User Manual

ADAM-6100EI Series

EtherNet/IP I/O Modules

ADVANTECH

*e*Automation

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If you think you have a defective product, follow these steps:

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 you get when the problem 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 an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.

4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.

5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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 kind of cable is available from Advantech. Please contact your local supplier for ordering information.

FCC Class A

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Technical Support and Assistance

1. Visit the Advantech web site at www.advantech.com/support where you can find the latest information about the product.
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 you call:
   – Product name and serial number
   – Description of your peripheral attachments
   – Description of your software (OS, version, application software, etc.)
   – A complete description of the problem
   – The exact wording of any error messages

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

■ To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.

Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

Safety Instructions

1. Read these safety instructions carefully.

2. Keep this User Manual for later reference.

3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.

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

5. Keep this equipment away from humidity.

6. Put this equipment on a reliable surface during installation. Dropping it or letting it 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. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.

9. Position the power cord so that people cannot step on it. 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 by transient overvoltage.

12. Never pour any 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 situations arises, get the equipment checked by service personnel:

15. The power cord or plug is damaged.

16. Liquid has penetrated into the equipment.

17. The equipment has been exposed to moisture.

18. The equipment does not work well, or you cannot get it to work according to the user's manual.

19. The equipment has been dropped and damaged.

20. The equipment has obvious signs of breakage.

21. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.

22. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.

23. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Chapter 1

Overview

1.1 Introduction

ADAM-6100EI is a series of EtherNet/IP remote I/O modules. EtherNet/IP protocol is very popular in industrial automation applications and all ADAM-6100EI series modules can comply with it. You can easily connect ADAM-6100EI modules to EtherNet/IP masters, like Allen-Bradley PLC, through EtherNet/IP protocol. ADAM-6100EI series module supports **Initial mode** and **Normal mode (EtherNet/IP mode)**, that you can set by the DIP switch on the side of ADAM module. Refer to Section 1.3.3 for how to configure it. When you configure the mode as **Initial mode**, you can configure ADAM-6100EI module's IP address and related setting by Advantech APAX/ADAM.Net utility. When you configure the mode as **Normal mode**, ADAM-6100EI modules are ready to communicate with EtherNet/IP master by EtherNet/IP protocol.

1.2 System Architecture

ADAM-6100EI series modules can be daisy-chained in an Ethernet network, making it easier to deploy, and helping improve scalability. You can refer to the figure below to see how a daisy-chain connection works in the network.

Figure 1.1 ADAM-6100EI Daisy Chain Connections

1.3 Features

### 1.3.1 Daisy Chain Connection

ADAM-6100EI 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 10/100Mbpst through standard RJ-45 connectors.

Pin	Assignment	Description
1	TD +	Transmit +
2	TD -	Transmit -
3	RD +	Receive +
4	N/C	not used
5	N/C	not used
6	RD -	Receive -
7	N/C	not used
8	N/C	not used

1.3.2 2,500V Isolation Protection

With triple isolation, including power supply, input/output, and Ethernet communication, ADAM-6100EI series ensures I/O data to be controlled correctly, and prevents devices from breaking down.
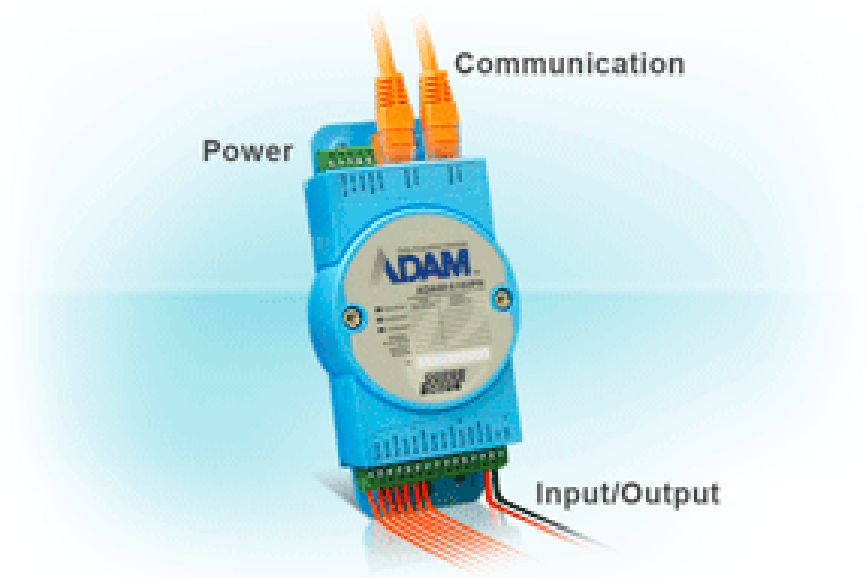

1.3.3 Ethernet-based Configuration Tool

You can configure ADAM-6100EI module as Initial mode or Normal mode by the DIP switch in the side of each module. When ADAM-6100EI module is set as Initial mode, you can use ADAM.Net utility to configure and test the module via Ethernet connection between PC and the module. This can ensure the ADAM-6100EI module is set properly and is working correctly before connecting it to an EtherNet/IP network. When ADAM-6100EI module is set as Normal mode, it can directly communicate with EtherNet/IP master device such as Allen-Bradley PLC by EtherNet/IP protocol.

1.3.4 Status LED Indicator

There are 3 LED indicators on the front of the ADAM-6100 module-Status/COM, Link/Speed 1, and Link/Speed 2. The Status/COM LED indicates the status of the module. The Link/Speed LEDs indicate the network connections of Ethernet port 1 and port 2. After power on, if the module is not connected to any network, the Status LED and the COM LED will keep ON. Once the module is connected, the Status LED and COM LED will work according to the table below.
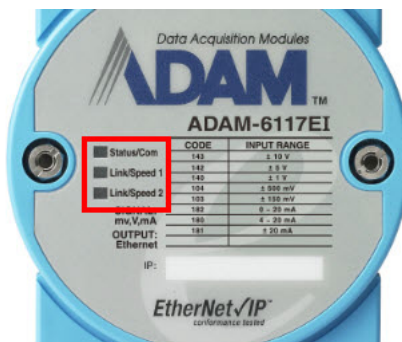
Status of the module*		
Mode	**Status LED (Green)**	**COM LED (Orange)**
Init mode (Initial mode)	ON/OFF flash	ON during communication
Normal mode (EtherNet/IP mode)	Keep ON	ON during Communication
Module Error	Keep OFF	ON/OFF flash
Port Communication		
Mode	**Link LED (Green)**	**Speed LED (Orange)**
Port 1 connected	Link 1 will keep ON	Speed 1 ON when network speed is 100M
Port 2 connected	Link 2 will keep ON	Speed 2 ON when network speed is 100M

Chapter 2

Product Specifications

2.1 Digital I/O Modules

2.1.1 Overview

The ADAM-6150EI, ADAM-6151EI and ADAM-6156EI are a series of isolated digital I/O modules which support the EtherNet/IP protocol. According to the channel number difference, you can choose the best digital I/O modules for your application.

■ ADAM-6150EI: 8-ch isolated digital input and 7-ch isolated digital output module
■ ADAM-6151EI: 16-ch isolated digital input module
■ ADAM-6156EI: 16-ch isolated digital output module

Figure 2.1 ADAM-6150EI

Figure 2.2 ADAM-6151EI

Figure 2.3 ADAM-6156EI

2.1.2 Specifications

Digital Input

- Channels:
  - ADAM-6150EI: 8
  - ADAM-6151EI: 16
- Dry Contact (Switch: ON):
  - Logic level 0: Open
  - Logic level 1: Close to DGND
- Wet Contact (Switch: OFF):
  - Logic level 0: 0 ~ 3 V_{DC} or 0 ~ -3V_{DC}
  - Logic level 1: 10 ~ 30 V_{DC} or -10 ~ -30 V_{DC}
- Input Impedance: 10 kΩ
- Transition Time: 0.2 ms

Digital Output

- Channels:
  - ADAM-6150EI: 7
  - ADAM-6156EI: 16
- Output Voltage Range: 8 ~ 35 V_{DC}
- Normal Output Current: 100 mA (per channel)
- FSV Safety Function

General

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: EtherNet/IP
- Power Input: Unregulated 10 ~ 30 V_{DC}
- Power Consumption: 2.4 W @ 24 V_{DC}
- Power Reversal Protection (30V Max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
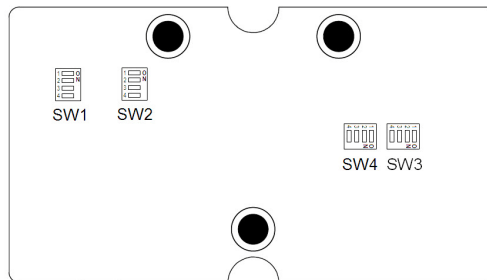- Operating Temperature: -10 ~ 70°C
- Storage Temperature: -20 ~ 80°C

2.1.3 Switch Settings

ADAM-6150EI:
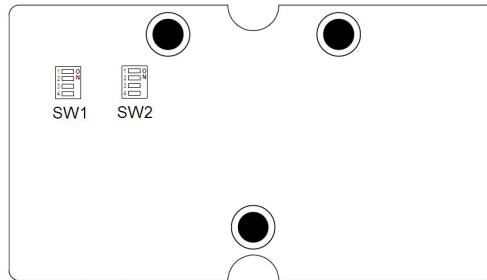
Switch	SW1				SW2			
Position	1	2	3	4	1	2	3	4
DI Channel	Ch3	Ch2	Ch1	Ch0	Ch7	Ch6	Ch5	Ch4
ON	Dry Contact (Default)							
OFF	Wet contact							

ADAM-6151EI:

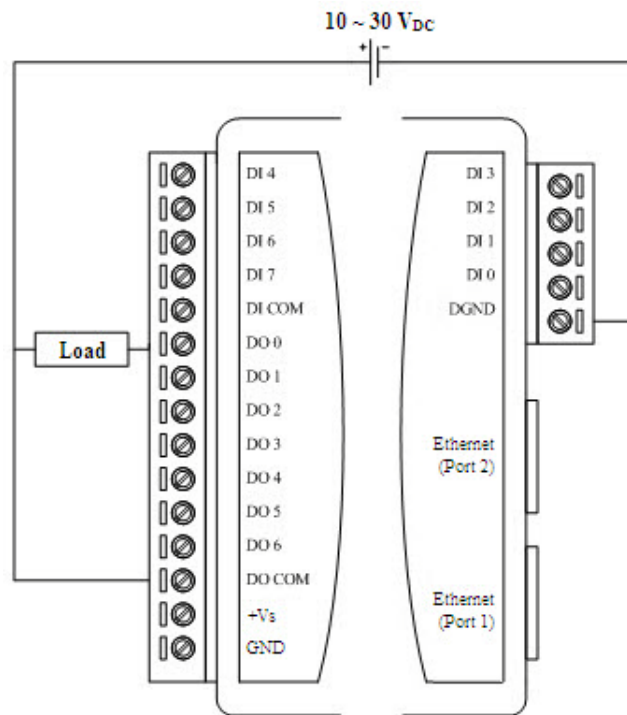| Switch	SW1				SW2			
Position	1	2	3	4	1	2	3	4
DI Channel	Ch3	Ch2	Ch1	Ch0	Ch7	Ch6	Ch5	Ch4
Switch	SW3				SW4			
Position	1	2	3	4	1	2	3	4
DI Channel	Ch11	Ch10	Ch9	Ch8	Ch15	Ch14	Ch13	Ch12
ON	Dry Contact (Default)							
OFF	Wet contact							

2.1.4 Application Wiring

Isolated Digital Input - Dry Contact
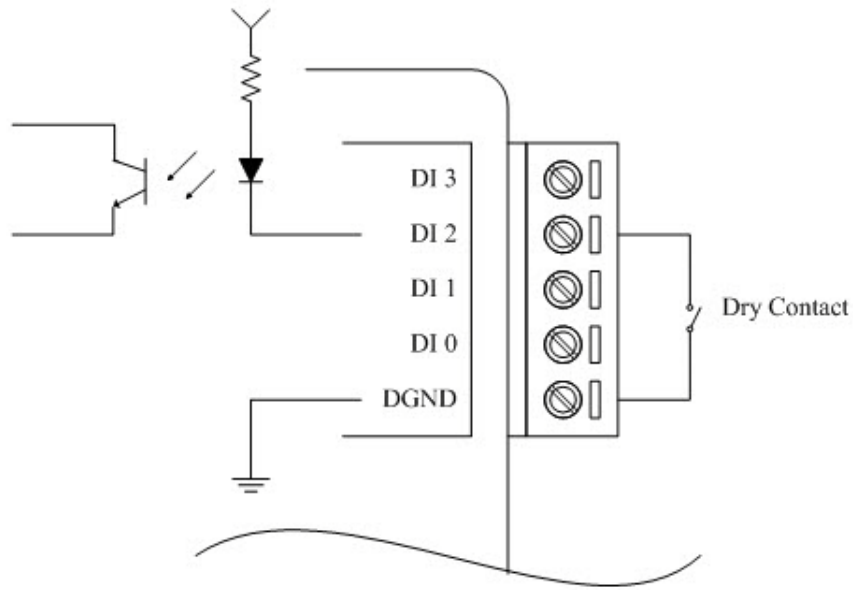
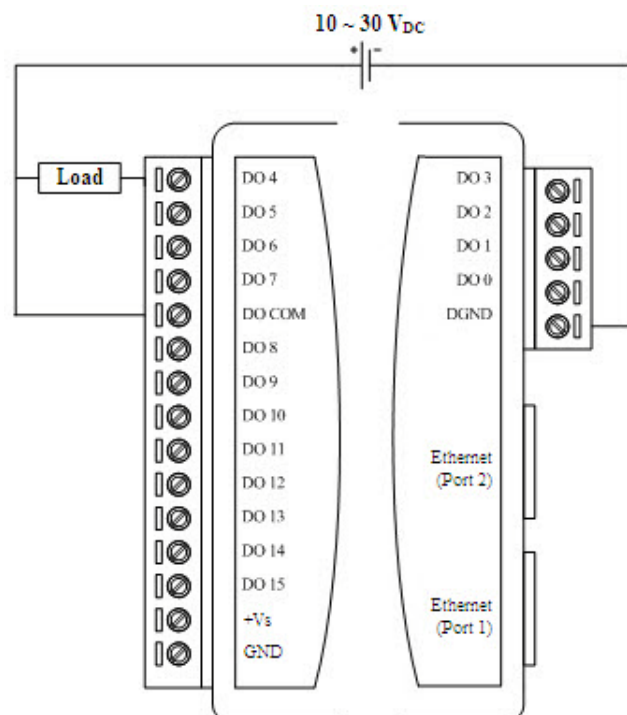**Isolated Digital Input - Wet Contact**
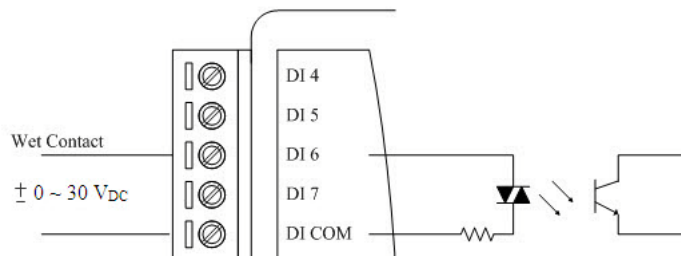
Isolated Digital Output (ADAM-6150EI)

Isolated Digital Output (ADAM-6156EI)

2.2   Relay Modules

2.2.1   Overview

The ADAM-6160EI is a relay module which supports EtherNet/IP protocol. It provides 5 Form C and 1 Form A/B (selectable) relay channels and is excellent for ON/OFF control or low-power switching applications in an EtherNet/IP system.

■   ADAM-6160EI: 6-ch Relay Module

Figure 2.4 ADAM-6160EI

### 2.2.2   Specifications

Relay

■   Channels: 5 Form C and 1 Form A/B (selected by jumper)
■   Contact Rating:
   –   AC: 250 V @ 5 A
   –   DC: 30 V @ 5 A
■   Breakdown Voltage:
   –   500 VAC (50/60 Hz)
■   Mechanism: 20,000,000 operations
■   Relay on time: 7 ms
■   Relay off time: 3 ms
■   Contact Resistance: 30 mΩ (max.)
■   Insulation Resistance: 1 GΩ at 500 V_{DC}
■   FSV Safety Function

General

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: EtherNet/IP
- Power Input: Unregulated 10 ~ 30 V_{DC}
- Power Consumption: 3.5 W @ 24 V_{DC}
- Power Reversal Protection (30V Max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
- Operating Temperature: -10 ~ 70°C
- Storage Temperature: -20 ~ 80°C

2.2.3 Jumper Settings
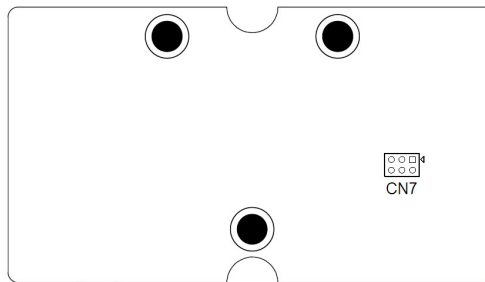
CN7	Relay Ch0 Configuration
	Normally Open (Default)
	Normally Closed

Note! *Users need to separate two PC boards to set the jumpers of the ADAM-6160EI.*

2.3   Analog I/O Modules

2.3.1   ADAM-6117EI: 8-ch Isolated Analog Input Module

2.3.1.1   Overview

The ADAM-6117EI is a 16-bit, 8-channel isolated analog input module. It accepts millivoltage inputs (±150 mV, ±500 mV), voltage inputs (±1 V, ±5 V and ±10 V) and current input (±20 mA, 0~20 mA, 4~20 mA). Each analog channel can be configured to an individual range for a variety of applications.
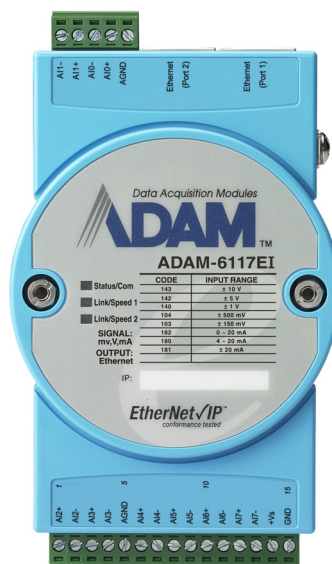

Figure 2.5 ADAM-6117EI

2.3.1.2   Specifications

Analog Input:

• Channels: 8 (Differential)

• Input Impedance:

　　Voltage: >10 MΩ

　　Current:120 Ω

• Input Type: V, mV, mA

• Input Range: ±150 mV, ±500 mV, ±1V, ±5V, ±10V, ±20 mA, 0~20 mA, 4~20 mA (different range can be configured for each channel in the utility)

• Accuracy:

　Voltage: ±0.1% or better at 25°C

　Current: ±0.2% or better at 25°C

• Resolution:

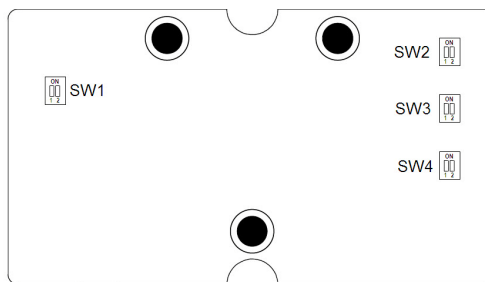| Voltage		Current	
Range	**Resolution**	**Range**	**Resolution**
±150 mV	16 bit	±20mA	15 bit
±500 mV	16 bit	0~20 mA	14 bit
±1 V	16 bit	4~20 mA	14 bit
±5 V	16 bit		
±10 V	16 bit		

- Sampling Rate: 12 samples/second (total)
- CMR @ 50/60 Hz: 92 dB
- NMR @ 50/60 Hz: 60 dB
- Span Drift: ±30 ppm/°C
- Zero Drift: ±6 µV/°C
- Isolation Voltage: 2,500 V_{DC}
- High Common Mode: up to 200 V_{DC}

General:

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: EtherNet/IP
- Power Input: Unregulated 10 ~ 30 V_{DC}
- Power Consumption: 3 W max. @ 24 V_{DC}
- Power Reversal Protection (30V max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
- Operating Temperature: -10 ~ 70°C
- Storage Temperature: -20 ~ 80°C

2.3.1.3 Switch Settings
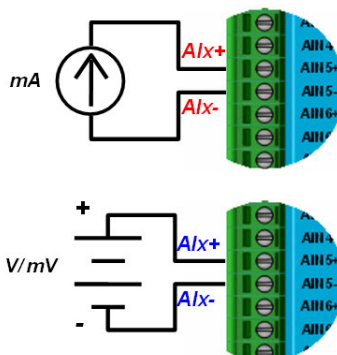
SW1~SW4: Set input mode of each AI channel

Switch	SW1		SW2		SW3		SW4	
Position	1	2	1	2	1	2	1	2
Channel	Ch1	Ch0	Ch3	Ch2	Ch5	Ch4	Ch7	Ch6
ON	Current Mode							
OFF	Voltage Mode (Default)							

2.3.1.4 Application Wiring

2.3.2 ADAM-6118EI: 7-ch Thermocouple Input Module

2.3.2.1 Overview

The ADAM-6118EI is a 16-bit, 7-channel thermocouple input module that provides programmable input ranges on all channels. It accepts various thermocouple inputs (Types J, K, T, E, R, S, B). It is designed for temperature measurement of several industrial control applications.

Figure 2.6 ADAM-6118EI

2.3.2.2 Specifications

Analog Input:

- Channels: 7 (Differential)
- Input Impedance:
  - Voltage: >10 MΩ
  - Current: 120 Ω
- Input Type: V, mV, mA, thermocouple
- Temperature Range: Type: J (-210 ~ 1,200°C), Type K (-270 ~ 1,372°C), Type T (-270 ~ 400°C), Type E (-270 ~ 1,000°C), Type R (0 ~ 1,768°C), Type S (0 ~ 1,768°C), Type B (200 ~ 1,820°C)
- Voltage/Current Range: ±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, ±20 mA, 0~20 mA, 4~20 mA (different ranges can be configured for each channel in the utility)
- Accuracy:
  - Temperature: ±0.2% or better at 25°C
  - Voltage: ±0.1% or better at 25°C
  - Current: ±0.2% or better at 25°C

• Resolution:

| Temperature		Voltage		Current	
Range	Resolution	Range	Resolution	Range	Resolution
Type J	14 bit	±150 mV	16 bit	±20 mA	15 bit
Type K	14 bit	±500 mV	16 bit	0~20 mA	14 bit
Type T	14 bit	±1 V	16 bit	4~20 mA	14 bit
Type E	14 bit	±5 V	16 bit		
Type R	14 bit	±10 V	16 bit		
Type S	14 bit		16 bit		
Type B	14 bit		16 bit		

• Sampling Rate: 12 samples/second (total)

• CMR @ 50/60 Hz: 92 dB

• NMR @ 50/60 Hz: 60 dB

• Span Drift: ±25 ppm/°C

• Zero Drift: ±6 μV/°C

• Isolation Voltage: 2,500 V_{DC}

• High Common Mode: up to 200 V_{DC}

General:

• Communication: 10/100 Base-T Ethernet

• Supported Protocol: Ethernet/IP

• Power Input: Unregulated 10 ~ 30 V_{DC}

• Power Consumption: 3 W (max.) @ 24 V_{DC}

• Power Reversal Protection (30V max.)

• Operating Humidity: 20 ~ 95% RH (non-condensing)

• Storage Humidity: 0 ~ 95% RH (non-condensing)

• Operating Temperature: -10 ~ 70°C
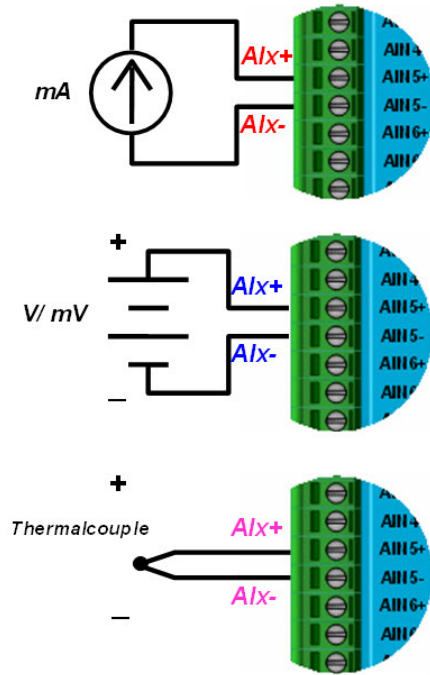
• Storage Temperature: -20 ~ 80°C

2.3.2.3 Switch Settings
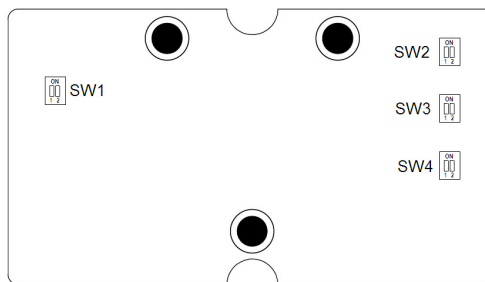
SW1~SW4: Set input mode of each AI channel

Switch	SW1		SW2		SW3		SW4	
Position	1	2	1	2	1	2	1	2
Channel	Ch1	Ch0	Ch3	Ch2	Ch5	Ch4	Ch7	Ch6
ON	Current Mode							
OFF	Voltage Mode/Thermocouple Mode (Default)							

2.3.2.4 Application Wiring

2.3.3 ADAM-6124EI: 4-ch Analog Output and 4-ch Digital Input Module

2.3.3.1 Overview

The ADAM-6124EI is a 12-bit, 4-channel analog output module along with 4-channel dry-contact digital input. It provides programmable output ranges on all channels and supports voltage and current outputs, which makes it an ideal output control solution.

Figure 2.7 ADAM-6124EI

2.3.3.2 Specifications

Analog Output:

• Channels: 4

• Output Type: V, mA

• Voltage/Current Range: 5V, 10V, ±5V, ±10V, 0~20mA,4~20 mA (different range can be configured for each channel in the utility)

• Resolution: 12-bit

• Output Impedance: 2.1Ω

• Output Settling Time: 20 us

• Output Slew Rate: 1.0 V/sec

• Accuracy:

  Voltage: ±0.1% or better at 25°C

  Current: ±0.1% or better at 25°C

Digital Input:

• Channels: 4

• Input type: Dry Contact (Close to Iso.GND)

General:

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: Ethernet/IP
- Power Input: Unregulated 10 ~ 30 V_{DC}
- Power Consumption: 3 W (max.) @ 24 V_{DC}
- Power Reversal Protection (30V max.)
- Operating Humidity: 20 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)
- Operating Temperature: -10 ~ 70°C
- Storage Temperature: -20 ~ 80°C