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How Semiconductor Plants Prevent Sudden Power Outages? Wireless Monitoring Technology Ensures Zero Risk for Critical Processes!

Application Story

✓ UA Communication Servers Enhance Security and Management With VPN Integration
 ✓ I-7016PD with TouchPAD Ensures Accurate Loss-in-Wenight Feeder Monitoring

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The Core Communication Server of Smart Manufacturing, BRK-2841M

- FRIO-9830 Redundant I/O Module
- GTP-541M Intelligent 4G Multi-Function Controller
- FZ-UAQ Utility Module Maintenance Tool Quick Deployment for Modbus Modules

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 Solution to RS-485 Communication Interference Caused by Inverters

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AIoT Kicks Off Now! Seminar on Empowering ESG implementation Coming Soon

W ith the advancement of global Sustainable Development Goals (SDGs), businesses face challenges in cutting carbon, saving energy, and boosting efficiency. AIoT technology provides smart connectivity and realtime data analysis to help achieve ESG sustainability goals.

To help businesses tackle smart manufacturing, energy management, and digital transformation, ICP DAS will host the "AIoT Kicks Off – Empowering ESG" seminar on March 26 and April 17, featuring expert insights and case studies. This event will offer attendees deep insights and practical strategies. We sincerely invite you to join us in exploring how data-driven transformation in the AIoT era can turn ESG visions into reality.

AIoT Kicks Off – Empowering ESG Seminar

【Taipei】 2025/3/26 (Wed.) 13:00~17:00 Amber Room, 3rd Floor, Le Méridien Taipei



▲ Event Information

【Hsin-Chu】 2025/4/17 (Thu.) 13:00-:17:00 Banguet

13:00~17:00 Banquet Hall I, East Wing, 3rd Floor, Sheraton Hsinchu Hotel





How Can Semiconductor Plants Prevent Sudden Power Outages? Wireless Monitoring Technology Ensures Zero Risk for Critical Processes!

Power anomalies in semiconductor manufacturing can cause severe losses. Although UPS systems offer protection, long-term use in unstable environments can lead to failure. Monitoring UPS status with LoRa and 4G reduces wiring costs, improves efficiency, and ensures the stable operation of key equipment.

Written by / Jack Huang (Translated by Lynn Tang)

Stable power is critical in semiconductor manufacturing, as any voltage fluctuations or interruptions can cause major losses or product scrap. UPS systems are key to ensuring power stability, but prolonged exposure to unstable conditions increases their load and failure risk. This application uses LoRa wireless transmission to enable efficient, wireless UPS monitoring.

UPS Ensures Stable Operation of Semiconductor Processes

Semiconductor manufacturing involves hundreds of steps, and any abnormality can

lead to product scrap. Precision equipment like EUV lithography, CVD systems, and ion implanters are highly sensitive to power quality—voltage or frequency issues may cause damage or shutdowns. For example, a halted lithography machine can result in days of recalibration and millions in losses. To prevent this, semiconductor fabs install UPS systems to stabilize voltage, filter fluctuations, and instantly switch to battery power during outages, ensuring uninterrupted operation and avoiding costly downtime.

When grid voltage becomes unstable, the UPS in the electrical room usually takes

Application Story

about 2 seconds to switch to stable power. This voltage sags can still affect critical process equipment, leading to shutdowns or malfunctions. To prevent this, semiconductor fabs often install a faster-responding UPS near key equipment to ensure immediate voltage stabilization during power disruptions.

Fast-response UPS systems are installed to protect critical process equipment, allowing it to continue operating during power disruptions or to safely execute emergency procedures like shutdown or data backup. This helps prevent equipment damage, process interruptions, or wafer scrap due to sudden voltage fluctuations, ensuring stable and efficient production.

UPS Monitoring: Key to Power Stability

In unstable voltage environments, UPS systems are more likely to fail due to frequent mode switching, overloads, and overheating, which accelerate component wear. Sudden voltage fluctuations can trigger the overload protection circuit, risking damage to key parts like MOSFETs and IGBTs. Continuous operation under unstable power also keeps components like rectifiers and inverters under high load, causing excessive heat.

Critical equipment often uses additional UPS systems, but unstable power conditions over time increase the risk of UPS failure. Voltage fluctuations, frequency deviations, or power outages can lead to unexpected shutdowns. Continuous UPS monitoring is essential to ensure reliable performance and maintain stable power supply.

Wireless Transmission Solves UPS Deployment Challenges

UPS systems are vital in semiconductor plants but often face challenges during deployment, such as limited space, high costs, and complex installation and maintenance.

Space Constraints

Space planning in semiconductor plants is often very tight, with cleanrooms and process equipment occupying most of the area, leaving limited space for UPS systems.

Cost Pressure

High-performance UPS systems are costly, and redundancy further increases the expense. Extensive wiring can also drive up installation costs.

Installation and Maintenance

UPS systems require complex installation and regular maintenance to ensure stability and longevity. Continuous monitoring is essential to prevent equipment downtime from UPS failures.

While space for UPS is usually planned in the plant' s electrical room, UPS units near machines may lack pre-planned space due to cost or space limits. This leads to challenges like limited installation space and wiring issues. Using wireless transmission to monitor UPS operation can greatly reduce wiring complexity.

Advantages and Uses of LoRa in Cleanrooms

Cleanrooms have limited space, making wired transmission costly and difficult due to extensive cabling. Wi-Fi offers high-speed transmission but has limited coverage based on AP range and is prone to interference, as it operates in the crowded ISM band.

UPS data can be transmitted via wired, Wi-Fi, or LoRa connections. The table below compares their pros and cons.

Item	Wired	Wi-Fi	LoRa
Installation	Extensive wiring, difficult	Less wiring, requires Wi-Fi AP	Less wiring, only transmitter and receiver needed
Infrastructure	Wiring/ Switch	Wi-Fi AP / Wired to Wi-Fi devices	Transmitter/ Receiver devices
Operating Frequency	-	2.4 / 5 GHz	Sub GHz
Transmission Range	Depends on wiring	30 ~ 50 meters	10km(10 kbps)
Transmission Speed	Depends on switch	9.6 Gbps (Wi-Fi 6 multi-stream)	50 kbps
Connection Capacity	Depends on switch	Depends on Wi-Fi AP	253 devices (per receiver)
Interference Resistance	High	Varies (many devices in ISM band)	High (CSS modulation)
Power Consumption	Medium	High	Low

▲ Comparison Table of Cleanroom Communication Technologies

Compared to Wi-Fi, LoRa is better suited for IoT applications. While slower, high-speed transmission isn't critical for monitoring UPS status. Its long range and high connection capacity help reduce receiver installations and lower deployment costs.

LoRa offers strong interference resistance and can maintain stable data transmission even in poor wireless environments by lowering its transmission rate (down to 250 bps). This makes it a reliable wireless solution for specialized settings like cleanrooms.

Wireless UPS Monitoring Reduces Wiring Limitations and Costs

ICP DAS' s wireless UPS monitoring uses a LoRa and 4G-based transmission architecture, as shown in the diagram at the bottom of next page.

LRA-900 is a wireless data converter that converts RS-232/RS-485 signals to LoRa using transparent transmission. It transforms UPS Modbus/RTU data into LoRa wireless messages and sends them to the receiver. The receiver, paired with a tGW-715 Modbus Gateway, converts the data to Modbus/TCP. To further reduce wiring, the system uses a GRP-540 (Ethernet to 4G gateway) to send the cleanroom's tGW-715 data over 4G.

Semiconductor manufacturers work with telecom providers to use customized MDVPN networks, ensuring secure data transmission and preventing leaks. Monitoring software on the control computer uses Modbus/TCP to efficiently poll the status of each UPS in the cleanroom, enabling stable remote monitoring.

LRA-900: A New Cleanroom UPS Transmission Solution with Technical Advantages

LRA-900 offers a new cleanroom UPS transmission option with strong technical advantages, enhancing reliability and reducing complexity in wireless communication.

Easy Configuration

Wired-to-Wi-Fi devices require multiple steps to connect to the factory' s Wi-Fi AP. They must be configured via a setup tool or web interface, and the MIS team needs to bind the MAC address. After connecting, MIS must also set switch routing rules to enable communication with the monitoring computer.

Unlike Wi-Fi' s complex setup, the LRA-900 only requires matching settings (e.g., group ID, frequency, speed) on both ends to connect. Most configurations use dials and DIP switches, with only advanced settings needing a configuration tool.

Interference Resistance

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Wi-Fi is widely used in factories and

operates on 2.4 GHz or 5 GHz ISM bands, making devices prone to interference due to shared frequencies.

LRA-900 features LoRa transmission with CSS modulation and high receiver sensitivity for strong interference resistance. It also supports 32 adjustable wireless channels, allowing devices to operate on different channels to prevent mutual interference.

High Scalability

The number of Wi-Fi connections depends on the AP' s capacity. If device connections exceed the limit, adding another AP and rewiring is necessary for expansion.

As a receiver, the LRA-900 supports up to 253 transmitters. Beyond that, devices connect to a switch and use the GRP-540M-4GE to convert signals to 4G.

Longer Transmission Range

Wi-Fi typically transmits over 30 to 50 meters, with shorter range on the 5 GHz band due to weaker diffraction. To improve range, high-gain antennas, repositioning devices, or adding APs are common solutions, but all



▲ Figure 1. Wireless UPS Monitoring Architecture Diagram

require time-consuming testing to ensure optimal communication quality.

At 10 Kbps, the LRA-900 reaches 1.5 km line-of-sight. Lowering the speed extends range further. If still insufficient, add another LRA-900 as a repeater—it only needs power and no complex setup.

Conclusion

Unstable grid voltage increases the risk of UPS failure. If a power issue occurs, the UPS may malfunction, leading to unexpected shutdowns of critical equipment. Continuous UPS monitoring is crucial to ensure stable operation of essential processes. This UPS monitoring application uses LoRa and 4G wireless transmission to reduce wiring, simplify engineering, and lower costs. The LRA-900 features easy setup, strong interference resistance, high scalability, and long range. Compared to Wi-Fi' s complex setup and shorter range, it is ideal for cleanroom environments.

More ICP DAS LRA-900 information

The diagram below shows more LRA-900 applications. For full details—specs,



catalogs, manuals, and uses—visit ICP DAS's website via the QR code. \blacksquare



▲ Figure 2. One-to-One Application Architecture of LoRa Wireless Products



▲ Figure 3. One-to-Many Application Architecture of LoRa Wireless Products

UA Communication Servers Enhance Security and Management With VPN Integration

ICP DAS UA series controllers add a VPN client function to transmit encrypted data and secure channels. It Integrates different network segments and private IP connection needs, solves IoT network issues, and improves security and efficiency for the system, making the UA series highly efficient in industrial applications.

Written by / Sun Chen (Translated by Eva Lee)

With the rise of digitalization, industrial automation faces increasing security challenges, such as unauthorized access and data breaches. VPN provides encrypted communication to prevent eavesdropping and ensure system integrity. It also allows seamless communication across network segments, offering security and management advantages.

ICP DAS UA Series Enables Seamless IT and OT System Integration

The UA series by ICP DAS is an IIoT gateway-equipped communication server that helps users integrate IT and OT systems and devices, and improves system performance and IIoT global competitiveness. Key features include:

Multi-Protocol Support

UA series supports Modbus, MQTT, OPC UA, SNMP, and RESTful API for seamless integration with industrial devices and systems.

Database Integration

UA series saves data to MS SQL/MySQL, streamlining data management and analysis efficiency.

IoT Cloud Connectivity

UA series supports IoT clouds like Azure and AWS for cloud-based data management and analytics. UA series is ideal for hydrology, energy, wind power, and automation, enhancing system performance and security.

Realizing Seamless Connectivity of UA Series in Geographically Dispersed Locations

Deploying dozens to hundreds of UA series controllers for large or distributed projects can complicate backend connections, especially across varied network environments. These UAs may face connectivity issues with backend control or IT systems on external networks, posing integration and communication challenges.

- •Corporate intranet (with firewall): Firewalls within corporate networks may block external connections, preventing the backend system from accessing these UAs.
- •**Private IP addresses:** If UA devices use private IP addresses, they cannot be accessed by backend systems on public networks as private IPs are non-routable.
- •Geographically dispersed sites: In dispersed geographic factories, devices may be on different subnets, making communication complex.
- •Network Limitations: Some environments have limitations, such as bandwidth limits or network isolation, which increases connection difficulty.

In these cases, the back-end system must connect and manage the UA series distributed

in different networks. UA's VPN client function establishes an encrypted channel for the system to securely and stably connect to the UA. UA's VPN client supports OpenVPN for enhanced accessibility and data security when using UA's VPN client.

Advantages of OpenVPN

High Security

OpenVPN uses SSL/TLS to encrypt data, ensuring strong protection against eavesdropping or tampering.

Multi-Platform Support

OpenVPN is compatible with Windows, macOS, Linux, iOS, and Android, offering wide accessibility across devices.

Flexibility

Highly customizable with various configuration options, including encryption protocols and authentication methods, to suit different network environments and security needs whether it is a corporate intranet, public network, or mobile network.

Stability

OpenVPN offers reliable service, maintaining a stable connection even when the network is unstable.

Connection Modes

OpenVPN supports TUN (for routing IP packets) and TAP (for virtual Ethernet) connection mode, accommodating various network protocols.

Remote Data Management - UA-2241M/UA-5231-4GE with VPN Applications

Write UA data into the company's internal database

A manufacturing company needs to deploy UA-2241M devices at multiple locations to monitor distributed factories. These devices must regularly write data to the central MS SQL database in the HQ's internal, firewall-protected network. Due to varying network setups and firewalls, direct access is impossible, so the company decided to use VPN technology.

The company deployed a VPN server in the intranet of the HQ and enabled the OpenVPN client function on all UA-2241Mequipped devices. These UA-2241Ms can connect to the company's MS SQL database across network segments and private IPs.



Distributed UA Controller 4G Network Integration

A public project aims to implement widearea hydrological monitoring for water quality and level. It uses ICP DAS UA-5231M-4GE controllers, which support 4G mobile networks, at various rivers and reservoirs across a wide geographic area.

Due to the wide monitoring range and scattered sites, managing IPs and remote access for 4G-connected UA-5231M-4GE devices is challenging, unlike in local networks.

To solve these, the system integrator used OpenVPN TAP mode to create a virtual LAN among the UA-5231M-4GE units, simplifying IP management and enabling seamless remote access and control.

Additionally, the integrator uses ICP DAS' s EZ-UAQ Utility, a powerful tool for bulk management of UA-5231M-4GE controllers over VPN. It offers a user-friendly interface for efficient monitoring and control of all connected devices.



Enhanced Security & Efficiency: Dual Benefits of UA Controllers

By enabling VPN Tunnels, ICP DAS' s UA series offers strong potential for security and management efficiency. VPN blocks unauthorized access and data leaks and integrates devices across different subnets and private. These strengths make UA controllers ideal for various industrial applications, from hydrological monitoring to energy management.

With OpenVPN' s security, flexibility, and stability, users can seamlessly transfer data and manage devices across distributed networks. System integrators can use EZ-UAQ Utility to improve management efficiency and manage multiple UA controllers.

In summary, VPN-enabled UA controllers offer robust support in security and management, becoming an ideal solution for modern industrial automation and data management.

More UA Series Infomation

For full UA series details—including specs, catalogs, manuals, and applications—visit the ICP DAS website via the QR

code below.





I-7016PD with TouchPAD Ensures Accurate Loss-in-Weight Feeder Monitoring

ICP DAS I-7016PD with TouchPAD significantly enhances the accuracy and anti-interference capability of loss-in-weight feeders, reducing measurement errors from over 10g to just 1–2g. It supports powder drop calculations, low-level alarms, and integrates with SCADA for stable monitoring.

Written by / Jim Hou (Translated by Carol Hsu)

Tackling Signal Interference in Loss-in-Weight Feeders

The Loss-in-Weight Feeder ensures highprecision control by measuring weight reduction to regulate feeding. It is widely used in processing, food, chemical, and pharmaceutical industries for continuous, precise feeding.

Reflects Weight Changes by Converting Electrical Signals

A Loss-in-Weight feeder uses a Load Cell (weighing sensor) to measure powder weight, converting it into an electrical signal to reflect real-time changes. An analog-todigital converter (ADC) then digitizes the signal, allowing the control system to monitor, analyze, and process the data.

Risks of Environmental Interference & Resolution Limits

In small-quantity powder measurement, high accuracy is crucial, but environmental interference can destabilize signals if the feeder's resistance is insufficient. Low data resolution hinders accurate measurements, affecting production accuracy, efficiency, and product quality, resulting in higher costs and management challenges.

The customer required small-quantity powder measurement and SCADA-based

data monitoring to analyze weight changes and calculate the average powder drop per minute. I-7016PD with TouchPAD ensures high-accuracy weighing for loss-in-weight feeders. Existing 4-wire Load Cells in these systems are more prone to interference than 6-wire ones, causing signal fluctuations. Additionally, the 12-bit ADC lacks resolution for accurate small-quantity powder measurement, leading to frequent errors of up to 10 grams. This prevents the SCADA system from accurately controlling powder flow, impacting production accuracy and efficiency.

I-7016PD Strain Gauge Solution with TouchPAD

ICP DAS introduces the I-7016PD module with the VPD-143-H solution, offering high accuracy and strong anti-disturbance capability. It ensures stable feeding and accurate weight management, enhancing efficiency and product quality.

Installation and operation

ICPDAS upgraded the customer's lossin-weight feeder by switching the Load Cell to a 6-wire connection and linking it to the I-7016PD module. The VPD-143-H connects via RS-485, reads voltage changes, calculates real-time weight changes, analyzes pastminute data, and estimates powder drop and refill time.

The system sends data to the remote SCADA for recording and displays the remaining and lower-limit weight on the VPD-143-H or an external screen, enabling easy monitoring and improving operational efficiency.

The VPD-143-H shows the remaining powder weight (e.g., 422 g) at the bottom and the low alarm (e.g., 300 g) at the top. The value appears white when normal and turns red when below the limit to alert the operator.



▲ Figure 1. On-site Installation Diagram

The I-7016PD's DO output connects to an external alarm, activating when the remaining powder drops below the lower limit weight to alert the user, ensuring safety and preventing production interruptions.

Product Features and Environment

I-7016PD Interference Immunity High-Resolution 6-wire Strain Gauge

I-7016PD is a 6-wire strain



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gauge input module for long-distance measurements, supporting Load Cells. With 16-bit resolution (65,536 levels), it ensures high accuracy, ideal for precision industrial weighing. It is suitable for long-distance measurements over 10 meters and features low line loss to ensure stable and accurate signal transmission.

I-7016PD offers enhanced noise, surge, and ESD protection in industrial environments, meeting IEC 61000-4-2 standards. It features high-voltage and high-current protection, resisting surges and ensuring stable operation in harsh environments with excellent antiinterference performance.

I-7016PD enhances signal stability and reduces measurement error from over 10g to only 1-2g. The RS-485 interface supporting the DCON protocol seamlessly integrates with the VPD-143-H HMI for real-time data transfer and remote control, enhancing automation and accuracy.



VPD-143-H Graphical UI for Easy Reading and Monitoring

VPD-143-H, a TouchPAD HMI from ICP DAS, functions like a mini-computer with logic control. Combined with the intuitive HMIWorks development software, it enables flexible and efficient customization to meet a wide range of application needs.

The VPD-143-H features a 4.3" (480x272) touchscreen for intuitive and easy operation, eliminating the need for external keyboard and mouse devices, saving space, and improving convenience. Its IP65-rated



▲ Figure 2. System Architecture of I-7016PD Measurement Module with VPD-143-H

waterproof, dustproof front panel with DIN-Rail mounting suits harsh industrial environments. Five rubber buttons enable quick function execution and page switching, enhancing efficiency.

The VPD-143-H supports RS-232/RS-485/ Ethernet and protocols like Modbus, DCON, and MQTT, enabling real-time I/O connection, data capture, and flexible control expansion ideal for smart production and enhancing system integration.

The VPD-143-H uses RS-485 and Modbus RTU to connect with I-7016PD, digital displays, and SCADA for real-time monitoring. Weight data is shown on TouchPAD and displays, while SCADA retrieves key info like drop rate and refill time. Alarms can be triggered via I-7016PD' s digital output, enabling quick responses to abnormalities.

The I-7016PD with VPD-143-H enhances measurement accuracy, production safety, and efficiency, ensuring stable quality



▲ Figure 3. Eight Key Functions of the TouchPAD HMI Monitoring System

management and a reliable foundation for business operations.

Features of TouchPAD Monitoring System

Next, we introduce the powerful functions of the ICP DAS TouchPAD monitoring system:

Rapid Response

The DCON protocol, used with ICP DAS I/O modules, employs simple ASCII commands for one-request-one-response communication. Its efficiency minimizes delays and errors. The system queries the I-7016PD every 100 milliseconds to monitor real-time powder weight changes, ensuring stable and reliable data exchange.

On-site Calibration

Calibration ensures accurate weighing by eliminating errors and improving precision. While minor drift may need factory calibration, ICP DAS offers on-site calibration, enabling users to self-calibrate easily, reducing downtime and simplifying maintenance.

Reset to Zero

In addition to calibration, we added a reset-to-zero function, letting users eliminate container weight for more accurate measurements.

Powder drop and estimated refill time

The system calculates the powder drop per minute from weight changes and estimates refill time, helping operators adjust production plans accurately.

Low Alarm

In addition to estimating the refill time based on the change of powder weight per minute during operation, the system supports setting a lower alarm to prevent anomalies or production interruptions. If the weight drops below this limit, TouchPAD's buzzer sounds and triggers an external alarm via the I-7016PD module. Operators can quickly return to the site to address the issue, ensuring operational safety, production stability, and minimizing potential losses.

In addition, to avoid repeated triggering and deactivation of the alarm due to fluctuation of the value when the measured weight is close to the set lower limit value, a new mechanism deactivates the alarm only when the user adds over 10g of powder above the limit. Users can also manually disable it to complete the last batch smoothly without disruptions, ensuring stable operation.

Accurate Values

Upgrading the Load Cell wiring from 4-wire to 6-wire reduced measurement error from over 10g to just 1-2g, greatly improving accuracy. However, slight voltage fluctuations may still occur. To further stabilize readings, the system applies a moving average calculation, minimizing fluctuations and ensuring the stability and consistency of the displayed value.

One-touch Switching

The system allows one-touch switching between g and kg, enabling quick unit changes for different operational needs and

greater convenience.

Load Cell Setting

Since the load cell specifications may vary from user to user, ICP DAS allows users to set the parameters of Excitation Voltage, Rated Capacity, and Rated Output according to the load cell specifications used to meet various application requirements.

Master/Slave Hybrid

The TouchPAD's ability to act as both a Slave and a Master makes it even more flexible in applications, especially in complex automation systems.

As a slave station, it can be connected to a remote SCADA host and provide realtime weight data to A Figure 4. Supports the host. As the master station, it can not only



External Digital Display for Remote Monitoring

read data from the I-7016PD module, but also write the measured weight and the set lower limit weight to an external digital display for remote monitoring.

Conclusion

The I-7016PD module with TouchPAD reduces measurement errors and offers key enhancements. It features a low alarm to monitor weight, calculates powder loss, and estimates refill time. When integrated with automatic feeding, it improves efficiency and stability. 🔳

The Core Communication Server of Smart Manufacturing, BRK-2841M

BRK-2841M integrates database and dashboard applications, automating data logging and initialization via MQTT. It supports redundant architecture and Grafana visualization, enhancing utilization, efficiency, and decision-making for smart manufacturing.

Written by / Jason Chen (Translated by Carol Hsu)

Challenges In the Manufacturing Industry

The biggest challenge in manufacturing is the inability to monitor real-time production. This causes delays in handling anomalies and unexpected equipment shutdowns. Changes in product and equipment conditions create new bottlenecks, reducing utilization and increasing lead times.

Industrial IoT enables real-time data collection from production floors, but manufacturers still face challenges in using this data to control operations, resolve bottlenecks, boost equipment uptime and capacity, and ultimately enhance factory productivity.

Powered by MQTT! Seamless Database and Device Integration

Data collection is routine in factories. Leveraging big data and AI helps improve equipment and process performance, predict maintenance, prevent failures, and support decisions through control rooms and quality reports—enabling insights from past trends and foresight for future operations.

Factories collect data from numerous devices and store it in databases for record tracking, order management, reporting, and visualization. However, integrating diverse equipment smoothly and ensuring future devices can seamlessly connect with existing systems remain key challenges for factory owners managing complex, long-running operations.

ICP DAS BRK-2841M writes data to databases, supporting InfluxDB, MongoDB, MySQL, and Microsoft SQL Server. Before writing, you must plan table columns; mismatches require extensive changes. Also, define data attributes like signed, unsigned, strings, or floats. BRK-2841M supports receiving MQTT write to database function, you just need to send the data to BRK-2841M via MQTT, BRK-2841M will automatically initialize the database (create database, tables, fields), and then record the data into the database, there is no need to write additional applications to process the write to database, which dramatically reduces the learning cost of the database. In addition, if the enterprise has newly purchased devices that need to be recorded in the database, they can be easily written into the database by simply converting to MQTT, which improves the flexibility of future device expansion.



BRK-2841M

▲ Figure 1: BRK-2841M supports writable databases

Zero data loss! Active backup with real-time, seamless takeover

In larger enterprises, a dedicated team will be responsible for data collection, storage, and management. However, in small businesses, it's difficult to dedicate staff to maintaining the availability, reliability, and integrity of data. Hardware failures (e.g., disk corruption, server crashes) or software errors (e.g., DBMS issues) can lead to temporary data unavailability or permanent loss. The BRK-2841M provides redundancy protection to keep the system running in case of failure, minimizing downtime and the risk of data loss.

BRK-2841M supports a redundant setup where multiple devices write data to the database at regular intervals for synchronization. Data is stored across devices simultaneously. There are two major benefits of redundancy:



- ▲ Figure 2. BRK-2841M (MASTER) Sync Database Data to Other BRK-2841M (BACKUP)
- 1. Important data will not be affected by device failure.
- 2. Access important data anytime with a connection.

Even if the original BRK-2841M

responsible for database recording fails and stops working, backup units preserve all accumulated data. This redundancy ensures 24/7 enterprise operation, a key goal for many digitalized businesses. With a network connection, data transmission remains stable and secure.

When two or more BRK-2841M form a backup structure, BRK-2841M will decide which one is the master and which one is the backup. The master is responsible for writing data into the database and backing up the data to the backup, ensuring all BRK-2841Ms in the redundancy setup stay synchronized.

The BACKUP monitors the MASTER at all times and takes over the database logging service in case of an unpredictable failure of the MASTER.



▲ Figure 3. BRK-2841M (MASTER) fails and stops operation, BRK-2841M (BACKUP) takes over to continue database logging, and the takeover BRK-2841M becomes the master and continues to provide database logging service.

The takeover of BRK-2841M will become the MASTER and continue the database service. Data between both BRK-2841Ms will stay synchronized with no loss.

Ten Keys to Build a War Room

The BRK-2841M Dashboard (Grafana) provides key benefits for industrial automation, monitoring, and data analysis. The following are the main benefits:

Real-time Data Monitoring and display

- Dashboards show real-time device status, performance, and KPIs.
- Provides visual charts for quick system health checks and early issue detection.

Improve Operational Efficiency

- Operators can access all critical data through a single interface, reducing time spent switching systems or checking multiple platforms.
- The automatic report generation function saves time in manually organizing data.

Enhance Security and Traceability

- Provide user access control to restrict data to authorized personnel.
- Logging of operations helps with troubleshooting and problem tracking.

Predictive Maintenance

- The dashboard analyzes trends to predict potential equipment failures.
- Reduces unplanned downtime and increases equipment life.

Remote Monitoring and Management

- Supports remote access for managers to monitor systems anytime, anywhere.
- Enables cloud integration for crossplatform data access and storage.

Customized Functions

Dashboards are customizable to show

relevant data and controls.

• Provides a flexible interface design to meet different application scenarios.

Rapid Troubleshooting

- Real-time display of abnormal conditions and alarms reduces troubleshooting time.
- Provides historical data to diagnose longterm issues.

Integration and Compatibility

- Supports various industrial protocols (e.g., Modbus, OPC UA), enabling easy integration with other devices and systems
- Seamlessly connects with a wide range of sensors, PLCs, and other industrial equipment.

Reduce overall costs

- Reduce labor costs and frequency of onsite inspections.
- Improve efficiency and reduce maintenance costs.

Data-driven decision support

- The dashboard offers real-time insights for smarter decisions.
- Provide trend and performance reports to help with long-term strategic planning.

Visualization Tool Grafana to Present Captured Data

Grafana is an open-source tool that helps us visualize data by querying the collected data and presenting it in a variety of visualizations with real-time notifications, support for multiple data sources, and a rich selection of dashboards.

Grafana supports a wide range of data sources, including time-series databases (e.g.,

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Prometheus, Graphite, InfluxDB, OpenTSDB), relational databases (MySQL, PostgreSQL, Microsoft SQL Server), cloud monitoring platforms (Google Cloud Monitoring, Amazon CloudWatch, Azure Monitor), and more. This can quickly integrate the user's customized platform data into charts for analysis.



▲ Figure 4: Grafana Dashboard Interface

Conclusion

Industrial PCs play a crucial role in Industry 4.0, facilitating seamless integration between databases and dashboards to enhance efficiency and enable intelligent production. With the BRK-2841M logging service, setup and maintenance costs are greatly reduced.

More ICP DAS BRK-2841M Information

The ICP DAS website provides comprehensive and detailed BRK-2841M product information, including product specifications, catalogs, user manuals, and applications. Please refer to the QR code below.





ICP DAS offers bottom-up redundancy solutions for enhanced security monitoring. The RIO-9830, a next-gen remote redundant I/O system, ensures high stability and flexibility. If the main module fails, the redundancy module takes over within 1ms, ensuring uninterrupted operation and enhancing monitoring security.

Written by / Edward Fang (Translated by Carol Hsu)

ICP DAS Redundant Solutions Enhance Monitoring Security

Monitoring systems increasingly prioritize operational stability and maintenance convenience. Over time, unforeseen events such as human error or natural disasters can disrupt operations, damage equipment, or lead to security incidents, resulting in significant costs. To prevent this, integrating security redundancy from the design stage enhances overall system reliability. ICP DAS offers comprehensive redundancy solutions, including Power Redundancy, I/O Module Redundancy, Controller Redundancy, Cyber-Ring Redundancy, and HMI Monitoring. Redundancy. Please see the following sections for descriptions:

RIO-9830 Next-Gen Redundant Remote I/O

For the I/O redundancy component of the overall monitoring and redundancy



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I/O Module Redundancy (No critical signals missed)

system, ICP DAS presents the RIO-9830, a nextgeneration modular redundant remote I/O solution featuring dual power, communication, and up to 8 I/O modules. If the main module fails, the backup takes over within 1ms, ensures the original system continues to operate stably without interruption, and greatly improves the reliability of system operation.

RIO-9830 System Features





I/O Duplex Configuration

▲ I/O Modules in Single/Duplex Configurations

Power Module (Duplex)

- 24 VDC power input: Provides a stable power supply for the communication modules and I/O modules of the RIO-98x0 system.
- Overvoltage Protection: 5A fuse prevents overload and protects the system from damage.
- LED Indicator: Shows status of external 24 VDC supply, helping users monitor power function.

Communication module (Duplex)

Modbus/TCP Slave: Allows Modbus/TCP

master to integrate and monitor RIO-9830 I/ O data quickly.

- Seven-segment display with LEDs: Shows all module status and network connection.
- Rotary Switch: Manually sets RIO-9830 IP address for easy network configuration.
- SD Card: Logs module errors for troubleshooting and future analysis.
- DIP Switch: Enables the seven-segment display to show status and switches the communication module to firmware update mode for easy maintenance.
- USB Connector (CAN): Connects to the baseboard (CAN bus) for debugging and to facilitate troubleshooting by developers.

I/O Module (Duplex)

- I/O Configuration Flexibility: 8 I/O slots can be configured with 8 single or up to 4 duplexes on demand.
- Multiple input/output signal types: analog current/voltage, digital signaling, TC/RTD temperature measurement, pulse counting, and HART communication.
- Fault & Disconnection Detection: Ensures stable signal acquisition.
- Channel point-to-point isolation design: Prevent signal interference between channels.
- LED Indicator: Real-time operation status of the module.
- Supported I/O points per node: 256 digital inputs, 64 analog outputs, 128 analog inputs, or 64 pulse inputs.

All RIO-9830 modules support hot-swap and auto-configuration, ideal for industrial automation and process control, enhancing stability and maintenance.

Features of RIO-9830 Utility

- Remotely read and configure the parameters of the module via Ethernet.
- Real-time I/O data and status monitoring.
- Display module operation status.



Support module firmware updates.

Support I/O Modules of RIO-9830



• Support analog current I/ O module with HART

▲ R-9017C1H

- Support analog voltage I/O module.
- Support Digital Signal Output/Input Module
- Support TC/RTD Temperature Measurement Module
- Support Pulse Input Counter/Frequency Module



RIO-9830 Support Terminal Blocks

- Supports spring clamp terminals (easy wiring)
- Support terminal block drop detection (stable wiring signals)
- Support single/duplex terminal blocks

Conclusion

The next-generation remote redundant



▲ All RIO-9830 modules support hot-swap and auto-configuration, ideal for industrial automation and process control, enhancing stability and maintenance.

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I/O system, RIO-9830, provides a higher level of stability and security for monitoring systems with its modular design and redundancy features. With redundant power, communication, and I/O modules, RIO-9830 ensures 1ms failover for uninterrupted operation. Its flexibility, remote monitoring, and maintenance features reduce downtime and costs, making it ideal for stable, efficient monitoring.



▲ Installation of RIO-9830

Туре		Model	Description	
Digital	Input	R-9040	32-ch digital input, isolation for every 16-ch, redundancy	
	Output	R-9041	32-ch digital output, isolation for every 16-ch, redundancy	
Analog	Input	R-9017C1H	8-ch 4~20mA input, channel isolated, HART master, redundancy	
		R-9017C2H	16-ch 4~20mA input, HART master, redundancy	
		R-9015	12-ch RTD (Pt100, Pt1000, JPt100) , redundancy	
		R-9019	16-ch thermocouple (J, K, T, E, R, S, B, N, C), redundancy	
	Output	R-9028V1	8-ch 1~5V or +/-10V output, channel isolated, redundancy	
		R-9028CH	8-ch 4~20mA output, channel isolated, HART master, redundancy	
Pulse	Input	R-9084	8-ch pulse input, channel isolated, redundancy	

▲ I/O Module Selection Guide

Туре		Model	Description	Supported Modules
Terminal Board	Single	RDB-S01	For single module with non-isolated analog current/ voltage	R-9017C2H
		RDB-S02	For single module with thermocouple (TC)	R-9019
		RDB-S03	For single module with RTD.	R-9015
		RDB-S05	For single module with digital output (DO)	R-9041
		RDB-S08	For single module with digital input (DI)	R-9040
		RDB-S09	For single module with isolated analog current/voltage and pulse	R-9017C1H/R-9028CH R-9028V1/R-9084
	Duplex	RDB-D01	For duplex module with non-isolated analog current/ voltage	R-9017C2H
		RDB-D02	For duplex module with thermocouple (TC)	R-9019
		RDB-D03	For duplex module with RTD	R-9015
		RDB-D05	For duplex module with digital output (DO)	R-9041
		RDB-D08	For duplex module with digital input (DI)	R-9040
		RDB-D09	For duplex module with isolated analog current/voltage and pulse	R-9017C1H/R-9028CH R-9028V1/R-9084

▲ Terminal Block Selection Guide

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GTP-541M is a smart 4G remote terminal device with networking, logic control, and alert functions. ICP DAS provides a variety of firmware/software for various application scenarios, cutting setup and development costs. With AI, DI, and DO, it supports measurement/control and logs data to microSD in real time.

Written by / Eugene Chen (Translated by Eva Lee)

Modern energy systems (hydro, solar, wind…) increasingly rely on automation, telemetry, and analytics for real-time insights and accurate forecasting. GTP-541M integrates key devices and protocols to monitor water levels, flow rates, energy storage, vibration, temperature, and more. It enables precise monitoring, remote management, and troubleshooting with full data support for decision-making. This improves system efficiency and reliability and is vital in alerts, environmental protection, and disaster prevention. GTP-541M is a smart 4G remote terminal device with logic control and alert notification. It transmits I/O signals via LTE/WCDMA/ GPRS for alarms, remote monitoring, and maintenance. ICP DAS provides various tools to simplify data integration and accelerate deployment. Tools include device management (M2M RTU Center), communication integration (M2M OPC Server, Modbus), databases (SMS Database System), libraries (M2M RTU API Tool), and virtual serial ports (VxServer, VxComm), etc.

FREEL

Edge computing capability

Offline local data log

Multiple mgmt. software

Avoid communication anomalies and interference Remote data collection and integration software

PACTECH https://www.icpdas.com/en/download/index.php?kind=13

GTP-541M Modularized Firmware Introduction

GTP-541M provides six firmware (SMSMB/SMSDIO/SMSTXT/RTU/VSPE/RMV). Users can load and switch between firmware using the SD card. It integrates various software tools to meet different application needs, reduces development costs and time, and is particularly suitable for IoT applications.

Modbus SMS Function



- Trigger alarm via Modbus RTU
 Modbus RTU specifies the SMS content and
- phone number.



- Trigger SMS alarm and local DO according to local AI/DI status.
- Report AI, DI, DO and Counter values regularly.
- Send SMS through mobile phone to inquire about I/O status or set DO.



- Support ASCII command communication to trigger SMS or voice alarm, and specify SMS content and the phone number
- 127 groups of alarm and 16 groups of phone books can be customized.

Remote Terminal Unit Function



- Support up to 3 Modbus RTU devices
- Regularly transmit device data to PC RTU Center
- Log files are uploaded via E-Mail or FTP



- Support third-party VPSE virtual COM port software mapping to local physical RS-234 / RS-485 serial port.
- Transparent transmission between physical and virtual COM port.



- Mapping RS-232/485 of GTP-541M to virtual COM port on PC
- Work with VxSrever and VxComm to realize virtual and physical COM port transfer.

M2M RTU Center Device Management Software Introduction



M2M RTU Center management software conveniently manages GTP-541M devices (RTU firmware required) and boasts excellent I/O data processing capability, enhancing user convenience and reducing troubles with large I/Os. It provides Modbus TCP/RESTful protocols and database integration systems.



Server & RTU API

OPC is an automation control protocol developed by Microsoft using COM/DCOM technology. M2M RTU Center works with

NAPOPC.M2M DA Server to support the OPC server. After configuration, users can use any software that supports the OPC protocol (AVEVA Edge, iFix, Citect, LabView, etc.) to connect to the server to transfer GTP-541M data.

M2M RTU Center, with M2M RTU API, provides the required libraries for software development (VC/VB/BCB/VS.Net). Users can easily integrate GTP-541M into customer applications, including real-time remote monitoring, SMS sending, database systems, etc.



VxServer Remote Transmission Service Software Introduction

VxServer is a Virtual COM middleware that allows the remote control host to mount the VxComm Driver and establish a virtual serial COM port with VxServer to map to the physical serial port of GTP-541M (RMV firmware required). User applications only need to connect to the virtual COM Port to access the serial device connected to the GTP-541M via the network.



GTP-541M Application Highlights

- Quick Setting Tools: Firmware-specific free tools simplify development.
- Multiple SMS Trigger Modes: Send SMS via Modbus protocol or ASCII text commands.
- Master Status & Control: Send SMS regularly or query I/O status; remote DO control for automation and safety.
- Multiple Protocols & Development Kits:

Access device data by OPC DA, Modbus TCP, and RESTful API protocols with ICP DAS' s dev tools and libraries for full convenience and integration.

Edge Control Management: Set AI/DI/ Counter limit value to trigger the DO to respond and control the situation immediately.

Conclusion

GTP-541M, with modular firmware and user-friendly utilities, enables fast logic setup with minimal effort. Its flexible deployment and long-range connectivity suit for IIoT, M2M, and wireless access applications. Wide-temp design ensures stability in harsh environments — ideal for transport, utilities, energy, and disaster prevention fields. Its low-power, low-cost 4G makes it a preferred choice for industrial, smart city, and IoT solutions.

More about GTP-541M

Visit the ICP DAS GTP-541M website or scan the QR code for specs, catalog, manuals, and product details.



EZ-UAQ Utility Module Maintenance Tool – Quick Deployment for Modbus Modules

ICP DAS offers a UA series solution with EZ-UAQ Utility, using Excel batch setup and OPC UA to simplify Modbus management and system expansion. It reduces manual PLC setup and improves automation efficiency and flexibility.

Written by / Howard Wu (Translated by Lynn Tang)

In PACTECH Vol. 78, "EZ-UAQ Utility Module Maintenance Tool – Firmware and Configuration Management", it was noted that EZ-UAQ Utility enables batch updates for remote UA and BRK series devices. With growing industrial automation needs, the number and complexity of control devices are increasing, exposing the limitations of traditional PLC architectures in system expansion and data handling.

As production scales, companies often need to add many Modbus modules to support diverse devices. Manual PLC configuration is time-consuming and errorprone, especially in large systems, affecting overall efficiency. Integrating different brands further complicates data exchange and raises maintenance costs.

Traditional PLCs are struggling to meet modern industrial demands, pushing companies to seek solutions that streamline expansion and simplify system management.

To tackle these challenges, ICP DAS launched the UA series with EZ-UAQ Utility, using OPC UA for data management and integrating Excel-based batch configuration. Excel, a widely used data processing tool, offers ease of use, flexible editing, and data formatting capabilities. These user-friendly interface and flexible editing allow companies to quickly set up many Modbus modules, reducing errors and boosting efficiency.

With Excel' s batch processing, users can easily manage large volumes of configuration



data, simplifying expansion and speeding up updates and modifications.

The solution enables quick Modbus module deployment and tackles expansion issues in traditional PLC systems. With Excel' s ease of use, it greatly enhances efficiency and simplifies management.

Expansion and Management Challenges in PLC Architectures

PLC architectures often face the following issues during system expansion and management:

Complex Manual Configuration

When adding or expanding Modbus modules, operators must manually configure each module' s parameters, as well as adjust settings in HMI and SCADA systems. This process is time-consuming, prone to errors, and difficult to debug.

Data Exchange Challenges

Interoperability between different brands or types of devices is often problematic, requiring extra time to handle communication protocols during expansion.

High Maintenance Workload

As the system grows, the number of data points increases significantly, making management and maintenance more difficult and putting greater pressure on operators.

These challenges make PLC architectures appear cumbersome and inefficient when responding to dynamic changes and expansion needs.

Large-Scale Deployment with UA Series Devices and EZ-UAQ Utility

ICP DAS offers an innovative solution to traditional PLC expansion and management challenges, using OPC UA and Excel batch configuration. With UA series devices (e.g., UA-5231, UA-2241) and EZ-UAQ Utility, Modbus modules can be quickly integrated and deployed at scale, providing four major benefits.

Excel Batch Configuration for Rapid Deployment

EZ-UAQ Utility allows users to define

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parameters for Modbus-to-OPC UA conversion directly in Excel, including settings like Modbus slave addresses and register addresses. After editing, the file is uploaded to UA modules for quick, large-scale configuration, simplifying module setup and management.

Supports Various Types of Modbus Modules

UA series devices seamlessly integrate both Modbus RTU and Modbus TCP modules, converting their data to OPC UA for realtime exchange. This allows easy and seamless expansion when adding new devices or upgrading existing systems.

Supports OPC UA Protocol: A Cross-Platform Data Communication Standard

OPC UA, a global standard in industrial automation, offers high compatibility. Regardless of the platform used—whether PLCs, HMIs, or SCADA systems—OPC UA enables stable data transmission and integration, making system expansion and management much simpler.

Secure and Stable Data Management

OPC UA offers built-in encryption and user authentication for secure data transfer. UA series devices also support database uploads, ensuring reliable data management for diverse industrial applications.

Conclusion

To tackle the challenges of traditional PLC expansion and management, ICP DAS offers a flexible solution with its UA series and EZ-UAQ Utility. Featuring Excel batch configuration and OPC UA support, it enables quick Modbus deployment, improves security, and boosts overall efficiency while lowering maintenance costs.

Choose ICP DAS UA series products to enhance the scalability and manageability of your PLC systems, providing a strong foundation for future industrial automation development. ■



SMART 4

LINE Notify Service Terminated? No Worries! ICP DAS Explains Three Seamless Transition Strategies

LINE ended the LINE Notify service on March 31, 2025, which affected the LINE Notify messaging function of ICP DAS WISE/PMC/PMD series products. ICP DAS provides options of using the LINE Messaging API or switching to Telegram, and adding the "Import LINE Notify Settings" function in the new version for users to transfer according to different needs without pain.

Written by / Wayne Liu (Translated by Eva Lee)

Impact of LINE Notify Termination

LINE Notify service termination affects WISE-523x/224x/284x, PMC-523x/224x/284x, and PMD-220x/420x series from sending messages via the LINE App's LINE Notify function. LINE officials recommend switching to LINE Messaging API, which has a monthly limit on free messages, after which users must pay. Thus, not only is the function lost, but messaging costs may also increase.

Solutions for LINE Notify Termination

In response, ICP DAS offers various alternatives. Options include the LINE

Messaging API and other platforms that allow free message sending. A brief overview is below.

Solution 1: WISE/PMC/PMD with the Bot Service Function of ICP DAS IoTstar



The IoTstar Bot Service is built on the LINE Messaging API. It supports sending messages (text, images, videos) and enables two-way monitoring and queries via the

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LINE App. However, users must pay LINE based on message volume, purchase the IoTstar software, and pay fees for an external server environment, e.g., domain name, SSL certificate, and server hardware. Best for: Users sticking with LINE and needing two-way monitoring, or are already using IoTstar.

Solution 2: LINE Messaging API Function via New WISE/PMC/PMD Firmware



This function is developed using the LINE Messaging API and works after updating to WISE v2.0.0 or PMC/PMD v4.0.0. It sends alerts directly from the controller to the LINE App. Need not pay for IoTstar or server setup, but only send text alerts, not images and videos. Have to pay the LINE message volume fees to LINE. Best for: Users sticking with LINE and only need text alerts.

Solution 3: WISE/PMC/PMD Switch to Telegram, replacing LINE Function



Solution	WISE/PMC/PMD + IoTstar + LINE Messaging API	WISE/PMC/PMD + LINE Messaging API	WISE/PMC/PMD + Telegram
App Used	LINE	LINE	Telegram
Message Fees	Based on message volume, paid to LINE	Based on message volume, paid to LINE	Currently free
Additional Costs	Purchase licensed IoTstar softwareSet up server environment	None	None
Message Types	Text, Image, Video	Text	Text, Image, Video
Group Messaging	Not supported	Supported (Message count = group size × messages)	Supported
Two-way Monitoring	Supported	Not supported	Not supported
Recommended For	 Want to use the LINE App Require two-way monitoring or already use IoTstar 	Want to use the LINE AppNo need to send images	 Willing to switch to the Telegram App Want to avoid extra costs

▲ Three alternative solutions compared for reference.

This solution uses the Telegram App instead of the LINE App and works after updating to WISE v2.0.0 or PMC/PMD v4.0.0. It supports sending text, images, and videos for free (as of now). Best for: Users are open to switching apps and want to avoid message fees.

Seamless Import the LINE Notify Settings

For help switching to Option 2 (WISE/ PMC/PMD + LINE Messaging API) or Option 3 (WISE/PMC/PMD + Telegram), the new WISE/ PMC/PMD firmware provides an "Import LINE Notify Settings" function. This simplifies the transition and reduces setup errors by

migrating existing LINE Notify settings into the new settings for LINE Messaging API or Telegram. Using Telegram as an example, there are four steps:

- Go to "Telegram S e t t i n g " page and click "Import LINE Notify Settings" .
- Click "OK" to confirm in the pop-up alert to proceed.
- 3. Settings from LINE Notify will be copied

to Telegram. However, the user must manually create a matching Telegram chat room, as the chat room systems differ.

 The IF-THEN-ELSE actions about "Send LINE Notify Message" will be autoconverted to "Send Telegram Message".

Conclusion

ICP DAS provides three alternatives to "The End of LINE Notify" . Users can choose based on project needs and costs, ensuring a smooth transition and readiness for future real-time alerts.



▲ One-click to auto-import all LINE Notify messages and change the rule set to send LINE Messaging API / Telegram (select one)

Solution to RS-485 Communication Interference Caused by Inverters

High-frequency noise from inverters may disrupt RS-485 communication. Using filters, ferrite cores, shielded twisted-pair cables, and ICP DAS's I-7510P three-way isolated repeater helps reduce interference, enhance stability, and ensure smooth system operation.

Written by / Jason Hsieh (Translated by Lynn Tang)

VFDs generate high-frequency noise during operation, which can interfere with RS-485 communication via conduction or radiation. This may cause data loss or malfunction in devices like PACs and I/O modules, especially in industrial environments where VFDs and communication systems coexist. Antiinterference measures are essential to ensure stable RS-485 communication.

Interference Prevention Solutions

At this point, the following methods can be used to prevent interference:

 As shown in the diagram on the right, install a filter at the input side (primary side) of the VFD to reduce interference affecting the power circuit. For example, a filter can be added between the power supply of peripheral devices (AC or DC, after a transformer) and the input of the VFD for isolation.



▲ Figure 1. Illustration of Filter Installation





- Wrap a ferrite core around VFD power lines (R, S, T) to suppress high-frequency noise and reduce signal interference.
- 3. Use twisted pairs with copper mesh shielding to improve communication cable interference resistance.



▲ Figure 3. Twisted Pair with Shielding of Isolated Copper Mesh

4. To isolate the RS-485 communication port, use devices with built-in RS-485 isolation

or install a "three-way isolated RS-485 repeater (I-7510P)" between the VFD and the equipment's RS-485 ports.

Conclusion

VFD interference with RS-485 communication is common but manageable. Installing filters, ferrite cores, shielded twisted pair cables, and RS-485 isolation devices can greatly reduce interference risks. These measures help maintain

stable system performance and ensure smooth communication, even in industrial environments with high-frequency noise.

More information about ICP DAS I-7510P

The ICP DAS website offers detailed I-7510P info, including specs, catalogs, manuals, and applications. Please refer to the QR code on the right.





▲ Figure 4. Illustration of Three-Way Isolated RS-485 Repeater I-7510P Installation

Device Server Solutions

Provides Various Device Server Options

