Advantech
Remote I/O Solutions

Complete Remote Measurement and Control Systems for Industrial Applications

- Wireless I/O Modules
- EtherNet/IP I/O Modules
- PROFINET I/O Modules
- Ethernet I/O Modules
- Robust I/O Modules
- RS-485 I/O Modules
- Remote I/O Systems

ADVANTECH

Enabling an Intelligent Planet

Advantech's ADAM Remote I/O Modules:
Small Devices 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 been constantly 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 having sold one million ADAM modules, Advantech would like to take a moment to share some of the background of this long-standing series of industrial products.

1993

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

1993   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.

The ADAM-6200 is an Ethernet module with daisy chain networking, remote monitoring and group configuration capabilities.
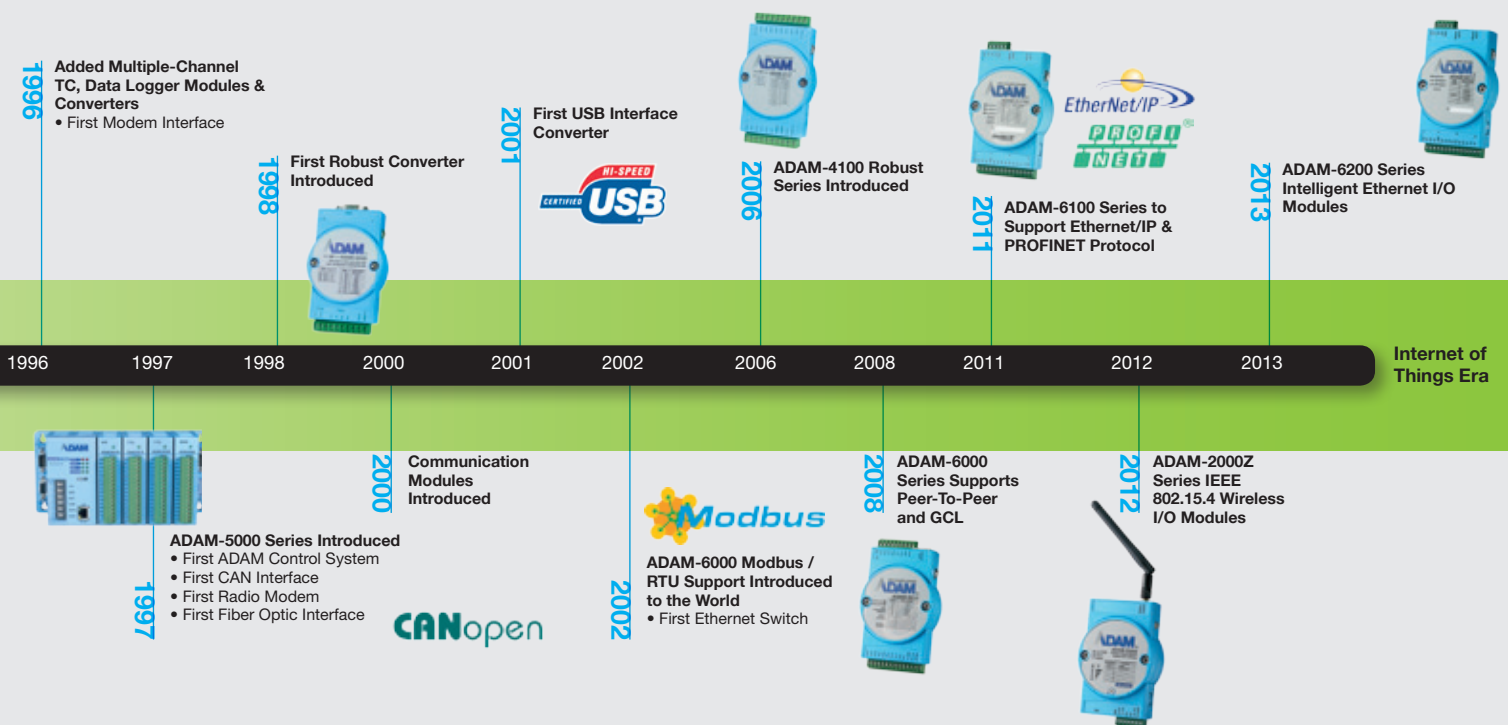
Installation

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 at least five stages of examinations and different modules have different examination jigs, which are calibrated annually. Furthermore, modules are packaged in antistatic bags, protecting against mechanical damage as well as electrostatic damage which can easily happen during shipping.

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

2013 — ADAM-6200 Series Intelligent Ethernet I/O Modules

2000 — Communication Modules Introduced

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

2012 — ADAM-2000Z Series IEEE 802.15.4 Wireless I/O Modules

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

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

Timeline: 1996 | 1997 | 1998 | 2000 | 2001 | 2002 | 2006 | 2008 | 2011 | 2012 | 2013 | Internet of Things Era

A Small Device for Big Applications

Factory Automation

Time dependent control is an important factor 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.
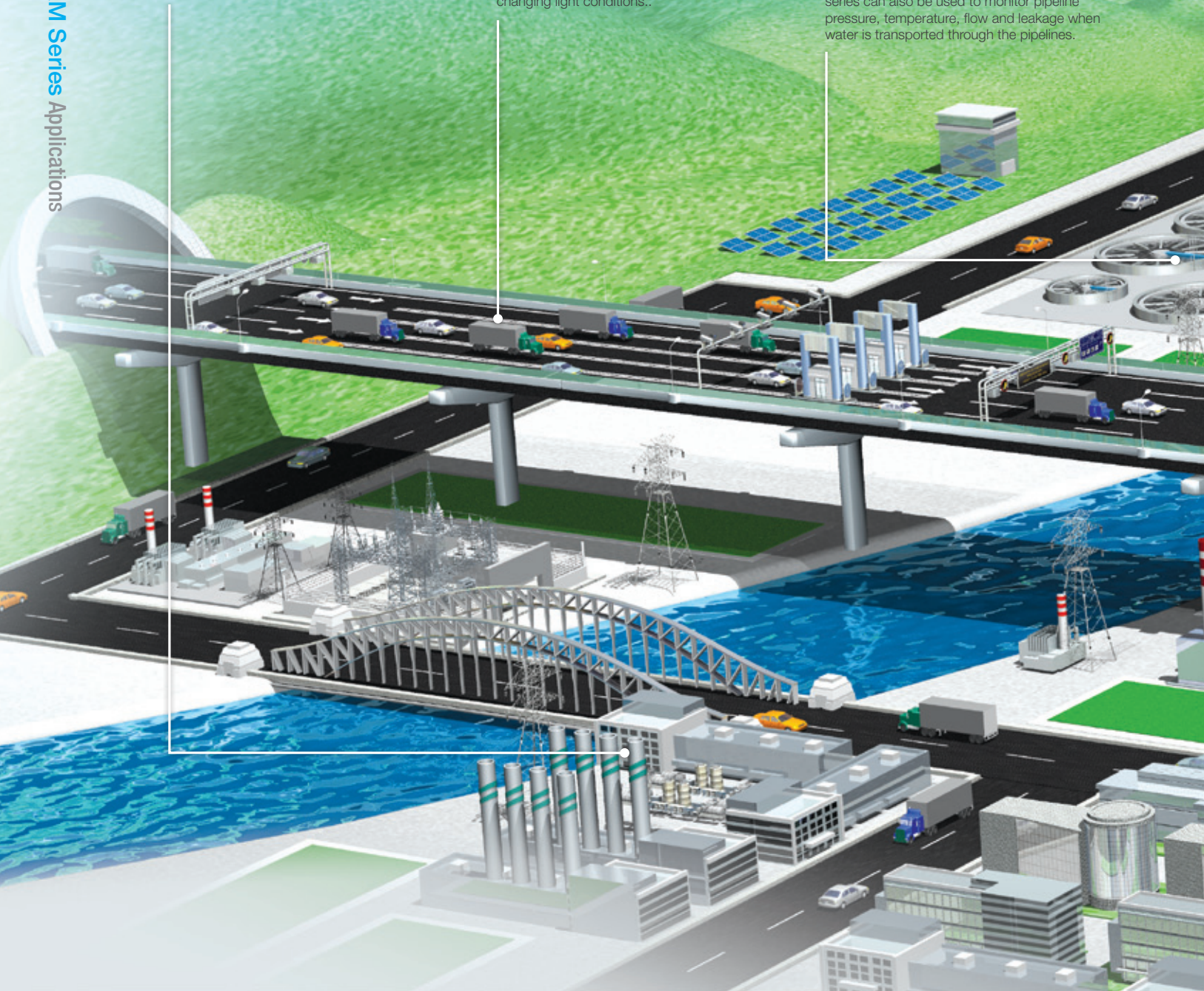
Advantech's ADAM family is one of the most compact remote I/O modules on the market. Despite being virtually hidden from view, it serves an important role as a key connection between the sensor and computer in various applications, such as: environmental monitoring & facility management building automation & 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 Stations

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
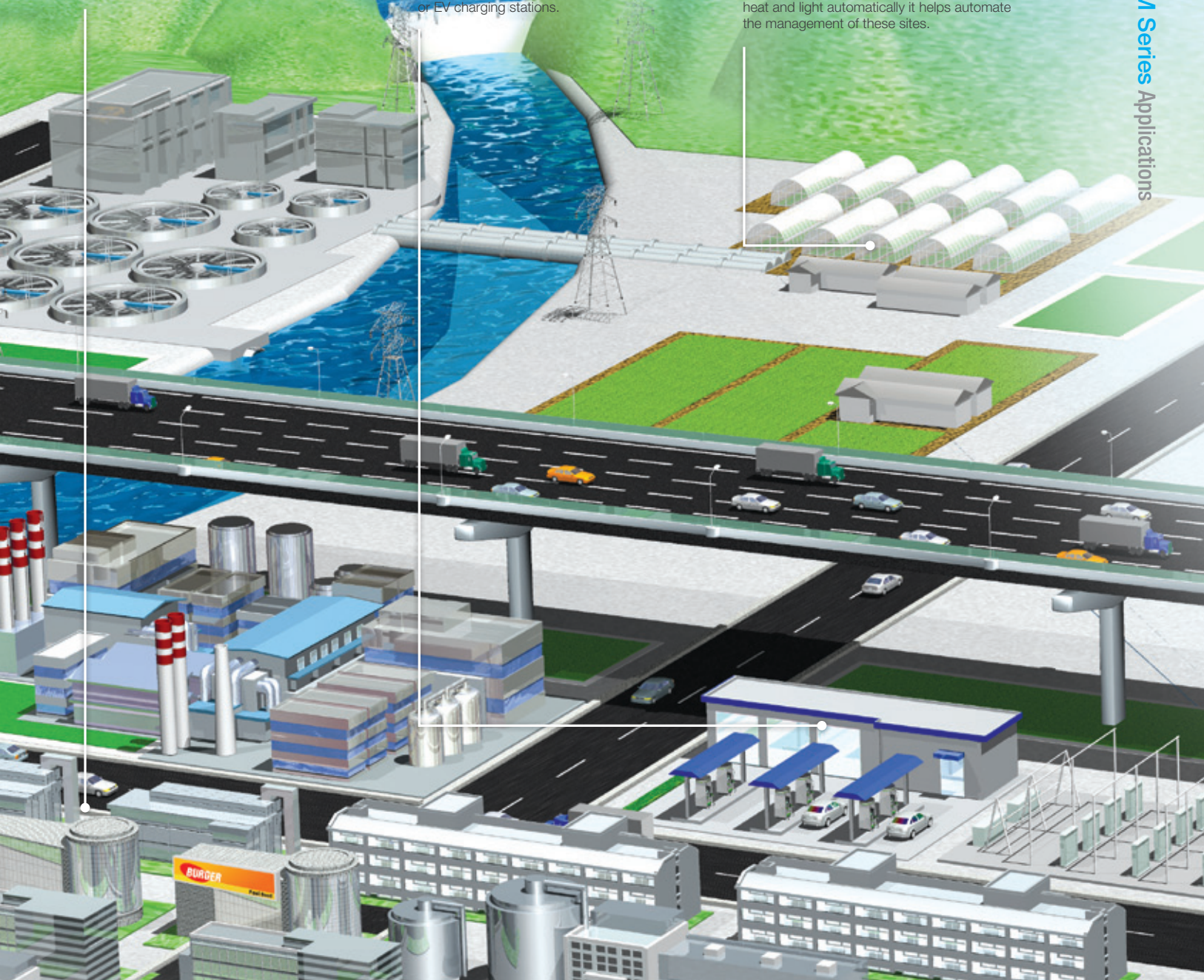
Machine to Machine Overview

Introduction

The Internet of Things (IoT) is a new design paradigm that's rapidly gaining wide global attention from academia, industry, and government. The concept is the emphasis is on ubiquitous computing among globally networked machines and physical objects, denoted as things, such as sensors, actuators, machine-to-machine (M2M) devices, wireless sensor network (WSN) devices etc..

Machine To Machine (M2M) Technology

Machine To Machine (M2M) technology is now sufficiently mature that large numbers of companies are confident enough in its potential to launch their own projects that include innovation in services and products. The use of M2M technology is particularly well-suited to interaction with a large number of remote, and possibly mobile, devices, usually acting as the interface with an end-user.

Wireless Sensor Networks

The IoT is composed of four layers, an application layer, service layer, network layer and device layer. The application layer is the real application system, the service layer is now defined as cloud computing and the network layer is the wired/wireless network infrastructure. The device layer connects everything to the internet and is the key infrastructure of the IoT. One of the most important technologies is the Wireless Sensor Network, which is the wireless I/O and sensor solution/interface to collect and transmit analog/digital signals to the internet. the wireless technology is based on IEEE 802.15.4 with many protocols, such as ZigBee, 6LoWPAN, WirelessHART. With different types of I/Os and sensors, signals can be measured in every situation. For example, bridges can be measured through strain gauges, and buildings can be measured for energy usage. WSN is the next generation of wireless data acquisition solution.

IEEE 802.15.4

IEEE 802.15.4 is defined and maintained by the IEEE organization. The standard intends to offer fundamental lower network layers of low-rate wireless personal area networks (WPANs) which focuses on low-data rate, low-power consumption ubiquitous wireless communication between devices. IEEE 802.15.4 conforming devices may use one of three possible unlicensed frequency bands for operation:

- 868.0-868.6 MHz: Europe, allows one communication channel.
- 902-928 MHz: North America, up to ten channels, extended to thirty.
- 2400-2483.5 MHz: worldwide use, up to sixteen channels.

IEEE 802.15.4 defines the Wireless Medium Access Control (MAC) and Physical Layer (PHY) for WPANs only, upper layer stacks can be implemented by users for variety of applications. One example of the known protocols is ZigBee.
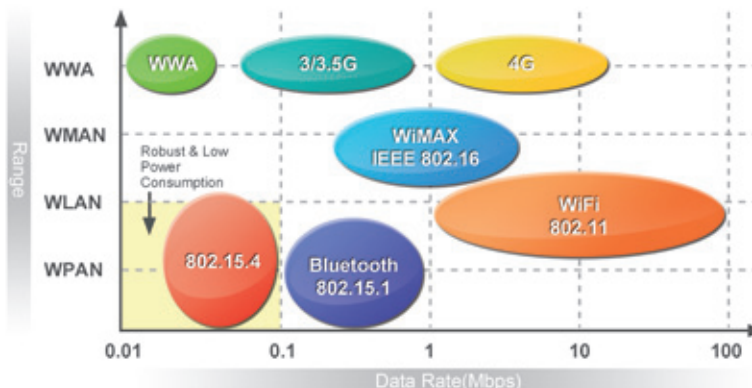
Network Topologies

Wireless Sensor Networks (WSN) can be built using a few or a lot of "nodes". Each node can be connected to one or several sensors; the network topology is composed of three typical components, PAN Coordinator/Gateway, Router and End Device (or called End Node), which can be built to Star, Tree and Mesh network topologies.

Three components of a wireless sensor network

PAN Coordinator/Gateway
A coordinator is the data collection center and also exists as a gateway to transfer and translate wireless data to other interfaces.

Router
A router enhances the wireless signal and a wireless router is used to select the optimal path for wireless communication between the coordinator and the end nodes.

End Node/Device
An end node is a wireless remote I/O for data acquisition. Data is acquired from sensors or devices which are then transmitted through it. The end node communicates with the coordinator directly or via a router to a coordinator.

Comparison of Topologies

Topology	Star	Tree	Mesh
Power Consumption	Low	Medium	High
Installation Fee	Low	Medium	High
Network Coverage	Small	Large	Large
Network Capability	Small	Large	Large
Reliability	Low	Low	High

ADAM-2000 Series

Advantech provides ADAM-2000 series industrial grade Wireless Sensor Network I/O solutions for low-power consumption, cost-efficient and reliable networking for remote monitoring applications. It utilizes IEEE 802.15.4 wireless technology and supports star, tree and mesh topologies. Once the modules are configured, the ADAM-2000 series will automatically construct the most suitable network topology for your control system without further configuration. The ADAM-2000 series contains several models, including coordinator (gateway), router, analog input, digital input, relay output and sensor modules. To perform as a Wireless Sensor Network, a gateway ADAM-2520Z is essential for collecting data from end nodes. With the Modbus RTU protocol, the ADAM-2000 series can be easily integrated into any SCADA or Modbus RTU compliant system.
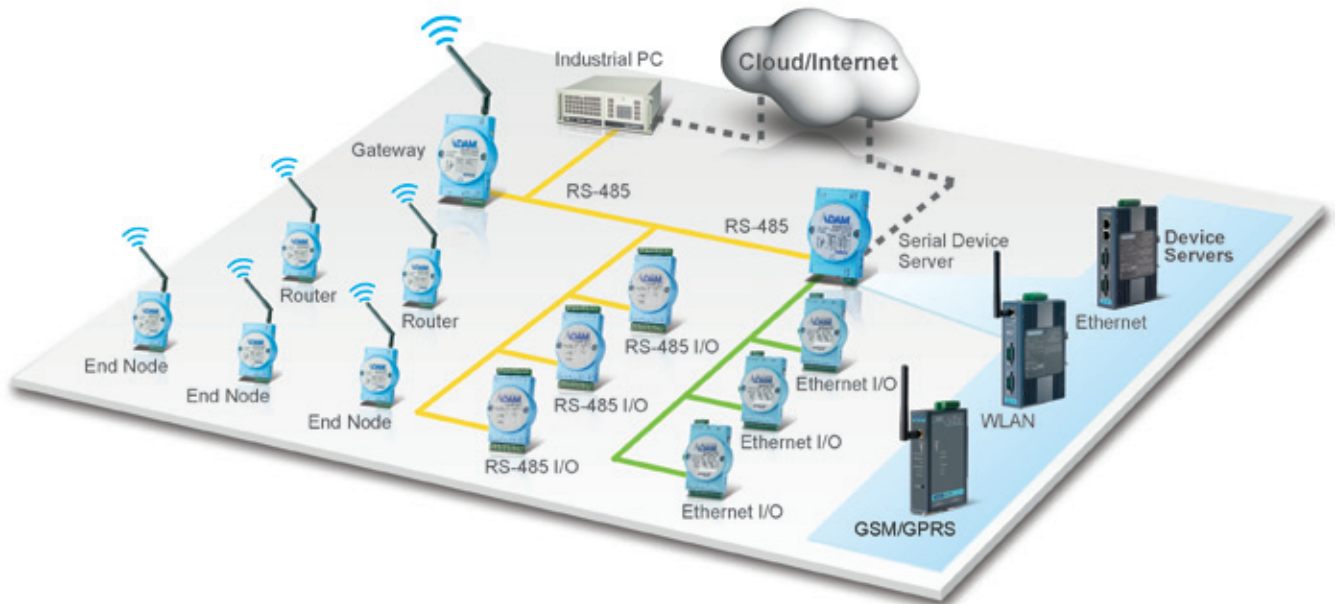
Features

Advantech's ADAM-2000 Series are wireless I/O devices designed for industrial systems and applications.

Global Deployable ISM 2.4GHz IEEE 802.15.4 Standard

The standard has the following benefits.

- With the global deployable of the ISM 2.4 GHz RF band, the ADAM-2000 series can be installed worldwide.
- Compared to a wired solution, wireless technology makes the network easily extendible and can be installed in almost any location, especially in distributed construction applications.
- Enhances transmission power and high gain antennas can expand network coverage.
- Enlarges highly effective network structure to reduce development costs and maintainable complexity in harsh applications.
- Self-forming and self-healing to cope with communication failures or node failures conditions.
  Low data rates and low duty cycles make it possible to act as standalone devices with batteries for a long term operation without maintenance.

Industrial Communication and I/O Interfaces

An open messaging structure ensures that Modbus RTU is the most popular industrial automation protocol in the world. A complete industrial solution may require both wired and wireless systems to fully cover the control field. The support of Modbus RTU makes the ADAM-2000 series easy to be integrated into industrial systems and is also compliant with ADAM-4000 and ADAM-6000 wired solutions. Through Modbus, all the wired and wireless data can be controlled in the same program.

Low Power Consumption Design

The ADAM-2000 series is designed for applications that require long-time operation without maintenance. Therefore power consumption is taken into consideration during its design. The ADAM-2000 series not only follows the IEEE-802.15.4 standard for low-power consumption wireless communication, but also optimizes the peripheral hardware and firmware design to achieve uA-level power consumption. This allows ADAM-2000 input/output and sensor modules to be powered by 2x AA Alkaline batteries.
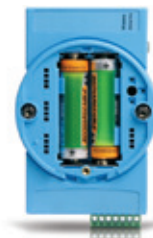
Advantech and Industrial SCADA Software Support

WebAccess
SCADA Software Support

The ADAM-2000 series can be configured through the Adam/Apax .NET Utility. Only a few steps are required, and wireless networks can be built up quickly. Due to the Modbus protocol design, the ADAM-2000 series can support any third-party SCADA software and HMI, including Advantech SCADA software, WebAccess.

Ensured Data Design

The ADAM-2000 family has an acking mechanism feature to ensure data communicating processes can be successfully transferred between the coordinator and end device before device entering sleep mode.

End Device
ADAM-2051Z

Router
ADAM-2510Z

Coordinator
ADAM-2520Z

Features

Event Triggering

ADAM-2000 digital input modules are empowered with an Event Triggering function. When receiving a DI status change, ADAM-2000 digital input modules will wake up immediately from sleep mode and send I/O data to a coordinator. This avoids the missing of events during operation.
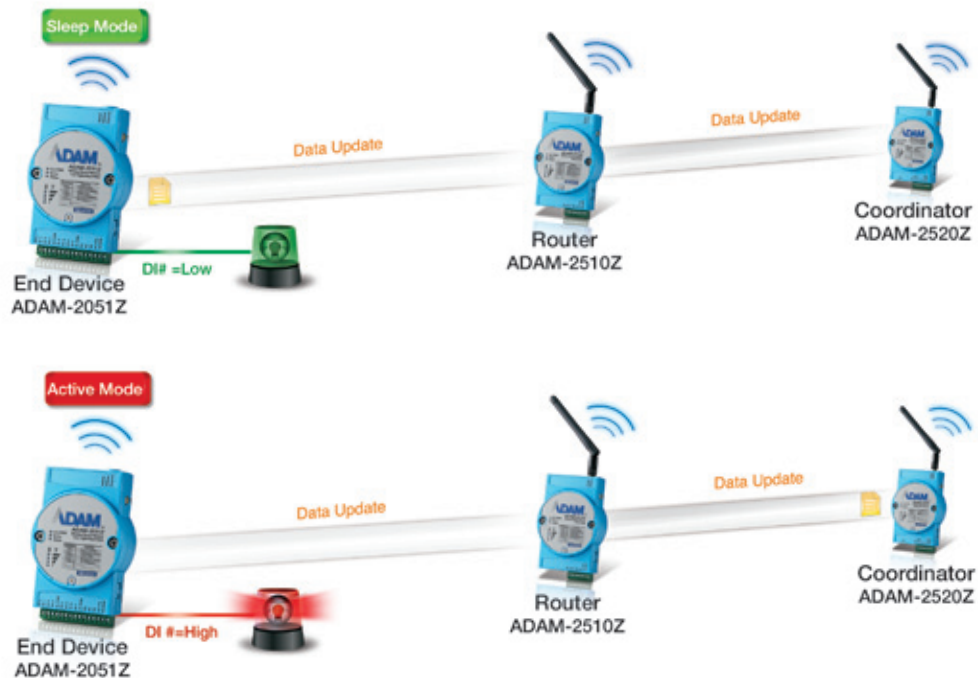
Over The Air (OTA) Firmware Update

The ADAM-2000 modules with strengthened firmware maintenance technique, which integrates a stable backup buffer and secure mechanism allowing wireless module firmware updates during operation.

Site Survey Monitoring

ADAM-2000 modules include useful site survey tools in the Adam/Apax .Net Utility to help users setup networks and perform remote maintenance tasks to and network error processes. The topology monitoring of an ADAM-2000 network adopts an easy place and drag action allowing users to choose the working field image for monitoring backgrounds, and lists the relations among ADAM-2000 modules then illustrated in a single page. Through site survey monitoring tools, users can comprehensively know each device's location, current status, and information in the customized background.
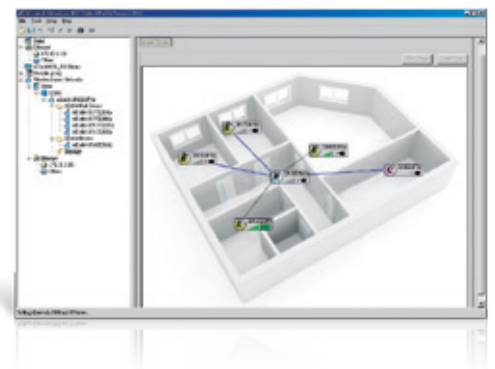
Wireless Solution for Cold Chain Logistics Monitoring System

System Description

Delivering fresh food and drink needs to be controlled in real time so the ideal solution is to use an in-vehicle system with sensors to closely monitor the status of the goods and trucks. Advantech's wireless solution combines the TREK and ADAM-2000 series to satisfy both fleet control and refrigerated container monitoring requirements. Through the built-in temperature sensor, the ADAM-2031Z can measure the refrigerators' temperature and send the data to the control center in real time. According to the data received from the ADAM modules, WebAccess can help logistics companies easily build a cloud service.

TREK-753
7" Mobile Data Terminal

ADAM-2520Z
WSN Modbus RTU Gateway

ADAM-2031Z
WSN Temperature & Humidity Sensor Node

Project Implementation

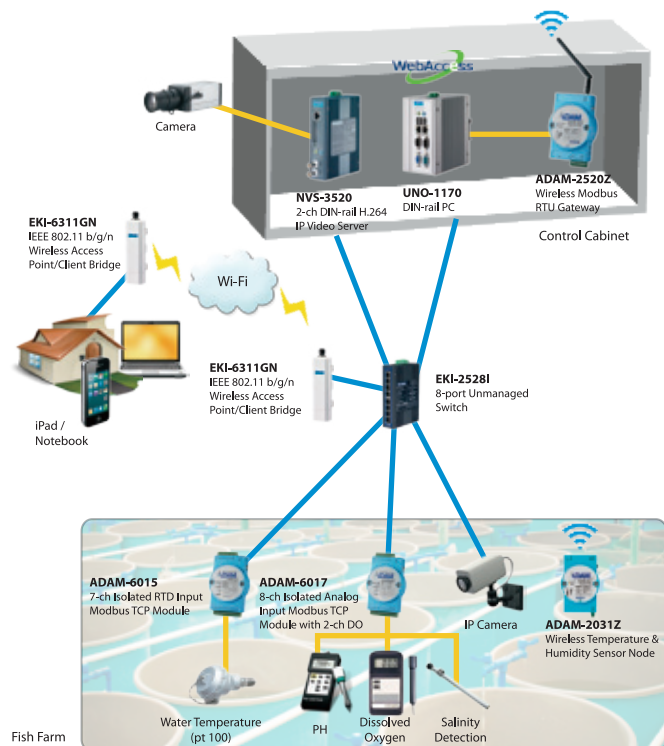| Product	Description
TREK-753	7" Mobile Data Terminal with Touch screen for fleet management
WebAccess	HMI/SCADA Software
ADAM-2520Z	Wireless Sensor Network Modbus RTU Gateway
ADAM-2031Z	Wireless Sensor Network Temperature & Humidity Sensor Node

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Enhancing Fish Aquaculture Farm Management with a Wireless Remote Control Solution

System Description

With an increase in world-wide interest, fish aquaculture has evolved into a huge business. In order to ensure high quality production, the aquaculture manager not only has to understand the situations of each fish tank, e.g. PH value, temperature, and CO2 of water, but also needs to control the various devices to keep the indoor temperature at a steady state. By using ADAM-4000 and ADAM-2000 remote I/O modules, the system can be monitored and controlled continuously. All of those parameters will be delivered to the UNO-1170 din-rail PC and the online status of the aquaculture system will be displayed on the screen.

Camera

NVS-3520
2-ch DIN-rail H.264 IP Video Server

UNO-1170
DIN-rail PC

ADAM-2520Z
Wireless Modbus RTU Gateway

Control Cabinet

EKI-6311GN
IEEE 802.11 b/g/n Wireless Access Point/Client Bridge

Wi-Fi

EKI-6311GN
IEEE 802.11 b/g/n Wireless Access Point/Client Bridge

iPad / Notebook

EKI-2528I
8-port Unmanaged Switch

ADAM-6015
7-ch Isolated RTD Input Modbus TCP Module

ADAM-6017
8-ch Isolated Analog Input Modbus TCP Module with 2-ch DO

IP Camera

ADAM-2031Z
Wireless Temperature & Humidity Sensor Node

Water Temperature (pt 100)　　PH　　Dissolved Oxygen　　Salinity Detection

Fish Farm

Project Implementation

Product	Description
Advantech WebAccess	Browser-based HMI/SCADA Software
EKI-2528I	8-port Unmanaged Industrial Ethernet Switch w/ Wide Temp
UNO-1170	Embedded Automation Computer
ADAM-2520Z	Wireless Sensor Network Modbus RTU Gateway
ADAM-2031Z	Wireless Sensor Network Temperature & Humidity Sensor Node
ADAM-6017	8-ch Isolated Analog Input Modbus TCP Module with 2-ch DO
ADAM-6015	7-ch Isolated RTD Input Modbus TCP Module

ADAM-2000 Series Comparison Table

M2M I/O Modules

Model		ADAM-2520Z	ADAM-2510Z	ADAM-2031Z
Description		Wireless Modbus RTU Gateway	Wireless Router Node	Wireless Temperature & Humidity Sensor Node
Wireless Network	IEEE Standard	IEEE 802.15.4		
	Modulation Type	DSSS (OQPSK)		
	Frequency Band	ISM 2.4 GHz (2.4 GHz ~ 2.4835 GHz)		
	Channels	11 - 26		
	Topology	Star / Tree / Mesh		
	Transmit Power	19 ± 1 dBm	19 ± 1 dBm	3 ± 1 dBm
	Receiver Sensitivity	-97 dBm		
	Outdoor Range (With Line of Sight)	1000 m (with 2 dBi Antenna)		110 m
	RF Data Rate	250 Kbps		
	Function	Coordinator	Router	End Device
Network	Interface	RS-422/485/USB	-	-
	Communication Protocol	Modbus RTU	-	-
Analog Input	Resolution	-	-	-
	Channels	-	-	-
	Sampling Rate	-	-	-
	Voltage Input	-	-	-
	Current Input	-	-	-
Digital Input and Digital Output	Input Channels	-	-	-
Sensor Input	Temperature	-	-	-20°C ~ 70°C (-4°F ~ 157.9°F)
	Humidity	-	-	0 ~ 100% RH
LED Indicator		External PWR/Error/Status/Level Index		
Power Requirements		Power Input: Unregulated 10 ~ 30 V_{DC} Battery Input: 2 x AA Alkaline 3 V_{DC}		
Operating Temperature	External Power	-20°C ~ 70°C (-4°F ~ 157.9°F)		
	Battery Power	0°C ~ 50°C (32°F ~ 122°F)		
Power Consumption	Power Supply	0.8 W @ 24 V_{DC}		0.3 W @ 24 V_{DC}
	USB	0.5 W @ 5 V_{DC}	-	-
	Battery AA * 2	0.3 W @ 3 V_{DC}		420 uW @ 3 V_{DC} (1 minute Tx Interval) 240 uW @ 3 V_{DC} (2 minute Tx Interval) 150 uW @ 3 V_{DC} (5 minute Tx Interval)
Storage Temperature		-40°C~ 85°C (-40°F ~ 184°F)		
Operation Humidity		20~95% RH		
Storage Humidity		0~95% RH		

ADAM-2017PZ	ADAM-2051Z	ADAM-2051PZ
Wireless Sensor 6-ch Analog Input Node with Power Amplifier	Wireless Sensor Network 8-ch Digital Input Node	Wireless Sensor Network 8-ch Digital Input Node with Power Amplifier
IEEE 802.15.4		
DSSS (OQPSK)		
ISM 2.4 GHz (2.4 GHz ~ 2.4835 GHz)		
11 - 26		
Star / Tree / Mesh		
15 ± 1 dBm	3 ± 1 dBm	19 ± 1 dBm
-97 dBm		
1000 m	110 m	1000 m
250 Kbps		
End Device		
-	-	-
-	-	-
16-bit	-	-
6 Non-Isolation (Differential)	-	-
10 samples/second (total)	-	-
±150mV,±500mV ±1V,±5V,±10V	-	-
±20 mA, 0~20 mA, 4~20 mA	-	-
-	8	8
-	-	-
-	-	-
External PWR/Error/Status/Level Index		
Power Input:Unregulated 10 ~ 30 V_{DC} Battery Input: 2 x AA Alkaline 3 V_{DC}		
-20°C ~ 70°C (-4°F ~ 157.9°F)		
0°C ~ 50°C (32°F ~ 122°F)		
0.3 W @ 24 V_{DC}		
-		
420 uW @ 3 V_{DC} (1 minute Tx Interval) 240 uW @ 3 V_{DC} (2 minute Tx Interval) 150 uW @ 3 V_{DC} (5 minute Tx Interval)		380 uW @ 3 V_{DC} (1 minute Tx Interval) 220 uW @ 3 V_{DC} (2 minute Tx Interval) 130 uW @ 3 V_{DC} (5 minute Tx Interval)
-40°C~ 85°C (-40°F ~ 184°F)		
20~95% RH		
0~95% RH		

ADAM-6000 Ethernet I/O Modules

Introduction

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/Apax .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.
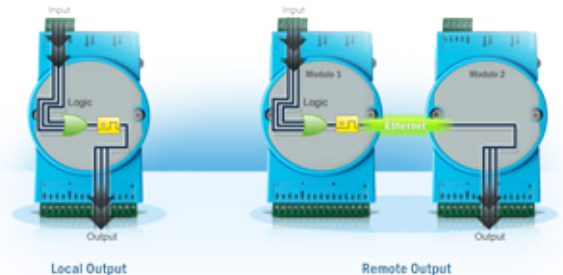
Advanced Security and High Reliability

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/Apax .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-6200 Ethernet I/O Modules

Introduction

- Daisy chain connection with auto-bypass protection
- Remote monitoring and control with smart phone/pad
- Group configuration capability for multiple module setup
- DI/O LED Indication
- Flexible user-defined Modbus address
- Intelligent control ability by Peer-to-Peer and GCL function
- Multiple protocol support: Modbus TCP, TCP/IP, UDP, HTTP, DHCP
- Web language support: XML, HTML 5, Java Script
- System configuration backup
- User Access Control

Features

Flexible Deployment with Daisy Chain Networking and Auto-Bypass Protection

Daisy chain connectivity offers flexible cabling and space saving capabilities. With Ethernet auto-bypass function supported, it prevents accidental power failure if one of the module's unexpectedly shuts down.

Remote Monitoring and Control with Smart Phone/Pad

With support for HTML5, the ADAM-6200 can be monitored and controlled from any browser on mobile devices whilst in the field and when the engineer is connected to their network.

Group Configuration Capability for Multiple Module Setup

ADAM-6200 series module is equipped with group configuration capability to reduce the repetitive efforts and quickly finish the multiple module setups, including firmware upgrade, configuration and HTML 5 file at one time. Users can finish the module installation faster than before as the configuration time is tremendously reduced.

ADAM-6000 Series Comparison 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 — Channels	7	8	8	6	6
Analog Input — Sampling Rate	10 Hz	10/100Hz	10 Hz	10 Hz	10 Hz
Analog Input — Voltage Input	-	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V 0~150mV, 0~500mV, 0~1V, 0~5V, 0~10V	-	±10 V	±10 V
Analog Input — Current Input	-	0 ~ 20 mA 4 ~ 20 mA ±20mA	-	0 ~ 20 mA 4 ~ 20 mA	0 ~ 20 mA 4 ~ 20 mA
Analog Input — Direct Sensor Input	Pt, Balco and Ni RTD	-	J, K, T, E, R, S, B Thermocouple	-	-
Analog Input — Burn-out Detection	Yes	-	Yes	-	-
Analog Input — Math. Functions	Max. Min. Avg.	Max. Min. Avg.	Max. Min. Avg.	-	-
Analog Output — Channels	-	-	-	2	2
Analog Output — Current Output	-	-	-	0 ~ 20 mA, 4 ~ 20 mA with 15 V_{DC}	0 ~ 20 mA, 4 ~ 20 mA with 15 V_{DC}
Analog Output — Voltage Output	- -	-	-	0 ~ 10 V_{DC} with 30 mA	0 ~ 10 V_{DC} with 30 mA
Digital Input and Output — Input Channels	-	-	-	2	2
Digital Input and Output — Output Channels	-	2 (Sink)	8 (Sink)	2 (Sink)	2 (Sink)
Digital Input and Output — Extra Counter Channels	-	-	-	-	-
Digital Input and Output — Counter Input	-	-	-	-	-
Digital Input and Output — Frequency Input	-	-	-	-	-
Digital Input and Output — Pulse Output	-	-	-	-	-
Digital Input and 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	-

ADAM-6000 Series Comparison Table

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 — Input Channels	12	12	8	6	6
Digital Input and Output — Output Channels	6 (Sink)	2 (Sink)	8 (Source)	6 (Relay)	6 (Power Relay)
Digital Input and Output — Extra Counter Channels	-	2	-	-	-
Digital Input and Output — Counter Input	3 kHz	4.5 kHz	3 kHz	3 kHz	3 kHz
Digital Input and Output — Frequency Input	3 kHz	4.5 kHz	3 kHz	3 kHz	3 kHz
Digital Input and Output — Pulse Output	Yes				
Digital Input and Output — 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-6200 Series Comparison Table

Model		ADAM-6217	ADAM-6224	ADAM-6250	ADAM-6251
Description		8-ch Isolated Analog Input Modbus TCP Module	4-ch Isolated Analog Output Modbus TCP Module	15-ch Isolated Digital I/O Modbus TCP Module	16-ch Isolated Digital Input Modbus TCP Module
Interface		10/100Mbps Ethernet			
Analog Input	Channels	8	-	-	-
	Input Impedance	>10MΩ (voltage) 120 Ω (current)	-	-	-
	Voltage Input	± 150mV, ± 500mV, ± 1V, ± 5V, ± 10V	-	-	-
	Current Input	0 ~ 20 mA, 4 ~ 20mA, ± 20mA	-	-	-
	Sampling Rate (sample/second)	10	-	-	-
	Burn-out Detection	Yes (4~20 mA)	-	-	-
	Resolution	16-bit	-	-	-
Analog Output	Channels	-	4	-	-
	Voltage Output	-	0 ~ 5V, 0 ~ 10V, ± 5V, ± 10V	-	-
	Current Output	-	0 ~ 20mA, 4 ~ 20mA	-	-
	Resolution	-	12-bit	-	-
Digital Input/Output	Input Channels	-	4 (Dry contact only)	8	16
	Output Channels	-	-	7 (Sink)	-
	Relay Output	-	-	-	-
	Contact Rating	-	-	-	-
	Counter Input	-	-	3kHz	3kHz
	Frequency Input	-	-	3kHz	3kHz
	Pulse Output	-	-	5kHz	-
	LED Indicator	-	-	8 DI, 7 DO	16 DI
Power Consumption		3.5W	6W	3W	2.7W
Isolation Voltage		2,500 V_{DC}			
Watchdog Timer		System (1.6 seconds), Communication (Programmable)			
Communication Protocol		Modbus TCP, TCP/IP, UDP, HTTP, DHCP			
Power Requirements		10 ~ 30 V_{DC} (24 V_{DC} standard)			
Operation/Storage Temperature		-20 ~ 70°C (-4 ~ 158°F) / -30 ~ 80°C (-22 ~ 176°F)			
Operating/Storage Humidity		20 ~ 95% RH (non-condensing) / 0 ~ 95% RH (non-condensing)			

ADAM-6200 Series Comparison Table

| Model	ADAM-6256	ADAM-6260	ADAM-6266
Description	16-ch Isolated Digital Output Modbus TCP Module	6-ch Relay Output Modbus TCP Module	4-ch Relay Output Modbus TCP Module with 4-ch DI
Interface			
Input Channels	-	-	4
Output Channels	16 (Sink)	-	-
Relay Output	-	6 (5 Form C + 1 Form A)	4 (Form C)
Contact Rating	-	250 V_{AC} @ 5A 30 V_{DC} @ 5A	
Counter Input	-	-	3kHz
Frequency Input	-	-	3kHz
Pulse Output	5kHz	5kHz	5kHz
LED Indicator	16 DO	6 RL	4 DI, 4 RL
Power Consumption	3.2W	4.5W	4.2W
Isolation Voltage			
Watchdog Timer	System (1.6 seconds), Communication (Programmable)		
Communication Protocol	Modbus TCP, TCP/IP, UDP, HTTP, DHCP		
Power Requirements	10 ~ 30 V_{DC} (24 V_{DC} standard)		
Operation/Storage Temperature	-10 ~ 70°C (14 ~ 158°F) / -20 ~ 80°C (-4 ~ 176°F)		
Operating/Storage Humidity	20 ~ 95% RH (non-condensing) / 0 ~ 95% RH (non-condensing)		

(Digital Input/Output rows grouped under "Digital Input/Output")

Dimensions of ADAM-2000 & 6000 Series

Unit: mm
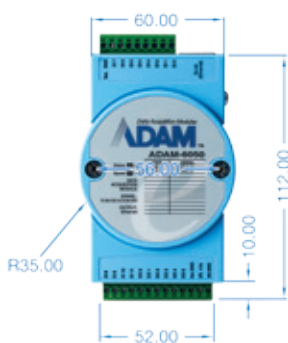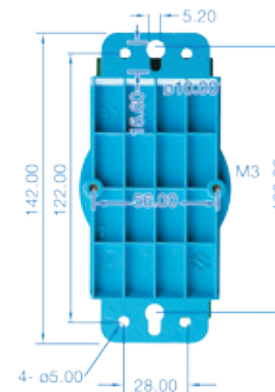
Front View

Side View

DIN-Rail Mounting Adapter

Wall Mounting Bracket

ADAM-6200 Comparison Table

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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 an open industrial Ethernet standard, which includes two modes - PROFINET IO and PROFINET CBA - allowing the flexible combination of distributed automation and distributed I/O.

Features

Daisy Chain Connections

ADAM-6100 real-time Ethernet modules are equipped with daisy chain capability making it 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/Apax .NET Utility. With Adam/Apax .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-6100 Series Comparison Table

Model		ADAM-6117	ADAM-6124
Description		8-ch Isolated Analog Input Real-time Ethernet Module	4-ch Analog Output Real-time Ethernet Module
Interface		10/100 Mbps Ethernet	
Support Protocol		ADAM-6100EI: EtherNet/IP; ADAM-6100PN: PROFINET	
Analog Input	Resolution	16-bit	-
	Channels	8	-
	Sampling Rate (sample/second)	10	-
	Voltage Input	±150 mV ±500 mV ±1 V ±5 V ±10 V	-
	Current Input	0 ~ 20 mA 4 ~ 20 mA ±20 mA	-
	Direct Sensor Input	-	-
Analog Output	Resolution	-	12-bit
	Channels	-	4
	Current Output	-	0~20 mA, 4~20 mA
	Voltage Output	-	0 ~ 5 V, 0 ~ 10 V, ±5 V, ±10 V
Digital Input/Output	Input Channels	-	4 (Dry Contact Only)
	Output Channels	-	-
Isolation Protection		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-6150	ADAM-6151	ADAM-6156	ADAM-6160
Description		15-ch Isolated Digital I/O Real-time Ethernet Module	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 (sample/second)	-	-	-	-
	Voltage Input	-	-	-	-
	Current Input	-	-	-	-
	Direct Sensor Input	-	-	-	-
Digital Input/Output	Input Channels	8	16	-	-
	Output Channels	7	-	16	6-ch power relay
Isolation Protection		2,500 V$_{DC}$	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-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

Supports 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.
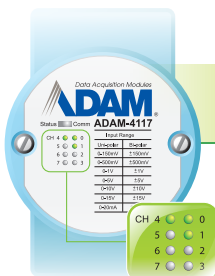
When the switch is set to "Init", the LED will display the node address.

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/Apax .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 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 -40~85ºC (-40~185ºF) 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 Series Comparison Table

Repeaters / Converters

Model	ADAM-4510 ADAM-4510S	ADAM-4520	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	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	-	Yes
Watchdog Timer	-	-	Yes	-	Yes
Isolation Voltage	ADAM-4510: - ADAM-4510S: 3,000 V_{DC}	3,000 V_{DC}	1,000 V_{DC}	-	ADAM-4561: 3,000 V_{DC} ADAM-4562: 2,500 V_{DC}
Power Requirements	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 Comparison 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 (total)				
	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 Comparison Table

Analog Input / Output Modules

Model	ADAM-4017+	ADAM-4018+	ADAM-4019+	ADAM-4022/T	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 (total)				-	-
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 Comparison 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 Comparison 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-4100 Series Comparison 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 Requirements		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$_{DC}$

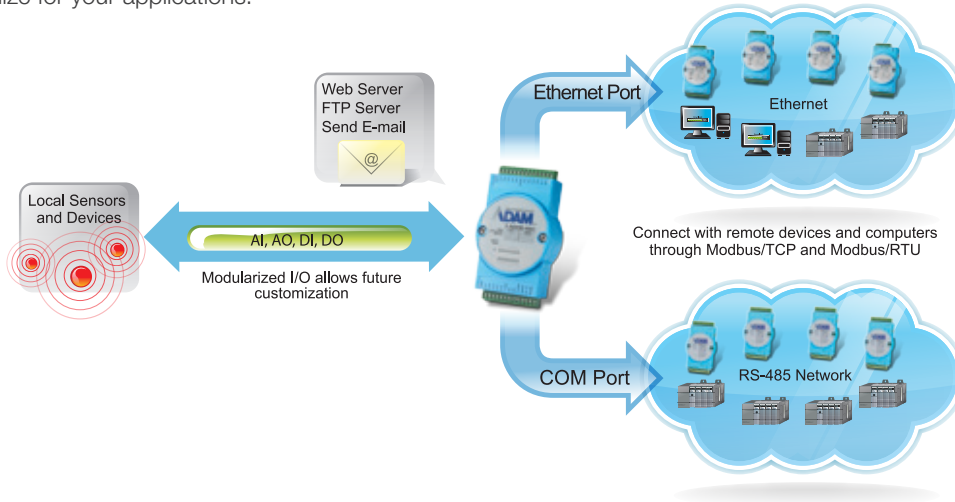*: If there is no command received by DO channels after the preset period, the DO channels will be set to its FSV.

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 Requirements	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-4500 Remote I/O Systems

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

Ethernet Port

Ethernet

Local Sensors
and Devices

AI, AO, DI, DO

Modularized I/O allows future
customization

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

COM Port   RS-485 Network

ADAM-4500 Series Comparison 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 Requirements		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.
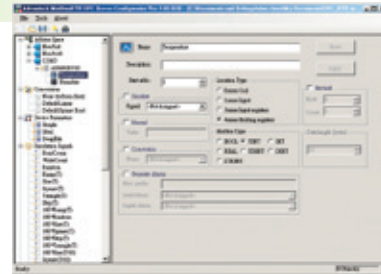

Adam/Apax .NET Utility

Adam/Apax .NET Utility is a user-friendly tool for system configuration. All ADAM I/O modules (ADAM-2000Z, ADAM-4000, ADAM-4100, ADAM-6000 , ADAM-6100 series and ADAM-6200 Series) and remote controllers (ADAM-4500 series) can be configured and tested through this easy-to-use graphical utility. Furthermore, the ADAM-2000 modules provide an useful site survey tool in Adam/Apax .NET Utility to help users to achieve network setup and major remote maintenance tasks to avoid try and error network processes. With its powerful functionality, users can configure all related settings such as channel range, calibration, IP address, security, peer-to-peer, GCL and wireless site survey.

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 be used to control any Advantech I/O device.
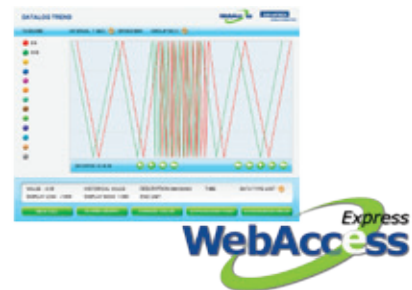
Dimensions of ADAM-4000 Series   Unit: mm

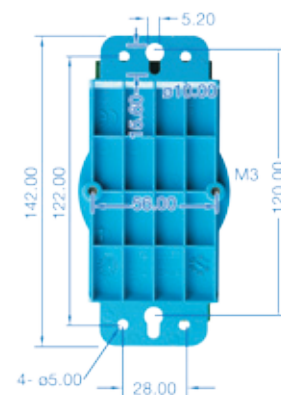

Front View   Side View   DIN-Rail Mounting Adapter   Wall Mounting Bracket
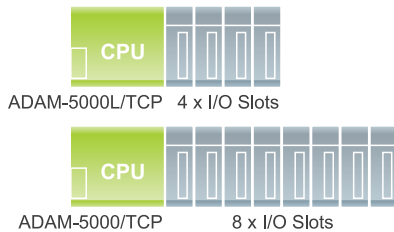
ADAM-5000 Series Remote I/O Systems

The ADAM-5000 series are suitable for basic and mid-level applications, and are designed to acquire data, and to monitor & control processes through multi-channel I/O modules. Each system consists of two modular components, the system kernel (main unit) and the I/O modules. Each system is capable of handling 4 to 8 I/O modules.

Depending on the layout and the number of I/O points required, you can configure an optimum system to suit your applications.
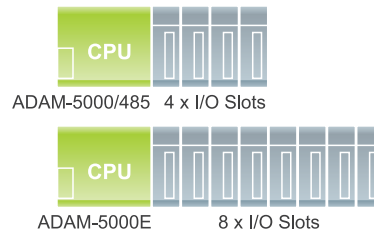
▶Remote I/O Systems

- Based on popular fieldbus data communication structure such as RS-485 & Modbus, ADAM-5000 series offers two different DA&C systems that allow field I/O devices to easily connect to PC network applications.

Ethernet based

CPU
ADAM-5000L/TCP   4 x I/O Slots

CPU
ADAM-5000/TCP   8 x I/O Slots

RS-485 based

CPU
ADAM-5000/485   4 x I/O Slots

CPU
ADAM-5000E   8 x I/O Slots

Graphic Condition Logic (GCL) Control Function Support

A GCL (Graphic Condition Logic) gives Ethernet I/O modules simple control ability. Users can define the control logic rules through graphical configuration environment in ADAM.NET Utility, and download defined logic rules to ADAM Ethernet based I/O. Now ADAM-5000/TCP can also support this function.

Through this function, ADAM-5000/TCP has the ability to execute the simple logic rules automatically just like a standalone controller.

For each ADAM-5000/TCP, 32 logic rules can be defined. In the configuration environment of ADAM.NET Utility, 4 graphic icons show the 4 stages of one logic rule: Input, Logic, Execution and Output. Users can simply click on each icon and one dialog window will pop-up for user to configure each stage. After completing all configurations, users can click one button to download the defined logic rules to the specific Ethernet I/O module.

ADAM-5000 Remote I/O Systems

System	ADAM-5000/485	ADAM-5000E	ADAM-5000L/TCP	ADAM-5000/TCP
CPU	80188	80188	RISC CPU	
RAM	-	-	4 MB	
Flash ROM (User AP)	-	-	512 KB	
Flash Memory (Data Storage)	-	-	-	
Flash Disk	-	-	-	
OS	-	-	real-time OS	
Timer BIOS	-	-	-	
Real-time Clock	-	-	-	
Watchdog Timer	Yes			
I/O Slots	4	8	4	8
Power Consumption	3 W		4.0 W	5.0 W
Isolation — Communication	$2,500\ V_{DC}$	$3,000\ V_{DC}$	RS-485: $1,500\ V_{DC}$	
Isolation — Communication Power	$3,000\ V_{DC}$			
Isolation — I/O Module	$3,000\ V_{DC}$			
Diagnosis — Status Display	Power, CPU, Communication		Power, CPU, Error Diagnostic, Communication	
Diagnosis — Self Test	Yes, while ON			
Diagnosis — Software Diagnosis	Yes			
Communication — Interface	RS-232/485 (2-wire)	RS-232/485 (2-wire)	Ethernet	
Communication — Speeds (bps)	1,200, 2,400, 4,800, 9,600, 19.2 K, 38.4 K, 57.6 K, 115.2 K	1,200, 2,400, 4,800, 9,600, 19.2 K, 38.4 K, 57.6 K, 115.2 K	10 M, 100 M	
Communication — Max. Distance	4,000 feet (1.2 km)	4,000 feet (1.2 km)	100 m without repeater	
Communication — Data Format	Advantech protocol: N, 8, 1 Modbus protocol: N, 8, 1 N, 8, 2 E, 8, 1 O, 8, 1	Advantech protocol: N, 8, 1 Modbus protocol: N, 8, 1 N, 8, 2 E, 8, 1	TCP/IP	
Communication — Max. Nodes	128	128	Depend on IP address	
Communication — Protocols	ADAM ASCII/Modbus Protocol	ADAM ASCII/Modbus Protocol	Modbus/TCP	
Communication — Remote I/O	-	-	20 nodes Modbus devices	
Communication — Power Requirements	$+10 \sim +30\ V_{DC}$			
Environment — Operating Temperature	-10 ~ 70°C (14 ~ 158°F)			
Environment — Storage Temperature	-25 ~ 85°C (-13 ~ 185°F)			
Environment — Humidity	5 ~ 95%			
Dimensions (mm)	231 x 110 x 75	355 x 110 x 75	231 x 110 x 75	355 x 110 x 75

ADAM-5000 I/O Modules

Analog Input/Output Modules

Module		ADAM-5013	ADAM-5017	ADAM-5017P	ADAM-5017UH	ADAM-5018
Analog Input	Resolution	16 bit	16 bit	16 bit	12 bit	16 bit
	Input Channel	3	8	8	8	7
	Sampling Rate	10 (total*)	10 (total*)	10 (total*)	200K**	10 (total*)
	Voltage Input	-	±150 mV, ±500 mV ±1 V, ±5 V, ±10 V	±150 mV, ±500 mV ±15V, ±10V, ±5 V, ±1 V 0 ~ 150mV, 0 ~ 500mV 0 ~ 1V, 0 ~ 5V, 0 ~ 10V 0 ~ 15V	±10 V, 0 ~ 10 V	±15 mV, ±50 mV ±100 mV, ±500 mV ±1 V, ±2.5 V
	Current Input	-	±20 mA	±20 mA, 4 ~ 20mA	0 ~ 20 mA, 4 ~ 20 mA	±20 mA
	Direct Sensor Input	Pt or Ni RTD	-	-	-	J, K, T, E, R, S, B
Isolation		3,000 V$_{DC}$	3,000 V$_{DC}$	3,000 V$_{DC}$	3,000 V$_{DC}$	3,000 V$_{DC}$

*Sampling rate value depends on used channel number.
Example: Using 5 channels on ADAM-5017, sampling rate for each used channel will be 10/5 = 2 samples/second.
**The sampling rate vary with the controller.

Module		ADAM-5018P	ADAM-5024	ADAM-5050	ADAM-5051/ ADAM-5051D/ ADAM-5051S	ADAM-5052
Analog Input	Resolution	16 bit	-	-	-	-
	Input Channel	7	-	-	-	-
	Sampling Rate	10 (total*)	-	-	-	-
	Voltage Input	±15 mV, ±50 mV ±100 mV, ±500 mV ±1 V, ±2.5 V	-	-	-	-
	Current Input	4 ~ 20 mA	-	-	-	-
	Direct Sensor Input	J, K, T, E, R, S, B	-	-	-	-
Analog Output	Output Channels	-	4	-	-	-
	Resolution	-	12 bit	-	-	-
	Voltage Output	-	0 ~ 10 V	-	-	-
	Current Output	-	0 ~ 20 mA 4 ~ 20 mA	-	-	-
Digital Input and Digital Output	Digital Input Channels	-	-	16 DI/O (bit-wise selectable)	16 (ADAM-5051) 16w/LED (5051D/5051S)	8 w/LED
	Digital Output Channels	-	-		-	-
Isolation		3,000 V$_{DC}$	3,000 V$_{DC}$	-	2,500 V$_{DC}$ (5051S)	5,000 V$_{RMS}$

*Sampling rate value depends on used channel number.
Example: Using 6 channels on ADAM-5017, sampling rate for each used channel will be 12/6 = 2 samples/second.

Digital Input/Output Modules

Module	ADAM-5055S	ADAM-5056/ ADAM-5056D	ADAM-5056S/ ADAM-5056SO	ADAM-5060
Digital Input and Digital Output — Digital Input Channels	8 w/LED	-	-	-
Digital Input and Digital Output — Digital Output Channels	8 w/LED	16 (ADAM-5056) 16 w/LED (ADAM-5056D)	16 w/LED	6 relay (2 form A/4 form C)
Isolation	2,500 V_{DC}	-	2,500 V_{DC}	-

Module		ADAM-5069	ADAM-5080	ADAM-5081
Digital Input and Digital Output	Digital Input Channels	-	-	-
	Digital Output Channels	8 power relay (form A)	-	-
Counter (32-bit)	Channels	-	4	4/8
	Input Frequency	-	0.3 ~ 1000 Hz max. (frequency mode) 5000 Hz max. (counter mode)	5 Hz ~ 1 MHz max. (frequency mode) 1 MHz max. (counter mode)
	Mode	-	Frequency, Up/Down Counter, Bi-direction Counter	Frequency, Counter (Up/Down, Bi-direction, Up, A/B Phase)
Communication	Channels	-	-	-
	Type	-	-	-
Isolation		-	1,000 V_{RMS}	2,500 V_{DC}