INDEPENDENT PROTECTION, AUTOMATION, AND CONTROL TESTING

Hardware-in-the-Loop Testing

The Real-Time Digital Simulator (RTDS®) can interact with devices or systems under evaluation in real time to identify weaknesses and performance issues in equipment, relay settings, and modeling before they are put into service. This enables the owner or operator to resolve any issues discovered, preventing potential misoperations in the power system.

Testing with an RTDS system has proven significantly valuable in enhancing power system protection and control applications. RTDS is primarily developed and used for hardware-in-the-loop (HIL) testing of protective relays, digital controllers, and process control devices. This allows for performance evaluation and pre-commissioning testing under conditions that closely mimic real-world scenarios. HIL testing is commonly employed for prototype development and finalizing new application designs involving various digital control, protection, and measurement devices.

Why Quanta Technology?

Quanta Technology's experts support all phases of project testing, including test plan development, test setup, test execution, and analysis of test results. They also identify and propose solutions for any problems encountered. Testing can be performed at Quanta Technology's two state-of-the-art RTDS test laboratories or on-site using customer-owned systems. Additionally, Quanta Technology can assist customers in building and specifying their own RTDS test laboratories.

Quanta Technology also provides support for testing in field environments. The outputs of RTDS testing are delivered as input files for other HIL test equipment, enabling field testing using playback functionality.

Our experts have extensive experience in protection and control applications, drawing from backgrounds in utilities, manufacturing, engineering, and consulting. Our expertise and focus on automation enable us to handle complex projects in an economical, time-effective, repeatable, and accurate manner.

Quanta Technology is vendor-neutral and has developed a best-in-class testing procedure that utilizes automation where possible.

Typical RTDS Test Applications

- End-to-end protection scheme testing
- Interoperability and conformance testing
- Testing of Remedial Action Schemes (RAS)/ System Integrity Protection Schemes (SIPS)
- Testing of Phasor Measurement Unit (PMU)/ Phasor Data Concentrators (PDC) systems
- Testing of IEC 61850 systems
- Testing of communication equipment, systems performance, and compliance
- Testing of microgrid protection and control applications
- Testing of renewable energy generation impact on protection performance

PICTURED: RTDS simulator

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Advanced Automation and Testing Process Used by Quanta Technology

Quanta Technology has extensive experience in RTDS testing, based on our work with utilities and manufacturers worldwide. We have utilized a combination of testing automation and process enhancements to reduce the time required for RTDS testing while simultaneously improving the quality of the results. **Our goal is to optimize the process to ensure all necessary tests are conducted as efficiently as possible.**

Project Examples

Impact of Inverter-Based Resources (IBRs) on the Protection System

Customers: Lonestar, nationalgrid, New York State NYSERDA

Scope:

- Model highly accurate IBR controls and the affected power system in RSCAD.
- Perform HIL testing using RTDS to evaluate the impact of IBRs on various protection schemes.
- Assess test results and provide prototype solutions.

Benefits of HIL testing for protection scheme verification:

- Help eliminate protection problems before deployment.

PICTURED: Impact of IBRs on the protection system

Digital Substation Verification using RTDS HIL Testing

Customers: FPL, Dominion Energy, LUMA

Scope:
Conduct HIL testing of the IEC 61850 system along with the power system by simulating contingencies and communication equipment failures, such as failures of switches, clocks, merging units, or communication links.

Benefits of HIL testing for IEC 61850 verification:

- Analyze the efficiency, redundancy, and performance of the communication network.
- Train utility employees to understand system operations.
- Move most site acceptance test cases to factory acceptance tests through HIL testing.

PICTURED: HIL test setup for FP&L project

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