# Data Center Solutions

**BELDEN**
SENDING ALL THE RIGHT SIGNALS

**Solving Your
Data Center
Design Challenges**

**Belden® –**
Your Data Center Partner

Belden provides superior-performing, end-to-end cabling solutions to meet your present day – and future – data center needs.

Belden knows your data center is much more than a space that simply houses servers and network equipment. Fueled by e-commerce and the IP world we live in today, the data center has become the most critical asset – and investment – for nearly every organization. It is truly the operations center of your business: housing all the mission-critical applications, equipment and systems you need to enable every transaction, communication and task; providing the links to customers, business partners and vendors around the world; and even controlling building environmental, security and life safety systems.

### The Challenges of Data Center Design

Faced with the now fundamental importance of the data center and the need to provide for ever-increasing applications, transmission speeds and data storage, businesses are experiencing a significant upsurge in the amount of equipment their data centers must support. Consequently, IT managers must design scalable data centers to support their future growth and potentially new technologies, while ensuring maximum **performance**, **density** and **manageability**. At the same time, the amount of power needed to run the data center is at an all time high, requiring sufficient cooling and energy efficient solutions.

And as if those challenges weren't enough, the new economics of IT has put budgets under increased scrutiny, requiring IT managers to ensure ROI and lowest total cost of ownership when selecting data center components.

## The Role of the Structured Cabling System

Within the data center, a variety of systems support, protect and manage both current and future equipment, the data transmitted, and the thousands of connections between servers and switches and the outlying areas of the network. These systems include storage, power distribution, cooling, cabling infrastructure, security and fire protection – and any design decision for one is likely to impact the others. All of these systems are interrelated and must be part of a unified structured cabling system. As the foundation of the data center, the structured cabling system should be designed considering the following:

- It should have the scalability necessary to outlast two to three generations of active equipment
- It should be flexible to facilitate reconfigurations
- It should be highly durable to ensure networking performance, reliability and availability.

Without a properly designed cabling infrastructure, the data center is in jeopardy. In fact, independent research indicates that while the cabling infrastructure only represents 2 to 5% of a typical IT budget, as much as 50% of network problems are related to an inadequate or underperforming cabling infrastructure.

## How Belden Meets Your Cabling System Needs

As your data center partner, Belden offers an in-depth knowledge of structured cabling, data center systems and the interaction between them. Belden understands your needs and the design challenges you are up against – and we have leveraged our decades-long expertise into the design of highly-flexible, end-to-end structured cabling systems that are unique in their ability to provide optimal system performance, while simultaneously solving your density and manageability issues – both now and in the future.

# Belden: Providing Data Center Performance, Density and Manageability...

# Without Compromise

## Belden® –
## We Understand Your Data Center Design Challenges

With beyond-standards performance and your high-density and cable management needs addressed, Belden can be your one-stop data center shop.

Regardless of your business or size, all data centers have similar needs, since their goal is the same: to provide secure and uninterrupted availability to computing, storage, networking and communications resources. Recent trends have further amplified the emphasis on data center uptime and cost savings, creating a greater need for **performance**, **density** and **manageability** than ever before. Belden Data Center Solutions seamlessly work together to meet all these needs.

- **Performance** – Every business today needs to support current and future bandwidth-intensive applications. With the beyond-standards performance guaranteed by Belden, IT managers have the flexibility to add capacity, reconfigure connections and bring new applications on line without sacrificing reliability and headroom.

- **Density** – The increasing number of applications and connections supported by the data center calls for cost-effective, high-density Belden solutions that are designed to offer scalability by yielding more rack, pathway and floor space for future build-outs and help reserve more premium cooling space.

- **Manageability** – Without manageability, disconnects, reconnects and cable rerouting can result in downtime, slower deployments, and lost revenue. Proper cabling management starts with Belden solutions that protect, store and organize cables and connections while facilitating installation.

Uninterrupted access to data center applications is essential for any business to maintain day-to-day operations, and IT managers everywhere are pushing to deliver "five 9s" availability. While individual components can meet standards and claim performance, density or manageability, they may not be capable of working together, which can ultimately leave gaps that impact data center uptime and cost of ownership.

Belden Data Center Solutions are comprised of a breadth of reliable end-to-end components that have been designed and engineered to exceed standards and cost-effectively work together as an integrated system that meets all data center needs…without compromise.

# Our Expertise Makes Us the Easy Choice

Belden is also proud to hold leadership roles on the following data center related industry standards committees and organizations while providing the quality products and support necessary to help make the IT professionals' job easier.

- **TIA–942** – In April 2005, TIA (Telecommunications Industry Association) introduced the TIA-942 Telecommunications Infrastructure Standard for Data Centers to address cabling infrastructure in the data center, including recognized cabling media type and maximum cabling distances. The standard also provides facility, space, management, reliability and power and cooling guidelines, including strategies like arranging equipment racks in hot and cold aisles to encourage airflow and reduce heat.

A key aspect of TIA-942 is the defining of specific functional areas within the data center to help determine the placement of cabling, components and equipment (based on the standard star topology defined by existing TIA standards for commercial spaces). The specific functional areas, their definitions per the standard and the typical Belden products found there are displayed on pages 6 and 7.



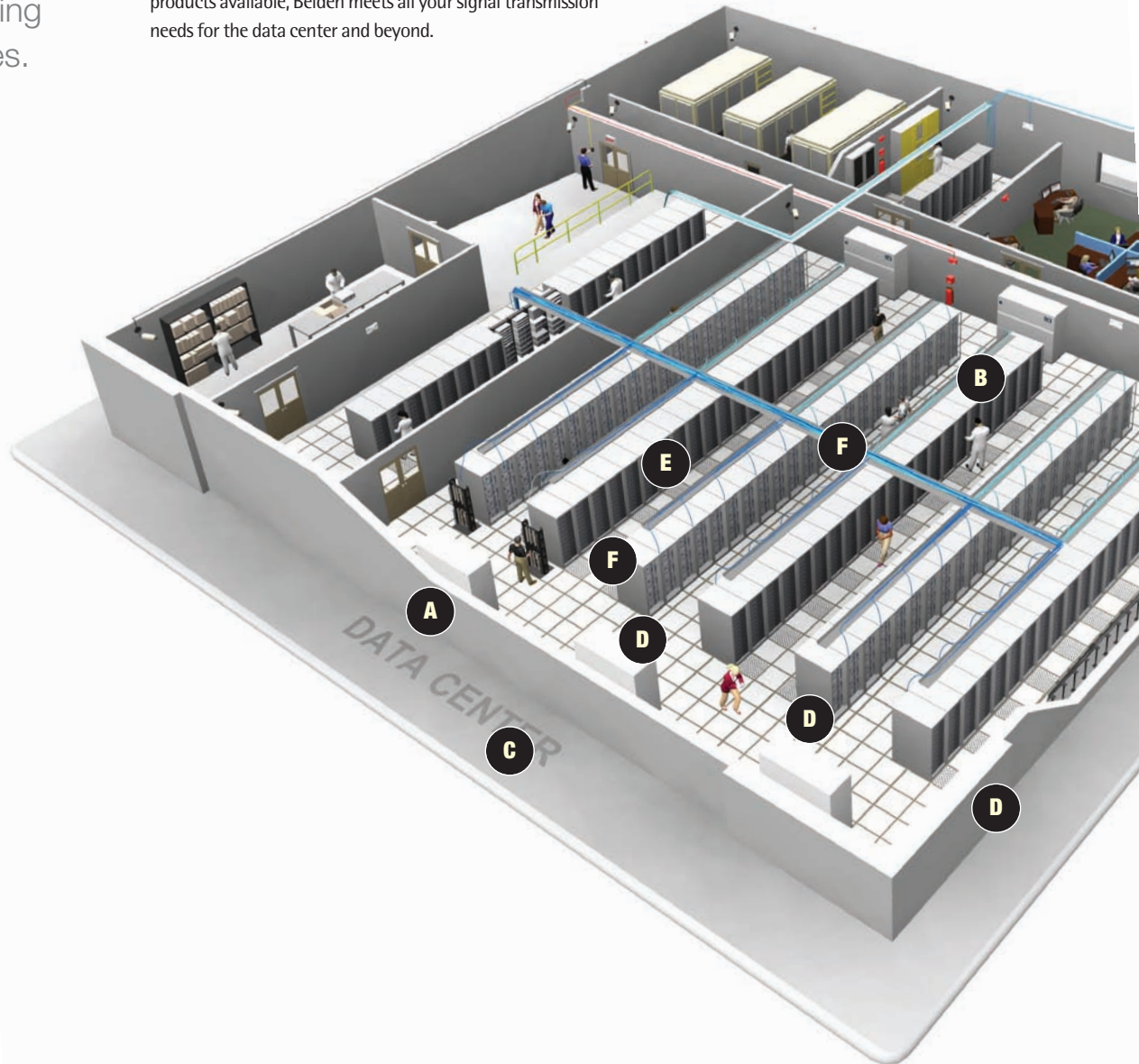Keeping up-to-date with data center standards is key to a leadership position within the industry.

- **10GBASE–T Short–Reach Mode –** The IEEE 802.3an standard for running 10 Gigabit Ethernet over copper includes an optional Short-Reach or Low-Power mode. Short-Reach Mode requires less power because the complexity of the digital signal processing (DSP) and the level of the transmit signal are reduced. Short Reach mode can be implemented over a channel of up to 30 meters and requires Augmented Category 6 or Class F cabling.

- **BICSI–002** – BICSI, in conjunction with the National Electrical Contractors Association (NECA), is developing a complementary standard to TIA-942, anticipated to be released in early 2008. The proposed ANSI-BICSI-002 Data Center Standard expands on the existing standard and its annexes to create a best practices document that addresses data center design and infrastructure in greater detail.

**Belden® –**
Solutions for the Data Center and Beyond

Belden solutions seamlessly integrate every space within the data center, while efficiently responding to future challenges.

From the demarc in the entrance room, to the cross connect, to the equipment rack, and all the cabling in between, Belden solutions for the data center are uniquely positioned to seamlessly integrate the data center's functional areas while cost-effectively responding to the latest trends and challenges. But Belden doesn't stop there.

Belden provides the optical fiber cable and connectivity for linking IT spaces, equipment, and facilities. We offer total copper and wireless networking solutions to deliver voice and data to the office, conference room or cafeteria. Our high-definition video and speaker cables deliver the best picture and sound in the auditorium. Belden's specialty cables for CCTV, access control, building automation and fire alarm systems ensure safety, security and comfort throughout any facility. With thousands of products available, Belden meets all your signal transmission needs for the data center and beyond.

**A** **Main Distribution Area (MDA) &
Horizontal Distribution Area (HDA)**

The MDA houses the main cross connect and the core routers and switches for the corporate LAN. The HDA houses cross connects and active equipment (switches) for connecting to the equipment distribution area and storage area network (SAN). Per the TIA-942 standard, both the MDA and HDA require separate racks for fiber, UTP and coax cable. Several Belden products provide maximum performance, density and management in the MDA and HDA, including:

- 10GX® Patch Panels and Cords
- GigaFlex Cat 6+ Patch Panels and Cords
- Fiber*Express*® Manager Modules and Patch Cords
- Optimax® Connectors
- Equipment Cable Harnesses
- High-density Racking System
- Enclosures

**B** **Entrance Room/
Telecommunications Room (TR)**

The entrance room of the data center is the location for access provider equipment, demarcation points and interface with other campus locations. The TIA-942 standard recommends locating the entrance room outside of the computer room for security purposes. Specific Belden products found in the entrance room include:

- Fiber*Express* Wall-mount and Rack-mount Patch Panels
- Fiber*Express* Manager
- Optimax Connectors
- GigaBIX and 110 XC IDC Systems
- 735 and 734 Series Coax Cable
- High-density Racking System
- Enclosures

Connected to the data center MDA through backbone cabling, TRs are spaces for housing equipment, cable terminations and cross connects that serve office areas on specific floors. In addition to voice, data, and wireless systems, TRs can house equipment for life safety/fire systems, security, and building automation systems. Belden offers a variety of products to support all of these systems within the TR:

- Belden Wireless LAN switch
- Belden PoE Midspan Hubs
- Belden IBDN® Patch Panels
- Fiber*Express* Patch Panels
- Enclosures
- 10GX and GigaBIX IDC Blocks
- High-density Racking System

**C** **Zone Distribution Area (ZDA)**

The optional ZDA acts as a consolidation point within the horizontal cabling run between the HDA and Equipment Distribution Area. Per the standard, the ZDA cannot contain any cross connects or active equipment. Belden products typically deployed in the ZDA include the following:

- 10GX Ultra High-density Patch Panels and Cords
- GigaFlex Cat 6+ Ultra High-density Patch Panels
- 10GX and GigaBIX IDC Systems
- 10GX IDC Distribution Frame System

**D** **Equipment Distribution Area (EDA)**

The EDA is where equipment cabinets and racks house the switches and servers and where the horizontal cabling from the HDA is terminated at patch panels. In the EDA, racks and cabinets should be arranged in a hot aisle/cold aisle configuration to encourage airflow and reduce heat. Belden offers a variety of products for the EDA, including our high-end freestanding enclosures that help provide airflow and cooling:

- Fiber*Express* Manager and Patch Cords
- Optimax Connectors
- 10GX Ultra High-density Patch Panels and Cords
- Cat 6+ Ultra High-density Patch Panels and Cords
- Server Enclosures

**E** **Storage Area Network (SAN)**

The SAN houses all data storage devices such as disk arrays, tape libraries and high-capacity optical disk libraries for applications like video surveillance. The use of a separate SAN eliminates the need to store data directly on servers, which provides better network capacity. Access to stored data must be fast, requiring high-speed connections from the HDA. Belden products for the SAN include:

- Fiber*Express* Manager with Patch Cords
- Fiber*Express* Multi-fiber Cable Assemblies
- Fiber*Express* Pre-terminated MPO Cable Assemblies and Fiber*Express* Bar
- High-density Racking System
- Enclosures

**F** **Backbone Cabling & Horizontal Cabling**

The backbone cabling within the data center provides the critical connections between the entrance room, MDA and HDA. The backbone cabling in many of today's data centers supports 10 Gigabit transmission speeds for current and future applications. The horizontal cabling within the data center provides the connection between the HDA and EDA and SAN, including the optional ZDA. Belden products for the backbone and horizontal cabling include:

- 10 Gigabit 850 nm Laser-optimized 50/125μm multimode Fiber*Express* Cables FX2000
- 10 Gigabit 4-pair UTP Belden 10GX Cable
- Belden IBDN Category 6 Cable
- Fiber*Express* MPO Cables

**G** **Support Offices and Open Areas**

Whether it's cubicles, conference rooms, hallways or cafeterias, there are many areas throughout a facility or campus where people conduct day-to-day activities. From wired and wireless voice and data systems to fire alarm and security surveillance, Belden offers a variety of products that deliver these systems to where it matters most.

- MediaFlex Outlets
- Belden IBDN Cable
- Wireless Access Points
- PoE Range Extenders
- Surveillance (CCTV) Camera Cable
- Door Access (Access Control) Cable
- Low Smoke, Zero Halogen Cable
- 2-hour EVAC Systems Cable

## Belden® –
### Copper Systems You Can Depend On

Belden has earned a reputation as an expert solutions provider precisely because our customers are now, and have always been, our #1 priority. Nearly every product we make is the result of our continued involvement in industry associations, on-going conversations with our customers, and a commitment to providing innovation.
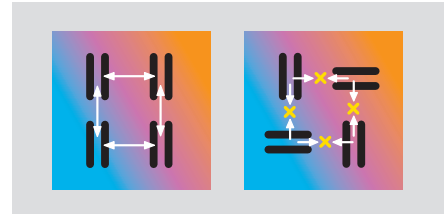
As evidence, we offer a broad selection of products designed to work together to maintain data center uptime with lower total cost of ownership. Moving forward, Belden will continue to introduce new innovations that complement the following data center solutions.

Belden's 10GX Solutions rely on innovative enabling technologies to ensure outstanding 10 Gigabit performance, while also offering an unmatched level of high-density and cable management products.

### Topping the Industry: Belden IBDN Copper Systems

**Belden System 10GX®** – Within the data center, cabling connecting switches and routers to servers and SANs require both high-density connections and high-speed transmission. The Belden IBDN System 10GX accommodates these requirements and is comprised of 10GX Cables, Patch Panels, Modular Cords and Modules. Each of these components is developed around the following series of dynamic enabling technologies that offer dramatically improved performance, density and management for the data center.

- MatriX IDC technology positions each IDC at a right angle to its neighboring IDC to cancel out Alien Crosstalk, resulting in a 15dB reduction in ANEXT over traditional technologies and supporting stable high performance in high-density environments where connectors are placed close together.

- X–Bar Technology uses a plastic device that positions pairs at a right angle during termination, allowing the 10GX IDC Connecting Block to have Installable Performance® – or performance similar to that measured in a laboratory environment.
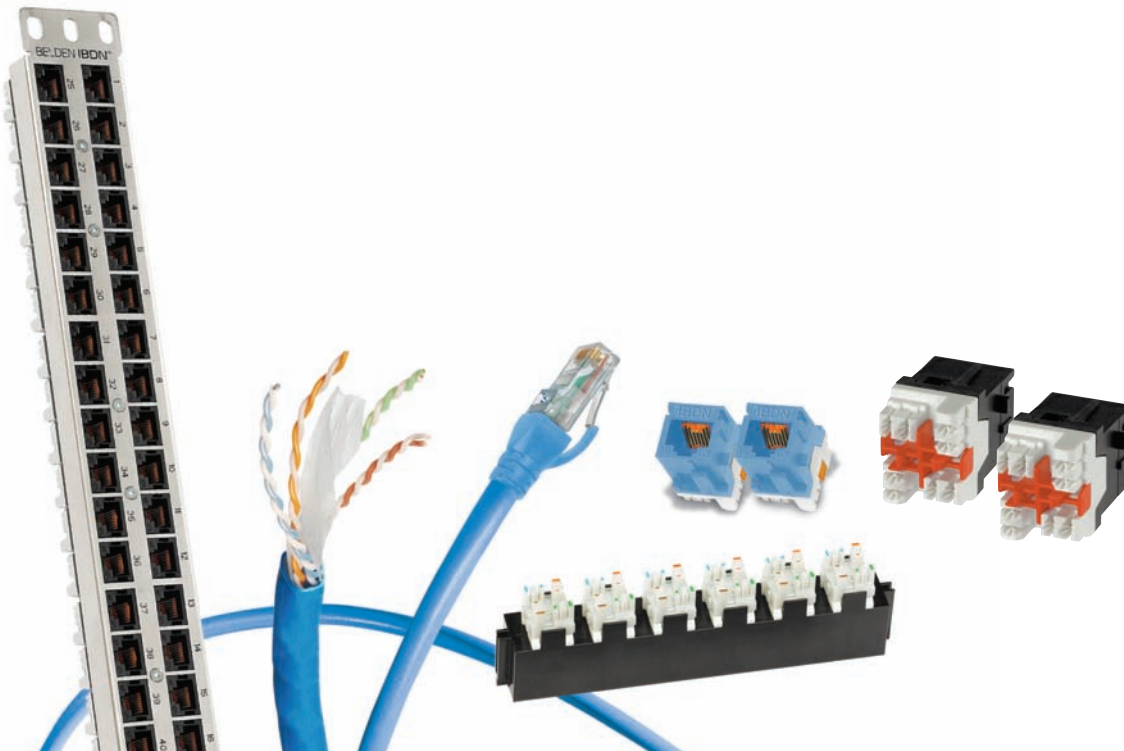
### Traditional Technology vs. Matrix IDC Technology



By altering each pair contact position by 90 degrees, the "antenna" effect is effectively cancelled.

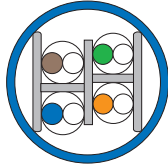### The X-Bar Eliminates Craft-related Termination Variances



The X-Bar assures Installable Performance by eliminating the possibility of a termination error.

- FleXPoint PCB (printed circuit board) technology is used within the 10GX module housing to position the compensation circuitry directly at the plug's point of contact for excellent crosstalk performance up to 625 MHz.

- Our 10GX cables feature an internal H-web construction that improves Alien Crosstalk, NEXT, and impedance performance for guaranteed reliable performance up to 625 MHz – far beyond what other manufacturers can support.

- And, Belden's engineers have attained a smaller diameter cable (only .295") with RoundFleX Technology, which means higher density at the rack and easier handling through pathways.


Belden cabling technologies ensure 10 Gigabit performance.

**Belden 10GX IDC System** – Complementing the System 10GX, the Belden IBDN 10GX IDC System is a high-performance, space-efficient modular connection system with flexibility to accommodate large, wall-mounted cross connects and interconnect systems. The 10GX IDC System relies on the innovative 10GX technologies, as well the following:

- X-Pair Technology has two IDC clips of the same pair forming an "X" that result in the continuation of the twisted pair and NEXT performance that is 32 times better than specified in the current standard for running 10 Gigabit over copper.

**IBDN Gigabit Cabling Systems** – Belden's end-to-end, copper-based systems include Category 6 systems optimized for Gigabit networking in the data center and beyond. The IBDN System 2400 delivers reliable 250 MHz performance while the IBDN System 4800LX is the industry's first enhanced 300 MHz system to support multi-Gigabit protocols.

For the highest density and a level of mated-performance unmatched in the marketplace, the GigaBIX Cross-Connect System is the most cost effective choice for Cross connects or Interconnects in the data center.

The IBDN Gigabit Cabling Systems also include GigaFlex PS6+ Modules and Modular Patch Cords that are based on a patented encapsulated lead frame technology that ensures excellent long-term reliability and performance, exceeding all specified Category 6 parameters.

**Equipment Cable Harnesses** – To ensure uptime and increased revenue, Belden's pre-dressed, pre-labeled patch cord bundles for 24- and 48-port applications are ideal for deploying high-density equipment quickly and easily.

## Belden® –
### Complete, End-to-end Fiber*Express*® Systems

Belden offers a broad selection of optical fiber products to support data center applications while enabling performance, uptime, density and manageability without compromise.

Belden's Fiber*Express* Solution is a complete end-to-end optical cabling system designed to meet the **performance**, **density** and **management** requirements wherever fiber is deployed in the data center. The solution features our FX2000 850 nm Laser-optimized 50/125µm multimode fiber to support 10 Gigabit transmission speeds.

**Fiber*Express* Ultra Patch Panel System** – Fiber*Express* Ultra brings fiber patching in the data center to a whole new level, featuring ultra high density, easy installation and maintenance, and better flexibility and manageability. Fiber*Express* Ultra lets IT managers ensure data center performance, reliability and lower total cost of ownership with faster, high-density deployments and upgrades while protecting existing systems and connectors. Additionally, Fiber*Express* Ultra supports a variety of data center applications, including mixing and matching of several connector types, rack and wall-mount solutions, and secure/keyed options.

System attributes include:

- Up to 96 fibers in a 1U space, the highest density available to maximize space and scalability
- Easy front access to connectors with dual swing-out frames
- 1-inch pull out to access individual connector modules without affecting adjacent connections
- Integrated cable management reduces slack and provides proper bend radius and intuitive cable routing
- User-friendly labeling feature displays labels during maintenance for easy identification

**Fiber*Express* Manager** – Designed to streamline termination, connection and maintenance activities in the data center, the Fiber*Express* Manager uses a scalable, modular approach to adapt to a variety of situations and make data center management easier than ever before.

**Optimax® Connectors** – The unique design of our Optimax field-installable connectors incorporates a factory-mounted fiber stub and pre-polished ceramic ferrule that provide an efficient and fast connectorization with no polishing, heat curing, bonding or epoxy. Optimax connectors ensure low loss, low reflectance and reliable high-bandwidth transmission, plus they can be installed in one minute.

**Fiber*Express* Pre-terminated Solutions** – The ultimate in easy, quick and reliable optical networking is the Fiber*Express* Pre-terminated System, ideal for plug-and-play applications like Storage Area Networks. This flexible solution speeds deployment and provides high density with Fiber*Express* MPO Cable Assemblies featuring multi-fiber cables and single MPO connectors.

**Fiber*Express* Secure/Keyed LC System** – In recent years, data center security has become increasingly important for mission critical applications. The Fiber*Express* Secure/Keyed LC System is a tamper-resistant Small Form Factor connection system that physically segregates network segments via 12 different keying options. The LC technology offers better performance, easier cleaning, design flexibility, fast installation and scalability to higher speeds.

# Belden® –
## Optimum Cable Management and Special Applications Solutions

### Cable Management Solutions

Belden offers a variety of cable management solutions that seamlessly integrate with both our copper and fiber solutions to help you bring data center systems on line faster, make moves, adds and changes easier, and ensure proper protection of cables and connectors for better reliability and uptime.

### High-density Modular Racking System –

This sturdy and exceptionally versatile racking system has been carefully designed and engineered to facilitate high-density data center installations that optimize system performance and manageability. The system's modularity makes it highly scalable to grow with your data center. The flat black finish and streamlined design also give your data center a professional, high tech look.

### Enclosures and Accessories –

From data deep and slim enclosures to ultra deep server enclosures, Belden offers something for every functional area of the data center. Our wide variety of management accessories helps IT managers deploy and manage high-density data centers. Available with solid, tempered glass, or vented doors, our full line of enclosures offers features like reversible doors, lift-off side panels, and adjustable bottom plates and access tops that minimize dirt and dust.

### Special Applications Solutions

Belden's full range of products includes integrated solutions to meet the needs of all systems supported by the data center. Our New Generation® Audio and Fire Alarm cables provide reliable signal transmission and crisp sound for auditorium, paging and life safety systems while control and Safe-T-Line® cables ensure that EVAC and HVAC systems function properly. When it comes to picture quality, Belden's Pan/Tilt/Zoom, CCTV and high-definition camera and video cables deliver clear images for better entertainment and security. Belden's Access Control cables help you protect people and property within the data center and beyond.

### One Solution, One Vendor

Whether copper or optical fiber, Belden delivers your solution for the data center. Our products are designed to work together to meet your networking requirements while providing exceptional quality for years to come. Built by an industry leader, Belden, our data center solutions also are backed by two unique warranties: a 25-year Product Warranty and a Lifetime Application Assurance Program.

For more information on these exceptional data center solutions, please call: **1.800.BELDEN.1**