PACTECH

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Specific Applications

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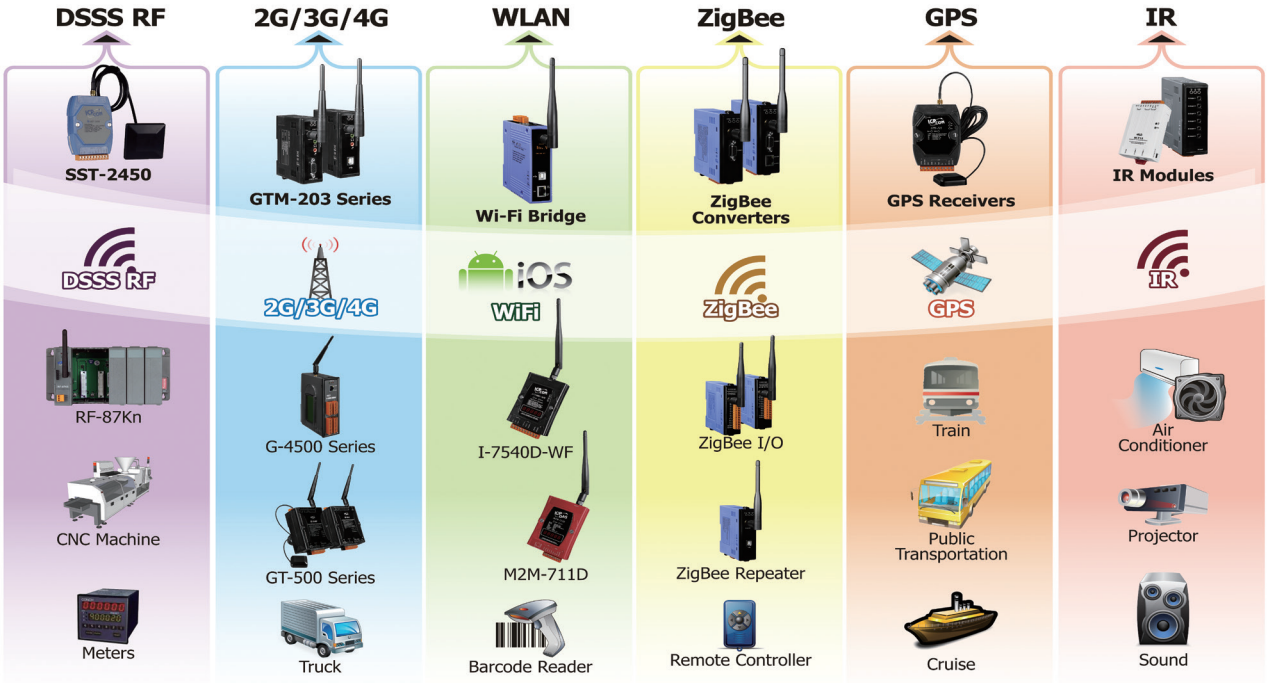
Industrial Internet of Things

WIRELESS



Fieldbus Solutions

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Contents

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New Generation of Power Management Solution

By Kevin Ho

ICP DAS provides total solution products for the second phase (measurement and analysis): providing products from power meter for measurement to power meter concentrator for data logging and report analysis. The solution is comprehensive and easy-to-use, it can save time and cost in system planning and implementation; it is flexible that the user can freely add or remove the power meters according to the measurement scale. The following is the architecture provided by ICP DAS solution. ICP DAS Power management solution is DIY feasible; it is flexible and helps to quickly introduce power measurement and analysis system to the end-users with easy-to-modify operations, reasonable price and low manpower demand.

★ Introduction:

To implement an energy saving project, it is recommended to implement the project step by step. A general energy-saving project usually is divided into the following stages:

Phase I: On-site investigation and inquiry
Initiate an energy saving profile and investigate potential energy saving opportunities.

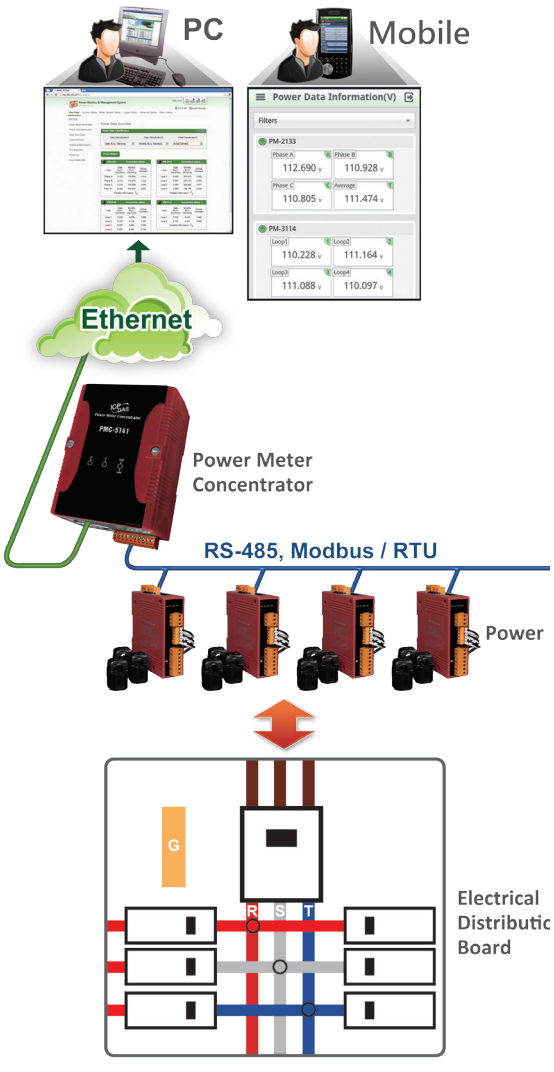
Phase II: Measurement and analysis
In this stage, the power measurement system should get involved to collect related data for setting up energy saving baseline.

Phase III: Planning and negotiation

Phase IV: Implementation and improvement

Phase V: Energy saving performance validation

To implement energy saving project in a company, usually the general department or factory facility management department will take charge of the related issues. In general situations, they are more familiar with hardware, sometimes the manufacturer can help to install the hardware as well. However; for software implementation, usually the IT department will need to get involved or require a system integration company to assist with program development. The process will be quite complicated and the cost will be high.



★ ICP DAS Solution:

ICP DAS provides total solution products for the second phase (measurement and analysis): providing products from power meter for measurement to power meter concentrator for data logging and report analysis. The solution is comprehensive and easy-to-use, it can save time and cost in system planning and implementation; it is flexible that the user can freely add or remove the power meters according to the measurement scale. The following is the architecture provided by ICP DAS solution.

★ Saving Cost:

Ethernet / RS-485 converter: not required, the cost can be saved

MV146-MCM is a Modbus/RTU to Modbus/TCP converter that allows SCADA software to access the data on the power meter via Ethernet. Using the PMC-5231(ICP DAS Power Meter Concentrator), it provides connection via Ethernet, the MV146-MCM is no more required and the cost can be saved.

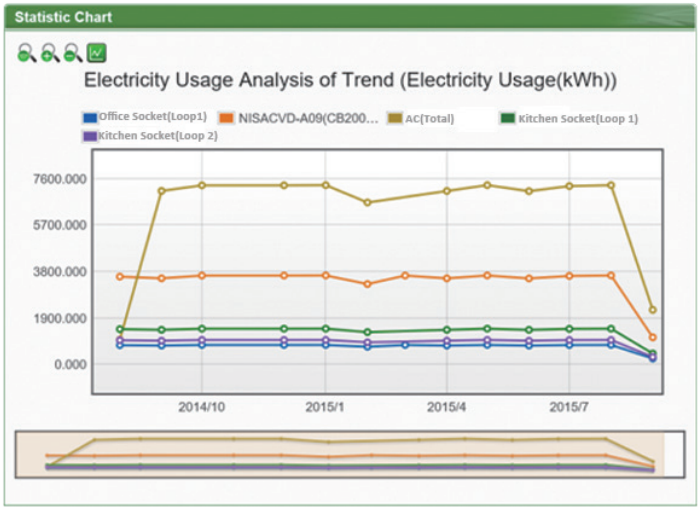
Cut out the panel board: not required, the cost can be saved

ICP DAS Power Meter features standard DIN rail installation, comparing to general panel power meter, it does not require to cut out the panel board for installation.

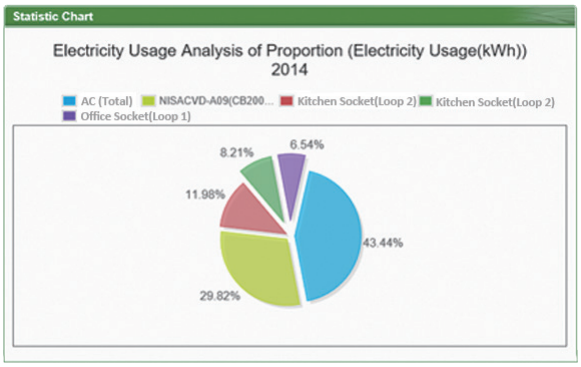
Software & Trials: the PC and SCADA software can be replaced by the power meter concentrator to save cost and time

To implement the software part in an application by using the SCADA software, the cost usually not only includes the software license fee and the project development cost; the cost of a PC to perform the SCADA software is also required. In addition, it always takes long time to communicate with the end users regarding requirements of all kinds of functionalities and reports.

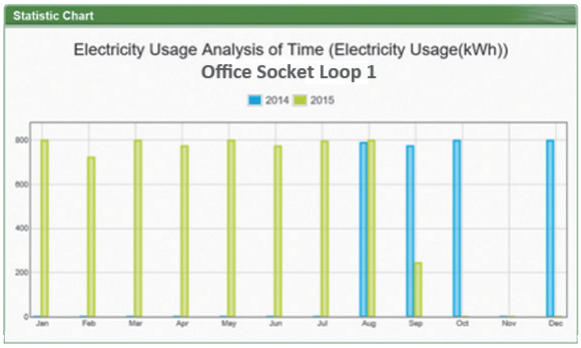
ICP DAS PMC-5231 power meter concentrator is specially designed for electricity measurement. The well-through designed software functions includes: real-time/historical data log/ display/inquiry functions. It can generate all kinds of analysis reports. In addition, with a few clips on webpage, all software settings can be done via PC, mobile phone or tablet through remote operations, the whole process only takes about 10 minutes.



▲ Real-time/Historical Electricity Usage Trend for All Devices



▲ Electricity Usages for Each Device



▲ Historical Electricity Usage Trend of Specific Device

For increasing power meters: easy to add devices and expand scale

The software design for PMC-5231 is based on web-based operations. It is easy to modify the setting when increasing or decreasing the power meters connected to the PMC-5151. When it requires to expand the scale, it only needs a qualified technician to install the power meter, the software parts can be easily taken care of by the users themselves. If use the SCADA software, unless there is a well-through plan to include the adding/deleting power meter function in the system at the very beginning; the system integrators usually charge additional fee to modify the software when require expanding the scale.

★ Conclusion:

ICP DAS Power management solution is DIY feasible; it is flexible and helps to quickly introduce power measurement and analysis system to the end-users with easy-to-modify operations, reasonable price and low manpower demand.

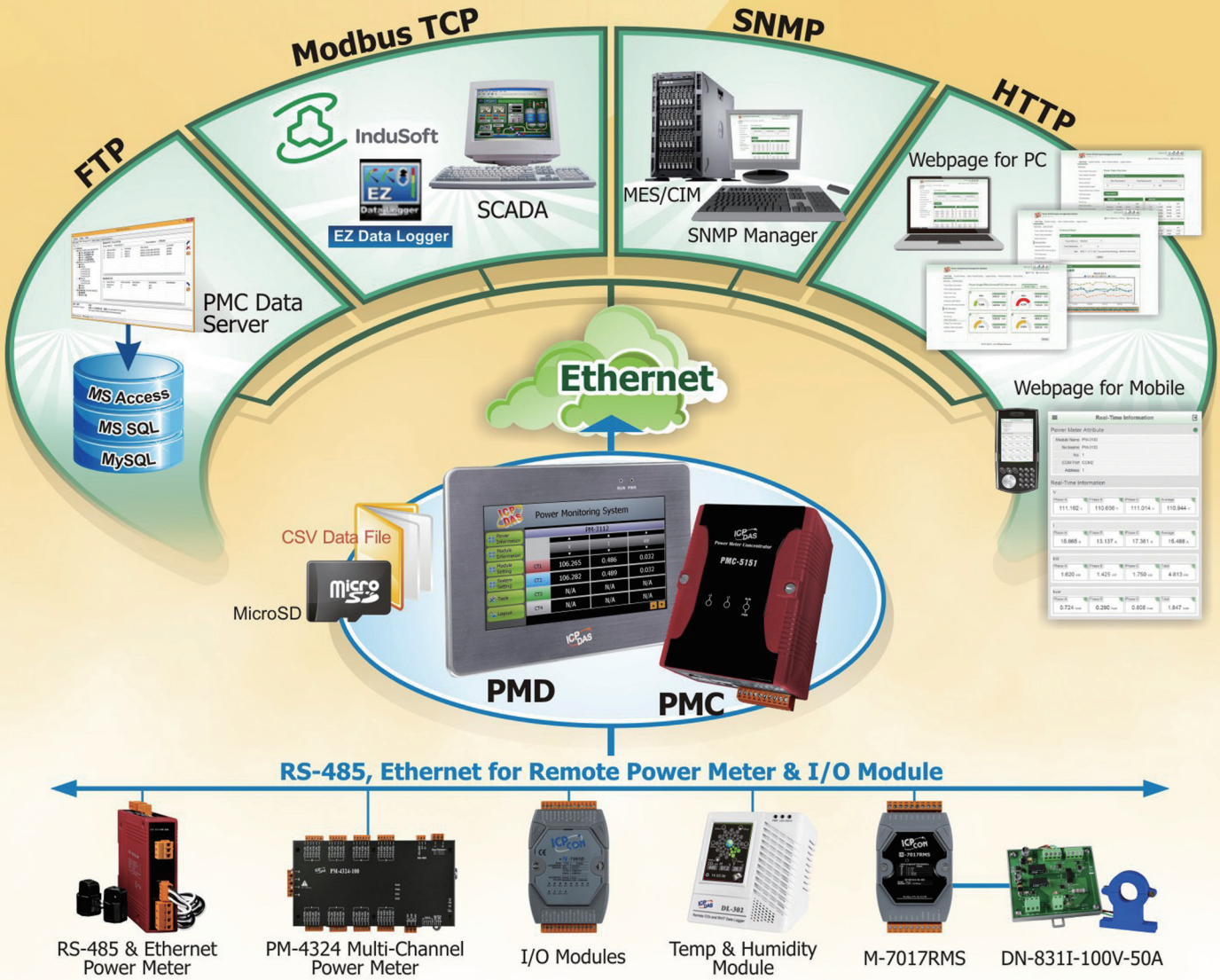
Ordering Information

PMC-5231	The Power Meter Concentrator supports at most 24 ICP DAS Modbus Power Meters
PM-3033/PM-3133 Series	Three phase Power Meter for 1 circuit
PM-3112/PM-3114Series	Single phase circuits Power Meter for 2/4 circuits
PM-4324 Series	Multi-Channel Power Meter for 8 three phase circuits or 24 single phase circuits

Energy Management Solutions

Power Management **Logic Control** **Data Redundancy**

- Rapidly construct energy management systems without extra software tools.
- Built-in IF-THEN-ELSE logic Engine,
  Include: Timer, Schedule, SSL Email sending, power demand, alarm notification...etc.
- Display real-time or historical power data trends and statistics reports.
- Support Modbus TCP/RTU, SNMP V2c, SNMP Trap protocol.
- Support DDNS communication mechanism.
- Support data logger operation, FTP Server/Client and data recovery mechanism.
- Support ICP DAS Smart Power Meters (RS-485 & Ethernet) and remote I/O modules.
- Provide local side power meter setting and data viewing (PMD).



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OPC UA: New Generation Technology of the Standard Industrial Communication

By Cony Yu

The OPC Unified Architecture (OPC UA), released in 2008, is a standard technology of industrial automation communication. It is a platform that integrates all technology standards such as OPC DA, HA, AE, and etc. It features real-time data reading & writing, historical data accessing, event/warning publishing functions.

By using reliable cross-platform architecture, the OPC UA is no longer need to rely on Windows platform as OPC DA used to be. The OPC products now can be deployed in different environments, such as: on the micro-controller or in the IT engine room. It completes the communication and interoperability between OPC data and events. In addition, for security reason, it also provides user account and authority validation between the Server and Client to protect the privacy of the service and security of the message transmission.

The advantage of using OPC UA technology

OPC is designed to play an intermediary role between the automation hardware providers and software developers. By standard OPC interface, the devices and the software can communicate with each other so that the service providers can focus on their specialties without worrying the issues for the communication protocol between the hardware and the software when performing the data transmission. The latest OPC UA technology provides the following features that provide more options to the users.

1. Guarantee seamless integration with the conventional OPC service products
   The data model of UA can be compatible with the conventional OPC. By using “Wrapper”, the UA program can be packaged in Microsoft COM technology. Therefore, the early users do not need to upgrade the conventional OPC, by using “Wrapper”, it can connect to new added OPC UA services.

2. Break the limitations of conventional OPC
   Functional equivalent: all classic specifications of COM OPC are included on the UA.
   Platform independence: can be deployed on the embedded controller or the cloud-based engine room, etc.
   Security: the encryption, authentication, and validation between the users and the services.
   Scalability: add new functionality without affecting current application and program.
   Full-range information modeling: can be used to define complex information modeling.

3. Reliable Design
   It ensures the arrival sequence of the data and content validation when performing message transmission so that helps the decision making for backend processing and enhances data accuracy for the data logger software. It is perfect to be applied to the industrial production or service system applications that cannot afford long idle time, by using the OPC UA redundant mode, it provides redundancy support to resume the system in real time or in short time.

4. Collaborative technology foundations
   OPC Foundation works with various technology foundations to incorporate data models of different kinds of technology into the OPC UA; so that it can achieve interoperability in technology and improve applications in industrial automation,

production process, ERP, sales enterprise, building automation, security and smart grid industry, etc. For example, the foundations related to field devices such as: the FDT Group, Fieldbus Foundation, HART Communication Foundation, PROFIBUS & PROFINET International, and the foundations related to building automation such as: BACnet Interest Group and ISA95 of the International Automation Association, etc.

ICP DAS OPC UA Solution

UA-5231 is the first data acquisition controller developed by ICP DAS which can be integrated with OPC UA Server, MQTT services and other data communication protocols. With the advantages of the RISC-based CPU architecture,compact size and low power consumption; UA- 5231 can be applied to a variety of field environments. Applying OPC UA allows integration the I/O products of ICP DAS with the third-party devices, and then import the data information to the backend SCADA, cloud or other decision making or data logging system. It satisfies the reliability,interoperability and security needs of the industrial automation system and meets the trend of the smart internet.

UA-5231 Hardware Features

- ❑ OPC UA Server and MQTT Client Service
- ❑ MQTT Broker Inside
- ❑ AM3354, 1 GHz
- ❑ 256 MB RAM and 512 MB Flash
- ❑ Linux kernel 3.2.14 OS
- ❑ Real-Time Capability
- ❑ 64-bit Hardware Serial Number for Software Protection
- ❑ Support Redundancy and PID
- ❑ 10/100/1000 Mbit/s Ethernet Port
- ❑ 4 Serial Ports (RS-232/RS-485)
- ❑ Wide Operating Temperature Range: -25 to +75° C

UA-5231 Software Features

With the Web-based User Interface, the users can log in and configure the controller via a web browser on a mobile device or PC.

The IEC 62541 standard OPC UA Server is certified by OPC UA Server OPC Foundation, it helps to integrate the on-site devices to actively upload the data to the application systems without worrying the problem of crossing the platforms.

Implement the Redundancy of OPC UA Server. With the ICP DAS OPC UA Client product, it can provide the redundancy function of the Server to enhance the reliability of the system.

The PID function can combine the remote I/O devices to simulate the PID control system for computing control solutions required on-site.

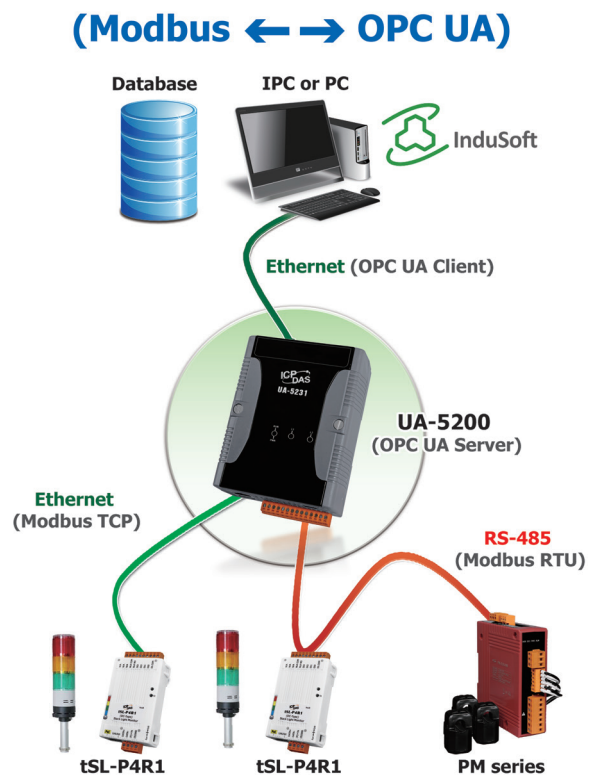
The Modbus TCP/RTU Master module can connect to all-kinds of standard Modbus TCP/RTU Slave devices via the RS-485, RS-232 or Ethernet ports on the controller. Therefore it is able to provide scalability and flexibility when building a system and meet various requirements for all kinds of applications.

The MQTT Broker is compliance with MQTT v3.1.1 protocol. It supports MQTT message distribution management. The users do not need to build Broker system when using MQTT communications.

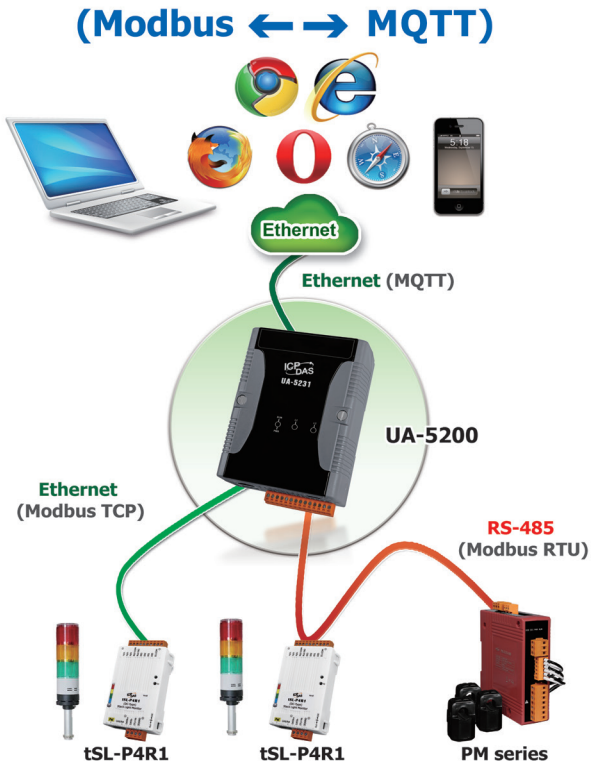
With the MQTT communication function, it allows communication between the IoT devices and the OPC UA system. The UA-5231 then conducts the data acquisition and management function; at the same time, the data of the devices managed by UA-5231 can also be converted and published to the IoT system.

Application Architecture:

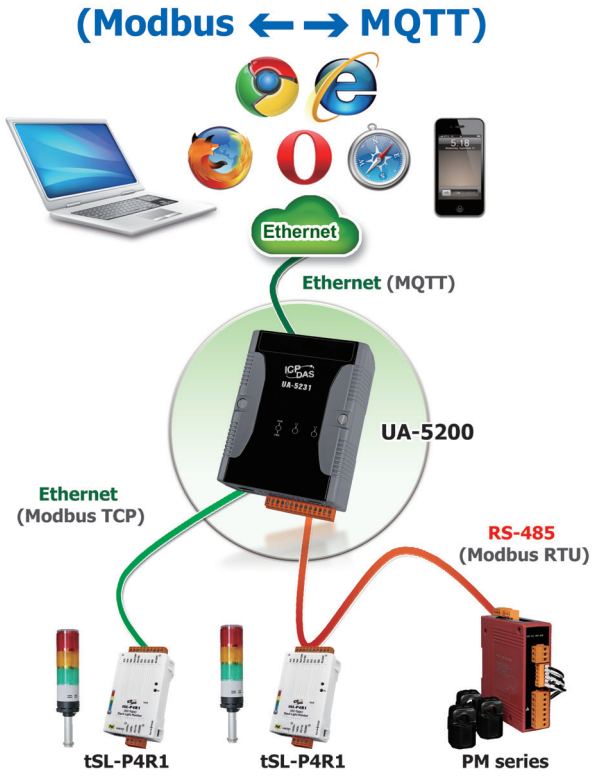
- Modbus I/O convert to OPC UA



- Modbus I/O convert to OPC UA



- MQTT convert to/from MQTT



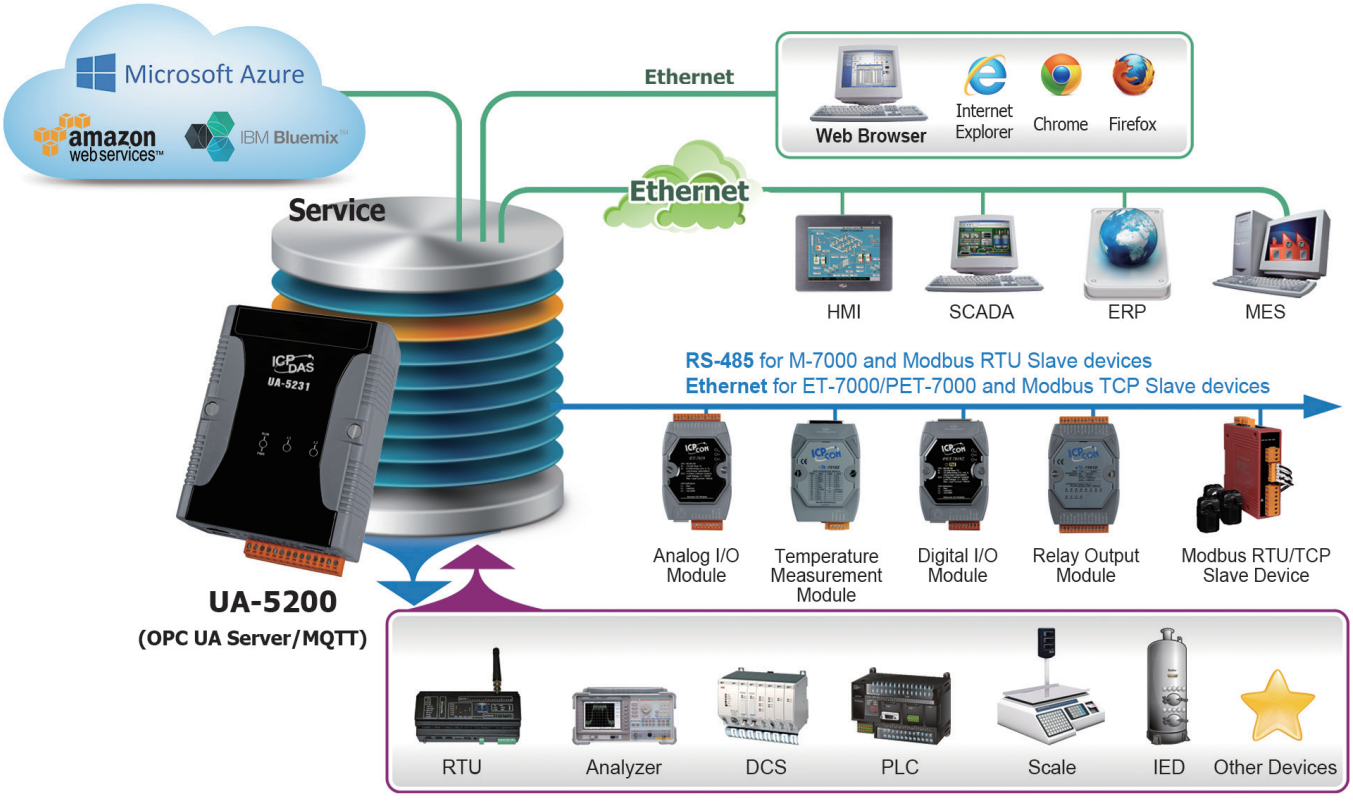
- MQTT convert to upper OPC UA Client

Summary

With the arrival of Industry 4.0 era, a smart factory is required to feature real-time response and automated production. ICP DAS UA-5231 can help to fulfill integration of all kinds of physical or virtualized functionalities. UA-5231 is a versatile intermediary control system; for its lower ends, it can integrate sensors, on-site devices and IoT applications, and for its upper ends, it can integrate project management, manufacturing and other management applications.

By using UA-5231, the factories and enterprises can fulfill:

1. Web-based vertical integration of upstream and downstream system.
2. The on-site data can be integrated at the back end system for further analysis.
3. Horizontally connect each subsystem.



▲ System Architecture

WISE-5231 Intelligent Multifunction IoT I/O Concentrator

By Rick Lee

Industry 4.0 is based on IoT (Internet of Thing) that incorporates the technological concept of communicating and exchanging information between all facilities which brought manufacturing industry to a new era. The WISE-5231 Intelligent IoT Controller developed by ICP DAS is a perfect start point to facilitate the vision of the Industry 4.0 era.

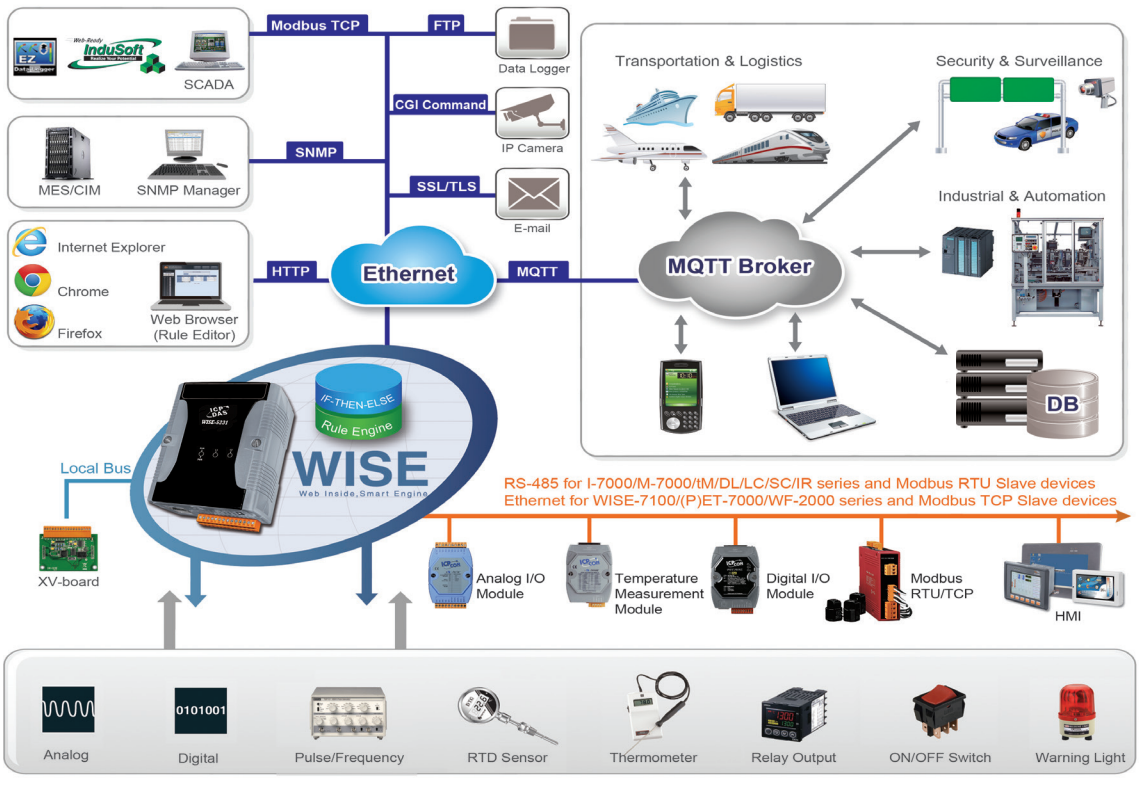
WISE-5231 provides powerful and flexible integration with the I/O modules and sensors at the field side, and also supports various IoT protocols for seamless integration with the SCADA/MES/MIS/IT/IoT Management systems to transfer the real-time I/O information from the front-end modules (or sensors) to the back-end management systems. It also features reliable real-time I/O logic control and data logger operations. All of these features make WISE-5231 a perfect concentrator of sensor and I/O modules in the IoT age.

Introduction

WISE(Web Inside, Smart Engine) is a product series developed by ICP DAS that functions as control units for use in remote logic control and monitoring in various industrial applications. WISE offers a user-friendly and intuitive web site interface that allows users to implement IF-THEN-ELSE control logic on controllers just a few clicks away; no programming is required. With its powerful and easy-to-use features, it will minimize the learning curve, shorten time to market and dramatically reduce the labor and cost spent on system development.

WISE-5231 provides more supports in I/O functions. It allows connections to XV-board; supports

WISE-5231 System Architecture

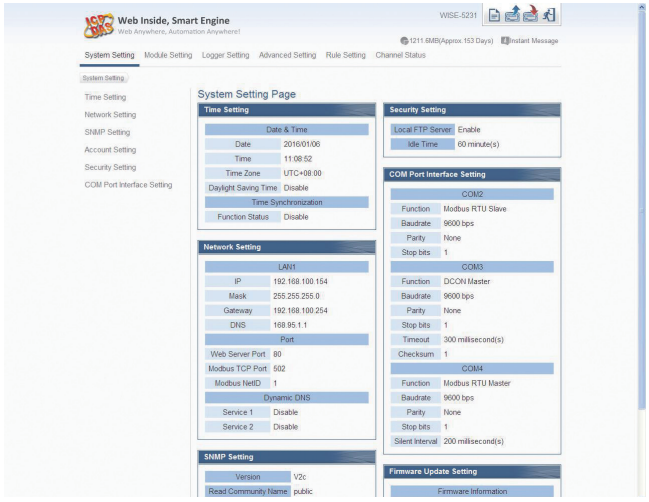


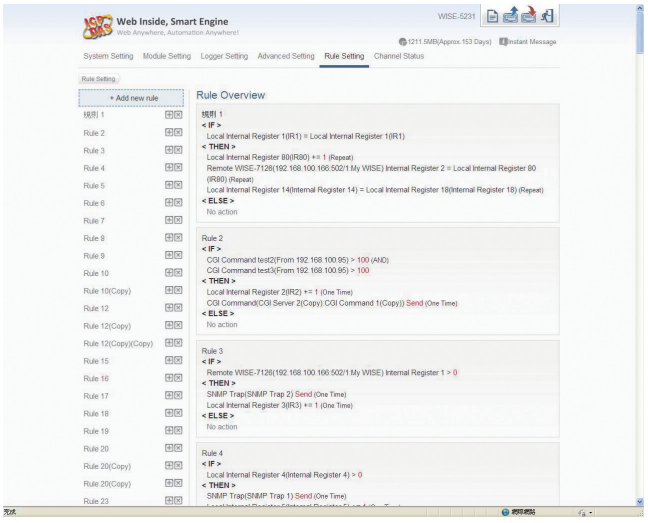
DCON I/O modules, Modbus RTU Slave modules and Modbus TCP Slave modules together. The wide range of selection options enables flexibility in I/O module integration to meet the requirements from various applications. WISE-5231 provides Data Logger function to record the I/O channel data by periodic cycle or event trigger. And it allows to send the data files by FTP to the control center. In addition to the CGI command sending function, WISE-5231 now supports the CGI command receiving function that allows the devices (such as IP camera) connected to the network to trigger the operation of IF-THEN-ELSE logic rule of WISE- 5231. The well thought-out CGI command functions make WISE-5231 being able to interact with the devices flexibly in the network environment. WISE-5231 also supports SNMP, SNMP Trap, MQTT and DDNS protocols and services. The flexible integration ability with the SCADA and IT software or devices and the reliable ability of real-time I/O logic control and data logger make WISE-5231 the most cost-effective I/O controller in the IoT (Internet of Things) Age.

Features

Simple, easy-to-use, no-programming-required for system development

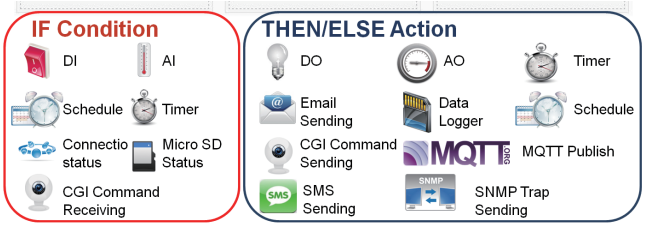
WISE provides user-friendly Web UI pages for editing control logic on the controllers. To edit control logic, it only requires a browser to connect to the Web server on WISE. No extra software tool installation is needed. WISE enables implementation of logic edition by a few clicks on the mouse to set up and deploy logic rules without writing a single line of code.





IF-THEN-ELSE logic rules execution ability

WISE controller features an IF-THEN-ELSE logic rule engine; it offers IF-THEN-ELSE rules for users to set up the logic content. After completing rule edition and downloading rules to the WISE, the rule engine will loop execute the rules in accordance with the execution order under specific conditions.

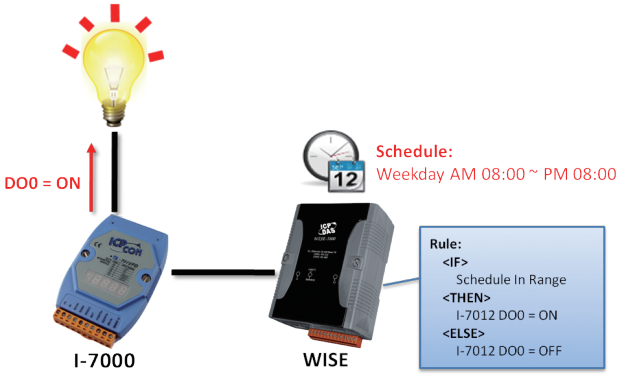


Connection ability to a variety of sensors and devices

WISE Controller allows to connect with sensors and devices that support Modbus TCP/RTU protocol for I/O monitoring. The ability to connect with Modbus TCP/RTU slave devices enables the flexibility and scalability for system implementation and allows to meet various requirements of the applications from the clients.

Provide Timer and Schedule operation

WISE features Timer and Schedule functions: It allows user to schedule specific date or time for control logic execution, or perform specific tasks such as time delay. With calendar user interface provided, Schedule setting can be more efficient and flexible.

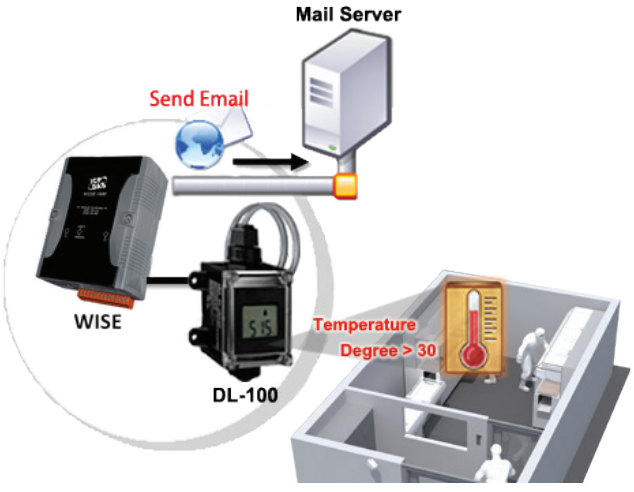


CGI Command sending & receiving for surveillance system integration

WISE supports full CGI command operations - CGI command sending and CGI command receiving. The CGI command sending action can be added to the logic edition as part of logic control in response to specific events. The CGI command receiving function enables WISE to receive the CGI commands from other network devices. The content of CGI command received can be used in IF condition statements to trigger the THEN/ELSE actions.

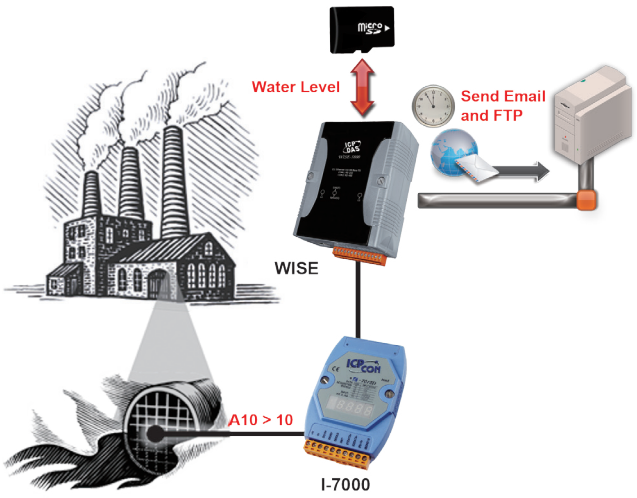
Real-time alarm notification via SSL Email

WISE supports SSL Email sending function for real-time message notification operation. The message sending action can be added to the logic edition as part of logic control to provide real-time message notification to the related personnel when an event occurs.

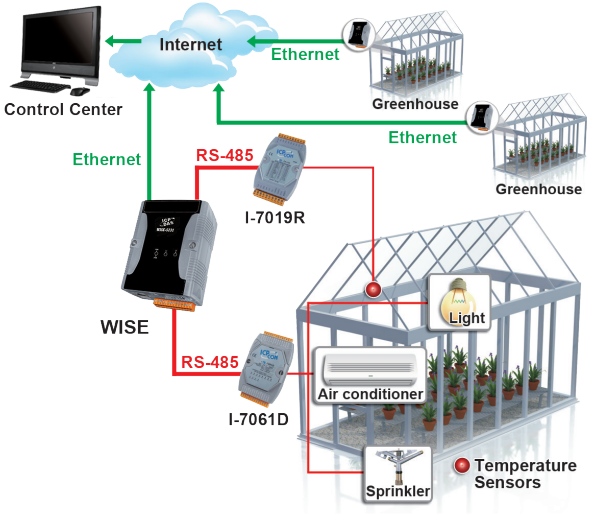


Data Logger operation

With the microSD card, WISE provides Data Logger function to real-time record the I/O channel data of the controller and sends the data files automatically by FTP to the control center for further administration management or data analysis.



Active I/O sending mechanism



In addition to the Modbus TCP/RTU slave function that enables SCADA system to poll the I/O channel data of the WISE, now WISE provides "Active I/O sending" mechanism (Modbus TCP master, SNMP Trap and MQTT publish). Based on the "Active I/O sending", WISE allows to send the I/O channel data of the controller actively to SCADA/IT system by event trigger (change of the I/O channel data) or periodic cycle. This function will improve the efficiency of the data communication between WISE and SCADA/IT system.

A variety of protocols supported for integration with SCADA/IT/IoT System

WISE supports various communication protocols to perform real-time monitoring and control of the controllers. The Modbus TCP/RTU protocol of WISE allows sharing I/O channel and system data with the SCADA system. WISE also support the SNMP, CGI, FTP and MQTT protocols for easy integration with the IT/MIS/MES/Facility management /Network management system. The flexible integration ability with the SCADA and IT system make WISE the most cost-effective I/O controller in the IoT (Internet of Things) applications.

- ❑ Support Modbus TCP / RTU industrial protocol
- ❑ Support SNMP (Simple Network Management Protocol) network management protocol
- ❑ Support MQTT (MQ Telemetry Transport) protocol, to achieve the data linked to the concept of networking industries
- ❑ Support FTP Server / Client mechanisms to provide two-way data log file maintenance operations
- ❑ Support SSL / TLS Email, instant notification live state
- ❑ Support CGI (Common Gateway Interface) commands to send and receive, with network equipment (such as: IP Camera) complete interaction
- ❑ Support DDNS dynamic domain name system

Application

- ❑ Building Automation
- ❑ Factory Automation
- ❑ Machine Automation
- ❑ Facility Management
- ❑ Facility Management
- ❑ Environment Monitoring

WISE-5231 features easy-to-use, reliable and multi-functions. It is designed to provide cost-effective software and hardware solutions to meet various requirements from the users and significantly reduce the time and labor spent in the process of system developments. For more information about WISE-5231 please visit:

WISE-5231product catalogue：

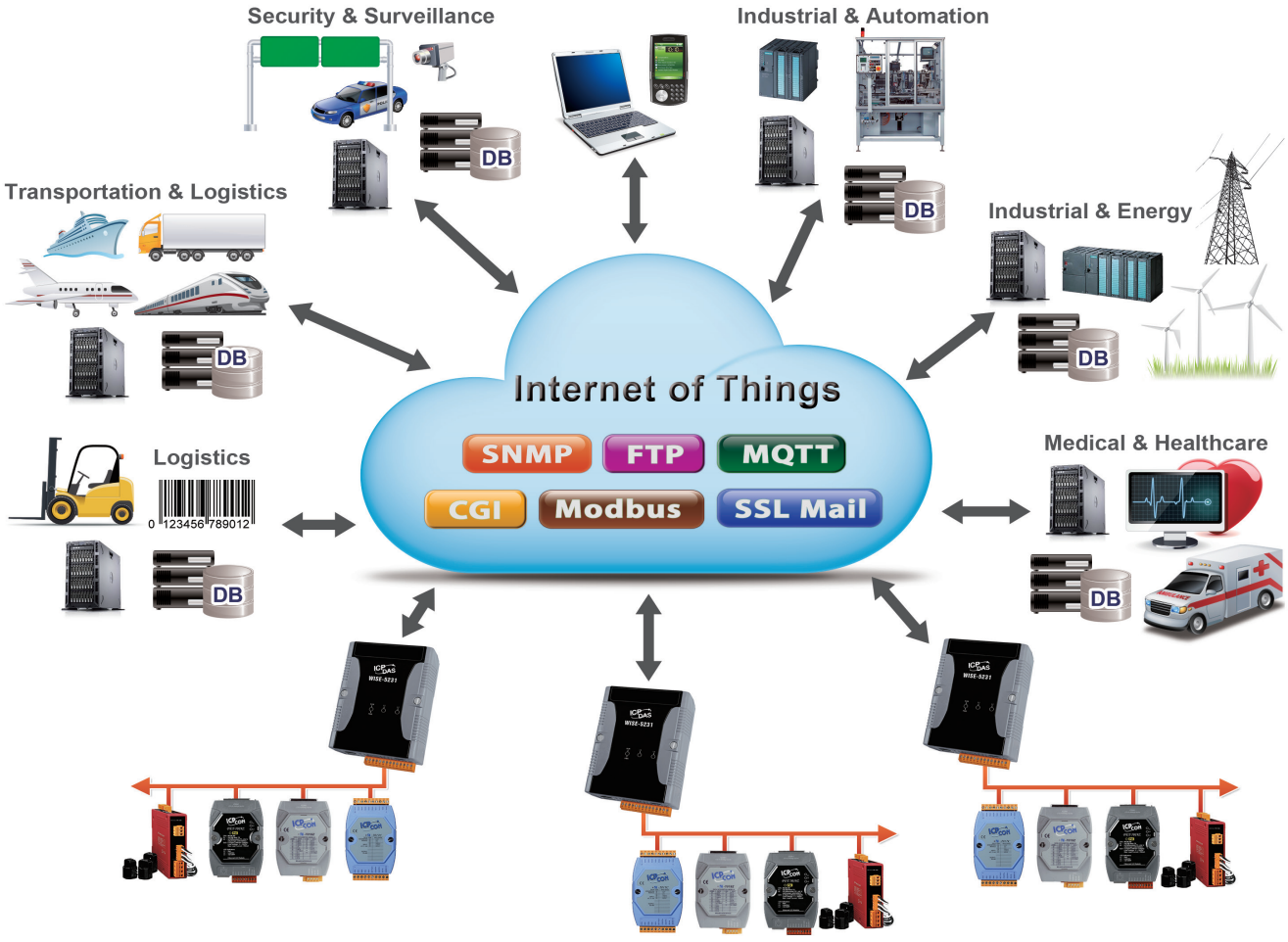
http://wise.icpdas.com/downloads/datasheet/WISE-52xx-EN.pdf

WISE-5231Website:

http://wise.icpdas.com/news/WISE-5231/

ICP DAS Website：

http://www.icpdas.com



Software Specifications

Function		Description
User-friendly and intuitive web site interface	Browser	Runs on browsers, no extra software tool is required No more programming, Web pages provided for control logic editing and system parameters setting
Various options for easy I/O module integration	Local side	Support XV-board
	Remote side	Support DCON or Modbus RTU Slave devices (Up to 32) Support Modbus TCP Slave devices (Up to 16)
Intelligent Logic operation and data logger ability at field sites	IF-THEN-ELSE Logic operation	Provide IF-THEN-ELSE logic rule editing, and the ability for IF-THEN-ELSE logic rules execution
	I/O channel monitoring and control	Offers various options for I/O channel settings; for example: deadband setting for AI signals, linear scale setting, temperature degree in Celsius or Fahrenheit setting, power on value setting for DO channel, pulse output setting and DI counter setting, etc
	Timer	Perform the timing function. The status of Timer can be included in IF condition statements to trigger the THEN/ELSE actions
	Schedule	Perform the prescheduled routine tasks. The status of Schedule can be included in IF condition statements to trigger the THEN/ELSE actions. "Calendar" and "Weekly repeat" schedule setting UI are provided.
	Email	Execute Email message sending. The SSL/TLS authentication is provided
	CGI Command	Perform CGI command sending and receiving functions. The content of CGI command receiving can be used in IF condition statements to trigger the THEN/ELSE actions
	Data Logger	Perform Data Logger function to real-time record the I/O channel data of the controller by Period or Event Trigger operation
Various protocols for seamless integration with SCADA/MIS/ MES/IT/Network Management systems	Real-Time I/O channel data	Support Modbus TCP/RTU protocol for SCADA system Support SNMP and MQTT protocols for the integration with MIS/MES/IT/Network Management systems CGI Command sending and receiving function supported for the integration with IP Camera and Network devices. Active I/O sending mechanism supported
	Historical I/O channel data files	FTP Server/Client ability for the maintenance of data logger files and the data logger files automatically send back operation Provide data recovery mechanism so that when experiences network disconnection, the data log files will be kept in WISE, and be recovered after the network is resumed Provide alarm notification mechanism so that when microSD card is damaged, the data log file will be stored in WISE to ensure zero data loss of the data logger
	Communication Service	DDNS (Dynamic DNS) service supported

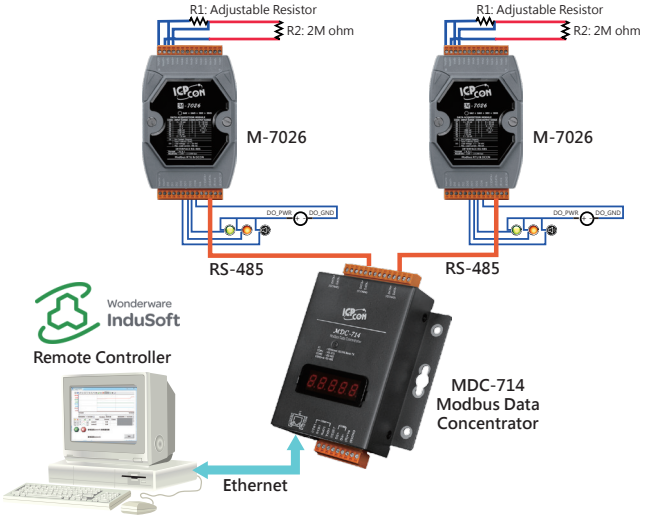
Residential/Commercial Building Leakage Monitoring Application

By Phileo Lin

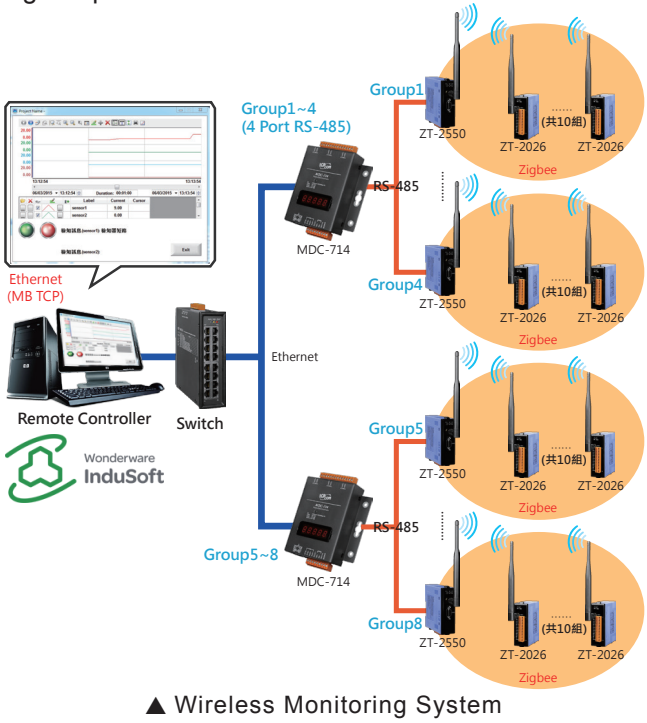
The applications in residential/commercial building leakage monitoring has become increasingly widespread. For example, large-scale monitoring system such as: water storage system, daily water purification system, wastewater discharge pipe system,fire fighting water systems, and small area monitoring system such as: kitchen sink, bathroom, water tower, senior home care, etc.. By applying the architecture of the internet of things, it allows to transmit the data to the cloud in real-time for monitoring and control via wired or wireless transmission. In this way, it provides solution to save water effectively, improve the safety or living household and avoid problems caused by water leakage.

Introduction:

ICP DAS provides both wired and wireless leakage monitoring solutions. Wired solution uses M-7026 with 3M S-1F Sensor Cable; each M-7026 can connect up to 6 S-1F Sensor Cable to monitor 6 spots. The monitoring data can be sent back to the control center via the built-in Modbus protocol in M-7026. The wireless solution uses ZT-2026 and 3M S-1F Sensor Cable. Each ZT-2026 can connect to up to 4 S-1F Sensor Cable to monitor 4 spots. The monitoring result can be sent to the control center via the built-in ZigBee protocol in the ZT-2026.

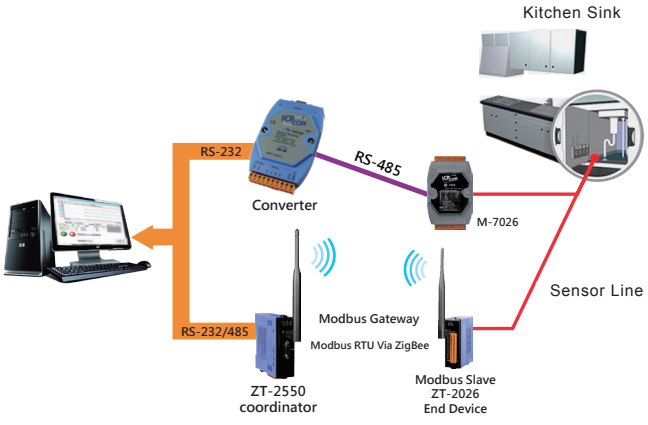


▲ Wired Monitoring System



▲ Wireless Monitoring System

Household Leakage Monitoring

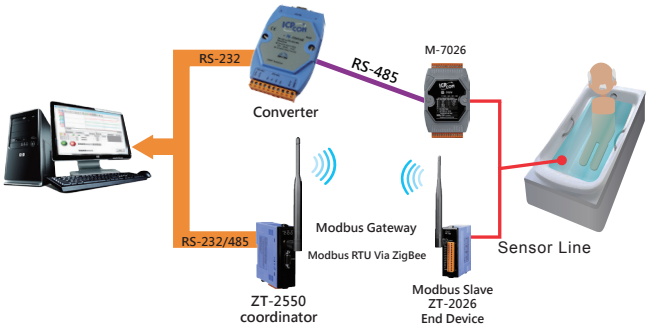


▲ Kitchen Sink Monitoring

For water leaks inside the household, the indoor stagnant water easy to occur in areas like kitchen sink, discharge pipe system of the washing machine and water tower. The water leakage system can be installed in these areas for real-time monitoring and if there is water leakage occurs; all unnecessary sources of stagnant water can be emptied immediately.

Senior Home Care

The residential security for the seniors is getting more and more important as our society is aging. The senior may fall into the bathtub and get drown due to falling or heart attack. Therefore we can monitor the water level of the bathtub by using the Leakage Monitoring system, and once there is an unusual event occurs, the immediately response can be taken in real time.



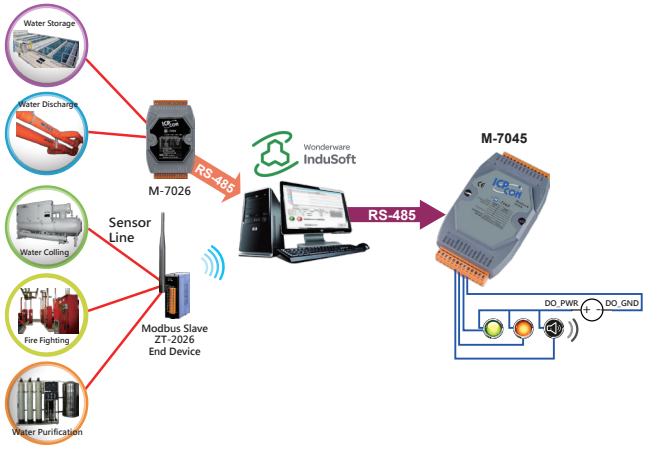
▲ Senior Home Care

Building Leakage Monitoring

The water system in the building usually includes the following system: daily water storage system, drinking water purification system, drainage system, fire fighting water system and Heating, Ventilation and Air Conditioning system, etc.

With the SCADA software InduSoft, it can quickly establish a monitoring systems and set up the trigger conditions to trigger the DO on the M-7045 module and then turn on the alarm and warning lights, and inform the related personnel for immediate response when an event occurs.

▲ Water System of the Building



▲ Building Water Leakage Monitoring System

Summary:

ICP DAS provides both wired and wireless leakage monitoring solutions. The customer can freely choose the most appropriate leakage monitoring solution for their specific application to achieve saving the water resource and enhance the home/building water consumption safety. In the future, ICP DAS will continue to bring more value to our customers by developing cost-efficient solutions in the field of environmental monitoring.

Lighting and Air Conditioning Management System in Hospital

By Austin Lin

ICP DAS TouchPAD features all in one functions such as: quick deployment, rapid integration, easy maintenance and display. It cut the cost of PLC and HMI yet provides similar or even more convenient features. By using ICP DAS TouchPAD (TPD) to control the devices and function as communication interface; TPD can work as a controller equipped with display function which add more values and upgrade the competitiveness in project implementation.

SC-4104-W1 module provides three types of built-in control logic: each type provides three interlocking control functions. The user can freely switch in functions to quickly build and design most appropriate applications.

Introduction

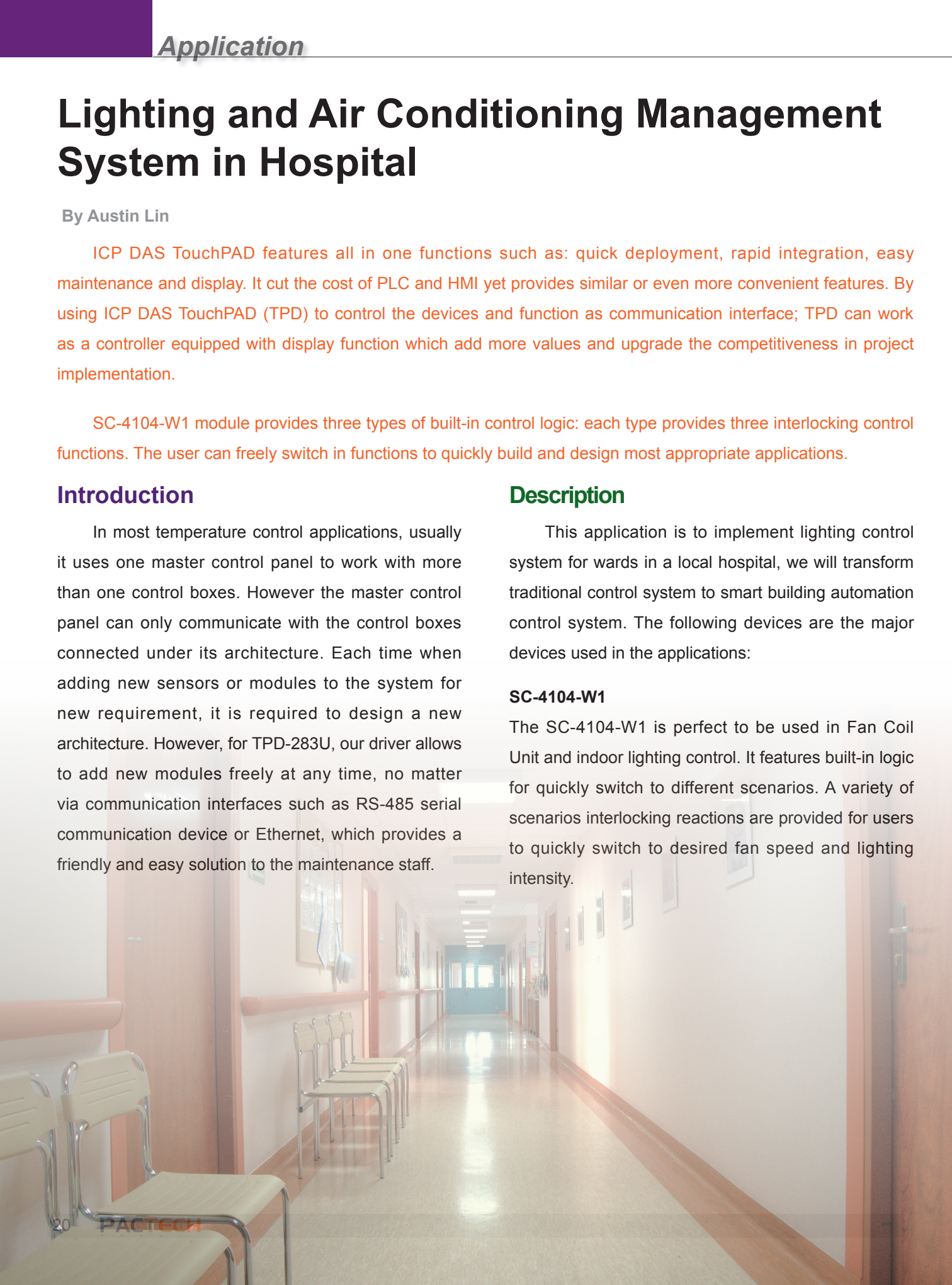
In most temperature control applications, usually it uses one master control panel to work with more than one control boxes. However the master control panel can only communicate with the control boxes connected under its architecture. Each time when adding new sensors or modules to the system for new requirement, it is required to design a new architecture. However, for TPD-283U, our driver allows to add new modules freely at any time, no matter via communication interfaces such as RS-485 serial communication device or Ethernet, which provides a friendly and easy solution to the maintenance staff.

Description

This application is to implement lighting control system for wards in a local hospital, we will transform traditional control system to smart building automation control system. The following devices are the major devices used in the applications:

SC-4104-W1

The SC-4104-W1 is perfect to be used in Fan Coil Unit and indoor lighting control. It features built-in logic for quickly switch to different scenarios. A variety of scenarios interlocking reactions are provided for users to quickly switch to desired fan speed and lighting intensity.



LC-101

Used for lighting control in the wards and walkway.

TPD-283U

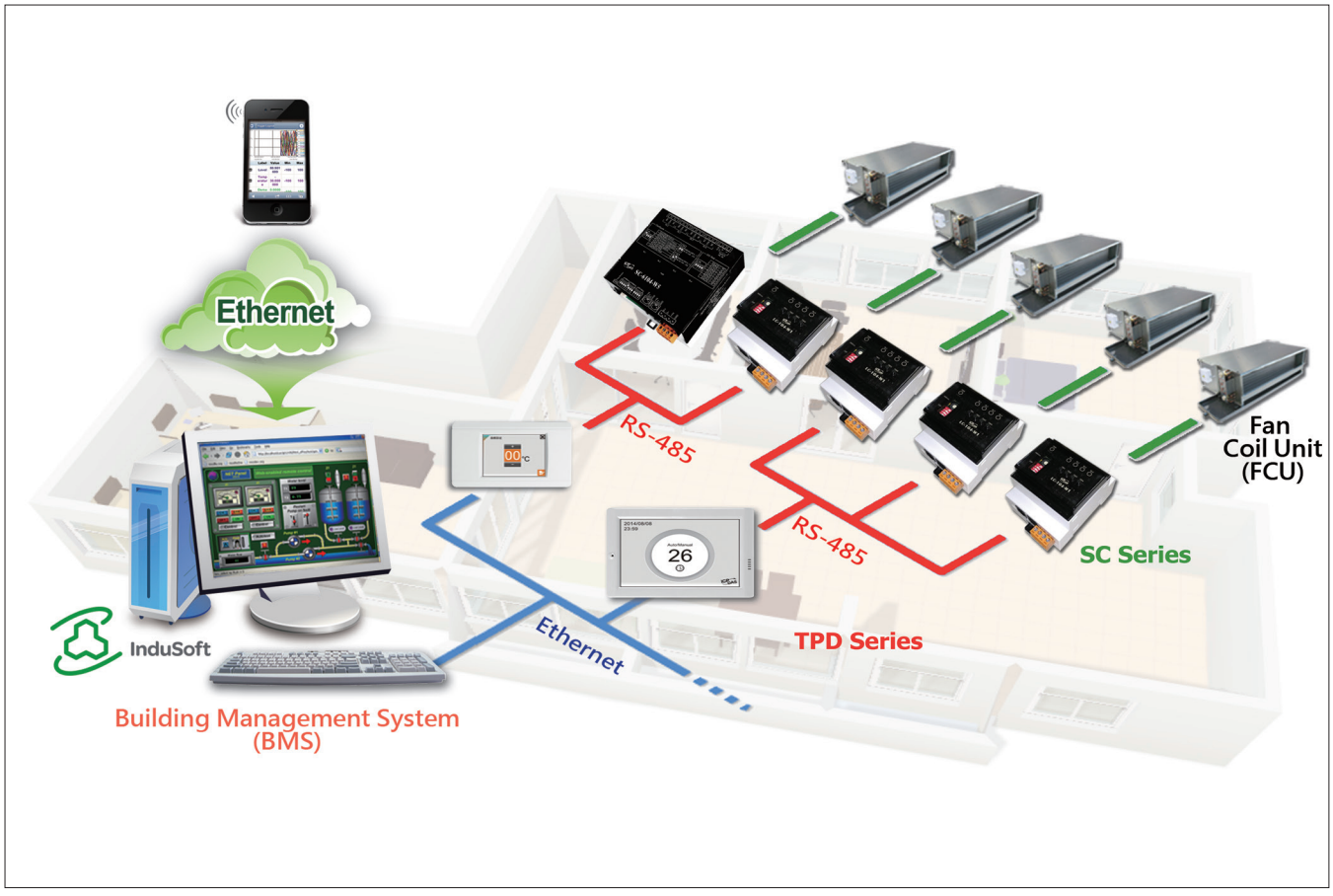
TPD-283U is 2.8 inch HMI and designed for data acquisition of the modules. And it provides seamless integration with the software(InduSoft) for central control. Unlike traditional control panel, TPD-283U features more functions as below:

1. Built-in DCON/Modbus Protocol, which allows to communicate with the devices that is equipped with the same communication protocol; not like the general control panel which can only control a few devices.
2. More flexible built-in C/ladder language, it also can work as a Gateway for different devices.
3. Features one RS-485 serial communication interface and one Ethernet interface. In this application, it performs data acquisition from the lower modules and then transmits the data to the central monitoring software via the Ethernet.

The TPD-283U and SC-4104-W1 provide a wide range options for used in different applications, in addition to the interlocking control, more control functions are provided as below:

1. Cooling Control
2. Heating Control
3. Alarm Control

In this application, the TPD replaces the previous controller and displayer, and the SC-4104-W1 is used to replace the lighting control and Fan Coil Unit. This cost-effective and easy-to-use solution provides competitiveness in project implementation.



PAC in Railway Signaling Application

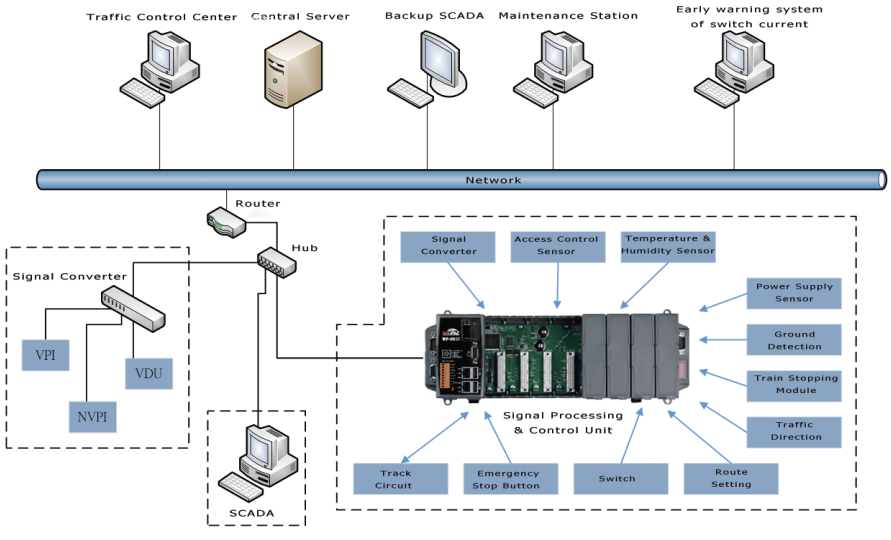
By Cony Yu

The Railway Signaling system is a series of chain control system. If one device is failed; a series of back-end devices may also be failed. It caused the difficulty for the maintenance personnel to trouble shooting; they can only check step by step to verify which operation is failed based on the final failure result; the maintenance personnel is easy to be confused and hard to find the source of the trouble.

By using the railway signaling monitoring & control system, the signal can be effectively operated, and the management can be centralized and can easily analyze and track the causes of failure which makes it easy to quickly rule out or trace the problem sources so that any device failure can be detected in real time. The safety of railway operations will be enhanced, train punctuality will be improved and the maintenance work will be easier to achieve a reliable and efficient railway signaling management system.

For railway signaling, as the increasing of the high-speed train and train service frequency, and external factors such as climates and night time driving risk, the railway signaling system has become more and more important.

The purpose for railway signaling monitoring & control system is aimed to increase the reliability and efficiency of railway signaling operations. By using network transmission and user-friendly graphic control interfaces, it is easy to perform operations of the hardware or software devices for railway signaling management, and then the information can be collected for further data analysis, furthermore, makes it easy to quickly rule out or trace the problem sources so that any device failure can be detected in real time. The safety of railway operations will be enhanced, train punctuality will be improved and the maintenance work will be easier to achieve a reliable and efficient railway signaling management system.



▲ System Architecture

System Architecture

The railway signaling monitoring & control system includes three parts: signal converter, SCADA systems and signal processing and control unit.

Signal Converter

The signal converter can connect to VPI, NVPI, VDU modules via RS-422 / RS-232 to receive/ send the information and exchange information with the SCADA system, traffic control center or the central server. The received/sent

information including the following: CTC information, VDU information, PIDS communication information, station information before (or after), receiving (or sending), etc.. The information that the SCADA system receiving before/after or sending before/ after will be decoded and then the data (or processed data) can be displayed or recorded.

Signal processing and control unit

WinPAC-8XX7 series Programmable Automation Controller (PAC) is used for signal processing and control. It features high computing performance CPU, large-capacity memory and storage space, a wide range of input/output interfaces (such as USB, VGA, Ethernet, RS-232 , RS485, etc.), built-in real-time operating system & firmware that meet the IEC-61131-3 standard, it also provides multiple programming options such as: functional block diagram (FBD), ladder diagram (LAD), Sequential Function Chart (SFC), and Structured Text (STL), etc..

With the help of the plug-in digital or analog modules (such as I-8014W, I-87053W or I-87057W) or with RS-485 / RS-232 (such as I-8144iW), it is able to receive or send the messages. After the data is processed, it can perform data exchange with the SCADA system, traffic control center and the central server via internet. The receiving/sending messages include: AF track circuit information (communication), PF track circuit information (communication), the emergency stop button status(digital), switch information (digital, analog), the route setting information (communication), the traffic direction information (communication, digital), information for train stopping module (analog), ground detection status (digital), power supply information (digital, analog), temperature and humidity information (communication), access control status (digital), signal converters (communication) and etc..

Model		WP-8137	WP-8437	WP-8837	WP-8147	WP-8447	WP-8847
OS		Windows CE 5.0					
ISaGRAF Software	ISaGRAF Ver. 3	IEC 61131-3 standard, LD, ST, FBD, SFC, IL & FC					
	Scan Time	3 to 15 ms for general program 15 to 50 ms for complex or large program					
CPU / SDRAM		520 MHz / 128 MB					
Flash		128 MB			96 MB		
Memory Expansion		microSD socket with one microSD card (support up to 32 GB)					
RTC (Real Time Clock)		Provide second, minute, hour, date, day of week, month, year					
Dual Watchdog Timers		Yes					
VGA		Yes 640 x 480, 800 x 600, 1024 x 768			Yes 640 x 480, 800 x 600		
Ethernet		RJ-45 x 2, 10/100 Base-TX (Auto-negotiating, LED indicators)					
Slot Number		1	4	8	1	4	8
		Note: For High Profile I-8K and I-87K Modules Only					
Operating Temperature		-25 to +75 ° C					
Input Power Range		+10 to +30 VDC					
Redundant Power Inputs		Yes, with one power relay (1 A @ 24 VDC) for alarm					

▲ Main Specifications of WinPAC-8XX7

SCADA System

The SCADA system adopts intuitive graphic control interface, the information of signal converter or the signal processing and control unit can be displayed hierarchically on pages. The main page includes: real-time data, accumulated data, and charts/data analysis. The sub-pages includes the following control interfaces: alarm management (real-time and historical data inquiry), statistics & analysis reports, parameter settings for critical values, database management, settings or modification for system operation parameters and replay of track operations. With access control mechanism, the administrators or general operators can access the control system in the control room or via remote network.

The real-time information page displays the route in diagram and shows the connection status of the stations in real time. The monitoring page shows the real-time information of each monitoring point in the station, and shows the speed code of each track circuit, working current of the track circuit and the reverse current value of the switch in the route map.

On the accumulated data page, it shows the error message log and the time chart of working current of each track circuit. The replay of track operations is also an important function to be displayed. When the track operation is abnormal, after performing troubleshooting operations, the replay of track operations can be used to verify the source problem that result in abnormal operations, and then improve the system or clarify the responsibility in relation accordingly.

The replay function of Track operation is designed to monitoring the system. It can be replayed at 0.5 or 2 times speed which makes it more efficient when retrieval of a specific event is required.

The data analysis chart page can be used to perform warning analysis to avoid failure occurring. The following figure shows an example of switch motor of railroad switch; the switch drive motor includes forward and reverse modes. The warning analysis can be done by comparing the motor data provided by the manufacture before the installation (including the voltage, current and power graph of the forward/ reverse motor) with the real detected data measured after installing the railroad switch. Based on thread hold criteria provided by the customer (including the time to start the railroad switch till reach the fixed position and the peak measure value after starting the switch.) When the criteria of the thread hold is exceeded; it will send out warning message to remind the related personnel for maintenance or replacement of the devices.

Summary

To implement a track signal monitoring & control system, the system integrator who plan and build the system usually need to invest a huge amount in initial investment; and the cost for mid-term & long-term maintenance is also quite impressive. In recent years, with the hard-working of ICP DAS and its cooperate system integrator, ICP DAS has accumulated experience in this field. We believes that more cost-effective applications for track signal system will be developed in the near future.

ZigBee Application - Emergency Bell Alarm System

By YY Chang

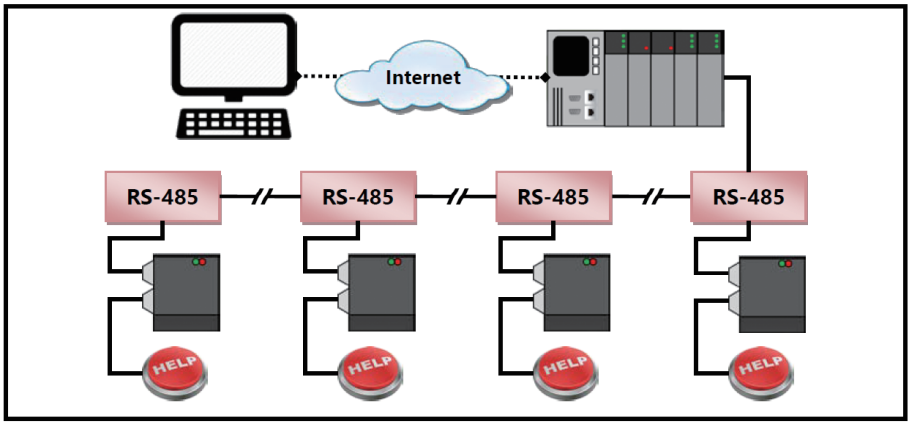
Emergency bell alarm system is often used in MRT, buildings, schools, hospitals and other public places for security management. When an accident occurs, one can press the alarm bell to immediately notify the related personnel, at the same time, the security control center will be informed the event's location and send the staff to take immediate actions right away.

Description

Using the campus security management as an example, in a traditional alarm bell system, the alarm bell is installed in a restroom entrance and is only linked to a buzzer bell for regional alarm notification. But in such way, when encounters an emergency, the staffs of the security center can not be notified immediately and efficiently. To reply the emergency state to the host of the security control center, users must pay higher costs in wiring deployment to transmit the messages from multiple locations to the security control center; if these locations are widespread or across different buildings, the costs are often quite expensive.

ZT-IOG System is Perfect for Emergency Bell Alarm System

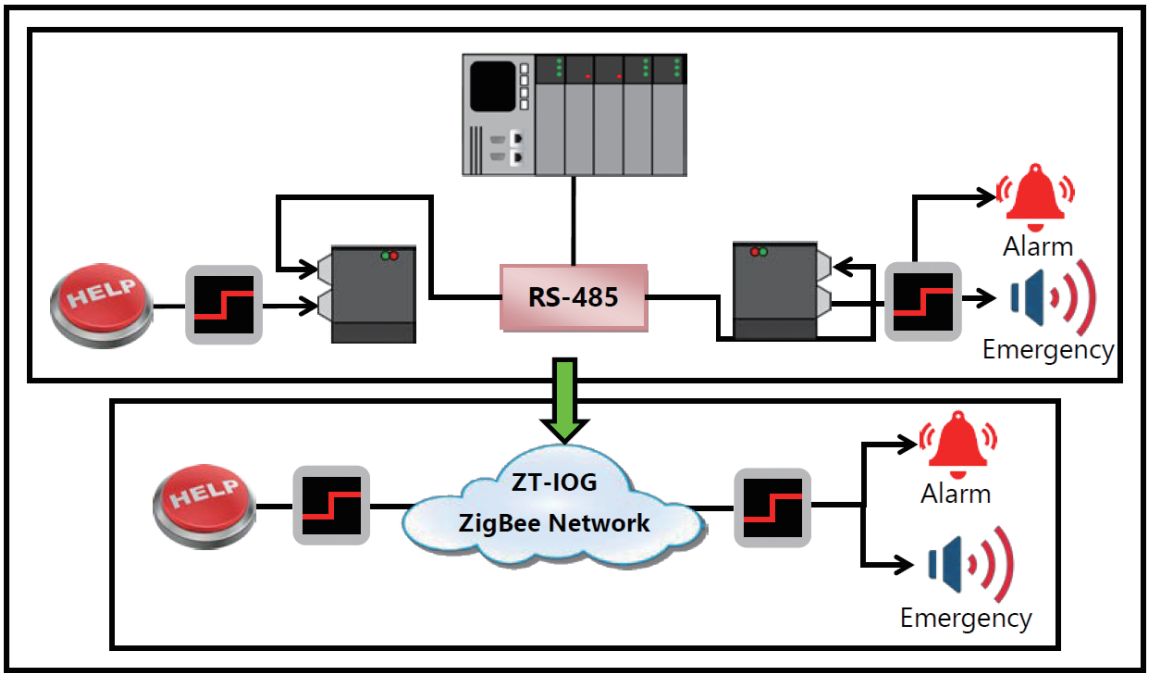
According to above application statement, in order to solve the difficulty and high cost problems of wiring deployment, ICP DAS provides the ZigBee wireless solution. The ZT-IOG system can automatically update the DIO channel status to the message center (ZigBee Coordinator) via the wireless communication, and then the message center will synchronize all DO channel status of the ZT-IOG network. This synchronization of changing DO states may function as the "emergency alert" to trigger the alarm bell.



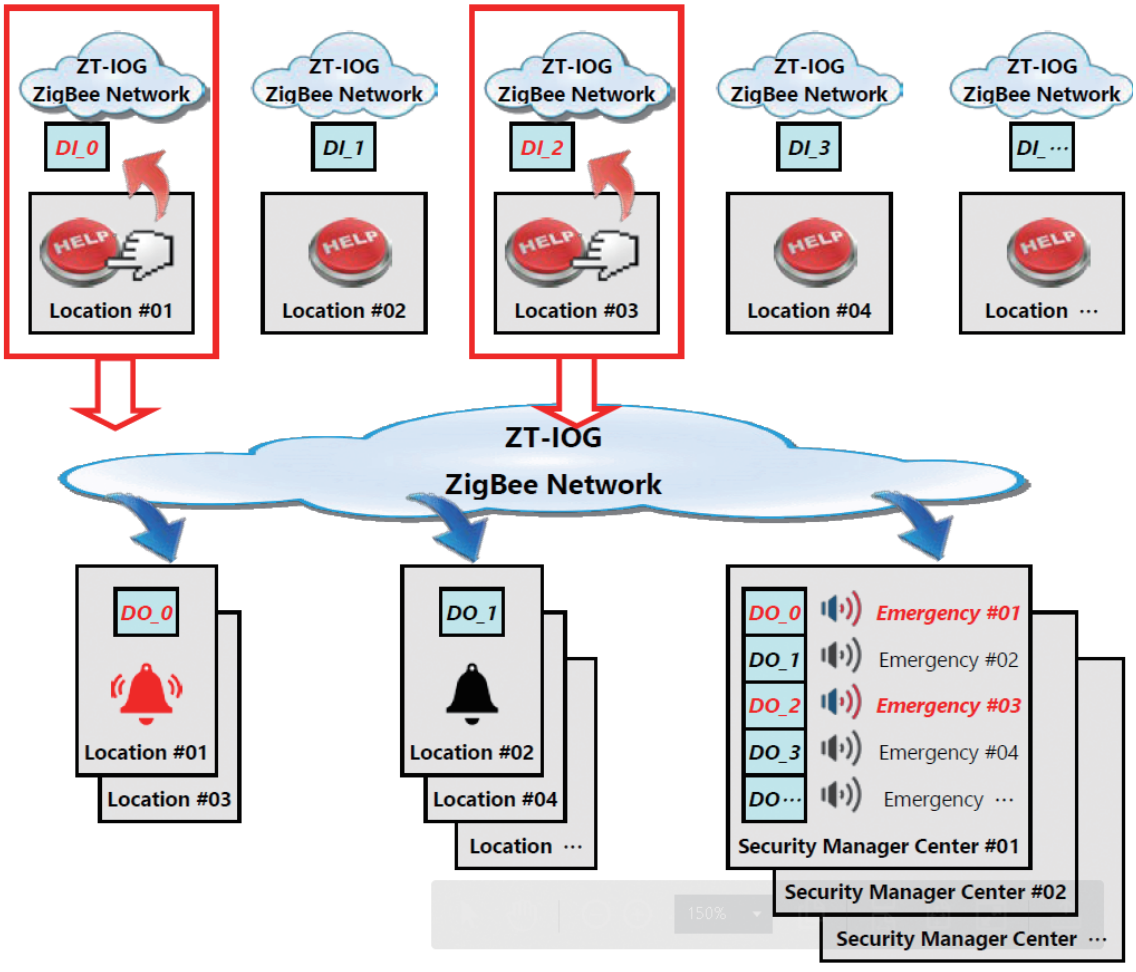
Application Architecture Description

The emergency alarm bells may be installed in many places, every alarm bell should be able to actively upload events to the security center. The ZigBee network of the ZT-IOG modules is multi-to-multi I/O Pair-connection architecture, so the triggered event of any alarm bell will be updated to the message center.

The ZT-IOG network is a multi-to-multi I/O Pair-connection architecture, so when any alarm bell is triggered, it will link all ZT-IOG modules' mapping DO channel in the network. By applying "Pulse Mode" control logic, the user can install the alarm bells in many locations and link the warning devices of these locations, for example, link the alarm buzzers or video devices in multiple locations to multiple security control centers.



▲ ZigBee Network Alarm Bell System



▲ ZigBee Network Alarm Bell System Architecture

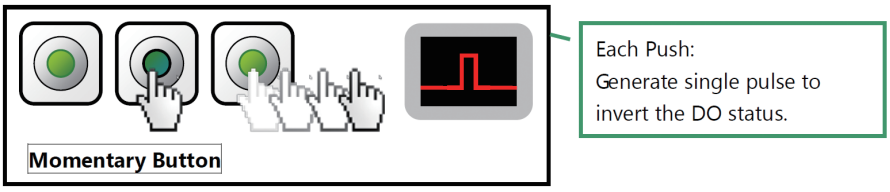
Event Triggering Modes

When applying ZT-IOG modules in different applications, the user can install different triggering devices according to the event mode of the application case.

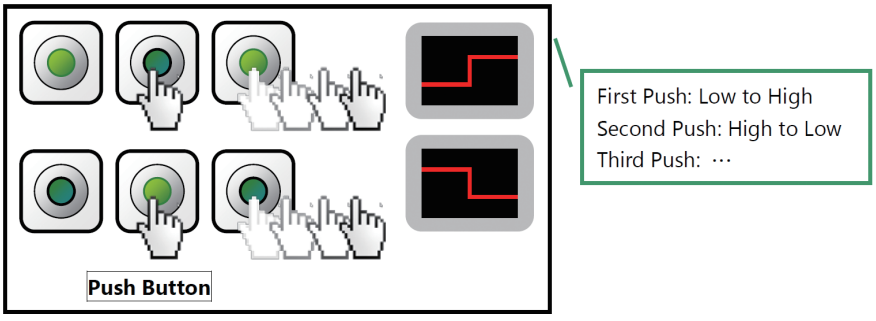
(1) The lighting control system can apply the "Edge Mode" to "Momentary Button", so that multiple lights can be turned on or off simultaneously.

(2) The emergency bell alarm system for fire safety can apply the "Level Mode" to "Push Button", so that the emergency alarm can be triggered and released at the same location.

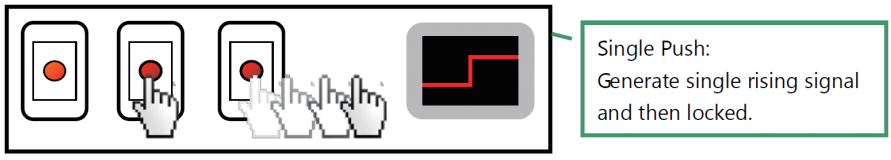
(3) When installing the emergency bell alarm system for campus restroom, to avoid the emergency alerts being disabled intentionally; the "Emergency Button" cannot be restored easily; therefore it can be used as an alarm trigger when an emergency occurs.



▲ Momentary Button



▲ Push Button



▲ Emergency Button

ZigBee Application - Route Management System for AGV

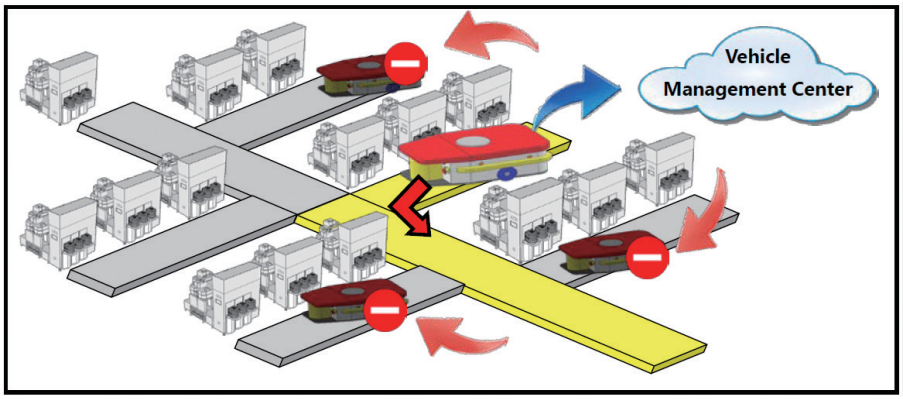
By YY Chang

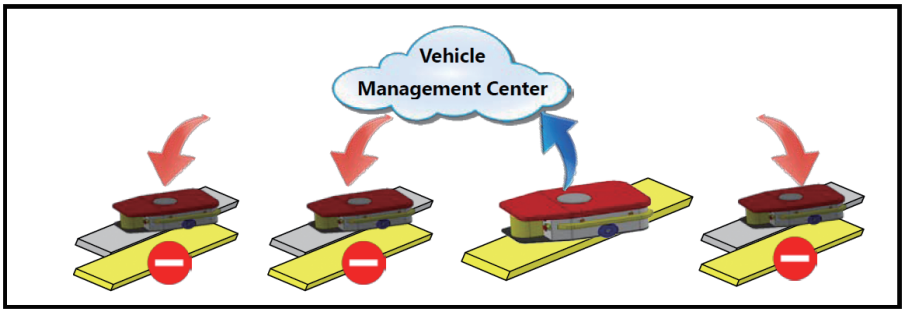
In recent years, the system of unmanned factory or warehouse automation becomes popular, the Automatic Guided Vehicles (AGV) are used to transport goods in the product lines, storage systems, transfer stations, etc. When there are several AGV in one location, the vehicle driving routes may overlap, therefore to prevent the routes conflict is an important issue.

Description

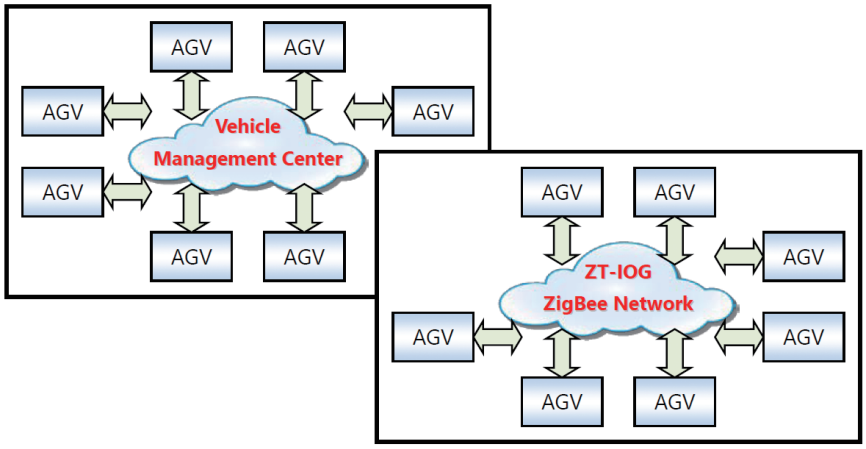
When an AGV is going to enter a restricted area, such as the main road, track or elevator..., the AGV needs to request the vehicle management center for entering permission. When the center accepts the request, the other AGV will no longer be able to enter that area until the AGV depart and the management center release the control, and then other AGV can apply to enter that restricted area.

According to the above application statement, each AGV can send messages to the vehicle management center, and can send an area disable message to other AGV in the region. The vehicle management center can be seen as a virtual cloud, it is a M2M (Machine to Machine) architecture. The AGV is a mobile device, so it needs a wireless device with the M2M architecture to do the message exchange.





▲ The ZT-IOG System is Suitable for the AGV Route Management System



▲ ZigBee network

The ZT-IOG network is a multi-to-multi I/O Pair-connection architecture, so any ZT-IOG module in the ZigBee network can change the I/O channel state of the other ZT-IOG modules. This feature meets the requirement of this application, and thus achieves the purpose of the message exchange.

Message Exchange

When an AGV is going to enter the restricted area, it must get the current status of the area, and update the status. In this case, the "On/Off" states of the DI/DO channels can be used to simulate the message of "occupied/idle" status and notify other AGV via the status of I/O channels to reach the route management goal.

Application Architecture (i)

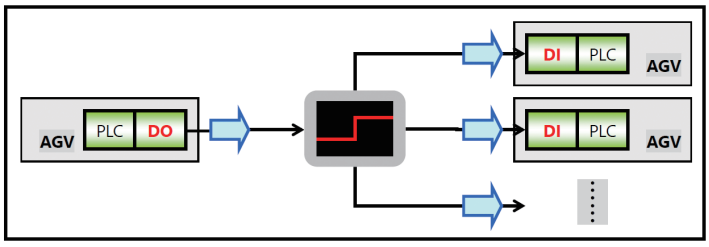
The architecture of the AGV route management system includes two levels:

(1) Control level: the AGV is equipped with PLC, PAC or IPC controller, etc. In addition to controlling the goods moving and the vehicle driving, it also manages the message exchange among vehicles in order to obtain the current route status and calculate the timing to enter the restricted area.

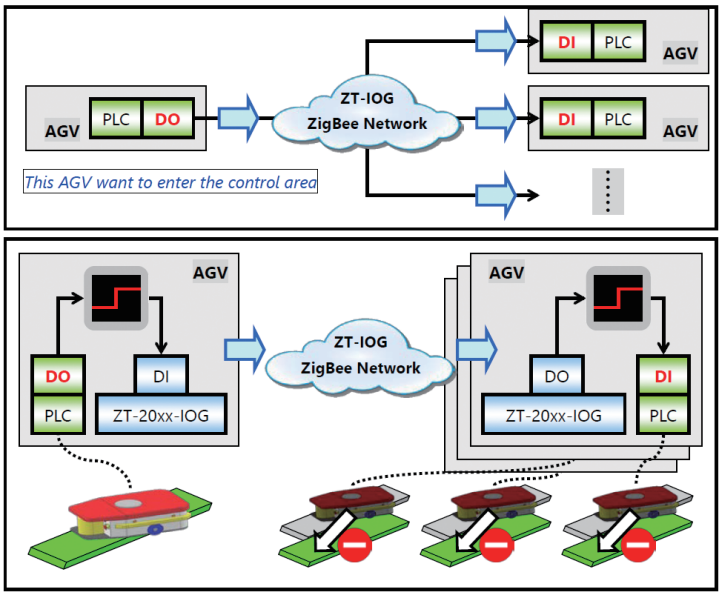
(2) Message exchange level: The ZT-IOG network can function as a medium of exchange messages. Not only simulate the "occupied/idle" status via the I/O "On/Off" status of the ZT-IOG module, but also automatically update the I/O states via the ZigBee wireless network to break the geographical limitation.

The Actual Operation

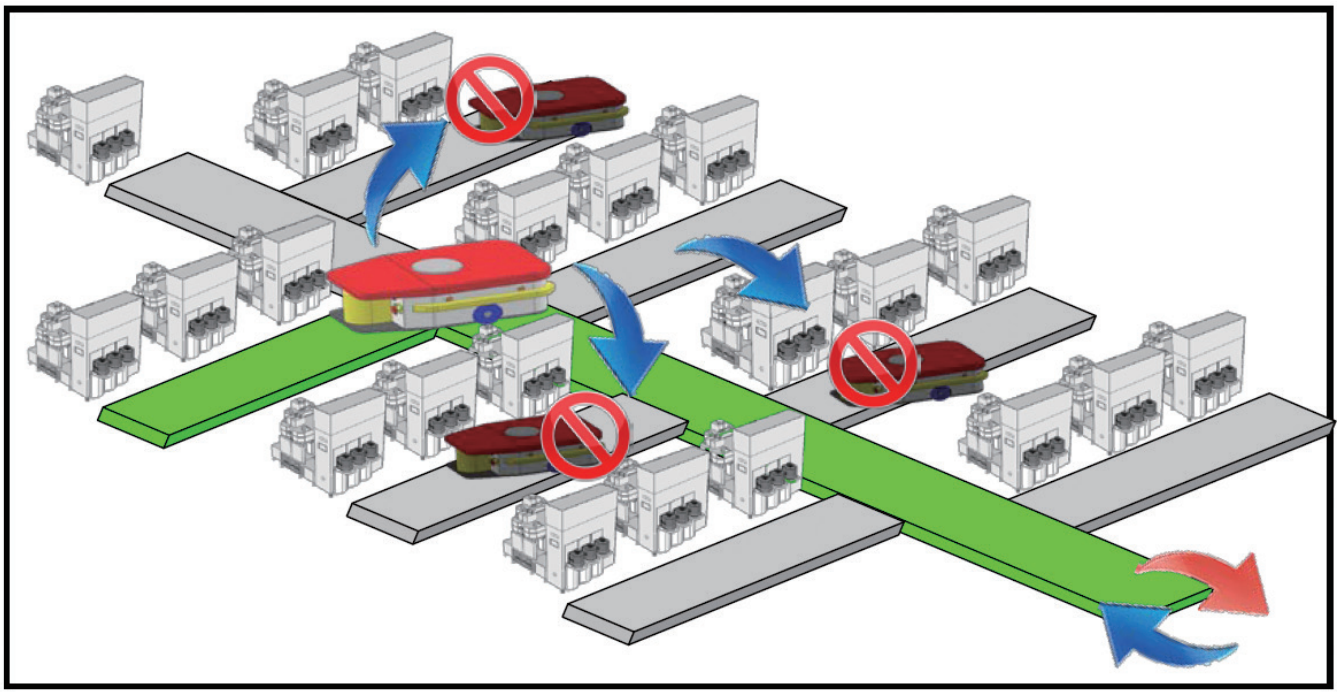
When an AGV wants to enter the restricted area, its PLC of the control level will output a "high" state to trigger the DI of the ZT-IOG module, meanwhile the DO of the ZT-IOG modules in the network will change to "high" based on the "Level Mode" Updating Logic, then will trigger the DI of the PLC on all vehicles to "high", and then they get the using status is "occupied", so that other vehicles will not enter this area for the safety reason. When this AGV leaves the restricted area, its PLC will cancel the "high" level state of the ZT-IOG, and then other AGV can send the requirement to enter this area again.



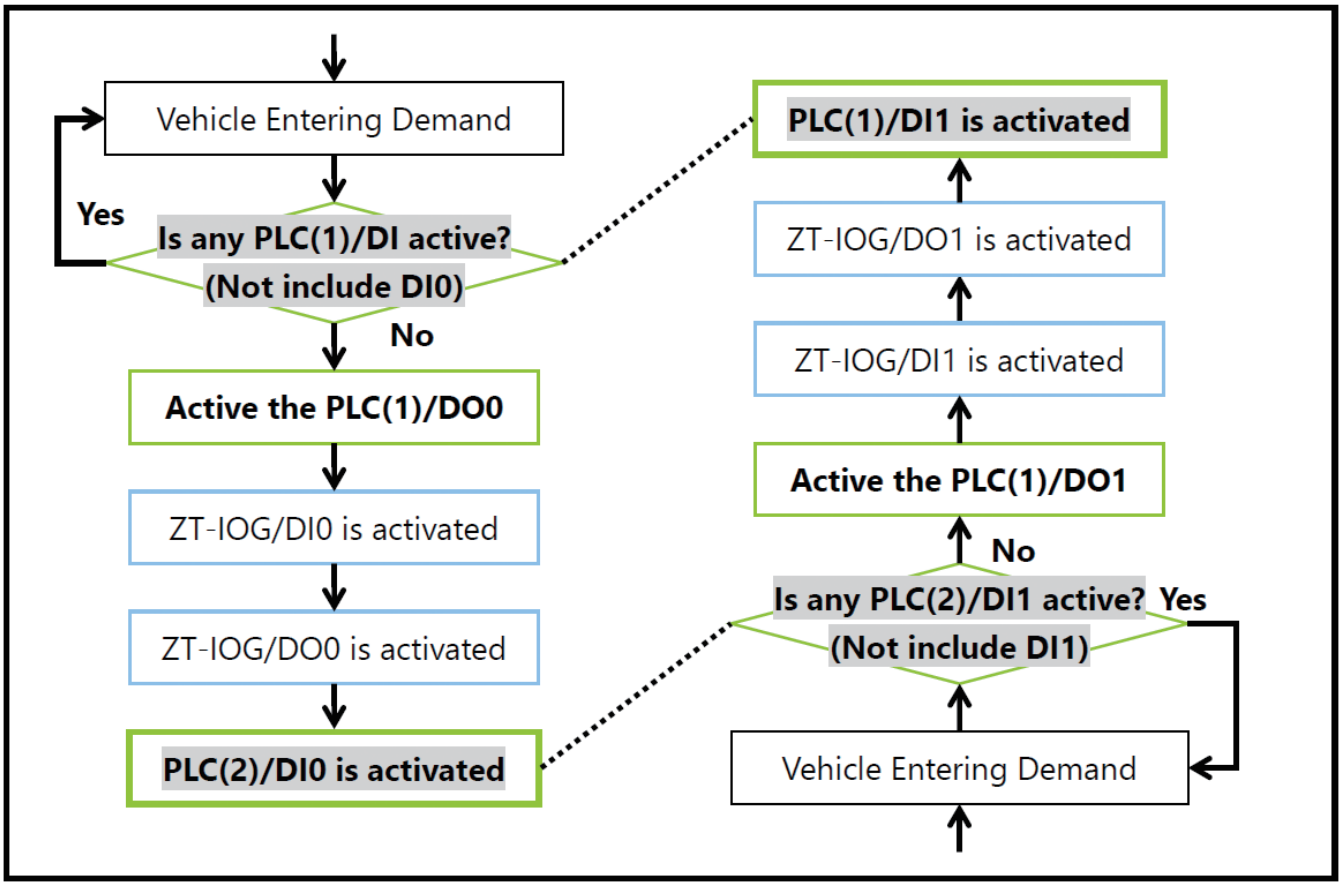
▲ Message Exchange



▲ The Actual Operation



▲ Overall Architecture Diagram



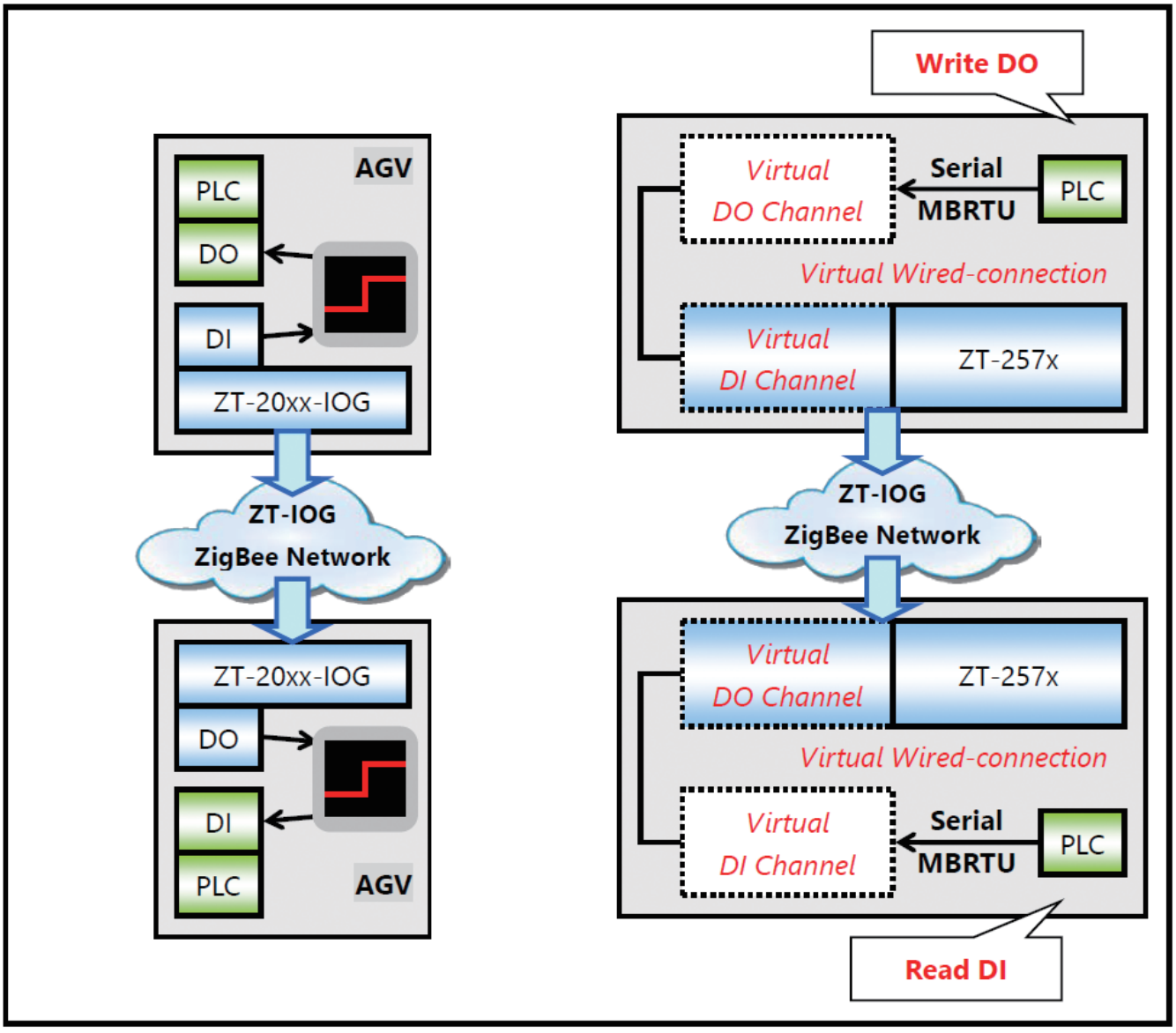
▲ Applications Logic Flow Chart

Application Architecture (ii)

Based on the above application and architecture, in addition to use the "physical I/O" of the ZT-20xx-IOG modules to simulate "occupied/idle" status via the "On/Off" state, you can also use the serial port communication (RS-232/RS-485) on the PLC to achieve the message exchange function.

The ZT-257x module provides 280 pairs of virtual digital input/output channels that can access the virtual I/O channel by the Modbus RTU protocol, and the virtual I/O channel states still can Pair-connection with the physical I/O channel states. Its DI/DO works the same way, for more detailed description, please refer to the ZT-2570 and ZT-2571 module IOG mode at the below link.

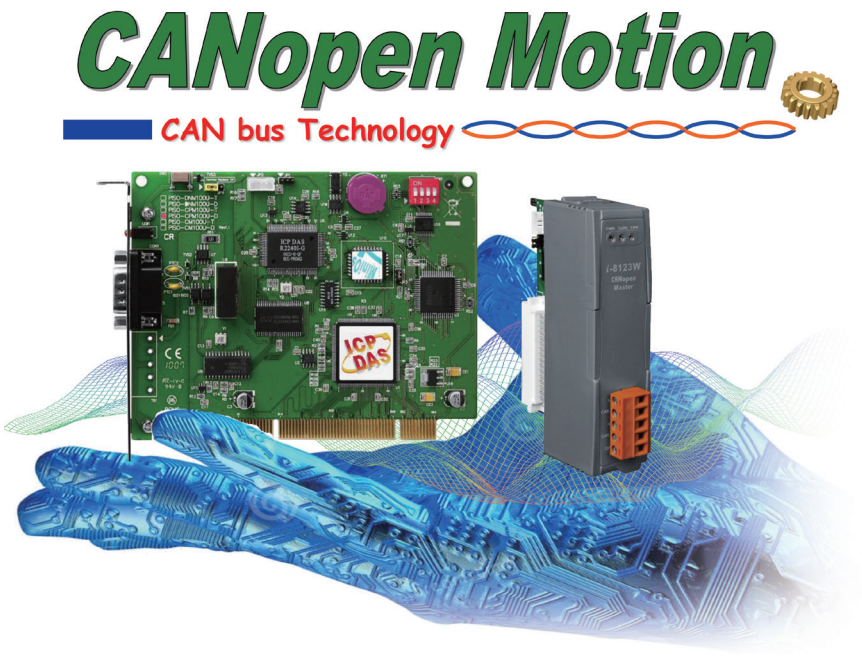
http://ftp.icpdas.com.tw/pub/cd/usbcd/napdos/zigbee/zt_series/document/zt-257x/



▲ Application Architecture

CANopen Application for Motion Control and Multi - Axis Compensation

By Johney Hu



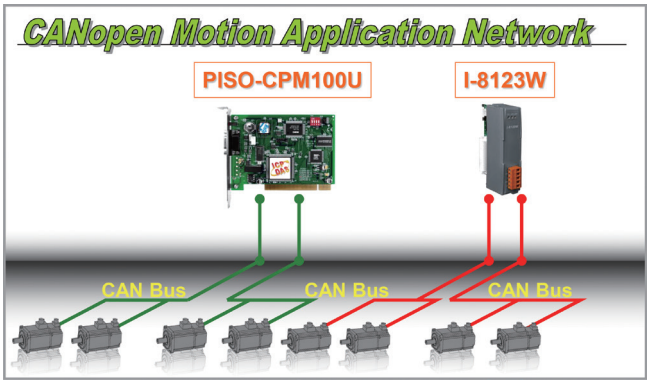
What is CANopen?

CANopen is a standard communication protocol based on CAN (Controller Area Network) bus. CAN was initially designed to be used as a communication interface for vehicle applications, for it is high stable and secure even under a harsh environment, it now has been widely used in industrial systems which require high security. Nowadays, CAN bus has been recognized as one of the most secure industrial network, and CAN technology has been used in various applications, such as: medical devices, vehicles, railway applications or building automation. The CANopen protocol (CiA 301) provides the device's network management (NMT) mechanism; it can remotely monitor the device status and the failure detection. The Heartbeat object can be used to control and monitor the operation status, and the SYNC object makes it possible to perform periodically synchronized action of multiple devices. Based on the excellent features above, the CANopen protocol is now used in fields like machine automation, medical devices, railway and wind power generation, etc.

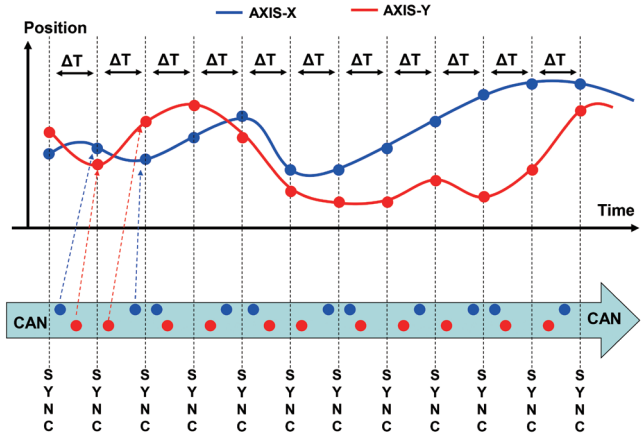
What is CANopen motion control?

CANopen motion control conforms to CiA 402 standard which is a protocol based on CANopen(CiA 301). CANopen motion control is a kind of distributed motion control; it can control each axis to perform various motion controls independently, such as position control, velocity control, toque control, synchronous action and interpolation control. The distributed motion control can enhance the performance and reduce the maintenance costs, it also allows

to increase or decrease the motors flexibly when performing system expansion. The operation of simple motion controls such as position, velocity, and toque control in the distributed motion control system can be distributed to each axis for independent processing. Therefore, the loading of the processing operation can be dramatically reduced in the control side, especially if the system is with more axes.



The interpolation motion of the multi-axis is coordinated motion between the axes. How does it work in the distributed system? CANopen can support different Baud Rate, how does the interpolation motion being operated without concerning the speed of the network communication? The following section will introduce how the distributed system achieves interpolation motion without concerning the speed of the network. The interpolation motion of the multi-axis of the distributed motion control is based on a common synchronization cycle. The synchronization cycle is like a conductor of a band; it will coordinate the motion clock of each axis. The synchronization cycle is the cycle to update the interpolation position and status of the motors between the main motion control terminal and all servo motors. During a synchronization cycle, the main motion control terminal will collect the operation status from all motors, and then send the next interpolation position to the servo motor of each axis. The interpolation position information sent from the main motion control terminal will be kept on the servo motor; and when the servo motor receives the broadcasted synchronization signal (SYNC), each axis will be operated to move to the specified position according to the position information it received. By repeating this operation, the interpolation motion of multiple servo motors can be implemented. The detailed operation is shown as below:



△T is the synchronization cycle. During the synchronization cycle, two servo motors receive the command position from the main motion control terminal. The motors will not move immediately until receiving the next SYNC sent from the main motion control terminal. All motors will move at the same time and will reach to the specified positions before receiving next coming SYNC. In this way, keep on sending "position" – "SYNC" information can achieve interpolation motion. The users can implement a variety of curves or more complex path so that the control of the device can be more flexible and more efficient.

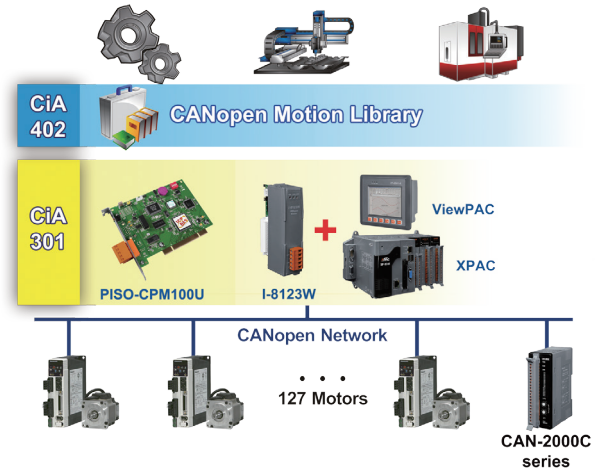
Features of CANopen Motion Control

CANopen protocol provides convenient management mechanism; it can features wire saving and is easy to control. It not only can control the motor easily and flexibly, but also easy for ruling

out the diagnosis and troubleshooting. Multiple CANopen motors can be series connected to the CAN bus, therefore it is easy to achieve multi-axis synchronization and complex motions. In addition to controlling the motors, the DI/AI/Counter information of the devices can also be collected by using the CANopen I/O modules, and then output the DO/AO/PWM signals. By using CANopen, it is easy to build a motion control system. The control can be simple and the wiring can be done easily.

Features

1. Particularly suitable for distributed multi - axis motion control systems. For example: distributed Sun Track Solar Energy System or conveyor belt transmission control ... and so on.
2. Save wiring costs, especially the labor cost spent in wiring deployment.
3. The users could freely choose from a variety of CANopen motor options without being limited to certain few brands.
4. CANopen network length can be extended through special equipment; therefore can be used in long-distance applications.
5. CANopen network can be converted into fiber transmission to avoid strong noise interference.
6. Follow the CiA 402 v1.1 standard.
7. In the same CANopen network, support different brands CANopen motors and I/O modules.
8. Provide motion control of absolute position and relative position.
9. Provide the position control, speed control and torque control of the motor.
10. Support up to 127 axis synchronous motion.
11. Support up to 32 axis arbitrary path interpolation motion.
12. Supports various homing control methods.
13. Supports the node guarding and heartbeat protocols.
14. Supports dynamic PDO object configuration.
15. Bus distance ranges between 25 m to 5000 m.
16. CAN bus ensures security and stability of the monitoring system.
17. Provide good network scalability and network debugging.



CANopen Motion Control Applications

Application of CANopen motion control for large tube bending machine

(The image above is used for illustration purpose only, it does not represent real device using in the application, the ownership and copyright of the image belongs to the creator.)

With the trend of precision machine design, metal processing requires higher accuracy and fewer defects. The requirements toward traditional machines are also raised to the level of precision machine. In this application, the software of the tube bending machine is greatly enhanced, the hardware design such as mechanism, appearance, and sensors is also significantly improved. The tube bending machine

originally used PLC as the controller, and now it changed to use industrial computer, by using PISO-CPM100U CANopen motion control, it greatly reduces the complexity of the control. The development can be focused on 3D preview and HMI design. The device features built-in HMI which is friendly and with powerful 3D functions, such as: 3D preview, mirror, rotation and so on. The operator can preview the effect of the bending tube to avoid error and offer better cost-effective value. The six axes motor in the device all use distributed CANopen motion control. During the process of bending the tube, the interpolation motions of the two axes for feeding the raw material and bending are cleverly designed to operate back and forward step by step; so the metal tube is not easy to break or rebound. It greatly enhances the yield rate of the bend tube production. The distributed motion control enables longer and bigger motion of the device so it can produce a variety of large metal pipe or thicker pipe. The development time for design can be shorter. The motion control software can flexibly adjust for use in device with different axis number which reduces the difference between device models due to programming difference; therefore it is easy for project maintenance and management.

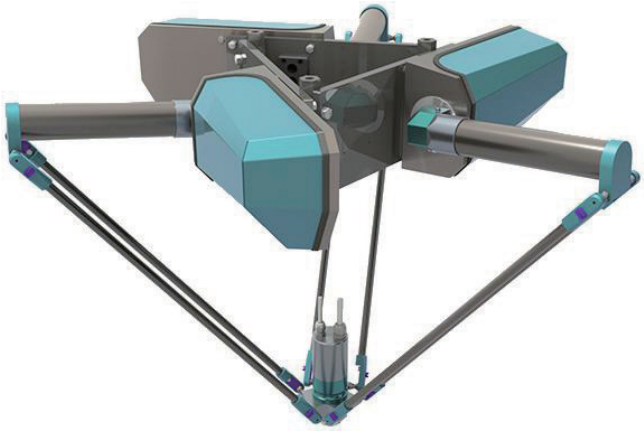
CANopen motion control for professional electric operating table

(The image above is used for illustration purpose only, it does not represent real device using in the application, the ownership and copyright of the image belongs to the creator)

Modern operating room will face a variety of surgical requirements, in order to provide patient comfort and safety surgery, the surgical team requires not only the ergonomic surgery bed, but also a reliable medical device which allows the health care workers perform the surgery smoothly. CANopen motion control runs the motor based on communication, therefore the external noise interference will not result in motor malfunction. It is safe for use in operating table. The compact size CANopen IO is easy to hide in the board of the bed to minimize the size of the operating table or operating chair. A professional surgery bed requires not only basic motion operations; it also requires interpolation motions between multi-axis. For example, when using the C-arm to control the operation table to rotate the body of the patient, it can keep the affected part (such as: tumor) of the patient body to be fixed in certain location, the affected part will not move during the process when rotating the body of the patient; so that the scan device can check the affected part of the patient from various angles.The surgery bed uses XPAC + I-8123W, it adopts interpolation technology of CANopen. It synchronize the interpolation cycle of each axis every 20ms, the bed will tilt in the speed of 0.8 degrees per second, and still keep the position within 2mm offset. This technology had won recognition from professional medical industry; it also has multiple medical certification and patent from various countries. CANopen motion control can simplify the complexity in design, and achieve safe control and precise positioning. It helps the manufacturers of surgery bed or surgery chair to better design in mechanism, visual technology or 3D scanning, etc; it enalbes to meet the

requirements of sophisticated medical technology in the modern world.

Delta Robot - Parallel Robot



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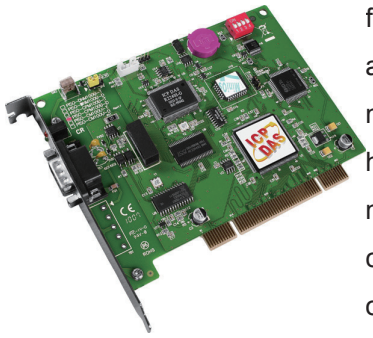
Delta Robot features parallel linkage mechanism, it has a larger working range and with high speed capability, and can be used in a lot of applications in the production line. Nowadays, there are a lot of factories use Delta Robot in food packaging, high precision pick-up/place operations and many others. The machine adopts XP-8341 + I-8123W for motion control, with only one CAN bus, it can series connect to four-axis motor, in the interpolation motion of the four-axis, it uses 5ms synchronization cycle, so it can move to 200 different target positions in one second. The high speed and complicated synchronization the interpolation motion are all done by the CANopen motion controller. The embedded controller only needs to calculate the virtual axis position and performs pick-up/place the target object. It does not need special axis control board and can be installed in limited space. The interpolation motion between multi-axis of CANopen motion control allows more flexible design of the interpolation motion for arbitrary path and can bring the advantages of Delta Robot such as high-speed movement and high-precision to full play. It also presents stable and smooth motion performance which is perfect for use in food processing industry or production lines in many other industries.

CANopen Motion Solutions and Product Selection

The lighter loading in handling the motion control operations in the machine computer or machine controller, the more operations in database, visual processing or other operations can be done by the machine. In ICP DAS CANopen master device module or PCI board card, it is equipped with one x86 80MHz CPU which is specific for running the CANopen Master core. So that the network management (NMT), emergency (EMCY) and heartbeat (Heartbeat), etc., can be processed by built-in CPU. Especially for the synchronization message(SYNC) which is the most important message and requires high accuracy, it relies on the built-in x86 CPU to handle the operations. It can speed up the processing of the CANope package, real-time monitoring of the operating status of all CANopen servo motors, and reduce the loading of the upper controllers.

PISO-CPM100U
1 Port Intelligent CANopen Master Universal PCI Board

The PISO-CPM100 gives a very powerful and economic solution of an active CANopen master device with one CAN channel. It uses the NXP SJA1000T and 82C250 to be the CAN controller and transceiver, which provide bus arbitration, error detection with auto correction and re-transmission function. The 16-bit on-board microcontroller with real-time O.S., MiniOS7, allows many functions such as real-time message transmission and reception,



filtering, preprocessing, and storage of CAN messages. With the high efficiency powerful microcontroller, this card can be made for one CAN controller manager without losing data, even in systems with a high PCI bus load. Therefore, the CANopen critical process can be implemented directly by CANopen firmware in the PISO-CPM100. In addition, users can develop their CANopen application by using the CANopen library on the host computer. When the PISO-CPM100 is active, the data exchange between users' application and CANopen firmware is performed via the memory mapping method of the PISO-CPM100.

Features

- ❑ Universal PCI interface supports 5 V and 3.3 V PCI bus
- ❑ Built-in 80186, 80M Hz CPU
- ❑ Baud Rate (bps): 10, 20, 50, 125, 250, 500 and 800 Kbps,1 Mbps
- ❑ Follows CANopen CiA 301 and CiA 402 standard
- ❑ Support Guarding of the motors and Heartbeat protocols
- ❑ Support receiving of EMCY message
- ❑ Allow dynamic PDO mapping
- ❑ Support operating system Win2K / XP, Win 7 (32-bit)
- ❑ Libraries for BCB6, VC6, VB6, C#, etc.

For more information, please refer to the following website:

http://www.icpdas.com/root/product/solutions/industrial_communication/fieldbus/canopen/master/piso-cpm100u.html

I-8123W
1 Port High Performance Intelligent CANopen Master Module

The I-8123W follows CiA CANopen specification DS-301 V4.02. It is a high price/performance CANopen master. With the ViewPAC, WinPAC or XPAC series MCU (main control unit), it can be generally applied in the industrial automation, building automation, vehicle, and embedded control network. Besides, owing to the feature of building the CANopen protocol firmware inside, users can easily access the slave devices via I-8123W without studying or dealing the complex CANopen protocol. It is helpful to reduce the development cycle time and let users set up their CANopen application more quickly and easily.

Features

- ❑ Support WinPAC/ViewPAC/XPAC series controllers
- ❑ Built-in 80186, 80M Hz CPU
- ❑ Baud Rate (bps): 10, 20, 50, 125, 250, 500 and 800 Kbps,1 Mbps
- ❑ Follows CANopen CiA 301 and CiA 402 standard
- ❑ Support Guarding of the motors and Heartbeat protocols
- ❑ Support receiving of EMCY message
- ❑ Allow dynamic PDO mapping
- ❑ Support WinCE 5/6, XPe operating system controller
- ❑ Libraries for BCB6, VC6, VB6, C#, etc.

For more information, please refer to the following website:

http://www.icpdas.com/root/product/solutions/industrial_communication/fieldbus/canopen/master/i-8123w.html

PMD-2201 Power Meter Concentrator with Touch Panel Display

By Tomy Lai

PMD-2201 (Power Meter Concentrator with Display) offers on-site display and remote webpage for power information display and interfaces for system settings. It helps the personnel who are in charge of the power monitoring system to view the power consumption information of the devices in real time via the LCD touch panel or the webpage. They can also quickly adjust the operations of the devices and the power meter parameters with ease. It can significantly reduce the time and labor when implementing a power monitoring system.

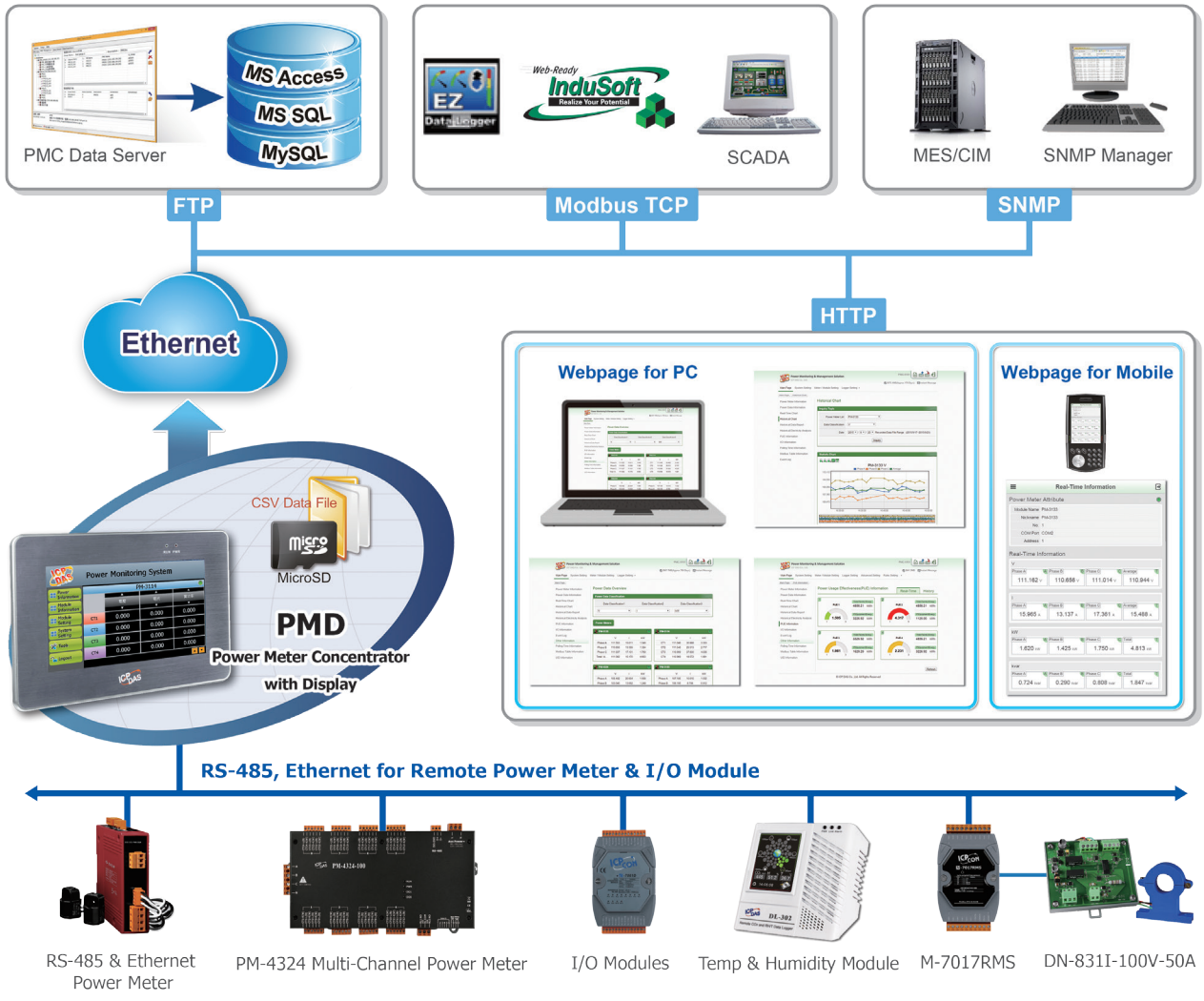
Introduction

The PMD-2201 is a web-based intelligent Power Meter Concentrator developed by ICP DAS. It offers webpage interface, and features various functions such as: power data collection, on-site control, power demand management, data logger, on-site display/Web page data display and alarm notification functions. The PMD-2201 is an easy-to-use and easy-to-build total solution for power management and monitoring that makes more efficient energy usage.

For the front-end devices, PMD-2201 supports standard Modbus TCP/RTU protocol that allows connections to ICP DAS Smart Power Meters to read the power data of the devices measured by the power meters; and then real-time record the power values in the data logger file. In addition to ICP DAS M-7000 I/O modules, the PMD-2201 could connect to standard Modbus TCP/RTU Slave modules. By working with the I/O modules, and functions such as IF-THEN-ELSE logic rule execution and alarm notification functions including Email/ SMS/SNMP Trap, PMD-2201 offers more thought-out power demand management and alarm notification functions, and is able to perform load shedding of the devices if required, and enables real-time monitoring and control of the power consumption of the devices.

For the back-end systems, the PMD-2201 provides an FTP send-back mechanism; with PMC Data Server or SCADA (Indusoft), it can integrate and analysis the power data. In addition, the PMD-2201 also supports standard Modbus TCP/RTU Slave and SNMP protocols to transmit real-time information and SCADA / IT / MIS systems in the Central Control Center, the manager can quickly review the status of the devices and perform statistics and analysis of the power information, it helps more efficient energy usage and can reduce the electricity bill dramatically.

Architecture:



Features:

- ❑ Provide 7" Touch Panel for On-Site system setting and power data display operations
- ❑ Provide Remote connection using browsers for system setting and power data display operations
- ❑ Support at most 24 ICP DAS Modbus Power Meters and 8 Modbus I/O modules
- ❑ Display real-time power data, historical power data, power data statistics report and Power Usage Effectiveness (PUE) report, etc.
- ❑ Provide power data recording function and data file auto send-back & recovery when disconnected network is resumed
- ❑ Built-in IF-THEN-ELSE logic engine and Email /SMS/SNMP Trap message sending function for thought-out power demand management and alarm notification.
- ❑ Provide Schedule and Timer function for operations of I/O modules (devices)
- ❑ Support Modbus TCP/RTU and for seamless integration with SCADA systems
- ❑ Support standard SNMP protocols to acquire real-time power information of each device.
- ❑ Support PoE (Power over Ethernet) function

PMC/PMD Function Comparison Table:

Function			PMC-5151	PMD-2201
Power Meter and I/O Module Connection	Power Meter		Allow connections to up to 24 ICP DAS Modbus TCP/ RTU Power Meters	
	I/O Module	Local Side	Support XW-Board (XW-107, XW-110, XW-304, XW-310 etc.)	–
		Remote Side	Allow to connect to up to 8 Modbus TCP/RTU I/O modules.	
Interface for System Setting and Data Display	On-Site Screen Interface		–	Yes (7" Touch Panel Interface)
	Remote-Site Website Interface		Yes(By browser)	
Power Data gathering, display, recording and management	Power Data Display	Real-time power data display	Yes	
		Historical power data display	Yes	
	Power Data Recording	Real-time power data logging	Yes	
		Logger file send back	Yes	
		Remote logger file management	Yes	
		Historical power data report	Yes	
	Power Demand Management	IF-THEN-ELSE Logical Operation	Yes	
		Email Alarm Message Sending	Yes (with SSL encryption)	
		SMS Alarm Message Sending	Yes (work with ICP DAS GTM-203M-3GWA)	
		I/O Module Monitoring	Yes	
		Timer Operation	Yes	
		Schedule Operation	Yes	
Others	Connect to SCADA or HMI Devices		Yes (By Modbus TCP or Modbus RTU Protocol)	
	SNMP & SNMP Trap Function		Yes	
	Time Synchronization Function(SNTP)		Yes	

The PMC/PMD series product features easy-to-use, reliable and multi-functional advantages. With PMC/PMD series product, the user could freely choose most suitable product to meet their specific requirements. PMC/PMD provides more efficient power management and monitoring function that will significantly reduce time and labor spent in developing power monitoring and management system. Please refer to PMC webpage or ICP DAS for more detailed information about PMC products.

ICP DAS Power Monitoring and Management Solution webpage: http://pmms.icpdas.com/en/index.html

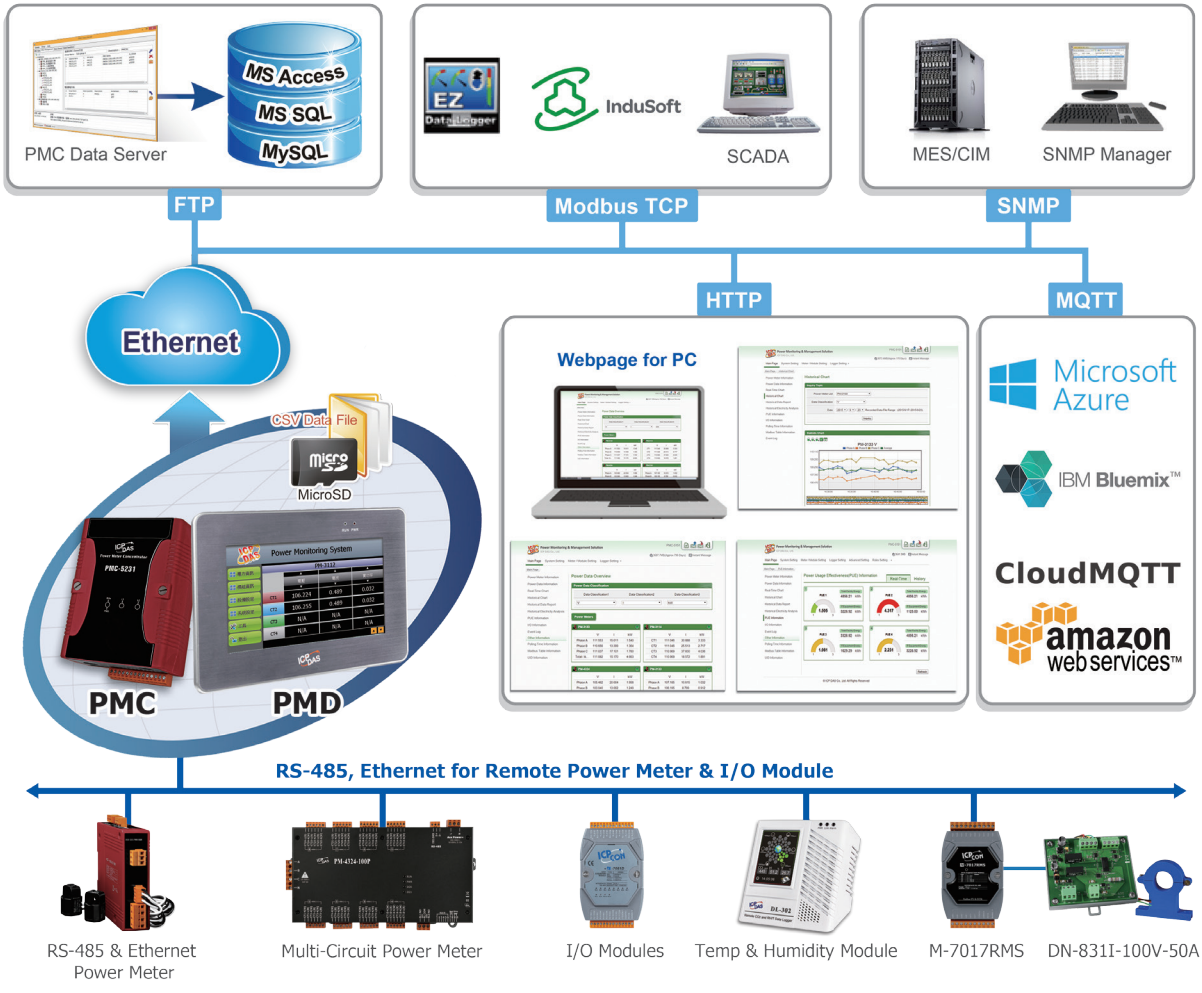
ICP DAS webpage: http://www.icpdas.com

Industrial IoT Power Meter Concentrator - PMC-52xx

By Rick Lee

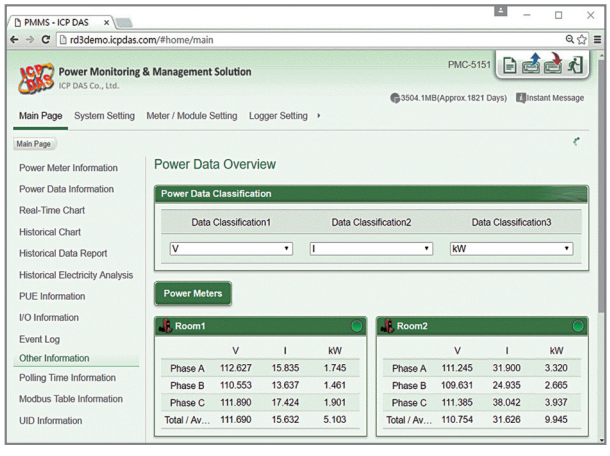
Industry 4.0 is based on Internet of Things (IoT) that incorporates the technological concept of communicating and exchanging information between all facilities which brought manufacturing industry to a new era. The PMC-52xx Industrial IoT Power Meter Concentrator developed by ICP DAS is a perfect start point to facilitate the vision of the Energy monitoring and management application of Industry 4.0 age. PMC-52xx provides flexible integration with the ICP DAS power meter, and features various functions such as: measure power consumption of the devices, power data logger, energy usage analysis, power demand management and alarm notification. It also supports various communication protocols for seamless integration with the back-end SCADA/MES/IT/IoT systems. So that the administrator can monitor the status of power consumption of each device and perform statistics and analysis of the power information, thus improving the overall efficiency in energy consumption to save costs on utility bills. All of these features make PMC-52xx a perfect concentrator of power meter in the Energy monitoring and management application of Industry 4.0 age.

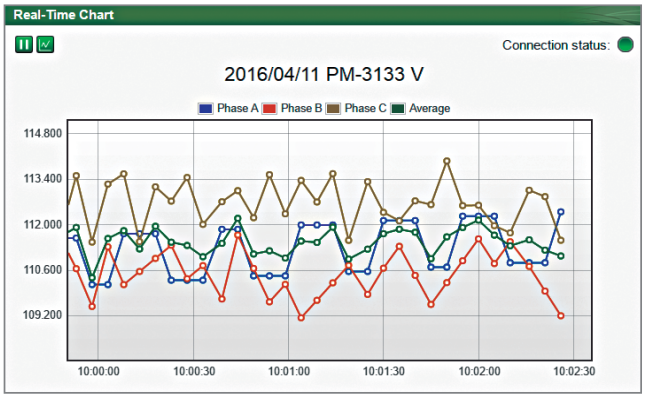
Introduction

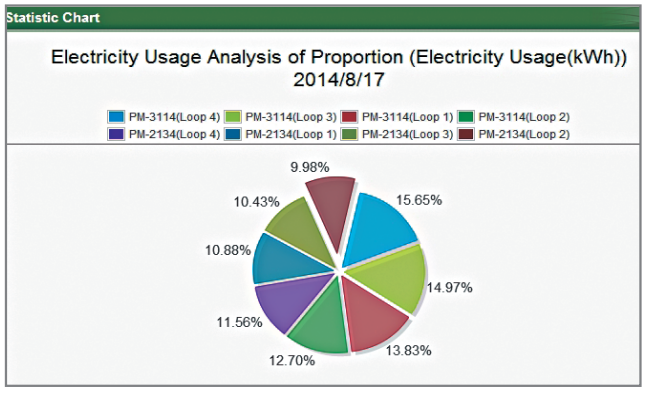


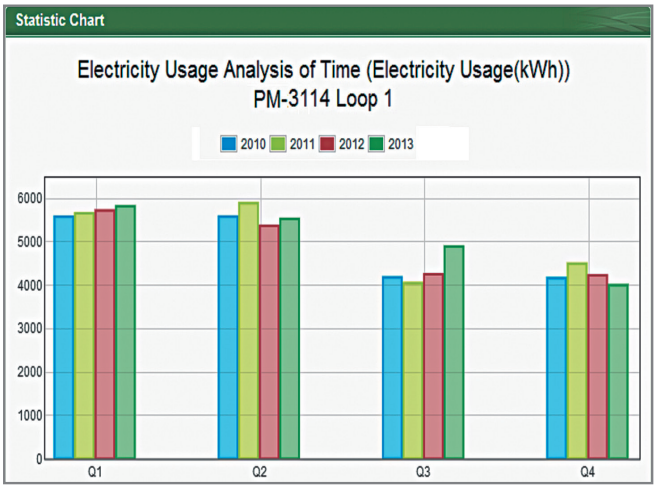
PMC-52xx is the new generation of Power Meter Concentrator for meeting the trend of energy saving and carbon reduction in the Industry 4.0 age. It provides flexible integration with the ICP DAS power meters via RS-485 or Ethernet interface, and features various functions such as: measure the power consumption of the devices, energy usage analysis, power demand management and alarm notification functions. The PMC-52xx features a built-in Micro SD card. After it retrieving the power data from the power meter, it will save the power data in data log file, and automatically send back the data log files to the back-end management center for data analysis and statistics.

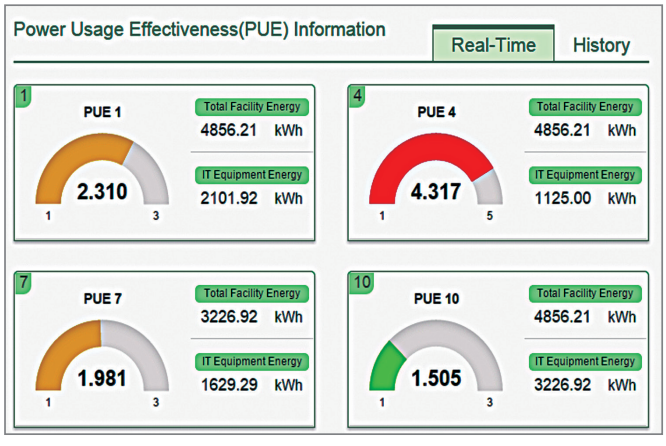
PMC-52xx offers a user-friendly and intuitive web site interface that allows users to implement the Energy monitoring and management system just a few clicks away; no programming is required. PMC-52xx also supports the Modbus TCP/RTU, SNMP, FTP and MQTT protocols for seamless integration with the back-end SCADA/MES/IT/IoT/Network Management systems. So that the administrator can monitor the status of energy consumption of each device and perform statistics and analysis of the power information, thus improving the overall efficiency in energy consumption to save costs on utility bills. All of these features make PMC-52xx a perfect concentrator of power meter in the Energy monitoring and management application of Industry 4.0 age.







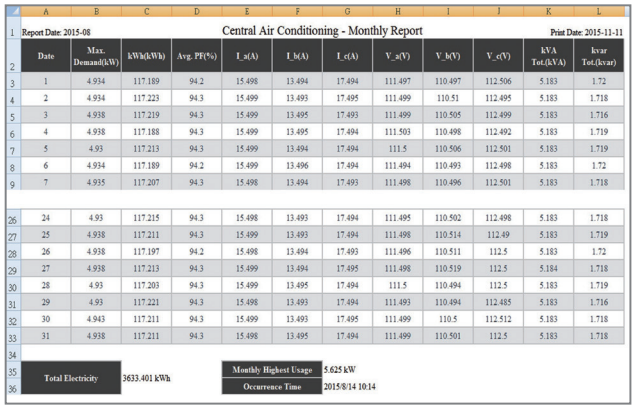




Main Functions:

◆ No more Programming! No extra software tool, using browsers to perform system operations

◆ Power data display and power data statistics report provided



Central Air Conditioning - Monthly Report

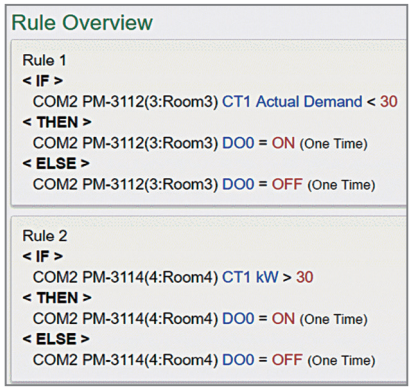
Report Date: 2015-08 | Print Date: 2015-11-11

Date	Max. Demand(kW)	kWh(kWh)	Avg. PF(%)	I_a(A)	I_b(A)	I_c(A)	V_a(V)	V_b(V)	V_c(V)	kVA Tot.(kVA)	kvar Tot.(kvar)
1	4.934	117.189	94.2	15.498	13.494	17.494	111.497	110.497	112.506	5.183	1.72
2	4.934	117.223	94.3	15.499	13.493	17.495	111.499	110.51	112.495	5.183	1.718
3	4.938	117.219	94.3	15.499	13.495	17.493	111.499	110.505	112.499	5.183	1.716
4	4.938	117.188	94.3	15.499	13.495	17.494	111.503	110.498	112.492	5.183	1.719
5	4.93	117.213	94.3	15.499	13.494	17.494	111.5	110.506	112.501	5.183	1.719
6	4.934	117.189	94.2	15.499	13.496	17.494	111.494	110.493	112.498	5.183	1.72
7	4.935	117.207	94.3	15.498	13.494	17.493	111.498	110.496	112.501	5.183	1.718
24	4.93	117.215	94.3	15.498	13.493	17.494	111.495	110.502	112.498	5.183	1.718
25	4.938	117.211	94.3	15.499	13.493	17.494	111.498	110.514	112.49	5.183	1.719
26	4.938	117.197	94.2	15.498	13.494	17.493	111.496	110.511	112.5	5.183	1.72
27	4.938	117.213	94.3	15.499	13.494	17.495	111.498	110.519	112.5	5.184	1.718
28	4.93	117.203	94.3	15.499	13.495	17.494	111.5	110.494	112.5	5.183	1.719
29	4.93	117.221	94.3	15.498	13.493	17.494	111.493	110.494	112.485	5.183	1.716
30	4.943	117.211	94.3	15.499	13.493	17.495	111.499	110.5	112.512	5.183	1.718
31	4.938	117.211	94.3	15.498	13.495	17.494	111.499	110.501	112.5	5.183	1.718

Total Electricity: 3633.401 kWh | Monthly Highest Usage: 5.625 kW | Occurrence Time: 2015/8/14 10:14

◆ Built-in Micro SD card for power data logging, and data files automatically send back (File recovery mechanism supported).

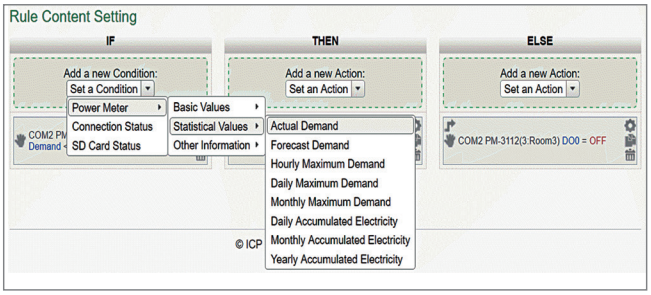
◆ Thought-out power demand management, flexible operation control of the device, and Email & SMS alarm notification mechanism by IF-THEN-ELSE logic rule.



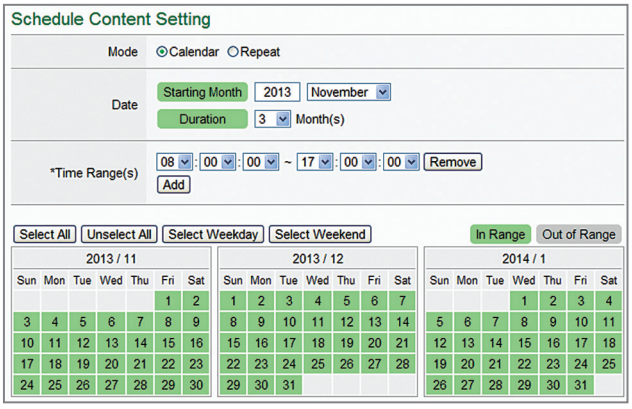
Rule Overview

Rule 1
< IF >
COM2 PM-3112(3:Room3) CT1 Actual Demand < 30
< THEN >
COM2 PM-3112(3:Room3) DO0 = ON (One Time)
< ELSE >
COM2 PM-3112(3:Room3) DO0 = OFF (One Time)

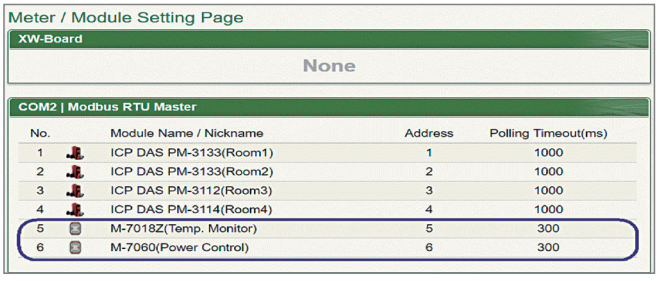
Rule 2
< IF >
COM2 PM-3114(4:Room4) CT1 kW > 30
< THEN >
COM2 PM-3114(4:Room4) DO0 = ON (One Time)
< ELSE >
COM2 PM-3114(4:Room4) DO0 = OFF (One Time)



◆ Schedule the operations for the devices as required for energy saving.

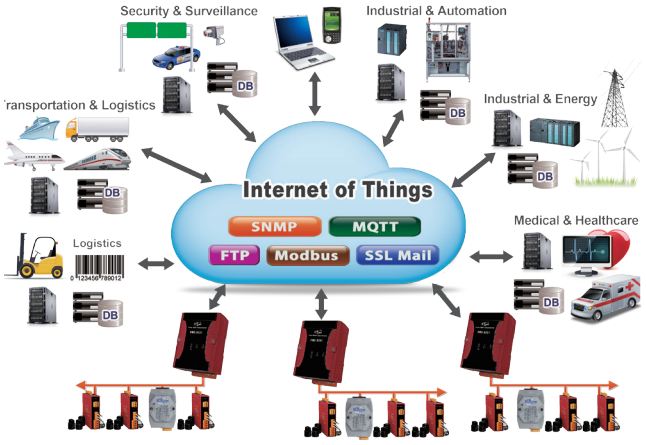


◆ Support a variety of I/O modules to flexibility adjust the operation of devices



◆ 3G Wireless data communication & SMS message operation (for PMC-5231M-3GWA only)

◆ A variety of protocols supported - a cost-effective power meter concentrator in the IoT age)



Summary:

As the energy price is globally on the rise; the effective use and cost control of the electricity are getting important for all kinds of industries. PMC-52xx Industrial IoT Power Meter Concentrator provides flexible integration with the ICP DAS power meter to measure and monitor the energy consumption of the devices and perform statistics and analysis of the power information. In addition, PMC-52xx also provides power demand management and alarm notification functions. With the integration of I/O modules, it can perform logic control or load shedding of the devices based on the power demand in real time. PMC-52xx also supports various communication protocols for seamless integration with the back-end SCADA/IT/IoT systems. So that the administrator can monitor the status of energy consumption of each device and perform statistics and analysis of the information, thus improving the overall efficiency in energy consumption to save costs on utility bills. If you need more detailed information of PMC-52xx, please refer to following link:

PMC-5231 Web Page:

http://pmms.icpdas.com/en/PMC_5231.html

PMC-5231M-3GWA Web Page:

http://pmms.icpdas.com/en/PMC_5231M_3GWA.html

ICP DAS Web Site:

http://www.icpdas.com/index.php

Product Model			PMC-5151 	PMC-5231 	PMC-5231M-3GWA 
Hardware Spec	CPU		32 Bit (520 MHz)	32 Bit (1GHz)	
	Network Interface		10/100 Base-TX	10/100/1000 Base-TX	
	microSD Interface		Yes (Max. 16 GB microSD)	Yes (Max. 32 GB microSD)	
	Power Meter Connection		Allow connection to up to 24 ICP DAS Modbus TCP/RTU Power Meters		
	I/O Module Connection	Local	XW-Board	XV-Board	
		Remote	Allow connection to up to 8 Modbus TCP/RTU I/O modules.		
Basic Function	Operation Interface		Web Interface		
	Power data display		Yes		
	Power data logging and data file send back		Yes		
	Historical power data report		Yes		
	PUE setting and display		Yes		
Power Demand Management	IF-THEN-ELSE Logic Operation		Yes		
	Alarm Email Sending		Yes (Support SSL)		
	Schedule/Timer		Yes	Yes (More powerful)	
	I/O Module Operation		Yes		
Integration with SCADA/ IT/IoT/ Cloud systems	Connect with SCADA		Yes (Support Modbus TCP/RTU Protocol)		
	FTP Server & Client		Yes		
	SNMP		Yes		
	MQTT Client		No	Yes (Support SSL)	
	Connect with public Cloud platform		No	Yes (Support connection with Microsoft Azure IoT platform and IBM Bluemix IoT platform)	
	Connect with IoTstar		No	Yes	
	DDNS		No	Yes	
	Wireless data communication & SMS operation		No	No	3G Wireless data communication & SMS operation

Non-Contact Three-Color Signal Tower Monitoring Application

By Harlem Li

The non-contact three-color signal tower monitoring system uses the LP-5231 with USB Webcam to record and collect data on the three-color signal tower. It will send back the status to the management center via Ethernet or RS-485 interface, etc. Therefore the management center is able to receive the working status of the production line in real-time.

Introduction

For factory production line management, ensuring maximum productivity and maintaining appropriate stock are keys to profitability. The main purpose of machine status management is to reduce the number of downtime and minimizing production costs. An easy way to achieve this goal is using intelligent image recognition module to monitor the status of the three-color signal tower on the devices to get the operation status of each devices in real time. ICP DAS provides non-contact three-color signal tower monitoring system; it uses LP-5231 to work with the USB Webcam to recognize the image of the three-color signal tower and perform data collection. The status of three-color signal tower can be transferred back to the management center via Ethernet or RS-485 interfaces, etc. So that the management center can receive the operation status of the production line devices in real-time.

Features

- ❑ Support monitoring of 4 three-color signal towers at the same time.
- ❑ 4 Webcams can be connected to the system via USB-2560 (USB Hub) to monitor 4 three-color signal towers
- ❑ Image recognition of the status of three-color signal tower
- ❑ The system will recognize the status of the signal for the specified area
- ❑ Provides display of the real-time or historical status information of the signal tower.
- ❑ The system will real-time display and record the current status and time of the signal tower
- ❑ Support WEB Server; no tool is required, the operation and setting of the system can be done via the browsers.
- ❑ Support Modbus TCP/RTU Slave function for seamless integration with the SCADA software.
- ❑ The users can access the monitoring status of the system via Modbus TCP/RTU communication.
- ❑ Provide SDK for users to develop their own applications.
- ❑ Provide simple API function to reduce the development time, it helps the user to create a three-color signal tower monitoring system with ease.

LP-5231 Hardware Features

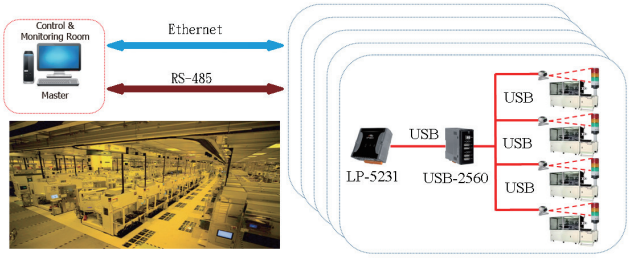
CPU Module	
CPU	AM3354, 1 GHz
DDR3 SDRAM	256 MB
Flash	512 MB
EEPROM	64 KB
Expansion Flash Memory	microSD socket with one 4 GB microSD card
RTC (Real Time Clock)	Provide second, minute, hour, date, day of week, month, year
64-bit Hardware Serial Number	Yes, for Software Copy Protection
Dual Watchdog Timers	Yes
LED Indicators	4 LEDs(Power、Running and 2 user defined LEDs)
Communication Ports	
Ethernet	RJ-45 x 1
USB 2.0 (host)	1
Console Port	RS-232 (RxD, TxD and GND); Non-isolated
ttyO2	RS-485 (Data+, Data-); Non-isolated

ttyO4	RS-232 (RxD, TxD and GND); Non-isolated
ttyO5	RS-485 (Data+, Data-); 2500 VDC isolated
I/O Expansion	
I/O Expansion Bus	Yes, one optional XV-board
Mechanical	
Dimensions (W x L x H)	91 mm x 132 mm x 52 mm
Installation	DIN-Rail Mounting
Power	
Input Range	+10 to +30 VDC
Consumption	4.8 W
Environmental	
Operating Temperature	-25 to +75 ℃
Storage Temperature	-30 to +80 ℃
Ambient Relative Humidity	10 to 90% RH (non-condensing)

Application

The non-contact three-color signal tower monitoring system uses the LP-5231 with USB Webcam (requires support of UVC, such as: Logitech C170). The "non-contact" indicates the system retrieves the image of the three-color signal tower via the webcam and performs the image recognition. In this way it can save the on-site wiring deployment and the cost of the wires. This monitoring system can work with USB-2560 to monitor status of 4 three-color signal towers which significantly reduce the cost to build a system.

The non-contact three-color signal tower monitoring system is implemented based on the LP-5231, the user connect to the LP-5231 to define the area of red, yellow and green of the three-color signal tower, and then the system will recognize the status of the signal tower in the defined areas. The status and time of the signal tower will be displayed and recorded in real time via the browser. The users can access the information of signal tower status in real-time via Ethernet or RS-485 interfaces by the Modbus TCP/ RTU protocol. If the users want to develop their own applications, some basic API functions are also provided to reduce the development time; so that the users can easily create a three-color signal tower monitoring system.



More Information of LP-5231

For more detailed product information such as: product specifications, manuals, software and firmware updates, and so on, please refer to the following link:
http://www.icpdas.com/root/product/solutions/pac/linpac/lp-52xx.html

Summary

The non-contact three-color signal tower monitoring system is one of the ICP DAS product line solutions. The system can be implemented easily by using the LP-5231, USB-2560 and webcam, which can save the cost of the hardware and improve the overall system efficiency.

ICP DAS is committed to develop solutions for factory production line applications. We provide a wide range of solutions to meet all kinds of requirements from our customers. With accumulated experiences, the devices in industry can be integrated in different ways. ICP DAS will continue to develop more solution to meet your requirements in all respects.

Ordering Information

LP-5231 CR PAC with Linux OS and one LAN port (RoHS)

Accessories

USB-2560 CR 4-Port Industrial USB Hub (RoHS)

Smart Power Meter Application - Measurements of Household Appliances

By Janus Lin

In Kaohsiung Automation Exhibition, ICP DAS displayed solution for easy electrical power measurement. The demo box is equipped with a PM-3112 smart power meter to measure two 110 to 220 VAC single-phase loops, and uses PMD -2201 for real-time information display and storage. It can fit in home decoration appropriately and perfect for use in home automation applications.

In Kaohsiung Automation Exhibition, ICP DAS displayed solution for easy electrical power measurement. The demo box uses 36 x 25 cm waterproof outer box, it is equipped with a PM-3112 smart power meter to measure two 110 to 220 VAC single-phase loops, and uses PMD -2201 for real-time information display and storage.

In these two years, due to the prevalence of Internet of Things and Smart Home; the power consumption measurement for household or for a single appliance has become very popular. When people receiving the electricity bill, they always want to know how the electricity consumed for each appliance, especially for energy-sucking appliances such as refrigerators and air-conditioning, etc.

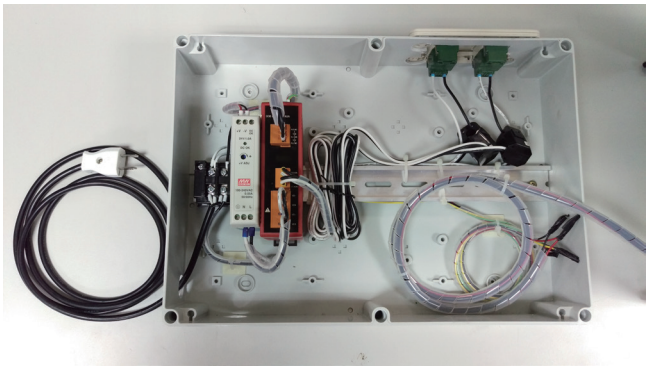
In the conventional way, if we want to perform power data collection, we will need to use the Current Transformer (CT) with the smart power meter, these Current Transformers needed to be installed on the switchboard. This may cause two problems:

1. The wiring for the switchboard for household usually is quite confusing. It is usually not planned and follows principle of convenience only.
2. A circuit usually connects to more than one appliance. Using a 220 VAC air conditioner as an example; usually a circuit will supply all air conditioners for the whole household.

Therefore, if we want to observe the power consumption of a specified appliance, it will be difficult to single out the electricity usage.

Based on ICP DAS power monitoring solution, we designed an easy electricity measurement solution for measuring a single appliance. It does not need to change the products and the system architecture; we only need to install the system in another way.

For the power supply and output, we use general sockets for 110 to 220 VAC power input, and then plug the appliance that you want to measure to the output socket, it looks like a larger extension cable.

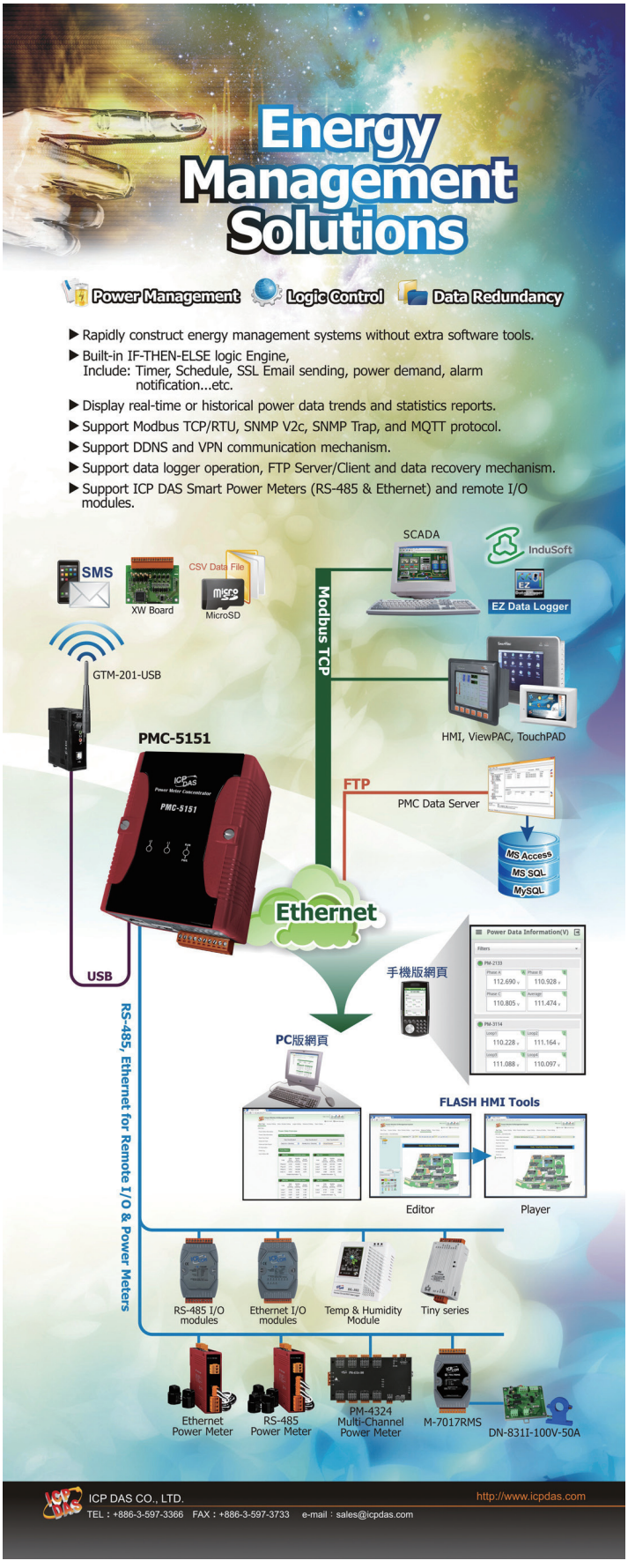


For power measurement, we use 110 to 220VAC power supply as a reference voltage, and clip the Current Transformer to the output circuit so it can measure the power data of the circuit.

In addition, the PM-3112 supports two sets of relay outputs, we can use these two relays to control the power transmission of the two sockets.

To display the power information, a power meter concentrator PMD-2201 is installed on the waterproof demo box. The power meter concentrator can connect to 24 ICP DAS smart meters at the same time. It can generate chart of the power data and statistical reports. It also features built-in Email alarm notification. In addition to the setting interface on the concentrator, it also provides web-based webpage for remote settings. It is perfect for managing multiple smart meters and can perform data send back function.

The user can also select cost-effective TPD-433-PM or VPD-143N-PM module to replace the PMD-2201. They do not provide chart, report and web-base setting but it also provides real-time display of the power data. It is also with compact size which can fit in home decoration appropriately and perfect for use in home automation applications.



Intelligent Monitoring System for Fisheries Research Institute

By Andrew Wu

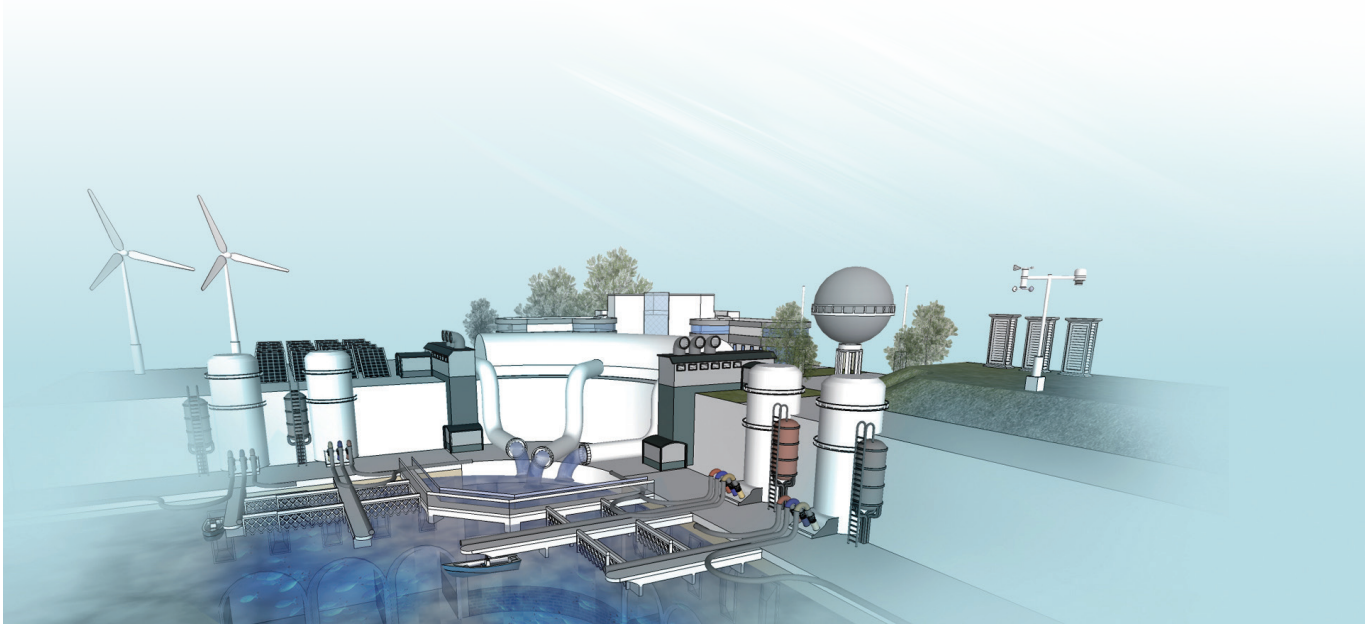
In this application, we are going to build a smart monitoring system which incorporates wireless communication technology, multiple sensors, and solar & wind power generation technologies; in order to solve the problems in the aquaculture industry; such as waste of water resources or electricity; or sudden drop in temperature that may cause lost.

The work for Taiwan fisheries research mainly focus on integrating the works from production unit, government, and research institute. So that the research and promotion of the aquatic technology can be fulfilled; furthermore, ensure the sustainable use of water resources and provide healthy and safe aquatic products. In this application, we are going to build a smart monitoring system which incorporates wireless communication technology, multiple sensors, and solar & wind power generation technologies; in order to solve the problems in the aquaculture industry; such as waste of water resources or electricity; or sudden drop in temperature that may cause lost.

Functions

❑ **Data collection of the power generation capacity and electricity consumption**

In the field, the power meter is used to measure the power generation capacity of the solar panels and wind turbines, the electricity consumption of the automatic feeding machine and the water heating device. The data of the power generation capacity and electricity consumption is sent to the server via wireless transmission module ZT-2551 (slave); it can connect to the RS-485 port on the power meter to read the power data; along with the ZT-2550(host) in the control room, the wireless communication can be performed.



The embedded controller VP-25W9 is used in the control room to read the power generation capacity and electricity consumption (including voltage, current, power, etc.) and store the data in the SQL server database on the data server.

❑ Water quality data collection

Water quality sensor can collect the data of temperature, dissolved oxygen in water, salinity and illumination and the water quality data can be send to VP-25W9 via ZigBee wireless communication, the VP-25W9 will then store the data in the data server.

❑ Meteorological data collection

Meteorological monitoring device is installed next to the pool. It can collect the data of illumination, temperature, humidity, rainfall, wind speed, wind gust direction and other information, and then the data can be sent to the VP-25W9 and stored in the data server via ZigBee wireless communication.

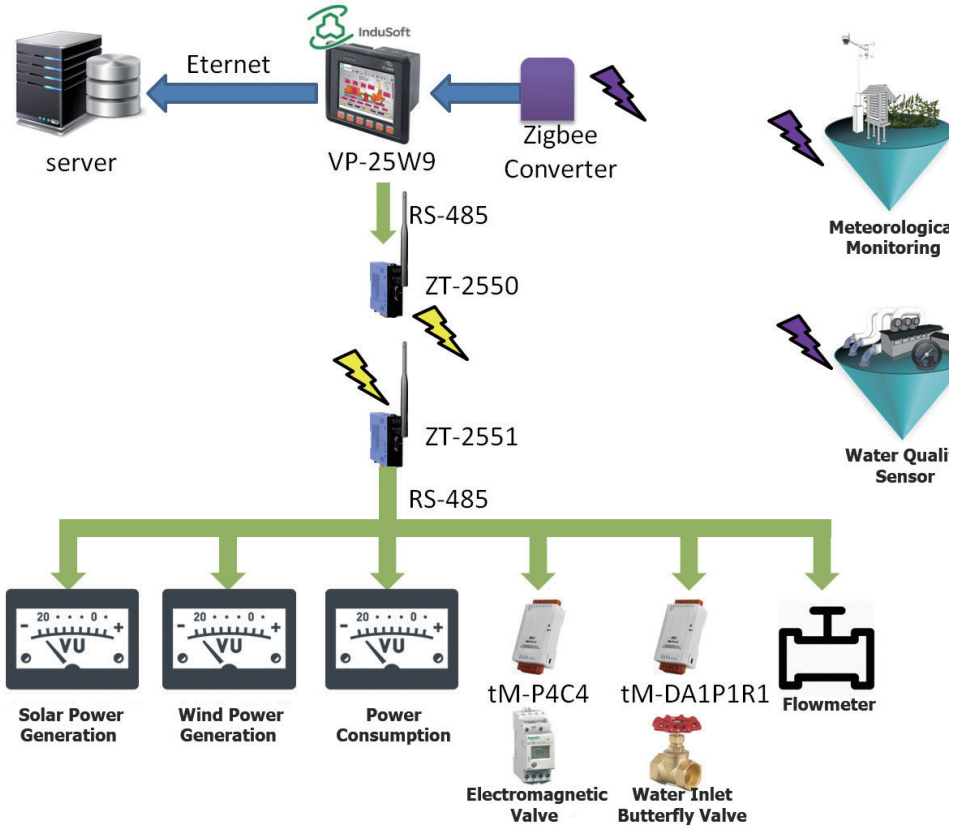
❑ System logic settings

The system can perform to control the on-site devices based on the data collected when required. For example, if the temperature falls below the lowest limit, the system will start the water heating devices till the temperature is back to normal temperature again. On the contrary, if the temperature is too high, the system will start the turbine butterfly valves and the blower to cool down the temperature.

In addition, the system can also control the feeding machine at the scheduled time; further more; it can also control the feeding frequencies and time based on the increasing or decreasing weight of the aquaculture animals.

❑ Alarm

The user can set up the upper and lower limits value for electricity consumption, water temperature, pH value, dissolved oxygen in water, etc. and the alarm



can be triggered when events occur, it also support historical data inquiry.

❑ **Report**

The excel report can be output by date for further data analysis.

❑ **Display data**

The users can remote access to InduSoft integrated WEB to view all data and trend graphic of all devices in all monitoring sites in real time.

System Architecture

Features

1. The InduSoft can integrate different devices and provide WEB pages for user to remote access the real time or historical data. It also allows control and logic operations at scheduled time, so that the environment and other factors can be controlled in the range.
2. ICP DAS ZigBee module can be used to convert the RS-485 serial communication to wireless signals. In this application, the wiring is quite difficult to be deployed between the control room and the pond, the ZigBee can be used to solve this difficulty.

Hardware

1. The VP-25W9 is used as the main controller, it is a programmable automatic controller featuring built-in InduSoft SCADA software; it also provides multiple interface (10/100 Base-TX Ethernet port, RS-232/485 serial port,and USB port) and 3 I / O module expansion slots and contains a 5.7"screen(touch control) and several buttons for programmable control.

2. ZT-2550 and ZT-2551 will convert the RS-485 signal to wireless ZigBee signal. ZT-2550 and ZT-2551 series modules support signal conversion between RS-232, RS-485 and ZigBee wireless signal, the communication frequency can be set between 2405MHz to 2480MHz, and separated into 16 RF communication channels. Each RF communication channel is separated by 5MHz frequency interval; it also provides 16384 logical network group identifier (Pan ID, 0x0000 to 0x3F00); In addition, a ZigBee network can support up to 255 ZigBee devices to transmit and receive the data from the parent node or child nodes.

3. tM-P4C4 - control the start or stop of the heating, feeding or blower devices. TM-P4C4 provides 4-channel digital input and 4-channel isolated open-collector output.

4. tM-DA1P1R1- Control the water inlet butterfly valve to regulates the flow of water. It provides an analog output channel, a digital input channel, and a relay output channel.

Intelligent Automation for Conventional Devices- Application of Production Statistics Database

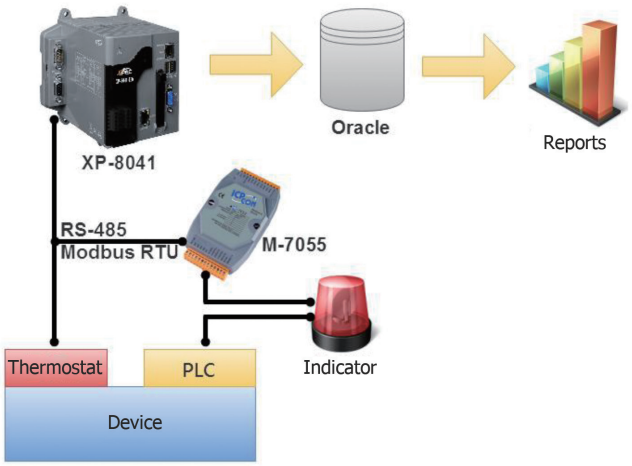
By Mac Cho

For devices in modern factories, usually the new devices are equipped with automatic production record function for statistical analysis, however a conventional factory may not has this function. In this application, we will show you how to introduce the automatic production record function into the system. In this scenario, the factory produces shoes, the devices are shoe sole pressing machines, the production processes are controlled by the PLC controllers. Each devices has 10 stations and can be operated at the same time. The staff will use different module to produce different soles according to the schedule. When each sole is produced, it should be recorded to the Oracle database with the station number and the time the production is completed. The temperature of each station will also be recorded to the database for analysis. For the PLC does not support database recording function, ICP DAS provides the solution for data recording by using the XP-8041.

The thermostat supports Modbus RTU communication and previously it is installed inside the device control box, therefore being difficult for the staff to check out the data. However, the temperature will affect greatly on the quality of sole production, therefore the factory want to implement an application to record the temperature data automatically into the database, so that the MIS can display the temperature on a large displayer, and then the manager can view it anytime. We use C # to develop the application on XP-8041; the ICP DAS nModbus library is used to implement Modbus communication. and then set the name of each thermostat based on its station number. And then the temperature of each station can be uploaded to the database by using polling mechanism.

The recording of Production data is more complex, if the rubber is not formed, the operator may need to change the mode from automatic to manual to press the sole one more time. So the soles may be pressed different times. Based on this issue, we cannot use a sensor (such as infrared sensor) to detect how many times the soles are pressed on the device. In addition, if the hardware is added on the device, it may affect the operation of the device. After our engineer discuss with the device PLC designer, we decided to use the DI on the M-7055 to connect to the production indicator and the manual and automatic switch. Only after the indicator shows the production operation is completed and the manual & automatic switch is in automatic mode, the production operation is counted as valid.

Before the installation, the software were done and tested, the PLC indicator wiring diagram and the wiring of manual & automatic switch were checked and verified in advance in Taiwan. And then the installation of XP-8041 and M-7055 were performed on site in China. For the two days on-site installation, it only took 20 minutes downtime to install the power supply. The production lines were function normally without interruption. The following is brief architecture of the application:



Remotely Monitoring Win-GRAF Control Systems by Using a Browser on a Smart Phone/Tablet/Laptop

By Janice Hong

Looking for an affordable, high-quality solution for HMI and device control? For many years, ICP DAS, has continued to make steady progress by tailoring a wide variety of products targeted at individual industries in order to meet the needs of specific customers. For users can real-time master the system procedures or rapidly solve the problem on devices in urgent cases. Consequently, ICP DAS provides the Win-GRAF Solution that can be implemented the perfect monitoring with zero-distance via a browser on a Smart Phone, Tablet, or Laptop.

Affordable, High-quality Monitoring solution

- IEC 61131-3 PLC Controller : WP-5238-CE7
- PLC SoftLogic Software : Win-GRAF
- HMI & Web Server Designer : eLogger (Free!)
- A wide range of Remote I/O Modules (Modbus TCP, Modbus RTU/ASCII, DCON)

ICP DAS is the general agent for InduSoft in the Greater China region, and we highly recommend that you take advantage of this powerful SCADA software. Please contact us for more information.

Beneath its deceptively small exterior, the WP-5238-CE7 contains a powerful and flexible soul based on Win-GRAF.

By taking a creative approach, system designers can utilize Win-GRAF and eLogger HMI to construct an easy to use monitoring system to achieve device control. Compared with the traditional way, the Win-GRAF program and the local/web HMI can operate within a single Win-GRAF PAC. Moreover, users can log into the Web Server and monitor the web HMI by using a smart phone, tablet, or laptop.

WinPAC series PAC : WP-5238-CE7

ICP DAS has recently launched the WP-5238-CE7, and is the most cost-effective Windows CE-based PAC, including an embedded Windows CE 7.0 operating system, a range of connectivity options (VGA, USB, Ethernet, RS-232 /RS-485), and an I/O expansion bus that can support a single XV board. The WP-5238-CE7 uses an industry standard 24 V power input, and can be installed where space is limited using DIN-Rail mounting.

With a Built-in Web Server, Allowing Remotely Control the Web HMI

The WP-5238-CE7 has a built-in web server which provides remote login service. The user can design the web HMI and set a username /password for logging, and then upload the project to the PAC. Further, users can log into the web server and supervise the web HMI through a browser on a smart handheld device at anywhere, anytime to instant grasp of device information.

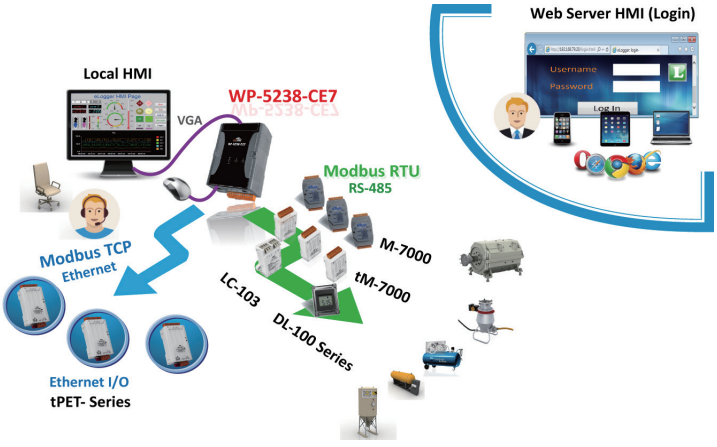
Support Multiple Modbus Protocol

For the upper layer (Client), the WP-5238-CE7 supports the Modbus TCP and Modbus RTU protocols and allows it to be connected to common SCADA software, such as InduSoft, iFix, InTouch, Wizon or Citect, etc. A single WP-5238-CE7 provides

connections to 1 to 32 hosts (up to a maximum of 64).

For the lower layer (Equipment), the WP-5238-CE7 supports the following protocols:

1. Modbus RTU/ASCII:
   You can choose from any of the ICP DAS M-7000 series I/O modules, DL-100 temperature and humidity meters, tM series I/O modules, LC series lighting control modules or Wireless ZigBee I/O modules. Other brands of I/O devices that support the Modbus RTU/ASCII protocol can also be selected.
2. DCON:
   You can choose from any of the ICP DAS I-7000 series I/O modules, which all support the DCON protocol.
3. Modbus TCP:
   The WP-5238-CE7 can be used as a Modbus TCP Master to connect to a wide range of Modbus TCP Slave devices. This means that you can choose from any of the ICP DAS ET-7000 and tET series I/O modules, or use the ICP DAS tGW-700 series Modbus TCP to RTU/ASCII gateway to expand the remote device network.
4. User-Defined Protocol:
   The embedded ISaGRAF Driver in the WP-5238-CE7 allows you to create custom protocols by using RS-232/422/485 communication function blocks (such as COM_open or COM_status and so on), and then implementing them on the corresponding devices.

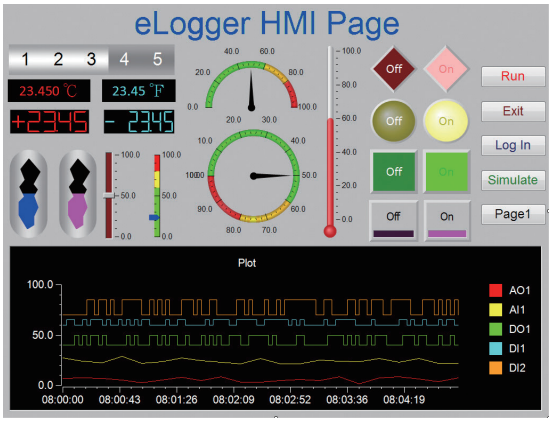


HMI Designer: eLogger

eLogger is a free charge and an easy-to-use HMI software platform developed by ICP DAS. It can be used to design the Web Server HMI for remotely controlling the PAC through a web browser on your PC or cell phone. With WinGRAF software, it is easy to create a professional monitoring application without requiring any complex programming skills or knowledge.

eLogger Features

- Support Account Management
  3-level operating management: Admin, Power User, User
- Support Real-time Data Trend
  Maximum of 5 trend lines in one plot
- Support Local HMI (Max. 32 Pages)



- Support Web Server HMI with Administrator Login

- Support the Remote Maintenance
  eLogger Developer’ s remote control function can be used to Upload project and web pages, Run / Stop the project through the Ethernet.
- Support Data Logging
  Local database: Supports csv format file. Remote database: Microsoft SQL Server 2005 or later

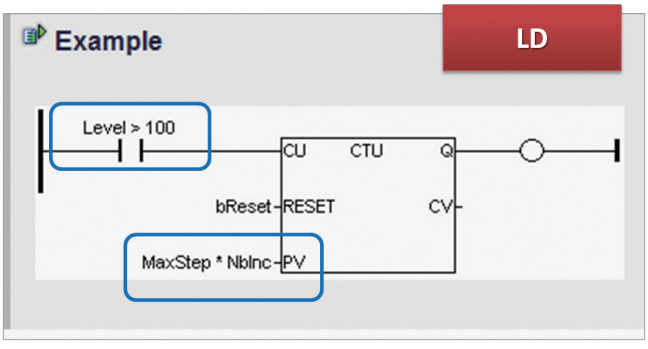
SoftLogic Software: Win-GRAF

Win-GRAF is a powerful SoftLogic development software and PLC-like SoftLogic package that supports IEC 61131-3 Standard Open PLC Languages running on Windows 7 and Windows 8.

Using the Win-GRAF software with the Win-GRAF PAC - WP-5238-CE7, the control/ monitor systems can easily implement an industrial level of data acquisition and logic control in various industrial fields.

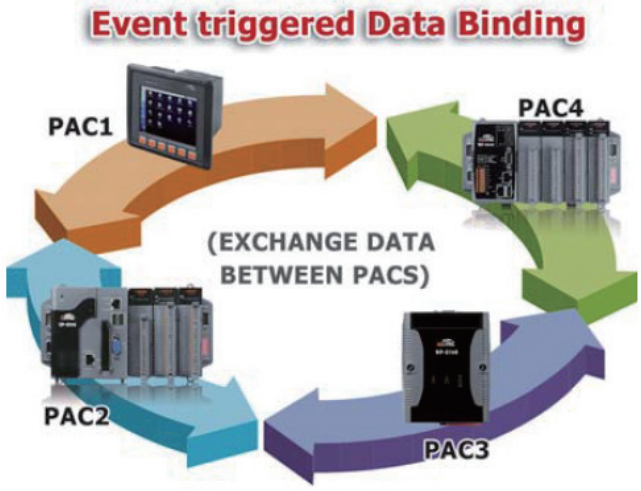
Win-GRAF Features

- Support IEC 61131-3 Standard Open PLC Languages: Ladder Diagram (LD), Function Block Diagram (FBD), Sequential Function Chart (SFC), Structured Text (ST) and Instruction List (IL).
- Support On-line Debugging/Monitoring
- Support Off-line Simulation
- Using ST Syntax in the FBD or LD Program



- Support On-Line Change
  Replace the current running project to a new modified one without stopping the project.

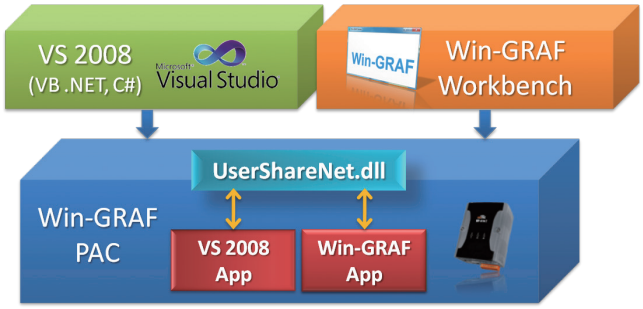
- Support Data Binding
  Exchange data between PACs



- Support Retain Variables
  Suitable to retain the data changed quickly and frequently. By using a FRAM, the data will be stored even if a power failure, and no battery is required. Further, it features superior performance through faster write speeds , greater reliability and lower power consumption.
- Support Password Protection
  Protect the Win-GRAF application by user-defined algorithm. Even others copy the application to the same model PAC, as long as he cannot get the source code, cannot run the application correctly
- Support Schedule-Control

- Support VS 2008 Development

  Using VS 2008 (VB.net, C#) to develop user own HMI and data management programs, and can exchange variables with the Win-GRAF control programs.



I/O Expansion

The WP-5238-CE7 allows you to expand the local I/O connection options by attaching a single XV series board. You can currently choose from the models indicated below, or visit our official web page to find the new XV-board.

Model	Channels			
	DI	DO	AI	AO
XV107/ XV107A	8	8	-	-
XV110	16	-	-	-
XV111/ XV111A	-	16	-	-
XV306	4	4	4	-
XV307			-	2
XV308	DI + DO = 8		8	-
XV310	4	4	4	2

As you can see, ICP DAS, has meticulously designed the most cost-effective combination for you. By selecting the WinPAC WP-5238-CE7, you can instantly improve your monitoring system using an economical solution, while enhancing your competitiveness within your industry.

Visit the following web page for more information about products:

- Win-GRAF Website

  www.icpdas.com > Product > Solution > Soft PLC, Win-GRAF, ISaGRAF & eLogger HMI > Win-GRAF

- eLogger Website

  http://www.icpdas.com/root/product/solutions/software/ scada_hmi/elogger/elogger.html

- WP-5238-CE7

  http://www.icpdas.com/root/product/solutions/softplc_ based_on_pac/win-graf/wingraf-pac/wp-5xx8.html

- XV-board (DI, DO, AI, AO)

  http://www.icpdas.com/root/product/solutions/hmi_touch_monitor/touchpad/xv-board_selection.html

- Remote I/O modules

  http://www.icpdas.com/root/product/solutions/remote_ io/remote_io_products.html

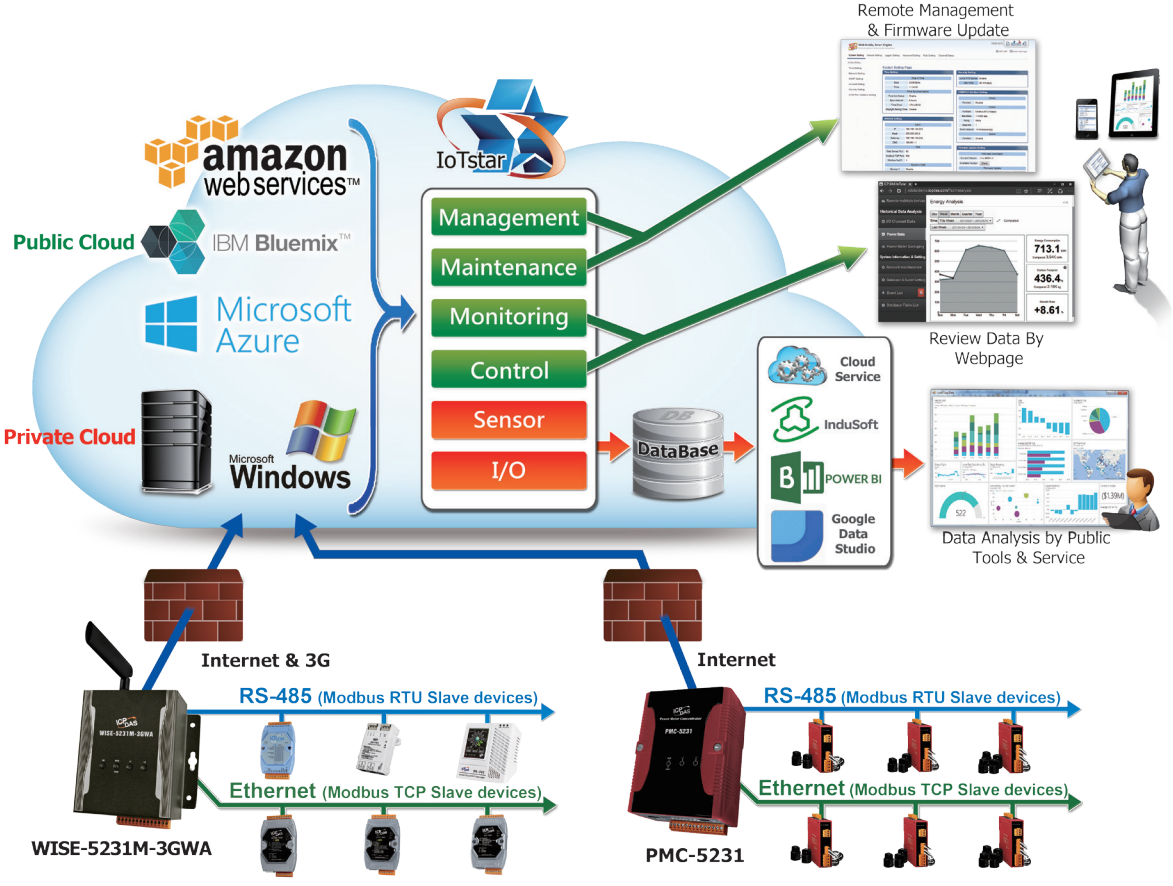
IoT Cloud Management Software for PMC/WISE Controllers - IoTstar

By Rick Lee

There's no doubt that IoT (Internet of Things) and Big Data are hot trends in today's industrial applications. The remote management, two-way interaction and real-time access, storage, analysis of the data of the devices and sensors, have become the key factors to fulfill the "IoT + Big Data" applications. The IoT cloud management software developed by ICP DAS – IoTstar; it can perform remote monitoring/settings/firmware update of ICP DAS WISE/PMC controllers. It also provides remote data services for the data of the I/O modules and sensors connected to WISE/PMC controllers. The IoTstar is a great starting point for achieving the cloud applications of "IoT + Big Data".

IoTstar is software developed by ICP DAS for use in remote monitoring and management of the PMC/WISE controllers in a variety of industrial applications. IoTstar offers a user-friendly and intuitive Web interface that allows users to implement system settings and monitoring on the remote controllers by a few clicks; no programming is required.

After the Network connection is built between the remote PMC/WISE controllers and the IoTstar via the Ethernet/3G Network, the IoTstar can then communicate with the remote controllers to implement the System Setting, Status Monitoring and Firmware Update (it works even the controller is in a Private IP Domain configuration environment, for example:



Locate behind the Firewall or use a Dynamic Virtual IP).

With the microSD card, the controller can provide the Data Logger function to real-time record data of the Sensors and I/O modules and send the data log files back to the IoTstar via FTP protocol. When the IoTstar receives the data log files from the remote PMC/WISE controllers, it will import the content of these files into the Database. And then these recorded data can be directly retrieved from the Database for future information analysis by the SCADA software, Data analysis tool (for example: Microsoft Power BI, Google Data Studio) or Cloud Service.

IoTstar can be installed on a general PC platform and works as a Private Cloud system. It can also be installed on the Microsoft Azure, IBM Bluemix or Amazon AWS, etc. and works as a Public Cloud system. By using IoTstar, it is easy to build a Remote Monitoring and Management IoT Cloud system, and during the whole process of system development; no programming is required; just makes a few settings on the PMC/WISE controller and IoTstar; then the users could quickly integrate the sensor and I/O module data with the IoT Cloud system. It is an easy-to-use and easy-to-build IoT Cloud solution for the IoT and Big Data applications.

Please Note：IoTstar currently support WISE-52xx (with V1.1.3 or later version firmware) and PMC-52xx/PMD (with V3.1.5 or later version firmware) controller.

Main Functions:

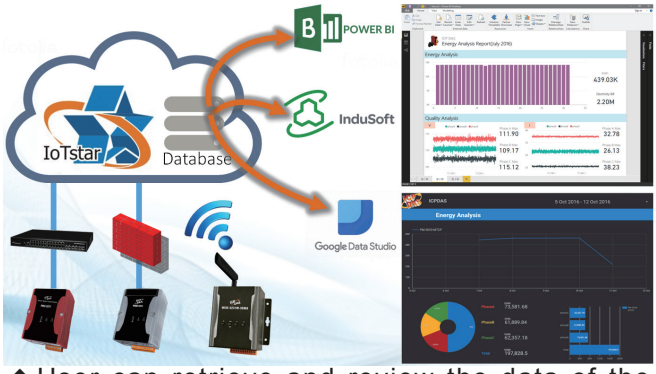
- ◆ No more programming! Using browsers to perform Remote Maintenance & Remote Data Service for WISE/PMC controllers.
- ◆ Can be installed on Public Cloud platform such as: Microsoft Azure, IBM Bluemix or Amazon AWS to implement the Public IoT Cloud solutions on the controllers.

- ◆ Can be installed on Windows system (Windows 7/8/10, Windows Server) to implement the Private IoT Cloud solution on the controllers.

- ◆ Enables the remote management and firmware update on the controllers via user-friendly and intuitive Web page interface.

◆ Receive the data log file of the Sensors and Power meters from the remote controllers and import the content of the data log file into the Database (MySQL or MS SQL).

◆ By Database interface, it is easy to integrate with SCADA, Microsoft Power BI, Google Data Studio or Cloud Service to retrieve the data of the Sensors and Power meters directly from the Database for Big Data analysis.



◆ User can retrieve and review the data of the Sensors and Power meters directly by the built-in IoTstar Web page interface.

	Description	Benefit
Installation Environment	IoTstar can be installed on Windows systems or Public Cloud (Microsoft, IBM or Amazon, etc.)	The installation environment can be selected flexibly according to the scale and requirements of the applications;it saves the cost in building the system and maintenance.
Network Environment	No need to worry about the network environment and connection; no need to record the IP of the controller; you only need to set "Static IP" or "DDNS + Dynamic IP" for the IoTstar.	Dramatically reduce the complexity and cost of the network when running the system. ◦
System Implementation	IoTstar and PMC/WISE all provide web-based setting interfaces.	During the whole process of system development;no programming is required; ，just makes a few settings on the web-based interface to complete the system implementation.The cost can be significantly reduced.
Remote Device Management	The administrator can perform remote monitoring, configuration and firmware update of the controllers via IoTstar at any time and any place.	Provide immediate devices maintenance, save the fee such as travel and transportation cost when performing maintenance operations.
Data Integration and Analysis	IoTstar can be used for database integration of the power meters, I/O modules and sensors; and can work with a lot of cloud platform services and data analysis tools (SCADA, Power BI, or Google Data Studio, etc.) for Big Data analysis.	By accessing and analyzing the data in the database, the status of the devices/facilities/ environments can be known in real time and the necessary actions can be taken in advanced to avoid possible damage or risk.

▲ IoTstar Benefit

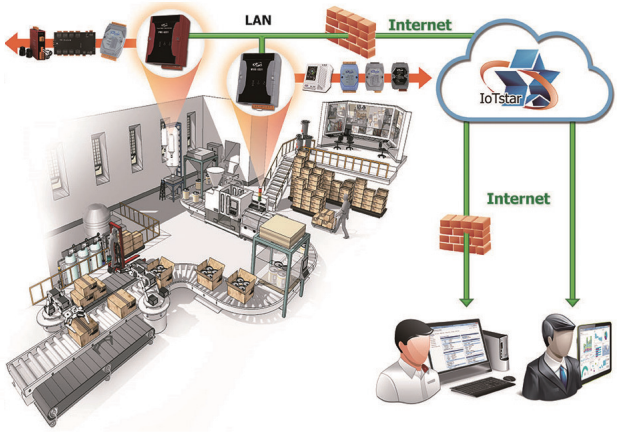
Why IoTstar ?

By IoTstar, the users can quickly build PMC/WISE cloud management system, and perform the storage, inquiry and viewing of the data from the power meters, I/O modules and sensors connected to the PMC/WISE on the cloud. "IoTstar + WISE/PMC" can be applied to monitoring and maintenance of the remote devices, facilities and environments.

Application Scenario

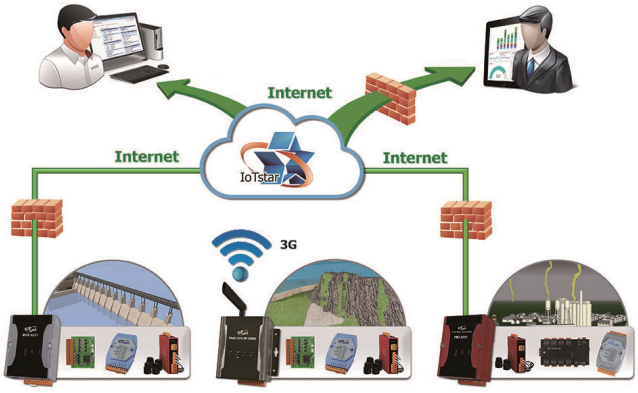
Remote Machine/Facility Management & Maintenance (two-way interaction)

Build the cloud monitoring system of the devices/ facilities via the "IoTstar + PMC/WISE" architecture, the administrator can perform remote monitoring of the devices, configuration and firmware update at any time and any place.



Remote Environment Monitoring and Control(two-way interaction)

Build the cloud monitoring system of the devices/ facilities via the "IoTstar + PMC/WISE" architecture, the administrator can perform remote monitoring of the devices, configuration and firmware update at any time and any place. By integrating the data in the database, the administrator can real time aware of the status change of the environment and take necessary actions in advanced to avoid possible damage or risk.



Summary

With the rapid development of Internet of Things(IoT), Big Data and Industrial 4.0 applications, the remote management of the controllers & sensors, two-way interaction, and access, storage & analysis of the data from the sensors; have become key factors to successfully build a system. With the help of ICP DAS IoTstar IoT cloud management software, the developers can quickly build the application architecture of the IoT systems. It can also achieve two-way access to the remote controllers and remote data integration of the sensors. No programming is required, it takes only a few clicks on the webpage interface to implement the settings of the system and build the data inquiry and review functions of the monitoring and control system on the cloud.

In addition, IoTstar supports a standard database interface that can be seamlessly integrated with the back-end cloud platform services or data analysis tools (SCADA, Power BI, and Google Data Studio); so that it can significantly reduce the time and cost when building a cloud monitoring system. For more IoTstar information, please refer to the following webpage:

ICP DAS IoTstar Web Page:
http://iotstar.icpdas.com/en/index.php

ICP DAS Web Page:
http://www.icpdas.com/index.php

Controllers supported list for IoTstar:

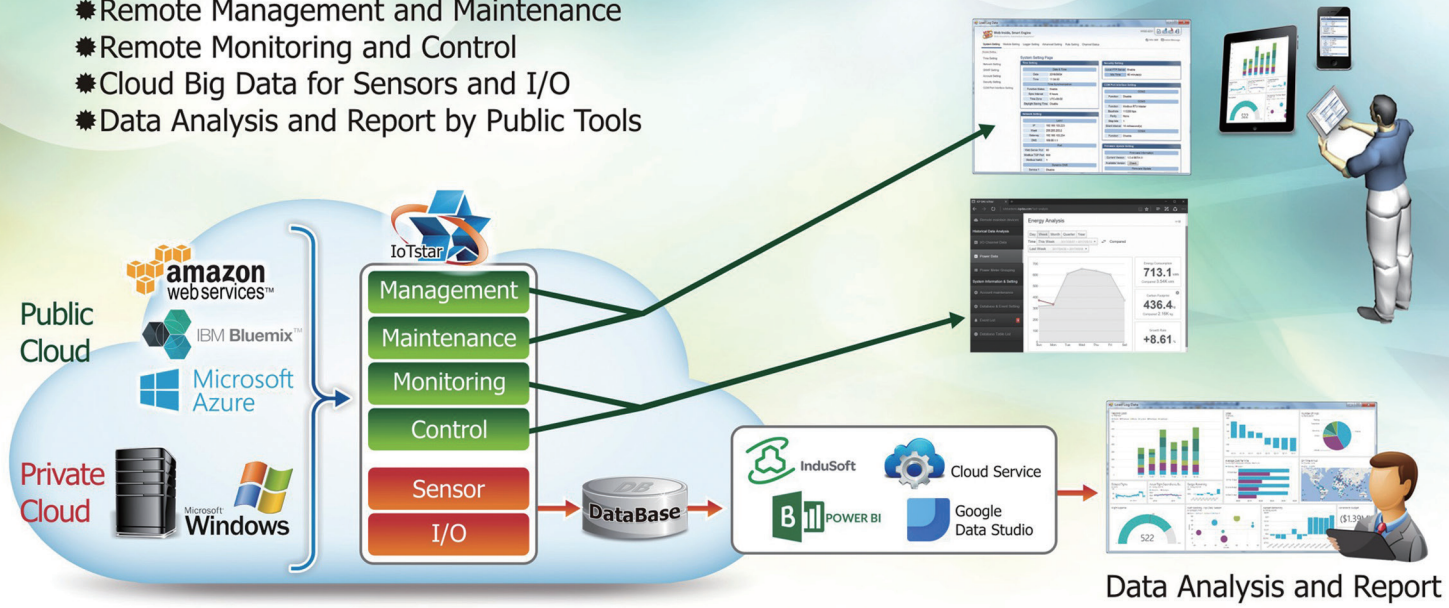
	Controller	Firmware version
WISE Series	WISE-5231	V1.1.3 or later version
	WISE-5231M-3GWA	V1.1.3 or later version
PMC/ PMD Series	PMC-5231	V3.1.5 or later version
	PMC-5231M-3GWA	V3.1.5 or later version
	PMD-2201	V3.1.5 or later version
	PMD-4201	V3.1.5 or later version

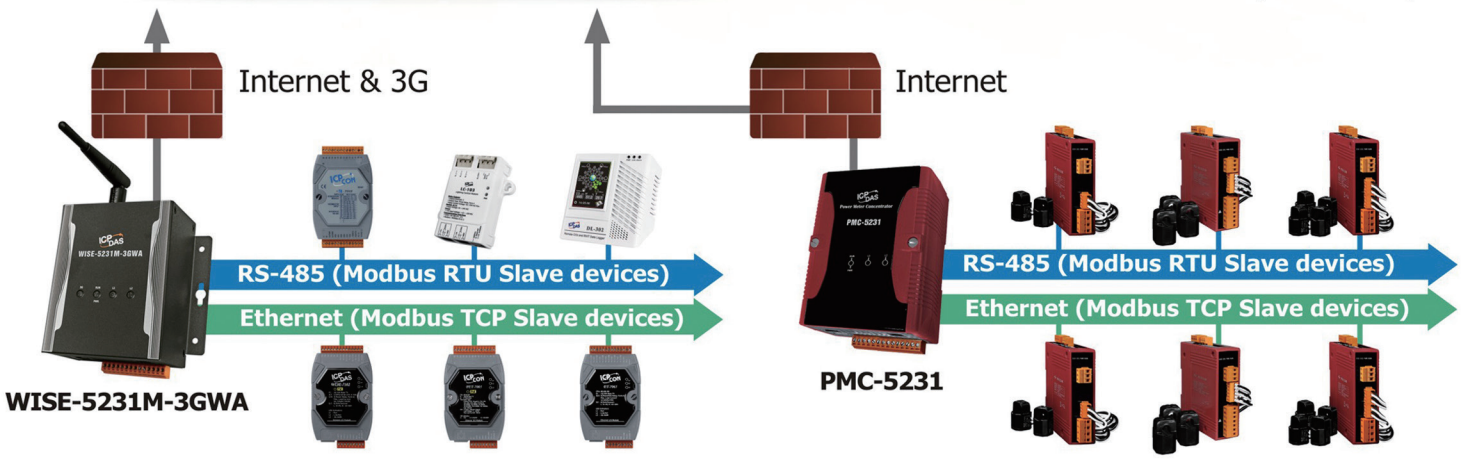
ICP DAS CO., LTD.
www.icpdas.com

Industial IoT Cloud Management Software

Features

- Based on Public Cloud: Microsoft Azure, IBM Bluemix, Amazon AWS
- Based on Private Cloud: Microsoft Windows 7/8/10
- Remote Management and Maintenance
- Remote Monitoring and Control
- Cloud Big Data for Sensors and I/O
- Data Analysis and Report by Public Tools





IoTstar

WISE-5231 series
smart front-end Sensor and I/O module concentrator for IIoT

Microsoft Azure Certified

TAIWAN EXCELLENCE 2016

WISE-5231M-3GWA
smart front-end sensor and I/O module concentrator with 3G Communcation for IIoT

Microsoft Azure Certified

New

PMC-5231 series
smart front-end power meter concentrator for IIoT

Microsoft Azure Certified

PMD series
smart front-end power meter concentrator with touch panel display for IIoT

Remote Motion Solutions

Ethernet

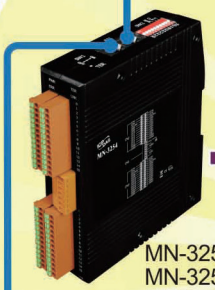
Internet
Intranet

Modbus-TCP
Modbus-TCP
Modbus-TCP

FRnet I/O series

Motionnet

PISO-MN200



MN-3254: 16 DI/ 16 DO
MN-3253: 32 DI
MN-3257: 32 DO

Panasonic
MINAS A4/A5

Mitsubishi
J3/J4

Delta
ASDA-A/A2

Yaskawa
Sigma II/III/V

Teco
TSTA-A/A+

CANopen

CANopen Motion Library (CiA 402)

CANopen Network

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