% (X5~X8, U_A)
Sensor/Actuator/Encoder Power Supply (24V) (Output Current)	0.5 A (Max. 1A) per each A-code M12 Support short-circuit protection for each A-code M12
Watchdog Timer	System (600 ms) & Communication
Dimensions	200 x 60 x 31.5 mm (7.87 x 2.36 x 1.24 in)
Protection	Built-in TVS/ESD protection Power Reverse Polarity Protection EMC: ESD ±8 kV (Contact), ±15 kV (air); EFT ±2 kV; Surge ±1 kV Isolation Voltage Protection: 750 V_{DC} between U_S & U_A, 1,500 V_{DC} (Ethernet)
Power Consumption	ADAM-250PN: 6W @ 24 V_{DC}

Operating Temperature (exclusive of RTC function)	-40 ~ 60 °C (-40 ~ 140 °F)
Operating Humidity	5 ~ 95% RH (Non-condensing)
Altitude	2000 m
Feature Highlights	➢ Offers 16-ch configurable DIO and 2-port power/ethernet daisy chain ➢ IEC 61131-2 type 3 sink DI and fast response source DO ➢ Built-in I/O & power diagnostics and DO safety value protection. ➢ Convenient printable marking label installation and comprehensive LED indicators. ➢ Enables cabinet-free front and side wall & machine mounting ➢ Support M12 screw-lock & push-pull fast-locking ➢ Rugged IP67 design resists EMC, vibration, dust, oil, and humidity from harsh/outdoors and compliance with EN50155 ➢ Built in sensor/actuator/encoder power supply from each I/O port ➢ Supports PROFINET and Modbus/TCP, with optional and extensible MQTT integration
Real-Time Clock (RTC)	ISO8601 format Note: The operating/storage temperature for the RTC function is -30 ~ 60 °C (-22 ~140°F)
Degree of Protection	IP67
Mounting	Wall, Machine (Front or Side mount)
Mechanical tests	Vibration resistance in accordance with 20g (EN/IEC 60068-2-6) Shock in accordance with 30g Continuous shock in accordance with 25g (EN/IEC 60068-2-27) EN 50155 compliance (IEC 61373 body mount class B)
Daisy Chain	Support Power and Ethernet 2-port Daisy Chain Connection

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2.2 Digital Input / Output Module (ADAM-250PN)
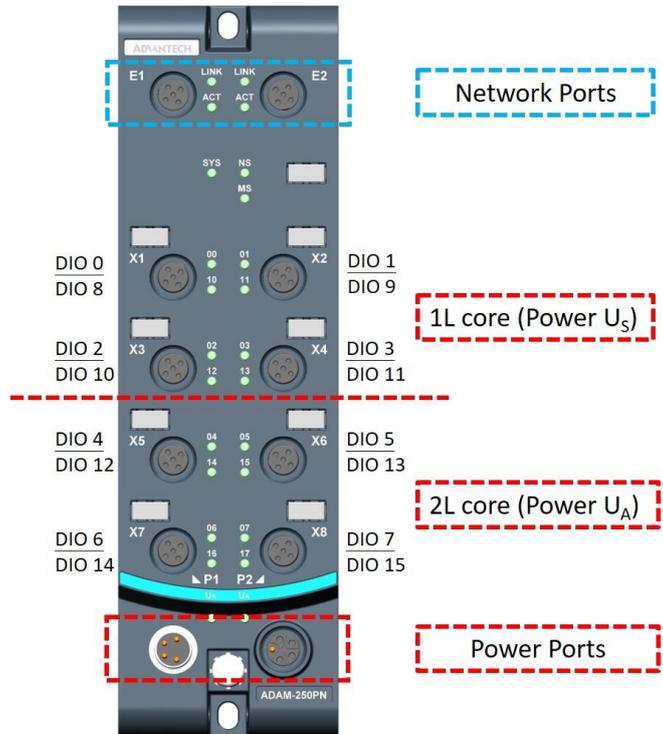
- − Configurable diagnostics can be set for each channel
- − Output current per output 0.5 A at X1 to X4

Total current max. 12 A for group X1 to X4 (U_S)

- − Output current per output 2 A at X14 to X17

total current max. 12 A for group X5 to X8 (U_A)

- − Suitable for solenoid valves, DC contactors, and indicator lights

Item	Description
Weight	714g
I/O Channels	16 (Configurable DI or DO)
Diagnostics Function	DO (by channel): Over current, Short to ground/power
	DI (by channel): Wire-break
	Sensor/actuator/Encoder Power Supply: Over current
	Power Input: Over voltage (30V), under voltage (18V), over current 12A (U_S or U_A)
Digital Input	
Channels	Max. 16 (Configurable), Sink(NPN) Type

IEC 61131-2	Support Type 3
	Input Voltage Logic level 0: 0-5 V_{DC}
	Input Voltage Logic level 1: 11-30V_{DC}
	Input Current Logic level 1: 2.4 mA (typical)
Filter (Input Delay)	0.05ms/ 0.1ms/ 0.4ms/ 0.8ms/ 1.6ms/ 3.2ms/
	12.8ms/ 20ms (configurable per each channel)
Digital Output	
Channels	Max. 16 (Configurable), Source Type
Output Current	U_S: 0.5 A/channel (Max. 1A)
	U_A: 2 A/channel (Max. 2.6A)
Switching Frequency	U_S: 0.5A 100 Hz at rated load 48 ohm
	U_A: 2A 40 Hz at rated load 12 ohm
Output delay	0 to 1:
	U_S: 0.5A 100 us at rated load 48ohm
	U_A: 2A 150 us at rated load 12 ohm
	1 to 0:
	U_S: 0.5A 150 us at rated load 48 ohm
	U_A: 2A 2.5 ms at rated load 12 ohm
Load Impedance	48 ~ 4K ohm @U_S
	12 ~ 4K ohm @U_A
Protection	Short-circuit protection for each channel
	Configurable reactions to CPU STOP (Safety Mode): Shutdown, keep last value and output substitute value 1

2.2.1 System Diagram

As below figure shows an example of the pin assignment of signal outputs and signal inputs with single and dual assignment of the sockets.
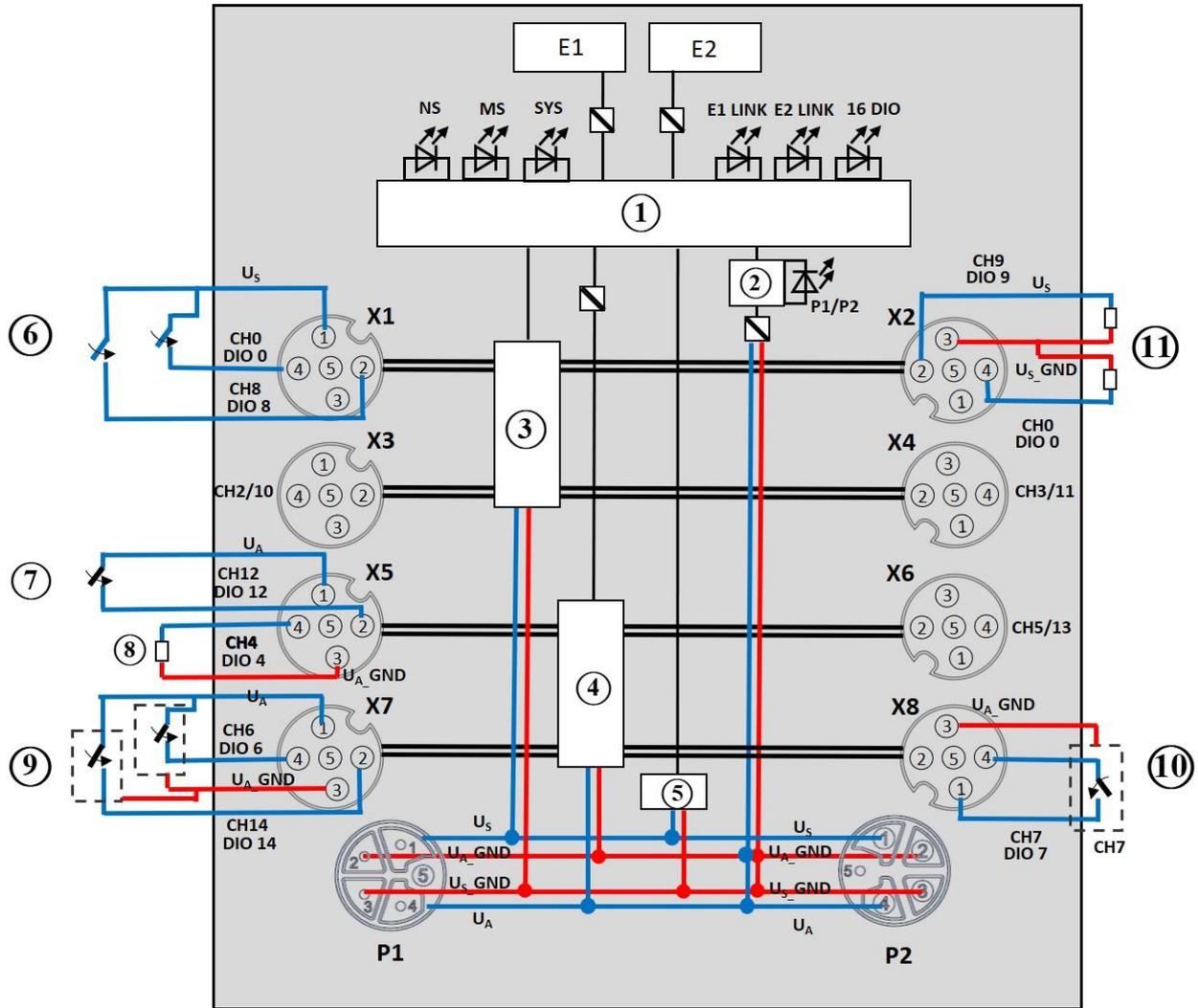
Designation	Description
①	Bus interface with integrated 2-port switch
②	Power Monitoring
③	DIO circuit : U_S (1L+), U_S_GND
④	DIO circuit : U_A (2L+), U_A_GND
⑤	Internal supply voltage
⑥	Configured as inputs: 2-wire connection
⑦	Configured as inputs: 2-wire connection
⑧	Configured as Outputs
⑨	Configured as inputs: 3-wire connection
⑩	Configured as inputs: 3-wire connection
⑪	Configured as Outputs

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X1-X8	Channels 0 to 15
P1	Infeed of supply and load voltage
P2	Loop-through of supply and load voltage
E1	MultiFieldbus interface Port 1
E2	MultiFieldbus interface Port 2
U_S (P1/P2)	Supply voltage U_S (1L+) (non-switched)
U_S_GND	Ground of U_S (non-switched) Ground with reverse polarity protection, diverted from US (non-switched)
U_A (P1/P2)	Load voltage U_A (2L+) (switched)
U_A_GND	Ground of U_A (non-switched) Ground with reverse polarity protection, diverted from UA (switched)
U_S (X1-X4)	24 V sensor/actuator/encoder power supply : From U_S (1L+)
U_A (X5-X8)	24 V sensor/actuator/encoder power supply : From U_A (2L+)
DIO_N	Input/output signal
NS	Network status LED
MS	Module status/maintenance/error LED
SYS	System status LED
E1 LINK	E1 LINK/ACT LED
E2 LINK	E2 LINK/ACT LED
16DIO	Channel status/channel error LEDs
P1/P2	U_S LED : load voltage U_S (1L+) U_A LED : load voltage U_A (2L+)

For this device, a distinction is made between two voltages:

Supply Voltage U_S:

System/sensor supply voltage of the communications power and sensors, or say: 1L+ (non-switched)

Electrically isolated from ethernet and U_A (load voltage supply)

<Notice>

➢ When selecting the power supply U_S, make sure that selectivity is ensured in the installation system. Recommended minimum nominal output current of the supply: ≥ 8 A

➢ Connect this supply voltage to each device. If the voltage is not present, the device will not work.

➢ Install the voltage supply for the device electronics independently of the voltage supply for the actuators. Protect the voltage supplies independently. In this way, the network can continue to run, even if some I/O devices are switched off.

➢ Connect the voltage supply U_S to port P1.

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➢ To supply additional devices, connect the cable for the outgoing supply voltage to port P2.

Supply Voltage U$_A$:

Load voltage, supply of the actuators, or say: 2L+ (switched)

Electrically isolated from all other circuit components.

<Notice>

The voltage supply U$_A$ is not required on this device. If you want to forward the voltage to additional devices, you can connect it here.

➢ If you require the voltage, connect it to port P1.

➢ To supply additional devices, connect the cable for the outgoing supply voltage to port P2.

➢ When determining the load for a supply voltage, take into account the number of outputs, the nominal current, and the simultaneity.

<Notice>

You may come into contact with live electrical wires connected to the main power supply.

Death or serious personal injury and damage to machines and equipment may result if proper precautions are not taken. Shut off the supply voltage before you wire the I/O devices.

To supply other devices, this device forwards the voltages. All supply voltages are connected via M12 connectors. See Section "2.2.2 Application wiring".

Current carrying capacity

The current carrying capacity of the M12 connectors is 12 A per U$_S$ or U$_A$

<Notice> Electronics may be damaged when overloaded

Exceeding the permissible current carrying capacity can damage the connectors.

➢ Make sure that this value is not exceeded.

➢ Connect both supply voltages completely (to +24 V and GND). Do not connect several supply voltages via one GND.

➢ Please note that the connection for the outgoing supply voltage is not monitored for overload.

2.2.2 Application wiring

Power Input (P1) Wiring

The ADAM-250PN module is designed with 24 V$_{DC}$ power (Input P1 and output P2). The device is powered via U$_S$ (system power) and U$_A$ (actuator power).

Connect P1 to a standard industrial unregulated 24 V$_{DC}$ power supply, supporting a tolerance of ±20%.

Connect P2 output to another ADAM module or external system devices, as needed.
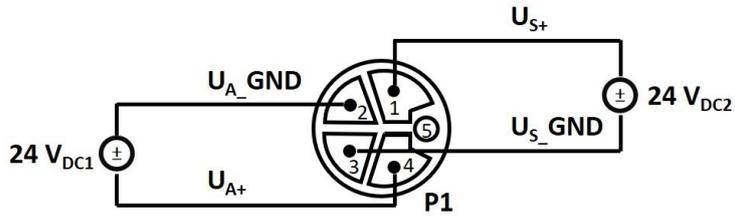
Sink-type DI wiring

ADAM-250PN sink-type (NPN) DI support 2-wire and 3-wire wiring, pin 1 also support sensor/actuator/encoder power supply for connected devices.
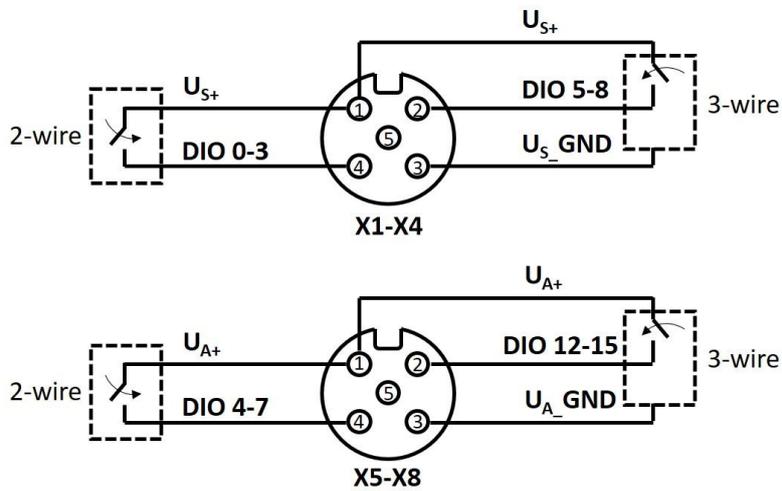
Source DO wiring

ADAM-250PN source-type DO support 2-wire and 3-wire wiring, X1-X4 (upper figure) from U_S power source and X5-X8 (lower figure) are from U_A power source, and pin 1 also support sensor/actuator/encoder power supply for connected devices.

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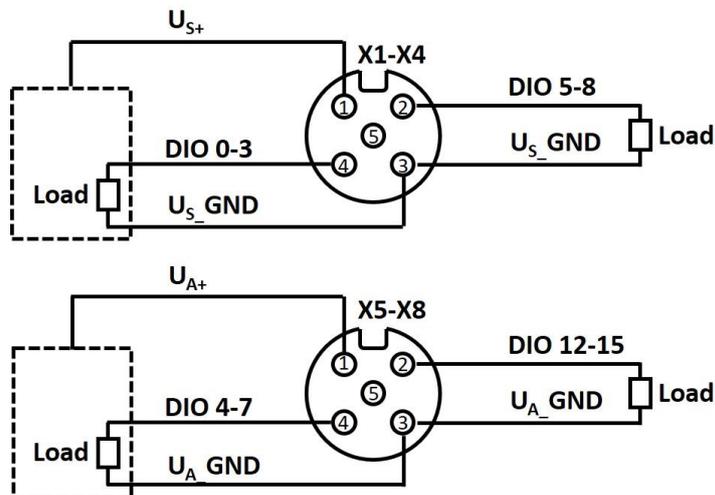
As above are X1-X4 (upper figure) and X5-X8 (lower figure) Digital Input Wiring, ADAM-250PN support

2.2.3 Pin Assignment

Please refer to below pin assignment and core color.

Pin	P1, P2		Front View
	Assignment	Core color	
1	U_S	Gray	
2	U_A_GND	White	
3	U_S_GND	Blue	
4	U_A	Brown	
5	FGND	Black	
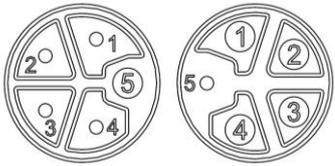
Pin	X1-X4		X5-X8		Front View
	Assignment	Core color	Assignment	Core color	
1	U_S	Red	U_A	Red	
2	DIO 8-11	Blue	DIO 12-15	Blue	
3	U_S_GND	Green	U_A_GND	Green	
4	DIO 0-3	Yellow	DIO 4-7	Yellow	
5	FGND	Black	FGND	Black	

Pin	E1, E2		Front View
	Assignment	Core color	
1	Tx+	White/Orange	
2	Rx+	Orange	
3	Tx-	White/Green	
4	Rx-	Blue	

2.2.4 LED Definition

Please refer to below ADAM-250PN LED definition:

LED	Color	Indication	Action
LINK(E1/E2)	Green	Off	Ethernet disconnected
		On	Ethernet connected
ACT(E1/E2)	Green	Off	Data is Not Transmitting
		Blink	Data is transmitting
SYS	Green	Off	System fail
		Blink	System is running
MS (Module Status)	Green	Off	No fault
		Blink	Maintain, low voltage Us fault
	Red	Blink	Error, diagnostic is available
NS (Network Status)	Green	Off	Device disconnect to Controller
		Blink	Device connect to Controller
Channels 00-07 (DIO 0-7) 10-17 (DIO 8-15)	Green	On	DI mode: Signal input (Logic 1) DO mode: DO Turn on (Logic 1)
		Off	DI mode: No signal input (Logic 0) DO mode: DO Turn off (Logic 0)
	Red	On	Diagnostic error
U_S (P1/P2)	Green	On	24 V_{DC} power input
		Blink	Over-voltage (> 30V_{DC})
		Off	No power input
U_A (P1/P2)	Green	On	24 V_{DC} power input
		Blink	Over-voltage (> 30V_{DC})
		Off	No power input

Chapter 3 Hardware Installation

3.1 Mounting

The ADAM-250PN module features IP67-rated protection, supporting both cabinet and direct machine (cabinet-free) mounting. It can be installed on any level, firm surface in any position.

For correct installation:

- Only use mounting accessories that maintain the required IP67 protection level.

- Fasten the I/O device using screws at both mounting points (see red circles in the diagrams below).

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- Recommended screw torque: 3 Nm (at least >1.4 Nm)
- The I/O device can be pre-wired.
- Install the ADAM-200PN distributed I/O devices only with disconnected supply and load voltages.

Mounting options:

- Front Mounting (onto level and firm surface)
- Side Mounting (onto level and firm surface)

Required tools:

For the installation you need a screwdriver, suitable for the screws used. For mounting, use screws with a diameter of 5 mm and a length of at least 35 mm.

<Notice>

- The axially symmetric drill holes allow you to fasten the I/O devices to an aluminum or carrier profile. The following picture shows an aluminum mounting rail on which the I/O devices can be mounted.

- Ensure the mounting surface is stable to prevent vibration and mechanical stress that may affect I/O performance.
- For detailed mounting dimensions, refer to the diagrams below.
- DO NOT disassemble or reassemble the ADAM module; improper reassembly may compromise the IP67 protection.
- All non-cable-connected M12 ports MUST need plastic waterproof cover added to keep IP67 protection (suggest torque 5~7 kgf-cm, i.e. 0.5~0.7 Nm)
- Marking label supports Murrplastik ACS Labeling System (KS 5/10), user can print on related information with compatible printer
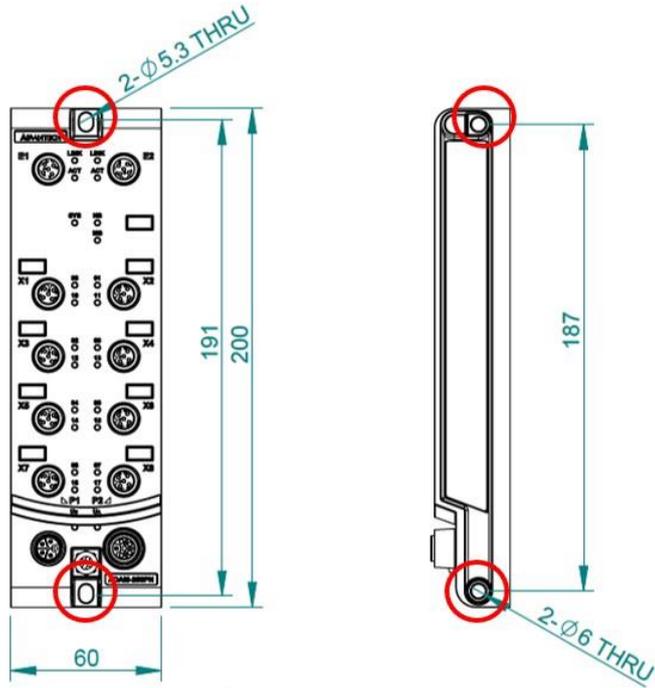
Screw location
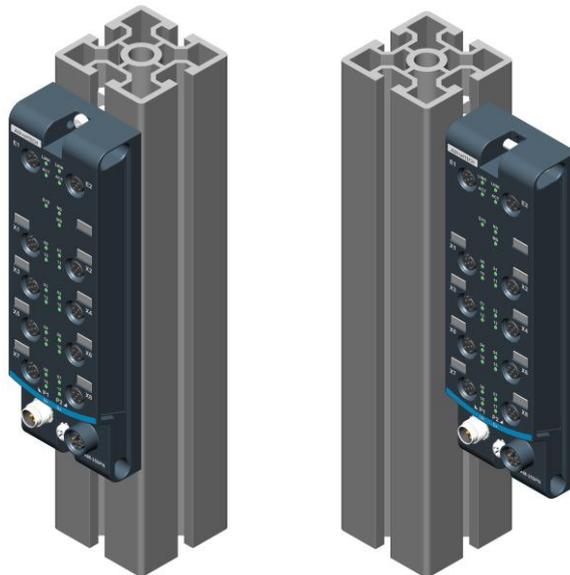
Front Mounting (Left) and Side Mounting (Right)

3.2 Daisy Chain Connection

In early stage of industrial automation field, most users used to deploy their automation environment as serial communication RS-422/RS-485 interface. The typical connection mode with RS-422/RS-485 is field

connection. That presents each device can be connected one after one in one line.

Since each ADAM-200PN module has already built in Ethernet switch, user can easily connect each ADAM-200PN module with standard Ethernet cable as following roughly diagram shows.
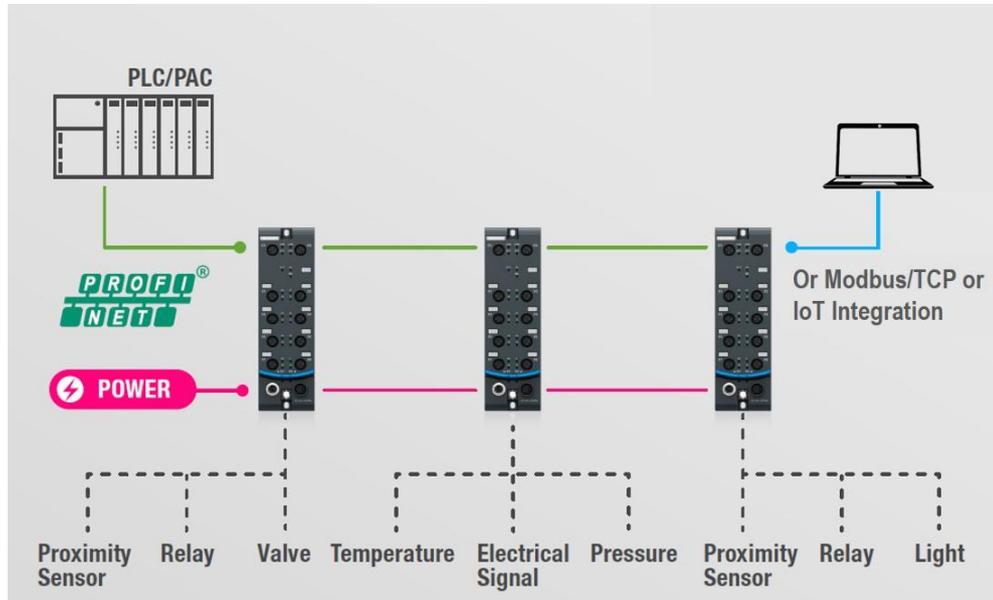
The benefits of Daisy chain topology

1. Easily expands the module in existing deployment.

2. Helps improve flexibility of I/O deployment, save wiring cost and space.

<Notice>

1. The average latency from one module to another: 15 - 20 μs:

2. Typically, the maximum cabling distance of each 100BASE-TX network segment is 100 meters. Based on this limitation, the maximum total connection length of daisy chain wiring should also be 100m.

ADAM-200PN also support Power port daisy chain, that can help user reduce power wiring cost, multiple ADAM-200PN can sharing with one power supply. User need to evaluate the power spec from power supply so that can know the quantity that can connected in serial.

3.3 Sensor/Actuator/Encoder Power Supply

The ADAM-200PN series modules are equipped with dedicated sensor/actuator/encoder power supply capabilities. This function is provided through IO port Pin 1, enabling the module to deliver power to connected field devices such as encoders, proximity sensors, or actuators directly from the I/O interface.

To ensure proper power domain isolation and stable performance, the module separates the power sourcing by channel group:

ADAM-250PN:

➢ X1–X4 Channels: Power supplied from the U_S (System/Sensor Supply) input

➢ X5–X8 Channels: Power sourced from the U_A (Actuator Supply) input

This dual-domain design ensures compatibility with mixed-signal environments, allowing simultaneous connection of sensing inputs (DI) and actuating outputs (DO) without mutual interference or power drop.

3.4 Diagnostics

Diagnostics: Undervoltage U_S (1L+)

Enabling of the diagnostics for insufficient supply voltage U_S (1L+).

Diagnostics: Missing U_A (2L+)

Enabling of the diagnostics for missing or insufficient load voltage U_A (2L+).

<Note>

This diagnostics is only available for channels supplied with U_A (2L+) voltage.

Diagnostics: Short-circuit

Enable diagnostics:

· for short-circuit of the sensor/actuator/encoder power supply to ground.

· for short-circuit of the output to ground.

· for short-circuit of the output to U_S (1L+) or U_A (2L+).

Diagnostics: Wire break detection and alarm

Activates wire break detection and enabling of diagnostics for the digital input in case of an interruption of the cable between the sensor/actuator/encoder and I/O device.

Note

· This diagnostics is only available for channels configured as inputs.

· Influence on the value status:

If the parameter is deactivated, wire break detection is switched off. A wire break does not have an effect on the value status.

Reaction to CPU STOP

With this parameter, you set the reaction of the digital outputs of the I/O device after a CPU STOP:

· Shutdown: The digital output is de-energized.

· Keep last value: The last value of the digital output remains activated.

· Output substitute value 1: The I/O device outputs the substitute value "1".

Chapter 4 System Configuration

4.1 Advantech IO Module Utility

Download Advantech IO Module Utility from http://www.advantech.com/support . Run the installation file and follow the prompts to install the utility. After completing the installation, you will find a new icon on your desktop.

<Notice>

Before installing Advantech IO Module Utility, you need to install .NET Framework 4.8 or later, which can be download from the Microsoft website:

https://dotnet.microsoft.com/en-us/download/dotnet-framework

4.2 First Connection

Since the ADAM-200PN device comes with a default IP address of 0.0.0.0, we need to use the DCP Tool to assign it a valid IP before it can be recognized by the Utility.

So when firstly using ADAM-200PN series or connecting with controller (ex. SIEMENS controllers), there're 3 software options suggested for users to do ADAM-200PN initial setting: Hilscher Ethernet Device Configuration, PRONETA and TIA Portal.

The connection process is as below:

1. Connects ADAM module to power supply and network

2. Verify the network topology with suggested software, initialize the ADAM module

3. Confirm connectivity to the controller (PLC) and configure the PLC (If use Modbus only without PLC, ignore this process)

4. User can also do ADAM-200PN module settings with Advantech IO Module Utility or 3rd party software (ex. PLC users with TIA Portal)

5. Apply settings and reboot the ADAM module.

4.2.1 Ethernet Device Configuration

For Modbus user that will use ADAM-200PN, Hilscher Ethernet Device Configuration software are suggested to do the first ADAM-200PN device searching and change IP, the associated product manual with detailed descriptions of the software are available from below link:

https://hilscher.atlassian.net/wiki/spaces/ETHDEVCFG

<Notice> Do initial network setting with Advantech IO Module Utility will be the new option, will be launched soon, welcome approaching if there's further demand.

Before using Ethernet Device Configuration, users need to download : WinPcap (WinPcap Download).

Here we use Ethernet Device Configuration as DCP Tool with below process:

Click "search device", right click device to set "IP Address" and then "Set Device Name".
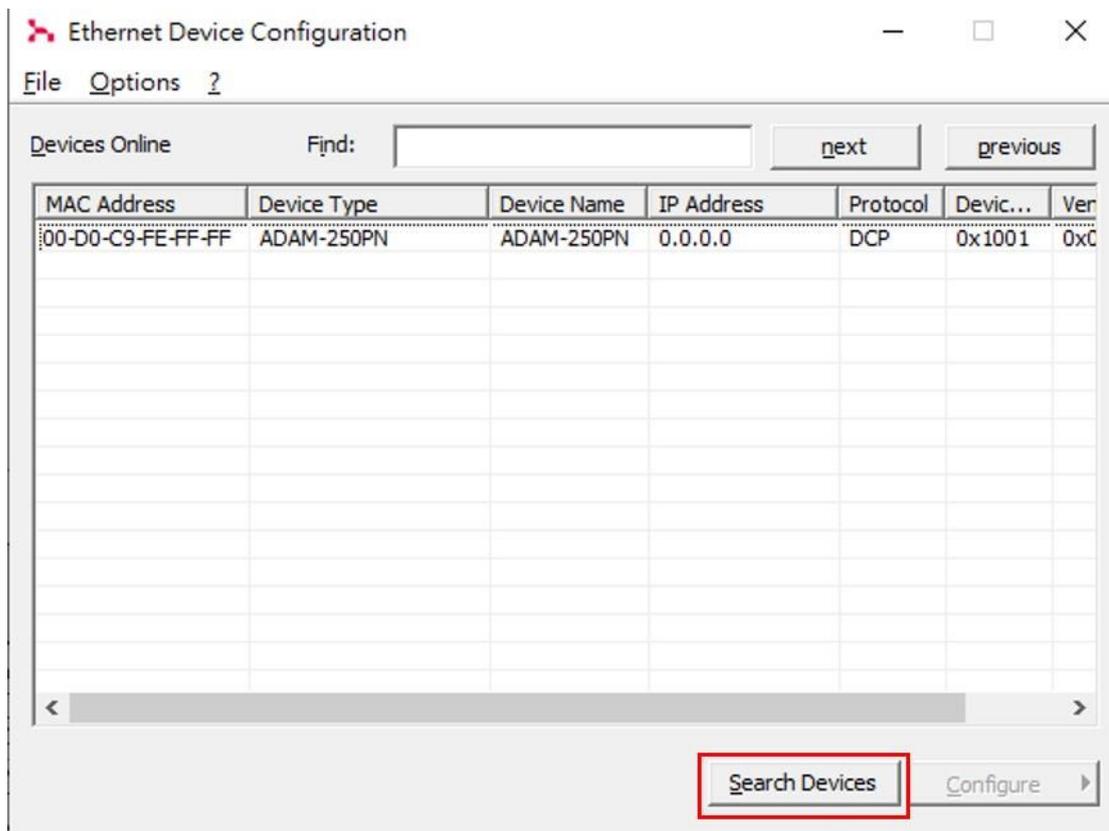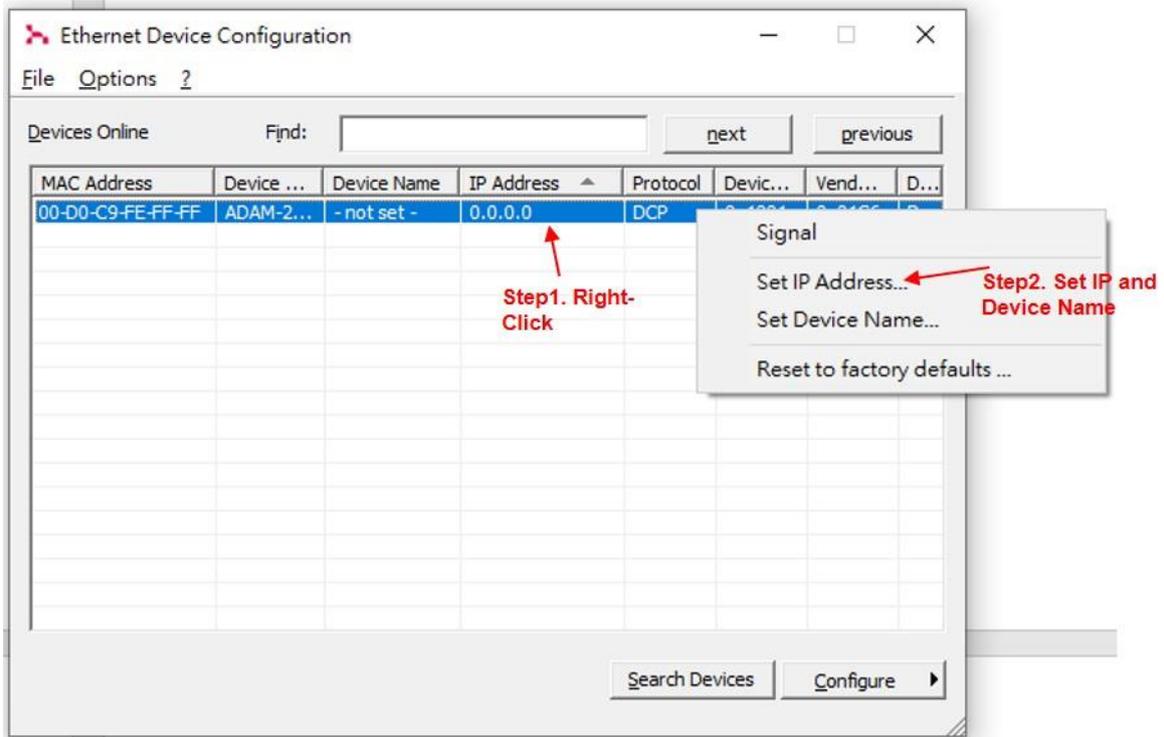
Make sure you select the "Store setting temporarily" option or not. If this option is selected, the IP address in the configuration will be reset to **0.0.0.0** on the next boot. Otherwise, the IP address will be saved.

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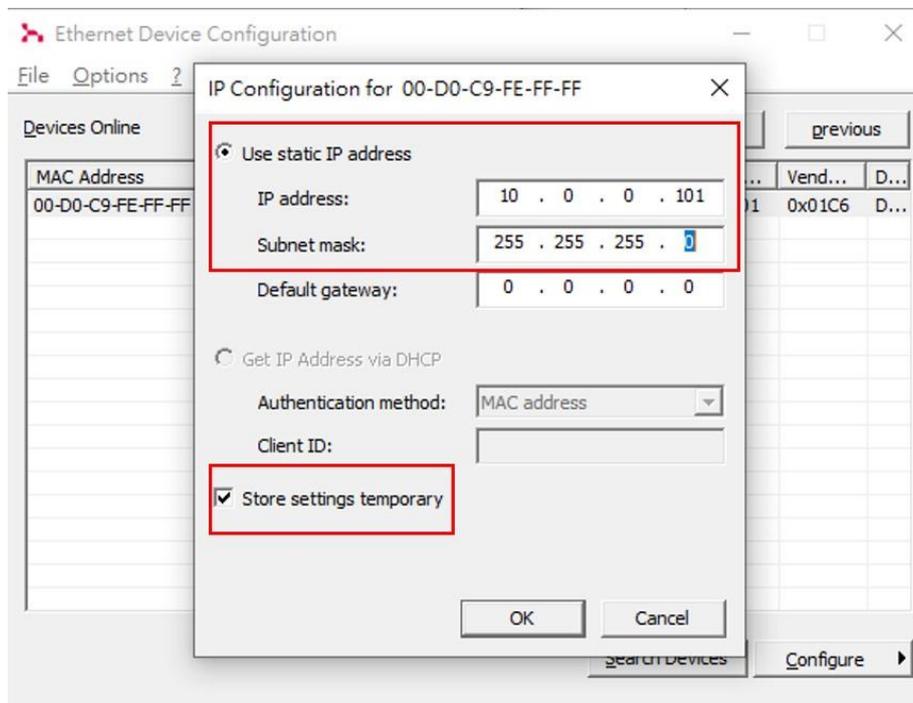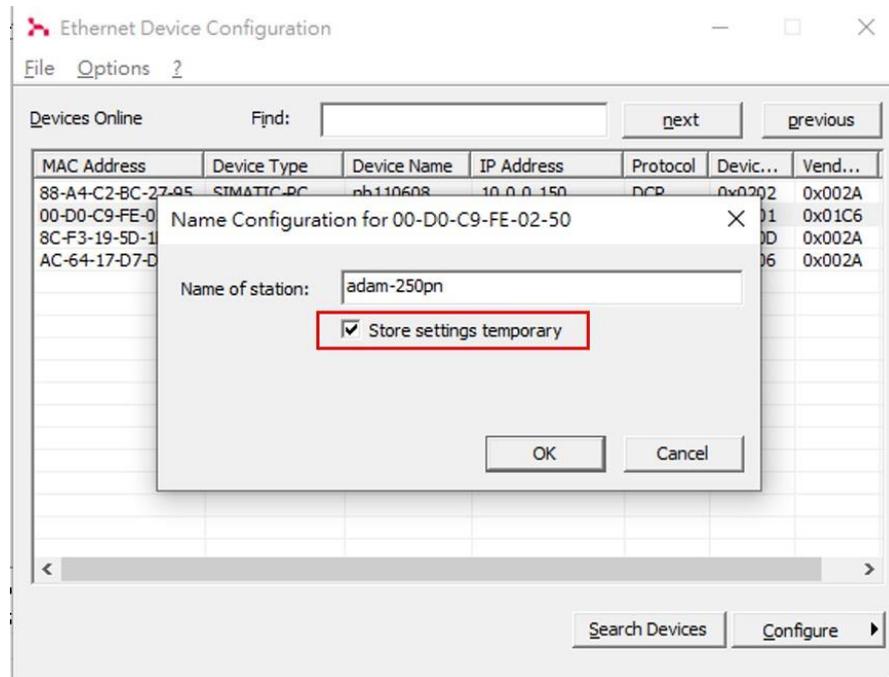
When doing "Name Configuration", "Store setting temporarily" is also the same function. If this option is selected, the name will be cleared (set to an empty string) on the next boot or it will be saved if not selected.

4.2.2 PRONETA

For users already have controller and PRONETA, after ADAM-200PN connecting the power supply and network, users can do first step to verify the network topology with PRONETA. When the network connection is successful, it will appear as shown in the figure below:

At this stage, you need to initialize the ADAM-250PN by assigning it a **device name**, **IP address** and **subnet mask**. Once it's successfully connected to the controller, it will appear as shown in the figure below:

4.3 Connect and Configure ADAM-200PN Modules with TIA Portal

For users already have SIEMENS controller, users can directly initial connect and do configuration for ADAM-200PN with TIA Portal software that already have, ADAM-200PN is fully compatible with TIA Portal.

This chapter introduce how to Connect and Control ADAM-200PN with an S7 PLC Using TIA Portal.

\<Notice\>
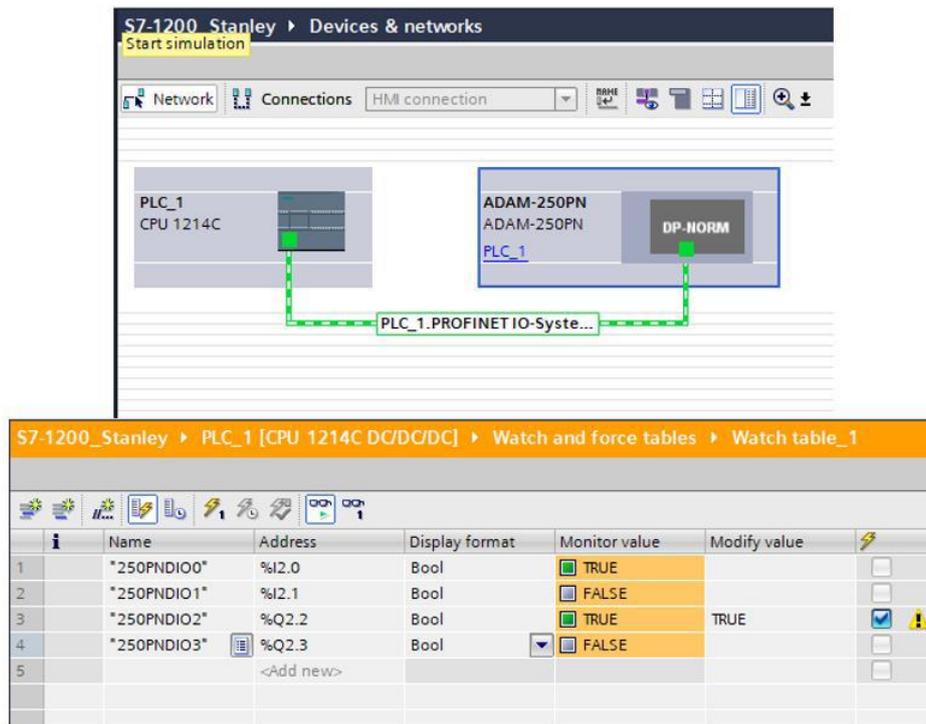
Before starting, please make sure your connections are connected as follow:
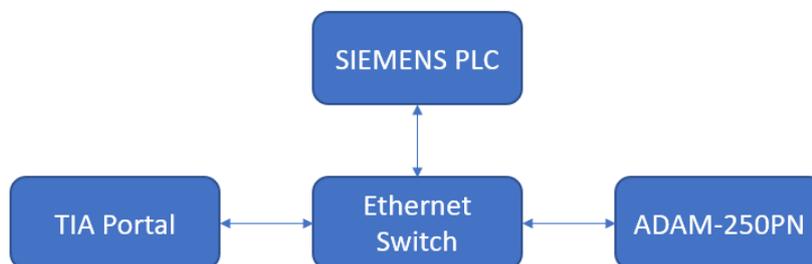
4.3.1 Connect ADAM-200PN Modules and Add GSD Files

1. **Create project** in TIA Portal.
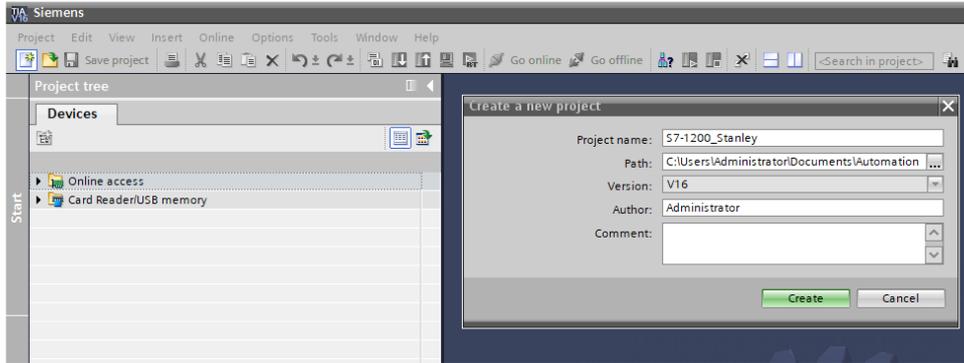
2. Check PLC Model, Article number and Firmware. Click Online access, Find the network card connected to your device. Double click on Online & diagnostics. You can get Module Information on the right.
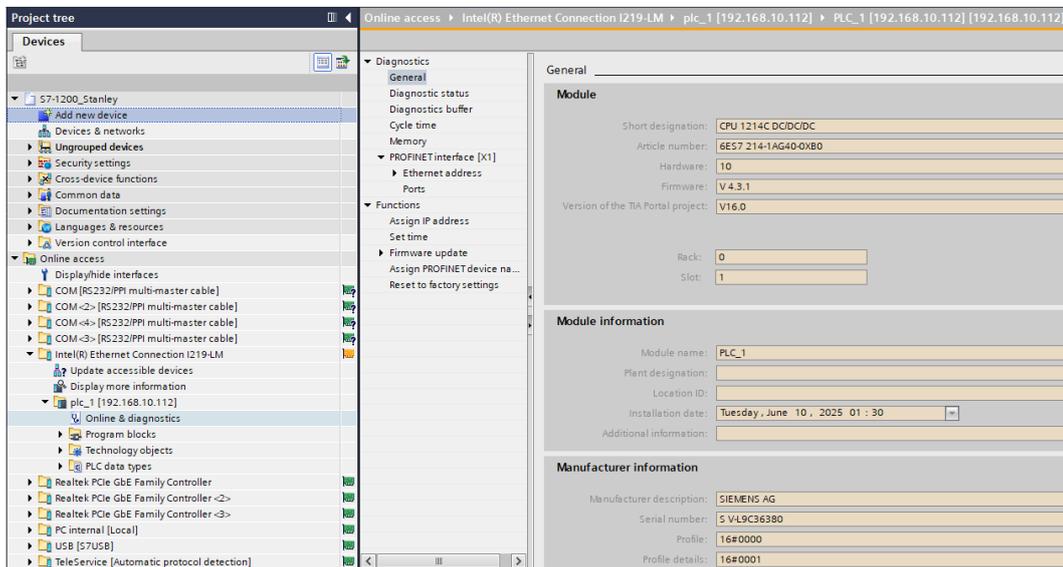
3. **Add new device:** Double click on new device. And select the device with your PLC Module information. Make sure the information is as same as what you get in the previous page and click ok.

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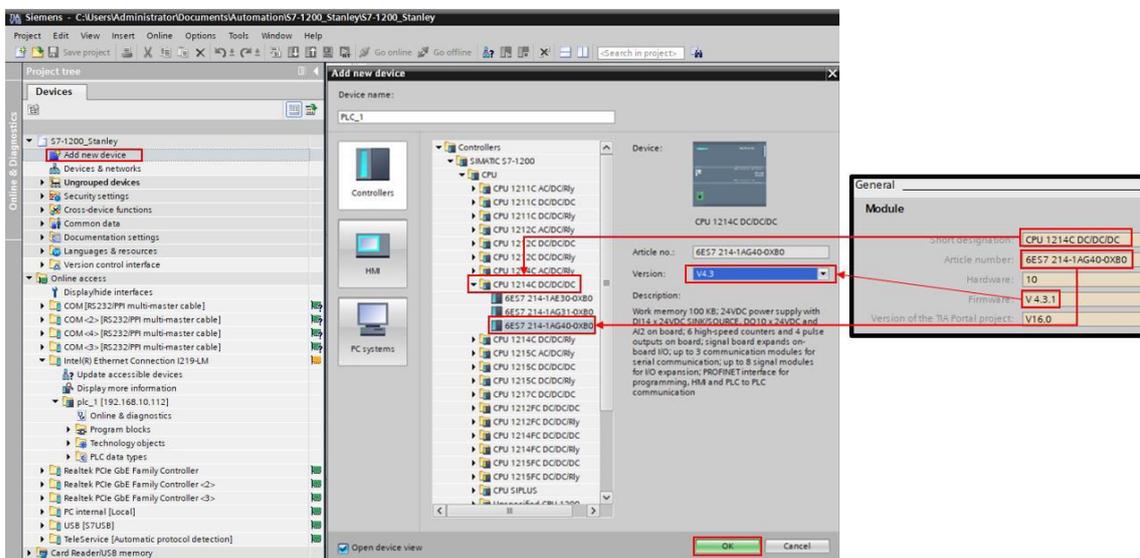
4. Once you added you will find a PLC_1 on the right side. Click on the LAN Port and Add new subnet then
   set your PLC IP.
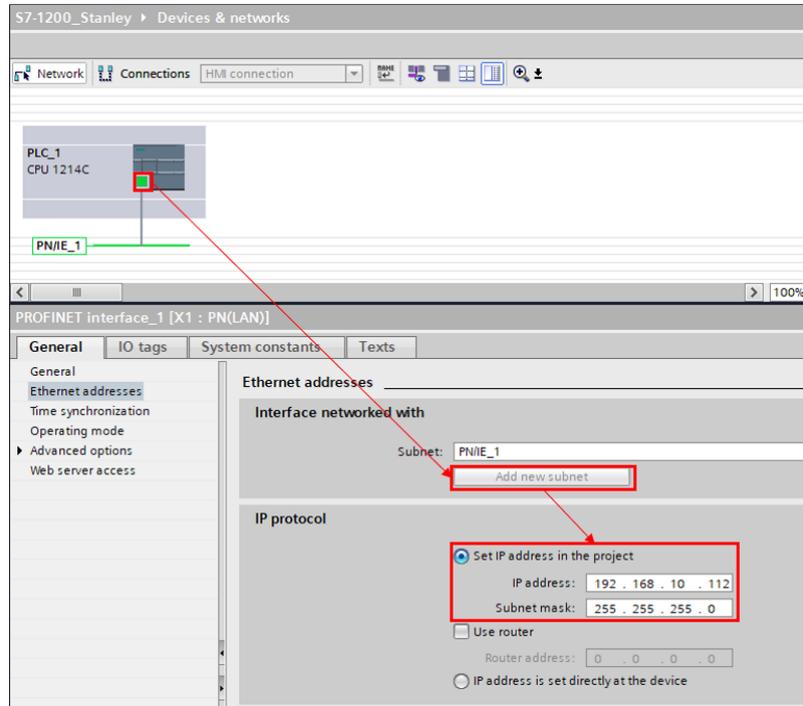
5. **Import ADAM-200PN GSD file**. Click Options, then manage general station description files(GSD).
We provide the GSD file for the ADAM-200PN (User can download from Advantech website:
https://www.advantech.com/en/search/?q=ADAM-250PN&st=support). The controller will recognize the
ADAM-200PN through the GSD file, so we need to first import the GSD file into TIA Portal
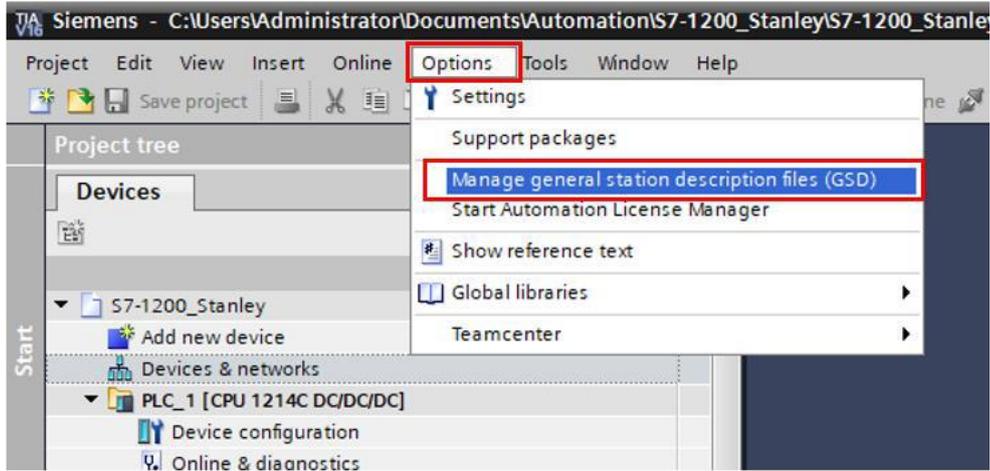
6. Select Source path, Choose the GSD you want to import and click install.
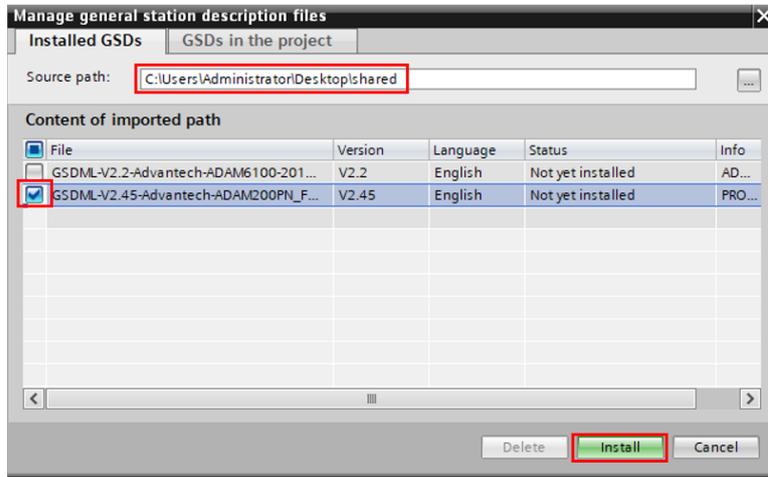
7. Back to Devices & networks, And find ADAM-200PN on the right hand side on the Catalog.
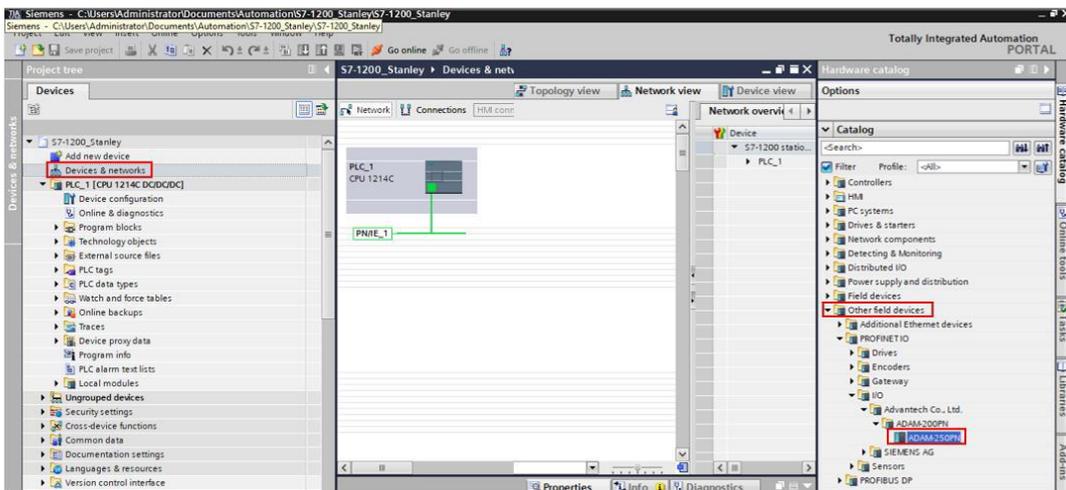
8. Double click on ADAM-200PN. You will find ADAM-200PN been created on the left.
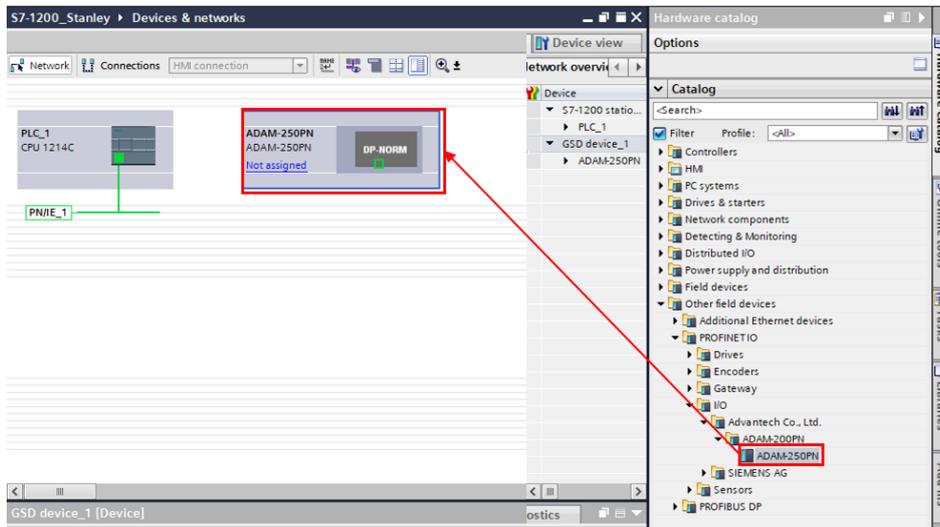
4.3.2 Configure the Network and Connection Process

Double-click inside the "ADAM-200PN" block to access the Device Configuration. Here you also need to configure **the device name, IP address, and subnet mask**, and establish the topology connection.

1. Assign ADAM-200PN to connect to PLC. Click Not assigned and select IO controller to PLC interface.
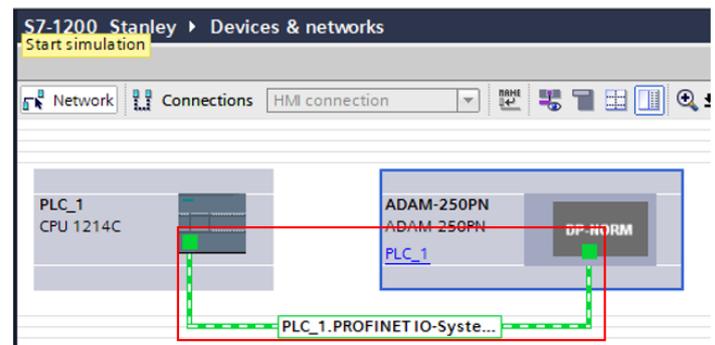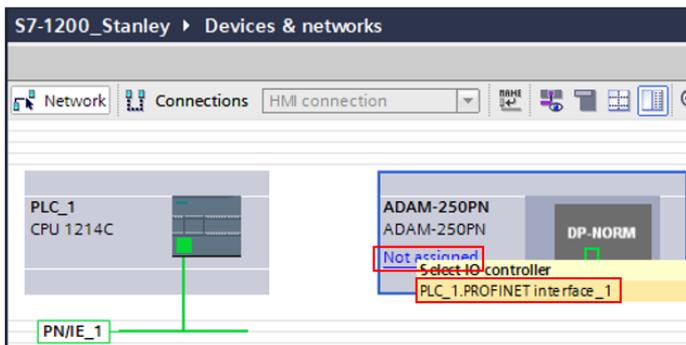
2. Assign IP to ADAM-200PN. Find ADAM-200PN under Online access. And Assign IP address to ADAM-200PN.
   <Note> The IP address need to be assigned in the same network segment with your PLC
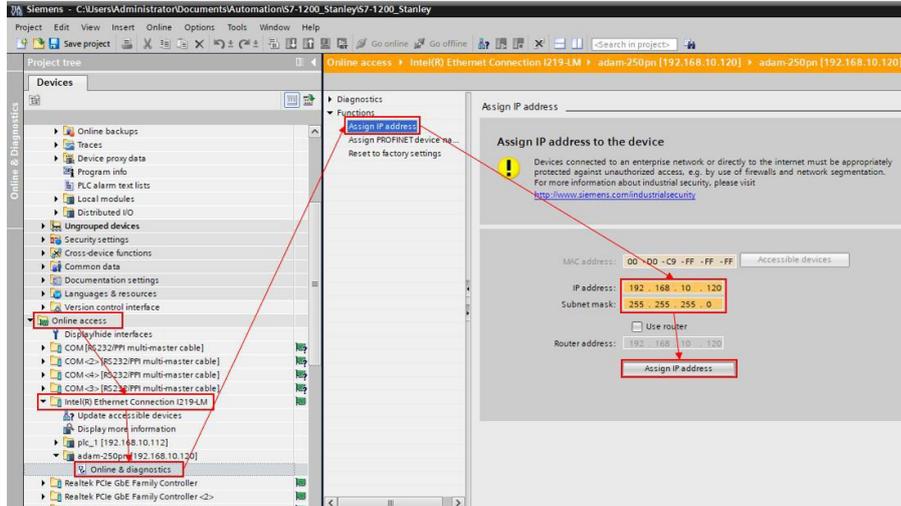
3. Assign device name to ADAM-200PN. Back to Device & Management, right click on ADAM-200PN and assign device name.
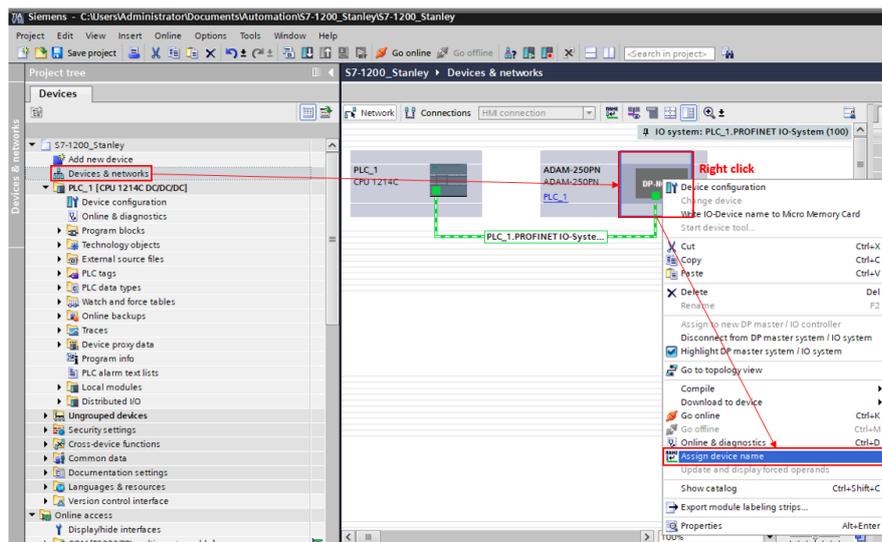
4. Click update list, select the device you want to assign name and click assign name.
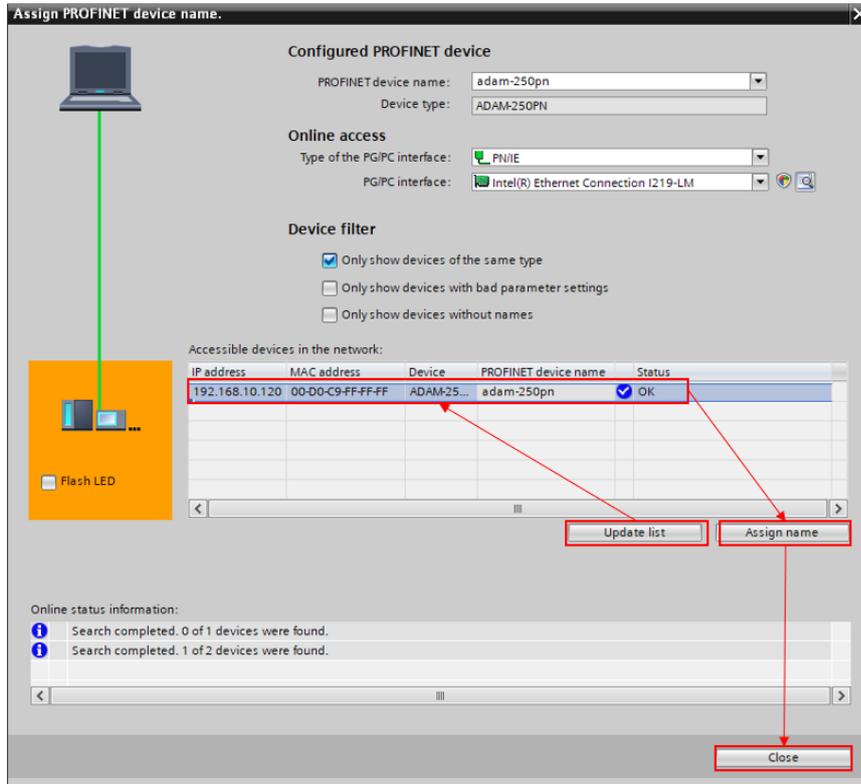
5. Download to project to PLC. Make sure the connection between PLC and ADAM 200PN are OK
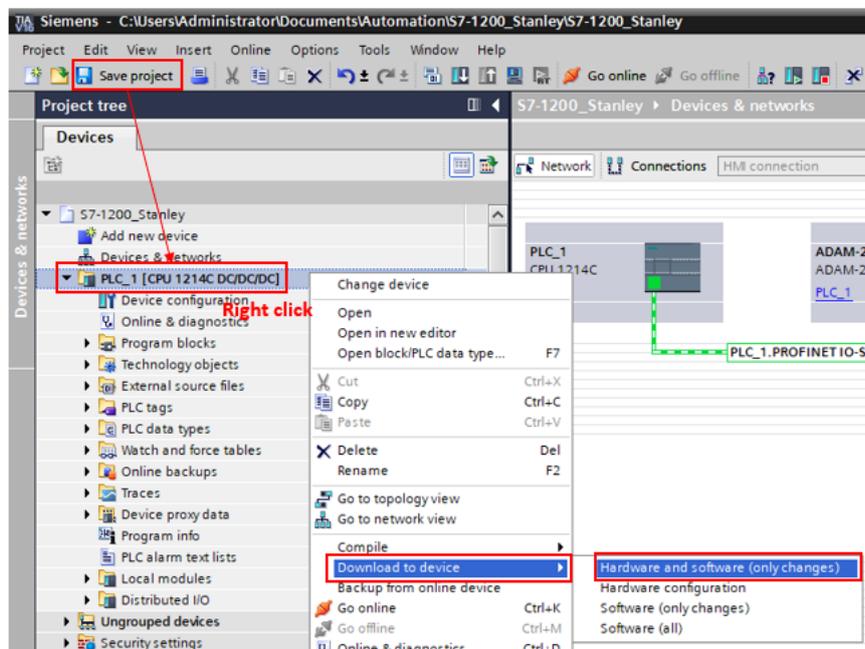
6. Search the PLC you want to download and click Load.
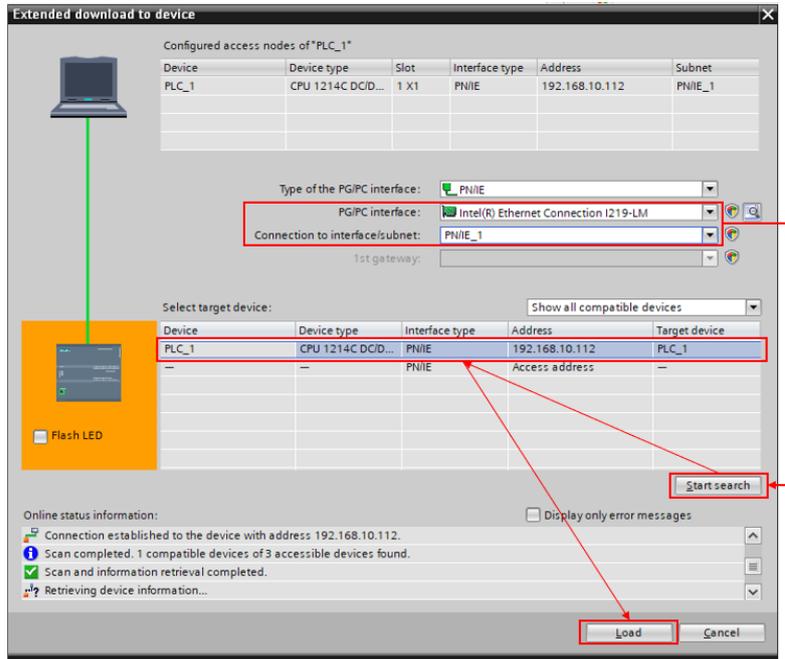
7. In the reset module part, choose "Delete all" and click load.
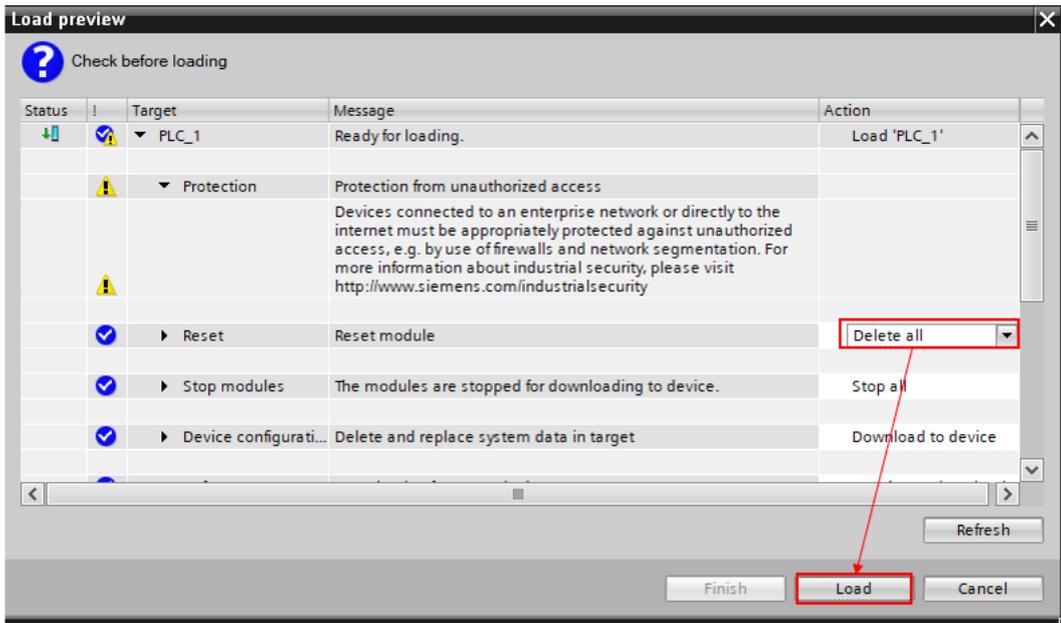
8. Once the Load is finish click finish.
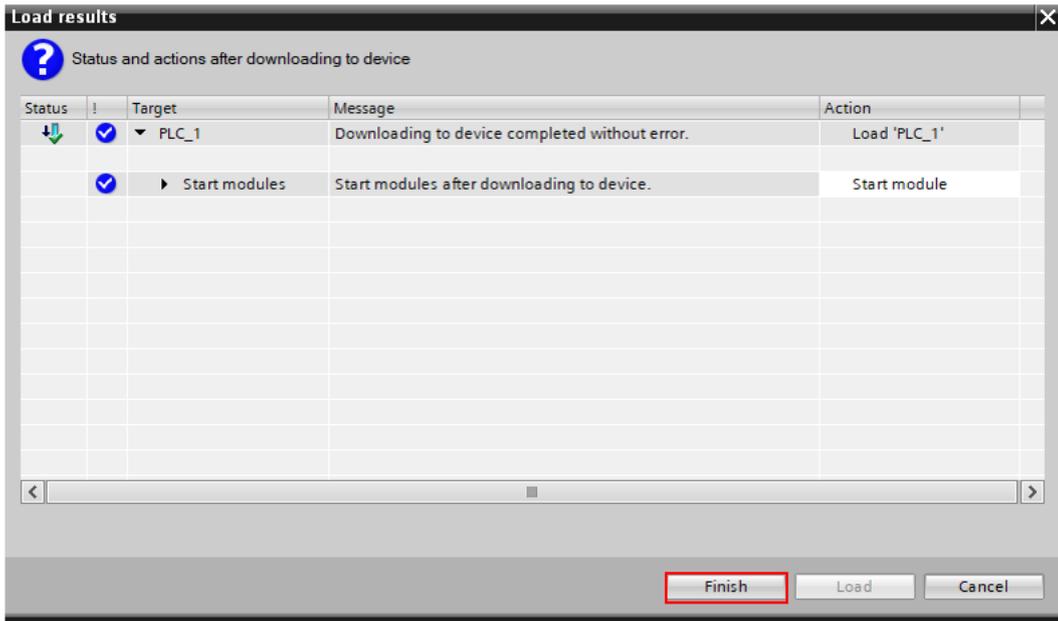
9. Click go online, make sure everything runs without error. (Should all show in green check sign.)
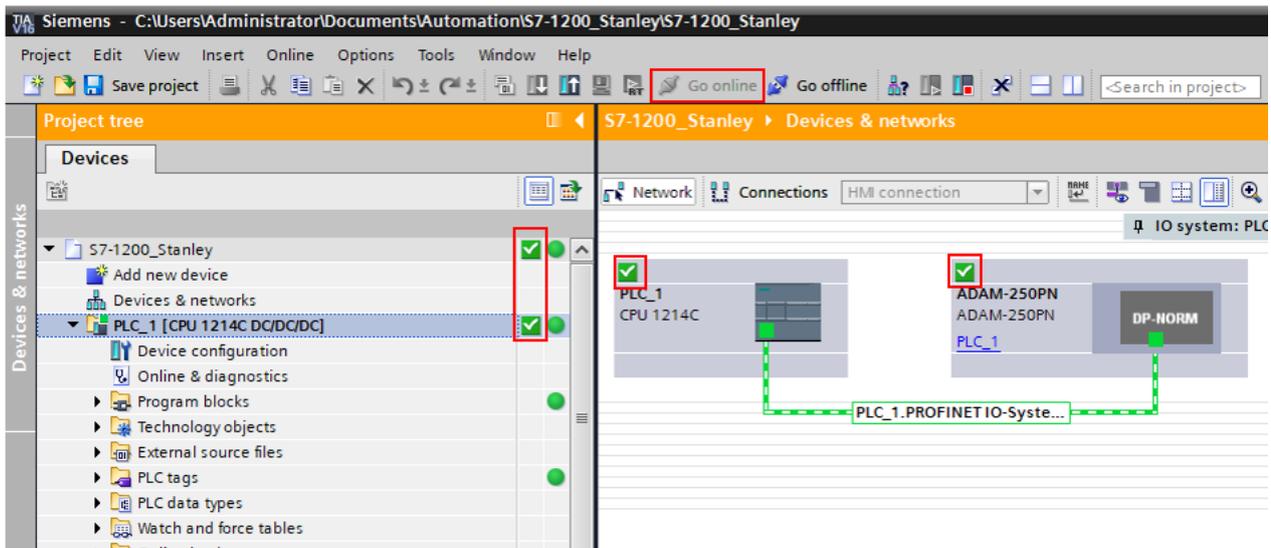
4.3.3 Create PLC Tags and Monitoring

When everything sets we are going to create PLC tags. Before creating tags. We need to find out what address been assigned to input and output. Follow the procedure below to find out the address been assigned to Input and output. In the following figure we can know Input address and output address are all been assigned to 2 and 3. So with information we can know the follows

Channel config as DI	Channel config as DO
Address %I2.0 will map to DI0.	Address %Q2.0 will map to DO0.
...	...

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Address %I2.7 will map to DI7.	Address %Q2.7 will map to DO7.
Address %I3.0 will map to DI8.	Address %q3.0 will map to DO8.
...	...
Address %I3.7 will map to DI15	Address %Q3.7 will map to DO15
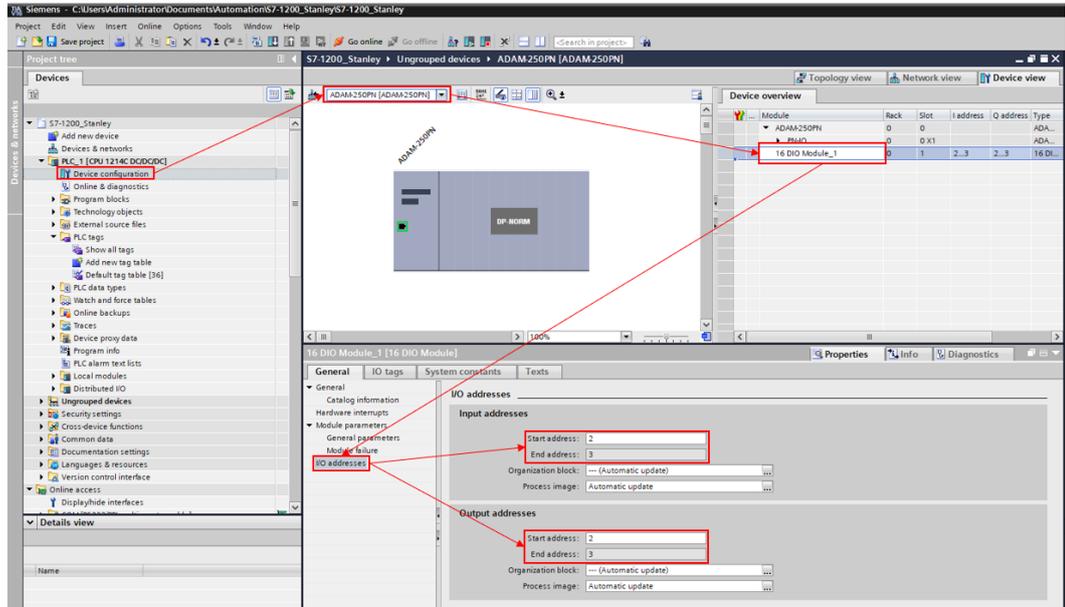
1. Start to add PLC tags. Go to PLC tags click show all tags. Give tag a name, and the most important part is filling the right Address.
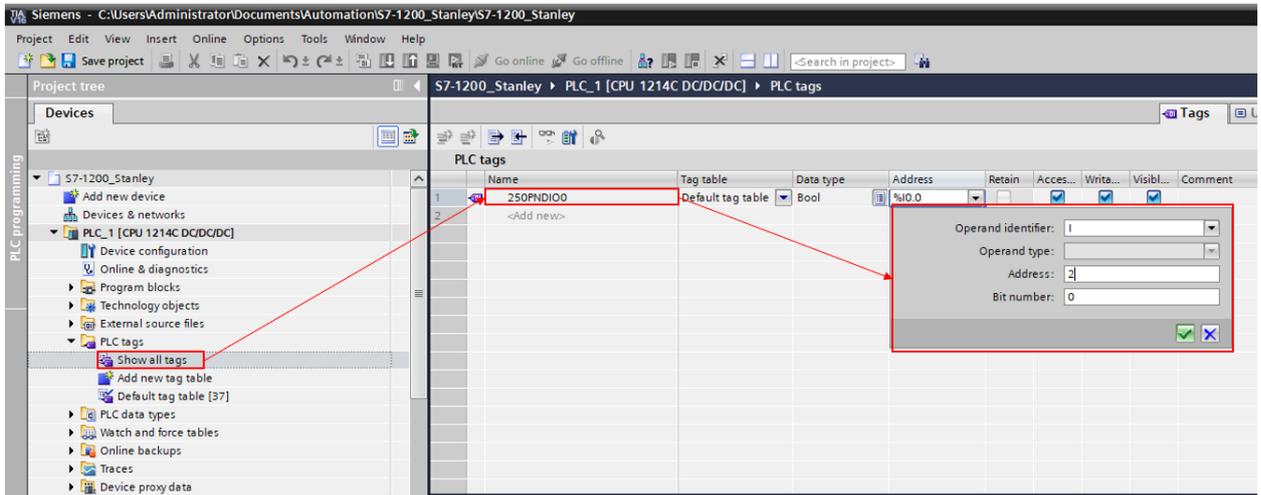
2. We can also add second tags.

3. Download project again.

4. Once the project downloading complete, we need to monitor the value. Find watch and force tables under your PLC, add new watch table and select the tag name you just created.
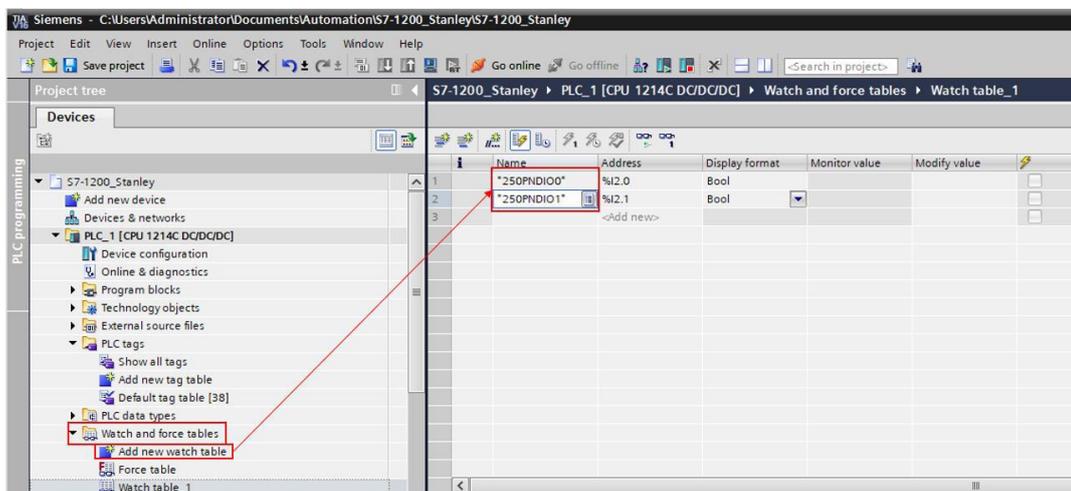
5. Click go online and click monitor all to monitor the value. You can try to trigger the DI to see if the value changes.
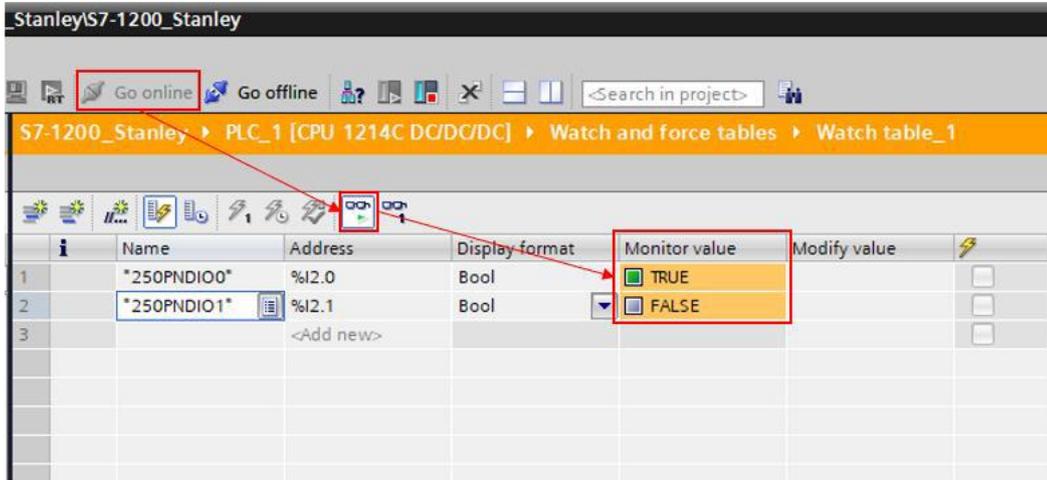
6. Now we can monitor the values. But how to configure the Channel as DI or DO. Back to Device configuration, select ADAM-200PN, Take ADAM-250PN as example, click on 16 DIO Module_1, click general parameter and we can set individual channel as DI or DQ(DO). In here we set Ch2 and Ch3 to DQ (DO)
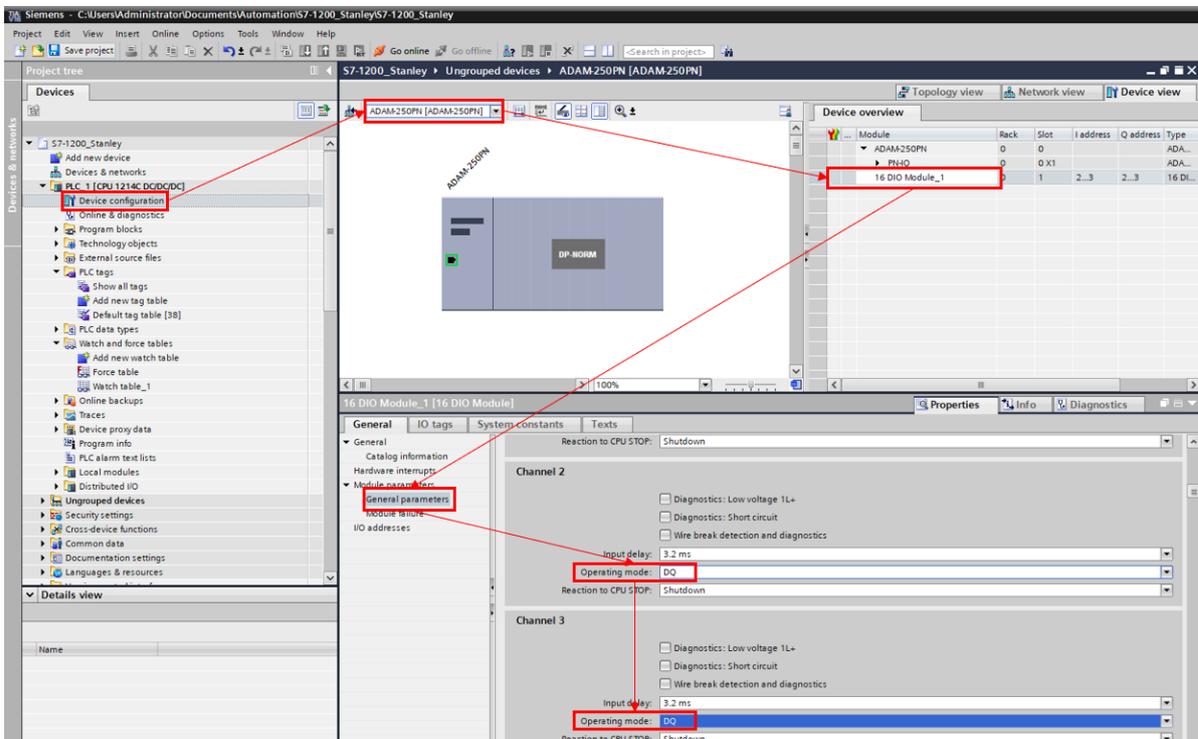
7. Back to PLC tags to add DQ (DO) tags.

8. Download project again

9. Add to Watch table and start monitor.

10. Try to change DO value and observe the LED on ADAM-200PN to see does it turn on.

4.3.4 Device IO Configuration

Each channel can be configured with the following options:
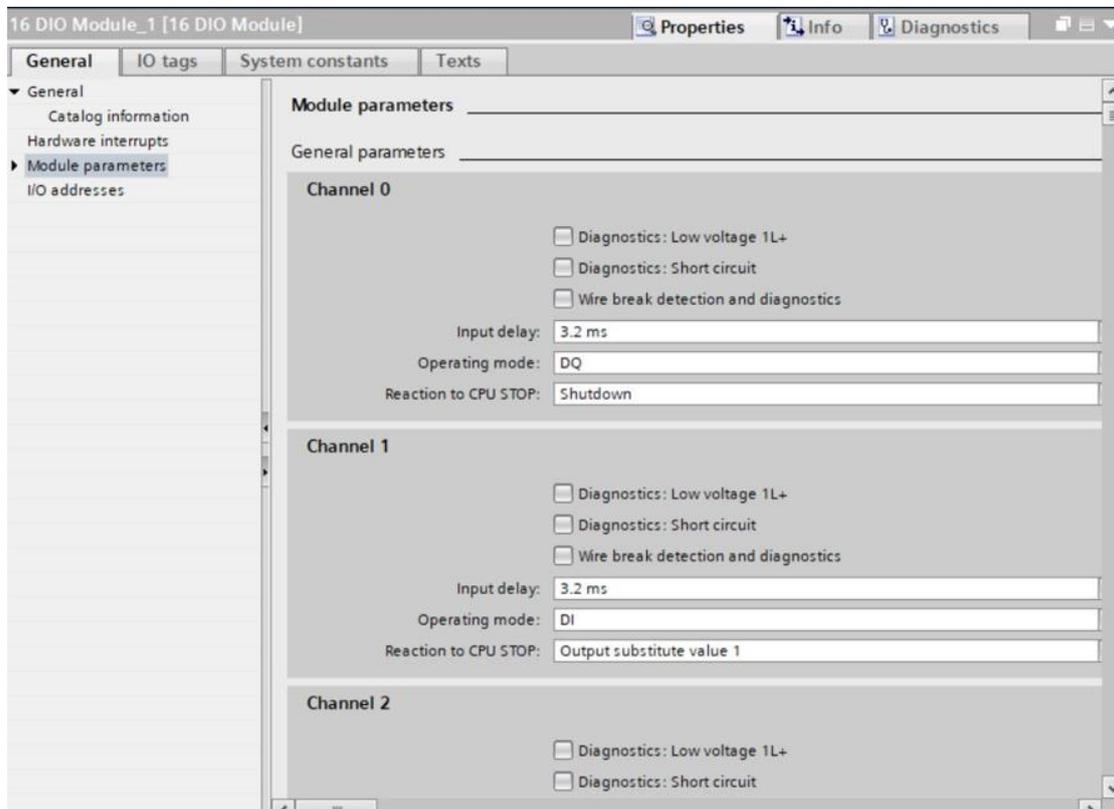
1. Diagnostic Enable : Enable/ Disable

Only Ch4~7 and Ch12~15 have Diagnostics: Missing Volatge 2L+

2. Input delay: 0.05/0.1/0.4/0.8/1.6/3.2/12.8/20ms

3. Oprating mode: DI / DO

4. Reaction to CPU STOP (Safety mode):

Shutdown / keep last value / Output substitute value 1

4.3.5 Download Configuration

After the configuration of the Device Name, Network, Connection, and IO Settings, the configuration needs to be downloaded into the Controller.
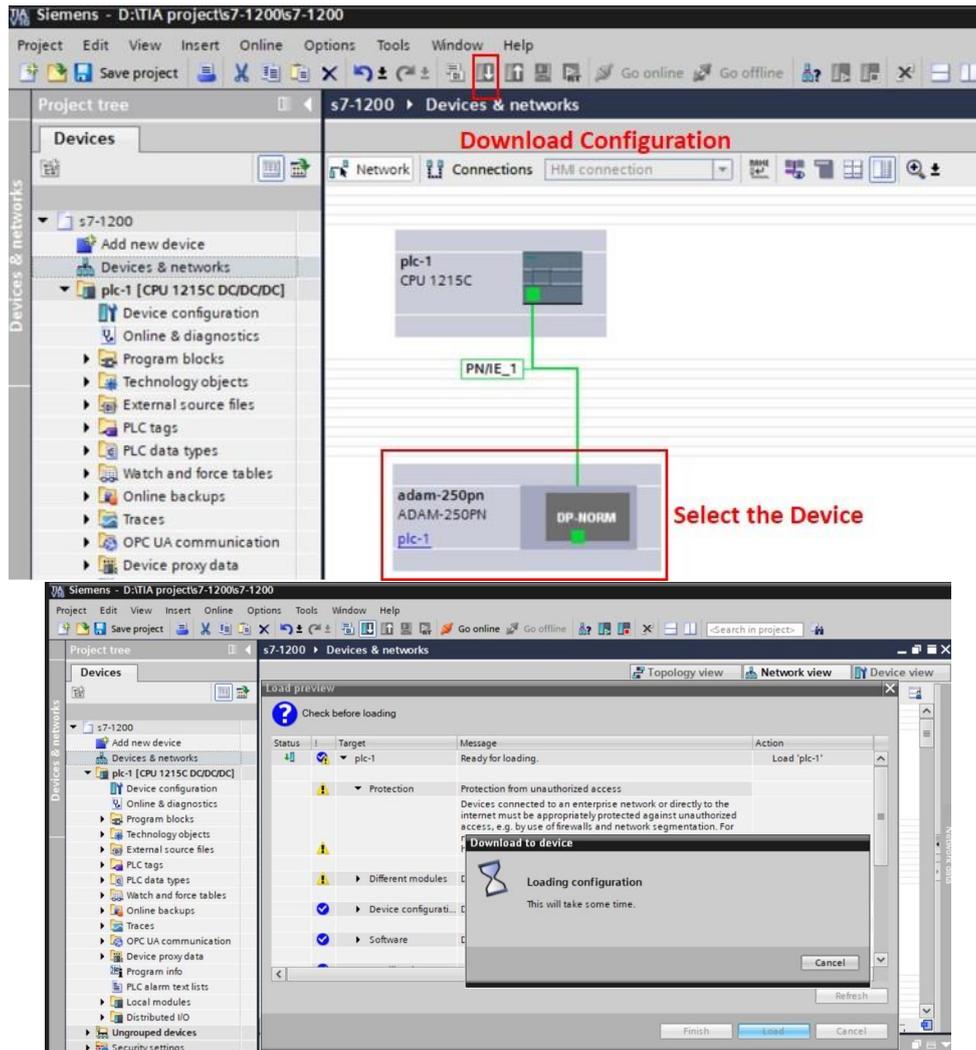
4.3.6 Online Diagnostics

Using "Go Online" allows you to start PROFINET communication with controller.

If the controller and the device are communicating with PROFINET properly, it will be displayed as shown below.
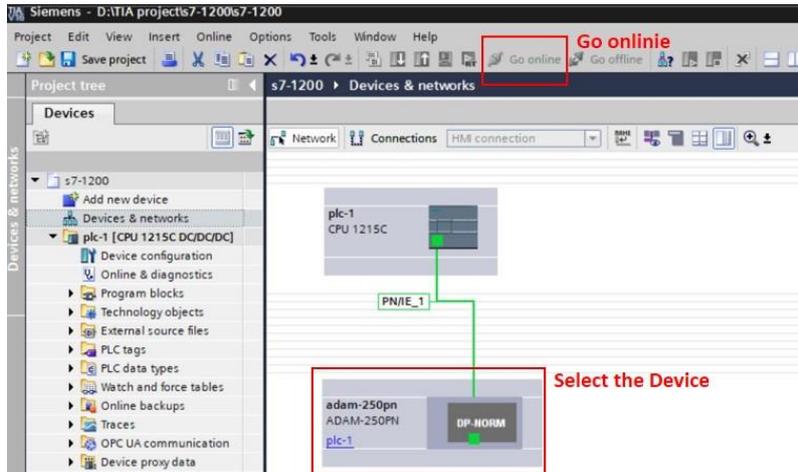
Otherwise, if the PROFINET communication fails, it will be:
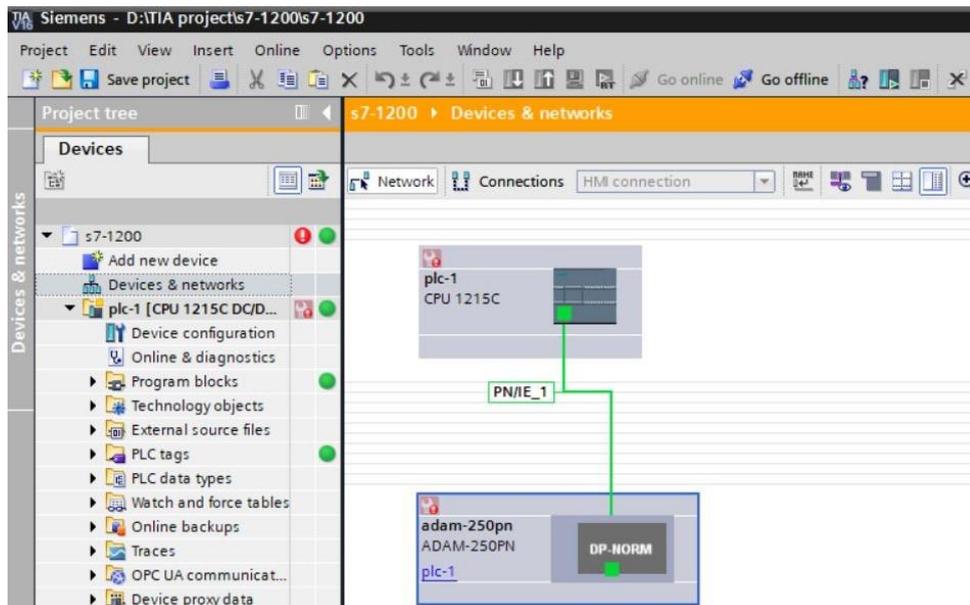
User need to check whether the Network Topology, as well as the IP and device name settings, (If user use PRONETA, also need to check they're same as setting in PRONETA)
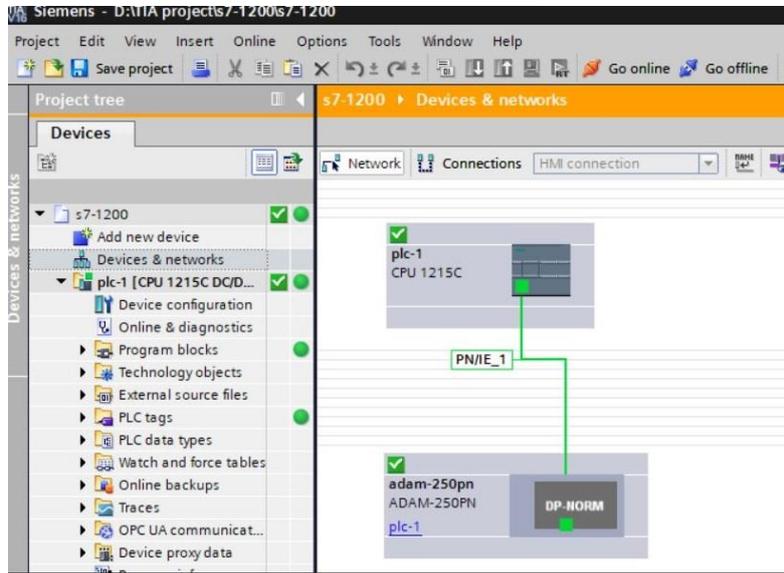
4.3.7 Channel Diagnosis

Double-click inside the (example) "16 DIO Module_1" block to access the Device Configuration.
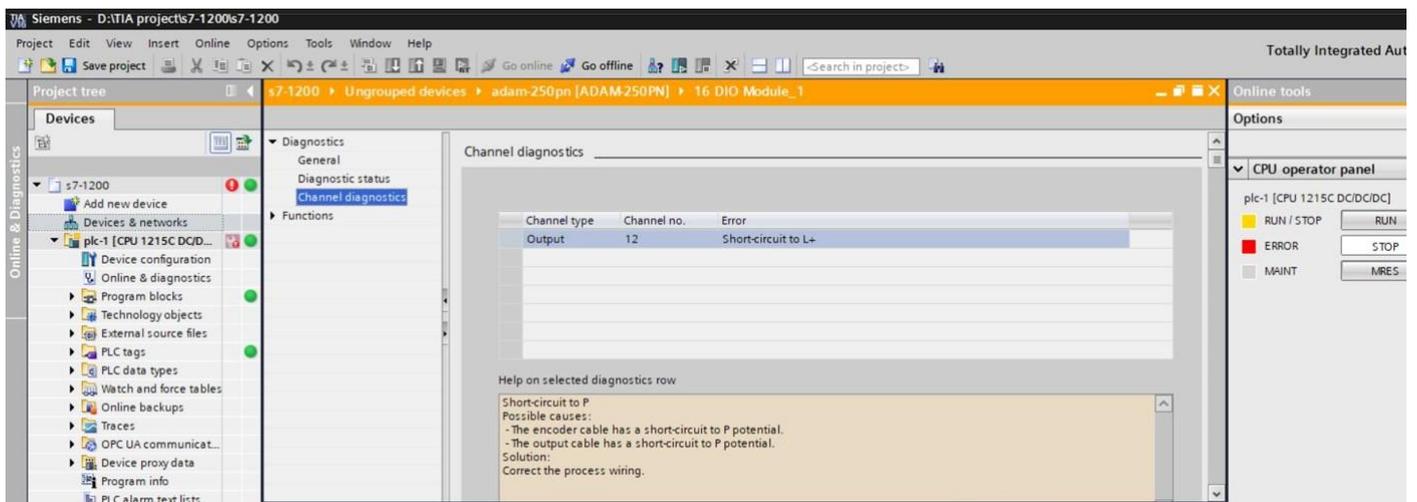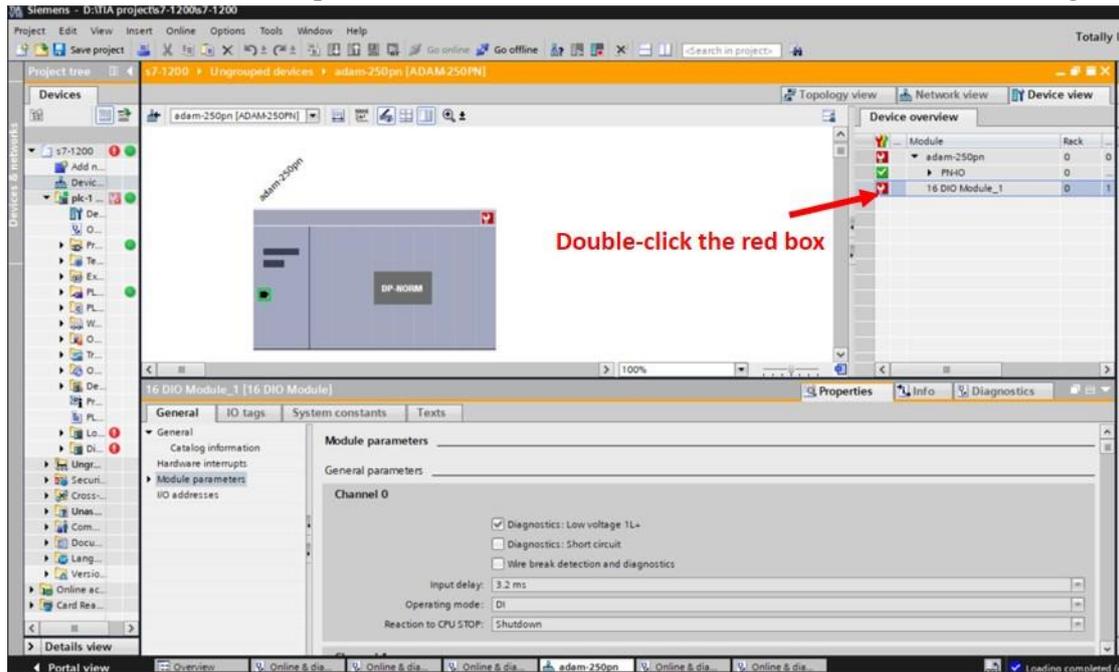
4.3.8 PROFINET IO Monitor

TIA Portal provide the function of input data monitor and output data force.

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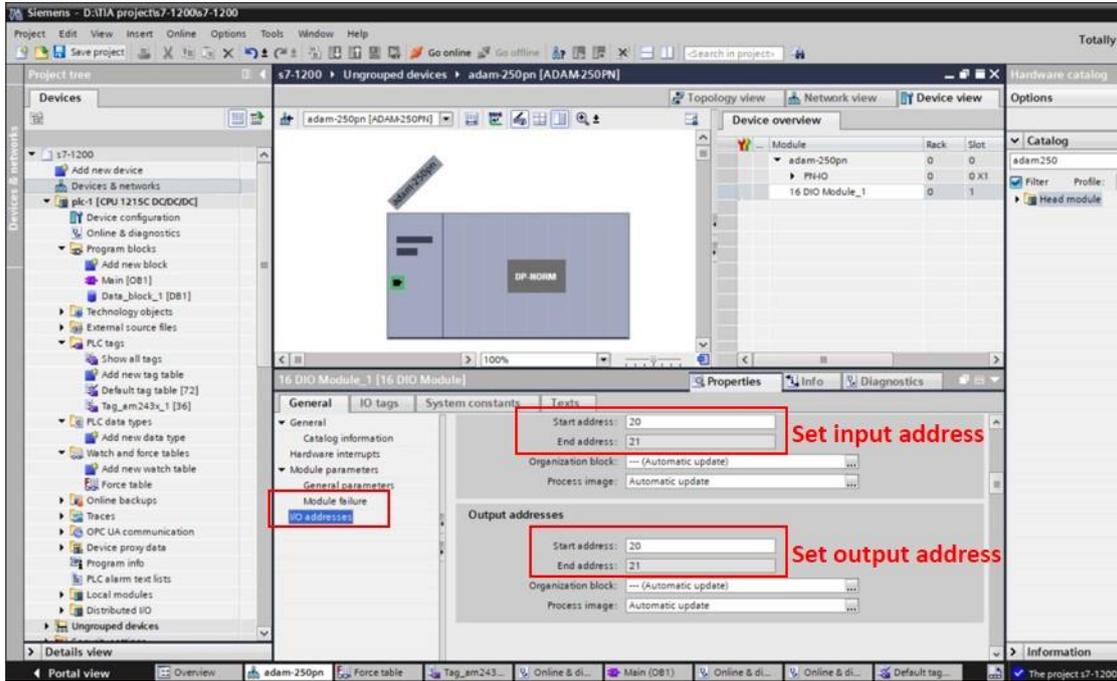
The controller assigns addresses to the Input and Output. Each address is 1 byte in size, and each channel is 1 bit. The I/O addresses are addressed separately, so the addresses for input and output can be the same.

After setting the addresses, you can use Tags to declare variables in the controller. In the Tag table, the following needs to be configured:

1. Name: Defined by the user; it is recommended to follow the address format.
2. Data Type: Bool (1 bit), Byte (8 bits), Word (16 bits)
3. Address: Can be selected after setting the data type
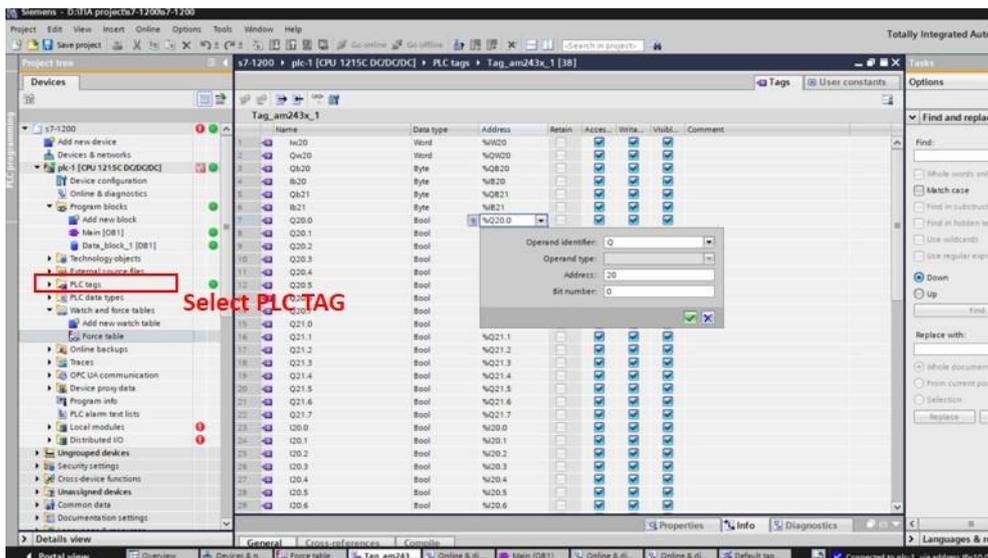
Inputs use addresses that start with "I", and outputs use addresses that start with "Q".

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For example, in the figure above, the input addresses are "I20" and "I21", while the output addresses are "Q20" and "Q21".

The number after the decimal point refers to the bit position. In the ADAM-200PN, bits are organized based on the product front side IO Designation Print Mark (like X1, X2, etc.).

Later on, you can control the I/O by entering the desired tag nae in the Force table while in Offline mode.
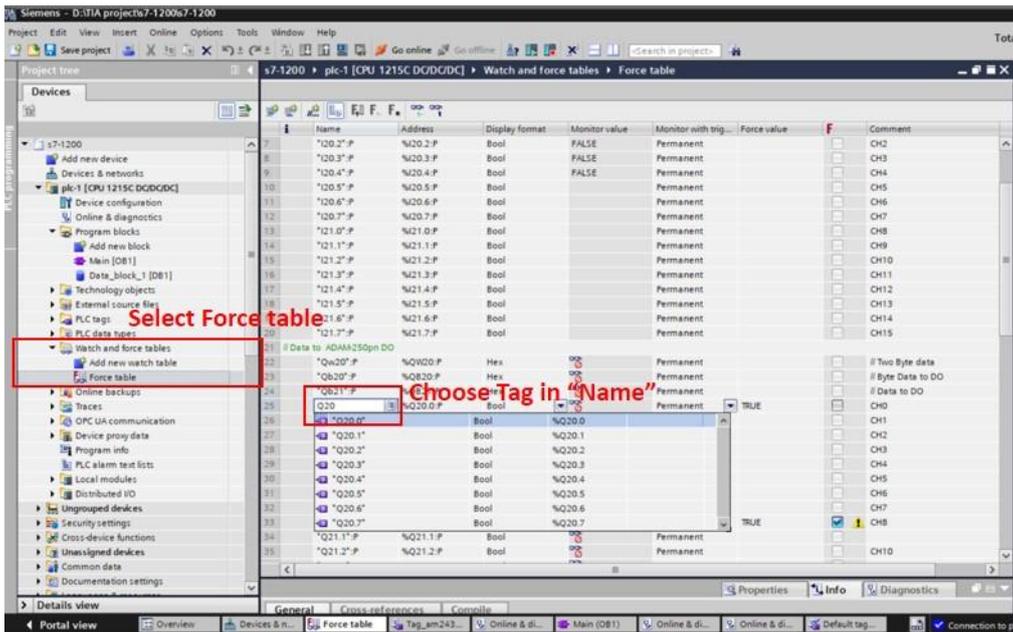
Output data: Can be controlled using Force or Program. The following output Force operation must be performed in Online mode.
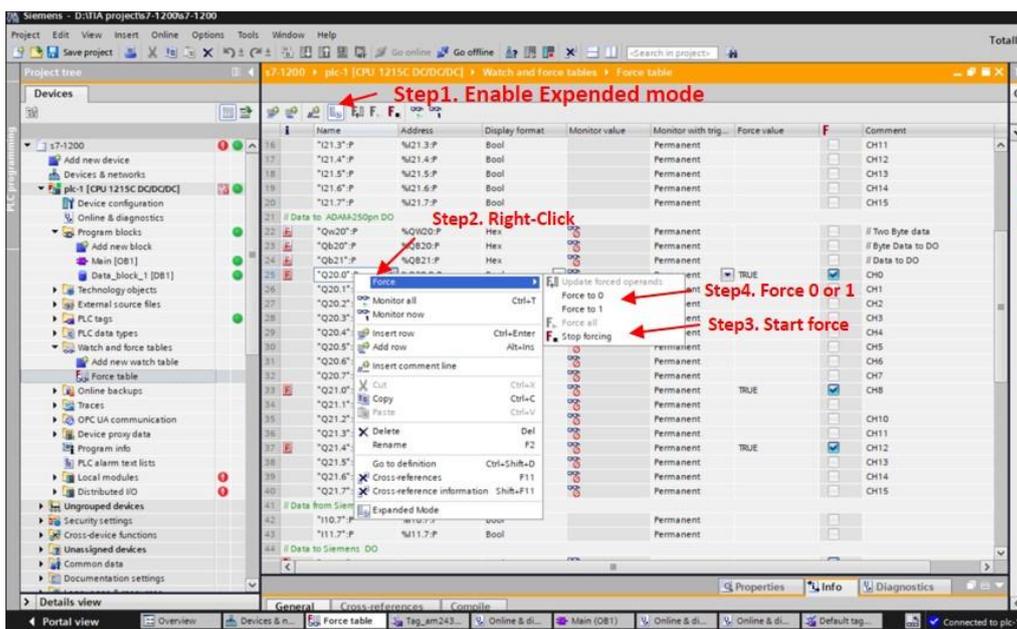
The image below shows a Program Block using the LAD language as an example
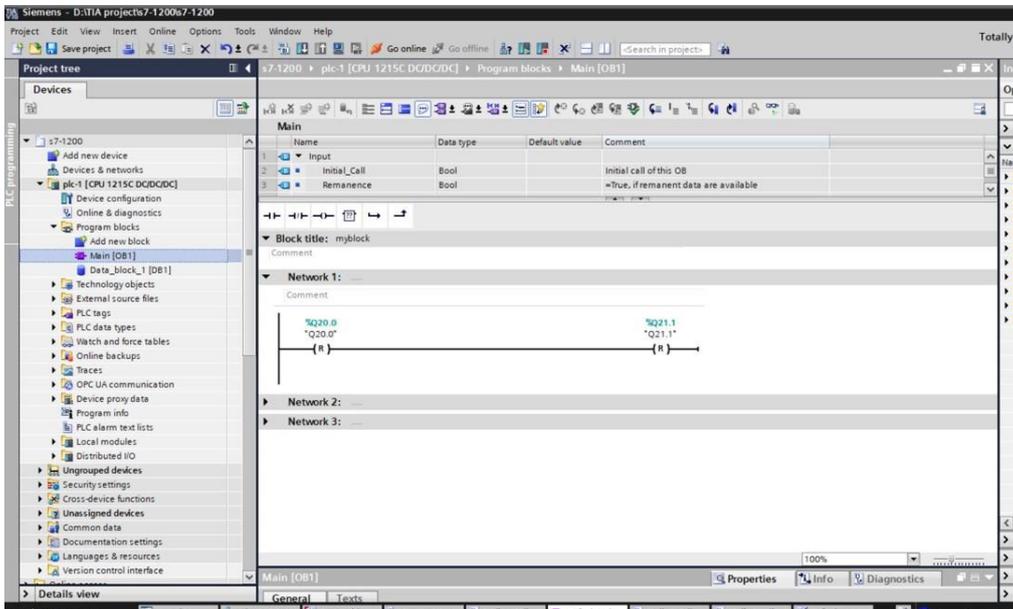
Input data: DI data can be monitored in Online Mode.
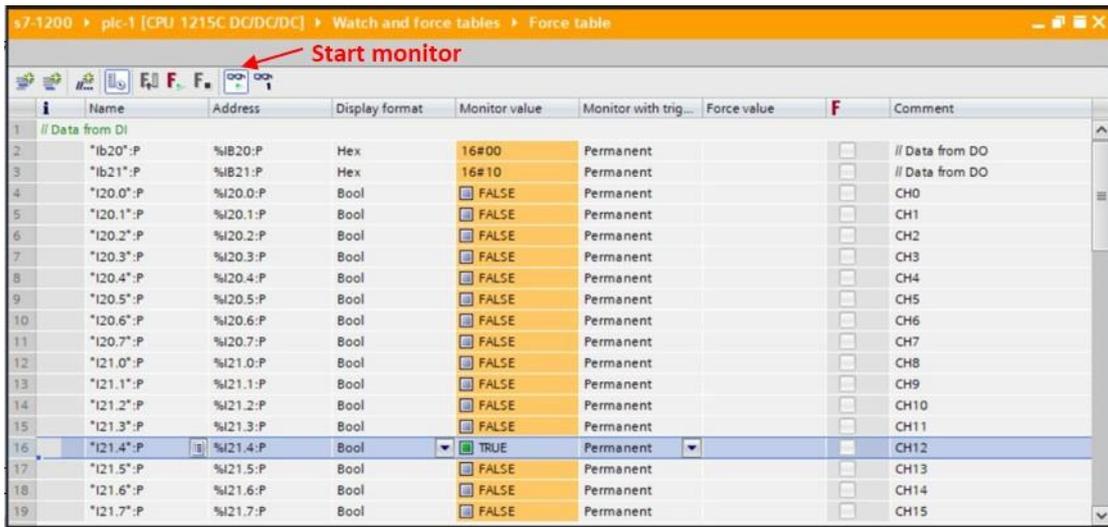
4.3.9 PROFINET MRP Configuration

Since ADAM-200PN is a MRP Client module, it needs a MRP Manager to complete the environment building.

In this case, we're using the EKI-5528-PNMA as the MRP Manager, so make sure it's connected in a ring. You can use the PRONETA to check the topology.

Once the MRP setup is complete, if one part of the ring is disconnected, it will reconnect within a short period of time.

4.4 Configure ADAM-200PN Module with Advantech IO Module Utility

After IP address setting via Ethernet Device Configuration, user can search ADAM-200PN in Advantech IO Module Utility (ex. 10.0.0.99), in "Network" setting, user can choose to enable PROFINET or not and can do host idle time and Modbus port setting.
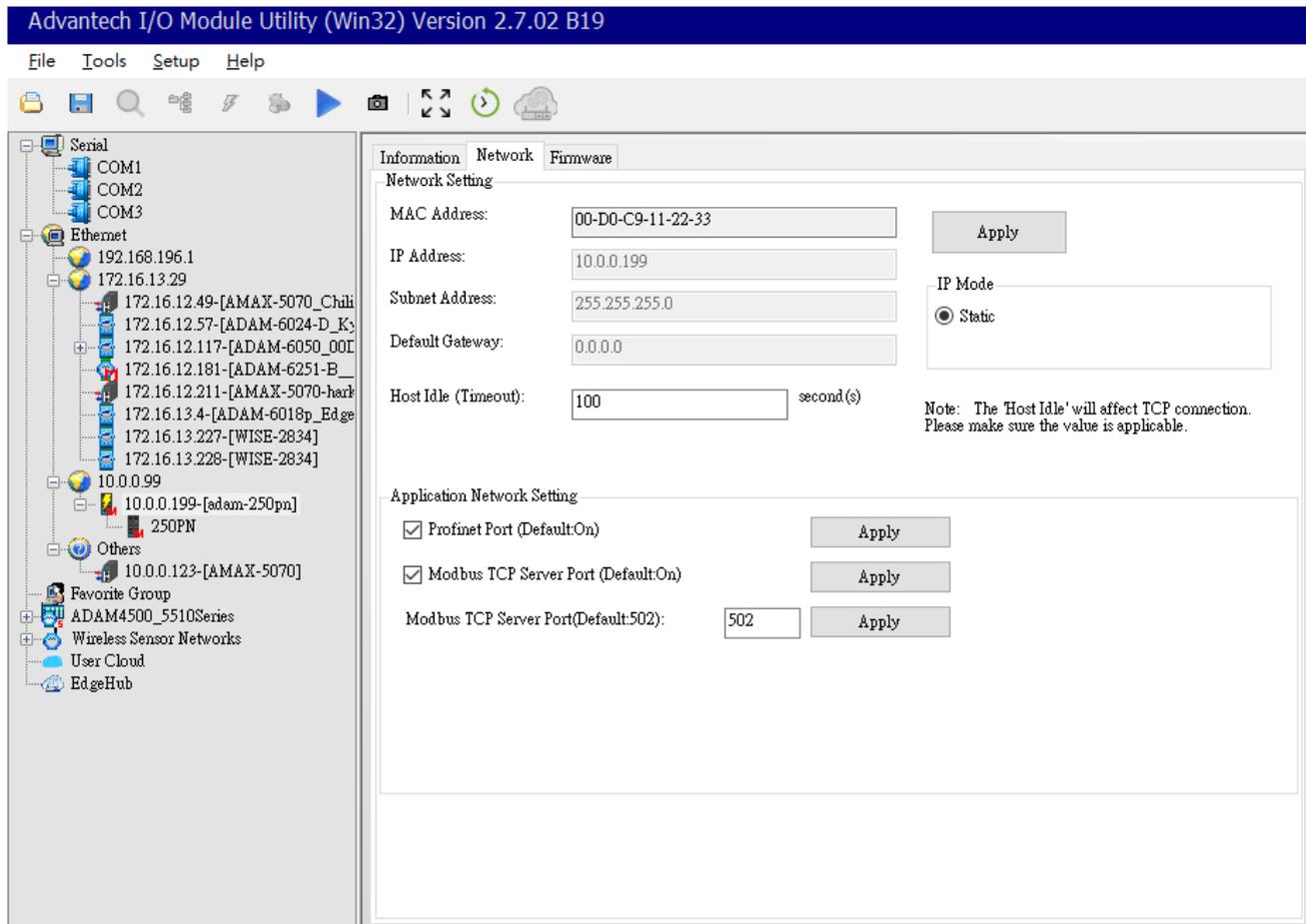
There're DI and DO setting when click in (example) "ADAM-250PN" model name icon, user can by channel setting to choose as DI or DO, or can setting one of them and "apply to all channels".

For DI setting, user can configure and apply "diagnostics", "Input delay" and related DI value
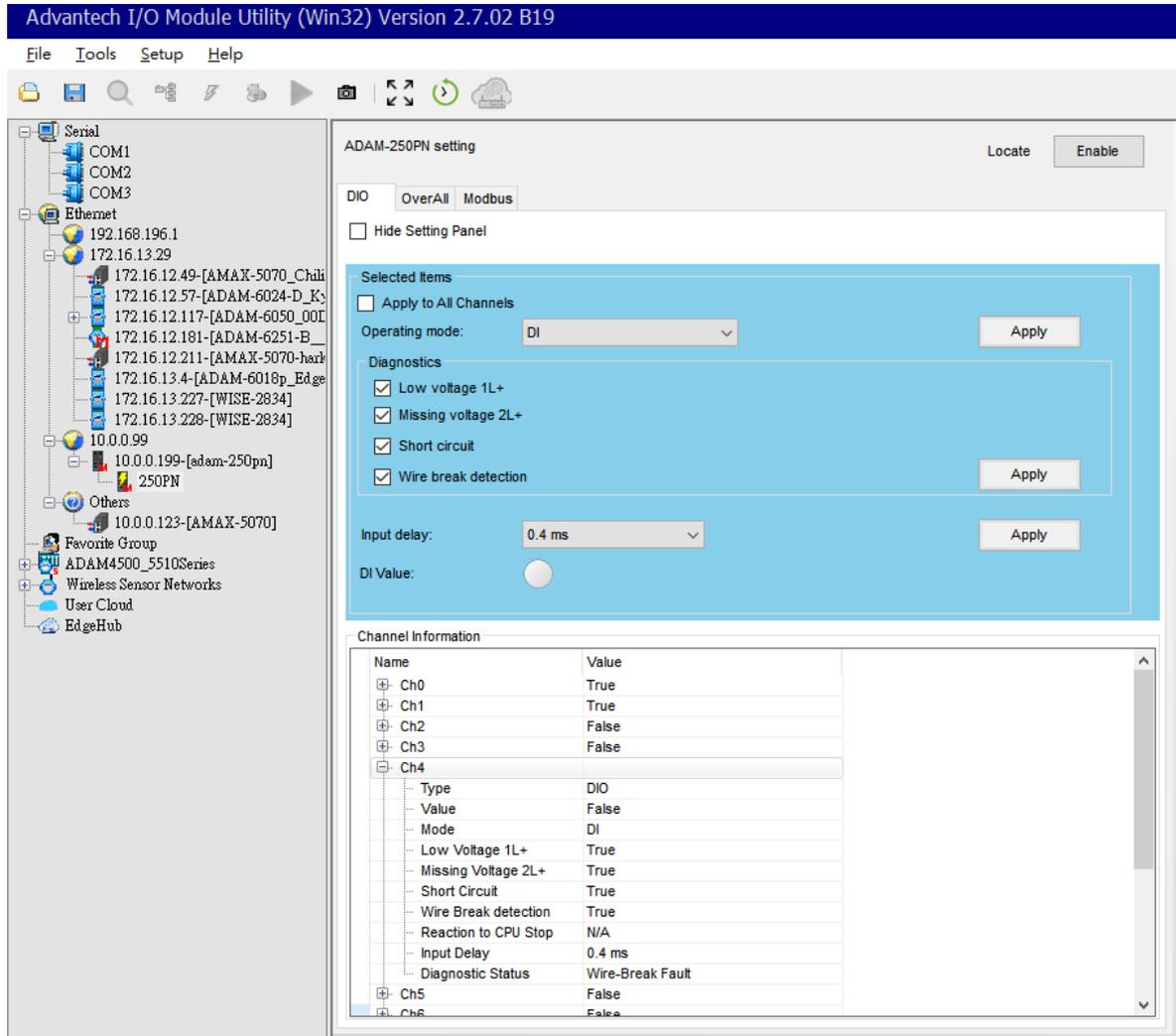
For DO setting, user can configure and apply "diagnostics" and "fail-safe value"
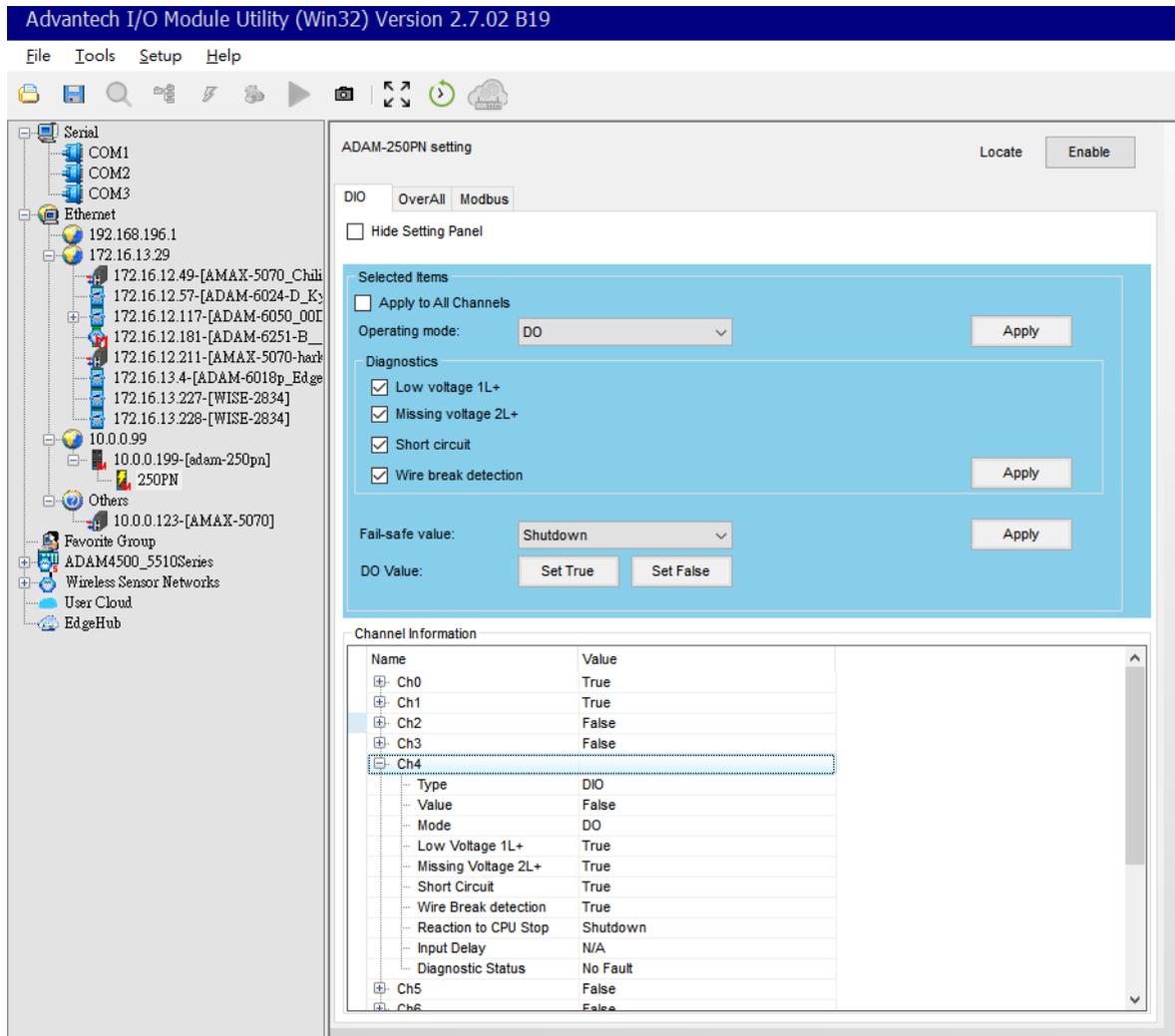
In Overall page to remote control DO on/off and a block to show diagnostics status.
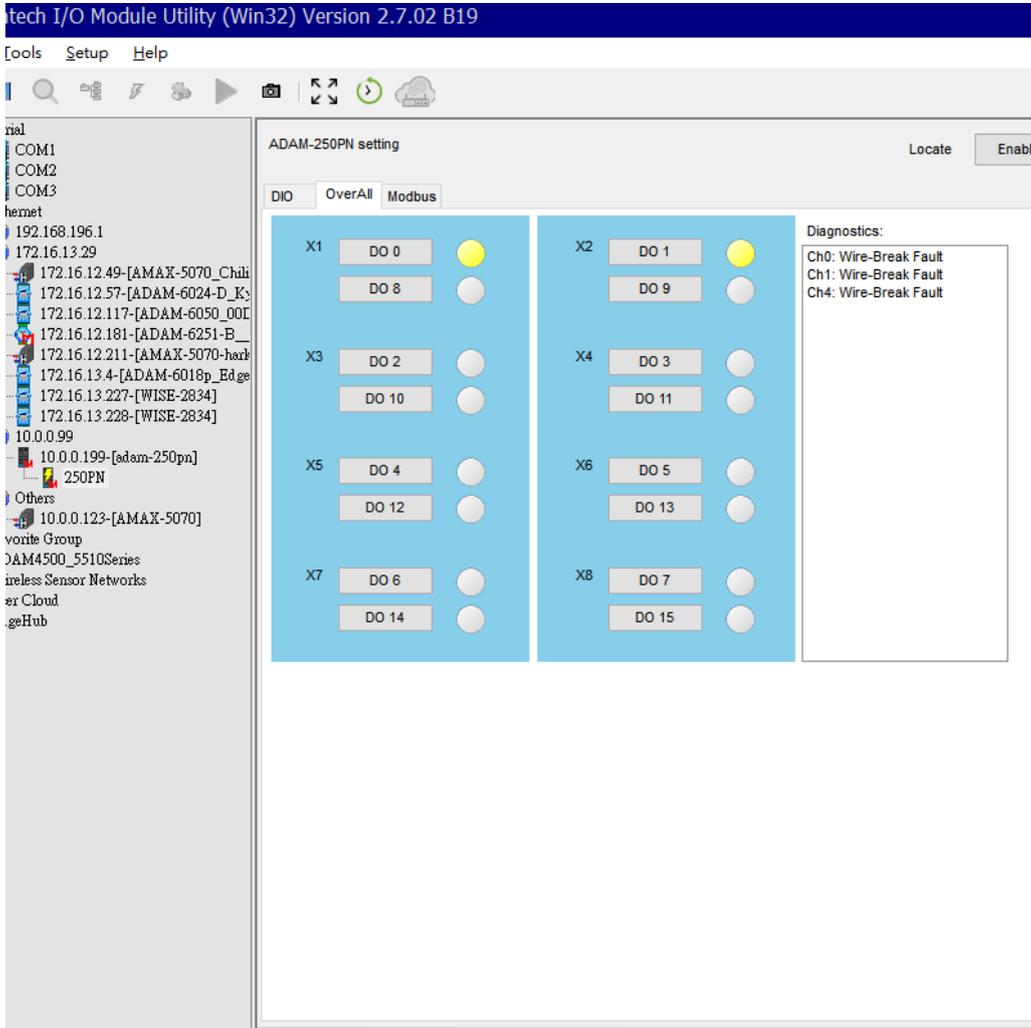
In Modbus page that shows overall DIO values.
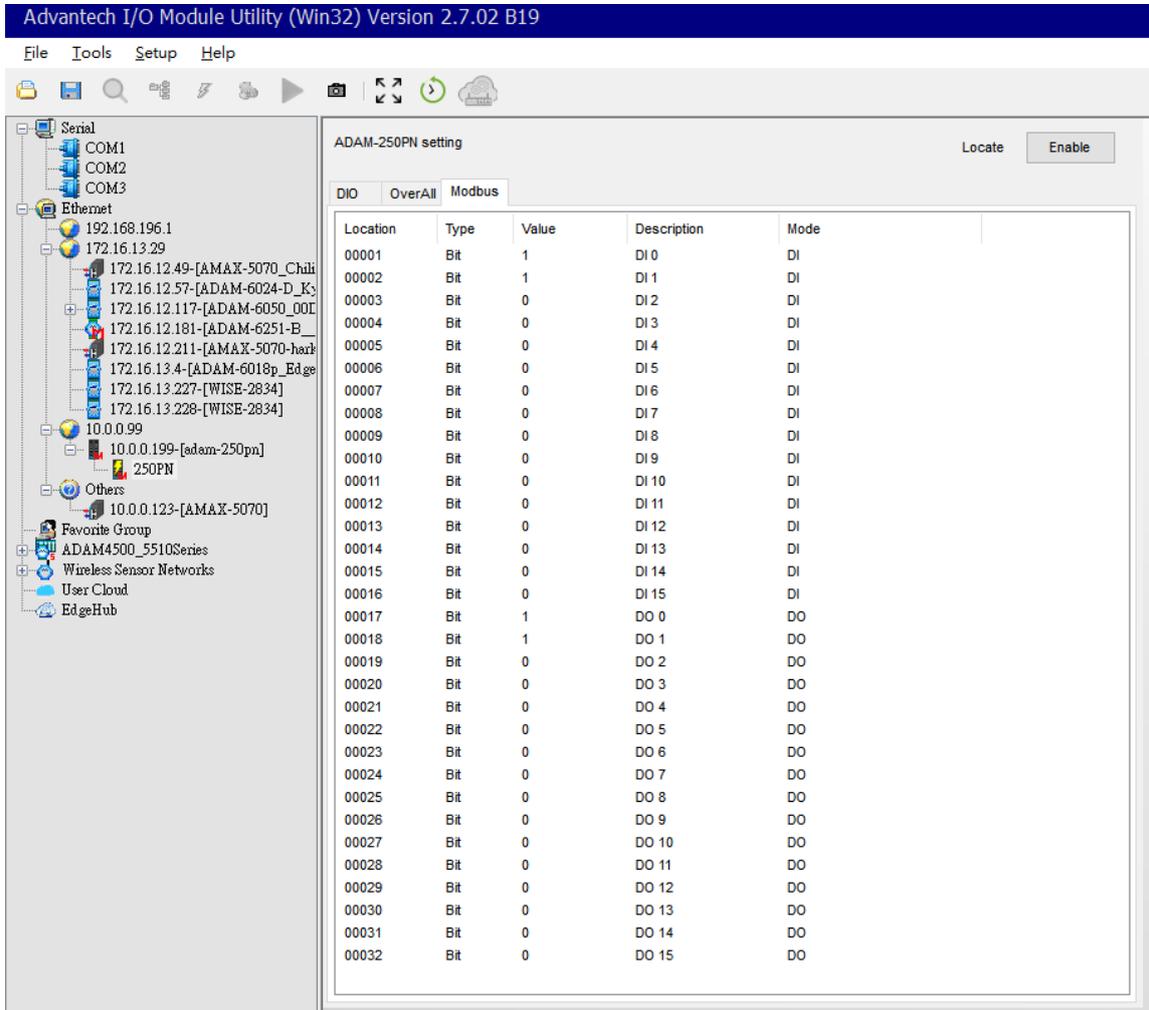
4.4.1 Firmware Download

Support with Advantech IO module Utility V2.7.03 or Later
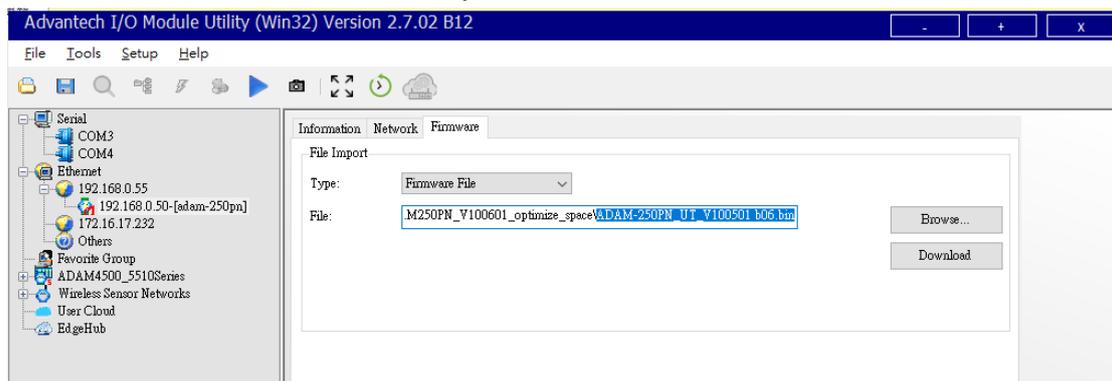
File name MUST be : ADAM-2XXPN_UT_V**xxxxxx** b**xx**.bin

The firmware can be download from Advantech website: http://www.advantech.com/support

<Note> Any "x" means Version number
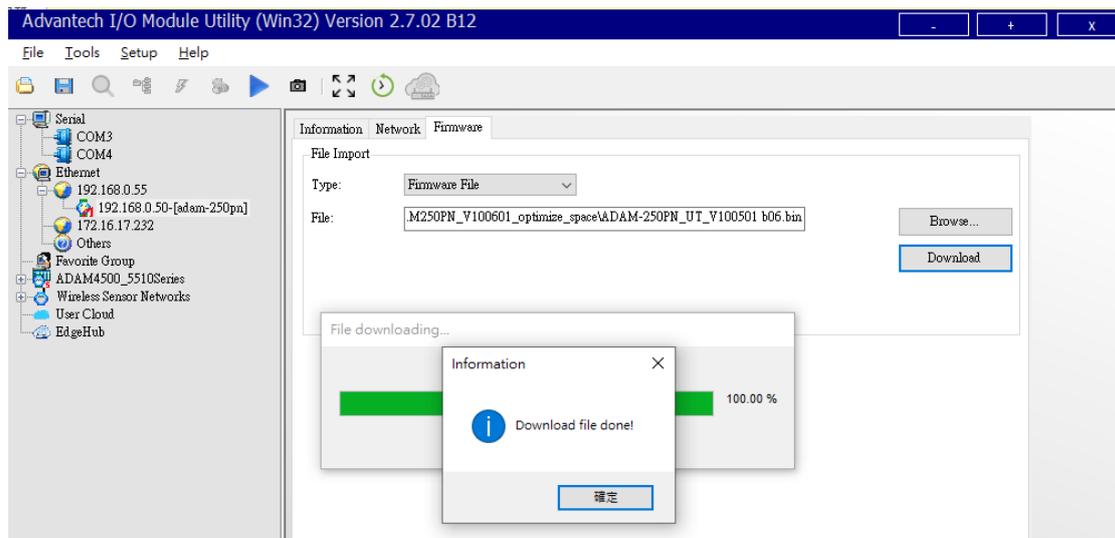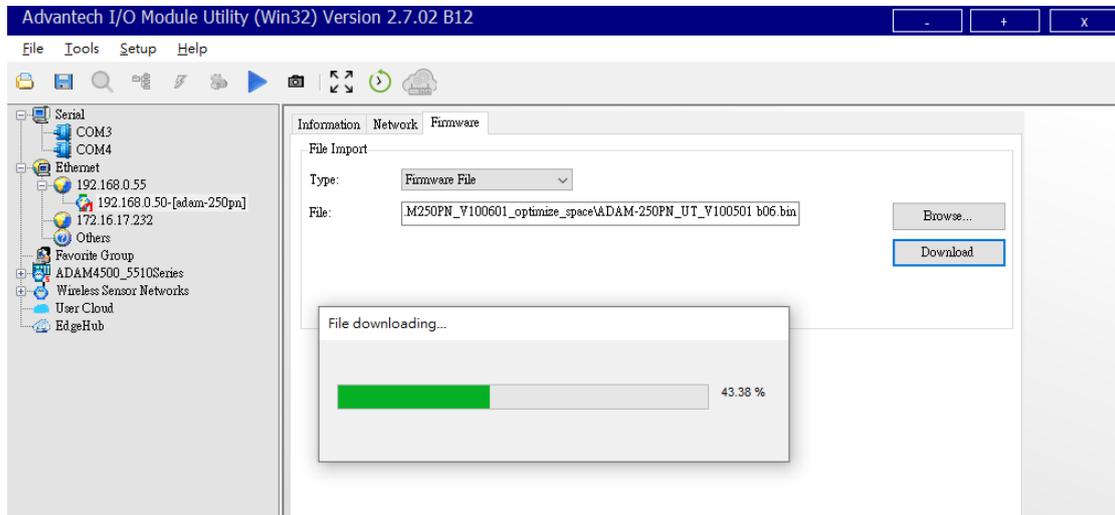
ADAM-200PN series module will auto reboot after the Firmware update.

4.5 ADAM-250PN Diagnostics Function

4.5.1 Diagnostics Level

In PROFINET, the diagnostics-defined ERRORs are categorized by levels based on their severity, it's

divided into three types:

1. Good

2. Pre-warning (Maintenance)

3. Diagnostic alarms (ERROR)

Diagnostic alarms must be used if the error or event occurs within an IO device or in conjunction with the connected components.
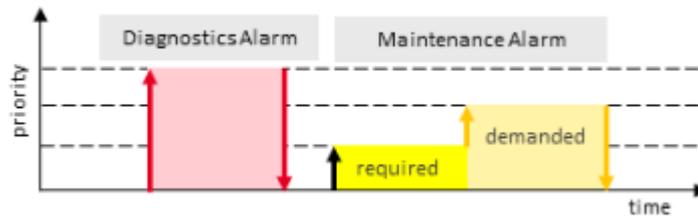
4.5.2 Diagnostics Behavior

Diagnostic Type	Triggered Alarm / Maintenance event	User Configurable	Diagnostic Level
Over Current Fault	Over-Load	No	Diagnostic alarm
Missing Voltage U_A(2L+) Fault	Supply Voltage missing	Yes	
Wire-Break Fault	Wire-Break	Yes	
Short-Circuit Fault	- Short to supply - Short to ground	Yes	
Low voltage U_S(1L+) Fault	Undervoltage	Yes	Maintain Event
Over-Voltage Fault	Over-Voltage	No	

1. Low Voltage U_S (1L+) Fault

➢ US (1L+) core power supply for Ch0 ~ Ch3 and Ch8 ~ Ch11

➢ Valid voltage range：18V(±1V) ≦ U_S ≦ 30V(±1V)

When the U_S (1L+) output voltage is lower than the Valid voltage range,

The maintain event "Low Voltage U_S (1L+) Fault" will be displayed.

➢ Error LED Indication: The left-side MS LED will flashing green

2. Missing Voltage U_A (2L+) Fault

➢ U_A (2L+) core power supply for Ch4 ~ Ch7 and Ch12 ~ Ch15

➢ Valid voltage range：18V(±1V) $\leqq$ U_A $\leqq$ 30V(±1V)

When the U_A (2L+) output voltage is lower than the valid voltage range,

The diagnostic error "Missing Voltage U_A (2L+) Fault" will be displayed.

➢ Error LED Indication: Ch4~Ch7 and Ch12~Ch15 will all light up red simultaneously

3. Over Voltage Fault

➢ The U_S (1L+) input voltage is higher than the 1L+ Valid voltage range

"Over Voltage Fault" error will be displayed on ch0~ch3, ch8~ch11

➢ The U_A (2L+) input voltage is higher than the 2L+ Valid voltage range

"Over Voltage Fault" error will be displayed on ch4~ch7, ch12~ch15

➢ Error LED Indication: The left-side MS LED will flashing green

4. Over Current Fault

➢ When the load on one of the power supplies (U_A or U_S) exceeds 12A, that power supply will trigger an
    overcurrent protection.

➢ Error LED Indication:

If U_S (1L+ core) Over Current ch0~ch3, ch8~ch11 will all light up red simultaneously.

If U_A (2L+ core) Over Current ch4~ch7, ch12~ch15 will all light up red simultaneously.

5. Wire-Break Fault

➢ In DI Mode, a Wire-break Fault is triggered if there is no input on the channel.

➢ In DO Mode, a Wire-break Fault is triggered if the channel is outputting ON but no current is detected.

➢ Error LED behavior: The channel that triggers the Wire-break Fault will light up with a red LED.

6. Short-Circuit (DI / DO) Fault

➢ There have two kinds of Short Circuit diagnostic:

➢ Short to supply Fault: Short to ground: DO (turn on) or supply short to ground

➢ Short to ground Fault: DO (turn off) short to supply

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The Channel A-code cable M12 connector is shown in the chart as below:

Pin	X1-X4		X5-X8		Front View
	Assignment	Core color	Assignment	Core color	
1	U_S	Red	U_A	Red	
2	DIO 8-11	Blue	DIO 12-15	Blue	
3	U_S_GND	Green	U_A_GND	Green	
4	DIO 0-3	Yellow	DIO 4-7	Yellow	
5	FGND	Black	FGND	Black	

Based on the wiring of the channel A-code cable, the table below shows the changes in diagnostics under various wiring combinations in DI and DO modes:

A-coded cable Wiring	DIO Port	
	DI	**DO**
U_S to U_S_GND **U_A to U_A_GND**	Short to ground	Short to ground
DIO to U_S **DIO to U_A**	No Error	➢ When DO turn On, there's No Error. ➢ When DO turn OFF, it will trigger **Short to supply**
DIO to U_S_GND **DIO to U_A_GND**	No Error	➢ When DO turn On, it will trigger **Short to ground.** ➢ When DO turn OFF, there's No Error.

Error LED Indication: The channel that triggers the **Short-Circuit** Fault will light up with a red LED.

4.5.3 Reaction to CPU Stop

Reaction to CPU STOP is a function of the DO (Digital Output) and is only available with the **PROFINET protocol**, When ADAM-250PN is not controlled by a controller, it will trigger DO action.

The channels in DO Mode will determine the DO output based on the behavior defined by the pre-configured DO value.

The safety value can be set through TIA Portal, with the configuration values shown as follows:

Reaction to CPU STOP	Describe
Shutdown	Turn off DO
Keep last value	Maintain last status
Output substitute value 1	Turn on DO

Diagnostic will still work in safety mode.

4.6 Digital Input Filter

Input Filter is a function of the DI (Digital Input). It only detects a change in the input signal when the variation in the signal persists for a duration longer than the configured input delay time.
Support: None/ 0.05ms/ 0.1ms/ 0.4ms/ 0.8ms/ 1.6ms/ 3.2ms/ 12.8ms/ 20ms

It can be configured for each channel's input filter delay via TIA Portal.

4.7 Fail-Safe Value

Fail-Save value is a function of the DO (Digital Output) and is only available with the **Modbus protocol**. When communication between the host PC and an ADAM-250PN is broken, the digital output channels can generate a predefined value, which is referred to as a fail-safe value (FSV).

There are three fail-safe value that can be configured via Modbus addresses 40391-40406 by channel: Turn off DO / Maintain last status / and Turn on DO.

4.8 Protocol Enable/Disable

Support Enable/Disable protocol: Modbus, PROFINET

By default, both protocols are enabled. Please note that if the PROFINET device has successfully connected before, **Modbus will switch to read-only mode**(disable the write function) until the next restart.

Func \ Protocol	Enable Profinet	Enable Modbus	Both Enable
Support DCP	Yes	No	Yes
Support DHCP	No	No	No
Default IP	0.0.0.0	0.0.0.0 [1]	0.0.0.0
Support Host Idle time	No	Yes	Yes [2]
DO value when disconnected	Reaction to CPU STOP	Fail-Safe value	Reaction to CPU STOP
Configurable Module Name& IP	Yes (Through DCP)	Yes (Through DCP)	Yes (Through DCP)
Modbus writable	No	Yes	No [3]

[1]. To use the Modbus TCP function, you must first configure the IP address via DCP.

[2]. Host Idle time only active on Modbus

[3]. It depends on whether PROFINET device has ever connected. If it has, Modbus will be unable to write to IO until the next restart. Otherwise, Modbus can be used to perform read/write functions normally.

4.9 Modbus TCP

1. Support up to 32 client connections

2. Support configurable Modbus TCP port, Default port: 502

3. Support Communication WDT, Default WDT time: 10 sec

4. Support disable/enable Modbus TCP server, Default enable.

5. Support Function code:

0x01(Read Single Coil), 0x05 (Force Single Coil)

0x03(Read Holding Reg), 0x06(Write Holding Reg)

0x10(Preset Multiple Reg), 0x0F(Force Multiple Coils)

APPENDIX A Modbus Mapping Table

A.1 Modbus Function Code Introduction

To full-fill the programming requirement, there is a series of function code standard for user's reference.

Code (Hex)	Name	Usage
01	Read Coil Status	Read Discrete Output Bit
02	Read Input Status	Read Discrete Input Bit
03	Read Holding Registers	Read 16-bit register. Used to read integer or floating point process data.
04	Read Input Registers	
05	Force Single Coil	Write data to force coil ON/OFF
06	Preset Single Register	Write data in 16-bit integer format
08	Loopback Diagnosis	Diagnostic testing of the communication port
0F	Force Multiple Coils	Write multiple data to force coil ON/OFF
10	Preset Multiple Registers	Write multiple data in 16-bit integer format

A.2 ADAM-250PN 16-ch Configurable Digital Input/ Output Module

Address (0X)

Modbus Address	Channel	Description	Attribute
00001	0		Read
00002	1		Read
00003	2		Read
00004	3		Read
00005	4		Read
00006	5	DI Value	Read
00007	6		Read
00008	7		Read
00009	8		Read
00010	9		Read

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00011	10		Read
00012	11		Read
00013	12		Read
00014	13		Read
00015	14		Read
00016	15		Read
00017	0		Read/Write
00018	1		Read/Write
00019	2		Read/Write
00020	3		Read/Write
00021	4		Read/Write
00022	5		Read/Write
00023	6		Read/Write
00024	7	DO Value	Read/Write
00025	8		Read/Write
00026	9		Read/Write
00027	10		Read/Write
00028	11		Read/Write
00029	12		Read/Write
00030	13		Read/Write
00031	14		Read/Write
00032	15		Read/Write
00151	0		Read/Write
00152	1		Read/Write
00153	2		Read/Write
00154	3		Read/Write
00155	4		Read/Write
00156	5		Read/Write
00157	6	IO Mode	Read/Write
00158	7		Read/Write
00159	8		Read/Write
00160	9		Read/Write
00161	10		Read/Write
00162	11		Read/Write
00163	12		Read/Write

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00164	13		Read/Write
00165	14		Read/Write
00166	15		Read/Write

1. Digital Input value
➢ Logic 1 represents there's signal input, otherwise, there's no signal input.

2. Digital Output Value
➢ Logic 1 represents there's signal output, otherwise, there's no signal output.
➢ When in DI mode, the DO value cannot be changed.

3. IO Mode
➢ Logic 1 represents DI mode, while Logic 0 represents DO mode.

Address (4x)

Modbus Address	Channel	Description	Attribute
40211 - 40212	-	Module name	Read
40301	-	DI Value	Read
40303	-	DO Value	Read/Write
40307	-	Module Diagnostic	Read
40309	-	IO Mode	Read/Write
40331	0		Read
40332	1		Read
40333	2		Read
40334	3		Read
40335	4		Read
40336	5		Read
40337	6	Channel Diagnostic Info	Read
40338	7		Read
40339	8		Read
40340	9		Read
40341	10		Read
40342	11		Read
40343	12		Read

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40344	13		Read
40345	14		Read
40346	15		Read
40351	0	Enable/Disable Diagnostic	Read/Write
40352	1		Read/Write
40353	2		Read/Write
40354	3		Read/Write
40355	4		Read/Write
40356	5		Read/Write
40357	6		Read/Write
40358	7		Read/Write
40359	8		Read/Write
40360	9		Read/Write
40361	10		Read/Write
40362	11		Read/Write
40363	12		Read/Write
40364	13		Read/Write
40365	14		Read/Write
40366	15		Read/Write
40371	0	DI Input Filter	Read/Write
40372	1		Read/Write
40373	2		Read/Write
40374	3		Read/Write
40375	4		Read/Write
40376	5		Read/Write
40377	6		Read/Write
40378	7		Read/Write
40379	8		Read/Write
40380	9		Read/Write
40381	10		Read/Write
40382	11		Read/Write
40383	12		Read/Write
40384	13		Read/Write
40385	14		Read/Write
40386	15		Read/Write

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40391	0	Fail-Safe Value	Read/Write
40392	1		Read/Write
40393	2		Read/Write
40394	3		Read/Write
40395	4		Read/Write
40396	5		Read/Write
40397	6		Read/Write
40398	7		Read/Write
40399	8		Read/Write
40400	9		Read/Write
40401	10		Read/Write
40402	11		Read/Write
40403	12		Read/Write
40404	13		Read/Write
40405	14		Read/Write
40406	15		Read/Write

4. Module Name

➢ Address 40211 displays the numeric part of the module e.g. 0x0250,

5. DI Value

➢ DI values are shown in 16-bit format — channel 0 is the LSB, and channel 15 is the MSB.

➢ It shows the same values as those of Modbus addresses 1 to 16 for DI value.

6. DO Value

➢ DO values are shown in 16-bit format — channel 0 is the LSB, and channel 15 is the MSB.

➢ It shows the same values as those of Modbus addresses 17 to 32 for DO value.

7. IO Mode

➢ IO Mode are shown in 16-bit format — channel 0 is the LSB, and channel 15 is the MSB.

➢ It shows the same values as those of Modbus addresses 151 to 166 for IO Mode

8. Diagnostic Info

Diagnostic data for each channel will be displayed, using 16-bit representation:

Diagnostic Information format		
Bit	**Diagnostic Type**	**Description**
0	Short-Circuit(DI/DO) Fault	Logic-1 indicates that the corresponding bit's diagnostic event has occurred; Logic-0 means it has not occurred or the diagnostic is not enabled
1	Wire-Break Fault	
2	Missing Voltage U_A (2L+) Fault	
3	Low Voltage U_S (1L+) Fault	
4	Over current	
5	Overvoltage U_S (1L+)	
6	Overvoltage U_A (2L+)	
7-15	Reserve	

For detailed diagnostic behavior, please refer to 5.2 Diagnostic Behavior

9. Enable/Disable Diagnostic

There are four diagnostic could be configurate:

➢ Short-Circuit(DI/DO)

➢ Wire-Break

➢ Missing Voltage 2L+

➢ Low Voltage 1L

Enable Diagnostic for each channel will be displayed, using 16-bit representation:

Enable Diagnostic format		
Bit	**Diagnostic Type**	**Description**
0	Short-Circuit (DI/DO) Fault	Logic-1 means the diagnostic for the corresponding bit is enabled; Logic-0 means it's disabled.
1	Wire-Break Fault	
2	Missing Voltage U_A (2L+) Fault	
3	Low Voltage U_S (1L+) Fault	
4	Over current (Fix 1)	
5	Overvoltage U_S (1L+) (Fix 1)	
6	Overvoltage U_A (2L+) (Fix 1)	
7-15	Reserve (Fix 0)	

10. DI Input Delay

For detailed diagnostic behavior, please refer to 4.6 Digital Input Filter

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Input Filter	Hex
0.05ms	0x0
0.1ms	0x1
0.4ms	0x2
0.8ms	0x3
1.6ms	0x4
3.2ms	0x5
12.8ms	0x6
20ms	0x7
None	0x8

11. Fail-Safe Value

For detailed diagnostic behavior, please refer to 4.7 Fail-Safe Value

Fail-Safe Value	Hex
Turn off DO.	0x0
Maintain last status	0x1
Turn on DO	0x2

A.3 Function on Utility

1. Modbus TCP Server Port
➢ Modbus TCP Server Port range: 1 – 65535
➢ It'll restart the system automatedly after you set.

2. Host Idle Time

➢ If no connection is received by the Modbus TCP server within the preset duration (default: 10 seconds), the Communication WDT triggers.
➢ This causes the system to enter Safety Mode, turning off the System LED_NS, which resumes blinking once a connection is detected.
➢ Communication WDT Time range: 1 – 4095 (sec)
➢ It'll restart the system automatedly after you set.

3. Enable/Disable Modbus

➢ It'll restart the system automatedly after you set.

4. Enable/Disable PROFINET

➢ It'll restart the system automatedly after you set.