PACTECH

Lifestyle augmented with Automation and Controllers

JUN.-AUG. 2013 Vol.39

Cover story

ICP DAS Solutions in Building Automation and Smart Homes

Global warming may force many people to change their lifestyles, to say nothing of its impact on the rest of Earth's ecosystem. And so one of the foremost quests of the twenty-first century has been to reduce ecological harm that we do to the planet. To that end, ICP DAS strives to make automation part of the solution to craft a more environmentally-friendly lifestyle that is both economical and enjoyable.

Featured Product

ICP DAS Building Automation Products - The LC Family: Particulars and Applications

Integrating CAN Bus Communication Interfaces in Various Industries

Specific Applications

ICP DAS Smart Home Exihibition & Experimentation Center

The LinPAC+TouchPad Amphitheater: Automation Makes a Room More Useful

The Ten Thousand Buddhas Hall's Lighting Control

ICP DAS' GST-43 Earthquake Switch, Deployed at a Chemical Plant

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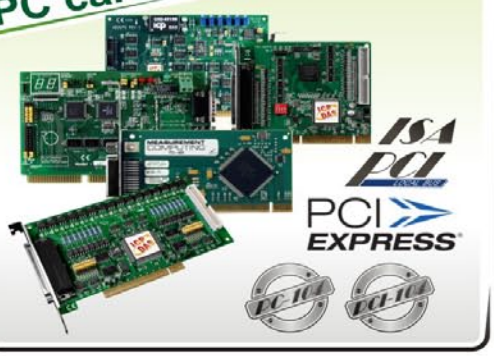
Automation Total Solutions

http://www.icpdas.com

Communication

PAC

PC card



Software

I/O

EXPANSION

WIRED

WIRELESS

Applications

Machine Automation

Engergy Solutions

M2M Solutions

Building Automation

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ICP DAS Building Automation Products - The LC Family: Particulars and Applications

By Tony Lee

Using the ICP DAS TPD master controller in conjunction with members of the LC family results in a well-connected system that matches the standards that could be required for any building. Using the HMIWorks WYSIWYG philosophy, you can spend more time actually doing things, instead of worrying about how things should be done. Discard the pesky menial stage, and focus instead on pure design, and observe as the result polishes itself.

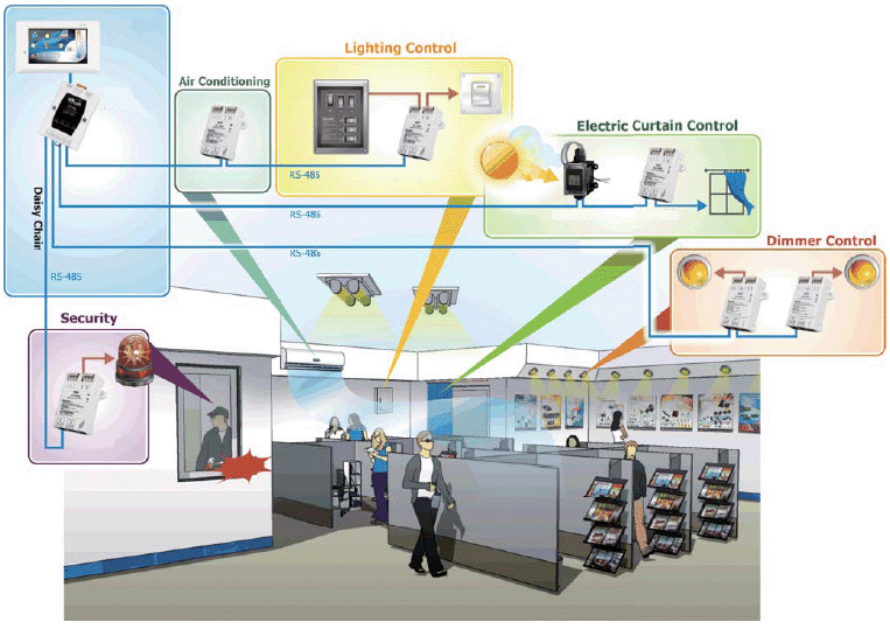
For nearly two decades ICP DAS has proven itself time and again, working closely with customers to continually identify creative outcomes to a range of problems, supply tailored solutions for individual needs, and provide a stream of innovation that continues to enhance its reputation. In recent years, ICP DAS has turned to the field of building automation, now offering the easy-to-install and robust LC family of products.

Applications for the LC Family

In an office (or home) environment, how can the LC family of products be used to meet high automation standards? All that is actually needed in order to smoothly create just such a system is a TPD touch screen connected to one or more of the LC products .

The ICP DAS TPD controller is equipped with built-in high resolution touch screen, real-time clock (RTC) and other communication interfaces such as: RS-232, RS-485, Ethernet, USB, and line-out connections.

The RS-485 interface can be connected to an LC product, a connection established to communicate with HMIWorks, and you can get straight to work in performing building automation tasks. The HMIWorks graphical library drastically shortens setup time, thereby speeding up system



deployment. The WYSIWYG nature of HMIWorks lets the user actually get things done, as opposed to wondering how to get them done. Shedding the layer of complicated coding greatly streamlines the process and makes for a ideal end result.

After that brief introduction to the TPD controller, let's now examine some of the LC family of products:

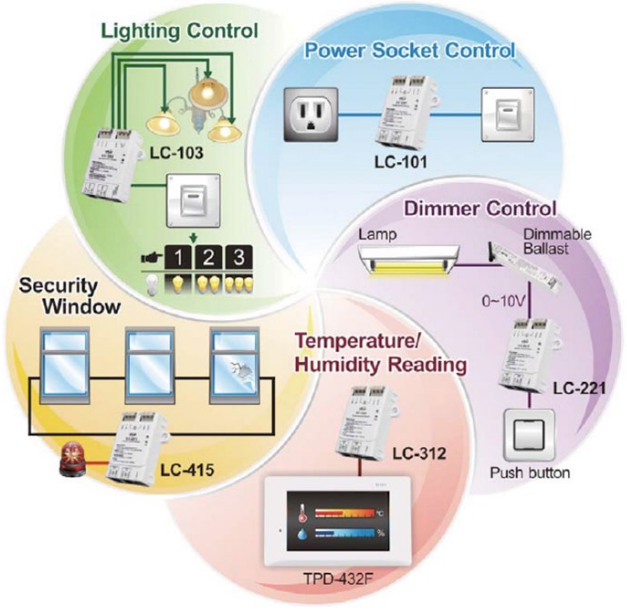
The simplest method of managing lighting requirements is to use the LC-101 model. Options are provided that allow either familiar physical switches or the TPD to be used to remotely control the lighting.

The TPD can also be configured to follow predefined rules, for example, switching off at a given time in order to save energy. For the average user - whether corporate or private - the LC-101 will definitely ensure that the working environment is much more convenient.

For finer management of lighting control, ICP DAS presents the LC-221, which provides the added capability of operating dimmers. The LC-221 thus takes energy management a step further, removing the need for additional energy that would otherwise be wasted.

In residential applications, the IR-210/712 infrared model can be used to control a wide range of household appliances that support IR codes. These can all connected and converted to a standard protocol so that they can be used by remote-controlled or programmable touch screens, thus fulfilling most monitoring needs. By adding the LC-312 temperature and humidity controller to create an intelligent air conditioning system, home life can be vastly improved.

For home security applications, the LC-131 can be connected to reed switches, glass break detectors, and many other kinds of sensors. Together with open-circuit detection, the result is a truly reliable security system.



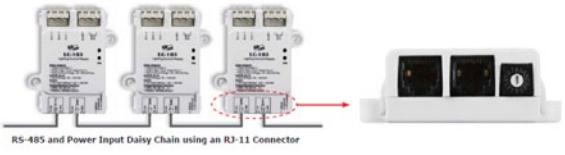
Note that there are a number of other modules in active development, including an illuminometer, a 360-degree infrared detector, and a 4-channel lighting control module, all of which will be available in the near future.

Let's now explore the LC family in greater detail.

Features of the LC Product Line

All devices in the LC Family:

I Are easy to install and debug in the field. The RJ-11 6P connector provides power and communication connections, and the spring clamp terminal block for the IO interface work together to make installation much easier, saving customers a lot of time usually spent on verification.


RS-485 and Power Input Daisy Chain using an RJ-11 Connector

II Come with full support for configuring both hardware and software. Both are quick and flexible, making them suitable for a variety of needs. The user is at liberty to decide how difficult things can be made, depending on the application.

III Simplify the division of work. Once the LC module is installed, it can be operated immediately with

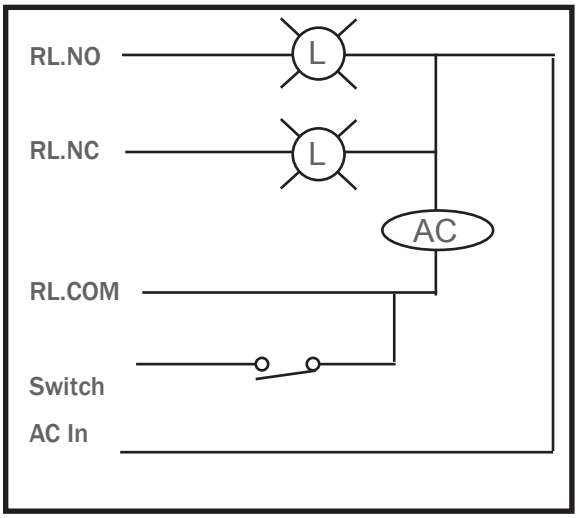
nothing special needing to be done to customize the software. Consequently, there is no need to wait for engineers to write control and verification programs. Maintenance or adjustment are both easy and flexible, and the system is robust enough to deal with any potential faults without the need to take the device out of service.

Maintenance costs are reduced and schedules can be eased thanks to the flexibility of the system; even without a controller, normal operations of the system are not compromised.

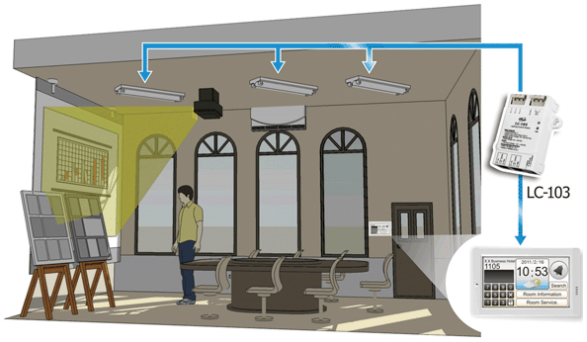
IV Support standard protocols and a variety of transmission formats. LC series modules can operate using either the DCON or Modbus RTU protocol. They also can work with N81, E71, O71, and N82 data formats, and communication speeds can range from 1200 to 115200 bps.

Detailed Documentation for LC Product Functions

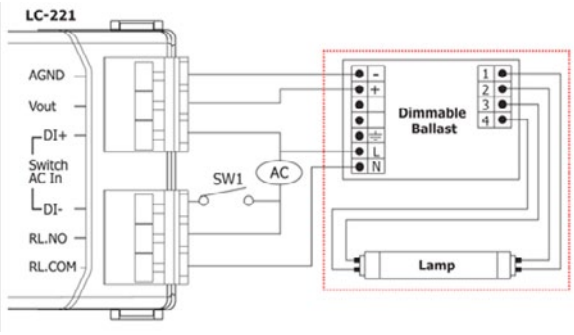
I LC-101 Light Control Module: This module is used to toggle between on and off using a high load relay output and a channel control switch input. An application block diagram is shown below:

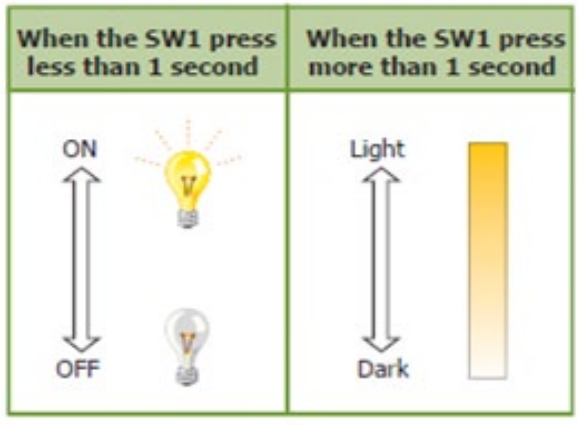


When the "Switch AC In" pin detects a change, the relay output status will change immediately without needing to pass through software control.



II LC-221 Dimmer Module: This module features one channel for analog output, one channel to turn lights on and off (with relay output), and a channel control switch input. An application block diagram is shown below:

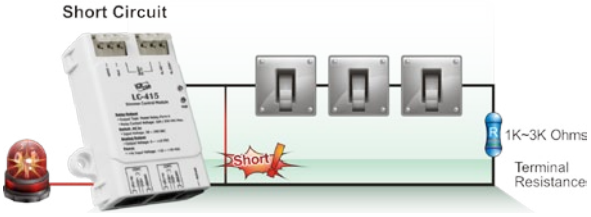


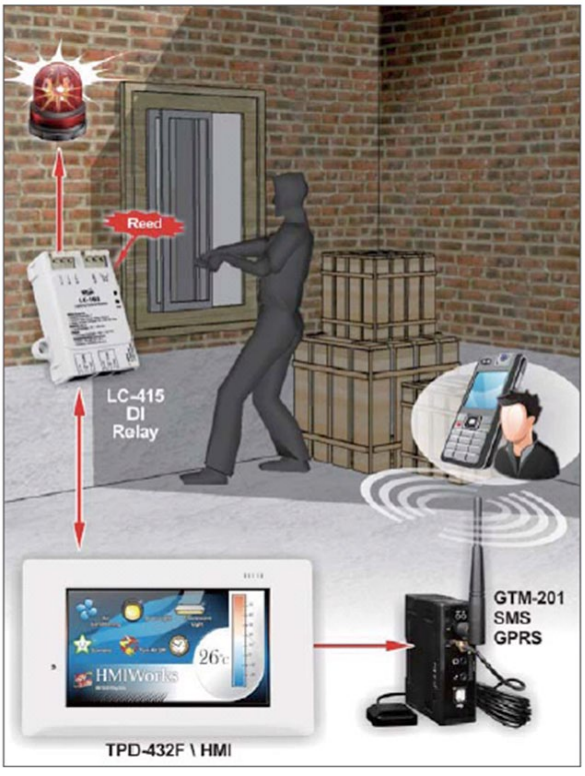


The LC-221 analog output is used to control dimmer switches connected to light sources. The "Switch AC In" pin can be connected to a control switch, which can be used manipulate fluorescent lights depending on the length of time the switch is pressed, for example, pressing for <1 sec. will switch the lights on or off, whereas pressing for >1

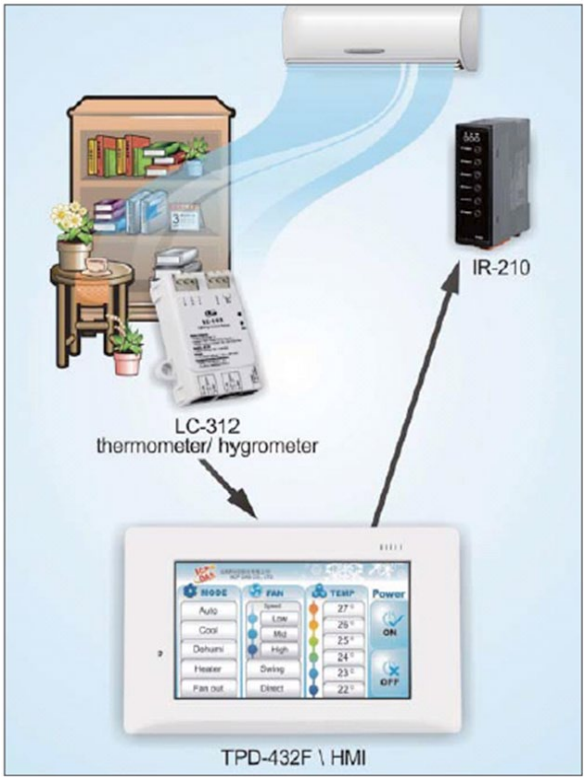
sec. will set the dimmer controls.

III LC-131: This module includes open circuit detection with three digital input channels and one high-load relay output channel. The input channels can be used for open circuit detection and, when connected, access control devices can provide a reliable source. Relay output channels can also be used to connect to a buzzer, so that when an open circuit is detected, a user-defined event is generated that triggers the alarm, effectively deterring vandalism or theft.



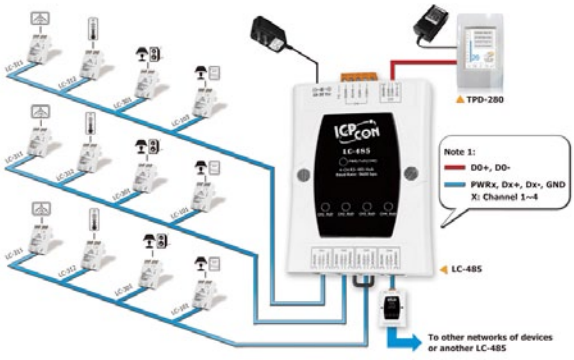


IV LC-312: This module contains temperature and humidity sensors that provide real-time monitoring of both values and includes an internal clock, which makes for easy collection of room temperature and humidity data, facilitating management of systems such as air conditioning.



V IR-210/712: This infrared learning module acts as an interface with household appliances via infrared transmission and can be programmed to "learn" specific features. It provides a standard communication protocol that can be linked with remote controls or programmable touch panels, and is the perfect addition to the management of a "Smart House."

VI LC-485 RS-485 Star Wiring Hub: This device can be used to solve the numerous complications that exist when wiring a network. Application details are shown below:



Integrating CAN Bus Communication Interfaces in Various Industries

By Johney Hu

The CAN bus itself has a host of special features, and its open architecture allows for great flexibility across a wide range of uses. The CAN Bus is both high-performance and high-security, common requirements for application in aviation, vehicular use, medicine, railways, robotics, and critical control systems. Not only was ICP DAS a frontrunner on the CAN Bus scene (making its first advance more than a decade ago), but it is also one among a few truly global R&D CAN Bus manufacturers. From its many years of experience, ICP DAS has produced hundreds of high-quality products related to the CAN Bus.

The CAN Bus is a serial communication system that can maintain high fidelity communication in harsh environments that have extensive electrical noise interference. CAN Bus also provides generous fault tolerance capabilities and ensures easy debugging. The bus itself includes a host of special features, and its open architecture allows for great flexibility across a wide range of uses.

The CAN Bus provides both high-performance and high-security, common requirements for applications in the aviation industry, for vehicular use, and for use in medicine, railways, robotics, and critical control systems.

To keep pace with the ever-increasing sophistication of industrial technology and industrial automation, major equipment manufacturers and system integrators alike have adopted the CAN Bus Communication System as their core technology. In the industrial sector, CAN Bus is generally regarded as a component that is integral to the stability and security of any system.

In real industrial settings, a wide range of communications interfaces, including RS-232, RS-485, Ethernet, and CAN Bus, to name a few, are used by the majority of automation applications. In order to create a heterogeneous system, it is necessary to take the various interfaces, together with their distances and speeds into consideration, meaning that the combined communication performance and cost is difficult to estimate.

To complicate matters further, integration issues and stability concerns are both very real and common. To resolve these difficulties, numerous types of converter and gateway devices are available on the

market - including those made by ICP DAS.

Not only was ICP DAS a frontrunner on the CAN Bus scene, making its first advance more than a decade ago, it is also one of only a few truly global R & D CAN Bus manufacturers. From its many years of experience, ICP DAS has produced hundreds of high-quality CAN Bus products.

The CAN Bus converter developed by ICP DAS manages a wide range of transmission interfaces, meaning that more complex network structures are within easy reach with the aid of the ICP DAS CAN Bus converter. The CAN Bus converter serves as a solid foundation upon which many basic components can be built, including COM, USB, and Ethernet communications. The I-7530 series signal converter supports the RS-232, RS-485, RS-422 interfaces. The I-7540 series converter supports both Ethernet and Wi-Fi interfaces, while the I-7565 series manages USB interfaces. By choosing – or possibly combining - the appropriate CAN Bus signal converters, users can easily manage and integrate multiple interfaces, bridging the exchange and transfer of information.

CAN bus vs. RS-485

Fieldbus / Feathures	CAN bus	RS-485
Interference Immunity	Best	Poor
Baud Rate	10K ~ 1M bps	9.6K ~ 115.2K bps
Distance	40m ~ 5Km	40m ~ 1.2Km
Error Detection	Yes, Provided by hardware	No
Arbitration	Yes	No
Multiple Masters	Supported	No
Data Exchange	Polling or replied by slave	Polling
Stability	Best	Poor

CAN Converter Comparison Sheet

CAN to COM Converter series products:

Module Name	I-7530-FT	I-7530	I-7530A	I-7530A-MR
Pictures				
COM 1	RS-232		RS-232/RS-422/RS-485	
Modbus RTU Slave	-			Yes
CAN Baud Rate (bps)	10 k ~ 125 k	10 k ~ 1 M		
CAN Specification	ISO 11898-3 (Low-Speed/Fault-Tolerance)	ISO 11898-2		
CAN Single-line Communication	Yes	-		
CAN Terminal Resistance	1 kΩ terminator resistor for CAN_H and CAN_L	Selectable 120Ω terminator resistor		

CAN to Ethernet Converter series products:

Module Name	I-7540D	I-7540-MTCP	I-7540D-WF
Pictures			
COM 1	RS-232		-
COM 2	RS-485		-
Virtual COM	Yes		-
Modbus RTU Slave	-	Yes	-
Ethernet Port	10/100 M		802.11 b/g, Infrastructure & Ad-hoc
Modbus TCP Serve	-	Yes	-
CAN Baud Rate (bps)	10 k ~ 1 M		5 k ~ 1 M
CAN Specification	ISO 11898-2		
CAN Terminal Resistance	Selectable 120Ω terminator resistor		

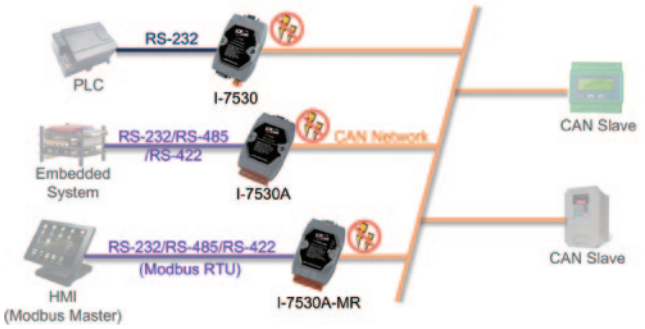
USB to CAN Converter series products

Module Name	I-7565	I-7565-H1	I-7565-H2
Pictures			
CAN Channel	1		2
CAN Baud Rate (bps)	10 k ~ 1 M	5 k ~ 1 M	
Real-time Cyclic Transmission	-	Yes	
Time Stamp	-	Yes	
FPS	250	3000 (Total CAN ports)	
PC Driver	Windows 98/Me/2000/ XP/XP-64bit/ Vista/Vista-64bit/7/7-64bit Linux	Windows XP/XP-64bit/7/7-64bit Linux	

Typical Applications of the CAN Converter Architecture

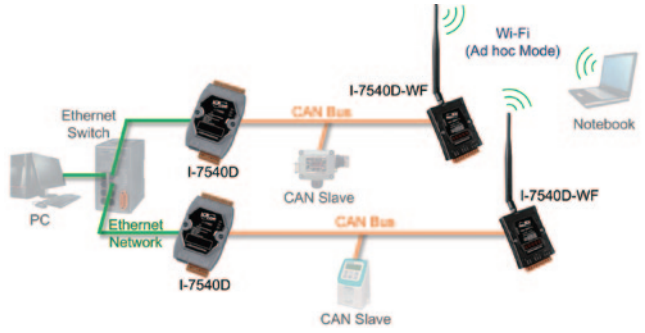
The CAN Bus sees a wide range of use in aviation, electric vehicles, solar energy, wind power, elevator systems, building fire protection systems, environmental monitoring, warehouse automation, and redundant control systems, etc.

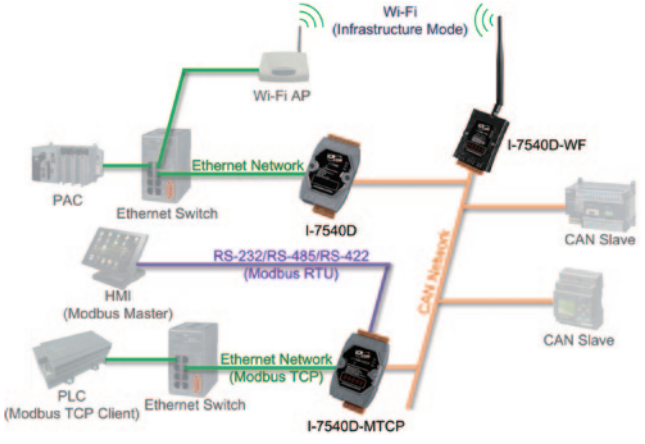
Communication between RS232/ RS485 and CAN bus



Pair connection application 2

Communication between CAN bus and Ethernet

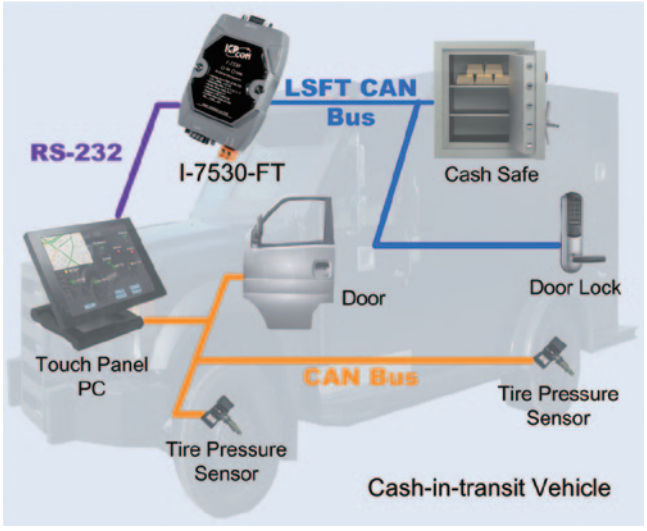




CAN Bus Applications

Usage in Armored Cars

This example is based on the monitoring systems used by a Chinese security company in their armored cars. When it comes to monitoring the current status and the state of the security door, stability and reliability is absolutely critical. To this end, a well-integrated data exchange interface is needed. LSFT (low speed fault-tolerant) systems are often used in automotive electronic systems: the I-7530-FT is designed to convert between LSFT CAN and RS-232. Consequently, the company can effectively control the security doors, which can also be monitored remotely.



Gyroscopic Vehicle Monitoring System

Real-time data is sent to the vehicle's CAN Bus devices via the J-1939-71 protocol. The gyroscope's real-time data is sent via RS-232. The I-7540 will receive the data and will then forward it to the Host PC. The speed of the vehicle, the engine speed, fuel consumption, air inlet pressure, and device manifold pressure is sampled and resolved by the Host PC and then stored into a database to be accessed in the future as the need arises.

ABS/ESP and Train-aided Radar System

The I-7540D-WF can be used in conjunction with ABS/ESP system data and assisted driving radar functions. iOS, Android, or other mobile devices can be used to connect to the system via Wi-Fi, and the I-7540D-WF will transform the information provided to CAN Bus signals and forward the data tp an ABS/ESP system or assisted driving radar system.

CAN Signal Converter Series

Product	Interface	Description
I-7530	CAN <--> RS-232	CAN to RS-232 converter
I-7530-FT		Low-Speed/Fault-Tolerance CAN to RS-232 converter
I-7530A-MR	CAN <--> RS-232/ RS-422/RS-485	CAN to Modbus RTU slave converter
I-7530A		CAN to RS-232/RS-422/RS-485 converter
I-7540D	CAN <--> Ethernet	CAN to Ethernet converter
I-7540D-MTCP		CAN to Modbus TCP server converter
I-7540D-WF	CAN <--> Wi-Fi	CAN to Wi-Fi converter
I-7565	CAN * 1 <--> USB	USB to CAN converter
I-7565-H1		High performance 1-port USB to CAN converter
I-7565-H2	CAN * 2 <--> USB	High performance 2-port USB to CAN converter

ICP DAS provides a thorough description of all its CAN-related products on the web. Full details, including product specifications and operating manuals, can be found at

http://www.icpdas.com/products/Remote_IO/can_bus/can_series.htm

Summary

With the introduction of more sophisticated industrial technology, automation and increasingly automated production equipment, customers are more focused on that elastic strain and the turnaround time to big changes in the market. For many years, ICP DAS has cultivated the automation market, actively working to meet market demand through its sizable R & D team, especially in the CAN Bus technology field, where the R & D department spares no effort. Although ICP DAS has attained full mastery of CAN Bus technology, the R & D team continues in its pursuit of innovation for its products in order to develop better and more diverse CAN devices. The ICP DAS R & D department continually strives to provide a wealth of bus and integration solutions to better meet the many needs of the market.

Using Digital Input Modules in Distributed Systems to Detect Switch State

By Martin Hsu

Distributed System monitoring applications often need to use digital input modules

(DI modules) to monitor the state of the switch used in the control logic. The procedure described in this article will be based on the two most typically seen general switched states for electrical signals in order to illustrate how to use the DI module to detect a switching action.

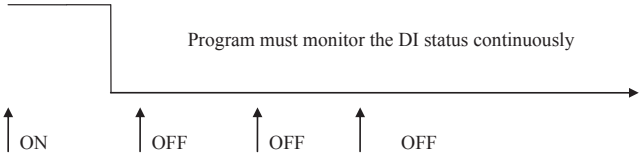
Switch button

A common switch is shown below.

When one toggles the switch from "Off" to "On," the electric current will change, as shown below.

There are a few points to note about such switches:

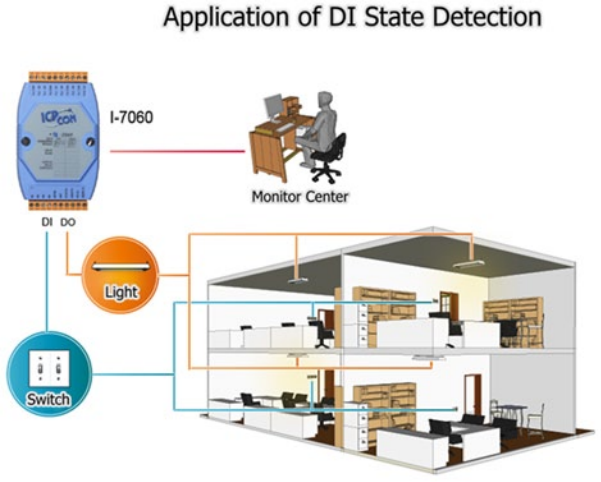
1. The position is physically apparent
2. The switch state will probably remain constant for minutes or even hours



Typical applications of such a setup are seen in general programs that constantly poll the DI state, acting accordingly depending on the status of the DI.

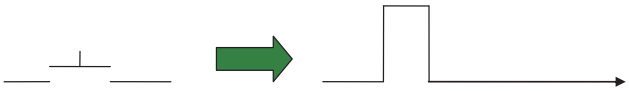
Reading DI as a Switch Control

If a change is detected in the switch output for the DI module, as in general indoor lighting, the switch maintains its state for a considerable time. This type of application is typical of using DI readings for logic control.



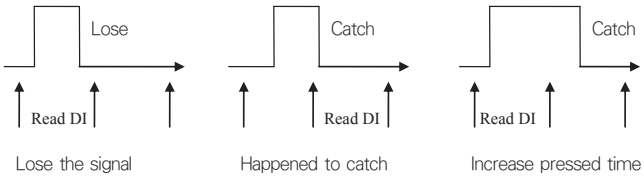
Push Button

Another typical switch is the push-button, as illustrated below.



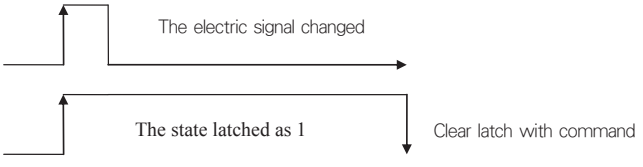
These switches have some particulars, too:

1. The position is also physically apparent
2. State changes only persist for a few (milli)seconds



In a distributed system, large, module-heavy networks contain hundreds of inputs, each only sending signals in bursts of a few milliseconds. Many users will complain that their systems are not reacting or are not sensitive to quick changes, requiring buttons to be pressed for a long time before eliciting any response.

In these (unfortunate) situations, ensuring that the switch properly sends a signal either requires some luck, or some familiarity with the system(i.e., knowing how long to press the button).



Accelerating communication is not a solution to such a situation – something that is a common misconception. In fact, the desired approach is to apply the module's DI Latch function.

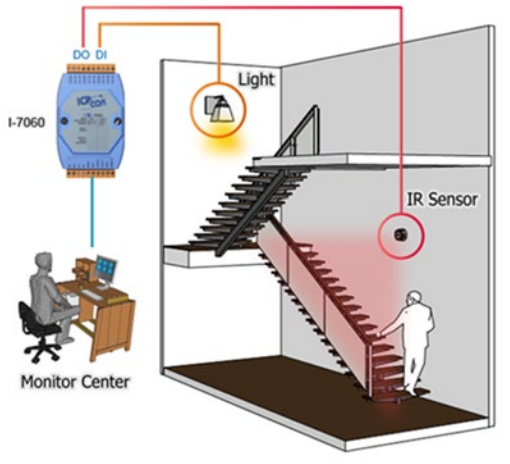
The following describes how to utilize the DI Latch function to sense switch state changes.

The DI Latch has both "High" and "Low" states; as the illustrated in the example, when the DI receives a change in the external signal from zero to one, the module will "latch" the signal “up” to its position, and the latched state is maintained until it is cleared by either a command or power cycle.

Application of the DI Latch to Switch Control

Sensors situated in staircases generally rely on the presence of a person in the stairwell in order to trigger the lights. As with the push-button example, any change is transient, so the DI Latch approach is well-employed here to detect changes in the signal to switch on the stairwell lighting.

Application of DI Latch Detection



Applying HMIWorks in Data Exchanges

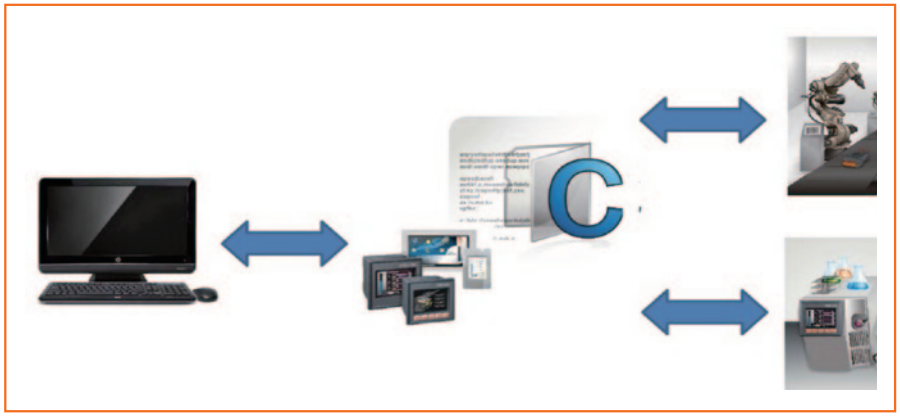
By Edwin Yang

The production line is the heart, the most critical portion, of industry. It is filled with electronic devices, controlled by different PLC's manning the communication interfaces. To integrate these interfaces, customers can use a TouchPAD as an interface between the different protocols in order to process the data exchanges. Consequently, the configuration of important parameters is easily performed through the TouchPAD.

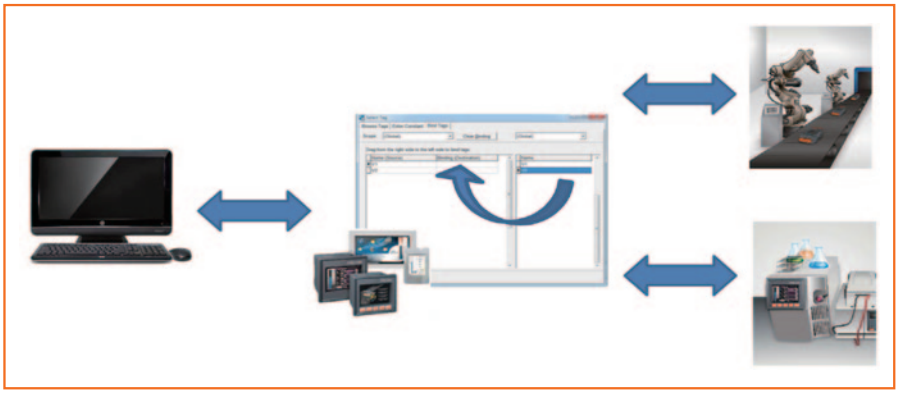
HMIWorks_STD_v2.05.11 adds data packed features. The TouchPAD's standardized data format and ability to convert between protocols gives it the central role in the exchange of information between different components and the PC. This mediative role is augmented by the ability of the device to automatically learn, process, and respond, making on-site application much more flexible.

The production line is the heart, the most critical portion, of industry. It is filled with electronic devices, controlled by different PLC's manning the communication interfaces. To integrate these interfaces, customers can use a TouchPAD as an interface between the different protocols in order to process the data exchanges. Consequently, the configuration of important parameters is easily performed through the TouchPAD.

Designing a custom function in C can be complicated, especially when converting between formats.

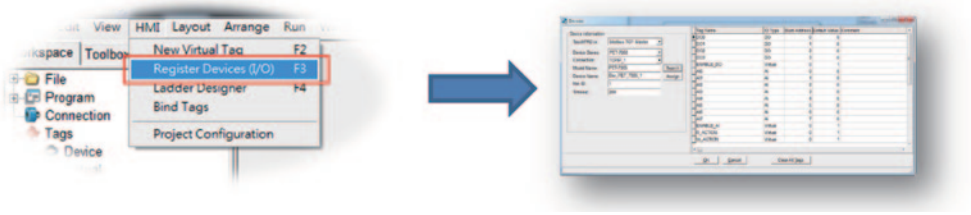


Using HMIWorks, the time spent on developing custom C programs and on conversion is eliminated, moving functional data exchange up the schedule.



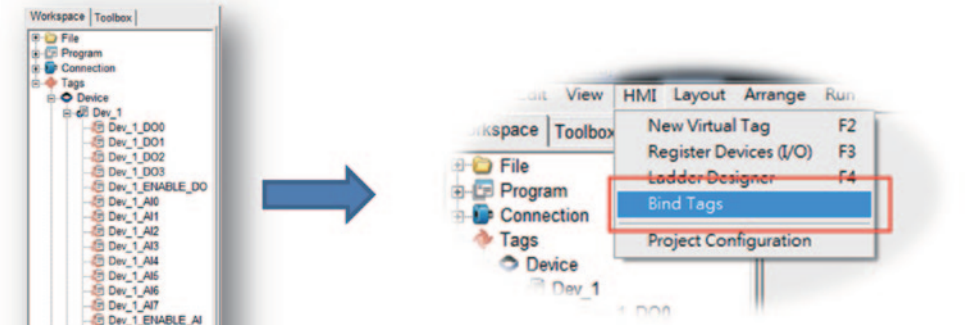
Step 1)

Initialize the devices in HMIWorks.



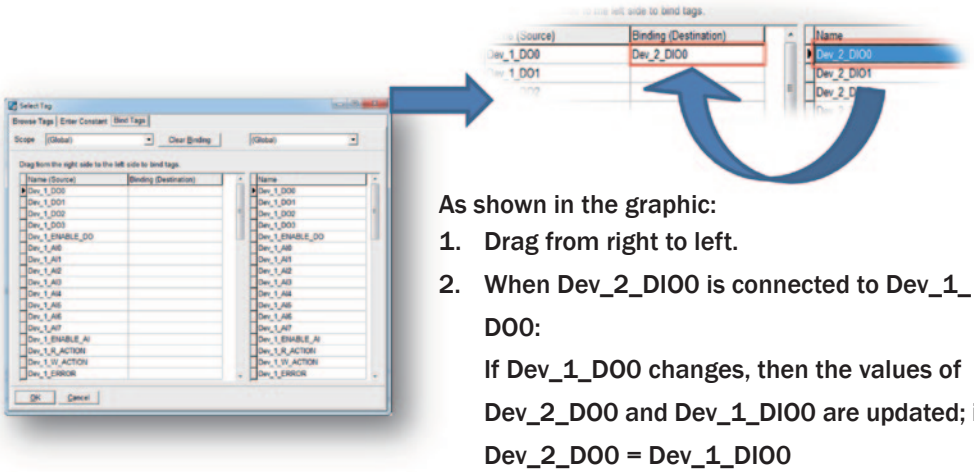
Step 2)

After initialization, a list of all the tags for all devices can be displayed by selecting "Bind Tags" from the drop-down menu.



Step 3)

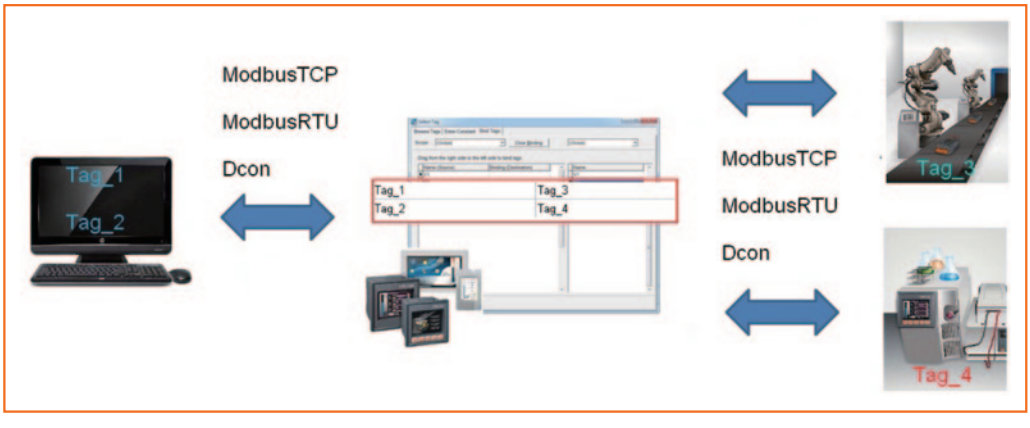
Drag-and-release to create connections between tags. See the illustrated example.



As shown in the graphic:

1. Drag from right to left.
2. When Dev_2_DIO0 is connected to Dev_1_DO0:
   If Dev_1_DO0 changes, then the values of Dev_2_DO0 and Dev_1_DIO0 are updated; i.e. Dev_2_DO0 = Dev_1_DIO0
3. Continue in the same vein; when B is dragged to A, and C to B, a change in the value of A is reflected in that B = A and C = A

Schematic diagram



ICP DAS Solutions in Building Automation and Smart Homes

By ICP DAS Staff, Shanghai Division

In recent years, the development of a variety of networking applications has promoted much technology that, once upon a time, was only a dream. ICP DAS follows its people-oriented philosophy to create innovative smart buildings, shaping the concept and design of the smart home.

Foreword

Smart buildings provide building-wide automation solutions. Building automation systems achieve automatic mechanical and electrical control over heating, ventilation, air conditioning, drainage, power, lighting, elevators, fire protection, security, and garage management. Network all these and hook them up to a central control center for real-time monitoring and management. Automatic reactions to environmental changes are also built-in to always keep operation at its peak, while also keeping building occupants safe and comfortable by supplying an energy-efficient and well-crafted environment.

The Smart home and smart building are closely related. But for the residential consumer, the support is finer, more personalized, with an emphasis on home automation devices and automatic condition adjustments. All this is lashed together via a wireless terminal that constantly monitors and operates home appliances.

Introduction

As technology continues to make enormous strides forward, one must recognize the contribution that embedded applications have made to making both smart buildings and smart homes. ICP DAS does so by continuing to provide embedded applications of the highest quality to provide complete solutions for a variety of fields.

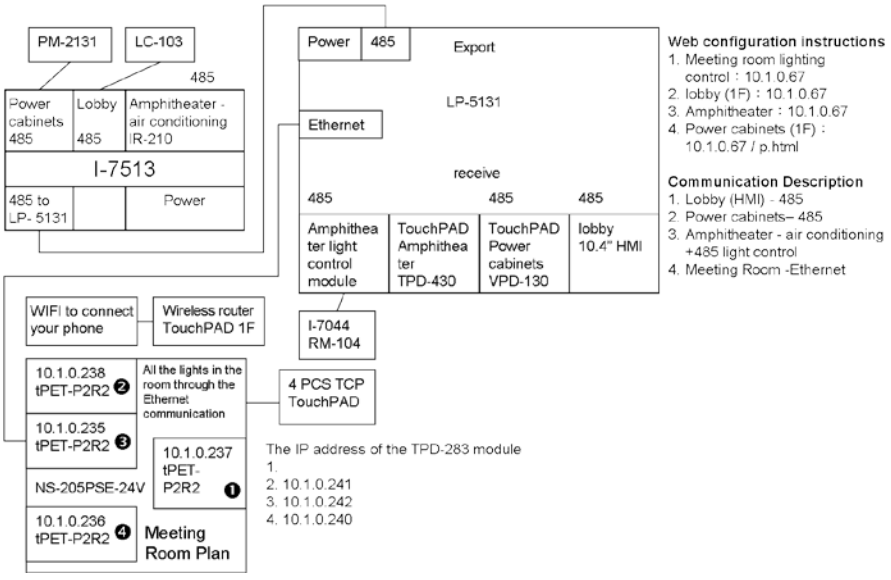
The following illustration shows a typical smart building design with ICP DAS components:

System Description

Building Lighting

The system is controlled by the LP-5131, an embedded controller that runs a version of Linux.

It can function as a web server, provide on-site bus network control, and works with digital output module relays to control electric switches. The two controls illustrated in the network diagram are the ones that the LP-5131 controller supports: they

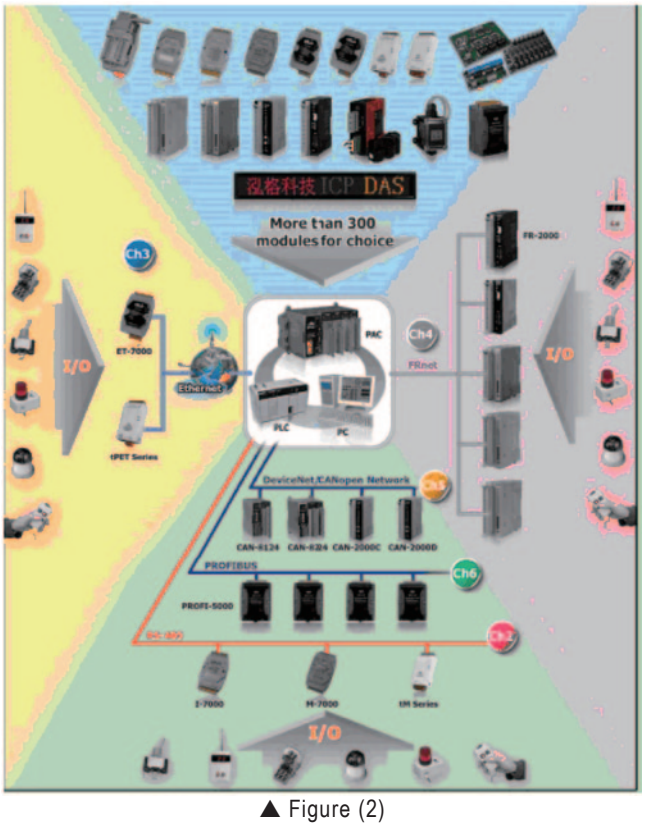


▲ Figure (1) : ICP DAS intelligent building solutions organization chart

use either the DCON protocol/MODBUS RTU via RS-485 serial bus or the MODBUS TCP protocol via Ethernet.

Different networks are filled with different bus modules; but ICP DAS can handle them all simply by offering a variety of on-site and distributed environment bus solutions.

See figure 2: in a distributed model of RS-485 module LC-103 and with decentralized Tiny-Ethernet modules tPET-P2R2, which directly support relay output. The room uses I-7044D and requires external RM-104 relay board outputs. For interactions between human and computer, the TPD-283 and TPD-430 are called to the bat to supplement the HMI touch screen terminal. Commands are sent to the LP-5131 controller via the network, and the corresponding modules on the network are sought out by their addresses, whereupon the control module processes I/O to operate the electric relay control switch.



▲ Figure (2)

Building Supply and Distribution

Building supply and distribution systems have the same basic structure as lighting control. First, retrieve data of single phase voltage & current and three phase voltage & current by the Current Transformer and Potential Transformer that are connected via PM-2134, after the data is processed, display the data on the VPD-130 HMI terminal via RS-485. The system enables real-time monitoring of the power consumption and single/three phase voltage & current of the Supply and Distribution system.

Temperature and Humidity

ICP DAS' temperature and humidity module, the DL-100T485, can be interfaced directly through MODBUS RTU to get current temperature and humidity values.

Air Conditioning and Ventilation

The IR-210 from ICP DAS completes any air conditioning control system. The IR-210 is a module that can actually learn infrared commands. In addition to air conditioning, other infrared-controlled devices can be controlled with the IR-210.

Introduction to the Modules

The LP-5131 is equipped with a 520 MHz PXA270 CPU. It runs Linux (kernel 2.6.19), providing a set of rich interfaces, including VGA, USB, Ethernet, RS-232 / 485.

A wide selection of different functions are available for the I/O expansion board. The LP-5131 has an ideal control system built in that does just about everything: a high-reliability microkernel, Web, FTP, Telnet, and SSH support.

It supports LinPAC SDK, GNU C, JAVA, and GUI programming and allows connection to expansion board. It's even fitted with dual watchdog, dual

Ethernet, and dual battery backup - all in the name of redundant design. The LinPAC-5131 melds together the best features of the traditional PLC and Linux kernel to build a robust and reliable embedded control system.

LP-5131 / LP-5141 Specifications

Models	LP-5131	LP-5131-OD	LP-5141	LP-5141-OD
System Software				
OS	Linux kernel 2.6.19			
Embedded Service	Web Server, FTP Server, Telnet Server, SSH Server			
SDK Provided	Standard LinPAC SDK for Windows and Linux by GNU C language			
CPU Module				
CPU	PXA270, 520 MHz			
SDRAM	128 MB			
NVRAM	31 Byte (Battery backup, data valid up to 10 years)			
Flash	64 MB			
EEPROM	16 KB			
Expansion Flash Memory	microSD socket with one 2 GB microSD card (support up to 32 GB microSDHC card)			
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year			
64-bit Hardware Serial Number	Yes, for Software Copy Protection			
Dual Watchdog Timer	Yes			
LED indicator	3 Dual-Color LEDs (PWR, RUN, L1 ~ L4; RUN, L1 ~ L4 for user programmable)			
Rotary Switch	Yes (0 ~ 9)			
VGA & Communication Ports				
VGA	Yes (640 × 480/800 × 600)			
Ethernet	RJ-45 x 1, 10/100 Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)		RJ-45 x 2, 10/100 Base-TX (Auto-negotiating, Auto MDI/MDI-X, LED indicators)	
USB 1.1 (host)	2		1	
Audio Port (Microphone-In and Earphone-Out)	-	Yes	-	Yes
COM 1	RS-232 (RxD, TxD and GND); Non-isolated			
COM 2	RS-485 (Data+, Data-); 2500 VDC isolated			
COM 3	RS-232 (RxD, TxD and GND); Non-isolated			
I/O Expansion				
I/O expansion bus	I/O expansion board optional			
Mechanical				
Dimensions (W x L x H)	91 mm x 132 mm x 52 mm			
Installation	DIN-Rail			
Environmental				
Operating Temperature	-25 °C ~ +75 °C			
Storage Temperature	-30 °C ~ +80 °C			
Ambient Relative Humidity	10 ~ 90% RH (non-condensing)			
Power				
Input Range	+10 VDC ~ +30 VDC			
Isolation	1 kV			
Consumption	4.8 W	6 W	4.8 W	6 W

Applications

The LP-5131 / 5141 is easily used in factory settings, general purpose buildings, communities, and private property. Its uses are more expansive than that, as our creative customers continue to demonstrate.

Conclusion

The smart home has changed the traditional system of home control, so that the whole family can be safer, wiser, and perhaps friendlier to the environment. ICP DAS leads on the charge for the future development of the hearth and home.

ICP DAS Smart Home Exihibition & Experimentation Center

By JE Wang

Global warming will directly impact human life in the future - and in the worst case it may affect the continuation of all life. Saving energy and reducing emissions are two common 21st-century global objectives. ICP DAS is one of the foremost specialists in automatic control and data acquisition; we experiment constantly with gathering environmental data and manipulating control equipment to achive energy savings, and hope that our products will give their users peace of mind from the thirst for energy.

Our Starting Point

A Method to Save Energy

Human life is often inseparable from the ubiquitous building, be it for work, entertainment, shopping, or the home. As the buildings differ, so do their demands for electricity; but as time goes by, the demand tends to increase. To face the rising want for energy, two approaches have arisen; the first is alternative energy solutions (like wind and solar power).

This is not always an easy approach because of the high start-up cost, which not every individual or entity can take. The second approach involves streamlining the use of energy: avoiding unnecessary waste of energy. Simply turning off unneeded devices can cut consumption drastically; yet the public is sometimes slow to pick this mindset up. And so we turn to automation as the fundamental solution, which is why we refer our customers to our smart home showroom in Wuhan.

Using low power-consumption LED lighting

Characteristics

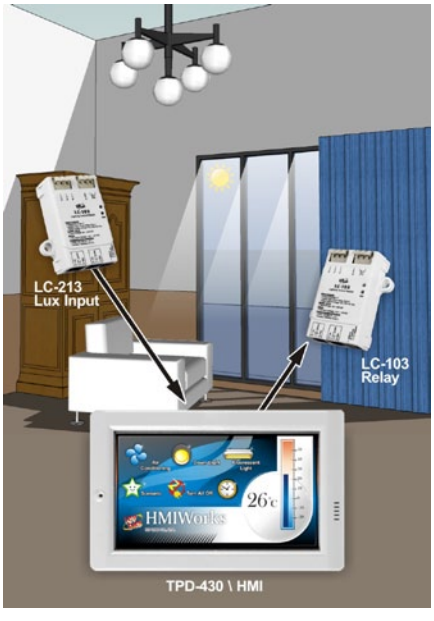
Sensors react quicker than humans do.

Electricity pervades all modern life - from steam power we went speedily to electricity, which now powers a huge majority of our lifestyles. It gives us light, keeps us warm (or cool), preserves our food, and entertains us by powering our many devices.

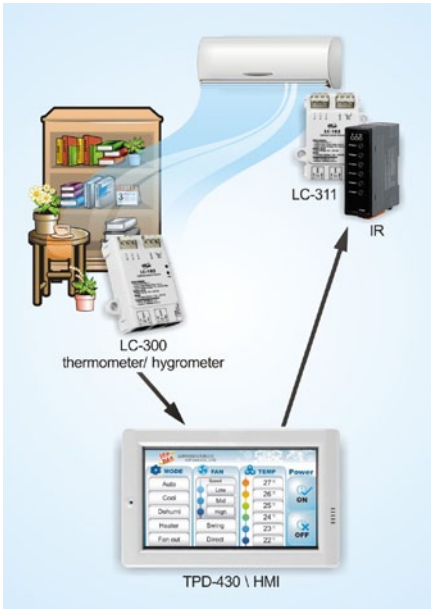
Statistics say that lighting and air conditioning make up 70% of a building's energy consumption, making the two prime for pruning in order to save energy. By trimming waste from unneeded air conditioning and lighting, the savings are immediately apparent in that 70% consumption.

Completely ceasing to use electricity is hardly an option. The only question,

Light perception



Temperature and humidity



then, is how should one optimize usage of electricity. The obvious solution is to get people to manually switch them on and off as needed - but in a busy work environment, who actually actively keeps score on when it's needlessly bright or warm? Automation comes to the rescue of the people who have better things to do than fret about every bulb in the building.

If the demand for electricity is traced to the environment inconveniencing efforts to save energy, then the integration of environmental factors is essential.

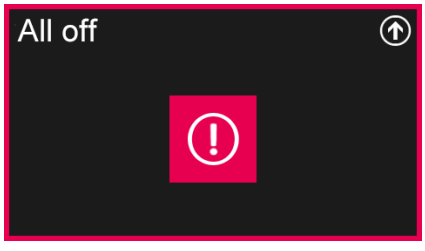
Using dimmers, for example, can go a long way to saving energy for those who need light but not 100% of it. By studying light usage in an environment and converting the data into procedures, an all-around lighting solution is in reach that intelligently adjusts lighting as needed. Data acquisition has long been a specialty of ICP DAS - by combining sensors with data, one will see a great improvement in energy savings and take a fair burden off the users.

One touch turns everything off

An all-in-one key is convenient, not only for simple building management but also for the last-out patrolmen who have to sweep the building to make sure that everything has been turned off. Instead of manually passing through the whole building, toggling all the power from one place is the way to go. The exhibition center places a TouchPAD at the entrance to each room with a one-touch "all off" option to smoothly turn everything off on your way out. Turning out the lights has never been so easy.

Bedroom HMI home page

"One-touch, all-off" button for the Bedroom

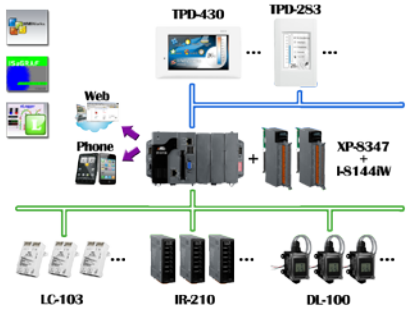


Structure and Function

Building Automation Framework

The quality of a complete system architecture is determined by the combined performances of both hardware and software. Most systems are built from the ground up with a specific structure in mind; many are unfortunately rigid and difficult to adapt for special cases. Is not the best case one where the system is both well-structure AND flexible? ICP DAS answers the call again.

Old architecture deployment is lacking of flexibility



Building model vs. System model

The Wuhan Exhibition Center is complete with a bedroom, living room, conference room, and reception hall - the five areas most likely to need an intelligent system. The Exhibition aims to be as all-encompassing as possible to cover most of the likely demands that a customer could have.

Built to operate within building engineering standards, the TouchPAD from ICP DAS can correspond with a variety of control groups; for example, the LC-103 comes with 3 relays to control lighting, the LC-221 controls 0 - 10V LED dimming, and the IR-210 infrared controls air conditioning, television, and music. Finally, we worked out a solution based on an idea called "subsystem", one subsystem maps to a room or an area that contains all of the most basic control, when we utilize subsystem concept, it will no longer be a single switch controlling a single device as in the past, subsystem will simplify our works and provides an interface for us to control all things.

Floor Plan

Subsystems

The latest TouchPADs have multi-channel communications that show off the highest performance of distributed systems. Control can be extended sequentially, one room at a time, from bedroom to living room to conference room to office to reception hall - and in the end, the whole setup can be threaded through the web and controlled remotely with mobile integration of SCADA to manage everything at once. Not only do we see an increased flexibility at work, but also a superior form of communication.

Subsystems are like building blocks for maximum flexibility

Optional Functions

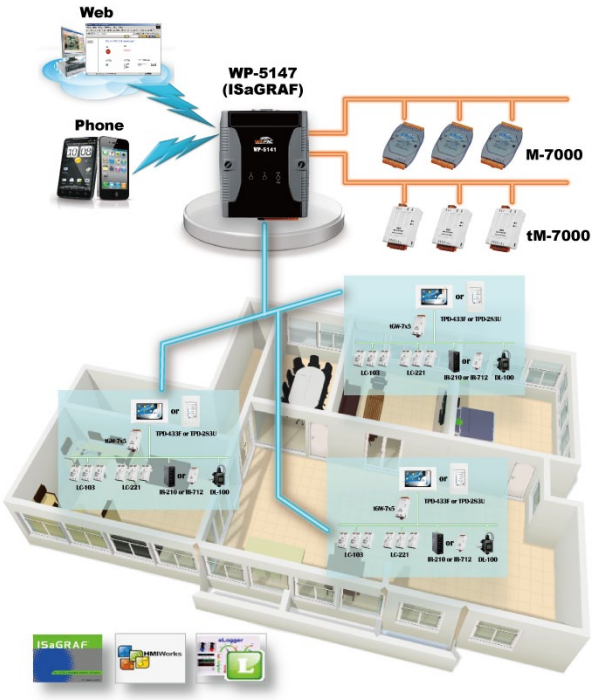
Web and mobile control co-exist harmoniously in WinPAC; both can benefit from ugmenting the system with additional sensors. For example, a light sensors could detect low levels and brighten up the room to compensate; a temperature sensor could distinguish uncomfortable temperatures and make the appropriate adjustments. These automatic adjustments do not override the usual controls, merely serving to increase the utility of the overall system.

They can be safely tacked on as per customers' needs without introducing complications in control.

Implementation Cost and

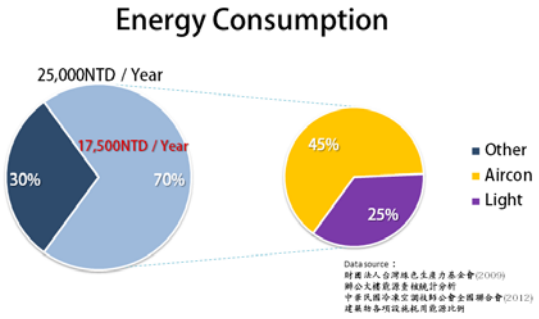
Energy Efficiency

In terms of the general-use control kit plus housing, implementation costs about 90,000 New Taiwan Dollars ($3,000). For an annual electric bill of 25,000 NTD, ICP DAS estimates as much as 40% savings on energy - typically in the area of 7,000 NTD. This means that one breaks even in about a decade - whereupon the benefits REALLY begin to kick in from the energy savings.

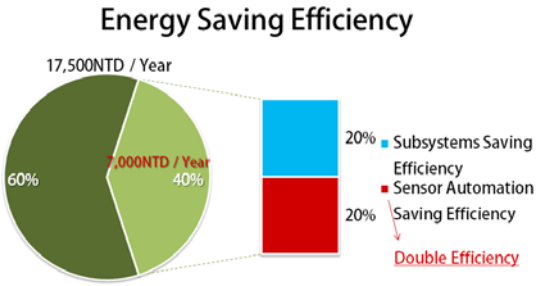


Implementation costs	
Subsystems	35,000NTD / Set
(Web & Sensor)	20,000NTD~ / Set

More than 70% of the energy used in buildings is used for lighting and air conditioning



Using subsystem could save up to 20% energy, with Sensor Automation would even double energy saving



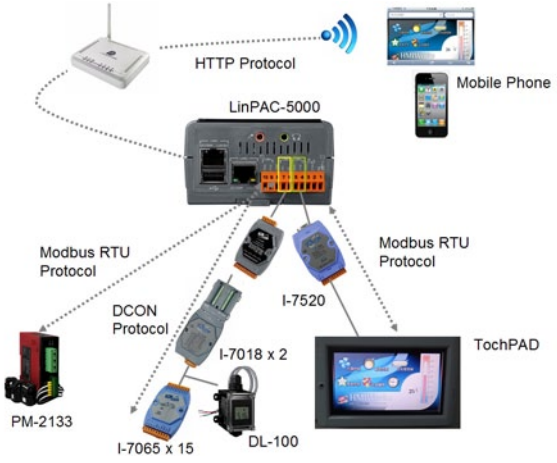
The LinPAC+TouchPad Amphitheater: Automation Makes a Room More Useful

By Jerry Chiu

Mobile devices have spread everywhere in recent years. Notebooks, tablet computers, and smartphones have become increasingly connected with our daily lives. Extending control to these handheld electronics has become a priority so to increase accessibility.

Using LinPAC and the TouchPAD controller together in the amphitheater along with other modules allows for complete control over the whole system, as well as detailed sensors levels on power consumption, temperature, and humidity. Not only can all this be done through the TouchPAD (connected via HMI to the LinPAC controller), but it can also be done on your mobile phone or computer; the if the LinPAC is connected to a wireless network, it's as easy as pointing your web browser to the appropriate page to access a control panel. Nor do the TouchPAD and separate device interfere with each other; they can be used separately, one without the other, or together in paralell - and where one makes a change, the other immediately updates its display to reflect as such: a very convenient feature.

System Architecture and Behavior



Module	Features
LinPAC-5000	controller
TPD-430	Touch HMI display
I-7065 x 15	fluorescent lamps, embedded switches, air conditioning, air flow control
I-7018Z x 2	measures air outlet temperature
DL-100	measures indoor temperature and humidity
PM-2133	measures indoor electricity usage
WiFi AP	serves as a network base station

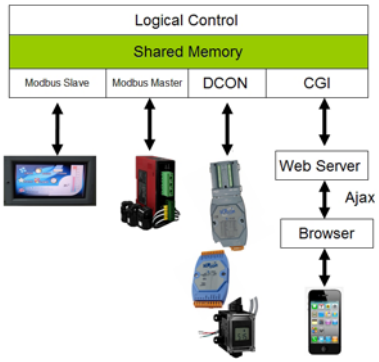
The LinPAC-5000 is the heart of the system. It's a palm-sized Linux-based controller; and as with most Linux systems, it's easily customizable to give users a great deal of flexibility to meet many different needs.

The LinPAC-5000:

- operates via the DCON protocol, and answers to the I-7000 module and DL-100 temperature + humidity module
- reads through the modbus master PM-2133 meter values
- provides the TPD-430 modbus slave communication

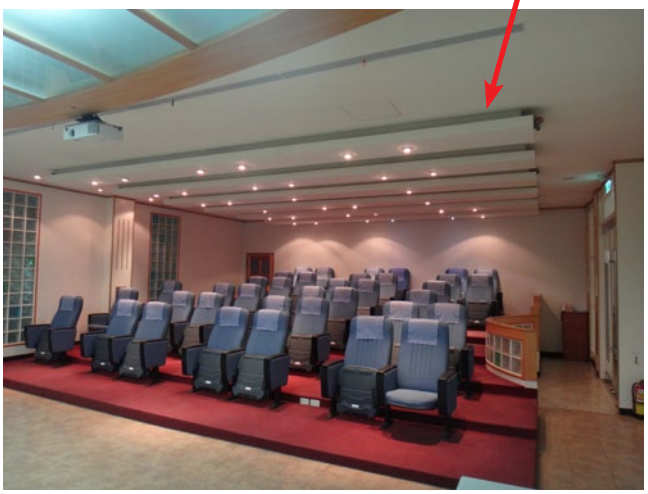
- provides a web interface for mobile devices or PC access
- implements logic control (e.g. situational mode, automatic temperature control)

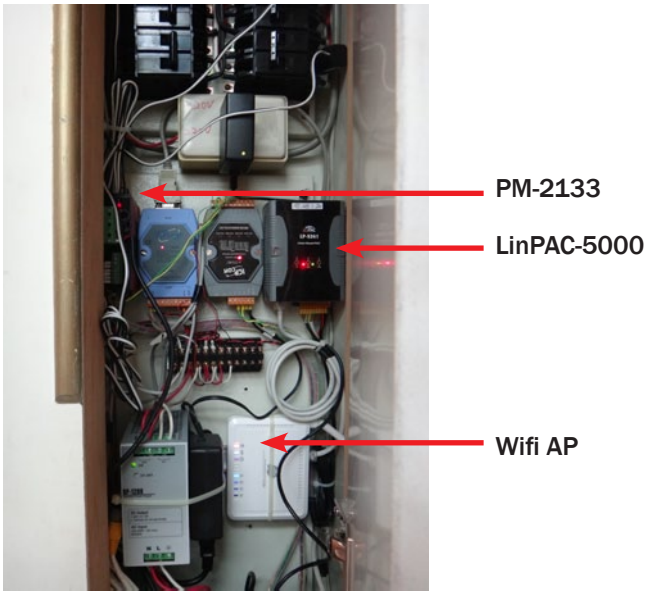
provides shared memory so that programs can communicate among each other; also makes adding different protocols or expanding application support easier

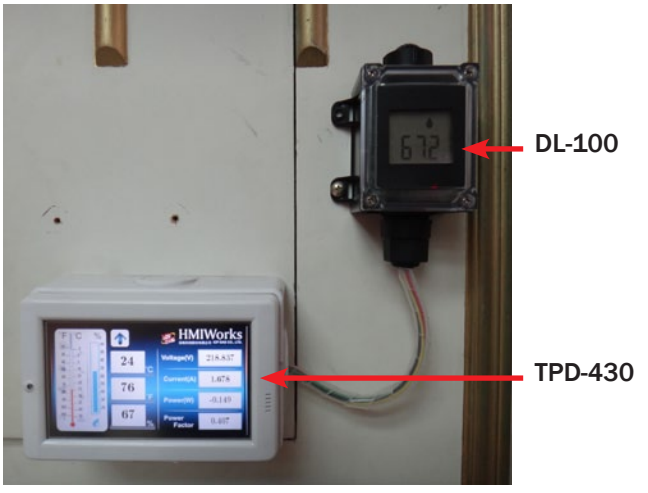


The HMI section online takes into account the cross-platform component by using HTML and Ajax. While Java and Flash, too, compete for dominance in the cross-platform world, there are plenty of examples where using Flash is impractical (iOS being the prime example). A more comprehensive cross-platform solution is reached with the combination of HTML and Ajax, meaning less work pushed into the porting and more in the actual application.

Application field

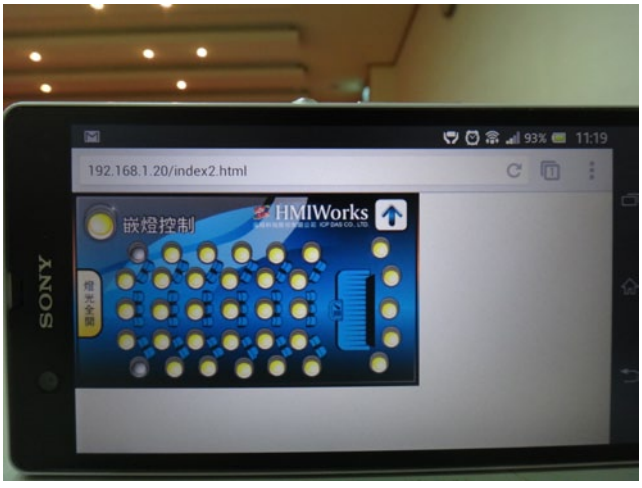






Screen of the TouchPad

The phone's screen



Afterword

In the post-PC era, mobile phones, tablets, and other devices have crept up to become the general computing machines of the generation. They have started to bridge the disconnect between home automation and personal computing; but to continue this, manufacturers must continue to provide support for mobile devices - a new topic itself in the post-PC age.

Related Products

LinPAC-5000

http://www.icpdas.com/root/product/solutions/pac/linpac/linpac-5000_introduction.html

TPD-430

http://www.icpdas.com/root/product/solutions/hmi_touch_monitor/touchpad/touchpad_introduction.html

I-7018Z

http://www.icpdas.com/products/Remote_IO/i-7000/i-7018z.htm

I-7065

http://www.icpdas.com/products/Remote_IO/i-7000/i-7065d.htm

DL-100

http://www.icpdas.com/root/product/solutions/remote_io/rs-485/dl_series/dl-100t485.html

PM-2133

http://www.icpdas.com/root/product/solutions/intelligence_power_meter/pm_series/pm-213x.html

The Ten Thousand Buddhas Hall's Lighting Control

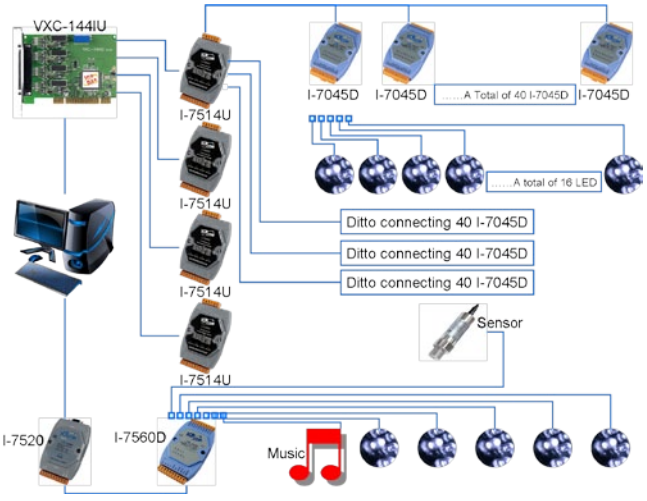
By ICP DAS Staff, Shanghai Division

The project is ambitious: its aim is to create a beautiful temple of light and music complete with a full-featured monitoring system to oversee the ten thousand Buddhas on their shelves all around the temple. The controls on the multitude of LED lights must be fine enough to react to the flow of guests entering the hall, to inspire them with a feeling of holiness.

Ten thousand Buddha Hall Lighting & Sound System Functions

In the Ten thousand Buddha Hall, there are ten thousand statues and ten thousand glass LED lights:

1. Ten thousand statues and ten thousand glass LED lights - ten thousand inputs to feed the computer, all processed separately and controlled independently.



2. The ten thousand Buddha statues and ten thousand glass LED lights can also be lit up at the same time.
3. To suit the Medicine Buddha Mandala, ICP DAS designed a sensor that would project colored lights. They came in shades of blue, red, yellow, black, and white; in addition, the setup was made to trigger lights and Buddha music(Medicine Buddha Dharani) automatically when visitors entered a certain area.
4. The Ten Thousand Buddha's dimensions are 75 by 47 by 18 meters; the control room next to the Ten Thousand Buddha was 8 by 5 meters.

Efficiency in Use

This setup enables customers to control all ten thousand as one, or manipulate each LED (from 0 to 10000) individually, because each I-7045D can control 16 of the LEDs, which makes wiring much easier. More importantly, such a solution cut almost half the cost comparing to using PLCs.

ICP DAS GST-43 Earthquake Switch, Deployed at a Chemical Plant

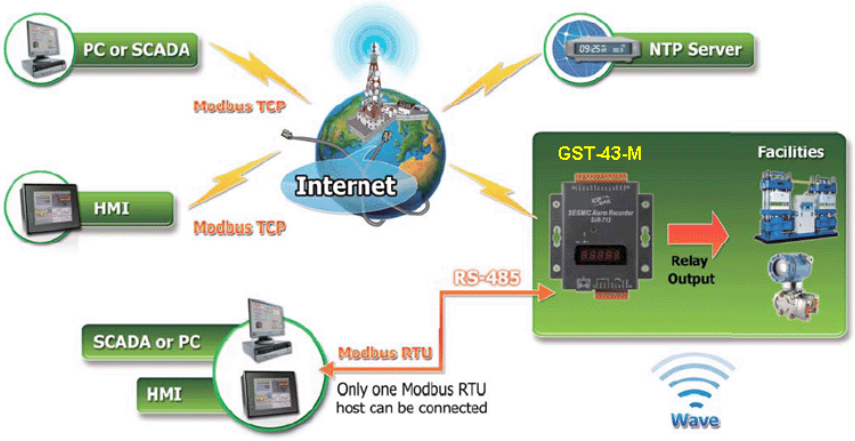
By Edward Fang

ICP DAS R&D team presents the GST-43 seismic switch that's used to predict and prevent secondary disasters. It's Can be applied to people's livelihood, factories, elevators, construction and other occasions

Introduction

Earthquakes come uninvited and unannounced - and while they may sweep through in a space of seconds, that short period is more than enough to collapse houses, highways, and even critical infrastructure. Floods, droughts, typhoons, and many other natural disasters are considerably easier to brace for - but the earthquake has been a global pain in the side for ages. The secondary disasters that follow earthquakes are sometimes even worse - fires, floods, landslides, illness, and so on. And yet the forces of nature are not entirely beyond human control, provided one takes the proper precautions.

Once again, ICP DAS comes in tights and a cape to the rescue - the R & D team presents the GST-43 seismic switch that's used to predict and prevent secondary disasters. It's already used in the elevator industry to make lifts smarter. For example, in case of an earthquake, the elevator controller is made aware of the situation instantly so that it can stop at the nearest floor to let its passengers disembark. The module can also trip additional events per situation, such as cutting off gas / liquid flow in a plant or powering down equipment immediately. These simple things are not so quickly performed by a nervous, quake-shaken crew who are probably all busy ducking and covering - and in the hands of automation the situation need not descend to disaster.



▲ Figure 1: A GST-43 system application architecture diagram

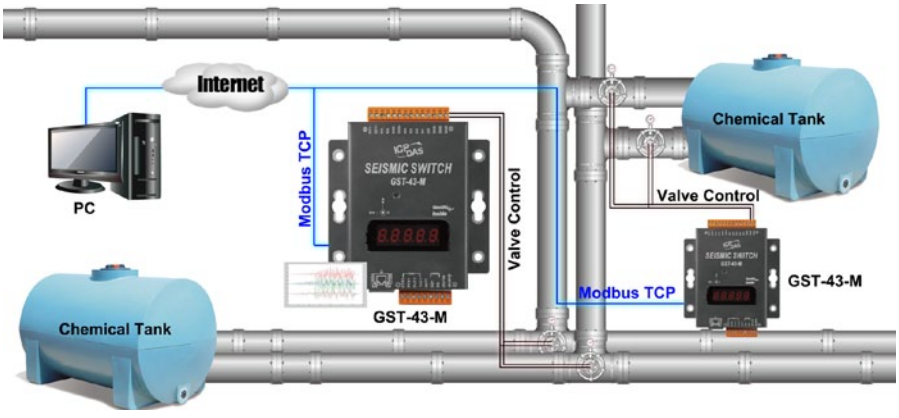
GST-43 Features

The GST-43 uses STA / LTA earthquake judgement logic to sample analog vibration signals a hundred times per second. A 20Hz low-pass filter is used to remove most of the non-seismic vibration signals to distinguish them from actual earthquakes. A built-in real-time clock provides network time management (via the Network Time Protocol) that allows the GST-43 to instantly display the correct time. It can detect and describe the quake along three axes and remember exactly when the last quake occurred. Quake measurement can be done either in CWD (the Taiwanese system) or GB/T-17742-2008 (the Chinese mainland system); triaxial acceleration vector synthesis is built-

in, and the instantaneous maximum acceleration along any of the three axes is easily disseminated. The GST-43 daisy-chains well with existing equipment and can be set to trigger user-defined actions when certain seismic levels are exceeded, such as stopping elevators at their nearest floors, or cutting off gas and electricity, or putting machinery into emergency shutdown. Support for Modbus RTU and Modbus TCP Server protocols make these possible: they allow the GST-43 to be connected directly to computers, PLCs, or human machine interfaces, making the recording of seismic activity and interfacing with other devices much easier.

System Architecture and Operation

When the GST-43 takes on the role of an overseer, it is easily applied in chemical plants to detect earthquakes and immediately stopper chemical lines to prevent dangerous leakage. Should a chemical tank rupture, its contents could cause serious casualties and invite a slew of tragedy - to say nothing of the paperwork, investigations, and probable lawsuits that follow. Relegating the monitoring to a human is inefficient, inconsistent, unsafe, and wasteful. Such an important task is best given to a failsafe system that responds promptly and safely every time. ICP DAS's GST-43 rises to the occasion: once a seismic threshold is reached, the corresponding DO (with two DO groups, a sub-start function is easy to implement) to automatically block the chemical lines is started. Because the GST-43 supports Modbus TCP and Modbus RTU communication protocols, it's easy to integrate into existing systems to ramp up overall control system security. A diagram of the complete seismic monitoring system is shown below:



▲ A diagram of the complete seismic monitoring system

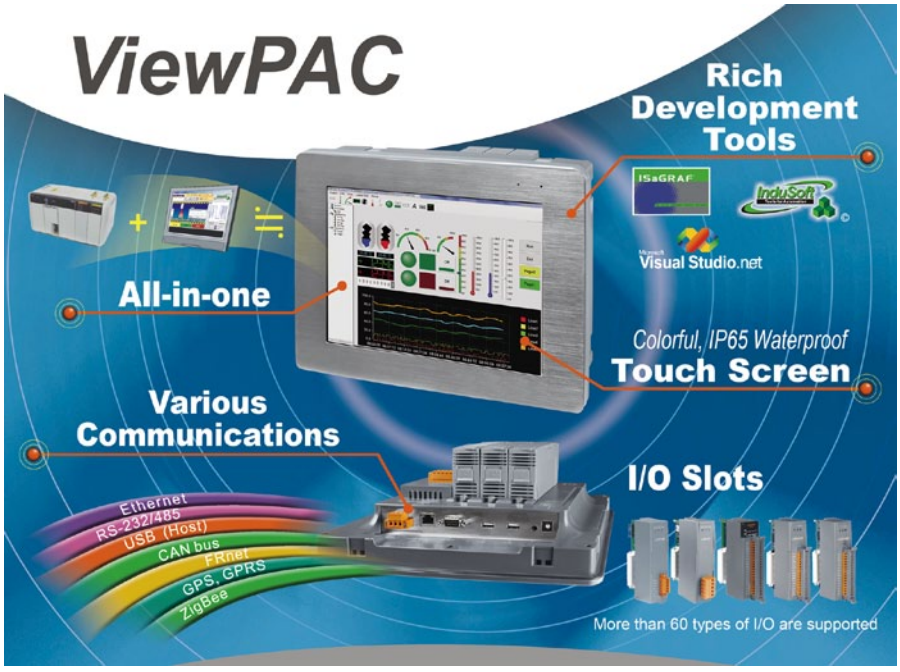
The Choice is Clear: ICP DAS' GST-43 Seismic Switch Will Visibly Improve Your Control System Security

The GST-43 is one of a myriad of products that ICP DAS provides to meet users' diverse needs. The DO is easily tweaked to meet any conditions one cares to set, and the switch supports both Modbus TCP and Modbus RTU, making a marriage to PCs / HMIs and ICP DAS PACs are both speedily accomplished. This particular application - to a chemical plant - is summarized by identify the GST-43 as a dependable system that increases the standard of safety in an industrial setting.

ICP DAS' long-term commitment to earthquake-related product development guarantees that it will continue to provide customers with solutions for a variety of cases. We will strive to keep creating products that both work and integrate well.

Introducing the VP-4131 All-purpose Controller with a 10.4" Touchscreen ViewPAC

By Kevin Ho



ICP DAS' touchscreen VP-25W1 controller has already reached crticial acclaim; the ViewPAC series will only see further increasas in screen size, as ICP DAS demonstrates by introducing the 10.4" touchscreen VP-4131.

On the hardware side, the ViewPAC uses the RISC architecture, featuring a PXA270 CPU (520 MHz). Besides drawing very little power, the ViewPAC requires no fan cooling and can be used in environments anywhere from -20 to 70 degrees Celsius. In addition to built-in USB support, Ethernet, RS-232/485 communication interfaces, it also has three I/O expansion slots. Ten years' development have gone

into providing this device with nearly a hundred I/O modules to choose from, to supplement the DI, DO, AI, and AO basic modules. RS-232/485, CAN Bus, 2G/3G modems, and HART communication modules can all communicate with the ViewPAC. Therefore the ViewPAC is quite capable of accodomating the needs of different fields. The elasticity of the system comes from its ability to interface with HMI and PLC.

The ViewPAC's LCD screen comes in two sizes, both 5.7" and 10.4" (640x480 and 800x600 resolutions). It functions between -20 and 70 degrees Celsius, making it a pretty hardy industrial-grade LCD screen. Its front is waterproof and dustproof, earning it the IP65 rating.

It comes with a pre-installed copy of Microsoft Windows CE.NET

VP-25W1 (5.7")

VP-4131 (10.4")

5.0. WinCE costs little, is stable, is reliable, and operates in real-time. In the most demanding situations, WinCE can provide up to 2 milliseconds' precision in passing an interrupt signal; using the I-8048W DI module, it can perform up to 10,000 interrupts per second.

To develop software for the ViewPAC, Visual Studio 2005/2008 creates perfectly compatible packages in VB.NET; C# is equally usable and comes in handy for extending development to embedded controllers. To simplify program development, ICP DAS provides eLogger as a simple man-machine interface. The easy drag-and-drop methodology makes programming accessible to those who may not be proficient in the arcane. HMI functionality is easily achieved with eLogger, including logic control. Shared memory usage is useful for customers who wish to develop using VB.NET and C# for data exchange and integration.

To address the growing popularity of smartphones and tablets, eLogger includes the corresponding software development kit for these devices; with a few easy steps, a mobile user can also get to developing HMI applications. Whether by local touchscreen or remote tablet / smartphone, all of the ViewPAC operations are very much accessible.

In addition to the standard VP-25W1, the VP-4131 provides VB.NET and C# development software, supplemented by ICP DAS' suite for PLC and SCADA clients.

Development Software	Model	Directions
Standard	VP-25W1, VP-4131	VB.NET, C # Developer
Soft PLC	VP-25W7, VP-4137	Built ISaGARF Runtime
SCADA	VP-25W9, VP-4139	Built-in InduSoft Runtime

Compared to generic IPC and PLC solutions, the ViewPAC's touchscreen display, I/O, and controller functions mark it as superior. It provides comparable features of both PLC and IPC and actually combines them all into a single package, reducing system complexity, cost, and installation space. It is in fact a more perfect solution.

Ordering Information

Model	directions
VP-4131	Standard ViewPAC with 10.4” LCD and 3 I/O slots (Multilanguage Version of OS) (RoHS)
VP-4137	ISaGRAF based ViewPAC with 10.4" Touch LCD and 3 I/O slots (OS: Multilanguage) (RoHS)
VP-4139	InduSoft based ViewPAC with 10.4" Touch LCD (RoHS)

TouchPAD

Building/Home/Factory Automation

Easy-to-Install & Easy-to-Duplicate

Features

- New TouchPAD series support RS-485 & Ethernet interface
- Provide Modbus and DCON standard protocol
- Provide rich template & example for quick configuration
- Easy-to-duplicate makes automation scalable
- Highly integrated with SCADA via Ethernet

New TouchPAD Series

2.8"	3.5"	4.3"
TPD-283U RS-485 + Ethernet(PoE)	**VPD-132** RS-485 + RS-232/RS-485 **VPD-133** RS-485 + RS-232/RS-485 + Ethernet(PoE)	**TPD-432F** RS-485 x2 **TPD-433F** RS-485 + RS-232 + Ethernet(PoE)

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