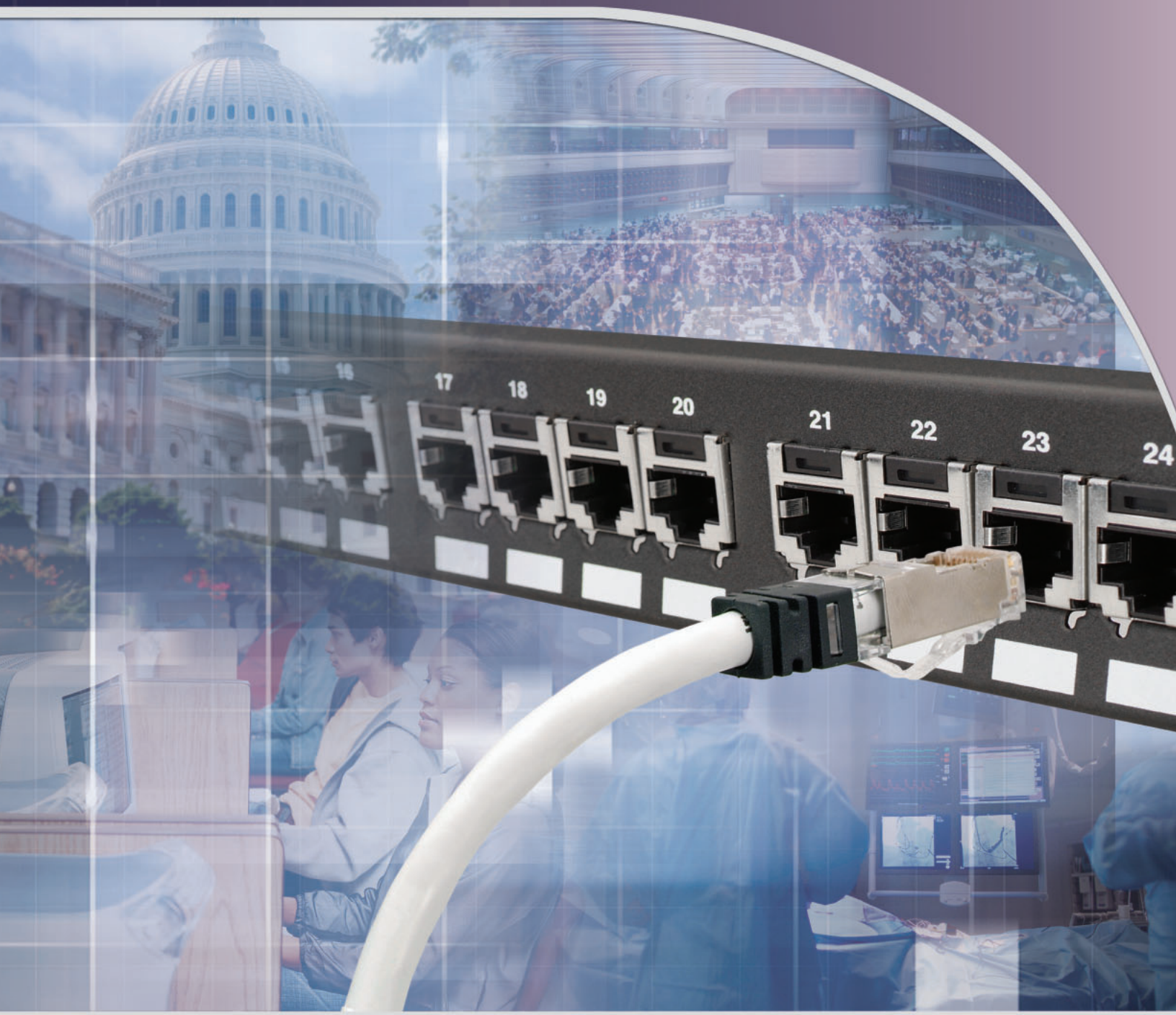
PANDUIT®




# *PANDUIT® TX6™ 10GIG™* SHIELDED COPPER CABLING SYSTEM

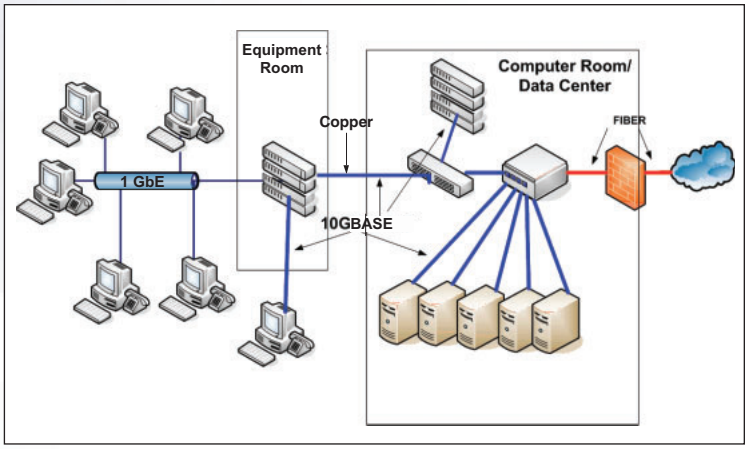
Innovative Connectivity Solution for Maximum Performance and Security

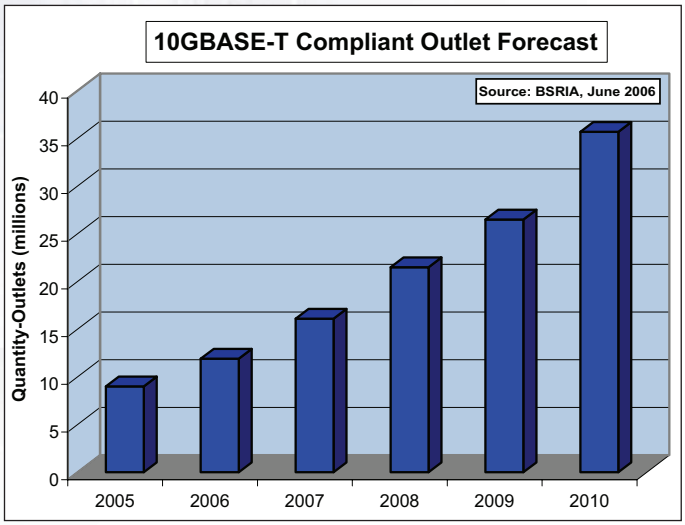
# 10 Gigabit Ethernet over Copper Deployment Trends

## 10 Gigabit Ethernet over Copper

With ever increasing bandwidth requirements, advancements in active equipment, and the ratified IEEE Standard, the market demand for 10 Gigabit Ethernet data transmission is rapidly growing. Initially designed for network backbones, 10 Gigabit Ethernet is now moving into the data center and will soon be required for high-end workstations and multimedia users. 10 Gigabit Ethernet over copper cabling is quickly becoming a trusted solution to fill the need for cost-effective, high capacity data transmission.

High-end data connections into a building will likely remain fiber. However, fiber or copper can be the medium for switch-to-switch, switch-to-server, and links to equipment closets, zone boxes, and high-end workstations up to 100m for 10 Gigabits/sec applications. *PANDUIT* has solutions to support both fiber and copper 10 Gigabit Ethernet cabling systems. When utilizing copper, the *PANDUIT*® *TX6*™ *10G*IG™ Shielded Copper Cabling System provides a cost effective media with exceptional performance margin to support expanding network needs.




**Now that the 10GBASE-T standard has been ratified, the market for compliant cabling is expected to rapidly increase.**

## 10GBASE-T Requires New Technology

10 Gigabits/sec to 100m over copper twisted pair is a significant technical accomplishment and requires a Category 6A cabling system, along with new electronics utilizing advanced signaling technology.

Two critical factors enable 10 Gigabits/sec performance but were not incorporated into the design of Category 6 cabling systems. They now are required for Category 6A systems.

1.) Electrical performance specified to 500 MHz
(Category 6 is specified to 250 MHz)

2.) Suppression of cable-to-cable alien crosstalk

# Utilizing 10 GbE Shielded Cabling Systems

## The *PANDUIT* 10 Gigabit Solution

The *PANDUIT*® *TX6*™ *10G*IG™ Shielded Copper Cabling System is a true end-to-end 10 Gigabit Ethernet solution with usable bandwidth beyond 500 MHz. Each component is fully shielded and designed to work together to achieve superior performance.

This system provides certified performance in a four connector channel up to 100m and exceeds the draft requirements of TIA/EIA 568-B.2-AD10 and ISO 11801 Class $E_A$ Edition 2.1, as well as the IEEE 802.3an-2006 ratified standard for supporting 10GBASE-T transmission over twisted-pair cabling systems. This level of performance provides technology advantages to a wide range of markets.

### Financial Institutions

- Supports high performance backbone which enables transfer of real-time financial information through voice, video, and data channels in demanding environments, such as trading floors
- Enables backup of high volume, bandwidth intensive data to meet regulatory requirements, such as the Sarbanes-Oxley Act
- Offers proven security when transmitting data between offices, branches, and remote locations

### Government Facilities

- Maintains integrity of sensitive information by reducing possibility of data interception through the minimization of signal emissions
- Protects against Radio Frequency Interference (RFI), which emanates from common devices such as WLANs, cellular phone, TV broadcasting or radios, which cause alien crosstalk
- Improves performance to support higher bandwidth applications, such as radar imaging and GPS mapping

### Healthcare Centers

- Assists with adherence to HIPPA, by protecting electronically secured health information from data interception or disruption during transmission between hospitals, healthcare facilities, insurance companies and other healthcare vendors
- Protects against forms of Electromagnetic Interference (EMI) generated from healthcare devices, such as imaging, MRI, and telemetry, which can distort patient results
- Enables high bandwidth applications, such as imaging transfer and video conferencing/collaboration

### Gaming and Hospitality Industries

- Supports high performance needs of video surveillance and media delivery services
- Maintains highly secure data transmission between casinos, cash cages, and main offices
- Provides EMI immunity and protects data integrity in proximity to electronic gaming equipment

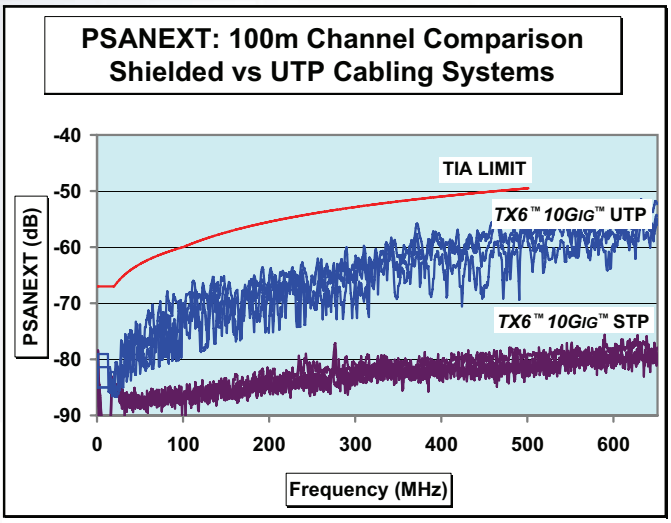
# Advantages of *PANDUIT® TX6™ 10GIG™* Shielded Copper Cabling System

## Suppression of Cable-to-Cable Noise

When transmitting at higher frequencies, the most critical electrical parameter becomes cable-to-cable noise coupling, known as alien crosstalk. The 10GBASE-T receivers can recover signals within the channel, but unfortunately cannot compensate for the external channel noise. Therefore, alien crosstalk suppression must be designed into the cabling system to ensure performance.

## Improved PSANEXT

The *TX6™ 10GIG™* Shielded Copper Cable utilizes a foil shield which nearly eliminates any cable-to-cable noise, provides up to 20dB more PSANEXT margin as compared to Category 6A UTP cabling systems and virtually eliminates the effect of alien crosstalk. This solution ensures that the 10GBASE-T cabling infrastructure will meet the required alien crosstalk specifications under all installation conditions.




## Enhanced Data Transmission Security

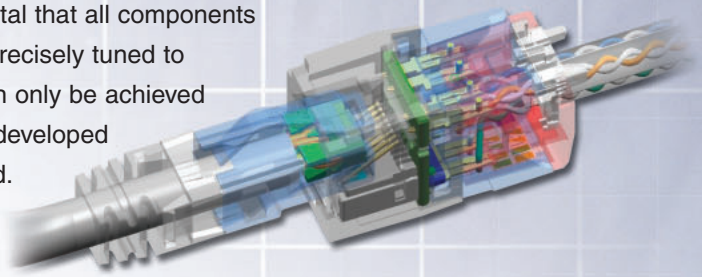
Since the *TX6™ 10GIG™* Shielded Copper Cabling System virtually eliminates external signal coupling, it has the added benefit of making data transmission more resistant to subversive intentions for greater security.

## Increased EMI/RFI Protection

Electromagnetic Interference (EMI) or Radio Frequency Interference (RFI) can degrade network performance. EMI/RFI can emanate from common devices such as WLANs, cellular phones, TV broadcasting or radios. When properly grounded, the *TX6™ 10GIG™* Shielded Copper Cabling System protects against EMI/RFI emissions.

## Integrated System Approach

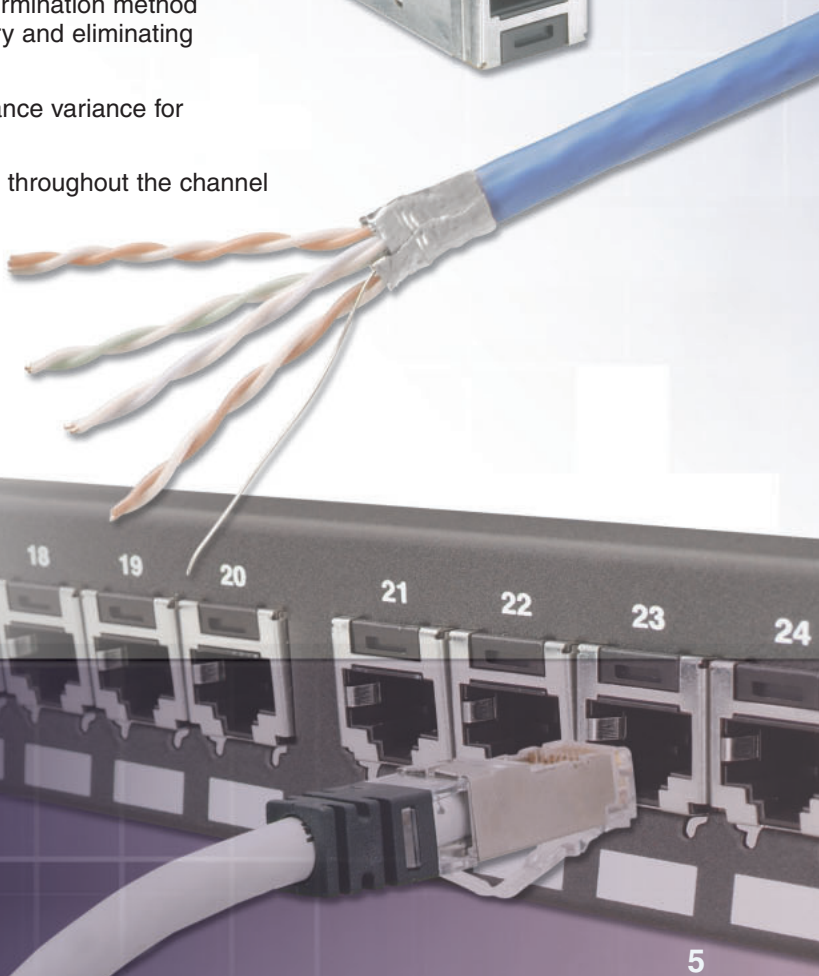
For optimal 10 Gigabit Ethernet cabling system performance, it is vital that all components of the system, including cable, jacks, patch cords and panels, are precisely tuned to work as a system. True 10 Gigabits/sec. warranted performance can only be achieved through the use of complementary design technologies. *PANDUIT* developed the *TX6™ 10GIG™* Shielded Copper Cabling System with this in mind. Furthermore, system connectivity components are 100% performance tested, driving production to deliver guaranteed reliability and include a serialized quality control number for future traceability.



## Innovative Design

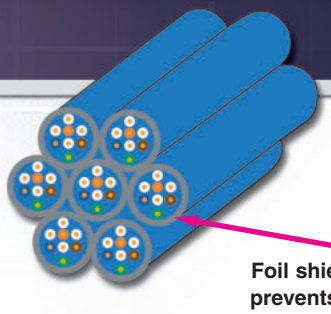
Innovative proprietary design techniques implemented by *PANDUIT* on the *TX6™ 10GIG™* Shielded Copper Cabling System include:

- Patent-pending enhanced *GIGA-TX™* Technology provides a termination method that optimizes performance by maintaining cable pair geometry and eliminating conductor untwist
- Tuning of connectors and patch cord plugs deliver low impedance variance for maximum channel performance
- Consistent twist rates ensure balanced electrical transmission throughout the channel
- Concentric conductors improve return loss and attenuation
- Larger diameter copper conductors improve signal strength throughout the channel

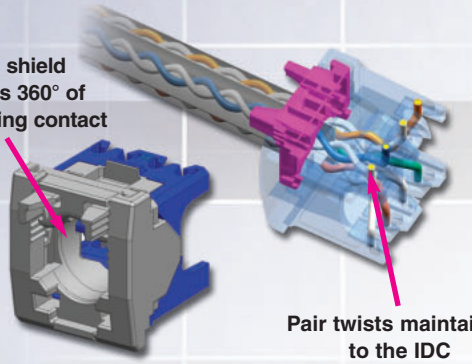


## TX6™ 10GIG™ Shielded Copper Cable

- Shielded design provides exceptional performance up to 500 MHz
- Shielding significantly reduces near-end and far-end alien crosstalk between adjacent cables
- Available in both Plenum and Riser cable jackets



Foil shield in cable prevents unwanted alien crosstalk



Integral shield provides 360° of grounding contact

Pair twists maintained to the IDC

## TX6™ 10GIG™ Shielded Jack Modules

- Built-in integral shields provide a 360° conductive cover and simplify proper system grounding
- Patent-pending Flex Technology shortens the tuning length of the jack, optimizing network performance
- Patent-pending Enhanced *GIGA-TX*™ Technology reduces conductor untwists, ensures termination consistency, optimizes performance and lowers cost of installation

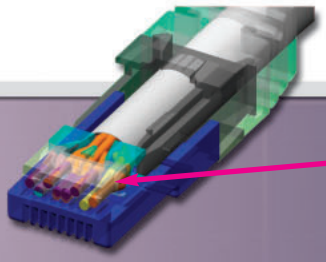
## MINI-COM® All Metal Shielded Modular Patch Panels

- Modular metal design with integrated shielding allows jacks to easily snap in, providing seamless integration with *PANDUIT*® *STRUCTUREDGROUND*™ Grounding System
- Flat and angled versions are utilized for layout flexibility and higher density installations
- Angled patch panels facilitate proper bend radius of each cable as it is routed directly into a vertical cable manager, eliminating the need for horizontal cable managers

Manage high-density network applications in up to 1/4 the area of conventional cable management systems

## TX6™ 10GIG™ Shielded Patch Cords

- Made of flexible 26 AWG stranded cable results in a 0.23 inch outer cable diameter for improved cable management
- Individual shielded pairs with an overall shield suppress EMI and minimize both NEXT and ANEXT giving substantial performance margins
- Plug is designed to perform in the center of TIA/EIA-568-B.2-1 component range ensuring interoperability and optimum performance

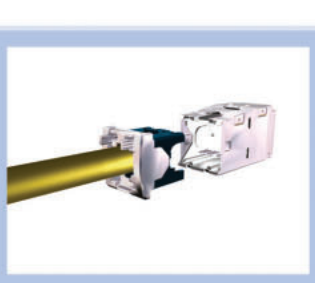


Integral pair manager ensures consistency and high performance

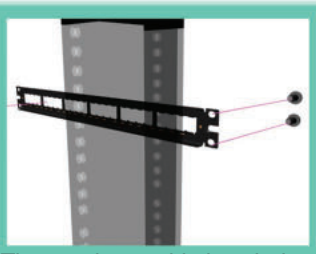
# Seamless Integration with *PANDUIT*®
# *StructuredGround*™ Grounding System

A key element of a shielded copper cabling system is proper grounding. To maintain efficient performance and ensure that sensitive electronic equipment is fully protected from potentially damaging events, *PANDUIT* has developed a comprehensive grounding and bonding solution for the *TX6*™ *10G*™ Shielded Copper Cabling System. *PANDUIT* offers a complete, highly reliable line of solutions to ground your building and network equipment in compliance with BICSI TDM Manual, 10th Edition and J-STD-607-A, TIA-942, IEEE Std 1100, UL and CSA.

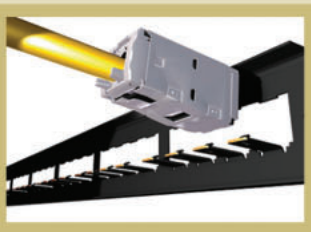
## Grounding Made Easy



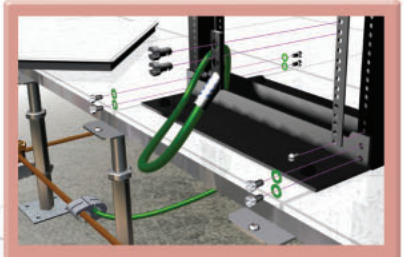
Jack module with integral shield and grounding tab provides 360° conductive path for proper grounding



The patch panel is bonded to the rack using thread-forming bonding screws that provide metal-to-metal contact



Contact between the module grounding tab and patch panel latch provides bond necessary for grounding



The entire system is bonded to a common grounding point located in the floor, using *PANDUIT*® *StructuredGround*™ Common Bonding Network (CBN) Jumper Kit

# Guaranteed System Performance

## Electrical Performance

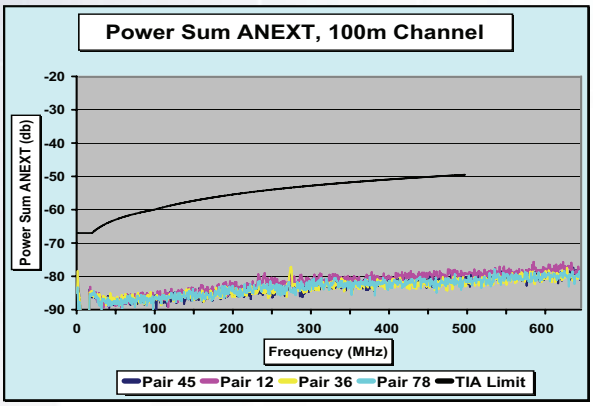
The *PANDUIT® TX6™ 10GIG™* Shielded Copper Cabling System supports a 4-connector channel up to 100m, exceeds the electrical channel requirements of IEEE 802.3an-2006 ratified standard for 10GBASE-T transmission over twisted-pair cabling system up to 500 MHz in a channel up to 100m, and supports the draft requirements of TIA/EIA 568-B.2-AD10.

Compliance is guaranteed for the following parameters:

- Power Sum Alien Near-End Crosstalk (PSANEXT)
- Power Sum Alien Attenuation to Crosstalk Ratio at the Far-End (PSAACR-F)
- Insertion Loss (IL)
- Return Loss (RL)
- Near-End Crosstalk (NEXT)
- Power Sum Near-End Crosstalk (PSNEXT)
- Equal Level Far-End Crosstalk (ELFEXT)
- Power Sum Equal Level Far-End Crosstalk (PSELFEXT)

**The *TX6™ 10GIG™* Shielded Copper Cabling System has passed third-party performance testing by Intertek/ETL**

The *PANDUIT® TX6™ 10GIG™* Shielded Copper Cabling System is a true 10 Gigabit Ethernet solution that delivers certified performance so you can specify with confidence a system to meet the demanding network requirements of today and tomorrow.




***Power Sum Alien Near-End Crosstalk (PSANEXT)*** is the sum of unwanted crosstalk at the near-end of a cable that comes from adjacent cables. When the signal current in a transmission pair couples with another pair, the noise current interferes with the signal. When the circuit between the noise emitting and receiving pairs egresses one cable boundary and crosses another cable boundary, the noise becomes alien crosstalk noise.

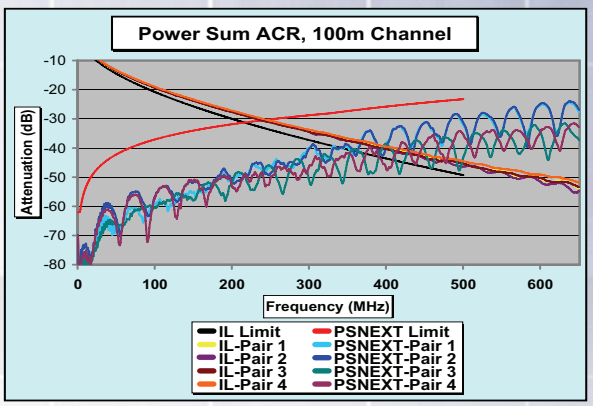
This effect of alien crosstalk is nearly eliminated in shielded cables since signals from adjacent cables cannot readily pass through the shield to cause noise.

In order to achieve a 10 Gigabits/sec. data rate, the *TX6™ 10GIG™* Shielded Copper Cabling System compensates for alien crosstalk to achieve end-to-end system integrity and performance.

## Power Sum Attenuation vs. Crosstalk Ratio (PSACR)

**Power Sum Attenuation vs. Crosstalk Ratio (PSACR)** is the difference between the total unwanted internal signal coupling measured as Power Sum Near-End Crosstalk (PSNEXT) from a transmitter at the near-end into an adjacent pair also at the near-end and the attenuated signal strength after loss in the cabling system.

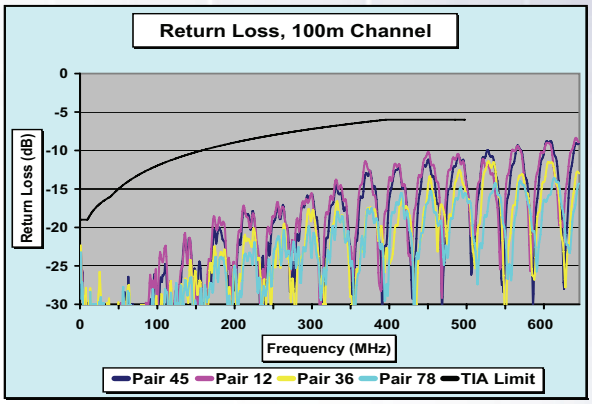
In full duplex environments where data is transferred in both directions at the same time, PSNEXT and attenuation are important parameters in distinguishing the signal from noise generated at the near-end. In order to achieve a 10 Gigabits/sec data rate, attenuation and PSNEXT must be "in-spec" for all frequencies up to 500 MHz.




## Return Loss (RL)

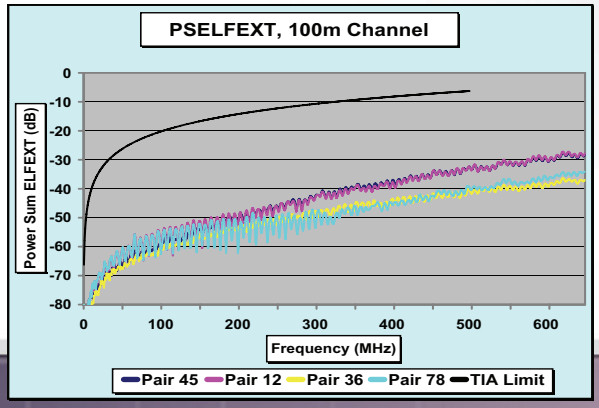
**Return Loss (RL)** is the ratio of the amount of signal that is reflected back at the transmitter relative to the original signal sent due to impedance mismatches in the cabling system. Reflected signals in a channel can also distort the data signal from both the transmitter and receiver.

*PANDUIT® TX6™ 10GIG™* components are centered around 100 Ohms to minimize reflections and maximize signal strength at the receiving end.



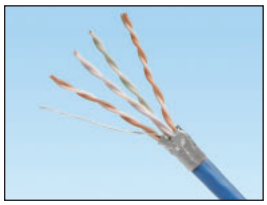

## Power Sum Equal Level Far-End Crosstalk (PSELFEXT)

**Power Sum Equal Level Far-End Crosstalk (PSELFEXT)** is the ratio of the amount of signal coupled onto a fourth pair at the receiving end when the other three pairs are transmitting, relative to the attenuated signal strength at the receiving end of the powered signal. Therefore, PSELFEXT is the measure of the total crosstalk that is seen at the receiving end. The *PANDUIT® TX6™ 10GIG™* Shielded Copper Cabling System effectively combats this with highly tuned plug and jack designs. In full-duplex 10 Gigabit Ethernet environments, PSELFEXT is an important parameter in distinguishing the signal from noise.



# *TX6™ 10GIG™* Shielded Copper Cabling System

## *TX6™ 10GIG™* Shielded Copper Cable



| PART NUMBER | DESCRIPTION | Color | Std. Pkg. Qty. (Ft.) | Std. Ctn. Qty. (Ft.) |
|---|---|---|---|---|
| **PSP6004BU-UG** | *10GIG™* Plenum (CMP) Shielded Cable. Conductors are 23 AWG construction (nominal cable diameter is .29"). Each pair has a metallic foil shield and conductors are protected in a flame-retardant PVC jacket. | Blue | 1000 | 15000 |
| **PSR6004BU-UGY** | *10GIG™* Riser (CMR) Shielded Cable. Conductors are 23 AWG construction (nominal cable diameter is .31"). Each pair has a metallic foil shield and conductors are protected in a flame-retardant PVC jacket. | Blue | 1000 | 15000 |

For other colors replace suffix BU (Blue) with WH (White), YL (Yellow), or IG (International Gray).

## *TX6™ 10GIG™* Shielded Jack Modules

| PART NUMBER | DESCRIPTION | No. of Module Spaces | Color | Std. Pkg. Qty. | Std. Ctn. Qty. |
|---|---|---|---|---|---|
| **CJS6X88TGY** | Shielded Augmented Category 6,10 Gb/s, RJ45 8-position, 8-wire universal *MINI-COM®* Jack Module. Compatible with *MINI-COM®* Modular Patch Panels, Faceplates, and Surface Mount Boxes. | 1 | Black | 1 | 50 |

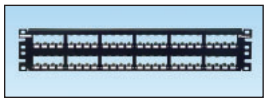
For bulk packaged jack modules, add -24 to end of part number.

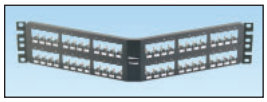
## *TX6™ 10GIG™* Shielded Patch Cords

| PART NUMBER | DESCRIPTION | Length (Ft.) | Color | Std. Pkg. Qty. | Std. Ctn. Qty. |
|---|---|---|---|---|---|
| **STP6X3IG** | Category 6A, 10 Gb/s STP patch cord with *TX6™ PLUS* Modular Plugs on each end. | 3 | International Gray | 1 | 10 |
| **STP6X5IG** | | 5 | International Gray | 1 | 10 |
| **STP6X7IG** | | 7 | International Gray | 1 | 10 |
| **STP6X10IG** | | 10 | International Gray | 1 | 10 |
| **STP6X14IG** | | 14 | International Gray | 1 | 10 |
| **STP6X20IG** | | 20 | International Gray | 1 | 10 |

For lengths 2' to 20' (increments of 1') and 25', 30', 35', 40' change the length designation in the part number to the desired length.
For standard cable colors other than IG (International Gray), add suffix with BL (Black), BU (Blue), GR (Green), RD (Red), YL (Yellow), OR (Orange) or VL (Violet) to end of part number. For example, the part number for a blue 15' cord is STP6X15BU.
Must be installed as part of a complete *TX6™ 10GIG™* Copper Cabling System in order to achieve 10GBASE-T certified performance.

## *MINI-COM®* All Metal Shielded Modular Patch Panels





| PART NUMBER | DESCRIPTION | No. of Rack Spaces^ | Std. Pkg. Qty. | Std. Ctn. Qty. |
|---|---|---|---|---|
| **CP24BLY** | 24-port flat all metal modular patch panel. | 1 RU | 1 | 10 |
| **CP48BLY** | 48-port flat all metal modular patch panel. | 2 RU | 1 | 10 |
| **CP72BLY** | 72-port flat all metal modular patch panel. | 2 RU | 1 | 10 |
| **CP24WSBLY** | 24-port flat all metal modular patch panel with strain relief bar. | 1 RU | 1 | 10 |
| **CP48WSBLY** | 48-port flat all metal modular patch panel with strain relief bar. | 2 RU | 1 | 10 |
| **CPA24BLY** | 24-port angled all metal modular patch panel. | 1 RU | 1 | 10 |
| **CPA48BLY** | 48-port angled all metal modular patch panel. | 2 RU | 1 | 10 |
| **CPA72BLY** | 78-port angled all metal modular patch panel. | 2 RU | 1 | 10 |

^One rack space = 1.75" (44.45mm)



Order number of pieces required, in multiples of Standard Package Quantity.

# *StructuredGround*™ Grounding System

- The only solution engineered to meet and exceed TIA-942 "Telecommunications Infrastructure Standard for Data Centers"
- Flexible design works with new and existing racks and cabinets that meet EIA-310-D
- Premium components are kitted to provide easy selection and installation

## Bonding Screws

| PART NUMBER | DESCRIPTION | Std. Pkg. Qty. |
|---|---|---|
| RGTBSG-C | Green thread-forming bonding screw, #12 – 24 x 1/2". | 100 |
| RGTBSM6G-C | Green thread-forming bonding screw, M6 x 15mm. | 100 |
| RGTBS1032G-C | Green thread-forming bonding screw, #10 – 32 x 1/2". | 100 |
| RGTBSM5G-C | Green thread-forming bonding screw, M5 x 15mm. | 100 |

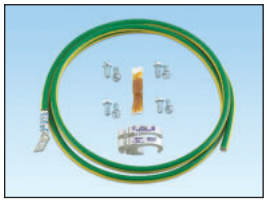
## Shielded Jack Module Grounding Kit

| PART NUMBER | DESCRIPTION | Std. Pkg. Qty. | Std. Ctn. Qty. |
|---|---|---|---|
| CJSGK-XY | Kit used to ground enhanced *Giga-TX*™ Style Shielded Jack Modules to another ground wire in shielded applications. | 10 | 100 |

## Access Floor Grounding Clamp

| PART NUMBER | ROUND PEDESTAL In. (mm) | SQUARE PEDESTAL In. (mm) | MCBN CONDUCTOR SIZE RANGE AWG (mm²) | FIGURE DIMENSIONS In. (mm) | | | | | TIGHTENING TORQUE In. – Lbs. (Nm) | | Std. Pkg. Qty. | Std. Pkg. Qty. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | W | H | A | B | Conductor | Clamp | | |
| GPQC1/0 | 3/4 – 7/8 (19.1 – 22.2) | 3/4 – 1 (19.9 – 25.4) | #6 – 1/0 (16 – 50) | 3.50 (88.9) | 1.75 (44.5) | 3.50 (88.9) | 7/16 (11.1) | 3/8 (9.5) | 385 (43.5) | 150 (17.0) | 1 | 10 |

## Common Bonding Network (CBN) Jumper Kit

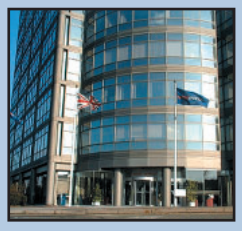


| PART NUMBER | DESCRIPTION | Std. Pkg. Qty. |
|---|---|---|
| RGCBNJ660PY | #6 AWG (16mm²) jumper; 60" (1.52m) length; 45° bent lug on grounding strip side; provided with .16 oz. (5 cc) of antioxidant, two each #12 – 24 x 1/2", M6 x 12mm, #10 – 32 x 1/2", M5 x 12mm thread-forming screws and a copper compression HTAP for connecting to the common bonding network in sizes ranging from #2 AWG to 250 kcmil (35mm² to 120mm²). | 1 |

For details on the complete offering of *StructuredGround*™ Grounding System, refer to www.panduit.com/dcgrounding.

***PANDUIT* Corp.**
**Worldwide Headquarters**
Tinley Park, Illinois 60477-3091

**For more information**
## Visit us at www.panduit.com
**Contact Customer Service by email: cs@panduit.com**
**or by phone: 800-777-3300**



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Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

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