

## MSE-TETRAGENICS SUCCESSFULLY COMPLETES STATE OF CALIFORNIA EVALUATION PROJECT

**MSE**-Tetragenics and the State of California Department of Water Resources (DWR) recently completed a two week site acceptance test on our new VME RTU platform. Following an extensive test plan, we proved the functionality of the new VME G-Series Central Processing Unit (CPU) and software platform. Once completed, the tests showed that our equipment and software could provide a long-term cost savings solution to meet both DWR's immediate and evolving control operation needs for new and existing Remote Terminal Unit (RTU) installations. The RTU performance test is best summarized by a single comment from a tester: "It would take three separate devices to get the same functionality provided by the MSE-Tetragenics G-Series RTU." The MSE-Tetragenics system provides a protocol translator/data concentrator, sequence-of-events recorder, and a plant logic controller in one unit — a PLC-based system would require three devices.

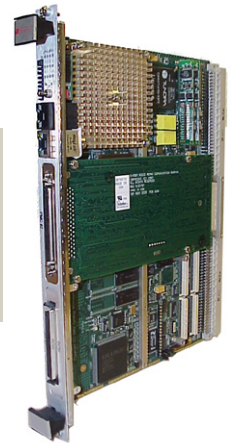
### Project Background

Since the late 1980s, MSE-Tetragenics RTUs have been in place along the California Aqueduct providing advanced monitoring and control capabilities as part of their overall control system. Since that time, technology advancements in both hardware and software have pushed some products out of production, giving way to new products that provide improved performance and enhancements. Because our RTUs—or as we sometimes call them advanced Programmable Logic Controllers (PLC)—are based on an industry standard VME architecture, we can continue to manufacture and support these RTUs indefinitely while keeping up with new technology advancements.

Over the past five years we have expanded our system

functionality and moved our proven VME CPU development to a new G-Series VME CPU board running a real-time Linux operating system. Our primary goal is to implement new features and protocol support without comprising existing functionality or forcing customers into a costly hardware replacement or

The G-Series CPU VMEbus Microprocessor upgrade provides a long-term savings solution for evolving control operations needs.



rewiring situation. Basing our RTUs on an industry standard VME-bus, we can provide new systems and upgrades to existing systems. This is contrary to most PLC systems, which are based on proprietary designs that require a complete replacement from the backplane to input/output modules and processor cards as well as new program development and wiring requirements as product lines get replaced.

For the DWR control system with more than 300 RTUs in service, long-term support, advanced system functionality, and minimal labor requirements became key elements in our latest VME-based G-Series RTU. The culmination of our research and development is the new G-Series-based RTU using a proven VME CPU board and the updated MSE-Tetragenics Software Database

Editing (SDE) package. The SDE software training and CPU testing was important to DWR personnel so they could work easily with the RTUs and have a cost-effective upgrade path. The MSE-Tetragenics RTUs have provided DWR with

“It would take three separate devices to get the same functionality provided by the MSE-Tetragenics G-Series RTU.”

... Continued on the inside...

### Issue

- Successful DWR Site Test
- G-Series Successes
- MSE's UL-Listed Panel Shop

### TETRAVIEWS

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## DWR Update

To further validate the new G-Series RTU platform, DWR personnel upgraded an existing RTU and have been field testing the new system.

On October 18, the system went live for a 30 day trial.

more than 17 years of continued operation and reliability. And we are providing a cost-effective upgrade path for future RTU support. In 2006, we accepted a contract to evaluate the new G-Series RTU platform and complete both training and testing on the new system. **By upgrading to the G-Series RTU instead of replacing existing RTUs, DWR can save millions of dollars.**

Following a one-week training session held at the DWR facility in Sacramento in June, we successfully completed a two week site acceptance test in September. Rich Clark and Chad Carpenter from MSE-Tetragenics conducted the site acceptance test with five personnel from DWR and a third-party engineering consultant group hired by DWR to verify the results. The completed test verified the following items that are not only part of the current system but may be required for future control needs.

Test	Result
<b>Hardware Layout and Database Conversion – Plug and Play Solution</b>	With minimal effort we installed the new VME CPU in an existing RTU enclosure, converted an existing RTU database, and ran the system on the new platform. Demonstrated: A plug-and-play solution to keep the system in place for long-term support. The process streamlined the RTU components by eliminating the need for additional memory and serial expansion boards, and proved that existing wiring and programmed logic could be left intact with the conversion process.
<b>Standard RTU Interfaces – GUI, interfaces, New Http and COMM ports</b>	Demonstrated: As part of our core system we demonstrated the advanced interfaces that are standard in the RTU. These include the New WTV32 graphical user interface, the local and Ethernet printer interfaces, the HTTP server interface, and the ability to view and analyze data on the communication ports.
<b>Control Jurisdiction Feature</b>	Reaffirmed that this existing feature supported in the database can restrict and/or lockout control execution in the RTU based on a jurisdiction switch.
<b>RTU x3.28 Host and Slave protocol support (serial and New TCP/IP)</b>	The x3.28 protocol is used for RTU communications to the local HMI interfaces and FEP interfaces. MSE-Tetragenics developed this open protocol and it incorporates several features not available in other PLC protocols such as report by exception, event time stamping, control execution verification, and sequence of events reporting. The TCP/IP compatibility for this protocol is a new feature that allows communications over an Ethernet connection. Essentially, the communications system can be updated in stages without compromising connectivity to the RTUs during the transition away from serial communications.
<b>RTU Sequence of Events (SOE) with filtering option</b>	Reaffirmed that our RTU design allows digital events to interrupt the processor and provide millisecond time stamping of inputs. You can configure the database to automatically filter and/or store events to an SOE queue, and request them later for further analysis.
<b>RTU Timeset Functionality</b>	Reaffirmed that support for WWVB time synchronization is built into the RTU, which allows a common time to be applied to the overall system. Our system tracks the WWVB time status and allows a backup time source to be used if the WWVB status is failed.
<b>RTU Sequential Control Functionality</b>	For this functionality, we verified and tested existing sequential control scripts as part of the conversion. It was important to verify that labor was not required to create new logic as part of the conversion to the new system.
<b>RTU connectivity to Accusonic 7500 flow meters</b>	Verified the existing functionality to obtain data updates from the Accusonic 7500 flow meters. This ensured existing meters would be compatible with the new system.

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## New G-Series CPU Features

### New G-Series CPU Features

Popular features of the G-Series CPU VME System include the following:

- 400-50 MHz CPU speed, up to 512 MB high-speed on board SDRAM
- Internet/Intranet Ready – View your system from a standard web browser
- Ethernet Polling – communicates with remotes over the network
- Machine Interface (WTV32) – Monitor & control from up to 32 workstations

Visit our web site at [www.tetragenics.com](http://www.tetragenics.com) and download the datasheet for a complete list of features and advantages to the G-Series CPU.

# COMING IN 2008 - SOFTWARE VERSION 16

MSE-Tetragenics Software Version 16 is scheduled for release in the second quarter of 2008. Take a look at what you get with the new software incorporated in the G-Series VME System, MC3000 Master System, and System Database Editors (SDE):

- OPC compliance
- Screen updates with no system reboot
- Enhanced scripting (IEC 1131-3) via the sequential control editor
- Live updates and trends available from the web page
- A WTV32 HMI general "Notes" feature
- A WTV32 Control Tag "Notes" feature
- An external disk logger -- one common file for dual systems

Test	Result
<b>New</b> - RTU Peer-to-Peer protocol support	For instances where RTUs need to exchange data directly, we verified a new peer-to-peer protocol (developed by MSE-Tetragenics) for the new system and tested it over an Ethernet connection.
<b>New</b> - RTU DNP 3.0 Host and Slave Protocol support (serial and TCP/IP)	A standard protocol available in the new system is DNP 3.0 protocol that can be used for RTU communications. During the site acceptance, we configured and tested several layouts to show the new system will meet any future DNP 3.0 protocol requirements.
<b>New</b> - RTU MODBUS Host and Slave protocol support (serial and TCP/IP)	Verified added functionality in the new system including RTU MODBUS protocol support for data communications to plant HMIs and third-party metering equipment. During the site acceptance test, several layouts were configured and tested to show the new system will meet any future MODBUS protocol requirements.
RTU connectivity to Schweitzer (SEL) relays via DNP protocol	Demonstrated that the new system can poll multiple SEL relaying equipment for plant control and monitoring. The test focused on using DNP 3.0 protocol to obtain real time data from the SEL equipment.
<b>New</b> - RTU connectivity to Plant HMI workstations via x3.28 TCP/IP protocol	Successfully tested and verified that the new system can talk via Ethernet using x3.28 TCP/IP to the existing HMI platforms without any further development or database modifications. This is an additional benefit of the new system that was overlooked until we performed the site acceptance test. Currently, DWR has implemented local HMI workstations in each plant for local control and data logging purposes. A vast amount of labor has been spent developing and testing the HMI database and operator interfaces. The HMI currently uses a serial x3.28 protocol connection to the RTU to get real-time data updates, SOE data, and perform plant controls. Future plant communications will more than likely move from serial connections to Ethernet network connections.

## G-Series VME CPU Upgrades

The G-Series upgrades are cost-effective and popular. We have upgraded several systems this year. Our customers are excited with the new upgrades. They are fast, require little new hardware, and provide big benefits (see features). Most upgrades require only an additional CPU and serial card. All existing input/output hardware and wiring remains in place. This translates into considerable cost savings. Here are just a couple of the G-Series upgrades:

USACE Laurel River Hydroelectric Plant/ Wolf Creek MC3000	Lewis County PUD, Cowlitz Falls Hydroelectric Plant	PPL-Montana Hydroelectric Plants
2006/2007, we upgraded the Laurel River plant control system to the G-Series CPU. We also upgraded the Master at Wolf Creek to allow Ethernet satellite communications. The original MSE-Tetragenics control system was installed in these Kentucky plants in 1999/2000.	In 1994, we installed the Cowlitz Falls Plant Control System shortly after construction of the plant located in Randle, WA.  In 2006, we upgraded the system to the G-Series CPU.	PPL-Montana operates several hydroelectric plants in Montana using MSE-Tetragenics control and automation systems. In 2006-2007 we upgraded two systems to the G-Series CPU: Holter Dam, located on the Missouri River near Helena, and Kerr Dam located on the Flathead River near Polson.

## Next Issue

System Upgrade to U.S. Army Corp of Engineers Wolf Creek/Laurel River systems

We upgraded the plant control system and MC3000 Master to enable faster Ethernet satellite communications.

## Did You Know? MSE IS A UL® INDUSTRIAL CONTROL PANEL SHOP

MSE is a UL 508A Industrial Control Panel Shop, manufacturing custom control panels used in a variety of applications. MSE is certified with an Underwriters Laboratories UL508A certification in the United States, and a Canadian Underwriters Laboratory CUL for Industrial Control panels in Canada, as shown at [www.ul.com](http://www.ul.com) (file: E229857 Industrial Control Panels - NITW, NITW7).

MSE's Industrial Control Panel Shop provides design, fabrication, wiring, implementation, and system commissioning. Panel applications include SCADA, pump/motor/process control, and security/remote monitoring.

MSE's staff is composed of UL-trained and Instrument Society of America (ISA) Certified Technicians and Engineers, skilled in providing

customized solutions for industrial panels, engineered to meet specific needs and often include remote telemetry transmission. ISA drawings including Piping & Instrument Diagrams, Process Flow Diagrams, Instrumentation Loop Diagrams, and Control Elementaries are professionally provided.

In addition to building the panels, we program PLCs and develop HMI's. We have expertise using products from National Instruments, Allen Bradley, Modicon, GE, and Wonderware.

Recent customers who have used our panel or programming resources include Sinclair Oil, Watervliet Arsenal, Town of Big Sandy, Butte Water, PPL Montana, City of Culbertson, REC/ASIMI, Fort Bragg, and Rochester Gas and Electric.

### Teamwork . . . why it works

Every process and system, no matter how well designed, is dependent upon human communication for success. No process or system can succeed when knowledge and communication are seriously flawed.

... Helen M. Grady and Marjorie T. Davis, Mercer University School of Engineering

**One test equals 1,000 expert opinions** ... The History Channel

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