User Manual

ADAM-6100PN Series

PROFINET I/O Modules

ADVANTECH
eAutomation

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

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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 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.

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Chapter 1

Overview

1.1 Introduction

ADAM-6100PN is a series of PROFINET remote I/O modules. PROFINET protocol is very popular in industrial automation applications and all ADAM-6100PN series modules can comply with it. You can easily connect ADAM-6100PN modules to PROFINET masters, like Siemens PLC, through PROFINET protocol. ADAM-6100PN series module supports **Initial mode** and **Normal mode (PROFINET 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-6100PN module's IP address and related setting by Advantech APAX/ADAM.Net utility. When you configure the mode as **Normal mode**, ADAM-6100PN modules are ready to communicate with PROFINET master by PROFINET protocol.

1.2 System Architecture

ADAM-6100PN 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.

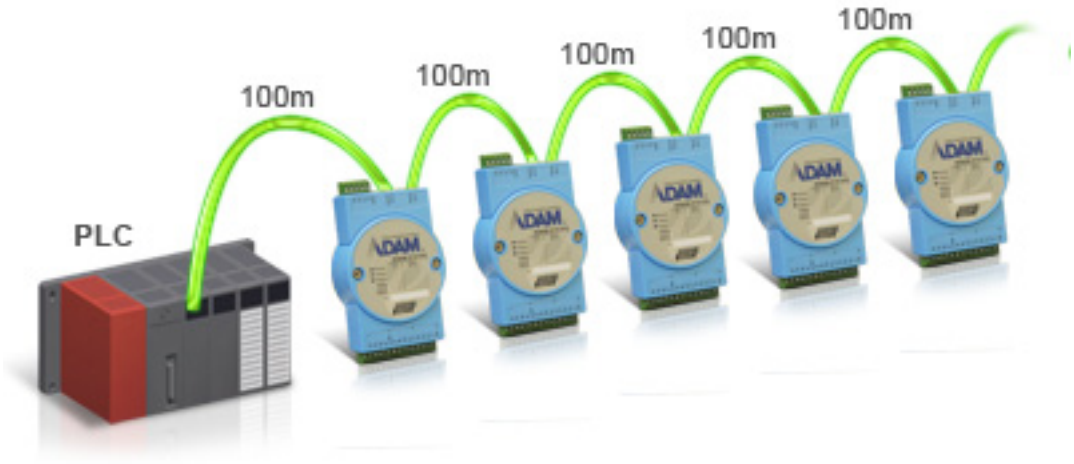
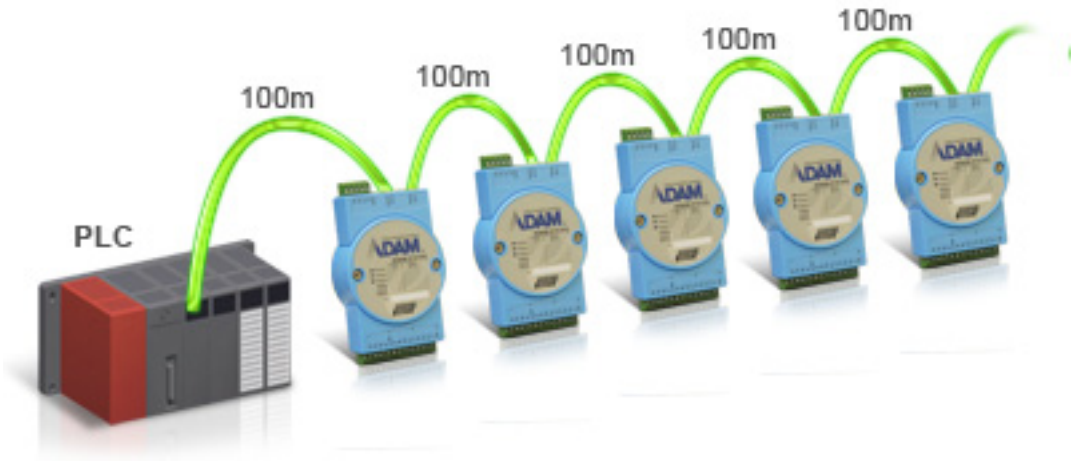


Figure 1.1 ADAM-6100PN Daisy Chain Connections

1.3 Features

1.3.1 Daisy Chain Connection

ADAM-6100PN 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.



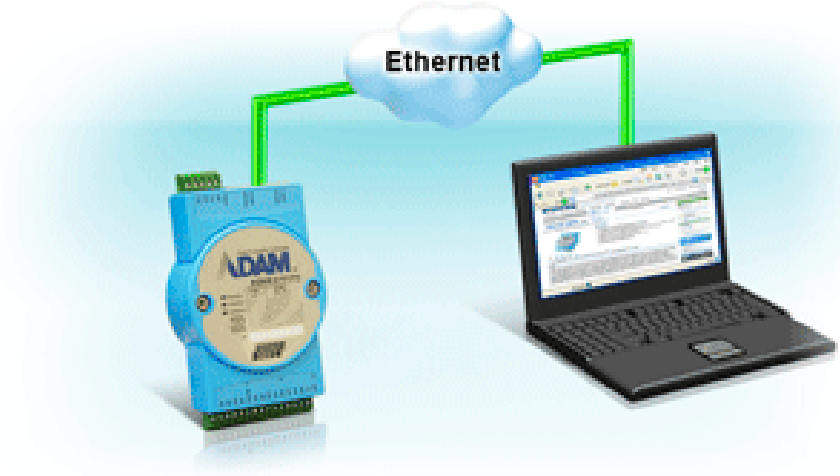
Pin	Assignment	Description
1	TD +	Transmit +
2	TD -	Transmit -
3	RD +	Receive +
4	N/C	not used
5	N/C	not used
6	RD -	Receive -
7	N/C	not used
8	N/C	not used

1.3.2 2,500V Isolation Protection

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

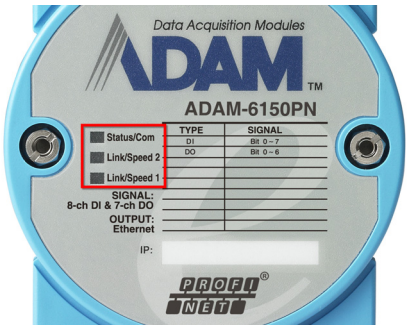
1.3.3 Ethernet-based Configuration Tool

You can configure ADAM-6100PN module as Initial mode or Normal mode by the DIP switch in the side of each module. When ADAM-6100PN 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-6100PN module is set properly and is working correctly before connecting it to an PROFINET network. When ADAM-6100PN module is set as Normal mode, it can directly communicate with PROFINET master device such as Simens PLC by PROFINET 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 (Utility mode)	Stays OFF	Flashes ON/OFF
Normal mode (PROFINET mode)	Flashes ON/OFF	OFF when no PROFINET communication; ON during PROFINET communication
"Locate" function in normal mode (PROFINET mode)	Flashes ON/OFF at the same time	
Port Communication		
Mode	**Link LED (Green)**	**Speed LED (Orange)**
Port 1 connected	Link 1 blinks ON	Speed 1 ON when network speed is 100M
Port 2 connected	Link 2 blinks ON	Speed 2 ON when network speed is 100M

1.3.5 Dimensions

The following diagrams show the dimensions of the ADAM-6100 modules:

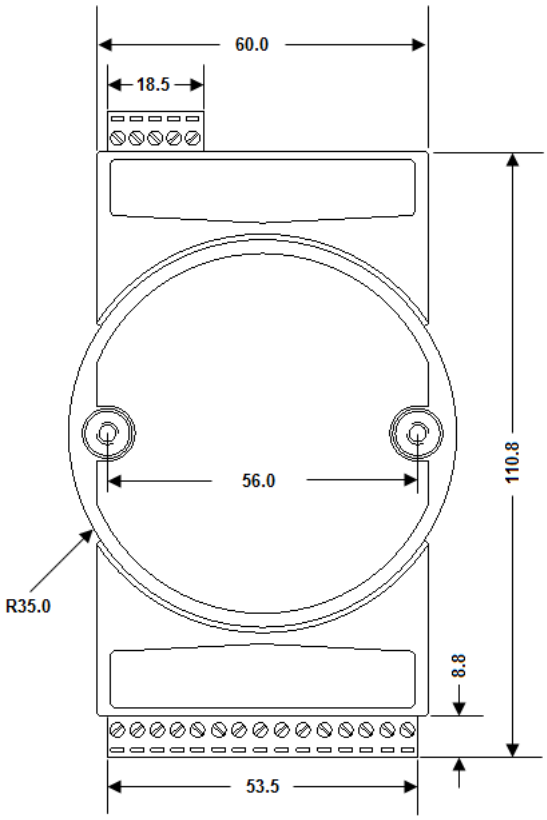


Figure 1.2 ADAM-6100 Front

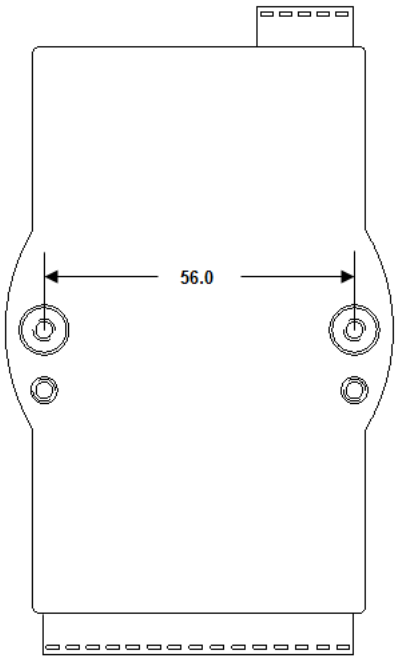


Figure 1.3 ADAM-6100 Back

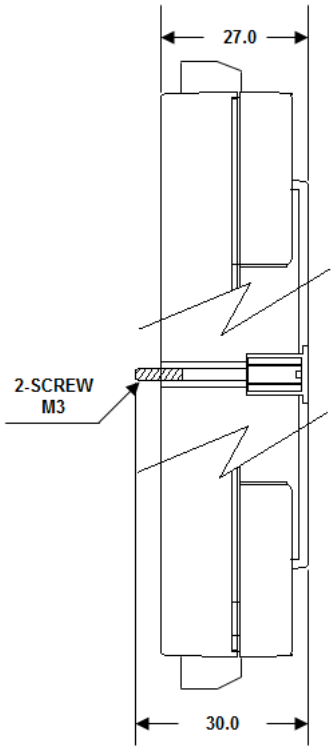


Figure 1.4 ADAM-6100 Side

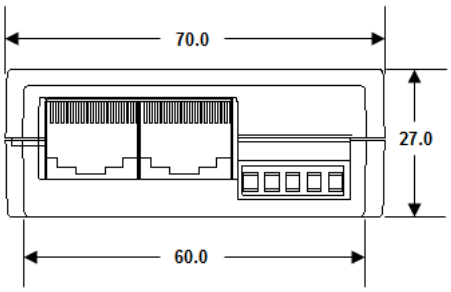


Figure 1.5 ADAM-6100 Top

Chapter 2

Hardware Installation Guide

2.1 Determining the Proper Environment

Prior to installing ADAM-6100 modules, please check the following.

2.1.1 Package Contents

Unpack the shipped boxes and make sure that the contents include:

- ADAM-6100 module with one bracket and DIN-rail adapter
- ADAM-6100 module User Manual
- ADAM CD

2.1.2 System Requirements

2.1.2.1 Host Computer

- Microsoft Windows CE/XP/7
- At least 32 MB RAM
- 20 MB of hard disk space available
- VGA color monitor
- 2x or higher speed CD-ROM
- Mouse or other pointing devices
- 10/100 Mbps or higher Ethernet Card

Ethernet Hub (at least 2 ports)

Two Ethernet Cables with RJ-45 connector

Power supply for ADAM-6100 (+10 to +30 V Unregulated)

2.2 Mounting

ADAM-6100 modules are designed as compact units and are allowed to be installed in the field site under the following methods.

2.2.1 Panel Mounting

Each ADAM-6100 Module is packed with a plastic panel mounting bracket. Users can refer the dimensions of the bracket to configure an optimal placement in a panel or cabinet. Fix the bracket first, then, fix the ADAM-6100 module on the bracket.

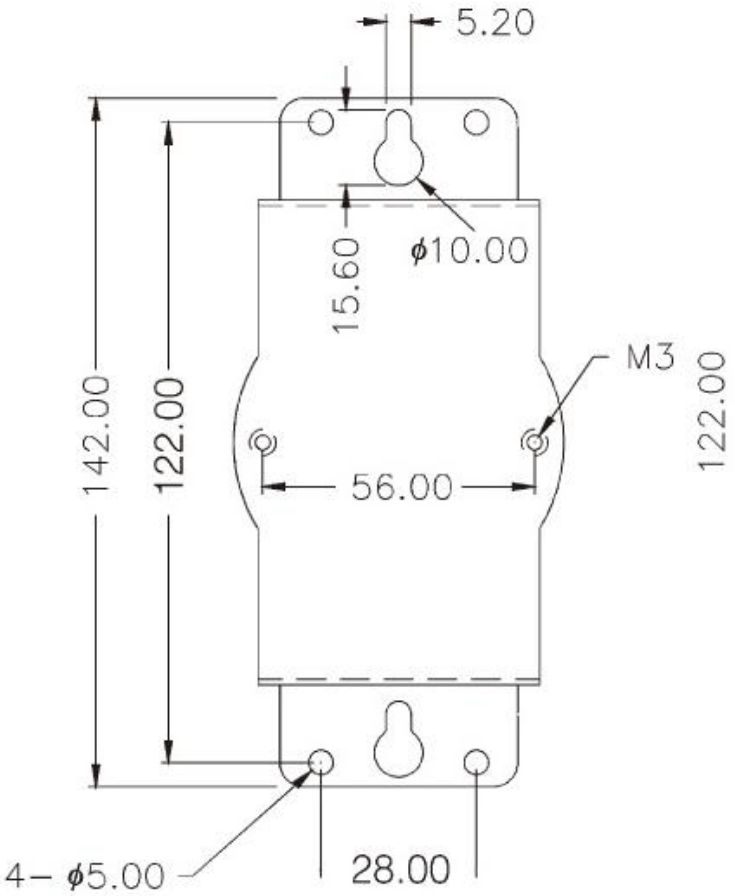


Figure 2.1 Panel Mounting Dimensions

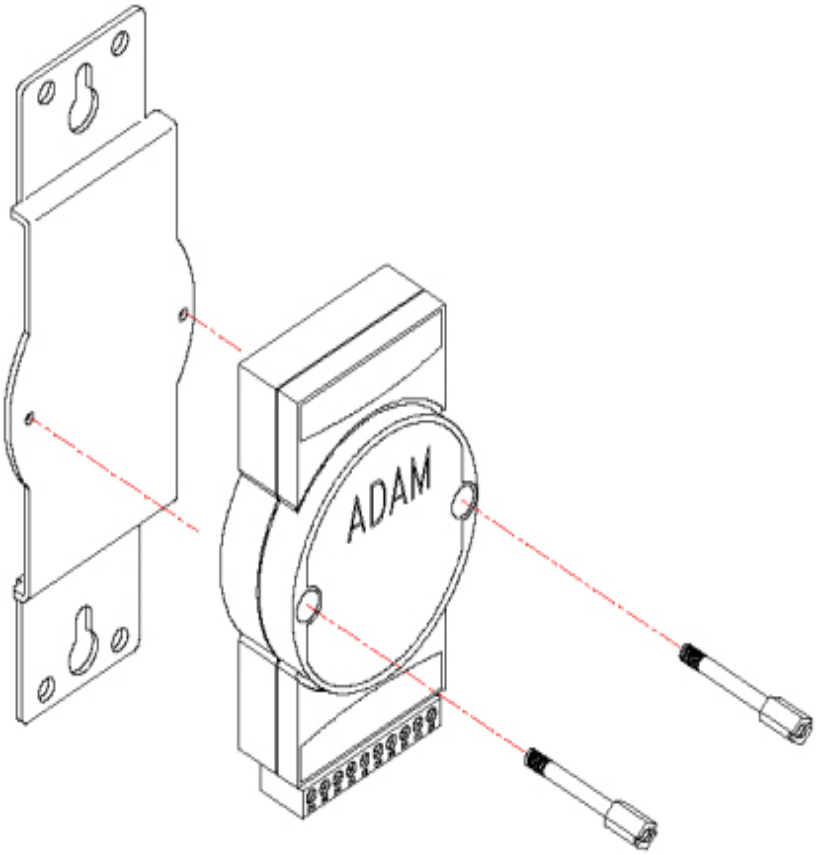


Figure 2.2 Fix Module on the Bracket

2.2.2 DIN-rail mounting

The ADAM-6100 module can also be secured to the cabinet by using mounting rails. Fix the ADAM-6100 module with the DIN-rail adapter as Figure 2-3. Then secure it on the DIN-rail as Figure 2-4. If you mount the module on a rail, you should also consider using end brackets at each end of the rail. The end brackets help keep the modules from sliding horizontally along the rail.

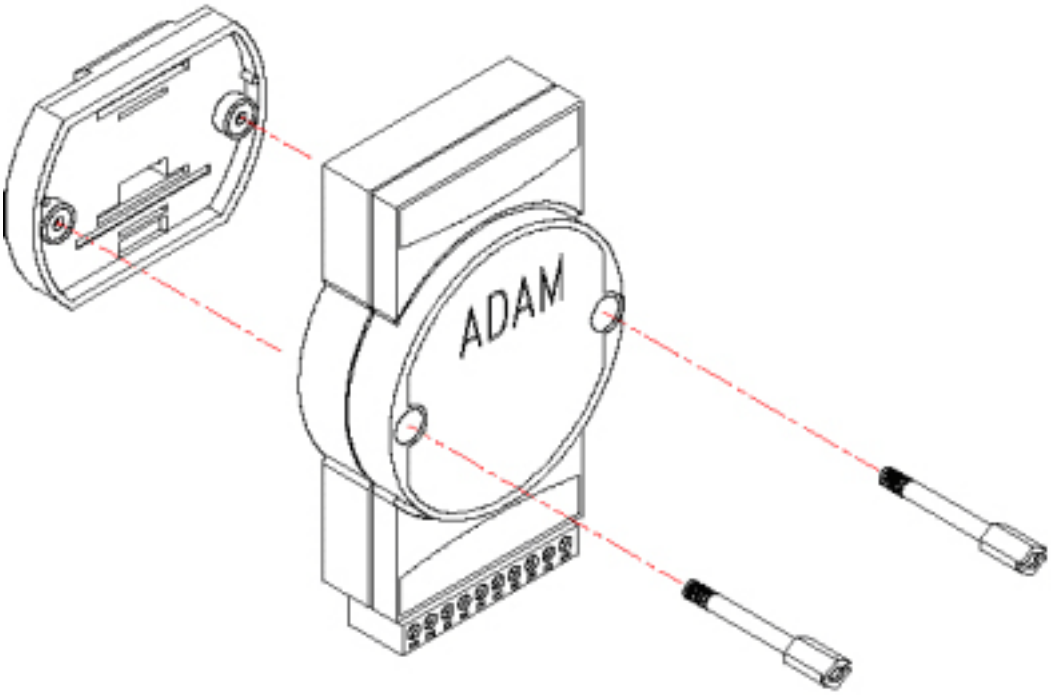


Figure 2.3 Fix Module on the DIN-rail Adapter

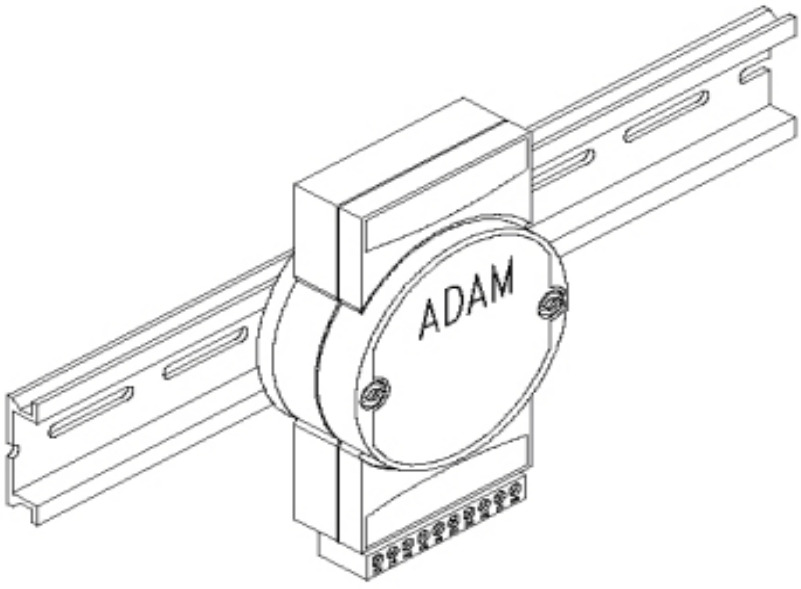


Figure 2.4 Secure Module to a DIN-rail

2.3 Wiring & Connections

This section provides basic information on wiring the power supply, I/O units, and network connection.

2.3.1 Power Supply Wiring

Although the ADAM-6100 systems are designed for a standard industrial unregulated 24 V_{DC} power supply, they accept any power unit that supplies within the range of +10 to +30 V_{DC}. The power supply ripple must be limited to 200 mV peak-to-peak, and the immediate ripple voltage should be maintained between +10 and +30 V_{DC}. Screw terminals +Vs and GND are for power supply wiring.

Note! *The wires used should be at least 2 mm.*

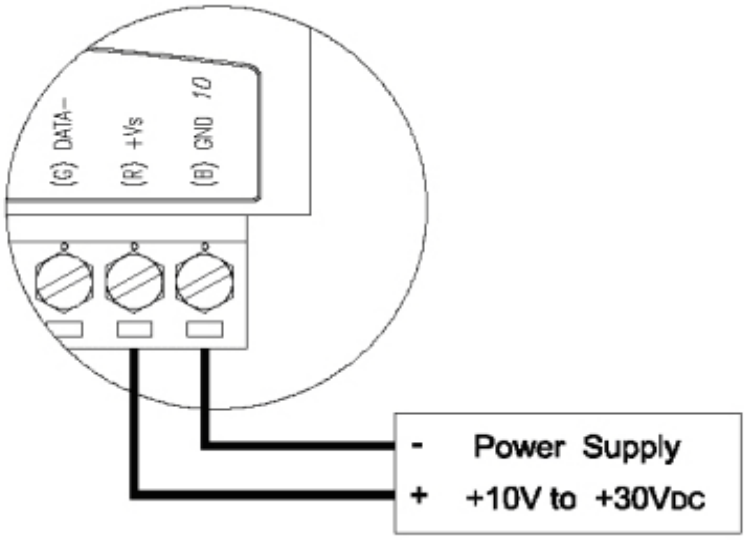


Figure 2.5 ADAM-6100 Module Power Wiring

We advise that the following standard colors (indicated on the modules) be used for power lines:

+Vs (R) Red

GND (B) Black

2.3.2 I/O Module Wiring

The system uses a plug-in screw terminal block for the interface between I/O modules and field devices. The following information must be considered when connecting electrical devices to I/O modules.

1. The terminal block accepts wires from 0.5 mm to 2.5 mm.
2. Always use a continuous length of wire. Do not combine wires.
3. Use the shortest possible wire length.
4. Use wire trays for routing where possible.
5. Avoid running wires near high-energy wiring.
6. Avoid running input wiring in close proximity to output wiring.
7. Avoid creating sharp bends in the wires.

Chapter 3

Product Specifications

3.1 Digital I/O Modules

3.1.1 Overview

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

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

Figure 3.1 ADAM-6150PN

Figure 3.2 ADAM-6151PN

Figure 3.3 ADAM-6156PN

3.1.2 Specifications

Digital Input

- Channels:
  - ADAM-6150PN: 8
  - ADAM-6151PN: 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

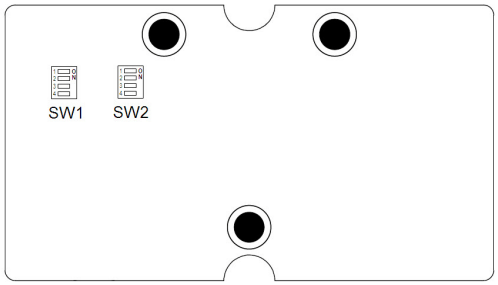
- Channels:
  - ADAM-6150PN: 7
  - ADAM-6156PN: 16
- Output Voltage Range: 8 ~ 35 V_{DC}
- Normal Output Current: 100 mA (per channel)
- FSV Safety Function

General

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: PROFINET
- 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

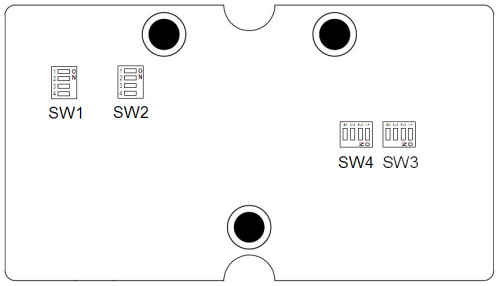
3.1.3 Switch Settings

ADAM-6150PN:



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							

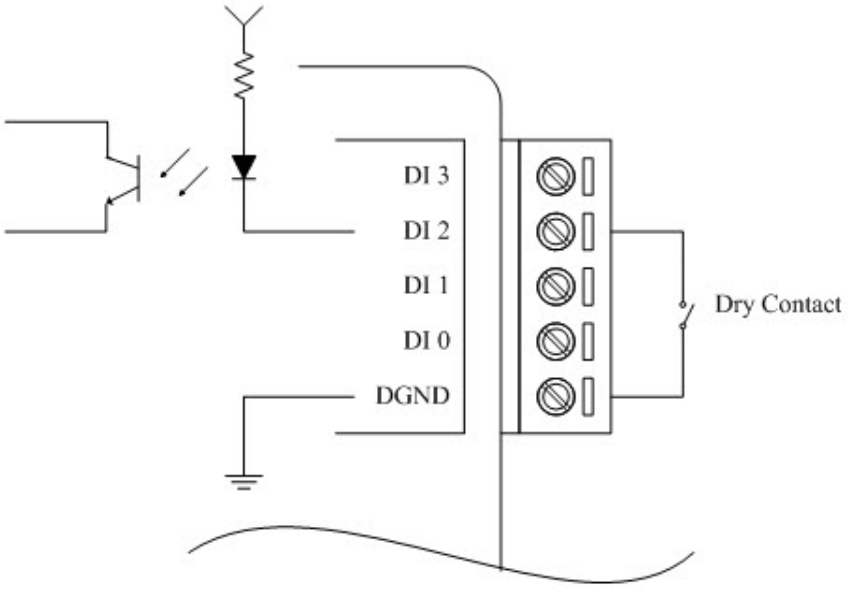
ADAM-6151PN:



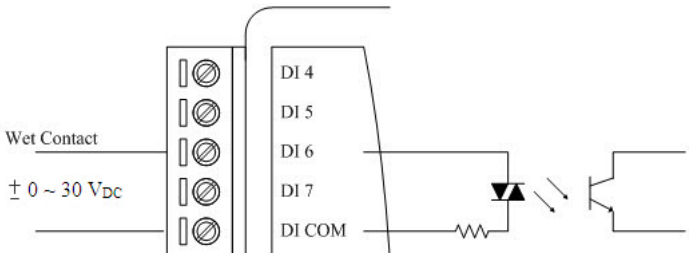
Switch	SW1				SW2			
Position	1	2	3	4	1	2	3	4
DI Channel	Ch3	Ch2	Ch1	Ch0	Ch7	Ch6	Ch5	Ch4
Switch	SW3				SW4			
Position	1	2	3	4	1	2	3	4
DI Channel	Ch11	Ch10	Ch9	Ch8	Ch15	Ch14	Ch13	Ch12
ON	Dry Contact (Default)							
OFF	Wet contact							

3.1.4 Application Wiring

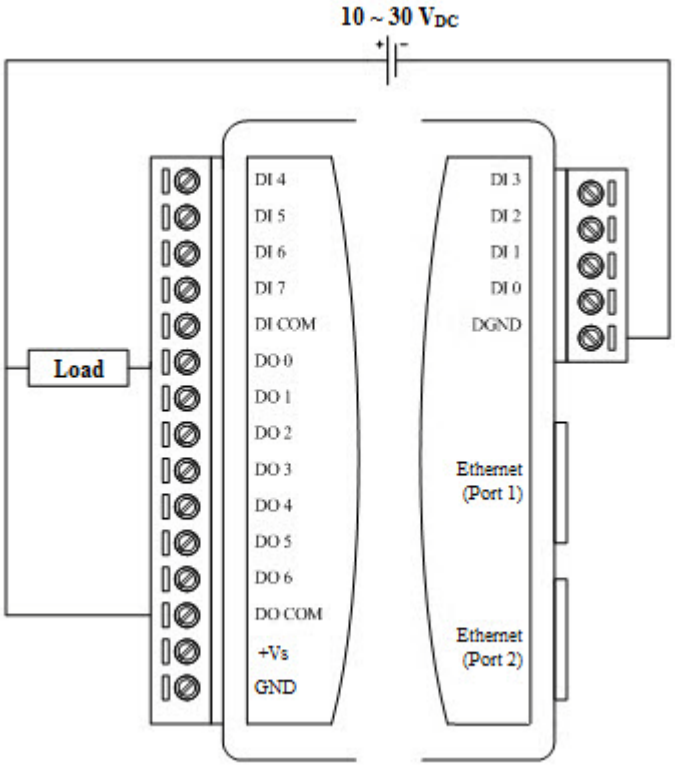
Isolated Digital Input - Dry Contact



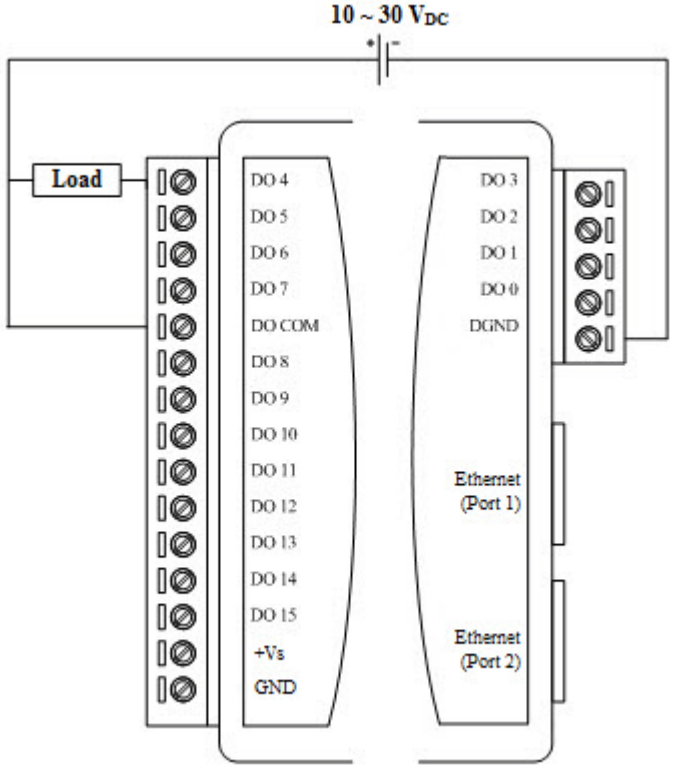
Isolated Digital Input - Wet Contact



Isolated Digital Output (ADAM-6150PN)



Isolated Digital Output (ADAM-6156PN)



3.2 Relay Modules

3.2.1 Overview

The ADAM-6160PN is a relay module which supports PROFINET 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 PROFINET system.

- ADAM-6160PN: 6-ch Relay Module

Figure 3.4 ADAM-6160PN

3.2.2 Specifications

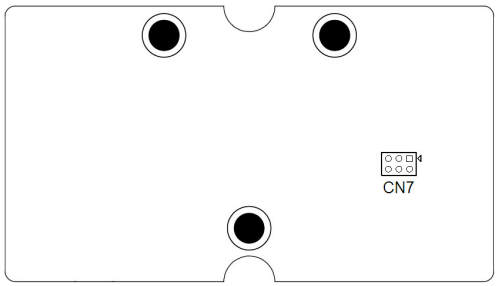
Relay

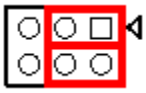
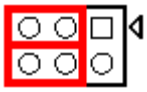
- Channels: 5 Form C and 1 Form A/B (selected by jumper)
- Contact Rating:
  - AC: 250 V @ 5 A
  - DC: 30 V @ 5 A
- Breakdown Voltage:
  - 500 VAC (50/60 Hz)
- Mechanism: 20,000,000 operations
- Relay on time: 7 ms
- Relay off time: 3 ms
- Contact Resistance: 30 mΩ (max.)
- Insulation Resistance: 1 GΩ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

General

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: PROFINET
- 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

3.2.3 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-6160PN.*

Note! *The two jumpers for CN7 must be moved together.*

3.3 Analog I/O Modules

3.3.1 ADAM-6117PN: 8-ch Isolated Analog Input Module

3.3.1.1 Overview

The ADAM-6117PN 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 3.5 ADAM-6117PN

3.3.1.2 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		

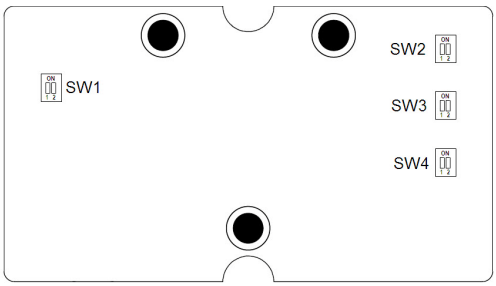
- Sampling Rate: 12 samples/second (total)
- CMR @ 50/60 Hz: 92 dB
- NMR @ 50/60 Hz: 60 dB
- Span Drift: ±30 ppm/°C
- Zero Drift: ±6 μV/°C
- Isolation Voltage: 2,500 V_{DC}
- High Common Mode: up to 200 V_{DC}

General:

- Communication: 10/100 Base-T Ethernet
- Supported Protocol: PROFINET
- 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

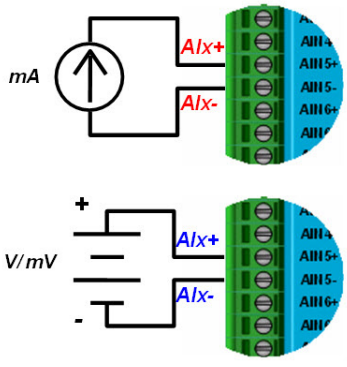
3.3.1.3 Switch Settings

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)							

3.3.1.4 Application Wiring



3.3.2 ADAM-6124PN: 4-ch Analog Output and 4-ch Digital Input Module

3.3.2.1 Overview

The ADAM-6124PN 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 3.6 ADAM-6124PN

3.3.2.2 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 Driving Capacity
  – Voltage: 2kΩ
  – Current: 500Ω
• 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: PROFINET
• 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

Chapter 4

System Configuration Guide

4.1 System Hardware Configuration

As we mentioned in Chapter 2-1, you will need following items to complete your system hardware configuration.

4.1.1 System Requirements

4.1.1.1 Host Computer

- Microsoft Windows CE/XP/7
- At least 32 MB RAM
- 20 MB of hard disk space available
- VGA color monitor
- 2x or higher speed CD-ROM
- Mouse or other pointing devices
- 10/100 Mbps or higher Ethernet Card

4.1.2 Communication Interface

- 10/100 Mbps Ethernet hub (at least 2 ports) and two Ethernet cables with RJ-45 connector
- Crossover Ethernet cable with RJ-45 connector

4.2 Install ADAM.NET Utility Software

Advantech provides a free download of ADAM.NET Utility software for ADAM-6100 modules operation and configuration. You can find the Utility installation file in the CD with your ADAM module, or link to the web site: http://www.advantech.com and click into the Download Area under Service & Support site to get the latest version of the ADAM-6100 Series ADAM.NET Utility. Once you download and setup the Utility software, there will be a shortcut of the Utility program on the desktop.

Note! *Before installing ADAM.NET Utility, you need to install .NET Framework 2.0 or later.*

4.3 ADAM.NET Utility Overview

The ADAM.NET Utility software offers a graphical interface that helps you configure the ADAM-6000 modules. It is also very convenient to test and monitor your remote data acquisition and control system. The following guidelines will give you some brief instructions on how to use this Utility.

4.3.1 ADAM.NET Utility Operation Window

After you have successfully installed ADAM.NET Utility, there will be one shortcut icon on the desktop. Double click the shortcut icon that you should be able to see the operation window as Figure 5.1.

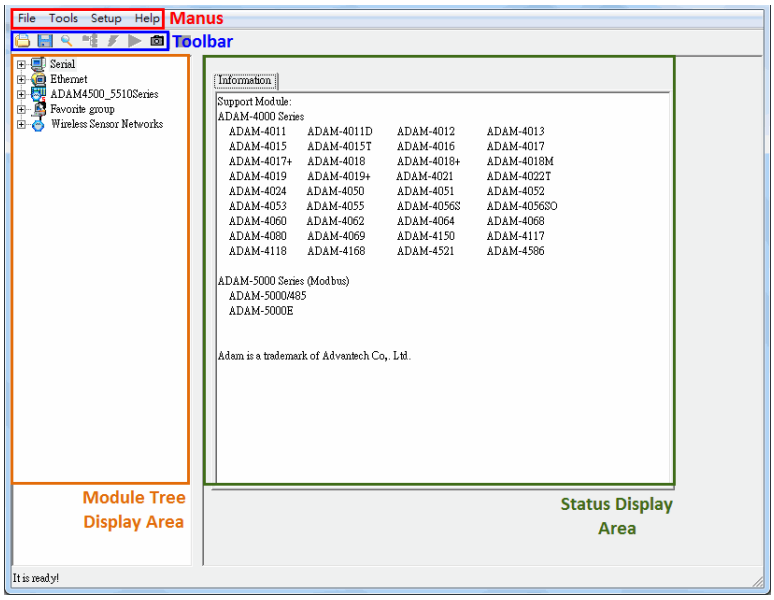


Figure 4.1 ADAM.NET Utility Operation Window

The operation window consists of four areas --- the **Menus**, the **Toolbar**, the **Module Tree Display** Area and the **Status Display** Area.

4.3.1.1 Menus

The menus at the top of the operation window contain:

4.3.1.2 File Menu:

1. Open Favorite Group - You can configure your favorite group and save the configuration into one file. Using this option, you can load your configuration file for favorite group.
2. Save Favorite Group - You can configure your favorite group and save the configuration into one file. Using this option, you can save your favorite group into one configuration file.
3. Auto-Initial Group - If you want to have the same favorite group configuration when you exit ADAM.NET utility and launch it again, you need to check this option.
4. Exit - Exit ADAM.NET Utility.

4.3.1.3 Tools Menu:

1. Search - Search all the ADAM modules you connected. The operation process will be described in Section 5.1
2. Add Devices to Group - You can add ADAM modules to your favorite group by this option. You need to select the device you want to add in the **Module Tree Display** area (it will be described below) first, and then select this option to add.
3. Terminal for Command Testing - ADAM-6000 modules support ASCII command and Modbus/TCP as communication protocol. You can launch the terminal to communicate with ADAM-6000 module by these two protocol directly.
4. DiagAnywhere Searcher - There are multiple Advantech products installed with DiagAnywhere server, which gives user remote control ability through Ethernet. When you choose this option, all devices with DiagAnywhere server in the Ethernet you connected with will be listed.
5. Print Screen - You can save current ADAM.NET Utility screen into an image file by this option.
6. Monitor Stream/ Adam5000 Event Data - ADAM-6000 modules support Data Stream function. You can define the Host (such as a PC) by IP. Then ADAM-6000 modules will periodically send its I/O status to the Host. The IP and period to transfer data is configured in the **Stream** tab of **Status Display** area.
7. Monitor Peer-to-Peer (Event Trigger) - ADAM-6000 modules with Peer-to-Peer function can play as Event Trigger function. You can choose this option to receive message from ADAM-6100 module which is enabled Peer-to-Peer (Event Trigger) function.
8. Monitor GCL IO Data Message - ADAM-6000 modules with GCL function can play as a standalone controller. Users can define logic rules and run the rules on ADAM-6100 module. User can define the logic rule to send out message, depending on the logic condition, to the Host defined by IP.

4.3.1.4 Setup Menu:

1. Favorite Group - You can configure your favorite group including add one new device, modify or delete one current device, sort current devices and diagnose connection to one device.
2. Refresh COM and LAN node - ADAM.NET utility will refresh the serial and LAN network connection situation.
3. Add COM Port Tree Nodes - This option is used to add serial COM ports in ADAM.NET Utility. You won't need to use this option for ADAM-6100/ADADAM-6000 modules.
4. Show TreeView - Check this option to display the **Module Tree Display** area.

4.3.1.5 Help Menu:

1. Check Up-to-Date on the Web - Choose this option, it will automatically connect to Advantech download website.You can download the latest utility there.
2. About Adam.NET Utility - Choose this option, you can see version of ADAM.NET Utility installed on your computer.

4.3.1.6 Toolbar

There are 7 graphical icons on the toolbar for 7 common used options of Menus. Figure 5.2 below shows definition for each graphical icon.

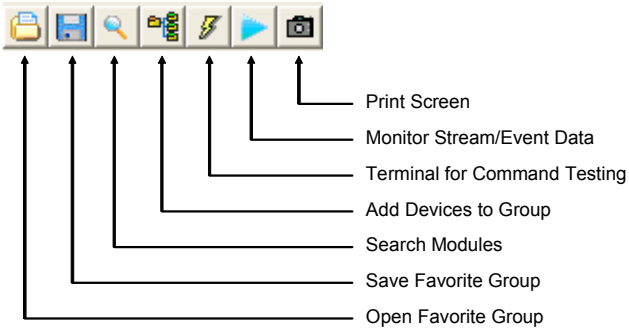


Figure 4.2 ADAM.NET Utility Toolbar

4.3.1.7 Module Tree Display Area

ADAM.NET Utility is one complete software tool that all ADAM remote I/O module and controller can be configured and operated in this utility. The **Module Tree Display** is on the left part of the utility operation window. There are four categories in the **Module Tree Display** Area:

- **Serial**

All serial I/O Modules (ADAM-4000 and ADAM-5000 RS-485 serial modules) connected to the host PC will be listed in this category.

- **Ethernet**

All Ethernet I/O Modules (ADAM-6000, ADAM-6100 and ADAM-5000 TCP modules) connected to the host PC will be listed in this category.

- **ADAM-4500_5510 Series**

This is a DOS interface utility for remote controllers such as ADAM-4500 and ADAM-5510 series.

- **Favorite Group**

You can define which devices listed in the three categories above into your personal favorite group. This will make you easier to find your interested modules. Right click on the ADAM device item under the Favorite Group item and you can select **New >> Group** to create a new group. After you create your own group, right click on your group and select **New >> Adam device** to add ADAM devices into your group. You can also select **Diagnose connection** to check the communication.

Note! *Remember to choose the correct module in the **Module Type** combo box when you add a new ADAM devices.*

- **Wireless Sensor Networks**

All wireless I/O Modules (ADAM-2000 modules) connected to the host PC, through wireless gateway, will be listed in this category.

4.3.1.8 Status Display Area

Status Display area, on the right part of utility operation window, is the main screen for operation. When you select different items in **Module Tree Display, Status Display** will change dependently. You can do all configurations and test in this area.

4.3.2 Search ADAM-6100 Modules

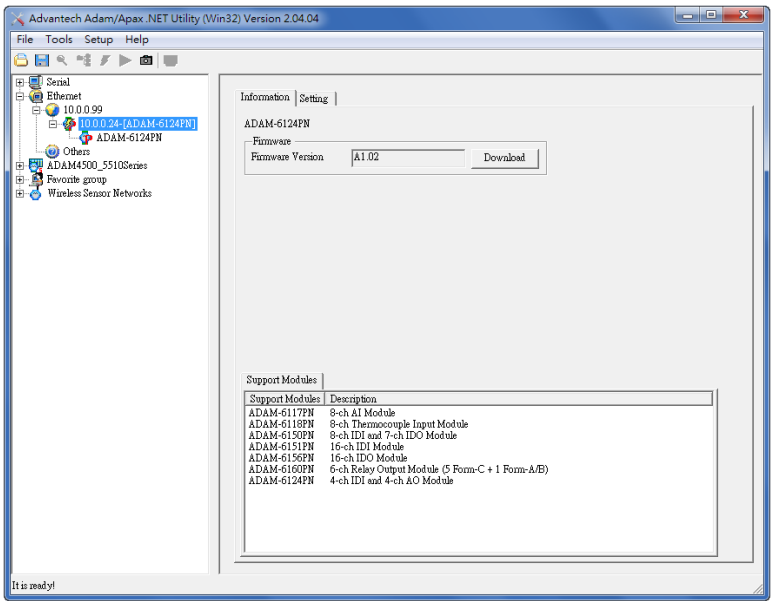
After you have confirmed the hardware wiring between host PC and your ADAM-6100 module, you can find that module in ADAM.NET Utility. Launch ADAM.NET Utility. Select the **Ethernet** item on the **Module Tree Display** area. Click the **Search Modules** button on the Toolbar. ADAM.NET Utility will then search all ADAM-6000 modules on the Ethernet network. If your ADAM-6100 modules is used the first time, its IP will be 10.0.0.1 by default. So you will find it showing on the **Others** item under **Ethernet**

Note! *If network Firewall is enabled on your computer, you may not be able to connect with your ADAM-6100 module. You need to add ADAM.NET Utility into lists of Program and Service of the Exception for Windows Firewall in Windows Control Panel.*

You need to change IP of the ADAM-6100 modules the same subnet with the host PC. Type the correct **IP address**, **Subnet address**, and **Default gateway** on the **Status Display** area. After complete setting, click the **Apply Change** button. A dialog box appears asking you to type the password. The default password of ADAM-6100 module is 00000000.

You can change the password later. After you type the correct password, the ADAM-6100 module is now under IP of your host PC.

When you select the IP address of the ADAM-6100 modules you want use in **Module Tree Display** area, there will be 8 tabs appearing in the **Status Display** area for you to set up general configuration of that module. Refer to figure below. Once you have changed any configuration, remember to click related **Apply** or **Apply Change** button.



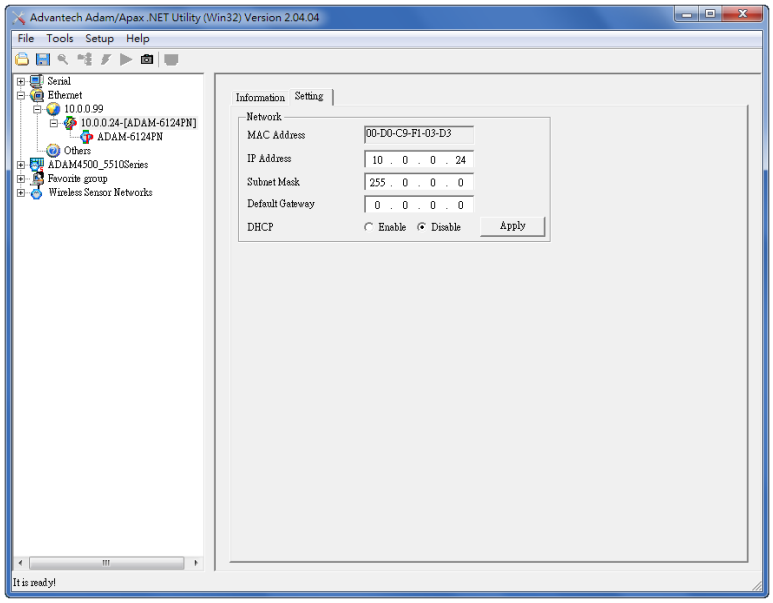
Below is detailed information for the 2 tabs in the **Status Display** area:

4.3.2.1 Information

You can see the **Firmware Version** on the selected ADAM-6100 module in this tab. You can also update the firmware by clicking **Download** button. The latest firmware for ADAM-6100 modules is available on Advantech website: http://www.advantech.com

4.3.2.2 Setting

You can change **IP Address, Subnet Address**, and **Default Gateway** of selected ADAM-6100 module in this tab. You can also enable or disable DHCP function for ADAM-6100 module.



4.3.3 I/O Module Configuration

After you have completed all general configuration of ADAM-6000 module described in previous section, then you need to configure setting for input and output channel such as channel range, calibration and alarm. At the same time, you can see input channel value and set value of output channel in the **Status Display** area of utility. In the **Module Tree Display** area, click the item showing IP of the ADAM-6100 modules you want to use. There will be two items appearing below the IP: **All Channel Configuration** and **GCL Configuration** item. Refer to Figure 5.4 below. (The related feature of **GCL** item will be described in Chapter 7)

Click the cross icon besides the **All Channel Configuration** item, one dialog window will appear to ask you typing password. After you enter the correct password, **Individual Channel Configuration** items will appear below the **All Channel Configuration** item.

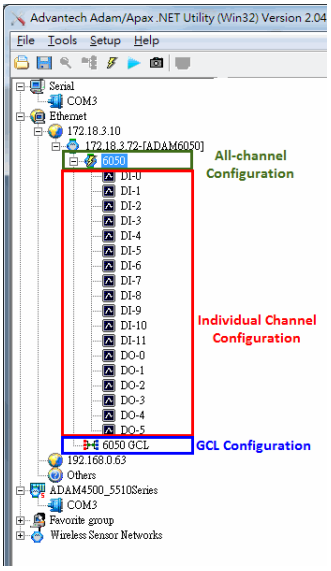


Figure 4.3 Channel & GCL Configuration

If you click the **All Channel Configuration** item, you can read analog input value or configure setting for all channels on the **Status Display** area. If you click the **Individual Channel Configuration** item, you can read AI values or configure setting for the specific channel you choose. Below, we will describe the **All Channel Configuration** and **Individual Channel Configuration** in more detail for ADAM-6000 I/O modules.

- Analog Input Module (ADAM-6015, ADAM-6017 and ADAM-6018)

4.3.3.1 All Channel Configuration

For these ADAM-6000 modules, when you click the **All Channel Configuration** item in the **Module Tree Display** area, there will be four parts on the **Status Display** area. In the top left-hand corner is the **Channels Range Configuration** area. You can set different range for each channel. In the **Channels Range Configuration** area, select the channel number in the **Channel index** combo box, and then select the range in the **Input range** combo box. After selecting appropriate range, click the **Apply** button. Refer to Figure 5.5 below.

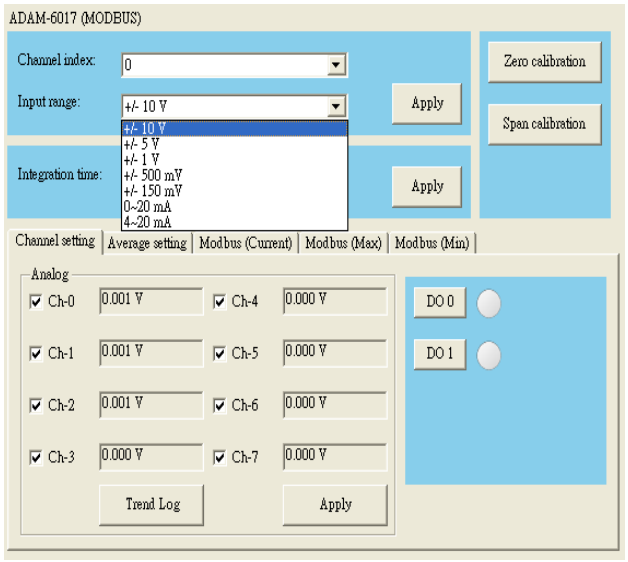


Figure 4.4 Channels Range Configuration Area

In order to remove the noise from the power supply, these analog input modules feature built-in filter. Two filters with different frequencies are provided to remove noise generated from different power supplies. The **Integration Time Configuration** area is under the **Channels Range Configuration** area. Refer to Figure 5.6 below. In the **Integration Time Configuration** area, you can select suitable filter in the **Integration time** combo box. After selecting appropriate filter, click the **Apply** button.

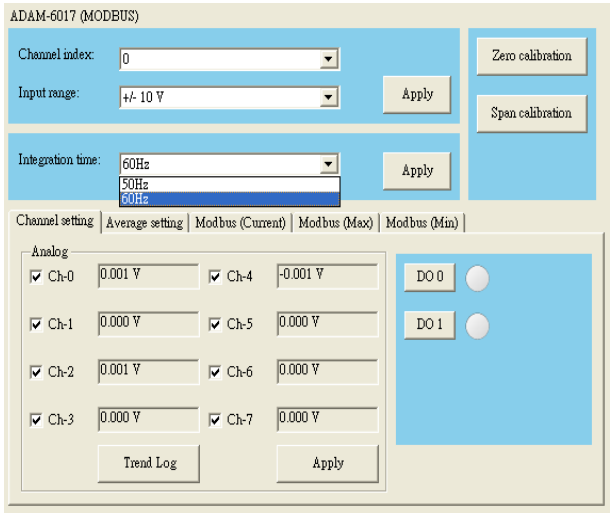


Figure 4.5 Integration Time Configuration Area

In the top right-hand corner of the **Status Display** area is the **Calibration** area. You can choose the **Zero Calibration** button to do zero calibration. After you click the button, a pop-up dialog window will remind you to connect a signal with minimum value of full scale range (for example, 0 Volt) to the calibrated channel. After you complete the hardware wiring, click the **Apply** button to start the calibration action. Similarly, you can choose the **Span Calibration** button to do span calibration. For span calibration, you need to connect a signal with maximum value of full scale range (for example, 10 Volt) to the calibrated channel. It is the same that when you complete the wiring, click the **Apply** button to start the calibration action.

At the bottom of the **Status Display** area, you can see five tabs to see analog input value of all channels:

1. Channel Setting

You can see the current value of analog input on this tab. (For ADAM-6017 and ADAM-6018 modules, the value of digital input channel is also displayed on this tab.) Simply choose the check box of the channels you want to monitor and click the **Apply** button.

Besides, you can see the graphical historical trend by clicking the **Trend Log** button. Refer to Figure 5.7 below. Simply choose the check box of the channels you want to log in the **Channel Setting** area at right side, and then click the **Apply** button. After that, click the **Start** button and the data log will start. You can see the real-time historical trend. If you click the **Stop** button, then you can click the **Save to file** to save the trend data into your computer.

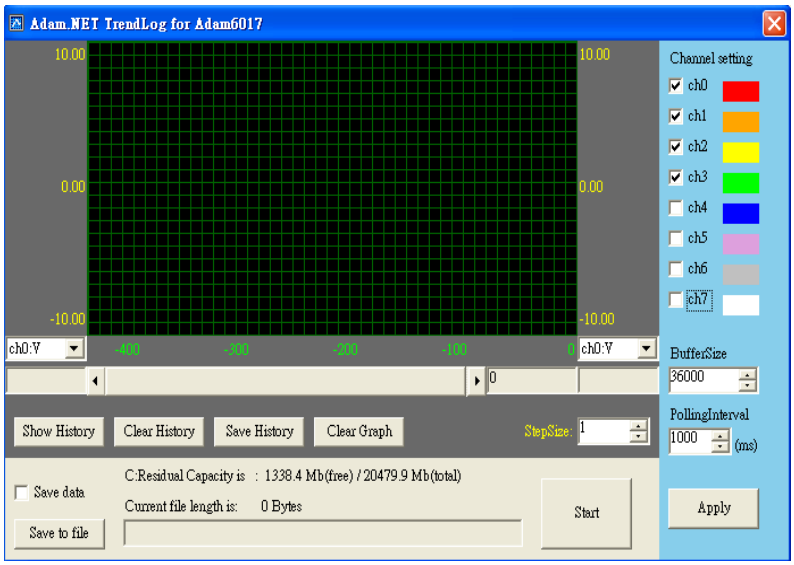


Figure 4.6 Analog Input Trend Log

With the wire burn-out detection function of ADAM-6015 and ADAM-6018, if there is no sensor connected to the input channel of ADAM-6015 or ADAM-6018 module, you can see “Burn out” characters showing in the text box of related channel.

2. **Average Setting**

ADAM-6015, ADAM-6017 and ADAM-6018 modules feature averaging calculation function by its built-in processor. You can simply click the check boxes representing the channels in the **Averaging channel setting** area to decide which channels are used for averaging. For example, by Figure 5.8 below, five channels (channel 0, 1, 2, 3, and 4) are used for averaging. So you can see the average value of those five channels displayed by the **Average** text box.

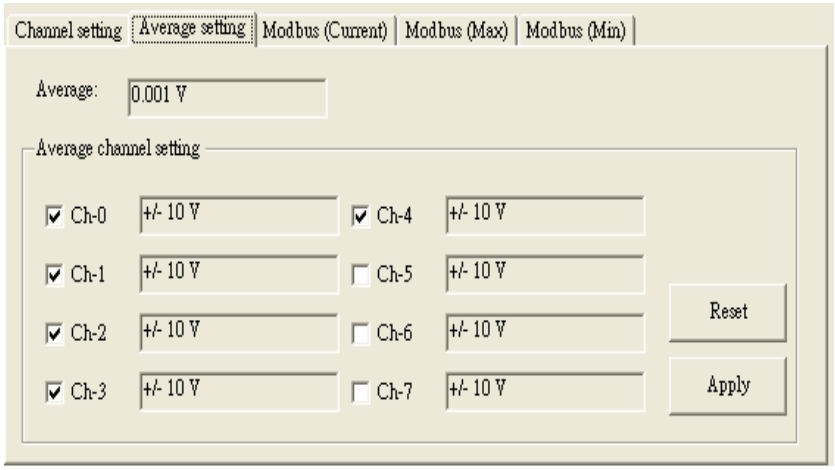


Figure 4.7 Analog Input Average Setting

3. **Modbus (Current)**

You can see current analog input value in decimal, hexadecimal, and engineer unit for all related Modbus address.

4. **Modbus (Max)**

ADAM-6015, ADAM-6017 and ADAM-6018 modules feature historical maximum value recording. You can see historical maximum analog input value in decimal, hexadecimal, and engineer unit for all related Modbus address. To re-initialize the recording, click the buttons representing the channels you want to reset.

5. **Modbus (Min)**

ADAM-6015, ADAM-6017 and ADAM-6018 modules feature historical minimum value recording. You can see historical minimum analog input value in decimal, hexadecimal, and engineer unit for all related Modbus address. If you want to re-initialize the recording, click the buttons representing the channels you want to reset.

4.3.3.2 Individual Channel Configuration

You can see analog input value and configure setting for each channel. Simply click one of the **Individual Channel Configuration** items for the interested channel. (The average channel you set in the **Averaging setting** will also be displayed here) At the upper part of the **Status Display** area, you can see the current analog input value and defined range of that channel by the **Input value** and **Input range** text box. Refer to Figure 5.9 below.

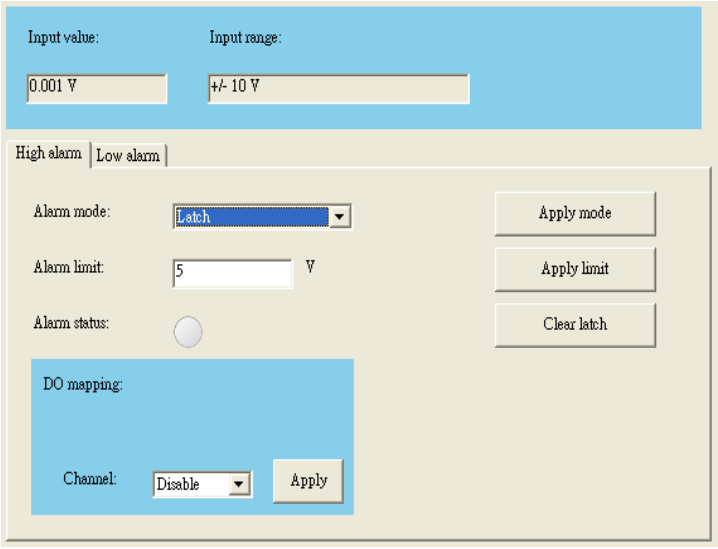


Figure 4.8 Analog Input Alarm Mode Configuration

ADAM-6015, 6017 and 6018 modules all feature built-in alarm function. At the lower part of the **Status Display** area, there are two tabs to configure the high alarm and low alarm for the selected channel: **High alarm** and **Low alarm**. When the analog input value is higher than the high alarm value, or lower than the low alarm value, the *alarm condition occurs*. Then the alarm status will be activated to logic high. For ADAM-6015 module, ADAM.NET Utility can detect the alarm status and show it by the **Alarm status** LED display. For ADAM-6017 and ADAM-6018 module, when the alarm condition occurs, the **Alarm status** LED display will be lit. Besides, the specified digital output channel will generate logic high value if you build the mapping relationship between alarm and DO channel in the **DO mapping** area. You can set the DO channel by **Channel** combo box in the **DO mapping** area. After choosing the interested channel, click the **Apply** button.

There are three alarm modes. You can select the alarm mode by the **Alarm mode** combo box for the low alarm and high alarm respectively.

1. Disable: Alarm is disabled. So even when the alarm condition occurs, nothing will happen.
2. Latch: Once the alarm condition occurs, the alarm status will be activated to logic high level and will keep the value until the alarm is clear manually. Before the value is clear, the **Alarm status** LED will continuously be lit. For ADAM-6017 and ADAM-6018 module, the specific output channel (chosen in the **DO mapping** area) will continuously generate logic high value. You can clear the alarm by click the **Clear latch** button.
3. Momentary: The alarm status will dynamically change depends on if the alarm condition occurs. If the alarm condition occurs, the alarm status will be logic high. If the alarm condition disappears, the alarm status will be logic low. So not only the **Alarm status** LED in the utility but also the specific digital output channel value will change depend on the alarm condition.

After you choose the alarm mode for high alarm or low alarm, click the **Apply mode** button. Then you can define the high alarm value or low alarm value by entering the value in **Alarm limit** text box. After you enter the alarm value, click the **Apply limit** button. Once you have configured the alarm mode and alarm value, you can leverage ADAM-6100 analog input alarm function.

- Universal Input and Output Module (ADAM-6024)

4.3.3.3 All Channel Configuration

ADAM-6024 module features analog input, analog output, digital input and digital output. Click the **All Channel Configuration** item. In the **Status Display** area, there will be two tabs: **Input** and **Output**. On the **Input** tab, there are still four parts on the **Status Display** area, which is the same as ADAM-6015, ADAM-6017 and ADAM-6018 module. All the configurations in the **Channels Range Configuration**, **Integration Time Configuration** and **Calibration** areas are just the same as the configuration of ADAM-6015, ADAM-6017 and ADAM-6018 module. Refer to Figure 5.10 below.

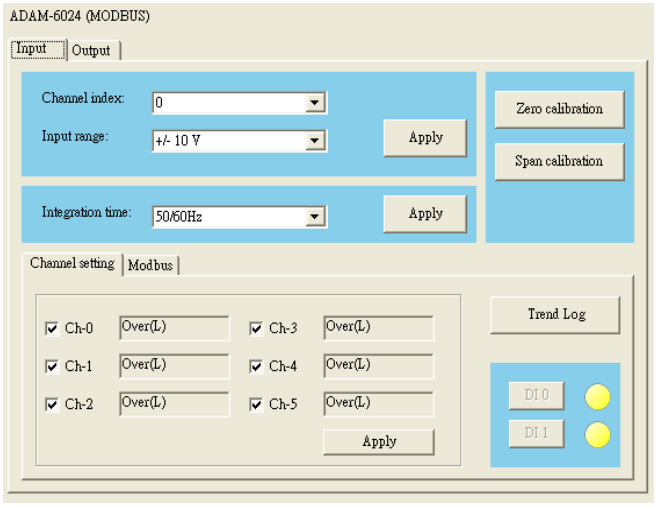


Figure 4.9 ADAM-6024 Input Tab

However, at the bottom of the **Status Display** area, there are only two tabs to see analog input value of all channels: (This is because ADAM-6024 doesn't feature averaging, maximum and minimum calculation function)

1. **Channel Setting**

You can see the current value of analog input on this tab. Choose the check box of the analog input channels you want to monitor and click the **Apply** button. If the analog input value is out of the input range, you will see "Over(L)" in the analog input value text box. At the right side, you can see current digital input value by **DI 0** and **DI 1** LED display.

You also can see the graphical historical trend of analog input channel by clicking the **Trend Log** button. All the operations for trend logging is the same as ADAM-6015, ADAM-6017 and ADAM-6018 module.

2. **Modbus**

You can see current analog input value in decimal and hexadecimal for all related Modbus address.

On **Output** tab, you can write value to analog and digital output channel, as well as configure all related setting. There are also two tabs on the Output tab: **Channel setting** and **Modbus**. Refer to Figure 5.11 below.

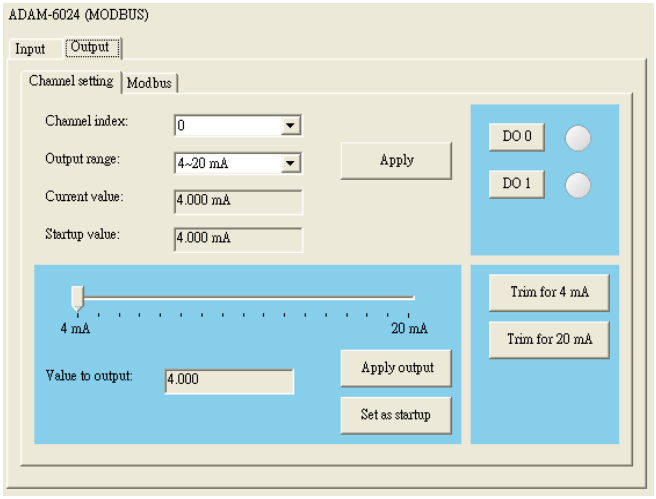


Figure 4.10 ADAM-6024 Output Tab

1. Channel Setting

Similar to analog input configuration, you can set different range for each analog output channel. Select the channel number in the **Channel index** combo box, and then select the range in the **Output range** combo box. After selecting appropriate range, click the **Apply** button.

At the bottom left-hand corner of the **Output** tab, you can define the analog output value by using the horizontal pointer slide or the **Value to Output** text box. After you have chosen the appropriate analog output value, click the **Apply output** button.

Besides, you can set the startup value of the specific analog output channel. (The analog output channel will generate the startup value output when it is power-on. In other words, start-up value can be considered as a power-on value.) Use the horizontal slider or the **Value to output** text box to define the value and click **Apply** button. Then click the **Set as startup** button to save that value as startup value.

At the bottom right-hand corner of the **Output** tab, it is **Calibration** area. There are two buttons used to calibrate the maximum and minimum value of full range. The label on the buttons will change depending on the output range. Take figure 5.11 as example, labels on the two buttons are **Trim for 4 mA** (calibrate for minimum value of full range) and **Trim for 20 mA** (calibrate for maximum value of full range).

After you click one of the buttons, one dialog window will appear. Use another instrument to measure the output value. Then use the four buttons (**-10**, **-1**, **+1**, **+10**) on the dialog window to correct the analog output value. For example, if you click the **Trim for 4 mA** button, the specific analog output channel should generate 4 mA. However, the instrument reads 3.88 mA. So you need to use **+1** and **+10** button to adjust the output value, until the output value is truly 4 mA.

In the top right-hand corner of the **Output** tab, you can control the digital output value by the **DO 0** and **DO 1** button. Their value will be display by the LED near the button.

2. Modbus

You can see current output value in decimal and hexadecimal for all related Modbus address.

- Digital Input and Output Modules

(ADAM-6050, ADAM-6051, ADAM-6052, ADAM-6060, ADAM-6066)

4.3.3.4 All Channel Configuration

When you click the **All Channel Configuration** item in the **Module Tree Display** area, there will be two tabs: **Channel Setting** and **Modbus**. Take ADAM-6050 as example. Refer to Figure 5.12 below:

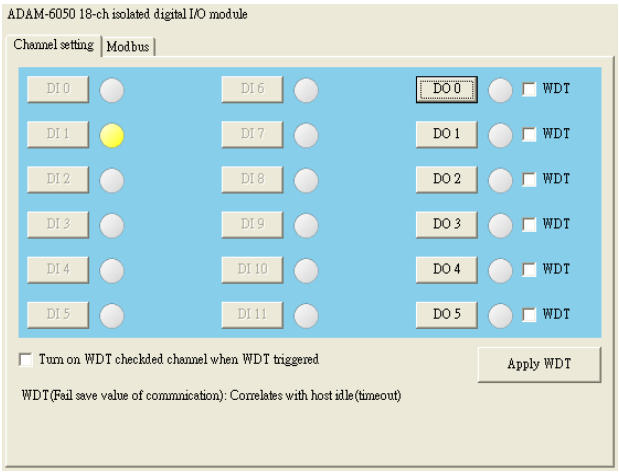


Figure 4.11 ADAM-6050 Channel Setting

1. Channel Setting

You can see value of all digital input channels by related LED display in this tab. Besides, you also can control values of all digital output channels by related button. The LED next to the button will display current value of that digital output channel.

When the communication between host PC and ADAM-6100 digital modules is broken, the digital output channel can generate a predefined value (this value is called *fail safe value*). You can enable or disable this function by click the **Turn on WDT checked channel when WDT triggered** check box. You can define the fail safe value by the **WDT** check box next to the DO status LED. After configure related setting, click the **Apply WDT** button. Take Figure 5.13 below as example. The fail safe value function is enabled. If the communication between ADAM-6100 digital module and host PC is broken, channels 0 and 2 will automatically generate logic high value, while channels 1, 3, 4, 5 will automatically generate logic low value.

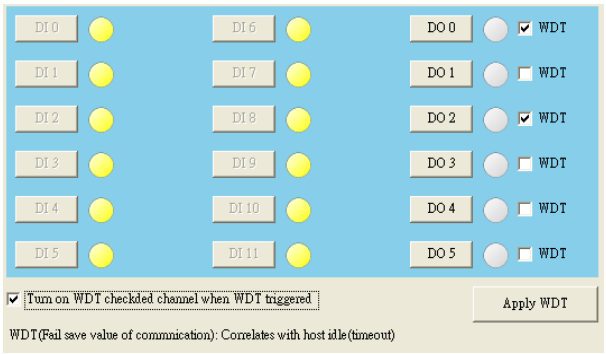


Figure 4.12 Fail Safe Value Configuration

2. Modbus

You can see current digital input or digital output values for all related Modbus address.

4.3.3.5 Individual Channel Configuration

You can see digital input value and configure setting for each digital input channel. It is the same that you can control the digital output value and configure setting for each digital output channel. Simply click the channel interested in the **Individual Channel Configuration** items.

If you choose a digital input channel, the **Status Display** area should look similar to Figure 5.14 below.

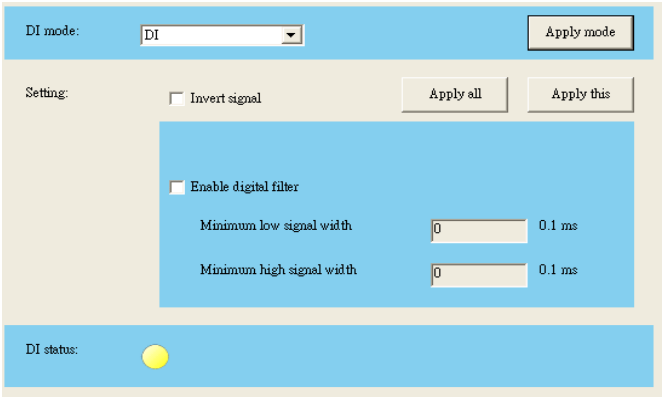


Figure 4.13 Individual Channel Configuration: DI

You can choose different mode for that digital input channel by choosing the **DI mode** combo box at top of **Status Display** area. (You should choose the appropriate mode depending on the hardware specification.) After you have chosen the mode, click the **Apply mode** button. There are a total of five possible DI modes you can choose:

1. DI

Figure 5.14 is the image when you choose DI mode. At the bottom of the **Status Display** area, you can see the digital input value by **DI status** LED display. If the digital module you are using supports Invert DI Status function, there will be **Invert signal** check box in the **Setting** area. You can click the check box to enable or disable that function. Remember to click the **Apply all** button for all channels or **Apply this** button for this specific channel to complete the configuration. When you enable the Invert DI Status function, the ADAM-6100 digital module will automatically inverse the digital input value. For example, if the real external signal value is logic level low, then the **DI status** LED display will be lit.

All ADAM-6100 digital modules support digital filter, so you can enable or disable the filter by click the **Enable digital filter** check box. If you enable the filter, you can define the minimum acceptable signal width by the **Minimum low signal width** and **Minimum high signal width** text box. (Unit: ms) The high frequency noise will be removed by this filter. Remember to click the **Apply all** button for all channels or **Apply this** button for this specific channel to complete the configuration.

2. Counter

When you choose Counter mode, one counter will count the pulse number of the digital signal from the selected channel, and then record the count number in the register. The image of the **Status Display** area looks similar as that of DI mode. At the bottom of the **Status Display** area, current count value of the selected channel is displayed by the **Counter value** text box. You can start or stop the counter to count by clicking the **Star**/**Stop** button next to the **Counter value** text box. You also can reset the counter (the value in the register will be initialized to zero) by clicking the **Clear** button.

Like the DI mode, you can enable/disable the Invert DI Status function and digital filter in the **Setting** area. The operation is the same. There is one extra setting that you can define if the counter should keep the last value when ADAM-6100 digital module powers off. If you enable this function, when the digital module powers off, the last value of counter will be kept in the register. As the module powers on, the counter will continuously count from that value. Without this function, when the module powers off, the counter will reset and the count value in the register will be zero. You can enable or disable this function by clicking the **Keep last value when power off** check box. Remember to click the **Apply all** button for all channels or **Apply this** button for this specific channel to complete the configuration.

3. Low to High Latch

When you choose Low to High Latch mode, once the digital input channel detects logic level changes from low to high, the logic status will be keep as logic high. The logic status will remain the logic high, until you clear latch manually. Then the logic status will back to logic low. The logic status can be seen by the **Latch status** LED display at the bottom of the **Status Display** area. You can clear latch by clicking the **Clear latch** button. It is the same as DI mode that you can enable or disable the Invert DI Status function in the **Setting** area. Remember to click the **Apply all** button for all channels or **Apply this** button for this specific channel to complete the configuration.

4. High to Low Latch

When you choose High to Low Latch mode, once the digital input channel detects logic level changes from high to low, the logic status will be keep as logic low. The logic status will remain the logic low, until you clear latch manually. Then the logic status will back to logic high. The logic status can be seen by the **Latch status** LED display at the bottom of the **Status Display** area. You can clear latch by clicking the **Clear latch** button. It is the same as DI mode that you can enable or disable the Invert DI Status function in the **Setting** area. Remember to click the **Apply all** button for all channels or **Apply this** button for this specific channel to complete the configuration.

5. Frequency

When you choose Frequency mode, ADAM-6100 digital module will calculate the frequency value of the digital input signal from the selected channel. The frequency value will be displayed by the **Frequency value** text box at the bottom of the **Status Display** area.

If you choose a digital output channel in the **Individual Channel Configuration** items, the **Status Display** area should look similar to Figure 5.15 below.

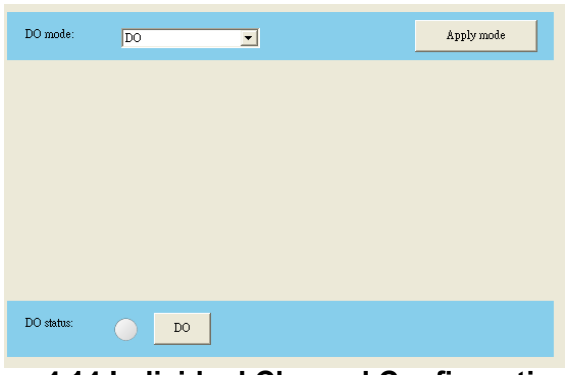


Figure 4.14 Individual Channel Configuration: DO

You can choose different mode for that digital output channel by choosing the **DO mode** combo box at top of **Status Display** area. (You should choose the appropriate mode depending on the hardware specification.) After you have chosen the mode, click the **Apply mode** button. There are totally four possible DO modes you can choose:

1. DO

Figure 5.15 is the image when you choose DO mode. You can control the digital output value of the selected channel by the **DO** button. The current digital output value will be shown by the **DO status** LED display.

2. Pulse Output

The pulse output is the same as PWR. After you choose the Pulse output mode, the selected digital output channel can generate continuous pulse train or finite pulses. You can define the pulse width by entering into the **Low signal width** and **High signal width** text box in the **Setting** area. (Unit: 0.1 ms) The frequency and duty cycle of the pulse output signal will be calculated automatically and displayed by the **Output frequency** and **Duty cycle** text box. After you complete the setting, click the **Apply change** button. Then you can choose to generate continuous pulse train or finite pulses by selecting the **Continuous** (for pulse train) or the **Fixed total** (for finite pulses) radio button. The text box at the right hand of the **Fixed total** button is used to define how many pulses you want to generate. After select the pulse output mode, click the **Start** or **Stop** button to generate or stop the pulse output.

3. Low to High Delay

When you choose Low to High delay mode, it is almost the same as choosing the DO mode. The only difference is that there will be certain time delay when the output value changes from logic low to logic high. Refer to Figure 5.16 below for its process. You can define the delay time by entering its value into the **Delay time** text box in the **Setting** area. After you complete the setting, click the **Apply** button. Then you can control the digital output value by the **DO** button and see its current value by the **DO status** LED display at the bottom of the Status Display area.

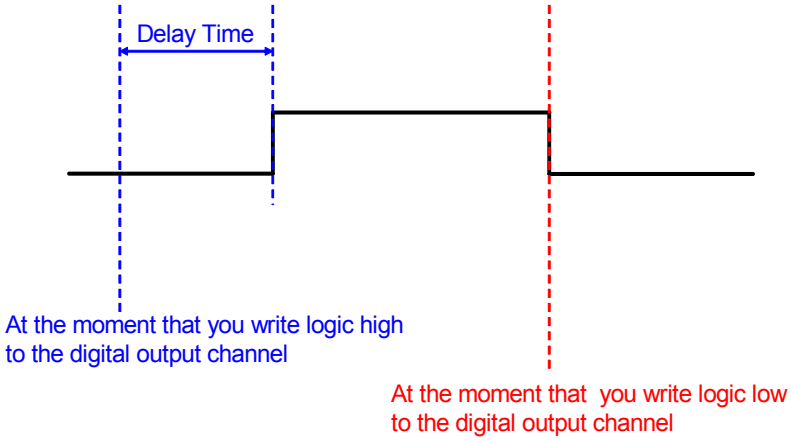


Figure 4.15 Low to High Delay Output Mode

4. High to Low Delay

When you choose High to Low delay mode, it is almost the same as choosing the DO mode. The only difference is that there will be certain time delay when the output value changes from logic high to logic low. Refer to Figure 5.17 below for its process. You can define the delay time by entering its value into the **Delay time** text box in the **Setting** area. After you complete the setting, click the **Apply** button. Then you can control the digital output value by the **DO** button and see its current value by the **DO status** LED display at the bottom of the Status Display area.

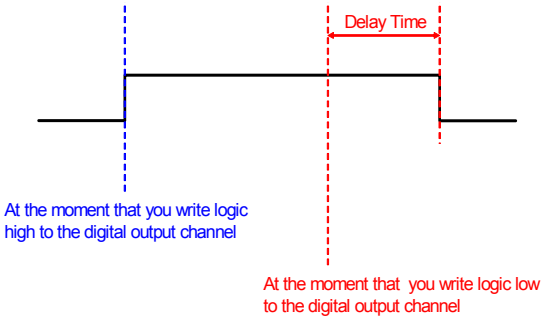


Figure 4.16 Low to High Delay Output Mode

Appendix A

PROFINET Mapping Table

A.1 Analog Input and Analog Output Modules

Each ADAM-6100 analog module will use up to 8 WORD address for its data. Each analog channel will occupy one WORD address.

ADAM-6117	Name	Data Type	Data Format
Input	AI Channel 0	Unsigned 16	Bit [15…0]
	AI Channel 1	Unsigned 16	Bit [15…0]
	AI Channel 2	Unsigned 16	Bit [15…0]
	AI Channel 3	Unsigned 16	Bit [15…0]
	AI Channel 4	Unsigned 16	Bit [15…0]
	AI Channel 5	Unsigned 16	Bit [15…0]
	AI Channel 6	Unsigned 16	Bit [15…0]
	AI Channel 7	Unsigned 16	Bit [15…0]

ADAM-6118	Name	Data Type	Data Format
Input	AI Channel 0	Unsigned 16	Bit [15…0]
	AI Channel 1	Unsigned 16	Bit [15…0]
	AI Channel 2	Unsigned 16	Bit [15…0]
	AI Channel 3	Unsigned 16	Bit [15…0]
	AI Channel 4	Unsigned 16	Bit [15…0]
	AI Channel 5	Unsigned 16	Bit [15…0]
	AI Channel 6	Unsigned 16	Bit [15…0]
	CJC Channel	Unsigned 16	Bit [15…0]

ADAM-6124	Name	Data Type	Data Format
Input	DI Channel 0...3	Unsigned 8	Bit [3…0]
Output	AO Channel 0	Unsigned 16	Bit [15…0]
	AO Channel 1	Unsigned 16	Bit [15…0]
	AO Channel 2	Unsigned 16	Bit [15…0]
	AO Channel 3	Unsigned 16	Bit [15…0]

A.2 Digital Input and Digital Output Modules

Each ADAM-6100 digital module will use up to 2 BYTE address for its data. Each BYTE address will contain 8 digital channel data.

ADAM-6150	Name	Data Type	Data Format
Input	DI Channel 0...7	Unsigned 8	Bit [7…0]
Output	DO Channel 0...6	Unsigned 8	Bit [6…0]

ADAM-6151	Name	Data Type	Data Format
Input	DI Channel 0...7	Unsigned 8	Bit [7…0]
	DI Channel 8...15	Unsigned 8	Bit [7…0]

ADAM-6156	Name	Data Type	Data Format
Output	DO Channel 0...7	Unsigned 8	Bit [7…0]
	DO Channel 8...15	Unsigned 8	Bit [7…0]

ADAM-6160	Name	Data Type	Data Format
Output	DO Channel 0...5	Unsigned 8	Bit [5…0]