Advantech Control IPC

Providing Fieldbus Control, Connectivity and Sustainability for Smart Factories

- ✓ Smart Factories Applications
- ✓ Control IPC
- ✓ Software
- ✓ Hardware Architectures & Design
- ✓ Selection Guide

SoftLogic
Motion Control

Data Acquisition,
Scaling and
Processing

EtherCAT

PROFI BUS

EtherNet/IP

Real-time
Fieldbus

ADVANTECH

Enabling an Intelligent Planet

www.advantech.com.tw/APAX

Control IPC in Smart Factories

APAX-5580 Control IPC is an industry first modular IPC, it is a PC-based control platform with comprehensive I/O modules, communication ports and control software for choice. It is particularly designed for integrating Operational Technology (OT) and Information Technology (IT) to take advantage of the trend in Industry 4.0 and realize smart factories in MES Integration & Production Traceability, Machine Automation, Equipment Monitoring & Optimization and Factory Environment Monitoring applications.

Managem

APAX-5580
Smart Factory Data Gateway
Bridges IT and OT System

Machine Automation

Machine Controller

- Fieldbus support and complete I/O modules ensuring a reliable connection with all PLCs, controllers and equipment from major providers
- IEC 61131-3 integration for real-time, stable control
- Library support to reduce configuration effort & focus on system design

Equipment Monitoring & Optimization

Manufacturing Testing Controller

- Expandable I/O design for customizing a large tag system and meeting the needs of test data collection
- Real-time equipment control and reaction

MES Integration & Production Traceability

Smart Factories Data Gateway

· All-in-one design with computing, I/O and communication
  integrated for easy configuration and rational wiring
· Real-time data acquisition and information display
· Compact Size and robust design for adapting to specific sites
· PC-based platform for satisfy diverse software application needs

ent & Analysis System

Factory Environmental Monitoring

Facility Data Collector

· Readiness I/O modules to suit all types of
  environmental monitoring sensors in the factory
· Distributed I/O design to collect wide area data and
  simplify the system building and troubleshooting time

Control IPC : APAX-5000 Series

Advantech's Control IPC is a powerful control platform for IoT and other industrial automation applications. Its computing power and different types of standard high speed communication interface make big data processing and decentralized architecture possible. Users can easily add their own vertical application software with the Control IPC and implement the system in automation field sites.

Reduce Data Acquisition Loading
• Built-in DSP for I/O access
• Modular APAX I/O module
• Distributed topology and decentralized comport

Scalable Solution
• Various CPU performance from RISC to Core i7
• Softlogic and SCADA software compatibly

Boundless Communication
• Internal SIM slot for cellular communication
• Reserve antenna hole
• mPCIe for Wi-Fi, BLE and GPS

Open Develop Environment
• Embedded Microsft Windows support with EWF, HORM and VS.NET framework
• Free API for WDT, RTC, H/W monitoring and I/O access
• Linux support

WebAccess

intel CORE i7 inside

Windows Embedded Standard 7

CODESYS

Stable Automation Platform
- mSATA as the primary disk for anti-vibration
- UPS to avoid unexpected power shut down
- System backup and one key recover
- Hardware status monitoring

High Performance Control IPC

APAX-5580

By providing the latest Intel CPU inside, the high computing power, rich connectivity and I/O control system can be done by one platform. It brings the new description of the next generation control platform.

## Compact Control IPC

APAX-5620

Its bigger size brings the more serial interfaces and Ethernet ports and even two CANBus ports. It means users have more chances to design more complex topologies. Data gateway is one of its applications.

Robust Design
- Fanless design
- Compact size for control cabinet
- High accuracy RTC and Multilevel WDT
- 10 years lifetime battery

New Automation Platform for Smart Factories

For the Industrial IoT, computing and connectivity are both key features of the automation controller. Big data processing and the capacity to connect with other devices or sensors will become the baseline of an IoT control platform.
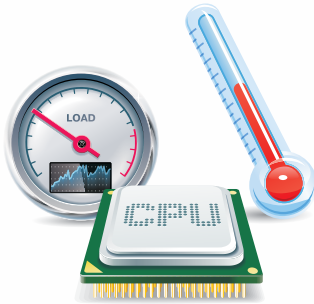
Real-time H/W Monitoring

A stable platform is the most important thing in automation sites. As soon as there's an abnormal situation on the system, users can take action and avoid any unexpected errors at the beginning. Advantech's Control IPC can monitoring to monitor CPU load, system voltage and I/O module status, then users can access this data by API or our utility without any complicated programming.

Versatile Connectivity Interface

Connectivity is another major aspect of PC-based control, especially for integrating Information technology and Operation technology in the Industry 4.0 eras. The standard interface enable control platform connect different kinds of remote devices and become a data gateway through wired or wireless technology. Whether using industrial or IT communication protocols, Advantech Control IPC is the best solution as a data gateway or data process center.
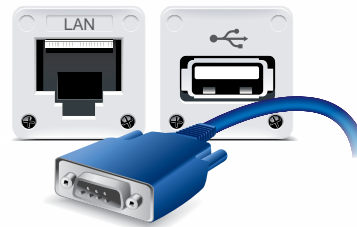
Data Analysis and Storage

Advantech's Control IPC series can provide not only excellent real-time I/O control, but also information processing benefits for automation application. With the ability to perform field operations, data exchange and valuable information collection, Control IPC is able to execute efficient decision-making. Information processing includes data logging and analysis with storage devices like SD or CF cards, and database exchanges through SQL and OPC.

Data Synchronization

Control IPC deliver data synchronization functionality for CPU redundancy 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' redundancy function is enabled, the APAX system will automatically delegate one controller to be the master. If the controller is switched, it means an error occurred on the previous master device. Therefore engineers can repair or swap this without shutting down the whole system.
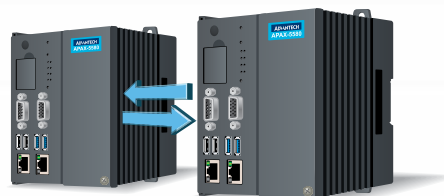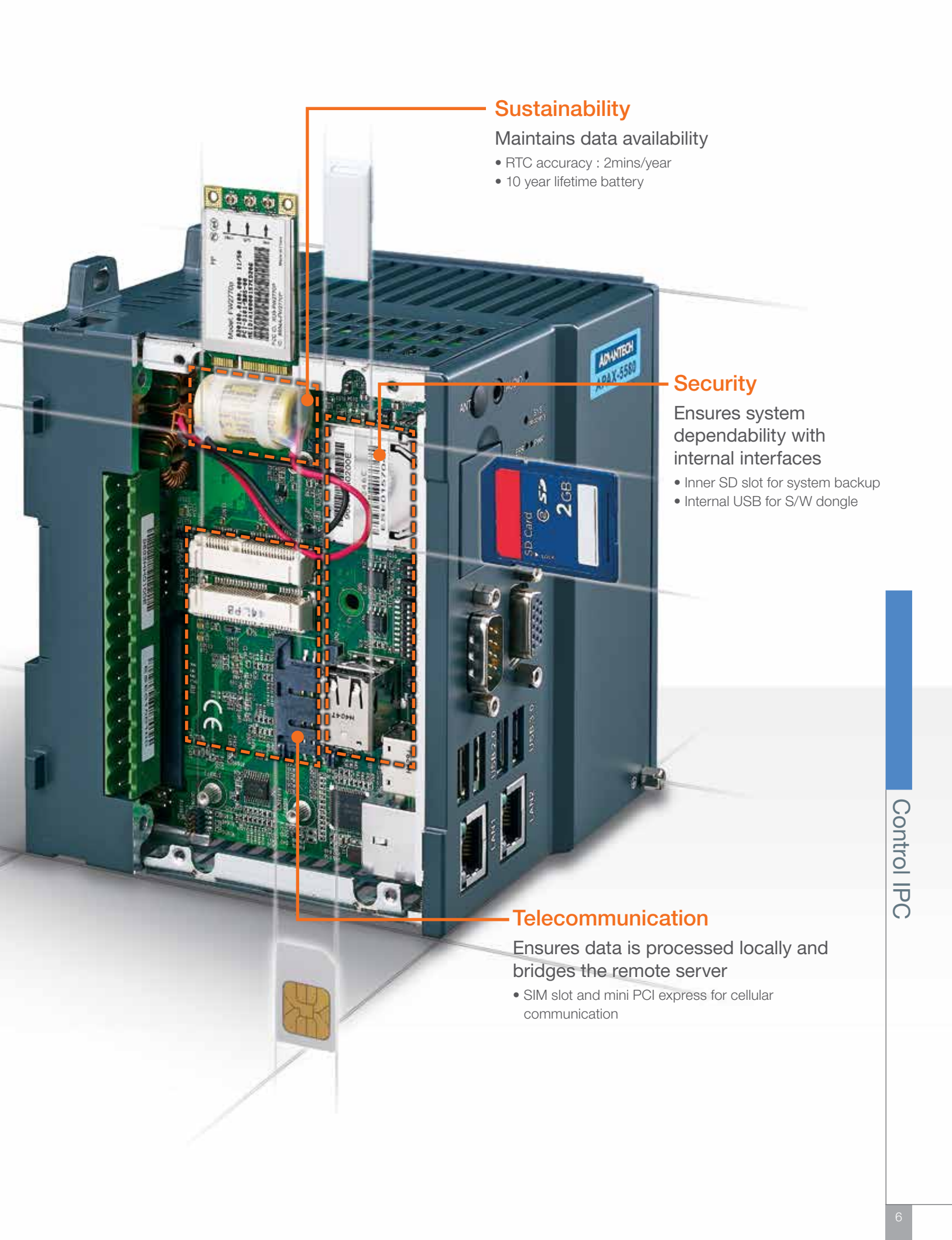
Sustainability

Maintains data availability

- RTC accuracy : 2mins/year
- 10 year lifetime battery

Security

Ensures system dependability with internal interfaces

- Inner SD slot for system backup
- Internal USB for S/W dongle

Telecommunication

Ensures data is processed locally and bridges the remote server

- SIM slot and mini PCI express for cellular communication

SoftLogic Software and Utility

IEC 61131-3 SoftLogic Control
CODESYS

• Programming languages according to IEC 61131-3 standard
• Controllers can be configured and operated using a Web server via intranet or Internet
• Available in multiple languages and free to download from the CODESYS website

The CODESYS engineering tool is a de-facto standard widely implemented in OEM products. The Logic support and integration with the Human Interface makes CODESYS ideal for use in many different applications in the market; from machine automation, factory automation, building automation, facility, infrastructure etc.

I/O System Configuration and Testing Utility
AdamApax .NET Utility

Control IPC provides one free configuration and testing utility in the system. Users can search local and remote I/O module by this utility, and get current value of each channel. This is one very easy way to check the status of each module with our controller without any programming.
AdamApax Utility is based on VS.NET, that means all the functionality in this utility you can find the API in our .NET library. User can integrate those functionality into their own programming.
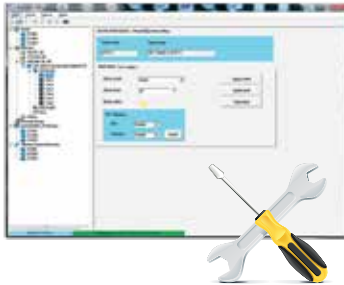
Remote Monitoring Software

Real-time Remote Diagnosis and Maintenance
DiagAnywhere

"DiagAnywhere", an abbreviation of "Diagnose Anywhere", is remote maintenance software for remotely monitoring and controlling Advantech control platform with Windows-based operating systems. Currently, DiagAnywhere includes the utility on the client side and the server on the target devices. The supported OS's include Windows XP, XP Embedded, Windows 7, WinCE 5.0 and WinCE 6.0. This useful software can help users to achieve major remote maintenance tasks including remote monitoring and control, remote screen snapshot and recording, file upload and download. Windows-based authentication is also supported for security concerns.

Remote Management and Hardware Monitoring
SUSIAccess

SUSIAccess is a remote management suite exclusively designed for Advantech embedded solutions to perform remote monitoring, active control, failure recovery and connected system protection. SUSIAccess supports both Windows and Linux platforms and works from the very entry level to high-end processors. Ready-to-use, easy-to-integrate.

PC-based Programming Software

VS.NET Development Environment
C/C++ and .NET library

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

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

Web-based HMI/SCADA Software
Advantech WebAccess

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

Advantech WebAccess is a 100% web-based HMI/SCADA software. It supports powerful remote monitoring and control functions through standard web browsers, so that users can easily monitor and control automation equipment with full featured SCADA functions by their Client or Thin Client device.

WebAccess

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.
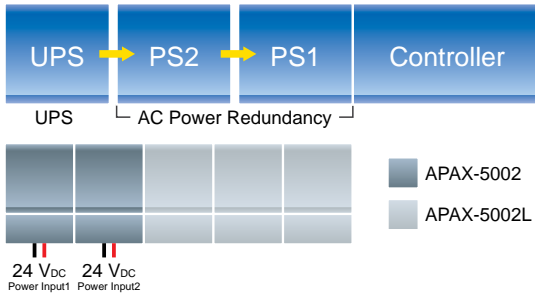
Software

Flexible System Architectures

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.

Robust Power System

Not only the single option of the power input, APAX provide the power redundancy and UPS to make our controller have the highest reliability in automation field.

UPS	PS2	PS1	Controller

UPS   └ AC Power Redundancy ┘

■ APAX-5002
□ APAX-5002L

24 V$_{DC}$ 24 V$_{DC}$
Power Input1   Power Input2

Controller Platform

Deliver fast computing, powerful functionality and rich connectivity likes an industrial PC. Three different level controller to make sure the best solution in the different application.
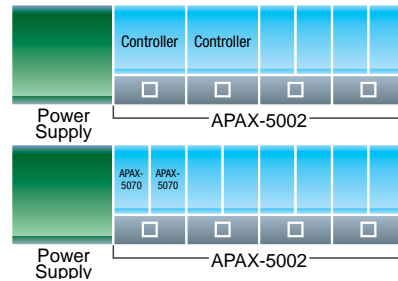
Controller   I/O
Power Supply   APAX-5002

Controller
Power Supply   APAX-5002

Controller
Power Supply
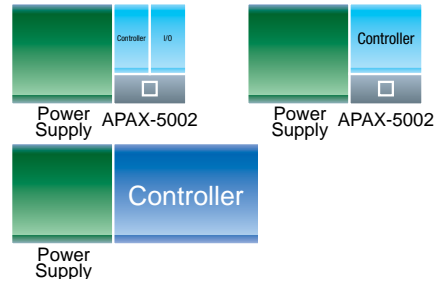
I/O System

APAX real-time I/O system can be working stand alone with APAX controller or linking to other automation system through couplers.

Controller
Power Supply   └ APAX-5002 ┘

Coupler
Power Supply   └ APAX-5002 ┘
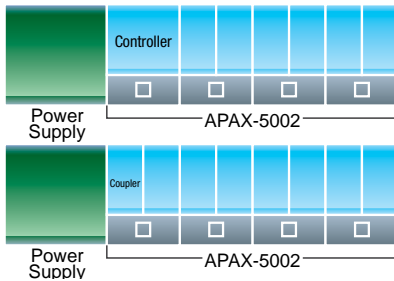
Dual CPU

With the data synchronization, the secondary controller can sync the parameters and take over the control task at the some unexpected condition within a very short time. By APAX dual power architecture, it can increase the availability.

Controller   Controller
Power Supply   └ APAX-5002 ┘

APAX-5070   APAX-5070
Power Supply   └ APAX-5002 ┘

Distributed Topology

The standard physical interface is not only the connection between controller and I/O system, but also provide the more possibility of the topology by switch.

Controller
Power Supply   └ APAX-5002 ┘

Switch

APAX-5002
APAX-5002
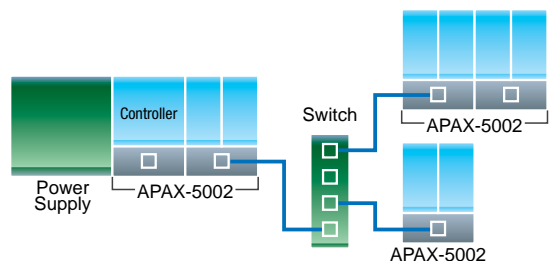
User-friendly Modules Design

Real-time Local Bus

APAX I/O local bus adopts raeal-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. Operators 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 labeled front-side ID switch enables operator to change the module ID number. The power LED not only displays the module power status, but also performs self diagnostic functions. 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 this.

Writable Labels with Wiring Information

For all I/O modules, a detachable 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.

APAX-5000 Controllers

Model	APAX-5580			APAX-5620
Description	APAX-5580 Controller with Intel® Celeron® CPU	APAX-5580 Controller with Intel® Core™ i3 CPU	APAX-5580 Controller with Intel® Core™ i7 CPU	APAX-5620 Controller
System Hardware — CPU	Intel® Celeron® 2980U ULT 1.6GHz Haswell Dual Core, 2MB L2	Intel® Core™ i3-4010U ULT 1.7GHz Haswell Dual Core, 3MB L2	Intel® Core™ i7-4650U ULT 1.7GHz Haswell Dual Core, 4MB L2	Marvel XScale PXA270 520 MHz
Memory	On-board 4GB (8GB optional)			-
Storage	1 x mSATA, 1 x SD, 1 x SD (for OS backup)			1 x Type II CompactFlash card slot
USB Ports	4 x USB ports (2 x USB 2.0, 2 x USB 3.0 compliant), 1 x internal USB			1 x USB 1.1
VGA	1 x VGA, supports 1920 X 1080 @ 60 Hz 24 bpp			DB15 connector
Audio	Line-Out			-
General — Dimensions (W x H x D)	128 x 106 x 110 mm			60 x 139 x 100 mm
Power Consumption	28 W (typical), 72 W(Max) @ 24 V_{DC} ± 20%			5 W @ 24 V_{DC} (typical)
Status Display	LEDs for power, battery, LAN (Active, Status), Tx/Rx and HDD			-
Software — Control Software	C/C++ library and .NET class library for C and .NET programming environment, CODESYS IEC 61131-3 SoftLogic control software			C/C++ and .NET library KW Multiprog (development tool), KW ProConOS (runtime kernel)
OS Support	Microsoft® Windows 7/8, Linux Kernel 3.X			Windows CE
Environment — Shock Protection	Operating, IEC 60068-2-27, 50G, half sine, 11ms			-
Vibration Protection	Operating, IEC 60068-2-64, 2Grms, random, 5 ~ 500Hz, 1hr/axis (mSATA)			-
Communications (Ethernet) — LAN Ports	2 x RJ45, 10/100/1000 Mbps IEEE 802.3u 1000Base-T Fast Ethernet			2 x RJ-45 Port, 10/100 Mbps
Communications (Serial) — COM Ports	1 x RS-232/422/485, DB9, 50~115.2kbps			2 x Isolated RS-485 (2-wire, isolated)

APAX-5000 Analog I/O Modules

Model	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
General — Dimensions (W x H x D)	30 x 139 x 100 mm				
General — Power Consumption	2.5 W @ 24 V_{DC} (typical)	4 W @ 24 V_{DC} (typical)	3.5 W @ 24 V_{DC} (typical)	3.5 W @ 24 V_{DC} (typical)	3.5 W @ 24 V_{DC} (typical)
Analog Input — Channels	8 (differential)	12 (differential)	12 (differential)	12 (differential)	-
Analog Input — Input Type	RTD (2-wire or 3-wire)	V, mV, mA	V, mV, mA	V, mV, mA, Thermocouple	-
Analog Input — Sampling Rates	10 sample/second (total)	12 sample/second (total)	1,000 sample/second (per channel)	12 sample/second (total)	-
Analog Input — Resolution	16-bit with accuracy ±0.1% of Full Scale Range	16-bit with accurancy ±0.1% or better of Full Scale Range (Voltage), ±0.2% or better of Full Scale Range (current)	12-bit with accurancy ±0.1% or better of Full Scale Range (Voltage), ±0.2% or better of Full Scale Range (current)	16-bit with accurancy ±0.1% or better of Full Scale Range (Voltage), ±0.2% or better of Full Scale Range (current)	
Analog Input — Input Impedance	> 10 MΩ	> 10 MΩ (voltage), 120 Ω (current)	2 MΩ (voltage), 120 Ω (current)	> 1 MΩ (voltage), 120 Ω (current)	-
Analog Input — Wire Burn-out Det.	Yes	Yes (4~20 mA only)	Yes (4~20 mA only)	Yes (4~20 mA and Thermocouple)	-
Analog Output — Resolution	-	-	-	-	14-bit with accurancy ±0.1% or better of Full Scale Range
Analog Output — Channels	-	-	-	-	8
Analog Output — Output Type	-	-	-	-	V, mA
Analog Output — Slew Rate	-	-	-	-	0.7 V_{DC}/µs (per channel)
Environment — Operating Temperature	-10 ~ 60°C (when mounted vertically)				
Environment — Storage Temperature	-40 ~ 70°C				
Environment — Relative Humidity	5 ~ 95% (non-condensing)				

APAX-5000 Digital I/O Modules

Model	APAX-5040	APAX-5045	APAX-5046/ APAX-5046SO	APAX-5060	APAX-5080
Description	24-ch DI module	24-ch DI/O module	24-ch/20-ch DO module	12-ch Relay module	4/8-ch Counter module
General Dimensions (W x H x D)	30 x 139 x 100 mm				
Power Consumption	2 W @ 24 V_{DC} (typical)	2.5 W @ 24 V_{DC} (typical)	2.5 W @ 24 V_{DC} (typical)	2 W @ 24 V_{DC} (typical)	2.5 W @ 24 V_{DC} (typical)
Status Display	LED per channel On: Logic level 1 Off: Logic level 0				
Digital Input Channels	24	12	-	-	4 (Sink)
Input Voltage	Rated Value: 24 VDC, For "0" signal: -5 ~ 5 VDC, For "1" signal: 15 ~ 30 V_{DC} and -15 ~ 30 V_{DC}	Rated Value: 24 VDC, For "0" signal: -5 ~ 5 VDC, For "1" signal: 15 ~ 30 V_{DC} and -15 ~ 30 V_{DC}	-	-	For "0" signal: 0 ~ 3 VDC, For "1" signal: 10 ~ 30 V_{DC}
Type	Sink or Source Load	Sink or Source Load	-	-	-
Digital Output Channels	-	12 (Sink)	24 (Sink)	-	4 (Sink)
Voltage Range	-	8 ~ 35 V_{DC}	8 ~ 35 V_{DC}	-	8 ~ 35 V_{DC}
Rated Current Output	-	0.5 A (per channel, at signal "1")	0.5 A (per channel, at signal "1")	-	0.5 A (per channel)
Relay Output Channels	-	-	-	12	-
Counter/ Frequency Input Channels and Mode	-	-	-	-	8 (Up and Frequency mode), 4 (Pulse/ Direction, Up/Down, A/B phase mode)
Counting Range	-	-	-	-	32-bit + 1-bit overflow
Minimum Pulse Width	-	-	-	-	1 µs for High Freq. mode and other modes
Counter Frequency	-	-	-	-	0.1 Hz ~ 10 Hz for Low Freq. mode and Wave Width mode, 10 Hz ~ 1M Hz for High Freq. mode and other modes
Input Voltage	-	-	-	-	For "0" signal: 0 ~ 3 VDC, for "1" signal: 10 ~ 30 V_{DC}
Environment Operating Temperature	-10 ~ 60°C (when mounted vertically)				
Storage Temperature	-40 ~ 70°C				
Relative Humidity	5 ~ 95% (non-condensing)				

APAX-5000 Coupler Modules

Model	APAX-5070	APAX-5071	APAX-5072
Description	Modbus/TCP Communication Copuler	PROFINET Communication Copuler	EtherNET/IP Communication Copuler
General — Dimensions (W x H x D)	30 x 139 x 100 mm		
General — Power Consumption	2 W @ 5 V_{DC} (typical)		
General — Connectors	2 x RJ-45 (2-channel switch, share same IP address)		
Communications — Protocols	Modbus/TCP	PROFINET RT	Ethernet/IP
Communications — Data Transfer Rates	10/100 Mbps		
Communications — Connected I/O Modules	32 (max.)*		
Communications — Digital Signals	768 (max.)		
Communications — Analog Signals	192 (max.)		
Environment — Operating Temperature	-10 ~ 60° C (mounted vertically)		
Environment — Storage Temperature	-40 ~ 85° C		
Environment — Relative Humidity	5 ~ 95% (non-condensing)		

APAX-5580 PCIe Modules

Model	APAX-5490	APAX-5435	APAX-5430
Description	RS-232/422/485 Module	mPCIe module for iDoor technology expansion	SATA HDD module
General — Dimensions (W x H x D)	30 x 139 x 100 mm		
General — Power Consumption	2 W @ 5 V_{DC} (typical)	2.5 W @ 24 V_{DC} (typical)	2.5 W @ 5 V_{DC} (typical)
General — Connectors	1 x 26-pin clamp-type terminal		
General — Interface	RS-232/422/485	mini PCI express 2.0 (Support iDoor), mSATA	SATA
Environment — Operating Temperature	-10 ~ 60°C (mounted vertically)		
Environment — Storage Temperature	-40 ~ 70°C		
Environment — Relative Humidity	5 ~ 95% (non-condensing)		

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