LEVITON®

Cat 6A

Interactive Reference Guide

Understanding Cat 6A

Cat 6A projects require proper design, planning, products, and installation practices. Use this guide to gain a better understanding of these requirements to help you efficiently plan, bid, and install a Cat 6A structured cabling system for networks up to 10 gigabit Ethernet. This guide will also cover the general areas and applications where Cat 6A may be deployed, and give you an overview of Leviton's Cat 6A system connectivity.

Cat 6A

Where is Cat 6A used?

Category 6A cabling systems have come a long way since the original "augmented Category 6" standard was first introduced in 2008. Today, Cat 6A is a popular specification for data center and other enterprise applications. The move to Cat 6A has been driven by several factors, including support for 10G networks, long-term planning for workstation areas, Power over Ethernet (PoE) applications, and new wireless access points.

Data Centers
Many data center managers looking to control costs are choosing Cat 6A twisted pair copper for 10 Gb/s applications, since it is the most cost-effective option for access layer networking. In fact, the cost of 10GBASE-T channels is at least 30% lower than alternative SFP+ channels.

Wireless Applications
More businesses are updating their wireless networks with 802.11ax access points, capable of delivering 10 Gb/s. Businesses won't see the true benefits of these higher speeds without the right cabling infrastructure; that's why TIA standards recommend Cat 6A for horizontal cabling to these wireless access points.

Where is Cat 6A used?

Power over Ethernet (PoE)

PoE is seeing explosive growth rates, boosted by new applications and standards that expand support to more devices. Higher current PoE brings important cabling and connectivity considerations while ensuring utmost performance in the network, and for this reason Cat 6A is recommended for all new installations.

10GBASE-T Networks

Data centers, businesses, government agencies, hospitals, and schools are all looking to 10 Gb/s networks to meet today's data demand. Since its introduction in 2008, 10GBASE-T has become widely adopted around the world. The standard defines 10 Gb/s over twisted-pair up to 100 meters, with Cat 6A as the required cabling.

HDBaseT Networks

HDBaseT™ is a key technology that enables audio visual signal extension over category cabling to high definition displays and projectors. It extends HDMI® video and audio, 100BaseT Ethernet, control, and power up to 100 meters on a single category-rated twisted-pair cable. The HDBaseT Alliance specifies Cat 5e, Cat 6 UTP, and Cat 6A UTP cabling as supported media types. But these category ratings will deliver varying performance results, with Cat 6A more capable of supporting higher bandwidth signals such as 4K.

Standards

Cat 6A requirements are addressed in standards from multiple organizations. Regardless of the standard, all Cat 6A cabling will provide 10 Gb/s data rates, operate at a maximum frequency of 500 MHz, and have a maximum distance of 100 meters.

TIA (Telecommunications Industry Association)

Telecommunications: ANSI/TIA-568.2-D
Defines: Performance requirements for Cat 6A channels, permanent links, and components

Data Center:

ANSI/TIA-942-B Telecommunications Infrastructure Standards for Data Centers specifies the minimum requirements for telecommunications infrastructure of data centers and computer rooms, including single-tenant enterprise data centers, and multi-tenant Internet hosting data centers

Note: Cat 6A is recommended for horizontal cable in data centers using 100 ohm balanced twisted pair

Health Care Facilities:

ANSI/TIA-1179-A Healthcare Facility Telecommunications Infrastructure Standard. Category 6A is recommended for new installations (for both backbone and horizontal copper cabling)

Power over Ethernet:

TIA TSB-184-A Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling raises requirements to Category 6A cabling to better support IEEE 802.3bt four-pair PoE

Wireless Access Points:

TIA TSB-162-B Telecommunications Cabling Guidelines for Wireless Access Points recommends Cat 6A for horizontal cabling to WAPs in new installations

ISO/IEC (International Standards Organization)

Standard: ISO/IEC 11801-1 Information (Technology — Generic Cabling for Customer Premises; Class E_A Specification)
Defines: Class E_A cabling and component performance requirements for customer premises. ISO equivalent of Cat 6A

Power over Ethernet:

The ISO/IEC 11801-6 Distributed Building Services standard raises cabling requirements
to Category 6A to better support IEEE 802.3bt four-pair PoE

IEEE (Institute of Electrical and Electronics Engineers)

Standard: IEEE 802.3 an
Defines: Channel performance for 10GBASE-T Ethernet over balanced twisted-pair cabling systems

Standard: IEEE 1911.3
Defines: Protocol for communicating 5Play™ over a single long-distance Local Area Network (LAN) cable
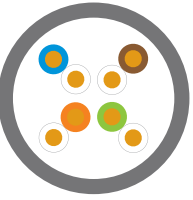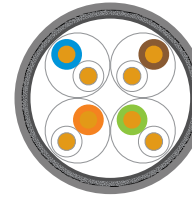
Network Migration

Cat 6A is backwards compatible with Cat 6 and 5e, allowing it to support gigabit Ethernet and provide a seamless migration path to 10 gigabit bandwidth in the future (10GBASE-T). Using Cat 6A in new installations prevents the need to recable when upgrading to 10 Gb/s, avoiding possible network disruption and additional project costs in the future. End users and building owners who are planning for network upgrades or new construction in the near future should consider Cat 6A as a way to extend the expected life of their cabling systems.

Twisted-Pair Migration Roadmap

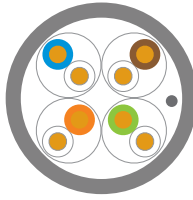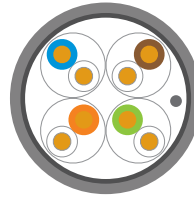|	1G to 2.5G	2.5G to 5G	5G to 10G	10G to 25G or 40G	
	1G	**2.5G**	**5G**	**10G**	**25G**	**40G**
Category	5e / 6	5e / 6	5e / 6	6A	8	8
Max. Bandwidth	100 / 250MHz	100 / 250MHz	100 / 250MHz	500MHz	1250MHz	2000MHz
Max. Application Data Rate	1000BASE-T	2.5GBASE-T	5GBASE-T	10GBASE-T	25GBASE-T	40GBASE-T
Max. Reach	100m	100m	100m	100m	30m	30m
# of Connectors in Channel	4	4	4	4	2	2
Cable Construction	Unshielded or Shielded	Unshielded or Shielded	Unshielded or Shielded	Unshielded or Shielded	Shielded	Shielded
Date Created	1999	2016	2016	2006	2016	2016

Copper Cable Terms and Types

		U / UTP	U / UTP	F / UTP	U / FTP	F / FTP	SF / UTP	S / FTP
Physical Description	**Cable**	Small Diameter Unshielded	Unshielded with isolation wrap	Foil shielded with drain wire	Unshielded	Foil shielded with drain wire	Foil and braid shielded	Braid shielded
	Pairs	Unshielded	Unshielded	Unshielded	Foil shielded	Foil shielded	Unshielded	Foil shielded
Cross Section								
Typical Size		0.230 - 0.245 in (5.84 - 6.22 mm)	0.265 - 0.30 in (7 - 8 mm)	0.29 - 0.30 in (7 - 8 mm)	0.267 - 0.283 in (7.4 - 8.3 mm)	0.279 - 0.295 in (7 - 8 mm)	0.29 - 0.325 in (7.4 - 8.3 mm)	0.232 - 0.315 in (7 mm)

Installation

Routing and Handling

Routing and Handling

Originally, Cat 6A cables were much larger and heavier than Cat 6 cables, but recent innovations in cable construction methods have greatly reduced the size and weight of Cat 6A cables being installed today.

The following tips will help ensure a smooth installation.

Cable Reels

Typically, Cat 6A cable will come on reels instead of in pull boxes and will require racks or carts that can support their larger size.

Cable Pulling

The maximum pulling tension for a four-pair balanced twisted-pair cable must not exceed 25 lbf (110N). Exceeding this tension will result in transmission degradation and may affect the system's ability to pass certification testing.

Bundling

Use VELCRO® Brand fasteners to secure all cable bundles. VELCRO® Brand fasteners won't crush or damage cables like tie wraps can, and are reusable for moves, adds, and changes.

DO

DON'T

Routing and Handling
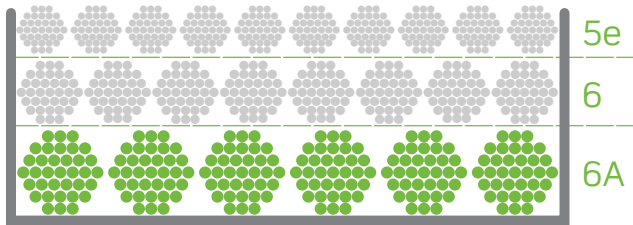
Placement

Leviton Cat 6A cable may be placed in the same tray with Cat 6, 5e, and other category-rated cables. In addition, Leviton warrants its product performance regardless of whether strict combing or randomizing dressing methods are used. As with all cable runs, large or heavy cable bundles should be positioned under other cable to prevent crushing. Cable trays should be loaded no more than six inches deep.

Follow NEC code for separating power and data cables.
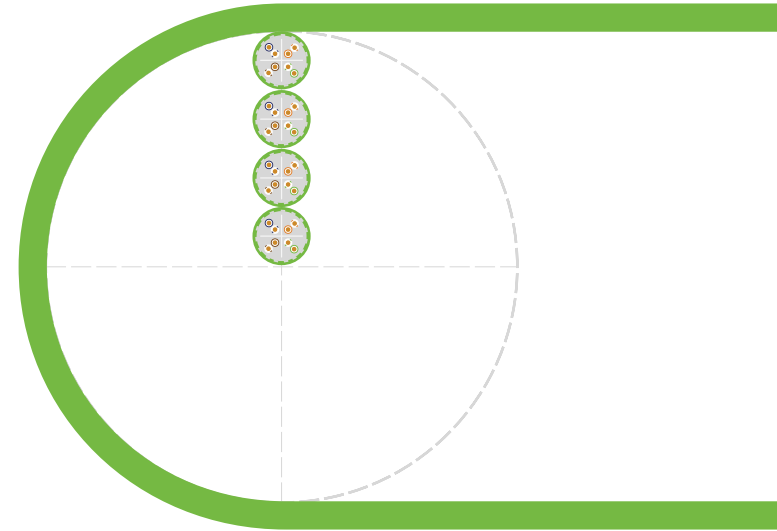
Bend Radius

To maintain Cat 6A performance, minimum bend radius should be 4x OD for UTP and shielded cable. This radius is significantly larger than Cat 6 and 5e. For example, Cat 6 cables at 4x OD is 0.904", whereas Cat 6A is 1.21". Plan carefully to ensure there is sufficient space throughout cable runs to maintain proper bend radius.

Routing and Handling

Slack Loops

TIA recommends storing 10 feet (3.05 m) of extra cable in the telecom room and 12-18 inches (304-457 mm) above work area installations for re-terminations and to accommodate moves, adds, and changes. Use an extended or figure-8 loop configuration to alleviate cable stress. Cable slack in bundled or excessive loops has been shown to degrade cable performance and is associated with return loss failures. Plan carefully to ensure there is sufficient space and support for heavy Cat 6A cable slack loops.

Pulling Lubricants

Using lubricants can degrade performance; the majority of insertion loss failures have been traced back to the use of general purpose lubricants. Additionally, pulling lubricants can encourage over-filling of conduits. For these reasons, pulling lubricants are not advised.

Pathways and Spaces

Pathways and Spaces

Cable Tray Fill

TIA-569-D recommends 25% fill at initial installation and up to 50% with unplanned additions. If a single cable tray will also carry power cables, a physical barrier is required to comply with the NEC and IEC. Finally, ensure tray support spacing is sufficient to prevent excessive sagging. Consider solid bottom tray for higher density applications.

Note: A tray at 25% fill looks half-full. A tray at 50% fill looks completely full. Cable trays should be loaded no more than six inches deep.

Conduit Fill

A maximum conduit fill ratio of 40% is recommended by TIA-569 standards to accommodate cable bundle bend radius requirements and allow for future expansion.

	CABLE CAPACITY FOR TRAYS AND CONDUIT					
	CAT 5E	CAT 6	CAT 6A			
	UTP	UTP	Small Diameter UTP	UTP	UTP with Isolation Wrap	Shielded
Average OD	0.185 in (5 mm)	0.23 in (6 mm)	0.235 in (5.84 mm)	0.3 in (8 mm)	0.25 in (6 mm)	0.29 in (7 mm)
Cable Tray	FILL 25% 50%	FILL 25% 50%	FILL 25% 50%	FILL 25% 50%	FILL 25% 50%	FILL 25% 50%
2" x 6" (51 x 152 mm)	111 222	72 144	69 138	42 84	61 122	45 90
4" x 8" (102 x 203 mm)	298 596	192 384	184 369	113 226	163 326	121 242
6" x 20" (152 x 508 mm)	1116 2232	722 1444	692 1384	424 848	612 1224	454 908
Conduit	FILL 40%	FILL 40%	FILL 40%	FILL 40%	FILL 40%	FILL 40%
¾" (19 mm)	6	5	4*	1*	3	2*
1" (25 mm)	11	8	7	4	6	4
1 ¼" (32 mm)	19	14	11	6	10	7
1 ½" (38 mm)	25	19	16	10	14	10

* Conduit Fill Ratio NEC Chapter 9: 1 Cable = 53% maximum fill ratio, 2 cables = 31%, 3 or more = 40%

Pathways and Spaces

Cable Tray Sizing Example

To determine the proper tray size based on 25% fill, use the following calculation
for cable with outer diameter of 0.30 inches (8 mm):

1. Determine cable diameter and total number of cables	**0.25" diameter each** **100 cables total** (6 mm diameter)	
2. Square the cable diameter	**0.30 x 0.30 = .09** (8 x 8 = 64)	
3. Multiply result by number of cables	**0.09 x 100 = 9** (64 x 100 = 6400)	
4. Multiply result by 0.785 to factor for cable roundness This result is the total cross-sectional area of your cables	**9 x 0.785 = 7.065 sq in** (6400 x 0.785 = 5024 sq mm)	
5. Multiply result by 4 to obtain pathway size at 25% fill	**7.065 x 4 = 28.26 sq in** (5024 x 4 = 20096 sq mm)	

At 25% fill, a 28 sq in (20096 sq mm) area is needed,
so a standard 4" x 8" (102 x 203 mm) tray would be adequate.

Note: For conduit, size for 40% fill by substituting 2.5 as the multiplier in Step 5

Cable OD^2 **x** No. of cables **= y**

y x 0.785 **= z**

z x 4 **= Pathway size at 25% fill**

Pathways and Spaces

Suspended Ceiling Space
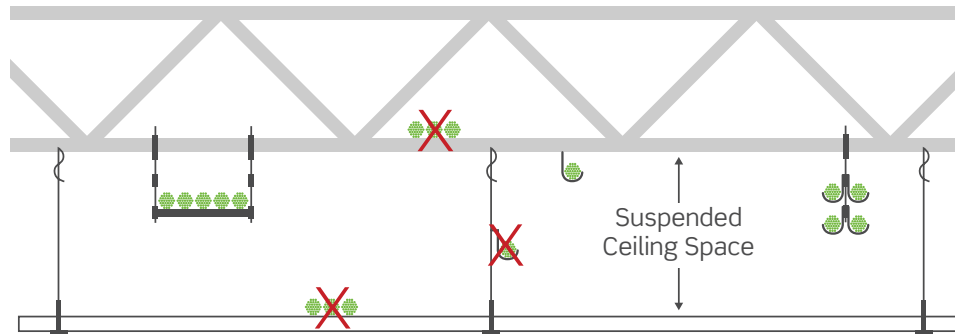
Firestopping
Cat 6A cables may require larger firewall penetrations. Always follow applicable national code (e.g. NEC or CEC) or superseding authority-having jurisdiction (AHJ) codes for firestopping requirements.

Structural and Cable Supports

- Stronger anchors and threaded rods are needed to support heavier Cat 6A cable
- Use properly sized J hooks and other supports to accommodate bundle size
- Limit bundles to 50 cables to prevent damage to cables on the bottom
- Do not exceed cable support manufacturer's recommended capacity
- Space cable supports randomly between 3 and 4 feet (0.9 -1.2 meters) apart to prevent system degradation due to sagging
- Do not use ceiling support wires or other ceiling components to support communications infrastructure

Pathways and Spaces

Consolidation Points and Zone Enclosures

TIA standards allow an optional consolidation point (CP) within a permanent link. A Cat 6A 110 block is Leviton's standard CP solution. It has a density that is ⅓ less than Cat 6 110 blocks (64-pair Cat 6A capacity versus 96-pair for Cat 6 in the same footprint).

Another CP option is to use a patch panel and plug-jack cable assembly. With this option, only an interconnect (one connection) may be used in a patch panel CP application. A cross-connect (two connections with a patch cord) may *not* be used.

Leviton also offers products like the VXC™ Coupler and Assembly and the e2XHD Mini Panel to make the installation and maintenance of consolidation points simple.

Work Area — Telecom Room

110 Block — Minimum of 15 m

Patch Panel — Plug to Jack Cable Assembly — Minimum of 15 m

Permanent Link: 90 m (295.28 ft) max
■ Horizontal Cable + Connectors + ■ Optional Consolidation Point

Channel: 100 m (328.1 ft) max
■ Permanent Link + ■ Patch Cords
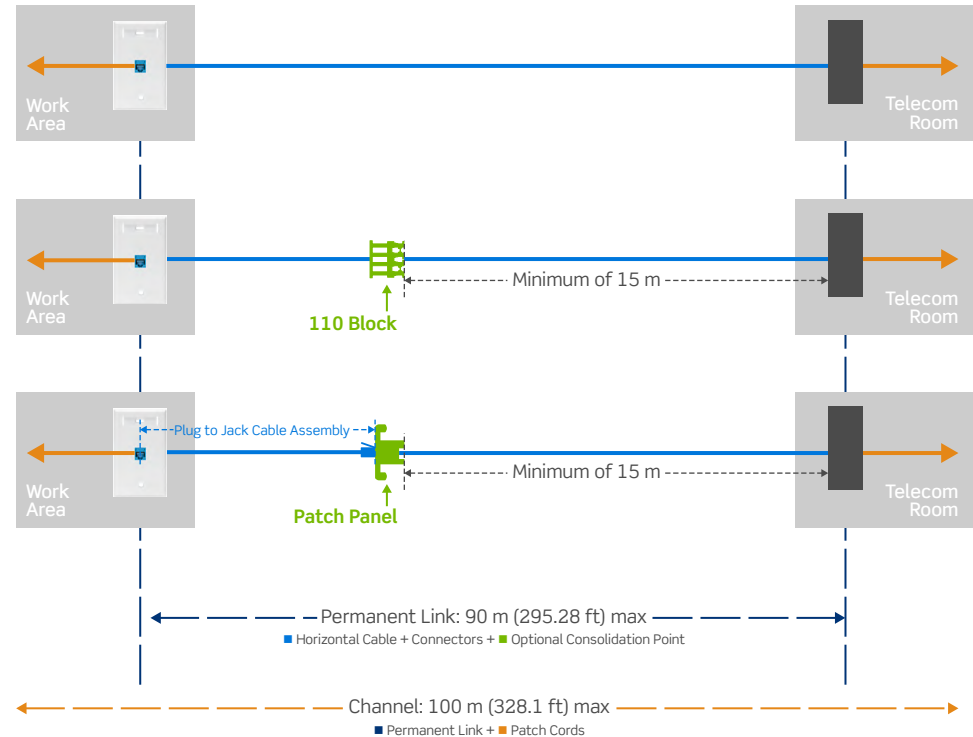
Pathways and Spaces
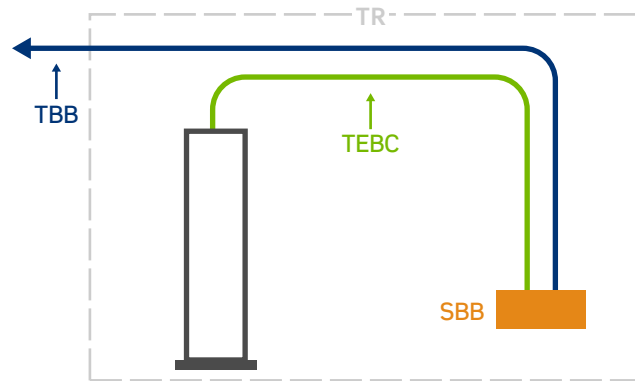
TBB: Telecommunications Bonding Backbone

TEBC: Telecommunication Equipment Bonding Conductor

SBB: Secondary Bonding Busbar

Ensure Shielded Category 6A Integrity

The general best practices below highlight the grounding/bonding elements within a single telecommunications room. You can download an expanded list of grounding best practices from Leviton (**pdf**). Refer to the TIA-607-C standard for additional elements required for a larger Telecommunications Grounding System.

- Follow standards-compliant methodology to install and verify an effective telecommunications grounding system
- Follow the manufacturer's instructions to properly install shielded connectors, cables, patch cords, and patch panels
- Finally, install individual #6 AWG Unit Bonding Conductors (UBC) between each Shielded Patch Panel and the rack or cabinet bonding element. While #12 AWG UBCs are the minimum called out by grounding and bonding standards, #6 AWG is the industry best practice.

Telecommunications Rooms

Organizing cable runs at racks and cabinets is essential to a well-managed network. Larger, heavier Cat 6A cables may require special planning and equipment for a successful installation. Select the best patch panels, cable management, and patch cords or trunks for your application to speed installation and simplify ongoing management.

Telecommunications Rooms

Rear of Rack (cables)

Whether routing cables from above or below, distribute bundles symmetrically to feed into each panel from left and right. This will balance the cable bundles, allow easier access to connections, and reduce congestion at the rear of the panels. Leviton rear cable managers, VERSI-DUCT™ vertical and horizontal finger duct (front/rear versions), and VELCRO® Brand fasteners all support Cat 6A cable at the rear of racks and cabinets.

TECH TIP: Routing and Patching Cables with One Rear Cable Manager

Follow the suggestions below for managing and dressing Cat 6A cables using a single rear cable management bar with a 2RU 48-port flat patch panel.

1. Split the cable bundle before routing it to the rack; connectors that will terminate to the right side of the panel should route down the right side of the rack. Connectors that will terminate on the left side of the panel route down the left side of the rack. (For angled panels: Connectors on the left will route to the right side and connectors on the right will route to the left, crossing over each other.)

2. Start with the bottom row of patch panel ports, and seat the connectors of the first six terminated cables into the first six ports.

3. Attach the bundle of six cables to the bottom of the cable management bar with VELCRO® Brand fasteners, and dress cables into the vertical cable manager on the right.

4. Install and dress the next group of six in a similar fashion, taking them again to the right side of the vertical cable manager.

5. Move to the left and install and dress the leftmost group of six cables first, then the final group of six on the bottom row of the patch panel.

6. Next, route terminated cables to the top row of patch panel ports.

7. Install the first six on the right and route the cables over the top of the cable management bar.

8. Attach this bundle in place to the top of the cable management bar with VELCRO® Brand fasteners, and dress it into the vertical cable manager.

9. Do the same with the next three top bundles.

Telecommunications Rooms

Front of Rack (cords)

Symmetrically dress cords and route into cable management. Leviton's Cat 6A cords have been independently- and field-tested to ensure 10G performance, whether they are strictly combed or randomized in cable managers. Our horizontal ring-type cable managers as well as horizontal and vertical VERSI-DUCT™ products help manage patch cords at the front of the rack. To reduce cord bundle sizes and save rack space, consider using angled patch panels with VERSI-DUCT vertical managers, as the angled design eliminates the need for horizontal managers. Also consider Leviton Cat 6A Small Diameter High-Flex patch cords. Their small cable OD, enhanced flexibility, and compact boots will reduce congestion at the face of the patch panel and high density switch equipment. Additionally, these patch cords increase cable capacity of horizontal and vertical cable managers.

Bend Radius

To maintain Cat 6A performance, minimum bend radius should be 4x OD for UTP and shielded cable. This radius is significantly larger than Cat 6 and 5e. For example, Cat 6 cables at 4x OD is 0.9" (23 mm), whereas Cat 6A is 1.21" (31 mm). Plan carefully to ensure there is sufficient space throughout cable runs to maintain proper bend radius.

Telecommunications Rooms

High-Density Patching

Many IT managers face physical space constraints, with limited room for additional network infrastructure. High-density patch panels are an efficient way to increase copper port density in racks. While standard patch panels offer 24 ports in one rack unit, high-density panels can double that amount with 48 ports per rack unit. However, one should factor in Cat 6A cable size when considering high-density panels, as too many panels in a rack or cabinet may create unwanted congestion.

Angled panel designs can also consolidate rack space, as they allow for proper cable bend radius without needing horizontal cable managers typically found above and below traditional flat panels in the rack.
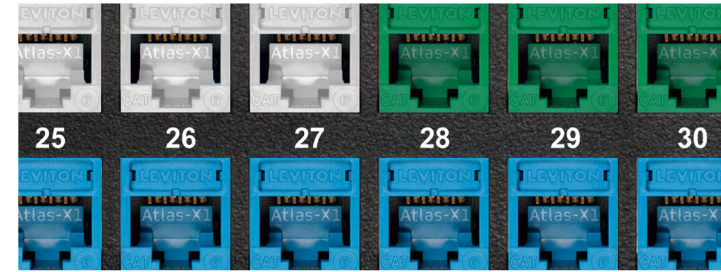
TECH TIP: Color Coding

Enhance telecom room and data center organization by color coding connectors and patch cords. Choose from several schemes, depending on application and system management priorities:

- A/B switch fabric for data center redundancy
- Connectivity types such as WAN/corporate data, LAN, engineering networks, voice, and more
- Campus location
- Company colors

Telecommunications Rooms — Leviton Solutions
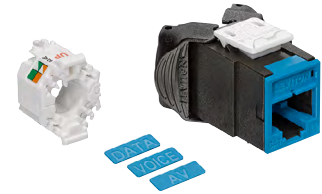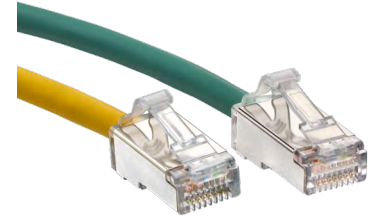
Work Area

Connectivity in the work area requires a finished look, ease of maintenance, and performance, all while meeting installation codes and guidelines. Simplify work area connectivity planning, design, and installation with the following tips.

Work Area — Cabling
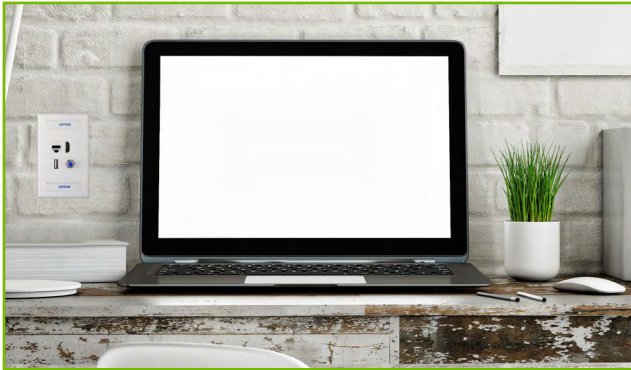
In-Wall Applications

Cat 6A cables require additional depth behind faceplates and at all directional changes to maintain proper bend radius. Before installation, verify that the design allows sufficient depth throughout the cable pathway.
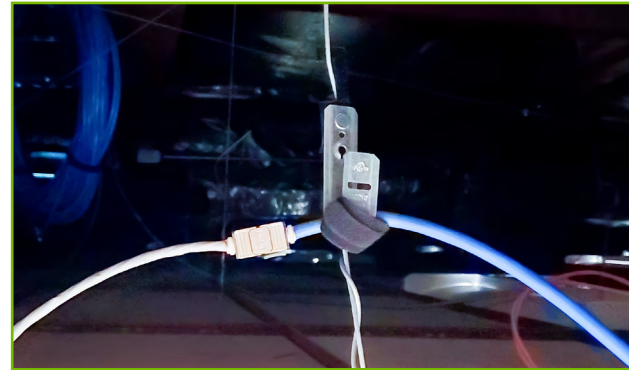
Drop Ceiling Applications

Cable infrastructure must be independently suspended by components designed for this purpose, separate from all other building systems. Do not use ductwork, piping, earthquake bracing, or the drop ceiling grid to suspend cable or cabling support infrastructure.

Note: Hanger wire shown above is not part of the drop ceiling grid hanging system; it was added later to independently hang the telecommunications infrastructure

Work Area — Cabling

WA
WA WA
TE
WA
WA
WA WA
CP
TE
WA
WA WA

WA WA
WA

← MM Fiber-Optic Cable
(Backbone)

WA WA

Racks or Cabinets

Zone Enclosure
(Active network
equipment/switch,
router, etc.)

Rack or
Cabinet

─── Backbone Cabling   ─── Horizontal Cabling
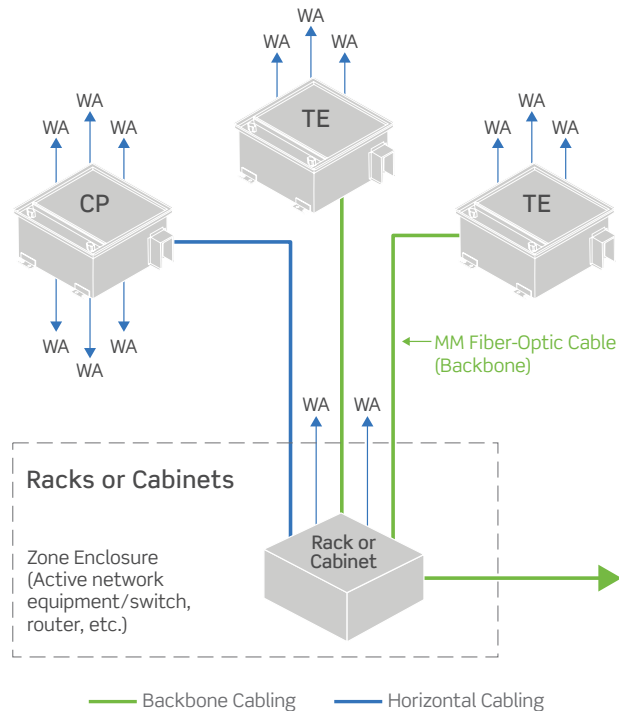
Consolidation Points and Zone Cabling

In a zone cabling design, cables are routed from the telecommunications room (TR) to appropriately placed zone enclosures or telecommunications enclosures (TE). Cabling is then run from the zone enclosure to each work area (WA). This kind of cabling design is ideal for open office architecture. When work areas are modified, cabling need only be reconfigured back to the consolidation point, rather than all the way to the telecom room.

Zone cabling benefits include:

- Maximum infrastructure flexibility
- Improved network performance
- Simplified moves, adds, and changes
- Reduced use of floor space
- Reduced cost of ownership

Work Area — Workstations

Junction Boxes and Mud Rings

Verify that the connectivity design specifies the proper junction box size before drywall is installed. Consider an oversized junction box to accommodate Cat 6A cabling and bend radius requirements, box eliminators, or Leviton QUICKPLATE™ Tempo 1-piece wallplates.

Surface-Mount Boxes

To maintain proper bend radius, consider exiting cable from modular furniture pathways into a surface-mount box instead of directly to a faceplate. Leviton's extended depth four-port surface-mount box works with most modular furniture and is an excellent solution for larger Cat 6A bend radius requirements.

TECH TIP: Modular Furniture Installations

Cubicle furniture and walls often have restricted wireways. Determine cable capacity before finalizing specifications to verify there is adequate space for cables and bend radius requirements. Consider mocking up a cubicle. Most cubicle installations use surface mount boxes or modular furniture faceplates, which help offset the space restrictions of narrow cubicle walls.

Work Area — Leviton Solutions
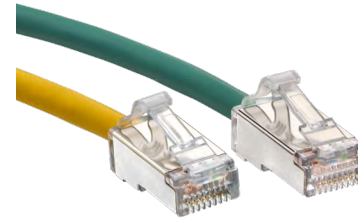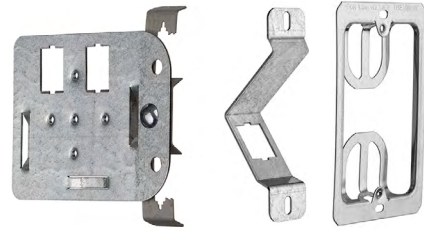
Systems Operation & Maintenance

Installation organizations are typically required to provide the building owner with an "As-built" drawings package, fully documenting the Category 6A installation. This package will typically include drawings, the cabling system labeling scheme, and detailed test results for all installed cabling.

The As-built package provides the basis for the Category 6A cabling system owner to operate and maintain the cabling system.

An annual inspection is typically recommended, which will include:

- Repair/replacement of any damaged cables
- Inspection and repair of any wall, floor, or ceiling penetration firestopping
- Removal of any unused cables (per NEC and CEC requirements)
- Ensure that all required metallic elements are properly bonded to the Telecommunications Grounding System, and that all bonding conductors are secure and properly labeled
- Ensure that all racks, panels, cables, and cords are properly labeled
- Verify that all system moves, adds, and changes (MAC work) is properly updated in system documentation

Applications

Data Centers

Data centers are one of the most critical parts of any data network and thus require the highest levels of performance and reliability. Cabling for data centers differs from horizontal installations in several ways: typical distances, network function, pathways, and spaces. Cat 6A cabling may affect requirements for all of these, but especially pathways and spaces. Careful planning and proper specifications will help ensure a successful installation.

Data Centers — Pathways and Spaces

In recent years, data center switches have been introduced that support 10GBASE-T at lower costs and higher densities, such as the Cisco Nexus 9500 Series and Arista 7300 Series switches. These switch manufacturers and others are promoting "flatter" network architectures that remove some of the north-to-south traffic from switch to server, and replace it with east-to-west, server-to-server designs.

As these new switches and architectures become widely used, it's important to understand how higher densities will affect cabling pathways, as cabinet and cable tray space may become an issue. Cat 6A cabling used to support the 10GBASE-T server connections has a significant impact on the physical support infrastructure needed to deploy it.

64 Cat 6A Pre-Terminated Trunks

40G Fiber Uplinks
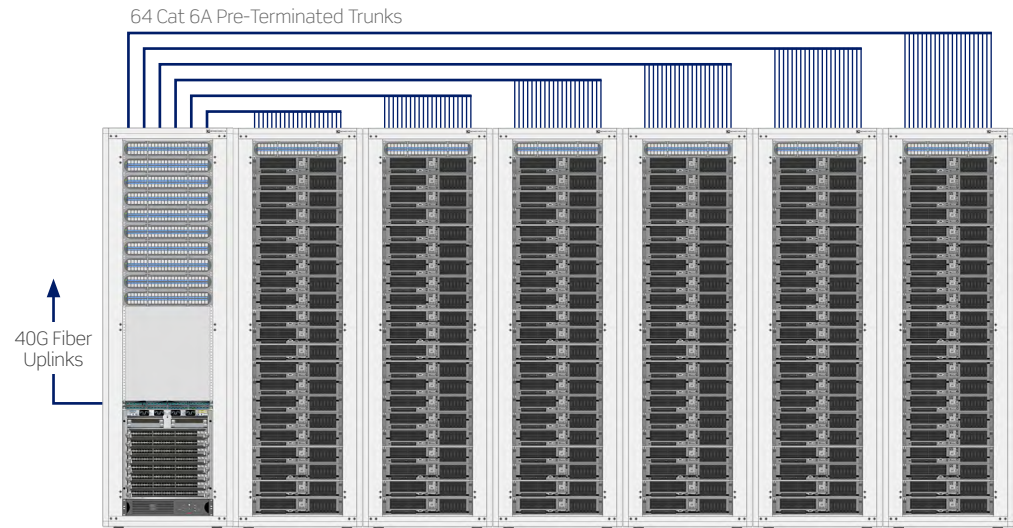
Higher density example: 8-Cabinet Row with Cisco Nexus 9508 Switch

Data Centers — Raised Floor vs. Overhead Cable Runs

There are three typical data center Cat 6A cable run configurations: power and data cabling both under a raised floor, both overhead, or power below and data overhead. The chosen configuration will affect other data center design elements:

- If power and communications cable are both overhead, cable trays must be properly sized, separated, and configured to support 6A cables and accommodate power runs
- If both are underfloor, pedestals must be higher to accommodate larger 6A cables, room for expansion, segregation from power runs, and proper airflow

INSTALLATION BEST PRACTICES

Pathways should be sized for 25% initial fill ratio, which allows space for up to 50% fill with future additions. Pathways should be no more than 6" (15 cm or 150 mm) deep; larger deployments may use multiple trays or pathways to support cabling requirements. See **page 18** for cable tray sizing in pathways.

Space cable bundle supports every three to four feet (0.9-1.2 meters) at irregular intervals.

Leviton trunks are pre-terminated with either a jack or plug. There are numerous advantages to using pre-terminated trunks, including factory testing. See this application note (**pdf**) on how to select the right copper trunk cables.

Data Centers — Leviton Solutions
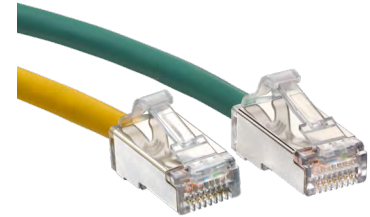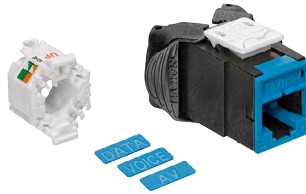
Wireless Access Points

The 10 Gbps Wi-Fi network is finally here. In 2021, IEEE released the Wi-Fi standard 802.11ax. The standard introduces many improvements, such as better performance in high density environments, increased throughput, and more efficient power consumption.

Organizations are deploying 802.11ax wireless access points faster than any other previous generation of Wi-Fi. However, achieving the full benefits of 802.11ax speed and capacity involves more than just a new wireless access point — it starts with properly designing your network infrastructure.

Wireless Access Points — TIA and Leviton Cabling Recommendations

TIA TSB-162-B
Based on a 60 ft x 60 ft Uniform Cell Size

⊢ 18.3 m (60 ft) ⊣

18.3 m (60 ft)

WAP

EO EO

Patch Panel

Active Equipment

- - - - Cat 6A Cable **Max = 80 m (262 ft)**
- - - - Equipment Cord **Max = 6 m (20 ft)**
- - - - WAP Cord **Max = 13 m (42 ft)**

Enterprise wireless access points (WAPs) and backbone cabling infrastructure need to be properly designed and deployed to achieve the real benefits of 802.11ax. In late 2013, TIA published TSB-162-A, Telecommunications Cabling Guidelines for Wireless Access Points, which recommended mounting and routing cable between LAN equipment and WAPs. Later, TIA TSB-162-B revised the recommendations:

Install twisted-pair Cat 6A for horizontal cabling to WAPs. These high-bandwidth solutions optimize network performance for current 802.11ac and 802.11ax devices, while also preparing for future data rates exceeding 10 Gb/s. By using a Cat 6A RJ-45 interface and twisted-pair structured cabling system, users benefit from backwards compatibility, and a horizontal cabling connection from the backbone to active gear.

Use grid-based zone cabling architectures where each grid cell is less than 60 feet (18.3 meters) wide. Many designs will use smaller grid cells, requiring additional WAPs to improve data rates and greater occupancy rates in each cell. 802.11ax WAPs allow for increased data and Power over Ethernet (PoE), so it is recommended to run two Cat 6A cables to each WAP for link aggregation and backup power capabilities. Leviton also suggests installing shielded cabling for these PoE applications to reduce performance issues from heat buildup in cable bundles.

Wireless Access Points — Plenum Cabling Systems for WAPs

Plenum-Rated Patch Cords

VXC Assembly

Plenum-Rated Cables
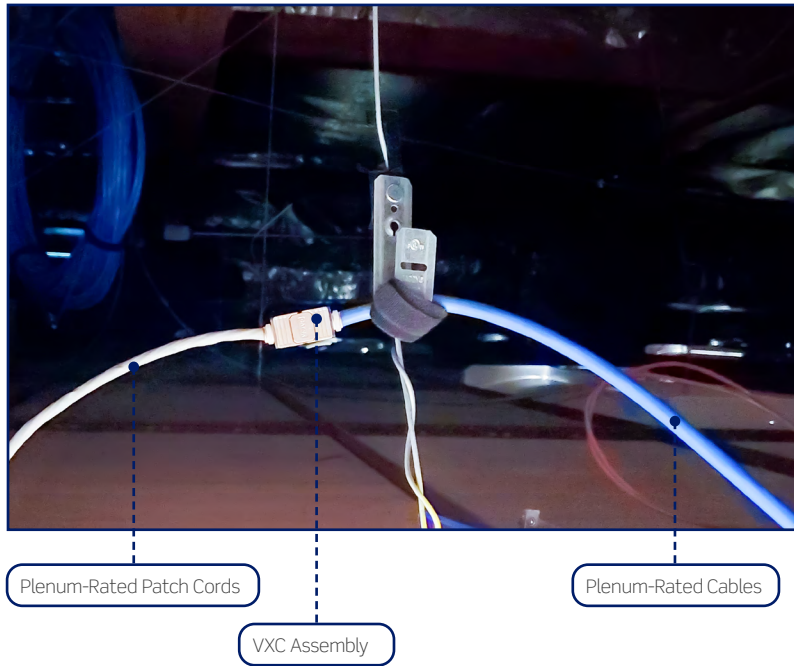
Many wireless access points are installed in drop ceilings, which means the cabling system may require a plenum rating to meet requirements for flammability and smoke density in air-handling spaces. Leviton offers a complete plenum-rated in-ceiling system which includes patch cords, cable, ATLAS-X1™ jacks, QUICKPORT™ surface-mount boxes, In-Ceiling Mounting Brackets, and VXC™ Coupler and Assembly.

The QUICKPORT in-ceiling mounting bracket provides a fixed location for terminating the data connector. This reduces the possibility of damage during construction. Contractors can perform the initial installation and permanent link testing, while allowing the flexibility to move the In-Ceiling Bracket to refine Wi-Fi® coverage or WAN placement without needing to retest the link.

The VXC Assembly creates a cost-effective method for terminating cables for wireless access points, video cameras, and other ceiling mounted devices. This Cat 6A rated assembly includes a VXC Coupler that creates a durable connection without the need for punchdown or other proprietary tools. The assembly also includes a standard size plug and flexible stranded patch cable.

* = Drop-wire not included in VXC Assembly and installed independent of ceiling grid suspension.

Wireless Access Points — Leviton Solutions
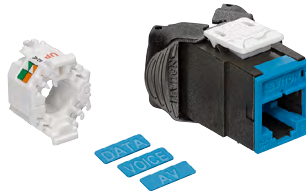
Power over Ethernet

High-quality connectivity is essential for attaining the performance and reliability needed in current and future Power over Ethernet (PoE) network operations. System components should be designed to minimize temperature increases and meet industry standards for performance.

Power over Ethernet — Standards

In 2013, IEEE announced a taskforce to create 802.3bt, a standard defining PoE over four pairs supporting 10GBASE-T. The standard defined two new tiers of PoE: Type 3 for up to 60 watts, and Type 4 for up to 90 watts. Both standards support devices requiring higher power, such as laptops, displays, and next-generation wireless access points. In early 2018, IEEE released publication of 802.3bt.

4-Pair PoE
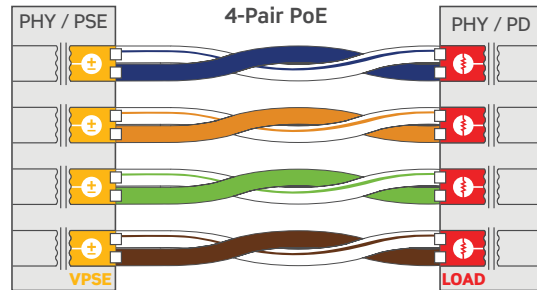
In June 2016, the US National Fire Protection Association (NFPA) voted for changes to the 2017 National Electric Code (NEC) that affected PoE. The NEC provides standards for installing electrical wiring and equipment in the United States and, while not a law, it is commonly adopted by states and cities around the country. The NFPA voted to create a new ampacity table to be referenced when the power supplied to conventional cables exceed 60 watts. This table, included in NEC article 725, governs the maximum cable bundle size allowed for conventional telecommunications cables with various temperature ratings, carrying various level of PoE.

The Telecommunications Industry Association (TIA) and the International Organization for Standardization (ISO) have updated standards that address cabling to support 4-pair PoE in accordance with 802.3bt. TIA TSB-184-A Guidelines for Supporting Power Delivery Over Balanced Twisted-Pair Cabling and the ISO/IEC TS29125 "Information Technology — Telecommunications Cabling Requirements for Remote Powering of Terminal Equipment" both offer cabling guidelines to support IEEE 802.3bt four-pair PoE, as well as other applications. These documents provide guidance on maximum bundle size for different category cables based on installation conditions and the maximum power delivered (15.4, 30, 60, or 90 watts).

Power over Ethernet — Cable and Connectivity Recommendations

One issue that can affect performance is heat generation in cable bundles. When power is added to balanced twisted-pair cabling, the copper conductors generate heat and temperatures rise. The heat dissipates into the surrounding area until a stable temperature is reached, with the cable bundle at a higher temperature than the surrounding ambient temperature. High temperatures can lead to higher insertion loss, and in turn shorter permissible cable lengths. It can also increase bit error rates, and create higher power costs due to more power dissipated in the cabling. Cables also behave differently with respect to heat dissipation depending on whether they are insulated in conduit, cable tray, or open air. The Telecommunications Industry Association (TIA) recommends 15 degrees Celsius as the maximum allowed temperature rise above ambient as a result of power over the cabling.

Leviton offers a list of tips for minimizing cable temperature rise in PoE installations.

leviton.com/ns/library

"Tips for Minimizing Cable Temperature Rise in PoE Installations"

Power over Ethernet — Cable and Connectivity Recommendations

Reduce the Number of Cables per Bundle

Separating large cable bundles into smaller bundles or avoiding tight bundles will reduce temperature rise. For example, TIA tested the temperature of a bundle of 91 cables, and three bundles of 37 cables. The temperature in the center of a 91 cable bundle was higher than the worst case temperature in center point of three bundles. Physically separating the three bundles from each other further reduced the maximum temperature.

Install Shielded Cabling or UTP with Isolation Wrap

UTP cable with patented isolation wrap controls alien crosstalk that can equal the protection afforded by a shielded cable, but eliminates the need for grounding and bonding required with shielded cabling. The lower resistance of the 23 AWG conductors used in Cat 6A cable also reduce temperature rise due to PoE over lower category cables.

SHIELDED CABLE

Shield/Foil

Drain Wire for Grounding and Bonding

UTP CABLE WITH ISOLATION WRAP

Isolation Wrap

No Drain Wire
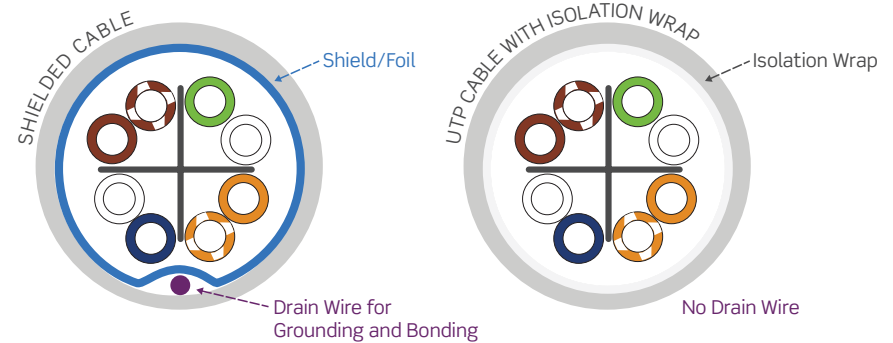
Power over Ethernet — Cable and Connectivity Recommendations for PoE

Consider Connection Integrity and Performance

Another consideration with PoE is the potential for damage over time to RJ-45 connectors in the network. Specifically, when a patch cord is unplugged while the connection is energized, a small electrical arc can occur between the connector and the plug. While there is no immediate damage (and the arc is not dangerous to users), it can create pitting on the connector tines and patch cord plug contacts over numerous disconnections, weakening the integrity of the connection.

Leviton recommends using a connector that is designed to keep the connection point between the mated connector tines and plug at a distance from the point of arcing damage. Leviton has designed the geometry of its connectors so that arcing occurs at a different area from the point of contact during data transmission. Leviton connectors also use a patented retention force technology that maintains contact force between plug and connector, preventing intermittent disconnects that cause arcing.

As with cable, temperature rise in connectors can also affect channel performance. Leviton engineers tested ATLAS-X1™ jacks and patch cords against standards requirements. The jack was tested to the IEC 60512-5-2 Connectors for Electronic Equipment standard. The higher performance in the ATLAS-X1 jack is largely due to its unique metal-body construction. Leviton testing found that using metal in the jack body — instead of commonly-used ABS plastic — creates a 53 percent improvement in heat dissipation.

Retention Force Technology

Plastic   Metal

Damaged Area from Arcing   Contact Zone

Tine Geometry
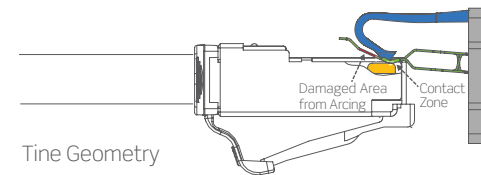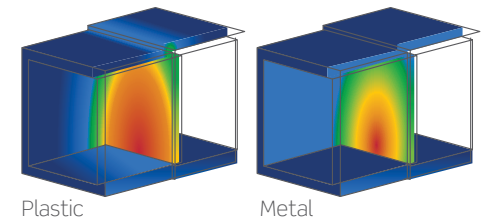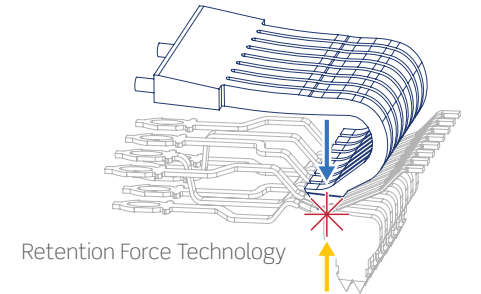
Power over Ethernet — Leviton Solutions
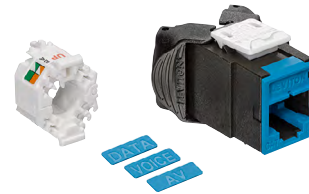
IT/AV and HDBaseT™

HDBaseT has become a key technology that enables audiovisual signal extension to high definition displays and projectors. HDBaseT 5Play™ extends HDMI® video and audio, 100BaseT Ethernet, control, and power up to 100 meters on a single category-rated twisted-pair cable. Category cable is not only faster and simpler to install than traditional HDMI cables, it is also more cost effective.

AV signals over HDBaseT look much like the 10GBASE-T data signals you encounter every day — they are just a little less forgiving. HDBaseT is packet based like Ethernet, but it doesn't have a retransmission mechanism, so there is no recovery from packet errors. You can avoid pixelation or complete video dropout due to packet errors by using the right cabling.

A key feature of HDBaseT 5Play is the ability to power transmitter and receiver devices over the category cable link using PoH. Typical power levels used are only 10-15 watts, but the system is capable of supporting the full 95 watts in compliance with the IEEE PoE+ standard. A Category 6A connectivity system is recommended.

HDBaseT 5Play at a Glance
Simultaneous transmission of 5 functions over a single category cable up to 100 m (328 ft)

	HD Video — Full HDMI: HD/3D and 2K/4K uncompressed video
	Audio — Full audio including Dolby Digital, DTS, Dolby TrueHD, and DTS HD-Master Audio formats
	Ethernet — Supports 100Mb Ethernet Channel. For connecting devices to the local area network; can also be utilized to enable IP control of devices
	Control — Control via bi-directional RS-232 and IR Channels
	Power over HDBaseT (PoH) — Power extenders from either the source or display end with certified bi-directional PoH extenders. Complies with IEEE802.3at-2009 "PoE+"

IT/AV and HDBaseT™

The HDBaseT Alliance specifies Cat 5e, Cat 6 UTP, and Cat 6A UTP cabling as supported media types. But these category ratings will deliver varying performance results, depending on the type of installation, video resolution, and distance. While Cat 5e channels can carry HDBaseT signals in an isolated point-to-point link, they do not support HDBaseT in real-world high-density installations with adjacent data or HDBaseT channels.

Leviton testing finds use of Cat 5e in these applications can lead to high packet error rates and total link loss, as the channels are not designed for resistance to alien crosstalk. Even Cat 6 cables can be limited in carrying HDBaseT signals when adjacent to other cables carrying HDBaseT. We recommend Cat 6A with alien crosstalk prevention technology to support HDBaseT signals that are in the presence of multiple disturbers, including other HDBaseT signals and 10 GbE.

Leviton offers a complete IT/AV System for HDBaseT applications, including HDMI extenders and Cat 6A connectivity and cable. This system can be installed, tested, and verified as a Cat 6A 10GBASE-T link, and is certified to HDBaseT Alliance Standards.

Shield/Foil

Shielded Cable

Drain Wire for Grounding and Bonding

Isolation Wrap

UTP Cable with Isolation Wrap

No Drain Wire
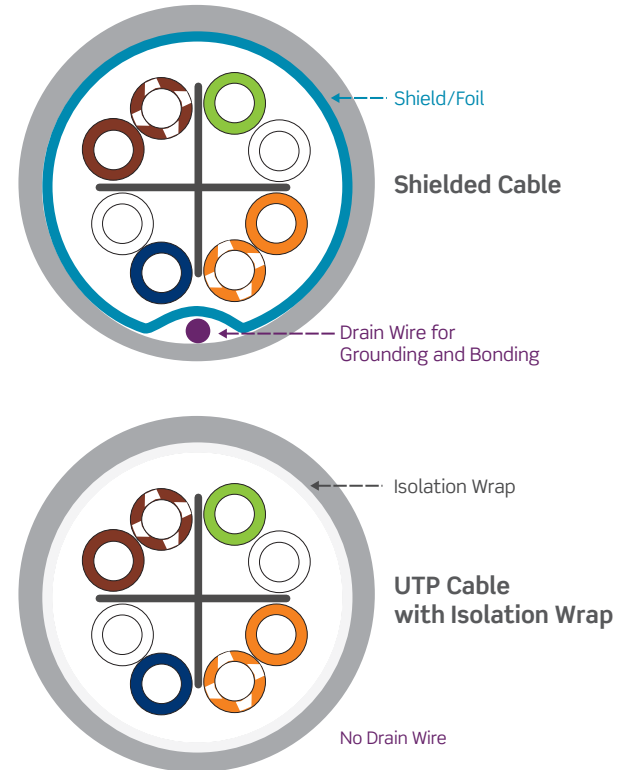
IT/AV and HDBaseT™ — Leviton Solutions

Testing

Cat 6A Testing

Field testing of Cat 6A installations is much like field testing for Cat 5e and Cat 6. However, Cat 6A testing is performed to a maximum frequency of 500 MHz. In addition, Cat 6A adds several tests for alien crosstalk (AXT).

Use an industry-recognized UL Level 4 or higher field tester capable of testing to 500 MHz. Contact the test equipment manufacturer for any necessary hardware or software upgrades, including AXT testing capabilities, for testing Cat 6A installations. Perform permanent link or channel tests for all installed drops. Upon completion, provide the customer with all test results.

- Wire map
- Length
- Attenuation
- Propagation delay
- Delay skew
- NEXT – near-end crosstalk
- FEXT – far-end crosstalk
- Return loss (RL)

- PSNEXT – power sum near-end crosstalk
- PSFEXT – power sum far-end crosstalk
- PSACRF – power sum attenuation-to-crosstalk ratio, far-end
- AACRF – alien attenuation-to-crosstalk ratio, far-end
- AFEXT – alien far-end crosstalk
- ANEXT – alien near-end crosstalk
- PSAFEXT – power sum alien far-end crosstalk
- PSANEXT – power sum alien near-end crosstalk

- ELFEXT (ACRF) – equal level far-end crosstalk (attenuation-to-crosstalk ratio, far-end)
- PSELFEXT (PSACRF) – power sum equal level far-end crosstalk (power sum attenuation-to-crosstalk ratio, far-end)
- PSAACRF – power sum alien attenuation-to-crosstalk ratio, far-end

MPTL Testing

MPTLs (Modular Plug Terminated Links) are terminated with a jack on one end and a modular plug on the other end. Category 6A MPTL testing is accomplished with a Permanent Link Adapter on the Tester Main Unit and a Category 6A Patch Cord Adapter on the Tester Remote Unit. (Testing an MPTL with a Channel Adapter yields inaccurate plug performance results). Select a Category 6A MPTL Test from the test choices in the Tester menu.

Permanent Link Testing

Interconnect
Optional Consolidation Point
Telecommunications Outlet
Horizontal Cabling
Consolidation Point Cabling
Permanent Link Adapter
BEGIN MEASUREMENT
END MEASUREMENT
Permanent Link Adapter

Channel Testing

Horizontal Cross Connect
Horizontal Cross Connect
Optional Consolidation Point
Telecommunications Outlet
Cross Connect
Horizontal Cabling
Consolidation Point Cabling
Equipment/ User Cable
BEGIN MEASUREMENT
END MEASUREMENT
Equipment/ User Cable
Channel Adapter
Channel Adapter

MPTL Testing

Interconnect
Horizontal Cabling
Optional Consolidation Point
Permanent Link Adapter
BEGIN MEASUREMENT
Modular Plug Termination
END MEASUREMENT
NOTE: Mated NEXT of plug and test head included in measurement. Centered test head required for testing.

AXT Testing

PSANEXT
Power Sum Alien Near End Crosstalk

Frequency (MHz): (Blue — Worst Case, Green — Average)

PSAACRF
Power Sum Alien Attenuation to Crosstalk Ratio — Far End

Frequency (MHz): (Blue — Worst Case, Green — Average)
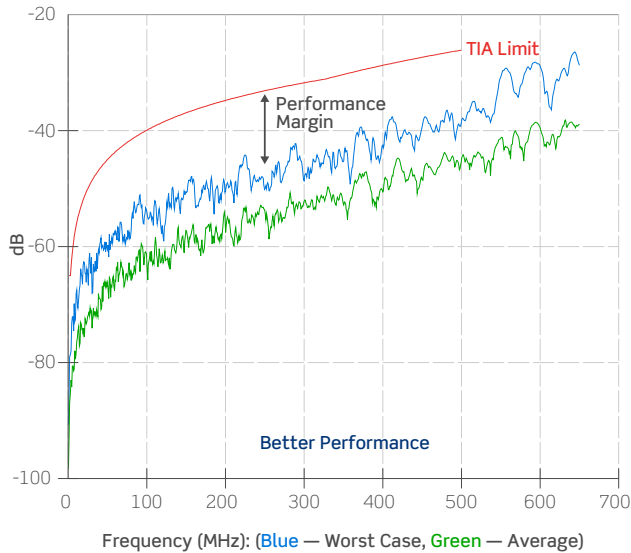
TECH TIP: Leviton AXT Performance

Alien crosstalk (AXT) can have a serious impact on Cat 6A cabling system performance. Choose Leviton and get excellent AXT suppression. Independent third-party and Leviton tests have proven that properly installed Leviton Cat 6A solutions have significant AXT headroom over the standard's requirements, even for permanent links as short as 10 feet (3.048 m). As a result, properly installed Leviton systems with approved cable do not require field alien crosstalk testing. In addition, Leviton pre-terminated, pre-tested trunk cables do not require any field testing.

AXT Testing Preparation
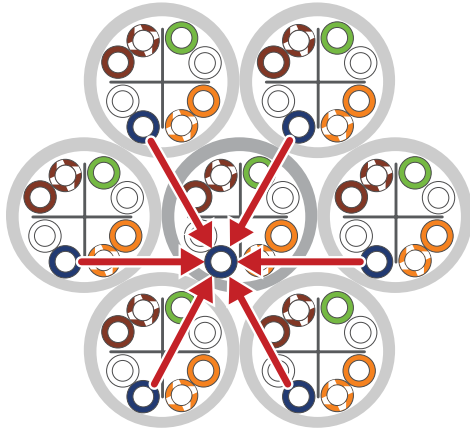
AXT testing measures the unwanted noise coupled to the cable being tested (called the "Victim" or "Disturbed") by surrounding cables (called "Disturbers"). Two tests need to be performed: the Power Sum Alien Near-end Crosstalk (PSANEXT) test and the Power Sum Alien Attenuation-to-Crosstalk Ratio, Far-end (PSAACRF) test. Results for the remaining AXT tests are taken as part of these two, so although they are not directly provided, a "pass" result for PSANEXT and PSAACRF ensures passing results for AACRF, AFEXT, ANEXT, and PSAFEXT. A 2% sample of the installed cables is typically recommended.

- AXT tests are time-consuming: budget AXT test time into your bid
- Handheld test instruments (field testers) require an additional AXT module
- A laptop computer is also typically used with the field tester
- The field tester's AXT application software must be loaded onto the laptop
- Installation personnel will require training prior to performing AXT testing

TECH TIP: Is AXT Testing Required?

Even though Leviton does not require field AXT testing for its Cat 6A solutions, you may still be required to perform this testing. Read project specifications carefully to determine if they call for field AXT testing. If they do, ask for a waiver based on the proven performance of Leviton's Cat 6A solutions. If the customer won't grant a waiver, you'll need to perform the testing.
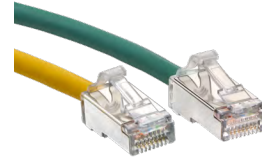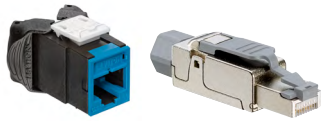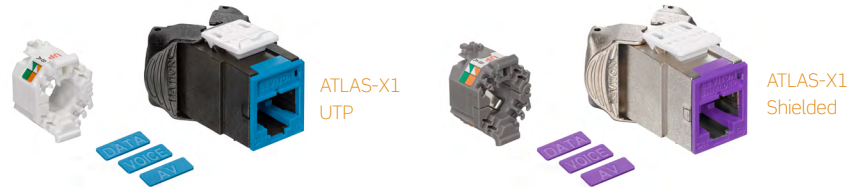
Product Overview

Connectors

Jacks

ATLAS-X1
UTP

ATLAS-X1
Shielded

ATLAS-X1™

ATLAS-X1 Cat 6A jacks deliver the highest level of verified performance and reliability, and offer simple tool-free terminations. The jacks feature interchangeable icons and optional internal shutters for protection. They have been tested and approved as a plenum-rated in-ceiling solution, and exceeds PoE standards up to 100 watts.

EXTREME™

EXTREME Cat 6A jacks pair high quality and performance with a user-friendly design to support fast, easy installations. They are ideal for enterprise or commercial environments where enhanced 10GBASE-T performance is required.

CAT 6A JACK OPTIONS			
DESCRIPTION		UTP	SHIELDED
ATLAS-X1	Cat 6A QUICKPORT™ Jack	6AUJK-R*6	6ASJK-R*6
	Cat 6A QUICKPORT Jack with Shutter	6AUJK-S*6	6ASJK-S*6
	Cat 6A QUICKPORT Jack, GREENPACK™ 12-pack	6AUJK-C^6	6ASJK-C~6
	Bulk Icons, pack of 72 (2-sided icons, 24 of each icon)	ICONS-IC*	ICONS-IC*
	Wire Managers, bag of 10	AXUJK-BWM	AXSJK-BGM
EXTREME	Cat 6A QUICKPORT Jack	6110G-R*6	—
	Cat 6A QUICKPORT Jack, GREENPACK 12-pack	6110G-C^6	—

* Color: White (W), Light Almond (T), Ivory (I), Yellow (Y), Orange (O), Crimson (C), Dark Red (R), Purple (P), Blue (L), Green (V), Gray (G), Black (E), Brown (B)
^ = Colors: White (W), Black (E), Blue (L)   ~ = Colors: White (W), Black (E), Gray (G)
All Leviton Category-Rated Jacks are RoHS Compliant.

13 Colors and Shutter Options

Universal Tool-Free Plug
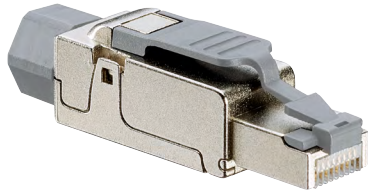
Cat 6A Universal Tool-Free Plug

Cat 6A Universal Tool-Free plug offers easy field termination without special tools and terminates from 26- to 22-gauge solid or stranded conductors, supporting shielded and UTP applications

UNIVERSAL TOOL-FREE PLUG	
DESCRIPTION	PART NO.
Cat 6A Univrsal Tool-Free Plug	6APLG-S6A

Patch Panels

e2XHD

Mini-Panel

Front Loading Panel

QUICKPORT

110-Style

e2XHD — Simple termination and improved cable routing. Cassettes quickly snap in and pull out of high-density panels, making installation and maintenance easier than ever. Panel covers and cassette blanks offer extra protection against dust and damage.

Mini-Panel — The e2XHD Mini Panel will accommodate two e2XHD cassettes for either copper or fiber connectors. Flexib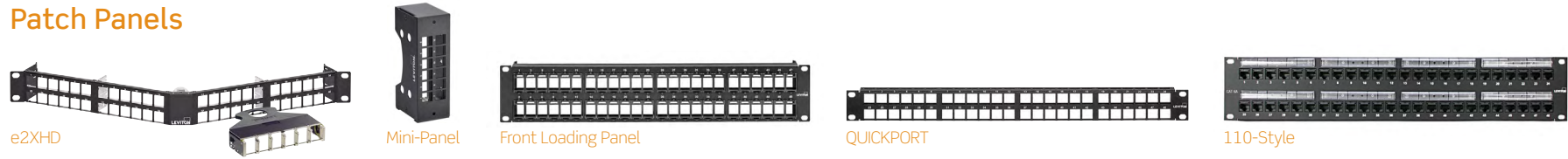le mounting options allow the e2XHD Mini Panel to be installed in a variety of wall-mount, rack, or cabinet applications.

QUICKPORT™ — Wide selection of panels, offered in both black and white, allows you to create the perfect mix of voice, data, video, and audio, all in a single panel.

110-Style — Ideal for modular cross connection and available in a multitude of port densities to meet the needs of high-speed data applications. Craft-friendly 110 punchdowns on the rear of the panel make installations fast and easy.

PATCH PANEL OPTION

TYPE		12 PORT	1RU 24 PORT	1RU 48 PORT	2RU 48 PORT	CASSETTE
e2XHD	Flat*	—	—	E2X1F-S48	—	E2XHD-BRK
	Angled*	—	—	E2X1A-S48	—	E2XHD-BRK
	Mini-Panel	E2XMB-D12	—	—	—	—
QUICKPORT™	Flat, kitted with connectors^	—	6910G-U24	—	6910G-U48	—
	Flat*	—	49255-H24	49255-Q48	49255-H48	—
	Flat, shielded‡	—	4S255-S24	4S255-D48	4S255-S48	—
	Front Loading Panel	—	—	—	49455-48B	—
	Flat with magnifying lens holder*	—	49255-L24	—	49255-L48	—
	Angled*	—	49256-H24	49256-D48	49256-H48	—
	Angled, shielded‡	—	4S256-S24	—	4S256-S48	—
110-Style	Flat	—	6A586-U24	—	6A586-U48	—
	Angled	—	6A587-U24	—	6A587-U48	—

* Sold empty, load with any ATLAS-X1™ or EXTREME™ QUICKPORT jacks
^ Kitted with EXTREME jacks   ‡ Sold empty, load with ATLAS-X1 shielded jacks

Patch Cords
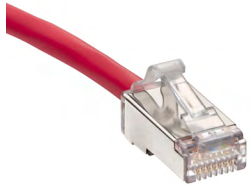
Cat 6A Patch Cords
These cords are equipped with a new compact plug-and-boot design to provide better flexibility, durability, and reduced bend radius, while delivering data rates up to 10 Gb/s.

Cat 6A Stranded Plenum Platch Cords
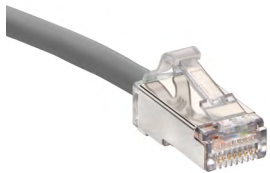Plenum rating for use above drop ceilings and other air handling spaces with stranded conductors for enhanced flexibility and longer flex life. Also, the snagless, plug-and-boot design makes these patch cords an excellent choice in environments where moves, adds, and changes are frequent.

Cat 6A Small Diameter High-Flex Patch Cords
Cat 6A High-Flex cords have an U/FTP construction for exceptional AXT suppression. They provide small diameter cable and superior cable flexibility for easier installation and routing.

CAT 6A PATCH CORD OPTIONS

DESCRIPTION	
Component-Rated Patch Cord, CMR	6AS10-xx*
Stranded Plenum Patch Cord	6ASP0-xx†
Small Diameter High-Flex Patch Cord, CM/LSZH	H6A10-xx*

xx Length in feet   * Color: White (W), Yellow (Y), Red (R), Blue (L), Green (G), Gray (S), Black (E)
† Color: Blue (L), Gray (S), White (W)   All Leviton Cat 6A patch cords are RoHS Compliant.

Color Options

Make to order!
leviton.com/configurator

Additional custom lengths available; for assistance please visit Leviton.com/MTOCords or call Tech Support at (800) 824 3005.

Cat 6A Cables

SST CAT 6A U/UTP Cables

These cables feature a small outer diameter 0.235" and offers unmatched assurance of network performance with superior signal isolation. The specially designed isolation wrap construction provides heat management and noise-cancelling performance.

LM-RDT™ CAT 6A U/UTP Cables

This cable features a reduced diameter of 0.245", creating better cable flexibility, and improving tray-fill ratio for high-density applications. It offers excellent signal isolation, with PoE and alien crosstalk performance that exceeds standards.
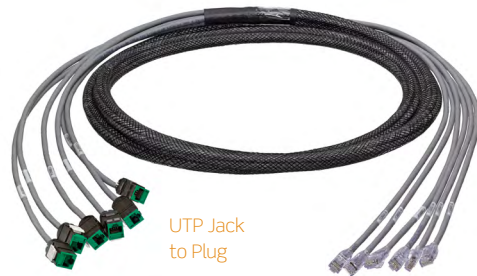
LM-RDT I/O CAT 6A U/UTP Cables

Dual-rated for CMP and CMX outdoor applications. The cable's jacket technology has been rigorously tested in Leviton's Systems Verification Lab to withstand water, sunlight, and extreme temperatures. It features a 0.235" outer diameter, slimmer than the industry's typical diameter of 0.270".

CAT 6A CABLES OPTIONS

DESCRIPTION	BLACK	WHITE	BLUE	GRAY	YELLOW	GREEN
SST Cat 6A U/UTP Cable, CMP, 1000 (305 m) foot reel	—	11140401	11101842	11140402	11140403	11140404
SST Cat 6A U/UTP Cable, CMP, 1000 foot (305 m) reel in a box	—	11140628	11140627	11140629	11140630	11140631
SST Cat 6A U/UTP Cable, CMR, 1000 foot (305 m) reel	—	11140409	11104157	11140410	11140411	11140412
SST Cat 6A U/UTP Cable, CMR, 1000 foot (305 m) reel in a box	—	11140640	11140639	11140641	11140642	11140643
LM-RDT Cat 6A U/UTP Cable, CMP, 1000 ft (305 m), reel	—	11141651	11141650	11141959	11142234	11142235
LM-RDT Cat 6A U/UTP, Cable CMR, 1000 ft (305m), reel	—	11143100	11142398	11142285	11143101	11143102
LM-RDT Cat 6A U/UTP, Cable I/O, CMP, 1000 ft (305m), reel	1142753	—	—	—	—	—
LM-10G FTP Cat 6A F/UTP Cable, CMP, 1000 ft (305m), reel	10189549	10167485	10143424	10167487	10167488	10189246
LM-10G FTP Cat 6A F/UTP Cable, CMR, 1000 ft (305m), reel	11077196	10189801	10189567	10189798	10189803	10107572

Pre-Terminated Copper Trunks

UTP Jack to Plug

UTP Jack to e2XHD Cassette

Leviton makes it easy to configure your own copper trunks, customized for length, jack type, and more. With factory testing and no need for field terminations, you can reduce installation time by up to 75%.

- Built in dedicated make-to-order US facilities
- 100% factory tested, with test results available for each link
- Available with e2XHD Cassettes, work exclusively with e2XHD Patch Panels

PRE-TERMINATED COPPER TRUNK OPTIONS

CABLE TYPE	CABLE RATING	# OF CABLES	CABLE LENGTH	CABLE COLOR*	INDIVIDUAL JACK COLOR	TERMINATION OPTIONS
Cat 6A UTP	CMP, CMR, LSZH	6, 8, 12	10-295 ft (3-90 m)	Blue	White, Light Almond, Ivory, Yellow, Orange, Crimson, Purple, Blue, Green, Gray, Black, Brown	Connector, Plug, Open, e2XHD Loaded Cassette
Cat 6A FTP	CMP, CMR	6		Gray	Black*	Connector, Open

* Additional cable and shielded connector colors are available, but may require additional lead-time. Contact Inside Sales at (800) 722 2082 for more details.
^ Noise-Canceling Technology   Available with ATLAS-X1™ or EXTREME™ jacks.   All trunks utilize solid conductor cable.

For assistance customizing your trunks, please visit Leviton.com/configurator or call Tech Support at (800) 824 3005.

Signal Extension

HDBaseT 100 m
Extender Transmitter

Extender Transmitter and Receivers

Extend HDMI®, VGA, or USB signals up to 100 meters, all over Cat 6A cabling, with plug-and-play extenders that require no set-up or programming. Extenders with HDBaseT offer full 5Play: Audio, Video, Control Signals (RS-232 and IR), 100BASE-T Ethernet, and Power over HDBaseT (PoH).

EXTENDER OPTIONS				
DESCRIPTION		100 M	70 M	40 M
HDBaseT Extender	Transmitter and Receiver	41910-HTE	41910-HT0	—
	IR Emitter and Receiver Kit	41910-HIR	41910-HIR	—
HDMI Extender	Transmitter and Receiver	—	—	41910-H00

Autoswitching Wallplate

8-Button Control Panel

Control Systems

Use the Autoswitching HDBaseT Extender Wallplate to connect, switch, and extend HDMI and VGA signals — including 1080p and 4K video — to displays or projectors. The optional 8-Button Panel allows you to easily control the Autoswitching Wallplate in classrooms or conference rooms. Pre-configured buttons control display or projector on/off, volume up/down, and source selection.

CONTROL SYSTEM OPTIONS	
DESCRIPTION	
Autoswitching HDBaseT Extender Wallplate	41920-HRC
Receiver (for use with 41920-HRC)	41910-HTR
8-Button Control Panel	41920-CP8

HDMI Cable

HDMI Cables

Leviton high-speed HDMI Cables with Ethernet are ideal for supporting in-wall and permanent installations. The cable is CL2-rated for in-wall installations, and it is flexible to accommodate common box depths while maintaining minimum bend radius requirements.
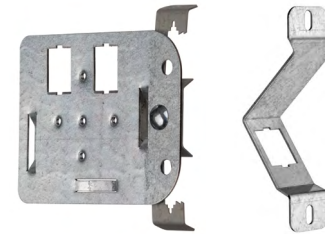
HDMI CABLES	
DESCRIPTION	
HDMI Cable	41900-xxE
HDMI Cable Lock Kit	41900-LKT

xx Length = 3 ft (03), 6 ft (06), 10 ft (10), 15 ft (15)

Wallplates and Housings

QUICKPORT™ Wallplates

Single Gang

Single Gang with ID Windows

QUICKPORT Standard Plastic Wallplates

QUICKPORT flush-mount wallplates accept all QUICKPORT jacks. They are available in single-gang, dual-gang, with or without designation windows, and more. They are cULus Listed.

WALLPLATE OPTIONS							
DESCRIPTION		WHITE	LT. ALMOND	IVORY	GRAY	BLACK	BROWN
Single Gang	6-Port	41080-6WP	41080-6TP	41080-6IP	41080-6GP	41080-6EP	41080-6BP
	4-Port	41080-4WP	41080-4TP	41080-4IP	41080-4GP	41080-4EP	41080-4BP
	3-Port	41080-3WP	41080-3TP	41080-3IP	41080-3GP	41080-3EP	41080-3BP
	2-Port	41080-2WP	41080-2TP	41080-2IP	41080-2GP	41080-2EP	41080-2BP
	1-Port	41080-1WP	41080-1TP	41080-1IP	41080-1GP	41080-1EP	41080-1BP
Single Gang with ID Windows	6-Port	42080-6WS	42080-6TS	42080-6IS	42080-6GS	42080-6ES	—
	4-Port	42080-4WS	42080-4TS	42080-4IS	42080-4GS	42080-4ES	—
	3-Port	42080-3WS	42080-3TS	42080-3IS	42080-3GS	42080-3ES	—
	2-Port	42080-2WS	42080-2TS	42080-2IS	42080-2GS	42080-2ES	—
	1-Port*	42080-1WS	42080-1TS	42080-1IS	42080-1GS	42080-1ES	—

* Single-gang 1-Port Wallplate has only one ID window on top.

More options available: Visit Leviton.com/wallplates for a full listing.

QUICKPLATE™ Wallplates

QUICKPLATE Tempo Wallplates with ID Windows

QUICKPLATE Tempo wallplates allow for fast, one-piece installations.
They feature patented rear wings that tighten the wallplate
to wallboard, eliminating the need for a box or mounting brackets.

WALLPLATE OPTIONS		
DESCRIPTION		WHITE
Single Gang	4-Port	42090-2WS
	2-Port	42090-4WS

QUICKPORT™ Surface-Mount Boxes

Surface-Mount QUICKPORT Boxes are easily field-configured with QUICKPORT jacks. All boxes can be mounted with screws or adhesive mounting tape (both provided) or with magnets or modular furniture brackets (sold separately). One-, two-, and four-port surface-mount boxes are plenum rated. Extended depth 4S089 boxes are best suited for use with Cat 6A cable.

12-Port Standard Surface-Mount Box

7.60" W x 5.02" D x 1.13" H

SURFACE-MOUNT BOX OPTIONS

	DESCRIPTION	WHITE	IVORY	LIGHT ALMOND	GRAY	BLACK
Standard	12-Port, 7.60" W x 5.02" D x 1.13" H (193 mm W x 128 mm D x 29 mm H)	41089-12W	41089-12I	—	41089-12G	41089-12E
	6-Port, 6.38" W x 3.22" D x 1.08" H (162 mm W x 82 mm D x 27 mm H)	41089-6WP	41089-6IP	—	41089-6GP	41089-6EP
	4-Port, 4.77" W x 3.21" D x 1.05" H (121 mm W x 82 mm D x 27 mm H)	41089-4WP	41089-4IP	—	41089-4GP	41089-4EP
Plenum Rated	2-Port, 2.52" W x 2.22" D x 1.10" H (64 mm W x 56 mm D x 28 mm H)	41089-2WP	41089-2IP	41089-2TP	41089-2GP	41089-2EP
	1-Port, 1.42" W x 2.22" D x 1.10" H (36 mm W x 56 mm D x 28 mm H)	41089-1WP	41089-1IP	—	41089-1GP	41089-1EP
	2-Port Extended Depth*, 2.5" W x 3.00" D x 1.22" H (64 mm W x 76 mm D x 31 mm H)	4S089-2WP	4S089-2IP	—	—	—
	4-Port Extended Depth*, 5.6" W x 5.20" D x 1.22" H (142 mm W x 132 mm D x 31 mm H)	4S089-4WP	4S089-4IP	—	—	—

* For shielded connectors and large bend-radius cables.
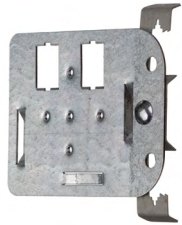

2-Port Plenum-Rated Surface-Mount Box

2.52" W x 2.22" D x 1.10" H

2-Port Plenum-Rated Surface-Mount Box Extended Depth

2.5" W x 3.00" D x 1.22" H

In-Ceiling and In-Wall Brackets

QUICKPORT™ In-Ceiling Bracket

This bracket provides a fixed location for terminating a data connector, creating a more reliable connection than a direct connect plug. It also reduces potential damage during construction. Contractors can perform the initial installation and permanent link testing and have the flexibility to move the bracket to refine Wi-Fi® coverage or WAN placement without needing to retest the link.

VXC™ Coupler and VXC™ Assembly

Leviton's VXC Coupler and Plenum Assemblies create a cost-effective method for terminating cables for wireless access points, video cameras, and other ceiling mounted devices. This Cat 6A rated assembly includes a VXC Coupler that creates a durable connection without the need for punchdown or other proprietary tools. The assembly also includes a standard size plug and flexible stranded patch cable. The VXC Assembly is plenum-rated and can be used in riser and plenum applications.

QUICKPORT In-Wall Bracket

This bracket creates a testable permanent link for cabling that terminates in the wall without using a traditional wallplate. It is ideal for Ethernet devices that mount to electrical/low-voltage boxes or directly to the wall, such as WAPs, cameras, or clocks. The bracket provides a stable mounting surface for a connector that is recessed behind the wall.

QUICKPORT IN-CEILING BRACKET OPTIONS	
DESCRIPTION	
Includes clip for drop wire/rod mounting	49223-CBC
No clip	49223-CB0

VXC COUPLER AND VXC ASSEMBLY	
DESCRIPTION	
VXC Plenum Assembly, VXC Coupler with 18" plenum patch cable connected	SBCPI-18L
VXC Coupler	SBCPI-00S

QUICKPORT IN-WALL BRACKET OPTIONS	
DESCRIPTION	
Set of 5	49223-BA5
Kit; includes bracket and single-gang wallplate mounting bracket	49223-BAK

Multimedia Outlet System (MOS)

VGA PC Module
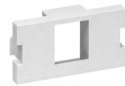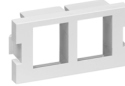
HDMI Module

1-Port QUICKPORT™ Module

2-Port QUICKPORT Module

Single-Gang Wallplate

Dual-Gang Wallplate

MOS provides a clean and flexible system to integrate data and AV modules into one wallplate or surface-mount box. Changes are made without removing the wallplate from the wall, and all wiring and cabling is done from the front side of the wallplate. The modules are available in 0.5, 1, 1.5, and 2 unit high sizes.

MOS OPTIONS

DESCRIPTION		WHITE	LT. ALMOND	IVORY	GRAY	BLACK	STAINLESS
Wallplates	Single-Gang Wallplate	41290-SMW	41290-SMT	41290-SMI	41290-SMG	41290-SME	41290-SMS
	Dual-Gang Wallplate	41290-DMW	41290-DMT	41290-DMI	41290-DMG	41290-DME	41290-DMS
	Three-Gang Wallplate	—	—	—	—	—	41290-TMS
AV Connector Modules	VGA PC Module, 110-style termination, 1 unit high^	41295-VPW	41295-VPT	41295-VPI	41295-VPG	—	—
	VGA Monitor Module, 110-style termination, 1 unit high^	41295-VMW	41295-VMT	41295-VMI	41295-VMG	—	—
	HDMI Module, feedthrough, 1 unit high	41290-HDW	41290-HDT	41290-HDI	41290-HDG	41290-HDE	—
Blank Modules	1-Port QUICKPORT Module (1 unit high)	41291-1MW	41291-1MT	41291-1MI	41291-1MG	41291-1ME	—
	2-Port QUICKPORT Module (1 unit high)	41291-2QW	41291-2QT	41291-2QI	41291-2QG	41291-2QE	—

^ 110-Style VGA modules require both PC and Monitor modules used in pairs to operate.

More options available: Visit Leviton.com/MOS for a full listing.

![Leviton logo]

Modular Furniture Products
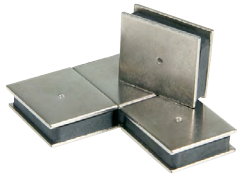
Magnet

Brackets

Wallplates

These products offer simple snap-in installation and attractive streamlined appearance. Furniture wallplates accept QUICKPORT™ couplers and jacks and snap easily and snugly into standard modular furniture. Modular Furniture Brackets facilitate installation of Leviton surface-mount boxes or wallplates with back boxes

MODULAR FURNITURE OPTIONS

DESCRIPTION		WHITE	IVORY	GRAY	BLACK	PART NO.
Magnets and Modular Furniture Brackets	Set of 4 Magnets	—	—	—	—	41030-SMJ
Modular furniture brackets	Steelcase Series 9000®, Haworth®, Knoll®, Allsteel®, Westinghouse®, and Teknion®	—	—	—	—	49222-BLK
	Herman Miller Ethospace® and Steelcase Avenir®	—	—	—	—	49222-ESP
	Herman Miller Action Office®	—	—	—	—	49222-HAO
QUICKPORT modular furniture wallplates	2-Port Standard Depth*	49910-SW2	49910-SI2	49910-SG2	49910-SE2	—
	4-Port Standard Depth with 1 QUICKPORT Blank*	49910-SW4	49910-SI4	49910-SG4	49910-SE4	—
	4-Port Extended Depth with 1 QUICKPORT Blank*	49910-EW4	49910-EI4	49910-EG4	49910-EE4	—
	2-Port Herman Miller†	49910-HW2	49910-HI2	49910-HG2	49910-HE2	—
	4-Port Herman Miller with 1 QUICKPORT Blank†	49910-HW4	49910-HI4	49910-HG4	49910-HE4	—
	4-Port Universal Angled Furniture Plate	—	—	—	49910-UE4	—

* = Fits openings of approximately 1.38" x 2.63" to 2.98"
† = Fits openings of approximately 1.88" x 2.98"

Cable Management

Cable Management

8" x 8" Channel
(Front, Rear, and Shown
with Optional Designer Cover)

5" x 4" Channel
(Front Only)

1RU
Horizontal

5"
8"
12"

VERSI-DUCT™

VERSI-DUCT is a versatile cable management solution that fits on any standard equipment rack and includes accessories for a wide range of cable management configurations. The vertical 8-inch and 5-inch managers have large finger passthrough spaces that align with rack units.

VELCRO® Brand Fasteners

VELCRO® Brand products won't crush or damage cables like tie wraps can, and are reusable for moves, adds, and changes.

VERSI-DUCT CABLE MANAGERS

	DESCRIPTION	FRONT ONLY	FRONT AND REAR
8" x 8" Vertical Channel	80" (2.03 m) Length, standard cover, black	8980L-VFO	8980L-VFR
	Center-Mount Bracket	—	89265-BKT
	Slack Loop Organizer	—	89265-SL1
	Cable Retainer	—	89265-WR1
	Designer Cover, gray (Set of 2)	—	89265-8DC
5" x 4" Vertical Channel	80" (2.032 m) Length, standard cover, black	4980L-VFO	4980L-VFR
	40" (1.016 m) Length, standard cover, black	4940L-VFO	4940L-VFR
	Center-Mount Bracket	—	49265-BKT
	Designer Cover, gray	—	59265-5DC
Horizontal	2RU, black cover	492RU-HFO	492RU-HFR
	1RU, black cover	491RU-HFO	491RU-HFR
	2RU Designer Cover, gray	—	49265-DC2
	1RU Designer Cover, gray	—	49265-DC1
	Cable Retainer	—	49265-WR1

VELCRO® BRAND FASTENERS

	DESCRIPTION	BLACK	MAROON PLENUM RATED
Tie Wrap	5" (127 mm)	43105-005	—
	8" (203 mm)	43108-008	—
	12" (305 mm)	43112-012	—
Bulk Roll	15' (4.57 m)	43115-015	—
	75' (22.86 m)	43115-075	43115-75P
	600' (182.88 m)	43115-600	—
75' (22.86 m) SoftCinch Lite Roll		4S115-75E	—

Leviton offers a wide variety of cable management solutions; for a full list please visit Leviton.com/cablemanagement

Zone Enclosures

Zone cabling enclosures are the perfect solution for adding flexibility within an open-office architecture or data center environment. They are plenum rated with included fire-rated foam sealing kits. Ceiling enclosures are available in active and passive styles.

Active Ceiling Enclosure, 2' x 2'

ZONE ENCLOSURE OPTIONS	
DESCRIPTION	
Active Ceiling Enclosure, 2' x 2' (610 x 610 mm), 2RU active and 5RU passive space	Z1000-AC2
Active Ceiling Enclosure, 2' x 4' (610 x 1219 mm), 4RU active and 10RU passive space	Z1000-AC4
Passive Raised-Floor Enclosure, 8" (203 mm) depth, 8RU passive space	Z1000-PF2
Passive Ceiling Enclosure, 2' x 2' (610 x 610 mm), 5RU passive space	Z1000-PC2
24-Port Zone Enclosure	49225-24E

Passive Raised-Floor Enclosure, 8" depth

24-Port Zone Enclosure

Cat 6A Termination

Leviton has designed several exclusive features into its new Cat 6A jacks to speed termination. Read on for details of these features, other tips for a seamless installation, and for termination instructions for our 110-style panel, UTP jacks, and shielded jack.
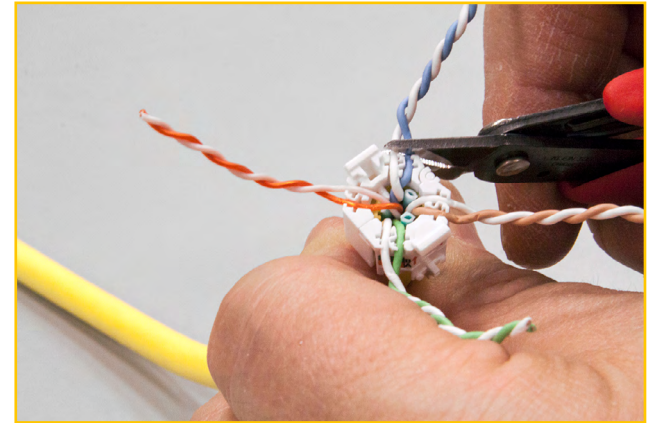
Termination Tips

Extra Cable for Re-Terminations

TIA recommends storing 10 feet (3 m) of extra cable in the telecom room and 12-18 inches (3-4.5 m) above work area installations for re-terminations and to accommodate moves, adds, and changes. Use an extended or figure 8 loop configuration to alleviate cable stress. Cable slack in bundled or excessive loops has been shown to degrade cable performance and is associated with return loss failures.

TECH TIP: Using Icons in ATLAS-X1 Jacks

One of the unique benefits of Leviton ATLAS-X1™ jacks is the ability to add icons to the front of the jack that designate specific applications, such as data, voice, and AV. These matching-color icons are provided with each jack.

First, select the desired icon. Then, trim away any residual plastic vestige from the icon packaging, and press the icon securely into the front of the jack.

If you want to remove an icon from the front of a jack, simply unbend a small paper clip, insert the end of the clip into the icon release hole, and gently pry outward.

Bulk orders of 72 icons are available. They come in 13 colors, and a package includes 24 of each icon. Use part number ICONS-IC* (the asterisk represents the color choice).

Icon Release Hole
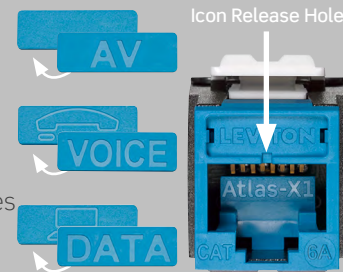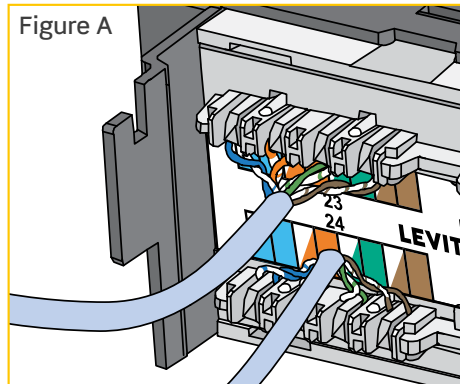
TECH TIP: Leviton Palm Termination Tool

Use Leviton's Palm Termination Tool to quickly and easily punch down EXTREME™ Cat 6A jacks at the jobsite. The Palm Tool offers an ergonomic comfort grip, increased jack stability, and integrated holes that allow rack mounting for QUICKPORT™ panel terminations.

Videos — get simple termination instructions at the Network Solutions YouTube page.

110-Style Patch Panel Termination Instructions

1   Mount the Cat 6A 110-Style Patch Panel to a standard 19" equipment rack or wall-mount bracket, using the provided screws.

2   Determine which color-coded wiring scheme is desired (T568A or T568B).

    Note: The color codes and port numbers are located on the panel labels between termination (IDC) slots

3   Remove approximately 3" (76 mm) of the jacket and center spline/separator from cable.

4   Route jacketed wire to the termination field so that the jacket is centered near the IDCs (Figure A).

    CAUTION: Use of mass termination impact tool is not permissible for this product

Figure A

Continued...

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100 Ω UTP
4 Pair Twisted Pair Wire

PAIR 4   PAIR 3   PAIR 2   PAIR 1

RING   TIP   RING   TIP   RING   TIP   RING   TIP
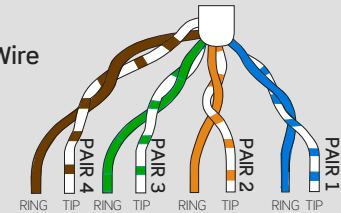
Category Rated / Plug Pinouts

Pair3
Pair2   Pair1   Pair4
+ - + - + - + -
T R T R T R T R
1 2 3 4 5 6 7 8

T568B

Pair2
Pair3   Pair1   Pair4
+ - + - + - + -
T R T R T R T R
1 2 3 4 5 6 7 8

T568A
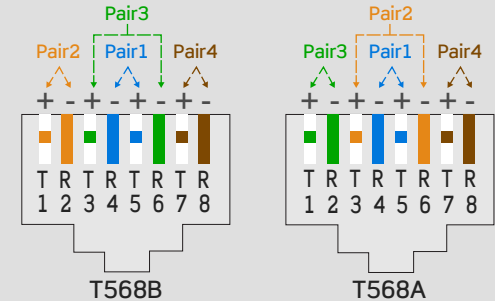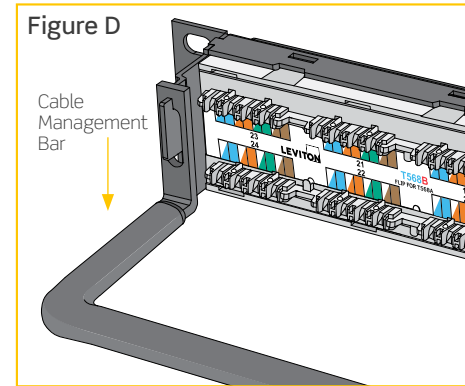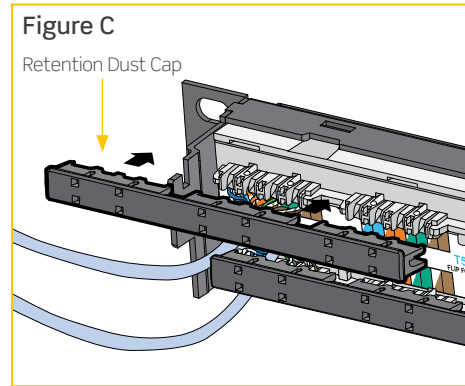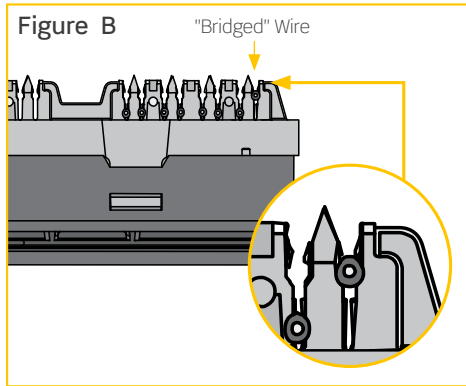
NOTE: One of these wiring configurations must be used for an installation to be standard compliant. Wiring label on connector shows both wiring standards

110-Style Patch Panel Termination Instructions Continued

Figure B

"Bridged" Wire

Figure C

Retention Dust Cap

Figure D

Cable Management Bar

5 Starting with the middle two pairs (orange/white and green/white) use your fingers to carefully seat and secure the wires into the IDC slots. Maintain wire pair twisting to within ½" (13 mm) of the IDC contact. Then position a 110-style impact tool (set to low impact) perpendicular to the IDC slot, seat and trim the cable.

Note: If wires appear to be "bridged" over the IDC, rather than securely seated into the slot, pull out the wires and reseat and repunch them (Figure B)

6 Once the Cat 6A module has been terminated, snap the 3-port retention cap to the back of the jack top and bottom sides. The retention cap can also be broken into single pieces (Figure C).

After the panel has been fully terminated, attach the cable management bar to the back of patch panel (Figure D).
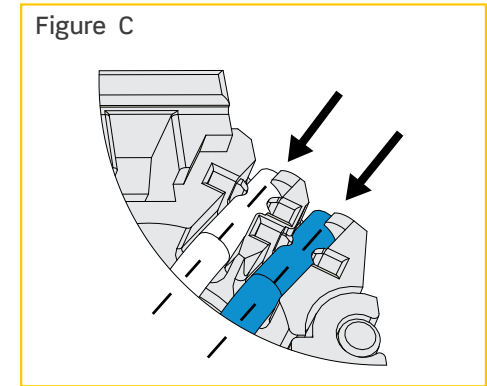
ATLAS-X1™ UTP Jack Termination Instructions

Figure A

Figure B

Figure C
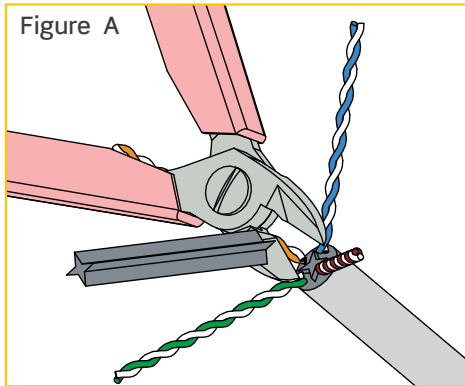
1 Using a cable stripper, remove 1.5 inches (38 mm) of cable jacket. At the strip point of the cable, use flush cutters to carefully remove strip string, Mylar® tape, cross-shaped pair separator, or any other cable fillers or spacers where applicable (Figure A).
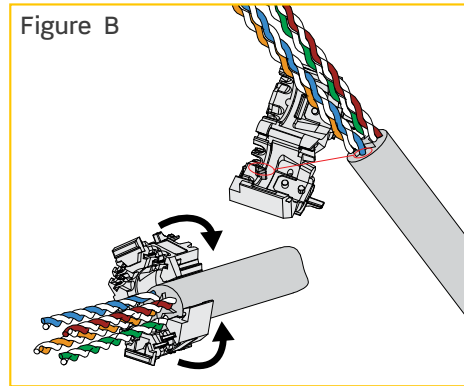
2 Line up the wire manager with the blue pair indication on the label in line with the blue pair of the cable. Ensure that the end of the cable jacket is at the cable jacket stop inside the wire manager and click the wire manager closed (Figure B).
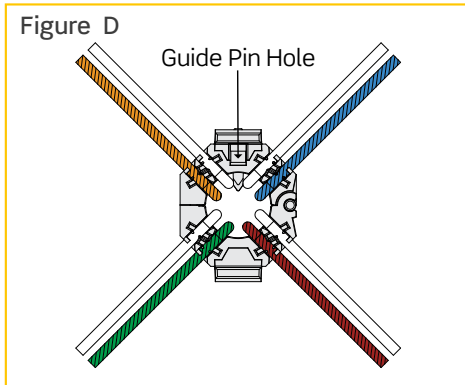
**3** Observing pair polarity and T568A or T568B wiring pattern, seat the four pairs into the wire manager.

Note: Pairs must be completely and securely seated into wire manager wire channels (Figure C)

Continued…

ATLAS-X1™ UTP Jack Termination Instructions Continued

Figure D

Guide Pin Hole

Figure E

Figure F

4 Check polarity by making sure the white wire of each pair will be closest to the guide pinhole in the face of the wire managers (Figure D).
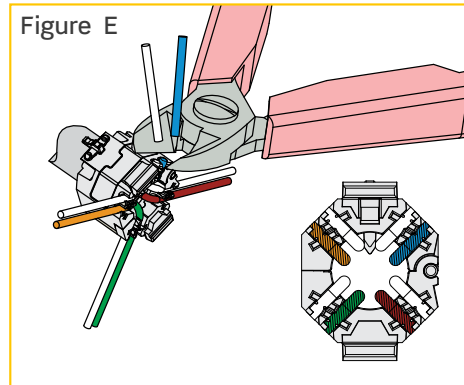
5 Using a flush cutter, trim all pairs flush with sides of wire manager.

Note: Wire ends must be cut flush: use of snips or side cutter is not recommended and may cause test failures (Figure E)
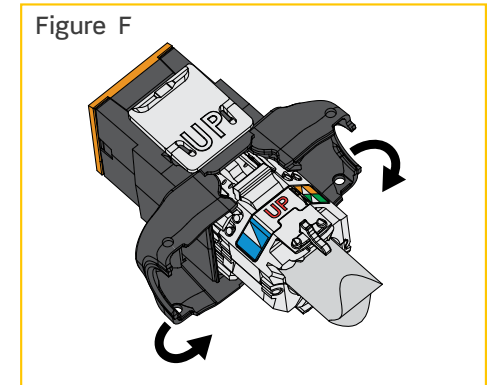
6 Align the prepared wire manager with the rear of the jack, matching "UP" on the wiring label to "UP" molded into the jack retaining tab (Figure F). Close jack doors to complete the termination. To rewire, depress the jack door-release tabs simultaneously.

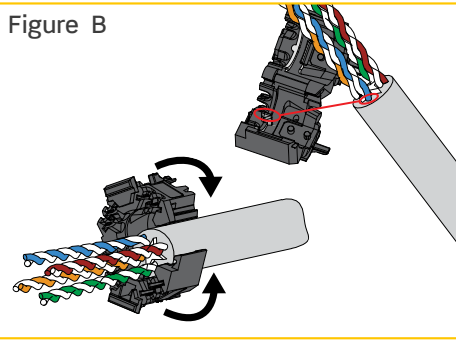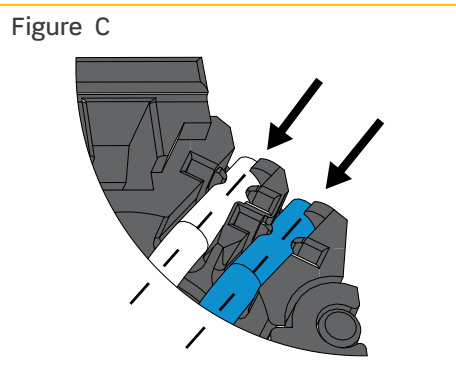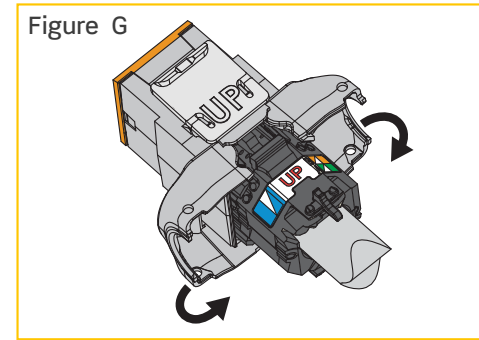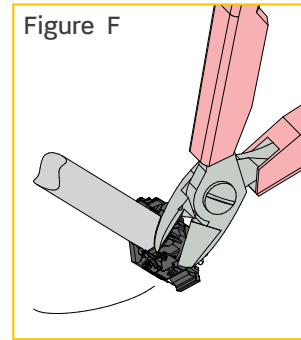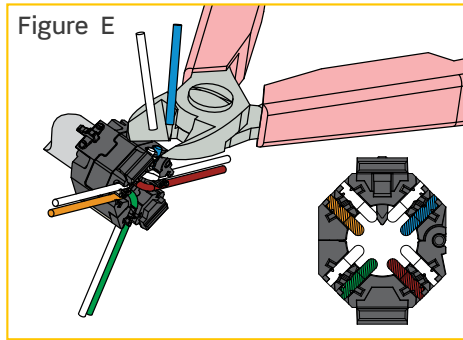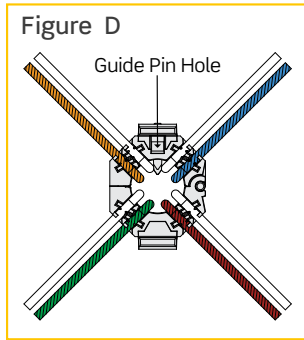# ATLAS-X1™ Shielded Jack Termination Instructions

Figure A

Figure B

Figure C

1 Using an appropriate cable stripper, remove about 1.5 inches (38 mm) of cable jacket. Inspect shield foil and pairs to ensure no foil or insulation damage.

2 At the strip point of the cable, use flush cutters to carefully remove strip string, if one is present. Spare back the foil metal side outward. Spare back the drain wire (Figure A). Use flush cutters to remove Mylar® tape, cross-shaped pair separator, or any other cable fillers or spacers.

3 Line up the wire manager with the blue pair indication on the label in line with the blue pair of the cable. Ensure that the end of the cable jacket is at the cable jacket stop inside the wire manager, and click the wire manager closed (Figure B).

4 Observing pair polarity and T568A or T568B wiring pattern, seat the four pairs into the wire manager.

Note: Pairs must be completely and securely seated into wire manager wire channels (Figure C)

ATLAS-X1™ Shielded Jack Termination Instructions Continued

Figure D

Guide Pin Hole

Figure E

Figure F

Figure G

5 Check polarity by making sure the white wire of each pair will be closest to the guide pinhole in the face of the wire managers (Figure D).

6 Using a flush cutter, trim all pairs flush with sides of wire manager.

Note: Wire ends must be cut flush: use of snips or side cutter is not recommended and may cause test failures (Figure E)

7 Pull drain wire into drain wire capture notch and trim flush with flush cutter. Use flush cutter to nick edge of foil, and tear foil off flush with rear of wire manager (Figure F).

8 Align the prepared wire manager with the rear of the jack, matching "UP" on the wiring label to "UP" molded into the jack retaining tab (Figure G). Close jack doors to complete the termination. To rewire, depress the jack door-release tabs simultaneously.

EXTREME™ Cat 6A Jack Termination Instructions

Figure A

T568A or T568B

Figure B
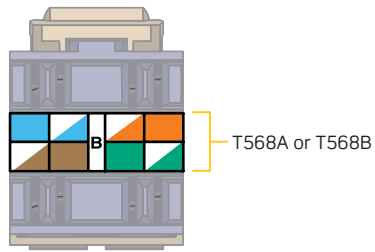
1 Remove about 3" (76 mm) of cable jacket and center spline (stiff plastic separator inside Cat 6A cable).

2 Determine whether to use wiring scheme T568A or T568B.

Note: The associated color codes and jack pin number on the label are located between the IDC jack slots (Figure A). Peel back label for T568A wiring
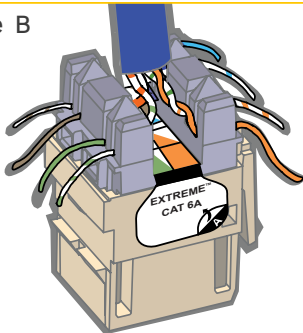
3 Leave the cable jacket within ⅛" (3 mm) of the jack side, then route the wires for termination using the selected wiring scheme (Figure B). Route cable perpendicular to the IDC field. Ensure there is enough slack in the twisted pairs, and do not place the cable jacket into the termination field.

Continued...

EXTREME™ Cat 6A Jack Termination Continued

Figure C

Figure D

4 Use your fingers to carefully seat wires into the IDC slots. Maintain wire pair twisting to within ½" (13 mm) of the IDC. Set a 110-style impact tool to low and position it perpendicular to the jack. Seat and trim the cable one pair at a time to prevent crushing the inside pairs (Figure C).

5 Place the CONE OF SILENCE™ over the terminated wires for secure connection and exceptional Cat 6A performance (Figure D).

Use the punch down puck to terminate the jack first, then install into a patch panel or wallplate.

Glossary

10GBASE-T (10 Gigabit baseband over twisted pair) » This IEEE standard, 802.3an, defines 10 Gigabit Ethernet running 10Gbps over balanced twisted-pair cabling.

ANSI (American National Standards Institute) » ANSI oversees the creation, circulation and use of standards and guidelines that directly impact businesses in various sectors. ANSI is also actively engaged in accrediting programs that assess conformance to standards.

Attenuation » The loss of volume during transmission, or decrease in the power of a signal, light beam, or light wave. Attenuation is the opposite of gain and is measured in decibels (dB).

AWG (American wire gauge) » The standard measuring gauge for nonferrous conductors (i.e., non-iron and non-steel). Gauge measures the diameter of a conductor (thickness of cable).

AXT (alien crosstalk) » Electromagnetic noise that can occur in a cable run alongside other signal-carrying cables. The term "alien" arises from the fact that this form of crosstalk occurs between different cables in a group or bundle, rather than between individual wires or circuits within a single cable.

Bandwidth » The difference between the highest and the lowest frequencies of a transmission channel (path for information transmission). Identifies the amount of data that can be sent through a given channel. Measured in hertz (Hz); higher bandwidth numbers mean higher data capacity.

Bend Radius » The amount of bend that can occur before a cable may sustain damage or increased attenuation.

BICSI (Building Industry Consulting Services International) » A non-profit professional association for the promotion of telecommunications industry standards and installation best practices.

Category 5e (enhanced category 5 or Cat 5e) » A standard for balanced twisted pair cable and components supporting signaling rates up to 100 MHz. Cat 5e is intended to support systems up to 1000BASE-T or Gigabit Ethernet up to distances of 100 m (328 ft).

Category 6 (CAT 6) » A standard for balanced twisted pair cable and components supporting signaling rates up to 250 MHz. Cat 6 is intended to support systems up to 1000BASE-T or Gigabit Ethernet up to distances of 100 m (328 ft).

Category 6A (augmented category 6 or Cat 6A) » A standard for balanced twisted pair cable and components supporting signaling rates up to 500 MHz. Cat 6A is designed to support 10GBASE-T or 10 Gigabit Ethernet up to distances of 100 m (328 ft).

Category of Performance » Cabling and cabling component standards adopted by the telecommunications industry.

Glossary

Channel ❯❯ In the horizontal cabling portion of a structured cabling system, the channel contains all of the elements of the permanent link, plus the equipment cords at the horizontal cross-connect (HC) and the patch cords in the work area.

Channel-rated ❯❯ Category-rated structured cabling components are said to be channel-rated if, when installed as a system in an industry-defined channel, they meet all of the transmission and noise characteristics defined in the standard. Compare with Component-rated.

Compliance ❯❯ A wiring device that meets all characteristics of a standard is said to be in compliance with that standard.

Component-rated ❯❯ Category-rated structured cabling components are said to be component-rated if they exceed all of the transmission and noise characteristics defined in the standard for an individual structured cabling component. Component specifications are more stringent than channel specifications and may provide greater permanent link and channel test margins. Compare with Channel-rated.

Conductor ❯❯ Any substance, usually a wire or cable, that can carry an electrical current.

Connecting Block ❯❯ Also called a terminal block, punch-down block, quick-connect block, or cross-connect block, this plastic block contains metal wiring terminals to establish connections from one group of wires to another. Usually each wire can be connected to several other wires in a bus or common arrangement. There are several types of connecting blocks: 66, 110, etc.

Connector ❯❯ A device that connects wires or fibers in cable to equipment or other wires or fibers. Wire and optical connectors most often join transmission media to equipment or cross connects. Connectors are sometimes referred to as jacks; but although all jacks are connectors, not all connectors are jacks.

Consolidation Point ❯❯ An optional location between an ER or TR and the workstation for interconnection of horizontal cables.

Data Center (DC) **❯❯** A data center is a facility used for housing a large amount of electronic equipment, typically servers, computers, data storage devices, and communications equipment. Data centers are designed to assure that the equipment and data housed in them are protected from environmental hazards and security breaches. Data centers can be private, serving a single company, or a public "utility" serving a variety of companies.

dB (decibel) **❯❯** A dB is a unit of measure of signal strength, usually the relationship between a transmitted signal and a standard signal source. Every 3dB equals 50% of signal strength, so therefore a 6dB loss is a loss of 75% of total signal strength.

EF (entrance facility) **❯❯** An entrance to a building for both public and private network service cables (including wireless) including the entrance point of the building and continuing to the entrance room or space.

Glossary

Ethernet » Leading local area network (LAN) protocol used for connecting computers, printers, workstations, terminals, etc. within the same building. Ethernet is a physical link and data link protocol that operates over twisted pair wire. See IEEE 802.3x.

ETL (Edison Testing Laboratories) **»** An independent testing, inspection, and certification laboratory owned by Intertek that provides electrical safety, electromagnetic compatibility, benchmark and performance testing. In addition, ETL issues two product safety marks: "listed" and "verified".

ER (equipment room) **»** is a centralized space that houses telecommunications equipment. ERs generally serve an entire building or campus, while TRs (telecommunication rooms) serve one floor of a building or a portion of a floor. An ER may contain active equipment, cross-connect equipment, and building systems (e.g. life safety, security, electrical, and HVAC).

FCC (Federal Communications Commission) **»** The FCC is an independent United States government agency. It was established by the Communications Act of 1934 and is charged with regulating interstate and international communications by radio, television, wire, satellite, and cable. The FCC's jurisdiction covers the 50 states, the District of Columbia, and US possessions.

FTP (foiled twisted pair) **»** Balanced twisted pair cable with an overall foil shield and drain wire. Also called screened twisted pair (ScTP) cable.

F/UTP (foiled screened with unshielded twisted pairs) **»** Overall shielded cable with no shield on individual twisted pairs.

Gain » An increase in signaling power when an electric device boosts the signal; measured in decibels (dB).

Gigabit » When used to describe data transfer rates, Gigabit refers to 10 to the 9th power (1,000,000,000) bits. Gigabit Ethernet, abbreviated GbE, supports data transfer rates of 1 Gigabit (1,000 megabits) per second. The first Gigabit Ethernet standard (802.3z) was ratified by the IEEE 802.3 Committee in 1998.

HC (horizontal cross-connect) **»** The HC is a location for the cross-connect of horizontal cabling to other cabling and equipment.

HDBaseT » A standard created by the HDBaseT alliance for delivering video, audio, power, Ethernet, USB and control signals over category-rated twisted pair copper cable.

IC (intermediate cross-connect) **»** The IC is a cross-connect point located between the MC (main cross-connect) and the HC in interbuilding backbone cabling.

Glossary

IDC (insulation displacement connection) » An IDC allows the termination of a conductor without stripping the conductor's insulation. When the conductor is inserted into the contact, the insulation is displaced, creating contact between the conductor and the IDC, producing a gas-tight connection.

IEEE (Institute of Electrical and Electronics Engineers) » A publishing and standards-making body responsible for many standards used in LANs.

IEEE 802.11ac » An IEEE wireless networking standard providing high-throughput wireless local area networks (WLANs) on the 5 GHz band, with theoretical speeds up to 6.9 Gb/s.

IEEE 802.3 » A collection of IEEE standards defining the physical layer and the media access control (MAC) sublayer of the data link layer of wired Ethernet. This is the most common local area network specification.

IEEE 802.3an » A standard for 10GBASE-T released in 2006 to provide 10 gigabit per second transmission over balanced twisted pair cables up to 100 meters (328 ft).

IEEE 802.3bt » In 2013, IEEE announced a taskforce to create 802.3bt, a standard defining PoE over four pairs supporting 10GBASE-T. The standard defined two new tiers of PoE: Type 3 for up to 60 watts, and Type 4 for up to 100 watts. Both standards support devices requiring higher power, such as laptops, displays, and next-generation wireless access points. In early 2018, IEEE released publication of 802.3bt.

Impedance » The total opposition (i.e. resistance and reactance) a circuit offers to the flow of alternating current. It is measured in ohms, and the lower the ohmic value, the better the quality of the conductor.

Insertion Loss (IL) » The difference in the amount of power received before and after something is inserted into the circuit.

Interconnect » A circuit administration point, other than a cross-connect or an information outlet, that provides capability for routing and rerouting circuits. It does not use patch cords or jumper wires, and typically is a jack-and-plug device used in smaller distribution arrangements or that connects circuits in large cables to those in smaller cables.

ISO (International Standards Organization) » The world's largest developer and publisher of international standards. It is a non-governmental organization (NGO) network of national standards institutes in 157 countries, based in Geneva, Switzerland.

Jacket (also cable jacket or sheath) » The outer covering applied over internal cable elements for protection.

LAN (local area network) » A LAN is a computer network covering a small physical area, generally a single building or contiguous campus. LANs are characterized by higher data-transfer rates (compared to a WAN or wide area network) and lack of leased telecommunications lines.

Glossary

Mbps (megabits per second) **»** One million bits per second.

MC (main cross-connect) **»** The MC is the cross-connect in the ER (equipment room) for connecting entrance cables, backbone cables and equipment cables.

MHz (megahertz) **»** A unit of frequency denoting one million hertz (1,000,000 cycles per second).

MPTL **»** An MPTL (Modular Plug Terminated Link) is an installed cabling link terminated with a jack on one end, and a modular plug on the other end. The MPTL is typically used for fixed devices, such as cameras or wireless access points (WAPs).

Mud Ring **»** Industry jargon for a plaster ring/frame mounted in a wall to support a telecommunications outlet such as a faceplate. Essentially, mud rings are backless junction boxes.

NEC (National Electric Code) **»** The NEC or NFPA 70 (NFPA is the National Fire Protection Association, the organization that publishes the Code) addresses safeguards for people and property from electrical hazards. The NEC also specifies fire resistance and smoke ratings for building materials and is recognized and enforced in the United States. NEC article 800 addresses requirements for communications circuits.

NEXT (near-end crosstalk) **»** Electrical noise coupled from one pair of wires to another within a multi-pair cable.

Part 68 **»** Requirements specifications established by the FCC as the minimum acceptable protection communications equipment must provide the telephone network. Part 68 also identified dimensional and material requirements for modular jacks and plugs, as well as the metallic contacts in these devices. Plug and jack requirements are now governed by ANSI/TIA-1096-A.

Patch Cord **»** A cord made from 4-pair 100-ohm balanced twisted-pair cable. Patch cords may be shielded or unshielded, depending on the type of system being installed. They are typically wired T568 A or B with an 8-position, 8-conductor (8P8C) plug on each end. Work area and TR patch cords are made from stranded cable, which has better flexibility, durability and longer life than solid-conductor cords.

Patching **»** A means of connecting circuits via cords and connectors that can be easily disconnected and reconnected at another point. May be accomplished by using modular cords connected between jack fields or by patch cord assemblies that plug onto connecting blocks.

Patch Panel **»** A piece of connecting hardware designed for use in a standard 19" equipment rack or cabinet. Standard patch panels have modular jack appearances on the front, and 110-style IDC connections on the rear. Field-configurable patch panels can be loaded with a variety of jacks or other connectors for mixed-media installations, or where the use of various jack colors is desired.

Glossary

Performance » The totality of a communication transmission's characteristics, including rate of transfer, barriers to peak transfer rate, and comparison to applicable standards. Compare with Compliance. A device can exhibit performance characteristics without being compliant to an industry standard.

Permanent Link » In the horizontal cabling portion of a structured cabling system, the permanent link contains the following: the telecommunications outlet (TO), the cabling between the horizontal cross-connect (HC) and the TO, an optional consolidation point (CP), and the connecting hardware at the HC.

Power over Ethernet (PoE) » PoE technology describes any system capable of transmitting electrical power, along with data, to remote devices over standard twisted-pair cable in an Ethernet network. This technology is useful for powering IP telephones, wireless access points, security cameras, and other appliances where it would be inconvenient or infeasible to supply power separately.

Power over HDBaseT (PoH) » PoH provides up to 100 watts of power to devices over HDBaseT technology and twisted pair cabling.

Power Sum » A test method for four-pair cable whereby the mathematical sum of pair-to-pair crosstalk from three pairs to one pair is measured.

Premises » Telephony term for the space occupied by a customer or authorized/joint user in a building(s) on continuous or contiguous property (except railroad rights of way, etc.) not separated by a public road or highway. Frequently used as "premises-based".

Premises Wiring System » The entire wiring system on the user's premises, especially the supporting wiring that connects the communications outlets to the network interface jack.

Punchdown » Refers to the use of an impact tool that enables installers to make efficient IDC style connections.

RCDD® (Registered Communications Distribution Designer) » The RCDD title is a professional credential granted by BICSI. RCDDs have demonstrated a superior level of knowledge of Information Transport Systems (ITS) design and associated disciplines.

Return Loss (RL) » A measure of the similarity of the impedance of a transmission line and the impedance at its terminations. It is a ratio, expressed in decibels, of the power of the outgoing signal to the power of the signal reflected back.

RJ (registered jack) » RJs are telephone and data jacks registered with the FCC. Specific RJs, such as RJ-11 and RJ-45, are widely used in the telecommunications industry. A much more accurate way to identify a jack is to specify the number of positions (width of opening) and number of conductors. Example: "8-position, 8-conductor (8P8C) jack" or "6-position, 4-conductor (6P4C) jack".

RU (rack unit) » A unit of measure of vertical space in an equipment rack or cabinet. One rack unit is equal to 1.75 in (45 mm).

Glossary

Standards » Agreed-upon principles of performance. Standards are set by committees working under various trade and international organizations.

Structured Cabling System » A structured cabling system (SCS) is defined as the complete collective configuration of cabling and associated hardware that has been installed at a given site to provide a comprehensive telecommunications infrastructure.

TDMM (Telecommunications Distribution Methods Manual) **»** The TDMM is a publication from BICSI that is based on internationally accepted industry standards, codes and guidelines. The TDMM addresses the newest methodologies and recommends best practices for the design of structured cabling systems.

TE (Telecommunications Enclosure) **»** Also referred to as a zone enclosure, a TE is a housing for telecommunications equipment, cable terminations, cross-connect cabling, and wireless access points. A TE serves the function of an horizontal cross-connect (HC) for a portion of a building floor and provides access to the building's backbone and pathways. A TE should supplement, not replace, the requirement for a TR on a building floor.

TIA (Telecommunications Industry Association) **»** The TIA is a trade organization of manufacturers which sets standards for use of its member companies. Formerly fell under the umbrella of EIA. See **www.tiaonline.org**.

TO (telecommunications outlet) **»** A connecting device in the work area on which horizontal cable terminates.

TR (telecommunications room) **»** A TR is an architectural space that provides an environmentally suitable and secure area for housing cables, terminations, cross-connects, hardware, and telecommunications equipment.

U/FTP » Also classified as STP (shielded twisted pair), is twisted pair cable with individually foil-screened twisted pairs, but no overall shield.

UL (Underwriters Laboratories®) **»** A privately owned product safety certification organization. UL also certifies category-rated cable performance and quality.

UTP (unshielded twisted pair) **»** Also classified as U/UTP, is overall unshielded twisted pair with unshielded twisted pairs.

Work Area (WA) or workstation **»** A building space where occupants interact with telecommunications terminal equipment.

WAN (wide area network) **»** A computer network that covers a broad geographic area. WANs connect LANs and other networks together. Some are private, but many are built by Internet service providers, who provide connection from organizational LANs to the Internet.

References

This guide has been developed consistent with all known applicable cabling practices as defined by the following:

ANSI/TIA-607-D
Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

ANSI/BICSI 002-2014
Data Center Design and Implementation Best Practices

ANSI/TIA-568.0-E
Generic Telecommunications Cabling for Customer Premises

ANSI/TIA-568.1-E
Commercial Building Telecommunications Cabling Standard

ANSI/TIA-568.2-D
Telecommunications Cabling, Copper Component, and Cabling Specifications

ANSI/TIA-569-E
Commercial Building Standard for Telecommunications Pathways and Spaces

ANSI/TIA-606-D
Administration Standard for Telecommunications Infrastructure of Commercial Buildings, published June 2012

ANSI/TIA-942-B
Telecommunications Infrastructure Standard for Data Centers

IEEE 802.3
Ethernet-based LANs (Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet)

IEEE 1100
Recommended Practice for Powering and Grounding Electronic Equipment

IEEE 1911.3
Standard for HDBaseT™ 5Play

ISO 11801
Generic Cabling for Customer Premises (multiple standards)

National Electrical Safety Code (NESC)
Published by IEEE

National Electric Code (NEC, NFPA 70)
Published by NFPA

Telecommunications Distribution Methods Manual (TDMM)
Published by BICSI

Underwriters Laboratories (UL)
Applicable listings and ratings

NECA/BICSI 607-2011
Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

Always follow superseding national, state, and local codes and regulations.

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