

SIEMENS

QUADLOG® The Safety PLC™





Certified Safety and Proven Reliability

The QUADLOG safety PLC provides cost-effective safety and availability along with seamless integration with the APACS+™ process control system. QUADLOG is a programmable electronic system (PES) for potentially dangerous applications, such as emergency shutdown, burner management, and fire and gas detection.

QUADLOG delivers a safer, more cost-effective solution than traditional programmable technologies. Unlike conventional PLCs, which require additional hardware and engineering for adequate protection, QUADLOG's built-in safety features provide pre-configured and pre-tested safety mechanisms that have all been independently certified. In fact,

QUADLOG's safety certification equals that of triple modular redundant (TMR) systems, but for less cost, lower complexity, and with greater system reliability.

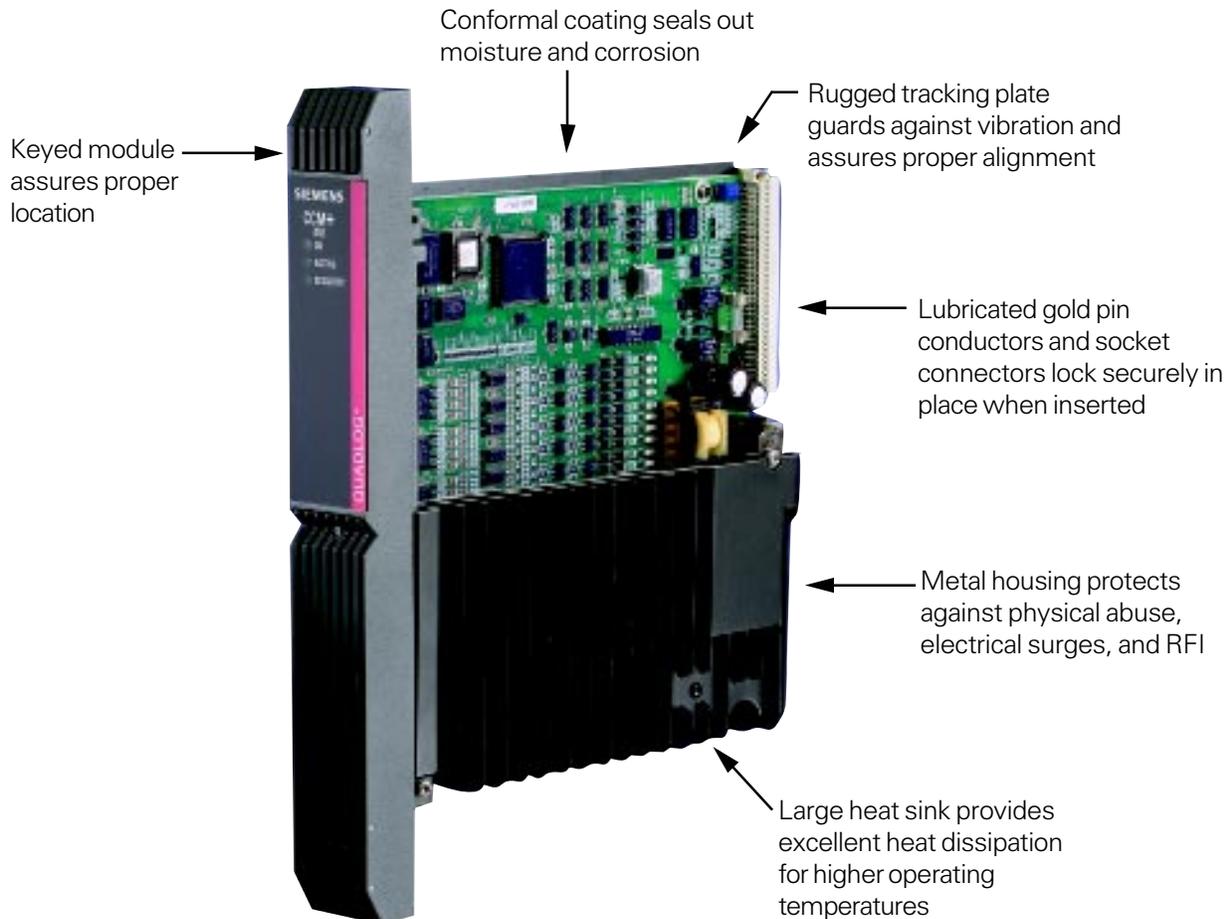
With its rugged hardware, extensive diagnostics, as well as other features, QUADLOG has been evaluated and certified by a variety of third-party organizations. QUADLOG carries the following approvals:

- ▶ TÜV approval to level AK6
- ▶ Approved to IEC 61508 SIL 3
- ▶ CE mark

- ▶ FM approval for Class I, Div. 2 hazardous locations
- ▶ CSA approval for Class I, Div. 2 hazardous locations
- ▶ ABS type approval
- ▶ UL 508

The above approvals enable the QUADLOG safety PLC to meet rigorous industry standards and government regulations.

This unique, proven approach to safety and reliability has led many companies to choose QUADLOG for their critical process control applications. Contact your local sales office for the latest list of QUADLOG users.



QUADLOG (1oo1D) architecture for **SIL 2** (TÜV AK4)

The QUADLOG safety PLC provides a scalable system architecture to meet the needs of many critical applications while ensuring safety and availability. Consisting of a series of plug-in modules, QUADLOG allows functionality to be modularized to reduce initial costs while supporting easy expansion in the future.

Every QUADLOG system comes equipped with a number of fault tolerant and fault avoidance features.

The QUADLOG 1oo1D system is approved to IEC 61508 SIL 2 (Safety Integrity Level) and TÜV's AK level 4. This architecture provides a simple architecture with comprehensive self-tests including a secondary shutdown path controlled by diagnostics. This architecture also incorporates dual circuit paths

with Protected Outputs to provide a safer solution than a traditional PLC architecture, which includes only a single circuit path.

A solid state switch provides the normal controller output. A relay, controlled by built-in diagnostics, supplies the second switch. If a dangerous failure is detected within the output channel, the relay can be automatically de-energized to ensure a safe system shutdown.

The 1oo1D QUADLOG architecture features redundant power supplies and redundant communication busses for high availability, diagnostics coverage of better than 99.5%. It can be expanded to include redundant control modules to provide a low-cost option for improving the system availability.

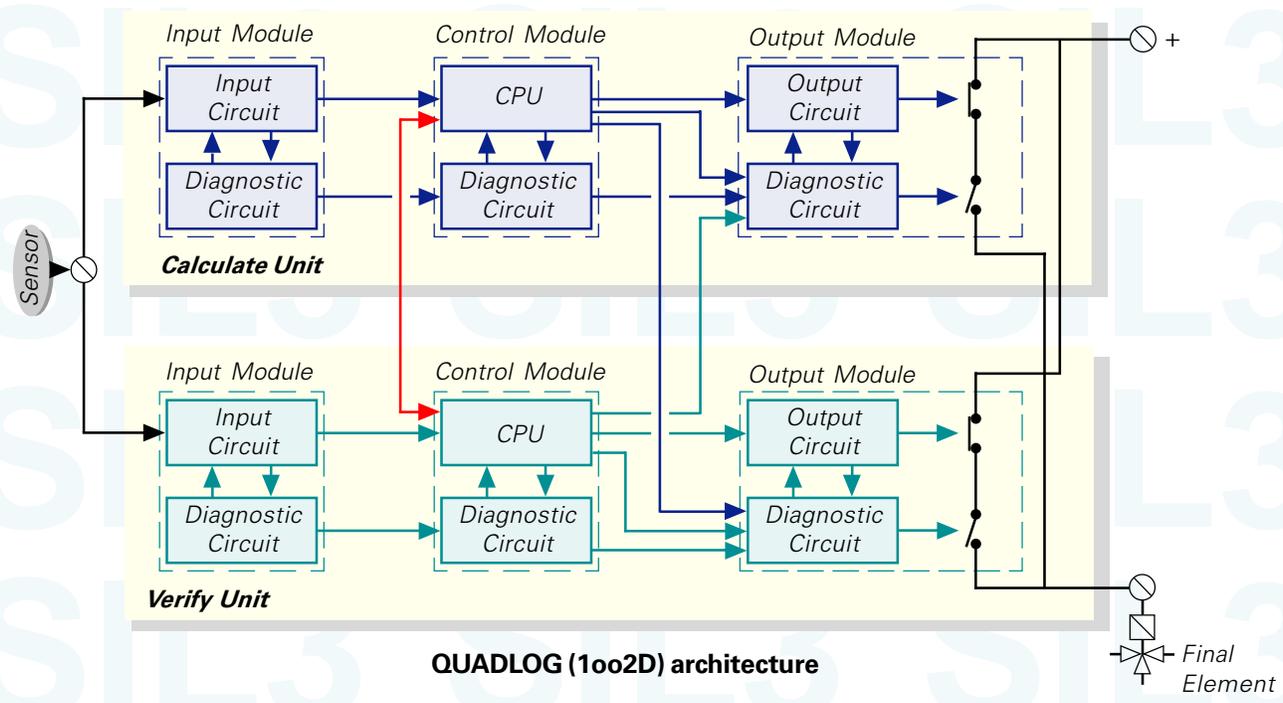
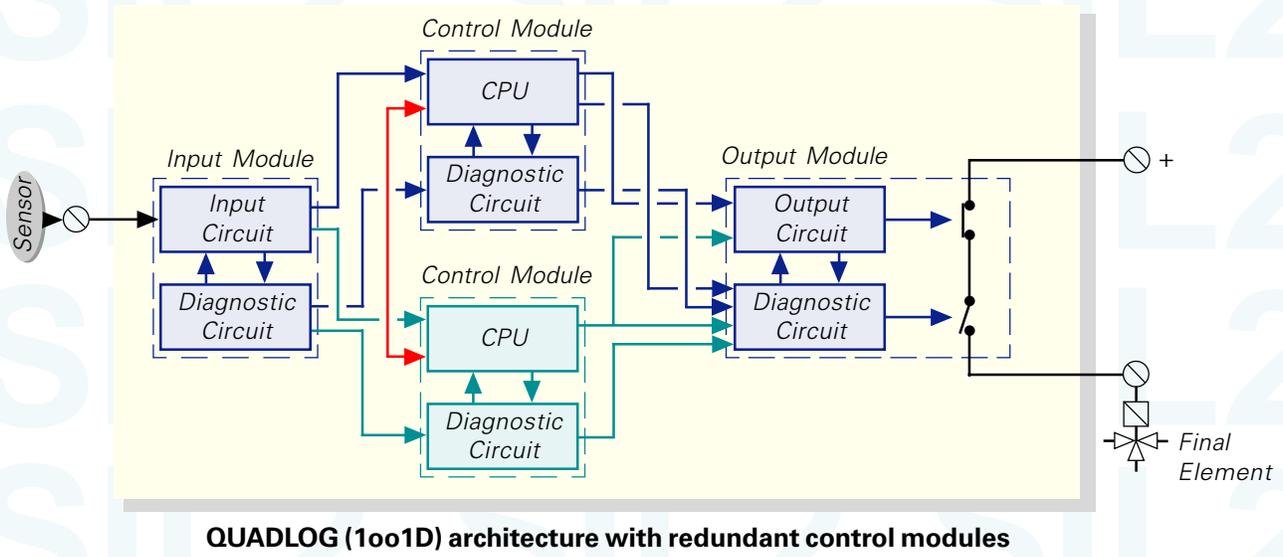
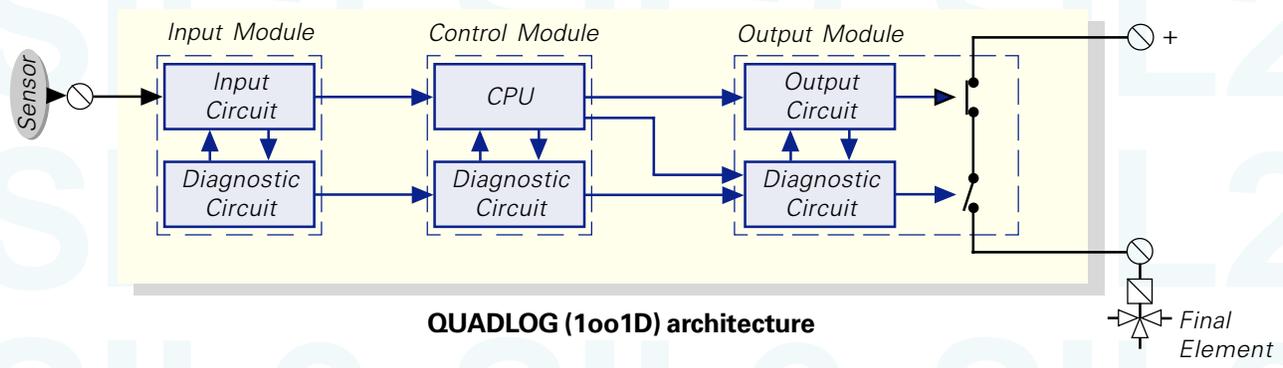
QUADLOG (1oo2D) architecture for **SIL 3** (TÜV AK6)

The QUADLOG 1oo2D architecture is approved for SIL 3 and TÜV AK level 6, and provides the highest level of safety and availability. The 1oo2D architecture provides the same basic features as the 1oo1D architecture plus fully redundant control and I/O modules. The 1oo2D refers to a dual architecture with comprehensive self-tests plus a secondary shut-down path controlled by diagnostics. This architecture provides the safety and availability equivalent to triple modular redundant (TMR) technology for less cost and reduced complexity.

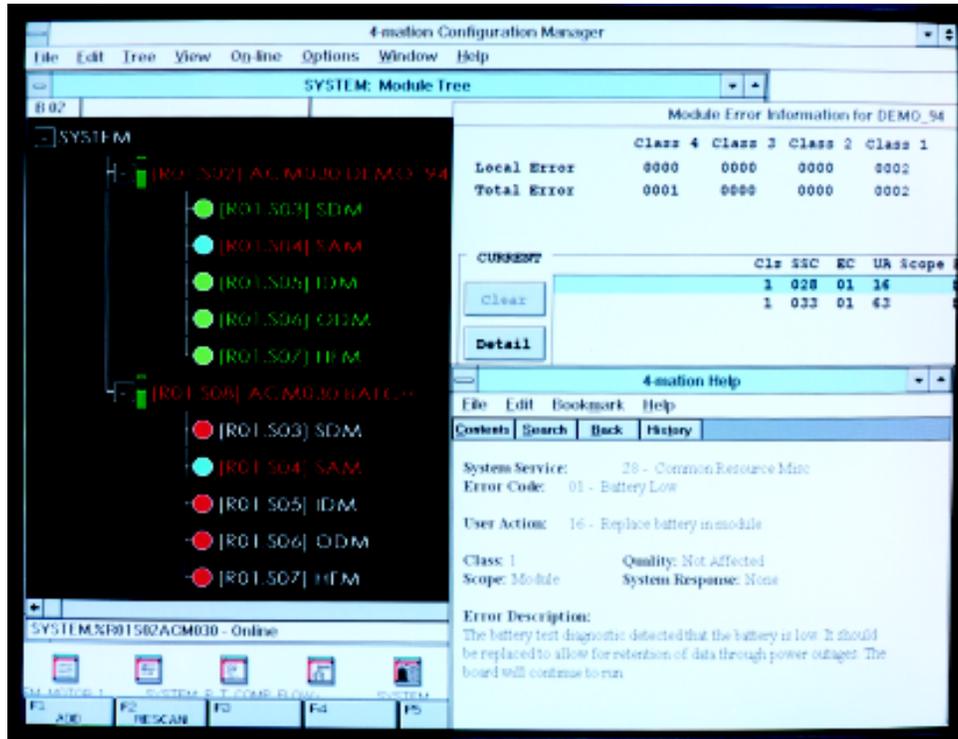
This architecture reduces the amount of hardware, typically required with

TMR systems, while providing a parallel combination of Protected Outputs. Should the on-line diagnostics detect a failure in one side of the system (input/processor/output), the other side maintains control and the system remains available.

This architecture also features high common cause strength. Unlike most other safety systems, QUADLOG's 1oo2D architecture can be mounted in separate chassis in separate cabinets, minimizing the system's exposure to common stresses, such as cabinet temperature or other physical damage.



Sophisticated Diagnostics



QUADLOG's sophisticated built-in diagnostics have been independently tested and certified to ensure safety, high availability, and faster start-up with better than 99.5% diagnostic coverage.

Certified safety

To achieve high ratings for use in safety-critical applications, a system must detect and alarm, any internal operational fault that could hinder the system's ability to bring the plant to a safe state. QUADLOG is fully capable of detecting all such faults, even in the non-redundant 1oo1D architecture.

High availability

Availability depends on the system's ability to detect minor problems early and facilitate a quick, accurate response to prevent larger problems

from ever occurring. QUADLOG pinpoints problems in seconds.

Diagnostics are detected, time and date stamped, and stored at the point of detection (control and I/O module). QUADLOG also appends the quality of an input or output to the I/O variable. If a diagnostic affects the validity of a system input or output, the variable's quality is flagged with bad, questionable, or unavailable quality for high visibility and easy troubleshooting.

I/O module diagnostic information is transferred to the associated control module and combined with the control module's self-diagnostics. The control module also maintains a list of active and historical diagnostics.

This diagnostic data is addressable, making it accessible to a variety of

clients. For example, QUADLOG's configuration and operator interface software includes features for interrogating and annunciating system diagnostics, and the Diagnostic Logger Utility consolidates system diagnostic data. A third-party device, such as another vendor's process control system, can easily interrogate all QUADLOG diagnostics through a serial data connection or OPC Client/Server Station.

Faster start-up

QUADLOG's extensive diagnostics expedite installation and commissioning a new system. By providing diagnostic tests for external field wiring faults and internal system hardware and software faults, the system assists with wiring check-out automatically. I/O modules test for a variety of field wiring faults.

Unmatched Reliability

In addition to the higher safety achieved through the extensive self-diagnostics, QUADLOG also outpaces conventional PLCs and TMR systems in reliability and availability. This is possible through a methodical approach to designing in features for superior strength against harsh industrial conditions.

The table to the right shows some of QUADLOG's protective features. These features were built into the product from the start and have been verified with extensive testing by both the R&D team and independent laboratories.

Stressor	Protection
Heat	<ul style="list-style-type: none"> ▶ Cast aluminum housing covering each module serves as a heat sink for all major heat-producing components ▶ Testing, for most safety critical modules, beyond the rated 70°C limit to ensure a good safety margin, with control modules operating at 100°C and beyond
Humidity and chemicals	<ul style="list-style-type: none"> ▶ Standard conformal coating of all electronic assemblies ▶ Connectors using gold-plated contacts coated with an anti-fetting "contact lubricant" for gas-tight contact between connections
Shock and vibration	<ul style="list-style-type: none"> ▶ Screw-in mounting to the module card cage ▶ Cable assemblies and connectors with screw-in and clamp-type security ▶ Independent laboratory testing to IEC, MIL, ABS, and TÜV standards
Electrical surge/ electrostatic discharge	<ul style="list-style-type: none"> ▶ Process I/O electrically isolated from the system common ▶ Process I/O and power circuits with surge suppressors, protection resistors, and other "hardening" circuitry ▶ Independent laboratory testing to ANSI/IEEE, IEC, and TÜV standards
Electromagnetic interference	<ul style="list-style-type: none"> ▶ Circuitry and packaging to shield sensitive components from electrical noise ▶ Independent laboratory testing to IEC and TÜV immunity and emissions standards
Explosive atmospheres	<ul style="list-style-type: none"> ▶ Most modules meet CSA and FM approval as non-incendive electrical atmospheres equipment for use in Class I, Division 2 hazardous locations
Operational and maintenance errors	<ul style="list-style-type: none"> ▶ Module insertion and removal from the card cage without removing power from the card ▶ Each module keyed so modules can only be inserted in the correct card cage slot ▶ Keyed cable connectors ▶ Elimination of setup jumpers and DIP switches ▶ Digital self-calibration of analog I/O ▶ Multiple levels of security to prevent unauthorized software changes ▶ Software version stored in non-volatile RAM of all modules ▶ Date/time stamping of individual configuration changes

Powerful Engineering Tools

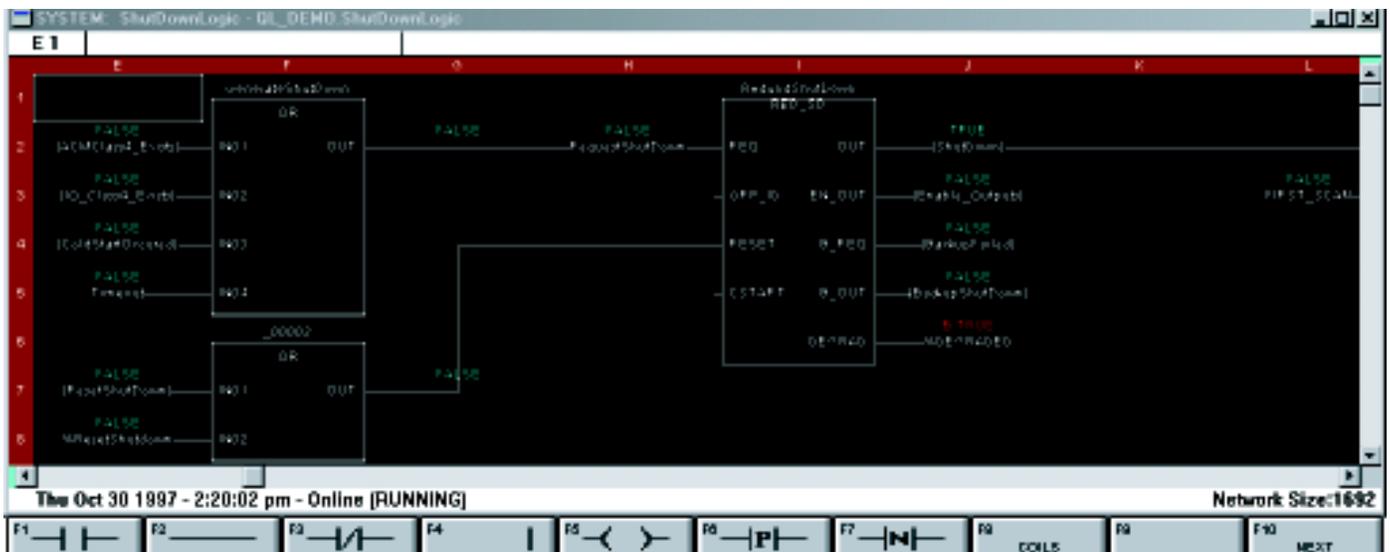
Traditional safety systems provide separate software for system configuration, operation, and data storage. QUADLOG offers a bundled Windows NT®-based process automation package to reduce the cost and complexity of your project.

Configuration software

QUADLOG is configured for your application using APACS+ 4-mation™ Configuration software. Based on the IEC 61131-3 standard for configuring programmable controllers, 4-mation allows you to use any mix of ladder logic, function blocks, sequential function charts, and structured text within a single control module's database.

Other 4-mation features include:

- ▶ Compilation-free configuration, providing instant syntax validation for fewer mistakes and less rework
- ▶ Version management and a compare utility to simplify management of change
- ▶ Security features such as an administrative password and access controls, as well as operator passwords and a physical security switch
- ▶ Forced I/O list and flags to prevent accidentally leaving I/O in a forced state
- ▶ On-line mode to simplify troubleshooting during commissioning
- ▶ Tag-based addressing scheme that associates controller hardware and process equipment, simplifying troubleshooting and maintenance
- ▶ Storage of entire graphical configuration, tag names, and comments in the controller's memory, which guarantees the accuracy of configuration drawings
- ▶ Ability to configure both QUADLOG and the APACS+ process automation system's Advanced Controller using the same tools, which substantially reduces the learning curve
- ▶ Online diagnostic reporting and logging built-in for fast, straightforward troubleshooting



Safety matrix

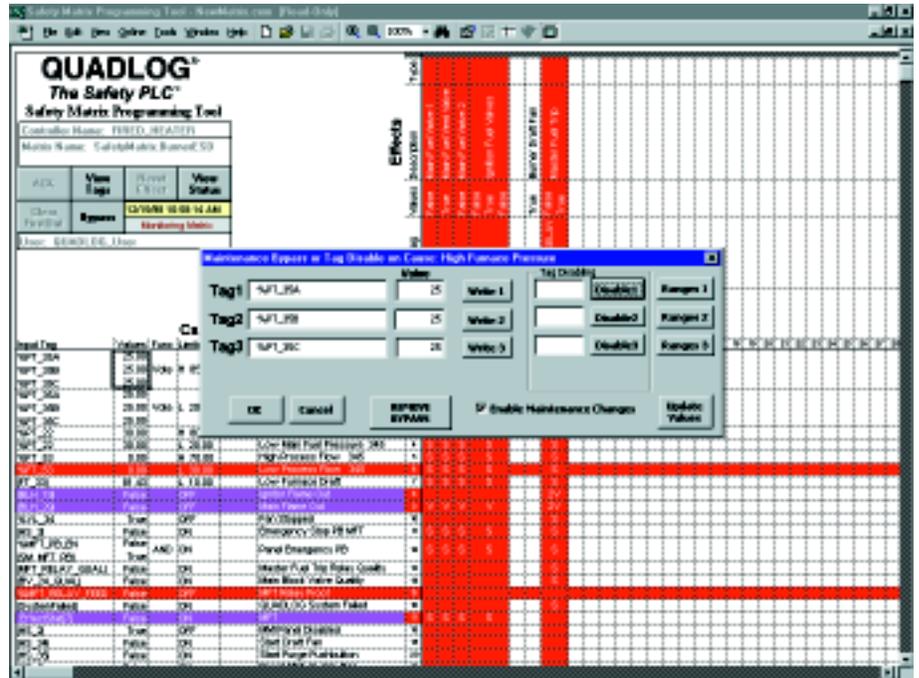
Cause and effect matrices allow you to describe and document a safety strategy, systematically identifying process events and possible effects. QUADLOG offers the Cause and Effect Matrix Toolkit for 4-mation for graphically configuring a cause and effect matrix that runs in QUADLOG. This toolkit also serves as a validation tool to test the resultant design. During operation, the toolkit provides online monitoring and secured maintenance bypass capability.

Thus, the toolkit:

- ▶ Provides clear documentation to facilitate better review
- ▶ Simplifies documentation tracking
- ▶ Reduces the development effort by eliminating the translation errors associated with converting the matrix to logic
- ▶ Facilitates documentation maintenance by requiring a documentation change to change logic

Control simulator

The APACS+ Control Simulator supports testing, simulation, and training for a QUADLOG configuration without the need for any QUADLOG hardware. Providing these comprehensive capabilities without the need for any external connections accelerates system configuration development and testing, and reduces training expenses.



Operator interface

QUADLOG's open architecture supports a wide variety of operator interfaces. It also offers the ProcessSuite® Vision operator interface. ProcessSuite Vision allows you to easily create and animate real-time graphical representations of your process and its safeguards within Windows NT.

ProcessSuite Vision includes many features to accelerate startup. These features provide a complete, secure, expandable shell for your user interface. For example, ProcessSuite automatically generates the operator interface point database from a QUADLOG database.

Sequence of events recording

QUADLOG offers preconfigured high-speed sequence of events recording (SOER) for capturing a process event that causes a shutdown and the events surrounding the shutdown to help diagnose the cause. For high-resolution recording needs, QUADLOG provides an unprecedented resolution of 3 ms, which is independent of the controller scan rate. Events from both QUADLOG and the APACS+ process automation system's Advanced Controller can be viewed in the Windows NT-based SOER Viewer.

Seamless Integration with Process Control Systems

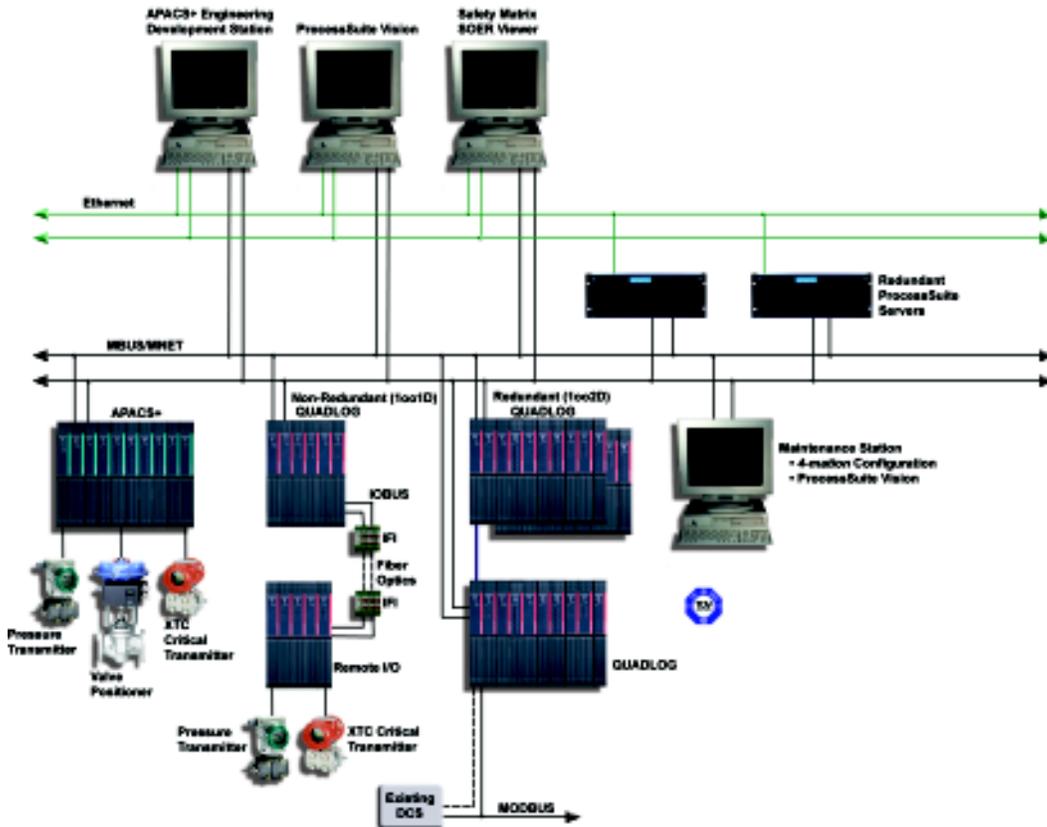
Corporate standards, industry standards, and regulations call for independence, diversity, and separation between the safety instrumented system (SIS) and the basic process control system (BPCS). However, a well integrated automation system requires effective communication between the SIS and BPCS.

QUADLOG integrates seamlessly into Siemens Energy & Automation's APACS+ and PCS 7 process automation systems.

QUADLOG operates independently of but on the same network as the APACS+ Advanced Controller. This allows efficient data exchange, a common operator interface, and common configuration to reduce training requirements and avoid confusion during on-line operation.

QUADLOG also communicates easily with a variety of other control systems. Extensive support of industry standards, such as OPC, Modbus and DDE, and the availa-

bility of application programming interfaces further facilitate communication with other devices and plant-specific applications. For any of these situations, however, QUADLOG offers communication protection through the ability to identify variables not to be overwritten by any type of external communications.



APACS+ Process Automation System

Comprehensive Services



QUADLOG comes with what has been voted in several third-party studies to be the best customer service for integrated control systems. This service starts at the very beginning of a project and continues through the life of your system.

When you are ready to get your project underway, you can choose from a variety of sources and services. You can take advantage of expertise from a Siemens engineering services team, an approved QUADLOG system integrator, a third-party engineering firm, or a combination of these groups. This allows you to tap into the knowledge base and geographical proximity most in line with your needs.

Siemens can share its experience applying safety systems by helping you design an ISA S84/IEC 61508-compliant safety system. Siemens' engineering services team can also provide:

- ▶ Project management and administration
- ▶ Control strategy design
- ▶ SIL verification
- ▶ Site planning
- ▶ System configuration
- ▶ Factory acceptance testing
- ▶ System installation and startup guidance, including pre-startup safety review



To prepare your staff for their upcoming responsibilities, you can choose from standard QUADLOG training programs designed for management, engineers, maintenance personnel, and operators. A program can also be customized according to your needs. Standard and custom programs can be held at a Siemens location or at your site.

Siemens also offers comprehensive technical and field services that are tailored to your needs while minimizing costs. Siemens accomplishes this through bundled service packages called ServiceSuites. Available ServiceSuites include:

- ▶ Foundation ServiceSuite, which is included with QUADLOG for customers with an in-house support staff
- ▶ Enhanced ServiceSuite, which adds services such as product updates and maintenance to maximize long-term return on your investment
- ▶ Strategic ServiceSuite, which facilitates maximum system reliability and availability with the Enhanced ServiceSuite's features plus services such as spare parts support and access to an emergency hotline
- ▶ Corporate ServiceSuite, which covers multiple sites

SIEMENS

For prompt, personal attention to your instrumentation and control needs, contact the Siemens location nearest you.



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