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Advantech's ADAM Remote I/O Module:
A Small Device for Big Applications

Advantech's ADAM Remote I/O Modules have been a consistent and reliable figure in the industrial automation field for almost 20 years. Although the core functions have remained relatively unchanged, Advantech's research & development teams have constantly been analyzing and improving the ADAM series, with applied technology more advanced than its competitors. From the early RS-485-based ADAM-4000 series to the more recent Ethernet-based ADAM-6000 I/O series, Advantech has been developing technology ahead of the curve with advanced networking technologies.

Whether dealing with large or small systems, Advantech's ADAM Remote I/O Modules can usually be found embedded somewhere as an integral keystone. These I/O modules support much larger interconnected systems with reliable functions and strong features. To celebrate the milestone of one million ADAM modules sold worldwide, Advantech would like to take a moment to share some background on this long-standing series of industrial products.

1993

ADAM-4000 Series Introduced
- I/O Modules
- Repeaters
- Converters

1994

Added Multiple-channel AI, Isolated DI/O and Counter Modules
- First Module with an LED Display

1994

Design

Advantech's ADAM module has had its signature sky blue color ever since it originated in 1992. Complimented with a bright green terminal, the ADAM module's appearance brings a fresh and approachable image into the traditionally gray-and-black industrial field. The initial ADAM design concept focused on its ability to be recycled, marking Advantech's efforts to be environmentally conscientious for over 20 years and in fact all of its housing and onboard terminals can be recycled and reused. Each ADAM shipping box contains more than 80% post-consumer recycled fiber to further reduce a drain on the Earth's resources.

Technology

Advantech's research & development team has always kept ahead of its customers' needs, providing distinct solutions for different needs. ADAM-4100 series for example, has been improving on its functionalities and usability over many years. The robust ADAM-4100 series is based on the design of the ADAM-4000 with reinforced isolation protection, wide operating temperature range and input power, strict environment applicability and watchdog communication.

When Advantech expected that networking would bring great change to the automation industry, we introduced the ADAM-6000 series, one of the first Ethernet-based data acquisition modules. And in the last half-decade the transfer speed of remote I/O became so demanding among users that Advantech launched the ADAM-6100 real-time Ethernet I/O solutions.
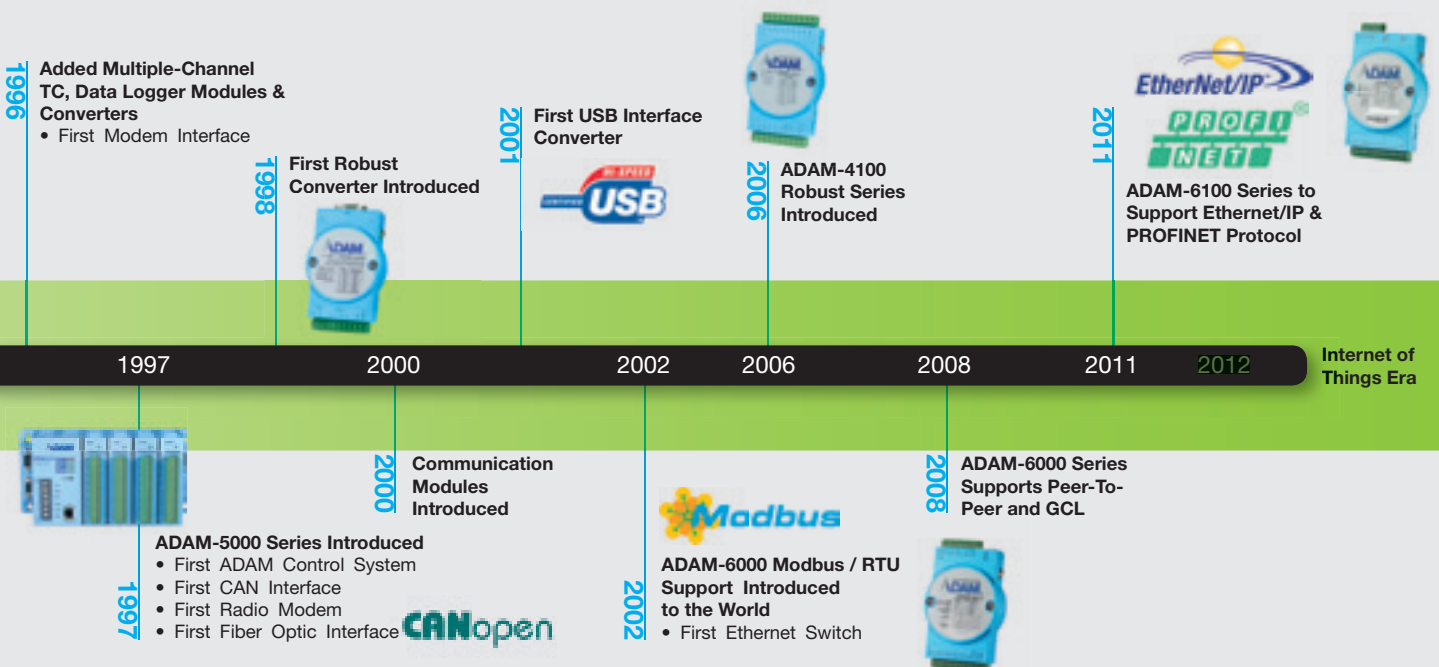
Installation

Advantech also emphasizes user friendliness, such as the convenience of installation and maintenance, as well as reliability and cost effectiveness. The modular industrial design enables ADAM modules to be easily mounted on a DIN-rail, panel or piggybacked on top of each other, depending on the customers' requirements.

Quality

Each ADAM module is strictly tested by Advantech's Production Engineers and Product Quality Controllers before it is shipped to the customer. To ensure quality unification and stability, Advantech not only dedicates on multi-dimensional approaches to test during production, but also avoids possible issues that may lead to the defects in the first place. All ADAM Remote I/O Modules must pass a least five stages of examinations and different modules have different examination jigs, which are calibrated annually. Furthermore, modules must be packaged in antistatic bags, protecting against mechanical damage as well as electrostatic damage which can easily happen during shipment.

Conclusion

As you can see from the timeline below, the ADAM series has continually evolved ahead of the curve, and has always strived to meet customer demands before they are even aware they need them. This trend is not one that has stopped and Advantech customers can expect to see many new technologies and innovations applied to the ADAM series for many years to come.

1996
Added Multiple-Channel TC, Data Logger Modules & Converters
• First Modem Interface

1998
First Robust Converter Introduced

2001
First USB Interface Converter

2006
ADAM-4100 Robust Series Introduced

2011
ADAM-6100 Series to Support Ethernet/IP & PROFINET Protocol

1997 — 2000 — 2002 — 2006 — 2008 — 2011 — 2012

Internet of Things Era

2000
Communication Modules Introduced

2008
ADAM-6000 Series Supports Peer-To-Peer and GCL

1997
ADAM-5000 Series Introduced
• First ADAM Control System
• First CAN Interface
• First Radio Modem
• First Fiber Optic Interface CANopen

2002
ADAM-6000 Modbus / RTU Support Introduced to the World
• First Ethernet Switch

A Small Device for Big Applications

Factory Automation

Time dependent control is one of the important factors for process control systems. With real-time Ethernet I/O modules i.e. the ADAM-6100 series, customers can easily extend the control system for production automation and process control to eliminate human error and accelerate time to market.

Freeway Facility Management

Efficient and reliable highway management requires products like the ADAM series to ensure safer travel on the roads. Advantech's remote I/O solution is targeted at simplifying payment for customers: helping to reduce congestion when passing through toll booths, and also for automatically controlling street lighting in changing light conditions..

Water & Wastewater Treatment

Water & wastewater treatment plants consist of treatment pools, mixers, pH control pools and precipitation pools: requiring different process functions and equipment. The compact ADAM series modules can receive data from the control room, send commands to process simple demands and control the quality. The ADAM series can also be used to monitor pipeline pressure, temperature, flow and leakage when water is transported through the pipelines.
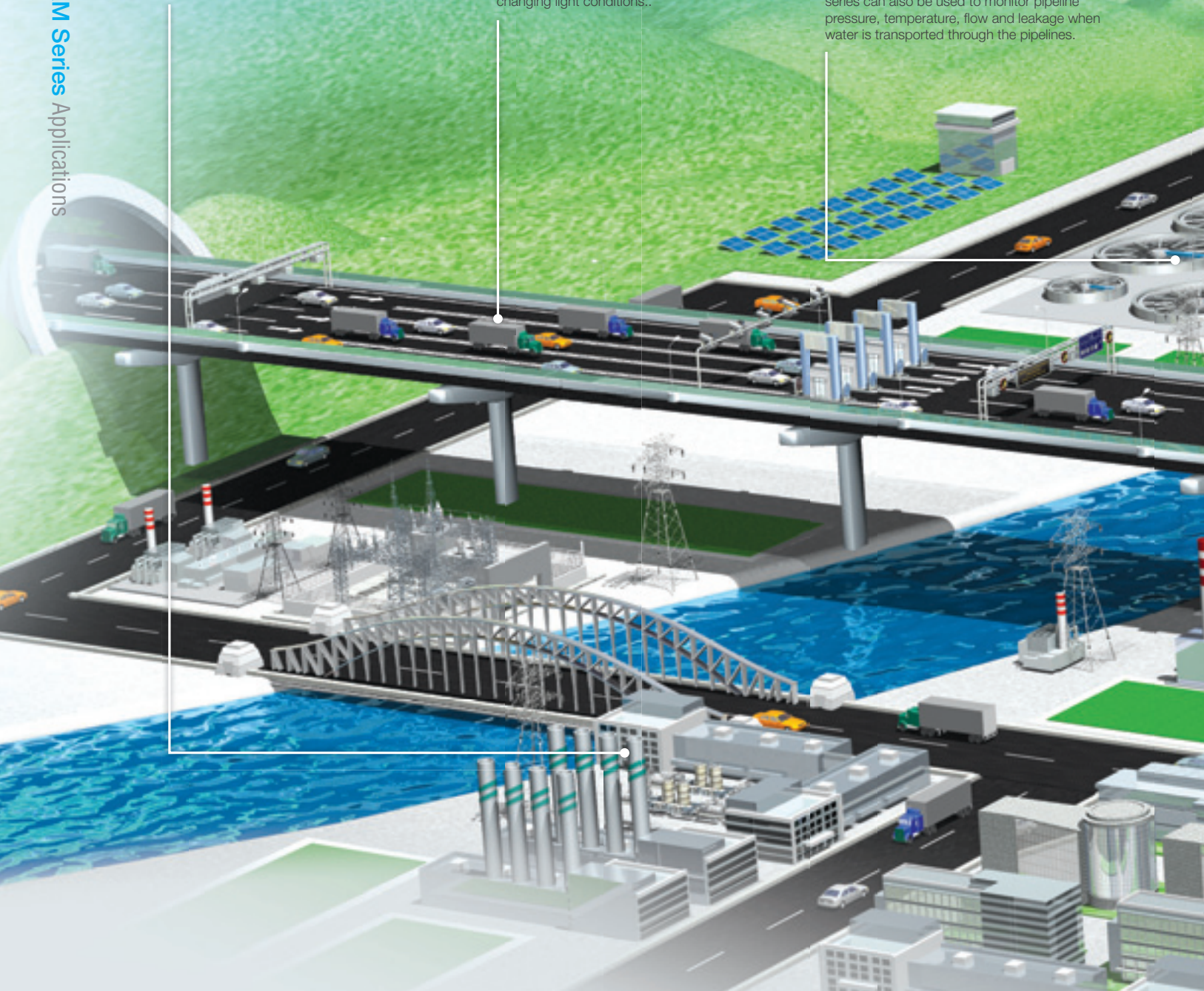
Advantech's ADAM family is one of the most compact remote I/O modules on the market. Despite being virtually hidden from view, it serves an important role as a key connection between the sensor and computer in various applications, such as: environmental monitoring & facility management building automation & energy management, factory automation, intelligent transportation systems and so on.

Building Automation

Many smart homes and buildings are being equipped with automated lighting and other electronic devices that provide a wide range of intelligent features. Our remote I/O modules are capable of detecting environmental changes and then managing the related devices to optimize heating, lighting and other mechanisms to open and close windows.

Automatic Parking and EV Charging Station

Parking facilities, whether indoor or outdoor, can take advantage of Advantech's ADAM series to manage and monitor the facilities. Advantages include easy installation & mounting, high isolation protection, wide temperature support, etc. Moreover, by integrating Advantech's touch panel computers with ADAM modules they can serve as self-service pay stations in parking lots or EV charging stations.

Agriculture & Fisheries

Advantech's ADAM series is an ideal solution for agriculture and fishery applications, such as: green houses, farmland, or fish farm monitoring. Because of its low power consumption and high reliability in allowing owners to measure the pH value, temperature, humidity etc. remotely in order to input fertilizers or pesticides as well as control the heat and light automatically it helps automate the management of these sites.

ADAM Series Applications

ADAM-6100 Real-time Ethernet I/O Modules

Introduction

Advantech's ADAM-6100 EtherNet/IP and PROFINET Series can build a real-time distributed control system that is reliant on reliable and real-time communication among the controllers and devices. Improving safety, quality, and efficiency, a real-time system is expected to respond not just quickly, but also within a predictable period of time via industrial-grade EtherNet/IP and PROFINET protocols.

EtherNet/IP & PROFINET

Today, EtherNet/IP and PROFINET are two commonly used protocols in process control, manufacturing, and other industrial automation applications, ensuring multi-vendor system interoperability. EtherNet/IP is known as object-orientated organization, and allows ordinary office Ethernet to become a more versatile system; PROFINET is the open industrial Ethernet standard, including two modes - PROFINET IO and PROFINET CBA - and allowing combining distributed automation and distributed I/O flexibly.

Features

Daisy Chain Connections

ADAM-6100 real-time Ethernet modules are equipped with daisy chain capability which is the easiest way to add more I/O modules into an existing network. That is, data acquisition modules are connected in series to the next and then bounce the signal along in sequence until it reaches the destination, helping improve scalability and improving resistance against interference common in factory settings.

Ethernet-based Configuration Tool

Like other ADAM-4000 and ADAM-6000 models, the ADAM-6100 series comes bundled with ADAM.NET Utility. With ADAM.NET Utility, users can remotely configure, set and test ADAM-6100 modules through Ethernet.

2,500 V$_{DC}$ Isolation Protection

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

ADAM-6000 Ethernet I/O Modules

Introduction

Nowadays Advantech's ADAM-6000 accomplishes the integration of automation and enterprise systems easily through internet technology, so that users can avoid changing the entire architecture of the control system and even remotely monitor the device status more flexibly. Advantech's ADAM-6000 modules are empowered by peer-to-peer (P2P) and Graphic Condition Logic (GCL), and can perform as standalone products for measurement, control and automation. Instead of having additional controllers or programming, system configurations can be done in an extremely short time with the easy-to-use and intuitive graphic utility.

Features

Peer-to-Peer
Unlike master/client mode, peer-to-peer enabled modules will actively update the input channel status to specific output channels. Without dealing with the trouble of long distance wiring, users can define the mapping between a pair of modules (one input and one output module) and then the input value will be transferred to the output channel actively, which greatly simplifies the process and means that no controller is required.
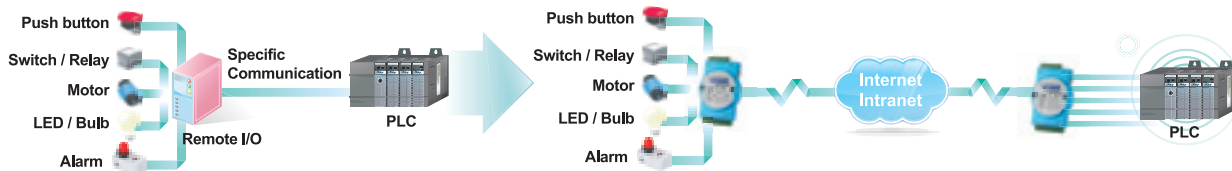
Graphic Condition Logic
GCL (Graphic Condition Logic) functionality empowers Ethernet I/O modules control ability. Users can define the control logic rules through graphical configuration environment in ADAM.NET Utility, and download defined logic rules to specific ADAM-6000 Ethernet I/O module. Then, that Ethernet module will execute the logic rules automatically just like a standalone controller. With the easy-to-use and intuitive graphic utility, system configurations can be done in an extremely short time.

Local Output   Remote Output
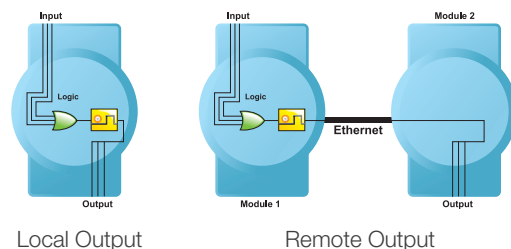
Advanced Security and High Reliability
ADAM-6000 Ethernet I/O modules not only have a fast response time (< 1.2 ms), but also advanced security and reliability. When engineers use peer-to-peer modules, the output module can only be controlled by its paired input module, rather than controlled by other non-authorized computers or devices. Even when communication between pairs of ADAM-6000 peer-to-peer modules is broken, the digital output module can generate pre-defined values to ensure safety.

Online Monitoring
After users complete all GCL configurations in ADAM.NET Utility, they can simply click the "Run Monitoring" button. Then users can see a real-time execution workflow of the logic rules on ADAM-6000 modules and current input values will also be displayed. This greatly helps users to maintain the system.

ADAM-6100 Series Selection Table

Model		ADAM-6117	ADAM-6118	ADAM-6150
Description		8-ch Isolated Analog Input Real-time Ethernet Module	8-ch Thermocouple Input Real-time Ethernet Module	15-ch Isolated Digital I/O Real-time Ethernet Module
Interface		10/100 Mbps Ethernet		
Support Protocol		ADAM-6100EI: EtherNet/IP; ADAM-6100PN: PROFINET		
Analog Input	Resolution	16 bit	16 bit	-
	Channels	8	8	-
	Sampling Rate	10 S/s	10 S/s	-
	Voltage Input	±150 mV ±500 mV ±1 V ±5 V ±10 V	±150 mV ±500 mV ±1 V ±5 V ±10 V	-
	Current Input	0 ~ 20 mA 4 ~ 20 mA ±20 mA	0 ~ 20 mA 4 ~ 20 mA ±20 mA	-
	Direct Sensor Input	-	J, K, T, E, R, S, B Thermocouple	-
Digital Input and Output	Input Channels	-	-	8
	Output Channels	-	-	7
Isolation Protection		2,500 V$_{DC}$	2,500 V$_{DC}$	2,500 V$_{DC}$
Connectors		2 x RJ-45 LAN (Daisy Chain) Plug-in screw terminal block (I/O and power)		

Model		ADAM-6151	ADAM-6156	ADAM-6160
Description		16-ch Isolated Digital Input Real-time Ethernet Module	16-ch Isolated Digital Output Real-time Ethernet Module	6-ch Relay Output Real-time Ethernet Module
Interface		10/100 Mbps Ethernet		
Support Protocol		ADAM-6100EI: EtherNet/IP; ADAM-6100PN: PROFINET		
Analog Input	Resolution	-	-	-
	Channels	-	-	-
	Sampling Rate	-	-	-
	Voltage Input	-	-	-
	Current Input	-	-	-
	Direct Sensor Input	-	-	-
Digital Input and Output	Input Channels	16	-	-
	Output Channels	-	16	6 (Power Relay)
Isolation Protection		2,500 V$_{DC}$	2,500 V$_{DC}$	2,500 V$_{DC}$
Connectors		2 x RJ-45 LAN (Daisy Chain) Plug-in screw terminal block (I/O and power)		

ADAM-6000 Series Selection Table

Model	ADAM-6015	ADAM-6017	ADAM-6018	ADAM-6022	ADAM-6024
Description	7-ch Isolated RTD Input Modbus TCP Module	8-ch Isolated Analog Input Modbus TCP Module with 2-ch DO	8-ch Isolated Thermocouple Input Modbus TCP Module with 8-ch DO	Ethernet-based Dual-loop PID Controller	12-ch Isolated Universal Input/Output Modbus TCP Module
Interface			10/100 Mbps Ethernet		
Peer-to-Peer*		Yes		No	Receiver Only**
GCL*		Yes		No	Receiver Only**
Resolution		16 bit		16 bit for AI 12 bit for AO	16 bit for AI 12 bit for AO

Analog Input		ADAM-6015	ADAM-6017	ADAM-6018	ADAM-6022	ADAM-6024
	Channels	7	8	8	6	6
	Sampling Rate			10 S/s		
	Voltage Input	-	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V	-	±10 V	±10 V
	Current Input	-	0 ~ 20 mA 4 ~ 20 mA	-	0 ~ 20 mA 4 ~ 20 mA	0 ~ 20 mA 4 ~ 20 mA
	Direct Sensor Input	Pt, Balco and Ni RTD	-	J, K, T, E, R, S, B Thermocouple	-	-
	Burn-out Detection	Yes	-	Yes	-	-
	Math. Functions	Max. Min. Avg.	Max. Min. Avg.	Max. Min. Avg.	-	-
Analog Output	Channels	-	-	-	2	2
	Current Output	-	-	-	0 ~ 20 mA, 4 ~ 20 mA with 15 V_{DC}	0 ~ 20 mA, 4 ~ 20 mA with 15 V_{DC}
	Voltage Output	- -	-	-	0 ~ 10 V_{DC} with 30 mA	0 ~ 10 V_{DC} with 30 mA
Digital Input and Output	Input Channels	-	-	-	2	2
	Output Channels	-	2 (Sink)	8 (Sink)	2 (Sink)	2 (Sink)
	Extra Counter Channels	-	-	-	-	-
	Counter Input	-	-	-	-	-
	Frequency Input	-	-	-	-	-
	Pulse Output	-	-	-	-	-
	High/Low Alarm Settings	Yes	Yes	Yes	-	-
Isolation Protection			2,000 V_{DC}		2,000 V_{DC}***	2,000 V_{DC}***
Remark		-	-	-	Built-in Dual Loop PID Control Algorithm	-

Model	ADAM-6050	ADAM-6051	ADAM-6052	ADAM-6060	ADAM-6066
Description	18-ch Isolated Digital I/O Modbus TCP Module	14-ch Isolated Digital I/O Modbus TCP Module with 2-ch Counter	16-ch Source-type Isolated Digital I/O Modbus TCP Module	6-ch Digital Input and 6-ch Relay Modbus TCP Module	6-ch Digital Input and 6-ch Power Relay Modbus TCP Module
Interface			10/100 Mbps Ethernet		
Peer-to-Peer*			Yes		
GCL*			Yes		

Digital Input and Output		ADAM-6050	ADAM-6051	ADAM-6052	ADAM-6060	ADAM-6066
	Input Channels	12	12	8	6	6
	Output Channels	6 (Sink)	2 (Sink)	8 (Source)	6 (Relay)	6 (Power Relay)
	Extra Counter Channels	-	2	-	-	-
	Counter Input	3 kHz	4.5 kHz	3 kHz	3 kHz	3 kHz
	Frequency Input	3 kHz	4.5 kHz	3 kHz	3 kHz	3 kHz
	Pulse Output			Yes		
	High/Low Alarm Settings	-	-	-	-	-
Isolation Protection			2,000 V_{DC}		

*: Peer-to-Peer and GCL cannot run simultaneously, only one feature is enabled at one time.

**: ADAM-6024 can only act as a receiver and generate analog output when using Peer-to-Peer or GCL.

***: Only for analog input and analog output channels.

ADAM-4100 Robust RS-485 I/O Modules

Introduction

The robust RS-485-based family includes the ADAM-4100 series I/O modules, ADAM-4510I and ADAM-4520I, which are designed to endure more severe and adverse environments. Not only does the ADAM-4100 series support a wider operating temperature range making it suitable for more widespread applications, but also features anti-noise functions which empower the ADAM-4000 robust family to confront harsh environments in many industrial automation applications.

Features
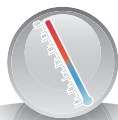
Wide Temperature & Power Input Range

The ADAM-4100 series can work under severe environments. The operating temperature range is -40~85°C (-40~185°F) and the power input is 10~48 V_{DC}, which allows it to be used in more demanding applications.

Dual Watchdog Timer

All ADAM-4100 modules provide two watchdog timers. The system watchdog will reboot the system when the module hangs, and the communication watchdog will re-initialize the RS-485 network if there is no communication for a specific time.

Over Current and Temperature Shutdown

This protection is for robust digital I/O modules. When the current is too big or the temperature is too high, that channel will automatically shutdown to prevent the whole system from damages.

Surge, EFT and ESD Protection

In order to prevent noise from affecting the system, ADAM-4100 robust family has been designed with advanced noise interference protection. Features included 1 kV surge protection on power inputs, 3 kV EFT, and 8 kV ESD protections.

Flexible Filter

For robust analog input modules such as ADAM-4117 and ADAM-4118, two filter options are available. Users can choose traditional 50/60 Hz hardware filter to remove the noise or choose the software filter, which will automatically decide the optimized working frequency to filter the noise.

Multiple Mounting Mechanisms

All Advantech's ADAM modules provide versatile mounting methods to fit various demands in the field. All ADAM modules support DIN-rail mounting, wall mounting and piggybacking. Customers can make signal connections through plug-in screw-terminal blocks, ensuring simple installation, modification, and maintenance.

ADAM-4000 RS-485 I/O Modules

Introduction

ADAM-4000 series modules provide ideal industrial automation, control and measurement solutions. Like ADAM-6000 series modules, ADAM-4000 modules provide rich I/O flexibility to satisfy a variety of applications. However, the main difference between ADAM-4000 and ADAM-6000 modules is the communication interface: ADAM-6000 modules leverage Ethernet while ADAM-4000 modules adapt RS-485.

Features

Support Two Communication Protocols

Most ADAM-4000 modules support two communication protocols, ASCII and Modbus/RTU, for customers to choose from. With these two widely-used industrial communication protocols, ADAM-4000 RS-485-based I/O modules can be easily integrated with other devices and software.

Easy to Diagnose and Maintain

There is a switch on the side of some ADAM-4100/4000 modules, helping users switch between 'Normal' and 'Init' (abbr. of Initialization) modes easily. Furthermore, with the LED indicators on the front of ADAM modules, the status of each channel can be identified instantly and greatly help engineers to troubleshoot the module in the field.

Display Channel Status and Node Address by LED

When the switch is set to "Normal", the LED will display the channel status.

For the analog module, the LED will be lit when the related channel is active. For the digital module, the LED will be lit when the related channel value is high. In this example of an analog input module, only channel 1 is active since only the LED of channel 1 is lit.
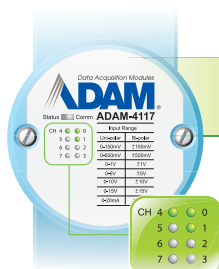
When the switch is set to "Init", the LED will display the node address.

If the switch is set to "Init", the LEDs will display the node address. In this example, the node address is 19 since LED's 0, 1, and 4 are lit.

Module Locate Function

When multiple ADAM-4100 series I/O modules are within the same RS-485 network, it is hard to find one specific module. With the Module Locate function, users can choose a specific module in ADAM.NET Utility, and the LED on that module will stop flashing. So users can easily identify the module location. This helps users easily maintain the system.

- Normal Situation (Flashing)
  Status ▮ Comm
- LED will stop flashing when you locate this module
  Status ▮ Comm

ADAM-4100 Series Selection Table

Robust RS-485 I/O Modules

Model		ADAM-4117	ADAM-4118	ADAM-4150	ADAM-4168
Description		Robust 8-ch Analog Input Module with Modbus	Robust 8-ch Thermocouple Input Module with Modbus	Robust 15-ch Digital I/O Module with Modbus	Robust 8-ch Relay Output Module with Modbus
Resolution		16 bit		-	-
Analog Input	Channels	8 differential		-	-
	Sampling Rate	10/100 Hz (total)		-	-
	Voltage Input	0 ~ 150 mV, 0 ~ 500 mV, 0 ~ 1 V, 0 ~ 5 V, 0 ~ 10 V, 0 ~ 15 V, ±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, ±15V	±15 mV, ±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5V	-	-
	Current Input	0 ~ 20 mA, ±20 mA, 4 ~ 20 mA	±20 mA, 4 ~ 20 mA	-	-
	Direct Sensor Input	-	J, K, T, E, R, S, B Thermocouple	-	-
	Burn-out Detection	Yes (mA)	Yes (mA and All T/C)	-	-
	Channel Independent Configuration	Yes		-	-
Digital Input and Output	Input Channels	-	-	7	-
	Output Channels	-	-	8	8-ch relay
Counter	Channels	-	-	7	-
	Input Frequency	-	-	3 kHz	-
Isolation Voltage		3,000 V$_{DC}$			
Digital LED Indicator		Communication and Power			
Watchdog Timer		System & Communication			
DO Fail Safe Value (FSV) *		-	-	Yes	Yes
Communication Protocol		ASCII Command/Modbus			
Power Requirement		10 ~ 48 V$_{DC}$			
Operating Temperature		-40 ~ 85°C (-40 ~ 185°F)			
Storage Temperature		-40 ~ 85°C (-40 ~ 185°F)			
Humidity		5 ~ 95% RH			
Power Consumption		1.2 W @ 24 V$_{DC}$	0.5 W @ 24 V$_{DC}$	0.7 W @ 24 V$_{DC}$	1.8 W @ 24 V$_{DC}$

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

Model	ADAM-4510I	ADAM-4520I
Description	Robust RS-422/485 Repeater	Robust RS-232 to RS-422/485 Converter
Network	RS-422/485	RS-232 to RS-422/485
Communication Speed (bps)	From 1,200 to 115.2k	
Communication Distance	Serial: 1.2 km	
Interface Connectors	RS-422/485: plug-in screw terminal	RS-232: female DB9 RS-422/485: plug-in screw terminal
Digital LED Indicators	Communication and Power	
Auto Data Flow Control	Yes	
Isolation Voltage	3,000 V$_{DC}$	
Power Requirement	10 ~ 48 V$_{DC}$	
Operating Temperature	-40 ~ 85°C (-40 ~ 185°F)	
Storage Temperature	-40 ~ 85°C (-40 ~ 185°F)	
Humidity	5 ~ 95%	
Power Consumption	1.4 W @ 24 V$_{DC}$	1.2 W @ 24 V$_{DC}$

ADAM-4000 Series Selection Table

Repeaters / Converters

Model	ADAM-4510 ADAM-4510S	ADAM-4520 ADAM-4522	ADAM-4521	ADAM-4541 ADAM-4542+	ADAM-4561 ADAM-4562
Description	RS-422/485 Repeater / Isolated RS-422/485 Repeater	Isolated RS-232 to RS-422/485 Converter / RS-232 to RS-422/485 Converter	Addressable RS-422/485 to RS-232 Converter	Multi-mode Fiber Optic to RS-232/422/485 Converter / Single-mode Fiber Optic to RS-232/422/485 Converter	1-port Isolated USB to RS-232/422/485 Converter / 1-port Isolated USB to RS-232 Converter
Network	RS-422 RS-485	RS-232 to RS-422/485		Fiber Optic to RS-232/422/485	USB to RS-232/485/422
Comm. Protocol	-				
Comm. Speed (bps)	Serial: from 1,200 to 115.2 k				
Comm. Distance	Serial: 1.2 km	Serial: 1.2 km	Serial: 1.2 km	ADAM-4541: 2.5 km ADAM-4542+: 15 km	Serial: 1.2 km
Interface Connectors	RS-422/485: plug-in screw terminal	RS-232: female DB9 RS-422/485: plug-in screw terminal	RS-232: female DB9 RS-422/485: plug-in screw terminal	RS-232/422/485: plug-in screw terminal Fiber: ADAM-4541: ST connector ADAM-4542+: SC connector	USB: type A client connector Serial: ADAM-4561: plug-in screw terminal (RS-232/422/485) ADAM-4562: DB9 (RS-232)
LED Indicators	Communication & Power				
Data Flow Control	-	-	Yes	-	Yes
Watchdog Timer	-	-	Yes	-	Yes
Isolation Voltage	ADAM-4510: - ADAM-4510S: 3,000 V_{DC}	ADAM-4520: 3,000 V_{DC} ADAM-4522: -	1,000 V_{DC}	-	ADAM-4561: 3,000 V_{DC} ADAM-4562: 2,500 V_{DC}
Power Requirement	10 ~ 30 V_{DC}				
Operating Temperature	-10 ~ 70°C (14 ~ 158°F)				0 ~ 70°C (32 ~ 158°F)
Humidity	5 ~ 95% RH	5 ~ 95% RH			
Power Consumption	1.4 W @ 24 V_{DC}	1.2 W @ 24 V_{DC}	1 W @ 24 V_{DC}	ADAM-4541: 1.5 W @ 24 V_{DC} ADAM-4542+: 3 W @ 24 V_{DC}	ADAM-4561: 1.5 W @ 5 V_{DC} ADAM-4562: 1.1 W @ 5 V_{DC}

ADAM-4000 Series Selection Table

Analog Input Modules

Model		ADAM-4011	ADAM-4012	ADAM-4013	ADAM-4015/T	ADAM-4016
Description		1-ch Thermocouple Input Module	1-ch Analog Input Module	1-ch RTD Input Module	6-ch RTD Module with Modbus / 6-ch Thermistor Module with Modbus	1-ch Analog Input/ Output Module
Resolution		16 bit				
Analog Input	Channels	1 differential	1 differential	1 differential	6 differential	1 differential
	Sampling Rate	10 Hz				
	Voltage Input	±15 mV ±50 mV ±100 mV ±500 mV ±1 V ±2.5 V	±150 mV ±500 mV ±1 V ±5 V ±10 V	-	-	±15 mV ±50 mV ±100 mV ±500 mV
	Current Input	±20 mA	±20 mA	-	-	±20 mA
	Direct Sensor Input	J, K, T, E, R, S, B Thermocouple	-	RTD	ADAM-4015: RTD ADAM-4015T: Thermistor	-
	Burn-out Detection	Yes	-	-	Yes	-
	Channel Independent Configuration	-	-	-	Yes	-
Analog Output	Channels	-	-	-	-	1
	Voltage Output	-	-	-	-	0 - 10 V
	Current Output	-	-	-	-	30 mA
Digital Input and Output	Input Channels	1	1	-	-	-
	Output Channels	2	2	-	-	4
	Alarm Settings	Yes	Yes	-	-	-
Counter (32-bit)	Channels	-	-	-	-	-
	Input Frequency	-	-	-	-	-
Isolation Voltage		3,000 V_{DC}				
Digital LED Indicator		-	-	-	-	-
Watchdog Timer		System	System	System	System & Comm.	System
DO Fail Safe Value (FSV) *		-	-	-	-	-
Modbus Support **		-	-	-	Yes	-

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

**: All ADAM-4000 I/O Modules support ASCII Commands.

ADAM-4000 Series Selection Table

Analog Input / Output Modules

Model	ADAM-4017+	ADAM-4018+	ADAM-4019+	ADAM-4022T	ADAM-4021	ADAM-4024
Description	8-ch Analog Input Module with Modbus	8-ch Thermocouple Input Module with Modbus	8-ch Universal Analog Input Module with Modbus	2-ch Serial Based Dual Loop PID Controller with Modbus	1-ch Analog Output Module	4-ch Analog Output Module with Modbus
Resolution	16 bit				12 bit	
Analog Input — Channels	8 differential			4 differential	-	-
Sampling Rate	10 Hz				-	-
Voltage Input	±150 mV ±500 mV ±1 V ±5 V ±10 V	-	± 100 mV ± 500 mV ± 1 V ± 2.5 V ± 5 V ± 10 V	0 ~ 10 V	-	-
Current Input	4 ~ 20 mA ±20 mA	4 ~ 20 mA ±20 mA	4 ~ 20 mA ±20 mA	0 ~ 20 mA 4 ~ 20 mA	-	-
Direct Sensor Input	-	J, K, T, E, R, S, B Thermocouple	J, K, T, E, R, S, B Thermocouple	Thermistor, RTD	-	-
Burn-out Detection	-	Yes	Yes (4 ~ 20 mA & All T/C)	-	-	-
Channel Independent Configuration	Yes	Yes	Yes	Yes	-	-
Analog Output — Channels	-	-	-	2	1	4
Voltage Output	-	-	-	0 ~ 10 V	0 ~ 10 V	±10 V
Current Output	-	-	-	-	0 ~ 20 mA 4 ~ 20 mA	0 ~ 20 mA 4 ~ 20 mA
Digital Input and Output — Input Channels	-	-	-	2	-	4
Output Channels	-	-	-	2	-	-
Alarm Settings	-	-	-	-	-	Yes
Counter (32-bit) — Channels	-	-	-	-	-	-
Input Frequency	-	-	-	-	-	-
Isolation Voltage	3,000 V$_{DC}$	3,000 V$_{DC}$	3,000 V$_{DC}$	3,000 V$_{DC}$	3,000 V$_{DC}$	3,000 V$_{DC}$
Digital LED Indicator	-	-	-	-	-	-
Watchdog Timer	System & Comm.	System & Comm.	System & Comm.	System	System	System & Comm.
DO Fail Safe Value (FSV) *	-	-	-	-	-	-
Modbus Support **	Yes	Yes	Yes	Yes	-	Yes

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

**: All ADAM-4000 I/O Modules support ASCII Commands.

ADAM-4000 Series Selection Table

Digital Input / Output Modules

Model		ADAM-4050	ADAM-4051	ADAM-4052	ADAM-4053	ADAM-4055	ADAM-4056S ADAM-4056SO
Description		15-ch Digital I/O Module	16-ch Isolated Digital Input Module with Modbus	8-ch Isolated Digital Input Module	16-ch Digital Input Module	16-ch Isolated Digital I/O Module with Modbus	12-ch Sink/ Source Type Isolated Digital Output Module with Modbus
Digital Input	Channels	7	16	8	16	8	-
	Dry Contact	-	Yes	-	Yes	Yes	-
	Wet Contact	Logic level 0: 1 V max. Logic level 1: 3.5 ~ 30 V	Logic level 0: 3 V max. Logic level 1: 10 ~ 50 V	Logic level 0: 1 V max. Logic level 1: 3 ~ 30 V	Logic level 0: 2 V max. Logic level 1: 4 ~ 30 V	Logic level 0: 3 V max. Logic level 1: 10 ~ 50 V	-
Digital Output	Counter Input	-	-	-	-	-	-
	Frequency Input	-	-	-	-	-	-
	Invert DI Status	-	Yes	-	-	-	-
	Channels	8	-	-	-	8	12
	Type	Sink	-	-	-	Sink	ADAM-4056S: Sink ADAM-4056SO: Source
	Mode	Open collector to 30 V	-	-	-	Open collector to 40 V	ADAM-4056S: Open collector to 40 V ADAM-4056SO: 10 ~ 35V
	Max. Current Load	30 mA	-	-	-	200 mA	ADAM-4056S: 200 mA ADAM-4056SO: 1 A
	Pulse Output	-	-	-	-	-	-
	Over Current Protection	-	-	-	-	-	Yes
Isolation Voltage		-	2,500 V_{DC}	5,000 V_{RMS}	-	2,500 V_{DC}	5,000 V_{DC}
Digital LED Indicator		-	Yes	-	-	Yes	Yes
Watchdog Timer		System	System & Comm.	System	System	System & Comm.	System & Comm.
DO Fail Safe Value (FSV) *		Yes	-	-	-	Yes	Yes
Modbus Support **		-	Yes	-	-	Yes	Yes

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

**: All ADAM-4000 I/O Modules support ASCII Commands.

ADAM-4000 Series Selection Table

Relay Output / Counter Modules

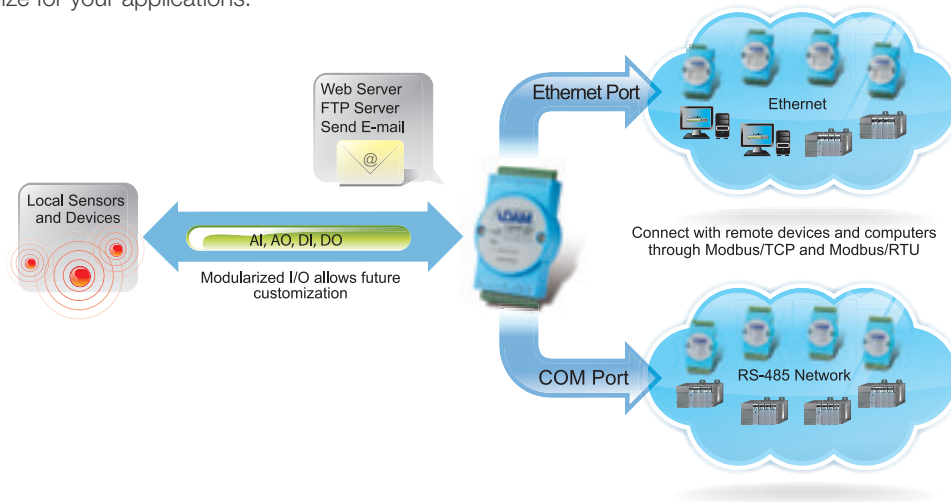| Model		ADAM-4060	ADAM-4068	ADAM-4069	ADAM-4080
Description		4-ch Relay Output Module	8-ch Relay Output Module with Modbus	8-ch Power Relay Output Module with Modbus	2-ch Counter/Frequency Module
Relay Output	Channels	2 x Form A 2 x Form C	4 x Form A 4 x Form C	4 x Form A 4 x Form C	-
	Breakdown Voltage	500 VAC (50/60 Hz)	500 VAC (50/60 Hz)	1,000 VAC (50/60 Hz)	-
	Contact Rating (Resistive)	0.6 A @ 125 V_{AC} 0.3 A @ 250 V_{AC} 2 A @ 30 V_{DC} 0.6 A @ 110 V_{DC}	0.5 A @ 120 V_{AC} 0.25 A @ 240 V_{AC} 1 A @ 30 V_{DC} 0.3 A @ 110 V_{DC}	5 A @ 250 V_{AC} 5 A @ 30 V_{DC}	-
	Initial Insulation Resistance	1 G Ω min. @ 500 V_{DC}	1 G Ω min. @ 500 V_{DC}	1 G Ω min. @ 500 V_{DC}	-
	Relay On Time (Typical)	2 ms	4 ms	5.6 ms	-
	Relay Off Time (Typical)	3 ms	3 ms	5 ms	-
	Max. Operating Speed	20 operations/min (at related load)	50 operations/min (at related load)	6 operations/min (at related load)	-
Digital Output	Channels	-	-	-	2 (Sink)
	Type	4-ch relay	8-ch relay	8-ch power relay	Sink
	Mode	-	-	-	Open collector to 40 V (30 mA max. load)
Counter Input	Channels	-	-	-	2 (indipendent)
	Resolution	-	-	-	32-bit + 1-bit overflow
	Input Frequency	-	-	-	50 kHz max.
	Input Pulse Width	-	-	-	>10 µs
	Isolated Input Level	-	-	-	Logic level 0: 1 V max. Logic level 1: 3.5~30 V
	Maximum Count	-	-	-	4,294,967,295 (32 bits)
	Preset Type	-	-	-	Absolute or relative
	Programmable Digital Noise Filter	-	-	-	2 µs ~ 65 ms
	Measurement Range	-	-	-	5 Hz ~ 50 kHz
Isolation Voltage		-	-	-	2,500 V_{RMS}
Digital LED Indicator		-	Yes	-	-
Watchdog Timer		System	System & Comm.	System & Comm.	System
DO Fail Safe Value (FSV) *		Yes	Yes	Yes	-
Modbus Support **		-	Yes	Yes	-

*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

**: All ADAM-4000 I/O Modules support ASCII Commands.

ADAM-4500 Communication Controllers

Introduction

A standalone control solution is made possible when the ADAM-4000 I/O modules are controlled by the ADAM-4500/ADAM-4501/ADAM-4502 PC-based communication controller. The ADAM-4500 compact-sized communication controllers contain x86 CPU and up to four serial (RS-232, RS-485, RS-232/485) and Ethernet ports, allowing users to download an application (written in a high-level programming language, such as C) into its Flash ROM and then customize for your applications.

Web Server
FTP Server
Send E-mail

Local Sensors and Devices

AI, AO, DI, DO

Modularized I/O allows future customization

Ethernet Port

Ethernet

Connect with remote devices and computers through Modbus/TCP and Modbus/RTU

COM Port

RS-485 Network

ADAM-4500 Series Selection Table

| Model	ADAM-4500	ADAM-4501	ADAM-4502
Description	PC-based Communication Controller	Ethernet-enabled Communication Controller with 8-ch DI/O	Ethernet-enabled Communication Controller with 2-ch AI/O and 4-ch DI/O
Network	RS-232, RS-485	Ethernet, RS-232, RS-485	
Comm. Protocol	ASCI command	Modbus/RTU, Modbus/TCP TCP/IP, UDP, ICMP, ARP, DHCP	
Comm. Speed (bps)	up to 115.2 kbps	Ethernet: 10/100M Serial: From 1,200 to 115.2 kbps	
Comm. Distance	1.2 km	Ethernet: 100 m Serial: 1.2 km	
Interface Connectors	RS-485: plug-in screw terminal RS-232: RJ-48	Ethernet: RJ-45 RS-485: plug-in screw terminal RS-232: RJ-48	
LED Indicators	-	Communication & Power	
Data Flow Control		Yes	
Watchdog Timer		Yes	
Isolation Voltage	-	-	1,000 V_{DC}
Special Features	Programmable download cable and utility included	Email function Built-in HTTP and FTP Server	
Built-in I/O	-	4DI/4DO	1AI/1AO/2DI/2DO
Power Requirement		10 ~ 30 V_{DC}	
Operating Temperature		-10 ~ 70°C (14 ~ 158°F)	
Humidity	5 ~ 95% RH	5 ~ 95% RH	
Power Consumption	2 W @ 24 V_{DC}	4 W @ 24 V_{DC}	

Software for ADAM Series

OPC Server

Advantech introduces a standardized interface for industrial device servers, the OPC (OLE for process control) Server. An OPC server provides devices, such as an I/O device, to communicate with a wide range of HMI/SCADA software packages residing on a host. Any software system with OPC client capabilities can access the Advantech OPC server drivers.
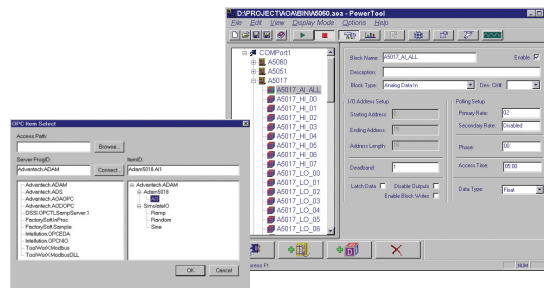
ADAM.NET Utility

ADAM.NET Utility is a user-friendly tool for system configuration. All ADAM I/O modules (ADAM-4000, ADAM-4100, ADAM-6000 and ADAM-6100 series) and remote controllers (ADAM-4500 series) can be configured and tested through this easy-to-use graphical utility. With its powerful functionality, users can configure all related settings such as channel range, calibration, IP address, security, peer-to-peer and GCL.
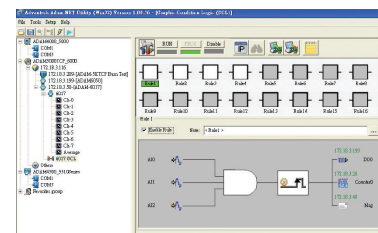
Advantech WebAccess Express

Advantech WebAccess Express brings your ADAM I/O data online with a single click. In addition to the professional powerful SCADA functions, WebAccess Express automatically discovers all the ADAM modules on the network or serial ports, generates a database and brings real-time data online with the prebuilt monitor graphics with a single click. It is free and comes with one remote web browser client with access to 75 I/O points and can only be used to control any Advantech I/O device.
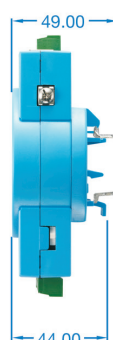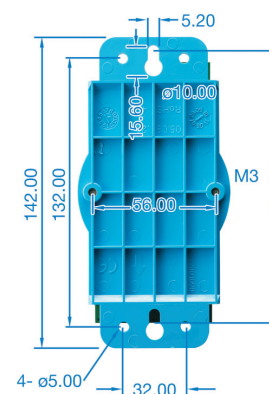
Dimensions of ADAM Series

Unit: mm
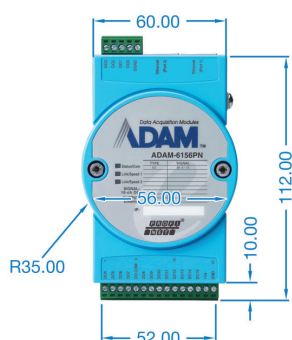
Front View | Side View | DIN-Rail Mounting Adapter | Wall Mounting Bracket