Belden

Control systems optimization and protocol compatibility

Application Brief

Resilient control networks for cooling and power systems supporting AI infrastructure

Eliminate thermal failure risks in AI data centers

AI workloads generate 10 (or more) times more heat than traditional data center equipment, with electrical loads in a lock-step growth trajectory. In this high-stakes environment, systems failures are catastrophic; our control networks must provide unquestionable integrity. A communication breakdown between the subsystems can trigger equipment damage, system errors, data loss or a facility shutdown within minutes.

The controls layer challenge

The controls layer —the critical infrastructure layer between white space production and building support systems—is where thermal management happens. Traditional approaches struggle to coordinate cooling control across major automation platforms. Without protocol compatibility and systems optimization, even minor communication issues like broadcast storms can escalate into runaway conditions that damage expensive AI hardware.

Belden's control systems optimization and protocol compatibility solution focuses on:

Deterministic behavior

Predictable results with real-time control ensure thermal stability across dynamic AI workloads.

Protocol resilience

MRP and RSTP protocols with <300ms recovery times prevent single points of failure.

Vendor compatibility

Works across multi-vendor environments, protecting existing control system investments.

Multiple redundancy rings

Diverse network paths with independent rings provide exceptional fault tolerance.

Comprehensive cooling control across all infrastructure layers

Belden's PLC-compatible solution delivers intelligent thermal management in facilities infrastructure through standardized control platforms, modular panel designs, and protocol compatibility across major automation vendors.

Protocol compatibility and optimization

- MRP and RSTP support with <300ms recovery times*
- Ensures heat-rejection subsystems communicate effectively
- Custom firmware configurations and field-switchable settings adapt to specific vendor requirements

Standardized control platforms

- Repeatable deployment at scale reduces training needs
- Predictable performance regardless of automation vendor

Modular industrial patch panels

- Panels ship fully configured and verified
- Building block configurations accelerate deployment

Vendor-agnostic compatibility

- Works with every major PLC systems provider
- Third-party validation labs ensure multi-platform reliability

*Specific outcomes vary by facility

Data center efficiency imperative

>80 GW AI data center-induced power demand by 2030 in US data centers[1]

170% Growth, fueled by demand in AI-powered services[2]

39% Surveyed, report current cooling solutions don't meet operational needs[3]

10-30X More energy generated with generative AI workloads[4]

1. Server Technology Blog, Dec 17, 2025;
2. Data Center Dynamics, January 02, 2026;
3. AFCOM 2026 Study;
4. American Action Forum, July 15, 2025

Belden's control solution delivers:*

- Zero points of failure through redundant communication architecture
- Sub-300ms recovery times that prevent thermal runaway conditions
- 25% reduction in commissioning time through pre-configured modular panels
- Multi-vendor compatibility that protects existing control system investments

*Specific outcomes vary by facility

How it works

Resilient network architecture

Media Redundancy Protocol (MRP) and Rapid Spanning Tree Protocol (RSTP) maintain robust systems that avoid single points of failure. Recovery times under 300ms prevent communication breakdowns that lead to thermal runaway conditions in high-density AI environments.

Standardized deployment approach

Modular panel designs ship fully configured and tested, reducing on-site commissioning time by 25%. Loop prevention and standardized configuration ensure repeatable deployment while maintaining flexibility for site-specific requirements and vendor preferences.

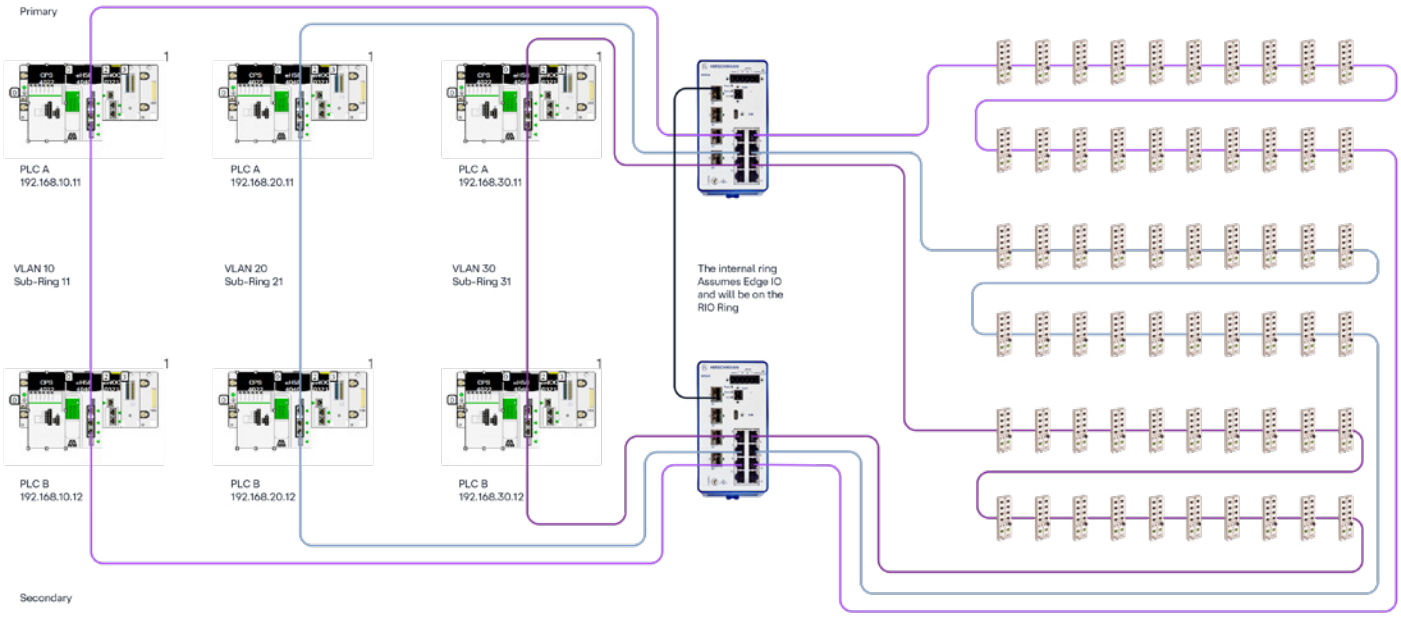
Independent validation and testing

Third-party development labs provide validation for integrated multi-platform and multi-vendor solutions. This independent testing proves reliability across control system vendors and ensures optimal performance in mission-critical cooling applications.

Proven in demanding environments

- AI and HPC facilities: Manages extreme thermal loads from GPU clusters and accelerated computing infrastructure
- Cloud and hyperscale operators: Ensures uptime for mission-critical operations where cooling failures mean revenue loss
- Multi-vendor data centers: Protects investments in existing automation systems while enabling standardized thermal management

Representative control network architecture



BOM per application

QTY	Description
2	BRS30's Layer 2 Switch with UL Approval
80	Up to 80 Lumberg
**	Lumberg M12 L-Coded Power Cables
**	Lumberg M12 D-Coded Ethernet Cables
**	Lumberg M12 A-Coded for IO-Link & I/O

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Connect to what's possible.

Application Brief

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Belden Inc. delivers complete connection solutions that unlock untold possibilities for our customers, their customers and the world. We advance ideas and technologies that enable a safer, smarter and more prosperous future. Throughout our 120+ year history we have evolved as a company, but our purpose remains – making connections. By connecting people, information and ideas, we make it possible. We are headquartered in St. Louis and have manufacturing capabilities in North America, Europe, Asia and Africa.

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Ready to eliminate thermal risk?

Schedule a validation lab demonstration to see protocol compatibility and systems optimization in action.

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