

Cover story

ICP DAS ZigBee Application for Wireless Monitoring in a Conventional Factory

ZigBee features wireless, low power consumption, compact design, easy-to- setup and mesh (mesh) network etc. It is particularly suitable for used in low-speed and limited-space area wireless transmission system. By using wireless ZigBee technology-based monitoring & control system, it can save the cost of wiring, and the transmission will not be limited by the distance between each factory site; the operation status of the equipment can be monitored in real time.

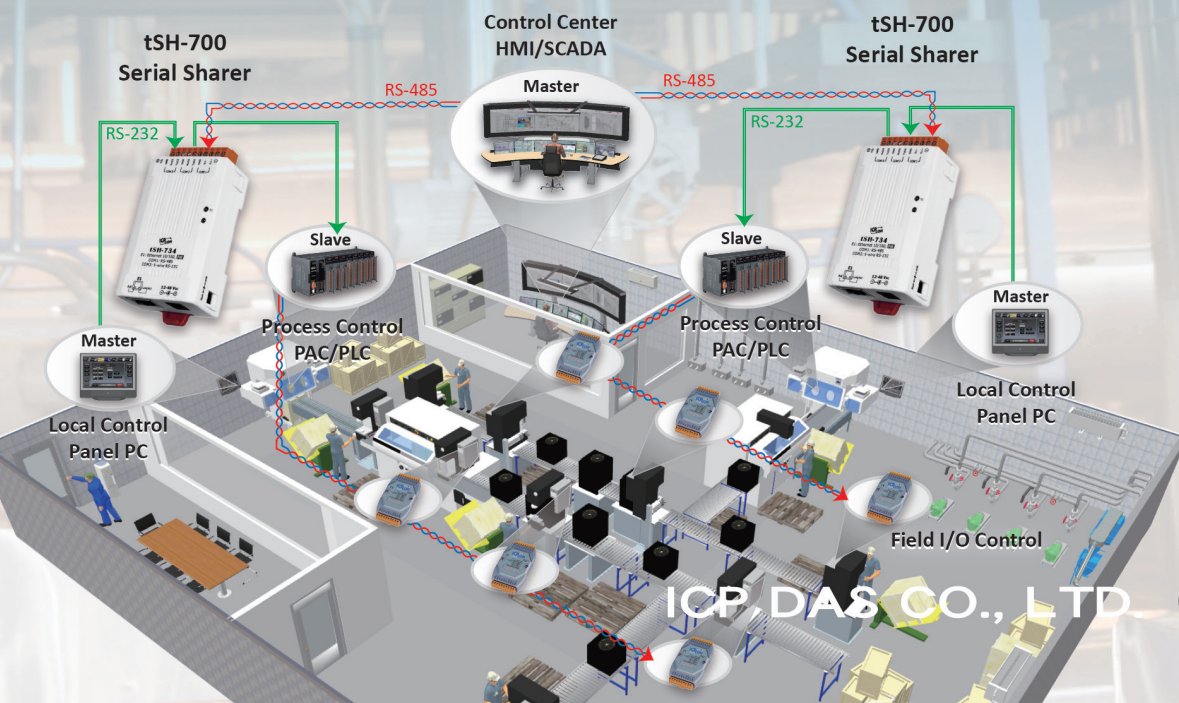
Specific Applications

ICP DAS ZigBee I/O Pair-Connection Products and Applications

Introduction of tSH-700 Function & Application





























PROFIBUS Gateway Control Product and Application

ICP DAS Solution for Monitoring and Controlling Groundwater Pumping Systems



Industrial Internet of Things

WIRELESS

DSSS RF	2G/3G/4G	WLAN	ZigBee	GPS	IR
 SST-2450	 GTM-203 Series	 Wi-Fi Bridge	 ZigBee Converters	 GPS Receivers	 IR Modules
 DSSS RF	 2G/3G/4G	 Wi-Fi	 ZigBee	 GPS	 IR
 RF-87Kn	 G-4500 Series	 I-7540D-WF	 ZigBee I/O	 Train	 Air Conditioner
 CNC Machine	 GT-500 Series	 M2M-711D	 ZigBee Repeater	 Public Transportation	 Projector
 Meters	 Truck	 Barcode Reader	 Remote Controller	 Cruise	 Sound

Fieldbus Solutions

CAN	DeviceNET	CANopen	J1939	M-Bus	PROFIBUS	PROFINET	EtherCAT	Ethernet/IP	BACnet/IP	HART
 PACs & Expansion Module Series	 Master Series	 Master Series	 Gateway Series	 Converter Series	 Converter Series	 Converter Series	 Remote I/O Module Series	 Remote I/O Module Series	 Remote I/O Module Series	 Gateway Series
 CAN	 DeviceNet	 CANopen	 J1939	 M-Bus	 PROFIBUS	 PROFINET	 EtherCAT	 Ethernet/IP	 BACnet	 HART COMMUNICATION PROTOCOL
 I-7530A-MR Gateway Series	 GW-7243D Gateway Series	 GW-7243D Gateway Series	 GW-7238D Gateway Series	 I-7590 Converter Series	 GW-7553 Gateway Series	 GW-7662 Gateway Series	 ECAT-2045 Remote I/O Module Series	 GW-7472 Gateway Series	 GW-5492 Gateway Series	 I-7547 Converter Series
 I-7565 converter series	 Remote I/O Unit Series	 Remote I/O Unit Series		 Remote I/O Module Series	 Remote I/O Module Series	 Remote I/O Module Series				 Remote I/O Unit Series
 Communication Board Series										



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ICP DAS ZigBee Application for Wireless Monitoring in a Conventional Factory

By Bao Huang

Introduction:

When it comes to factory automation, to be aware of the status of the equipment during operation in real time is a very important part for it may affect production process and product quality. In the conventional factories, the operation environments may have problems such as: high temperature, heavy equipment, sour gas, and other dangerous factors, etc. Therefore these factories most adopt semi-automated or fully automated devices to ensure the stability and security during the production process in order to reduce the risk of industrial accidents. On the other hand, the operation status of the devices may require to be sent to the control room in scheduled time for real time monitoring so that the related personnel can perform necessary maintenance in time to extend the life of the devices, and reduce the incidence of sudden machine shutdown as well.

However, the deployment of wiring for long distance is a big issue when building the architecture of such monitoring system. The complexity of various environment factors cause difficulty in wiring.

Therefore, how to reduce the wiring has been an important issue for automation applications.

In order to solve the problem, in recent years, ICP DAS has been working on ZigBee wireless technology and provides integrated solutions for wireless control applications. ZigBee features wireless, low power consumption, compact design, easy-to- setup and mesh network etc. It is particularly suitable for used in low-speed and limited- space area wireless transmission system. By using wireless ZigBee technology-based monitoring & control system, it can save the cost of wiring, and the transmission will not be limited by the distance between each factory site; the operation status of the equipment can be monitored in real time. The following section will illustrate how to apply ICP DAS ZigBee wireless technology to fulfill wireless monitoring application in a conventional factory.

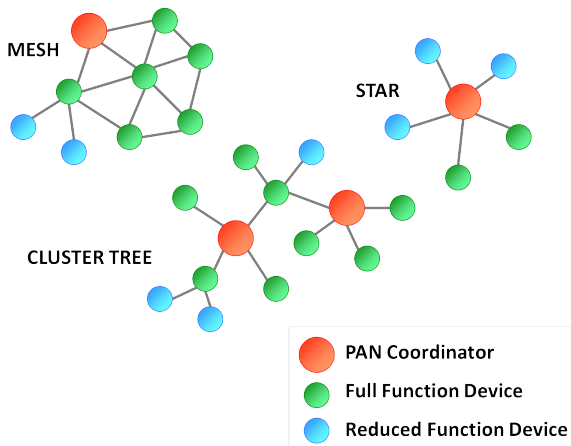
ZigBee features and applications:

Zigbee Alliance was established in 2001 and was committed to build an international standards-based wireless network protocol. ZigBee wireless transmission technology is in line with IEEE802.15.4



standard, the operation frequencies are:

1. Low power consumption: using general battery can last a few months or even a few years.
2. Low cost: low cost in manufacturing, installation and maintenance.
3. Low data rate: generally used for monitoring and control of small amount data transmission.
4. Large network capacity: support a large number of transmission nodes.
5. High reliability: self-repairing network topology



▲ Figure 1. ZigBee Network Topologies

ZigBee network topology includes: Mesh, Star and Tree, etc., is shown as Figure 1 and is composed by three roles:

1. Coordinator (Host) : initiate a ZigBee network by selecting the working channel of the network and personal area network identification (PAN ID). Once the network starts, the router and the end device will be able to join the network.
2. Router (Repeater) : to assist the Coordinator and End Device to transmit data or routing data, and to allow other routers or end device to join the network.
3. End Device (Slave) : not involved in data routing, so it can sleep when not transmitting or receiving data. When joining a ZigBee network, the parent-child relationship is formed between the devices, the added device is the child device and the device allows to join the network becomes parent device.

Three basic concepts for ZigBee networking:

1. Each Node requires the same PAN ID and communications channel.

2. There is only one Coordinator in a ZigBee network.
3. Each node requires a unique Node ID.

ZigBee can be applied to: consumer electronics, energy efficiency & management, health care, home automation, communication services, building automation and industrial automation.

For more detailed information please visit ICP DAS ZigBee webpage:

http://www.icpdas.com/root/product/solutions/industrial_wireless_communication/wireless_solutions/zigbee_introduction.html

System Architecture and Operation

Description and Requirement of the System:

The scenario is located in the Kaohsiung area in Taiwan where lots of factories produce raw materials for iron & steel and chemical industries. One conventional factory requires using heavy machine to hang the semi-products and wash the semi-products by acid pickling liquid. For the pickling process is highly dangerous, it usually use automated hanging devices to perform such operations. And during the pickling process, it is strictly forbidden for unauthorized personnel to enter the site to assure the safety and smooth going of the production process. There are more than 20 hanging devices operating in one track. Each hanging device performs different production process according to the logic rule in its PLC. For the maintenance personnel cannot always keep an eye on the warning light of the hanging device and the environment is noisy that one cannot tell the operating status by the sound. And furthermore, the hanging devices share the same track, if one hanging device encounter unusual situation, the entire production process will be affected. Therefore the customer want to build a system that the main controller in the control room can automatically send requests for the operation status, production process and operation location of various parts from the PLC of each hanging device at scheduled sequence, so that the entire production process can be monitored, possible conflict between each hanging device can be avoid and errors can be ruled out and fixed in real time to ensure smooth going production process.

For the hanging device will move backward and forward to different locations, it is not feasible to deploy wiring between the hanging devices and the control room, in addition, there are metal girders and cranes all over the place, the obstacles in between may affect the transmission of wireless signals and even cause interruption of the communication.

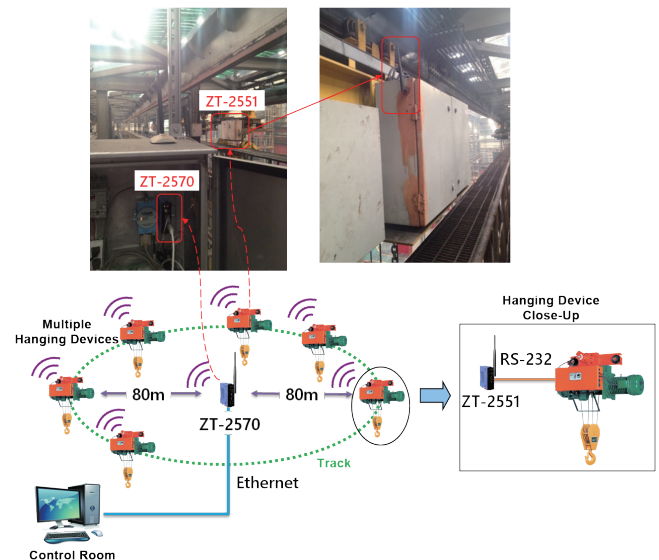
Solution

The ZigBee wireless communication products of ICP DAS ZT-2000 series are used in this scenario to solve the problems mentioned above. The system architecture is shown in Figure 2. In the control room, the host PC is connected to ZT-2570 via the Ethernet interface and the signal from host PC is converted to ZigBee wireless signal. Each hanging device is equipped with a ZT-2551 module that can convert ZigBee signal to RS-232/RS-485 signal. The received ZigBee signal is converted to RS-232 signal and read by the PLC. For the data rate of the request command sent from the host PC in the control room and the received response information from the PLC on the hanging device only involve small data exchange; Zigbee solution can be used in this scenario.

The ZT-2570 offers VxCOMM communication technology; therefore when the host PC in the control room communicates with PLC via COM port of RS-232; by using VxCOMM technology, it does not require any modification on the software of the host PC. The VxCOMM driver will automatically transform the data of COM port to Ethernet data and send to ZT-2570 (ZigBee coordinator), and the ZT-2570 will send the data to the ZT-2551 connected to the hanging device. When the data size of the response data that PLC sends to the host PC exceed the maximum data allowance of the ZigBee wireless transmission packet, the ZT-2570 can deliver it by dividing the data into packets and compose it back to original data before sending it to the host PC to avoid possible error.

Because each ZT-2551 connected to the ZigBee network plays the role of a router; it can perform data transmission. When encounters any obstacle that cause the wireless information of one ZT-2551 cannot

be sent back to the ZT-2570, the information can be sent by other ZT-2551 on other hanging devices. Therefore there is no additional ZigBee repeaters required.



▲ Figure 2 Architecture of the Hanging Devices Monitoring System

ICP DAS ZigBee Product Solution

ICP DAS offers a complete ZigBee solution, including Converter, Repeater, I/O, and other related modules. The users may choose products specifically meet their requirements. For more detailed product information, please visit ICP DAS ZigBee webpage:

(http://www.icpdas.com/root/product/solutions/industrial_wireless_communication/wireless_solutions/wireless_selection.html#e)

ICP DAS ZigBee Wireless Product is perfect for Factory Wireless Monitoring Applications

ZigBee product is one of the ICP DAS wireless product lines providing a variety of ZigBee converters, gateways and I/O modules. They can be integrated into the PC/HMI or ICP DAS PAC to build specific monitoring systems for applications in all fields. Using ZigBee to implement a monitoring & control system in the factory, the monitoring of the operation status of the remote devices can be easily done and is flexible when requires expansion of the system.

ICP DAS has been working on ZigBee technology and products for years and is dedicated to provide a variety of specific solutions for applications in all fields. We keep on developing products that perfectly meet our customers' requirements. With extended experiences in wireless technology and industrial communication, ICP DAS provides solutions that are able to integrate different combination of industrial devices. ICP DAS is committed to continue developing solutions to challenge all kinds of difficulties that our customer encountered.

Type	Model	Description
ZigBee AIO (Router)	ZT-2015	Wireless 6-ch RTD Input Module with 3-wire RTD Lead Resistance Elimination
	ZT-2017	Wireless 8-ch Analog Input Module with High Voltage Protection
	ZT-2017C	Wireless 8-ch Current Input Module with High Common Voltage Protection
	ZT-2018	Wireless 8-ch Analog Input Module with High Voltage Protection
	ZT-2024	Wireless 4-ch Voltage/Current Output Module
	ZT-2026	Wireless 4-ch Voltage Input, 2-ch Voltage Output, 2-ch Digital Input and 2-ch Digital Output Module
ZigBee DIO (Router)	ZT-2042	Wireless 4-ch PhotoMOS Relay Output and 4-ch Open Collector Output Module
	ZT-2043	Wireless 14-ch Isolated Digital Output Module
	ZT-2052	Wireless 8-ch Isolated Digital Input Module with 16-bit Counters
	ZT-2053	Wireless 14-ch Isolated Digital Input Module
	ZT-2055	Wireless 8-channel Isolated Digital Input and 8-channel Isolated Digital Output Module
	ZT-2060	Wireless 6-ch Isolated Digital Input and 4-ch Relay Output Module
ZigBee Digital Pair-connection (Coordinator)	ZT-2052-IOP	ZigBee Pair-connection to the 8-ch Isolated Digital Input Module
	ZT-2053-IOP	ZigBee Pair-connection to the 14-ch Isolated Digital Input Module
	ZT-2055-IOP	ZigBee Pair-connection to the 8-channel Isolated Digital Input and 8-channel Digital Output Module
	ZT-2060-IOP	ZigBee Pair-connection to the 4-ch Isolated Digital Input and 4-ch Relay Output Module
ZigBee Sniffer	ZT-CHK	ZigBee Sniffer
ZigBee Repeater	ZT-2510	ZigBee Repeater (Router)
ZigBee Converter	ZT-2550	RS-485/RS-232 to ZigBee Converter (Coordinator)
	ZT-2551	RS-485/RS-232 to ZigBee Converter (Router)
	ZT-2570	Ethernet/RS-485/RS-232 to ZigBee Converter (Coordinator)
	ZT-2571	Ethernet/RS-485/RS-232 to ZigBee Converter (Router)
	ZT-USBC	USB to ZigBee Converter (Coordinator)

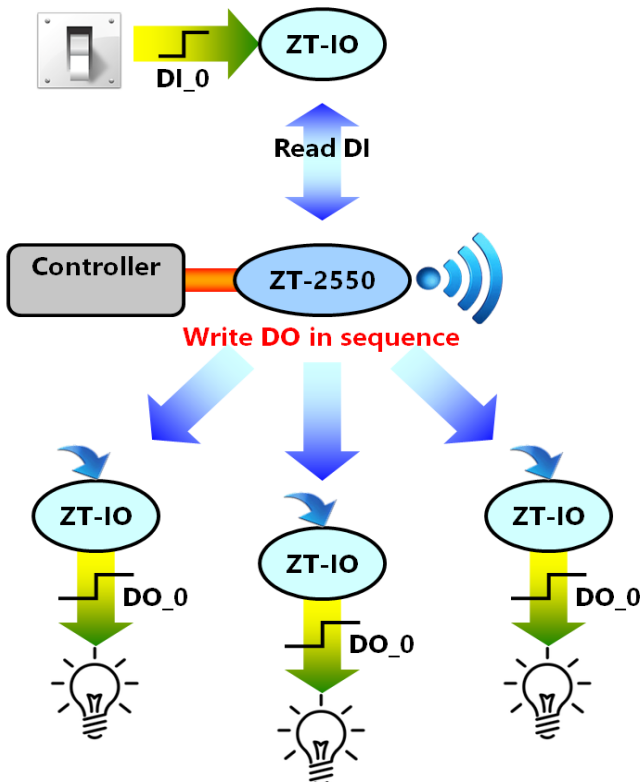
ICP DAS ZigBee I/O Pair-Connection Products and Applications

By YY Chang

ZigBee wireless transmission features low power consumption, low-power, low data rate, compact design, easy-to-setup and mesh network etc. It is particularly suitable for wireless transmission technology in a limited-space area. As we are in the Internet of Things era, there are numerous requirements in monitoring of the devices at the terminal end; therefore wireless communication becomes one of the most important applications. ICP DAS has been working on ZigBee wireless communication products for years; and with extended experiences in I/O monitoring applications, the new ZT-2000-IOP series product has been developed and introduced to the market to meet the increasing demands; it is an I/O Pair-connection product, no programming is required and features digital input & output channels, automatic I/O status synchronization via ZigBee. And with Mesh network properties; it can broadcast and update the messages to each terminal device immediately. ZT-2000-IOP series product is equipped with benefits of ZigBee system such as: wireless, low-cost, easy-to-deploy, etc.

Conventional Monitoring Architecture

In a conventional automation monitoring system, the system usually has to go through “read & write” process repeatedly to achieve automation operations.



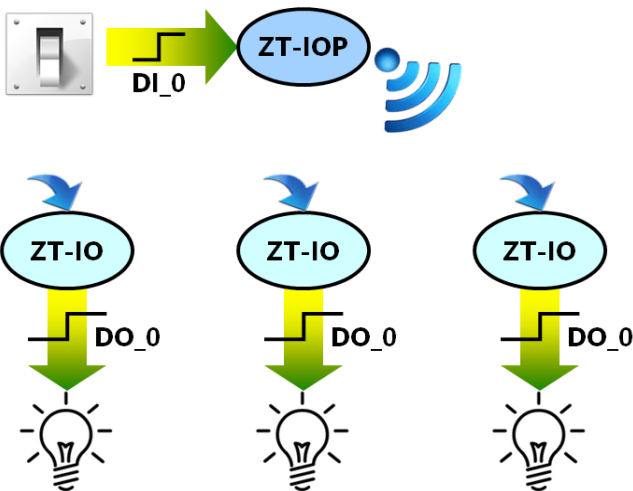
For example: when there is a status modification of one Digital Input channel, the system will perform corresponding actions (such as: output Digital output) according to the preset logic on the controller.

However, in this architecture, a series of tedious issues such as: equipment selections, design of the software architecture, program writing, logic debugging, on-site installation, etc. always brought headache to the users and is inevitable to meet the following problems:

- ◆ High Cost
 - It requires using of controllers, the cost of hardware is high.
 - It requires programming, the cost of labor is high.
- ◆ Slow
 - It requires to update remote I/O module one by one via DCON/Modbus.

What is IOP (I/O Pair-connection)?

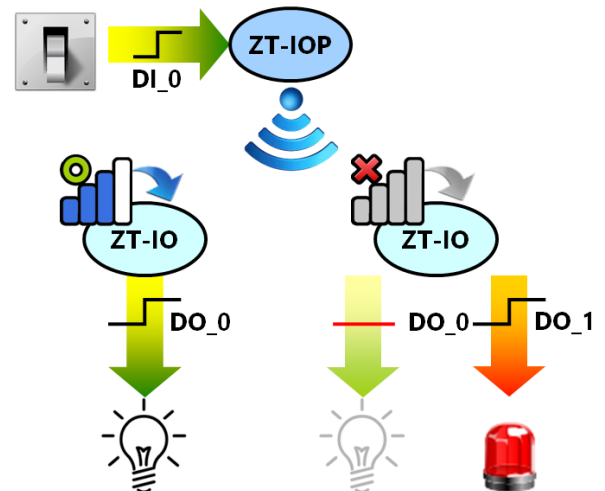
- ◆ IOP (I/O Pair-connection) indicates that the I/O channels are paired and bounded. Using ZT-2000-IOP series (below abbreviated as ZT-IOP) as an example; when the DI channel status of ZT-



▲ <Figure 1> When the DI_0 channel status of the IOP module changes, all remote I/O modules will update the status immediately and perform the same output (ON/OFF).

IOP module is changed, ZT-IOP will automatically broadcast the status of this DI channel to all ZigBee nodes in the Zigbee network, and synchronize the DO channel status of ZT-2000 I/O series module (below abbreviated as ZT-IO). It does not require using of controller and no programming is required to achieve the update I/O channel status automatically.

- ◆ Low Cost
 - No controller is required, reduce the cost of equipment
 - No programming is required, reduce the cost of labor
 - Wireless, reduce wiring and simplified wiring deployment
- ◆ Fast
 - ZigBee Mesh network architecture enables fast broadcast updates



▲ <Figure 2> When the wireless communication is interrupted and ZT-IOP cannot be updated the channel status via ZT-IOP; at this time, the Watchdog will be triggered, a preset Safe Value DO channel will be turn on to show failure warning of the node until the communication is resumed to normal again.

controller for programming to complete the pairing control of I/O channels; it is occasionally when the ZigBee wireless communication is interrupted, and the users cannot be aware of the communication disconnection of the ZigBee nodes. This may cause potential damage. Therefore, ZT-IOP and ZT-IO modules provide Safe Value option for warning purpose. The setting steps of the Safe Value is:

- ◆ Set up ZT-IOP hardware settings:
 - Set the Safe Value of the DIP switch to be "ON"
 - Set up the number of devices to be monitored by setting up the Pair Number of the DIP switch.
- ◆ Set up the ZT-IO software settings (via ZT Converter Series):
 - Set up the specified DO channel as Safe Value
 - Set Watchdog trigger time WDT (Watchdog Time)

Prevent & deal with the interruption of wireless communications - Warning

Because it does not require using the

Through a few simple steps, the refresh and reset operations of watchdog on the remote ZT-IO module can be done automatically. And once when the wireless communication of ZigBee is interrupted, the warning lights, buzzer can be triggered for warning purpose via Safe Value DO channel on the ZT-IO module until the resumption of communication.

Enhance ZigBee Wireless Signal Strength and Quality

ICP DAS ZigBee wireless product is compatible with IEEE 802.15.4 standard products. Its communication quality will be affected to the environmental and atmospheric conditions. If the environment of the application encounters interference sources such as: rain, snow, high/low level terrain, slopes, swales, or obstacles (such as buildings, metal objects or others), the wireless communication quality may be reduced and communication distance may be shortened; in some serious cases, it may even not be able to communicate at all. Therefore, initiate a communication test for the on-site environment is necessary. For each on-site environment may not have the same problem, the following solutions are provided to enhance the signal strength and quality; the users may choice best solution according to their specific on-site environment condition.

◆ Add ZigBee Repeater

ZT-2510	ZigBee Repeater (Slave, ZigBee Router)
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◆ Change the External Antenna

ANT-15 (Omni-Directional)	15 dBi 2.4GHz External Antenna
ANT-18 (Directional)	18 dBi 2.4GHz External Antenna
ANT-21 (Directional)	21 dBi 2.4GHz External Antenna

◆ Add Antenna Extension Cable (Changing the Installation Location of the Antenna)

3S001-1	RG58A/U 1 Meter Long RP-SMA male to RP-SMA Female
3S003-1	RG58A/U 3 Meter Long RP-SMA male to RP-SMA Female
3S005-1	RG58A/U 5 Meter Long RP-SMA male to RP-SMA Female
3S008-1	RG58A/U 8 Meter Long RP-SMA male to RP-SMA Female

◆ Add Amplifier

ANF-2401	1W 2.4GHz Power Amplifier
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Pairs		ZT-IOP Series	ZT-IO Series
Two-Ways	4	ZT-2060-IOP	ZT-2060
Two-Ways	8	ZT-2052-IOP	ZT-2042
Two-Ways	8	ZT-2055-IOP	ZT-2055
Two-Ways	14	ZT-2053-IOP	ZT-2043

▲ <Table 1> ZT-2000-IOP Series Products Default Matching Table

How to select and pair ZT-2000-IOP series modules?

ICP DAS provides total solution of wireless ZigBee products, the default factory settings of ZT-IOP products will match the ZT-IO module with the same I/O channels (refer to Table 1). The users can choose the modules according to their requirements.

- ▶ I/O Channel Numbers
- ▶ I/O Channel Mode

- ◆ Select the module as Digital Input from ZT-IOP series

ZT-IOP Series		ZT-2052-IOP	ZT-2053-IOP	ZT-2055-IOP	ZT-2060-IOP
DI	Channels	8	14	8	6
	Wet Contact	Sink/Source	Sink/Source	Sink/Source	Sink/Source
	Dry Contact	---	Source	Source	---
DO	Channels	0	0	8	4
	Type	---	---	Isolated O.C.	Power Relay, Form A
	Output Voltage	---	---	+3.5 to 50 VDC	250 VAC/30 VDC
	Max. Load Current	---	---	700 mA	4 A

- ◆ Select the module as remote Digital Output from ZT-IO series to match with the ZT-IOP module.

ZT-IO Series		ZT-2042		ZT-2043	ZT-2055	ZT-2060
DI	Channels	0	0	0	8	6
	Wet Contact	---	---	---	Sink/Source	Sink/Source
	Dry Contact	---	---	---	Source	---
DO	Channels	4	4	14	8	4
	Type	PhotoMOS Relay, Form A	Isolated O.C.	Isolated O.C.	Isolated O.C.	Power Relay, Form A
	Output Voltage	60 VAC/VDC	+5 to 50 VDC	+5 to 50 VDC	+3.5 to 50 VDC	250 VAC/30 VDC
	Max. Load Current	700 mA	700 mA	1.1 A	700 mA	4 A

- ▲ <Note> If not using with its default matching module; it will require using of ZT Converter Series (ZT-USBC / ZT-255x / ZT-257x) for ZT-IOP software settings.

Compliance with environmental standards, electromagnetic compatibility (EMC)

ICP DAS concerns on product development as well as environment protection. From raw material to manufacturing, all processes are compliance with certificates such as: RoHS, WEEE, CE and FCC. From the product itself to a variety of packaging materials are in line with relevant regulations. In addition, ZT-2000 series modules are manufactured under electromagnetic compatibility (EMC) certification standard. The electromagnetic interference waves of the module will not affect the operations of other devices; therefore ensures each device can function appropriately under harsh industrial environments.

ZT-2000-IOP series modules are flexible to meet customized requirements

ICP DAS provides total solution of wireless ZigBee products. The standard ZT-IOP products are one-to-one (a DI channel binding to a DO channel), one-to-many (a DI channel binding to multiple DO channels) - which can synchronize the upgrade of status. If customers have specific application cases that require adding customized logic program, ODM project is available for customized service.

Introduction of tSH-700 Function & Application

By Tammy Chuang

tSH-700 is Tiny Serial Port Sharer, it features: "Baud Rate conversion function", "Modbus RTU / ASCII conversion function" and "two Master devices access to a single Slave device function". It also features a built-in Web Server that provides web management interface; the users can easily and quickly set the parameters without memorizing any commands.

Introduction

The ICP DAS tGW/tDS-700 compact series modules have received highly positive feedback from our customers worldwide since they were released. In response to requirements from our customers, ICP DAS continue to develop new modules to achieve more functionality to meet the needs for various applications. Recently the new tSH-700 Tiny Serial Port Sharer is released and features three main functions: "Baud Rate conversion function", "Modbus RTU / ASCII conversion function" and "two Master devices access to a single Slave device function".

The tSH-700 module also features a built-in Web Server that provides web management interface; the users can easily and quickly set the parameters without memorizing any commands. It is palm-sized, compact space, and is equipped with removable terminal block connector for easy wiring. It automatically controls the direction either to receive or to send via RS-485. The tSH-700 module also provides Power over Ethernet (PoE) function that matches true IEEE 802.3af-compliant (Class

1) standard. It can accept power supply by PoE Switch (eg: NS-205PSE) over the standard Category 5 Ethernet cable or accept power supply via DC adapter. tSH-700 module is designed for low power consumption, it saves energy especially when using a large number of device servers.

Features:

Baud Rate Conversion Function

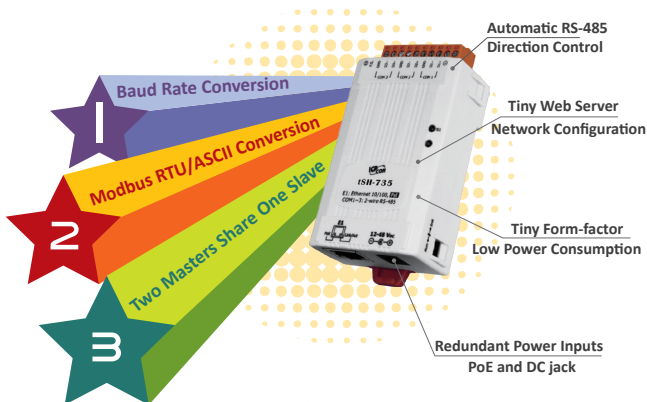


Allow a Master device to communicate with Slave devices with different Baud Rate or Data Format. In the Raw Data mode, it can be applied to most of the half-duplex communications that do not require protocol conversion (Request - Response), such as DCON. When the Data Size is less than 512 bytes buffer size (built-in buffer for each serial port), it can perform full-duplex communication. ◦

Modbus RTU/ASCII Conversion Function



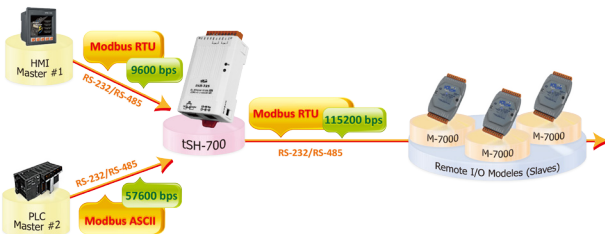
Allow a Modbus RTU/ASCII Master device to communicate with a Modbus RTU/ASCII Slave device with different Protocol, Baud Rate or Data Format.



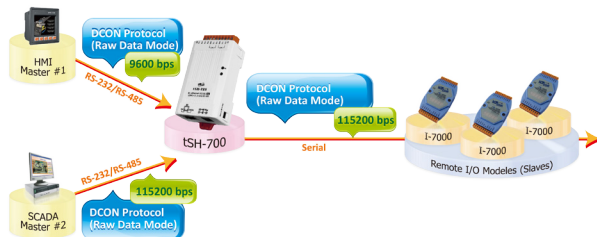
Allow Two Master Devices to Access a Slave Device

Allow two Master devices to connect to different serial ports and access to the Slave device. Modbus mode can be used to convert Modbus RTU/ASCII protocol, and Raw Data Mode can be used for DCON or other Request - Response protocols. Each serial port can be configured with different Baud Rate or Data Format (depends on connected devices). When two Master devices request the same Modbus information, the built-in Cache function will remove duplicated request message to reduce the load of communication of the Slave device serial port. Note: It may need to set up a longer Timeout for the Upper Computer.

- ▶ Modbus protocol and Baud Rate Conversion Function:



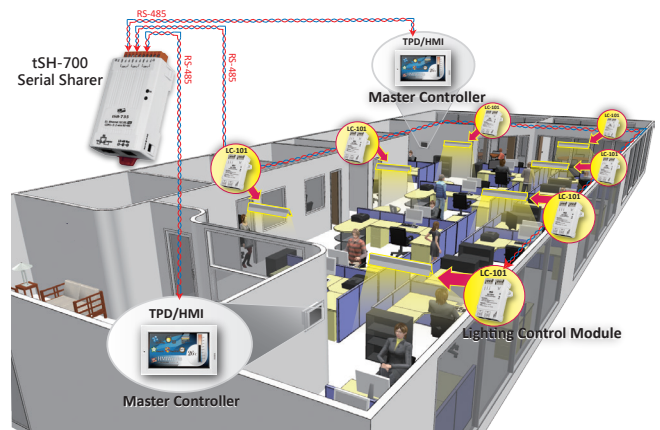
- ▶ Baud Rate Conversion in Raw Data Mode:



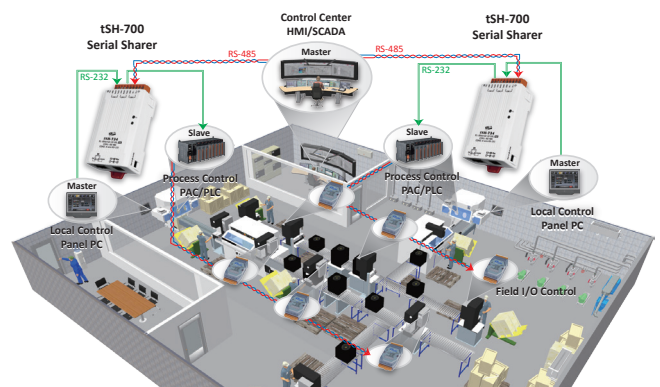
Office Lighting Control Application

Connect the two uplink serial ports on the tSH-735 module to the two control panels (Master controller such as TPD/HMI) in the front area as well as the back area of the office. And connect the downlink serial port on the tSH-735 module to the lighting control circuit (RS-485 bus). And then the lighting control of the office can be done by using the Master controller (TPD / HMI) in different locations.

Production Line Application



In this production line application, the monitoring & control center (HMI/SCADA) is connected to uplink serial ports on the tSH-734 module of the production line 1 and production line 2 via RS-485. And then the on-site Master controller (Panel PC) of the production line 1 and production line 2 are connected to another uplink serial port on the tSH-734 module via RS-232. Furthermore, the downlink serial port on the tSH-734 module is connected to the slave process controller (PAC/PLC) and then each on-site I/O module can be connected to the RS-485 serial port on the slave process controller (PAC/PLC) to achieve monitoring and control of the production process from the Monitoring & control center or from the on-site controllers.



tSH-700 Series Selection Guide

Model	RS-232	RS-485	Application	COM1	COM2	COM3
tSH-722	2	-	Converter	3-wire RS-232	3-wire RS-232	-
tSH-725	-	2		2-wire RS-485	2-wire RS-485	-
tSH-724	1	-		2-wire RS-485	3-wire RS-232	-
tSH-732	3	-	Sharer	3-wire RS-232	3-wire RS-232	3-wire RS-232
tSH-735	-	3		2-wire RS-485	2-wire RS-485	2-wire RS-485
tSH-734	2	1		2-wire RS-485	3-wire RS-232	3-wire RS-232

For more detailed tSH-700 series module specifications and functions, please refer to ICP DAS product page:

http://www.icpdas.com/root/product/solutions/industrial_communication/pds/tsh-700.html

Device Server Solutions

Provides various Device Server Options

Features

- ✦ Provides various Port options, great for applications in all fields.
- ✦ Supports I/O control function(Virtual I/O).
- ✦ Provides TCP/IP communication and virtual COM techniques for easy retrieval and integration of the system.
- ✦ Supports programmable function, quick for customized adjustments.
- ✦ Provides easy-to-use VxComm Utility.
- ✦ Provides exclusive DynaCOM function that allows easy modification of the configuration via API call.
- ✦ Offers a variety of options including: Ip67 waterproof, metal case, PoE versions.
- ✦ Support Modbus TCP protocol(applies to specific products).

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PROFIBUS Gateway Product and Application

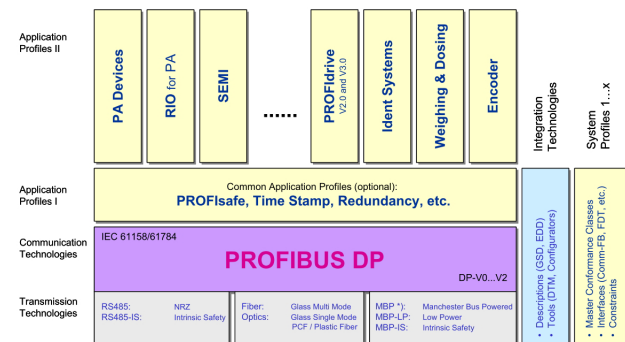
By Ryan Lin

PROFIBUS is an open digital communication system. It can be used in wide range of applications; particularly in factory automation and process automation. PROFIBUS is perfect for time-critical applications that require fast response and involve complex communication work. In the application of steel factory cold rolling system, the GW-7552 can be connected to multiple inverters to transmit data between PLC and inverter with low cost, and is able to fast access to a variety of on-site status, and by using error diagnosis mechanism of the PROFIBUS, it can response to unexpected events in real time.



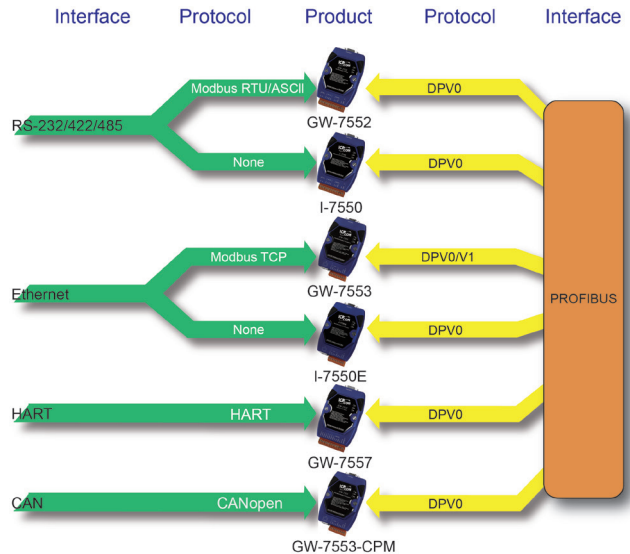
PROFIBUS was developed in 1987 by Siemens and a few enterprises and research institutions; it has now been incorporated into the international standard IEC 61158 and IEC 61784. PROFIBUS is an open digital communication system. It can be used in wide range of applications; particularly in factory automation and process automation. PROFIBUS is perfect for time-critical applications that require fast response and involve complex communication work.

PROFIBUS-DP is a popular protocol, providing a simple, fast, cyclic and deterministic way to perform data exchange between the main station and the sub-station.



PROFIBUS Technology System Architecture

Gateway Solutions



▲ Gateway Selection Guide

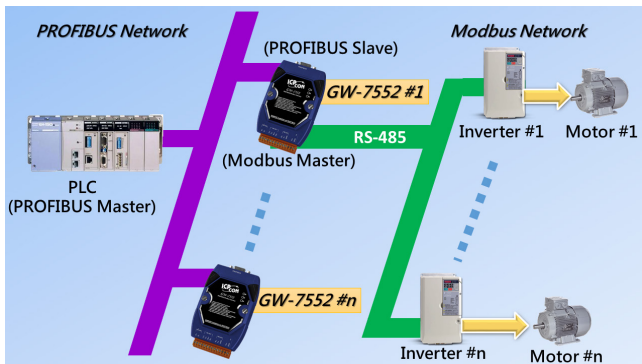
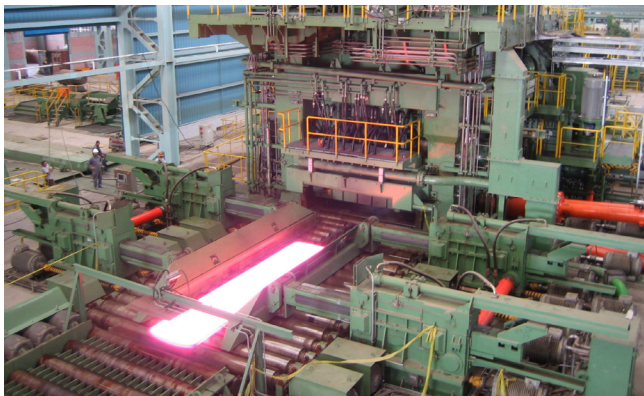
To meet requirements to convert between PROFIBUS and other field bus protocols, ICP DAS developed various gateways. The users can freely choose the gateway to integrate into PROFIBUS network according to the communication protocol they are using when planning the system architecture.

Application

The cold rolling system in the steel factory mainly includes three parts: unwinding, cold rolling and rewinding. The operation of each part is done by controlling the inverter via PLC, and then the inverter control the rotation of the motor to complete the operation. The inverter uses Modbus RTU communication protocol and the main controller PLC uses PROFIBUS communication protocol. Each inverter requires installation of the PROFIBUS communication module to communicate via PROFIBUS communication protocol. The cost to implement the system will be high.

To solve the problem, GW-7552 is used in this application. A GW-7552 can connect to multiple inverters to transmit the data between the PLC and the inverters. The cost will be much lower.

In this application, GW-7552 works as a Modbus RTU master terminal that retrieves the status information of each inverter. And in the PROFIBUS network, GW-7552 works as a PROFIBUS slave terminal. Therefore, by using GW-7552, the PLC can communicate with the inverters easily; and the users can quickly access a variety of on-site status and response in real time via the diagnosis mechanism of the PROFIBUS to deal with unusual events.



Device information

GW-7552: PROFIBUS-DP slave to Modbus RTU/ASCII Gateway

- Supports PROFIBUS DP-V0 slave terminal function
- Features PROFIBUS transmission rates auto-detection function
- Transmission rate of PROFIBUS can be up to 12 Mbps, transmission rate of COM port can be up to 115.2 kbps
- The maximum input/output data length is 132/131 bytes.

- Support Modbus master and slave operation mode
- Support Modbus RTU and ASCII data format
- Built-in self-tuner ASIC controller on RS-485 port
- Network Isolation Protection, 2500 Vrms High Speed Coupler for PROFIBUS
- 3000 VDC isolation protection for PROFIBUS port
- With 4 kV ESD protection

http://www.icpdas.com/root/product/solutions/industrial_communication/fieldbus/profibus/gateway/gw-7552.html

Converter Selection Guide

Module		I-7550	I-7550E
PROFIBUS Interface			
Connector	9-pin female D-Sub		
Baud Rate (bps)	9.6 k, 19.2 k, 45.45 k, 93.75 k, 187.5 k, 500 k, 1.5 M, 3 M, 6 M, 12 M (bps)		
Transmission Distance (m)	Depend on baud rate (for example, max. 1200 m at 9.6 kbps)		
Protocol	DP-V0 Slave		
Max Input / Output Data Length	128/128 bytes	240/240 bytes	
UART Interface			
COM	RS-232/RS-485/RS-422 (can't be used simultaneously)	RS-232	
Baud Rate (bps)	1.2k to 115.2 k (bps)	115.2 k (bps)	
Protocol	Modbus RTU/ASCII, Master/Slave	For setup via Utility software tool only	
Ethernet Interface			
Channel	-	1	
Baud Rate (bps)	-	10/100M	
Protocol	-	TCP/UDP, Server/Client	
Hardware			
Watchdog	Watchdog IC (Refresh every 0.8 sec.)		
ESD Protection	4 kV class A		

Gateway Selection Guide

Module				
PROFIBUS Interface				
Connector	9-pin female D-Sub			
Baud Rate (bps)	9.6 k, 19.2 k, 45.45 k, 93.75 k, 187.5 k, 500 k, 1.5 M, 3 M, 6 M, 12 M (bps)			
Transmission Distance (m)	Depend on baud rate (for example, max. 1200 m at 9.6 kbps)			
Protocol	DP-V0 Slave	DP-V0 Slave / DP-V1Slave	DP-V0 Slave	
Input / Output Data Length	132/131 bytes	240/240 bytes		
UART Interface				
COM	RS-232/RS-485/RS-422 (can't be used simultaneously)	RS-232		
Baud Rate (bps)	2.4k to 115.2 k (bps)			
Protocol	Modbus RTU/ ASCII, Master/ Slave	For setup via Utility software tool only		
Ethernet Interface				
Channel	-	1	-	-
Baud Rate (bps)	-	10/100M	-	-
Protocol	-	Modbus TCP, Server/Client	-	-
HART Interface				
Channel	-	-	4	-
Baud Rate (bps)	-	-	HART Master	-
Protocol	-	-	Point-to-Point/Multi-Drop	-
CAN Interface				
Channel	-	-	-	1
Baud Rate (bps)	-	-	-	10K, 20K, 50K, 125K, 250K, 500K, 800K, 1M (bps)
Protocol	-	-	-	CANopen Master
Hardware				
Watchdog	Watchdog IC (Refresh every 0.8 sec.)			
ESD Protection	4 kV class A			

More PROFIBUS Information

Please refer to the following link for more product information, such as product specifications, manuals, software tools and firmware updates:

http://www.icpdas.com/root/product/solutions/industrial_communication/fieldbus/profibus/profibus_selection_guide.html

Summary

The PROFIBUS series product is one of ICP DAS Fieldbus product line. With the help of ICP DAS PROFIBUS converter /gateway / repeater and I O modules, the old system can be improved by integrating different communication interface/protocol into the PROFIBUS controller. It reduces the upgrade fee and enhances the efficiency of the entire system.

ICP DAS has been working on development of PROFIBUS products for a long time. We provide a variety of solutions for different applications and keep on developing specific products that meet customers' needs for applications in all fields. With extended experiences in industrial communication, ICP DAS will continue to develop more solutions to solve problems that our customers challenge us with.

ICP DAS Solution for Monitoring and Controlling Groundwater Pumping Systems

By Instruments CHT SRL

Introduction

A municipal water supply company in Romania intends to upgrade their groundwater pumping and water storage system with a modern SCADA solution. This system includes ground water extraction and pumping, chlorine water treatment, water storage in tanks, and pumping drinking water to a major city and to an industrial park.

The current SCADA system uses two-way radios for data transmission between locations, which are a few kilometers away from each other. The main requirements are to upgrade the outdated SCADA software, replace the old monitoring and control devices, implement TCP/IP data transmission via fiber optic, and keep the existing radio system as a backup. The customer requests equipment designed for harsh conditions, surge and lightning protection, 24/7 system availability, autonomous and manual control, a modern SCADA system with remote access functionality, and long-term availability for spare parts.

Solution

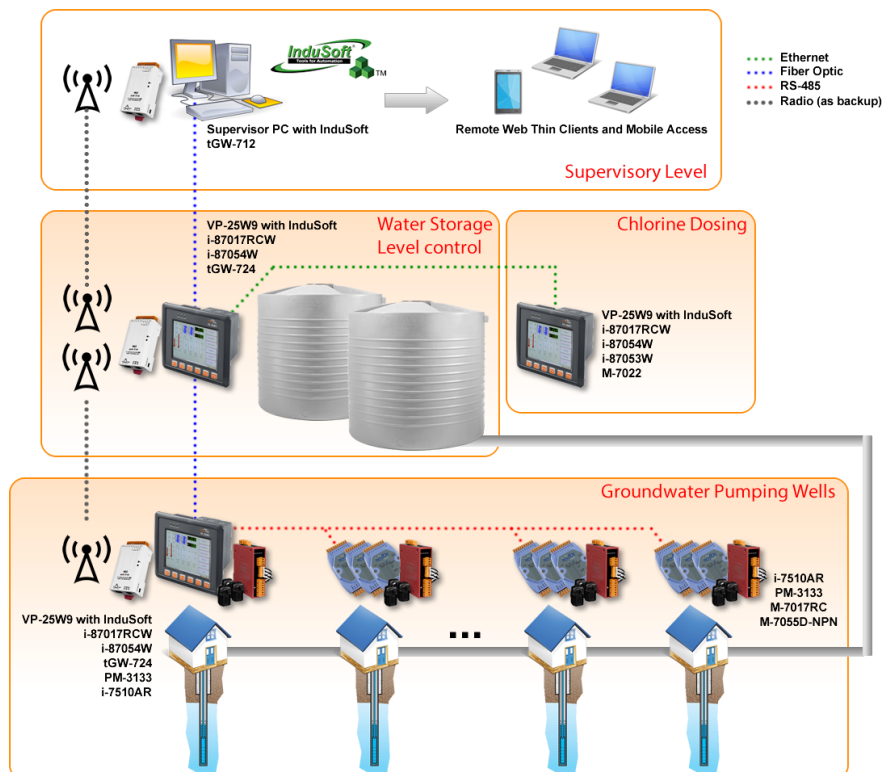
The ICP DAS solution met all project requirements and the previous SCADA system was upgraded without affecting the pumping system operation.

ICP DAS products for data acquisition and control proved to be a high quality and cost-effective solution for implementing the project, allowing great flexibility by meeting industrial standards like Modbus TCP and Modbus RTU.

The VP-25W9 programmable automation controllers powered by

Windows CE 5.0 and InduSoft Web Studio were used for monitoring and controlling important nodes in the system, thanks to the high reliability and ability to function in harsh environments. The InduSoft Web Studio runtime allows the unit to act both as a PLC and HMI, with great flexibility and the ability to access the runtime remotely.

The tGW-700 Series gateway modules allowed to implement redundant data transmission via fiber optic (Modbus TCP) and via radio (Modbus RTU / RS-232). The InduSoft WebStudio runtime proved



to be very versatile and allowed the use of both interfaces, and also switch between them automatically when needed.

I-7510AR repeaters were used to connect the equipment at each groundwater pumping location on the long RS-485 bus. Thanks to the three-way isolation provided by the repeater, the equipment is protected against surges caused by lightning storms.

Indusoft Web Studio is a very versatile and cost-effective SCADA platform, providing local operator interface, remote web thin client access and mobile access. Future development and upgrading is an easy task.

Company: Instruments CHT SRL

Location: Romania

Products:

- VP-25W9 InduSoft-based Programmable Automation Controllers
- I-87K Series Modules for data acquisition
- M-7000 Series Modules for remote data acquisition
- I-7510AR Series Repeaters for RS-485 bus
- tGW-700 Series as Modbus gateways
- PM-3133 Series Intelligent power meters
- Indusoft Web Studio as SCADA and HMI solution

Wireless Sensor Network Solution

Wireless Sensor Network Solution



MQTT server

Creator

MQTT

Smart Devices

HMI, PAC

Reliable Network

Wi-Fi, 2.4GHz/433MHz, ZigBee, 2G/3G/4G



Wi-Fi series

2.4GHz / 433MHz
RF series

ZigBee series

2G/3G/4G series

2G/3G/4G
Service Providers

Sensors

Solar Powered Module



RFID
Multifunction
Reader

PIR Motion
Detector

CO/CO2
Sensor

Temperature/
Humidity
Sensor

Gas Detection
Sensor



Window
Multifunction
Sensor

Temperature/
Humidity
Sensor

2G/3G/4G
Controller

Smart Applications

Smart Home

Commercial
Building Monitoring

Factory
Automation

Greenhouse
Automation

Aquacultural
Automation



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