

Network Infrastructure for Warehouse Automation



PANDUIT®

infrastructure for a connected world

When Quality, Trust, and Leadership Matter

When your name is on the box, you want to know that the work is right.

That's when it is important to rely on network infrastructure solutions from Panduit.

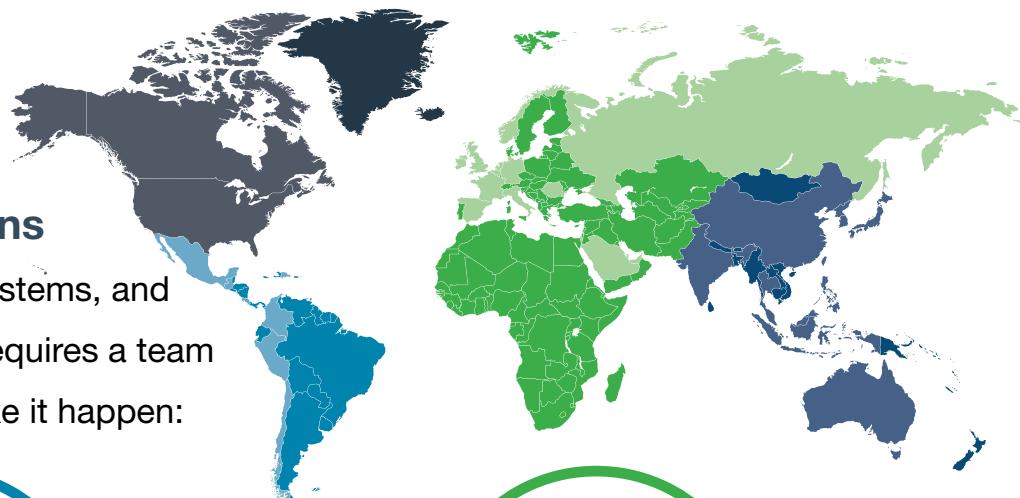
Learn more about our environmental stewardship efforts.
www.panduit.com/esg

Building a Sustainable Business for Our Customers and Our World

Our commitment to corporate citizenship extends to our pledge to be a good steward to the environment. By mobilizing our talent and resources, we can minimize our ecological footprint and help our customers with their sustainability journey.

A World of Connections

Connecting technology, systems, and people on a global scale requires a team of specialists that can make it happen:

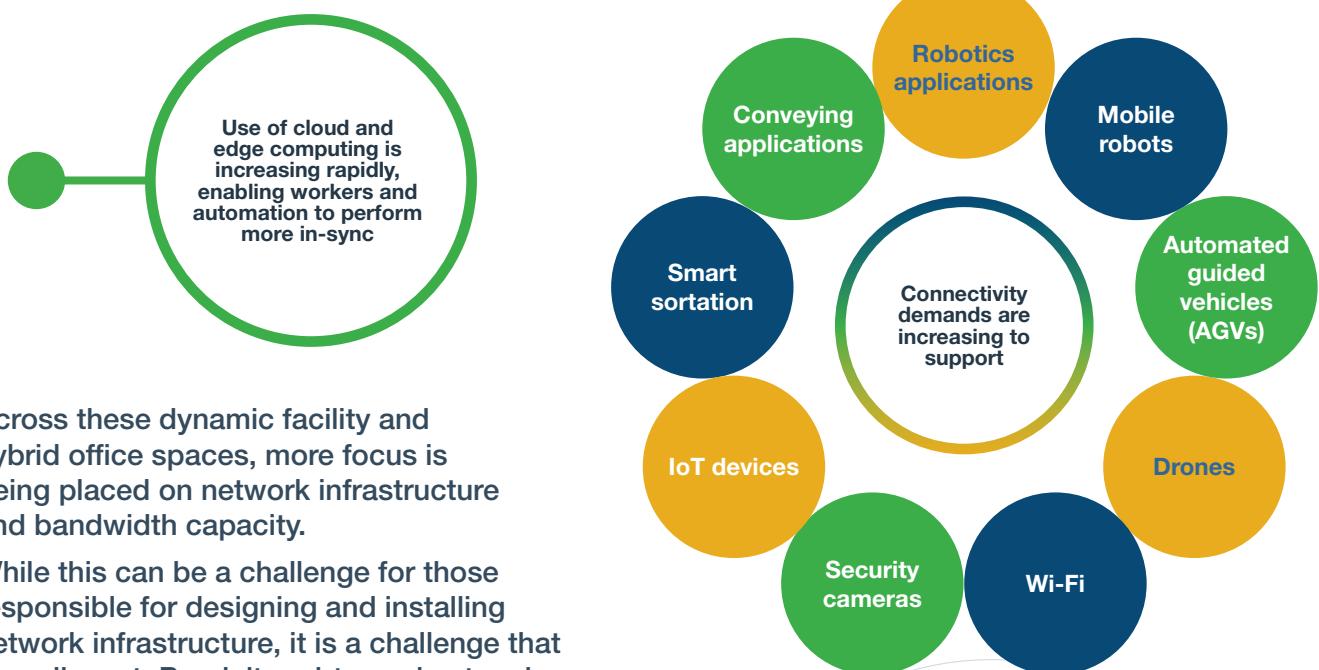


Our global network of distributors provides local inventory, product support, and a wide range of logistics services so our customers can expect to receive exactly what they need when they need it, across the globe

Panduit ONESM Partners are highly skilled installers, contractors, and system integrators who are trained and certified to design, develop, and deploy high-performing electrical and network infrastructure that drives the business of tomorrow

Digital Transformation in E-commerce, Retail, and Logistics

Modern distribution centers, fulfillment centers, and micro fulfillment centers leverage the latest automation and smart building technologies for improving productivity, delivery response, and competitiveness in fast-paced omni-channel retail environments:



Across these dynamic facility and hybrid office spaces, more focus is being placed on network infrastructure and bandwidth capacity.

While this can be a challenge for those responsible for designing and installing network infrastructure, it is a challenge that is easily met. Panduit end-to-end network infrastructure solutions are built for performance, reliability, and growth, helping e-commerce, retail, and logistics companies optimize production and operations, reduce downtime, and mitigate risks when adopting new technologies in support of digital transformation and IoT.

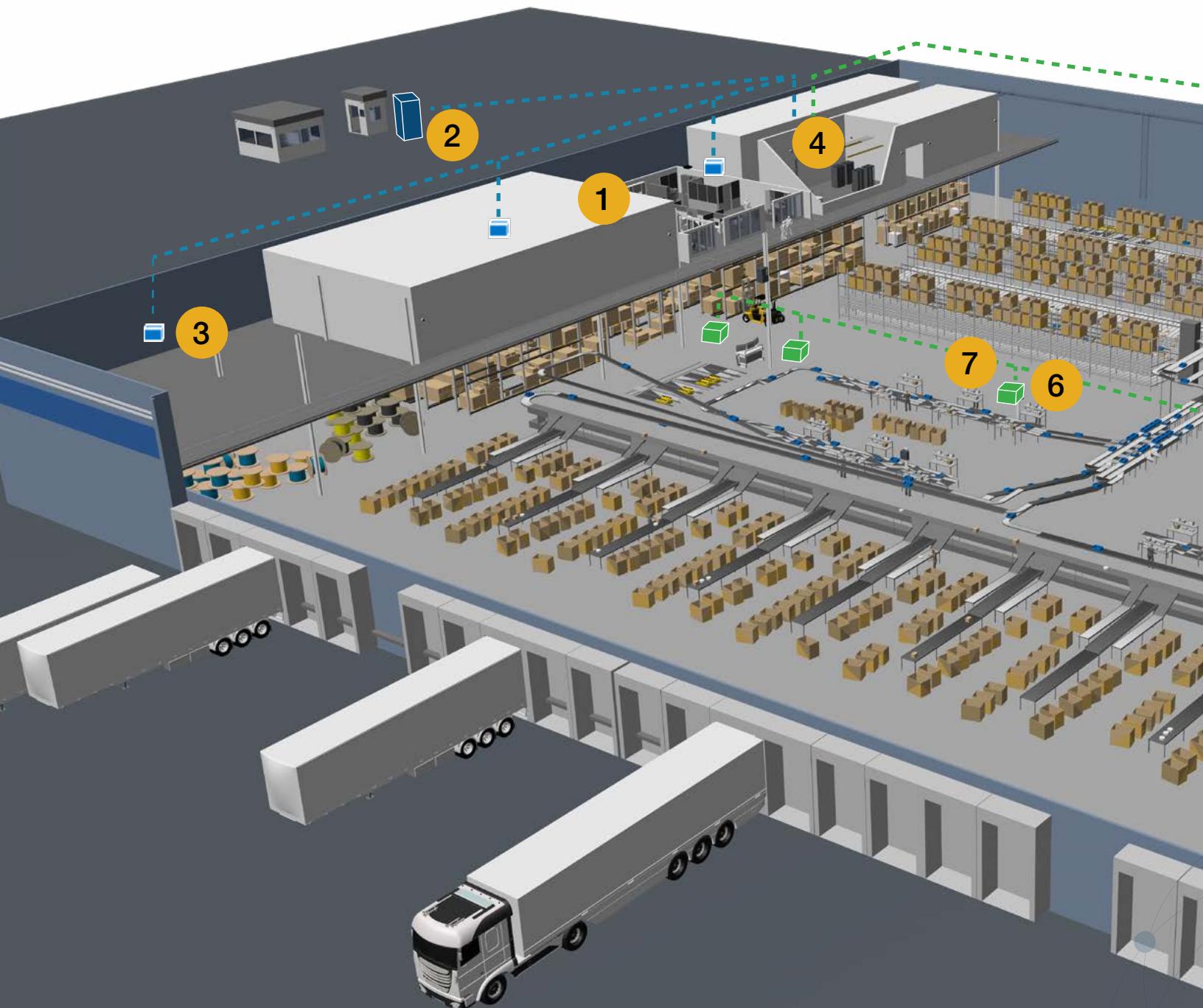


"Industry studies predict productivity gains up to 46% in distribution centers that introduce automated or robotic technology."

— MHI Deloitte Evolution to Revolution 2022 Annual Report



Network Infrastructure for Warehouse Automation



Network Architecture and Standards

Structured Cabling

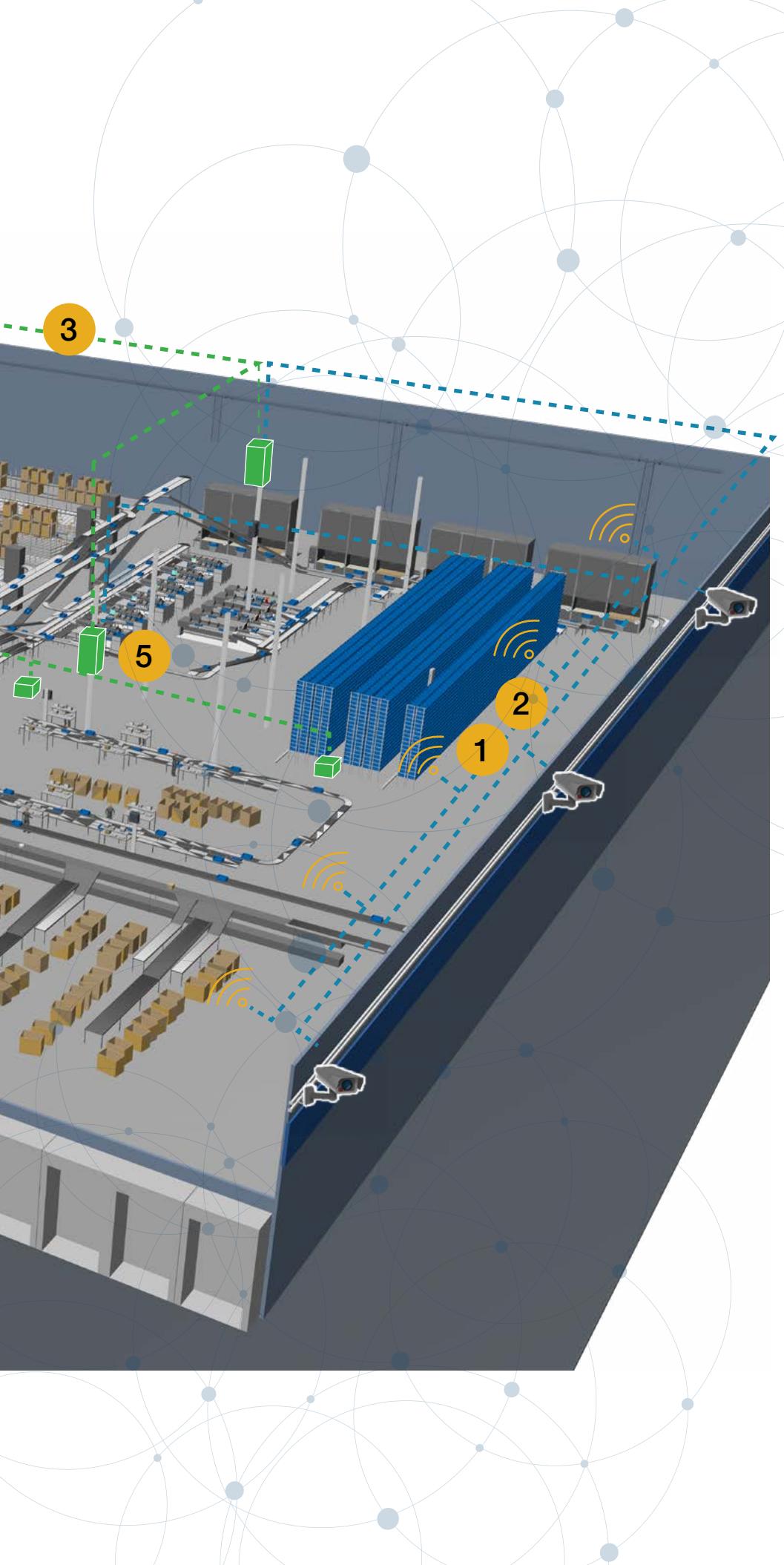
- Telecommunications Industry Association (TIA)
- ANSI/TIA-568 Commercial and Common Standards

Smart Building

- ANSI/BICSI 007-2020

Industrial Premises

- TIA-1005 / IEC 11801-3
- ISA-95
- IEC 61784-2



1. Office

- Ethernet-enabled building solutions
- AV and digital displays
- Power over Ethernet
- Wireless connectivity

2. Security/Monitoring

- Camera network infrastructure
- TrueEdge™ enclosures
- Network extenders
- Pathways and J-Hooks

3. Facility

- Backbone fiber
- Copper cabling systems
- Wall-mount intermediate distribution frame enclosures

4. Telecommunications Room

- Racks and cabinets
- Fiber enclosures
- Pathways and routing
- Identification
- Grounding and bonding
- Intelligent infrastructure
- SmartZone™ Cloud
- SmartZone™ UPS

5. Industrial Network Infrastructure

- Micro data center
- Intermediate distribution frame enclosures
- Zone enclosures

6. Industrial Ethernet

- Industrial Ethernet cabling
- Field terminable plugs and cords

7. Control Panel Solutions

- 600 V-rated cord sets
- DIN rail patch panels
- Industrial UPS



Equipping Smarter Warehouse Spaces

Buildings are getting smarter, and warehouses are no exception. In smart buildings, connected devices such as lights, security, HVAC, and AV converge on the IP network where these systems communicate with each other, collect actionable data, and fuel efficiencies.

A smart warehouse comprises various interconnected spaces from the office and meeting and training rooms to the facility floor and campus environment with high demand for wireless and wired IP for people, robotics, and automation.

High-performing, highly reliable networks rely on Panduit infrastructure solutions to connect devices and deliver voice and data wherever they are needed.

Wireless Connectivity

Ubiquitous wireless connectivity is mission critical to support workers with stable data and cellular connections as they move across the office environment and warehouse facility, as well as mobile automated guided vehicles (AGV) and co-bots that support digital picking, automated sorting and conveying.

State-of-the-art Wi-Fi requires Category 6A cabling infrastructure, and best practices suggest running four cables per access point, to prepare for both expansion and upgrade at a later date. Panduit Category 6A Vari-MaTriX HD cable is an ideal choice to connect wireless access points, delivering the highest levels of Category 6A performance in a Category 6-sized cable, and the industry's best thermal properties for Power over Ethernet.



Key Features:

Performance

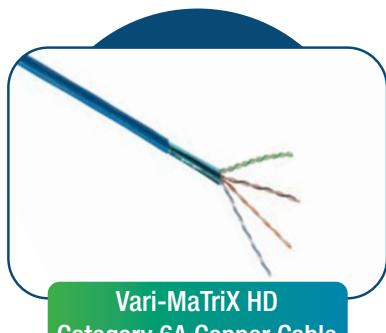
Whether you're looking for Category 6A copper systems for Wi-Fi, or fiber to connect antenna systems for in-building wireless, Panduit cabling and connectivity is guaranteed to deliver

Size matters

Vari-MaTriX HD is the industry's smallest Category 6A cable, meaning you can upgrade from Category 6 and use existing pathways

Simple installation

Field terminable connectors make installation quick and easy, directly connecting access points to horizontal cable runs, eliminating the need for plenum-rated boxes, jacks, and patch cords in the ceiling



Power over Ethernet

Power over Ethernet (PoE) is the new power grid in buildings, delivering power and bandwidth to a myriad of devices, among them security cameras and access points. Many health and safety systems that are being installed to help protect employees can benefit from PoE, which is powering both sensors and the systems themselves.

With sensors, PoE has the added benefit of eliminating the need for batteries, which require routine maintenance and replacement throughout the life of the sensor. The beauty of PoE lies in its simplicity: the same cable that is delivering data also delivers power to connected devices.

Panduit's Vari-MaTriX HD cables are an ideal choice for PoE, with improved thermal capabilities to manage the heat rise that naturally occurs with PoE

An estimated 3.2 million security cameras will be installed on building networks in the US by 2025.—BSRIA



AV Solutions for Logistics Operations

Manufacturing and warehousing operations are all about efficiency in production, streamlining operations to improve and speed up processes while reducing costs, and maximizing throughput, all while protecting workers and equipment. In highly automated environments, AV solutions can contribute to those efficiencies, with signage on the production floor that highlights current processing rates, average production costs, downtime, and even safety reminders. Additionally, AV equipment will be found in network operations centers and office conference spaces. Each of these applications have their own unique requirements and equipment designs.

Learn more about AV applications in warehouses in our application guide.

Extended Run Cabling and Connectivity

Modern fulfillment and distribution centers can be massive, ranging from 300,000 square feet to more than 3 million square feet. This size can make it challenging to deliver Ethernet to end devices while remaining in the standard-specified channel length. The ability to extend the range to a small percentage of remote IP connections can be advantageous to the overall network infrastructure design.

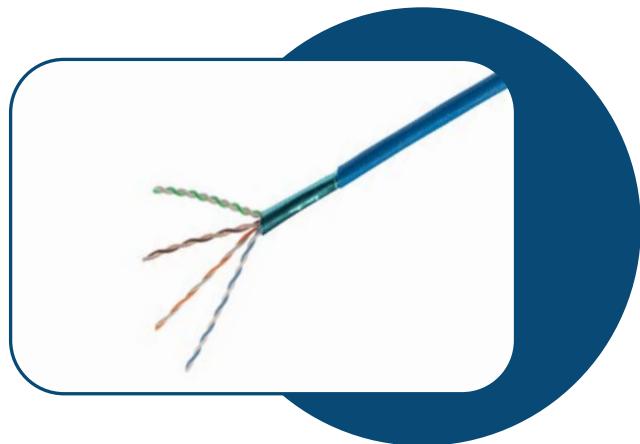
Extended-run cables — Enable smart buildings with Panduit Utility Grade Infrastructure (UTG), which is engineered to support all types of connected devices.

Support copper cabling runs up to 185 meters

UTG solutions are third-party tested and certified at distances up to 185 meters, instead of the industry standard 100 meters.

Other key parameters of the UTG offering are:

- Higher frequencies
- Elevated maximum temperatures
- Advanced AV protocols
- Next-Gen Wi-Fi technology
- Superior cable bundle performance under load
- HD and 4K UHD video surveillance



Network Extenders

Push the distance for end devices with Panduit network extenders. Network extenders are used in a wide array of applications including in the operational and automation environments. Anywhere with an Ethernet connection (speeds up to 100 Mbps and cable distances exceeding 328 feet) is a potential network extender application.



Facility and control devices benefiting from network extender technology include:

- Remote input/output modules
- Remotely mounted motor controls
- Video cameras for equipment monitoring
- Security cameras
- Access card readers

These types of devices are typically spread out over wide areas and not always within proximity to a network switch. Installing a device that is far from a network switch is easily accomplished with a network extender and standard category cable.

Connecting Building Systems Equipment

Plan for a converged all-IP building management system and building automation system. Future-proof these systems with Single Pair Ethernet, which enables TCP/IP communication to the last sensor on the network with a single twisted pair cable and connector.

Key Features:

Simplify

Reduce or eliminate gateway conversion of data from serial protocols

Faster, further, more powerful

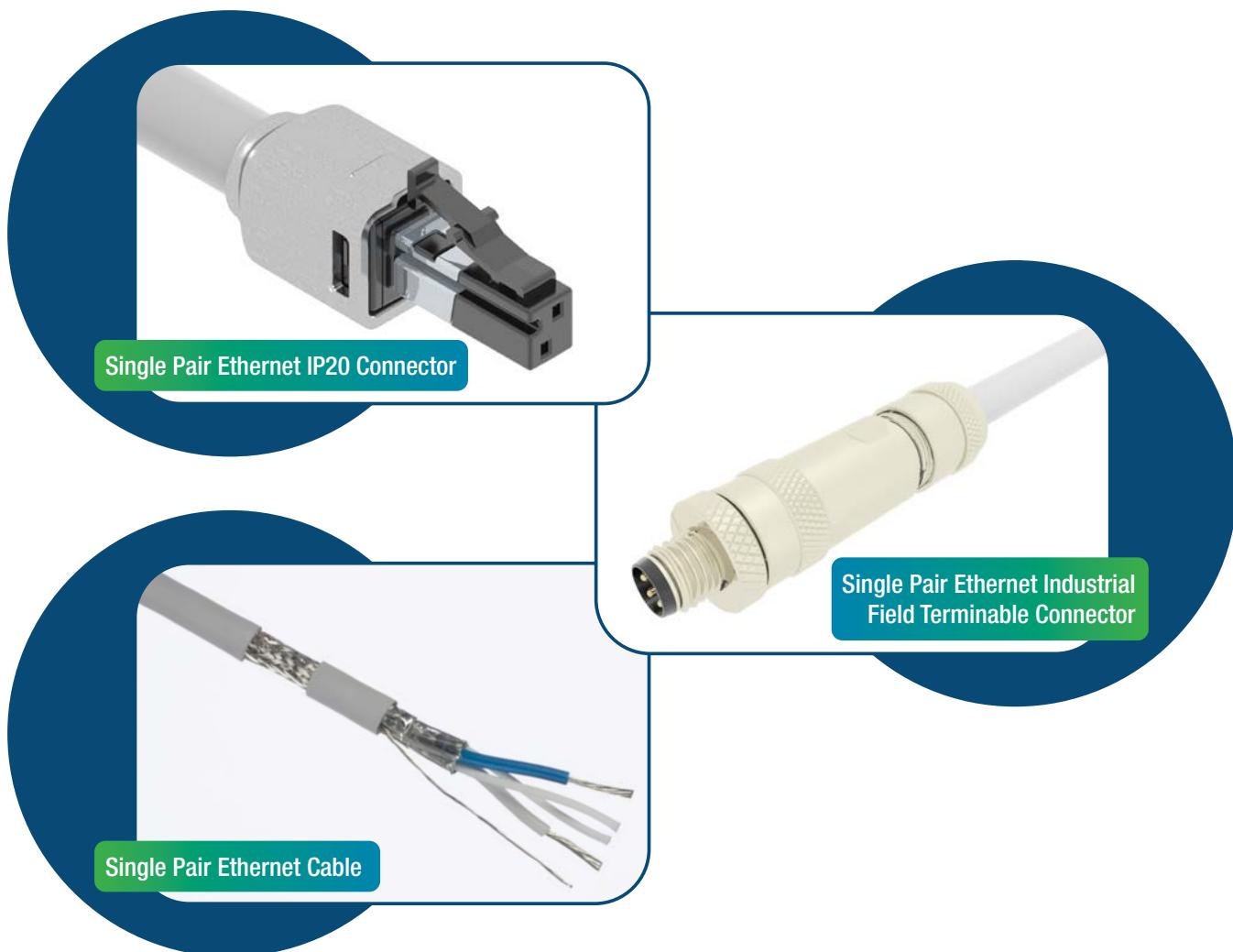
SPE delivers 10Mb/s for distances up to 1km and PoE-like power to end devices

Data collection and analysis

An Ethernet connection simplifies access to untapped data

Today and tomorrow

Support legacy technologies and enable migration to the future



Network Infrastructure Deployments

Panduit end-to-end network infrastructure solutions provide the foundation to deploy structured cabling across the office and facility. Comprehensive solutions reduce installation time, grow with your needs, and provide both standard and NEMA/IP-rated product grades for reliable performance in dynamic application environments.

Simplify the design, installation, and operation of your evolving enterprise networks with comprehensive Panduit cabling and physical infrastructure solutions.

e-commerce companies estimate that downtime costs \$220,000/minute.

Telecommunications Room Solutions

Simplify Network Deployment On-Site

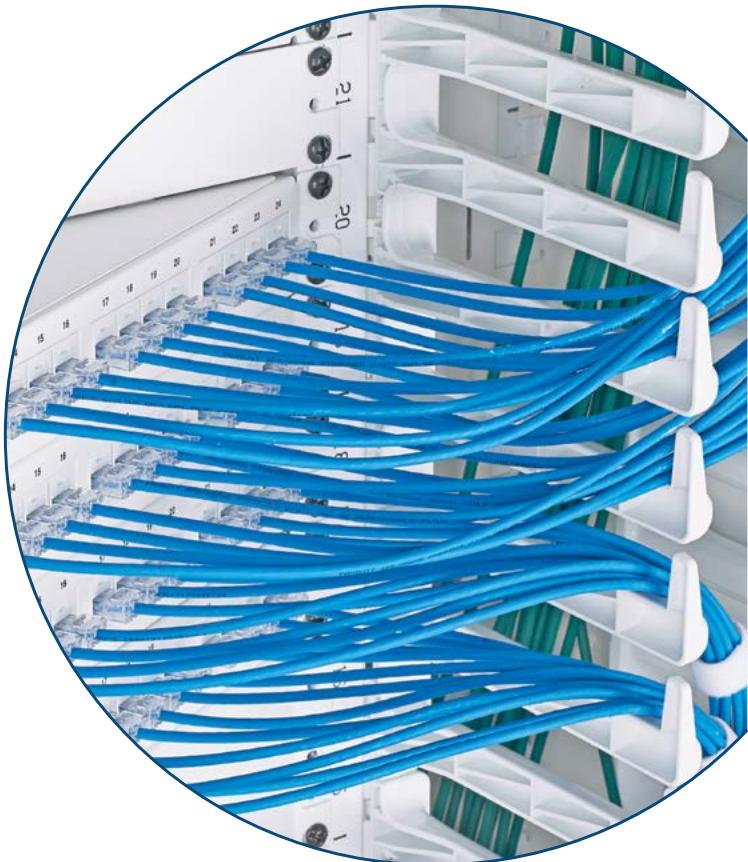
E-commerce has fueled enormous growth in fulfillment center projects (1400% growth since 2010). This means building owners and tenants need to deploy systems at a fast pace, using minimal footprint for equipment and with the ability to reliably support systems to avoid downtime.

Panduit understands these challenges and provides solutions to optimize space, while speeding network deployment and moves, adds, and changes in telecom room systems that can be installed and maintained with few or no technical resources onsite.

Space Optimization

Save critical space in the rack with innovative solutions that allow for increased rack density.

- PatchRunner™ 2 Cable Managers install quickly and easily, and efficiently route cable to preserve valuable rack space
- 28 AWG patch cords are half the size of traditional patch cords, saving space and simplifying installation and moves, adds, and changes. And all Panduit patch cords are compatible with the RapidID™ Network Mapping System which makes network documentation a snap.



Quick Deployment—Quick deployment solutions allow users to quickly and easily swap out network equipment if an issue arises. This minimizes downtime and eliminates troubleshooting in the field, which can be time-consuming.



QuickNet™ Cassettes, Harnesses, and Trunks install quickly for a clean, consistent installation



RapidID™ Network Mapping System automates cable documentation, reducing the time and cost of patch cord documentation by up to 50%

Security and Reliability—Best-in-class intelligent power solutions are highly reliable, provide efficient power distribution, and have secure access and manageability. These solutions support a range of applications from data centers and enterprise environments to supporting Edge IT equipment, including in-plant environments.



SmartZone™ UPS provides efficient and reliable power that provides protection and backup for IT equipment



SmartZone™ Security Handles ensure that only authorized users can access critical network systems



Basic and SmartZone™ PDUs offer reliable power for maximum uptime



SmartKeeper blockout devices block open RJ45, USBA and USBC ports to prevent unauthorized access to critical equipment and the network

Cabinets and Enclosures

Micro Data Center for Facility Floor

A micro data center (MDC) is a versatile combination of hardware, software, and cabling that serves as an end-to-end networking hub, sized to serve the demands of a manufacturing or operations environment. Panduit pre-configured MDCs are designed and validated to allow a physical layout that facilitates deployment of best-in-class logical network architectures.



Net-Access™ Micro Data Center is preconfigured for fast, reliable deployment while protecting the network

NEMA Type 12 Micro Data Center deploys quickly, with an added layer of protection against airborne particles, water, and other damaging environmental hazards



Zone Cabling Enclosures

Zone cabling products are meant for open office architecture applications, which serve as a main distribution point for that particular zone. Zoned approaches reduce demands on the telecommunications room, enabling additional active equipment to be mounted in ceiling or wall-mount enclosures.



Edge Computing Enclosures

Low-profile wall-mount enclosures are less obtrusive when located at person level, such as when deployed in a guard shack or near a network operations center (NOC). These enclosures house traditional horizontal equipment vertically on a wall and, in tandem, minimize network infrastructure investment by providing a solution to eliminate a rack or cabinet. An optional filter kit prevents dust and debris from entering the enclosure.



Wall Mount Cabinets, Industrial Distribution Frame (IDF)

On the facility floor, enclosures with a NEMA 1 (IP20) or NEMA 4/12 (IP66) rating enable the mounting of 19" equipment, including switch, UPS, active gear, or additional accessories, which are deployed across zoned areas. These enclosures provide space for termination, protect fiber optic uplink and copper downlink cabling, and support wire management.



[Find the right enclosure for your facility in our selection guide](#)

Material Handling & Automation

The facility floor is where the action happens: products move in and out, with robotics playing a part in automated sorting, conveying, packaging, and all types of material handling. As the industry tries to manage in the face of labor shortages, automation is more important than ever, and a robust, reliable network infrastructure helps ensure that unexpected downtime isn't a factor.

Robotics and automation leads innovation in supply chain; 56% believe it provides disruption or a competitive advantage—MHI - Deloitte Evolution to Revolution, MHI 2022 Industry Report

Industrial Zone Enclosures

Panduit network zone systems rapidly deploy industrial network switches to support controls and automation equipment on the facility floor. The reliable, structured approach of the network zone system reduces installation time and lifecycle costs. Available in a variety of sizes, materials, and configurations to work with most DIN rail mount switches for the utmost in flexibility.



DIN Rail Patching and Shielding Solutions

IndustrialNet™ DIN Rail Mount Patching Solutions conserve precious real estate by consolidating all patching (fiber and copper) onto the DIN rails of a zone enclosure or control panel. These patching solutions deploy easily and are designed to “fit” with standard industrial switches to support a structured cabling environment in the industrial network.



Cordsets and Connectors

IndustrialNet™ patch cords connect automation devices in industrial environments and are rated for 600 V panel or on-machine applications when the space is shared with high voltage power cables. Panduit connectors and adapters provide the cabling interface that protects the integrity of the Ethernet data transfer from the switch or PLC out to the devices.



Industrial Cabling

Whether you're running wired connections to robotic equipment or connecting wireless devices, the right cabling infrastructure makes a difference. Panduit has a full line of industrial copper and fiber cables, rated for use in environments where temperatures, vibration, debris, and airborne particles could be a factor. From 600 V shielded copper cables to the smallest diameter Category 6A cable on the market, to dielectric dual jacketed fiber cables, you can find the right solution with Panduit.

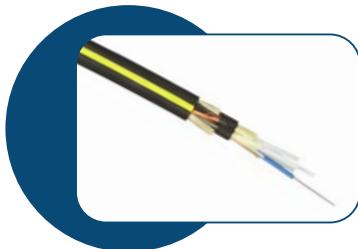


Industrial UPS

Reduce the risk of downtime by providing uninterrupted power for critical applications including managed network switches, micro PLCs, and HMIs.



Warehouse Floor and Facility



Dielectric Double Jacketed (DDJ) Fiber Cable

Kevlar reinforced dual layer jacketing makes this fiber cable impact-, crush-, and UV-resistant for the harshest of environments. The jacket means no additional conduit or defined pathway is required.



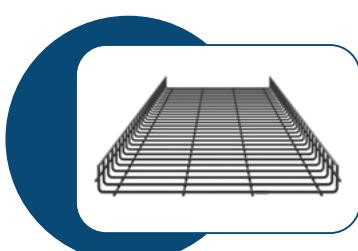
28 AWG Patch Cords

Preserve the limited space within enclosures with 28 AWG patch cords, which are half the size of traditional patch cords, saving space and simplifying installation and moves, adds, and changes. And all Panduit patch cords are compatible with the *RapidID™* Network Mapping System which makes network documentation a snap.



Surface Mount Boxes

Connect devices to horizontal cable with strategically placed surface mount boxes. Boxes can house anywhere from a single port to a dozen to connect a number of devices through a single housing. Boxes attach easily to poles, cabinets, or other structures with screws, magnets, or adhesive, allowing boxes to be placed almost anywhere.



Wire Basket Overhead Cable Tray

Route and manage copper and fiber optic data cables and/or power cables. Innovative features provide quick, safe, and easy assembly for reduced installation costs and faster deployment.



J-Hooks

Stronghold™ J-Pro™ and J-Mod® J-Hook Cable Supports provide an ideal communication and low voltage cable routing solution for use in plenum or air-handling spaces. They provide complete horizontal and vertical 1-inch bend radius control.



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