

HUBBELL®
Premise Wiring



End-to-End **LOG**
Infrastructure Solutions



Table of Contents

Industry Issues and Solutions

- PoE4
- Short Link5
- Performance Copper6
- Performance Fiber7
- Interoperability8
- AXT9

Warranty Protection

- 25-Year System Warranty . . 10



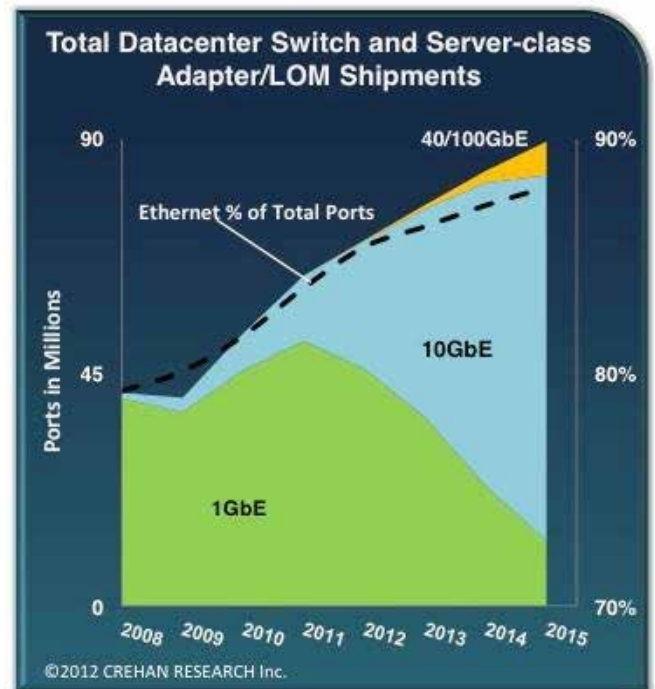
The Hubbell Integrated System Advantage

Cabling Infrastructure for 10GBASE-T and Beyond

Over the past decade, Ethernet data rates have escalated to support transmission of increasing volumes of data with larger file sizes associated with cloud computing, virtualization, streaming video and other digital media content. The increase in data rates impacts how networks and cabling infrastructure are designed and deployed. Supporting today's bandwidth intensive applications has resulted in strong growth 10GBASE-T deployments. As a result, 10GBASE-T is expanding in the enterprise as well as data center applications. Active equipment manufacturers are estimating 80 million ports by the year 2015.

Major Trends Driving 10GbE Demand

- Exponential growth in data volume
- Internet traffic growth at over 30% CAGR
- More powerful data centers in support of online traffic
- Tremendous wireless data growth driven by mobile devices
- Advances in storage area networks
- Consolidation and clustering
- Server virtualization
- Increasing application speeds
- Digital media content



Key Industry Challenges

PoE



Efficiently powering IP devices through PoE and PoE+ protocols designed to handle continuous power over time

Short Link



Supporting short length channels and links in data centers

Performance



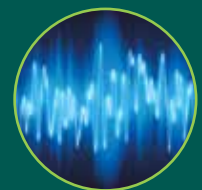
Bandwidth beyond 10G, verified and third party tested for transmission and performance beyond TIA-568C requirements

Interoperability



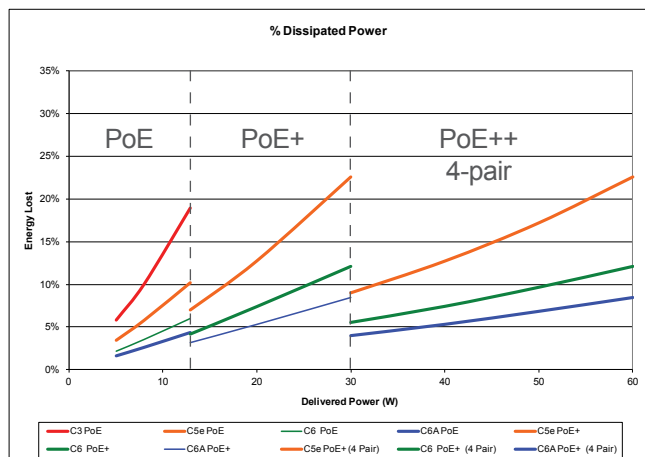
No space constraints, backward compatible, component compliant

AXT



Eliminating Alien Cross Talk (AXT), EMI and security issues

PoE



Situation

The category of cabling has an effect on energy efficiency. Installing a Category 6A cabling infrastructure over a lower rated cabling infrastructure will have a direct impact on the bottom line for power consumption. It comes down to efficiency. Power loss combined with increased heat generation will escalate operating costs.

Challenges

- Growing deployment of IP based PoE devices generate more heat
- IEEE 802.3 PoE+ delivering 26W on two pairs
- IEEE 802.3 4-pair PoE study group targeting 50-100 watts

Benefits

- Connecting hardware and cable designed and qualified to support IEEE PoE+ levels on all four pairs
- Improves equipment efficiency by reducing current and power levels for transceiver electronics
- Lower energy consumption to power the same application (higher efficiency)
- Lower cooling needs to overcome heat build-up in the cables
- Lower capacity/cost for power supplies and backup systems

PoE



PoE+



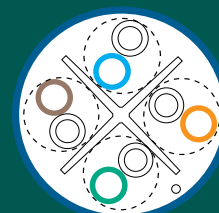
PoE++



Solution

Category 6A Systems

- Connectivity printed circuit boards feature traces capable of handling 550ma of current with less than 10 degrees of temperature rise
- Comply with IEC 60512-99-001 requirements ensuring contact seating surfaces are not damaged during plug/jack mating and disconnecting under remote powering loads
- 23 AWG copper reduces heat rise, and pair separation design improves heat dissipation
- Category 6A cables comply with TIA TSB-184



Situation

Data center deployments pose unique cabling infrastructure challenges. Up to 30% of cabling installations (or deployments) are 10 meters or less, while enterprise applications have typical link lengths of 50 to 60 meters. Short length links may generate marginal results across key performance parameters that can compromise network performance.

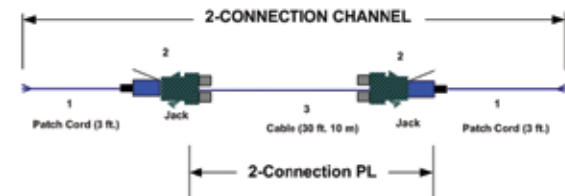
Challenges

- 30% of all cabling installations are under 10 meters
- Links and channels ranging from 2 to 100 meters
- Compliant performance in AXT, RL or NEXT measurements

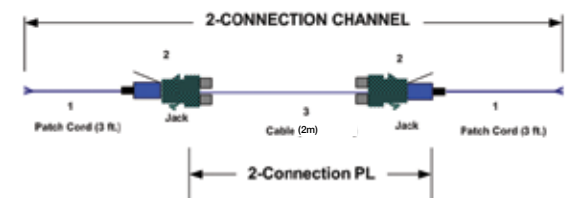
Benefits

- System exceeds all Category 6A specifications
- Resolves design issues that limit distance and performance
- Cutting edge enhanced common mode design and AXT elimination techniques allow the Category 6A system to support connections between 1 and 100 meters apart, based on practical real world channel configurations

TIA Standard Worst Case 10m Permanent Link



Worst Case 2m Permanent Link



Cable Distribution



Top of Rack



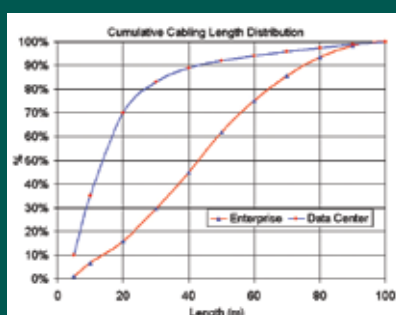
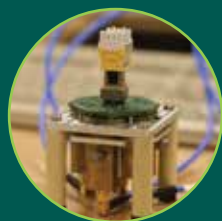
End of Row



Solution

Category 6A Systems

- Superior component NEXT performance yields channels and links with significant headroom throughout the frequency range
- Shorter links and channels require component compliant connections with margin beyond the standard
- Channel and link Return Loss are also significantly better than the standard requirements
- Improved return loss minimizes reflected power into the transmitter and reduces the power usage in the electronics



(HPW Lab)

Performance Copper

Situation

Copper cabling transmission speeds have progressed from 10Mbps, to 100Mbps, to 1Gbps, to 10Gbps, and beyond (see Technology Progression Time Line). To support today's content delivery data rate of 10 Gigabit Ethernet (10GbE), a higher performance Category 6A copper cabling system is a necessity.

Challenges

- Meeting today's bandwidth requirements—headroom is now needed at all frequencies
- Designing for component-compliance with backward compatibility and application assurance

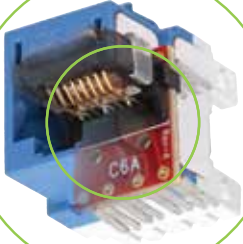
Benefits

- Component performance with 7.5dB of headroom of NEXT at 500MHz allows for applications such as 10GBASE-T, a transparent path at 417MHz, eliminating bit errors and retransmissions
- The system will perform in short links, passing NEXT and RL performance in configurations typically found in Mission Critical data centers supporting application (10GBASE-T) needs from 1 to 100 meters

Technology Progression Time Line

	1990	1995	1999	2002	2006	2008	2010	2015
TIA Standards	Cat 3	Hubbell Cat 5 Cat 5	Hubbell Cat 5e Cat 5e	Hubbell Cat 6 Cat 6		Hubbell Cat 6A Cat 6A		Hubbell Cat 8 Beyond
IEEE Applications	10BASE-T	100BASE-T	1000BASE-T		10GBASE-T			Emerging 40GBASE-T
Personal Computers	386 2MB RAM	486DX2/66 4MB RAM	400MHz Pentium II 64MB SDRAM		2.33 GHz Core 2 Duo Processor 2GB RAM		32-nanometer Microprocessors for laptops	Next Gen

Connectors



Bandwidth

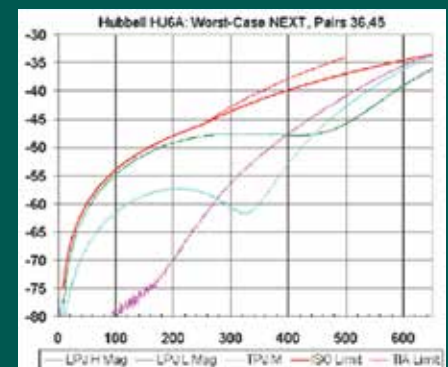
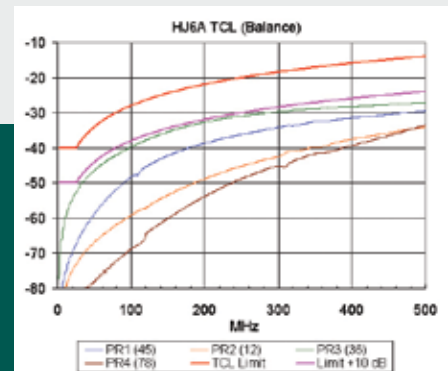


Cable



Solution Category 6A Systems

- Category 6A connectivity has been tested against the most stringent limits, exceeding the TIA and ISO standards
- HJ6A's worst case NEXT of 40dB at 500MHz has more than 7.5dB better than the minimum standard
- System NEXT performance exceeds the highest proposed industry standards by 3dB at 500MHz and performs to an extended limit clear out to 750MHz.



Performance Fiber

Situation

High speed core data center equipment for SAN, LAN, and WAN deployments have evolved to new applications using advanced laser-based fiber transceivers and high performance fiber cabling. Interconnecting the optical core with high bandwidth laser optimized multimode, and single-mode fiber infrastructure advances the equipment distribution area (EDA) network to new levels. The Hubbell fiber channel solution delivers the bandwidth and reliability needed for any Mission Critical fiber optic network.

Challenges

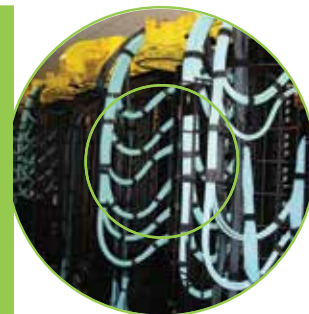
- Evolution from 10G to 40G and 100G applications
- Performance advancement from OM3 to OM4 laser optimized multi-mode fiber
- Future-proofing 10G installations for migration to 40G/100G applications

Benefits

- Premium optical fiber exceeds all TIA-492, IEEE 802.3, Telcordia and ICEA standards
- High quality PROclick® no-polish field termination connectors reduce installation labor
- Advanced MPO connectivity solutions assure seamless migration to future 40G and 100G applications, in a high density space-saving footprint
- High reliability pre-terminated cable assemblies are custom made to order and 100% factory tested with fast delivery for rapid deployment



10 Gig



40 Gig



100 Gig



Solution

Advanced Fiber Systems

- Quality, high performance fiber connectivity, combined with industry-leading cable, exceeds all industry standards for reliability and applications assurance
- Premium quality, low loss, bend insensitive fiber used in all Hubbell cable assures performance beyond industry standards, including new 40/100G applications from IEEE 802.3
- Space-saving fiber cable, with maximum bandwidth per square inch, minimizes cable congestion in high density infrastructure deployments

Interoperability

Situation

Today's complex IT environment is about empowering your entire enterprise through increased productivity, improved customer response and reduced cost of ownership. It's about leveraging new technologies for a competitive advantage, being more agile while preparing for whatever comes next. Hubbell offers a comprehensive infrastructure solution with one objective—evolving your network to empower your enterprise.

Challenges

- High density solutions
- Backward compatibility
- Components designed to work together in form, fit and function, as well as performance

Benefits

- Standards component based performance provides seamless open architecture
- Designed and developed to maximize cabling system performance without sacrificing reliability
- Third-party verified components
- Hubbell 10G systems are designed to support emerging technologies



High Density



Solutions



No Restrictions



Solution

Category 6A Systems

Whether your vision is clear or complex, we pride ourselves on being a trusted advisor who understands your challenges, responding with system solutions that maximize the impact of emerging technologies while preparing you for technologies to come. We will work one-on-one with you to foster a long-term business relationship.

Hubbell's systems work seamlessly. This dynamic versatility maximizes the value of your cabling infrastructure in ways that standalone connectivity, delivery and management systems simply cannot.



Situation

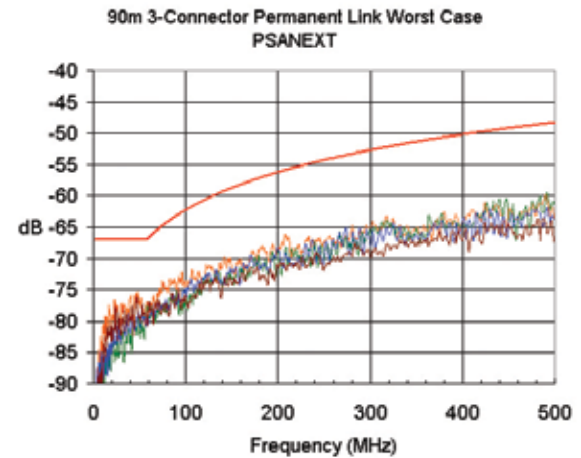
Alien crosstalk (AXT) is a critical electrical parameter limiting the performance of 10G. As the signal from one channel couples into adjacent channels, AXT occurs throughout the entire channel in neighboring cables, patch cords, jacks and patch panel ports. Extending the frequency range out to 500 MHz and defining this critical performance parameter was the basis for the Category 6A standard to support 10GBASE-T.

Challenges

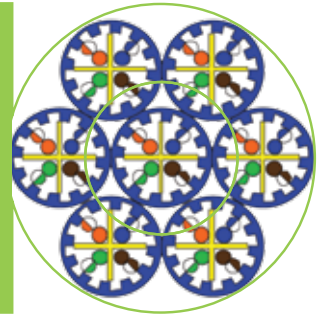
- Designing a noise-free, EMI-tolerant transmission
- Eliminating AXT throughout the connectors and cabling

Benefits

- Superior noise suppression
- Unique inner jacket to suppress AXT, ensuring maximum transmission quality and minimum bit error rate (BER)
- Standard 110 terminations with no specialized equipment
- Traditional cable installation in runs of 1 to 100 meters
- Qualified active transmission under adverse EMI conditions



Cable Testing



AXT in Bundling



AXT Design



Solution

Category 6A Systems

- Power-sum alien near end crosstalk (PSANEXT) tested from 1 to 500MHz demonstrates headroom margins
- Component performance of the connectivity (jack and panel) exceeds all TIA/ISO standards requirements
- Category 6A application assurance
- Maximum bandwidth beyond 625MHz
- Component compliant AXT performance
- PoE and PoE+ ready

Primary Insulation
CMP: FEP
CMR: Polyolefin

23 AWG Solid
Bare Copper



Cable Jacket (designed
to control AXT)
Nominal Cable O.D.
CMP/CMR .340 max.

Rip Cord
under Jacket
Star filler

Warranty



Comprehensive Warranty Coverage and Support

Hubbell 10G Systems provide comprehensive coverage for applications and performance headroom, along with training and support services:

- Independent third party (ETL) verified performance
- System must be registered and installed in accordance with Hubbell's Mission Critical® warranty program
- PoE+ application assurance
- Backward compatibility
- Trained, qualified network of design-install partners
- BIM models (available on Autodesk® Seek; visit seek.autodesk.com)

ETL Report



Certified Installers



Autodesk® Seek



The graphic features a large, stylized number '1' in the background, composed of a light green vertical bar and a light blue circular shape. In the foreground, there are two circular insets. The top inset shows a close-up of a black patch panel with blue Ethernet cables plugged into it, and a white patch panel with a blue Ethernet cable plugged into it. The bottom inset shows a black patch panel with blue Ethernet cables plugged into it, and a white patch panel with a blue Ethernet cable plugged into it. The background is a solid dark teal color.

Hubbell End-to-End Solutions