Advantech PAC Solutions

Integrating Control, Information Processing and Networking in a Single Controller

- ✓ Programmable Automation Controllers
- ✓ PC-based Controllers
- ✓ Remote I/O Systems
- ✓ Motion Control
- ✓ SoftLogic Software
- ✓ SCADA Software

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Advantech PACs -

Integrating Control, Information Processing and Networking in a Single Controller

Over the years automation controllers have evolved to provide ever increasing control options. Today's Programmable Automation Controllers (PACs) deliver control across multiple production layers, transmitting data to software applications and helping improve decision-making on all levels. Recent advancements in controller technology allow better flexibility, information processing, network capabilities, and improved scalability. Advantech PACs provide state-of-the-art solutions for variety of industrial automation applications, from Machine Automation to SCADA.

Real-time I/O Control Suitable for Multiple Domain Applications

Currently most PC-based controllers face one major challenge, especially DIN-rail PAC systems, which is real-time I/O control. Performance is severely hampered when I/O points increase because the access time also increases, which impacts control precision as well.

Food and beverage companies face shorter production runs on a wide range of products for different vendors, while automotive companies are dealing with changes in customer preference, aggressive competition and rising fuel costs. These industries require a mix of discrete, batch, process and motion control solution. In the past, these applications had forced engineers to use multiple controllers: a PLC for discrete control, a motion controller for multi-axis control, and a distributed control system or loop controller for process applications, which has proven time consuming and costly. Advantech PACs feature the ability to handle all these tasks with a single control system.

The result is shortened development time through reusable programming tools, lower maintenance costs through reduced parts, better information sharing among applications, and fewer personnel support throughout the plant.

Information Processing and Networking Capabilities

Advantech's PAC series not only provide excellent real-time I/O control, but also another key benefit for automation applications: information processing. With the ability to perform field operations, data exchanges and valuable information collection, this series is able to execute efficient decision-making. Information processing includes data logging and analysis with storage devices like SD or CF cards, recipe management for batch control, and database exchanges through SQL and OPC. Furthermore, implementing Human Machine Interface (HMI) software enables local operation.

This improves control system networking tremendously, allowing the network to share a common protocol at the device level, control level, and information level. It provides the ability to move information from the device level to executives at the enterprise resource planning (ERP) level without new protocols or drivers.

Advantech PACs feature a PC-based architecture, delivering significant networking benefits for manufacturers by USB, RS-232, RS-422/485 and Ethernet interfaces. Users can connect to field devices through serial or USB interface to satisfy any kind of application. The Ethernet interface allows users to effectively manage I/O control and information flow throughout the manufacturing and IT enterprise. Leveraging the high computing power of Advantech PACs also allows networks to communicate seamlessly on the factory floor with other common sets of IT capabilities like video, data and telephones. Easy access to such information is critical to making decisions about the capacity of an enterprise.

Scalability

In the past, many PLCs required users to learn different programming software and specify networks depending on the size and complexity of the application. Advantech PACs, ranging from ADAM-5000 series, APAX-5000 series to APAX-6000 series, allow users to more closely match the controller to application needs without compromising functionality or learning a new control system. Such scalability reduces the headaches and high cost associated with system redesign, lack of program re-use, and re-training.

Software

Advantech PACs support software to satisfy both PC-based and PLC-based programmers. The C/C++ and .NET class library can satisfy programmers familiar with high level programming languages like C or Microsoft Visual Studio .NET, while PLC-based users can leverage KW Software Multiprog, which supports IEC-61131-3 compliant PLC programming languages. These flexible programming capabilities take PLC operations to the next level in many areas, such as communication, information processing, enterprise level database integration, and user interface development.

Contents

Overview

Advantech's New Generation PAC - APAX Series

APAX series, the new PAC solution from Advantech, integrates control, information processing and networking in a single platform. By leveraging the latest automation technology, APAX series offers a unique system architecture, providing dual controllers for different tasks, same I/O with changeable controllers, and flexible I/O expansion with deterministic performance. All these features make Advantech's PAC system more reliable, scalable and flexible, satisfying various complicated control and automation applications.

▶ Dual Controllers for Different Tasks

Controller for HMI/SCADA

Controller for I/O Tasks

One controller focuses on I/O processing, while another controller can execute other tasks such as HMI/SCADA, database, recipe, image processing, etc. This architecture ensures system reliability since I/O processing won't be affected by other tasks.

▶ Changeable Controllers and Couplers

APAX-5070 Coupler

APAX-5000 I/O

APAX-5520 Controller

APAX-6000 Controller

APAX-5570/5571 Controller
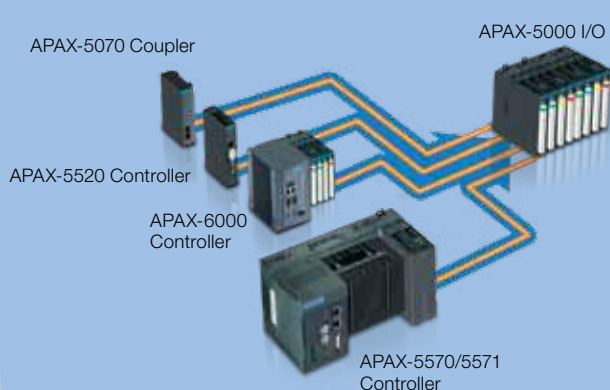
APAX I/O modules can combine different controllers or couplers to satisfy different applications. Using different couplers, I/O modules can link to various real-time Ethernet and fieldbus systems. It saves investment in I/O and offers scalability for future needs.

▶

Star Topology
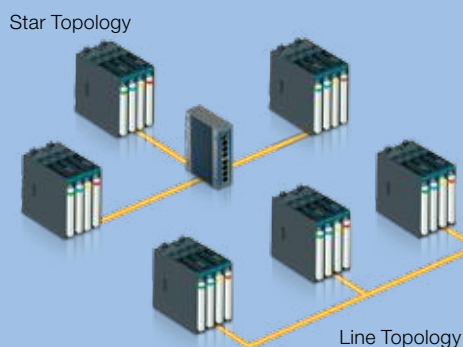
All APAX I/O modules are inserted on the backplane. Through the expansion port and Ethernet cable, different backplanes can be connected. This decentralized architecture retains high-speed data transfers, so the distributed I/O modules provide real-time performance. Almost any topology, such as line, tree or star, can be easily established. The hot swap capability is also available for remote expansion I/O modules.

Line Topology

4

Features

Flexible System Architectures - Optimized Solutions

To simplify the system configuration, Advantech's APAX series provides an easy and flexible way to setup different functions and configurations. There are multiple APAX series system combinations that can be selected to develop reliable control systems as detailed below.

1 High Performance Controller

- Delivers fast computation, high throughput, powerful functionality and rich connectivity like an industrial PC.

APAX-5343   APAX-5570   APAX-5002 [Backplane]   APAX-5001
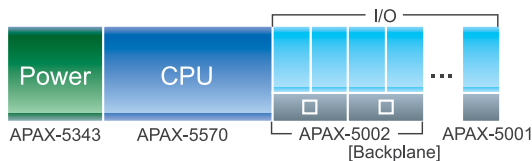
2 Compact Controller

- Combines PLC features (compact size, cost-effectiveness and reliability) with PC technology (local display, storage and network connectivity).

APAX-5343E   APAX-5002 [Backplane]   APAX-5001
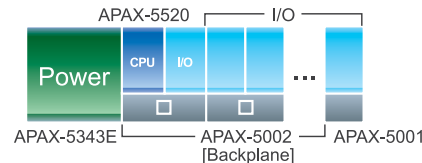
3 Remote I/O System

- Links APAX-5000 I/O modules to different real-time Ethernet or fieldbus systems through couplers, making it a remote I/O system.

APAX-5343E   APAX-5002 [Backplane]   APAX-5001
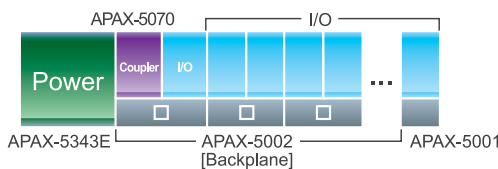
4 Dual Controller

- One controller concentrates on I/O processing, while another controller works on other tasks.

APAX-5343   APAX-5570   APAX-5002 [Backplane]   APAX-5001
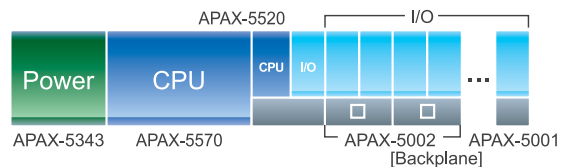
5 Backup System

- If the master controller fails, the backup controller will automatically take over control tasks.

APAX-5343   APAX-5570

APAX-5343   APAX-5570   APAX-5002 [Backplane]

APAX-5002 [Backplane]   APAX-5001

Note: The APAX-5570 can be upgraded to APAX-5571, APAX-6572, etc.

- The dual controller architecture with I/O backup system provides double reliability for the I/O process to build a non-stop SoftLogic I/O control system.

APAX-5343   APAX-5570   APAX-5002 [Backplane]   APAX-5001

Versatile APAX Modules - Unlimited Possibilities

Power Supply

APAX-5343
Power Supply for APAX-5570 Series

APAX-5343E
Power Supply for APAX Expansion Module

Coupler

APAX-5070/5071/5072
Modbus/TCP Coupler Profinet
Coupler Ethernet/IP Coupler

CPU

APAX-5570/5571
Intel Celeron M 1 GHz/1.5 GHz

APAX-5620
Marvel XScale CPU with CAN

APAX-5520
Marvel XScale CPU

APAX-6572
Intel® Atom™ 1.66 GHz

I/O

APAX-5013
8-ch RTD

APAX-5017
12-ch AI

APAX-5017H
12-ch High Speed AI

APAX-5018
12-ch Thermocouple Input

APAX-5028
8-ch AO

APAX-5040
24-ch DI

APAX-5045
24-ch DI/O

APAX-5046
24-ch DO

APAX-5060
12-ch Relay Output

APAX-5080
4/8-ch Counter

APAX-5082
8-ch Pulse Width
Modulation Module

APAX-5202P
2-port AMONet
Master

Backplane

APAX-5001
1-slot Backplane

APAX-5002
2-slot Backplane
with RJ-45 Port

APAX-5002L
2-slot Backplane

System Selections

①Application Ready High Performance PACs

Advantech's APAX-5570/5571/6572 series offers several high performance controllers with Intel Atom and Celeron M processors. These controllers benefit from the high throughput, openness, flexibility and connectivity brought by PC-based architectures. Contributed by excellent heat dissipation technology with no hard disks, they deliver great system reliability. Various peripheral interfaces such as LAN, USB, DVI, audio, RS-232, RS-422/485, etc, are provided. These high performance PAC controllers are suitable for many complex control applications.

②Robust, Compact PACs

APAX-5520/5620 series controllers offer a compact size without fans. These controllers have no rotating parts, helping further increase system reliability. APAX-5520/5620 features a VGA interface, enabling local displays, and its RS-485 and LAN ports offer communication ability with Modbus protocol. Internal CF slot and battery backup RAM can be used for data storage. These features make APAX-5520/5620 as compact and robust as a PLC, but with enhanced displays, connectivity, and storage.

③Scalable Systems with Remote I/O

For different fieldbus or real-time Ethernet networks, such as Modbus, Ethernet/IP, Profinet etc, APAX series offers different kinds of couplers for communication. Any controller or computer in the same network can access APAX I/O modules through the coupler. Not having to change I/O modules for different fieldbus or real-time Ethernet networks helps ensuring current I/O modules' investment for future demands. These couplers feature daisy-chain design, making installation easier.

Real-time Local Bus

APAX I/O local bus adopts real-time I/O access methodology to ensure deterministic control with real-time performance. Contributed by the dedicated Digital Signal Processor (DSP) which handles I/O data process without controller's CPU resource, the I/O scan rate can be maintained within 1 ms, offering time deterministic I/O. The I/O processing is running on the back-end, and controller's CPU and DSP can share data through built-in dual port RAM. All these deliver real-time performance regardless of the number of I/O points. Programmers can concentrate on their application program development, and APAX system can perform real-time I/O access automatically.

User-friendly Designs

▶ Hot Swappable, High Density I/O Modules

APAX I/O modules can communicate and obtain power through backplanes. APAX I/O modules are hot swappable, allowing them removed from or inserted on the backplane, even when the system is powered-on. Operator can replace specific I/O modules without shutting down the whole system. This significantly saves system maintenance costs.

▶ Clamp Type Terminal Blocks

All APAX I/O modules offer detachable clamp type terminal blocks for I/O wiring. Compared to traditional screw type terminal blocks, clamp type terminal blocks can save installation time (up to 75%), and doesn't require the connection to be checked or retightened. They also have higher resistance to shock and vibration.

▶ Easily Identifiable Modules

The front-side ID switch enables operator to change the module ID number. The power LED not only displays module power status, but also performs self diagnostic functionality. All digital modules offer channel status LED. Inserting the terminal block on the wrong module may cause module damaged. Matching the terminal block and front label with the same color can prevent from this.

▶ Writable Labels with Wiring Information

For all I/O modules, a pluggable label gives operators the ability to write important notes on it, like channel information. The opposite side shows the wiring diagram, so operators can refer to it for wiring. This label provides convenience for maintenance and operation.

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System Selections

④ Unique and Dedicated System with Dual Controllers

APAX series features unique system architecture, two individual controllers executing different tasks, integrated into one platform. One controller focuses on I/O control processing, while the other controller possesses high computing performance to be responsible for tasks like database, HMI/SCADA software, recipes, communication, storage, vision processing, and more.

For example, the APAX-5570 can be one controller delivering powerful computing ability and sufficient resources to execute all other tasks except I/O processing. Another controller could be the APAX-5520, concentrating on I/O control. For many control applications, I/O control is critical, and this dual controller architecture offers excellent reliability and efficiency. Regardless of what happens on the APAX-5570 (even if the operating system crashes), I/O control process is still secure.

Any application running on APAX-5570, such as HMI/SCADA software, can access data from APAX-5520 through Modbus protocol. HMI/SCADA software which supports Modbus client can link to Modbus server on APAX-5520 to get data. Advantech offers related libraries for programmers. This can save a lot of development time for communication.

▶ System Diagram

Control Center

Ethernet

APAX-5570

I/O

APAX I/O

APAX I/O

Touch LCD Panel   APAX-5343   APAX-5520

Local Bus

Ethernet

Switch   Ethernet I/O   Ethernet I/O

RS-485

RS-232

RS-485 Device   RS-485 Device

RS-232 Device

Ethernet

Switch   Ethernet I/O   Ethernet I/O

APAX Coupler with APAX I/O

RS-422/485

RS-422/485 Device   RS-422/485 Device   RS-422/485 Device
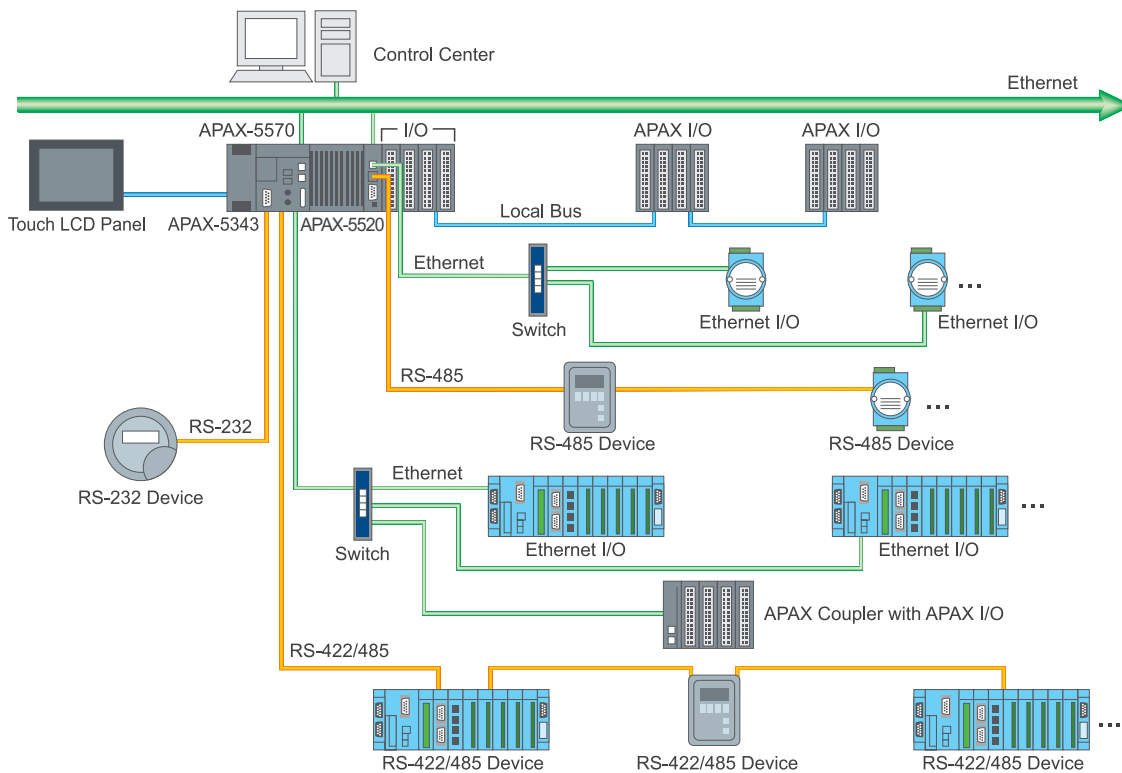
5 Reliable Control System with Backup Technology

The APAX series delivers system backup functionality to significantly decrease the risk that the system will fail when the controller crashes. To leverage this, two controllers with the same control program are installed in one system. After both controllers' backup function is enabled, APAX system will automatically delegate one controller as the master controller.

The master controller will run the control program to execute the control process, while another controller (the backup controller) is put on standby. The master controller periodically sends live messages to the backup controller. If the backup controller does not receive a message from the master controller, it will automatically become the master controller and restart the control process.

If the master controller is switched, it means there was an error happening on the previous master controller. Therefore, engineers can repair or change the previous master controller and re-enable it as the backup controller. Then if the new master controller fails, the new backup controller will automatically take over the control once again. This mechanism ensures the control system will continuously run the control process.

▶ System Diagram

Control Center

Ethernet

Ethernet   Ethernet   Ethernet

APAX-5343E   APAX-5343   APAX-5343

APAX-5520   APAX-5570   APAX-5570
APAX-5520   Local Bus   Local Bus

APAX I/O

APAX I/O   Unmanaged Switch

APAX I/O   APAX I/O   APAX I/O
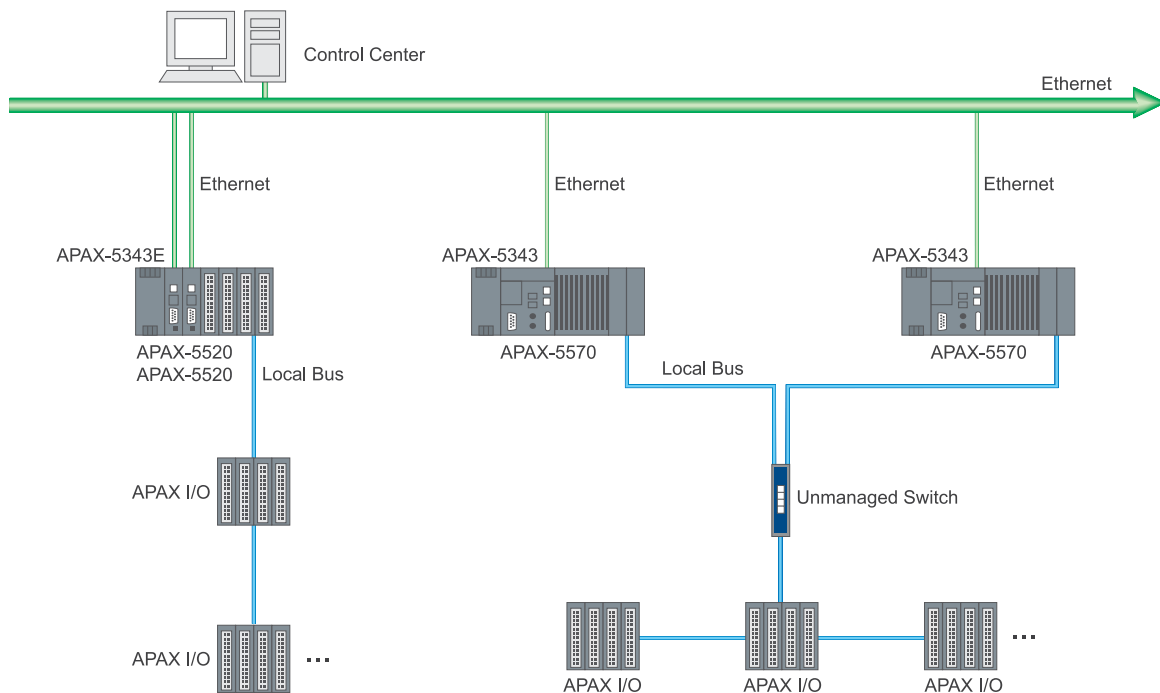
Selection Guide

APAX-5000 Controllers

NEW   NEW

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System		APAX-5520	APAX-5620	APAX-5570/5571	APAX-6572
CPU		Marvel XScale PXA270 520 MHz		APAX-5570: Intel Celeron M 1 GHz APAX-5571: Intel Celeron M 1.5 GHz	Intel Atom D510 1.66 GHz
Memory		Flash 32 MB, SDRAM 64MB		512 MB DDR2 DRAM	2 GB DDR2 DRAM
Storage		1 x CF slot		1 x SD card slot	1 x CF slot (internal)
Local Display		VGA		DVI-I	VGA
USB Ports		1 x USB 1.1		4 x USB 2.0	4 x USB 2.0
Audio		-		Mic in, Line out	Mic in, Line in, Line out
Cooling System		Fanless		APAX-5570: Fanless APAX-5571: With Fan	Fanless
Power Input		18 ~ 30 V$_{DC}$		18 ~ 30 V$_{DC}$	9 ~ 36 V$_{DC}$
Diagnostics LED		Power, Battery, Run, Error			Power, IDE, LAN, Serial
Real-time Clock		Yes			
Watchdog Timer		Yes			
Control Software		C/C++ library and .NET class library for C and .NET programming environment KW IEC 61131-3 SoftLogic programming tool			
Local Real-time I/O Modules		32 (max.)*			
Digital I/O Points		2048 (max.)			
Analog I/O points		512 (max.)			
Communication (Ethernet)	LAN Ports	1	2	2	3
	Speed	10/100 Mbps		10/100/1000 Mbps	10/100/1000 Mbps
	Protocol	Modbus/TCP			
Communication (Serial)	COM 1	RS-485	RS-485	RS-232	RS-232/422/485
	COM 2	-	RS-485	RS-422/485	RS-232/422/485
	COM 3	-	-	-	-
	CAN Bus	-	2	-	-
	Protocol	Modbus/RTU, CANopen (APAX-5620 only)			
Isolation	Communication	2500 V$_{DC}$ (RS-485)	2500 V$_{DC}$ (CAN & RS-485)	2500 V$_{DC}$ (RS-422/485 only)	-
Environment	Operating Temperature (when mounted vertically)	-10 ~ 55°C			-10 ~ 50°C
	Storage Temperature	-40 ~ 70°C			
	Relative Humidity	0 ~ 95 % (non-condensing)			
	Vibration Protection	IEC 60068-2-64/60068-2-6: 1 Grms @ 5 ~ 500 Hz (Random, operating) 2 G @ 5 ~ 500 Hz (Sine, non-operating)		IEC 60068-2-64/2-6: 2 Grms @ 5 ~ 500 Hz (Random, operating) 2 G @ 5 ~ 500 Hz (Sine, non-operating)	IEC 60068-2-64: 2 Grms @ 5 ~ 500 Hz (Random, operating)
	Shock Protection	IEC 60068-2-27: 20 G @ wall mount		IEC 60068-2-27: 30 G @ wall mount	IEC 60068-2-27: 50 G @ wall mount
Power Supply Module (Optional)		APAX-5343E		APAX-5343	PWR-244

*APAX DI/O modules can use ID numbers 0 ~ 31, while AI/O modules and counter modules can only use ID numbers 0 ~ 15

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APAX-5000 I/O Modules

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Module Name		APAX-5013	APAX-5017	APAX-5017H	APAX-5018	APAX-5028
Description		8-ch RTD Module	12-ch AI Module	12-ch High Speed AI Module	12-ch Thermocouple Module	8-ch AO Module
Analog Input	AI Channels	8	12	12	12	-
	Input Type*	RTD (2-wire or 3-wire)	V, mV, mA	V, mV, mA	V, mV, mA, Thermocouple	-
	Sampling Rate (Samples/second)	50 Hz filter: 8 (Total**) 60 Hz filter: 10 (Total**)	12 (Total**)	1000 (per channel)	12 (Total**)	-
	Input Resolution	16-bit	16-bit (voltage) 14 ~ 15-bit (current)	12-bit	16-bit (voltage) 14 ~ 15-bit (current, thermocouple)	-
	Input Accuracy	±0.1 % of FSR	±0.1 % of FSR (Voltage) ±0.2 % of FSR (Current)	±0.1 % of FSR (Voltage) ±0.2 % of FSR (Current)	±0.1 % of FSR (Voltage) ±0.2 % of FSR (Current)	-
	Voltage Input	-	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V	0 ~ 500 mV, ±10 V, 0 ~ 10 V	±50 mV, ±100 mV, ±500 mV, ±1 V, ±2.5 V	-
	Current Input	-	±20 mA, 0 ~ 20 mA, 4 ~ 20 mA	0 ~ 20 mA, 4 ~ 20 mA	±20 mA, 0 ~ 20 mA, 4 ~ 20 mA	-
	Direct Sensor Input	RTD (Pt-100, Pt-200, Pt-500, Pt-1000, Balco, Ni 518)	-	-	Thermocouple (Type J, K, T, E, R, S, B)	-
	Wire Burnout Detection	All RTD range	4 ~ 20 mA	4 ~ 20 mA	4 ~ 20 mA and all Thermocouple range	-
Analog Output	AO Channels	-	-	-	-	8
	Output Type*	-	-	-	-	V, mA
	Output Resolution	-	-	-	-	14-bit
	Output Accuracy	-	-	-	-	±0.1 % of FSR
	Output Slew Rate	-	-	-	-	0.7 V_{DC}/µs (per channel)
	Voltage Output	-	-	-	-	±2.5 V, ±5 V, ±10 V, 0 ~ 2.5 V, 0 ~ 5 V, 0 ~ 10 V
	Current Output	-	-	-	-	0 ~ 20 mA, 4 ~ 20 mA
	Short Circuit Protection	-	-	-	-	Yes
	Fail Safe Value	-	-	-	-	Yes
General	Weight	170 g	170 g	175 g	170 g	175 g
	Operating Temperatrure	-10 ~ 60°C (when mounted vertically)				
	Storage Temperature	-40 ~ 85°C				
	Relative Humidity (non-condensing)	5 ~ 95%				
	Power Consumption (typical)	2.5 W @ 24 V_{DC}	4 W @ 24 V_{DC}	3.5 W @ 24 V_{DC}	3.5 W @ 24 V_{DC}	3.5 W @ 24 V_{DC}
	Isolation between channels and backplane	2500 V_{DC}				
	Power Supply Module (optional)	APAX-5343E				
user manual		online	online	online	online	online

*Each cahnnel can be configured with different type and range
**Sampling rate value depends on used channel number.
Example: Using 6 channels on APAX-5017, sampling rate for each used channel will be 12/6 = 2 samples/second.

Selection Guide

APAX-5000 I/O Modules

NEW

Module Name		APAX-5040	APAX-5045	APAX-5046	APAX-5060	APAX-5080	APAX-5082
Description		24-ch DI Module	24-ch DI/O Module	24-ch DO Module	12-ch Relay Module	4/8-ch Counter Module	8-ch Pulse Width Modulation Module
Digital Input	DI Channels	24	12	-	-	4	6
	Input Type	Sink or Source Load	Sink or Source Load	-	-	Source Load	Sink or Source Load (Wet Contact)
	Rated Input Voltage	24 V_{DC}	24 V_{DC}	-	-	24 V_{DC}	-
	Input Voltage Range (signal "0")	-5 ~ 5 V_{DC}	-5 ~ 5 V_{DC}	-	-	0 ~ 3 V_{DC}	-5 ~ 5 V_{DC}
	Input Voltage Range (signal "1")	15 ~ 30 V_{DC} -15 ~ -30 V_{DC}	15 ~ 30 V_{DC} -15 ~ -30 V_{DC}	-	-	10 ~ 30 V_{DC}	15 ~ 30 V_{DC} -15 ~ -30 V_{DC}
	Rated Input Current	4.4 mA (typical)	4.4 mA (typical)	-	-	10 mA (typical)	7.3 mA
	Input Filter	3 ms	3 ms	-	-	3 ms	3 ms
	Over Voltage Protection	Yes	Yes	-	-	Yes	-
Counter Input/ Pulse Width Output	Channels	-	-	-	-	4 or 8 (depends on mode)	8
	Rated Input Voltage	-	-	-	-	24 V_{DC}	Output Voltage Range: 8 ~ 35 V_{DC}
	Input Voltage Range (signal "0")	-	-	-	-	0 ~ 3 V_{DC}	-
	Input Voltage Range (signal "1")	-	-	-	-	10 ~ 30 V_{DC}	-
	Current	-	-	-	-	Rated Input Current (signal *1): 5 ~ 15 mA (typical)	Normal Output Current: 0.5A (per channel)
	Counting Range	-	-	-	-	32-bit + 1-bit overflow/underflow	-
	Counter Frequency	-	-	-	-	Counter Frequency: 1 MHz (max.)	Pulse Frequency: 0 ~ 30kHz
	Counter Gate and Alarm Function	-	-	-	-	Yes	-
	Over Voltage Protection	-	-	-	-	Yes	-
Digital Output	DO Channels	-	12	24	12	4	6
	Output Type	-	Sink	Sink	Relay (Form A, SPST)	Sink	Sink
	Rated Output Voltage	-	24 V_{DC}	24 V_{DC}	250 V_{AC}, 30 V_{DC}	24 V_{DC}	8 ~ 35 V_{DC}
	Rated Output Current (signal "1")	-	0.5 A	0.5 A	5 A	0.5 A	0.5 A (per channel)
	Short Circuit Protection	-	Yes	Yes	-	Yes	-
	Thermal Shutdown Protection	-	Yes	Yes	-	Yes	-
General	Weight	160 g	165 g	165 g	195 g	170 g	165 g
	Operating Temperatrure	-10 ~ 60°C (when mounted vertically)					
	Storage Temperature	-40 ~ 85°C					-40 ~ 70° C
	Relative Humidity (non-condensing)	5 ~ 95%					
	Power Consumption (typical)	2 W @ 24 V_{DC}	2.5 W @ 24 V_{DC}	2.5 W @ 24 V_{DC}	2 W @ 24 V_{DC}	2.5 W @ 24 V_{DC}	2.5 W @ 24 V_{DC}
	Isolation between channels and backplane	2500 V_{DC}					
	Channel Status LED	Yes (per channel)					
	Fail Safe Value	-	Yes (DO channel)	Yes	Yes	Yes (DO channel)	Yes
	Power Supply Module (optional)	APAX-5343E					

Overview

ADAM-5000 Series

The ADAM-5000 series are suitable for basic and midlevel 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 up to four I /O module-s. The ADAM-5550, ADAM-5510E/TCP, ADAM-5510E, ADAM-5000/TCP and ADAM-5000E are capable of handling up to eight 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.
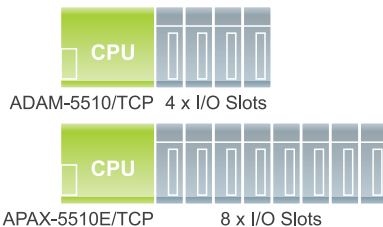
▶ 8-slot PAC

■ ADAM-5550KW is designed for control tasks which need industrial PC computing performance with a PLC form factor and I/O module design.
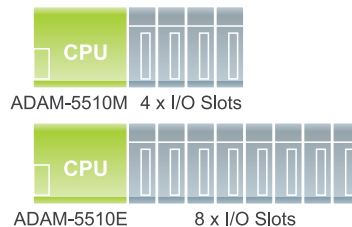
CPU — ADAM-5550KW   8 x I/O Slots

▶ PC-based Controllers

■ ADAM-5510 series offers 2 kinds of options, one is Ethernet-based and the other is RS-485 based.

Ethernet based

CPU — ADAM-5510/TCP 4 x I/O Slots

CPU — APAX-5510E/TCP   8 x I/O Slots

RS-485 based

CPU — ADAM-5510M 4 x I/O Slots

CPU — ADAM-5510E   8 x I/O Slots

Note: Advantech also provides optional SoftLogic controller modules

▶ 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
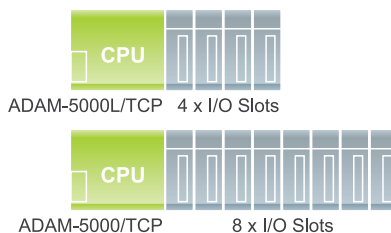
Selection Guide

ADAM-5000 Controllers

NEW

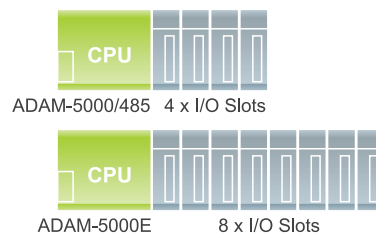| System	ADAM-5510	ADAM-5510E	ADAM-5510/TCP	ADAM-5510E/TCP	ADAM-5560CE/KW
Description	4-slot PC-based Controller with RS-485 (ADAM-5510M)	8-slot PC-based Controller with RS-485 (ADAM-5510E)	4-slot PC-based Controller with Ethernet (ADAM-5510/TCP)	8-slot PC-based Controller with Ethernet (ADAM-5510E/TCP)	7-slot PC-based Controller with Intel Atom CPU (ADAM-5560CE)
	4-slot SoftLogic Controller with RS-485 (ADAM-5510KW)		4-slot SoftLogic Controller with Ethernet (ADAM-5510KW/TCP)	8-slot SoftLogic Controller with Ethernet (ADAM-5510EKW/TP)	7-slot Micro PAC with Intel Atom CPU (ADAM-5560KW)
CPU	80188				Intel Atom Z510P
RAM	640 KB				1 GB DDR2 SDRAM
Flash ROM	256 KB				-
Flash Memory	256 KB				-
Flash Disk	1 MB				-
OS	ROM-DOS				WinCE 5.0
Control Software	.NET Class Libraries (ADAM-5510M) KW MultiProg (ADAM-5510KW)	.NET Class Libraries (ADAM-5510E)	.NET Class Libraries (ADAM-5510/TCP) KW MultiProg (ADAM-5510KW/TCP)	.NET Class Libraries (ADAM-5510E/TCP) KW MulitProg (ADAM-5510EKW/TP)	eVC and .NET Class Libraries (ADAM-5560CE) KW MulitProg and ProConOS (ADAM-5560KW)
Real-time Clock	Yes				
Watchdog Timer	Yes				
COM1	RS-232	RS-232/485	RS-232	RS-232/RS-485	RS-232/485
COM2	RS-485				
COM3 (Programming)	RS-232 (TX, RX, GND)				RS-232/485
COM4	RS-232/485				
I/O Slots	4	8	4	8	7
Power Consumption	4W				17W
Isolation					
Communication	2,500 V$_{DC}$ (COM2 RS-485)				2,500 V$_{DC}$ (COM2 RS-485) 1,500 V$_{DC}$ (COM1, COM3, COM4 RS-485)
Communication Power	3,000 V$_{DC}$				
I/O Module	3,000 V$_{DC}$				
Diagnosis					
Status Display	Power, CPU, Communication, Battery				Power, User Defined
Self Test	Yes, while on				
Software Diagnosis	Yes				
Communication					
Network	RS-232/485		Ethernet (RJ-45)		Ethernet (2 x RJ-45)
Speeds	1,200 bps ~ 115.2 kbps		10/100 Mbps		10/100 Mbps
Max. Distance	4,000 feet (1.2 km)		150 m		150 m
Data Format	N, 8, 1, 1		-	-	-
Max. Nodes	32	32	256 for Ethernet, 32 for RS-485	256 for Ethernet, 32 for RS-485	256 for Ethernet, 32 for RS-485
Protocols	User Defined, Modbus/RTU	User Defined, Modbus/RTU	User Defined, Modbus/RTU, Modbus/TCP	User Defined, Modbus/RTU, Modbus/TCP	Modbus/RTU, Modbus/TCP
Remote I/O	Modbus Device				
Power Requirements	+10 ~ +30 V$_{DC}$				
Environment					
Operating Temperature	-10 ~ 70°C (14 ~ 158°F)				0 ~ 55°C (32 ~ 131°F)
Storage Temperature	-25 ~ 85°C (-13 ~ 185°F)				
Humidity	5 ~ 95%				

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Controller Support Table

Type		PAC			PC-based Controller		
System		ADAM-5560KW	ADAM-5510KW ADAM-5510EKW	ADAM-5510KW/TCP ADAM-5510EKW/TP	ADAM-5560CE	ADAM-5510/TCP ADAM-5510E/TCP	ADAM-5510M ADAM-5510E
Function	I/O Module	7-slot Micro PAC with Intel Atom CPU	4/8-slot Softlogic Controller w/ RS-485	4/8-slot Softlogic Controller w/ Ethernet	7-slot PC-based Controller with Intel Atom CPU	4/8-slot PC-based Controller with Ethernet	4/8-slot PC-based Controller with RS-485
Analog Input (AI)	ADAM-5013	●	●	●	●	●	●
	ADAM-5017P	●	–	–	●	●	●
	ADAM-5017UH	●	–	–	●	●	●
	ADAM-5018P	●	–	–	●	●	●
Analog Output (AO)	ADAM-5024	●	●	●	●	●	●
Digital Input (DI)	ADAM-5051S	●	●	●	●	●	●
	ADAM-5053S	●	–	–	●	–	–
Digital Output (DO)	ADAM-5056S	●	●	●	●	●	●
	ADAM-5056SO	●	●	●	●	●	●
	ADAM-5057S	●	–	–	●	–	–
Digital I/O	ADAM-5055S	●	●	●	●	●	●
Relay Output	ADAM-5068	●	●	●	●	●	●
	ADAM-5069	●	●	●	●	●	●
Counter/ Frequency	ADAM-5080	–	●	●	–	●	●
	ADAM-5081	●	–	–	●	●	●
Comm.	ADAM-5090	–	●	●	–	●	●
	ADAM-5091	●	–	–	●	–	–
	ADAM-5095	●	–	–	●	–	–
Motion	ADAM-5202	●	–	–	●	–	–
	ADAM-5240	●	–	–	●	–	–
SD	ADAM-5030	●	–	–	●	–	–

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ADAM-5000 Remote I/O Systems

System	ADAM-5000/485	ADAM-5000E	ADAM-5000L/TCP	ADAM-5000/TCP
Description	4-slot Distributed DA&C System for RS-485	8-slot Distributed DA&C System for RS-485	4-slot Distributed DA&C System for Ethernet	8-slot Distributed DA&C System for Ethernet
CPU	80188	80188	RISC	RISC
RAM	-	-	4 MB	
Flash ROM (User AP)	-	-	512 KB	
OS	-	-	Real-time OS	
Control Software	.NET Class Libraries			
Watchdog Timer	Yes			
COM1/COM2)	RS-485	RS-485	RS-485 (Modbus)	
COM3 (Programming)	TX, RX, GND		-	-
I/O Slots	4	8	4	4
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} Ethernet: 3,000 V_{DC}	
Communication Power	3,000 V_{DC}			
I/O Module	3,000 V_{DC}			
Diagnosis				
Status Display	Power, CPU, Communication		Power, CPU, Error Diagnostic, Communication	
Self Test	Yes, while on			
Software Diagnosis	Yes			
Communication				
Interface	RS-232/485 (2-wire)	RS-232/485 (2-wire)	Ethernet	
Speeds (bps)	1,200, 2,400, 4,800, 9,600, 192 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, 115.2K	10 M, 100 M	
Max. Distance	4,000 feet (1.2 km)	4,000 feet (1.2 km)	100 m without repeater	
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	
Max. Nodes	128	128	Depend on IP address	
Protocols	ADAM ASCII/Modbus Protocol	ADAM ASCII/Modbus Protocol	Modbus/TCP	
Remote I/O	-	-	20 nodes Modbus devices	
Power Requirements	+10 ~ +30 V_{DC}			
Environment				
Operating Temperature	-10 ~ 70°C (14 ~ 158°F)			
Storage Temperature	-25 ~ 85°C (-13 ~ 185°F)			
Humidity	5 ~ 95%			

Remote I/O System Support Table

Remote I/O System			ADAM-5000/485	ADAM-5000E	ADAM-5000L/TCP	ADAM-5000/TCP
Function	I/O Module	Description	4-slot Distributed DA&C for RS-485	8-slot Distributed DA&C for RS-485	4-slot Distributed DA&C for Ethernet	8-slot Distributed DA&C for Ethernet
Analog Input (AI)	ADAM-5013	3-ch RTD Input	●	●	●	●
	ADAM-5017	8-ch AI	●	●	●	●
	ADAM-5017P	8-ch AI w/ Independent Input Range	●	●	●	●
	ADAM-5017H	8-ch high Speed (1K) AI	●	●	●	●
	ADAM-5017UH	8-ch Ultra high Speed (200K) AI	●	●	●	●
	ADAM-5018	7-ch Thermocouple Input	●	●	●	●
	ADAM-5018P	7-ch Thermocouple Input w/ Independent Input Range	●	●	●	●
Analog Output (AO)	ADAM-5024	4-ch AO	●	●	●	●
Digital Input (DI)	ADAM-5051	16-ch DI	●	●	●	●
	ADAM-5051D	16-ch DI w/ LED	●	●	●	●
	ADAM-5051S	16-ch Isolated DI w/ LED	●	●	●	●
	ADAM-5052	8-ch Isolated DI w/ LED	●	●	●	●
Digital Output (DO)	ADAM-5056	16-ch DO	●	●	●	●
	ADAM-5056D	16-ch DO w/ LED	●	●	●	●
	ADAM-5056S	16-ch Isolated DO w/ LED	●	●	●	●
	ADAM-5056SO	16-ch Source Type Isolated DO w/ LED	●	●	●	●
Digital I/O	ADAM-5050	16-ch Universal Digital I/O	●	●	●	●
	ADAM-5055S	16-ch Isolated Digital I/O w/ LED	●	●	●	●
Relay Output	ADAM-5060	6-ch Relay Output	●	●	●	●
	ADAM-5068	8-ch Relay Output	●	●	●	●
	ADAM-5069	8-ch Power Relay Output w/ LED	●	●	●	●
Counter/ Frequency	ADAM-5080	4-ch Counter/Frequency	●	●	●	●
	ADAM-5081	4-ch High Speed Counter/ Frequency	●	●	●	●

Selection Guide

ADAM-5000 I/O Modules

Module		ADAM-5013	ADAM-5017	ADAM-5017P	ADAM-5017UH	ADAM-5018	ADAM-5018P	ADAM-5024	ADAM-5050	ADAM-5051/ ADAM-5051D/ ADAM-5051S	ADAM-5052	ADAM-5053S
Analog Input (AI)	Resolution	16 bit	16 bit	16 bit	12 bit	16 bit	16 bit	-	-	-	-	-
	Input Channel	3	8	8	8	7	7	-	-	-	-	-
	Sampling Rate	10	10	10	200K	10	10	-	-	-	-	-
	Voltage Input	-	±150 mV ±500 mV ±1 V ±5 V ±10 V	±150 mV ±500 mV ±15 V ±10 V ±5 V ±1 V 0 ~ 150 mV 0 ~ 500 mV 0 ~ 1 V 0 ~ 5 V 0 ~ 10 V 0 ~ 15 V	±10 V 0 ~ 10 V	±15 mV ±50 mV ±100 mV ±500 mV ±1 V ±2.5 V	±15 mV ±50 mV ±100 mV ±500 mV ±1 V ±2.5 V	-	-	-	-	-
	Current Input	-	±20 mA	±20 mA, 4 ~20 mA	0 ~ 20 mA 4 ~ 20 mA	±20 mA	4 ~ 20 mA	-	-	-	-	-
	Direct Sensor Input	Pt or Ni RTD	-	-	-	J, K, T, E, R, S, B	J, K, T, E,R, S, B	-	-	-	-	-
Analog Output (AO)	Resolution	-	-	-	-	-	-	12 bit	-	-	-	-
	Voltage Output	-	-	-	-	-	-	0 ~ 10 V	-	-	-	-
	Current Output	-	-	-	-	-	-	0 ~ 20 mA 4 ~ 20 mA	-	-	-	-
Digital I/O	Digital Input Channels	-	-	-	-	-	-	-	16 DI/O (bit-wise selectable)	16/ 16 with LED/ 16 with LED	-	32
	Digital Output Channels	-	-	-	-	-	-	-		-	8	-
Isolation		3,000 VDC	3,000 VDC	3,000 VDC	3,000 VDC	3,000 VDC	3,000 VDC	3,000 VDC	-	2,500 VDC (5051S)	5,000 VRMS	2,500 VDC

Vertrieb durch

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Module		ADAM-5055S	ADAM-5056/ ADAM-5056D	ADAM-5056S/ ADAM-5056SO	ADAM-5057S	ADAM-5060	ADAM-5068	ADAM-5069	ADAM-5080	ADAM-5081	ADAM-5090/ ADAM-5091	ADAM-5095
Digital I/O	Digital Input Channels	8 w/LED	-	-	-	-	-	-	-	-	-	-
	Digital Output Channels	8 w/LED	16 w/ LED (5056D)	16 w/ LED	32	6 relay (2 form A/ 4 form C)	8 relay (8 form A)	8 power relay (form A)	-	-	-	-
Counter (32-bit)	Channels	-	-	-	-	-	-	-	4	8	-	2
	Input Frequency	-	-	-	-	-	-	-	5000 Hz (max)	5 Hz ~ 1 MHz max. (frequency mode) 1 MHz max. (counter mode)	-	-
	Mode	-	-	-	-	-	-	-	Frequency, Up/Down Counter, Bi-direction Counter	Frequency, Up/Down, Bi-direction, up, A/B Phase, Counter	-	-
COMM.	Channels	-	-	-	-	-	-	-	-	-	4	-
	Type	-	-	-	-	-	-	-	-	-	RS-232	CAN
Isolation		2,500 V_{DC}	-	2,500 V_{DC}	2,500 V_{DC}	-	-	4,000 V_{RMS}	1,000 V_{RMS}	2,500 V_{DC}	-	1,000 V_{DC}

ADAM-5000 Motion

| Module		ADAM-5202	ADAM-5240	ADAM-5030
Axes	Number of Axes	-	4	-
	Linear Interpolation	-	V	-
	2-Axis Circle Interpolation	-	V	-
Advanced Functions	Encoder Channels	-	4	-
	Limit Switch Input Channel	-	8	-
	Home Input Channel	-	4	-
	Emergency Stop Input Channel	-	1	-
	Slow Down Limit Switch	-	8	-
	General Purpose DI Channel	-	-	-
	Servo On Output Channel	-	4	-
	General Purpose DO Channel	-	4	-
	Position Compare Event	-	V	-
	Remote Motion	V	-	-
	Remote I/O	V	-	-
	Board ID	-	-	-
Connectors		4 x RJ-45,	100-PinSCSI-II	-
Wiring Board		-	ADAM-3952	-
Remote Slave Module		AMAX-2752SY/2754SY/2756SY AMAX-2241/2242/2243	-	-
Storage	Type	-	-	SD (Secure Digital Card)
	Channel	-	-	2
	Size	-	-	2 GB (Max)
USB	Type	-	-	V2.0 (compliant)
	Channel	-	-	2
Supported Controller			ADAM-5550KW	

Overview

Motion Control I/O Modules

Advantech's AMAX series is decentralized motion control master and slave modules. While the master module is kept in the host controller, the slave modules can be distributed so that they are next to motor drivers on the factory floor. The distance between a master card and its slave module can be up to 100 meters, and this distance is covered with a low-cost Cat 5 network cable. In addition to saving wiring costs, debugging and maintenance is also simplified.

▶ Motion Solutions

Advantech offers three form factors with different processors and two kinds of programming tools, one is SoftLogic (KW solution) and the other is API (.Net class library solution) to meet the different requirements of motion control applications.
Advantech also has a series of slave modules, AMAX-2000 series, which includes digital input/output slave modules (AMAX-2750SY series) and AMONet motion slave modules (AMAX-2240 series).

Solution 1:
UNO-1172AE(Fanless design, Intel Atom CPU), plus motion control I/O modules

CPU

UNO-1172AE PCM-3202P
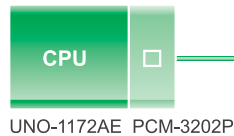
Solution 2:
APAX-5570 + APAX-5202P (PLC form factor, Intel Celeron M CPU, and 2-port AMONet Master Module), plus motion control I/O modules

CPU

APAX-5570   APAX-5202P

AMONet   Slave   AMONet   Slave

Motion Slave Modules
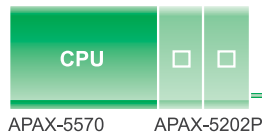
Solution 3:
ADAM-5550 + ADAM-5202 (PLC form factor, GX2 CPU, 2-port AMONet Master Module), plus motion control I/O modules

CPU

ADAM-5550   ADAM-5202
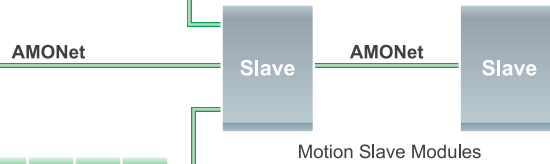
▶ Controller & Motion Control Devices

Controller	UNO-1172AE	APAX-5570	APAX-6572	ADAM-5550
SoftLogic (KW)	-	-	-	ADAM-5550KW
API (.Net class library solution)	Windows Embedded Standard	APAX-5570XPE	APAX-6572WES	ADAM-5550CE
Motion Module	PCM-3202P	APAX-5202P	APAX-5202P	ADAM-5202

Selection Guide

▶ Motion Slave Modules

Module		AMAX-2241/PMA	AMAX-2242/J2S	AMAX-2243/YS2
Description		4-axis AMONet Motion Slave Module for Panasonic Minas A	4-axis AMONet Motion Slave Module for Mitsubishi MR-J2S	4-axis AMONet Motion Slave Module for Yaskawa Sigma-II
Axes	Number of Axes	4	4	4
	Linear Interpolation	v	v	v
	2-axis Circle Intepolation	v	v	v
Advanced Functions	Encoder Channels	4	4	4
	Limit Switch Input Channels	8	8	8
	Home Input Channels	4	4	4
	Emergency Stop Input Channels	1	1	1
	Servo On Output Channels	4	4	4
	BoardID Switch	v	v	v
	Position Compare Event	v	v	v
Servo Driver	Panasonic Minas A	4	~	~
	Mitsubishi MR-J2S	~	4	~
	Yaskawa Sigma-II	~	~	4
Connectors		4 x 50-pin SCSI	8 x 20-pin SCSI	4 x 50-pin SCSI
		1 x 40-pin Terminal	1 x 40-pin Terminal	1 x 40-pin Terminal

▶ Digital I/O Slave Modules

Module			AMAX-2752SY	AMAX-2754SY	AMAX-2756SY
Description			32-ch Isolated Digital Input AMONet Module	32-ch Isolated Digital Output AMONet Module	16/16-ch Isolated Digital I/O AMONet Module
Isolated DI/O	Input	Channels	32	~	16
		Isolation Voltage	2500 V$_{DC}$	~	2500 V$_{DC}$
		Input Range	Dry Contact	~	Dry Contact
	Output	Channels	~	32	16
		Isolation Voltage	~	2500 V$_{DC}$	2500 V$_{DC}$
		Output Range	~	5~30 V$_{DC}$	5~30 V$_{DC}$
		Max. Sink Current	~	150 mA	150 mA
Advanced Function	Change of State		v	~	v
	BoardID Switch		v	V	v
	Output Status Read Back		~	~	v
	Dry Contact		v	v	v
Connectors			2 x RJ45 2 x 40-pin Terminal	2 x RJ45 2 x 40-pin Terminal	2 x RJ45 2 x 40-pin Terminal

SoftLogic Programming Software

▶ KW MULTIPROG
IEC-61131-3 SoftLogic Control Software

Key Features:

- Online program download
- Intuitive programming with a clear project structure
- Cross-compiling: FBD, LD and IL can be cross-compiled to each other

Introduction:

Advantech's PAC solution leverages KW Multiprog and ProConOS as the development tool and SoftLogic control kernel. Users can easily leverage the control know-how into different control platforms to meet versatile automation projects needs.
Multiprog supports all IEC 61131-3 programming languages. Depending on the task handled, your experience and company standards, you may choose one of the five standardized programming languages. You can easily achieve real-time performance without additional programing. Advantech's long-term experience in the automation industry guarantees you a sophisticated software product.

IEC-61131-3 Programming Languages

- Instruction List (IL)
- Structured Text (ST)
- Sequential Function Chart (SFC)
- Function Block Diagram (FBD)
- Ladder Diagram (LD)

Supports PLCopen Motion Control Function Blocks

KW Multiprog also supports Motion Control Function Blocks for AMONet motion control modules which shall be applicable in the IEC 61131-3 languages with following factors in consideration:

1. Simplicity   2. Efficiency   3. Consistency   4. Universality   5. Flexibility   6. Completeness

Continuous Motion

MC_Move Velocity_A1_1
MC_Move Velocity_A1

Axis	Axis
Execute	InVelocity
Velocity	Busy
Acceleration	Active
Deceleration	Command A borted
Jerk	Error
Direction	ErrorID
BufferMode	

Home

MC_Home_A1_1
MC_Home_A1

Axis	Axis
Execute	Done
Position	Busy
Direction	Active
Velocity	Command A borted
AccDec	Error
HomingMode	ErrorID
BufferMode	

Discrete Motion

MC_MoveRelative_A1_1
MC_MoveRelative_A1

Axis	Axis
Execute	Done
Distance	Busy
Velocity	Active
Acceleration	CommandAborted
Deceleration	Error
Jerk	ErrorID
BufferMode	

Interpolation Motion

MC_MoveLinearRel_A1_1
MC_MoveLinearRel_A1

AxGroup	AxGroup
Execute	Done
Distances	Busy
Velocity	Active
Acceleration	CommandAborted
Deceleration	Error
Jerk	ErrorID
BufferMode	

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PC-based Programming Software
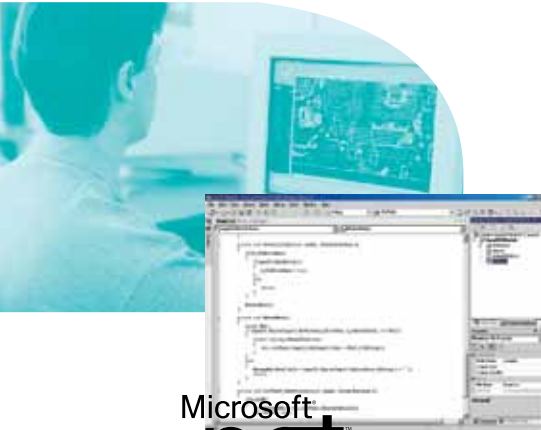
▶ **C/C++ and .NET Class Libraries**
API for VC/C++ and .NET development environment

Key Features:

- Complete PC-based open platform
- Multiple built-in libraries for industrial tasks to shorten development time
- Various C/C++ and .NET examples for reference

Introduction:

APAX-5000 series offers a complete PC-based open platform with Application Programming Interface (API). With C/C++ libraries and .NET class libraries provided by Advantech, programmers can develop their own programs for industrial control and automation tasks, involving I/O control, communication, SQL and scheduling. Plenty of C/C++ and .NET examples save programmer learning time, helping save programmers' development and effort to shorten time to market.

Microsoft .net

HMI/SCADA Software

▶ **Advantech WebAccess**
Browser-based HMI/SCADA Software

Key Features:

- View, control, configure system remotely over Intranet or Internet using ordinary Web browser
- Supports vector-based graphics
- Use the open standard programming TCL, JScript or VB script

Introduction:

Advantech WebAccess is browser-based software package for human-machine interfaces (HMI) and supervisory control and data acquisition (SCADA). All the features found in conventional HMI and SCADA software packages are available in an ordinary browser including Animated Graphics Displays, Real-time Data Control, Trends, Alarms and Logs. WebAccess is based on standard Internet architecture, its basic components include SCADA Node, Project Node, Client and Thin Client.

Web-browser Client to View and Control

Using a standard Web browser, users can view and control automation equipment used in industrial, manufacturing, process and building automation systems. Data is displayed to users in real-time with dynamically updated graphics using full-motion animation.

Historical and Real-time Trending, Data Logging and Centralized Logs

Each tag is logged to a separate file on the SCADA node, and user can view the real-time and historical data from the historical trend. Besides, new tags can be added to a historical trend display without losing history of other tags. Real-time data, alarms and events from all nodes are logged to central ODBC database.

Scheduler and Report

The Scheduler provides control and changes setpoint status based on time and date. Lights, fans, and HVAC equipment are turned on and off based on the time, day of week and date. The Scheduler is also used in process control and manufacturing applications. All these schedule configurations can be modified remotely through Internet.

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IC Packaging and Test Machine

Machine Automation

Integrated circuit (IC) packaging is the final stage of semiconductor device fabrication, followed by IC testing. In IC packaging and test machines, providing a total solution from wafer probes, manufacturing, packaging, and testing to module assembly is the key to success. One machine maker wanted to develop advanced process technology for IC manufacturing, including thermally enhanced packages, flip chip packages and wafer bumping. They teamed up with Advantech to create a total solution, enabling them to vertically link up activities across the manufacturing value chain.

▶ System Requirements

The goal of this solution was to create a stable, high performance, information-enabled, and open control system with a robust computing controller and local operation interface. Advantech knew the key to this project was to integrate control, information processing, open networking interface and Microsoft Window Application together, and then fulfill user's optimization control requirements.
The requirements are:
• Multi close-loop temperature control   • Recipe & batch control   • Motion control
• Optimizing control parameter within each equipment   • Local operation

▶ Project Implementation

UNO-1172AE
PC-based
Controller
with Intel Atom CPU

APAX-5570XPE
PC-based
Controller with
Intel Celeron
M CPU

APAX-5520CE
PC-based
Controller with
Marvel XScale
CPU

APAX-5520KW
Micro PAC with
Marvel XScale
CPU

APAX-5013
8-ch RTD
Module

APAX-5028
8-ch Analog
Output
Module

APAX-5045
24-ch Digital
Input/Output
Module

APAX-5202P
2-port AMONet
Master Module

AMAX-2241/PMA
4-axis AMONet
Slave Module
for Panasonic Minas A

AMC

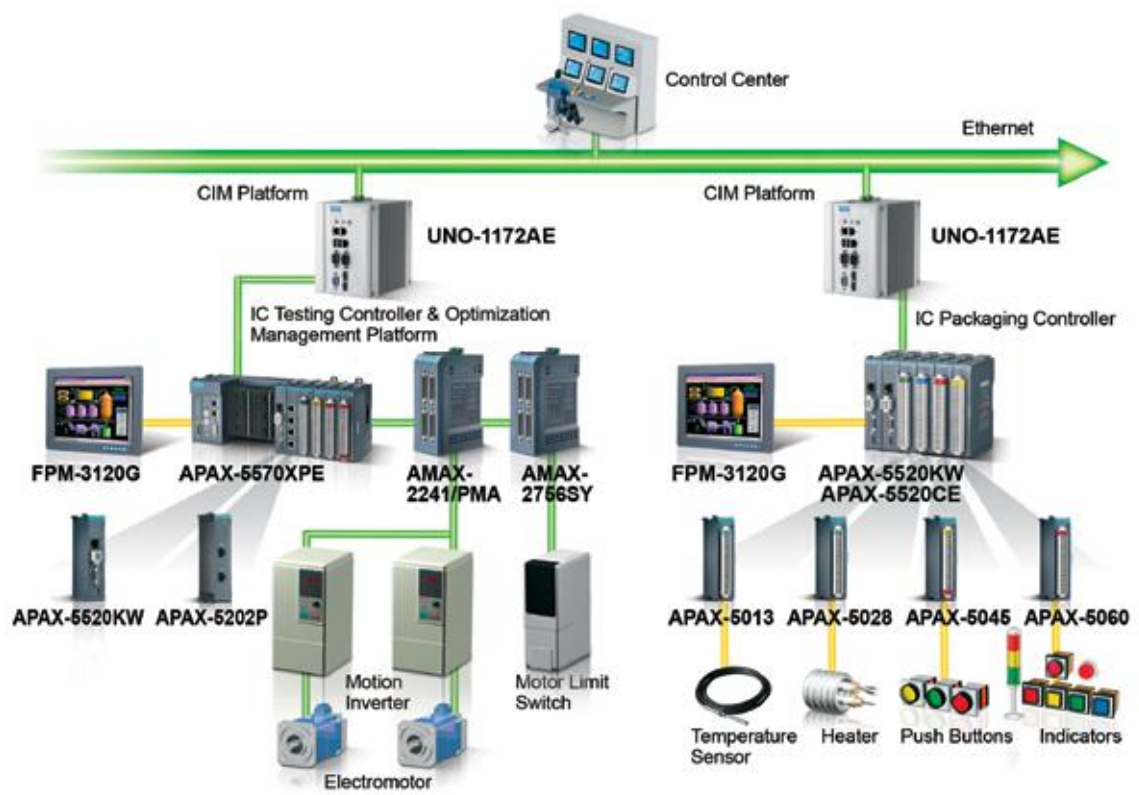**ADVANTECH**
Premier Partner

▶ System Description

There are two systems for this application. For the IC packaging controller, Advantech PAC delivers a dual CPU architecture to execute different tasks. APAX-5520KW executes PID, sequence, batch and motion control. Another CPU module, APAX-5520CE with HMI software, provides animated displays and self diagnostic functions, which reduces labor intensity and helps increase production efficiency and quality. For the IC testing controller and optimization management platform, APAX-5570XPE connects to an HMI display (FPM-3120G touchscreen monitor here), which enables users to easily edit, modify, store and analyze the production data for fine tuning production parameters. These parameters are sent to the APAX-5520KW to perform production line optimization. This system supports a total integration solution to link to the ERP and machine makers' service center. Collecting all equipment system diagnostic information in the UNO-1172AE controller allows the machine maker to develop their own CIM software, with maintenance and production information that can respond to any situation.

▶ Conclusion

This solution provided a complete, reliable, high performance and seamlessly integrated solution for the machine maker. The APAX system not only provided real-time control and operation, but also raw production data for analysis, statistics and management. Moreover, the versatile communication interface can easily integrate 3rd party devices and upload processed data to the supervisory level.

▶ System Diagram

Weighing and Packaging Machine
Machine Automation

Automatic and highly accurate weighing & packaging machines are critical for many sectors, like pharmaceutical, medicine, food & beverage, jewelry, gold, silver, and more. After the weighing process, a conveyor system transports the material to the packaging system. In recent years, these automatic weighing & packing devices have started to include intelligent features such as flexible orders and more detailed production systems. One of Advantech's clients was looking to upgrade their weighing and packaging machinery with a powerful PAC to achieve high-precision driving with high-end capabilities.

▶ System Requirements

In the past this customer had been using a PLC with a touchscreen, which was causing them a lot of problems, such as difficulty in integrating 3rd party weighing scales via communication interface, difficulty in PLC motion control and interlock control functions, and running out of memory for control and production parameters. They were looking for a powerful new PAC to realize easy expansion capabilities with simple secondary development to achieve high-precision driving with advanced features. Advantech's APAX-6571XPE and AMAX-2000 series were the ideal solution to integrate motion, networking & information processing functionality.

▶ Project Implementation

FPM-3120G
Industrial 12.1" SVGA Flat Panel Monitor

APAX-6572WES + APAX-5202P
PC-based Controller with Atom CPU

AMAX-2242/J2S
4-axis AMONet Motion Slave Module for Mitsubishi MR-J2S

AMAX-2756SY
16/16-ch Isolated Digital Input/Output Slave Module

**ADAM-4117**
Robust 8-ch Analog Input Module with Modbus

▶ System Description

This system uses Advantech's APAX-6572WES controller and realizes complicated processing by integrating high-precision motors and high-power variable frequency drives. Combining digital input and output achieves integration and optimization of incorporated control. Through the built-in AMONet port, AMAX-2242/J2S and AMAX-2756SY can be managed by APAX-6572WES through APAX-5202P. AMAX-2242/J2S controls four Mitsubishi motors revolving the conveyer belt. AMAX-2756SY receives digital sensor signals and generates output signals to control LED indicator, buzzer, switches and buttons. To get the weight information of the object, ADAM-4117 is connected through RS-485 to measure the analog signal from the weighing-scale. FPM-3120G and its resistive touchscreen functionality complete the system with flexible HMI. AMONet has been implemented to ensure time-deterministic control with 1 ms time interval. APAX system provides C and .NET API for high-performance motion and DI/O control. Furthermore, Microsoft embedded systems allows conversion and storage between the HMI and database to be easily realized, while production data can be transmitted to the back database via Ethernet.

▶ Conclusion

This application focuses on high accuracy measurement and motion control. By connecting APAX-6572WES with ADAM-4000 and AMONet motion modules, the system integration effort has been greatly shortened, improving both reliability and accuracy. By integrating a high-precision motor and high-speed data acquisition modules, the overall system cost has been greatly reduced as well, reducing the overall wiring & cabling cost. With the help of high speed computing, mass storage and versatile communication interfaces, the system now meets the requirements of rapid communication with high-precision weighing and quick data acquisition.

▶ System Diagram
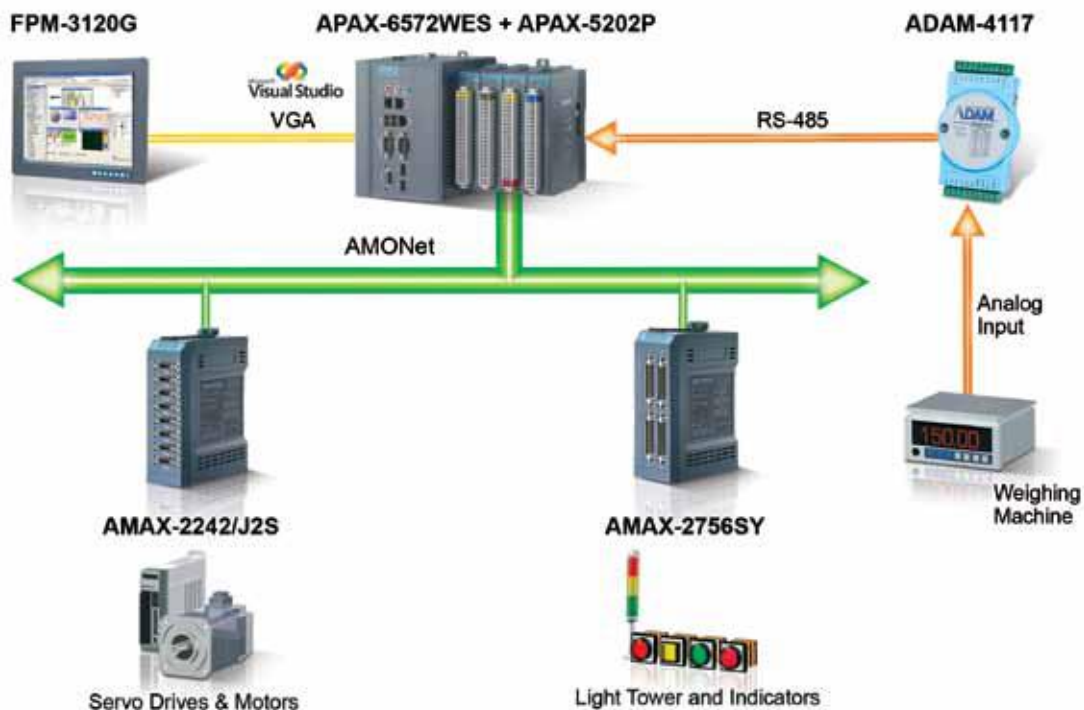
Solar Cell Loader/Unloader Application

Machine Automation

Vertrieb durch **AMC**

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In the solar cell manufacturing process, cells need to be loaded into each in-line system and then unloaded after the process is complete. In order to properly handle these cells, the position control of the conveyor belt and robotic machines must be highly accurate, or there can be significant risk of damaging the cells or ruining an entire batch. Advantech PAC products helped create a solution for this complex solar cell loader/unloader project, which was aimed at reducing wiring costs and improving the reliability of communication.

▶ System Requirements

The traditional control system for this application was highly complicated, making maintenance and troubleshooting very difficult. This customer needed a distributed motion control architecture to help increase the reliability of the communications between subsystems. In addition, the installation space was very limited, so a DIN-rail mounted controller was necessary. Other requirements are as follows:
• Real-time distributed motion control
• Flexible I/O expansion
• A simplified distributed real-time cabling infrastructure to reduce wiring
• The ability to integrate all production information into MES and CIM systems

▶ Project Implementation

APAX-5570XPE
PC-based Controller with
Intel Celeron M 1 GHz CPU

APAX-5202P
2-port AMONet
Master Module

AMAX-2243/YS2
4-axis AMONet Motion Module
for Yasakwa Sigma-II

**AMAX-2752SY/
AMAX-2754SY**
32-ch AMONet Isolated Digital
Input/Output Slave Module

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▶ System Description

Advantech provided the AMAX-2243/YS2 to control the conveyer belt and the solar cell lifting mechanisms. A junction cable and wiring terminal board was also provided to allow the AMAX-2243/YS2 to connect with a Yaskawa servo motor. The AMAX-2752SY/2754SY are used to integrate all light indicators, switches and buttons. The APAX-5570XPE is the main controller for this project. It communicates with the solar cell process controller and issues the motion control commands to the AMAX-2000 slave I/O modules. All the production information is also stored here for further integration into MES and CIM systems.

▶ Conclusion

High speed capabilities with accurate position control are the key to efficient performance on a semi-conductor production line. Leveraging the flexibility of a decentralized motion control system is the best way to meet the strict demands of this kind of application. Advantech's PAC solution with AMONet is the best solution able to increase performance by simplifying the system architecture and replacing the centralized motion control architecture with a decentralized motion control solution.
This new system is easier to maintain and troubleshoot. In the past, this customer needed to stop production and open the chassis of their machine to maintain the plug-in motion control and DAQ cards, which is not necessary any longer with this APAX-5000 solution.

▶ System Diagram

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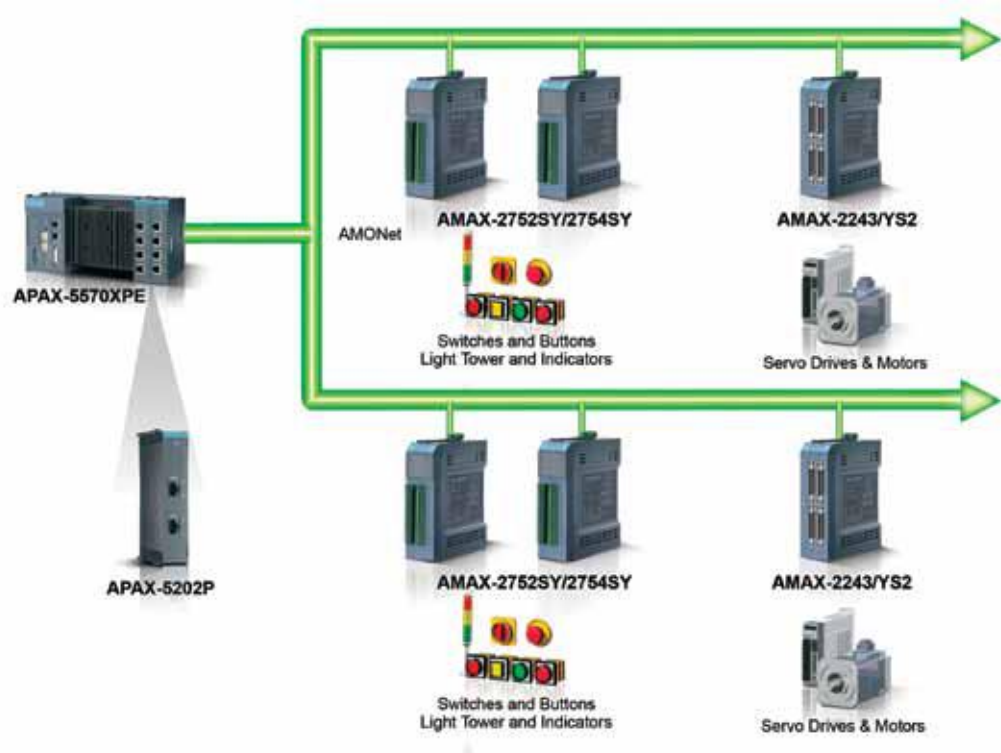
Expressway Tunnel Monitoring System

Transportation

This expressway tunnel monitoring system utilizes a distributed network control architecture, including Ethernet switches, a zone controller and a local controller. The ultra-compact and high cost-performance controller greatly simplifies system architecture and connection.
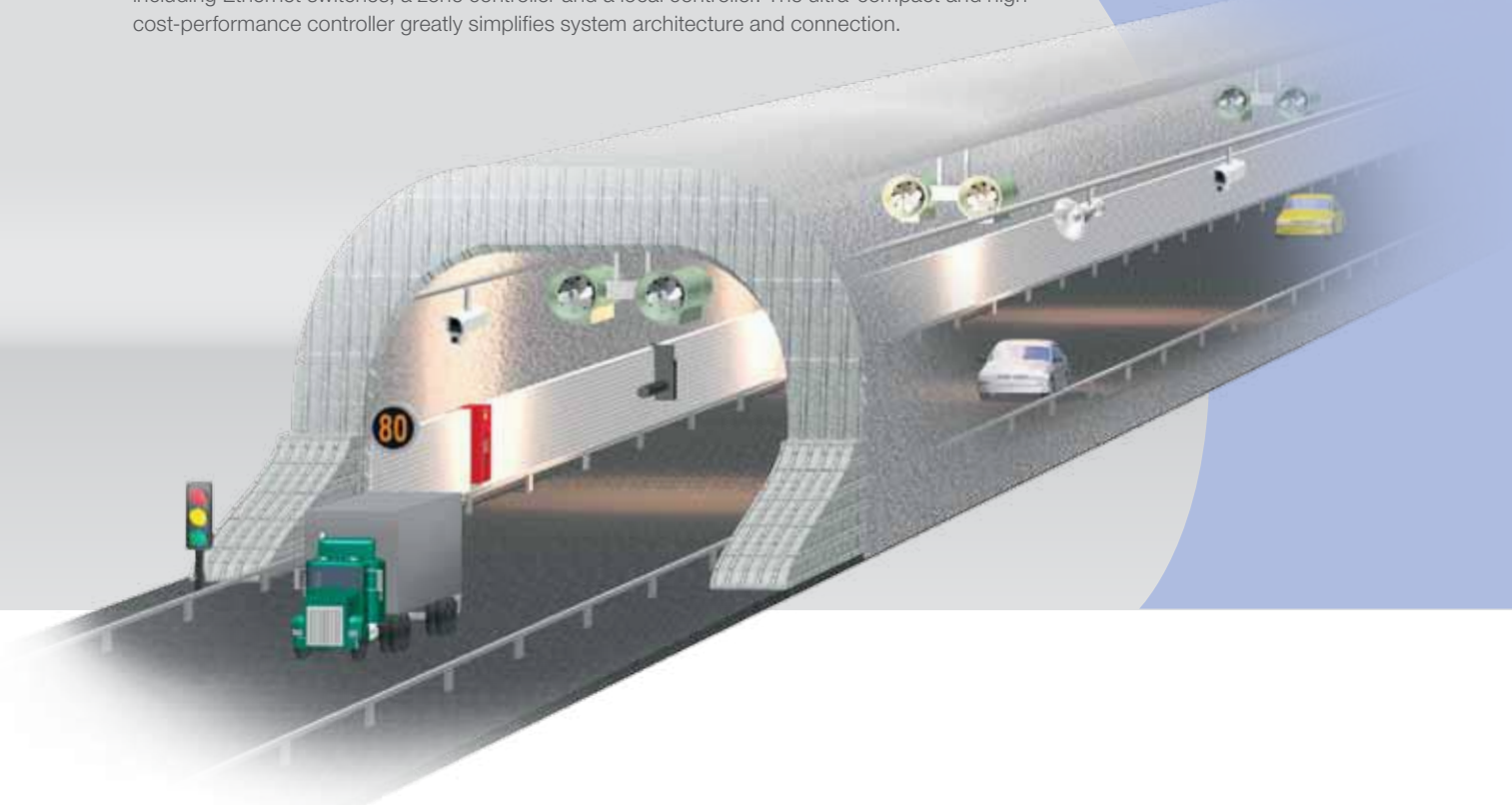
▶ System Requirements

Tunnels can be classified into four categories by length: short tunnels (L<250m), middle long tunnels (250m<L<1000m), long tunnels (1000m<L<3000m) and super long tunnels (L>3000m). The longer the tunnel, the more monitoring devices are needed. According to the sub-systems, the tunnel monitoring system can be divided into: the lighting system, a ventilating system, traffic guidance system, CCTV system, fire alarm system, fire control system, emergency telephone system, broadcasting system, and additional tertiary tasks. The tunnel monitoring system can be classified into four groups by device: testing devices, controlling devices, display devices and communication devices. Testing devices include fire-alarm probes, vehicle detectors, COVI, visibility sensors, and wind sensors. Controlling devices include a traffic area controller, illuminated area controller, and ventilated area. Display devices include a computer workstation, large-scale monitor, and solar alarm. Finally the communication devices include switches, hubs, serial signal transmission equipment, optical transmitter and receiver.

▶ Project Implementation

EKI-7659C
8+2G Combo Port Gigabit Managed Redundant Industrial Ethernet Switch

APAX-5343E
Power Supply for APAX Expansion Modules

APAX-5520KW
Micro PAC with Marvel XScale CPU

APAX-5017
12-ch Analog Input Module

APAX-5018
12-ch Thermocouple Input Module

APAX-5040
24-ch Digital Input Module

APAX-5060
12-ch Relay Output Module

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▶ System Description

The zone controllers are used to collect information from field testing devices, process the information and send the information to the local control center. Control commands from the local control center are then sent to the zone controllers in order to directly control the corresponding devices. If the connection between the local control center and zone controllers is broken, the zone controllers can independently control field devices. Therefore, the zone controllers must be highly reliable. Advantech PAC is used as tunnel monitoring zone controller (APAX-5520KW). It supports backup functionality. Each controller offers serial port to communicate with other industrial devices. APAX high-performance I/O modules could meet signal processing commands of monitoring system. Every module is stacked and provides multiple functionality and program capacity, and is easy to detach and maintain.

▶ Conclusion

APAX-5520KW can be simply used as the backup zone controller, concentrating on I/O process. In this way, it will not be disturbed by any other task and will achieve the most efficient and real-time control capability. APAX-5570XPE/5571XPE installed at central control room can process other tasks, such as HMI/SCADA, process, database, data log and communication with other systems. This architecture ensures system reliability, because APAX-5520KW could continuously implement I/O tasks without disturbing by other tasks running on APAX-5570XPE/5571XPE.

▶ System Diagram
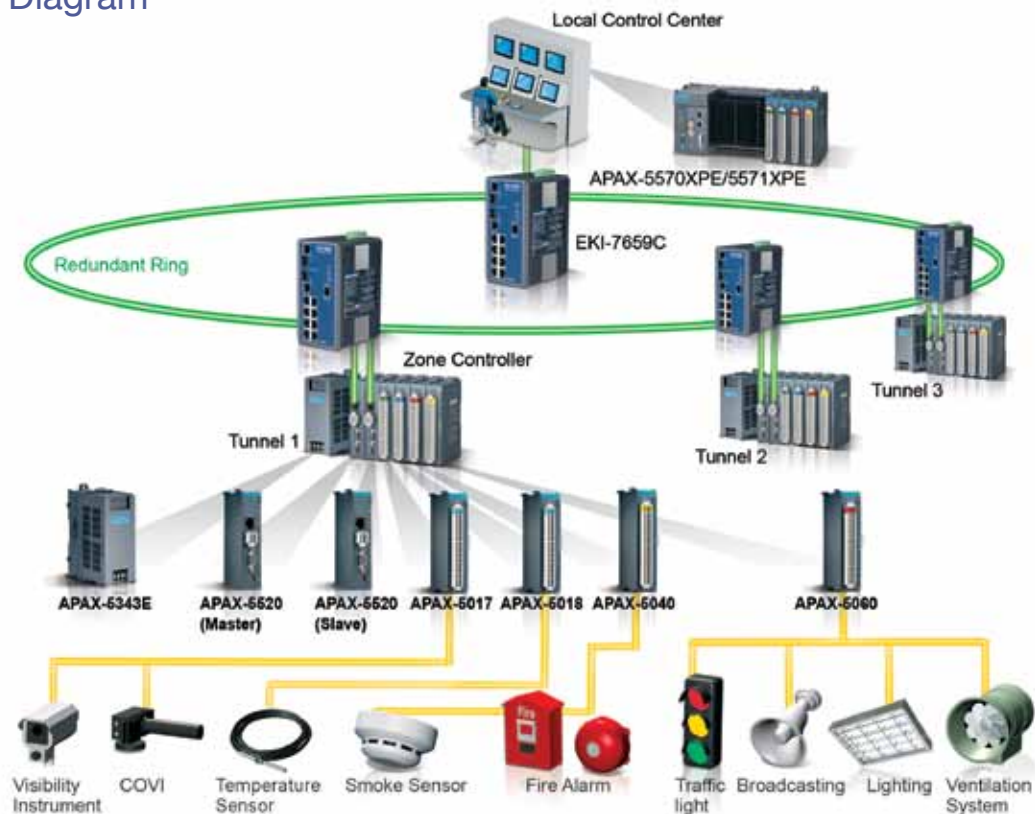
Energy & Equipment Management
Facility Management and Control

Vertrieb durch **AMC**
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Energy issues are becoming more important as our natural energy resources gradually deplete. Many enterprises, manufacturers, stores, and even governments are trying their best to optimize energy management to reduce costs. Advantech's PAC solution combines powerful integration capabilities with robust hardware to provide solutions for any energy management system. This solution is suitable to save operation costs for chain stores and enterprises of all kinds.

▶ System Requirements

Chain stores with efficient energy management systems have proven there can be a significant amount of annual savings in operating costs. The key to implementing these systems is implementing powerful controllers, robust communications and open architectures. HVAC, gas meters, water meters, lighting control, and video security are integrated. The openness of PC technology has driven system integrators to adopt management systems with open platforms. This means that they can flexibly choose or build their own energy saving software under popular Microsoft platforms, as long as the hardware provided is capable of delivering data between hundreds of chain stores and the central monitoring station.

▶ Project Implementation

Advantech WebAccess
Browser-based HMI/SCADA Software

FPM-3120G
12.1" SVGA Industrial Monitor with Resistive Touchscreen

APAX-6572WES
PC-based Controller with Intel Atom CPU

EKI-2525
5-port Unmanaged Ethernet Switch

APAX-5520KW
Micro PAC with Marvel XScale CPU

APAX-5017
12-ch Analog Input Module

APAX-5045
24-ch Digital Input/Output Module

APAX-5060
12-ch Relay Output Module

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▶ System Description

This energy management system can be easily achieved through Advantech's APAX-5000 series. APAX-5000 delivers a new architecture, providing two individual controllers for different tasks. APAX-5520KW, running KW IEC-61131-3 I/O SoftLogic, performs many data acquisition and control functions, acting as a centralized measuring and control system. Contributed by the APAX-5000's flexible topology, many different kinds of I/O modules can be installed in different locations to read data from sensors and equipment, and controlled by the APAX-5520KW remotely (including utility temperatures, humidity, sunlight and more). Data from power consumption devices can also be read. All necessary data can be transferred to APAX-6572WES, which performs energy optimization based on the Advantech's WebAccess HMI/SCADA software, as well as communicates with the control center and IP camera for video surveillance. APAX-5000 series' architecture separates I/O process control from HMI/SCADA, making the system more reliable, and ensuring I/O processes won't be affected by HMI/SCADA software tasks.

▶ Conclusion

Advantech's APAX-5000 series offers a unified and open platform to satisfy demands for applications of this type. It decreases system integration difficulty, allowing engineers to easily integrate communication, HMI/SCADA, database and control in a short amount of time through a standard development environment. Another important feature is the hot swap functionality, allowing I/O modules to be replaced while the system is running. It helps saving system maintenance costs and increasing system reliability.

▶ System Diagram
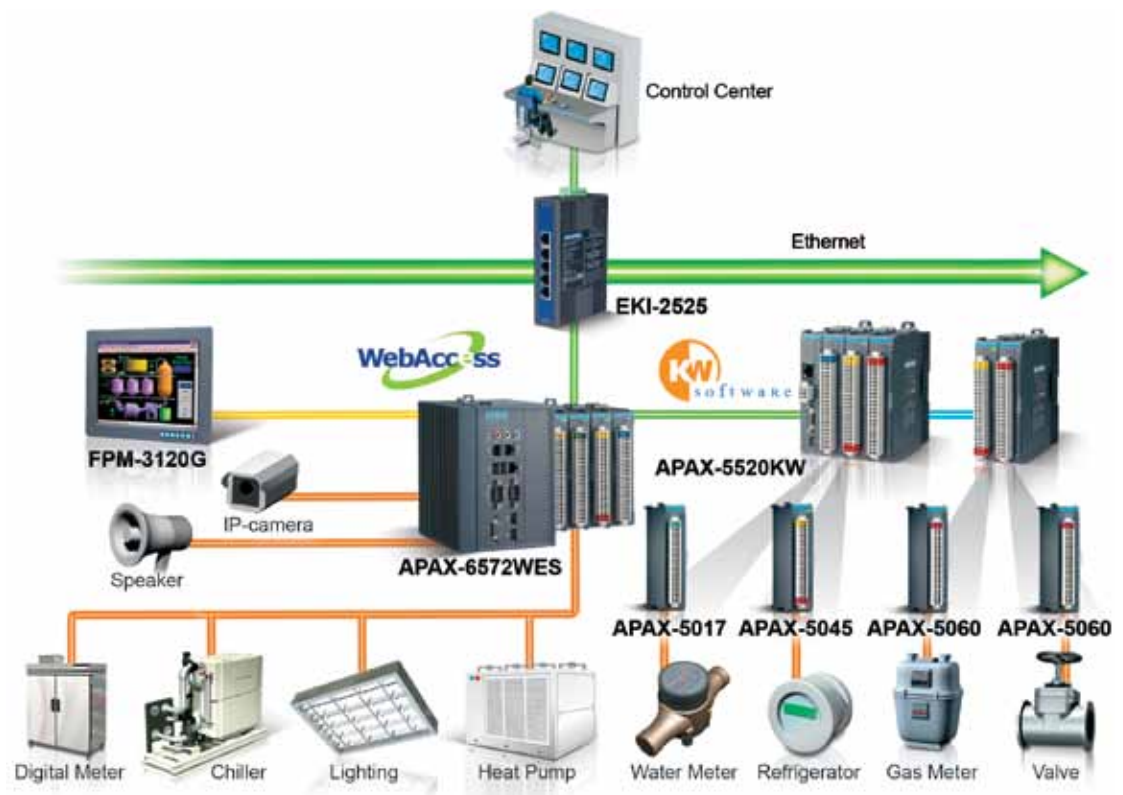
Wind Energy Control System

Power & Energy

Distributed Energy Resource (DER) systems are small-scale power generation technologies (typically in the range of 3 kW to 10,000 kW) used to provide an alternative to or an enhancement of traditional electric power systems. Wind energy is one of the major power sources for DER, especially for standalone power generators within a smart grid system. One of Taiwan's leading smart grid projects is working to integrate wind energy systems to develop a complete system with an excellent cost/performance ratio. They turned to Advantech for a solution which could deliver pitch control, hydraulic system monitoring and wind turbine control.
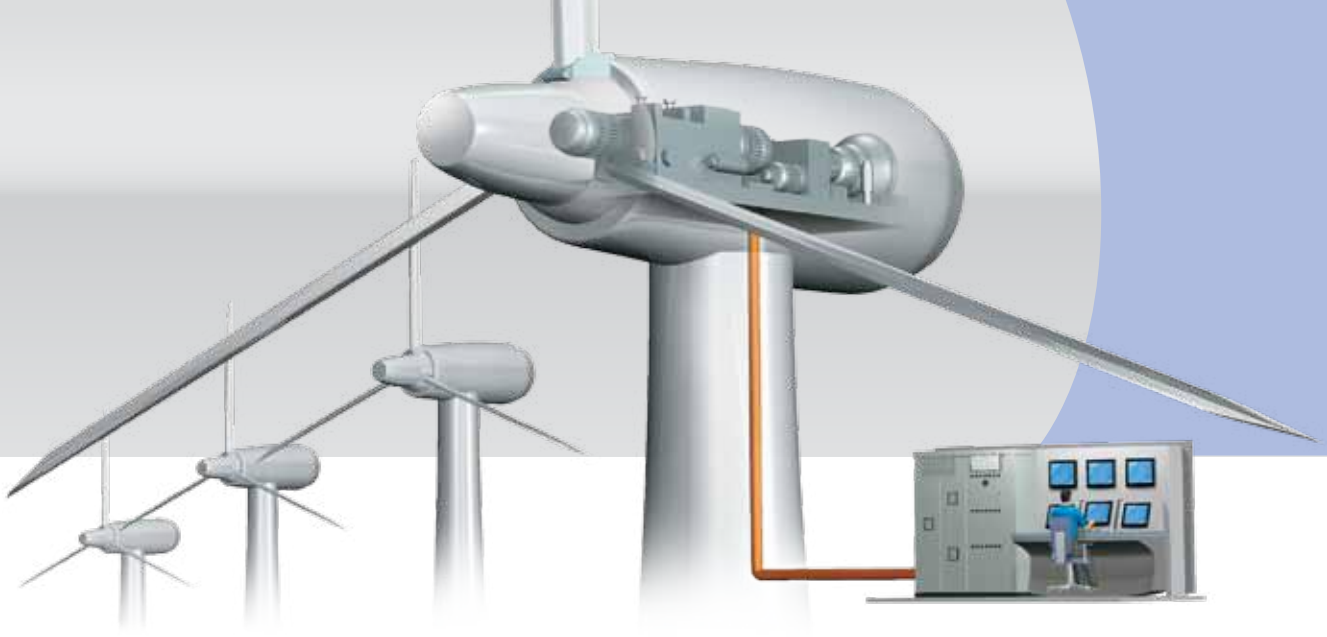
▸ System Requirements

To provide easy maintenance and accessibility through the web, our client needed a dedicated HMI device able to manipulate the wind control system from the tower base and provide real-time monitoring capabilities. Furthermore, the integrator required a reliable and compact PAC controller that could receive wind speed/direction analog signals from an anemometer to direct the nacelle and rotor blade in order to catch the optimal wind direction. They also wanted to program a pitch control algorithm using SoftLogic to slow the blades from moving too fast in the event of high winds or abnormal vibrations from the wind tower. Furthermore the relative devices used in such kind application utilize CANopen as the standard communication protocol, so compatibility with the software was important.

▸ Project Implementation

WebView-1270
12.1" Web-enabled HMI with Intel® Celeron® M

APAX-5620KW
Micro PAC with Marvel XScale CPU and CAN

APAX-5017H
12-ch High Speed Analog Input Module

APAX-5013
8-ch RTD Module

APAX-5060
12-ch Relay Output Module

APAX-5045
24-ch Digital Input/Output Module

APAX-5080
4-ch AB Encoder Input Module

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▶ System Description

APAX-5521KW combined with APAX I/O modules were integrated into the wind control system to provide optimum control. As a powerful PAC controller with embedded KW SoftLogic, APAX-5620KW is the best platform to provide real-time deterministic execution of complicated pitch control application. Furthermore, it takes advantage of one CANopen interface and one LAN ports to offer communication ability with other devices. The APAX-5080PEC high-speed counter module provides accurately encoded A/B/Z signals from wind yaw and rotor blades. Through APAX-5060, 12 channel relay output can be connected to the hydraulic system to control the yaw and rotor blades.

▶ Conclusion

Electrical rotor blade adjustment has come to be a standard feature for modern wind energy plants. Not only does it offer significant advantages for the pitching systems, but also ensures the wind turbine operates at optimum yield under all weather conditions. Advantech APAX offers an integrated, scalable and modular control system for this wind turbine control system.

▶ System Diagram
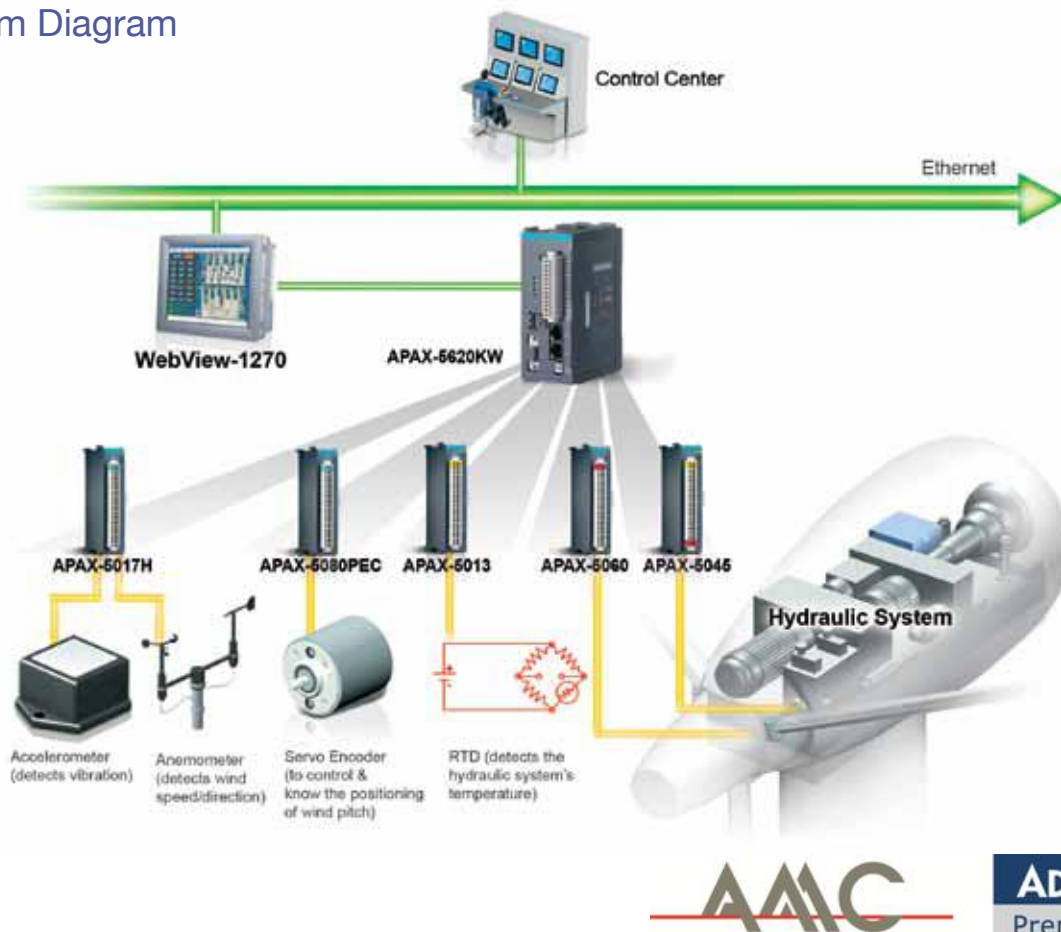
Ordering Information

ADAM Series

Programmable Automation Controller (PAC)

ADAM-5550KW	Micro PAC w/ GX2, KW, 8-slot
MPROG-BAS33	KW Multiprog Basic v3.3 (128 bytes I/O)
MPROG-ADV33	KW Multiprog Advanced v4.6 (64 kbyte I/O)
ADAM-5510KW	4-slot PC-based SoftLogic Controller
MPROG-BAS33	KW Multiprog Basic v3.3 (128 bytes I/O)
ADAM-5510KW/TCP	4-slot Ethernet-enabled SoftLogic Controller
MPROG-BAS33 KW	Multiprog v3.3 for WinNT/2K/XP (128-byte I/O)
ADAM-5510EKW/TP	8-slot Ethernet-enabled SoftLogic Controller
MPROG-BAS33 KW	Multiprog v3.3 for WinNT/2K/XP (128-byte I/O)

PC-based Controller

ADAM-5550CE	8-slot PC-based Controller w/ GX2 CPU
ADAM-5510/TCP	4-slot PC-based Controller w/ Ethernet
ADAM-5510E/TCP	8-slot PC-based Controller w/ Ethernet
ADAM-5510M	4-slot PC-based Controller w/ RS-485
ADAM-5510E	8-slot PC-based Controller w/ RS-485
ADAM-5000L/TCP	4-slot Ethernet-based Distributed DA&C System
ADAM-5000/TCP	8-slot Ethernet-based Distributed DA&C System
ADAM-5000/485	4-slot Distributed DA&C System for RS-485
ADAM-5000E	8-slot Distributed DA&C System for RS-485

Communication

ADAM-5090	4-port RS-232 Module
ADAM-5091	4-port RS-232 Module w/ Share Interrupt
ADAM-5095	2-port CAN Module w/ Isolation Protection

Analog Input

ADAM-5013	3-ch RTD Input Module
ADAM-5017	8-ch Analog Input Module
ADAM-5017P	8-ch Analog Input Module w/ Ind. Input Range
ADAM-5017UH	8-ch Ultra High Speed Analog Input Module
ADAM-5018	7-ch Thermocouple Input Module
ADAM-5018P	7-ch Thermo. Input Module w/ Ind. Input Range

Analog Output

ADAM-5024	4-ch Analog Output Module

Digital Input

ADAM-5050	16-ch Universal Digital Input/Output Module
ADAM-5051	16-ch Digital Input Module
ADAM-5051D	16-ch Digital Input Module w/ LED
ADAM-5051S	16-ch Isolated Digital Input Module w/ LED
ADAM-5052	8-ch Isolated Digital Input Module
ADAM-5053S	32-ch Digital Input Module
ADAM-3920	20-pin Flat Cable Wiring Board
PCL-10220	40-pin IDC to two 20-pin IDC cable, 1 m

Digital Output

ADAM-5056	16-ch Digital Output Module
ADAM-5056D	16-ch Digital Output Module w/ LED
ADAM-5056S	16-ch Sink Type Iso. DO Module w/ LED
ADAM-5056SO	16-ch Source Type Iso. DO Module w/ LED
ADAM-5057S	32-ch Digital Output Module
ADAM-3920R	20-pin Flat Cable Wiring Relay Board
PCL-10220	40-pin IDC to two 20-pin IDC cable, 1 m
ADAM-5060	6-ch Relay Output Module
ADAM-5068	8-ch Relay Output Module
ADAM-5069	8-ch Power Relay Output Module w/ LED

Digital Input/Output

ADAM-5055S	16-ch Isolated Digital I/O Module w/ LED

Counter/Frequency

ADAM-5080	4-ch Counter/Frequency Module
ADAM-5081	4-ch High Speed Counter/Frequency Module

Specific Modules

ADAM-5202	2-port AMONet Master Module
ADAM-5240	4-axis Stepping/Pulse Servo Motor Control Module
ADAM-5030	2-slot SD Storage Module

Power Supply

PWR-242	DIN-rail Power Supply
PWR-243	Panel Mount Power Supply
PWR-244	Panel Mount Power Supply

APAX Series

Controller

APAX-6572	PAC with Intel Atom D510 CPU
APAX-5570	PAC with Intel Celeron M 1 GHz CPU
APAX-5571	PAC with Intel Celeron M 1.5 GHz CPU
APAX-5520CE	PAC with Marvel XScale CPU, WinCE
APAX-5520KW	PAC with Marvel XScale CPU, KW
APAX-5620CE	PAC with Marvel XScale CPU, CAN, WinCE
APAX-5620KW	PAC with Marvel XScale CPU, CAN, KW

Communication and Coupler

APAX-5090P	4-port RS-232/422/485 Comm. Module
APAX-5095P	2-port CANopen Module
APAX-5070	Modbus/TCP Communication Coupler
APAX-5071	Profinet Communication Coupler
APAX-5072	Ethernet/IP Communication Coupler

Analog Input

APAX-5013	8-ch RTD Module
APAX-5017	12-ch Analog Input Module
APAX-5018	12-ch Thermocouple Input Module
APAX-5017H	12-ch High Speed Analog Input Module

Analog Output

APAX-5028	8-ch Analog Output Module

Digital Input

APAX-5040	24-ch Digital Input Module

Digital Output

APAX-5046	24-ch Digital Output Module
APAX-5060	12-ch Relay Output Module

Digital Input/Output

APAX-5045	24-ch Digital Input/Output Module

Counter/Frequency

APAX-5080	4/8-ch High Speed Counter Module
APAX-5082	8-ch Pulse Width Modulation Module

Power Supply

APAX-5343	Power Supply for APAX-5570 Series
APAX-5343E	Power Supply for APAX Expansion Module

Backplane

APAX-5001	1-slot Backplane Module
APAX-5002	2-slot Backplane Module with RJ-45 port
APAX-5002L	2-slot Backplane Module

Motion Control - AMAX Series

Motion Slave

APAX-5202P	2-port AMONet Master Module

Motion Slave

AMAX-2241/PMA	4-axis AMONet Motion Module for Panasonic Minas A
AMAX-2242/J2S	4-axis AMONet Motion Module for Mitsubishi MR-J2S
AMAX-2243/YS2	4-axis AMONet Motion Module for Yaskawa Sigma-II

Digital Input/Output Slave

AMAX-2752SY	32-ch Isolated Digital Input AMONet Module
AMAX-2754SY	32-ch Isolated Digital Output AMONet Module
AMAX-2756SY	16/16-ch Isolated Digital I/O AMONet Module

Accessories

PCL-10220M-2	20-pin SCSI Cable, 2 m
PCL-10150M-2	50-pin SCSI Cable, 2 m
ADAM-3940	Wiring Board for AMAX-2240 Series

Software

KW Multiprog

MPROG-PRO535E	KW Multiprog Pro v5.35

Advantech WebAccess

WebAccess-70-AE	WebAccess V7.0 Software Suit Package
968W0070P0	WebAccess 150 tags control file (Professional)
968W0070P1	WebAccess 300 tags control file (Professional)
968W0070P2	WebAccess 600 tags control file (Professional)
968W0070P3	WebAccess 1200 tags control file (Professional)
968W0070P4	WebAccess 5000 tags control file (Professional)
968W0070P5	WebAccess 20K tags control file (Professional)
968W0070P6	WebAccess 99K tags control file (Professional)

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