Accelerating eAutomation Solutions with Value-added System Components

Advantech’s Industrial Automation Group is focused on creating innovative products and solutions for a wide range of applications and market needs.

Focus on eAutomation Technologies
As a leading Industrial Automation provider, Industrial Automation Group combines connectivity, flexibility and ruggedness with today’s most reliable PC-based automation technologies. Aligned with the open architecture movement, we empower our customers with fully integrated platforms, open system components and solution competence. In this way, we help our customers realize streamlined and customized solutions that improve efficiency & productivity.

Wide Product Range
Advantech’s Industrial Automation Group products cover the full range from operator terminals (HMI) and rugged industrial PCs to versatile distributed and plug-in I/O systems with software. Customers can take advantage of a high degree of scalability within and between product lines, with unique capabilities and performance in cost-effective embedded automation controllers and high-performance operator workstations. Our broad product coverage allows customers to select the best combination of components to solve unique application challenges, providing great flexibility while maintaining the convenience of “one stop automation shopping.”

Global Network of Solution and Distribution Partners
Advantech’s Industrial Automation Group is positioned to provide global support with worldwide support teams, and is dedicated to deliver state-of-the-art solutions that meet our customers’ automation requirements. With this application story brochure, we believe that we can help customers by sharing solution experiences. Our customers get field-proven solutions that give direction and help reduce engineering effort.

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Building Automation

Machine Automation

Transportation

Environmental Monitoring Systems
Project Introduction:
A train station in China was looking to develop an equipment monitoring & controlling system at their substation in the main building of their station. Concerned with future expansion of the station, they were also looking for a solution that could be easily upgraded in the future, and even expanded into other substations. Thus, Advantech stepped in to help them realize a complete and easily expandable Building Automation system.

System Requirements:
The train station wanted an expandable central monitoring & controlling system which could monitor over six different subsystems, including an air conditioning system, water supply and drainage system, lighting & emergency lighting systems, escalators, and a variety of other equipment. They also wanted a redundant network backbone to guarantee reliability and hoped that the solution would also be able to monitor power usage to save energy costs as well.

System Description:
The station’s mechanical and electrical equipment monitoring & controlling system is built on a distributed structure composed of a central monitoring & controlling system, a field controlling DDC, input & output equipment and the corresponding communication network. The network architecture of the equipment monitoring and controlling system uses a redundant and fiber-optic solution, which is a main feature of the EKI series. What’s more, combined with energy-saving DDC equipment and WebAccess software, the system not only monitors and controls all of the respective equipment and systems, but also helps the station to save power, energy and money.

The substation’s system consists of air conditioning system, water supply and drainage system, illumination system, emergency illumination system, low-voltage transformation and distribution system, and escalator.

Conclusion:
With the functions of DDC field controlling and WebAccess monitoring & controlling, Advantech’s BA solution not only meets the needs of safety monitoring & equipment controlling, but also saves energy. For the air-conditioning system, WebAccess saves energy through scheduler management; which is how it saves energy similarly in the illumination system. Furthermore, the X-ring redundant network of EKI series ensures 24-hour system operation without breakdown.

System Diagram:
Energy Saving & Power Monitoring System

Building Automation
Taiwan

Project Introduction:
Recently a university in Taiwan was experiencing dramatic power usage increases due to its growing number of campus buildings and students. Aiming to analyze their power consumption and increase their power efficiency across 52 buildings, the university wanted to build a power management system utilizing web-based hardware and software. With these goals in mind, they contacted Advantech to help them develop their system and provide them with the means to save energy in the years to come.

System Requirements:
• To create a power management system across 52 campus buildings to monitor and improve the management of power consumption, and guarantee efficient energy usage.
• The ability to monitor power consumption at each building in real-time, forecast power demands, adjust power consumption, and improve power management.
• Take advantage of the features of their network to create a power consumption inquiry system.
• To create a real-time display system to show the power use conditions in each building, in order to push forward and advocate power saving around the whole campus.

System Description:
The power monitoring computer workstation uses WebAccess HMI to collect data and show status. The system is used to analyze and compare the data and then take appropriate action to reduce power consumption and save energy.
In order to ensure that the data will not be lost when there is no network connection, BAS-3520 DDC Controller is connected to digital multimeter. Then data can be stored temporarily on local computer and will be uploaded when the connection is resumed to ensure the integrity of data.

Conclusion:
This university uses WebAccess and BAS-3520 DDC controllers to create a web-based power monitoring management system. It not only helps the University, staff and student body to save power, but also promotes the concept of energy saving and efficient energy use, which are important ideas as we move into the future.

System Diagram:

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Project Implementation:

WebAccess
Browser-based HMI/SCADA Software

BAS-3520
20-ch Web-enabled DDC Controller

BAS-3051
16-ch DI Expansion Module

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System Diagram:

Energy Saving & Power Monitoring System

Building Automation
Taiwan
Project Introduction:
Intelligent residential quarters in China have been increasing in popularity since their introduction in the 1980’s, especially in the larger cities like Beijing and Shanghai. Intelligent residential quarters are equipped with elevators, water & sewage pumps, lighting, security and more. Automatic monitoring is necessary for ensuring safe operation at all times. An international intelligent residential quarter located in Shanghai city uses Advantech’s WebAccess as the kernel of its Building Automation system.

System Requirements:
One of China’s latest high-tech intelligent residential quarters is being touted as providing the best in modern living. This large development required a reliable and state-of-the-art equipment monitoring system to provide residential security monitoring with real-time alarms. The contractors turned to Advantech, seeking a reliable monitoring system that would enhance property management quality, reduce labor intensity for the management staff, cut down the cost of property management, and help to provide a safe and comfortable living environment for all residents.

System Description:
This equipment monitoring system for this intelligent residential quarter is composed of an upper computer for monitoring, and a lower computer for control. The upper computer includes the IPC-610H and Advantech WebAccess components; while the lower computer includes the ADAM-4051 and its corresponding Modbus Data Gateway module, EKI-1222. The WebAccess configuration of the system allows it to communicate with sub-systems of the lower computer through different communication protocols, thus creating an integrated system.

- The perimeter alarm system: 24 couples of infrared alarm signals spread across the Beautiful Garden are connected to the upper computer through two ADAM-4051 modules and an EKI-1222 module via Modbus RTU universal protocol.
- Gate guard: WebAccess acquires card reader data by accessing the SQL data base of the sub-system.
- BA System: The web-enabled DDC controller of BAS-3520 and its expansion module BAS-3050 is developed by embedding WebAccess through TCP/IP protocol.
- Video monitoring: Integrating a PV-1000E Video/Audio Capture Card into IPC-610H, allows it to act as a video server. WebAccess is integrated with a video server so as to integrate the video monitoring screen.

Conclusion:
The equipment monitoring system of this intelligent residential quarter features simple wiring, convenient mounting, easy software configuration and reliability. Efficient monitoring helps improve the living environment, greatly enhances the property management quality, reduces the labor intensity of property management staff, cuts down the cost of property management and provides comfortable living environment for all residents.

System Diagram:
Project Introduction:
One of our clients is an international computer company known for exceptional research, development, and manufacturing. Recently, they were looking to implement an intelligent automation system in their headquarters in Taiwan to monitor and control automation systems in the 13-floor building. This project integrates a variety of equipment through powerful network functionality. The design of this system was aimed at achieving an energy-saving solution: each floor is equipped with automation monitoring and controlling equipment, the electrical power system sets the scheduling for start and stop times, and the efficient security system reduces the human resources needed on-site. This helps achieve maximum benefits with minimum costs.

System Requirements:
The customer was looking for a unified system integrated with energy saving features and a reliable network infrastructure. Furthermore, they wanted easy-to-use software that could control multiple sub-systems simultaneously.

System Description:
The entire automation system is composed of the following subsystems:

- A temperature control system with trend displays and data logging.
- A security system with access control which can generate alarms in the event of a breach.
- A digital video surveillance system for continuous 24 hours a day operation.
- An power system with energy-saving functionality.
- A parking system that uses a card reader only allowing authorized access.

WebAccess provides open integration components, such as ActiveX, HTML report, Graphic import, DDE, OPC, ODBC I/F as well as JAVA/TCL/VB script which helps the system integrator easily develop subsystem interfaces to form a complete intelligent Building Automation system.

WebAccess also supports the use of live video cameras and DVRs that are IP enabled via ActiveX control, Windows Media player, JPEG and other formats supported by internet Explorer 6.0 (or later).

Conclusion:
With browser-based WebAccess software, engineers can remotely view and control building automation systems using a standard web browser. Data is displayed to users in real-time with dynamically updated graphics and full-motion animation. Furthermore, the video image appears in the same display area as the graphic display, alarm and trend charts. With WebAccess' powerful integration capabilities, the building owner can reduce human resources and save energy costs to gain a quick return on their investment.

System Diagram:
Project Introduction:
Solar cells convert solar energy into electricity through the photovoltaic effect, which is useful for many applications. Individual cells can be used for powering small devices, such as electronic calculators, while the larger photovoltaic arrays can generate a significant amount of renewable electricity. One machine builder in Taiwan integrated a wide range of Advantech products to help them create a solution for their complex solar cell loader/unloader project, which was aimed at reducing wiring costs and improving the reliability of their Ethernet communications infrastructure.

System Requirements:
This customer wanted a solution to reduce their wiring costs and increase the reliability of their Ethernet communications between four subsystems. Their existing system was highly complicated, making maintenance and troubleshooting very difficult. Furthermore, they wanted to utilize a decentralized motion control solution, which led to the following requirements:

• High performance products with great reliability
• A simplified Ethernet infrastructure to reduce wiring
• The ability to integrate all production information into MES and CIM systems

System Description:
In this solution, the AMAX-2241/PMA was used to control the conveyor belt and the solar cell lifting mechanisms. Due to special customer concerns, we successfully created and provided a special junction cable to allow the AMAX-2241/PMA to integrate with a Panasonic servo motor. The AMAX-2752SY/2754SY was used to integrate all light indicators, switches and buttons.

The UNO-3074 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 series modules through the PCI-1202U. All the production information is also stored here for further integration into MES and CIM systems.

Conclusion:
Leveraging the flexibility of a decentralized motion control system with Advantech products was the only way to meet the strict demands of this project. The new solar cell loader/unloader machine reduced the distribution panel’s dimensions by 50% and reduced the overall wiring of the system by 37%. We were also able to increase performance 23% by simplifying the architecture of the system by replacing the outdated centralized motion control architecture with our decentralized motion control solution. This new system is also 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.

Project Implementation:

System Diagram:
**Project Introduction:**
Although the global semiconductor market was relatively flat in 2007, back-end semiconductor machine builders in Asia still experienced strong growth, especially in test and handler machines. Due to the high cost of those machines, many customers choose to inspect the dies manually with a microscope to reduce operation costs. Using this method though, performance and yield rate are very low. Recently a machine builder developed a PC-based handler system with centralized motion control solution, but the system is very complex and the dimensions are quite big. The machine builder turned to Advantech seeking help to extend the complexity of the electronic components while increasing the reliability and performance of the system.

**System Requirements:**
Our customer was looking to phase in new automatic test equipment that fulfilled these requirements:

- Reduce the equipment’s size (overall dimensions)
- Integrate both motion control and digital I/O interfaces
- Can integrate Panasonic and Sanyo servo motor drivers
- All production information can be integrated into both MES and CIM systems

**System Description:**
This handler system is composed of an IACP-4000D, PCI-1739U, PCI-1202U and 8 AMONet slave modules. PCI-1739U serves as the loader/unloader of the IC components in different segments. AMAX-2752SY/AMAX-2754SY is used to control the power and the LEDs of the machine. Advantech offers a customized circuit which allows AMAX-2241/PMA to fit both Panasonic and Sanyo motor drivers. The complex PC-based control scheme is completed through the implementation of the AMAX-2000 series products.

**Conclusion:**
Leveraging decentralized motion control’s flexibility and technology were the only way to meet our customers’ demands. This new handler machine reduces distribution panel’s dimension by 50% and saves 33% wiring and effort. It also increases performance by 20% and simplifies the architecture (decentralized motion control replaced centralized motion control).

Moreover, this new system is easy to maintain and troubleshoot. In the past, they needed to open the chassis to maintain plug-in motion control and DAQ cards, but now it’s not necessary. Furthermore, the consistent outlook and dimension of whole AMAX-2000 series brings more add-on value to machine builders. The AMAX-2000 series’ DIN-rail mounting method has also provided convenience to the engineers through easy installation.
Project Introduction:

One customer in Taiwan develops variant electronics manufacturing machines. They received a new order for laser carving machines, and wanted to upgrade their existing motion control solution to eliminate the complex system architecture and machine’s large size. They had been evaluating our AMAX-2000 series, but were a bit concerned that the connector was different than their current solution. Advantech was willing to modify the design of the AMAX-2000 series for the customer, creating new and unique AMAX-2000 series modules.

System Requirements:

Customer would like to phase in the new laser carving machines that need to fulfill below enquiries.

- To reduce the distribution panel’s space to fit reduce machine dimension demand
- To provide the transferring solution to be compatible with current products
- The production information needed to be integrated into MES and CIM systems

System Description:

UNO-3072L features an onboard DI/O interface which is useful for power management issues. When finishing all production in the factory floor, the operator can press the “shut down” button to trigger digital input of UNO-3072L to close the application program and the operating system. After that, digital output of UNO-3072L will be triggered to notify the main controller to turn off the whole system power. The function will protect UNO-3072L and its relative interface to provide improved performance and reduce maintenance efforts. Furthermore, the addition of the PCI-1620A makes allows the carving machine to communicate with more devices through RS-232. Thus the PLCs and motor sets outside the system are integrated as well.

Conclusion:

Most of the machines were required to reduce the dimension. Embedded automation computers plus AMAX-2000 series can meet this demand. This solution is more robust than traditional IPC, also saving wiring and maintains effort. They are perfect match for future electronics manufacturing machines. This new laser carving machine reduces 50% distribution panel’s dimension and saves 33% wiring time and effort. It also increases the performance by 20% through a simplified architecture (using a decentralized motion control architecture to replace the centralized motion control architecture) and flexible to expansion for further usage.

System Diagram:
Human Machine Interfaces in Modern Oil Drilling & Data Collection
Machine Automation
China

Project Introduction:
A mudlogger in the modern oil field gathers data and collects samples during the drilling process. This information is then organized in the form of a graphic log. This information (known as “offset data”) can provide valuable clues as to the characteristics of the particular geo-strata that the rig crew is about to drill through. Mudloggers have to connect various sensors to the drilling apparatus and install specialized equipment before they can monitor or “log” drill activity. This can be quite strenuous and challenging, especially when having to be done during drilling activity. Much of the equipment will require precise calibration or alignment by the mudlogger to provide accurate readings.

System Requirements:
Mudloggers observe and interpret the indicators in the mud returns during the drilling process. At regular intervals the mudlogger logs properties such as drilling rate, mud weight, flowline temperature, natural gas content and type, oil indicators, pump pressure, pump rate, lithology (rock type) of the drilled cuttings, and various other items of interest. The job of a mudlogger requires a good deal of diligence and attention. Sampling the drilled cuttings must be performed at predetermined intervals, and can be difficult during rapid drilling.

Our customer’s specific requirements were as follows:
• Over 30 data parameters needed to be recorded and controlled
• The device should be able to withstand the harsh conditions of a modern oil field (intense electromagnetic interference, noise, vibration, unstable currents)
• Distributed control on the mudlogging device should be implemented by advanced computer control technologies, so as to improve the control precision of all technological parameters during the operation

Project Implementation:

System Description:
The host panel PC on the electrical control cabinet of the mudlogging unit implements functions of: 1) Detection processing; 2) Closed loop controlling; 3) Graphic report forms; 4) Recording; 5) Online adjustment; 6) Printing; 7) Alarming; 8) Statistical analysis; 9) Historical documentation; 10) System safety; 11) Web features; 12) User-friendly HMI.

The sensor monitors accidents such as pierced pipes, lost drills, lost bits, breaks, blowouts and slough. The monitoring parameters include: drilling load, pick-up weight, weight on hook, torque, stack pressure and flow.

Conclusion:
Adding Advantech’s IPPC-9151G to this solution provided the following advantages: touchscreen display, all-in-one design, robust and durable capability, a wide temperature and humidity range, and rugged design that withstands environmental conditions such as noise, high temperature, dust & vibration.

Intelligent control on the mudlogging unit could be now implemented through the IPPC-9151G, enhancing the control accuracy of each parameter, saving energy, improving efficiency, lessening maintenance difficulty, strengthening project monitoring and accurately analyzing oil & gas status.

System Diagram:
Project Introduction:
Injection molding machines are used for manufacturing plastic parts, and in recent years many of these machines have begun integrating intelligent features with energy-saving capabilities. Additional functions, such as electronic measurements, calculators, network communications, real-time auto-control, automatic adjustments and auto system diagnosis are being integrated as well, improving reliability, control and machine owners’ competitive power in the market.

System Requirements:
The purpose of this solution was to integrate an older injection molding machine with a new Programmable Automation Controller (PAC). The customer was looking to achieve the following benefits:

- Improved precision and stability, with a quick response time
- Improved energy-efficiency
- Complete closed-loop control with a high degree of accuracy
- A very low temperature variance to improve injection stability
- Injection location at 0.01 mm, over 10 times than hydraulic driving machine
- Touchscreen operation
- High power output, with a quick dynamic response rate
- Reasonable price

System Description:
ADAM-5550KW connected to this system increases the injection molding machines response time through high-speed analog input, monitors its closed-loop process through analog output, and controls related machines’ motion through digital input and output to control the right location and dose of objectives through the high-speed calculator module. The various modules connected to the PAC can also control various system devices, such as push button control, LED indicators, thermometer, heating, storage, and more. Combined with Advantech’s FPM-3120G 12.1” industrial monitor with resistive touchscreen, customers have a higher degree of control over energy efficiency.

Conclusion:
After implementing the ADAM-5550KW into their system, this customer was able to improve their production speed, reliability, energy efficiency and power consumption. Combined with the rugged features of all the devices, and the low price point Advantech was able to provide, this solution will also save the customer maintenance and production costs.

Project Implementation:

<table>
<thead>
<tr>
<th>Device</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADAM-5550KW</td>
<td>8-slot Programmable Automation Controller</td>
</tr>
<tr>
<td>ADAM-5017UH</td>
<td>8-ch Ultra High-Speed Analog Input Module</td>
</tr>
<tr>
<td>ADAM-5056S</td>
<td>16-ch Sink Type Isolated Digital Output Module</td>
</tr>
</tbody>
</table>

System Diagram:
Project Introduction:
Conventional wind turbine controllers have only limited resources, and can only offer restricted monitoring and diagnostic functions. System developers expect controllers to not only monitor environmental conditions, temperatures and pressures in the hydraulic system, including rotation speeds and vibrations, but also allow remote management and diagnostics through a network.

System Requirements:
The customer required a controller that could receive wind data from an anemometer, direct the nacelle and rotor blade in order to catch the wind, and brake the blades from moving too fast and becoming damaged, which led to the following requirements:
- An open PC-based control platform to provide compatibility with various I/O peripherals and unexpected application adjustments
- A compact system that could fit into space limited towers, and also had front accessible I/Os
- Sufficient processing power
- No moving parts, wide operating temperature range, shock and vibration tolerance
- Embedded OS for real-time control

System Description:
The UNO-1150 is installed inside the wind power turbine. Hundreds of I/O distributed over the nacelle, such as wind speed and direction were passed to the UNO-1150 controller. The environmental conditions, temperatures and pressures in the hydraulic system, rotation speeds and vibrations are all monitored. The UNO-1150 also processes this information and can quickly adjust the rotor blade to the available wind. However, when the wind is too strong, the UNO-1150 can engage the brake to stop the rotor blade from damaging. The embedded OS in the system ensures the general control and regulation lies in the “real time” time range.

The UNO-1150 also links to the main monitoring network and frequency converter monitors. The information in the nacelle could be transferred via Ethernet, fiber optic or serial COM port. This shows the implementation flexibility and the reliability of the UNO-1150 about the information redundancy.

Conclusion:
The UNO-1150 is a compact system with open PC-based control platform. It is designed fanless, and cableless for harsh, varied environments with a wide range temperature. The high vibration and shock tolerance caused by the blade rotation was within the tolerance of range of UNO-1150. These features not only increase reliability but also reduce the costs of maintenance.

From the implementation point of view, the front access I/O design saves the time on integration and wiring. The DIN-rail mounting form factor makes the UNO controller easily align together with other device such as BUS coupler or Fieldbus circuit without occupying extra space. The x86 computer architecture extends the possibility for future application adjustment and I/O enhancement without a lot of integration effort.

System Diagram:

Project Implementation:
- **UNO-1150**
  - AMD GX2 UNO with 2 x LAN, 3 x COM, 2 x USB
- **EKI-7559SI/7554SI**
  - 8+2 / 4+2 SC-type Fiber Optic Managed Redundant Industrial Ethernet Switch with Wide Temperature
Project Introduction:
Rising energy costs are forcing many enterprises to step up their efforts to reduce energy consumption and improve energy management. Making the most of all available energy and facility resources is becoming crucial for all business across all industries. Advantech’s open networking technologies combined with compact and robust platforms and reliable controllers are a powerful solution for any Energy Management System (EMS). Successfully applied in a large American chain store, this EMS solution allowed our client to control and manage energy resources in hundreds of their stores across the USA.

System Requirements:
This client was looking for a flexible, robust and rugged Energy Management System to improve energy usage and efficiency, aimed at reducing their costs across hundreds of stores nationwide. While they wanted to implement their own energy-saving software, they required a complete hardware solution consisting of reliable, compact and open products to withstand harsh conditions, allowing alternative communication connectivity and support for Microsoft platforms.

System Description:
This EMS includes an UNO-2053E, an ADAM-5510KW/TCP with ADAM-5000E, an EKI-2525 and a legacy power input module. ADAM-5510KW/TCP system were chosen as field controllers as they are designed to independently perform a number of data acquisition and control functions, acting as a centralized measuring, supervisory & control system the EMS. ADAM-5000E works as a local controller to read data from different sensor equipment operating conditions, utility conditions (temperature, infrared, humidity, sunlight and more) and other power consumption devices then enact optimized conditions for energy saving based on the decision of the SCADA software running on UNO-2053E platform. UNO-2053E is an open platform and allows WinCE, XP & Linux OS, also providing industrial NAT (Network Address Transfer) functions, for communication with the central monitoring room.

Conclusion:
As a pure hardware-oriented solution, Advantech stepped in and provided this client with the products and platforms needed to run an efficient EMS. The UNO-2053E and ADAM-5000 series are compact systems with open, PC-based control platforms and PAC controllers designed for harsh, varied environments with wide temperature ranges. The capability to withstand these environments and still be fitted inside a local compact cabinet provides reliable and robust performance for EMS requirements. All features not only increase reliability but also reduce the total costs of ownership.

System Diagram:
Project Introduction:
Generally, power substation systems include control, signal, measurement, protection, automation and remote handling equipment. Power substation systems are used to compile the data from various devices and send the information to the central control station. Due to the different communication/device/protocol requests, the system must support various I/O inputs and be able to integrate information for the control center.

System Requirements:
Our customer was looking to improve their substation management and conversion control, allowing them to have more accurate information reading, as well as implement the following functions:
- Withstand heavy electronic interference
- Operate reliably in the harsh environment
- Provide multiple Ethernet ports for data backup/communication
- Meet the strict IEC-61850 requirement
- Compact and stable OS for application program development
- Real time synchronized watch to work with other power system
- Stackable for space limited installation requirements

System Description:
Power stations operate 24 hours a day, and are usually located far away from its customers. These systems demand reliable products and reliable communications with the control center, which needs to constantly monitor power status to ensure all operations are operating safely and efficiently. There are many devices used in power stations, to provide the following main functions:
- Measure the signals from field devices
- Transfer different data and protocols from devices to the control center
- Analyze different device data and execute related control commands
- Ensure that all work is synchronized with other power systems

Conclusion:
After implementing this new solution, the following benefits were realized:
- Built-in optical isolated and surge protected serial ports to protect the system from electrical damage
- The system controller features a fanless and diskless design, providing reliability in the harsh conditions
- Equipped with three LAN ports, it’s easy to switch data backup/communication with control center
- Equipped with industrial CompactFlash card allows the system to operate reliable and stable
- Supports WinCE 5.0, easy to develop application program for protocol transfer/conversion
- 1U Rack 19” dimension with robust/compact chassis design, easy for stack installation

Project Implementation:
UNO-4678 Intel Celeron M UNO with 3 x LAN, 8 x COM, PC/104
EKI-4654R 24+2 SFP Port Managed Redundant Industrial Ethernet Switch

System Diagram:
Project Introduction:
Hydroelectric power stations require complex automated scheduling systems to regulate their power generation processes. These systems can benefit from adopting a topological structure which combines reliable industrial-grade products and redundant ring networks. The backbone for such networks require at least two fiber optic rings to realize both link and device redundancy. All of these elements combine to provide excellent performance and high reliability with automated operations, remote control, fault self-recovery and advanced network management functions.

System Requirements:
Our customer had specific demands which needed to be met in order to satisfy their advanced networking needs. These requirements included:

- Long distance data transmission capabilities.
- The network needs to be progressively built and allow easy future expansion.
- All devices should be highly reliable to fulfill unmanned tasks.
- A single point of failure on the link should not affect the data transmissions of the entire network.
- All devices need to be able to withstand harsh, high-temperature and high-humidity environments with strong electromagnetic interference resistance.

System Description:
In this project, the system takes advantage of two redundant rings to create a fully redundant environment. This means that if one ring fails or is shut down, the other ring will automatically begin handling the network and information flow, within 10ms. Furthermore, Advantech EKI-7659C and EKI-7656C are rugged modules that can operate stable in extreme temperatures, so they are ideal for any outdoor environment. The EKI-7000 modules feature fast recovery time and industrial-grade designs to satisfy any need.

Conclusion:
Advantech’s EKI-7659C and EKI-7656C were used due to their incredibly fast recovery time (< 10ms) and highly reliable and durable design. Once implemented, the system was able to provide the following features:

- **Real-time capabilities.** This solution provides 1000Mbps full duplex fiber optic Ethernet, which could speed up the transmission, reduce the transmission conflict and improve real-time capability.
- **High reliability.** Redundant ring structures ensure network flexibility. When any connection in the loop fails, the system can get back to normal operation in less than 10ms. Secondly, couple ring network design protects communication from being affected when any switch fails. Furthermore, high-quality Advantech industrial network switch can work stably in an environment and MTBF averages more than 200,000 hrs.
- **High security.** In order to achieve security, different sub stations can be separated from each other through VLAN partition. Besides, binding between the device and port or the close of unused port can greatly improve the security of network.

System Diagram:
Project Introduction:
Taipei’s MRT (Mass Rapid Transit) system is one of the most high-tech, user-friendly public transportation systems in the world. When they were looking to institute a supervision and information system, they contacted Advantech for the solutions and services they needed. Their goal was to implement a communications system to provide their conductors with up-to-date, real-time information on the temperature, air pressure, air conditioning and emergency conditions within the train.

System Requirements:
Taipei’s MRT system needed a reliable, versatile supervision and communications system to keep their employees informed of up-to-date information on the conditions within the train, which led to the following requirements:

- A compact platform which could operate reliably even under extreme conditions
- The ability to monitor multiple systems and data simultaneously
- A user-friendly touchscreen interface for the train conductors
- Multiple storage solutions for keeping detailed history reports

System Description:
By installing two PC-104 serial communication modules, UNO-2000 series can provide excellent communications with the facilities on the train and the attached ADAM-5000/4000 devices. ADAM-5510E is an intelligent controller and, by integrating 5 ADAM-5051S modules, its high density Digital Input ports can grab all the necessary information on the train. ADAM-4017P is an enhanced Analog Input module with high reliability and is in charge of all the analogue values on the train, such as temperature and pressure. For this system, customer’s requirement is to get hundreds of I/O data within 1ms, which was easily met by the solution Advantech created. This system also required a user friendly touchscreen interface with which could survive under the harsh conditions of a high-speed underground transportation system.

Project Implementation:

UNO-2170
Intel Celeron M UNO with 2 x LAN, 4 x COM, PC/104

PCM-3618
8 Port RS-422/485 High-Speed Module

ADAM-5510E
8-slot PC-based Programmable Controller with RS-485

Conclusion:
This solution successfully combined ADAM, UNO and PCM series products to create a complete information and communications system for train conductors in Taipei’s MRT system. Conductors now have access to real-time information on the trains various systems, allowing them to quickly respond to any situation and save valuable data for future reference.

System Diagram:
Project Introduction:
To meet the growing challenges of increasing highway traffic worldwide, more sophisticated Intelligence Transportation Systems are needed. The latest automation products can greatly help improve efficiency and safety on highways worldwide.

By adopting Advantech eAutomation products as the heart of their signal control system, Taiwan’s National Freeway Bureau now has an intimate understanding of their freeway traffic flow situations, and can use this information to make sure that all traffic is flowing smoothly, helping people get to their destinations faster and safer than before.

System Requirements:
As the world’s population expands, the amount of vehicles and traffic on roads worldwide is increasing exponentially. This requires Intelligent Transportation Systems to evolve, become more complex, and be able to provide accurate real-time traffic information to drivers, which can also take into account the weather, emergencies, and speed limits. In an effort to upgrade their intelligent transportation systems, Taiwan’s National Freeway Bureau turned to Advantech for products to help them monitor, manage, and maintain control on their roadways nationally. Aside from the strict demands they had on the products they needed to complete this project, they also required rugged and powerful components which could adapt to the harsh and critical environments of Taiwan’s roadways.

System Description:
The goal of an efficient traffic flow system is to display the real-time traffic and weather situation for drivers. The remote control room needs to gather the weather information, taking into account variables such as wind speed, wind direction, and rain fall through outdoor weather sensors. They are connecting to ADAM-5510M by RS-232 then the data will transfer to Ethernet packet and send back to the remote control room. Afterwards, the remote control room will obtain the remote weather information and send instant traffic information to the remote outdoor display boards via UNO-2171/2172. Due to the fact that the transmission distance is more than 2km, the EKI-2541S (an industrial-grade Ethernet to single-mode fiber optic media converter) is required to convert the Ethernet signals to single mode fiber optic which can extend the transmission distance up to 30km.

Conclusion:
• Taiwan’s National Freeway Bureau improved highway efficiency, and created a safer driving environment
• Traffic information display boards now contain more accurate and up-to-date information for drivers
• The EKI-2541S allowed the traffic data to easily be converted into fiber optic signals for long-distance transmissions

System Diagram:
Project Introduction:
Like many countries, the Netherlands continues to grow more concerned with its density of vehicle traffic as the number of motorists increases. Creating traffic flow installations that ensure safe, efficient and environmentally friendly traffic and mobility is the day to day business of our customer, who is a market leader in conceiving and realizing mobility solutions as a systems developer, systems integrator, and service provider. Working closely with our customer we searched for creative and functional solutions to improve their traffic control systems.

System Requirements:
An integrated approach is necessary to keep traffic moving: to combat traffic jams, keep cities liveable and to streamline the flow between cities and motorways. Having detailed information about communication and traffic systems for urban road networks and road systems, plus the capability to connect together different systems, guarantees a successful integrated approach at all levels.

Moreover, with the intelligent control panels supplied by Advantech, our customer can easily make alterations without onsite complications.

System Description:
A traffic control system consists of a central processor, which has online connection with the control processor to detect conflicts and check all instructions. Items such as evacuation times, light conflicts, security sequences per signal group, the power supply, and defective LED lights can be monitored.

Furthermore, with the intelligent control panel, users can easily make alterations without complications. The program will check the setup, and the user has a clear view of the traffic conjunctions on the graphic panel. Because this system is operated in outdoor environments, a transflective solution was also required.

Conclusion:
The robust fanless TPC-1261H is a perfect solution for this market. The open Windows operating platform ensures our customers can easily integrate more intelligence and value-added services for end users. Moreover, the unique transflective solution Advantech provides makes work easy even when operating in direct sunlight.

System Diagram:
Project Introduction:
Wireless communication technology has become essential in the transportation industry due to the popularity of many fleet management applications. Real-time vehicle tracking and monitoring is critical for maximizing productivity, safety, and security of mobile fleets. Not only can they provide the management team with real-time vehicle location information, driving times, waiting times, and service records, but they also empower the drivers themselves by always having advanced real-time information displayed on their in-vehicle monitors.

System Requirements:
In order to provide an efficient management system for transportation applications, our customer was looking to implement an advanced solution that was easy to use while being powerful and functional. They required the ability to interact with maps onscreen, and view multiple vehicles onscreen at once. Furthermore, they wanted to have detailed reports for monthly distance tracking, average/top speeds, suburbs visited, driving times, waiting times and more.

- Real-time vehicle information display
- Route planning management
- Parameter/information input
- Service records
- Vehicle management & audit
- Vehicle tracking record & audit
- Vehicle periodic maintenance records
- Periodic statistics

System Description:
The fleet management system consists of an FPM-3060G Flat Panel Monitor and smart card reader, both attached to an UNO-2053E, which is installed within the truck. The UNO-2053E takes the service record information from the smart card reader, and sends it back to the control center. Meanwhile, a satellite tracks the vehicle through a GPS, sending this information to both the control center and the truck itself. This way, the management team will always know the location of the truck, while the driver has access to updated road, safety and weather information displayed through the FPM-3060G.

Conclusion:
The success of this project involved creating a unified structure for information gathering between different vehicles, from trucks, buses, vehicles, trains, with proven technology and services. Furthermore, after implementing this solution, the customer was able to realize the following benefits:

- Increased productivity
- Real-time assisted tracking
- Eliminated the majority of paper work
- Lowered fuel bills
- Stopped unauthorized vehicle use

System Diagram:
**Project Introduction:**
In today’s hectic world of traffic, emergency services rely more and more on having accurate information to save time & lives. In case of an accident, the response time is always under pressure due to traffic consequences and dangerous situations. Embedding emergency vehicles, in this case fire trucks, with automation can equip response teams with all the necessary information needed to efficiently complete their work.

**System Requirements:**
Up-to-date and highly accurate information is needed when an emergency occurs. For example, knowing exactly where a car’s roof can be cut without hitting an airbag pressure tube can help release trapped passengers quickly, without injuring them any further. Moreover, getting information about the current traffic information and environment can help the firemen to work efficiently, so time can be saved and further traffic jams limited. The requirements for this solution were as follows:

- A platform able to handle large amounts of graphic information needed.
- Low power consumption is very important as many additional tools in the fire truck will need backup power.
- A transflective display is needed because of the reflective clothing; the screens will be unreadable when the yellow-security jackets reflect into the screens.

**System Description:**
The UNO-2182 and FPM-3060G were mounted in the fire truck to handle the complicated graphic information. The system can get traffic information as well as environment data for the firemen which can provide necessary information to make efficient preparation. Many layers of detailed information will be sent out from a central information point via UMTS/GPRS towards this central computer. The FPM-3060G will be used as HMI to visualize information during the ride.

At the accident site the MARS-3100 will take over this function via WLAN to be able to collect all necessary information close to the accident. Also detailed information like photo video can be made by the tablet computer to communicate via UNO-2182 towards the information desk to help hospital, insurance and after-care.

**Conclusion:**
The UNO-2182 gives a perfect solution for a strong, low power central computer. Together with its compact size it can be used for different ITS applications where much CPU speed is required. Combined with the FPM-3060G as the display and a MARS-3100, we have created a complete multi-functional solution.
Project Introduction:
A customer of Advantech’s developed an excavator guidance system for the construction industry, providing an easy-to-use visual interface which has all the information that excavator drivers need for accurate measurement, efficient digging, and bucket teeth monitoring with unparalleled accuracy. The system not only helps drivers dig precise grades, trenches and profiles, but installation is so easy that it doesn't require a specialist to set it up.

System Requirements:
The excavator guidance system features wireless sensors, a Touch Panel PC, and a user friendly interface, making it easy to dig outside the excavator area without extra equipment. In contrast to the systems already on the market, this concept is designed for installation by the end users themselves. There is no need for specially trained crew to set up the system. The installation can be done in less than one hour. Another distinguishing feature is that users can operate the system on more than one excavator. The sensors can simply be unclipped from the brackets of one machine and clipped into the brackets of another machine. Instead of having a wired system that is permanently locked machine. This system is very flexible: allowing the users the freedom to choose which machine to operate the system on, and allowing them to easily move it from one machine to another.

Because the system is used in a harsh environment our customer was looking for a Touchscreen Panel PC, which was suitable to operate in heavy shock and vibration conditions. The PC had to be slim and lightweight, readable in bright sunlight, low in power consumption and with an open platform to build dedicated software for the system.

System Description:
This excavator guidance system was developed to be sold over the counter like any laser or leveller, and everything users need for installation and operation are available in the package. The system has only one cable, which is for the power supply, and is so efficient that it can be powered from an automobile’s cigarette lighter. All control and HMI functions are integrated in the TPC-660G-Transflective. Moreover, the application software runs on an open Windows platform provided by Advantech.

Conclusion:
After working closely with our clients’ highly qualified engineers, Advantech helped design and supply a customized ‘fit for purpose’ PC, which can work in the heavy duty environment of digging with excavators. The slim, robust and lightweight design of the 6.4” TPC with its sunlight readable screen gives the driver an optimum Human Machine Interface, allowing them to work more efficiently and creating more workspace around the excavator.

Project Implementation:
TPC-660G
6.4” VGA TFT LCD Geode LX800
Touch Panel Computer with Transflective Touchscreen and CAN-bus

System Diagram:
Project Introduction:
LED flashlights are gaining popularity in the industrial field, not only do they save energy, but they are also lighter and cheaper than their traditional counterparts. One of our clients is a major manufacturer of automotive repair tools, including LED flashlights, and they were looking to reduce the battery requirements in their flashlights down to a one coin cell battery. Thus, they turned to Advantech help them design a rise-voltage circuit for driving the LED.

System Requirements:
The manufacturers outsourcing team wanted to leverage Advantech’s industrial-grade USB DAQ module to verify their thermo specifications, which was difficult to gauge due to the interference from the voltage circuits inside the flashlight. To make sure quality is under control, they were looking for products that:

- Provided speed data transmission rate
- Provided firm mounting and installation kits
- Provided firm cable connections
- Provided ready to use utilities for data logging

System Description:
USB-4718 was used to connect with thermocouple sensors, and then transfer data to the desktop’s HDD. The WaveScan utility inside the desktop is free, providing data logging, real-time waveform and historical trend functions. All the signals can be displayed on the screen in real-time, providing offline analysis or transfer of the data into Excel format for further data analysis at a later time.

Conclusion:
After implementing Advantech products, the client not only saved cabling and installation efforts, they also saved 70% on the test station’s cost. Moreover, this test tool can be used in the central or subcontractor’s office, providing increased flexibility for the engineers.

System Diagram:
Mobile Phone Test System
Automatic Test Equipment
China

Project Introduction:
Mobile phones have quickly become a necessary tool in our modern-day lives, and they are evolving so quickly that many new technologies are becoming standard features. Not only do these mobile devices allow access to communications anywhere, but also access to information and advanced technology, such as digital cameras, digital video/voice recorders, calendars, email, MP3 players, GPS navigations, and more. The latest technology to be incorporated in these devices is HSDPA-enabled (High-Speed Downlink Packet Access) USB ports, which allows higher data transfer speeds and capacity.

System Requirements:
One of the electronic manufacturers would like to leverage industrial grade USB hub to test the latest new interface HSDPA, to meet mass production with high performance yet low cost. They were looking for products that:

- Provides high-speed data transmission rate
- Provides lockable external power connector
- Provides secure mounting kit
- Provides secure cable connection

System Description:
USB-4622 was used to connect with four HSDPA modules, and USB-4671 was used to connect the instrument. When the testing program which inside the box PC issues the command to each HSDPA through USB-4622, the instrument will get the response signals and verify them to see if match the condition or not. After that, the display will show the pass or fail information to the operator.

Conclusion:
After choosing Advantech products, the customer was able to significantly increase productivity, while saving on cabling and installation efforts. The manufacturer also saved 29% on the test station’s cost, mainly due to the ease of installation and connectivity options. Furthermore, the test system is very reliable with no downtime since installation over 1 year ago.

Advantech’s USB DAQ product series were designed for industry applications. Two unique features are dual end lockable cable and versatile mounting method. With Advantech’s unique features, users can easy mount the module into the suitable place and trust the connection in the field.

The USB-4671 is a high-performance USB module with a GPIB interface, which can perform the basic IEEE-488 talker, listener and controller function required by IEEE 488.2. Users can also connect up to 15 piece GPIB instruments. Therefore, USB-4671 is especially suitable for instruments and control. The USB-4622 is a real USB 2.0 hub, which provides high-speed and full-speed data transmission rates. With its lockable USB cable and external power cable, it’s very reliable to utilize in the product line.

System Diagram:
Project Introduction:
LCD panels are becoming more popular every year, and can be found in a wide variety of electronic devices such as TVs, monitors, notebooks, digital cameras, digital video camera recorders, mobile phones, and more. Providing good cost-performance ratio and quality are the two most important factors for LCD panel manufacturers, who rely on automated equipment to verify panel resolution, quality, and cost-effectiveness.

System Requirements:
Since the dimensions for different applications are very diverse, LCD panel manufacturers need a system that can be very flexible to fulfill various demands.
- Provide memory storage for different product profiles
- PC-Based DAQ solutions to provide high testing performance
- The test information needs to be integrated into MES and CIM systems

System Description:
The multifunctional PCI-1711 outputs 5~10V voltage into the signal mixing box to drive the LCD panels. After that, it will check the PCI-1711’s analog input to verify the capture voltage from the signal mixing box. Once the feedback signals exceed the expected range, the system will provide the operator with a message to highlight which functional LCD panels have failed. The DI/O interface of the PCI-1711 is used to integrate relative push buttons and limit switches into the system.

Conclusion:
This PC-based DAQ system is very suitable for such applications because of the need to store different LCD panel profiles in the test workstation. Production Engineers can change the production items within few minutes, and the operators just follow up the production SOP to verify the different LCD panels.

Moreover, all the test information will register into the factory’s MES/CIM server automatically. This solution is more flexible than the previous proprietary system (testing one panel at a time), saving over 37% of cost, 17% of maintenance effort and increasing performance by 43%.

System Diagram:

Project Implementation:
PCI-1711
100 kSa/s, 12-bit, 16-ch SE Input PCI Multifunction Card

PCA-5612
Industrial PCI Graphics Card

IPC-6806
6-slot Desktop/Wallmount Chassis with 1U Power Supply

China
Project Introduction:
Vehicles have become an integral part of our daily lives, but rarely do many of us consider the impact our vehicles emissions have on the environment. In Southeast Asia where the economy is booming, the rate of vehicles on the roadways is increasing exponentially. In order to protect the environment, many governments have been paying special attention to the waste emissions of vehicles.

System Requirements:
In order to implement effectual inspections for vehicles, most governments encourage qualified vehicle mechanics to participate in inspection skill trainings. Moreover, on its own expense, the government provides inspecting equipments for qualified mechanics. This lightens the inspection burden of the governments and at the same time provides more convenient and efficient inspection service. In addition, the inspecting equipment is required to be highly reliable and dust-proof because the vehicle garage is always in a mess with waste gas and dust due to daily oil change and vehicle repair.

System Description:
USB-4622 (USB 2.0 hub) was used to integrate the USB camera, USB-4711A (multifunction DAQ module) and USB-4718 (thermocouple module). USB-4711A and USB-4718 were used to control the gas intake and to analyze the CO2, HC, and CO emissions from the vehicles. To keep records in government’s database, the USB camera was used to take pictures of each vehicle’s license plate. The UNO-2170 was used as a controller for this entire process.

When the vehicles are parked at a specific location, UNO-2170 activated the USB camera to take a photo of the license plate. After the OCR (Optical Character Recognition), UNO-2170 will get the vehicles profile through the government’s database. The operator will then double-check all the information and start the emissions inspection. The system will then show whether the result is pass or fail and save the records in the government’s database.

Conclusion:
Normally, governments and police agencies use commercial computers for emissions inspection. However, the CPU fan has to be cleaned manually and the hard disk has to be changed regularly, which makes it inconvenient for the government and mechanics to use it in outdoor applications. Despite all the benefits of commercial computers, the UNO-2100 series embedded fanless computers and industrial USB-based DAQ modules can greatly reduce the maintenance cost and tremendously enhance the system reliability. Moreover, the modularized system design can be easily upgraded and maintained.

System Diagram:
Project Introduction:
Many industrial applications leverage audio to improve performance. One of our clients is a major manufacturer of consumer electronics devices, and they were looking to reduce the cost of their audio quality analysis system. Thus, they turned to Advantech to help them create a simple yet cost-effective solution to improve efficiency and increase production.

System Requirements:
Our clients’ in-house R&D team wanted to create a PC-based measurement and testing solution to analyze audio quality, and hoped to reduce costs compared to traditional, proprietary test stations. Their requirements included:

- Multiple analog input channels to test many products at the same time
- A high gain interface for analyzing microphone signals
- Multiple digital input/output channels to trigger the objects (electronic devices)
- GPIB card to communicate with instruments

System Description:
The PCI-1710HG’s digital output channels were used to trigger the electronic devices, which play preloaded music. The PCI-1710HG’s analog input channels were used to connect to the earphone port, which acquires audio signals from the electronic devices. The test application will verify the data to see if the conditions match or not. After that, the display will show the pass or fail information to the operator.

Conclusion:
Compared to their previous solution (proprietary test workstation), this new solution increased production by 50% (it can now test two electronics devices at the same time) and saved 29% on the test workstations cost. This solution can test all audio electronic devices with specific fixtures. Furthermore, the ease of operability allows their local R&D team to manage the system themselves, reducing maintenance costs.

The PCI-1710HG’s advanced circuit design provides high quality with advanced functions, including the five most popular measurement and control functions: 12-bit A/D conversion, D/A conversion, digital input, digital output, and counter/timer. The high gain design allowed this system to measure even small signals (± 0.005V) without any extra amplifier circuit.

System Diagram:
Project Introduction:
The INER (Institute of Nuclear Energy Research) in Taiwan uses an embedded platform real-time system to create a “Wind Power Generation Simulation Platform”, which simulates the wind and blade models they build in Simulink. Through this unique solution, INER can modulate the speed of the dynos based on actual wind direction and strength. This affordable and robust multi-function platform can rapidly control prototype and hardware-in-the-loop test applications. The system is installed with Advantech’s UNO-2170 and PCM-3718HO.

System Requirements:
INER wanted to develop a simulation and test station for their wind power generation machines. To do so, they needed a rugged and robust real-time system to run hardware-in-the-loop testing. Therefore, INER made a request for a new system include following requirements:

- Real-time analysis and control systems testing needs.
- Rugged, high-performance industrial PC which is fanless, low power consumption design, sturdiness, compact size and also can support all standard PC peripherals.
- Standalone ability, xPC self-installed software tools are able to run on stand-alone mode. And users can burn the pre-set model to CF card without connecting through internet.

System Description:
The customer used Simulink to build their physical wind and blade models, and an embedded platform with Advantech’s UNO-2170 and PCM-3718HO devices to create a “Wind Power Generation Simulation Platform” for the HIL simulation. The goal of the simulation is to gauge the efficiency and performance of their power generation machines, including stress-testing. From the results of HIL simulations, they can then modulate the speed of dynos according to the actual wind direction and strength, driving the shaft of wind power generator.

Conclusion:
INER’s engineers need to run real-time analysis and control system testing to test the wind power generation machines, and this platform offers an excellent combination of performance, compact size, sturdiness, and I/O expandability. By integrating Advantech’s UNO-2170 to customize various requirements and integrating MATLAB/Simulink and related control modules, the engineers can conduct real-time modeling and simulation of control systems, rapid prototyping, and hardware-in-the-loop testing without the need of manual code generation and complicated debug processes. This results in significant cost savings and reduced development time.

System Diagram:
Project Introduction:
Environmental protection is one of the important current topics in the industrial community. In 2007 China established the Polluting Prevention Regulation to limit its emissions, control pollution, and raise the standard of pollution monitoring. This regulation mandated that every power and industrial plant must adopt higher standards for pollution monitoring, which directly increased the demand for Advantech’s ADAM-5000 Series.

System Requirements:
CEMS stands for the Continuous Emissions Monitoring System regulation, which was proclaimed by the National Environment Protection Bureau in China. It uses advanced and reliable technologies for photoelectric measurement and Ethernet communications to monitor and transmit data of the exhaust gases and emission volume.

In these investments, the CEMS system is designed to acquire and manage real-time data in exhaust gas discharged from the chambers of the fire power plants, thermal power plants, incinerator plants and the industrial kilns.

System Description:
CEMS is adapted to all kinds of boilers in Continuous Emission Monitoring, which includes real-time monitoring of the exhaust gas and emissions volume, and transmits the data to a central station in the Environmental Protection Bureau. The CEMS project adopts Advantech products, including: Embedded Automation Computers (UNO) and Ethernet I/O Modules (ADAM-5000). The specialty of the fanless and anti-vibration design guarantees stable operation even in the harshest environment. MTBF is up to 60,000 hours to greatly save maintenance costs. Gas analyzer, dust analyzer and data acquisition processor are the 3 primary parts of CEMS. They are adopted of real-time continuous monitoring for the chroma of the primary pollutant, such as dust, SO2, NOx, in industrial boiler, industrial kilns and electric boiler. They also provide the parameters of gas temperature, pressure, flow, and O2 cube. The system collects the data automatically and transmits it to the central station and environment management division through internet. The staff also can get the real-time data and report through internet. This ensures that the national pollutant emission volume control project and acid rain control project are on the track, and provides the measurement for charging the polluters.

Conclusion:
The data acquisition processor collects the parameters of gas temperature, pressure, flow, and O2 cube and so on. At the same time, it needs some digital I/O to process the data automatically as well as save the data. This customer also needed a PLC which could collect more simulation data, had bigger memory, and had more COM ports to connect to gas and dust analyzers. Furthermore, Advantech provides convenience, compatibility, and time saving to customers. Customers can have one-stop shopping instead of having to outsource a lot of the works. Compatibility will not be an issue between any of Advantech’s hardware and software components, saving the time it usually takes to integrate various products across multiple brands.
Project Introduction:
The Earth hoards many treasures beneath its unassuming rock and soil. Geological surveys provide an efficient way to analyze and locate natural resources such as oil and gas, which is important for the mining and construction industry. A globally known company wanted to upgrade their geological survey system with a robust and highly efficient platform to deploy on vessels, aircraft and even an unmanned station in desert.

System Requirements:
The customer required a platform that could help them work more efficiently, which led to the following requirements:
- A platform with high computing power
- Many serial communication ports to connect various equipment
- Audio to provide voice indicators to the operator
- A dual-display to monitor different data for collection and interpretation
- An embedded operating system for simple maintenance and increased reliability
- A compact & fanless system that could fit into tight control cabinets without temperature issues

System Description:
Geological survey systems usually deal with large amounts of data, so high computing power is very critical to the overall efficiency of the system. Intel’s Core 2 Duo CPU can handle interpreting the data, and the UNO-2182 provides flexible PCI-104 expansion, which allows customers to easily integrate Advantech’s PCM-3641I 4-port RS-232 PCI-104 interface card. Customers use the extended COM port to communicate with high-tech equipment, such as sonar and GPS equipment.

First-tier operators need dual-displays for monitoring and analyzing the data, and the UNO-2182 provides a DVI-I interface for this support. Furthermore, the audio provides a friendly indicator voice to assist in work.

Conclusion:
The UNO-2182 is equipped with an Intel Core 2 Duo CPU which is a low power consuming and highly efficient CPU. Also the UNO’s industrial design is fanless, cableless and has a wide operating temperature (-20 ~ 60 °C) which helps customers deploy applications in critical environments.

System Diagram:
Project Introduction:
Commercial glass greenhouses are high-tech production facilities for growing vegetables or flowers, filled with equipment like screening installations, heating, cooling, and lighting. In many cases, these systems are automatically controlled by a computer to regulate and maintain proper plant growth. One of our customers aimed to develop a PC-based control system for automatically monitoring the temperature of their greenhouse.

System Requirements:
Due to the fragile nature of growing plants within a greenhouse, this customer had strict requirements for the implementation of their automated system, which included the following:

- The temperature and humidity of the greenhouse should be recorded and allow automatic adjustments
- The system should allow remote monitoring and control through the Internet
- Any failure of the air-conditioner needs to be immediately reported to the administrator
- Surges from outside should be avoided in order to prevent the controller from malfunctioning
- The greenhouse was far from the control station, requiring highly reliable products

System Description:
All temperature and humidity data is sent to the ADAM-4017, while the signals monitoring the air-conditioner are sent to ADAM-4501. The temperature of air-conditioner is adjusted and controlled by ADAM-4068 and ADAM-4056S. Communications are supported by RS-485. If the PC does not support Ethernet, then the conversion could be supported by ADAM-4571L. The program can be implemented manually or automatically, and any alarm event record can be searched and viewed on the PC screen. The temperature and humidity can be configured and adjusted on a timer according to season, weather, etc. The variation of temperature and humidity is shown and analyzed by the curve chart. The entire system can be remotely controlled through the Internet.

Conclusion:
This system can remotely monitor and manage the temperature and humidity within the greenhouse through the Internet, providing a more accurate, efficient and reliable system than constant physical monitoring. Due to the distance from the control room, the rigorous monitoring requirements and the demanding physical environment of the greenhouse, Advantech’s ADAM series was the ideal solution.

System Diagram:
Project Introduction:
Steel mills are industrial plants for turning molten steel into ingots, billets, and plates. These mills are high temperature, high risk environments prone to outbursts of fire. Since the factory area is too large for the workers to monitor at all times, it’s very difficult to enforce safety measures in the event of a fire or other accident. These types of accidents can lead to loss of life, production time, revenue and more. The third largest steel mill in the world is in Korea, and they were experiencing a high volume of accidents each year. In order to improve safety, they tried implementing various new systems, to no effect. Therefore, they called in Advantech to help them establish a proper monitoring system to increase safety and improve production.

System Requirements:
Safety is the first priority in steel mills, where large risk factors are always present. A fire monitoring system needed to be applied for strict monitoring of the equipment and working environment. The largest problem found was that the quality of wiring within the mill was old and very poor quality. Compounding this issue was the fact that the existing system was dependant on sensors and cables only.

The system should be stable, reliable, and be able to send signals to the central monitoring room in the event of an accident, so appropriate safety actions can be taken.

System Description:
Since the factory area is so large, the transmission route between fire annunciator and receiver can’t be changed. A control module is applied to transmit messages between the receiver and all disaster monitoring departments. Advantech’s ADAM-5000/TCP is a distributed control module which uses the existing network backbone as the basis of the new system. The disaster monitoring departments use the ADAM-5051D digital input module to input alarm messages while all the fire equipment (water sprinklers, fire extinguishers and alarms) use the ADAM-5068 digital output module. The existing communication port employs ADAM-4571 and other modules to transmit the messages to the disaster monitoring departments in each factory, so real-time communication is accomplished between the departments in each factory and the central disaster monitoring department.

Conclusion:
After implementing this fire monitoring system, factory workers can work hard in a safe environment and have the peace of mind that corrective actions can be taken in case of an unexpected accident. This ADAM-based system contributes a lot to decrease the fire rate and increase the production capacity. The mill was very satisfied in the respect that the system was constructed at a low price point while still solving the large issue of the existing wiring problem. The new system contributed to the improvement of overall safety, and endeavors are being made to apply Advantech’s disaster monitoring system to other mills currently under construction.

System Diagram:
Project Introduction:
A military institute in Taiwan wanted to monitor their ammunition depot against illegal access or break-ins. When the window or door of the ammunition depot is opened, an alarm will be activated and a message will be sent to the server (a computer) in the central control room. While traditionally the job of a PLC, this customer chose to apply the ADAM-6000 series with new GCL (Graphic Condition Logic) functionality, saving them money and allowing more employees to customize the logic programming software.

System Requirements:
The following requirements were needed for complete this system:

- One remote I/O device to receive signals.
- All data can be transferred to the server via Ethernet, so an Ethernet I/O device is also needed.
- The customer didn’t want to write programs on the server to control the Ethernet I/O device, so the Ethernet I/O device should have the ability to operate as a standalone module.
- The customer also wanted the Ethernet I/O device to be able to actively send messages to the server when an event occurs (illegal break-in), so that the server doesn’t need to periodically poll the status of the Ethernet I/O device.

System Description:
There are alarm detectors installed in the doors & windows of the ammunition depot which will generate digital output signal when the door (window) is opened. Since this is an ammunition depot, every entrance should be monitored and notified. ADAM-6050 modules are located near the door (window) detectors and connect to the detectors. The GCL utility is running on the ADAM-6050 and will continuously check if the value of the digital inputs from the detectors has changed. In the event of a change, it will automatically generate a digital output signal to activate the alarm (power the buzzer). At the same time, ADAM-6050 modules will also send predefined message through Internet or Intranet to the remote server in the central control room. Then the guard in the central control room can take related action.

Conclusion:
Advantech’s ADAM-6000 with GCL solution is perfect for this application. Not only is this a very simple system, but only one ADAM-6050 module is needed. The developer can build the system in a very short time, and they don’t need to write a detailed program on the server to read DI or DO status on the module. They only needed to complete the program in the graphical configuration environment, which actually took them less than 10 minutes to complete.

System Diagram:
Project Introduction:
Recently libraries have been extending beyond the physical walls of a building, by including material accessible by electronic means. Library 2.0, a term coined in 2005, is the library’s response to the challenge of Google, and an attempt to meet the changing needs and wants of the users, using Web 2.0 technology. Some aspects of Library 2.0 include commenting, tagging, bookmarking, discussions, using social software, plug-ins, and widgets. Inspired by Web 2.0, it is an attempt to make the library a more user-driven institution.

System Requirements:
One of Korea’s top vending machine makers wanted to leverage RFID (Radio Frequency Identification) to design a modern self-service book borrowing and returning system. The idea was that customers reserve a book through the library’s website, choose the location to physically pick up the book, and the computer would provide the customer with a special barcode that they should print out and bring with them. The customer then simply goes to the assigned location, shows the printed barcode information to the vending machine, and the reserved book would show up automatically.

Customers could also return the book to any applicable vending machine, and due to the fact that all books are tagged with an RFID, the library’s website and vending machine system can deliver and trace all the books automatically. To complete this project, they required:
• Compact digital I/O modules with a built-in wiring terminal block
• Easy to mount
• Firm cable connection

System Description:
In this solution, the USB-4751 is setup to control the drawer switches when the information is retrieved from the barcode/RFID readers. Alternately it can sense which drawer is not occupied for customers to return their books. The USB-4622 acts as a USB hub to gather all the necessary information. The industrial display interacts automatically with customers, which is considerably time-saving and cost-saving.

Conclusion:
This system is the first library 2.0 system in Korea, and was integrated with an online shopping business model, RFID and vending machine technology. Not only was the manufacturer able to save cabling and installation efforts, but also a lot of maintenance effort by leveraging Advantech’s DiagAnywhere utility. All of the vending machine’s operations can be monitored remotely from the central control room.

System Diagram:
Project Introduction:
While the quality of home entertainment centers continues to advance, nothing can replace the experience of watching a film in a movie theater. Every week millions of consumers travel to their local theater to watch films, and many cinemas struggle to maintain a clean, comfortable environment with the latest cutting edge technology. One large projector company was looking for a way to increase the amount of projectors they could install in a monthly period, while also reducing the costs of installation.

System Requirements:
One of world top 10 projector maker would like to bundle its projector with compact and rugged I/O interfaces. They were looking for products that were:

- Compact in size
- Easy to mount
- Had a firm cable connection with a built-in wiring terminal block

System Description:
The two unique features of Advantech’s USB DAQ series are its dual-end lockable cables and versatile mounting methods. Users can leverage USB’s bus power to get rid of power cable and ease connects to USB port of personal computer, notebook or other device. With Advantech’s unique features, users can mount the module in a suitable place and trust the connection.

Conclusion:
After choosing Advantech products, the customer was able to significantly increase productivity, mainly due to the ease of installation and connectivity options. Benefits to customers include saved money, improved quality, and increased productivity. The system integrator can very easily install the projector and this USB DAQ module. No extra power is needed; just connect field signals into this module. Thus, they were able to install in 1,000 theaters within 4 months, a full 2 months ahead of their original plan.

System Diagram:
# Regional Service & Customization Centers

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<tr>
<th>China</th>
<th>Taiwan</th>
<th>Netherlands</th>
<th>Poland</th>
<th>USA</th>
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**Greater China**

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<tr>
<th>China</th>
<th>Toll Free</th>
<th>Beijing 86-10-6298-4346</th>
<th>Shanghai 86-21-6282-8959</th>
<th>Chengdu 86-28-8545-0198</th>
<th>Shenzhen 86-755-8212-4222</th>
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<tr>
<td>Taiwan</td>
<td>Toll Free</td>
<td>0800-55-77-99</td>
<td>886-2-2218-4557</td>
<td>886-4-2378-8250</td>
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**Asia Pacific**

| Singapore | 65-6442-1000 | Malaysia | 60-4-397-3788 | Japan | Tokyo | 81-3-5212-5789 | Osaka | 81-6-6267-1887 | Korea | Seoul | 82-2-3663-0405 | Thailand | Bangkok | 66-2-248-3140 | India | Chennai | 91-44-4230-3878 | Australia | Sydney | 61-2-9482-2999 | Melbourne | 61-3-3797-0100 |

**Europe**

|---------|-----------|-----------------------------|--------|--------------------------|-------|----------------------|-------------------|-----------|--------------------------|-----|-----------|--------------------------|

**Americas**

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<tr>
<th>USA</th>
<th>Toll Free</th>
<th>Cincinnati, OH 1-513-742-8895</th>
<th>Milpitas, CA 1-408-519-3801</th>
<th>Brazil</th>
<th>São Paulo 55-11-5592-5355</th>
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</thead>
</table>

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