



IT Infrastructure and Cabling
Design and Sourcing Guide

Cabling
Infrastructure Hardware
Cabinets & Racks
Cooling
Power & Surge Protection
Remote Monitoring
Testers & Tools

The IT Infrastructure and Cabling Design

Your source for everything from the data center to the desktop—

In this guide, you'll find the latest technologies, tools, tips, and trends to build and upgrade your physical infrastructure for today's networks and to prepare for tomorrow's.

Because the infrastructure is a critical component of your entire network, smart planning and design can have a real effect on your organization's day-to-day operations and can contribute to its success.

As always, we're here 24/7 to answer your questions and to help you plan your infrastructure. Whether it's finding the right cooling solution for your data center or some jacks for desktop connections, our engineers can help. And, if you don't see what you need, call us. We can custom-design a solution just for you.



Cooling

- Cooling solutions for every application:
 - Data centers
 - Communications closets
 - Server rooms
- Need advice? Ask our application engineers.



Power & Surge Protection

- An all-encompassing power plan involves multiple components. We can help with:
 - UPSs
 - PDUs
 - Data line protectors
 - Opto-isolators



Cabinets, Racks, & Accessories

- Find the right cabinet or rack to support your computing needs.
- Choose from:
 - Full-size cabinets
 - Wallmount cabinets
 - Racks
 - Acoustic cabinets
 - NEMA-rated cabinets
 - Shelves
 - Cable management
 - Ladder racks
 - Accessories

and Sourcing Guide: and beyond.



- Ensure optimum performance with ETL Verified CAT6A/6/5e channels.
- Secure network ports with CAT6A/6/5e lockable patch cables.
- Move to 10-GbE with OM3 fiber patch and bulk cables.
- Plan for future 40-/100-GbE migration now with MTP® MPO-style cassettes, trunking cables, panels, and enclosures.
- Complete your multimedia and surveillance systems with high-performance video and coax cabling.

FREE, live, Tech Support!

Let our experts help you find the right solutions—right now.

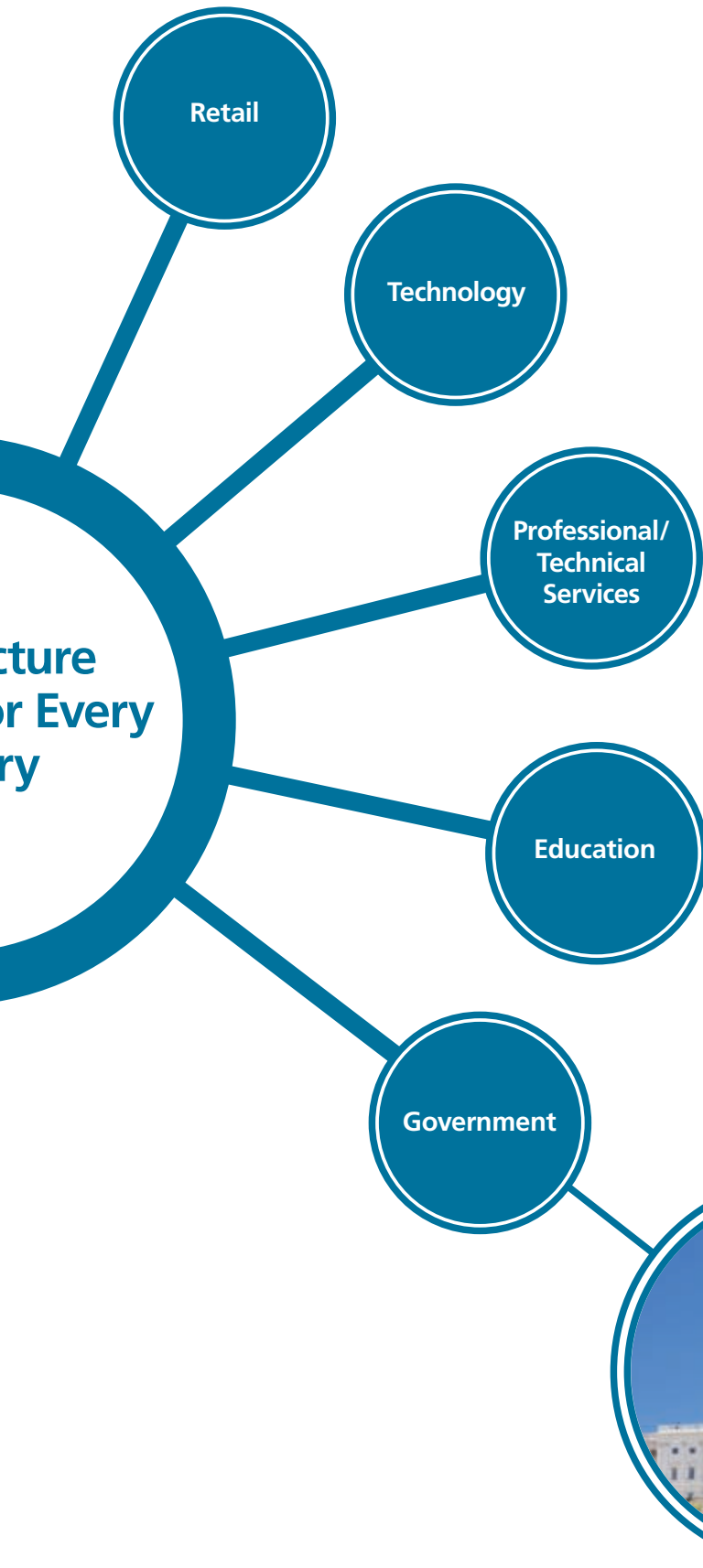
- FREE—The advice is absolutely FREE whether you buy or not!
- Live—Our techs answer your calls live.
- Call our product experts with questions anytime.

Call us or visit blackbox.com.



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Infrastructure Solutions for Every Industry

Support and solutions to make your infrastructure goals a reality.

Planning a network infrastructure is a daunting task, even for the most seasoned IT professional. What works in one industry might work in another—or might not.

While security may be a top priority for the government or financial institutions, other industries, such as healthcare may need custom-designed cables and cabinets to satisfy regulatory requirements. Education poses entirely different challenges in terms of the proliferation of tablets and mobility in the classroom. And manufacturing and industrial environments must deal with the question of the best way to set up infrastructure in harsh, remote, and extreme environments.

When you need advice, turn to the experts at Black Box. For more than 35 years, our engineers have been helping IT professionals like you achieve their goals with off-the-shelf, custom-made, and cutting-edge infrastructure technologies. We're here to help you put the latest trends in network infrastructure to work for you.



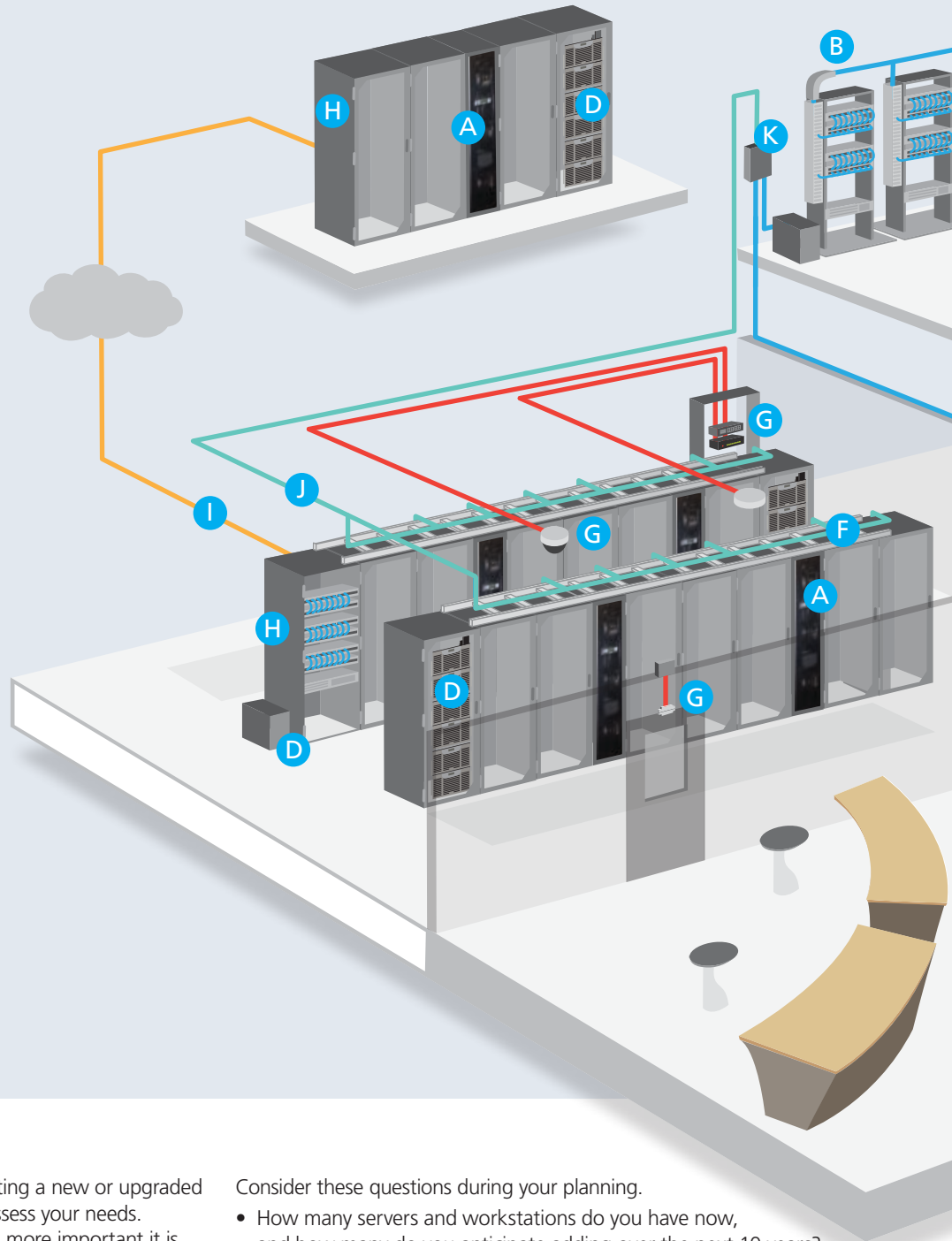
Physical network infrastructure

A physical network infrastructure that's smartly designed takes careful planning and can be a daunting project, even for the most experienced IT professional.

The network infrastructure in your office, building, or campus is a critical component of your organization. Proper planning, design, installation, and maintenance of this infrastructure can have a positive impact on your company's day-to-day operations and can contribute to its success.

The system you plan or upgrade today will be supporting new and different applications for at least 10 years, possibly more. The question is, how do you plan for the future?

In this solutions guide, you'll find everything you need to plan your infrastructure from the data center to the desktop.



Design considerations

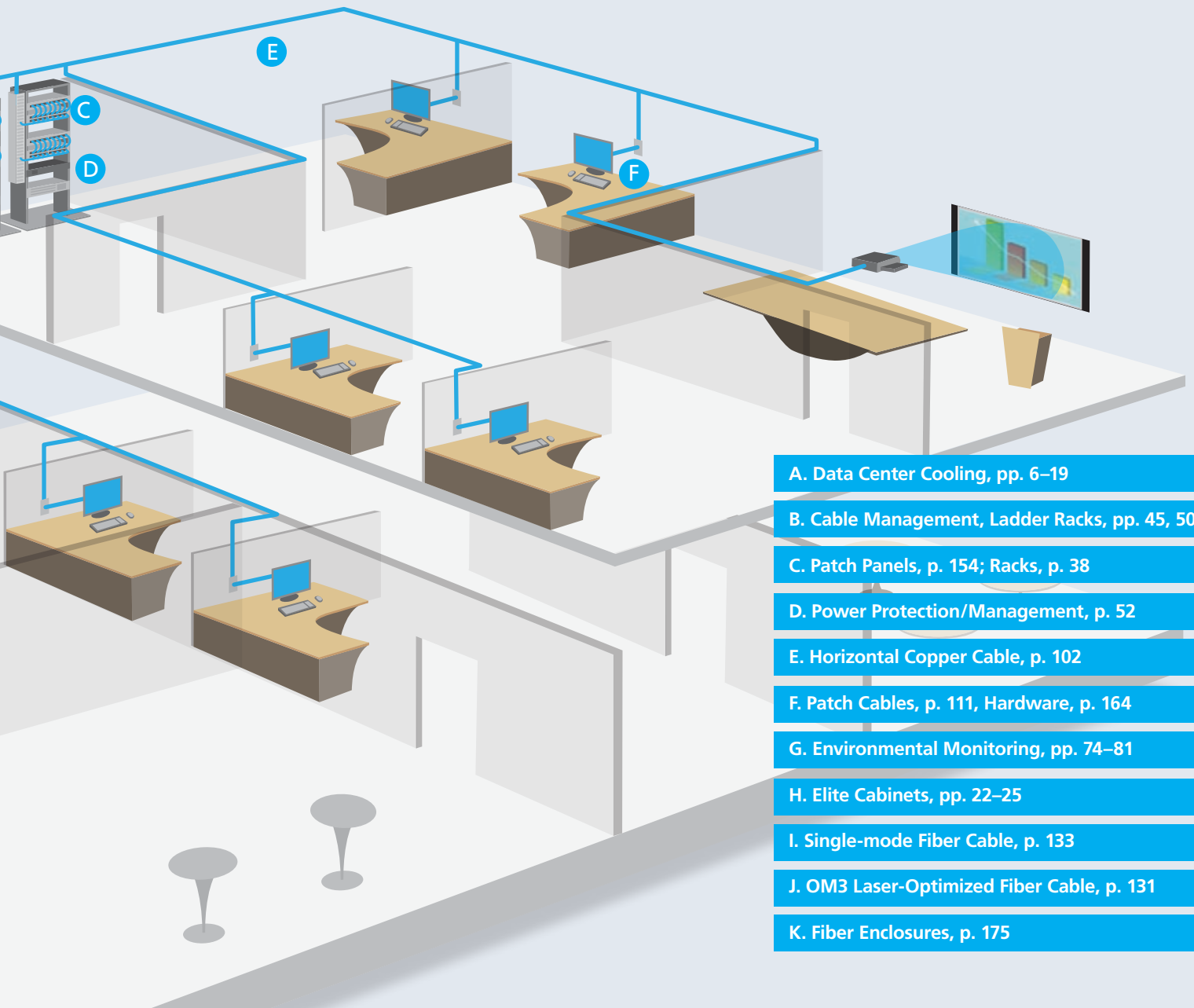
The first step in designing and implementing a new or upgraded network infrastructure is to step back and assess your needs. The more complex your network is now, the more important it is to successfully plan for growth. No matter if your network consists of a two-room office or a multi-building campus, decisions you make now will impact your business's or organization's success for many years to come.

Plan on using the best cable, hardware, and components your budget can afford. The latest technologies you install today will be old hat by the time you're ready to replace your cabling system in 10, 15, or even 20 years. And, most importantly, plan for more capacity and space than you think you'll need.

Consider these questions during your planning.

- How many servers and workstations do you have now, and how many do you anticipate adding over the next 10 years?
- Where will you locate your data center?
- How much power do you need in your data center?
- What cooling methodology and solutions are best for your data center/server room?
- How much network bandwidth do you need now? How much do you think you'll need in 5 years? 10 years?
- What are your requirements for redundancy and scalability?
- What type of media will you use? Fiber, copper, both?

design considerations.



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- Do you need to connect equipment in remote environments?
- Do you plan on using PoE for remote or VoIP phone connections?

Other tips include:

- Plan for complete wireless coverage.
- Future-proof your network by using the best technology and products your budget can afford.
- Leave room for growth in cabinets, racks, conduits, cable trays, etc.
- Label, label, label and document your cabling system.

Guaranteed for life Infrastructure performance.

You'll find everything you need to build and upgrade your data center right here. Better yet, most of Black Box's infrastructure components—cabinets, racks, cables, panels, etc.—are guaranteed for life.

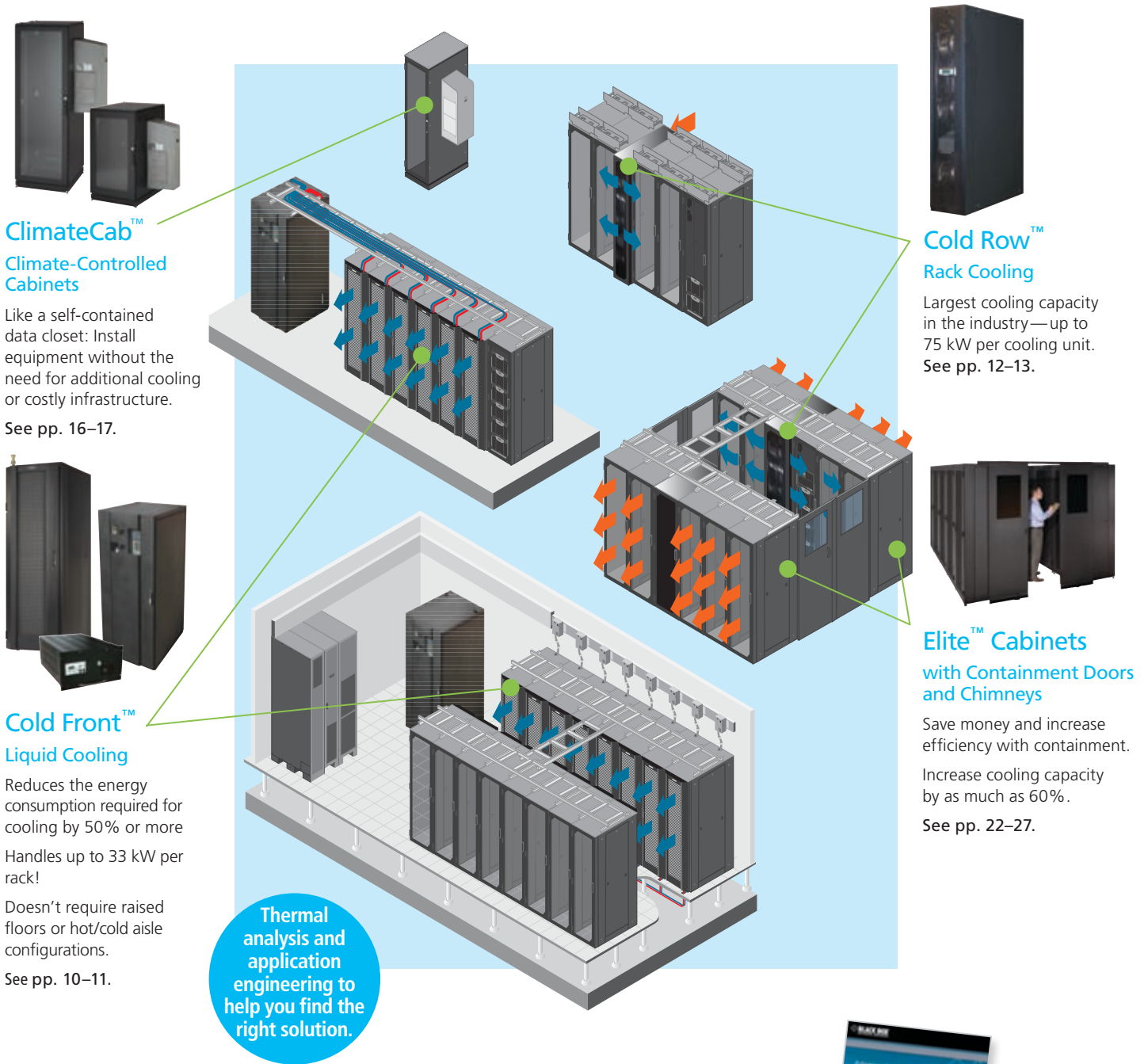
Free pre-sales application engineering support.

Need some assistance in planning your infrastructure? Call the experts at Black Box. Our engineers will work with you to help you assess, plan, and design your new or upgraded network infrastructure. Just call or go to blackbox.com.

Complete, Customized Data Center Solutions

From hot spots to server rooms to data centers of all sizes.

Need additional cooling capacity in your data center? Whether you have a couple of racks, a large data center, or anything in between, Black Box will recommend the right solution for your situation.



ClimateCab™ Climate-Controlled Cabinets

Like a self-contained data closet: Install equipment without the need for additional cooling or costly infrastructure.
See pp. 16–17.

Cold Row™ Rack Cooling

Largest cooling capacity in the industry—up to 75 kW per cooling unit.
See pp. 12–13.

Cold Front™ Liquid Cooling

Reduces the energy consumption required for cooling by 50% or more
Handles up to 33 kW per rack!
Doesn't require raised floors or hot/cold aisle configurations.
See pp. 10–11.

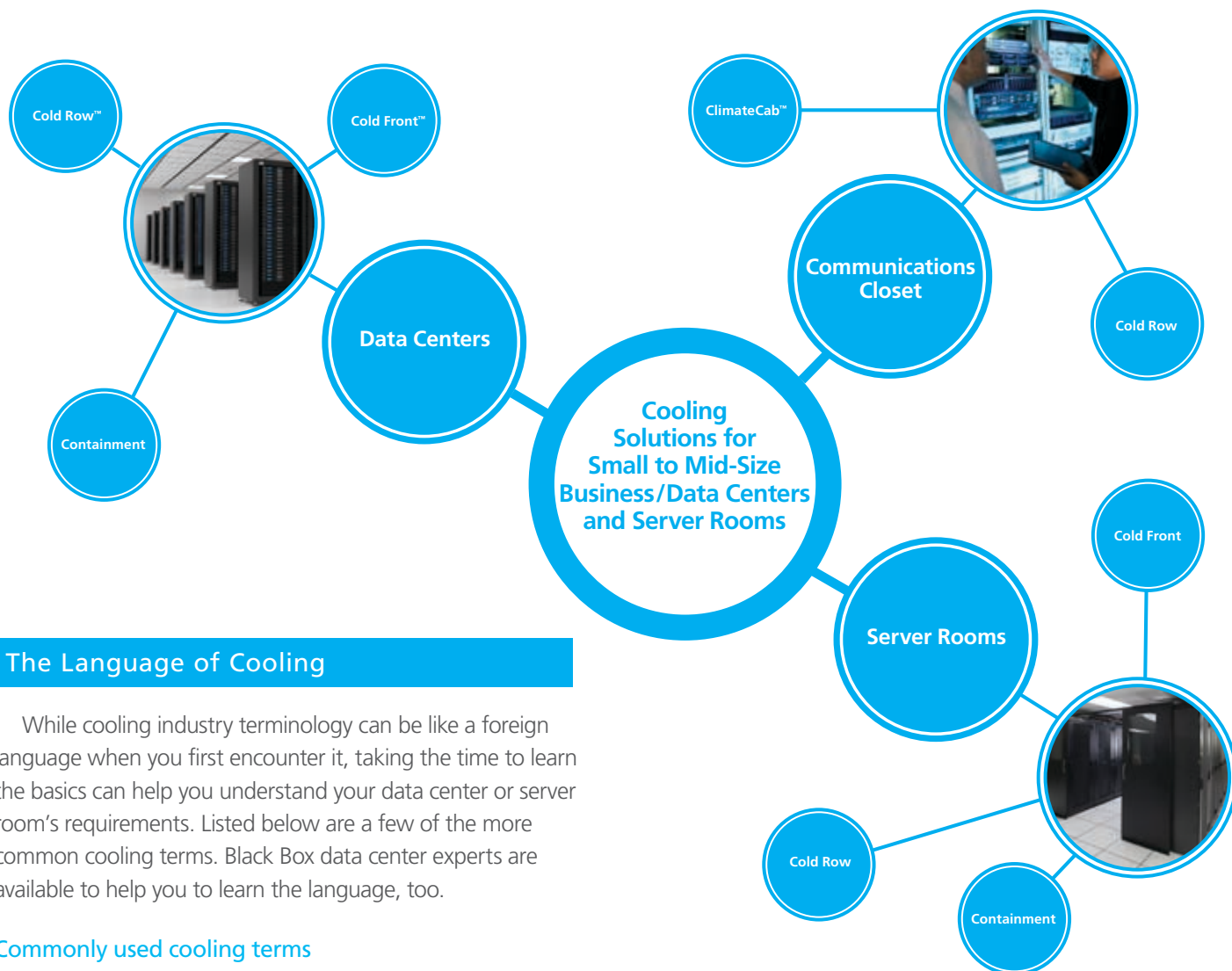
Elite™ Cabinets with Containment Doors and Chimneys

Save money and increase efficiency with containment.
Increase cooling capacity by as much as 60%.
See pp. 22–27.

Thermal analysis and application engineering to help you find the right solution.

For a FREE white paper and webinar on localized cooling solutions, visit blackbox.com/go/DataCenter.





The Language of Cooling

While cooling industry terminology can be like a foreign language when you first encounter it, taking the time to learn the basics can help you understand your data center or server room's requirements. Listed below are a few of the more common cooling terms. Black Box data center experts are available to help you to learn the language, too.

Commonly used cooling terms

British Thermal Unit (BTU)—The amount of heat required to raise the temperature of one pound of water by 1° F.

Note: BTU is also an abbreviation for BTU/hr.

Chilled Water System (CW)—A cooling system that uses chilled water to cool the warm return air and discharge the cool air. Typically, the chilled water is cooled by a remote chiller.

Dew Point Temperature (DP)—The temperature at which a sample of air will be 100% saturated with water vapor (100% relative humidity).

Direct Expansion System (DX)—A cooling system that utilizes a refrigerant and an evaporator coil to cool the warm return air.

Dry-Bulb Temperature (DB)—The temperature indicated by an ordinary thermometer. It indicates the sensible heat of air and water vapor mixture.

MBTU – Thousands of BTUs.

Relative Humidity (RH)—The ratio of the partial pressure of water vapor in an air-water mixture to the saturated vapor pressure at a certain temperature.

Ton—The amount of heat required to melt a ton of ice in 24 hours at 32° F.

Wet Bulb Temperature (WB)—An air temperature that is used to evaluate the humidity in the air. It is obtained with a wet thermometer bulb to record the evaporation rate with an airstream passing over the bulb to help in evaporation.

Conversions:

- kW to BTU/hr: $\text{kW} \times 3,412 = \text{BTU/hr}$
- kW to Tons: $\text{kW} \times 0.2843 = \text{Tons}$
- BTU/hr to Tons: $\text{BTU/hr} / 12,000 = \text{Tons}$
- BTU/hr to kW: $\text{BTU/hr} / 3,412 = \text{kW}$
- Tons to kW: $\text{Tons} \times 3.513 = \text{kW}$
- Tons to BTU/hr: $\text{Tons} \times 12,000 = \text{BTU/hr}$

Determining the best way to cool your server room or data center is

Perimeter cooling with hot aisle/cold aisle.

Cabinets are configured back to back and front to front so that aisles of cold air and hot air are created. This is typically done on a raised floor with perforated tiles in the cold aisle to achieve the desired airflow.

This arrangement works best for lower equipment densities and power loads less than 5 kW per enclosure. As more equipment is added, the inlet temperature starts to exceed ASHRAE standards putting equipment at risk. Other cooling methodologies need to be considered.

Advantages:

- Already exists in many facilities.
- Familiar technology.

Disadvantages:

- Low cooling capacity (<5 kW per enclosure).
- Inefficient: Need 25–100% more cooling than actual requirement.
- Maintenance costs, service agreements.
- Infrastructure for entire white space must be installed on Day One.
- Is not easily scalable.
- Existing cabinets cannot always be easily moved or reconfigured due to existing cabling.

Perimeter cooling with containment.

Cold aisle containment (CAC) adds doors to the ends of the cold aisle and possibly a ceiling to minimize the mixing of the air, thus increasing cooling efficiency. The airflow barrier can range from makeshift arrangements of plastic strips to doors and ceilings made expressly for this purpose.

Because cold aisle containment concentrates cool air at the front of equipment where it's most needed, it's an exceptionally effective cooling method. Cold aisle containment significantly reduces energy usage, lowering power bills as well as reducing a data center's carbon footprint. In addition, it increases the available cooling capacity.

With hot aisle containment, hot exhaust air from IT equipment is contained so that it doesn't mix with cool air. The front of IT equipment is accessed in the external cold aisle.

This method uses doors and other barriers like cold aisle containment does. However, in this configuration, hot air is captured and directed back to the computer room air conditioning (CRAC) unit. This method also prevents the mixing of hot and cold air, again increasing overall efficiency.

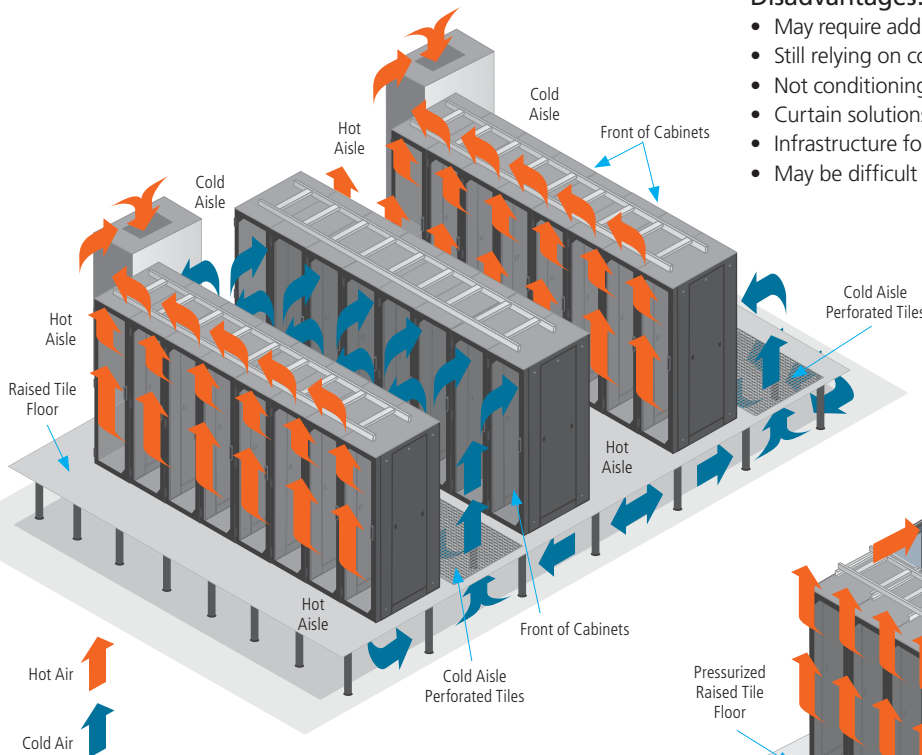
Advantages:

- No fans required.
- Isolation of hot exhaust from cool supply.
- Increases efficiency of computer room air conditioner/heater (CRAC/H).
- Easily deployed in existing data centers.
- More consistent predictable temperatures.
- Can be curtains, metal, plastic ceiling.

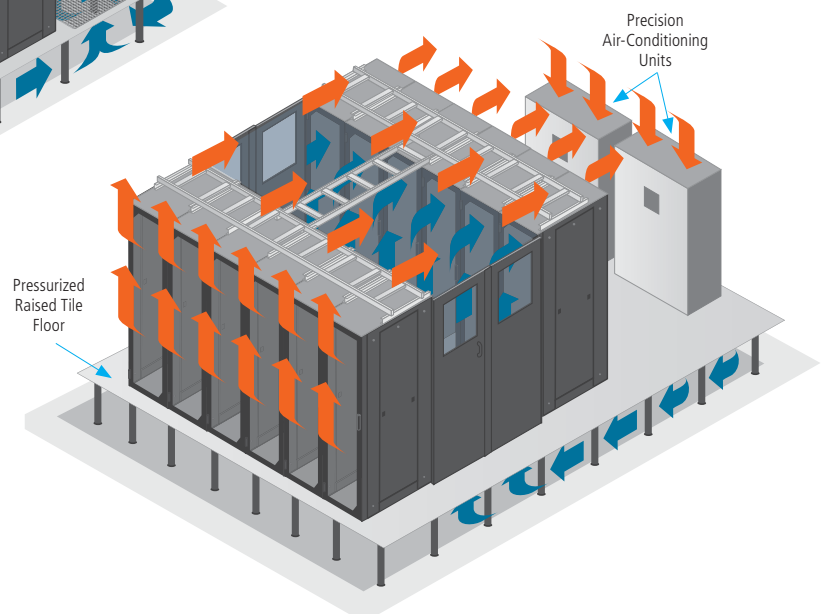
Disadvantages:

- May require additional lighting and smoke/fire detection and suppression.
- Still relying on computer room air conditioner/heater (CRAC/H).
- Not conditioning air, just moving it more effectively.
- Curtain solutions sway and are leaky.
- Infrastructure for entire white space must be installed on Day One.
- May be difficult or impossible to create a redundant (2N) cooling design.

Hot Aisle / Cold Aisle Configuration



Cold Aisle Containment (CAC)



vital to its reliability and efficiency.

Row cooling, with and without containment.

Designed for scalability, reliability, and seamless integration into new or existing data centers, rack cooling systems are suitable for use in open and contained hot aisle and cold aisle configurations. They're also ideal for hot spot cooling in small- to enterprise-size data centers.

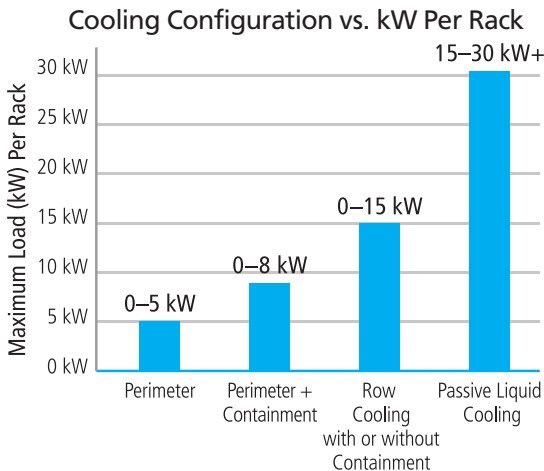
Black Box Cold Row systems are available in chilled water or direct expansion (DX) configurations. They capture high-temperature (hot aisle) discharge air from adjacent rack-based IT equipment and reintroduce it as conditioned air through the front of the unit (cold aisle).

Advantages:

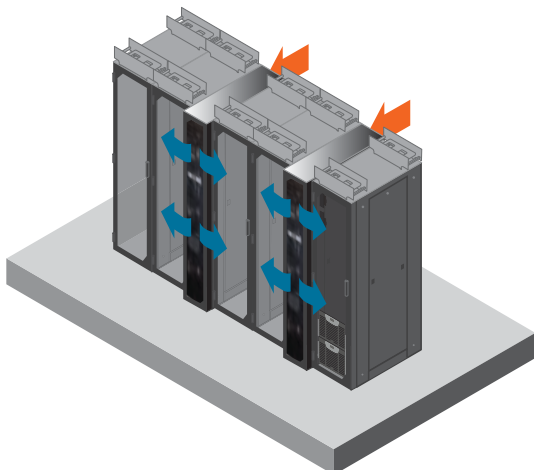
- Easily scalable over time as loads and footprint increase.
- Capacity from 17 kW to 30 kW.
- Does not interfere with overhead cable management.
- Cooling near source more efficient than CRAC/H.
- Good for hot spots or supplemental cooling in existing facilities.
- Can use with containment to increase capacity.
- A raised floor is not necessary.
- Can create a redundant 2N cooling design.
- EC fan technology offers significant improvement in efficiency vs. first generation in-row cooling.

Disadvantages:

- Need to accommodate condensers required for DX versions.
- Chilled water versions require a chiller or capacity from an existing chiller.



Cold Row™ Intelligent Rack Cooling



Passive liquid cooling.

Suitable for new data centers as well as existing ones, passive liquid cooling at the rack level supports increasing IT rack power densities. Resources can be added on an as-needed basis rather than completing a full build-out of an entire space at one time. For existing data centers, this solution also enables upgrades with no disruption to IT operations while achieving a significant cost savings in energy consumption, not to mention the capital expense of constructing a new data center.

Using passive liquid cooling opens options in retrofitting for optimized performance, a comparable initial cost compared with traditional cooling options, and the opportunity to increase cooling capacity without disrupting operations. Long-term, liquid cooling is significantly more cost-effective to data center operators.

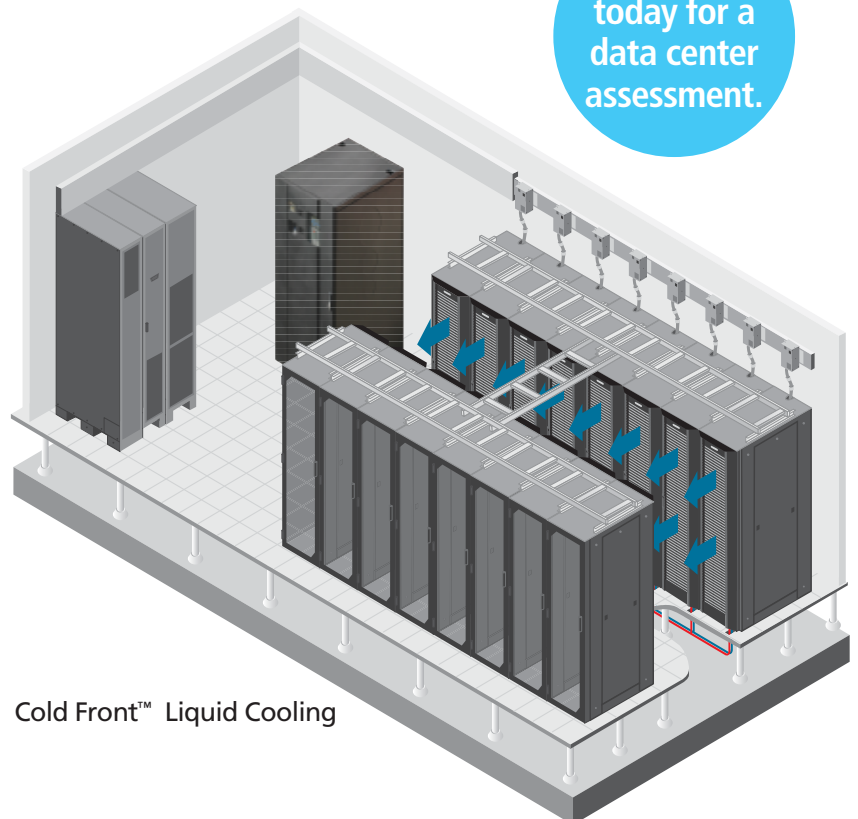
Advantages:

- Highly efficient.
- Very flexible—can install where cooling is needed.
- Lower total cost of ownership (TCO) than other solutions due to passive devices.
- No fans mean no power and reduced operating costs.
- Highly predictable—when close coupled.
- Less costly to pump liquid than to blow air.
- Water cools >3,400x more than air.
- Localized liquid cooling has been around for more than 45 years (IBM® mainframes, Cray super-computers, military electronics).

Disadvantages

- Need a chiller or have capacity available from an existing chiller.
- Up-front cost may be large.

Contact us today for a data center assessment.

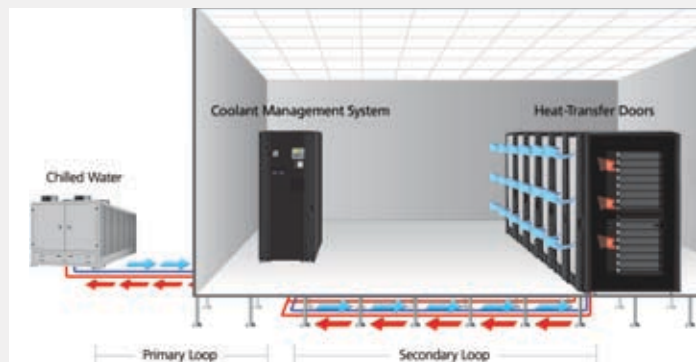


Cold Front™ Liquid Cooling

Cold Front

Passive liquid cooling for your data center

- Neutralizes heat at the source, returning cooled air into the data center and providing up to 33 kW of cooling per cabinet.
- Eliminates the need for hot-aisle/cold-aisle configurations and raised floors—place your computing equipment where you want it.
- Saves on energy bills. Reduces energy consumption of indoor cooling units by 90% or more!
- Installs easily and requires no rearrangement of your enclosure.
- Supports five times the computing power of air-cooled facilities.
- Coolant Management System intelligently moves liquid through Heat-Transfer Doors.



Nothing cools like chilled water. Now you can harness the cooling power of liquid in your data center with Cold Front™.

Cold Front is the perfect solution for tightly packed server rooms or high-density enclosures. It works to sensibly cool a data center enclosure—and can lower data center total cost of ownership by as much as 50% because it reduces both energy and space requirements.

Heat-Transfer Door

The Heat-Transfer Door (HTD) neutralizes heat at the source. Chilled liquid passing through the door cools the exhaust air before it re-enters the data center. It requires no fans or electricity because it uses the server fans to move the hot air through the door.

The door uses a closed-loop circulatory system, and its specially designed perforations and coil maintain airflow through the cabinet.

Because the Heat-Transfer Door features a passive design with no moving parts, it is reliable and quiet.



The door replaces the existing rear door and installs easily, requiring little if any regular maintenance. Plus, it can be installed without the need for pressurized raised floors, air plenums, or exhaust chimneys. It also eliminates secondary pump systems for condensate.

Choose from top- or bottom-feed versions, as well as models that support 100% neutralization (maximum) of the heat load for 24–33 kW of cooling capacity. The door works with most enclosures and can be ordered for many standard cabinet sizes.

Use the door with our Coolant Management System for consistent data center cooling that grows as your computing capacity increases.

Coolant Management System

The advanced Coolant Management System (CMS) works with enclosure-mounted Heat-Transfer Doors to keep data center equipment running cool and lower your overall energy consumption.

On a primary loop, it attaches to your chilled water system or a dedicated chiller. On its secondary loop, the system connects to the Heat-Transfer Doors, providing up to 20 or 260 kW of cooling capacity, depending on the model.

The system maintains the isolated secondary loop supply temperature above the dew point of the data center, preventing condensation and ensuring 100% sensible cooling.

The system does this by monitoring the temperature and pressure conditions and increases and decreases in flow as conditions change in your data center. Heat removed by connected Heat-Transfer Doors is then ejected to the chilled water supply by using a stainless steel plate heat exchanger.

What's more, the system's controller provides intelligent monitoring, interfacing with building management systems and Web management tools for high reliability.

The versatile Coolant Management System features redundant variable speed pumps, actuators, and control valves to maximize system availability.

The system is available in two base versions:

- A floor-mount model that boasts up to 260 kW of cooling capacity, supports up to 48 Heat-Transfer Doors, is easy to install and maintain, and can be placed next to your IT enclosures or outside of the white space entirely.
- A smaller, 6U-high rackmount system that supports up to 20 kW of cooling capacity and provides a cost-effective way to support one or two Heat-Transfer Doors.

Data Center High-Density Solution

The Challenge:

A large IT reseller with an old data center needed to consolidate servers due to a recent acquisition of another company. The small space had CRAC units on a raised floor, with numerous old underfloor cable runs.

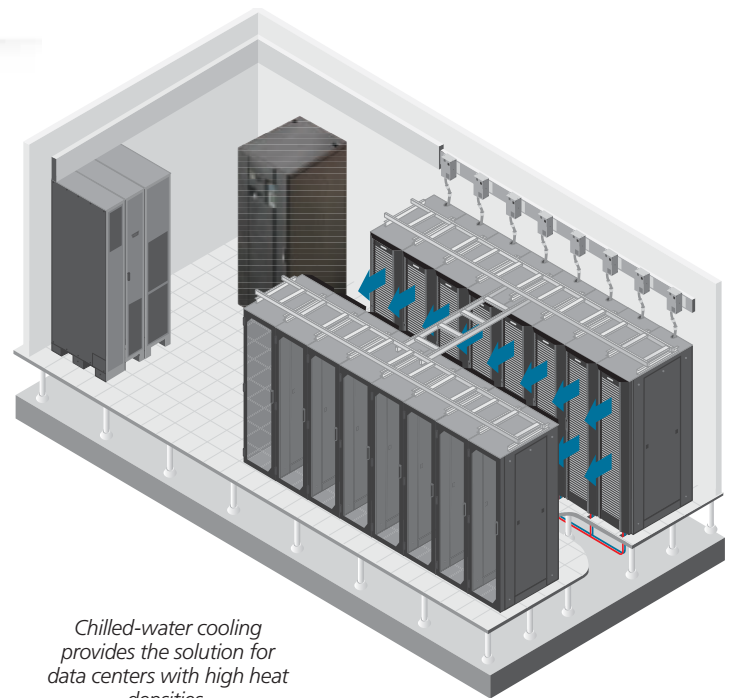
Needing new cabinets, cable management, power, and cooling, the company contacted Black Box for help, and provided us with details on their current equipment and site, as well as potential future needs.

The Solution:

Due to high server density, limited floor space, and planned future acquisitions, we recommended liquid cooling. Chilled-water cooling provides the solution for data centers with high heat densities (approximately 15+ kW per rack). Liquid cooling lines were placed under the raised floor. Cabling was moved overhead using ladder rack. The old CRAC unit will be kept online for supplemental cooling in an emergency or for comfort if needed.

The package Black Box put together (**below**) includes cooling, cabinets and accessories, UPSs, PDUs, and environmental monitoring.

- Sixteen (16) Elite™ Cabinets, including air dams, baying hardware, and blanking panels. (Cabinets are 42U, 24" wide, and 42" deep.)
- One (1) 260-kW Coolant Management Unit.
- Sixteen (16) Cold Front™ Heat-Transfer Doors.
- Complete metered 240-kW UPS solution with remote management including (1) cabinet, buss bars, wire-way, power distribution, assembly, and startup services. (Cabinet is 73.94" high x 52.83" wide, x 34.45" deep.)
- Thirty-two (32) PDUs—3-phase, 8.64-kW (24-A), 33-outlet [(6) NEMA 5-20R, (24) IEC-320-C13, (3) IEC-320-C19)], plug type: L21-30P, 0U vertical mounting (2 per cabinet).
- AlertWerks™ ServSensor package with sixteen (16) temperature/humidity sensors to monitor each cabinet and intelligent rope water sensors to alert of any water leaks.
- KVM tray—1U, 17" LCD display that includes keyboard and touchpad.



- One (1) preconfigured ladder rack bundle including ladder rack brackets, ladder rack, splice kits, radius drop kits, and runway termination kits.
- Sixteen (16) floor tile brush grommet kits.

Resources

Cold Front brochures, flyers, white paper, and spec sheets:
www.blackbox.com/go/ColdFront

Cold Row

An innovative, economical, energy-efficient data center cooling solution.

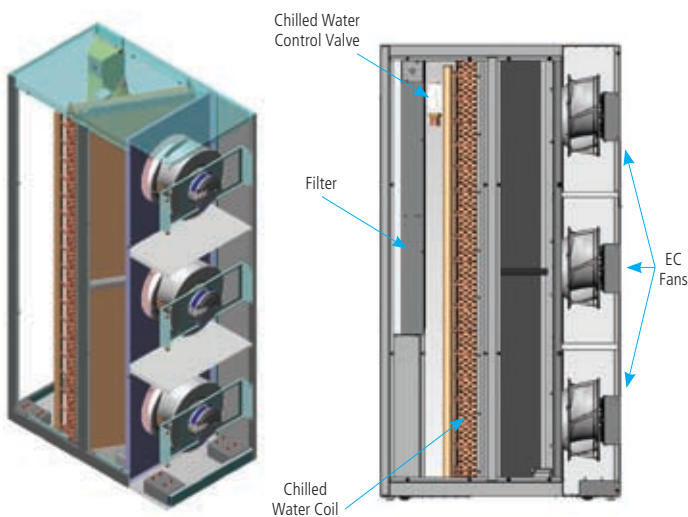


- Wide range of cooling capacities for small, medium, and even the largest applications.
- Highest cooling capacities in the industry—up to 75 kW per unit.
- Seamless integration with most BMS platforms.
- Fully adjustable fan speed control for energy savings.
- Built-in redundancy.
- Scalability—add Black Box Cold Row cooling units as your data center grows.
- Ideal for data centers with or without raised floors.
- Highly efficient cold aisle or hot aisle containment systems can be implemented.
- Independently, infinitely adjustable EC fans ensure maximum efficiency. (See Pro Tip below.)

Designed for scalability, reliability, and seamless integration into new or existing data centers, Black Box Cold Row rack cooling systems are suitable for use in open and contained hot aisle and cold aisle configurations. Cold Row is ideal for hot spot cooling in small- to enterprise-size data centers.

Cold Row™ and Chilled Water

Chilled water (CW) is supplied to the Cold Row unit via a building chiller or other chilled water plant. Chilled water has a high affinity for heat, thus making it a very efficient cooling method. The Black Box controller allows for independent valve and fan control so the unit can adjust immediately, and precisely, to varying heat loads. This optimizes energy efficiency.

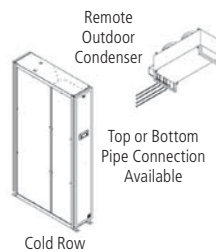


Cold Row Chilled Water

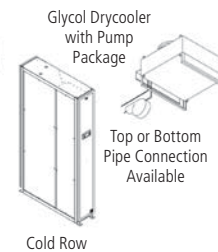
Cold Row DX

Direct-expansion-type (DX) units cool air in the space with a condenser-based system using green R410A refrigerant and either air, water, or glycol. Water is supplied by the building water plant, and heat is rejected to the outdoor environment via air-cooled condensers for air-cooled units, the water tower for water-cooled units, or fluid coolers for glycol-cooled units.

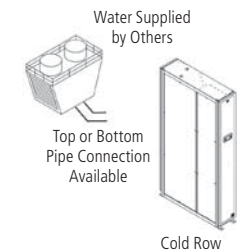
Air Cooled



Glycol Cooled



Water Cooled



Pro Tip

Advantages of EC (Electronically Commutated) Fans

- Oversized fans can run at reduced speeds to maximize energy savings and feature fully scalable air volume.
- Efficiency is superior to forward-curved fans:
 - More than 20% immediate energy savings by design.
 - More than 60% energy savings when running at partial load.
- Balanced air flow.
- Low vibration; no belt dust.
- Maintenance-free.

Cold Row

An innovative, economical, energy-efficient data center cooling solution.

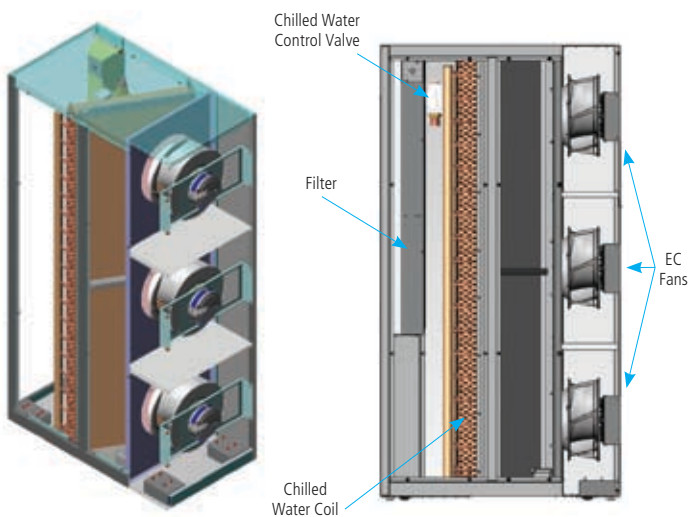


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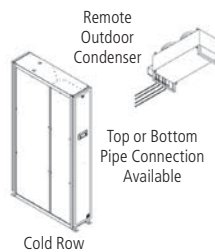


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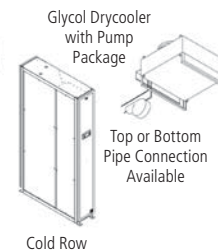
Cold Row DX

Direct-expansion-type (DX) units cool air in the space with a condenser-based system using green R410A refrigerant and either air, water, or glycol. Water is supplied by the building water plant, and heat is rejected to the outdoor environment via air-cooled condensers for air-cooled units, the water tower for water-cooled units, or fluid coolers for glycol-cooled units.

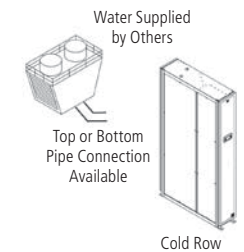
Air Cooled



Glycol Cooled



Water Cooled



Pro Tip

Advantages of EC (Electronically Commutated) Fans

- Oversized fans can run at reduced speeds to maximize energy savings and feature fully scalable air volume.
- Efficiency is superior to forward-curved fans:
 - More than 20% immediate energy savings by design.
 - More than 60% energy savings when running at partial load.
- Balanced air flow.
- Low vibration; no belt dust.
- Maintenance-free.

Server Room Medium-Density Solutions

The Challenge:

A small but growing software company had been hosting all of their IT equipment offsite. They decided to bring the equipment in-house and use the offsite hosting location for disaster recovery. They did not have a server room or data center on site, but they did have space available to dedicate to this purpose.

They were, of course, on a budget and wanted to dedicate as much spending as possible to IT equipment instead of the costly infrastructure that can be associated with a small data center. Their current load requirements were for two cabinets at about 8kW per rack. Uptime is critical to them because they host customer data in an SaaS environment. They also wanted a scalable solution so that, as the company grows in the future, their data center can grow with them.

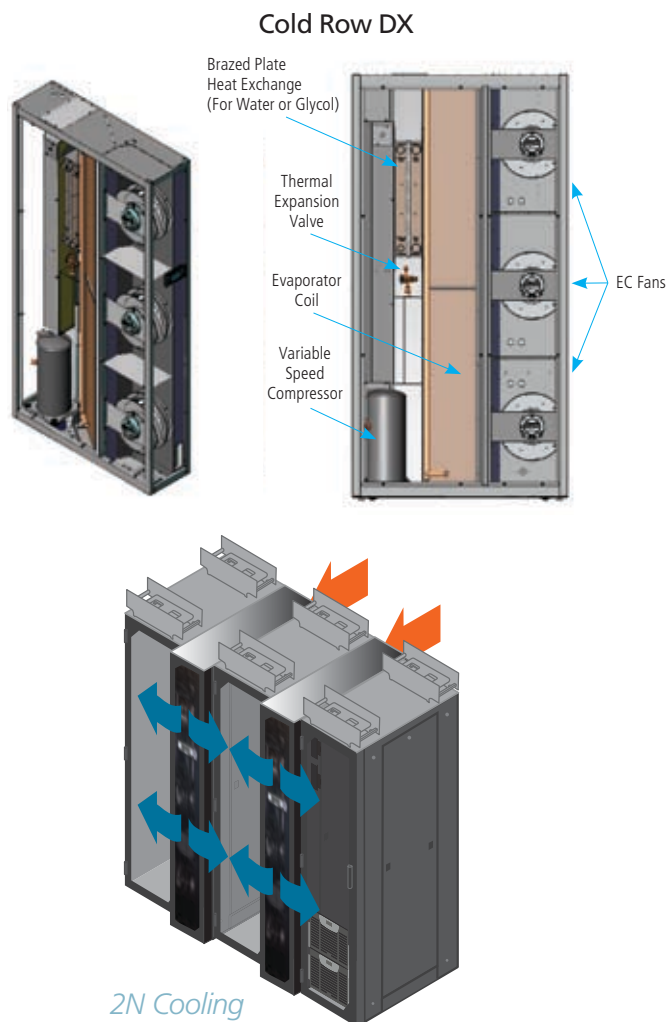
After learning about their situation and requirements, Black Box recommended a total infrastructure solution for their server room that included cooling, cabinets and accessories, UPSs, PDUs, and environmental monitoring.

The software company implemented the Cold Row DX in-row cooling solution for their server room, enabling them to get the cooling capacity that they need for current loads and have the ability to scale it over time by adding containment and/or additional Cold Row units. By using the DX version of Cold Row and placing condensers on the building's roof, they did not have to purchase a chiller.

The Solution:

The solution included two Cold Row units in order to allow for redundancy. In addition, redundancy was built into their power configuration, offering N+1 power distribution. This included a scalable UPS solution as well as PDUs.

- Two (2) Elite™ Cabinets for housing IT equipment, including air dams, buying hardware, and blanking panels. (Cabinets are 42U, 30" wide, and 42" deep.)
- For 2N cooling—Two (2) Cold Row DX units (air-cooled with condenser and authorized startup services).
- Complete 24-kW metered UPS solution with remote management including (1) cabinet, buss bar, wire-way, power distribution, assembly, and startup services. (Cabinet is 42U, 30" wide, and 42" deep.)
- For 2N power distribution—Four (4) metered PDUs, 3-phase, 8.64-kW (24-A), 33-outlet [(6) NEMA 5-20R, (24) IEC-320-C13, (3) IEC-320-C19], plug type: L21-30P, 0U vertical mounting (2 per cabinet). (N + 1 power available.)
- AlertWerks™ ServSensor Jr. package with two (2) temperature/humidity sensors to monitor each cabinet.
- Two (2) sets of cable troughs for overhead cable management.



Data Center Design Tips

What are the most important things to consider when designing a data center?

- ✓ Consider initial and future loads.
- ✓ Lower data center power consumption and increase cooling efficiency by grouping together equipment with similar heat load densities and temperature requirements. This allows cooling systems to be controlled to the least energy-intensive set points for each location.
- ✓ Reference 2011 ASHRAE Thermal Guidelines for Data Processing Environments to review the standardized operating envelope for the recommended IT operating temperature.
- ✓ Identify the class of your data center to determine the recommended and allowable environmental envelopes:
 - Recommended combines energy-efficient operation with high reliability.
 - Allowable outlines boundaries tested by IT equipment manufacturers for functionality.
 - Keep in mind that operating outside the recommended envelope may cause server fans to operate at higher speeds and therefore consume more power.
- ✓ Implement effective air management to minimize or eliminate mixing air between the cold and hot air sections. This includes configuration of equipment's air intake and heat exhaust paths, location of air supply and air return, and the overall airflow patterns of the room. Benefits include reduced operating costs, increased IT density, and reduced heat-related processing interruptions or failures.
- ✓ Under-floor and overhead cable management is important to minimize obstructions within the cooling air pattern.
- ✓ Prevent mixing of hot and cold air by implementing a hot aisle/cold aisle configuration. Create barriers and seal openings to eliminate air recirculation. Supply cold air exclusively to cold aisles and pull hot return air only from hot aisles.
 - Higher return air temperatures extend the operating hours of air economizers.
- ✓ Choose an enclosure configuration that supports your cooling method.
- ✓ If using raised-floor cooling, carefully consider the location of perforated floor tiles to optimize air flow.
- ✓ Managing a uniform static pressure in the raised floor by careful placement of the A/C equipment allows for even air distribution to the IT equipment.



ASHRAE Best Practices

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) TC9.9 contains guidelines for data processing environments. The guidelines are created by a committee that includes representatives from major equipment manufacturers. TC9.9 recommendations are made for "recommended" and "allowable" temperature and humidity ranges for the data center to maintain high reliability as well as efficient operation. In the most recent update, the guidelines were changed to increase the range of temperature and humidity.

ASHRAE Recommended

- ✓ Server Inlet Air Temperature: 64-80.6° F DB.
- ✓ Relative Humidity: 41.9° F DP to 60% RH and 59° F DP.

ASHRAE Allowable

- ✓ Server Inlet Air Temperature: 59-89.6° F DB.
- ✓ Relative Humidity: 20-80% RH up to 62.1° F DP.

How does raising air temperatures impact the data center?

- ✓ Increases CRAH sensible capacity up to 66%.
- ✓ Same or better sensible capacity with up to 33% less fan power.
- ✓ Allows higher chilled water temperature for more efficient chiller operation.



Hospitality

The Challenge:

A hotel chain was building out a new data center, in the new corporate headquarters, that would be used to house the IT infrastructure for all of their facilities nationwide.

The Solution:

After learning about the hotel chain's situation and requirements, Black Box recommended a total infrastructure solution for their data center, including cooling, cabinets and accessories, UPSs, PDUs, and environmental monitoring.

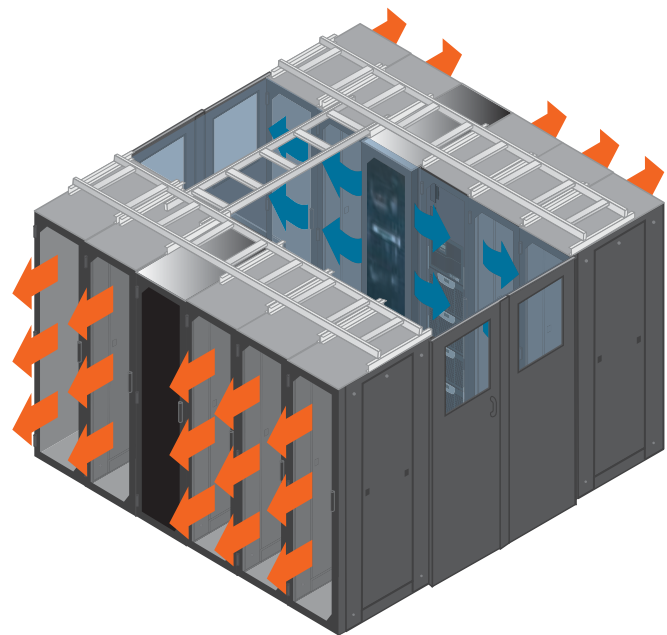
The implemented solution is a cold aisle containment configuration with overhead cable management. It doesn't require a raised floor and provides some redundancy. It can handle heat loads of up to 60 kW within the containment pod with just two Cold Row chilled water units and has the UPS capacity to support the load as well. Since it was a new building, the hotel was able to size their new chiller with enough capacity to support the Cold Row units.

The solution includes a 9-cabinet package with cold aisle containment, 2N cooling and n+1 power distribution:

- Nine (9) Elite™ Cabinets for housing IT equipment, including air dams, baying hardware, and blanking panels. (Cabinets are 42U, 30" wide, and 42" deep.)
- Two (2) sets of Elite Cabinet containment doors.
- One (1) custom containment ceiling.
- Two (2) Cold Row™ chilled water units (with authorized startup services).
- Complete 60-kW, n+1 metered UPS solution with remote management including (1) cabinet, buss bar, wire-way, power distribution, assembly, and startup services. (Cabinet is 42U, 30" wide, and 42" deep.)
- Eighteen (18) metered PDUs—3-phase, 30 A/8.64-kW (24-A), 33-outlet [(6) NEMA 5-20R, (24) IEC-320-C13, (3) IEC-320-C19], plug type: L21-30P, 0U vertical mounting (2 per cabinet).
- AlertWerks™ ServSensor package with nine (9) temperature/humidity sensors to monitor each cabinet.



A total infrastructure solution was needed that could handle a load of approximately 60 kW.



- KVM tray—1U, 17" LCD display that includes keyboard and touchpad.
- One (1) preconfigured ladder rack bundle including ladder rack brackets, ladder rack, splice kits, radius drop kits, and runway termination kits.

Additional information is available at blackbox.com/go/Cooling.

Coolness for Your Cabs

Save by cooling only the cabinet, not the entire room.

ClimateCab Server and Data Cabinets

- Ideal for indoor use when you need to keep your servers outside a climate-controlled data center.
- Digitally controlled air conditioners are available in 5000, 8000, and 12,000 BTUs (1465, 2344, and 3516 W) and in 120V or 230V (other models available upon request).
- NEMA 12 rated for protection against falling dirt; circulating dust, lint, and debris; and dripping or splashing liquids in indoor environments.
- Fully gasketed openings, including a gland plate in the base, help to protect your devices from dust and other contaminants.
- Plexi window in front door.
- Fully welded 12-gauge steel frame holds up to 1500 pounds (680 kg).
- Three-point locking handles on front and rear doors.
- Feature standard 19" rails.
- Include casters and levelers for easy placement.
- Rack angles are adjustable front to rear.

NEMA 12



Included AC unit mounts on the side of the ClimateCab cabinet. Installation takes about five minutes.

CC42U5000M6

CC24U5000M640:
left: front view;
right: rear view.

Digital Temperature Display

The ClimateCab™ NEMA 12 Cabinet is the answer when you need to house servers or IT equipment but don't have a cooling infrastructure in place. In smaller installations, you can save thousands of dollars by using a ClimateCab cabinet instead of installing a complete data center with a custom cooling system and raised floors.

ClimateCab is sealed against dripping water and dust. Sealed cable entries prevent air exchange. The digitally controlled air-conditioning unit (included) keeps your equipment comfortably cool. Just install your equipment, plug in the AC unit, and you have a complete, self-contained, self-supporting data center!

The air-conditioning unit helps to control the temperature inside your ClimateCab by removing the heat buildup created by hot network devices. This unit uses closed-loop cooling in which the clean air inside the cabinet is kept separate from the ambient air to protect delicate components from humidity, dust, and other contaminants.

The AC mounts on the side of the cabinet in minutes with eight bolts and can easily be installed by one or two people. Mounting hardware, gaskets, and instructions are included.

Resources

Brochure, specs
www.blackbox.com/go/ClimateCab

Related

Continued on p. 18.
Wallmount Climate Cab, p. 34.

Education

The Challenge:

Tight on space, a school district was housing IT equipment in a 4-post rack in a storage closet with a variety of other items. Not only was the room dusty, it also wasn't air conditioned and got very hot in the summer. The school had experienced equipment failures in the past due to dust build-up and heat. They needed a comprehensive solution for housing their equipment that would be cost-effective and protect \$100,000 worth of electronics from dirt and heat. A dedicated server room was not in the budget, nor was there space for one.



Schools need cost-effective, scalable cooling solutions to protect their IT equipment.

The Solution:

Based on the customer's information and location, a 42U ClimateCab™ with a 12,000-BTU AC unit was installed, as well as a UPS to provide power in emergencies and a vertical PDU for power distribution to the equipment in the cabinet (four servers, two switches, and some data communication equipment).

ClimateCab Cabinets feature a sealed, closed-loop system so no humidity can enter the cabinet. The AC only kicks on for a few minutes every hour, making it very energy efficient.

With ClimateCab

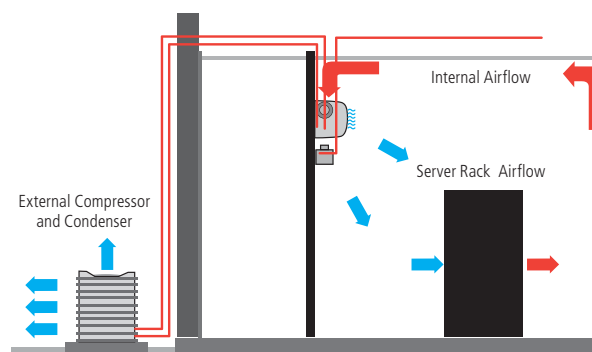
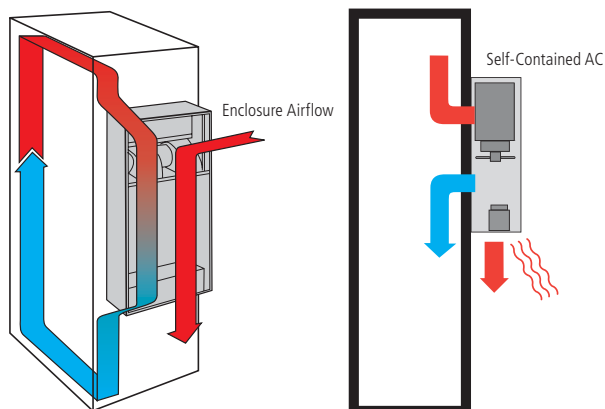
- Cooling equipment is simple.
- Put the cabinet where you want it and plug it in.
- No need for piping, wiring, or a drain.
- ClimateCab is efficient, self-contained cooling that doesn't waste your money cooling an entire room.

The school district saves money by not having to cool the entire room or replace costly equipment. In fact, it plans to implement the ClimateCab solution in all the other schools in the district—multiplying its savings for each school.

In addition, environmental monitoring provides remote monitoring of the temperature and humidity in the storage closet and provides alerts if the conditions exceed preset parameters.

Without ClimateCab

- Compressor, air handler, and pump all require dedicated electrical circuits.
- Piping and wiring installation can be disruptive.
- Air conditioners need a drain for condensate.
- Project can take weeks to implement and can require contractors.
- Inefficient cooling wastes money.



No cooling available? One cabinet running hot? No problem. Just use a ClimateCab.



ClimateCab™

- A series of cabinets specifically engineered to solve those tough cooling problems.
- NEMA 12 rated for protection against dirt, dust, lint, debris, and splashing liquids.
- Air-conditioning units keep equipment cool even with temperatures up to 130° F.
- Fully gasketed openings, including a gland plate in the base, help to protect your devices from dust and other contaminants.
- High efficiency, closed-loop cooling system recirculates air in the cabinet and keeps outside air out. An internal evaporator eliminates condensation.
- All feature a robust 12-gauge frame and 14- or 16-gauge sides and key-lock doors.
- **Go Green** — Save energy and money by cooling only the cabinet rather than a whole room or IT center.
- **Standard Warranty** — Cabinets: 5 Years; Air-Conditioning Units: 1 Year
- **Extended Warranty** — Add 1 Year or 3 Years



Selection Guide | ClimateCab Kits

Size	Depth (inches)	Rail Type	AC Size (BTU)	Power (V)	Code
24U	31.5	M6	5000	120	CC24U5000M631
	40	M6	5000	120	CC24U5000M640
	40	M6	5000	230	CC24U5000M640-23
	31.5	M6	5000	230	CC24U5000M631-23
	31.5	M6	8000	120	CC24U8000M631
	40	M6	8000	120	CC24U8000M640
	40	M6	8000	230	CC24U8000M640-230
	36	M6	8000	120	CC24U368000M6
	36	Tapped	8000	120	CC24U368000T
	42	M6	5000	120	CC24U425000M6
	42	Tapped	5000	120	CC24U425000T
	42	M6	8000	120	CC24U428000M6
	42	Tapped	8000	120	CC24U428000T
	31.5	M6	8000	230	CC24U8000631-230
42U	42	M6	5000	120	CC42U5000M6
	42	Tapped	5000	120	CC42U5000T
	40	M6	5000	230	CC42U5000M6-230
	40	Tapped	5000	230	CC42U5000T-230
	42	M6	8000	120	CC42U8000M6
	42	Tapped	8000	120	CC42U8000T
	40	M6	8000	230	CC42U8000M6-230
	40	Tapped	8000	230	CC42U8000T-230
	42	M6	12,000	120	CC42U12000M6
	42	Tapped	12,000	120	CC42U12000T
	40	M6	12,000	230	CC42U12000M6-230
	40	Tapped	12,000	230	CC42U12000T-230
	36	M6	5000	120	CC42U365000M6
	36	Tapped	5000	120	CC42U365000T
	36	M6	8000	120	CC42U368000M6
	36	Tapped	8000	120	CC42U368000T
	36	M6	12,000	120	CC42U3612000M6
	36	Tapped	12,000	120	CC42U3612000T
	42	M6	5000	120	CC42U425000M6
	42	Tapped	5000	120	CC42U425000T
42	M6	8000	120	CC42U428000M6	
42	Tapped	8000	120	CC42U428000T	
42	M6	12,000	120	CC42U4212000M6	
42	Tapped	12,000	120	CC42U4212000T	

What's included

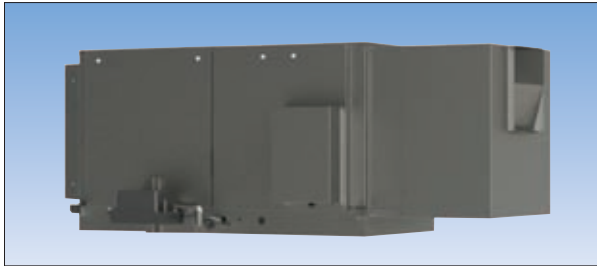
- ClimateCab NEMA 12 Cabinet with M6 or Tapped Rails
- 5000-, 8000-, or 12,000-BTU air-conditioning unit
- Hardware to mount the AC to the cabinet ([8] mounting bolts, [8] steel washers, and a gasket kit) and Instructions

For full features and specs, go to blackbox.com.

Alternative Cooling Solutions

Ceiling-Mounted Supplemental Air Conditioners

- Direct Expansion (DX) and chilled water.
- Small-capacity precision cooling.
- Free-cooling or alternate water source.
- Split systems are available.
- Spot cooler and ducted configurations.
- True self-contained systems.
- 1–10 tons in eleven incremental sizes.
- All-aluminum cabinet construction.
- Reliable scroll compressor.
- Widest range of capacities and options.



Ceiling-mounted air-conditioning units provide temperature and/or humidity control for those hot spot areas in a building that exceed the central system's capacity.

They are an economical solution for applications such as when you carve out offices from an existing plant area, add another laboratory to a school, or install new medical equipment in a hospital.

The design of the ceiling ACs is the ultimate space saver. No floor space is required by the ceiling-mounted units. They easily mount in a standard 2' x 4' grid of a dropped ceiling plenum and are available with high-static blowers for connection to ceiling plenum ducts. They're especially useful where there is no floor or wall space available for cooling units or where aesthetics demand out-of-sight installation.

Ultrasonic Humidification



Ultrasonic Humidifiers are designed for standalone direct room applications. Humidifiers are typically mounted on a wall or column or suspended below the ceiling, serving applications such as printing houses, lithographic printing processes, telephone exchanges, telecommunications rooms, electronics manufacturing, wood and textile processing, plus many more.

Advantages

- Maximum energy savings: Require 93% less electrical energy than electrode boilers or infrared humidifiers.
- Clean humidification: Deionized water provides cleaner, mineral-free humidification.
- Redundancy by design: Each humidification module/transducer is independently wired.
- Very fine mist: A mist of approximately 1 micron diameter is quickly absorbed into the air stream.
- Reduced air-conditioning requirements: Uses an adiabatic constant (enthalpy) humidifying process, which reduces air temperatures and reduces the air-conditioning cooling load.

Low-Density, Floor-Mounted Precision Air Conditioners



- Direct Expansion (DX)—air-, water- or glycol-cooled, or chilled water.
- 24 x 7 mission-critical operation.
- BMS data communication capability.
- From 1 to 7 tons.
- Compact footprint.
- Front service access.
- Microprocessor control.
- High-efficiency return air filtration/upflow and downflow air patterns.

Microprocessor Controls

The advanced microprocessor-based controller continually monitors outside air conditions and maintains proper compressor and reheat operation, using a unique control method.

Steam Humidification

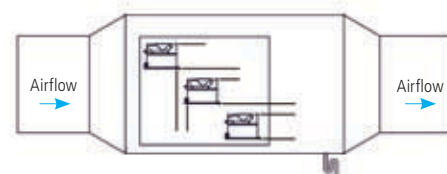
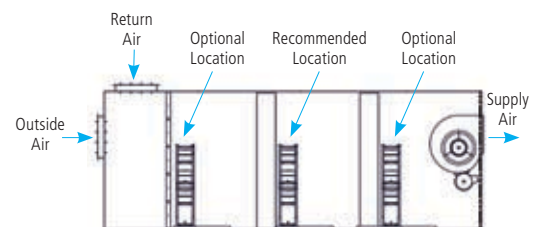
The electrode steam canister humidifier is available with all systems. Manually adjusted on/off and optional proportional steam humidifiers are available.

High Efficiency/Quiet Operation

Low sound power scroll compressors coupled with low RPM blower design and acoustically lined cabinets provide the optimum in quiet operation.

In the Room

From 4 to 18 lb./hr., Standalone Wall- or Shelf-Mounted.



Consider your requirements to choose the right enclosure for your needs.

By Monty Wilsher, Product Engineer

How to select a cabinet.

The sheer number of available options and variations can make choosing a data or server cabinet a daunting task. But, by considering your requirements one at a time, you can zero in on the enclosure that fits your needs best.

Do you need a cabinet or a rack?

A cabinet is an enclosure with a door (or doors); a rack is an open frame. There are several things you should consider when you're deciding whether you need an enclosed cabinet or a rack.

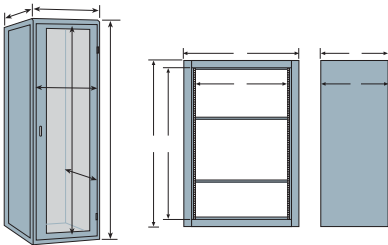
First, what equipment will you be putting in it? The extra stability of a cabinet might be important if you're installing large, heavy equipment like servers. But if you need frequent access to all sides of the equipment, an open rack might be more convenient.

Second, in what environment will you be installing it? If the environment is open or dusty, for example, you might need the extra protection of an enclosed cabinet. On the other hand, a rack might be perfectly adequate in a well-maintained data center.

Finally, there's security. An enclosed cabinet can be locked. It's a small investment to secure all of your high-cost equipment.

Don't neglect aesthetics.

Will customers or clients see your installation? A cabinet with a door looks much neater than an open rack. When you're trying to create a professional image, everything counts.



Size.

Before you choose a cabinet size, you need to determine what equipment you need to house. This list can include servers, switches, patch panels, UPSs, and KVM trays. Consider the depth of your equipment—servers require extra depth and may require a cabinet that's at least 42 inches deep. Bigger is better! Lastly, remember to allow space for cabling and power provisions.

A standard full-sized cabinet is 79" high (42U). This is the height that makes the most efficient use of floor space in rooms with standard-height 8-foot ceilings.

For tight spaces, you can choose a smaller cabinet or even a wallmount cabinet, but unless space is limited, it's better to go larger rather than smaller—there always seems to be just one more thing that needs to go into a cabinet, plus extra space is always useful for cable management.

Rails.

A main cabinet component is one or two pairs of vertical rails with mounting holes to which you attach your equipment or shelves. The most common spacing between rails is 19" with hole-to-hole centers measuring 18.3 inches. A less common standard is 23-inch rails. Most rackmount equipment is made to fit 19-inch rails but can usually be adapted to fit the larger 23-inch rails.

A cabinet usually has two pairs of rails—one in front and one in back—so equipment is supported at all four corners. The two pairs of rails may be adjustable front to rear to accommodate different equipment depths.

Cabinet rails have holes for mounting equipment. Although these holes can be 12-24 or 10-32 tapped holes, the M6 square hole has become the dominant standard for cabinet rails. Square M6 holes are adapted for use with screws through the use of snap-in cage nuts, so stripped threads caused by frequent equipment changes are not a problem. M6 holes are also used for tool-less mounting of servers designed to hook onto these holes.

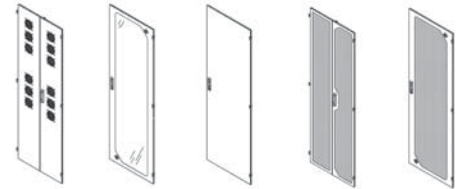
Cabinet rails and the equipment that mounts in them are measured in rack units, abbreviated "RU" or "U." One rack unit (1U) is 1.75" of usable vertical space. So, for example, a rackmount device that's 2U high takes up 3.5 inches of rack space. A rack that's 20U high has 35 inches of usable space. This measurement is usually marked on the rails.

The amount of vertical space is what determines how much equipment you can install. Remember that a cabinet's measurement in rack units is smaller than its external height.

The amount of vertical space is what determines how much equipment you can install. Remember that a cabinet's measurement in rack units is smaller than its external height.

Doors.

The first decision you need to make about cabinet doors is whether you need them at all. Doors offer protection to equipment and can make cabinets look clean and more attractive,



but within a protected data center, they often serve little use and just get in the way.

If you choose to use cabinet doors, there are mesh, split-mesh, solid, fan, split-fan, and plexi.

Because ventilation is important, choose mesh doors unless you're using an enclosure blower or other ventilation scheme that moves air from the bottom to the top of the cabinet. In that case, you'll require plexi or solid doors. Doors are also available with fans to help move air through the cabinet.

In areas with limited space, choose split doors, which require less clearance to open.

If cabinet doors are there for security, be sure you select an appropriate lock. Key locks are standard, but can be problematic because of lost keys and the ease with which keys can be duplicated. Because of the key issue, combination locks are preferable for cabinets that must be accessed frequently yet kept secure.

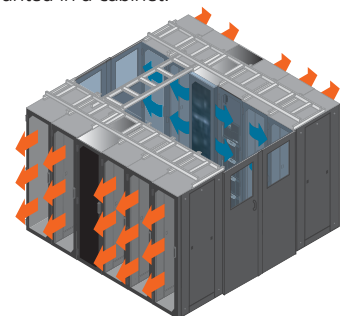
Side panels.

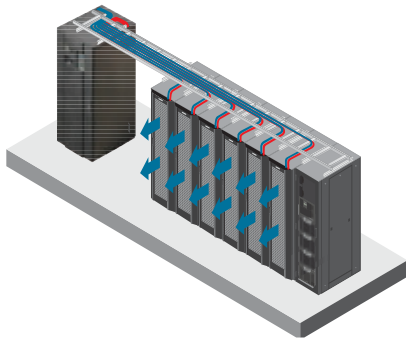
Like doors, side panels are optional and may be omitted in protected data centers, except where they're needed to control air flow.

Without doors or sides, a cabinet starts to look a lot like a four-post rack. The difference is that you could add doors or sides to the cabinet should they become needed, but you cannot add them to a rack. Also, a cabinet usually has adjustable rails whereas a four-post rack typically does not.

Cooling.

Because network equipment generates heat, airflow requirements increase as more equipment is mounted in a cabinet.





Data centers generally have special cooling equipment such as CRAC units, in-row AC units, or liquid cooling to meet their high cooling requirements. But even if your data center is cool, the inside of a cabinet may overheat if air distribution is inadequate. The temperature inside a cabinet is affected by many variables, including door type, air flow, and the equipment housed within the cabinet.

The most direct way to keep network equipment cool is to ensure adequate airflow. The goal is to ensure that every server, every router, every switch has the necessary amount of air no matter how high or low it is in the cabinet.

Most major server manufacturers recommend that cabinet doors used in hot aisle/cold aisle installations have at least 63% open area for airflow. You can achieve this by either removing cabinet doors altogether or by buying cabinets that have mesh doors.

Because most servers and other network devices are equipped with internal fans, open or mesh doors may be the only ventilation you need

as long as your CRAC unit has enough capacity to dissipate the heat load.

You can increase ventilation even more by installing fans to actively circulate air through cabinets. The most common cabinet fans are mounted on the rear door.

Or you can use a fan or fan panel that mounts inside the cabinet or a specialized high-speed fan that mounts in the bottom of the cabinet to pull cool air from a raised floor across the front of the cabinet where it can be used by equipment.

An enclosure blower requires a solid front door with adequate space—usually at least four inches—between the front of your equipment and the cabinet door for air movement.

If you're housing components outside of a temperature-controlled area, you may want a cabinet with its own air conditioner. It's also important to monitor components to ensure that they're operating within their approved

temperature range. Many network devices come with SNMP or internal temperature sensors to tell you what their internal temperature is. An IP-addressable environmental monitoring system can also be a valuable addition to your cooling plan, especially if cabinets contain older devices that don't have internal sensors.

Moisture and dust resistance.

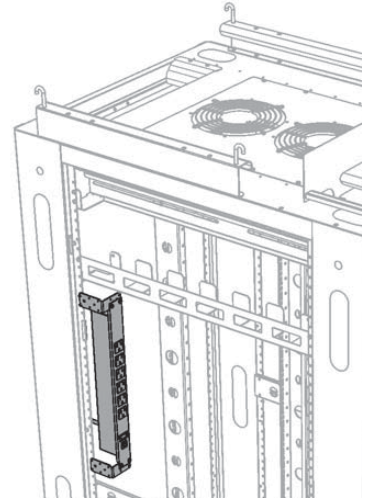
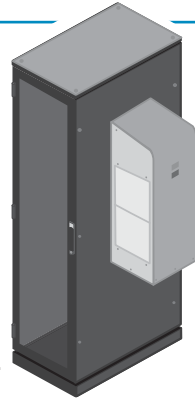
When you're housing delicate electronic components outside of a protected data center—for instance on a factory floor—look for a cabinet with a NEMA rating.

The National Electrical Manufacturers' Association (NEMA) specifies guidelines for cabinet certifications. Common NEMA ratings for data cabinets include NEMA 12 and NEMA 4X.



NEMA 12 cabinets are constructed for indoor use to provide protection against contaminants including falling dirt; circulating dust, lint, and fibers; and dripping or splashing liquids. Protection against oil and coolant seepage is also a prerequisite for NEMA 12.

NEMA 4X cabinets are weather-proof enclosures suitable for indoor or outdoor applications offering protection from windblown dust, rain, or hose-directed water. NEMA 4X cabinets are also corrosion resistant.



Power provisioning.

Cabinets need provisions for powering enclosed equipment and for managing the cables associated with the equipment.

Rackmount power strips mount either vertically or horizontally with a wide range of outlet counts, types, and spacing.

Power distribution units (PDUs) are high-end power strips that have additional capabilities such as remote management and metering. PDUs may be rackmounted or mount vertically behind the rails—in which case they don't take any rack space. When choosing a vertical (OU) PDU, make sure it's compatible with your cabinet for ease of mounting.

Uninterruptible power supplies (UPSs) are an important part of power provisioning. If you're planning to use a rackmount UPS, it's important to allot space when planning the cabinet.

UPS units are typically mounted in the bottom of a cabinet because of their weight. Alternatively, several UPS units may be housed in a separate cabinet in the data center.

Cable management.

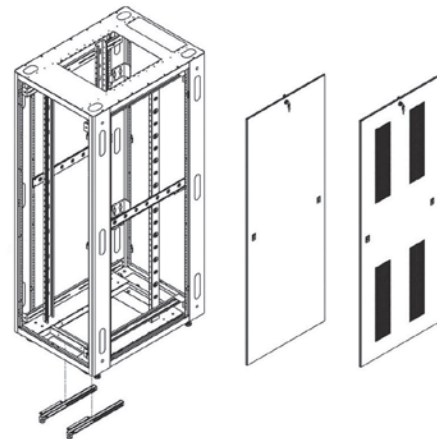
Although most cabinets come with cable management features, you will still need to plan for some additional organizers to keep cables under control.

Plotting your connections in advance helps you to decide how to organize the cables. Knowing where the connectors are on your equipment tells you where it's most efficient to run cables.

The important thing is to have a plan—if you let your cables get away from you now, you're sure to pay for it down the road.

Need help? Give us a call.

Black Box Tech Support is always happy to help you figure out what you need and how to put it together. Call our FREE, live Tech Support.



Assembled or not.

Order a preassembled cabinet if you need to set up your installation in a hurry—you can load your equipment as soon as the cabinet arrives.

A flat-pack cabinet, on the other hand, requires some time and effort to assemble, but can be maneuvered through narrow doors and spaces that may not accommodate a full-sized assembled cabinet. Most cabinets are preassembled.

Elite Cabinets

Configure a cabinet to support your cooling needs.



EC45U2436SMDSSNK: left: front view; right: rear view



EC45U2436SPDS3NK: left: front view; right: rear view

Elite Cabinets and data center cooling.

The Elite™ Cabinet family from Black Box delivers more features and options than any other Black Box cabinet—more door and panel choices, more cable management, and dual universal PDU mounting brackets.

Plus, Elite Cabinets feature heavy-duty, welded steel construction and come with the protection of a lifetime Black Box® Double Diamond™ warranty. The cabinets arrive fully assembled and ready to populate.

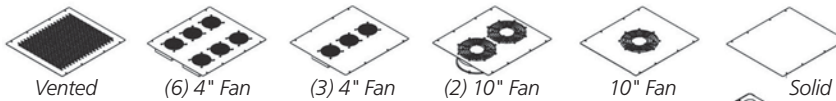
Elite Cabinets are specifically designed to be adaptable to your exact needs. Whether you need a high-airflow cabinet for your data center or a small, secure cabinet for an office, the Elite Cabinet family has exactly the cabinet for you.

Select a preconfigured cabinet or have one customized to your specifications. Choose from a wide range of sizes to suit all your data and server cabinet needs. Our Black Box pre-sales engineers can help you specify the cabinet you need—FREE of charge.

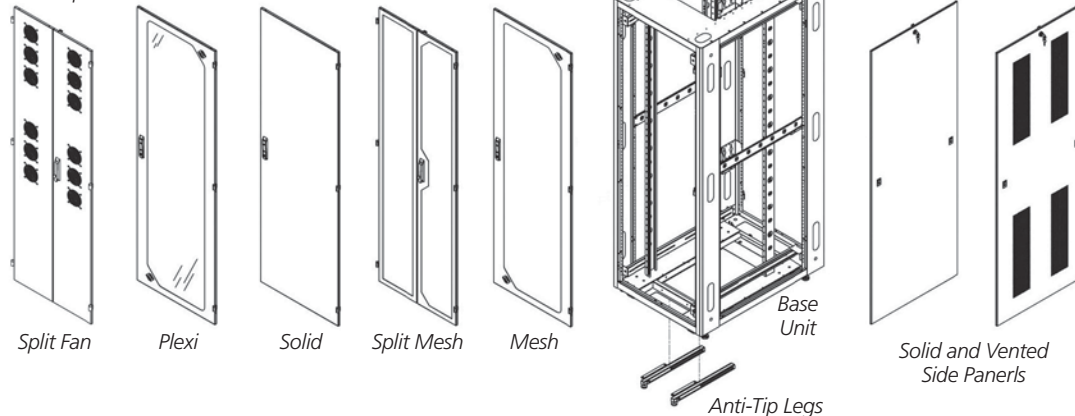
Hey, so what does EC45U2436SMDSSNK mean?

It's not just alphabet soup. See the facing page for more information, or configure your cabinet now at blackbox.com/go/CabCon.

Top Panels:



Door Options:



Configuring Elite Cabinets

Building an Elite Cabinet specific to your application is easy.

Just use the codes (below) to fill in the line in the middle of the page, matching colors as you go. When you're done, call us with the number, and we'll have your custom-built cabinets on your doorstep in a flash.

The example below is a 79"H (42U) x 30"W x 42"D cabinet with M6 rails, a mesh front door, a split mesh rear door, solid side panels, a mesh top, anti-tip legs, and keyed locks. Need help? Call our fast, FREE Tech Support.

Example:



Step 1:

Choose your enclosure.

48"H (24U) x 24"W x 42"D E C 2 4 U 2 4 4 2	72"H (38U) x 30"W x 36"D E C 3 8 U 3 0 3 6	84"H (45U) x 30"W x 32"D E C 4 5 U 3 0 3 2
48"H (24U) x 30"W x 32"D E C 2 4 U 3 0 3 2	79"H (42U) x 24"W x 42"D E C 4 2 U 2 4 4 2	84"H (45U) x 30"W x 36"D E C 4 5 U 3 0 3 6
72"H (38U) x 24"W x 32"D E C 3 8 U 2 4 3 2	79"H (42U) x 30"W x 42"D E C 4 2 U 3 0 4 2	84"H (45U) x 30"W x 42"D E C 4 5 U 3 0 4 2
72"H (38U) x 24"W x 36"D E C 3 8 U 2 4 3 6	84"H (45U) x 24"W x 36"D E C 4 5 U 2 4 3 6	84"H (45U) x 30"W x 48"D E C 4 5 U 3 0 4 8
72"H (38U) x 30"W x 32"D E C 3 8 U 3 0 3 2	84"H (45U) x 24"W x 42"D E C 4 5 U 2 4 4 2	

Fill in the blocks below to get your ideal cabinet's SKU. For help configuring your cabinet, call our FREE Tech Support.



* Doors have either a keyed or combination lock. Choose "None" when there is no door.

Step 2:
Choose your rail type.

S
M6 rails with square holes

T
10-32 tapped rails

Step 3:
Choose your front door.

N None
S Solid

M Mesh
D Split Mesh

P Plexi
F Split Fan Door

Step 4:
Choose your rear door.

N None
S Solid

M Mesh
D Split Mesh

P Plexi
F Split Fan Door

Step 5:
Choose your side panels.

N None
S Solid

M Mesh

Step 6:
Choose your cabinet top.

N None
S Solid

M Mesh

1 1-Fan Unit (10" Fan, 550-cfm)
2 2-Fan Unit (10" Fans, 1100-cfm)

3 3-Fan Unit (4" Fans, 225-cfm)
6 6-Fan Unit (4" Fans, 450-cfm)

Step 7:
Decide on anti-tip legs.

Y Yes
N No

Step 8:
Choose your lock*.

N None

K Keyed

C Combination

Related
Protect your IT investments. Environmental monitoring is a cost-effective, proactive way to protect your investments from climate, overheating, theft, etc. Find out more about AlertWerks™ on page 74, or blackbox.com/go/AlertWerks.

▶ Use the cabinet configurator at blackbox.com/go/CabCon.

Elite Cabinet Accessories

More features and options than any other Black Box cabinet.

Add accessories to add function.

After you select the right cabinet configuration, it's time to outfit your cabinet with cooling accessories, cable management, keyboard trays, and all the parts that make your Elite™ Cabinet perfect for your application.

Change your cabinet configuration.

If you already own an Elite Cabinet, it's easy to change top panels and other parts when your requirements change—parts such as top panels can be changed in a just few minutes with basic tools.

Further improving cooling efficiency.

Add a chimney to an Elite cabinet.

A chimney added to the top of a cabinet directs hot air into the plenum and to the CRAC. This prevents the hot and cold air from mixing as well as shortens the distance the exhaust air has to travel to the cooling unit.

Air distribution is critical.

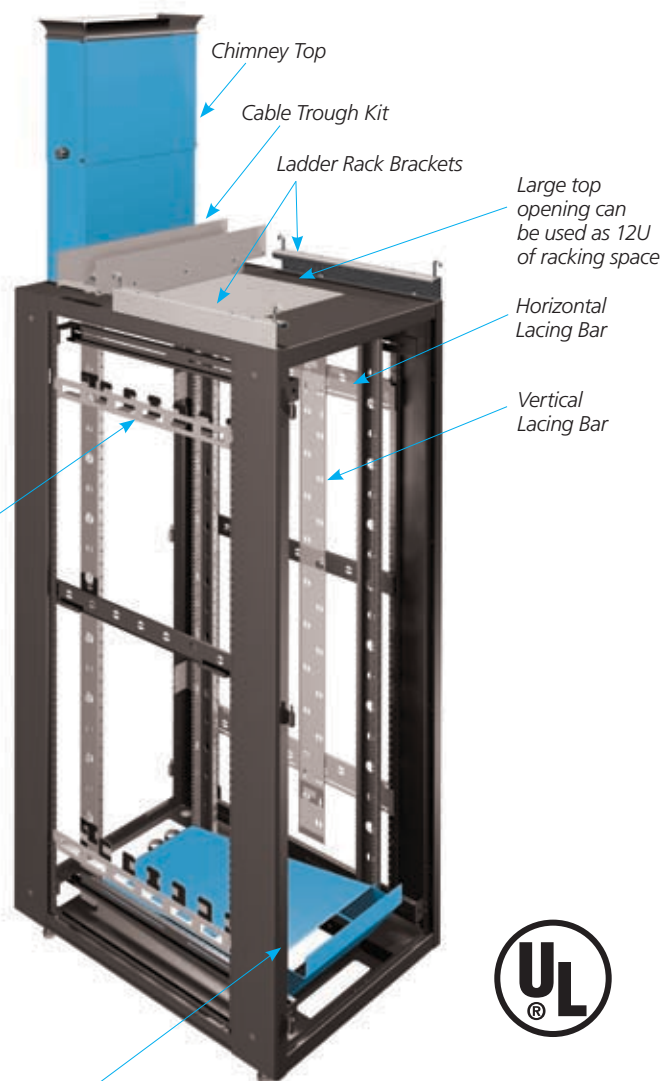
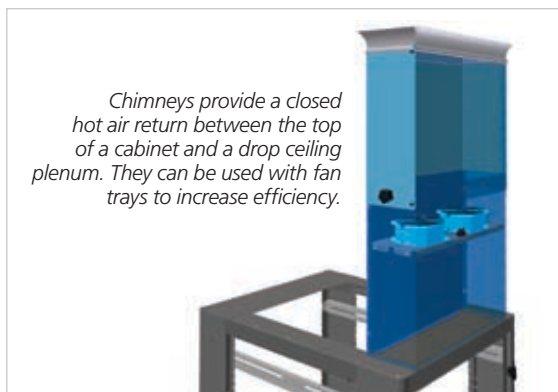
Even if your data center is cool, the inside of a cabinet may overheat if air distribution is inadequate. The temperature inside a cabinet is affected by many variables, including door perforations, cabinet size and location, and the types of components housed within the cabinet.

The most direct way to cool equipment is to ensure adequate airflow. The goal is to ensure that every server, every router, every switch has the necessary amount of air no matter how high or low it is in the cabinet.

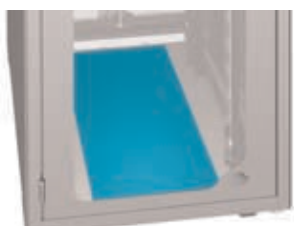
Filler panels fill empty space in racks and cabinets to help control airflow, preventing the mixing of hot and cold air and keeping hot exhaust air from being recirculated and affecting cooling efficiency. They also conceal unused spaces, giving a rack or cabinet a more polished look.

Equipment placement.

Don't overload the cabinet by trying to fit in too many servers—75 to 80% of capacity is about right. Maintain at least a 1.5" clearance between equipment and the front and back of the cabinet. And finally, ensure all unused rack space is closed off with filler panels to prevent recirculation of warm air.



Filler Panels and Air Dams keep cool air in the front of the cabinet where it is needed by equipment, and keep warm air from escaping to the front of the cabinet.



Add solid bottom panels to your cabinet to keep cold air from escaping.



Air Funnel Kits direct cool air from the raised floor and deliver it to the front of servers or other network components, cooling cabinet hot spots by 15° F, extending the life of servers, and minimizing downtime.

Related

See these accessories and more on pp. 25–27.

The right accessories improve your cabinet's cooling efficiency.

Elite Cabinet Accessories

• Standard Warranty — All: Lifetime



Chimney Top

- Provides a closed hot air return between the top of an Elite™ cabinet and a drop ceiling plenum.
- Includes a chimney for the Elite Cabinet small 3U top opening plus a solid panel to cover the large top opening.
- Chimney adjusts from 20" to 34".

Chimney Top

Chimney Top	ECTOPCHIM
Fan Tray for Chimney	ECTOPCHIMFT

Air Dams

- Mount on the front rails of Elite Cabinets.
- Keep cool air in the front of the cabinet to increase cooling efficiency.

Air Dams

for 24" Wide 42U and 45U Cabinets	ECAD24
for 30" Wide 42U and 45U Cabinets	ECAD30
for 24" Wide 24U and 38U Cabinets	ECAD24S
for 30" Wide 24U and 38U Cabinets	ECAD30S

Filler Panels

- Keep cool air from dissipating before it reaches the top of the rack.
- Matte black finish.
- Mount easily to a 19" cabinet or rack with four included 10-32 screws.

Filler Panels, Black

1U (1.75")	RMTB01
2U (3.50")	RMTB02
3U (5.25")	RMTB03
4U (7.00")	RMTB04
5U (8.75")	RMTB05
6U (10.50")	RMTB06

Horizontal Cable Manager



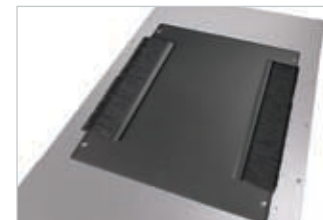
- Use this brush-style cable manager with any 19" cabinet.
- Features a high-density nylon brush that provides a clean look while keeping dust out and preventing unwanted airflow.
- Heavy-duty steel construction.
- Includes mounting screws.

Horizontal Cable Manager

Brush Style, 1U	RMT701
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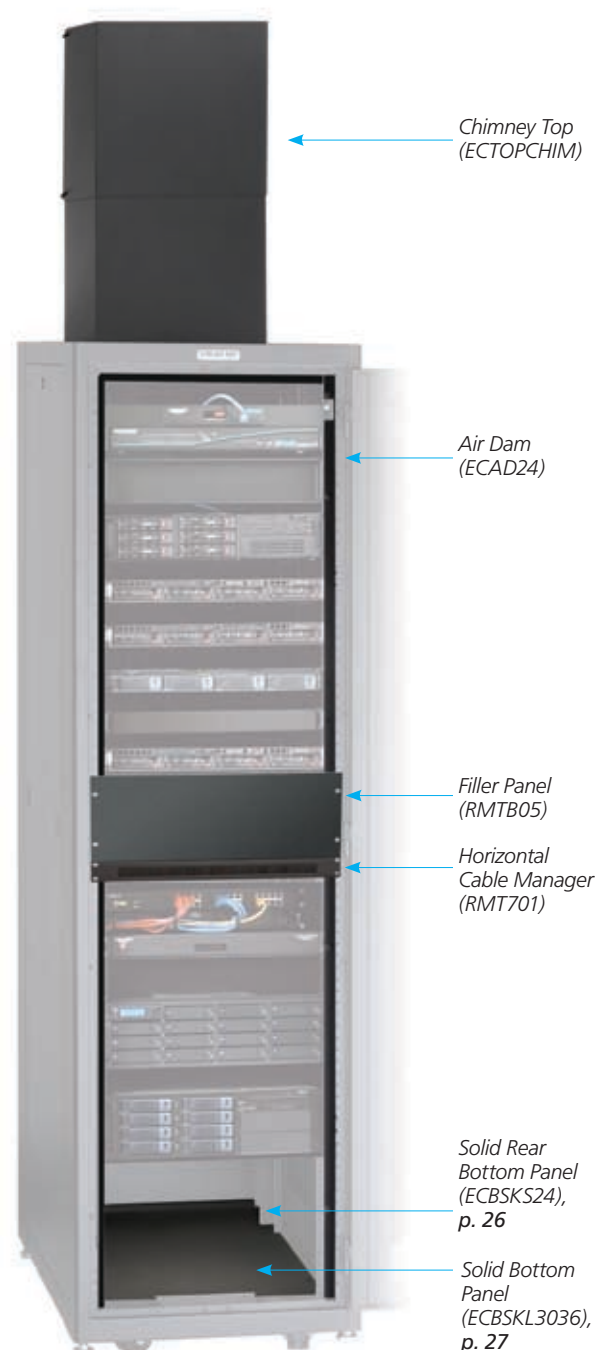
Brush Grommet Top Panel

- Top panel keeps your cable entry organized and clean.
- Fits top opening in Elite Cabinets.
- Includes grommet kit and mounting hardware.



Brush Grommet Top Panel

[ECTOPB](#)



Chimney Top
(ECTOPCHIM)

Air Dam
(ECAD24)

Filler Panel
(RMTB05)

Horizontal
Cable Manager
(RMT701)

Solid Rear
Bottom Panel
(ECBSKS24),
p. 26

Solid Bottom
Panel
(ECBSKL3036),
p. 27

Related

For full features and specs, go to blackbox.com.

Cable Trough Kits and Ladder Rack Bracket



• Standard Warranty — All: Lifetime



Cable Trough Kits

- Route cables across the top of an Elite Cabinet in multicabinet installations.
- Install anywhere along the top of the cabinet.
- Include (10) 10-32 mounting screws.

Ladder Rack Bracket

- Easily attach a ladder rack to an Elite Cabinet for cable management.
- Includes mounting hardware.

Cable Trough Kits

24" Wide	EC24WTCTK
30" Wide	EC30WTCTK

Ladder Rack Bracket

24"	EC24LR
-----	------------------------

Horizontal Lacing Bars

- Attach cables to this bar to keep your Elite Cabinet organized and neat.

Horizontal Lacing Bars

for 30"W x 32"D Cabinets
for 30"W x 36"D Cabinets
for 30"W x 42"D & 48"D Cabinets

[ECHLB32](#)
[ECHLB36](#)
[ECHLB42](#)



Vertical Lacing Bars

- Attach cables to this bar to keep your Elite cabinet organized.
- Requires a Horizontal Lacing Bar for mounting (ECHLB22, ECHLB36, ECHLB42, left).
- Order (2) for a 48"H cabinet, (3) for a 72"H or 79"H cabinet, or (4) for an 84"H cabinet.

Vertical Sectional Cable Manager

- Adds vertical cable management in 11U increments.

Vertical Lacing Bars for Elite Cabinets

for 48" H Cabinets	ECVLB48
for 72" H Cabinets	ECVLB72
for 79" H Cabinets	ECVLB79
for 84" H Cabinets	ECVLB84

Vertical Sectional Cable Manager

[ECVCM](#)

Front-to-Back Cable Managers

- Manage cables horizontally from the front to the back of the cabinet.

Front-to-Back Cable Managers

for 30"W x 32"D Cabinets	ECFB32
for 30"W x 36"D Cabinets	ECFB36
for 30"W x 42"D & 48"D Cabinets	ECFB42

Solid Rear Bottom Panels

- Cover the cable cutout on the bottom rear of the Elite Cabinets.
- To cover the larger opening at the bottom of the cabinet, order Solid Bottom Panels (facing page).



Solid Rear Bottom Panels

24"W	ECBSKS24
30"W	ECBSKS30

Elite Cabinet Grounding Kit

- Ensure safety with this grounding kit that works with Elite Cabinets.



Elite Cabinet Grounding Kit

[ECGK](#)

Gland Plate

- Fits the top rear 3U opening on an Elite™ Cabinet or an Elite Wallmount Cabinet.
- Enables you to route cables into the cabinet while sealing off the opening to help prevent dust or to control ventilation.

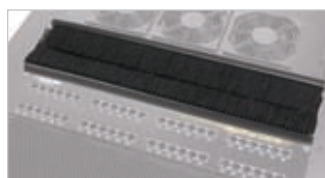


Gland Plate

for 3U Top Opening	EC3UGP
--------------------	------------------------

Brush Grommet Kit for 3U Opening

- Fits the small 3U opening on the top of Elite Cabinets.
- Brushes enable you to run cable into the cabinet while keeping out dust and contaminants.
- Can be installed along with the Elite Cabinet Waterfall Brackets for 3U Top Opening (ECW3U), facing page.



Brush Grommet Kit

for 3U Opening	ECBGK3U
----------------	-------------------------

Conduit Knockout Panel



- Fits the small 3U opening on the top of Elite™ Cabinets.
- Three knockout plates on 5" centers enable you to route 1", 2", or 3" conduit.
- Includes eight screws.

Conduit Knockout Panel

for 3U Top Opening

[ECP3U](#)

Elite Cold Aisle Containment System

- Use this kit to shut off the aisle ends to contain cool air for cold aisle containment.
- Create more efficient cold or hot aisles by reducing air recirculation.
- Includes one pair of center-opening doors and all the parts you need for installation.

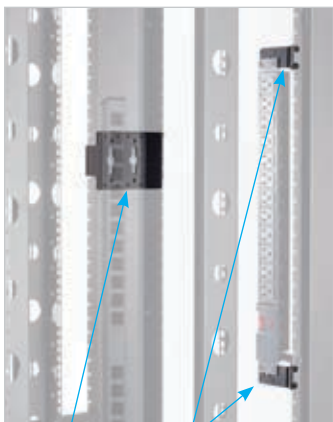


Elite Cold Aisle Containment System

42U
45U

[EC42U48WCD](#)
[EC45U48WCD](#)

PDU Mounts



[ECPDUMK](#)
[ECPDUMK24](#)

Vertical PDU Mounting Kit

- Mounts a PDU or other 19", 1U rackmount equipment behind the rails without using any rack space.
- Includes (2) 1U brackets.

Vertical PDU Mounting Kit

19", 0U [ECPDUMK](#)

Dual PDU Mounting Brackets, 1 Pair*

- Provide an additional pair of brackets to mount more than two PDUs or to mount PDUs in more than one corner of the cabinet.

Dual PDU Mounting Brackets

for 24"W Cabinets [ECPDUMK24](#)
for 30"W Cabinets [ECPDUMK30](#)

* A pair of Brackets is included with the Elite Cabinet base frame.



[ECBSKL3042](#)

Solid Bottom Panels

- Standard Elite Cabinets are open on the bottom—this panel covers the large bottom opening.
- To cover the cable cutout, also on the bottom of the cabinet, order the Solid Rear Bottom Panel (facing page).

Solid Bottom Panels

24"W x 42"D
30"W x 36"D
30"W x 42"D

[ECBSKL2442](#)
[ECBSKL3036](#)
[ECBSKL3042](#)

Waterfall Brackets for 3U Top Opening

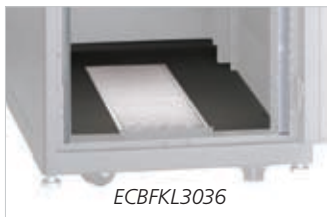
- Fit the small 3U opening on the top of Elite Cabinets.
- Enable you to maintain bend radius when routing cable into the top of the cabinet.



Waterfall Brackets

for 3U Top Opening

[ECW3U](#)



[ECBFLK3036](#)

Bottom Filter Kits

- Allow air circulation in Elite Cabinets.
- Filter out dust and other airborne debris.

Bottom Filter Kits

For 24"W x 36"D Elite Cabinet
For 24"W x 42"D Elite Cabinet
For 30"W x 32"D Elite Cabinet
For 30"W x 36"D Elite Cabinet
For 30"W x 42"D Elite Cabinet

[ECBFLK2436](#)
[ECBFLK2442](#)
[ECBFLK3032](#)
[ECBFLK3036](#)
[ECBFLK3042](#)

Air Funnel Kits

- Draw cool air from the bottom of the cabinet and deliver it right across the front of servers or other network components.
- Require only 2U of mounting space.
- Fit on standard 19" rails.
- Air distribution cools cabinet hot spots by 15° F, extending server life and minimizing downtime.



[ECAIRFLOW42](#)

Air Funnel Kits

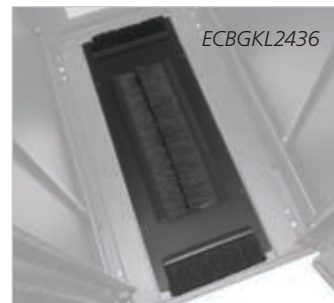
for 24"W x 36"D
for 24"W x 42"D and 30"W x 42"D
with Dual Fan Tray
for 24"W x 36"D
for 24"W x 42"D

[ECAIRFLOW36](#)
[ECAIRFLOW42](#)

[ECAIRFLOW2436FT](#)
[ECAIRFLOW2442FT](#)

Bottom Brush Grommet Kits

- Run cable into the cabinet while limiting airflow and keeping out dust and contaminants.
- Bottom Brush Grommet Kits fit over the large bottom opening in your Elite cabinet and include a cover for the rear cable cutout.
- Bottom Rear Brush Grommet Kits fit the rear cable cutout.



[ECBGKL2436](#)

Bottom Brush Grommet Kits

for 24"W x 36"D Cabinets
for 24"W x 42"D Cabinets
for 30"W x 32"D Cabinets
for 30"W x 36"D Cabinets
for 30"W x 42"D & 48"D Cabinets

[ECBGKL2436](#)
[ECBGKL2442](#)
[ECBGKL3032](#)
[ECBGKL3036](#)
[ECBGKL3042](#)

Bottom Rear Brush Grommet Kits

for 24"W Cabinets
for 30"W Cabinets

[ECBBGKS24](#)
[ECBBGKS30](#)

These cabinets have split rear doors and come in models deep enough to hold extra-large servers!



Select Plus Cabinets with Mesh Split Rear Door



RM2540A: left: front view; right: rear view

- Weight capacity of 2200 pounds.
- Constructed of 16-gauge steel.
- 42"-deep models hold deeper servers with plenty of room for rear cabling.
- Feature mesh split rear doors.
- Server cabinets feature mesh front doors; network cabinets have tempered glass front doors.
- Cabinet baying is easy with the optional Multicabinet Joining Kit (RM2407).
- These cabinets offer versatile mounting with standard 19" M6 rails that work with most Black Box® Cabinet Accessories.
- Two sets of adjustable rails provide even more versatility.
- Generous cable access.
- Arrive fully assembled.
- **Standard Warranty** — Lifetime

Select Plus Cabinets, Mesh Split Rear Door

Server, Mesh Front Door, 24"W	
15U (38.5"D)	RM2500A
24U (38.5"D)	RM2515A
38U (38.5"D)	RM2520A
42U (38.5"D)	RM2540A
42U (42"D)	RM2640A
Server, Mesh Front Door, 30"W	
42U (42"D)	RM2545A
Network, Tempered Glass Front Door, 24"W	
15U (38.5"D)	RM2510A
24U (38.5"D)	RM2525A
38U (38.5"D)	RM2530A
42U (38.5"D)	RM2550A
42U (42"D)	RM2650A
Network, Tempered Glass Front Door, 30"W	
42U (32"D)	RM2555A

For full features and specs, go to blackbox.com.

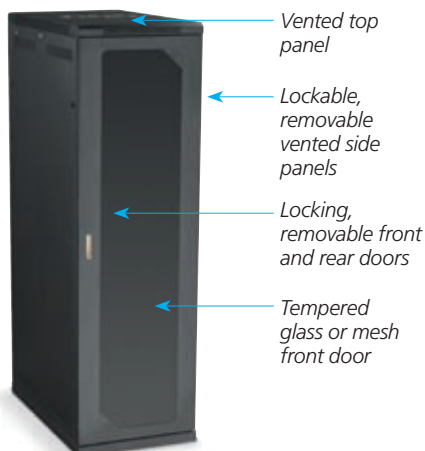
What's Included

- Cabinet
- Tempered glass or mesh front door
- 2.5" casters
- Mesh split rear door
- Leg levelers

Fully assembled and ready for heavy-duty data center work.

Select Server Cabinets

- Weight capacity of 2200 pounds.
- Constructed of 16-gauge steel.
- Standard 19" M6 rails work with most Black Box® Cabinet Accessories.
- Generous cable access.
- Mesh rear door.
- Arrive fully assembled.
- **Standard Warranty** — Lifetime



RM2450A

Select Server Cabinets

15U	
Mesh Door	RM2400A
Tempered Glass Door	RM2410A
38U	
Mesh Door	RM2420A
Tempered Glass Door	RM2430A
42U	
Mesh Door	RM2440A
Tempered Glass Door	RM2450A
To join two or more Select Server Cabinets, order:	
Multicabinet Joining Kit	RM2407
To ground your Select Server Cabinets, order:	
Grounding Kit	RM2408
To ventilate your Select Server Cabinets, order:	
3-Fan Unit	RM2409
6-Fan Unit	RM2415

For full features and specs, go to blackbox.com.

What's Included

- Cabinet
- Tempered glass or mesh front door
- 2.5" casters
- Mesh rear door
- Leg levelers

Resources

Video... *How to Pick a Cabinet*
In the Cabinets & Racks section at blackbox.com/go/Videos.

Server cabinets and racks that won't be rocked.

Zone 4 Seismic Cabinets and Racks



Zone 4 Seismic Cabinets

- Protect servers, networking equipment, and phone and voice mail equipment through Zone 4 seismic activity.
- Weight capacity of 1100 pounds.
- Vented heavy-gauge steel base can be bolted to floor with seismic-rated fasteners.
- Door and side panels removable for easy installation and access.
- Top features two cable entry ports with caps and grommets, and two fan-ready cutouts with finger guards.
- Performance rating based on NEBS-Telcordia GR-63-CORE standard vibration test.
- EIA standard for 19"-rackmount equipment.
- **Warranty** — All: 1 Year Limited

Zone 4 Seismic Rack

- Weight capacity — 1000 lb.
- Meets California Building Code requirements.

- Integral front waterfall top.
- Pre-drilled holes on the top make runaway installation a cinch. Cable entry cutouts on the top and bottom.
- Easily join with other 4-post racks.
- EIA standard to fit 19" rack equipment and accessories.
- Pre-assembled.
- **Warranty** — 1 Year Limited

Zone 4 Seismic Cabinets and Racks

Zone 4 Seismic Cabinets, 45U	
84"H x 28"W x 40"D	RM5100A
84"H x 28"W x 32"D	RM5110A
Zone 4 Seismic Rack, 45U	
4-Post	RM5210A

For full features and specs, go to [blackbox.com](#).

NOTE: Ships via motor freight.

These compact cabinets offer big features for small or home offices.

Small-Office/Home-Office (SOHO) Cabinets

- Constructed of a welded 16-gauge steel frame with 12-gauge M6 mounting rails.
- Fit under standard-height modular desktops.
- Open bottom promotes air circulation. Cool air is drawn from the floor through the fan cutouts on the rear door.
- To seal the bottom of the cabinet, order an optional Base Plate.
- The optional Fan Assembly with two 4-inch fans and finger guards can be added to the rear door to provide additional heat dissipation.
- Weight capacity of 500 pounds.
- **Standard Warranty** — Lifetime

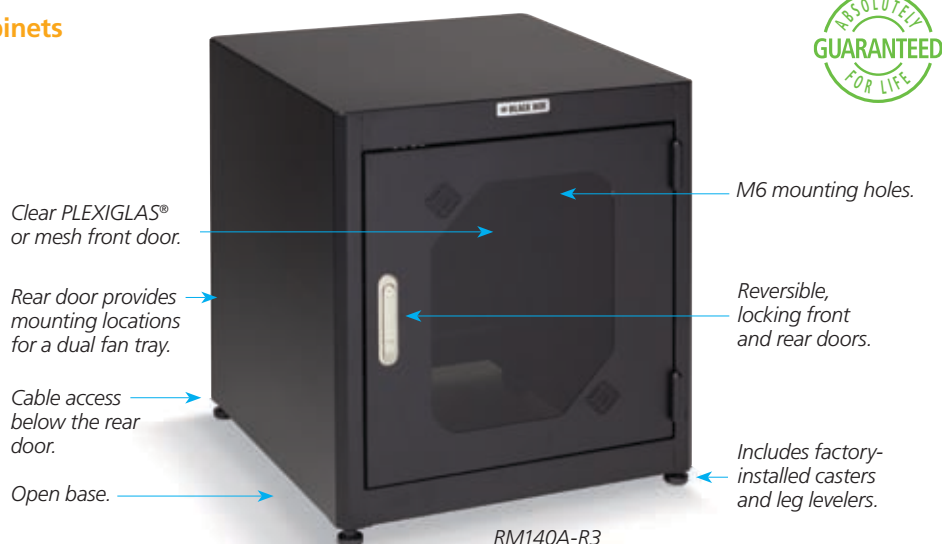
Here's the perfect solution for home- and small-office networks: compact cabinets. At less than 26" high, they're small enough to easily slide under a desk or countertop. And, with the included casters, they're easy to roll in and out when you need to access equipment and cables.

Don't worry about heat buildup either. The rear doors provide mounting locations for two 4" fans.

Compact and secure.

At 11U, you have plenty of room to house servers, routers, switches, and other networking equipment. The adjustable 19" rails feature M6 holes for mounting regular servers and blade servers.

To keep prying fingers out of your equipment, both the front and back doors lock. The base is open to promote air circulation.



What's included

- Fully assembled cabinet
- (4) non-locking, swiveling casters (installed)
- (4) leveling legs (installed)
- (30) M6 cage nuts
- (30) M6 screws
- (2) pairs of keys

Small-Office/Home-Office (SOHO) Cabinets

24.02"D, Plexi Door	RM140A-R3
24.02"D, Mesh Door	RM140A-M-R3
36.02"D, Plexi Door	RM145A-R3
36.02"D, Mesh Door	RM145A-M-R3

You may also need:

Base Plates	
for 23.6"D Cabinet	RM140ABGK-R2
for 35.4"D Cabinet	RM145ABGK-R2
Dual Fan Kit	RM4002A
Filter Panel	RM4003A
Blanking Panel	RM4004A
Fixed Vented Shelf, 22.25"D, 200 lb. Capacity	RM399-R2

For full features and specs, go to [blackbox.com](#).

Reduce noise, keep equipment cool, increase productivity.

QuietCab and Elite QuietCab Sound Dampening IT Enclosures

Why is noise control so important?

Increased productivity. Increased profits. Research shows that prolonged exposure to noise creates stress and lowers morale. It can also lead to an increase in accidents and errors. A simple 5-dB reduction in noise can actually cut the risk of hearing loss in half.

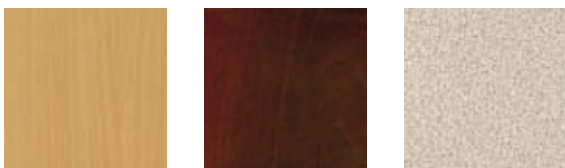
A quiet office is a productive office. The Black Box® Elite™ QuietCab™ reduces sound by an amazing 27–28.5 dB—the most you can get today in a soundproof enclosure. And, the cabinet goes through independent, third-party testing to ensure it. The QuietCab reduces audible server and hardware noise by 15 dB and, with its attractive appearance, it can be placed nearly anywhere.

So what does that mean?

Noise is measured in decibels. So a 27–28.5-dB noise attenuation (or reduction) means that the cabinet is removing that amount of noise from the sound source.

The noise level in a busy office with people talking measures 78 dB. Normal conversation is about 60 dB. A quiet office with no talking is 48 dB. A whisper is 23 dB. If you put the cabinet in a busy office, you'll reduce the sound to that of an office without speech. If you start with a quiet office, the sound from the cabinet would be as quiet as a whisper.

The cabinet design ensures noise reduction without compromising cooling capacity. To reduce sound, the inside of the Elite QuietCab model is heavily lined with one of the most effective acoustic materials available.



QuietCabs are available in beech, walnut, and light gray veneers.

This heavy-duty, multilayer composite material covers all inside surfaces. Even the six cable routing panels on top and bottom (three each) are covered. QuietCab models have acoustic foam lining as well.

Very cool.

Elite QuietCab cabinets have an incredible thermal load capacity of up to 7.2 kW, while QuietCab cabinets offer up to 3.6 kW.

To cool equipment, Elite cabinets feature two variable-speed fans on the rear doors that are controlled by a temperature sensor to ensure maximum energy efficiency. QuietCab cabinets have one, two, or three fan modules.

QuietCab

- Put networking equipment where you need it—without the noise, space, or cost concerns.
- Acoustic foam lining reduces audible server and hardware noise by 15 dB to normal office background levels.
- Integrated ventilation fans keep equipment cool.
- Cabinets look like furniture, and are available in beech, walnut, and light gray veneers in three sizes.
- Ideal for environments where you need to store network equipment near workers, such as offices, schools, medical offices, retail establishments, and more.
- Includes heavy-duty casters and a pre-installed power strip.
- 19" M6 rails are adjustable.
- Generous cable management space is built in.
- Accommodates all leading servers, including blade servers.
- Fully assembled—just plug it in!
- **Standard Warranty** — 3 Years
- **Extended Warranty** — Add 1 or 3 Years



QuietCab: left: QC24UBE, middle: QC24UWA, right: QC24ULG

Elite QuietCab (QCE24U)

Very accommodating.

This 19" cabinet is extremely well-designed and built to last. The Elite™ QuietCab™ can hold a very hefty 1100 pounds of equipment, including all leading servers—even blade servers. To accommodate different types of equipment, the 19" M6 mounting rails are adjustable. Load-bearing casters make it easy to move. Locking front and rear doors secure equipment. The cabinet is also designed with very generous cable management for both horizontal and patch cables.

A good fit in open environments.

Why spend money on a data center when all you need is the QuietCab? It's a very economical and smart solution for environments where you need to locate equipment near workers, such as open offices, schools, medical practices, etc. By eliminating equipment noise, you'll reduce stress and improve productivity.



Elite QuietCab, 12U (QCE12U)

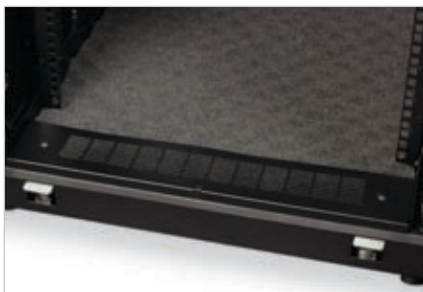
QuietCab



Acoustic foam lining reduces noise by 15 dB.



Cable management is built in.



Filtered air vents are along bottom front.



Includes pre-installed power strip.

QuietCab™

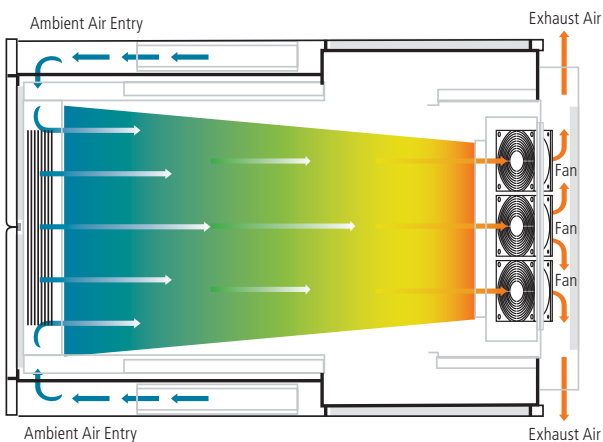
12U	Beech	QC12UBE
	Light Gray	QC12ULG
	Walnut	QC12UWA
24U	Beech	QC24UBE
	Light Gray	QC24ULG
	Walnut	QC24UWA
42U	Beech	QC42UBE
	Light Gray	QC42ULG
	Walnut	QC42UWA

Elite™ QuietCab

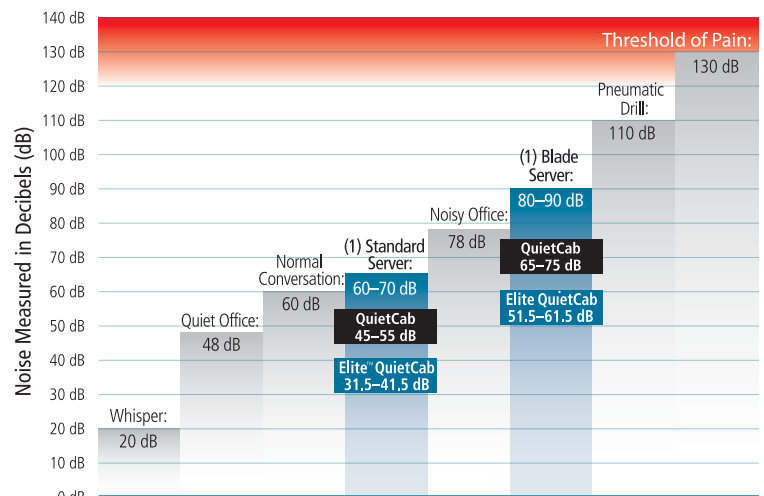
12U	QCE12U
24U	QCE24U
42U	QCE42U

For more on the Elite QuietCab, as well as a video, brochure, and specs, go to blackbox.com/go/QuietCab.

QuietCab Airflow Characteristics



QuietCab and Elite QuietCab Acoustic IT Enclosures



Customize these cabinets to your application.

Elite Wallmount Cabinets

- Large openings in the back panel enable you to easily install patch panels or other prewired equipment.
- Accessories that fit the 3U opening in other Elite cabinets also fit into these cabinets' 3U opening.
- Doors can be reversed to open left or right.
- Double hinged for easy access to rear of equipment.
- **Standard Warranty** — Lifetime

These members of the Elite™ family of cabinets from Black Box have all the quality you've come to expect plus features that set them apart from other wallmount cabinets.

Easily add equipment

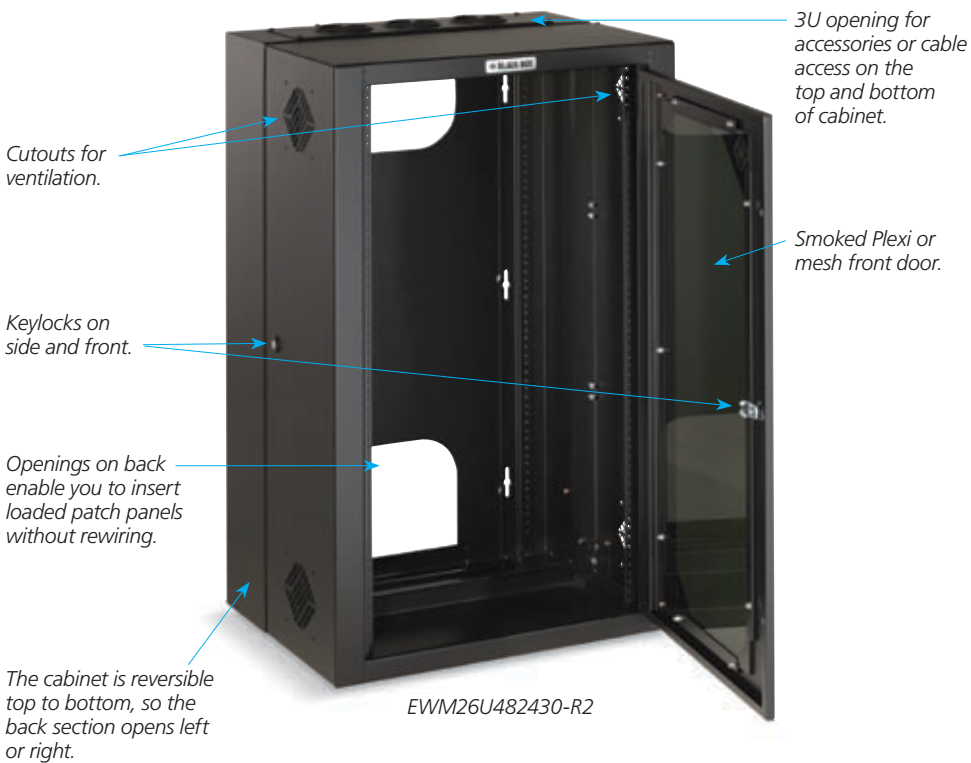
Elite Wallmount Cabinets feature large openings on the back panel that enable you to simply slide in a loaded patch panel. This saves time and money—you do not need to reterminate.

Accessorize

If you want to add fans, a Brush Grommet Kit, a Waterfall Radius Bracket, or other accessory, it couldn't be easier. That's because just about any Elite accessory (pages 25–27) that fits into the 3U opening on the top of an Elite cabinet will work with the wallmount cabinet.

Add a Brush Grommet Kit (ECBGK3U) to run cable into the cabinet while protecting the interior of the cabinet from dust and debris. Install a Fan (RMT373) to increase air circulation and keep equipment cool. Attach a Waterfall Bracket (ECW3U) to maintain bend radius when routing cable into the top of the cabinet. And more!

For even more versatility, optional brackets attach to the back panel of the cabinet and enable you to rackmount patch panels, PDUs, etc., behind the equipment in the cabinet at 45° or 90° angles.



Related

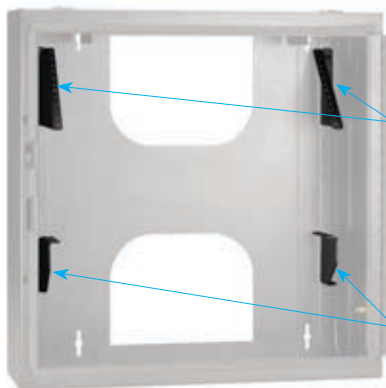
For more Elite Cabinet accessories, pp. 25–27.



Optional Waterfall Radius Bracket (ECW3U)



Optional Brush Grommet Kit (ECBGK3U) in 3U opening.



45° Brackets (EWM45DAB-R2)

90° Brackets (EWM90DAB-R2)



EWM12U242418-R2



EWM20U362418-R2



EWM26U482430-R2

Elite Wallmount Cabinets

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Main Body Depth	Rear Section Depth	Code
24" (61 cm)	24" (61 cm)	18" (46 cm)	12U	23.75" (60 cm)	9.125" (23 cm)	7" (18 cm)	EWM12U242418-R2
		24" (61 cm)			22.125" (56 cm)		EWM12U242424-R2
		30" (76 cm)			28.125" (60 cm)		EWM12U242430-R2
38.5" (98 cm)	24" (61 cm)	18" (46 cm)	20U	23.75" (60 cm)	9.125" (23 cm)	7" (18 cm)	EWM20U362418-R2
		24" (61 cm)			22.125" (56 cm)		EWM20U362424-R2
		30" (76 cm)			28.125" (60 cm)		EWM20U362430-R2
49" (124 cm)	24" (61 cm)	18" (46 cm)	26U	23.75" (60 cm)	9.125" (23 cm)	7" (18 cm)	EWM26U482418-R2
		24" (61 cm)			22.125" (56 cm)		EWM26U482424-R2
		30" (76 cm)			28.125" (60 cm)		EWM26U482430-R2

Elite Wallmount Cabinet Accessories

Dust Cover Plate	EWMDCP-R2
90° Angle Bracket, 2U, Pair	EWM90DAB-R2
45° Angle Bracket, 4U, Pair	EWM45DAB-R2
Brush Grommet Kit	ECBGK3U
Gland Plate	EC3UGP
Waterfall Radius Bracket	ECW3U
Spare Rails	
12U	EWM12URK-R2
20U	EWM20URK-R2
26U	EWM26URK-R2
Fans* (Add up to four)	RMT373-R2

* The RM4002A fan will not work with this cabinet. For full features and specs, go to blackbox.com.

How to pick the correct wallmount cabinet for your application.

By Dave Takach, Tech Support Representative

Know Your Needs

When you want a secure cabinet, but lack floor space, choose a wallmount cabinet. There are several things to consider to ensure you get the right enclosure for your needs.

- Height—How many rackmount units do you need?
- Depth—Will you house extra-deep equipment? Remember to consider total depth, including rear cables.
- Rails—Front vertical rails need to be about three inches from the front door so cables can be plugged into the front of your devices.
- Contents—What equipment and peripherals do you need to house? What weight capacity does the cabinet need to have?

- NEMA Rating—Does the cabinet need a NEMA rating and, if so, which one?
- Cooling—Do you need cooling, either a fan or an air conditioner, or will you rely on passive cooling?
- Access—Do you envision installing patch panels or other prewired equipment? Cabinets that swing out, away from a wall, allow easy access to rear of equipment.

A good place to start is our Wallmount Cabinet Configurator at blackbox.com/go/WallCabSel. Or talk to a pre-sales Technical Engineer.

Variety plus: Wallmount cabinets in three heights and two depths.

Wallmount Cabinets

- Weight capacity—12U models: 150 pounds; 20U models: 250 pounds; 26U models: 300 pounds.
- Fully welded, 14-/16-gauge steel construction.
- Two sets of adjustable 10-32 rails hold 19" equipment with different depths.
- Ship fully assembled.
- **Standard Warranty** — Lifetime



The optional Pro Series Wallmount Cabinet Fan Tray (RM4002A) has two quiet fans to increase air flow.

Access equipment from the front or rear.

Front and rear door locks provide equipment security.

Cutouts provide ventilation.



RM234A-R3



Wallmount Cabinet Accessories

Pro Series Wallmount Cabinet

- Fan Tray [RM4002A](#)
- Filter Tray [RM4003A](#)
- Blanking Panel [RM4004A](#)

To add a shelf, order:

- Rackmount Fixed Shelves, 35-lb. Capacity
- Solid [RMTS01](#)
- Vented [RMTS02](#)

To add a power strip, order:

- 19" Rackmount Power Strips, 6-Outlet (For details, see p. 64.)
- Switchable [PS186A-R2](#)
- Switchless [PS188A-R2](#)

For full features and specs, go to blackbox.com.

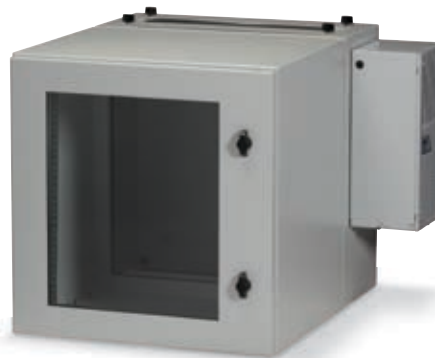
Wallmount Cabinets

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Max. Rail Depth	Weight	Code
24.02"	21.25"	26"	12U	21"	19.75"	88 lb.	RM232A-R3-RM233A-R3
24.02"	21.25"	26"	12U	21"	19.75"	75 lb.	RM334A-R3-RM335A-R3
37.75"	21.25"	26"	20U	21"	19.75"	111 lb.	RM435A-R3-RM436A-R3
37.75"	21.25"	20.15"	20U	21"	13.75"	95 lb.	RM433A-R3
51.14"	21.25"	26"	26U	21"	19.75"	129 lb.	RM234A-R3
51.14"	21.25"	20.15"	26U	21"	13.75"	100 lb.	RM336A-R3

Protect and cool equipment in areas without air-conditioning.

Wallmount ClimateCab™

- NEMA 12 rated for protection against dirt, debris, and liquids in indoor environments.
- 19" rails have 10-32 tapped mounting holes.
- Fully welded, 12-gauge steel body and door.
- 800 BTU AC. Dissipates 405 watts at 80° F, 235 watts at 100° F. Maximum ambient temperature is 120° F.
- **Standard Warranty** — Air-conditioned cabinets: 1 Year
Cabinets with fans: 5 Years



RMW5110ACG-R2
Shown with AC unit installed.



ClimateCab Gland Plate

The ClimateCab models with air-conditioning ship assembled without the air-conditioning unit mounted. Mounting the AC unit takes about two minutes.

Wallmount ClimateCab

NOTE: To learn about BTU/watt conversion, see page 7.

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Equipment Depth	Weight Capacity	With Air Conditioning	With Fan	Code
24" (61 cm)	24" (61 cm)	24" (61 cm)	12U	21.2" (53.8 cm)	200 lb. (90.7 kg)	Single-Hinged	—	RMW5130AC-R2
						Double-Hinged	—	RMW5110AC-R2
						Double-Hinged with Gland Plates	—	RMW5110ACG-R2
						—	Single-Hinged	RMW5120AF-R2
						—	Double-Hinged	RMW5100AF-R2

Store and secure communications equipment.

Pro Series Wallmount Cabinet



Clear acrylic door enables you to view the front of your equipment (RM4001A).



- Weight capacity of 200 pounds.
- Extra depth accommodates large servers.
- Rear door enables you to swing the cabinet out.
- Side panels are vented for airflow.
- Locking front and rear doors are reversible.
- One set of standard 19" M6 rails. Additional rails are available.
- **Standard Warranty** — Lifetime

Pro Series Wallmount Cabinet Accessories

Fan Tray	RM4002A
Filter Tray	RM4003A
Blanking Panel	RM4004A
Extra Vertical Rails	RM4005A
45° Rear Mounting Rails	RM4006A
10" Shelf	RM4007A

For full features and specs, go to [blackbox.com](#).

Pro Series Wallmount Cabinet, 12U

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Interior Depth	Load Capacity	Weight	Code
24"	24"	30"	12U	19"	28.75"	200 lb.	94 lb.	RM4001A

The economical way to keep your equipment safe.

Select Wallmount Cabinets

- Weight capacity of 50 pounds.
- Solid welded construction.
- Reversible door—hinges left or right.
- Standard 19" M6 rails.
- **Standard Warranty** — Lifetime



RM2413A



Left and right cable knockouts.



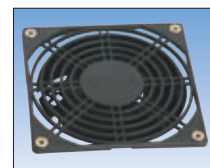
Key lock for security.

Select Wallmount Cabinets

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Interior Depth	Weight	Code
13"	22"	23.6"	6U	18.3"	22.6"	41 lb.	RM2411A
16.5"	22"	23.6"	8U	18.3"	22.6"	46 lb.	RM2412A
20"	22"	23.6"	10U	18.3"	22.6"	50 lb.	RM2413A



Top and bottom venting holes.



Low-noise, top-mounted fan.

Sized for extra-deep equipment.

Deep Wallmount Cabinet

- Weight capacity of 250 pounds.
- Up to 22.75" of interior mounting depth.
- Smoked PLEXIGLAS® front door.
- Removable rear door enables you to swing the entire cabinet away from the wall.
- M5 rails are fully adjustable front to back.
- Knockouts at the top, bottom, and rear for 1", 2", or 3" cable openings.
- **Standard Warranty** — Lifetime



NOTE: Maximum rail spacing 23". Maximum mounting depth is 22.75". Maximum usable depth is 30".



Front door with lock

Rear door with lock

Deep Wallmount Cabinet

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Interior Depth	Weight	Code
24"	24"	32.13"	11U	23"	30"	125 lb.	RM3050A-R2

Related

For accessories, see [RM4001A](#) above.

Unique side-mount design saves space when mounting servers.

Server Side-Mount Wall Cabinet

- Weight capacity of 250 pounds when secured to three wall studs.
- Unique side-mount design—enables you to get more servers in a tighter space by mounting them sideways.
- Mesh front doors ensure optimal airflow to keep hard-working servers cool. Rear door has two Dual Fan (RM4002A) mounting locations.
- Internal depth of 34" with a maximum rail depth* of 29.75".
- Flexible cable access features a sliding grommet panel on top of the cabinet and a 3U conduit panel with 1", 2", and 3" knockouts on the bottom.
- Left and right doors, as well as the front panel, can be locked to safeguard your expensive servers and prevent tampering.
- **Standard Warranty** — Lifetime



* NOTE: At 29.75" rail spacing, the cabinet provides 2" of space in the front and 3" in the rear. The 10U of space isn't possible with all equipment configurations. For example, if you mount a 29" server in the cabinet, the maximum space is 8 RU because of the necessary rail adjustments.

Server Side-Mount Wall Cabinet

Server Side-Mount Wall Cabinet [RM610A-R2](#)

To add fan cooling to your cabinet, order:
Wallmount Cabinet Dual-Fan Kit [RM4002A](#)
For full features and specs, go to [blackbox.com](#).

Squeezed for space? Go up against the wall.

Low-Profile Side Wallmount Cabinets

- Weight capacity is 50 pounds.
- 16-gauge steel frame construction.
- For extra room, mount hubs and other network equipment against the wall.
- Efficient design keeps your equipment out of sight and out of the way.
- Equipment mounting depth is adjustable for convenient cable management.
- A preinstalled 10-32 rack rail makes equipment mounting easy.
- The cover conceals your equipment and keeps it free from dust.
- Fully compliant with TIA specifications.
- **Standard Warranty** — Lifetime



This Low-Profile Side Wallmount Cabinet (RMT355A-R2) is shown with installed equipment (sold separately). For cabling convenience, components can be mounted in the cabinet at depths of 3/16", 1 1/2", or 3".



The cabinets include cable lacing points at the rear of each unit to help you organize and manage cable runs.

Low-Profile Side Wallmount Cabinets

2U [RMT355A-R2](#)
4U [RMT356A-R2](#)

For full features and specs, go to [blackbox.com](#).

Compact cabinets designed for hubs, routers, and switches.

2U Wallmount Cabinets

- Weight capacity is 50 pounds.
- Constructed of rugged 16-gauge steel.
- Components mount in the cabinet vertically, facing up.
- Vented on both sides to cool equipment.
- Two built-in, 3" cable knockouts on each side are 3 inches (7.6 cm) in diameter to accommodate large cable runs.
- Perfect for small network equipment.
- Keyhole mounting holes make installation easy.
- **Standard Warranty** — Lifetime



RM425A-R3



2U Wallmount Cabinets

Black [RM425A-R3](#)
Beige [RM525A-R2](#)

For full features and specs, go to [blackbox.com](#).

Tough enclosures built to keep components safe.

NEMA 12 Wallmount Cabinets

- Weight capacity—RMN600A-R2: 150 pounds; RMN625A-R2: 250 pounds; RMN650A-R2: 300 pounds.
- Fully welded steel construction: M6 mounting rails are 12 gauge; rear section's main body is 14 gauge; door is 16 gauge.
- Independently tested and certified to NEMA-250-1997 Type 12 standard. Meets guidelines for protection against dirt, dust, and noncorrosive liquids.
- **Standard Warranty** — Lifetime

NEMA 12



RMN600A-R2

Front and back sections lock independently.



Double hinging enables access to the front and back of your equipment.

For full features and specs, go to blackbox.com.

NEMA 12 Wallmount Cabinets

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Interior Depth	Weight	Code
24"	24"	24"	12U	23"	23"	105 lb.	RMN600A-R2
36"	24"	24"	19U	23"	23"	140 lb.	RMN625A-R2
48"	24"	24"	26U	23"	23"	175 lb.	RMN650A-R2

Related

These cabinets work with the NEMA Fan Assembly (NEMAFAN1).

Find your cabinet *FAST!*

Our on-line configurator makes it easy.

- First, select a base cabinet size.
- Next, select your options.
- Then, select from the list of matching cabinets.



Need a Cabinet?
Use our selectors to configure a cabinet for your application.

Freestanding

Wallmount

Rack Mount Units

- 2U - 8U
- 10U - 13U
- 14U - 20U
- 21U+

Height Range

- 12" - 17"
- 18" - 22"
- 23" - 29"

Weight Capacity

- Under 50 lbs.
- Up to 100 lbs.
- Up to 150 lbs.
- Up to 200 lbs.
- Up to 300 lbs.
- Up to 350 lbs.

NEMA Rating

- No NEMA Rating

Just go to: blackbox.com/go/CabCon

What to consider when choosing a rack.

By Dave Takach, Tech Support Representative

Why Racks?

A rack is any freestanding frame that doesn't have doors or sides. If you need frequent access to all sides of the equipment and cabling, an open rack is more convenient than a cabinet. If your equipment needs ventilation, a rack offers more air circulation than cabinets. With the open design, racks are a good choice in areas where security isn't a concern, or inside data centers and closets with locked doors. And racks typically cost less than cabinets. There are several things you should consider when choosing a rack.

Types of racks.

The best place to start when picking a rack is to ask yourself: Where will it be located and what equipment will be in it? This will help you determine if you need a wallmount or a floor-mount model and whether you need a 2-post or 4-post rack.

You have a number of options depending on the type of equipment you need to house. If you're installing patch panels, a two-post rack with some cable management is the right choice. But if you have a mix of networking equipment, servers, and patch panels, then a 4-post rack makes more sense because it provides more stable, 4-point mounting for deep equipment. Accessories are available which allow you to mount both standard and extra-deep equipment.

Rack widths.

The main component of a rack is a set of vertical rails with mounting holes to which you attach your equipment or shelves. Most racks come in rails spaced at the standard 19" with hole-to-hole centers measuring 18.3". To rackmount smaller equipment, add rackmount adapter brackets. For mounting older legacy equipment, there are 23" wide racks.

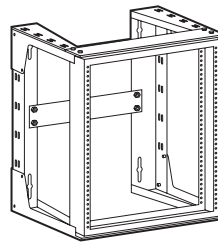
Two-post racks typically have threaded 12-24 or 10-32 holes for quick installation of patch panels, and 4-post racks usually have M6 square mounting holes for mounting servers.

Rack heights.

Height, or rack units, is one of the most important specifications in choosing a rack. One rack unit (1U) is 1.75" of usable space. So, for example, a rackmount device that's 2U high takes up 3.5" of rack space. Most free-standing racks come in a standard 45U height, which is 6.5 feet high, so they fit rooms with standard ceilings. But there are other height options—from smaller 10U-high wallmount models all the way up 58U-high units. These tall racks, towering up to 9 feet, allow for an extremely dense installation of equipment while saving floor space.

Wallmount racks.

Wallmount-style racks save floor space, too. They're very convenient for installing in cramped wiring closets or narrow hallways. Some even swing out for easy equipment installation and cable connections. Other low-profile racks enable you to flushmount equipment vertically against a wall to further reduce the amount of space they take up. Wallmount racks



are typically designed to be installed on 16-inch-on-center studs or on backing boards attached to the wall.

To determine which wall rack is best for your application, measure the deepest piece of equipment and cable(s) out of the back end to be sure they will fit. Then verify the weight capacity needed.

Powering your equipment.

Now that you've chosen a rack, you'll need to get power to equipment. Rackmount power strips come in versions that mount either vertically or horizontally. Some have outlets that are spaced widely to accommodate transformer blocks.

Cable management.

Next you need to select the appropriate accessories. The first, and most important, is cable management. Many racks have built-in cable management troughs and cable rings for routing cable. If your rack doesn't have these, consider adding managers for neatly routing cable. Vertical managers are great for organizing cable runs top to bottom. Horizontal managers are designed to guide cables and hold them precisely at the same level as mounted equipment. You can also add inexpensive hook-and-loop cable ties to hold and bundle cable securely.

For high-density applications, there are specially designed cable managers that handle large amounts of cables. These systems have oversized channels with molded fingers that guide wiring to mounted devices at precise increments while maintaining the proper bend radius for the cable. They also have covers that you can remove completely for faster cable installation.

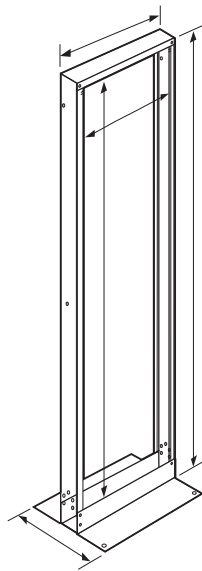
The extras.

Consider shelving for your rack. The type you choose depends on the equipment you plan to mount. You can choose from solid or vented shelves, stationary or pull-out shelves. There are shelves built to hold specific pieces of equipment such as servers, monitors, and keyboards. You can place small devices on a cantilevered shelf. Larger, heavier items, such as monitors, should be put on a center-weight shelf. There are even panels designed to hold flat-screen monitors.

Other accessories include rackmount fan trays and filler panels, which can be vented or nonvented. Also, don't forget grounding bars to ground the rack and the equipment in it.

So, as you can see, you have a number of things to consider when setting up a rack.

If you have questions, contact the experts at Black Box Tech Support or at blackbox.com.



"How to Pick a Rack"

blackbox.com > Resources > Videos

Learn step by step how to pick a rack for your application and equipment by watching this in-depth video.

blackbox.com > Resources > Videos

Freedom is a rack you can adjust to fit equipment with different depths.

Freedom Rack Plus

- Weight capacity of 2500 pounds.
- Depth can be changed to accommodate a variety of equipment.
- Further customize the racks with adjustable shelves.
- Link multiple racks side-by-side with the joining kit (sold separately).
- Ships to you unassembled, enabling easy transport to a job site.
- **Standard Warranty** — Lifetime

Freedom Rack Plus

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Weight	Code
72"	20.25"	17.72"–41.34"	38U	65 lb.	RM082A
84"	20.25"	17.72"–41.34"	45U	69 lb.	RM084A RM088A
96"	20.25"	17.72"–41.34"	51U	73.5 lb.	RM086A
84"	24.25"	17.72"–41.34"	45U	75 lb.	RM089A



RM082A



Choose from 12-24 or M6 mounting holes.

Customizable with a variety of adjustable shelves.

Depth is adjustable in 0.98" (25-mm) increments from 17.7" to 41.3".

Predrilled mounting holes at the base enable you to anchor the rack to the floor for a safe and secure installation.

Freedom Rack Plus Accessories

Joining Kit	RM087
Adjustable Vented Shelves	
1U, 150-lb. Capacity	RM083
2U, 60-lb. Capacity	RM085

For full features and specs, go to blackbox.com.

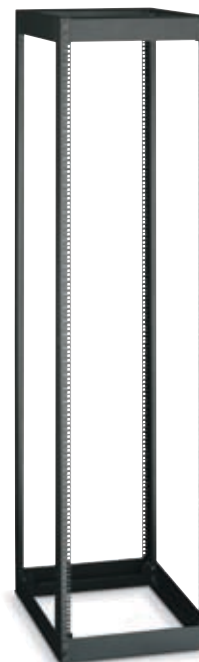
Exceptional stability plus great Black Box quality—all at an economical price.

4-Post Racks

- Weight capacity of 2200 pounds (750 pounds when using RM7006-R2 casters).
- M6 mounting.
- Shipped unassembled.
- Assembly hardware and mounting hardware is included.
- Can be standalone, or bayed with other racks with optional Baying Kit.
- **Standard Warranty** — Lifetime

4-Post Racks

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Weight	Code
33.25"	20.6"	29"	15U	19"	60 lb.	RM7003A
45.5"	20.6"	29"	22U	19"	65 lb.	RM7001A
72"	20.6"	29"	37U	19"	71 lb.	RM7008A
80.5"	20.6"	29"	42U	19"	80 lb.	RM7000A
96"	20.6"	29"	51U	19"	94 lb.	RM7004A
108"	20.6"	29"	58U	19"	101 lb.	RM7005A



RM7000A-R3



4-Post Rack Accessories

Baying Kit	RM7002
Caster Set	RM7006-R2
Flat Top	RM7007-R2
Fixed Vented Shelf	
28.9"D, 150-lb. Capacity	RM7010

You may also need:

Fixed Vented Server Shelves (For details, see p. 42.)	
27.25"D	RM403-R2
30"D	RM410-R2

For full features and specs, go to blackbox.com.

Related

Rack Accessories, p. 42.

Organize your computer room.

19" Steel Distribution Racks

- Constructed of rugged 16-gauge steel.
- For use in secure computer rooms where access is limited and locking cabinets aren't needed.
- Use them to mount patch panels, hubs, shelves, and more.
- Feature 10-32 holes on the front and back of the vertical rails for mounting accessories on both sides. Holes are spaced for standard 19" mounting.
- Easy, bolt-together assembly.
- **Standard Warranty** — Lifetime



19" Steel Distribution Racks

Exterior Height	Exterior Width	Base Depth	Rack Units	Interior Width	Interior Depth	Weight	Code
39.0"	21.2"	21"	20U	17.5"	18.3"	32 lb.	RM392A-R2
74.0"	21.2"	21"	40U	17.5"	18.3"	55 lb.	RM391A-R2
86.5"	21.2"	21"	47U	17.8"	18.3"	60 lb.	RM390A-R2

High-quality sturdy racks and versatile shelves.



Premier Aluminum Distribution Racks

- Weight capacity of 750 to 1000 pounds.
- Constructed of high-grade 6061-T6 aluminum.
- UL® 60950-1 approved.
- Easy to assemble—they're self-squaring and self-supporting.
- Available in 2-post and 4-post versions.
- Premier Shelves available at blackbox.com.
- **Standard Warranty** — Lifetime



Premier Aluminum Distribution Racks

	Finish	Height	Exterior Width	Interior Width	Weight	Code
2-Post	Mill	72" (38U)	19" (48 cm)	17.2" (44 cm)	27.5 lb. (13 kg)	RM155A-R3
		84" (45U)	20.3" (52 cm)	17.2" (44 cm)	30.2 lb. (14 kg)	RM156A-R3
	Black	72" (38U)	19" (48 cm)	17.2" (44 cm)	27.5 lb. (13 kg)	RM161A-R3
		84" (45U)	20.3" (52 cm)	17.2" (44 cm)	30.2 lb. (14 kg)	RM162A-R3
4-Post	Black	96" (51U)	20.3" (52 cm)	17.8" (45 cm)	27.5 lb. (13 kg)	RM251A
		96" (51U)	20.3" (52 cm)	17.8" (45 cm)	70 lb. (32 kg)	RM253A
		108" (58U)	20.3" (52 cm)	17.8" (45 cm)	73 lb. (33 kg)	RM254A

For shelves go to blackbox.com.

Get room to move—quick-release pins swing the rack open left or right.

Wallmount Frames

- Weight capacity of 75 pounds.
- Heavy-duty 14-gauge steel construction adds stability.
- Quick-release pins enable the rack to swing open easily, either left or right, even when fully loaded.
- Slots for cable ties are incorporated in the frame's top, sides, and bottom, making cable management simple.
- 12-24 rails accommodate 5/8"-long 12-24 panhead screws.
- Easy rear access for punching down cable or troubleshooting.
- **Standard Warranty** — Lifetime

Wallmount Frames

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Weight	Code
23.9"	20.7"	18"	12U	20.4"	26 lb.	RM070A-R3
36"	20.7"	18"	20U	20.4"	32 lb.	RM069A-R3
47"	20.7"	18"	25U	20.4"	42 lb.	RM080A-R3



RM069A-R3



Mount your heavy network equipment in tight spaces.

Ultra Wallmount Racks

- Weight capacity of 150 pounds.
- Reinforcement pan on the bottom is constructed of 12-gauge steel.
- Mount 19" equipment to the wall without losing access for moves, adds, and changes.
- The 25" depth provides plenty of room to open and close the rack, even when it's fully loaded with patch panels, hubs, or routers. The racks swing open to the left or right.
- Feature 12-24 mounting holes and include (12) 12-24 x 1/2" screws.
- Drilled with a 5/8", 5/8", 1/2" universal hole pattern.
- **Standard Warranty** — Lifetime

Ultra Wallmount Racks

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Weight	Code
24.25"	19.8"	29"	11U	19.5"	49 lb.	RM050A-R2
38.25"	19.8"	29"	19U	19.5"	54 lb.	RM051A-R2



RM051A-R2



A great equipment rack for areas where there isn't a lot of floor space.

Flushmount Wall Brackets

- Weight capacity of 50 pounds.
- Constructed of 1/8"-thick aluminum with a black, powder-coat finish.
- Flushmount equipment vertically against a wall.
- Mount 3U or 6U of network equipment in a limited space.
- Predrilled 10-32 holes accommodate 19" equipment.
- Rails have 3" channels.
- **Standard Warranty** — Lifetime



Take your network management equipment to the wall—literally. Flushmount Wall Brackets are the perfect mounting accessories for tight wiring closets. They're logical space savers for everything from small office networks to enterprise networks.

NOTE: Switch and cables shown in photo are not included.

Flushmount Wall Brackets

3U	RMT048
6U	RMT052

For full features and specs, go to blackbox.com.



Shelves, drawers, and panels add functionality to cabs and racks.

Heavy-Duty Equipment Shelves



RM114-R2

RM116-R2

- Put up to 150 pounds of equipment on a single shelf.
- Store heavy equipment in one convenient place.
- Weight capacity of 150 pounds.
- 21.75" deep, solid and vented.
- Mounting depth within rack is adjustable.

Heavy-Duty Equipment Shelves

Solid	RM114-R2
Vented	RM116-R2

- ◆ Includes (1) shelf and mounting hardware.

Rackmount Keyboard with Trackball or Touchpad



- Retracting keyboard fits into only 1U of rack space.
- Helps keep your data center looking sleek and attractive.
- Mounting depth is adjustable.
- Standard 101-key AT® style keyboard.



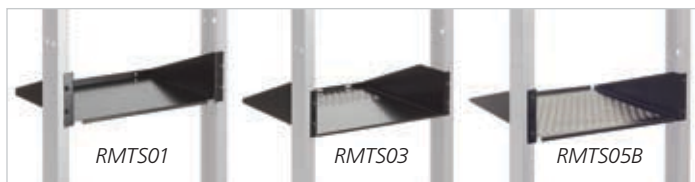
RM419-R3

Rackmount Keyboards

with Trackball	RM418-R4
with Touchpad	RM419-R3

- ◆ Includes (1) shelf and mounting hardware.

Rackmount Solid Fixed Shelves



RMTS01

RMTS03

RMTS05B

- These sturdy shelves fit securely in your cabinets.
- Weight capacity of 35–60 lbs.
- Use 3U of rack space.

Rackmount Solid Fixed Shelves

35-Pound Capacity	RMTS01
	RMTS02
	RMTS05B
50-Pound Capacity	RMTS04
60-Pound Capacity	RMTS03

Rackmount Vented Sliding Shelf



- This sliding shelf is vented for improved air circulation.
- Weight capacity of 50 pounds.
- Constructed of 18-gauge steel.

Rackmount Vented Sliding Shelf

[RMTS06B](#)

Rackmount Server Shelves

- These versatile, 200-pound capacity shelves stand up to the pressure.
- Two 10"D shelves included.
- Mount two shelves back-to-back to create a 20-inch deep shelving area.
- Weight capacity of 200 pounds.
- Constructed of 18-gauge steel.



RMTS07-19

Two-Part Rackmount Server Shelves

19"	RMTS07-19
23"	RMTS07-23

- ◆ Includes (2) shelves, mounting hardware, and user's manual.

Rackmount Drawer with Writing Surface

- This 6.5"-high drawer features a top that's a writing surface.
- Store important log books, manuals, and other documents.
- The drawer is 16" wide by 18.5" deep.



Rackmount Drawer with Writing Surface

19" Rackmount [RM595-R2](#)

Elite™ Server-Mount Cabinet Heavy-Duty Solid Shelves

- Put this 300-pound capacity stationary shelf anywhere in your cabinet.
- Hold up to 300 pounds.

- Perfect for mounting heavy servers and other equipment. • Shelves are 20.75" deep.
- **Standard Warranty**— Lifetime

Elite™ Server-Mount Cabinet Heavy-Duty Solid Shelves

19"W	RM590-R2
23"W	RM591

- ◆ Includes (1) shelf and mounting hardware.



RM590-R2

Filler Panels

- Keep your 19" cabinet or rack looking neat with the simple addition of Black Box® Filler Panel in unused spaces.

- Includes 10-32 screws.
- Constructed of heavy metal with a matte black finish.
- **Standard Warranty**— Lifetime

Filler Panels

Black	
1U (1.75")	RMTB01
2U (3.5")	RMTB02
3U (5.25")	RMTB03
4U (7.0")	RMTB04
5U (8.75")	RMTB05
6U (10.5")	RMTB06
White	
1U (1.75")	RMTW01



RMTB05



Pull out and pivot into position to type.
Pivot and push in for storage.

Sliding Pivoting Keyboard Tray with Side Mouse Tray

- Holds a keyboard up to 20.5" wide, so you can use a keyboard even if it's wider than your cabinet or rack.
- Cushioned wrist rest for more comfortable use.
- Slides out to 19".
- Pull out the tray and pivot it from side to side for the best working position. You can even place the mouse tray on either the right or left.
- Mouse tray features nonskid surface for easy rolling, pointing, and clicking.



- Features adjustable four-point mounting.

Sliding Pivoting Keyboard Tray with Side Mouse Tray
3.5" H (2U) x 20.6" W x 9.5" D (8.9 x 52.3 x 24.1 cm) [RMT385](#)

Rackmount shelves slide out for easy access to equipment.



RMS1924S

RMS1924S-LOCK

Rackmount Sliding Vented 4-Point Shelves

- Weight capacity of 50 pounds.
- Shelves slide out for easy access.
- Vented for improved air circulation.
- 24" deep.

Rackmount Sliding Vented 4-Point Shelves
19" Rails [RMS1924S](#)
Locking [RMS1924S-LOCK](#)
23" Rails [RMS2324S](#)

Fixed shelf holds up to 60 pounds.

Rackmount Fixed Vented 4-Point Shelf



- Weight capacity of 50 pounds.
- Vents improve air circulation within the cabinet.
- Measure 24" deep.

Rackmount Fixed Vented 4-Point Shelf
19" Rails [RMS1924F](#)

- Standard Warranty— All:Lifetime

This shelf separates smaller components.

Sliding Server Shelf with Fins

- Holds 100 pounds.
- Shelf is 17½" wide and fits in a 19" rack.
- Three sections hold smaller components.
- Removable fins and cable management bar.
- Mount the shelf anywhere in your cabinet.



RMT400



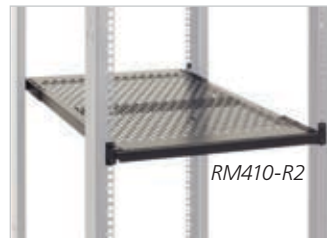
RMT411

Sliding Server Shelf with Fins, 29" D
Sliding Server Shelf with Fins [RMT400](#)
Sliding Server Shelf Only [RMT411](#)
Fins Only [RMT412](#)

A high-capacity shelf to mount a heavy server or other heavy equipment.

Fixed Vented 4-Point Shelves

- Weight capacity of 50 pounds.
- Vents improve air circulation within the cabinet.
- Measure 24" deep.
- Standard Warranty— Lifetime



RM410-R2

Fixed Vented 4-Point Shelves
200-lb. Capacity 19" D [RM399-R2](#)
150-lb. Capacity 27.25" D [RM403-R2](#)
30" D [RM410-R2](#)

Adjust to virtually any cabinet depth—without tools.

Tool-less Telescoping Shelves

- Easy installation—no tools required.
- Support up to 150 pounds.



RM047-R2

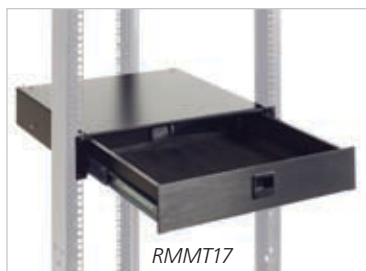
Tool-less Telescoping Shelves
23.6"–35.4" D [RM047-R2](#)
35.4"–47.2" D [RM049-R2](#)

Related

For full features and specs, go to blackbox.com.

Store and organize your media.

Rackmount Media Storage Drawers and Partitions



Media Storage Drawers

- Rugged construction.
- Measure 15.9"W x 14.5"D.
- Fully enclosed top.
- Spring-loaded latches.
- Fit standard 19" rails.

Media Partitions

- Divide Media Storage Drawers for storing media or other small objects.
- Snap together easily.

- **Standard Warranty** — All: Lifetime

Rackmount Media Storage Drawers

Black	
2U	RMMT17
3U	RMMT18
4U	RMMT19
Silver	
4U	RMMT16

Media Partitions for Storage Drawers

2U (Stores 84 DAT Tapes)	RMMT20
4U (Stores 101 CDs)	RMMT22

For full features and specs, go to blackbox.com.

Save time—install these panels on M6 rails without tools.

Tool-Less Filler Panels and Filler Panels



Tool-Less Filler Panels

- Save time on installation—no tools or hardware required!
- Fasten easily with a quarter-turn fastener.
- Fill empty racking space to help control airflow.
- Fit 19" rails with square M6 holes.
- Constructed of 14-gauge steel with black powder coat finish.

Filler Panels

- Constructed of heavy metal with a matte black or white finish.
- Mount easily to a 19" cabinet or rack with four included 10-32 screws.
- **Standard Warranty** — All: Lifetime

Tool-Less Filler Panels

1U	RM1031
2U	RM1032
3U	RM1033
4U	RM1034
5U	RM1035

Filler Panels

Black	
1U (1.75")	RMTB01
2U (3.50")	RMTB02
3U (5.25")	RMTB03
4U (7.00")	RMTB04
5U (8.75")	RMTB05
6U (10.50")	RMTB06
White	
1U (1.75")	RMTW01
2U (3.50")	RMTW02
3U (5.25")	RMTW03
4U (7.00")	RMTW04

For full features and specs, go to blackbox.com.

Secure and manage large numbers of cables.

Cable Management Tray

Cable Management Arm



- Tough solid-steel construction.
- Fits any standard 19" 2- or 4-post rack with square, round, or threaded holes.
- Measures 19" wide and 1U high.
- Has a 3" mounting depth.

- Smaller than other cable arms so it doesn't sag.
- Mounts on left or right side of rack.
- Fully adjustable and designed for equipment with slide rails.
- Compatible with standard square or round hole 19" racks.

- **Standard Warranty** — All: Lifetime

Cable Management Tray

1U, 19" W	CMT-1U
-----------	--------

Cable Management Arm

1U (Extends from 28.5" to 33")	CMA-1U
--------------------------------	--------

Eliminate cable congestion.

Patch Cable Management Panels

- Equipped with five sturdy steel rings.
- Rackmount panels organize your cables.
- **Standard Warranty** — Lifetime



Patch Cable Management Panels

1U with 1.25" x 3" Rings	37803-R2
2U with 3" x 3" Rings	37804-R2

Put more equipment on your rack.

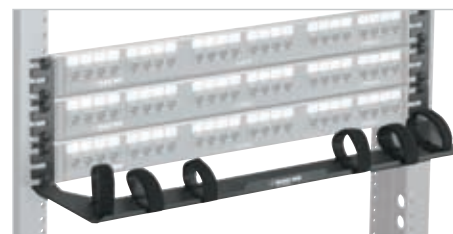
Zero U-Height Cable Manager

- Frees up your rack space for patch panels and other equipment.
- Designed with a standard rack hole pattern to fit all 19" equipment.
- Supports cables in front of the patch panel.
- To mount two Zero U-Height Cable Managers together, just install the second unit upside down below the first.
- **Standard Warranty** — Lifetime



Installs quickly with existing patch panel or equipment screws.

Uses no rack space!



Mounts in front of the patch panel.

Zero U-Height Cable Manager

[JPM500A-R2](#)

Support and route patch cable.

19" Wire Manager

- Has rolled edges for added strength and four split rings for patch cable support and routing.
- Mounting hardware is included.
- **Standard Warranty** — Lifetime



19" Wire Manager

[JPM140A](#)

Route cables wherever there's room on your racks.

Rackmount Cable Raceways



- Installation's a snap—mount it easily onto any distribution rack.
- Now with cable passthrough holes for improved cable runs.
- Perfect for tighter spaces where you may have less cable.
- **Standard Warranty** — Lifetime

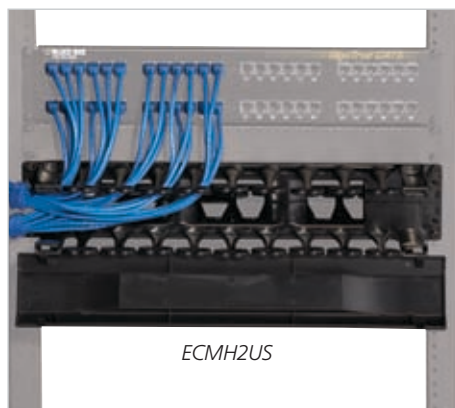


Rackmount Cable Raceways

Single-Sided		
Horizontal, 19"	1U	RMT100A-R3
	2U	RMT102A-R3
Vertical, Center Mount		RMT201A-R3
	Vertical, Side Mount	RMT200A-R3
Double-Sided		
Horizontal, 19"	1U	RMT101A-R3
	2U	RMT103A-R3
Vertical, Center Mount		RMT203A-R3
	Vertical, Side Mount	RMT202A-R3

Our top-of-the-line cable managers have extra-high cable capacity and easy cable access.

Elite Cable Managers



- Double-hinged, spring-loaded removable covers feature a central latch for quick cable access.
- No obstructions. An entire unit can be used for cable routing.
- Arrowhead-shaped fingers in the **Horizontal Elite™ Cable Managers** funnel cables into the base and hold them securely. Insert and remove cables while maintaining retention.
- Mount the **Vertical Elite Cable Managers** on the side of or between open racks.
- Add the **Vertical Rear Post & Gate Kit** to make your Vertical Elite Cable Manager two sided in seconds!
- **Standard Warranty — Lifetime**



Horizontal Elite Cable Managers

Single-Sided	
1U	ECMH1US
2U	ECMH2US
Double-Sided	
2U	ECMH2UD
Horizontal Tie-Down Bar	
1U	ECMTDB
Vertical Elite Cable Managers	
45U	
6"	ECMV45U6
12"	ECMV45U12
Vertical Rear Post & Gate Kit (10) Pieces, 48" H x 26" D	
6"	ECMVPG6
12"	ECMVPG12

For full features and specs, go to [blackbox.com](#).

Super cable access and capacity at an economical price.

Deluxe Vertical Cable Managers

- Extra-deep cable channel offers super capacity and multiple tie-down points.
- Arrowhead fingers hold cables securely but move apart easily for cable insertion/removal.
- Includes a front cover with snap hinges.
- The front provides high-cable capacity. The rear provides support for horizontal cabling. Get unobstructed access from all rack locations.
- Turn single-sided cable managers into double-side managers with the **Rear Post & Gate Kit**.
- **Standard Warranty — Lifetime**



DCMV45U6S



Deluxe Vertical Cable Managers, 45U

Single-Sided	
3.5"	DCMV45U35S
6"	DCMV45U6S
Double-Sided	
3.5"	DCMV45U35D
6"	DCMV45U6D
Rear Post & Gate Kit, (10) Pieces 48" H x 26" D	
3.5"	DCMRC35
6"	DCMRC6
Deluxe Rear Cover	
3.5"	DCMVPG35
6"	DCMVPG6

For full features and specs, go to [blackbox.com](#).

Keep your cables hidden, protected, and organized.

Premier Vertical Cable Managers

- Constructed of heavy-gauge aluminum.
- Latches hold and separate wiring.
- Narrow and wide styles available.
- Mounts on any EIA standard 2- or 4-post rack.
- **Standard Warranty — Lifetime**



RM129



Premier Vertical Cable Managers, 45U

Single-Sided	
Mill 3"	RM122
6"	RM123
Black 3"	RM128
6"	RM129
Double-Sided	
Mill 3"	RM124
6"	RM125
Black 3"	RM130
6"	RM131

For full features and specs, go to [blackbox.com](#).

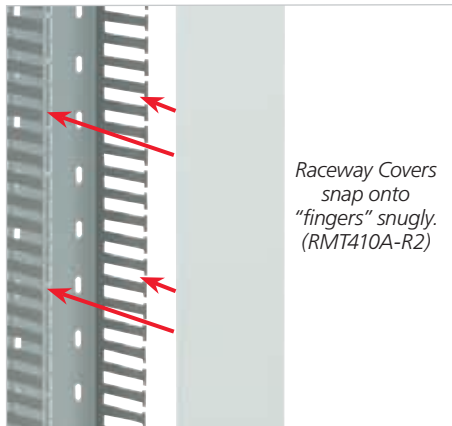
Related

Premier Aluminum Distribution Racks, see p. 40.

Innovative “finger” design holds cables in place.

Slotted-Duct Raceway System

- Slotted holes enable flexible cable mounting.
- Fingers are rounded to prevent abrasion.
- Simply remove cover to reroute cables.
- **Standard Warranty** — Lifetime



Slotted-Duct Raceway System

6-ft. (1.8-m) Lengths	
2" H x 2" W (5.1 x 5.1 cm)	
Gray	RMT300A
Black	RMT301A-R2
4" H x 2" W (10.2 x 5.1 cm)	
Gray	RMT400A-R2
Black	RMT401A-R2
4" H x 4" W (10.2 x 10.2 cm)	
Gray	RMT402A-R2
Black	RMT403A-R2
Raceway Covers	
2" W (5.1 cm)	
Gray	RMT310A
Black	RMT311A-R2
4" W (10 cm)	
Gray	RMT410A-R2
Black	RMT411A-R2

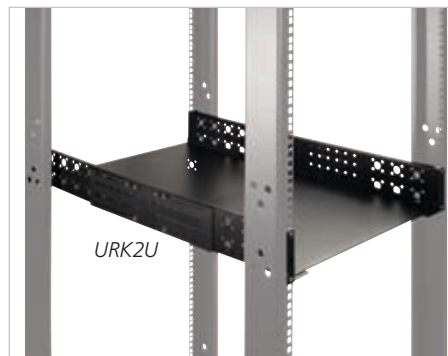
For full features and specs, go to blackbox.com.



Cost-effective, flexible solution for rackmounting servers, switches, and more.

Universal Rail Kits

- Universal Rail Kit is compatible with all 19" cabinets and racks.
- Enables easy mounting of servers, data communication gear, A/V equipment, and other items not equipped for rackmounting.
- **Standard Warranty** — Lifetime



Shown with shelf plate installed.

Universal Rail Kits

1U	URK1U
2U	URK2U
3U	URK3U

For full features and specs, go to blackbox.com.



An economical way to mount servers without slides.

Equipment Mounting Rails

- Ideal for replacing broken or damaged rack rails.
- Also available in versions with 1U, 2U, or 3U rails, as well as 4-post models.
- Work with 2-post round- or square-hole racks.
- Include cable management bar with hook-and-loop straps.
- **Standard Warranty** — Lifetime

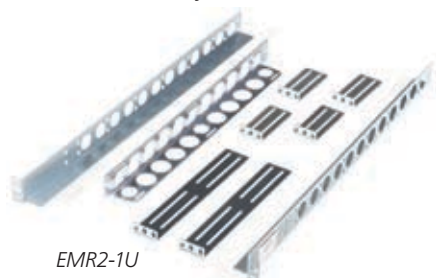


EMR2-1U: left: front view; right: rear view

Equipment Mounting Rails

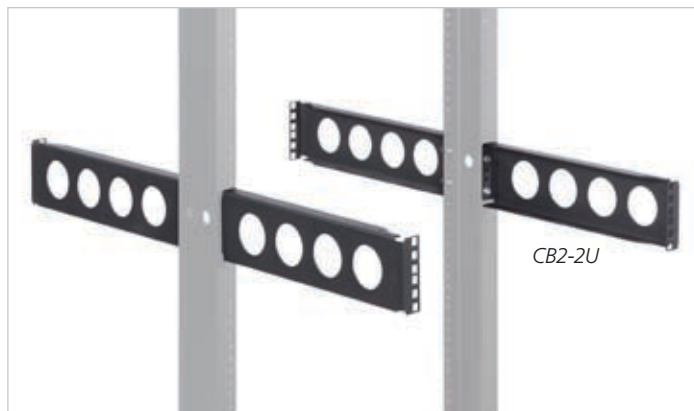
2-Post		4-Post	
1U	EMR2-1U	1U	EMR4-1U
2U	EMR2-2U	2U	EMR4-2U
3U	EMR2-3U	3U	EMR4-3U

For full features and specs, go to blackbox.com.



Transform a 2-post rack into a 4-post rack.

Center-Mount Conversion Brackets



- Enables you to mount 4-post equipment in 2-post racks.
- Convert only the space you need.
- Fast and easy installation.
- Holds up to 100 pounds (45.4 kg).
- **Standard Warranty** — Lifetime

Center-Mount Conversion Brackets

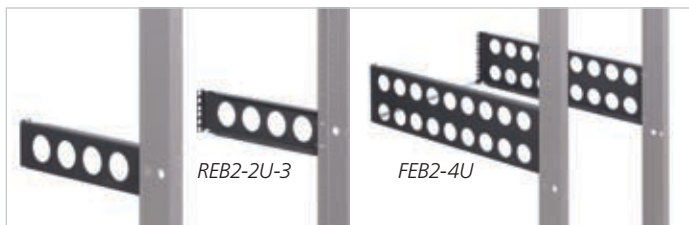
2U	CB2-2U
3U	CB2-3U
4U	CB2-4U
5U	CB2-5U
7U	CB2-7U

For full features and specs, go to blackbox.com.

Mount 4-post equipment in a 2-post rack.

Rail Extension Brackets

- Convert only the space you need in your 2-post rack to a 4-post configuration.
- Brackets couple together to create contiguous space.
- Available in 3", 5", and 6" depths.
- High-quality, solid-steel construction.
- Create an entire 4-post cabinet or any portion you need.
- Quick and simple installation.



Rail Extension Brackets

2U	
3" Deep	REB2-2U-3
5" Deep	REB2-2U-5
6" Deep	REB2-2U-6

Flushmount Extension Brackets

4U	FEB2-4U
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For full features and specs, go to blackbox.com.

Flushmount Extension Brackets

The Flushmount Extension Bracket, 4U, enables servers to be mounted in 2-post telco racks. When front space is limited, this kit provides an alternative to center-mount kits. It provides 4-point corner attachments to allow most OEM rails to be used.

- **Standard Warranty** — All: Lifetime

Adjust the installation depth in a server rack.

1U Mounting Conversion Bracket Kit



- Fits any 4-post rack.
- Converts round holes to square.
- Easy to install without tools in almost any 19" rack.
- Includes 10 brackets.
- Compatible with most Dell®, HP®, and IBM® rail kits.
- **Standard Warranty** — Lifetime



The 1U Mounting Conversion Bracket enables you to install rackmount servers into a variety of different racks by adjusting the installation depth, as well as changing the hole type from round holes to square. The assortment of brackets can be configured in multiple ways to solve most common installation issues.

1U Mounting Conversion Bracket Kit

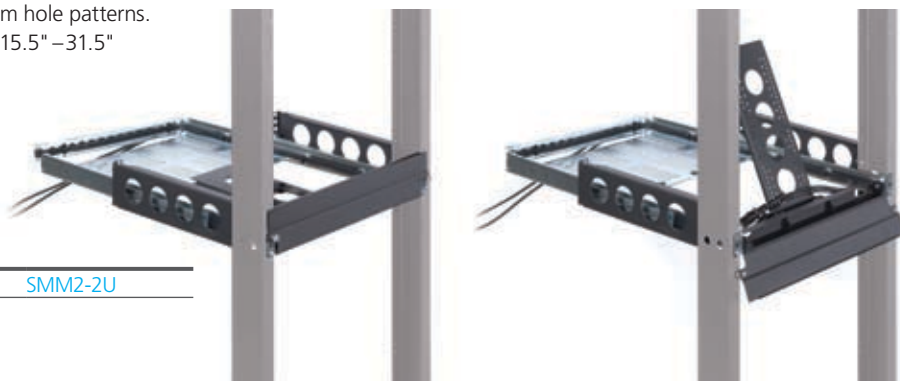
MCB4-1U

For full features and specs, go to blackbox.com.

Install a flat-panel monitor in a rack.

Sliding Monitor Mount, 2-Post, 2U

- Supports flat-panel monitors with 75-mm or 100-mm hole patterns.
- For use in 2-post racks with an installation depth of 15.5" –31.5" (39.4–80 cm).
- Also compatible with any KVM switch.
- Use with a 15–19" LCD with a VESA mount.
- Articulated cable management included.
- **Standard Warranty** — Lifetime



Sliding Monitor Mount

2-Post, 2U

[SMM2-2U](#)

For full features and specs, go to [blackbox.com](#).

Save space by mounting a CPU behind your monitor.

Desktop CPU and Monitor Stand

- Works with most small computers and monitors.
- No assembly required.
- Monitor slides or tilts up and down.
- Ergonomic handle enables easy transport.
- Monitor height can be adjusted up and down 3.75" (9.5 cm) and tilted down 5 degrees and up 22 degrees.
- Works with any LCD with a VESA 75-mm or 100-mm hole pattern.
- Rubber feet under base keep the unit from slipping.
- Monitor is attached to stand with one thumbscrew.
- Chassis is secured with nylon strap.
- **Standard Warranty** — Lifetime



Desktop CPU and Monitor Stand

[DTCPU](#)

For full features and specs, go to [blackbox.com](#).

Mount any 1U or 2U server on its side.

Rack-to-Tower Conversion Kit



- Save space by mounting a 1U or 2U server on its side.
- Tension knob and high-friction foam keep the server secure.
- Rubber feet protect the tabletop.
- **Standard Warranty** — Lifetime

Rack-to-Tower Conversion Kit

[RTCK](#)

For full features and specs, go to [blackbox.com](#).

Easily mount a PC to a wall or other flat surface.

Wallmount PC Bracket

- Mount a PC up to 18" (45.7 cm) tall to a wall or other flat surface.
- 50-pound (23-kg) capacity.
- Includes sheet rock anchors and equipment strap.
- PC is easily removed for maintenance.
- **Standard Warranty** — Lifetime



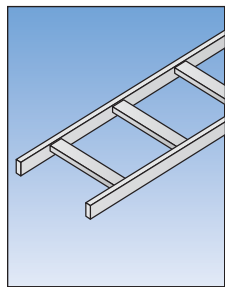
Wallmount PC Bracket

[PCWM](#)

For full features and specs, go to [blackbox.com](#).

Overhead cable management for any application.

- Create a cable management solution to fit to your installation exactly.

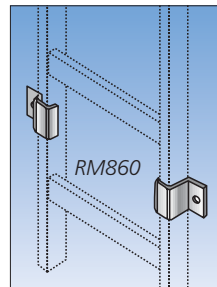


Ladder Racks

- Constructed of 16-gauge tubular steel.

Ladder Racks

6' x 12'	Black	RM650
	Gray	RM663
10' x 12'	Black	RM651
	Gray	RM664

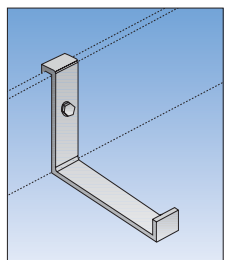


Wall Brackets

- The Vertical Wall Brackets secure the Ladder Rack section to wall or other flat surface.
- Wall Angle Support Brackets support the Ladder Rack perpendicularly to the wall.

Wall Brackets

Vertical Wall Brackets	RM860	
Wall Angle Support Brackets	Black	RM655
	Gray	RM668

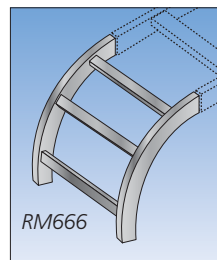


L-Bracket Kit

- Supports cables, such as power cables, that need to be separate from the main cable run.
- Includes mounting hardware.

L-Bracket Kit

RM692

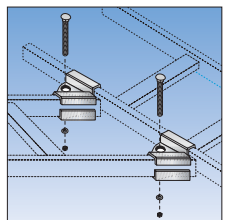


Cable Runway Radius

- Joins Ladder Racks at 90°.
- Maintains cable bend radius.
- Has 33° between stringers.
- Mounts with Butt Splice Kit (RM657) (below).

Cable Runway Radius, 12"W

Black	RM652
Gray	RM666

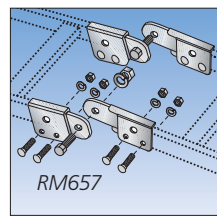


Adjustable Junction Splice Kit

- Connects two Ladder Rack sections at any junction angle.
- Includes all necessary hardware.

Adjustable Junction Splice Kit

RM862

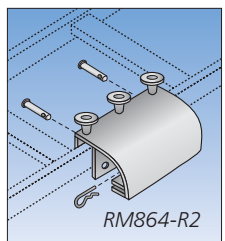


Butt Splice Kits

- Join Ladder Racks to form a continuous runway.
- Adjustable Butt Splice Kit adjusts to any angle from 0 to 90°.

Butt Splice Kits

Butt Splice Kit	RM657
Adjustable Butt Splice Kit	RM861

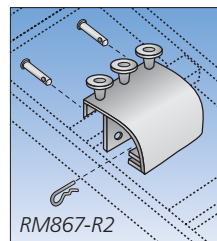


Stringer Radius Drop Kits

- Constructed of aluminum.
- Mount over Ladder Rack stringer to provide bend radius for cable.

Stringer Radius Drop Kits

Black	RM864-R2
Gray	RM863

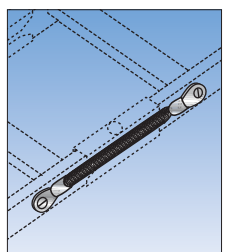


Radius Drop Kits

- Constructed of aluminum.
- Mount over Ladder Rack cross member to provide bend radius for cable.

Radius Drop Kits

Black	RM867-R2
Gray	RM866

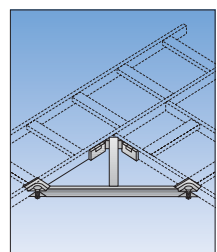


Grounding Kit

- Eight-inch braided copper grounding strap provides continuous ground across Ladder Rack splices.
- Requires drilling mounting-screw holes in Ladder Rack stringers.

Grounding Kit

RM865

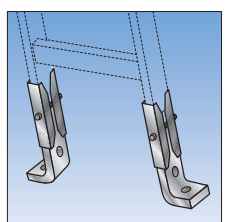


Corner Support Bracket Kit

- Provides extra support for 90° Ladder Rack junctions.

Corner Support Bracket Kit

RM693

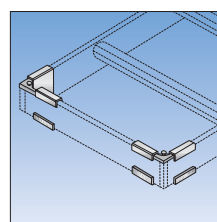


Foot Kit

- Used to secure Ladder Rack to floor or wall.
- Includes: (2) cable rack foot angles, (4) splice plates, head bolts, hex nuts, and split lock washers.

Foot Kit

RM649-R2



Runway Termination Kit

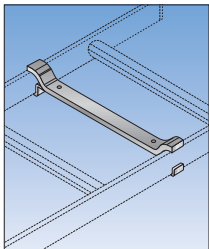
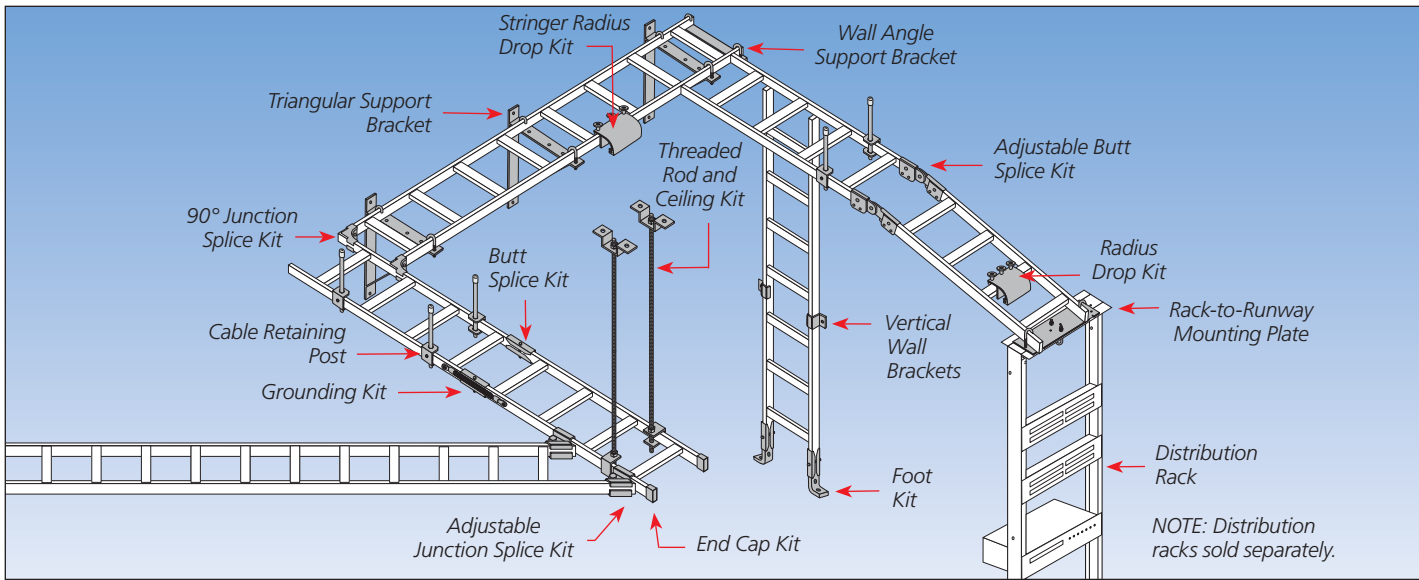
- Finishes and stabilizes the last section when the Ladder Rack ends away from a wall.

Runway Termination Kit

RM694



- Standard Warranty — RM6XX Series: Lifetime; RM860–RM867-R2: 1 Year
- Extended Warranty — Add 1 Year or 3 Years

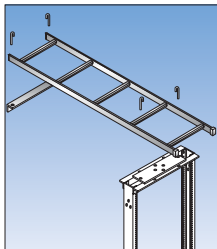


Movable Cross Member

- Helps to support cable at drop locations between welded cross members.
- For maximum cable protection, use with the Radius Drop Kit.

Movable Cross Member

RM695

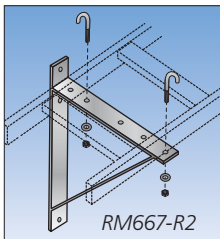


Rack-to-Wall Kit

- Includes one section of straight Ladder Rack plus all needed hardware.
- The ladder section is 54" long by 12" wide.
- Also includes a wall angle support, a rack-to-runway mounting kit, and an end-cap kit.

Rack-to-Wall Kit

RM696



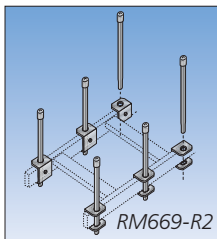
Triangular Support Brackets

- Provide parallel wall support for the Ladder Rack.
- Works with the Black Box® Ladder Rack.
- Includes all necessary hardware.

Triangular Support Brackets, 12"W

Black
Gray

RM654-R2
RM667-R2



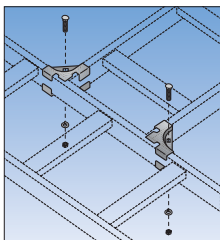
Cable Retaining Posts

- Post is constructed of steel tubing.
- Mount on Ladder Rack side stringers to form 6" side legs for cable retention.

Cable Retaining Posts (One per Pack)

Black
Gray

RM658-R2
RM669-R2

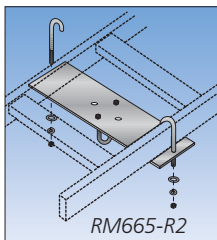


90° Junction Splice Kit

- Completes a right-angle Ladder Rack "T" junction.
- Includes: (4) corner clamp latches, (2) 3/8" x 3/8" round-head, square-neck bolts, (2) 3/8" hex nuts, and (2) split lock washers.

90° Junction Splice Kit

RM656



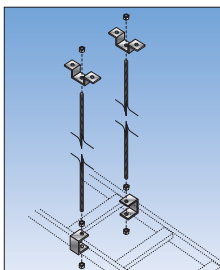
Rack-to-Runway Mounting Plates

- Constructed of 11-gauge steel.
- Feature hole pattern for attaching Ladder Rack to top of wide variety of racks.

Rack-to-Runway Mounting Plates

Black
Gray

RM653-R2
RM665-R2



Threaded Rod

- **Threaded Ceiling Kit**
- Used to suspend Ladder Rack from ceiling.
- Recommended spacing is 5 feet between kits.
- Order two of each per ladder segment.
- Kit includes (1) ladder rack bracket, (1) ceiling bracket, and (4) hex nuts.

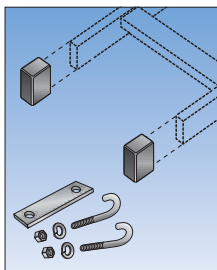
Threaded Rod

3/8" x 6 ft.

Threaded Ceiling Kit

RM660

RM659-R3



Miscellaneous Hardware

- End Caps cover exposed ends of the Ladder Rack.
- Use the J-Bolt Kit to attach the Ladder Rack to Wall Angle Support Bracket (facing page).

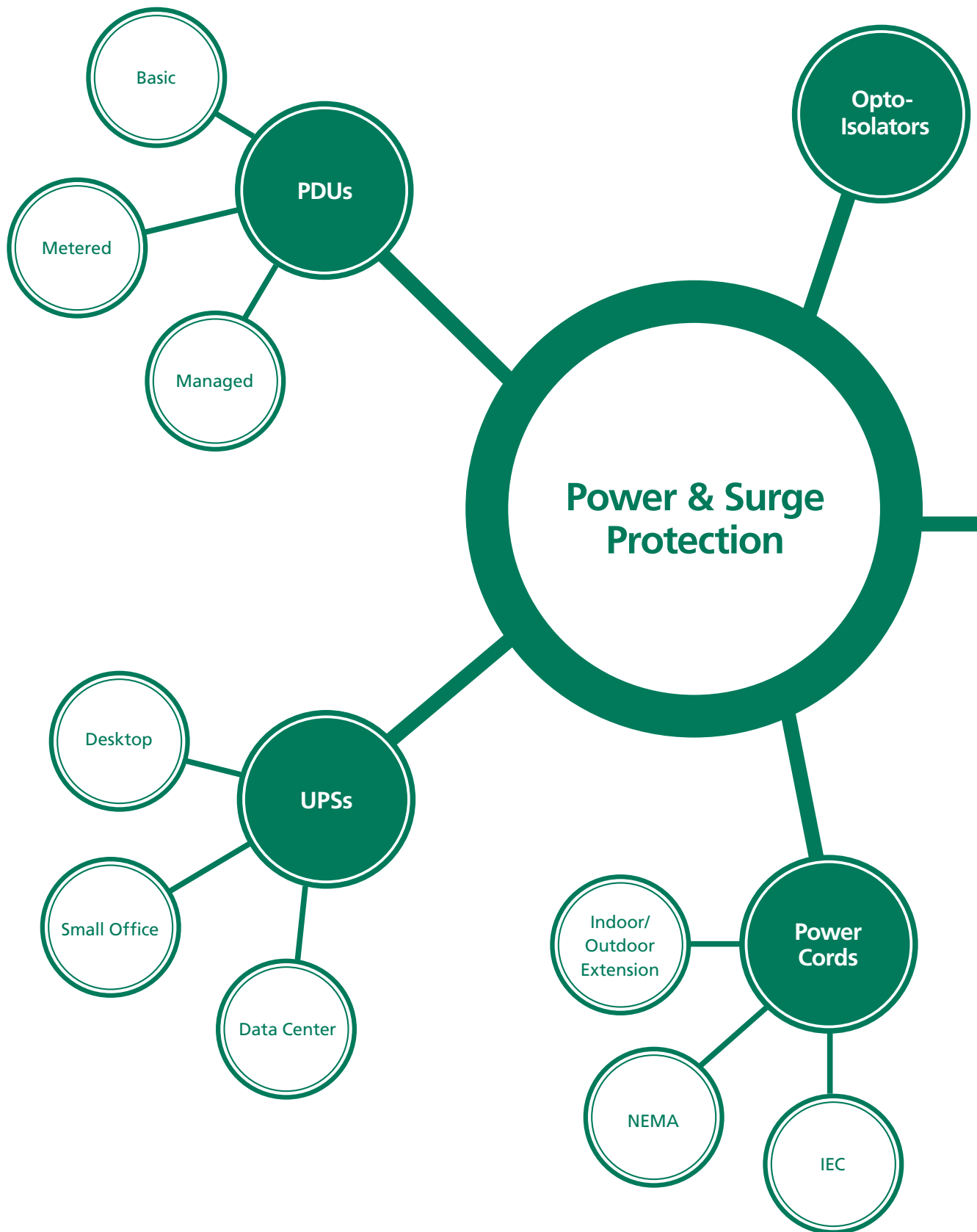
Miscellaneous Hardware

End Cap Kit (2 Caps)

J-Bolt Kit (2 Bolts with Nuts)

RM661

RM662



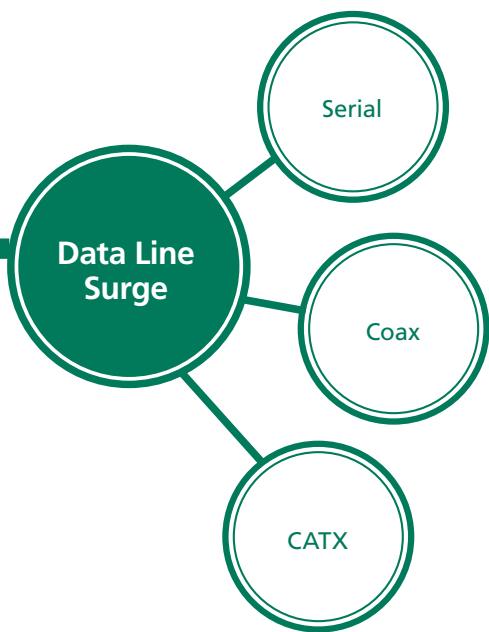
Power distribution and protection.

Black Box can help you properly plan your power distribution network. From server closets to large data centers, Black Box has the solutions you need—power strips, PDUs, UPS units, protection devices, and more—to keep your equipment running.

Distributing power throughout your data center or server room is easy with Black Box PDUs. Basic PDUs are best for applications that require no supervision, scheduling, or metering. Metered PDUs have an LCD display that shows current load in real time. Some have an alarm that sounds if the current draw approaches the maximum current rating, alerting you of a potential problem. Managed PDUs have the most functionality, providing remote management including outlet-level power cycling, scheduling, and reporting. For a PDU comparison chart, see [pages 58-59](#).

Uninterruptible power supplies (UPSs) can protect your systems against power outages, keeping mission-critical equipment running through brief outages and brownouts. In addition, UPSs enable you to shut down computers in an orderly manner in the event of a complete power failure. UPS units come in many sizes and provide run times from minutes to hours in the event of a power loss. They also feature many different outlet types. Give Black Box tech support a call and we will help you choose a UPS that is suited for your application.

Surge protection is more than just buying a surge-protected power strip. A good surge protection system includes the network/communication lines as well. Black Box offers a full range of surge protection devices for every type of communication line, from Gigabit network links to RS-232 serial links. Black Box has the surge protection product to keep your equipment running.



Why do you need a UPS? Here are some facts.

Impact of power outages

Every day, interruptions to electrical service in homes, businesses, and public sector organizations occurs. The losses from these power outages can be extensive and of great consequence. For a business, the recovery time is significant and the costs are high. According to PricewaterhouseCoopers research, after a power outage disrupts IT systems:

- More than 33 percent of companies take more than a day to recover.
- 10 percent of companies take more than a week.
- It can take up to 48 hours to reconfigure a network.
- It can take days or weeks to re-enter lost data.
- 90 percent of companies that experience a computer disaster and don't have a survival plan go out of business within 18 months.

Power outages can cause substantial losses for the companies affected. According to the U.S. Department of Energy, when a power failure disrupts IT systems:

- 33 percent of companies lose \$20,000-\$500,000.
- 20 percent lose \$500,000 to \$2 million.

Why a UPS?

In general, a UPS protects IT equipment and other electrical loads from problems that plague our electrical supply, performing the following three basic functions:

- Preventing hardware damage typically caused by surges and spikes. Many UPS models continually condition incoming power as well.
- Preventing data loss and corruption. Without a UPS, devices that are subjected to a hard system shutdown can lose data completely or have it corrupted. In conjunction with Intelligent Power Manager, an Eaton UPS can facilitate a graceful system shutdown.
- Providing availability for networks and other applications while preventing downtime. In some cases, they provide enough battery runtime to ride through brief outages; in other cases, they provide hours of runtime to ride through extended power outages. UPSs are also paired with generators to provide enough time for them to power up.

The following data was compiled by Eaton based on reported power outages during 2012.

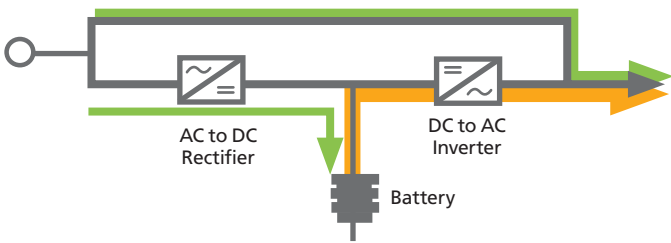
Total number of people affected by outages (This is the sum of the number of people affected by reported power outages in the U.S. for 2012.)	23,488,028
Total duration of outages (This is the sum of the durations of the reported power outages.)	74,598 minutes (approximately 1,243 hours, or 52 days)
Total number of outages (This is the sum of the number of reported power outages.)	2,808
Average number of people affected per outage (This number is determined by dividing the "Total number of people affected by outages" by the number of outages that reported the number of people affected. Not all reports of outages included number of people affected.) See Note A, below.	12,648
Average duration of outage (This number is determined by dividing the "Total duration of outages" by the number of outages that reported durations. Not all reports of outages included the duration.) See Note B, below.	154 minutes (more than 2.5 hours)

Notes:
 A. Total number of people affected (and average) is based on 2,167 (63%) of the total reported outages. Total duration of outages (and average) is based on 991 (29%) of the total reported outages. These are the number of outages that had reports including data for number of people affected and duration, respectively.
 B. Reports from news services, newspapers, Web sites, etc., used as sources, sometimes give statistics using different terms. For example, some reports may be based on "people" while others may be based on "addresses," "homes and businesses" or "utility customers." For purposes of this report, all of these are assumed to be and counted as people.

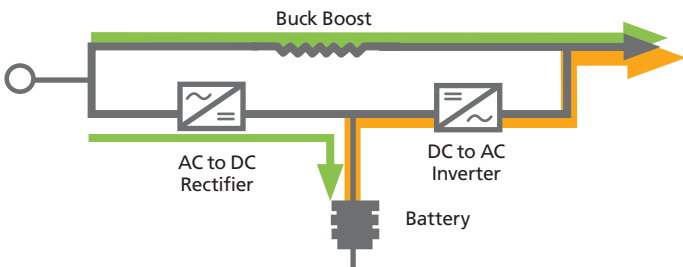
UPS Topologies

There are several different UPS topologies that provide varying degrees of protection. Selecting the best fit depends on several factors, including the level of reliability and availability desired, the type of equipment being protected, and the application/environment. While all four of the most common UPS topologies outlined below meet the input voltage requirements for IT equipment, there are key differences in how the result is achieved, as well as the frequency and duration of demands on the battery.

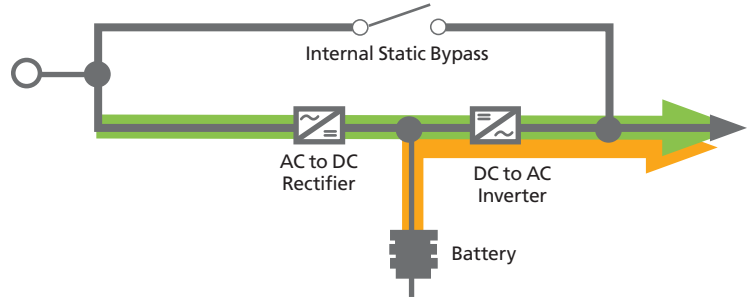
Standby UPSs allow equipment to run off utility power until the UPS detects a problem, at which point it switches to battery power to protect against sags, surges or outages. This topology is best suited for applications requiring simple backup such as small office/home office and point-of-sale equipment.



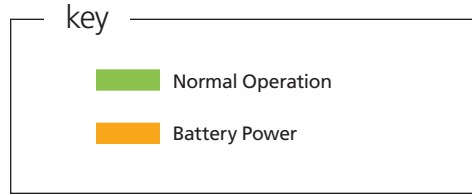
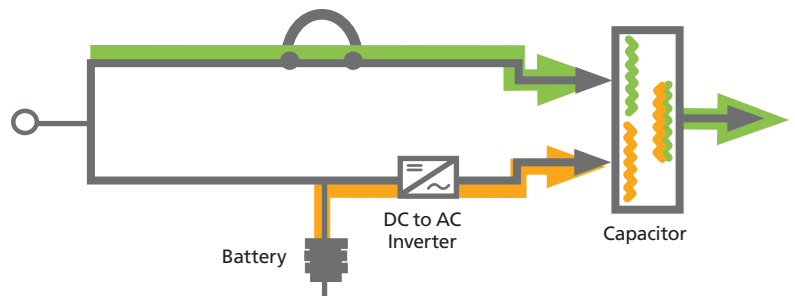
Line-interactive UPSs actively regulate voltage either by boosting or decreasing utility power as necessary before allowing it to pass to the protected equipment or by resorting to battery power. Line-interactive models are ideal for applications where protection from power anomalies is required, but the utility power is relatively clean. MDF and IDF communication closets, non-centralized server and network rooms, and general IT enclosures are ideally suited for this topology.



Online UPSs provide the highest level of protection by isolating equipment from raw utility power—converting power from AC to DC and back to AC. Unlike other topologies, double conversion provides zero transfer time to battery for sensitive equipment. This topology is best applied to mission-critical equipment and locations where power generally is poor.



Ferroresonant UPSs operate similarly to line-interactive models with the exception that a ferroresonant transformer is used to condition the output and hold energy long enough to cover the time between switching from line power to battery power, which effectively means a no-break transfer. Many ferroresonant UPSs are 82-88 percent efficient and offer excellent isolation. Although no longer the dominant type of UPS, these robust units are still used in industrial settings, such as the oil and gas, petrochemical, chemical, utility, and heavy industry markets.



Eaton UPS Solutions for the Desktop, Server Room, or Data Center

Black Box and Eaton

Need a UPS? Black Box has partnered with Eaton to provide the best uninterruptible power supply technology available. Eaton's UPSs are designed to deliver high-quality backup power from desktop PCs to large data centers.

Black Box Tech Support can recommend the right solution for your application. Just call us.

Power Management Monitoring and Control

Eaton's Intelligent Power Software Suite incorporates two important applications for ensuring quality power and uptime.

The Intelligent Power Manager supervisory software lets you monitor and manage multiple power and environmental devices across the network from a single interface, giving you up-to-the-minute information on the status of power in your network. It also works seamlessly with VMware's vCenter™ Server and vMotion, as well as other platforms and migration applications.

UPS Solutions



5PX UPS & 9PX UPS

Efficiency: Provides industry leading efficiency of up to 99 percent.

LCD display: Eaton's next-generation LCD offers a graphical interface that provides all critical UPS information in a single view.

Battery life: Eaton's exclusive ABM technology increases battery service life by 50 percent.

More power: Protects more devices by providing 28 percent more power compared to traditional UPSs.

Software management: Eaton's Intelligent Power Software suite allows you to monitor and manage your network power devices.

1000-3000VA



9155 UPS

True double-conversion online operation protects equipment from the most common power problems.

Efficiency: High-efficiency design saves money on operating costs across all load levels.

Size: Compact tower design delivers maximum power density, providing 5,500 watts per square foot with .9 output power factor.

Capacity: Easily add capacity or redundancy with Powerware Hot Sync paralleling technology.

Battery life: Eaton's exclusive ABM technology increases battery service life by 50 percent.

Software management: Eaton's Intelligent Power Software suite allows you to monitor and manage your network power devices.

5000-11,000VA



Blade UPS

Mission critical environments: Protects mission-critical applications with innovative backup power technology designed specifically for high-density computing environments.

Growth: Modular, scalable, and flexible backup power architecture provides building-block upgrades from 12kW to 60kW in a single cabinet.

Size: Conserves valuable rack space with 12kW of power in only 6U of rack space, including batteries.

Performance and savings: Reduces energy costs and cooling needs through best-in-class performance.

Battery life: Eaton's exclusive ABM technology results in more uptime and fewer battery replacements.

Service: Installation and service is simplified by true plug-and-power connections and hot-swappable batteries and electronic modules.

8, 10, 12, 15kVA

Intelligent Power Protector protection software provides graceful, automatic shutdown of network devices during a prolonged power disruption, preventing data loss and saving work-in-progress. As part of Eaton's power network management system, these two applications work together to deliver comprehensive power management and protection.

Both software programs are compatible with virtualization platforms from VMware®, Microsoft®, Red Hat®, and Xen.



Eaton Intelligent Power Manager



Eaton Intelligent Power Protector

UPS Solutions



9E UPS

Efficiency: Provides industry leading efficiency of up to 98 percent.

Protection: Provides surge protection for the entire load.

Compact footprint: Up to 35 percent smaller than similar solutions.

Cost of ownership: Maximize your return on investment (ROI). Delivering the lowest TCO of any UPS in its class.

Compact footprint: Up to 35 percent smaller than comparable competitors.

Software management: Eaton's Intelligent Power Software suite allows you to monitor and manage your network power devices.

12-60kVA



93PM UPS

Cost of ownership: Eaton's acclaimed Energy Saver System (ESS) delivers unbeatable energy efficiency without compromising power protection or availability.

Efficiency: Reduces power and cooling expenses. Provides up to 99 percent efficiency in ESS mode and 97 percent efficiency in double-conversion mode.

Compact footprint: The smallest footprint of any UPS in its class. 35 to 50 percent smaller than competitive units.

Easy deployment: Flexible deployment and configuration including wall, row, and hot aisle/cold aisle configurations.

Software management: Eaton's Intelligent Power Software suite allows you to monitor and manage your network power devices.

20-60kVA



9390 UPS

Transformer-less design: Provides increased efficiency over transformer-based UPS units resulting in a smaller footprint and higher power density.

Voltage options: Conventional 208V and 480V designs for standard U.S. power systems. 400V design available for higher efficiency U.S. systems.

Flexible deployment: Place directly against a wall or in a corner. The front panel provides complete access for service and maintenance.

Powerware hot sync: Easily expandable system capacity.

Advanced battery management: Cyclical battery charging increases service life, reducing TCO. Battery condition monitoring, testing and alerts identify problems before they affect your network.

Low total harmonic distortion: Low input THD ensures compatibility with generators in the event of prolonged power loss. Low-output THD provides clean power for your equipment.

100kVA 20-160KW

Basic

Power Fallback PDUs connect to two different power feeds. If the primary feed goes down, the PDU switches to the secondary feed in a few milliseconds.

120V, 15A, (8) 5-15R Outlets



PFBS120

Basic PDUs are best for standard or basic applications. They provide no remote management or metering functions.

200–250V, 24A, (24) C13 Outlets



PDUBV24-S20-200+

200–250V, 20A, (12) C13 Outlets



PDUBH12-S20-200+

120V, 20A, (14) 5-20R Outlets



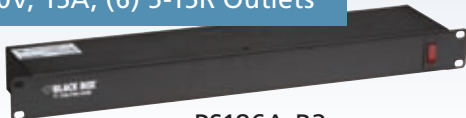
PDUBH14-S20-120V

120V, 20A, (8) 5-20R Outlets



SP194A-R2

120V, 15A, (6) 5-15R Outlets



PS186A-R2

Metered

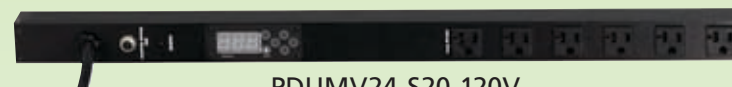
Metered PDUs have an LCD display that shows current load. Some have an alarm that sounds if the current draw approaches the maximum current rating.

200–250V, 30A, (12) C13 Outlets



PDUMH12-S30-200+

120V, 20A, (24) 5-20R Outlets



PDUMV24-S20-120V

120V, 15A, (14) 5-15R Outlets



PDUMH14-S15-120V

Managed

120V, 20A, (16) 5-20R Outlets



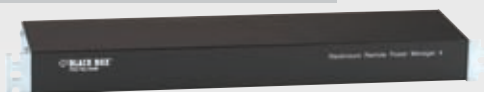
MPSH16-D20-120V

120V, 20A, (8) 5-20R Outlets



MPSH8-S20-120V

120V, 15A, (4) 5-15R Outlets



PS580A-R2

Managed PDUs have receptacles that can be individually controlled from a remote location.

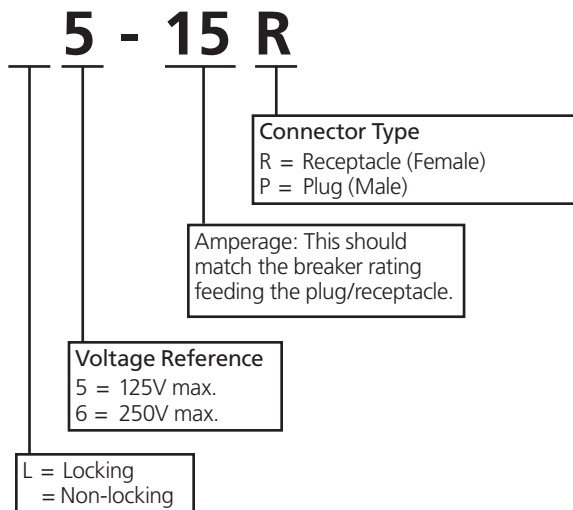
- Help reduce IT power consumption.
- Perform scheduled shutdowns during off-peak hours.
- Enable you to precisely analyze usage so you can zero in on waste.
- Switches power on/off for individual network devices or for groups of equipment.

Plugs and receptacles.





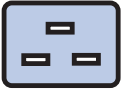




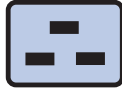
When selecting a power strip or PDU, it's important to choose the correct plug and outlet type. The first thing to consider is what line voltage and outlet type are available at the location where the strip or PDU will be installed. You must match the voltage and plug type on the power strip or PDU to what you have available. For example, if you have a NEMA 5-15R available on you wall, you can't plug a NEMA 5-20P into it.

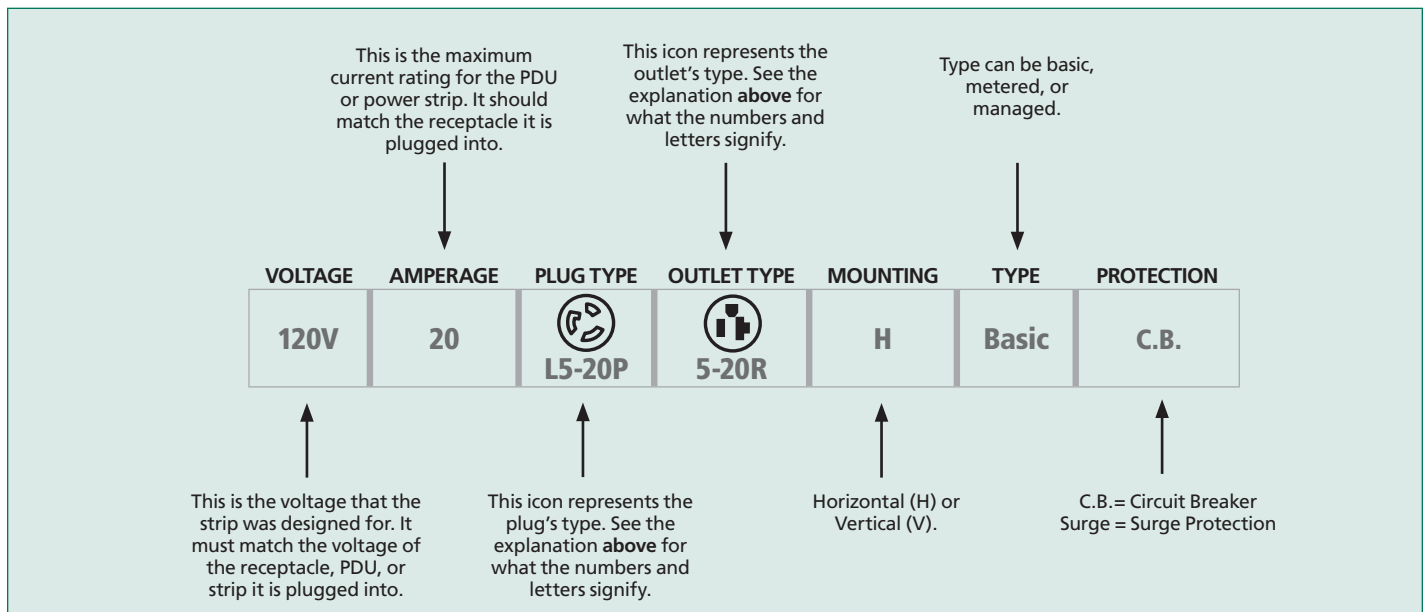
The next step is to identify what type of outlet or outlets you need to plug your equipment into. Some PDUs offer two or three different outlet types on the same unit but most only have one. Some can even be configured with a custom set of input and output connectors. Outlets commonly available on strips and PDUs include 5-15R, 5-20R, C13, and C19. If required, locking outlets can be found on some UPS units or hardwired wall outlets. Locking plugs and receptacles prevent accidental disconnections and are preferred for higher voltage and mission-critical devices.

NEMA Plugs and Connectors Explained



Common IT Power Connectors

Plug Types				
	5-15	5-20	L5-20	
				
	C14	C20	L6-30	
	Receptacle Types			
		5-15	5-20	C13
				
C19				

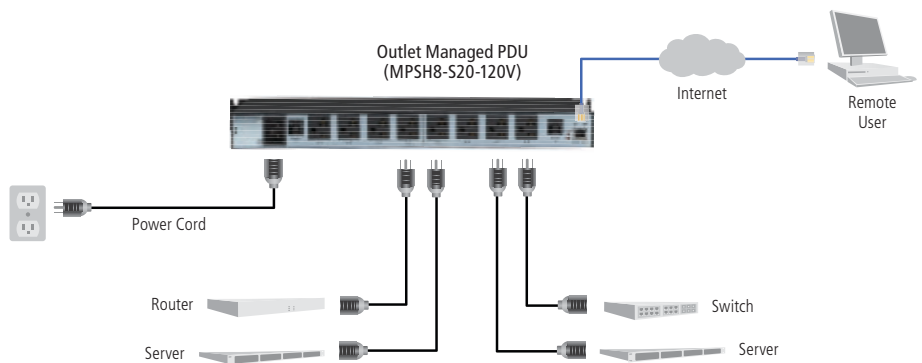


Remotely switch and manage power for one network device or multiple devices.

VOLTAGE	AMPERAGE	INPUT TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120 208-240	20	C20	5-15R	H	Managed	—

Outlet-Managed PDUs

- Get complete power control: remote and timed individual outlet switching, auto on/off/reboot, load shed switching, outlet sequencing, and more.
- Switch power on/off for individual network devices or for groups of equipment.
- Monitor equipment power and automatically notify you of changes in current levels, circuit breaker status, temperature, unauthorized access attempts, ping response, and more.
- Notify you via e-mail, text, SNMP, SYSLOG, and audible alarms when user-defined thresholds are exceeded.
- Generate reports with detailed records of current and power consumption.
- **Standard Warranty** — 5 Years
- **Extended Warranty** — Add 1 or 3 Years



Networks today demand 98%+ uptime. When it's your job to make sure your network equipment is up and running, Black Box® Outlet-Managed PDUs can be one of your best friends in the data center.

One of these switched PDUs will keep an eye on your network equipment no matter if you're in the office, across the country, or asleep at home at 3 A.M. You'll know if something is going wrong so you can correct the situation before it turns into a crisis. The PDU will automatically notify you via e-mail, text message, SNMP, or SYSLOG when changes in current levels, temperature, circuit breaker status, and other factors exceed threshold values that you set. This gives you the chance to reboot your rackmounted equipment when devices aren't responding; disable outlets to reduce current consumption; or even switch on cooling devices to lower the rack/cabinet temperature.

You can reboot equipment over the Internet, via a text message, through an external modem, or a local terminal plugged into the RS-232 port. The PDU also features a 10/100BASE-T port for network connections.

Individual or group play.

One of the best features of these PDUs is the ability to remotely switch one outlet, a group, or a branch, or to switch a whole group of outlets. You can also set the PDU to monitor one outlet, a group, or a branch of outlets.

Sound the alarm.

The PDU boasts a robust selection of monitoring features to help you keep tabs on vital network equipment, avoid costly service calls, and maximize uptime. You can customize the PDU to your network by selecting the alarms and setting individual thresholds.

Use the PDU to alert you when, for example, the temperature gets too high, the power supply has been interrupted, excessive invalid passwords are attempted, and much more.

Power down.

Another great feature of these switched PDUs is that you can set them to respond automatically in case you're not there. Set the parameters for the PDUs to disable outlets to reduce current consumption or to switch on cooling devices. If the current load goes too high, it intelligently sheds load by temporarily shutting down non-essential devices.

Outlet-Managed PDUs

8-Outlet, Single-Circuit	120 VAC, 20-Amp 208+ VAC, 20-Amp	MPSH8-S20-120V MPSH8-S20-208+V
8-Outlet, Dual-Circuit	120 VAC, 20-Amp 208-240 VAC, 20-Amp	MPSH8-D20-120V MPSH8-D20-208+V
16-Outlet, Dual-Circuit	120 VAC, 20-Amp 208+ VAC, 20-Amp	MPSH16-D20-120V MPSH16-D20-208+V

◆ Include (1) PDU and rackmount brackets

For full features and specs, go to blackbox.com.

Three-phase power

Three-phase power is the most efficient way to distribute power over long distances and allows for large industrial equipment to operate more efficiently. It's characterized by three single-phase waves that are offset in their phase angle by 120 degrees, or one-third of the sine wave period as illustrated in Figure 1. This phase angle is why the power can go long distances.

Three-phase voltage can be measured from each phase to neutral or from one phase to any other. The voltage relation between phase-to-neutral and phase-to-phase is a factor of the square root of 3 (e.g., 120V versus 208V).

Conversely, single-phase power is distributed through common household outlets to power everyday equipment such as laptops, lighting, and televisions. When looking at an oscilloscope image of the voltage coming out of a single-phase outlet as illustrated in Figure 2, there's only a single wave. Single-phase power is obtained by simply using only one phase of a three-phase system. Its root mean square (RMS) voltage is 120V (for North America) and it oscillates between its peaks of $\pm 170V$ at 60 Hz (or 60 times a second).

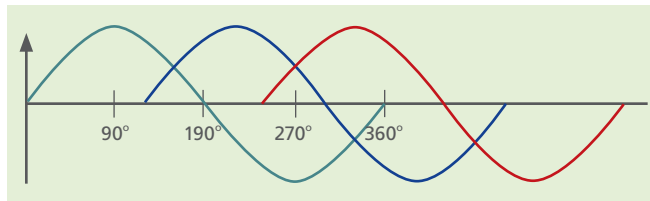


Figure 1. Three-phase power

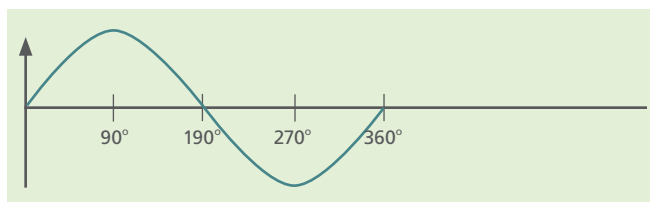



Figure 2. Single-phase power

Convenient rackmount power control for up to 16 remote network devices.

Rackmount Remote Power Managers

- Reboot up to 4, 5, 8, or even 16 network devices.
- Control devices via Telnet™, serial commands, over a TCP/IP network, a Web browser, or a modem.
- Feature individually controllable outlet plugs.
- Include password protection plus encrypted 64-bit password security.
- Only authorized users can make configuration changes.
- Feature an easy-to-use graphical interface.
- **Standard Warranty** — 5 Years
- **Extended Warranty** — Add 1 Year or 3 Years

Reboot up to 16 network devices from across your network by modem or from the Internet. Just type the power manager's IP address into your Web browser, enter your name and password, and access your network devices to switch them on, switch them off, or reboot. The power managers are perfect for remotely rebooting servers, routers, network switches, Web cams, firewalls, and other network devices.

VOLTAGE	AMPERAGE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120, 208-240	20	 5-15R C13	H	Managed	C.B.



Horizontal Rackmount Remote Power Managers

105-120 VAC Single Circuit, (4) NEMA 5-15 Outlets	PS580A-R2
100-120 VAC Dual Circuit, (8) NEMA 5-15 Outlets Dual Circuit, (16) NEMA 5-15 Outlets	PS568A-R2 PS569A-R2
208-240 VAC Single Circuit, (4) IEC-320-C13 Outlets Dual Circuit, (8) IEC-320-C13 Outlets Dual Circuit, (16) IEC-320-C13 Outlets	PS581A-R2 PS582A-R2 PS583A-R2

For full features and specs, go to blackbox.com.

See the current draw on a digital LCD display.

Metered Rackmount PDUs with Front and Rear Outlets

- Amp meter measures AC current flowing through the outlets and shows current draw on a digital LCD readout. Alarm sounds if overcurrent is detected.
- Feature 15-amp or 20-amp overcurrent protection.
- Fit in only 1U of rack space.
- NEMA 5-15R rated outlets on both front and back for extra convenience.
- The 6-foot (18-m) power cord is NEMA rated.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 Year or 3 Years

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	15/20	5-15P	5-15R	H	Metered	C.B.



PDUMH14-S15-120V

Metered Rackmount PDUs with Front and Rear Outlets

15-Amp	PDUMH14-S15-120V
20-Amp	PDUMH14-S20-120V

For full features and specs, go to [blackbox.com](#).

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	20	L5-20P	5-20R	V	Metered	C.B.

Space-saving PDU measures and displays AC current.

Vertical Metered PDU

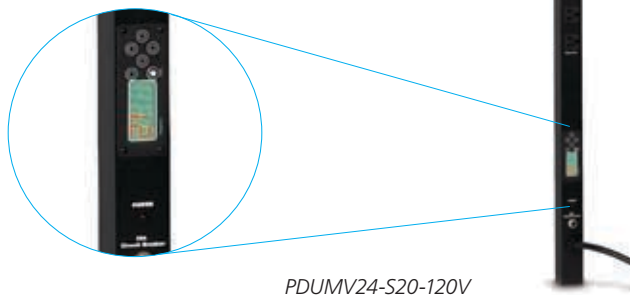
- Provides 24 NEMA 5-20R outlets.
- Includes mounting clips.
- Three-digit LED display shows current draw.
- Alarm notifies you when current threshold has been reached.
- Includes a 15-foot (4.5-m) NEMA L5-20P power cord.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 Year or 3 Years

NOTE: This PDU does not provide surge protection.

Vertical Metered PDU

[PDUMV24-S20-120V](#)

For full features and specs, go to [blackbox.com](#).



PDUMV24-S20-120V

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
200+	30	L5-20P	5-20R	H	Metered	C.B.

Provides 12 NEMA 5-20R outlets.

Horizontal Metered PDU



- The horizontal PDU is only 1U high and has rackmount ears.
- Three-digit LED display shows current draw.
- Includes a 12.5-foot (3.8-m) NEMA L6-30P power cord.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 Year or 3 Years

NOTE: This PDU does not provide surge protection.

Horizontal Metered PDU

[PDUMH12-S30-200+](#)

For full features and specs, go to [blackbox.com](#).

Get 14 outlets in only 1U of rack space.

20-Amp Rackmount Power Strip with Front and Rear Outlets

- Organize your power cords—front and rear outlets make access easy.
- Features 20-amp overcurrent protection.
- Fits in only 1U of rack space.
- Includes 6-ft. (1.8-m) cord with NEMA L5-20P plug.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

NOTE: This strip does not provide surge protection.



20-Amp Rackmount Power Strip

Front and Rear Outlets [PDU BH14-S20-120V](#)

For full features and specs, go to [blackbox.com](#).

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	20	L5-20P	5-20R	H	Basic	C.B.

Designed to meet your higher load-capacity requirements.

20-Amp Rackmount Surge Protector Power Strips

- Surge suppression is fail-safe 330-volt computer grade.
- Include a 20-amp circuit breaker (derated 16 amp).
- Fit all standard 19" relay racks.
- Feature eight, rear-mounted receptacles with 3" center-to-center spacing.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



Top: SP472A-R3, front view; bottom: SP472A-R3, rear view

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	20	L5-20P	5-20R	H	Basic	Surge

Selection Guide | 20-Amp PDUs

Twist-Lock Plug	On/Off Switch	Outlets	Circuit Breaker	Surge Protection	Clamping Voltage	EMI/RFI Noise	Surge Current (Maximum)	Cord Length	Code
•	•	8 Rear	20 Amp*	•	330 V	•	30,000 amp	15 ft. (4.5 m)	SP472A-R3
•	•	1 Front, 8 Rear	20 Amp*	•	330 V	•	30,000 amp	9 ft. (2.7 m)	SP194A-R2

*Derated to 16 amp.

Keep your rack neat—plug all your rackmount equipment into one central location.

Rackmount Power Strips and Surge Suppressors

- Organize your power cords with rackmountable power strips and surge suppressors.
- **Standard Warranty** — 2 Years: PS188A-R2; 1 Year: PS186A-R2, PS189A-R2, SP196A-R2, SP215A-R2
- **Extended Warranty** — Add 1 or 3 Years



Top: SP215A-R2; middle: PS188A-R2; bottom: PS189A-R2

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	15	5-15P	5-15R	H	Basic	C.B. Surge

19" Rackmount Power Strips, 6-Outlet

Rear Outlets, Reset/Power [PS186A-R2](#)

Rear Outlets [PS188A-R2](#)

Front Outlets, Reset/Power [PS189A-R2](#)

For full features and specs, go to [blackbox.com](#).

Premium Rackmount Surge Suppressor

6 Rear Outlets [SP215A-R2](#)

Rackmount Power Strip

1 Front, 8 Rear Outlets [SP196A-R2](#)

For full features and specs, go to [blackbox.com](#).

Put outlets where you need them.

20-Amp Vertical AC Power Outlet Strip

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	20	L5-20P	5-20R	V	Basic	C.B.



- Provides 24 NEMA 5-20R receptacles.
- Mounts vertically in your cabinet or rack.
- Includes a 15-foot power cord.

- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

NOTE: This strip does not provide surge protection.

20-Amp Vertical AC Power Outlet Strip

[PDUBV24-S20-120V](#)

For full features and specs, go to [blackbox.com](#).

Bring powerful organization with easy installation to your cabinets.

Vertical AC Power Outlet Strips

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	15	5-15P	5-15R	V	Basic	—

- Mounts vertically in your cabinet or rack.
- Includes a 15-foot power cord.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



NOTE: These strips do not provide surge protection.

Vertical AC Power Outlet Strips

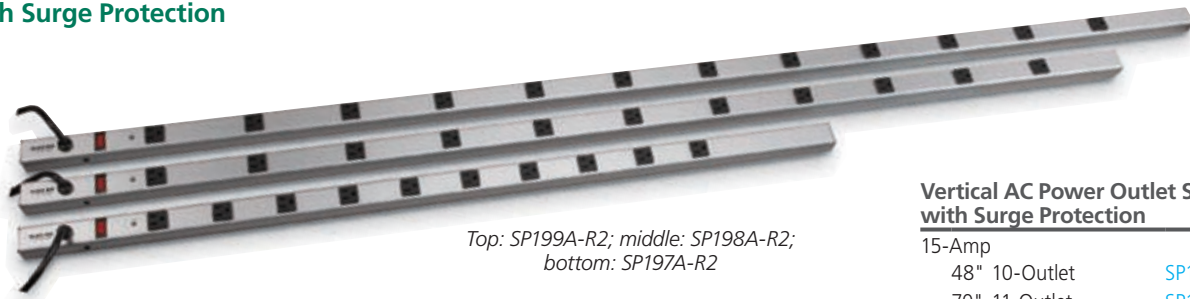
26"	8-Outlet	PS182A-R2
49"	16-Outlet	PS181A-R3

For full features and specs, go to [blackbox.com](#).

Get safe, convenient power access for cabinets and racks.

Vertical AC Power Outlet Strips with Surge Protection

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	15, 20	5-15P 5-20P	5-15R 5-20R	V	Basic	Surge



Top: SP199A-R2; middle: SP198A-R2; bottom: SP197A-R2

- 120-VAC strips provide surge protection for cabinet- or rackmounted equipment.
- A green light indicates surge suppression.
- Include a 15- or 20-amp circuit breaker.
- Integral 15-foot cords with molded-on plugs.
- Wallmounting hardware included.

- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

Vertical AC Power Outlet Strips with Surge Protection

15-Amp		
48"	10-Outlet	SP197A-R2
70"	11-Outlet	SP198A-R2
77"	12-Outlet	SP199A-R2
20-Amp		
24"	8-Outlet	SP214A-R3
48"	10-Outlet	SP216A-R2
70"	11-Outlet	SP217A-R2
77"	12-Outlet	SP218A-R2

For full features and specs, go to [blackbox.com](#).

Get twice the capacity of an ordinary power strip with this slim PDU.

Dual-Circuit Power Distribution Unit, 30-Amp

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	30	L5-30P	5-20R	V	Basic	C.B.



- Provides 24 NEMA 5-20R receptacles.
- 30-amp capacity enables you to draw twice as much power as a standard power strip.
- Features two UL® 489 Listed 15-amp (12-amp derated) circuit breakers, each with a front reset.
- Each circuit is independent—when one is overloaded, the other still gets power.
- Has a 12-foot power cord with L5-30P plug.
- Install with T-slot mounting rail or included rackmount brackets.
- **Standard Warranty** — 2 Years
- **Extended Warranty** — Add 1 or 3 Years

Dual-Circuit Power Distribution Unit, 30-Amp
[PS585A](#)

For full features and specs, go to [blackbox.com](#).

Add power outlets wherever you need them.

Outlet Power Strips



VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120	15	5-15P	5-15R	V	Basic	—

- Feature a circuit breaker with reset button.
- Electrically and mechanically grounded.
- Rated at 15 amps (12 amps derated), 125 volts, 60 Hz maximum. (Rating is for the entire strip, not individual outlets.)
- The lighted power switch gives you power status at a glance.
- Include two slide-on mounting clips and two screws.
- Constructed of aluminum.
- **Standard Warranty** — 1 Years
- **Extended Warranty** — Add 1 or 3 Years

Outlet Power Strips

- 6-ft. (1.8-m) Cord
 - 6-Outlet [PS163A-R2](#)
 - 8-Outlet [PS164A-R2](#)
- 5-ft. (4.5-m) Cord
 - 6-Outlet [PS166A-R2](#)
 - 8-Outlet [PS167A-R2](#)

◆ All include (1) power strip, (2) slide-on mounting clips and (2) screws.

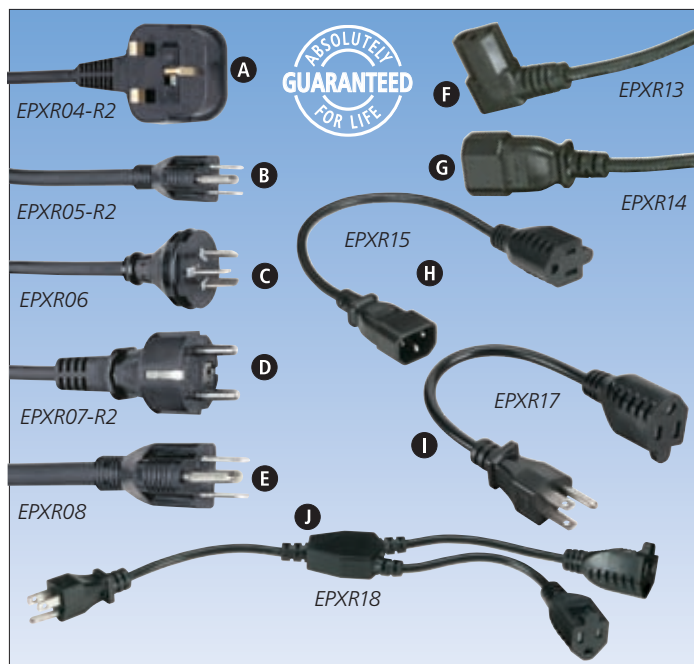
For full features and specs, go to [blackbox.com](#).

NOTE: These strips do not provide surge protection.

Power up in North America and around the world.

Power Cords

- One end features a molded IEC 320 plug for the computer connection. The other end has the appropriate power plug for that country or region.
- **Standard Warranty** — Lifetime



Power Cords

International PC/Monitor Power Cords, 6.5-ft. (2.0-m)

- IEC 320 Female to Power Plug Male for:
 - A** U.K. [EPXR04-R2](#)
 - B** Japan [EPXR05-R2](#)
 - C** Australia [EPXR06](#)
 - D** Europe [EPXR07-R2](#)

North American (N.A.) PC/Monitor Power Cords

- IEC 320 Female to N.A. 3-Prong Power Plug Male
 - E** In-Line 6.5-ft. (2.0-m) [EPXR08](#)
 - 10.0-ft. (3.0-m) [EPXR12](#)
 - F** Right-Angle 6.5-ft. (2.0-m) [EPXR13](#)

Extension Power Cord

- G** IEC 320 Female to Male 6.0-ft. (1.8-m) [EPXR14](#)

PC Adapter Cords

- IEC 320 Male to N.A. 3-Prong Power Plug Female
 - H** 1.0-ft. (0.3-m) [EPXR15](#)
 - 6.0-ft. (1.8-m) [EPXR16](#)

Outlet Saver AC Mini Extension Cord, 10" (25.4-cm)

- I** N.A. 3-Prong Power Plugs, Male to Female [EPXR17](#)

Power Cord Y Adapter, 12" (30.5-cm)

- J** N.A. 3-Prong Power Plugs, Male to Female/Female [EPXR18](#)

For full features and specs, go to [blackbox.com](#).

Fallback Power Switches

A Reliable Power Redundancy Solution for Single-Inlet Security Devices

In this security-conscious age, webcams, motion detectors, and badge scanners have become increasingly common elements in most businesses and public facilities. It doesn't matter if you're checking ID cards, observing activity in a lobby or community space, or monitoring a building during off-hours for suspicious activity; most mission-critical security applications rely on the sort of constant vigilance that can only be supplied by a monitoring device, ID scanner, or electronic sensor.

An intelligently planned electronic security system can monitor badge-in/badge-out activity, detect movement in buildings during non-work hours, generate alarms when doors are opened in secure areas, and keep watch over huge buildings without the need for regular patrols by ever-present security personnel.

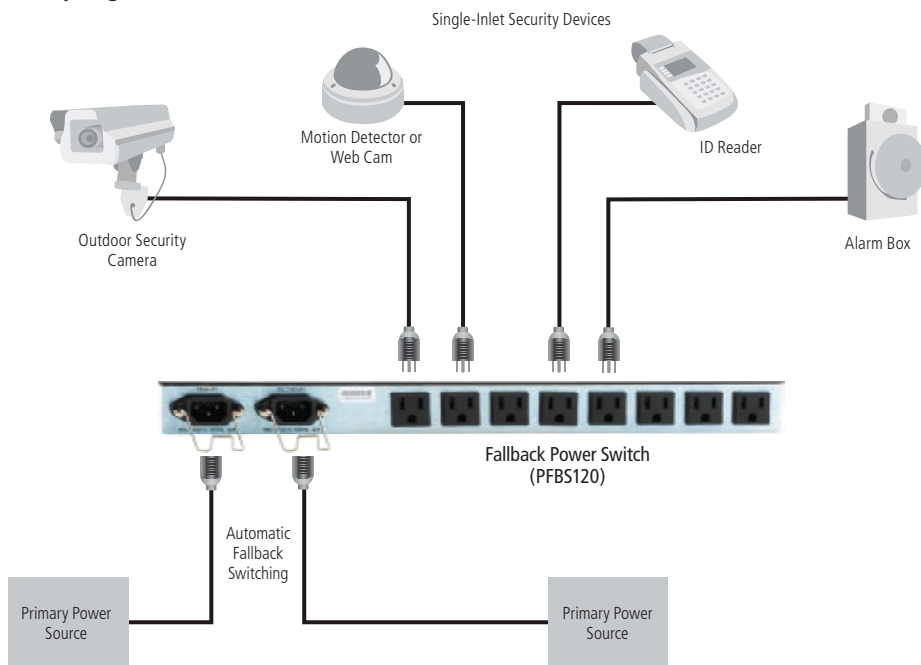
But as useful as these devices are, it's important to remember that many electronic sensors and monitoring devices do not include power fallback capabilities, and as such, they can often be rendered useless by a simple power interruption. This means that even if your security solution includes the most advanced equipment available, without a reliable power fallback solution, your building can still be left unprotected during a power outage or blackout—or when external power to the security system has been purposely defeated.

If your security system or access control application lacks an effective power redundancy solution, fallback

power switches can provide fast, reliable power fallback capabilities, without the need to replace existing single power inlet devices with new, dual-inlet devices. The switches can help to minimize or eliminate downtime for your security system by ensuring that even when your main power source is not available, the security system can automatically switch over to a back-up power source almost instantaneously.

Installation of a fallback power switch is simple. No switch configuration is required; just connect the fallback power switch to your primary and secondary power supplies and then connect your single inlet security devices to the switch's outlets and you're ready to go.

Once installed, the switch will continuously monitor the power source, checking for instability or other trouble signs. If power to the fallback power switch is interrupted, it can quickly switch to the back-up power supply, providing nearly seamless power switching with switchover times less than 16 milliseconds—fast enough that the switchover is generally undetectable by most devices. Later, if the switch determines that the primary power supply has been restored or stabilized, it can also automatically switch from the secondary power supply back to the primary power supply.



Reliable, seamless, automatic power switching.

Fallback Power Switches

- Provide redundant power to any AC-powered device that does not include a secondary power inlet.
- Automatically switch to a secondary, backup power source if the primary source fails.
- Rackmountable in only 1U of space.
- Easy installation—no configuration needed.
- Offer the perfect power redundancy solution for single-cord devices.
- **Standard Warranty** — 5 Years
- **Extended Warranty** — Add 1 or 3 Years

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120, 200–240	15/20			H	Basic	—



Fallback Power Switches

120-VAC	PFBS120
240-VAC	PFBS240

For full features and specs, go to blackbox.com.

NOTE: Switches do not include power cords.

Tech Overview: Data Line Surge Protectors

By Monty Wilsher, Product Engineer

Data is transmitted across copper lines using electrical impulses. Unexpected electrical interference on these lines can interrupt the operation of your network, so it is imperative to have a good surge protection system in place.

Where surges come from

Power lines aren't the only way surges can get to your equipment. Any communications line can also be a source of damaging surges. These surges can come in from the outside through telecommunications lines. However, many surges that are assumed to originate in phone or other telecommunications lines actually enter on power lines and find a ground in the phone line.

Data line surges can also originate in your own equipment. This is because most networking devices are connected to both a power line and a data line. If the data ground is "better" than the power ground—for instance if it's plugged into an ungrounded outlet—then any electrical system surge will go through the equipment circuitry and out the data ground, often traveling across data lines into other equipment to do so. Data line surges often damage equipment that was thought to have been already protected because it had surge protectors on the power lines.

EMI/RFI

Electromagnetic interference (EMI) and radio-frequency interference (RFI) can interfere with data transmission over copper wires, slowing communication and causing errors. Although EMI/RFI often comes in over your equipment's power lines, it can also affect data lines directly when your network cabling is installed near sources of interference, such as fluorescent lights or elevator motors.

Ground loops

An electrical problem not often thought about or understood is that of ground loops, which are often encountered when running copper data lines between two buildings, although they can occur within the same building as well.

When a copper cable links devices that draw power from separate electrical sources with different grounding systems, ground loops can happen. Although each device references its own grounding system as zero volts, differences in the earth's composition at the separate grounding sites may actually yield a voltage difference higher or lower than zero when the systems are compared to one another. If there is a difference, a ground loop is created when the two devices are connected and the excess energy causes the data line voltage to fluctuate as information is transmitted in both directions.

Unlike electrical surges, which are fast-rising voltage spikes that last a very short time, a ground loop is a constant electrical state that can, over time, cause equipment malfunctions or even severe damage. It's tough to diagnose ground loops, but unexplained system damage such as strange outages and failing components are all common symptoms of the problem. Fortunately, ground loops can be easily prevented.

Static electricity

We've all felt the subtle sting of a static electric shock—that tiny spark that arcs from your fingertips to a metal doorknob after you've walked across a carpeted surface. But did you know that a single electrostatic discharge packs enough energy to damage electronic equipment?

Static electricity is a charge that builds up when two dissimilar objects rub against one another—like fabric in a clothes dryer or shoes on a carpet. Under normal conditions, this charge dissipates gradually through conduction with the moisture in the air around us. But when the air is



particularly dry, there's less humidity so the air becomes much less conductive. This provides an opportunity for electrostatic charges to accumulate quite a large potential, which, if discharged by touching sensitive electronic devices, may be destructive.

You can take precautions to avoid the threat of static discharges by using special static-free floor mats in your work area and by humidifying the air in your building.

Types of surge protectors

There are many different kinds of surge protectors. Surge protectors installed on power lines don't absorb or otherwise diminish damaging power surges. Their primary function is to divert these destructive forces away from your sensitive circuitry.

There are four basic kinds of surge protectors: metal oxide varistors (MOVs), avalanche diodes, filters, and gas tubes.

Metal oxide varistors (MOVs) are a common choice. The word varistor is a combination of two words: variable resistor. As these words imply, an MOV is a highly resistive device that triggers during an AC power surge and diverts the excess voltage, preventing it from reaching your expensive computer equipment.

MOVs are designed to accommodate surge levels up to a specified breakdown voltage. When this limit is exceeded, the MOV varies from a highly resistive state to a state of low resistance. The excess energy is "clipped" from the power line and sent to ground.

Surges occurring at the peak of a sine wave are clipped by the MOV, but high-voltage spikes may still occur (though they'll eventually be clipped), and the MOV response times can range up to 500 picoseconds. This is the primary weakness of an MOV, but it's usually overcome by the inclusion of some other suppression technique within the surge protector.

Avalanche diodes, also known as Zener diodes, are semiconductor devices similar to MOVs, but they feature much faster response times (usually less than one picosecond). Avalanche diodes are available in a wide range of sizes to provide accurate and repeatable voltage clamping. However, they have a limited ability to withstand large surges, which means they should be combined with other devices to make them useful for lightning surge protection.

Filters are also usually built into surge protectors, along with other suppression devices, to offer enhanced levels of protection. They're made up of discrete coils, called chokes, and capacitors that are designed to filter noise occurring within specific frequency ranges on AC power lines.

Gas discharge tubes are specialty devices usually installed near a building's main service entrance or transformer to divert particularly devastating surges well before they enter your building. Intense voltage levels striking the tube ionize the gas, turning it into a conductive path to ground. Gas discharge tubes generate their own disruptive high-frequency levels during this grounding process, so they should never be installed near

any electronic equipment that might be damaged as a result.

Gas tubes can absorb huge voltages, so they're often used to protect against lightning strikes. However, they take a certain amount of time to activate—just enough time to let in a surge that can damage electronic equipment. For this reason, they're best used with other forms of surge protection.

Because all the common surge protection methods have inherent advantages and disadvantages, the best systems use more than one type achieve the best performance. The most common combinations incorporate a high-current but relatively slow-acting component with a faster-acting but lower-power-rated component.

Choosing surge protectors

A good surge-protection system involves more than one type of protection—silicon avalanche diodes for quick response, for example, with gas tubes to take the main hit. When evaluating surge protectors, you should also look at the clamping voltage, UL® clamping category, and the maximum surge current.

Clamping voltage is a measure of the actual voltage level that the protective device will allow through to your equipment. Often called the let-through voltage, this measure is the best performance indicator to consider when choosing surge protection equipment. The lower the number, the better the degree of protection.

UL® clamping category is a rating of surge protector effectiveness defined by Underwriters Laboratories®. As with clamping voltage, the lower the number of the UL® clamping category, the better protection you can expect for your equipment. However, note that devices rated within a similar category may have a wide range of clamping voltages.

Maximum surge current is a measure of overall capacity for diverting surges or the highest voltage a surge protector will take before sacrificing itself. In the face of an extremely large surge, a surge protector will break the link to your hardware and sacrifice itself.

Solutions for data line electrical problems

Fiber optic cable

Fiber optic cable is the ideal choice for installations between buildings because it doesn't carry electrical surges caused by nearby lightning strikes or cause ground loops. All your data line surge, interference, and ground loop problems can be solved simply by installing fiber optic rather than copper cable. Common copper cable works by carrying electrical impulses. The problem is that any other kind of electrical impulse can also travel along the copper cable, too. On the other hand, fiber optic cable is completely

immune to interference. The fiber is made of glass, which is an insulator, so no electric current can flow through.

There are other reasons to choose fiber optic cable as well: Fiber offers greater bandwidth than copper and can operate over longer distances. With all these benefits and with the cost of fiber installation dropping, fiber optic cable is rapidly becoming a top choice for new cable installations.

If you have existing copper cabling, fiber optic cable can be used to create surge-proof "firewalls" within your network.

Copper cable solutions

One basic precaution for copper cable is to avoid running it in electrically noisy areas such as near heavy machinery. If you must run copper cable through an electrically noisy area, choose a shielded cable. Foil is the most basic cable shield; a copper-braid shield provides even more protection.

There are two primary options to protect data lines from surges: grounded surge protectors and opto-isolation.

Grounded surge protectors—usually with avalanche-diode technology—divert excess energy to an earth ground. They're simple to install: Just connect them between ports and data lines, then connect the ground. That little pigtail of a ground wire hanging off the surge protector is very important. It needs to be connected to ground for the surge protector to work. If you install the surge protector but don't connect the ground, you might as well not install a surge protector.

Opto-isolators use fiber optic technology to effectively break the pathway over which potentially damaging ground loops can travel between separate electrical systems. These devices contain photoelectric transistors that introduce a physical gap in the circuit. The transistors convert digital electrical signals from copper wires into light pulses that are transmitted optically across this air gap, interrupting the copper-wire connection. This enables you to use your existing copper wire without worrying about ground loops.

There are a variety of opto-isolators to choose from, so select one that's appropriate for your system. Just one standalone unit can provide protection for an entire between-building network. Many surge protectors feature built-in opto-isolators, but if you use these in a building-to-building network, you need to install one at each site. That's because even though one opto-isolator is all it takes to prevent ground loops, you still need dedicated surge protection at each end of the circuit to prevent damaging surges and spikes from entering either building over the outdoor cable.

If you've already installed copper cable between buildings and decided that replacing it with fiber optic cable is cost prohibitive, opto-isolation is an inexpensive cure for ground loops.

Key Factors to Consider When Rating Surge Protectors

Clamping Voltage

This is a measure of the actual voltage level that the protective device will allow through to your computing equipment. Often called the let-through voltage, this measure is the best performance indicator to consider when choosing surge protection equipment. The lower the number, the better the degree of protection.

UL® Clamping Category

Underwriter Laboratories® has defined several categories for rating surge-protector effectiveness. As with clamping voltage, the lower the number of the UL clamping category, the better protection you can expect

for your equipment. However, note that devices rated within a similar category may have a wide range of clamping voltages.

Maximum Surge Current

This is a measure of overall capacity for diverting surges. Protective devices are designed to keep surges from your computer. In the event of an extremely large surge, they'll do this by breaking the link to your hardware and sacrificing themselves. Ultimately, they're designed to fail. This rating provides a measure of their performance ability in extreme cases.

Stop ground loops of up to 2500 volts from wreaking havoc on your system.

Opto-Isolators

Our High-Speed Opto-Isolator (SP340A-R3) protects devices with 115.2-kbps serial ports up to 1000 feet (304.8 m) on either side of the interface.

The RS-422/485 Opto Isolator (SP401A) protects RS-422/485 lines up to 2000 feet (609.6 m). Order the Bidirectional Converter (IC109A-R3) to protect RS-232 to RS-422/485 lines.



SP340A-R3

- **Standard Warranty** — SP340A-R3: 5 Years; SP401A, IC109A-R3: 1 Year
- **Extended Warranty** — Add 1 or 3 Years

Opto-Isolators

High-Speed Opto-Isolator [SP340A-R3](#)

RS-422/RS-485 Opto-Isolator [SP401A](#)

RS-232 to RS-485/422 Bidirectional Converter Plus with Opto-Isolation, Standalone [IC109A-R3](#)

For full features and specs, go to blackbox.com.

Grounding & Bonding

All metal components in data center infrastructure (cabinets, racks, ladder rack, basket tray) should be bound to the grounding system to protect the equipment from electrical surges.

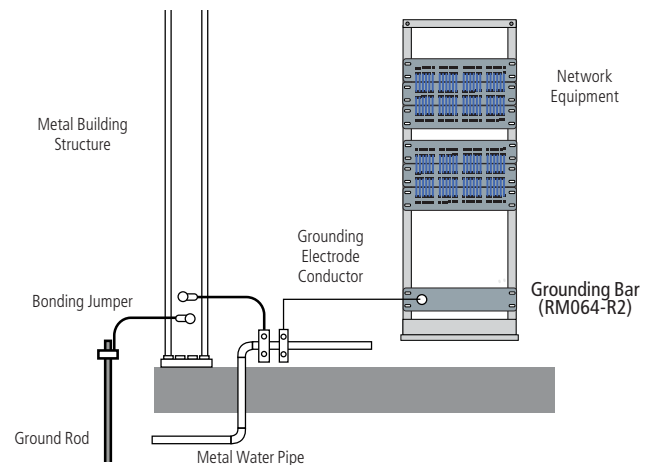
A grounding system with a poor ground is the same as having no ground at all. Recommended grounds are the utility company ground, a ground rod, well casings, and metal cold water pipes. (Caution: Metal cold water pipes can be repaired and/or extended using PVC, which renders the cold water pipe unusable as a proper ground. Other unacceptable grounds include sprinkler pipes, PVC pipe, conduit, buried wire, and any ground that cannot be verified.)

Bonding ensures the most effective ground for all equipment. It ties all of the grounds in the building together electrically. If there is a rise in ground potential and all of the grounds are bonded, no damage will occur since it is differential voltage that causes problems.

The ground used for AC power **MUST** be the same as the ground used for surge protectors. A common ground reference must be achieved for all equipment. In addition, all ground wires must be as short and straight as possible and not be coiled or looped. The larger the diameter of the ground wire, the better, as this results in better electrical conductivity. Finally, the earth ground resistance must be less than 5 ohms.

A properly designed grounding system has to be verifiable, sized to handle expected currents safely, and able to direct damaging currents away from sensitive equipment.

Lines that need protection include incoming telco lines, lines to off-premise sites, LANs, and cable runs between multiple buildings in campus environments. All lines entering or exiting a building need protection at both ends!



Protect computer and USB devices from voltage spikes and ground loops.

USB Opto-Isolators

- The USB to RS-232 Opto-Isolator provides 2000-volt RMS isolation against ground loops.
- The USB to RS-422/RS-485 Opto-Isolator provides 2000-volt protection.
- **Standard Warranty** — 2 Years
- **Extended Warranty** — Add 1 or 3 Years



SP385A-R2

SP390A-R2

USB Opto-Isolators

USB to RS-232 Opto-Isolator [SP385A-R2](#)

USB to RS-422/RS-485 Opto-Isolator [SP390A-R2](#)

For full features and specs, go to blackbox.com.

NOTE: Must be used in pairs.

Protects network interfaces up to CAT6 from damaging power surges.

CAT6 In-Line Surge Protector

- Protects CAT5, CAT5e, and CAT6 LAN interfaces against power surges, electrostatic discharges, and ground loops.
- Supports network speeds up to 1000 Mbps, making it ideal for Gigabit Ethernet applications.
- Use to protect network devices such as PCs, switches, routers, and more.
- State-of-the-art avalanche diode and thyristor technology.
- Low shunt capacitance reduces signal loss.



- **Standard Warranty** — 10 Years
- **Extended Warranty** — Add 1 or 3 Years

CAT6 In-Line Surge Protector

[SP529A](#)

For full features and specs, go to [blackbox.com](#).

Protect a 100-MHz 100BASE-TX port.

100BASE-TX In-Line Surge Protector

- Protects your 10BASE-T/100BASE-TX networks against surges and electrical noise.
- Guards all eight wires.
- Shielded RJ-45 sockets tied to surge protection circuitry.
- **Standard Warranty** — 10 Years
- **Extended Warranty** — Add 1 or 3 Years



100BASE-TX In-Line Surge Protector, RJ-45

1-Port

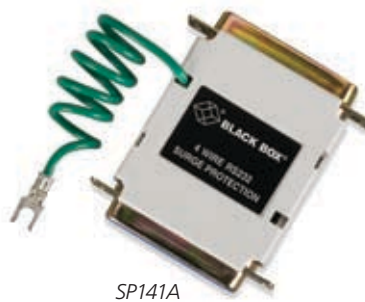
[SP512A-R3](#)

For full features and specs, go to [blackbox.com](#).

Perfect for equipment designed to span long cable runs.

RS-232 Surge Protectors

- Get protection from ground spikes, electrostatic discharge, AC power interference, or nearby lightning-induced energy.
- Extremely sensitive avalanche-diode and thyristor technology.
- Minimal signal loss.
- **Standard Warranty** — 10 Years
- **Extended Warranty** — Add 1 or 3 Years



SP141A



DB25



SP522A-R2



RJ-45 Jack

RS-232 Surge Protectors

DB15

[SP507A](#)

DB25 4-Wire Serial

[SP141A](#)

DB25

[SP360A](#)

RJ-45

[SP522A-R2](#)

For full features and specs, go to [blackbox.com](#).

Save space and stay organized with in-line surge protection in a compact DIN rail mount format.

DIN Rail Mount In-Line Surge Protectors



SPD512A



The Rackmount DIN Rail Shelf enables you to mount up to 16 surge protectors in only 1U of rack space.

SPDINRAK

- Maximize uptime by protecting data lines at the source.
- Low shunt capacitance reduces signal loss.
- Protect data lines with state-of-the art avalanche diode and thyristor technology.
- Order the Rackmount DIN Rail Shelf to fit up to 16 compact in-line surge protectors on 19" rails using only 1U of rack space.
- **Standard Warranty** — 5 Years
- **Extended Warranty** — Add 1 or 3 Years

NOTE: To determine the correct PoE surge protector for your application, contact our FREE Tech Support.

Technical Specifications

Clamping	SPD512A: 7.5 volts; SPD050A, SPD075A: Pins 1, 2, 3, 5: 7.5 volts, Pins 4, 5, 7, 8: 60 volts
Pulse Current	SPD512A: 100 amps; SPD050A: 50 amps; SPD075A: Pins 1, 2, 3, 6: 132 amps, Pins 4, 5, 7, 8: 50 amps
Response Time	<5 nanoseconds
Shunt Capacity (Maximum)	SPD512A: <8 pF; SPD050A: <75 pF; SPD075A: <25 pF (Ethernet lines only)
Connectors	(2) RJ-45

DIN Rail Mount In-Line Surge Protectors

10/100/1000BASE-TX, RS-422, RS-485, RS-423	SPD512A
ISDN, T1, DDS (Fused)	SPD050A
PoE	SPD075A

To rackmount up to 16 surge protectors on 19" rails, order:

Rackmount DIN Rail Shelf for In-Line Surge Protectors	SPDINRAK
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For full features and specs, go to blackbox.com.

Guard your fax machines, phone system, and modems.

Telco (Dialup Modem/Fax) RJ-11 Surge Protector

- Overcurrent and overvoltage protection.
- Protects four center wires.
- Standard clamping voltage is 240 volts.
- **Standard Warranty** — 10 Years



Telco RJ-11 Surge Protector

[SP365A-R2](#)

For full features and specs, go to blackbox.com.

Mining

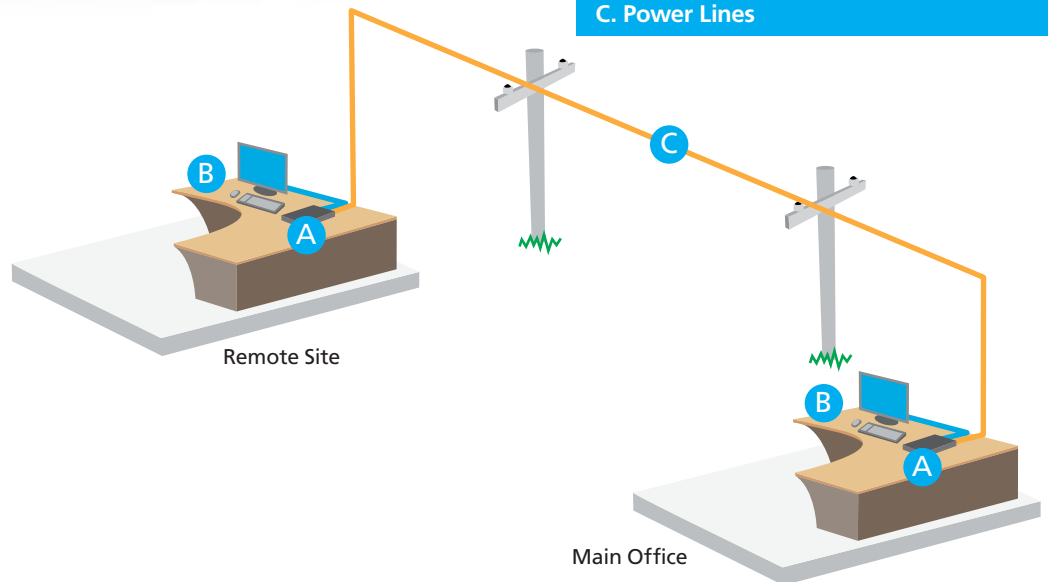
The Challenge:

A mining company located in the southeastern United States discovered that communication had been cut to several of their remote sites after a severe thunderstorm moved through the area. Upon inspection, the company realized that, while the equipment at the remote sites was protected from power surges by UPS units, the communications lines were not. As a result, several thousand dollars' worth of communication equipment had to be replaced.



The Solution:

When the new equipment was installed, the mining company contacted Black Box, who recommended that surge protectors be installed at each end of the connections, thus protecting both sides of the link and preventing any future equipment damage.



A. Surge Protection

B. Communication Equipment

C. Power Lines

Protect the PoE equipment on your network.

Power over Ethernet Surge Protector

- Prevents damaging power surges and spikes from wreaking havoc on PoE equipment.
- Provides protection for both line-to-line data transmissions and ground-to-line surges.
- Attaches to PoE equipment in schools, restaurants, airports, offices—everywhere.
- **Standard Warranty** — 5 Years
- **Extended Warranty** — Add 1 or 3 Years



Power over Ethernet Surge Protector

60-Volt

SP075A

For full features and specs, go to blackbox.com.

Guard your mission-critical IT equipment against physical threats—

By Melissa Rohm



Beyond virus protection.

It has become almost automatic to protect your data center by backing up your servers, installing firewalls and virus protection, and keeping the protection up-to-date.

But what about more tangible threats? Do you have hot spots in your racks? If the cooling system shuts down, how will you know when temperatures climb out of control? Are you alerted to humidity changes or water leaks that threaten your equipment?

Planning for the unexpected is a critical task because there are more systems performing mission-critical functions than ever before. These systems are often deployed without the proper environmental infrastructure to support them. Equipment density is increasing constantly, which is creating more stress on ventilation and power.

That's where Black Box's environmental monitoring systems enter the picture.

The top three IT risks:

1. Environmental disruption.

The number one cause of downtime for remote locations, environmental problems go beyond fires and floods and affect as much as 30% of a company's mission-critical infrastructure. Cooling and power are key points of exposure and increase as equipment density does.

2. Unnecessary risk.

When systems are housed in less-than-optimal settings, or are in remote and unsupervised locations, any error causes downtime. Yet, it's not practical to have someone babysitting the servers. We offer more effective ways to keep track of your equipment.

3. Sabotage.

Regardless of the probability, terrorism is now something each of us must plan for. Your systems can also be brought down from within if the proper security safeguards are not in place.

What's an environmental monitoring system?

Environmental monitoring products enable you to actively monitor the conditions in your rack, server room, data center, or anywhere else you need to protect critical assets. Conditions monitored include extreme temperatures, humidity, power spikes and surges, water leaks, smoke, and chemical materials. With proper environmental monitoring, you're alerted to any conditions that could have an adverse effect on your mission-critical equipment. These products can also alert you to potential damage from human error, hacking, or prying fingers.

Environmental monitors consist of three main elements: a base unit, probes or sensors, and network connectivity and integration. The base units may contain one or more built-in sensors, as well as ports for hooking up external probes. Additionally, they include an Ethernet port and have software for remote configuration and graphing. This software may also work with existing network management software, such as SNMP systems.

Features:

Measurement (see chart below).

The environmental monitoring appliance displays the values measured by the attached probes, e.g. temperature, humidity, airflow, status of dry contact, door, motion detector, and other sensors.

Data collecting and graphing (see chart below).

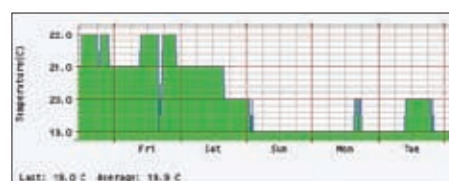
The measurements are periodically stored in the internal memory or external storage media and displayed as graphs.

Alerting (see chart on facing page).

When the measured value exceeds the predefined threshold, it triggers an alert: a blinking LED on the front panel, an audible alarm, SNMP trap, e-mail, etc. The environmental monitoring appliance can also activate an external alarm system like a siren or strobe light.

Temp Rack 03	66° F (19° C)
Humidity Rack 03	34%

Measurement



Data Collecting and Graphing



Benefits of environmental monitoring:

- **Reduced downtime**—When things go wrong, you're the first to know. Minimize downtime by being alerted about conditions that cause damage to servers and other network devices.
- **Increased profits**—Black Box environmental monitoring systems are easy to implement. Also, they help you cut replacement equipment costs and redistribute your workforce more effectively.
- **Increased employee satisfaction**—With built-in notification features like e-mail, SMS, and SNMP traps, a remote monitoring system enables employees to better manage their work.

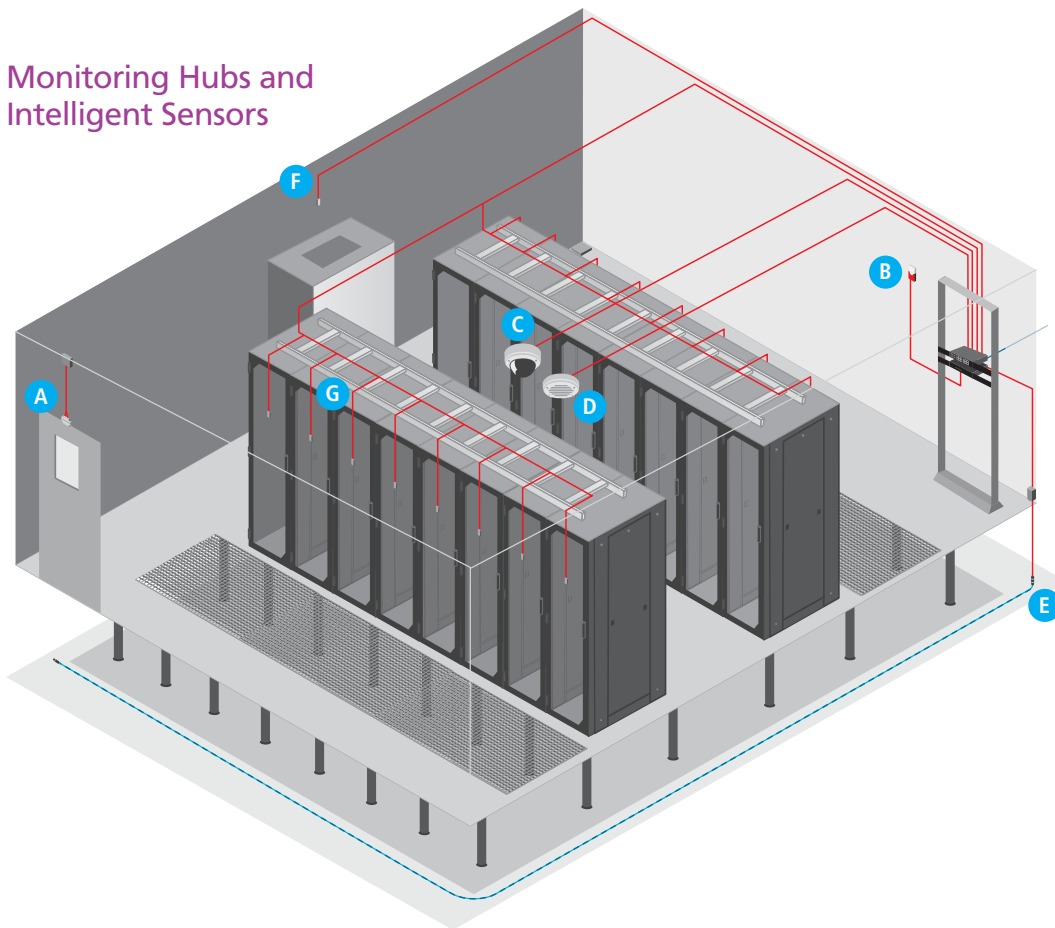
Applications:

The Black Box AlertWerks™ System consists of SNMP-enabled, Web-based monitors that alert the user to any abnormal conditions. AlertWerks monitors multiple environmental conditions, including temperature, humidity, airflow, smoke, security, and voltage. Black Box has complete solutions for a variety of applications, including:

- Data center monitoring
- Server room monitoring
- Rackmount industrial equipment
- Telecommunications
- UPS/battery backup
- Educational institutions
- Food and beverage applications
- Buildings/warehouses
- Air conditioner/refrigerants/freezer monitoring
- Greenhouses
- Oil and gas

from temperature extremes to water damage.

Monitoring Hubs and Intelligent Sensors



- A. Security
- B. Siren and Strobe Light
- C. Camera
- D. Smoke/Fire
- E. Rope Water
- F. Dual Temperature Humidity
- G. Temperature

Selection Guide | AlertWerks Sensor Hub Features

For product details, see pages 80–81 or go to blackbox.com.

	ServSensor V4E (EME134A-R3)	ServSensor V4EL (EME144A-R2, EME149A-20, EME149A-60, EME149D-20, EME149D-60)	ServSensor (EME108A-R2, EME158A)	ServSensor 4 (EME105A, EME155A)	ServSensor Junior (EME102A-R2, EME152A)	ServSensor Contact (EME111A-20-R2, EME111A-60)
Features						
Intelligent sensors supported (maximum)	500*	500*	8	4	2	8
Dry contacts supported (maximum)	2/60/500*	2/60/500*	8	4	10†	28 / 68 ‡
Cameras supported (maximum)	4	—	—	—	—	—
Alerting						
Relay output	✓	✓	✓	✓	✓	✓
Siren and strobe light	✓	✓	✓	✓	✓	✓
SNMP trap	✓	✓	✓	✓	✓	✓
E-mail	✓	✓	✓	✓	✓	✓
SMS	✓**	✓**	✓§	✓§	✓§	✓§
MMS	✓**	✓**	—	—	—	—
Phone call	✓††	✓††	—	—	—	—
Skype® call	✓	✓	—	—	—	—
FTP upload	✓	✓	—	—	—	—
Picture log	✓	✓	—	—	—	—
Wakeup/shutdown	✓	✓	—	—	—	—
Virtual sensors	✓	✓	—	—	—	—

*Requires expansion hubs.

†With two 5-dry contact input cables and license.

‡20 and 60 dry contacts respectively, plus up to 8 dry contacts at the standard sensor ports.

§Requires third-party e-mail to SMS gateway.

**Requires third-party GSM USB modem.

†† Requires third-party voice modem.

Data Center

The Challenge:

eASP.Net was launched in 2000 by Nortel Networks in Taiwan with a goal to be the premier carrier-neutral data center and “Application Service Provider” (cloud computing) in Asia. Today, eASP.Net is still the top data center not owned or established by any local carrier in Asia. They are proud to be the Tier 1 Internet/Submarine Cable landing hub of Taiwan and were selected by the world-renowned carriers as the Asia POP.

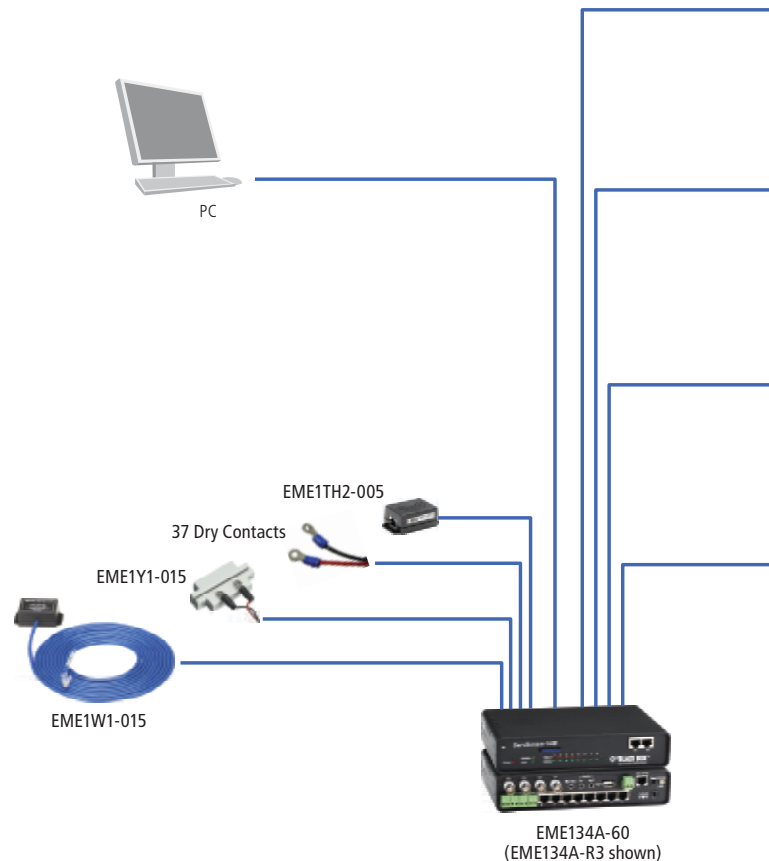
eASP.Net’s data center is on four floors in one building, with equipment located on multiple floors. They had an old environmental monitoring system which was using PLC (power line control) technology. By using a PLC system, their management team could only get environmental status reports via alarm notifications. The team was aware when something happened but did not know the details. So they had to send somebody to every floor to see what was going on and to fix the problem—a very ineffective, time-consuming process.

For these reasons, eASP.Net wanted a brand new environmental monitoring system that could be monitored remotely. They also needed it to provide details on conditions, locations, and events. The new system had to provide integration capabilities with their existing network management software. Finally, they needed an environmental monitoring system that could provide remote monitoring via IP and also support SNMP.

The Solution:

Black Box installed one AlertWerks™ ServSensor V4E Hub (EME134A-60) and multiple expansion units. eASP.Net uses network management software in their control center to monitor all the sensors and dry contact status.

The AlertWerks solution for eASP.Net provides them e-mail notifications, a different audible alarm for each kind of notification through broadcasting speakers, and SNMP TRAP. They can maintain the entire system by themselves.

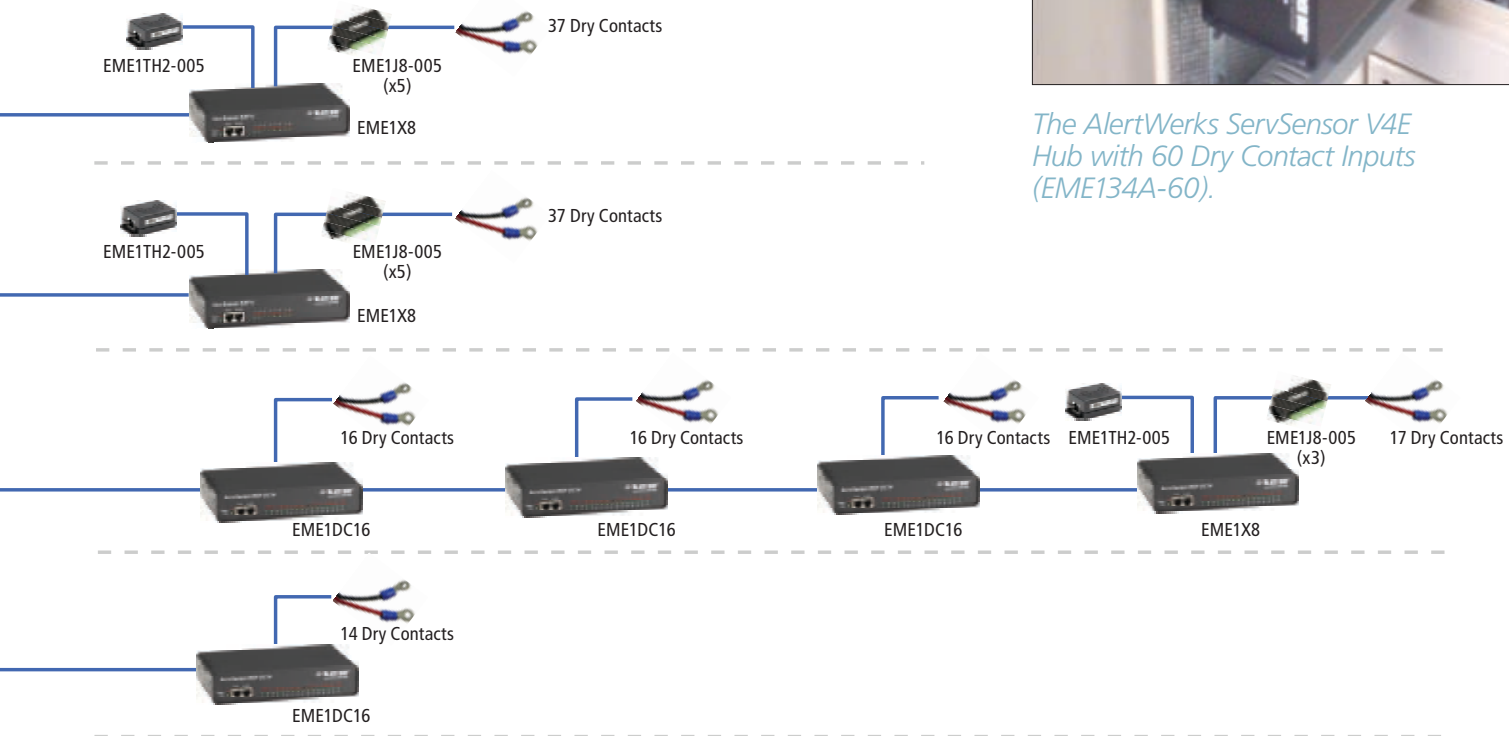


The solution includes:

- ServSensor V4E Hub, 60 Dry Contact Inputs (EME134A-60)
- ServSensor Expansion Unit, 8-Port Sensor Hub (EME1X8)
- Serv Sensor Expansion Unit, 16-Port Dry Contact Hub (EME1DC16)
- AlertWerks Digital I/O Sensor, (8) Dry Contacts (EME1J8-005)
- AlertWerks Dual Temperature Humidity Sensor, Remote (EME1TH2-005)
- AlertWerks Security Sensor/Contact (EME1Y1-015)
- AlertWerks Water Sensor (EME1W1-015)



The AlertWerks ServSensor V4E Hub with 60 Dry Contact Inputs (EME134A-60).



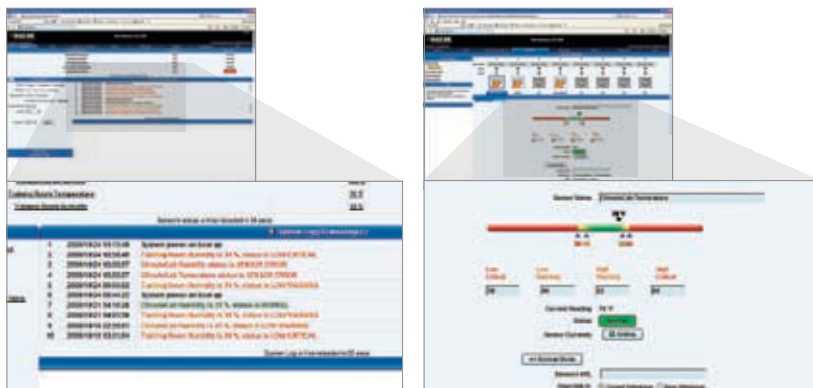
Real-time, extensive environmental and video monitoring and



EME134A-R3: top: front view;
bottom: rear view



EME108A-R2: Top: front view;
bottom: rear view



Access the clear, easy-to-use graphical interface from your Web browser, like Alert log (left) and Sensor configurations (right).



EME102A-R2: front view

- **Standard Warranty — Lifetime**

A. AlertWerks ServSensor V4E Hub, V4EL Hubs

- Support up to eight plug-and-play Intelligent Sensors (pages 80–81).
- Can be daisychained to expansion hubs, increasing the total sensor count up to 500.
- V4E model also supports up to four surveillance cameras (see page 81 for the AlertWerks cameras).
- Notify you of alarms in a variety of ways, including e-mail, SNMP, and text messages.
- Can also monitor up to 80 SNMP devices.
- Monitors external devices via SNMP or IP “ping.”
- Manageable through an easy-to-use Web interface.
- Full SNMP v1, v2, and v3 compliance.
- Include a combination temperature/humidity sensor.

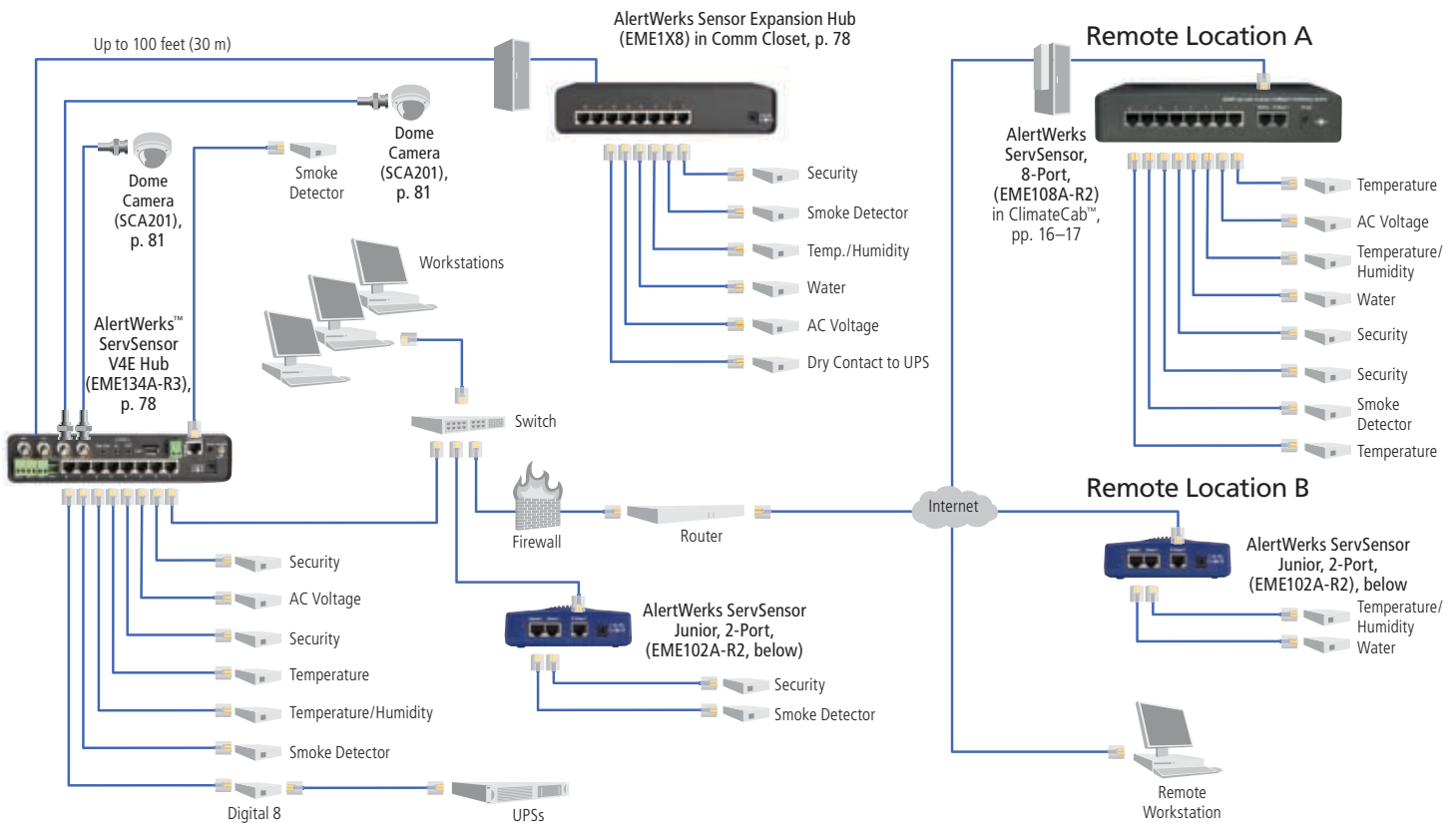
The AlertWerks ServSensor V4E family enables you to integrate environmental sensors and surveillance cameras into one seamless remote monitoring system that watches over your premises. Each ServSensor supports up to eight AlertWerks Intelligent Sensors (pages 80–81). Sensors automatically configure and go on-line, ready to report any status change. Choose from a wide variety of sensors, including temperature, humidity, water, airflow, motion, and voltage.

AlertWerks ServSensor V4E

AlertWerks ServSensor V4E, No Video	EME134A-R3
No Dry Contacts	EME144A-R2
with 20 Dry Contacts	EME149A-20
with 20 Dry Contacts, DC-Powered	EME149D-20
with 60 Dry Contacts	EME149A-60
with 60 Dry Contacts, DC-Powered	EME149D-60
ServSensor Expansion Units	
8-Port Sensor Hub	EME1X8
8-Port Relay Hub	EME1P8
16-Port Dry Contact Hub	EME1DC16

For full features and specs, go to blackbox.com.

alerting system.



B. AlertWerks ServSensor Hubs

- Function as a central hub for your AlertWerks Intelligent Sensors.
- Use them for remote monitoring of a wide range of areas from server rooms to factory floors.
- Feature four or eight RJ-45 ports; AlertWerks Intelligent Sensors sold separately.
- Work with a wide range of sensors: temperature, humidity, water, airflow, smoke, motion, security, dry contact, and AC and DC voltages.
- Use sensors in any combination.
- Easy to set up, easy to use.
- Integrate hubs into your SNMP-managed network or use as an independent monitoring system.

AlertWerks ServSensor Hubs

ServSensor	
8-Port, No Sensor	EME108A-R2
8-Port with PoE, No Sensor	EME158A
8-Port, (1) Temperature Sensor (Kit)	EME109A-R2
8-Port, (1) Dual Temperature and Humidity Sensor (Kit)	EME110A-R2
ServSensor 4	
4-Port, No Sensor	EME105A
4-Port with PoE, No Sensor	EME155A
4-Port, (1) Dual Temperature and Humidity Sensor (Kit)	EME106A

For full features and specs, go to blackbox.com.

C. AlertWerks ServSensor Junior

- Functions as a central hub for up to two AlertWerks Intelligent Sensors ([pages 80–81](#)).
- Ideal for limited areas, such as wiring closets.
- Java™ based Web user interface enables you to access the hub over any IP network—even the Internet.
- PoE model features 802.3af Power over Ethernet, so you can easily place the hub away from power outlets.
- Send alerts through SNMP or e-mail.

AlertWerks ServSensor Junior

2-Port, No Sensor	EME102A-R2
2-Port, (1) Temperature Sensor (Kit)	EME103A-R2
2-Port, (1) Dual Temperature and Humidity Sensor (Kit)	EME104A-R2
AlertWerks ServSensor Junior with PoE	
2-Port, No Sensor	EME152A
2-Port, (1) Temperature Sensor (Kit)	EME153A
2-Port, (1) Dual Temperature and Humidity Sensor (Kit)	EME154A
Dry Contacts for ServSensor Junior, 5 Inputs	
15 ft. (4.5-m) (Requires EME1DC-UPG, below)	EME1DC-015
60 ft. (18.2-m) (Requires EME1DC-UPG, below)	EME1DC-060
100 ft. (30.4-m) (Requires EME1DC-UPG, below)	EME1DC-100
Activation Key for ServSensor Junior Dry Contacts	EME1DC-UPG

For full features and specs, go to blackbox.com.

Choose from a wide range of sensors to work with AlertWerks

AlertWerks™ Intelligent Sensors



EME1F1-005-R2

Airflow Sensor

- Thermistor sensor.
- On/off alarm signal for airflow.
- Two LEDs indicate the status.

AlertWerks Airflow Sensor

5-ft. (1.5-m) Cable [EME1F1-005-R2](#)



EME1C1-005

AlertWerks 4-20 mA Converter

- Add a third-party, industrial sensor to AlertWerks ServSensor hubs.
- Enables you to communicate with equipment in industrial settings.

AlertWerks 4-20 mA Converter

[EME1C1-005](#)



EME1S2-005

Photoelectric Smoke Detector Sensor

- More effective than ionization smoke detectors at sensing smoldering fires.
- Auto resets when smoke clears.

AlertWerks Photoelectric Smoke Detector Sensor

5-ft. (1.5-m) Cable [EME1S2-005](#)



EME1K1-015

Dry-Contact Sensors

- Open/closed contact switch indicates Alarm or Normal.
- The input voltage range of 0 to 5 VDC can be set through software.
- Normally open; normally closed can be set through software.

AlertWerks Dry-Contact Sensors

15-ft. (4.5-m) Cable [EME1K1-015](#)
 60-ft. (18.2-m) Cable [EME1K1-060](#)
 100-ft. (30.4-m) Cable [EME1K1-100](#)



EME1M1-005-R2

Motion Detection Sensor

- Detection speed of 0.5–9.8 feet per second (0.15–3 m/sec).
- Temperature range of -4 to +144° F (-20 to +50° C).
- 150° detection angle.

AlertWerks Motion Detector Sensor

5-ft. (1.5-m) Cable [EME1M1-005-R2](#)



EME1SS-005

Siren and Strobe Light

- Siren sounds at 100 ± 3 dB at 100 cm.
- Supports maximum cable runs of up to 1000 feet (304.8 m).
- Can be triggered by any other sensor connected to the ServSensor hub.

AlertWerks Siren and Strobe Light

5-ft. (1.5-m) Cable [EME1SS-005](#)



EME1A1-005



EME1D1-005-R2

Voltage Sensors

- AC Voltage Sensor detects voltage from 50 to 250 VAC and indicates Alarm or Normal.
- DC Voltage Sensor is user programmable with both the base and top voltage from 0 to 60 volts.

AlertWerks Voltage Sensors

AC 5-ft. (1.5-m) Cable [EME1A1-005No](#)
 DC 5-ft. (1.5-m) Cable [EME1D1-005-R2](#)



EME1KJ8-005

Digital I/O Sensors

- Provide eight dry contacts on one sensor port.

AlertWerks Digital I/O Sensors

with 5-ft. (1.5-m) Cable
 (8) Dry Contacts [EME1J8-005](#)
 (2) RJ-45 to (8) Dry Contacts [EME1KJ8-005](#)



EMESDIN



EMEDRMK

Rackmount Kits

AlertWerks Rackmount Kits

Rackmount DIN Rail [EMEDIN](#)
 DIN Rail Mounting Bracket for Sensors [EMESMB](#)
 Rackmount Bracket for EME134A-R2 and (1) Expansion Hub [EMEDRMK](#)
 Rackmount Bracket for EME134A-R2 with Integral Half-Width DIN Rail for Mounting Sensors [EMESDIN](#)

For full features and specs, go to blackbox.com.



ServSensor hubs.



EME1W1-015



EMERW-020

Water Sensors

- Accurate enough to measure distilled water.
- Use **Rope Water Sensors** on the floor to detect the presence of water or liquid.
- **Intelligent Rope Water Sensors** report where the water is along the length of the sensor.

AlertWerks Spot Water Sensors

15-ft. (4.5-m) Cable	EME1W1-015
60-ft. (18.2-m) Cable	EME1W1-060
100-ft. (30.4-m) Cable	EME1W1-100

AlertWerks Rope Water Sensor

20-ft. (6.0-m) Cable	EMERW-020
10-ft. (3.0-m) Extension	EMERWE-010

AlertWerks Intelligent Rope Water Sensors

20-ft. (6.0-m) Cable	EMELW-020
----------------------	---------------------------



EME1TH2-005



EME1TH3-015

Dual Temperature/Humidity Sensors

- Measure temperature from -40 to 167° F (-40 to +75° C) in 1° F increments.
- Measure 0 to 100% relative humidity.

AlertWerks Dual Temperature/Humidity Sensors

Standard	EME1TH1-001
Remote	EME1TH2-005
Waterproof	EME1TH3-015



EME1Y1-015

Security Sensors/Contacts

- Tell you when doors to secure areas have been opened.

AlertWerks Security Sensors/Contacts

15-ft. (4.5-m) Cable	EME1Y1-015
60-ft. (18.2-m) Cable	EME1Y1-060
100-ft. (30.4-m) Cable	EME1Y1-100

All:

- **Standard Warranty** — Lifetime



EME1T2-005

Temperature Sensors

- Never need calibration.
- Measurement range of -67 to +167° F (-55 to +75° C) with 1° F resolution.
- Measurement accuracy of ±0.9° F from +14 to +167° F (-10 to +75° C).
- Connect up to four daisychainable sensors with CAT5 cable for a total distance of up to 1000 feet (304.8 m).

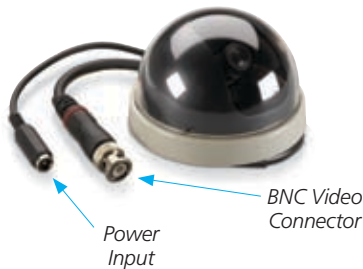
AlertWerks Temperature Sensors

Standard	EME1T1-001
Remote	EME1T2-005
Waterproof	EME1T3-015
Daisychainable	EMEDTEMP
4-Pack	EMEDTEMP4
8-Pack	EMEDTEMP8

High-resolution dome cameras.

AlertWerks Cameras

- High-resolution 1/3" Sony™ CCD cameras.
- Dome cameras feature remote pan and tilt; universal-mount cameras are stationary.
- Clear, sharp pictures, even in low light conditions.
- Horizontal resolution of 640 pixels.
- A precision, custom-designed stepper motor moves the dome camera over 330° (pan) and 160° (tilt) and can be controlled by the ServSensor V4E via its Web interface.
- **Standard Warranty** — Lifetime



EME1FC-NTSC

AlertWerks Universal-Mount Cameras

North American	EME1FC-NTSC
European PAL	EME1FC-PAL



SCE201

AlertWerks PT Dome Cameras

North American	SCA201
European PAL	SCE201

For full features and specs, go to blackbox.com.

For full features and specs, go to blackbox.com.

Black Box ETL Verified Channel Solutions: Guaranteed for Life,

For proven performance in your mission-critical networks, choose Black Box channel solutions.

Guaranteed for life.

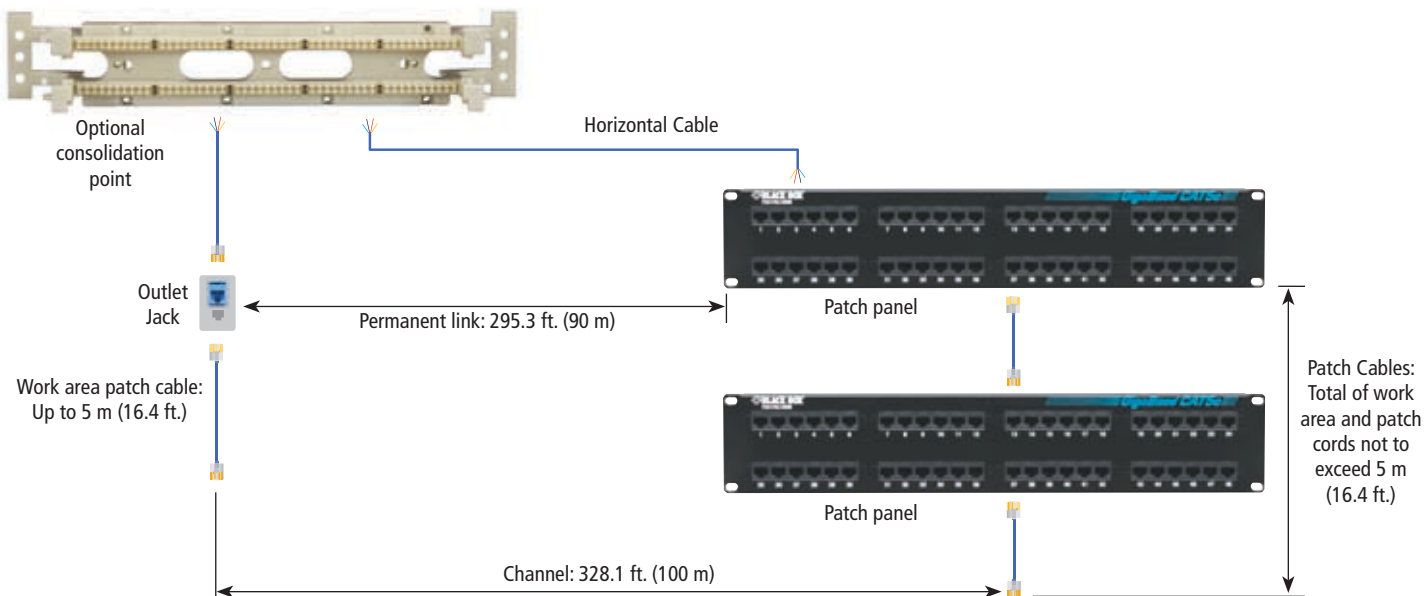
For performance designed to last the lifetime of your structured cabling system, choose Black Box channel solutions. These structured cabling systems are designed to work together so you get the absolute best channel performance.

To fully back our claims of quality and performance, we guarantee—for life—every component in our channel solutions. If it fails, we'll replace it. Black Box's unbeatable Double Diamond™ Warranty covers everything from manufacturing defects to accidental damage—including water and surge damage.

Plus, all Black Box® brand copper cables, most fiber cables, and infrastructure components are also guaranteed for life.



Channel and Permanent Link



CAT6A Channel Solution

- Patch Panel, p. 155
- Patch Cable, p. 112
- Bulk Cable, p. 102
- Jack, p. 164

CAT6 Channel Solution

- Patch Panel, p. 157
- Patch Cable, p. 113
- Bulk Cable, p. 104
- Wiring Block, p. 159
- Jack, p. 165

CAT5e Channel Solution

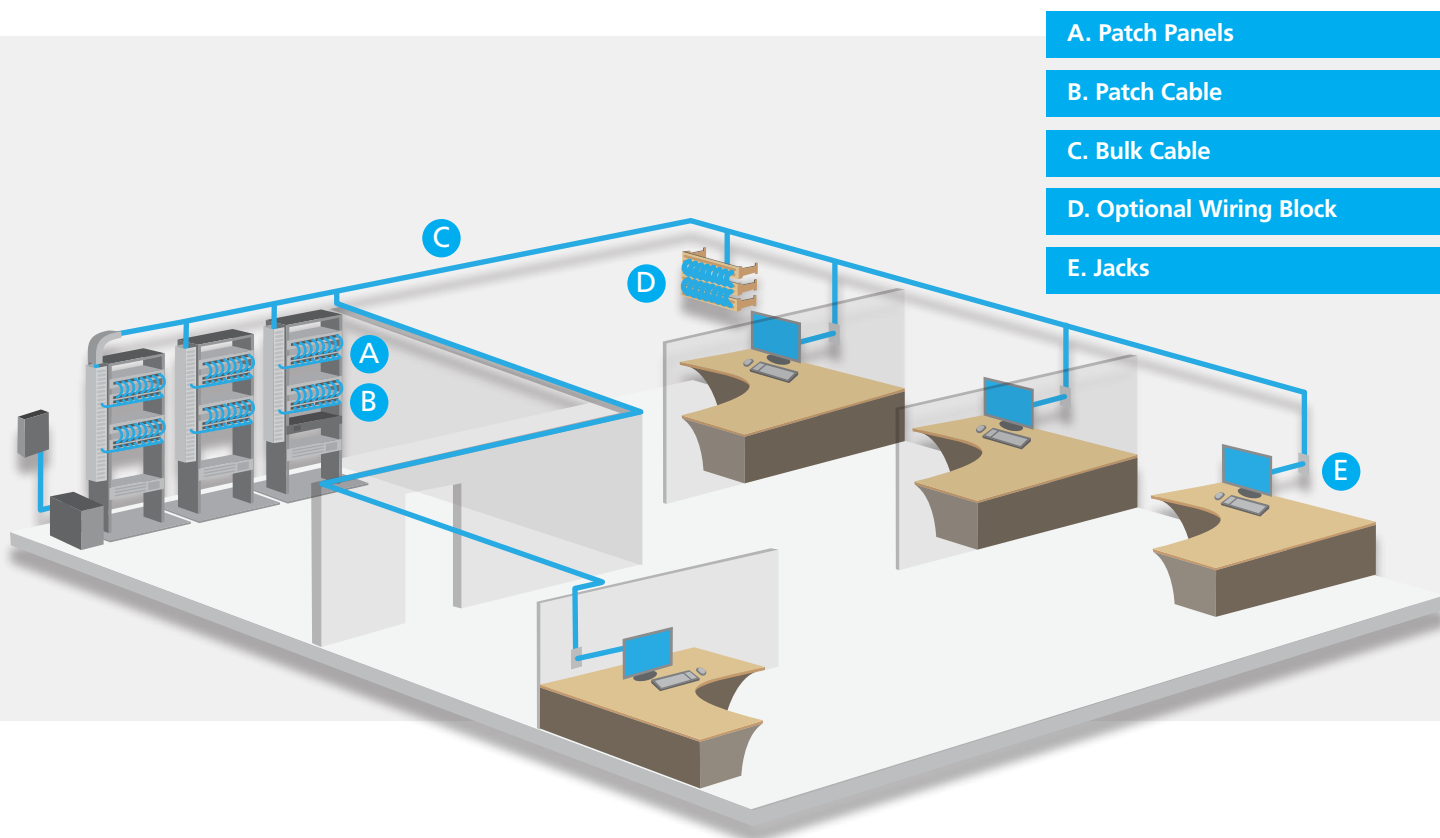
- Patch Panel, p. 161
- Patch Cable, p. 119
- Bulk Cable, p. 107
- Wiring Block, p. 163
- Jack, p. 165

Guaranteed Performance.

GigaTrue³ CAT6A

GigaTrue³ CAT6

GigaBase³ CAT5e



A. Patch Panels

B. Patch Cable

C. Bulk Cable

D. Optional Wiring Block

E. Jacks

Guaranteed performance.

Independent testing

To back up our performance claims, Black Box puts our channel solutions to the test.

Black Box engages independent third-party testing. Intertek Testing Services—ETL Semko, Inc. conducts ETL® Verification tests of our CAT6A, CAT6, and CAT5e channels.

Four times a year, an ETL inspector visits Black Box and randomly selects cable and cabling products from our warehouse for ongoing performance testing. The result time and time again: Black Box channels exceed all key measurements for their respective categories.

In addition, Black Box's GigaTrue® CAT6A, GigaTrue CAT6, and GigaBase® CAT5e bulk cable are all component-level tested.

Passive testing

In passive testing, the channel solution is tested against the appropriate specifications. The results indicate how much headroom the products provide above the specification. These are important numbers to consider because you want your system to have enough headroom to accommodate future growth. For test results, contact us.

UL® large-scale fire testing

In addition to independent laboratory testing of our channels, Black Box puts our bulk cable through independent laboratory testing at UL to further ensure consistent quality and burn resistance.

Four times a year, we randomly select samples from our warehouse and send them to the UL large-scale fire-testing facility. There, the cables are subjected to riser, vertical tray, and plenum tests. Black Box cable passes with flying colors.

UL Market Surveillance Program

Black Box willingly participates in the UL Market Surveillance Program as one more means of assuring the compliance of our cabling products. As a distributor of UL® Listed cables, Black Box products are made available for purchase by UL representatives for countercheck testing at the UL lab. UL verifies compliance of listed cables in the marketplace as part of its overall Mark Integrity Program.

Security solutions that start at the port: Lockable cables and

CAT6A, CAT6, CAT5e Patch Cables with LockPORT™ technology boots

GigaTrue³ CAT6A

GigaTrue³ CAT6

GigaBase³ CAT5e

Secure network ports—only when you need to.

These one-of-a-kind cables give you the ability to lock down critical network ports—when you need to—without buying new patch cords.

Use these high-performance cables for your everyday network connections. Then when you need to secure network ports, you can—in seconds. Just slip an optional Locking Pin under the locking tab on the patented, slimline boot. Now no one can come along and unplug your cable. It stays locked until you decide to release it. To unplug the cable, release the Pin with the Removal Key (sold separately).

Prevent unauthorized access and disconnects.

These 3-Series cables are ideal for protecting mission-critical network ports from unauthorized access and removal. They're also ideal for preventing accidental disconnects, particularly in industrial and manufacturing applications.

Premium performance.

You won't sacrifice performance for security. These high-performance cables are tested to 650 MHz (CAT6A), 550 MHz (CAT6), or 350 MHz (CAT5e) and are guaranteed for life. Our CAT6A cables are also component-level rated.

Rugged, patented, slimline boot.

No one is going to break this boot or pull out your cable!

The extremely rugged, hard-polymer plug and boot are integrated to protect the cable and to prevent tampering. The hard shell also protects the strain-relief and prevents excessive bending and flexing. The snag-free, slimline form fits all standard RJ-45 openings.

The boot's slimline design makes it ideal for high-density applications. It fits all RJ-45 openings.



The hard-polymer boot and plug are integrated for better strength and strain-relief and to prevent tampering.



To secure network ports, slip the Locking Pin under the built-in locking tab on the patented boot. Once inserted, it can only be released with the Removal Key.

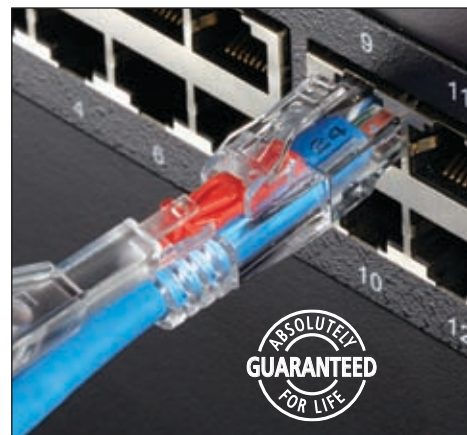
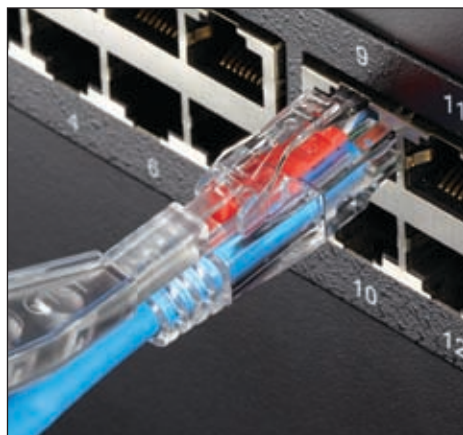


Ideal for many industries and applications.

- Government
- Healthcare
- Education
- Finance/banking
- Transportation
- Hospitality
- Retail/point-of-sale
- Manufacturing
- Co-location data centers.
- Data centers/wiring closets
- Wireless, security, and PoE connections
- Publicly accessible lobbies
- Medical facilities
- Classrooms/conference rooms
- Airports/transportation hubs
- Internet cafes
- Environmental monitoring



Port Locks.



A locked-down cable with Pin inserted in the boot. To unlock, insert the Key into the Pin until it clicks. Pull the Pin back and lift the Key to release.

Turn network ports into a layer 1 security tool.

3-Series cables are one of the simplest and most effective ways you can increase your Layer 1 security. Use them to protect mission-critical and publicly accessible network ports from unauthorized access and tampering, especially in government offices, conference rooms, lobbies, hotels, airports, event centers, and more.

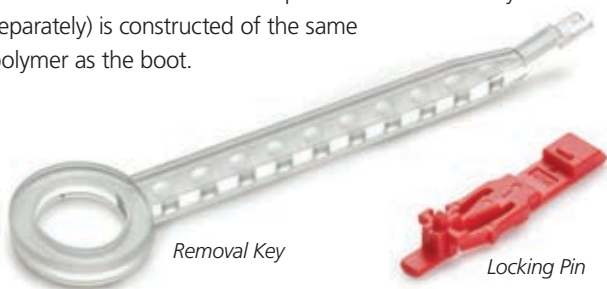
Here's where to find them.

- CAT6A Patch Cables and Port Locks, page 111.
- CAT6 Patch Cables and Port Locks, page 114.
- CAT5e Patch Cables and Port Locks, page 118.

Questions? Contact our FREE Tech Support.

The lock and key.

The Locking Pin (sold separately) comes in convenient packs of 10 and 25. Keep a bag on hand so you're ready when you need to lock down critical network ports. The Removal Key (sold separately) is constructed of the same hard-polymer as the boot.



Removal Key

Locking Pin

Port Locks



Choose from red and black Port Locks.

Port Locks and Removal Tool

- Each 25-pack of Port Locks includes a Removal Tool.
- Insert the tool to release the Port Lock.

Related

- CAT6A Patch Panels, pages 154–155.
- CAT6 Patch Panels, pages 156–159.
- CAT5e Patch Panels, pages 161–163.
- GigaStation2 Wallplates, page 172.
- GigaStation2 Surface-Mount Housings, page 172.

Tame cable chaos in the data center.



Without SpaceGAIN

Did this ever happen to you? These cables protrude so much you can't even close the cabinet door.



With SpaceGAIN

Gain up to 4" of valuable cabling space and keep cabinet doors securely locked with SpaceGAIN 90° Right-Angle Patch Cables and Panels.

Reduce cabling space, management, and costs.

- Retrofitting a cabinet?
- Installing newer, deeper equipment?
- Upgrading your data center?

Today, as more and more IT managers move to high-density configurations, space in the data center is becoming more and more valuable. Keeping your data center a showplace takes time and effort. When making changes, it's easy to say, "I'll add that cable management tomorrow." Before you know it, you end up with data center cable spaghetti.

Tame cable chaos and gain space with SpaceGAIN™, a family of patch cables and panels designed to help you create space instead of taking up space. Found only at Black Box, they turn tight spaces into right spaces. Gain space for cabling in the closet and reduce cable management, installation time, and costs.

The SpaceGAIN family consists of:

- 90° Right-Angle Patch Cables, Unshielded and Shielded, a **Black Box Exclusive**, pages 116, 122.
- 6" Reduced-Length Patch Cables, pages 116, 122.
- 45° Angled-Port Patch Panels, page 158.
- Multimedia Patch Panels, page 158.
- Angled Patch Panels, page 158.
- 48-Port, 1U, High-Density Feed-Through Patch Panels, a **Black Box Exclusive**, page 156.
- 24-Port ½ U Patch Panels, page 158.

Best of all, SpaceGAIN products are guaranteed for life!



With some time, planning, and SpaceGAIN, you can turn this into a data center showcase. Photo was submitted by a Black Box customer.

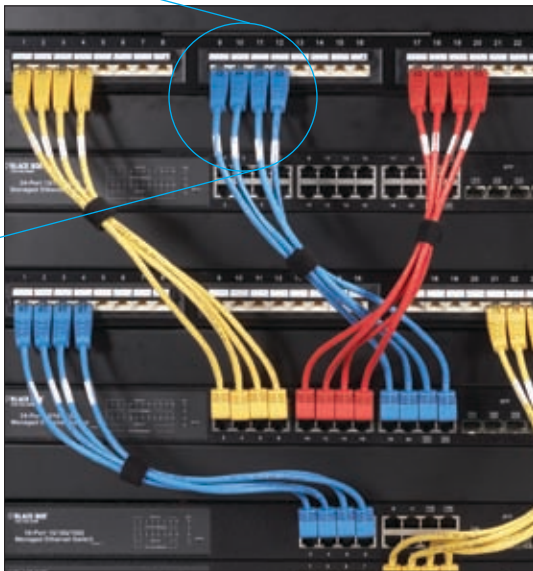


FREE, Live, Tech Support
Talk with an expert or go to blackbox.com.

For the SpaceGAIN brochure and SpaceGAIN video go to blackbox.com/go/SpaceGAIN.



Cables flow downward—not out—saving even more space with our award-winning SpaceGAIN 45° Angled-Port Patch Panels. See them on page 158.



Save space in crowded cabinets.

SpaceGAIN cables give you an ingenious new way to save space in high-density configurations. Streamline panel and switch connections and gain up to four inches of valuable space in crowded cabinets. You'll never have to worry about closing cabinet doors again. See SpaceGAIN Panels on pages 157–158.



Make neat patches.

Follow data center cabling best practices and use the right length cable. You'll avoid cable spaghetti and eliminate the use of cable management. See the 6" Reduced Length Cables on pages 117 and 122.

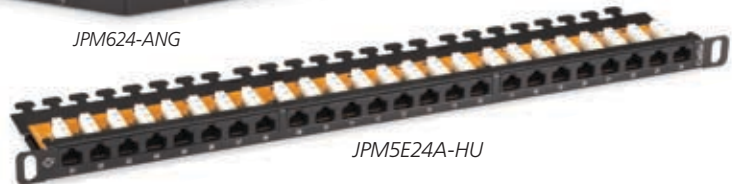


More space-saving panels.

Eliminate the need for horizontal cable managers with the SpaceGAIN Angled Patch Panels, page 158. Tight quarters in your rack? Free up space with the 1/2U SpaceGAIN Patch Panel, page 158.

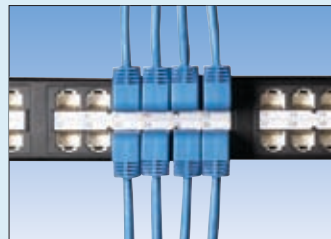


JPM624-ANG



JPM5E24A-HU

Save even more space with this exclusive SpaceGAIN combo!

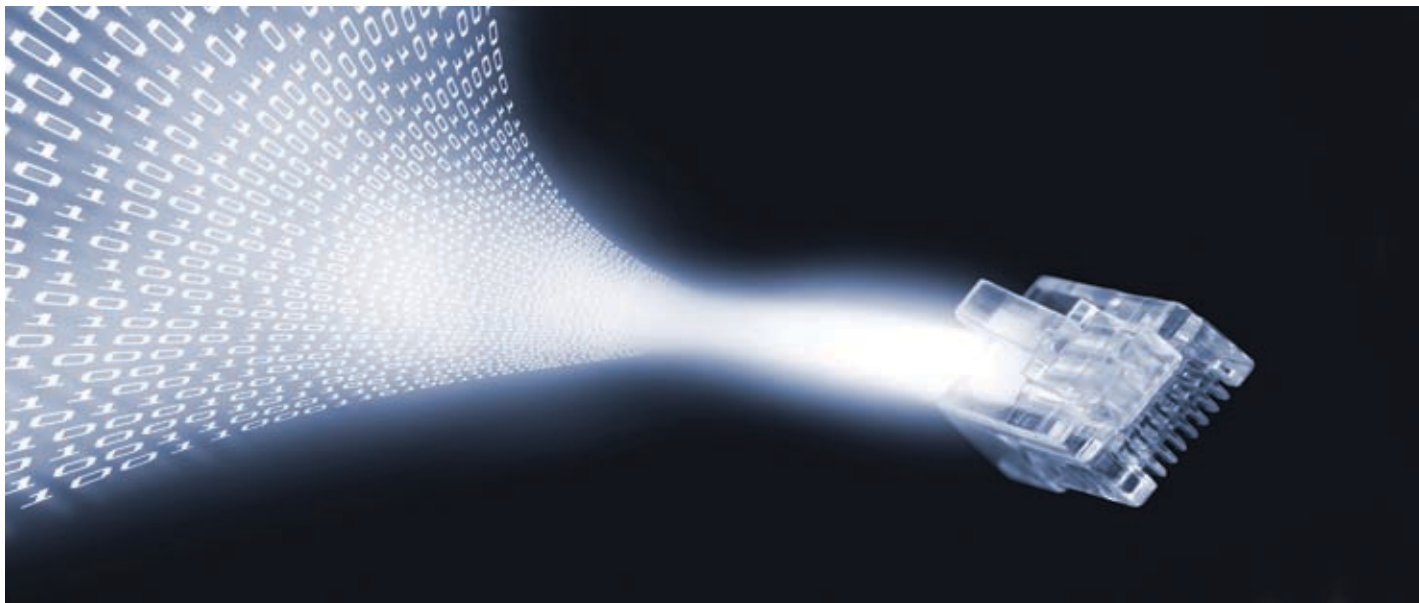


The high-density SpaceGAIN solution. Use our 90° Down Patch Cables and High-Density Feed-Through Patch Panels (p. 156).

Retrofitting a cabinet? Installing newer, deeper equipment? Want to make sure your cabinet door closes?

In high-density configurations, cabinet space is becoming an increasingly scarce commodity. Gain space in your cabinets (and ensure the door will close) by using our exclusive SpaceGAIN 90° Right-Angle Patch Cables with our 48-Port, 1U, High-Density Feed-Through Patch Panel (page 156).

To fit 48 ports in only 1U, the patch panel connectors face up on the top row and down on the bottom row as indicated by the tab area. To achieve the tight, neat configuration as shown above, use 90° Down Cables (pages 117 and 122) for both rows.

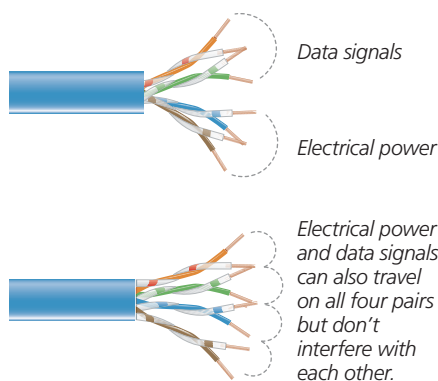


Put technology wherever you need it—without running power.

What is PoE?

Power over Ethernet (PoE) is a standard for sending data and power over your Ethernet cable to low-wattage devices, such as cameras, wireless access points, VoIP phones, and more. The greatest benefit PoE gives you is the ability to power devices in remote, hard-to-reach, and non-powered locations—without worrying about the cost or hassle of running new AC power lines. And it's a lot easier to install an Ethernet line than electrical wiring.

PoE technology has matured and gone from a being a hodgepodge of home-brew and proprietary methods to the safe, reliable standard it is today.



Electrical power has a frequency of 60 Hz or less. Data signals travel at 10–100 MHz.

How does PoE work?

The way it works is simple: Ethernet cable that meets CAT5 (or better) standards consists of four twisted pairs of cable, and PoE sends power over those pairs to PoE-enabled devices. In one method, two pairs are used to transmit data, and the remaining two pairs are used for power. In the other method, power and data are sent over all four pairs.

When the same pairs are used for both power and data, the power and data transmissions don't interfere with each other. Because electricity and data function at opposite ends of the frequency spectrum, they can travel over the same cable. Electricity has a low frequency of 60 Hz or less, and data transmissions have frequencies that can range from 10 MHz to 100 MHz.

There are two types of devices involved in PoE configurations: Power Sourcing Equipment (PSE) and Powered Devices (PD).

PSEs, which can include end-span and mid-span devices, provide power to PDs over the Ethernet cable. PDs are devices such as surveillance cameras, sensors, wireless access points, etc., that receive power via the Ethernet line.

PoE standards.

The original PoE standard is IEEE 802.3af or simply Power over Ethernet. It was ratified by the Institute of Electrical and Electronic Engineers (IEEE) in June 2000 as the 802.3af-2003 standard. It defines the specifications for low-level power delivery—15.4 watts at 48 VDC—over twisted pair Ethernet cable to PoE-enabled devices such as VoIP phones, wireless access points, Web cameras, and audio speakers.

In 2009, this standard was joined by the IEEE 802.3at standard, PoE Plus. This standard provides at least 25.5 watts to more power-hungry devices such as pan/tilt/zoom cameras. This standard specifies using only two of the four twisted pairs for power rather than all four pairs. 802.3at is backwards compatible with 802.3af.

Newer, proprietary higher-powered PoE methods capable of outputting at least 60 watts or more are also available.

In addition to standards-based PoE, there are other methods for delivering power over data lines, including legacy PoE, high-wattage PoE, and passive PoE. Different kinds of PoE are not interchangeable, and you may damage a device by connecting it to the wrong kind of power sourcing equipment.

PoE applications and benefits: Save money and time.

PoE enables you to easily move equipment from room to room without costly, time-consuming rewiring. Additionally, if your LAN is protected from power failure by a UPS, the PoE devices connected to your LAN are also protected from power failure.

Using PoE can save hundreds of dollars per Wi-Fi access point (AP) location compared to a non-PoE solution.

In a non-PoE installation, in addition to the Ethernet link, power must be wired to the access point. Depending on factors such as AP location, distance from the AC circuit, and local safety codes, the savings from using a PoE solution can be \$250-\$500 per AP. In harsh, outdoor, or industrial environments, you can save \$750-\$1500 per AP by using PoE.

PoE is also the answer if you're doing a VoIP phone conversion. There's a much lower installation cost—all you need to do is provide the Ethernet connection.

Plus, using PoE can improve VoIP phone system availability. PoE PSE gear can be located in data centers with uninterruptible power supplies and battery backup. This arrangement means that your PD VoIP phones will remain working if there's a power failure. On the other hand, wall-outlet powered phones will stop working when the power goes out.

Common myths about PoE.

Myth #1: PoE requires special wiring.

If you're using CAT5 or greater cable, there's no need to modify or upgrade your existing cabling to use PoE. It operates over regular, 4-pair Ethernet cable. You can use CAT5 and up, and it can be shielded or unshielded.

Myth #2: PoE requires electrical expertise.

It's easy to add PoE equipment to your network and you don't have to be an electrician. While early PoE required electrical expertise and a lot of calculating, today's 802.3 af/at standards-based PoE requires no special electrical expertise.

Because most of the equipment is plug and play, you don't have to worry if a PD is getting the wrong amount of power, or worse, getting power when it shouldn't. This is because the PSE communicates with the PD to determine power requirements. This keeps power from accidentally going to devices that don't support PoE.

Myth #3: PoE requires expensive new equipment.

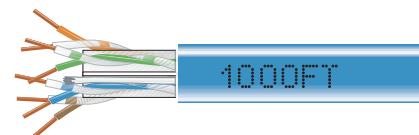
Actually, you can add PoE devices to your network quite economically.

PoE powered devices, such as cameras and wireless access points, are relatively inexpensive. You can buy PoE switches as PSEs, but it could be much more economical to use mid-span power sourcing equipment, such as injectors or splitters. They go in between your regular network switch and the network and don't require you to replace any existing infrastructure.

That pretty much covers the basics of PoE. It can be an easy, economical way to add equipment to remote, hard-to-reach, and unpowered areas of your enterprise.

Connect your PoE equipment.

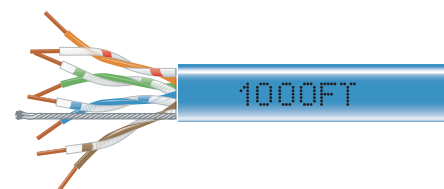
Use high-quality Black Box CAT5e/6/6A cable to power your PoE phones, cameras, wireless access points and more.



CAT6A Bulk Cable, page 102.



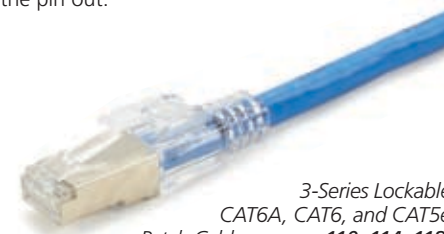
GigaTrue® CAT6 Bulk Cable, page 104.



GigaBase® CAT5e Bulk Cable, page 107.

Prevent PoE disconnects.

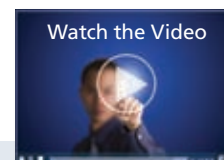
Protect your PoE connections with **3-Series Lockable Patch Cables**. Use them to prevent accidental patch cable disconnects of critical PSE and PD connections. Just slip in the Locking Pin and your connection is rock solid, until you take the pin out.



3-Series Lockable
CAT6A, CAT6, and CAT5e
Patch Cables, pages 110, 114, 118.

PoE Standards

	PoE IEEE 802.3af	PoE+ IEEE 802.3at
Power available at powered device	12.95 W	25.50 W
Maximum power delivered	15.40 W	34.20 W
Voltage range at source	44.0–57.0 V	50.0–57.0 V
Voltage range at powered device	37.0–57.0 V	42.5–57.0 V
Maximum current	350 mA	600 mA
Maximum cable resistance	20 ohms	12.5 ohms



Watch the video and download the brochure.
blackbox.com/go/PoE

Since 1976, Black Box has helped customers solve unique connectivity

Can't find what you need? Tell us what you want to accomplish and we'll design a custom solution for you. Depending on your application, we can modify existing cables, adapters, and other products to your specs—or we can build them from scratch. Best of all, the engineering support and custom design service is **absolutely free**. Custom capabilities include:

- Cables: UTP, fiber, coax, A/V, RS-232, and more.
- Bundled cables.
- Y and octopus cables.
- Nurse call cables.
- Special connectors and adapters.
- Special pinning.
- Faceplates.
- Pinning, striping, and coloring.
- Kitting, labeling, and bundling.
- Packaging and shipping.



Special requirements are no problem. Every day, experienced technicians in our manufacturing facility in Lawrence, PA, build custom cable assemblies, wallplates, switches, and more.

Custom capabilities can include:

Custom copper cables

We can customize any kind of copper cable: twisted pair, AV, coax, RS-232, and more. Need special snap-on/off connectors for security reasons? You've got it. We can also build custom Y and large octopus cables with extremely unusual connector combinations. Tell us what you want, and we'll make it.



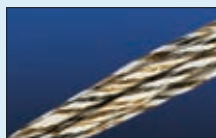
Bundled CAT5e and CAT6 Bulk Cable

Black Box saves you time by delivering bundled cables with the exact number of cables of the type and length you need. You can even specify color. Pull cable once and you're done. Ask about our bundled fiber cables, too.



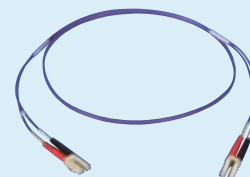
Dyed, striped, UV, and more

Camouflage? Company colors? Red, white, and blue? Show your colors with Black Box Custom Cable. We provide you with the jacket solution you need, whether it's special colors or striping for easy identification, or even cable that can stand up to the sun's UV rays.



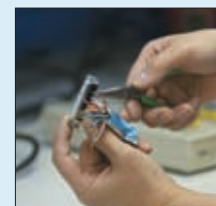
Custom fiber colors and lengths.

Color-code your network with fiber cable in 12 different colors and 13 different lengths. For details, see pages 140–141.



Adapters

Tell us the specific pairing, jumpers, and drains you need. Not sure? Describe your your application, and our Tech Support experts will help you. We even do quick connect/disconnect adapters for industrial applications. Have legacy equipment and can't find adapters? We'll make them for you.



Feed-through faceplates

Need custom faceplates for conference rooms, classrooms, digital signage displays, or even healthcare facilities? We can create your installation with the connectors of your choice: CAT5e, CAT6, fiber optic, VGA, audio, S-Video, and more.



And, much, much more!

problems. We can help you too.

How to get your custom.

Call our FREE pre-sales engineering team.
Or go to blackbox.com/go/CableandAdapterCon
to request a quote.

After you submit your request, a Black Box representative
will contact you.



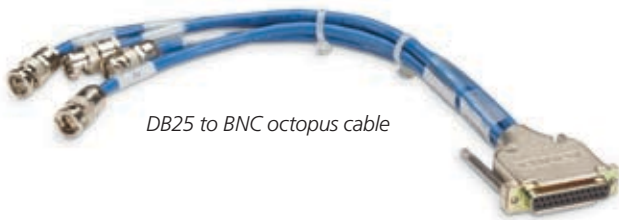
Custom octopus cable



Custom modular to 3.5-mm adapter



Custom grounding bar



DB25 to BNC octopus cable



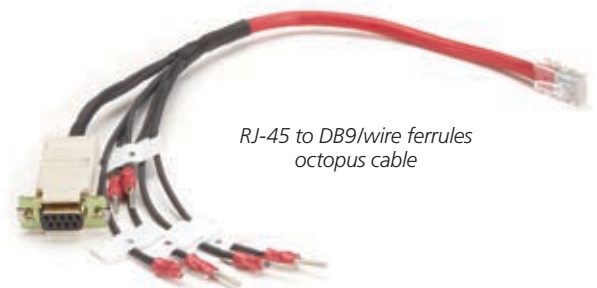
Custom labeling



Custom RJ loopback



DB15 adapter modified with BNCs



RJ-45 to DB9/wire ferrules octopus cable



Custom configured faceplates

Healthcare: Custom Adapters

One of the many services and products Misys Healthcare Systems provides for healthcare organizations is the development of software and instrumentation for medical labs.

Misys developed a new system for one of its clients that involved new instrumentation and software at three different sites. For the system to be properly connected, it required adapters with custom pinning. Based on previous experience, Misys recommended Black Box to its client for the custom adapters.

The Misys rep called Black Box and explained what type of adapters and special pinning was needed. Black Box provided the quote for the custom order and told Misys the adapters would take a week or more to be shipped. Unfortunately, critical system testing was about to begin in a few days. When the Black Box rep heard about the tight time frame, she went the extra mile to get the adapters produced and shipped in two days—plenty of time for the system launch.

“The crunch was on when the Black Box rep called back. She worked magic and was able to get the custom adapters out to us in two days—literally! Not only were we here at Misys ecstatic, but the client was very happy and relieved. Awesome teamwork!”

Jaime Schisel
Instrument Specialist
Misys Healthcare Systems

Order custom-length CAT5e/6 patch cables today, and we'll ship today. *Or the cables are FREE!**

Cable 911: Custom-Length Patch Cables

Get the exact length cables you need, when you need them—tomorrow!

If you order by 1 p.m. ET, we can ship your order this evening. The maximum order is 50 cables per customer per day.

If we don't keep our promise to ship your cables today, you'll get your cables FREE! Now that doesn't include taxes, shipping, and handling, but who can argue with free?

*For all the details, see page 123.

Cable options.

You can order patch cables with the following options:

- CAT5e/CAT6.
- PVC/plenum (plenum is only available with solid-conductors).
- Shielded/unshielded.
- Solid/stranded conductor.
- Snagless boot/basic connector.
- Eight colors: blue, white, black, gray, green, orange, red, yellow.
- Lengths: 1–100 feet.

Applies to continental US Customers only.



Why settle for this mess when you can get exactly what you want tomorrow?



Cable 911

Easily find the exact cable you need in seconds!

CATx and Fiber Cable Selectors

CATx Cable Selector

<p>Category</p> <p>please select ...</p> <p><input type="checkbox"/> Patch <input type="checkbox"/> Bulk</p> <p><input type="checkbox"/> Stranded <input type="checkbox"/> Solid</p> <p><input type="checkbox"/> PVC <input type="checkbox"/> Plenum</p> <p><input type="checkbox"/> un-Shielded <input type="checkbox"/> Shielded</p>	<p>MHz Rating</p> <p>please select ...</p> <p>Boot or LockPORT</p> <p>please select ...</p> <p><input type="checkbox"/> Straight Pinned</p> <p><input type="checkbox"/> Cross Pinned</p>	<p>Color Preference</p> <p>please select ...</p> <p>Length Preference, feet</p> <p>please select ...</p>
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➤ Helpful hints.

find cable

Find what you need with these fast on-line selectors.

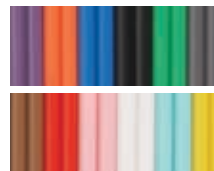
CATx Patch



Bulk CATx



Multicolor Fiber Patch



Fiber Patch



blackbox.com/go/Configurators

CATx Cable Selector: blackbox.com/go/CopperSel

Fiber Cable Selector: blackbox.com/go/FiberSel

Custom Cable and Adapter Configurator: blackbox.com/go/CableandAdapterCon

Resources

Buyer beware: Not all cable is created equally.

Learn what you need to know at blackbox.com/go/Counterfeit.

Read the White Paper.
The dangers, risks, and how to spot counterfeit cable.

Watch the Video.

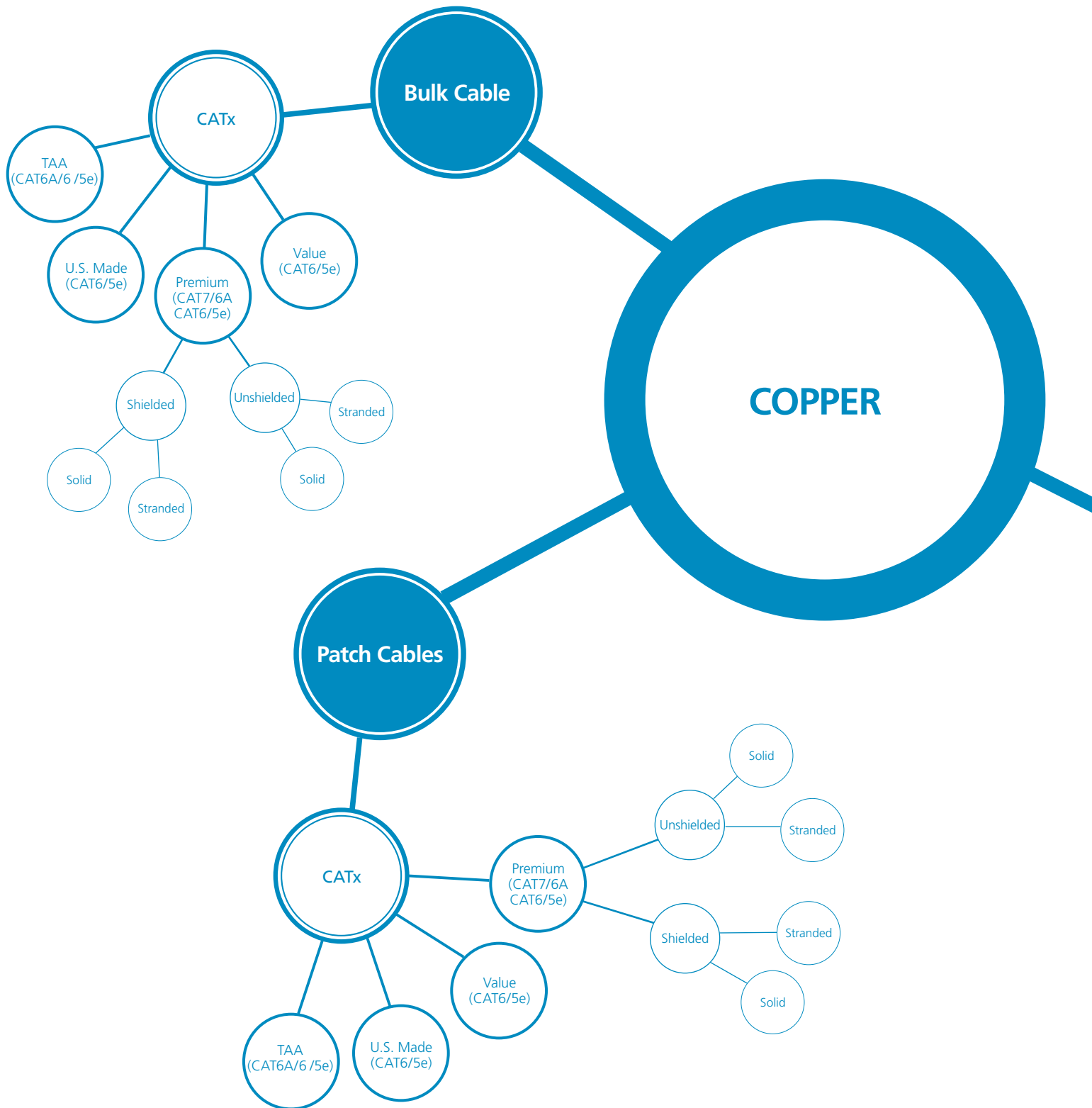
Download the Brochure.

Read the Blog Posts.

Check UL®, CCCA, and ETL Websites.

"After checking the quality of some lower-priced cable, I'm definitely sticking with the Black Box brand. After inspecting and testing the competitor's [cable], I decided to discard it without using it. Too risky based on my examination of it. I can't afford to take a chance on questionable cable or supplies."

Dan Latner
NeedWire.com

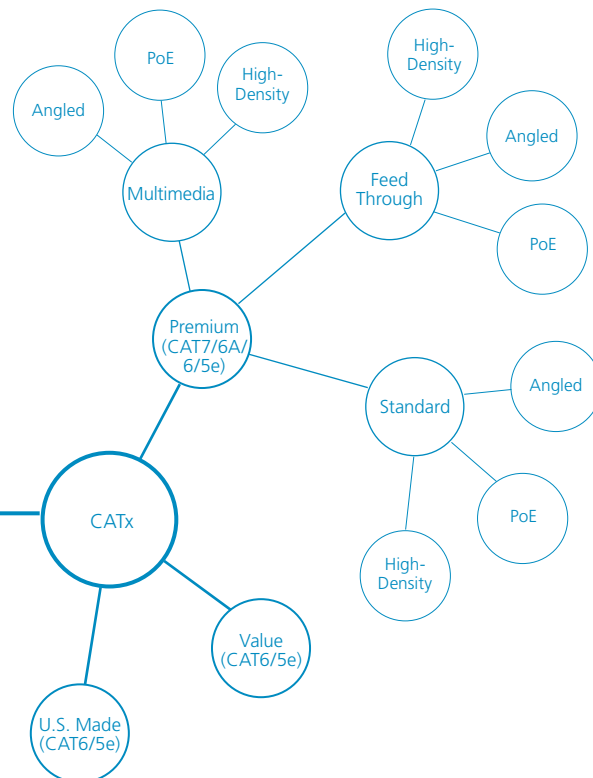
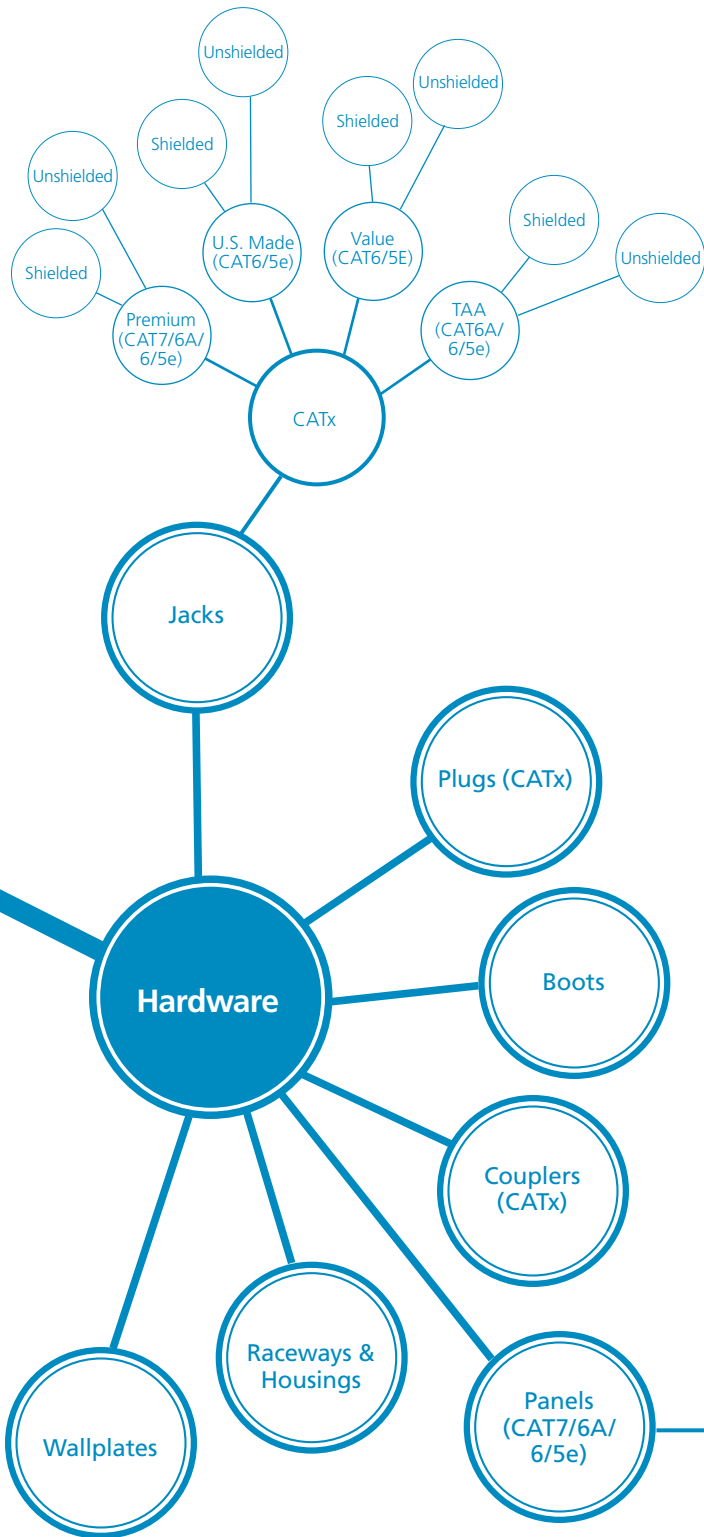


Copper Structured Cabling

Solutions for every network and industry.

No matter what type of structured cabling system you're planning, Black Box can help. Whether you want a premium, guaranteed-for-life channel that will last for years, a TAA-compliant system, or even an inexpensive solution for a temporary network, you'll find it right here. Black Box can take your structured cabling system from the data center to the desktop and beyond. Count on Black Box for:

- ETL Verified CAT6A/6/5e channel solutions.
- Guaranteed-for-life cable and components.
- TAA-compliant and U.S.-made channels.
- Lockable patch cables for security and reliability.
- Value Line channels (blackbox.com).



Copper Cabling

By Roberta Bowen Szyper



Cabling lifespan

Cabling is one of the most important components of your network. Choosing the right cabling can be a daunting proposition as we move forward to 10-/40-/100-Gbps, even 1 TB networks. You have to consider many factors including cost, mobility, convergence, and even applications that haven't been developed yet. In a July 2012 report, the IEEE estimated that industry bandwidth requirements in 2015 would be 10 times the traffic of 2010, and in 2020, 100 times more than 2010.

Cabling is the most long-lived component of your network, with an expected life span of at least 10 years to as long as 15–20 years. You'll most likely replace your network equipment three to four times over the life of the cabling system. Plan on cabling to be about 3-5% of your total network cost. An investment in high-quality cabling is easily justified in reduced downtime, reduced maintenance, and better network performance.

If you're planning a structured cabling infrastructure today, you'll most likely specify cabling that, at minimum, supports 10-Gigabit Ethernet now with an upgrade to a 40-/100-Gigabit network in 5–10 years.

Copper cable

One of the most obvious advantages copper offers is that it is less expensive than fiber cable and much easier to terminate in the field. Twisted pair cable consists of four pairs of 22–28 AWG copper wires, each covered by insulators and twisted together. There are two types of twisted pair cable, unshielded and shielded.

Unshielded twisted pair

This is the most widely used cable. Known as balanced twisted pair, UTP consists of twisted pairs (usually four) in a PVC or plenum jacket. When installing UTP cable, make sure you use trained technicians. Field terminations, bend radius, pulling tension, and cinching can all loosen pair twists and degrade performance. Also take note of any sources of EMI. Choose UTP for electrically quiet environments.

Shielded twisted pair

Over the past twenty years, the need for speed in networking has driven new cabling specifications and technologies at an ever-accelerating rate. Alongside the development of each generation of Ethernet are corresponding developments in cabling technologies. Part of that development is the increased use of shielded cable. It's becoming more common in high-speed networks, especially when it comes to minimizing ANEXT in 10-GbE runs.

Shielded cable was traditionally used to extend distances and to minimize EMI. It still is. Sources of EMI, commonly referred to as noise, include elevator motors, fluorescent lights, generators, air conditioners, and printers.

Shielded cable can be less balanced than UTP cable because of the shield. The metal sheaths in the cable need to be grounded to cancel the effect of EMI on the conductors. Shielded cable is also more expensive, less flexible, and can be more difficult to install than UTP cable because of the grounding and bonding. (NOTE: See tutorial on CAT6A UTP vs. FIUTP on page 110.)

Most shielded cable is thicker than UTP, so it fills conduits quicker. Keep that in mind as you plan your cable pathways.

Types of shields. There are a number of different types of shielded twisted pair cable and the terminology has evolved over the years.

There are two common shields: foil sheaths and copper/metal braids. Foil gives a 100% shield while a copper braid provides 85% to 95% coverage because of the holes in the braid. But, a braided shield offers better overall protection because it's denser than foil and absorbs more EMI. A braided shield also performs better at lower frequencies. Foil, being thinner, rejects less interference, but provides better protection over a wider range of frequencies. For these reasons, combination foil and braid shields are sometimes used for the best protection. Shields can surround all the twisted pairs and/or the individual twisted pairs.

Twisted Pair Cable Shielding

Old name	New name	Outer shield	Inner, pair shields
UTP	U/UTP	—	—
STP	U/FTP	—	Foil
FTP	F/UTP	Foil	—
S-STP	Sc/FTP	Braiding (or screening)	Foil
S-FTP	SF/UTP	Foil and braiding	—

U = Unshielded
Sc = Braiding or Screening

TP = Twisted Pair
F = Foil

Shielding acronyms

Shielding acronyms have evolved over the years after confusion as to what FTP is versus STP and S/FTP. Now, the letter for the outer shield (under the cable jacket) is noted first. The letter after the slash denotes any shield on the individual twisted pairs.

U/FTP (Unshielded/Foiled Twisted Pair). This cable does not have an overall outer shield. It does have foil shields on each of the four pairs. Formerly called FTP.

F/UTP (Foiled/Unshielded Twisted Pair). This cable has an overall foil shield surrounding all the pairs. Formerly called FTP.

Sc/FTP (Screened/Foiled Twisted Pair). This cable features an overall braided or screened shield underneath the cable jacket. It has individual foil shields on each twisted pair. Formerly called S/FTP.

F/FTP (Foiled/Foiled Twisted Pair). This cable features an overall foil shield underneath the cable jacket. It has individual foil shields on each twisted pair. Formerly called S/FTP.

Sc/FTP and F/FTP cables offer the best protection from external noise and ANEXT.

Solid vs. stranded conductors

Copper cable conductors can be solid or stranded.

Solid-conductor. A solid conductor is a single, solid-copper wire. Solid-conductor cable has better electrical characteristics and lower attenuation than stranded-conductor cable. But, solid-conductor cable is less flexible and shouldn't be bent, flexed, or twisted. Solid-conductor cable is usually used for backbone and horizontal cables runs, such as between equipment rooms or from the telecommunications room to the wallplate.

Stranded-conductor. In stranded cable, each individual conductor is made up of a bundle of smaller-gauge wire strands bundled or wrapped around a center strand to form a single conductor. This conductor has a diameter similar to a solid-conductor but with less conducting area. The stranding gives the cable more flexibility. Stranded cable is better for short runs, such as between the outlet and desktop, and in patching applications where it will be repeatedly bent, plugged, and unplugged. Stranded cable does have a higher attenuation, so the total length in your channel should be kept to 10 meters or less to reduce signal degradation.

PVC, Plenum, LS0H

PVC cable features an outer polyvinyl chloride jacket that gives off smoke and toxic fumes when it burns. It's most commonly used between the wallplate and workstation. It can be used for horizontal and vertical runs, but only if the building features a contained ventilation system. PVC cable is designated CM or CMR.

Plenum cable has a special flame-resistant coating, such as Teflon® FEP, which lowers the emission of toxic fumes or smoke when it burns. Plenum cables must self extinguish and not reignite.

A plenum is the space within a building designed for the movement of environmental air. In most office buildings, the space above the ceiling is used for the HVAC air return. Plenum spaces enable fire and smoke to travel quickly. If cable goes through that space, it must be "plenum-rated" if no conduit is used. A false ceiling is not a plenum. Plenum cable is designated CMP.

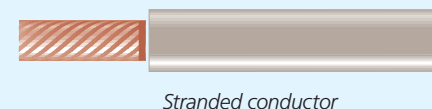
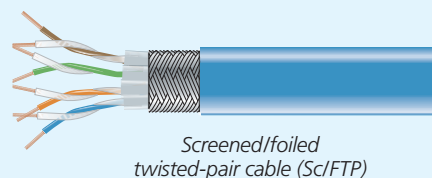
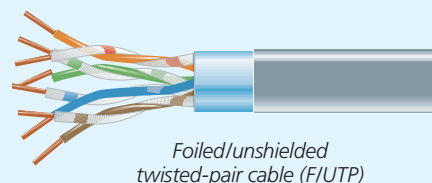
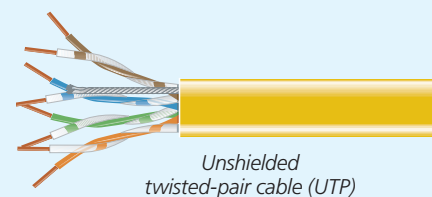
Low Smoke, Zero Halogen (LS0H, LSZH) is a type of plenum cable with a thermoplastic or thermoset compound in the jacket. It limits the emission of smoke and corrosive gases and permits no halogens to be released when exposed to high heat or flames. Halogen in cable jackets is considered to be a good flame retardant, but it emits toxic fumes and smoke when exposed to flame and it can create acid when exposed to moisture. LS0H cables are ideal for use in areas with poor ventilation, such as aircraft and rail cars. They are commonly used in Europe. LS0H cables are also less flexible than PVC cable.

Cable Designations

Type	Description/Use	Substitutions
CMP	Plenum-rated communications cable. (Plenum means air handling space.) Install in ducts, plenums, and spaces used for environmental air.	None
CMR	Riser-rated communications cable. (Riser means between floors.) For use in vertical tray applications, such as runs between floors or in elevator shafts, and not in environmental air spaces. Cable must self-extinguish and prevent the flame from traveling in a vertical burn test.	CMP
CM	General-purpose communications cable. For use in locations other than risers or plenums. Will burn and partially self-extinguish. Often used for workstations and patching.	CMP, CMR

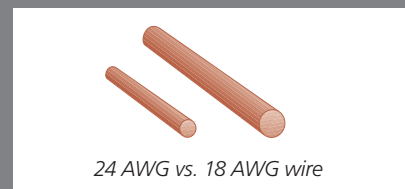
For information about copper standards, turn the page. 

Types of twisted-pair cables



Hey, so what does AWG mean?

AWG (American Wire Gauge) is a classification system for the diameter of the conducting wire. The more a wire is drawn or sized, the smaller the diameter. For example, a 24-gauge wire is smaller than an 18-gauge wire.



Copper Cabling (continued)

The importance of standards

Standards are the platform of all telecommunications networks. They establish guidelines and recommend best practices for every aspect of telecommunications cabling systems from network design and installation to cable performance and verification. Standards establish technical criteria and ensure uniformity and compatibility in and between networks.

In communications cabling, standards define cabling types, distances, connections, cabling architectures, performance parameters, testing requirements, and more. And because they provide recommended best practices, standards can reduce downtime and installation expenses. They also simplify moves, adds, and changes.

Standards enable you to build structured cabling systems that can easily accommodate existing technologies, equipment, and users, as well as future ones.

Standards organizations

Today, there are a few primary organizations involved in the development of structured cabling standards.

In North America, standards are issued by the Telecommunications Industry Association (TIA), which is accredited by the American National Standards Institute (ANSI). That's why its standards are commonly known as ANSI/TIA. The TIA creates standards for telecommunications cabling infrastructure in user-owned buildings, such as commercial buildings.

Globally, the organizations that issue standards are the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Standards are often listed as ISO/IEC. These standards focus on networking. The IEEE (Institute of Electrical and Electronics Engineers) standards focus on local and metropolitan area networks.

Other organizations include the Canadian Standards Association (CSA), CENELEC (European Committee for Electrotechnical Standardizations), and the Japanese Standards Association (JSA/JSI).

The committees of all these organizations work together and the performance requirements of the standards are very similar. But there is some confusion in terminology.

The TIA cabling components (cables, connecting hardware, and patch cords) are labeled as a "category." These components together form a permanent link or channel that is also called a "category." The ISO /IEC defines the link and channel requirements with a "class" designation. But the components are called a "category."

TIA and ISO /IEC Classifications

	TIA Components and Channel	ISO/IEC Components	ISO/IEC Channel
100 MHz	CAT5e	CAT5e	Class D
250 MHz	CAT6	CAT6	Class E
500 MHz	CAT6A	CAT6A	Class EA
600 MHz	—	CAT7	Class F
1000 MHz	—	CAT7A	Class FA
1–2000 MHz	CAT8 (Proposed)	Category 8.1/Class I*	
		Category 8.2/Class II*	

*Under development.

The standards

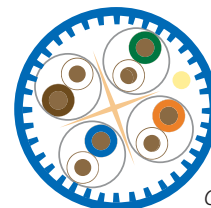
Category 5 (CAT5), ratified in 1991. It is no longer recognized for use in networking.

Category 5e (CAT5e)–ISO/IEC 11801 Class D, ratified in 1999, is designed to support full-duplex, 4-pair transmission in 100-MHz applications. The CAT5e standard introduced the measurement for PS-NEXT, EL-FEXT, and PS-ELFEXT. CAT5e is no longer recognized for new installations. It is commonly used for 1-GbE installations.

CAT6 vs. CAT6A



CAT6
OD: 0.21"–0.24"



CAT6A UTP
OD: 0.29"–0.35"

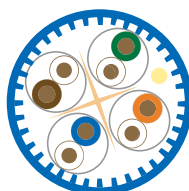
Category 6 (CAT6)–Class E has a specified frequency of 250 MHz, significantly improved bandwidth capacity over CAT5e, and easily handles Gigabit Ethernet transmissions. CAT6 supports 1000BASE-T and, depending on the installation, 10GBASE-T (10-GbE).

10-GbE over CAT6 introduces Alien Crosstalk (ANEXT), the unwanted coupling of signals between adjacent pairs and cables. Because ANEXT in CAT6 10-GbE networks is so dependent on installation practices, TIA TSB-155-A and ISO/IEC 24750 qualifies 10-GbE over CAT6 over channels of 121 to 180 feet (37 to 55 meters) and requires it to be 100% tested, which is extremely time consuming. To mitigate ANEXT in CAT6, it is recommended that the cables be unbundled, that the space between cables be increased, and that non-adjacent patch panel ports be used. If CAT6 F/UTP cable is used, mitigation is not necessary and the length limits do not apply. CAT6 is not recommended for new 10-GbE installations.

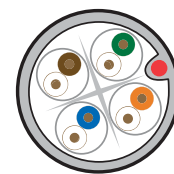
Augmented Category 6 (CAT6A)–Class EA was ratified in February 2008. This standard calls for 10-Gigabit Ethernet data transmission over a 4-pair copper cabling system up to 100 meters. CAT6A extends CAT6 electrical specifications from 250 MHz to 500 MHz. It introduces the ANEXT requirement. It also replaces the term Equal Level Far-End Crosstalk (ELFEXT) with Attenuation to Crosstalk Ratio, Far-End (ACRF) to mesh with ISO terminology. CAT6A provides improved insertion loss over CAT6. It is a good choice for noisy environments with lots of EMI. CAT6A is also well-suited for use with PoE+.

CAT6A UTP cable is significantly larger than CAT6 cable. It features larger conductors, usually 22 AWG, and is designed with more space between the pairs to minimize ANEXT. The outside diameter of CAT6A cable averages 0.29"–0.35" compared to 0.21"–0.24" for CAT6 cable. This reduces number of cables you can fit in a conduit. At a 40% fill ratio, you can run three CAT6A cables in a ¾" conduit vs. five CAT6 cables.

CAT6A UTP vs. CAT6A F/UTP



CAT6A UTP
OD: 0.354"



CAT6A F/UTP
OD: 0.290"

CAT6A UTP vs. F/UTP. Although shielded cable has the reputation of being bigger, bulkier, and more difficult to handle and install than unshielded cable, this is not the case with CAT6A F/UTP cable. It is actually easier to handle, requires less space to maintain proper bend radius, and uses smaller conduits, cable trays, and pathways. CAT6A UTP has a larger outside diameter than CAT6A F/UTP cable. This creates a great difference in the fill rate of cabling pathways. An increase in the outside diameter of 0.1", from 0.25" to 0.35" for example, represents a 21% increase in fill volume. In general CAT6A F/UTP provides a minimum of 35% more fill capacity than CAT6A UTP. In addition, innovations in connector technology have made terminating CAT6A F/UTP actually easier than terminating bulkier CAT6A UTP.

For a discussion of ANEXT and CAT6A, see page 110.

Category 7 (CAT7)–Class F was published in 2002 by the ISO/IEC. It is not a TIA recognized standard and TIA plans to skip over it.

Category 7 specifies minimum performance standards for fully shielded cable (individually shielded pairs surrounded by an overall shield) transmitting data at rates up to 600 MHz. It comes with one of two connector styles: the standard RJ plug and a non-RJ-style plug and socket interface specified in IEC 61076-2-104:2.

Category 7a (CAT7a)–Class Fa (Amendment 1 and 2 to ISO/IEC 11801, 2nd Ed.) is a fully shielded cable that extends frequency from 600 MHz to 1000 MHz.

Category 8 – The TIA decided to skip Category 7 and 7A and go to Category 8. The TR-42.7 subcommittee is establishing specs for a 40-Gbps twisted-pair solution with a 2-GHz frequency. The proposed standard is for use in a 2-point channel in a data center at 30 meters. It is expected to be ratified in February 2016. The TR-42.7 subcommittee is also incorporating ISO/IEC Class II cabling performance criteria into the standard. It is expected to be called TIA-568-C.2-1. The difference between Class I and Class II is that Class II allows for three different styles of connectors that are not compatible with one another or with the RJ-45 connector. Class I uses an RJ-45 connector and is backward compatible with components up to Category 6A.

Recommended channel and permanent link

The horizontal cabling channel encompasses everything between the communications room cross-connects to the outlets in the work area. It's specified in TIA-568-C.2.

Channel performance is when all the parts of the channel are tested together and meet the applicable industry standards.

Component-level compliance is when one part of the channel, say the horizontal cabling, is tested and meets or exceeds category performance requirements. Meeting component-level performance does not guarantee the channel will meet specification as some parts may have better or worse performance or may come from different manufacturers.

Fill Capacity (Number of Cables)

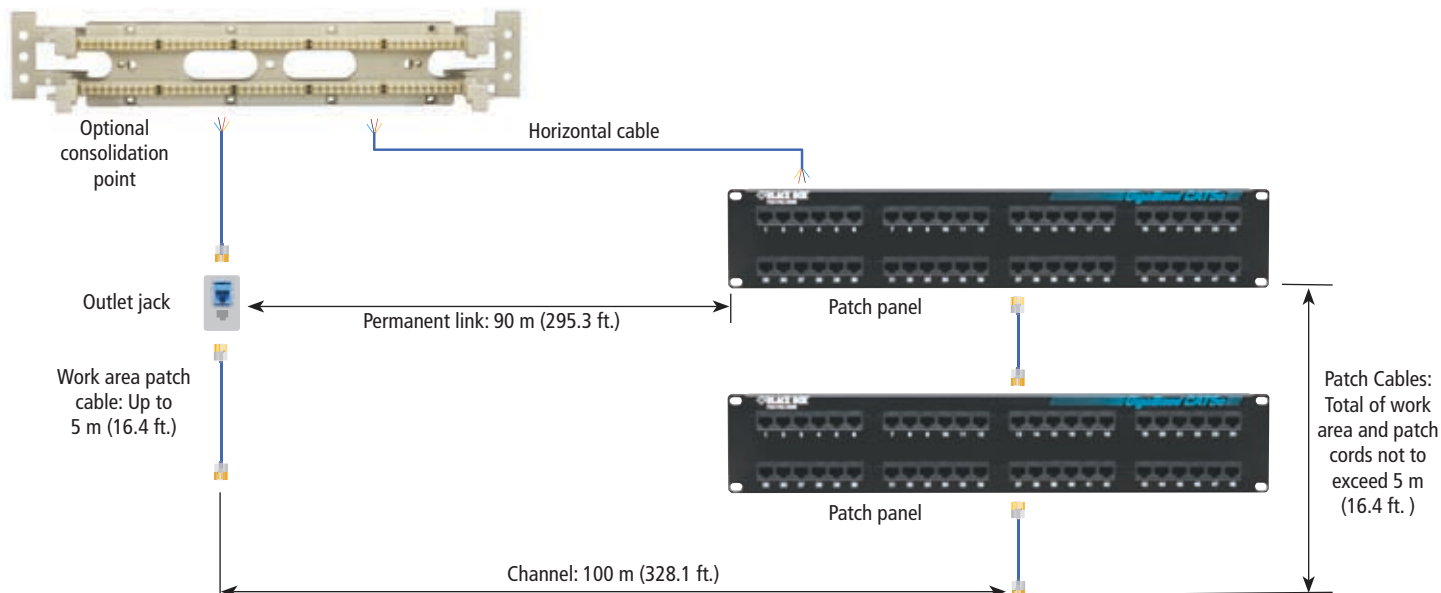
Conduit Trade Size	Fill*	CAT6A UTP 9.00 mm (0.354") O.D.	CAT6A F/UTP 7.4 mm (0.290") O.D.
53 mm (2")	40%	13	20
	60%	20	30
78 mm (3")	40%	30	45
	60%	45	66
103 mm (4")	40%	51	80
	60%	78	116

*40% is the fill ratio recommended for initial runs to allow for growth. 60% is the maximum fill ratio.

TIA and ISO/IEC Standards

TIA CAT5e/6/6A	ANSI/TIA-568-C.2 Balanced Twisted-Pair Telecommunications Cabling and Components
ISO/IEC Class D/E	ISO/IEC 11801, 2nd Ed., Information Technology–Generic Cabling for Customer Premises, 2002
ISO/IEC Class EA	Amendment 1 to ISO/IEC 11801, 2nd Ed., Information Technology–Generic Cabling for Customer Premises, 2008
ISO/IEC Class F	ISO/IEC 11801, 2nd Ed., Information Technology–Generic Cabling for Customer Premises, 2002
Class FA	Amendment 1 to ISO/IEC 11801, 2nd Ed., Information Technology–Generic Cabling for Customer Premises, 2010
Class I/II	ANSI/TIA-568-C.2-1 TR42.7 Category 8; ISO/IEC TR 11801-99-1 Category 8.1 Class I/Category 8.2 Class II (ISO/IEC 11801 3rd Ed., proposed); IEC 46C/976/NP

Channel and Permanent Link



Copper Cabling (continued)

Channel performance standards at 100 MHz

TIA/ISO/IEC	CAT5e—Class D dB @ 100 m	CAT6—Class E dB @ 100 m	CAT6A*—Class E _A dB @ 100 m	CAT7†—Class F dB @ 100 m	CAT7a†—Class F _A dB @ 100 m
Frequency (MHz)	100 MHz	250 MHz	500 MHz	600 MHz	1000 MHz
Insertion Loss (dB)	24.0	21.3—21.7	20.9	20.8	20.3
NEXT (dB)	30.1	39.9	39.9	62.9	65.0
PS-NEXT (dB)	27.1	37.1	37.1	59.9	62.0
ACR (dB)	6.1	18.6	18.6	42.1	46.1
PS-ACR (dB)	3.1	15.8	15.8	39.1	41.7
ACRF‡ (dB)	17.4	23.3	23.3—22.5	44.4	47.4
PS-ACRF§ (dB)	14.4	20.3	20.3—22.5	41.1	44.4
Return Loss (dB)	10.0	12.0	12.0	12.0	12.0
PS-ANEXT (dB)	—	—	60.0	—	67.0
PS-AACRF (dB)	—	—	37.0	—	52.0
TCL (dB)	—	—	20.3	20.3	20.3
ELTCTL	—	—	0.5/0	0	0
Propagation Delay (ns)	548	548	548	548	548
Delay Skew (ns)	50	50	50	30	30
Networks Supported	1000BASE-T	1000BASE-TX	10GBASE-T	N/A	N/A

* The TIA Category standards are nearly identical to the ISO/IEC Class standards. Where there is a difference, it's noted.

† CAT7 and CAT7a are not recognized by the TIA. They are listed in the ISO/IEC 11801 2nd Ed Standard.

‡ ACRF (Attenuation to Crosstalk Ratio Far End) was specified as EL-FEXT (Equal-Level Far-End CrossTalk) for CAT5e/Class D and CAT6/Class E.

§ PS-ACRF (Power Sum Attenuation to Crosstalk Ratio) was specified as PS-ELFEXT (Power Sum Equal-Level Far-End CrossTalk) for CAT5e—Class D and CAT6—Class E.

Relationship between TIA-568-C and other relevant TIA standards.

Common Standards	Premises Standards	Component Standards
ANSI/TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises	ANSI/TIA-568-C-1: Commercial Building Telecommunications Cabling Standard	ANSI/TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standard
ANSI/TIA-569-B: Commercial Building Standard for Telecommunications Pathways and Spaces	ANSI/TIA-570-C: Residential Telecommunications Infrastructure Standard	ANSI/TIA-568-C.3: Optical Fiber Cabling Components Standard
ANSI/TIA-606-B: Administration Standard for Commercial Telecommunications Infrastructure	ANSI/TIA-942: Telecommunications Infrastructure Standard for Data Centers	ANSI/TIA-568-C.4: Broadband Coaxial Cabling and Components
ANSI/TIA-607-B: Telecommunications Grounding (Earthing) and Bonding for Customer Premises	ANSI/TIA-1005: Telecommunications Infrastructure Standard for Industrial Premises	—
ANSI/TIA-758-B: Customer-Owned Outside Plant Telecommunications Infrastructure Standard	—	—
ANSI/TIA-862: Building Automation Systems Cabling Standard for Commercial Buildings	—	—

Cable installation guidelines

You can invest in the best cable and hardware, but if they're not installed properly, they won't work, or at least they won't work well. Protect your investment and follow these installation guidelines.

Cable pair twists. This is the most important guideline you can follow for twisted-pair cable. The pair twists are responsible for much of cable's performance. If you lose the twists, you lose performance.

When terminating CAT5e or higher, maintain pair twists to within 13 mm (0.5 in.) from the point of termination. And remove as little of the sheath as possible.

When terminating cable, only strip back the cable sheath 1". Keep pair untwists to a maximum of 0.5".

Bend radius. If you bend twisted-pair cable too much, you loosen the twists, and yes, lose performance. The following bend radii are under no-load conditions:

UTP horizontal: 4 times the cable diameter.

Sc/UTP horizontal: 8 times the cable diameter.

Multipair backbone: 10 times the cable diameter.

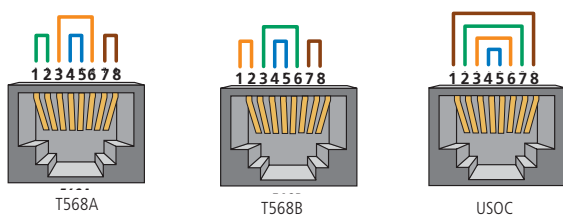
Tension. To avoid stretching, pulling tension should not exceed 110 N (25 lb./ft. or 110N). Pulling too hard untwists the pairs, which can cause transmission problems, and can affect cable certification. Use supports and trays in cable runs to minimize sagging, which pulls on the pairs and degrades performance.

Cinching. Take care not to cinch cable bundles tightly, which causes stress and degrades performance. Tie cable bundles loosely. And never staple cables.

Connecting hardware. Use connecting hardware of the same category or higher. The transmission of your components will always be the lowest category in the link. So, if you're using CAT6 cable, use CAT6 connectors.

Miscellaneous considerations. Visually inspect the cable for proper terminations, bend radius, tension, nicks, etc. Don't uncoil UTP cable on a spool. It can cause kinks. Rotate the spool instead. Plan for 12 inches of slack cable behind wall outlets for possible future reterminations.

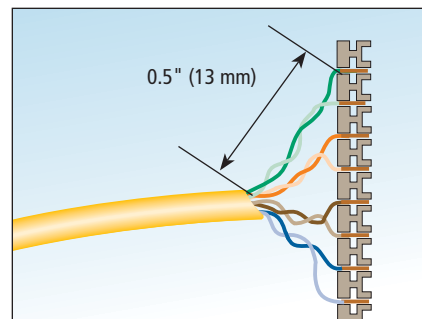
T568A, T568B, and USOC wiring



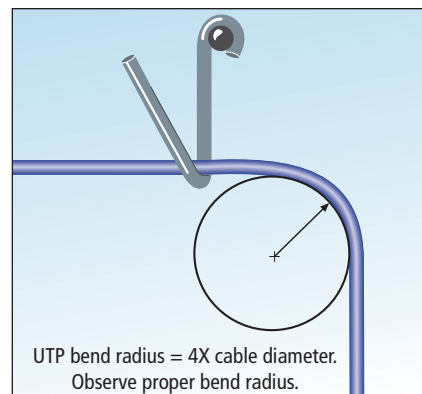
There are two approved pinning methods in the TIA-568-C standard for terminating network cable to 8-position RJ-45 jacks and connectors: T568A and T568B. The difference between the two is the pin position of the orange and green pairs.

The T568B wiring scheme is the de facto standard for communications networking in the U.S. It is the same as AT&T's old 258A color scheme. T568B offers backward compatibility with USOC through one pair. T568A is backward compatible with both one- and two-pair USOC connections.

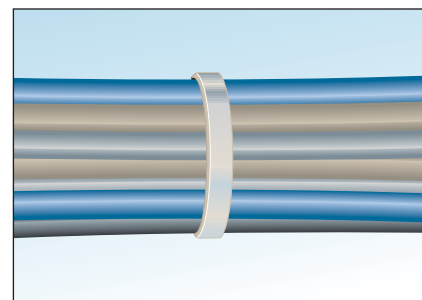
Whichever pinning scheme you choose to use, stick with it. T568A and T568B pinnings are not interchangeable. Mixing the two can cause crossed pairs, which just don't work.



Keep jacket removal and untwists to a minimum.



UTP bend radius = 4X cable diameter.
Sc/UTP bend radius = 8X cable diameter.



Keep cable wraps snug, but don't pull or crush cables. Wrap CAT6A cables loosely.

Straight-pinned and crossover cable

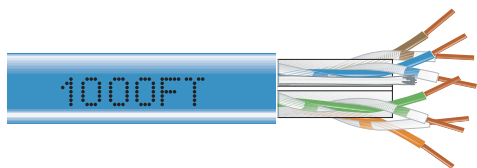
Straight-pinned cable has the most common type of pinning. The send and receive pairs are wired straight through on either end of the cable.

Crossover cable is generally used for peer-to-peer connections. The send and receive pairs are crossed between Connector A to Connector B on either end of the cable.

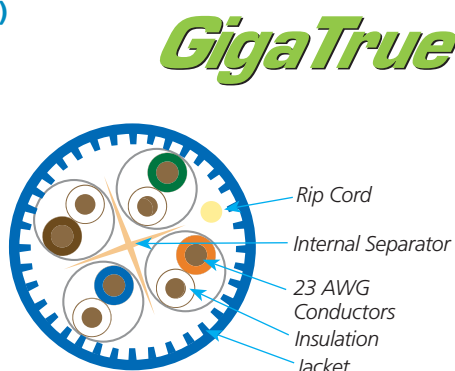
T568A and T568B Crossover Cable		USOC Crossover Cable	
Connector (A)	Connector (B)	Connector (A)	Connector (B)
1	3	1	8
2	6	2	7
3	1	3	6
6	2	4	5
5	4	5	4
4	5	6	3
7	8	7	2
8	7	8	1

Move to 10-GbE with this ETL Verified 650-MHz cable.

GigaTrue® CAT6A Solid Bulk Cable (UTP)



- ETL Verified for component-level performance and as part of our CAT6A channel.
- Supports 10-GbE up to 328 feet (100 m).
- Ideal for server-to-server/-storage/-switch, distributed backbone, and zone connections.
- Supports PoE and PoE+ for VoIP, WAP, and security applications.
- Diameter: 0.334"
- **Standard Warranty** — Lifetime



GigaTrue CAT6A



CAT6A 650-MHz Solid Bulk Cable (UTP)

23 AWG, Solid, 650-MHz, 1000-ft. (304.8-m)

Riser PVC CMR C6ABC50-XX-1000

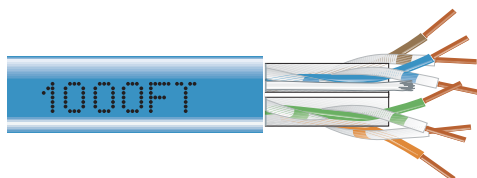
Plenum CMP C6ABC51-XX-1000

To order, replace the **XX** with the color.
Blue = BL Black = BK Gray = GY White = WH

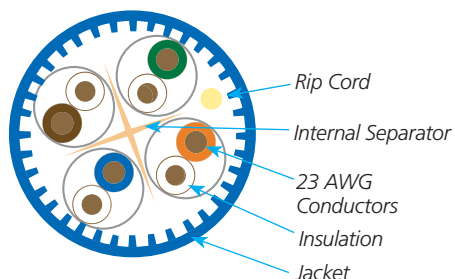
For specs, go to blackbox.com.

625-MHz CAT6A cable that's made in the USA.

10-Gigabit CAT6A Solid Bulk Cable (UTP)



- Maximum bandwidth exceeds 625 MHz.
- Ideal for server-to-server/-storage/-switch, distributed backbone, and zone connections.
- Jacket design reduces Alien Crosstalk.
- Supports PoE and PoE+ applications like VoIP, WAP, and security.
- Diameter: 0.340"
- **Standard Warranty** — Lifetime



CAT6A



10-Gigabit CAT6A Solid Bulk Cable (UTP)

23 AWG, Solid, 625-MHz, 1000-ft. (304.8-m)

PVC CMR EYN10G1XA-1000

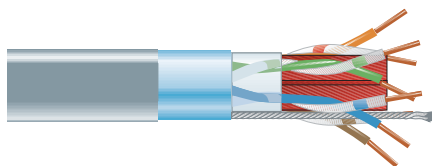
Plenum CMP EYN10G0XA-1000

To order, replace the **X** with the color.
Blue = 0 White = 1 Yellow = 2
Gray = 3 Green = 4

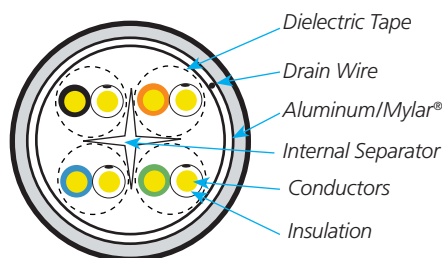
For specs, go to blackbox.com.

Eliminate ANEXT worries with a CAT6A shielded channel.

CAT6A 650-MHz F/UTP Bulk Cable



- Use with Black Box® CAT6A shielded components for a 10GBASE-T channel.
- Smaller outside diameter than CAT6A UTP.
- Diameter: 0.303"
- Foil shield construction virtually eliminates alien crosstalk.
- **Standard Warranty** — Lifetime



CAT6A



CAT6A F/UTP Bulk Cable

23 AWG, Solid, 650-MHz, 1000-ft. (304.8-m), Blue

PVC CMR EYN770A-RL-1000

Plenum CMP EYN771A-RL-1000

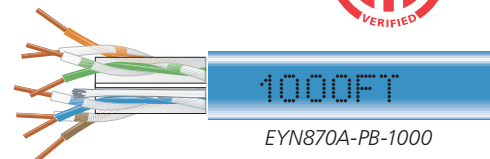
For specs, go to blackbox.com.



Our best CAT6 cable: guaranteed, ETL Verified performance.

GigaTrue 550 CAT6, 550-MHz Solid Bulk Cable (UTP)

- ETL Verified component level performance and as part of our ETL Verified GigaTrue® CAT6 channel solution.
- Guaranteed to exceed CAT6 requirements.
- Cross-web design increases strength and performance.
- Ideal for digital video, 100-Mbps TP-PMD, and 155-Mbps ATM and Gigabit Ethernet.
- Cable is marked in two-foot increments.
- **Standard Warranty** — Lifetime



GigaTrue® 550 CAT6 550-MHz Solid Bulk Cable (UTP)

23 AWG, Pull Box, 1000-ft. (304.8-m)
 PVC CMR EYN8XXA-PB-1000
 Plenum CMP EYN8YYB-PB-1000

PVC: replace the **XX** with the color.
 Blue = 70 Yellow = 72 White = 74 Gray = 76
 Violet = 64 Green = 78 Orange = 66 Red = 68
 Black = 80

Plenum: Replace the **YY** with the color.
 Blue = 71 Yellow = 73 White = 75 Gray = 77
 Violet = 65 Green = 79 Orange = 67 Red = 69
 Black = 81

For specs, go to blackbox.com.

Related
 The ETL Verified channel consists of:
 GigaTrue CAT6 Patch Cable, p. 113
 GigaTrue CAT6 Jacks, p. 165
 GigaTrue CAT6 Patch Panel, p. 157
 CAT6 Wiring Block Kit, p. 159

CAT6 and CAT6A Cable Diameters

by Roberta Bowen Szyper

What you need to know.

Although shielded cable has the reputation of being bigger, bulkier, and more difficult to handle and install than unshielded cable, this is not the case with CAT6A F/UTP cable. It is actually easier to handle than CAT6A UTP; requires less space to maintain proper bend radius; and uses smaller conduits, cable trays, and pathways.

CAT6A UTP is significantly larger than CAT6 and CAT6A F/UTP cable because it is designed with more interior space between the pairs to minimize ANEXT. The outside diameter of CAT6A UTP can be as large as 0.354" compared to 0.265"–0.30" for CAT6A F/UTP, and 0.21"–0.24" for CAT6.

CAT6A UTP cable design differs among manufacturers. It may have double interior pair separators and/or a rigid jacket with a gear-shaped interior wall to create interior air space and decrease crosstalk.

CAT6A UTP is constructed with larger conductors, usually 23 AWG, and tighter twists than are used in CAT6 and CAT5e cable. The heavier conductors and heavier, larger, rigid jacket combine to make CAT6A UTP more difficult to install. It also requires a bend radius of 4x O.D., which is significantly larger than CAT6 and CAT6A F/UTP.

The CAT6A UTP outside diameter creates a greater difference in the fill rate of cabling pathways.

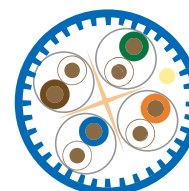
TIA-569 recommends a maximum conduit fill ratio of 40% to accommodate bend radius requirements and to allow for future expansion. An increase in the outside diameter (O.D.) of 0.1", from 0.25" to 0.35", represents a 21% increase in fill volume.

In general, CAT6A F/UTP cable provides a minimum of 35% more fill capacity than CAT6A UTP cable. For example, at a 40% fill ratio, you can run (3) CAT6A UTP cables in a ¾" conduit vs. (5) CAT6 cables, and (3) CAT6A F/UTP cables.

In addition, innovations in connector technology have made terminating CAT6A F/UTP cable actually easier than terminating bulkier CAT6A UTP cable.



CAT6
OD: 0.21"–0.24"



CAT6A UTP
OD: 0.354" (max.)



CAT6A F/UTP
OD: 0.265"–0.30"

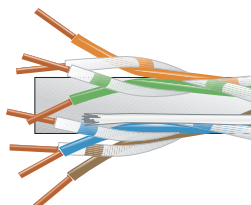
Conduit Trade Size	Fill*	No. of CAT6A Cables	
		9.0 mm (0.354") O.D.	7.4 mm (.290") O.D.
53 mm (2")	40%	13	20
	60%	20	30
78 mm (3")	40%	30	45
	60%	45	66
103 mm (4")	40%	51	80
	60%	78	116

*40% is the fill ratio recommended for initial runs to allow for growth. 60% is the maximum fill ratio.

High-performance CAT6 cable that's made in the USA.

GigaTrue Plus CAT6 Solid Bulk Cable

- Sweep tested and characterized to 250 MHz.
- Cross-web design increases strength and performance.
- Ideal for high-speed applications, such as Gigabit Ethernet, 100BASE-TX, 100-Mbps TP-PMD, T1, 155-Mbps ATM, 622-Mbps ATM, and voice.
- Cable is marked in two-foot increments so you know how much is left.
- **Standard Warranty** — Lifetime



CAT6U-R-PBC-SLD-BL

GigaTrue[®] Plus

CAT6



Performance Specifications

MHz	Attenuation 100 m (dB) Min.	ACR 100 m (dB) Min.	PS-ACR 100 m (dB) Min.	ELFEXT (dB) Min.	PS-ELFEXT (dB) Min.	NEXT (dB) Min.	PS-NEXT (dB) Min.
100	19.8	24.5	22.5	37.8	24.8	44.3	42.3
200	29.0	10.7	8.7	21.8	18.8	39.8	37.8
250	32.8	5.4	3.4	19.8	16.8	38.3	36.3

GigaTrue Plus CAT6 Solid Bulk Cable (UTP)

23 AWG, 4-Pair, 1000-ft. (304.8-m), Pull Box

PVC CAT6U-R-PBC-SLD-XX

Plenum CAT6U-P-PBC-SLD-XX

To order, replace the **XX** with the color.

Blue = BL Black = BK Gray = GY White = WH
Red = RD Yellow = YL Green = GN

CUSTOM SPOTLIGHT

When you need it made to order, count on us!

Special requirements? No problem!

Black Box can build a custom cable or adapter to your requirements. Every day, experienced technicians in our manufacturing facility in Lawrence, PA, build custom cable assemblies, wallplates, switches, and more!

Customs can include:

- Bundled CATx and fiber bulk cables.
- Coax cables for DAS systems.
- Pre-terminated fiber cables.
- Dyed, striped, and UV cables.
- Y and octopus cables.
- Nurse-call cables.
- Feed-through faceplates.
- Connectors and adapters.



Jacqueline has built our custom cables for 23 years and counting.

To Get Started

Call our Pre-Sales Engineers. Or design your cable online at blackbox.com/go/Configurators.

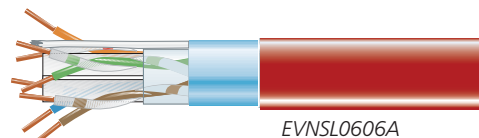
Shielded cable for long runs in noisy environments.

CAT6 400-MHz Shielded Solid Bulk Cable (F/UTP)

- Ideal for carrying data, audio, and video, and for use in 10-/100-/1000-Mbps networks.
- Features aluminum Mylar® tape. Foil shield protects against noise and EMI/RFI interference.
- **Standard Warranty** — Lifetime



NOTE: For cable assemblies, see p. 116.



CAT6 400-MHz Shielded Solid Bulk Cable (F/UTP)

24 AWG, 1000-ft. (304.8-m)
 PVC CM EVNSL060XA-1000
 Plenum CMP EVNSL061XA-1000

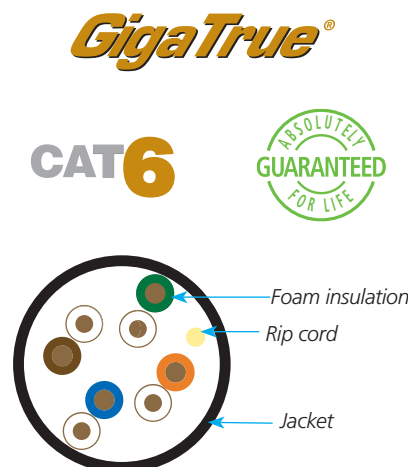
To order, replace the X with the color number.
 Blue = 1 Yellow = 4 White = 5 Gray = 2
 Violet = 9 Green = 7 Red = 6 Orange = 0
 Black = 8

For specs, go to blackbox.com.

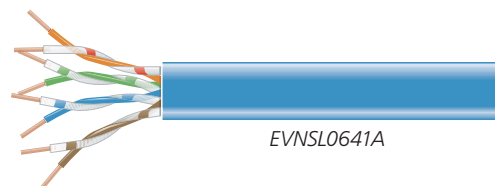
CAT6 stranded cable for making assemblies or short runs.

GigaTrue CAT6 550-MHz Stranded Bulk Cable (UTP)

- High-quality stranded CAT6 cable enables you to terminate your own patch cables.
- Stranded design makes it ideal for use in patching or for short runs.
- Designed for use with GigaTrue® products.
- For 1000BASE-T, 100BASE-TX, 100BASE-VG, 155-Mbps ATM, 100-Mbps FDDI/CDDI, and other high-speed applications.
- Perfect for full broadband and baseband video.
- **Standard Warranty** — Lifetime



NOTE: For cable assemblies, see p. 115.



GigaTrue CAT6 550-MHz Stranded Bulk Cable (UTP)

24 AWG, PVC (CM)
 250-ft. (76.2-m) EVNSL06XXA-0250
 500-ft. (152.4-m) EVNSL06XXA-0500
 1000-ft. (304.8-m) EVNSL06XXA-1000

To order, replace the XX with the color.
 Gray = 40 Blue = 41 Green = 42
 Red = 43 Yellow = 44 Beige = 45
 Pink = 46 Black = 47 Violet = 48
 Orange = 49 White = 50

For specs, go to blackbox.com.

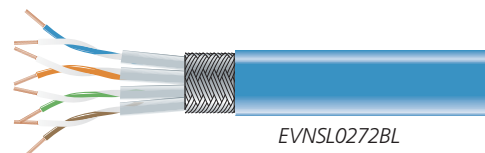
Double-shielded CAT6 cable for noisy data center and workgroup connections.

CAT6 250-MHz Shielded, Stranded Bulk Cable (Sc/FTP)

- Features four individually shielded twisted pairs with foam insulation, aluminum/Mylar foil tape, and an overall tinned copper braid.
- Ideal for use in audio and high-speed broadband video transmissions, and data applications up to 1000BASE-T.
- **Standard Warranty** — Lifetime



NOTE: For cable assemblies, see p. 115.



CAT6 250-MHz Shielded, Stranded Bulk Cable (Sc/FTP)

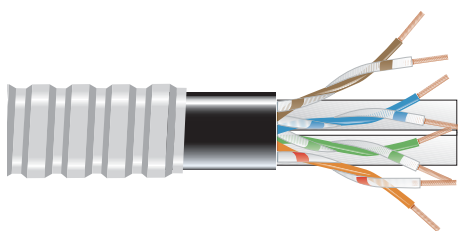
26 AWG, PVC (CM) 1000-ft. (304.8-m)
 EVNSL0272XX-1000

To order, replace the XX with the color.
 Gray = GY Blue = BL Green = GN
 Red = RD Yellow = YL Black = BK
 Violet = VI Orange = OR White = WH

For specs, go to blackbox.com.

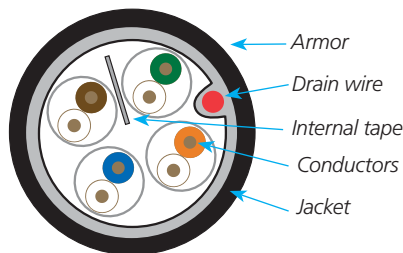
Save money! Run this armored cable anywhere in your building—no innerducts required.

GigaTrue® Plus CAT6 Heavy-Duty, Armored Indoor Cable



CAT6

- Save money on labor and materials. Pull this cable once instead of pulling conduit and then pulling cable.
- Romex® aluminum armor also acts like a shield.
- Run anywhere in your building.
- Ideal for out-of-the-way areas and harsh and industrial environments.
- Well-suited for military, aerospace, energy, and manufacturing applications.
- Proudly made in the USA.
- **Standard Warranty** — Lifetime



Check out how you can save on labor and materials!

The Expensive Way:
 GigaTrue Plus CAT6
 Plenum Cable (1000 ft.)
 Plenum innerduct
 Labor to pull cable and innerduct

The Interlocking Armored Way:
 GigaTrue Plus CAT6 Heavy-Duty, Armored Cable (1000 ft.)
 Labor to pull cable

NOTE: Costs based on a 1000-foot run using Black Box materials. Labor costs are estimated and can vary widely based on the building and environment.

GigaTrue Plus CAT6 Heavy-Duty, Armored Indoor Cable
 250-MHz, PVC, Black, 1000-ft. (304.8-m)
 C6-IA-1000

For specs, see blackbox.com.

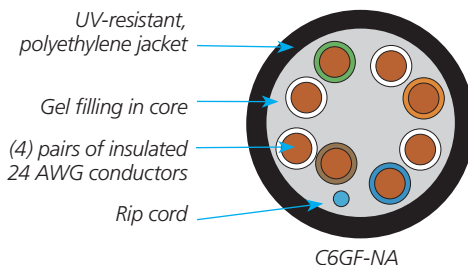
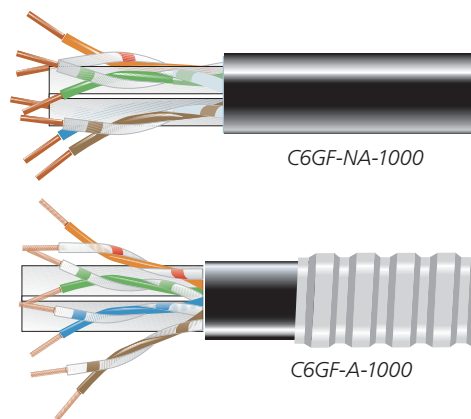
Tough cables that resist the elements, crushing, and EMI.

CAT6 Outdoor-Rated, Gel-Filled Armored and Non-Armored Cable

- Use for direct burial, in ducts, or lashed to an aerial support member.
- Romex® aluminum armored version also resists rodent damage.
- Gel-filled, solid-conductor cables feature UV- and abrasion-resistant jackets.
- Withstand extreme temperatures.
- Internal separator helps reduce crosstalk.
- Meets CAT6 250-MHz requirements.
- **Standard Warranty** — Lifetime



CAT6



CAT6 Outdoor-Rated Solid, Gel-Filled Bulk Cable

Non-Armored	
1000-ft. (304.8-m)	C6GF-NA-1000
Custom lengths	C6GF-NA
Armored	
1000-ft. (304.8-m)	C6GF-A-1000
Custom lengths	C6GF-A

For specs, go to blackbox.com.

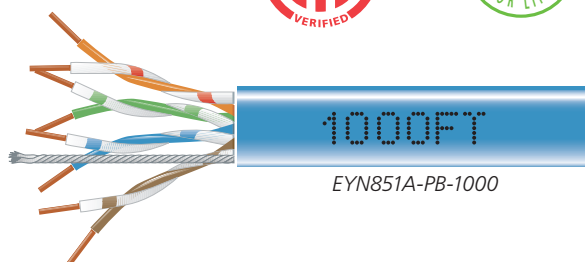
Our best CAT5e cable: guaranteed, ETL Verified performance.

GigaBase 350 CAT5e, 350-MHz Solid Bulk Cable (UTP)

- This cable is ETL Verified for component-level performance and is part of our ETL Verified GigaBase® CAT5e channel solution.
- Use with our GigaBase jacks, panels, and patch cable for a complete solution.
- Guaranteed to meet or exceed CAT5e specs.
- Ideal for Gigabit Ethernet.
- Longitudinal rip cord for easy jacket opening.
- 1000-foot (304.8-m) cable is marked in two-foot increments so you always know how much you have left.
- **Standard Warranty** — Lifetime

GigaBase®

CAT5e



GigaBase® 350 CAT5e, 350-MHz Solid Bulk Cable (UTP)

24 AWG, Pull Box, 1000-ft. (304.8-m)
 PVC CMR EYN8XXA-PB-1000
 Plenum CMP EYN8YYA-PB-1000

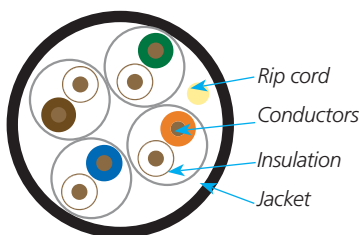
PVC: replace the **XX** with the color.
 Blue = 51 White = 53 Yellow = 55 Gray = 57
 Violet = 45 Green = 59 Red = 49 Orange = 47
 Black = 61

Plenum: Replace the **YY** with the color.
 Blue = 50 White = 52 Yellow = 54 Gray = 56
 Violet = 44 Green = 58 Red = 48 Orange = 46
 Black = 60

For specs, go to blackbox.com.

Related

The ETL Verified channel consists of:
 GigaBase CAT5e Patch Cable, p.120
 GigaBase CAT5e Patch Panel, p. 161
 CAT5e Wiring Block, p. 163
 CAT5e Jack, p. 165



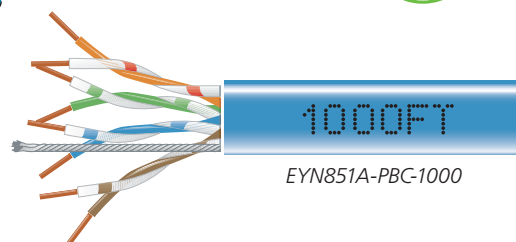
High-performance CAT5e cable that's made in the USA.

GigaBase Plus CAT5e, 200-MHz Solid Bulk Cable (UTP)

- Meets ANSI/TIA CAT5e specs.
- Sweep tested and characterized to 200 MHz.
- Ideal for high-speed applications, such as Gigabit Ethernet, 100BASE-TX, and voice.
- Every master pull box is tested for electrical performance.
- Longitudinal rip cord for easy jacket opening.
- 1000-foot (304.8-m) cable is marked in two-foot increments so you always know how much you have left.
- **Standard Warranty** — Lifetime

GigaBase® Plus

CAT5e



GigaBase® Plus CAT5e Solid Bulk Cable (UTP)

24 AWG, Pull Box, 1000-ft. (304.8-m)
 PVC CMR EYN8XXA-PBC-1000
 Plenum CMP EYN8YYA-PBC-1000

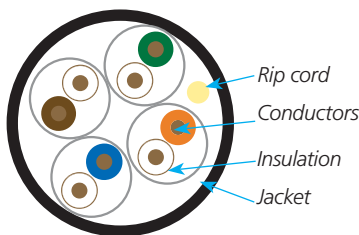
PVC: replace the **XX** with the color.
 Blue = 51 White = 53 Yellow = 55 Gray = 57
 Green = 59 Red = 49 Black = 61 Orange = 47

Plenum: Replace the **YY** with the color.
 Blue = 50 White = 52 Yellow = 54 Gray = 56
 Green = 58 Red = 48 Black = 60 Orange = 46

For specs, go to blackbox.com.

Related

This cable works with:
 GigaBase CAT5e Patch Panel, p. 161
 CAT5e Wiring Block, p. 163
 GigaBase Plus Jacks, blackbox.com



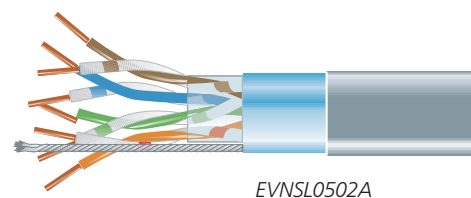
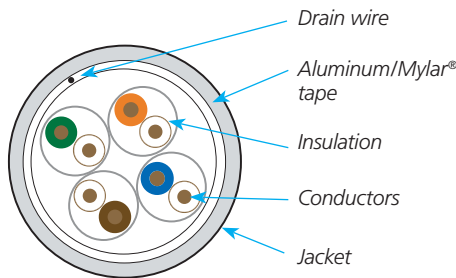
Shielded cable for long runs in noisy environments.

CAT5e 350-MHz Shielded, Solid Bulk Cable (F/UTP)

CAT5e



- Ideal for long runs in industrial environments.
- Meets TIA-568-C.2 CAT5e specs.
- Rated for 350-MHz.
- Low attenuation and near-end crosstalk provide excellent transmission.
- **Standard Warranty** — Lifetime



CAT5e 350-MHz Shielded, Solid Bulk Cable (F/UTP)

24 AWG, 1000-ft. (304.8-m)

PVC CM	EVNSL050XA-1000
Plenum CMP	EVNSL051XA-1000

To order, replace the X with the color number.
 Blue = 1 Yellow = 4 White = 5 Gray = 2
 Violet = 9 Green = 7 Red = 6 Orange = 0
 Black = 8

For specs, go to blackbox.com.

Related

For shielded, solid patch cables, see p 121
 GigaBase CAT5e Patch Panels, p. 161
 GigaBase CAT5e Jacks, p. 165

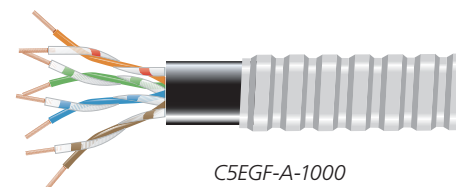
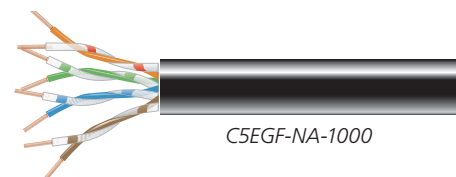
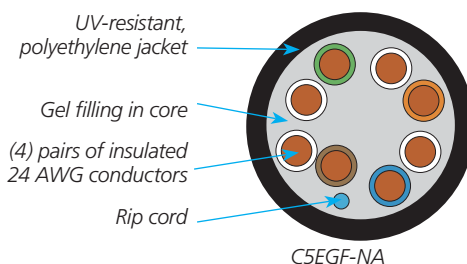
Tough cables that resist the elements, crushing, and EMI.

CAT5e Outdoor-Rated, Gel-Filled Armored and Non-Armored Cables

CAT5e



- Use for direct burial, in ducts, or lashed to an aerial support member.
- Romex® aluminum armored version also resists rodent damage.
- Gel-filled, solid-conductor cables feature UV- and abrasion-resistant jackets.
- Withstand extreme temperatures.
- **Standard Warranty** — Lifetime



CAT5e Outdoor-Rated, Gel-Filled Bulk Cable

100-MHz, Solid, 24 AWG

Non-Armored	1000-ft. (304.8-m)	C5EGF-NA-1000
	Custom lengths	C5EGF-NA
Armored	1000-ft. (304.8-m)	C5EGF-A-1000
	Custom lengths	C5EGF-A

For specs, go to blackbox.com.

Cable, connectors, and hardware for your legacy systems.

For more information, go to blackbox.com.

USOC Jacks
 Make legacy USOC connections.
 FMT238-25PAK



CAT5 Modular Plugs
 For legacy cable connections.
 FMT5U-STR



CAT5 Patch Cables
 For legacy equipment connections.
 EYN550MS-0002



Media Track 6 and 8
 Hide cables when you need to run them along a wall.
 JPT600



RJ-11 and RJ-45 Modular Cables
 Flat satin cabling for voice and data.
 EL04M-04



RJ-11 Modular Plug Kit
 Make modular terminations.
 FTM600-R2

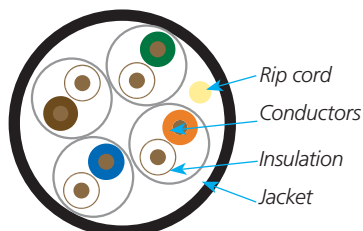
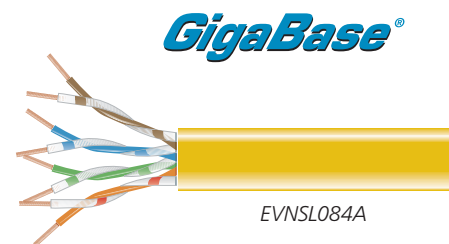


Make your own terminations.

GigaBase® 350 CAT5e, 350-MHz Stranded Bulk PVC Cable (UTP)

- Tested to 350 MHz.
- Meet or exceed CAT5e T568-C.2 standards.
- Use to make your own cable assemblies.
- **Standard Warranty** — Lifetime

CAT5e



GigaBase® CAT5e 350-MHz Stranded Bulk Cable (UTP)

24 AWG, PVC (CM)
 500-ft. (152.4-m) EVNSL0XXA-0500
 1000-ft. (304.8-m) EVNSL0XXA-1000

Replace the **XX** with the color.
 Gray = 80 Blue = 81 Green = 82 Red = 83
 Yellow = 84 Beige = 85 Pink = 86 Black = 87
 Purple = 88 Orange = 89 White = 99

For specs, go to blackbox.com.

Related

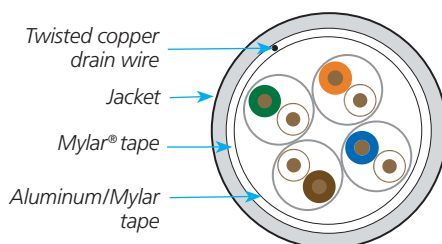
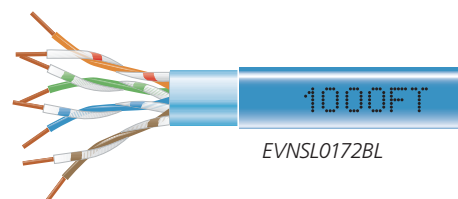
This cable works with:
 CAT5e Modular Plugs, p. 169
 CAT5e EZ-RJ45 Plugs, p. 168
 GigaBase CAT5e Patch Panels, p. 161
 GigaBase CAT5e Jacks, p. 165
 For patch cables, see pp. 118–120

Shielded CAT5e cable for noisy data center and workgroup connections.

CAT5e 100-MHz Shielded, Stranded Bulk PVC Cable (F/UTP)

- Meets CAT5e standards.
- Cable construction: 26 AWG stranded conductor, Mylar® tape, tinned-copper drain wire, aluminum/Mylar tape, PVC jacket.
- Flame retardancy verified to IEC 60332-1.
- **Standard Warranty** — Lifetime

CAT5e



CAT5e 100-MHz Shielded, Stranded Bulk Cable (F/UTP)

26 AWG, PVC (CM), 1000-ft. (304.8-m)
 EVNSL0172XX-1000

To order, replace the **XX** with the color.
 Gray = GY Blue = BL Green = GN
 Red = RD Yellow = YL Black = BK
 Violet = VI Orange = OR White = WH

For specs, go to blackbox.com.

Related

This cable works with our CAT5e Shielded Modular Plugs, p. 169
 For shielded stranded patch cables, see p. 122

Modular Adapters and Couplers
 Extend modular cable runs.
 FM009



Cross-Connect Wire
 Use in wiring closets.
 EYN7001BL-1000



Telco Adapters
 For legacy telco connections.
 FM052-R2



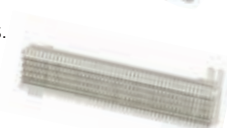
Telephone Bulk Cable
 Cable for traditional phone lines.
 EL04A-500



CAT3 Jacks
 Make legacy CAT3 connections.
 FMT364-R2



Telco Splice Blocks
 For legacy interconnects.
 JP600



CAT6A: What you need to know.

by Roberta Bowen Szyper

UTP vs. F/UTP

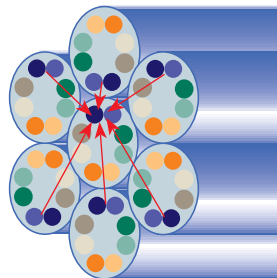
CAT6A is specified in ANSI/TIA-568-C.2 (Balanced Twisted-Pair Communications Cabling and Components Standard), published in August 2009. It defines 10-Gigabit data transmission for a distance of 100 meters. It extends electrical specifications to 500 MHz up from 250 MHz for CAT6. CAT6A supports bundled cable installations up to 100 meters and PoE+ low-power implementations. The standard adds the performance parameter, Alien Crosstalk (ANEXT), which wasn't a concern with previous cabling categories.

ANEXT

Alien Crosstalk (ANEXT) is a critical and unique measurement in 10-GbE networks. It's the measurement of the unwanted signal coupling between wire pairs in different and adjacent cables or from one balanced twisted-pair component, channel, or permanent link to another.

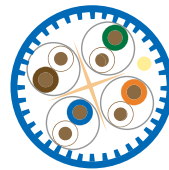
The amount of ANEXT depends on a number of factors, including the type of cable, cable jacket, cable length, cable twist density, proximity of adjacent cables and connectors, and EMI. Patch panels and connecting hardware are also affected by ANEXT.

Typically in a laboratory, measuring alien crosstalk is based on cables in a "six-around-one" configuration. The central or affected cable is called the victim cable and the surrounding, adjacent cables are the disturber cables. This test configuration bundle presents a worst-case scenario, and the center cable would be adversely affected by ANEXT. A total of seven equal length links are connected to each other at previously defined distances. Every pair is measured against the other so there are 96 individual measurements.

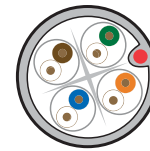


10-GbE

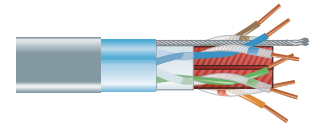
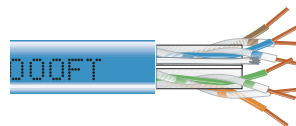
CAT6A is currently the cable of choice for 10-GbE installations. You will typically replace your electronic equipment three to five times during the lifespan of one cabling system, which can be as long as 15–20 years. That's why you should consider getting the best cabling you can—CAT6A minimum. It has been extensively tested and has been proven to support 10-GbE systems with plenty of headroom.



CAT6A UTP
OD: 9.0 mm
(0.354" max.)



CAT6A F/UTP
OD: 7.4 mm
(0.290")



CAT6A UTP

CAT6A UTP cable is larger than CAT6A F/UTP and can have a diameter up to 0.354 inches. It's constructed to minimize crosstalk and ANEXT with larger conductors (23 AWG minimum), tighter twists, extra internal airspace, an internal separator between the pairs, and a thicker outer jacket. Despite this, CAT6A UTP is still affected by ANEXT.

ANEXT can be improved by laying CAT6A UTP cable loosely in pathways and raceways with space between the cables, as opposed to tight bundles of cable. CAT6A UTP also needs to be tested for ANEXT. This is a complex and time-consuming process where all possible wire-pair combinations need to be tested for ANEXT and far-end ANEXT. It can take up to 50 minutes to test one link in a bundle of 24 CAT6A UTP cables.

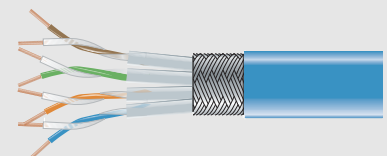
CAT6A F/UTP

ANEXT and the time needed to test for it can be greatly reduced, if not eliminated completely, by using shielded cables and equipment to isolate adjacent cables from each other. Studies have shown that CAT6A F/UTP cable does a much better job of eliminating ANEXT than CAT6A UTP and provides significantly more headroom (as much as 20 dB) for 10-GbE over copper. The foil shield acts as a barrier preventing EMI/RFI from coupling onto the twisted pairs from other adjacent cables. In effect, it reflects the noise from machinery, lights, motors, and other sources of EMI, as well as RFI from cell phones, wireless access points, and radios. In addition, the foil shield prevents data signals from leaking out of the cable, making the cable more difficult to tap and better for secure installations.

For more information on cable diameters and conduit fills, see [pages 104–105](#).

Looking for a CAT7 channel? Go to blackbox.com/go/Cables.
For pricing details, call.

- CAT7 S/FTP Patch Cable
- CAT7 S/FTP Bulk Cable
- CAT7 S/FTP Jack
- CAT 7 S/FTP Faceplate
- 10-GbE Patch Panel



Get component-level performance with optional lockability—no need to replace existing cables.

GigaTrue 3 CAT6A 650-MHz Lockable Patch Cable (F/UTP)



- Use for all your network connections.
- Boot uses LockPORT™ technology and optional Locking Pin provides security—without buying new cables.
- Insert the optional Locking Pin into the patented boot to lock down ports.
- Secure network ports from unauthorized access and accidental disconnects.
- Cables stay locked in place—until YOU take them out.
- Tested to 650 MHz.
- Part of our ETL Verified channel.
- **Standard Warranty** — Lifetime



A locked-down cable with Pin inserted in the boot.

To unlock, insert the Key into the Pin until it clicks. Pull the Pin back and lift the Key to release.



Lock'em or not: The choice is yours.

These one-of-a-kind cables give you the ability to lock down critical network ports—when you need to—without buying new patch cords.

Use these component-level cables for your everyday network connections. Then, when you need to secure network ports, you can. Just slip an optional Locking Pin into the tab on the patented, slimline LockPORT™ boot. To unplug the cable, release with the Removal Key (sold separately).

Turn ports into a Layer 1 security key.

GigaTrue 3 cables are one of the simplest and most effective yet inexpensive ways you can increase your Layer 1 security. Use them to protect mission-critical and publicly accessible ports from unauthorized access. They're also ideal for preventing accidental disconnects in industrial, manufacturing, and PoE applications.

Premium performance.

You won't sacrifice performance for security. These component-level cables are tested to 650 MHz and are guaranteed for life.

Rugged, patented, slimline boot.

No one is going to break this boot or pull out your cable! The extremely rugged, hard-polymer plug and boot are integrated to protect the cable and to prevent tampering.

The lock and key.

The Locking Pin (sold separately) comes in convenient packs of 10 and 25. The Removal Key (sold separately) is constructed of the same hard-polymer as the boot.

Ideal for many industries.

Lock up network ports in healthcare, education, government, finance, transportation, retail/point-of-sale, and more.

GigaTrue® 3 CAT6A TAA-Compliant 650-MHz Component-Level Lockable Patch Cable (F/UTP)

26 AWG, PVC CMR	
3-ft. (0.9-m)	C6APC80S-XX-03
5-ft. (1.5-m)	C6APC80S-XX-05
7-ft. (2.1-m)	C6APC80S-XX-07
10-ft. (3.0-m)	C6APC80S-XX-10
15-ft. (4.5-m)	C6APC80S-XX-15
20-ft. (6.0-m)	C6APC80S-XX-20

To order, replace the **XX** with the color. Blue = BL Black = BK Gray = GY White = WH

Related Products

Locking Pins	
10-Pack	LP50-RD-10PK
25-Pack	LP50-RD-25PK
Removal Key	KEY-CL

For specs and the video, go to blackbox.com/GigaTrue3.

Call for custom lengths at competitive prices!

Lock up unused network ports.

Port Locks

25-Pack, Includes Removal Key	
Red	PL-AB-RD-25PAK
Black	PL-AB-BK-25PAK
Extra Port Lock Removal Key	
	RT-AB-CL



Port Locks with Port Lock Removal Key



Cable designed especially for blade servers and tight spaces.

CAT6A High-Density Data Center Patch Cable (UTP)

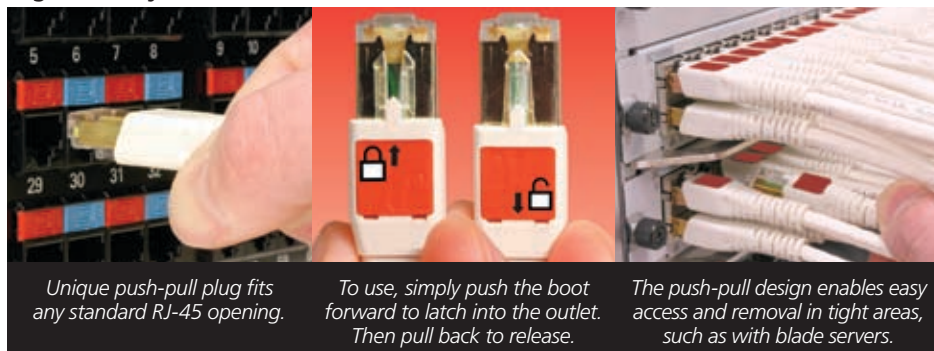
- Patented, low-profile, push-pull boot design for use with high-density data center equipment, such as blade servers.
- Offers side-by-side stackability.
- Boot provides excellent bend relief and has no thumb tab.
- 500-MHz cable supports 10GBASE-T and beyond.
- PoE and PoE+ Ready.
- Dual jacket construction and internal separator minimizes ANEXT.
- Standard Warranty — Lifetime

Related This cable works with:
 10-GbE CAT6A Patch Panels, pp. 154–155
 10-GbE CAT6A Jacks, p. 164



CAT6A

High-Density Data Center Patch Cable



CAT6A High-Density Data Center Patch Cable (UTP)

500-MHz, RJ-45, Stranded, Low-smoke PVC

3-ft. (9.0-m)	EVNSL6A-XX-BS-0003
5-ft. (1.5-m)	EVNSL6A-XX-BS-0005
7-ft. (2.1-m)	EVNSL6A-XX-BS-0007
10-ft. (3.0-m)	EVNSL6A-XX-BS-0010
15-ft. (4.5-m)	EVNSL6A-XX-BS-0015
20-ft. (6.0-m)	EVNSL6A-XX-BS-0020

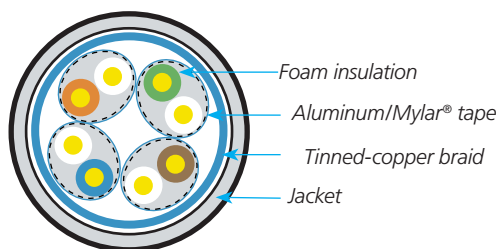
Replace the **XX** with the color.
 Gray = 70 Blue = 71 White = 80

For specs, go to blackbox.com.

Shielded CAT6A cable designed for 10GBASE-T applications.

CAT6A 600-MHz S/FTP Patch Cable

- Meets or exceeds all CAT6A performance requirements.
- Tested to 600 MHz.
- Fully shielded construction virtually eliminates alien crosstalk.
- Supports high-end applications such as 10GBASE-T.
- Standard Warranty — Lifetime



CAT6A



Performance Specifications

MHz	Attenuation 100 m (dB) Min.	NEXT (dB) Min.	PS-NEXT (dB) Min.	ELFEXT (dB) Min.	PS-ELFEXT (dB) Min.	Return Loss (dB) Min.
100	28.5	72	69	54	51	19
200	41.2	68	65	48	45	16.4
250	46.5	66	63	46	43	15.6
300	51.3	65	62	44	41	15.6
600	75.1	61	58	38	35	15.6

CAT6A Solid Bulk Cable (S/FTP)

600-MHz, 26 AWG, Stranded, PVC, Blue

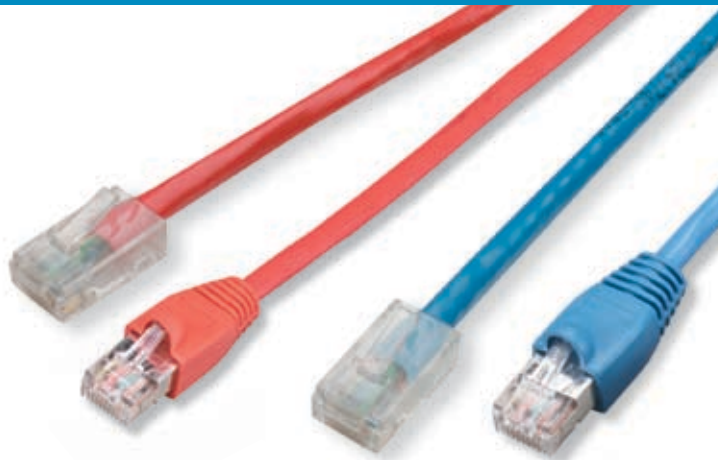
3-ft. (0.9-ft.)	EVNSL741-0003
6-ft. (1.8-ft.)	EVNSL741-0006
10-ft. (3.0-ft.)	EVNSL741-0010
15-ft. (4.5-ft.)	EVNSL741-0015

For more specs, go to blackbox.com.

CAT6 patch cables for all your high-performance applications.

GigaTrue CAT6 550-MHz Patch Cables (UTP)

GigaTrue® **CAT6**



Component Performance Molded Boots

GigaTrue CAT6 Component 550-MHz Patch Cable (UTP)

Stranded, 24 AWG, RJ-45, PVC, Straight-Pinned

3-ft. (0.9-m)	EVNSL6XX-0003
5-ft. (1.5-m)	EVNSL6XX-0005
6-ft. (1.8-m)	EVNSL6XX-0006
7-ft. (2.1-m)	EVNSL6XX-0007
10-ft. (3.0-m)	EVNSL6XX-0010
14-ft. (4.2-m)	EVNSL6XX-0014
20-ft. (6.0-m)	EVNSL6XX-0020

Replace the **XX** with the color. For 25 packs, add **-25PAK** to the end of the code.

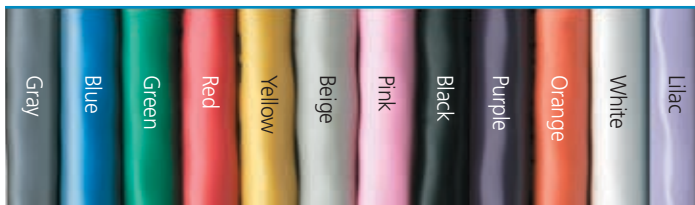
Gray = 70	Yellow = 74	Purple = 78
Blue = 71	Beige = 75	Orange = 79
Green = 72	Pink = 76	White = 80
Red = 73	Black = 77	

For specs, go to blackbox.com.

- For 1000BASE-T and other high-speed, high-performance applications.
- Delivers full power sum performance.
- Provides full-duplex operation.
- Meets balance requirements (LCL/LCTL), resulting in better transmission.
- Quantity discounts are available.
- **Standard Warranty** — Lifetime

**Tested to
550 MHz!**

Choose from as many as 12 colors.



Channel Performance Snagless Boots

GigaTrue CAT6 Channel 550-MHz Patch Cable (UTP)

Stranded, 24 AWG, RJ-45, PVC, Straight-Pinned

	Single	25-Pack
1-ft. (0.3-m)	EVNSL6XX-0001	
2-ft. (0.6-m)	EVNSL6XX-0002	
3-ft. (0.9-m)	EVNSL6XX-0003	
4-ft. (1.2-m)	EVNSL6XX-0004	
5-ft. (1.5-m)	EVNSL6XX-0005	
6-ft. (1.8-m)	EVNSL6XX-0006	
7-ft. (2.1-m)	EVNSL6XX-0007	
10-ft. (3.0-m)	EVNSL6XX-0010	
15-ft. (4.5-m)	EVNSL6XX-0015	
20-ft. (6.0-m)	EVNSL6XX-0020	
25-ft. (7.6-m)	EVNSL6XX-0025	
30-ft. (9.1-m)	EVNSL6XX-0030	
50-ft. (15.2-m)	EVNSL6XX-0050	
100-ft. (30.4-m)	EVNSL6XX-0100	
Custom Lengths	EVNSL6XX	

Replace the **XX** with the color. For 25 packs, add **-25PAK** to the end of the code.

Gray = 40	Yellow = 44	Purple = 48
Blue = 41	Beige = 45	Orange = 49
Green = 42	Pink = 46	White = 50
Red = 43	Black = 47	

For specs, go to blackbox.com.

Channel Performance Basic Connectors

GigaTrue CAT6 Channel 550-MHz Patch Cable (UTP)

Stranded, 24 AWG, RJ-45, PVC, Straight-Pinned

	Single	25-Pack
1-ft. (0.3-m)	EVNSL6XX-0001	
2-ft. (0.6-m)	EVNSL6XX-0002	
3-ft. (0.9-m)	EVNSL6XX-0003	
4-ft. (1.2-m)	EVNSL6XX-0004	
5-ft. (1.5-m)	EVNSL6XX-0005	
6-ft. (1.8-m)	EVNSL6XX-0006	
7-ft. (2.1-m)	EVNSL6XX-0007	
10-ft. (3.0-m)	EVNSL6XX-0010	
15-ft. (4.5-m)	EVNSL6XX-0015	
20-ft. (6.0-m)	EVNSL6XX-0020	
25-ft. (7.6-m)	EVNSL6XX-0025	
30-ft. (9.1-m)	EVNSL6XX-0030	
50-ft. (15.2-m)	EVNSL6XX-0050	
100-ft. (30.4-m)	EVNSL6XX-0100	
Custom Lengths	EVNSL6XX	

Replace the **XX** with the color. For 25 packs, add **-25PAK** to the end of the code.

Gray = 20	Yellow = 24	Purple = 28
Blue = 21	Beige = 25	Orange = 29
Green = 22	Pink = 26	White = 30
Red = 23	Black = 27	Lilac = 31

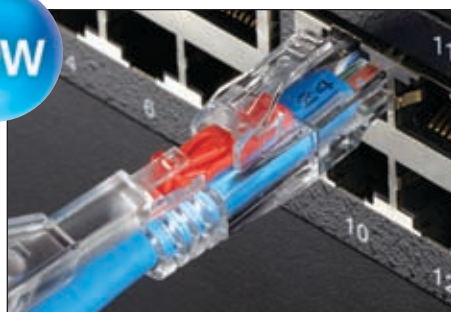
For specs, go to blackbox.com.

Get premium performance and lockability.

GigaTrue® 3 CAT6 550-MHz Lockable Patch Cables (UTP)

- Use for all your network connections.
- LockPORT™ technology provides rock-solid security without buying new cables.
- Insert the optional Locking Pin into the patented boot to lock down ports.
- Secure network ports from unauthorized access and accidental disconnects.
- Cables stay locked in place—until YOU take them out.
- **Standard Warranty** — Lifetime

GigaTrue[®] 3 CAT6



A locked-down cable with Pin inserted in the boot.

To unlock, insert the Key into the Pin until it clicks. Pull the Pin back and lift the Key to release.



Removal Key



Locking Pin



Port Locks with Port Lock Removal Key

Lock'em or not: The choice is yours.

These one-of-a-kind cables give you the ability to lock down critical network ports—when you need to—without buying new patch cords.

Use these high-performance cables for your everyday network connections. Then, when you need to secure network ports, you can. Just slip an optional Locking Pin into the tab on the patented LockPORT™ boot. To unplug the cable, release with the Removal Key (sold separately).

Turn ports into a Layer 1 security key.

GigaTrue 3 cables are one of the simplest and most effective yet inexpensive ways you can increase your Layer 1 security. Protect mission-critical and publicly accessible ports from unauthorized access. They're also ideal for preventing accidental disconnects in industrial, manufacturing, and PoE applications.

Premium performance.

You won't sacrifice performance for security. These component-level cables are tested to 550 MHz and are guaranteed for life.

Rugged, patented, slimline boot.

No one is going to break this boot or pull out your cable! The extremely rugged, hard-polymer plug and boot are integrated to protect the cable and to prevent tampering.

Ideal for many industries.

Lock up network ports in healthcare, education, government, finance, transportation, retail/point-of-sale, and more.

The lock and key.

The Locking Pin (sold separately) comes in convenient packs of 10 and 25. Keep a bag on hand so you're ready when you need to lock down network ports. The Removal Key (sold separately) is constructed of the same hard-polymer as the boot.

GigaTrue® 3 CAT6 550-MHz Lockable Patch Cable (UTP)

24 AWG, PVC CM		
1 ft. (0.3 m)	C6PC70-XX-01	
2 ft. (0.6 m)	C6PC70-XX-02	
3 ft. (0.9 m)	C6PC70-XX-03	
4 ft. (1.2 m)	C6PC70-XX-04	
5 ft. (1.5 m)	C6PC70-XX-05	
6 ft. (1.8 m)	C6PC70-XX-06	
7 ft. (2.1 m)	C6PC70-XX-07	
10 ft. (3.0 m)	C6PC70-XX-10	
15 ft. (4.5 m)	C6PC70-XX-15	
20 ft. (6.0 m)	C6PC70-XX-20	
25 ft. (7.6 m)	C6PC70-XX-25	
30 ft. (9.1 m)	C6PC70-XX-30	
50 ft. (15.2 m)	C6PC70-XX-50	
100 ft. (30.4 m)	C6PC70-XX-100	

Replace the **XX** with the color.
 Blue = BL Black = BK Gray = GY
 Red = RD White = WH Green = GN
 Yellow = YL Orange = OR Violet = VT

For specs and the video, go to blackbox.com/GigaTrue3.

Call for custom lengths at competitive prices!

GigaTrue® 3 CAT6 TAA-Compliant 550-MHz Lockable Patch Cable (UTP)



24 AWG, PVC CM	
3 ft. (0.9 m)	C6PC80-XX-03
5 ft. (1.5 m)	C6PC80-XX-05
7 ft. (2.1 m)	C6PC80-XX-07
10 ft. (3.0 m)	C6PC80-XX-10
15 ft. (4.5 m)	C6PC80-XX-15
20 ft. (6.0 m)	C6PC80-XX-20

Replace the **XX** with the color.
 Blue = BL Black = BK Gray = GY
 Red = RD Green = GN

Related Products

Locking Pins	
10-Pack	LP50-RD-10PK
25-Pack	LP50-RD-25PK
Removal Key KEY-CL	
Port Locks, 25 Pack, Includes Removal Key	
Red	PL-AB-RD-25PAK
Black	PL-AB-BK-25PAK
Extra Port Lock Removal Key RT-AB-CL	

For specs and the video, go to blackbox.com/GigaTrue3.

Call for custom lengths at competitive prices!

Double-shielded, lockable CAT6 cable for industrial environments.

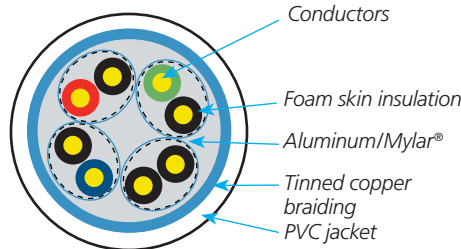
GigaTrue 3 CAT6 250-MHz Lockable Shielded Stranded Backbone PVC Cable

- Ideal for noisy connections in data centers, manufacturing and other industrial settings.
- LockPORT™ technology boots provide inexpensive security—without having to buy new cables.
- Lock boots to prevent accidental disconnects, particularly in factories, industrial settings, mining, even aerospace applications.
- Supports 1000BASE-T and broadband video.
- Features four individually shielded twisted pairs with foam insulation and foil tape and an overall tinned copper braid for superior high-speed transmissions, particularly in noisy environments.
- **Standard Warranty** — Lifetime

NOTE: For the optional Locking Pins, see page 114.



GigaTrue³ CAT6



GigaTrue 3 CAT6 250-MHz Lockable Shielded, Stranded Backbone PVC Cable (Sc/FTP)

26 AWG, PVC CM		
1 ft. (0.3 m)	C6PC70S-XX-01	
2 ft. (0.6 m)	C6PC70S-XX-02	
3 ft. (0.9 m)	C6PC70S-XX-03	
5 ft. (1.5 m)	C6PC70S-XX-05	
6 ft. (1.8 m)	C6PC70S-XX-06	
7 ft. (2.1 m)	C6PC70S-XX-07	
10 ft. (3.0 m)	C6PC70S-XX-10	
15 ft. (4.5 m)	C6PC70S-XX-15	
20 ft. (6.0 m)	C6PC70S-XX-20	
25 ft. (7.6 m)	C6PC70S-XX-25	

Replace the **XX** with the color.
 Blue = BL Black = BK Gray = GY
 Red = RD White = WH Green = GN
 Yellow = YL Orange = OR

For specs and the video, go to blackbox.com/GigaTrue3.

Call for custom lengths at competitive prices!

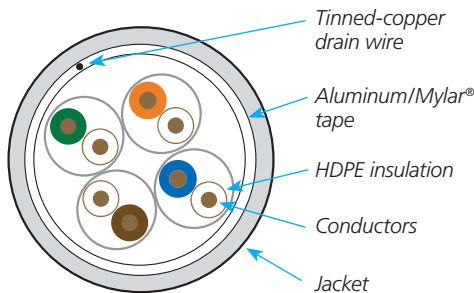


GigaTrue 3 Lockable Patch Cables
blackbox.com/go/Videos

Foil twisted-pair cable for patches and backbone runs in areas with interference.

CAT6 400-MHz, Shielded, Solid Backbone Cable PVC (F/UTP)

- Solid, dependable CAT6 patch and backbone cable for new and existing networks—particularly those in environments with electronic noise and EMI/RFI interference.
- Ideal for data, audio, and video applications, and for horizontal network connections.
- Slimline, so it's ideal for high-density applications.
- Shielding features aluminum/Mylar® tape with tinned copper drain wire.
- HDPE insulation: 0.03" (1.05 ± 0.02 mm).
- Molded connectors.
- **Standard Warranty** — Lifetime



CAT6

CAT6 400-MHz Shielded, Solid Backbone Cable PVC (F/UTP)

24 AWG, PVC CM		
1-ft. (0.3-m)	EVNSL06XXMS-0001	
2-ft. (0.6-m)	EVNSL06XXMS-0002	
3-ft. (0.9-m)	EVNSL06XXMS-0003	
5-ft. (1.5-m)	EVNSL06XXMS-0005	
6-ft. (1.8-m)	EVNSL06XXMS-0006	
7-ft. (2.1-m)	EVNSL06XXMS-0007	
10-ft. (3.0-m)	EVNSL06XXMS-0010	
15-ft. (4.5-m)	EVNSL06XXMS-0015	
20-ft. (6.0-m)	EVNSL06XXMS-0020	
25-ft. (7.6-m)	EVNSL06XXMS-0025	
30-ft. (9.1-m)	EVNSL06XXMS-0030	

PVC: replace the **XX** with the color number.
 Blue = 01 Gray = 02 Yellow = 04 White = 05
 Red = 06 Green = 07 Black = 08 Orange = 10

For specs, go to blackbox.com.

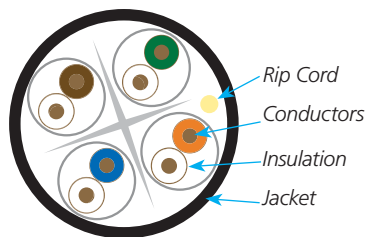
500-MHz backbone cable for CAT6 runs.

CAT6 550-MHz Solid-Conductor Backbone Cable (UTP)

- Solid, dependable CAT6 backbone cable for new and existing networks.
- Meets or exceeds CAT6 specifications.
- Use in 1000BASE-T, 100BASE-T, and other high-speed, high-bandwidth applications.
- **Standard Warranty** — Lifetime



CAT6



CAT6 550-MHz Solid Backbone Cable (UTP)

24 AWG, PVC CM		
2-ft. (0.6-m)	EYN9XXMS-0002	
5-ft. (1.5-m)	EYN9XXMS-0005	
10-ft. (3.0-m)	EYN9XXMS-0010	
15-ft. (4.5-m)	EYN9XXMS-0015	
20-ft. (6.0-m)	EYN9XXMS-0020	
25-ft. (7.6-m)	EYN9XXMS-0025	
30-ft. (9.1-m)	EYN9XXMS-0030	
35-ft. (10.6-m)	EYN9XXMS-0035	
50-ft. (15.2-m)	EYN9XXMS-0050	
100-ft. (30.4-m)	EYN9XXMS-0100	

PVC: replace the **XX** with the color.
 Blue = 01 Green = 02 Red = 03
 Yellow = 04 White = 06
 For specs, go to blackbox.com.

CAT6 550-MHz Solid Backbone Cable (UTP)

24 AWG, Plenum CMP		
2-ft. (0.6-m)	EYN9XXMS-0002	
5-ft. (1.5-m)	EYN9XXMS-0005	
10-ft. (3.0-m)	EYN9XXMS-0010	
15-ft. (4.5-m)	EYN9XXMS-0015	
20-ft. (6.0-m)	EYN9XXMS-0020	
25-ft. (7.6-m)	EYN9XXMS-0025	
30-ft. (9.1-m)	EYN9XXMS-0030	
35-ft. (10.6-m)	EYN9XXMS-0035	
50-ft. (15.2-m)	EYN9XXMS-0050	
100-ft. (30.4-m)	EYN9XXMS-0100	

Plenum: replace the **XX** with the color.
 Blue = 11 Green = 12 Red = 13
 Yellow = 14 White = 16
 For specs, go to blackbox.com.

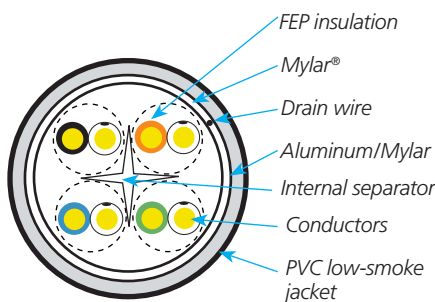
400-MHz shielded backbone cable for noisy CAT6 runs.

CAT6 400-MHz Shielded, Solid Backbone Plenum Cable (F/UTP)

- Features four solid copper pairs, FEP internal separator, Mylar® tape, tinned copper drain wire; aluminum/Mylar tape, flame-retardant, low-smoke PVC jacket, straight pinning, and molded boots.
- Solid, dependable CAT6 backbone cable for new and existing networks.
- Ideal for use in data, audio, and video applications and for horizontal network connections.
- **Standard Warranty** — Lifetime



CAT6



CAT6 400-MHz Shielded, Solid Backbone Plenum Cable (F/UTP)

24 AWG, Molded, Slimline Hoods		
1-ft. (0.3-m)	EVNSL0273XX-0001	
2-ft. (0.6-m)	EVNSL0273XX-0002	
3-ft. (0.9-m)	EVNSL0273XX-0003	
5-ft. (1.5-m)	EVNSL0273XX-0005	
6-ft. (1.8-m)	EVNSL0273XX-0006	
7-ft. (2.1-m)	EVNSL0273XX-0007	
10-ft. (3.0-m)	EVNSL0273XX-0010	
15-ft. (4.5-m)	EVNSL0273XX-0015	
20-ft. (6.0-m)	EVNSL0273XX-0020	
25-ft. (7.6-m)	EVNSL0273XX-0025	
30-ft. (9.1-m)	EVNSL0273XX-0030	

Replace the **XX** with the color.
 Blue = BL Black = BK Gray = GY
 White = WH Yellow = YL Green = GN
 Orange = OR Brown = BR Red = RD

For specs, go to blackbox.com.

Make blade server connections.

CAT6 High-Density Data Center Patch Cable (UTP)

- Gray EVNSL6-70-BS series
- Blue EVNSL6-71-BS series
- White EVNSL6-80-BS series

For features, specs, and pricing, go to blackbox.com.



Make tight spaces right spaces with SpaceGAIN.

SpaceGAIN CAT6 90° Right-Angle Patch Cables (UTP, SC/FTP)



CAT6



Gain up to 4" of valuable space with SpaceGAIN 90° Right-Angle Patch Cables. Shown left: Down-Up cables. Shown right: Down cable; cable clip faces down and the cable angles down. (EVNSL216-0001-90DD).

Down-Up Cable
The Down Cable clip faces down and the cable runs down. The Up Cable clip faces down and the cable runs up. Shown: EVNSL213S-0003-90DU.

Down-Down Cable
The Down Cable clip is on the bottom and the cable runs down. Shown: Unshielded EVNSL216-0003-90DD

Down-Straight Cable
The Down Cable clip is on the bottom and the cable runs down. Shown: Unshielded EVNSL276-0003-90DS

Reduce cabling space, management, and costs.

- Save up to four inches of space in crowded cabinets.
- Make tight wallplate connections behind furniture and equipment.
- Meet or exceed CAT6 specifications.
- Choose from UTP or Sc/FTP cable.
- **Standard Warranty** — Lifetime



Up cable: Cable clip faces down and the cable angles up. Shown: EVNSL246-0003-90DU



Down cable: Cable clip faces down and the cable angles down. Shown: EVNSL236-0003-90DD

SpaceGAIN CAT6 Unshielded 90° Right-Angle Patch Cables (UTP)

24 AWG, Stranded, 250-MHz

1-ft. (0.3-m)	EVNSL2X6-0001-90YY
3-ft. (0.9-m)	EVNSL2X6-0003-90YY
6-ft. (1.8-m)	EVNSL2X6-0006-90YY
10-ft. (3.0-m)	EVNSL2X6-0010-90YY
15-ft. (4.5-m)	EVNSL2X6-0015-90YY

Replace the **X** with the color: Blue = 1 Red = 3 Yellow = 4 Black = 7
 Replace the **YY** with the connector style: 90° Down-180° Straight = DS
 90° Down-90° Up = DU 90° Down-90° Down = DD

For specs, go to blackbox.com.

SpaceGAIN CAT6 Shielded 90° Right-Angle Patch Cables (Sc/FTP)

26 AWG, Stranded, 250-MHz, Aluminum Mylar® Tape, Tinned Copper Braid

1-ft. (0.3-m)	EVNSL21XS-0001-90YY
3-ft. (0.9-m)	EVNSL21XS-0003-90YY
6-ft. (1.8-m)	EVNSL21XS-0006-90YY
10-ft. (3.0-m)	EVNSL21XS-0010-90YY
15-ft. (4.5-m)	EVNSL21XS-0015-90YY

Replace the **X** with the color: Blue = 6 Green = 2 Red = 3 Yellow = 3 Black = 3
 Replace the **YY** with the connector style: 90° Down-180° Straight = DS
 90° Down-90° Up = DU 90° Down-90° Down = DD

For specs, go to blackbox.com.

Save money by eliminating the need for horizontal cable management.

SpaceGAIN CAT6 Reduced-Length Patch Cable

- Eliminates the time and money needed to buy and install horizontal cable managers.
- Cable is 6" long with 3" of connectors, for an overall length of 9".
- Use for super-easy connections in relay racks and cabinets.
- **Standard Warranty** — Lifetime



CAT6



Shown: CAT6 Reduced-Length Cable (EVNSL643-006IN) connecting our GigaTrue® CAT6 48-Port Patch Panel (JPM612A-R7), (p. 157)

SpaceGAIN CAT6 550-MHz Reduced-Length Patch Cable

24 AWG, Stranded, PVC, 6-in. (15.2 cm) EVNSL6XX-06IN

Replace the **XX** with the color. Gray = 40 Blue = 41 Green = 42 Red = 43 Yellow = 44 Black = 47

For specs, go to blackbox.com.

Get channel-level performance with optional lockability—no need to replace existing cables.

GigaBase 3 CAT5e 350-MHz Lockable Patch Cables (UTP)

- Use for all your network connections.
- LockPORT™ technology provides rock-solid security without buying new cables.
- Insert the optional Locking Pin into the patented boot to lock down ports.
- Secure network ports from unauthorized access and accidental disconnects.
- Cables stay locked in place—until YOU take them out.
- Tested to 350 MHz.
- **Standard Warranty** — Lifetime

GigaBase³ CAT5e



A locked-down cable with Pin inserted in the boot.

To unlock, insert the Key into the Pin until it clicks. Pull the Pin back and lift the Key to release.



Removal Key

Locking Pin

Lock'em or not: The choice is yours.

These one-of-a-kind cables give you the ability to lock down critical network ports—when you need to—without buying new patch cords.

Use these high-performance cables for your everyday network connections. Then, when you need to secure network ports, you can. Just slip an optional Locking Pin into the tab on the patented, slimline LockPORT™ boot. To unplug the cable, release with the Removal Key (sold separately).

Turn ports into a Layer 1 security key.

GigaBase 3 cables are one of the simplest and most effective yet inexpensive ways you can increase your Layer 1 security. Use them to protect mission-critical and publicly accessible ports from unauthorized access. They're also ideal for preventing accidental disconnects in industrial, manufacturing, and PoE applications.

Premium performance.

You won't sacrifice performance for security. These cables are tested to 350 MHz and are guaranteed for life.

Rugged, patented, slimline boot.

No one is going to break this boot or pull out your cable! The extremely rugged, hard-polymer plug and boot are integrated to protect the cable and to prevent tampering.

The lock and key.

The Locking Pin (sold separately) comes in convenient packs of 10 and 25. The Removal Key (sold separately) is constructed of the same hard-polymer as the boot.

Ideal for many industries.

Lock up network ports in healthcare, education, government, finance, transportation, retail/point-of-sale, and more.

GigaBase® 3 CAT5e 350-MHz Lockable Patch Cables (UTP)

24 AWG, Stranded, PVC CM		
1-ft. (0.3-m)	C5EPC70-XX-01	
2-ft. (0.6-m)	C5EPC70-XX-02	
3-ft. (0.9-m)	C5EPC70-XX-03	
4-ft. (1.2-m)	C5EPC70-XX-04	
5-ft. (1.5-m)	C5EPC70-XX-05	
6-ft. (1.8-m)	C5EPC70-XX-06	
7-ft. (2.1-m)	C5EPC70-XX-07	
10-ft. (3.0-m)	C5EPC70-XX-10	
15-ft. (4.5-m)	C5EPC70-XX-15	
20-ft. (6.0-m)	C5EPC70-XX-20	
25-ft. (7.6-m)	C5EPC70-XX-25	
30-ft. (9.1-m)	C5EPC70-XX-30	
50-ft. (15.2-m)	C5EPC70-XX-50	
100-ft. (30.4-m)	C5EPC70-XX-100	

Replace the **XX** with the color.
 Blue = BL Black = BK Gray = GY
 Red = RD White = WH Green = GN
 Yellow = YL Orange = OR Violet = VT

Related Products

Locking Pins	
10-Pack	LP50-RD-10PK
25-Pack	LP50-RD-25PK
Removal Key	KEY-CL

For specs and the video, go to blackbox.com/GigaTrue3.

Call for custom lengths at competitive prices!

Port Locks

25-Pack, Includes Removal Key	
Red	PL-AB-RD-25PAK
Black	PL-AB-BK-25PAK
Extra Port Lock Removal Key	
	RT-AB-CL

Lock up unused network ports.



Premium CAT5e cables tested to 350 MHz.

GigaBase 350 CAT5e Patch Cables (UTP)

- Specially designed for use with other GigaBase® components.
- Improved near-end crosstalk (NEXT) compared to standard CAT5 cable.
- Superior construction offers significant headroom.
- Tuned-plug design maintains a tighter twist and reduces noise.
- Gold-plated contacts.
- **Standard Warranty** — Lifetime



350 MHz!



Choose straight-pinned cable with either snagless boots or basic connectors, or cross-pinned cable with snagless boots.

GigaBase® CAT5e

Choose from as many as 11 colors.



Snagless boots Straight-pinned

GigaBase 350 CAT5e Patch Cable (UTP)
 Snagless Boots, Stranded, 24 AWG, RJ-45,
 4-Pair, T568B, PVC, Straight-Pinned

	Single	25-Pack
1-ft. (0.3-m)	EVNSLXX-0001	
2-ft. (0.6-m)	EVNSLXX-0002	
3-ft. (0.9-m)	EVNSLXX-0003	
4-ft. (1.2-m)	EVNSLXX-0004	
5-ft. (1.5-m)	EVNSLXX-0005	
6-ft. (1.8-m)	EVNSLXX-0006	
7-ft. (2.1-m)	EVNSLXX-0007	
10-ft. (3.0-m)	EVNSLXX-0010	
15-ft. (4.5-m)	EVNSLXX-0015	
20-ft. (6.0-m)	EVNSLXX-0020	
25-ft. (7.6-m)	EVNSLXX-0025	
30-ft. (9.1-m)	EVNSLXX-0030	
50-ft. (15.2-m)	EVNSLXX-0050	
100-ft. (30.4-m)	EVNSLXX-0100	
Custom Lengths	EVNSLXX	

Replace the **XX** with the color. For 25 packs, add **-25PAK** to the code.

Gray = 80	Yellow = 84	Purple = 88
Blue = 81	Beige = 85	Orange = 89
Green = 82	Pink = 86	White = 90
Red = 83	Black = 87	

For specs, go to blackbox.com.

Basic connectors Straight-pinned

GigaBase 350 CAT5e Patch Cable (UTP)
 Basic Connectors, Stranded, 24 AWG, RJ-45,
 4-Pair, T568B, PVC, Straight-Pinned

	Single	25-Pack
1-ft. (0.3-m)	EVNSLXX-0001	
2-ft. (0.6-m)	EVNSLXX-0002	
3-ft. (0.9-m)	EVNSLXX-0003	
4-ft. (1.2-m)	EVNSLXX-0004	
5-ft. (1.5-m)	EVNSLXX-0005	
6-ft. (1.8-m)	EVNSLXX-0006	
7-ft. (2.1-m)	EVNSLXX-0007	
10-ft. (3.0-m)	EVNSLXX-0010	
15-ft. (4.5-m)	EVNSLXX-0015	
20-ft. (6.0-m)	EVNSLXX-0020	
25-ft. (7.6-m)	EVNSLXX-0025	
30-ft. (9.1-m)	EVNSLXX-0030	
50-ft. (15.2-m)	EVNSLXX-0050	
100-ft. (30.4-m)	EVNSLXX-0100	
Custom Lengths	EVNSLXX	

Replace the **XX** with the color. For 25 packs, add **-25PAK** to the code.

White = 20	Yellow = 54	Gray = 58
Blue = 51	Beige = 55	Orange = 59
Green = 52	Pink = 56	Purple = 79
Red = 53	Black = 57	

For specs, go to blackbox.com.

Snagless boots Cross-pinned

GigaBase® 350 CAT5e Patch Cable (UTP)
 Snagless Boots, Stranded, 24 AWG, RJ-45,
 4-Pair, PVC, Cross-Pinned

	Single	25-Pack
1-ft. (0.3-m)	EVCRBXX-0001	
3-ft. (0.9-m)	EVCRBXX-0003	
6-ft. (1.8-m)	EVCRBXX-0006	
7-ft. (2.1-m)	EVCRBXX-0007	
10-ft. (3.0-m)	EVCRBXX-0010	
20-ft. (6.0-m)	EVCRBXX-0020	
Custom Lengths	EVCRBXX	

Replace the **XX** with the color. For 25 packs, add **-25PAK** to the code.

Gray = 80	Red = 83	Beige = 85
Blue = 81	Yellow = 84	White = 90
Green = 82		

For specs, go to blackbox.com.

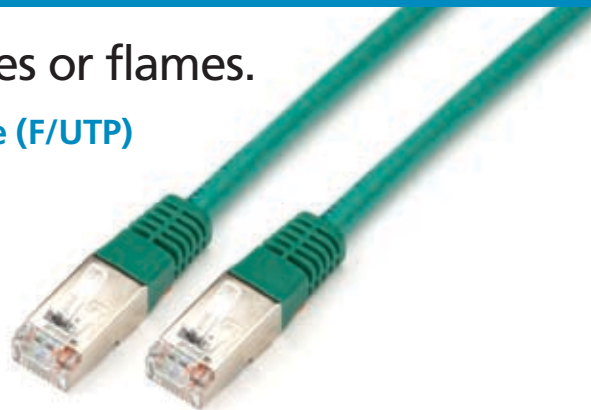
Cable for environments requiring no fumes or flames.

CAT5e 100-MHz Shielded, Solid Backbone Plenum Cable (F/UTP)

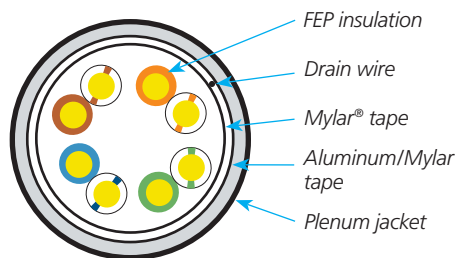
- Solid, dependable CAT5e backbone cable.
- Ideal for use in data, audio, and video applications and for horizontal network connections.
- Cable construction: 24 AWG solid conductor, straight-pinned, 4-pair, T568B, molded boots.
- Shielding: Mylar® tape, tinned copper drain wire; aluminum/Mylar tape.
- FEP Insulation: 0.03" (0.99 mm).
- Jacket: flame-retardant PVC (low smoke).
- **Standard Warranty** — Lifetime



CAT5e



EVNSL0173GN



CAT5e 100-MHz Shielded Solid Backbone Plenum Cable (F/UTP)

24 AWG, Solid, Plenum, CMP	
1-ft. (0.3-m)	EVNSL0173XX-0001
2-ft. (0.6-m)	EVNSL0173XX-0002
3-ft. (0.9-m)	EVNSL0173XX-0003
5-ft. (1.5-m)	EVNSL0173XX-0005
6-ft. (1.8-m)	EVNSL0173XX-0006
7-ft. (2.1-m)	EVNSL0173XX-0007
10-ft. (3.0-m)	EVNSL0173XX-0010
15-ft. (4.5-m)	EVNSL0173XX-0015

24 AWG, Solid, Plenum, CMP	
20-ft. (6.0-m)	EVNSL0173XX-0020
25-ft. (7.6-m)	EVNSL0173XX-0025
30-ft. (9.1-m)	EVNSL0173XX-0030

Replace the **XX** with the color.
 Blue = BL Gray = GY White = WH
 Green = GN Red = RD Black = BK
 Yellow = YL Orange = OR Brown = BR

For specs, go to blackbox.com.

Backbone cable for noisy CAT5e runs.

CAT5e 100-MHz Shielded, Solid Backbone PVC Cable (F/UTP)

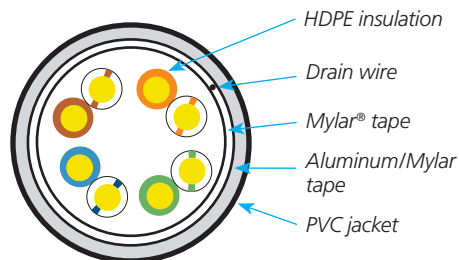
- Solid, dependable CAT5e backbone cable.
- Ideal for use in data, audio, and video applications and for horizontal network connections.
- Cable construction: 24 AWG solid conductor, straight-pinned, 4-pair, T568B, molded hoods.
- Shielding: Mylar® tape; tinned copper drain wire; aluminum/Mylar tape.
- HDPE insulation: 0.009" (0.225 mm).
- **Standard Warranty** — Lifetime



CAT5e



EVNSL0501MS



CAT5e 100-MHz Shielded Solid Backbone PVC Cable (F/UTP)

24 AWG, Solid, PVC, CM	
1-ft. (0.3-m)	EVNSL0XXXMS-0001
2-ft. (0.6-m)	EVNSL0XXXMS-0002
3-ft. (0.9-m)	EVNSL0XXXMS-0003
5-ft. (1.5-m)	EVNSL0XXXMS-0005
6-ft. (1.8-m)	EVNSL0XXXMS-0006
7-ft. (2.1-m)	EVNSL0XXXMS-0007
10-ft. (3.0-m)	EVNSL0XXXMS-0010
15-ft. (4.5-m)	EVNSL0XXXMS-0015

24 AWG, Solid, PVC, CM	
20-ft. (6.0-m)	EVNSL0XXXMS-0020
25-ft. (7.6-m)	EVNSL0XXXMS-0025
30-ft. (9.1-m)	EVNSL0XXXMS-0030

Replace the **XXX** with the color.
 Blue = 501 Gray = 502 Yellow = 504
 White = 505 Red = 506 Green = 507
 Black = 508 Brown = 509 Orange = 510

For specs, go to blackbox.com.

Lockable, shielded CAT5e cable. Great for industrial connections.

GigaBase 3 CAT5e 100-MHz Shielded, Stranded, Lockable PVC Cable (F/UTP)

GigaBase³ CAT5e



- Features four twisted pairs with Mylar® tape, a drain wire, an overall aluminum/Mylar shield, and a PVC jacket.
- LockPORT™ technology boots provide inexpensive, optional security—without having to buy new cables.
- Slip in the optional Locking Pin to avoid accidental disconnects, particularly in factories, industrial settings, mining, even aerospace applications.
- **Standard Warranty** — Lifetime



GigaBase 3 CAT5e 100-MHz Shielded, Stranded, Lockable Cable (F/UTP)

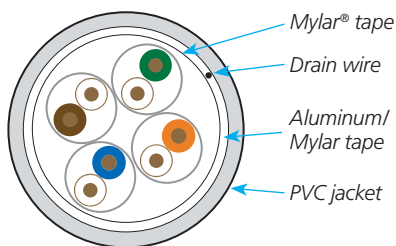
26 AWG, PVC, CM		
1-ft. (0.3-m)	C5EPC70S-XX-01	
2-ft. (0.6-m)	C5EPC70S-XX-02	
3-ft. (0.9-m)	C5EPC70S-XX-03	
5-ft. (1.5-m)	C5EPC70S-XX-05	
6-ft. (1.8-m)	C5EPC70S-XX-06	
7-ft. (2.1-m)	C5EPC70S-XX-07	
10-ft. (3.0-m)	C5EPC70S-XX-10	
15-ft. (4.5-m)	C5EPC70S-XX-15	
20-ft. (6.0-m)	C5EPC70S-XX-20	
25-ft. (7.6-m)	C5EPC70S-XX-25	

Replace the **XX** with the color.
 Blue = BL Black = BK Gray = GY
 White = WH Yellow = YL Green = GN
 Orange = OR Red = RD

Locking Pins
 10-Pack LP50-RD-10PK
 25-Pack LP50-RD-25PK
 Removal Key KEY-CL

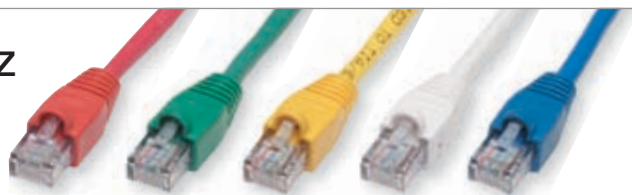
For specs, go to blackbox.com.

Call for custom lengths at competitive prices!



Install superior performance 350-MHz cable in backbone runs.

CAT5e 350-MHz Solid-Conductor Backbone Cable (UTP)



EYN849MS EYN859MS EYN855MS EYN853MS EYN851MS



CAT5e

- Solid, dependable CAT5e backbone cable.
- Meets or exceeds CAT5e specifications.
- Nonmolded, snag-free hoods prevent cable kinks. They also reduce crosstalk.
- **Standard Warranty** — Lifetime

CAT5e 350-MHz Solid Backbone Cable (UTP)

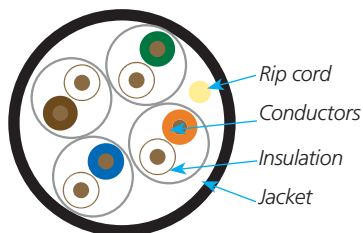
24 AWG, PVC, CMR		
2-ft. (0.6-m)	EYN8XXMS-0002	
5-ft. (1.5-m)	EYN8XXMS-0005	
10-ft. (3.0-m)	EYN8XXMS-0010	
15-ft. (4.5-m)	EYN8XXMS-0015	
20-ft. (6.0-m)	EYN8XXMS-0020	
25-ft. (7.6-m)	EYN8XXMS-0025	
30-ft. (9.1-m)	EYN8XXMS-0030	
35-ft. (10.6-m)	EYN8XXMS-0035	
50-ft. (15.2-m)	EYN8XXMS-0050	
100-ft. (30.4-m)	EYN8XXMS-0100	

24 AWG, Plenum, CMP		
2-ft. (0.6-m)	EYN8XXMS-0002	
5-ft. (1.5-m)	EYN8XXMS-0005	
10-ft. (3.0-m)	EYN8XXMS-0010	
15-ft. (4.5-m)	EYN8XXMS-0015	
20-ft. (6.0-m)	EYN8XXMS-0020	
25-ft. (7.6-m)	EYN8XXMS-0025	
30-ft. (9.1-m)	EYN8XXMS-0030	
35-ft. (10.6-m)	EYN8XXMS-0035	
50-ft. (15.2-m)	EYN8XXMS-0050	
100-ft. (30.4-m)	EYN8XXMS-0100	

PVC: replace the **XX** with the color.
 Blue = 51 Green = 59 Red = 49
 Yellow = 55 White = 53

Plenum: replace the **XX** with the color.
 Blue = 50 Green = 58 Red = 48
 Yellow = 54 White = 52

Custom lengths are available.
 For specs, go to blackbox.com



Make tight spaces right spaces with SpaceGAIN.

SpaceGAIN CAT5e 90° Right-Angle Patch Cables (UTP, F/UTP)



CAT5e



Gain up to 4" of valuable space with SpaceGAIN 90° Right-Angle Patch Cables. Shown left: Down-Up cables. Shown right: Down cable; cable clip faces down and the cable angles down. (EVNSL21E-0001-90DD).



Down-Up Cable
The Down Cable clip faces down and the cable runs down. The Up Cable clip faces down and the cable angles up. Shown: EVNSL23ES-0003-90DU.

Down-Down Cable
The Down Cable clip is on the bottom and the cable runs down. Shown: Unshielded EVNSL21E-0003-90DD

Down-Straight Cable
The Down Cable clip is on the bottom and the cable runs down. Shown: Unshielded EVNSL27E-0003-90DS

Reduce cabling space, management, and costs.

- Save up to four inches of space in crowded cabinets.
- Make tight wallplate connections behind furniture and equipment.
- Meet or exceed CAT5e specifications.
- Choose from UTP or F/UTP cable.
- Learn more at blackbox.com/go/SpaceGAIN.
- **Standard Warranty** — Lifetime



Up cable: Cable clip faces down and the cable angles up. Shown: EVNSL24E-0003-90DU



Down cable: Cable clip faces down and the cable angles down. Shown: EVNSL23E-0003-90DS

SpaceGAIN CAT5e Unshielded 90° Right-Angle Patch Cables (UTP)

100-MHz, 24 AWG, Stranded		
1-ft. (0.3-m)		EVNSL2XE-0001-90YY
3-ft. (0.9-m)		EVNSL2XE-0003-90YY
6-ft. (1.8-m)		EVNSL2XE-0006-90YY
10-ft. (3.0-m)		EVNSL2XE-0010-90YY
15-ft. (4.5-m)		EVNSL2XE-0015-90YY

Replace the **X** with the color:
Blue = 1 Red = 3 Yellow = 4 Black = 7

Replace the **YY** with the connector style: 90° Down-180° Straight = DS
90° Down-90° Up = DU 90° Down-90° Down = DD

For specs, go to blackbox.com.

SpaceGAIN CAT5e Shielded 90° Right-Angle Patch Cables (F/UTP)

100-MHz, 26 AWG, Stranded, Down-Up, Aluminum Mylar® Tape		
1-ft. (0.3-m)		EVNSL2XES-0001-90YY
3-ft. (0.9-m)		EVNSL2XES-0003-90YY
6-ft. (1.8-m)		EVNSL2XES-0006-90YY
10-ft. (3.0-m)		EVNSL2XES-0010-90YY
15-ft. (4.5-m)		EVNSL2XES-0015-90YY

Replace the **X** with the color:
Blue = 1 Green = 2 Red = 3 Yellow = 4 Black = 7

Replace the **YY** with the connector style: 90° Down-180° Straight = DS
90° Down-90° Up = DU 90° Down-90° Down = DD

For specs, go to blackbox.com.

Save money by eliminating the need for horizontal cable management.

SpaceGAIN CAT5e Reduced-Length Patch Cable

- Eliminates the time and money needed to buy and install horizontal cable managers.
- Cable is 6" long with 3" of connectors, for an overall length of 9".
- Use for super-easy connections in relay racks and cabinets.
- **Standard Warranty** — Lifetime



CAT5e



Shown: CAT5e Reduced-Length Cable (EVNSL83-006IN) connecting our GigaBase® CAT5e 48-Port Patch Panel (JPM906A-R5), (p. 161)

SpaceGAIN CAT5e 350-MHz Reduced-Length Patch Cable

24 AWG, Stranded, PVC, 6-in. (15.2-cm) EVNSLXX-06IN

Replace the **XX** with the color.
Gray = 80 Blue = 81 Green = 82 Red = 83 Yellow = 84 Black = 87

For specs, go to blackbox.com.

Custom-Length Patch Cables

Order custom-length CAT5e/6 patch cables today—
we'll ship today. *Or, the cables are FREE!**

"Cable 911" at Black Box. Get *exactly* the length you need, *when* you need it.

When you need patch cables right away, call Cable 911.

Why compromise your work by using the wrong length cable? Don't settle for whatever's lying around in the back room, especially if it's way too long. Why use 10-foot cables when you really need 8-foot cables? Plus you risk jeopardizing your network organization and performance. Keep your telecom rooms and data centers well-organized, good-looking showpieces by using the right length cable. Call us today and you'll have them tomorrow. Better yet, you'll save money, too, by buying exactly what you need and no more.

Take the risk out of custom-length cables.

With this exclusive service, Black Box eliminates long lead times of days or weeks for custom cables. While others may say they offer same-day service, can you really afford to take a chance?

With our long history of absolute top-notch customer service, you can trust Black Box. If we say we'll ship your cables today, we will. Best of all, you won't take any risks when it comes to quality because we test every single custom cable we build.

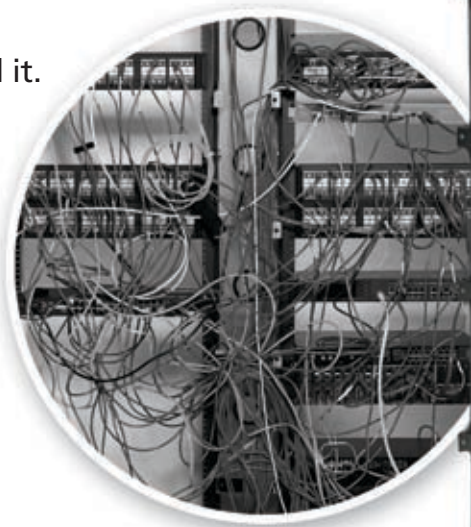
***How the FREE part works.**

If we don't keep our promise to ship your cables today, you'll get your cables FREE! Now that doesn't include taxes, shipping, and handling, but who can argue with free?

The details.

To keep our promise to ship your cables the same day, we have a few very reasonable caveats:

1. Orders must be placed by 1 P.M. ET Monday–Friday.
2. The maximum order is **50 cables** per customer per day.
3. Cable 911 customers must be pre-approved credit customers or those buying with a credit card.
4. To order, you must call Customer Service.
On-line orders will not be accepted.



Why settle for this mess when you can get exactly what you want tomorrow?



blackbox.com/go/Customs

Get your cables tomorrow.

If you order by 1 P.M. ET, we can ship your order that evening.

Cable options.

You can order patch cables with the following options:

- CAT5e/CAT6.
- PVC/plenum (plenum is only available with solid-conductor assemblies).
- Shielded/unshielded.
- Solid/stranded conductor.
- Snagless boot/basic connector.
- Eight colors: blue, white, black, gray, green, orange, red, yellow.
- Lengths: 1–100 feet.

Applies to continental US Customers only.

Cable 911 ordering: blackbox.com/go/Customs.

Guidelines for choosing fiber optic cable.

By Roberta Bowen Szyper

The advantages of fiber optic cable.

Greater bandwidth

Fiber provides far greater bandwidth than copper. Fiber also gives network designers future-proofing insurance with speeds of 1000-Mbps or 10-Gbps now and the ability to upgrade to 40- or 100-Gbps later. Fiber speeds and distances are dependent on the type of cable used. Single-mode cable offers far greater distance than either 62.5- OM1 or 50-micron OM2 multimode cable. Laser-optimized OM3 and OM4 50-micron multimode cable offer more distance and bandwidth than OM1 and OM2 cable and are less expensive than singlemode cable. In addition, fiber optic cable can carry more information with greater fidelity than copper wire. That's why phone and cable companies use fiber.

Low attenuation and greater distance

Because the fiber optic signal is made of light, very little signal loss occurs during transmission, and data can move at higher speeds and greater distances. Fiber does not have the 100-meter distance limitation of unshielded twisted-pair copper. Fiber distances can range from 100 meters to 40 kilometers, depending on the style of cable, wavelength, and network. (Fiber distances are typically measured in metric units.)

Security

Your data is safe with fiber cable. It doesn't radiate signals and is extremely difficult to tap. If the cable is tapped, it's very easy to monitor because the cable leaks light, causing system failures. If an attempt is made to break the physical security of your fiber system, you'll know it.

Fiber networks also enable you to put all your electronics and hardware in one central location, instead of having wiring closets with equipment throughout the building.

Immunity and reliability

Fiber provides extremely reliable data transmission. It's completely immune to many environmental factors that affect copper cable. The core is made of glass, which is an insulator, so no electric current can flow through. It's immune to electromagnetic interference and radio-frequency interference (EMI/RFI), crosstalk, impedance problems, and more. You can run fiber cable next to industrial equipment without worry. Fiber is also less

susceptible to temperature fluctuations than copper and can be submerged in water.

Design

Fiber is lightweight, thin, and more durable than copper cable. Plus, fiber cable has pulling specifications that are up to 10 times greater than copper cable's. Its small size makes it easier to handle, and it takes up much less space in cabling ducts.

Although fiber is still more difficult to terminate than copper, advancements in connectors are making termination easier. Fiber is actually easier to test than copper cable because only insertion loss and return loss are measured. Copper has far more electrical measurements.

Migration

The proliferation and lower costs of media converters are making copper to fiber migration, especially fiber to the desktop much easier. The converters provide seamless links and enable the use of existing hardware. Fiber can be incorporated into networks in planned upgrades.

Standards

The use of fiber in networks is covered in TIA-568-C.3.

Costs

The cost for fiber cable, components, and hardware is steadily decreasing. Installation costs for fiber are higher than copper because of the skill needed for terminations. Overall, fiber is more expensive than copper in the short run, but it may actually be less expensive in the long run. Fiber typically costs less to maintain, has less downtime, and requires less networking hardware.

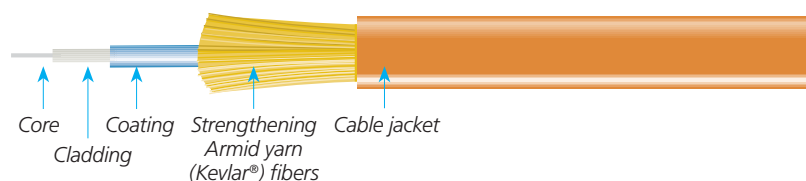


Fiber optic cable construction

Core—This is the physical medium that transports optical data signals from an attached light source to a receiving device. The core is a single continuous strand of extruded silica glass or plastic that's measured in microns (μm) by the size of its outer diameter. The larger the core, the more light the cable can carry.

All fiber optic cable is sized according to its core's outer diameter. The two most common multimode sizes are 50 and 62.5 microns. Single-mode cores are 8.5–9 microns.

The cores of OM1 and OM2 multimode cable are made differently than the cores of laser-optimized OM3 and OM4 cable. OM1 and OM2 have a small defect in the core called an index depression. This enables them to be used with LED light sources. OM3 and OM4 are manufactured without the center defect to



enable them to be used directly with VCSELS for greater speeds and distance.

Cladding—This is the thin layer that surrounds the fiber core and serves as a boundary that contains the light waves and causes the refraction, enabling light to travel the length of the fiber segment.

Coating—This is a layer of plastic that surrounds the core and cladding to reinforce and protect the fiber core. Coatings are measured in microns and can range from 250 to 900 microns.

Strengthening fibers—These components help protect the core against crushing forces and excessive tension during installation. The materials can range from aramid yarn (Kevlar®) to wire strands to gel-filled sleeves.

Cable jacket—This is usually constructed of extruded PVC. It protects the fiber and enables easy handling.

Multimode vs. single-mode.

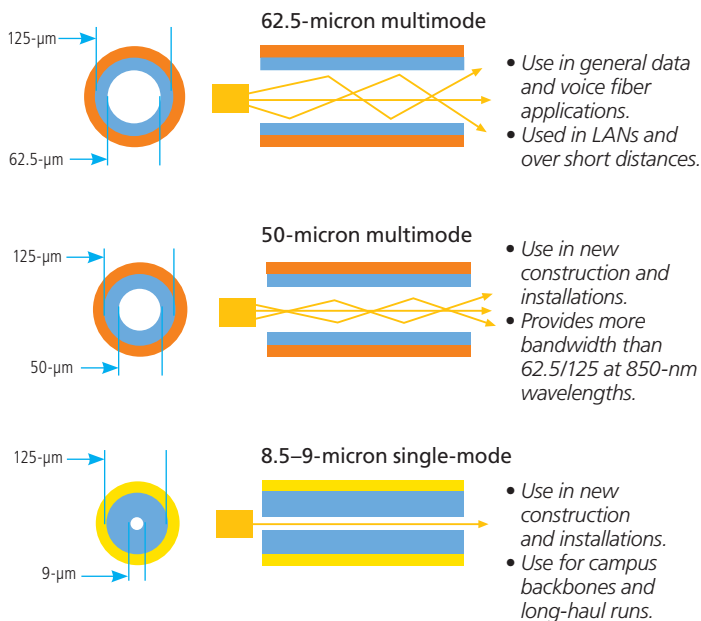
Multimode cable has a large-diameter core and multiple pathways of light. It can be used for most general data and voice applications, such as adding segments to an existing network.

Multimode comes in two core sizes and four varieties: 62.5-micron OM1, 50-micron OM2, 50-micron OM3, and 50-micron OM4. (OM stands for optical mode.) All have the same cladding diameter of 125 microns, but 50-micron fiber cable has a smaller core (the light-carrying portion of the fiber). Although all can be used in the same way, 50-micron cable, particularly laser-optimized OM3 and OM4 50-micron cable, provides longer link lengths and/or higher speeds and is recommended for premise applications (backbone, horizontal, and intrabuilding links) and should be considered for new installations. OM3 and OM4 can also be used with LED and laser light sources. For more information on OM3 and OM4 cable, see [page 132](#).

Single-mode cable (OS1, OS2) has a small (8–10-micron) glass core and only one pathway of light. (OS stands for optical single-mode.) With only a single wavelength of light passing through its core, single-mode realigns the light toward the core center instead of simply bouncing it off the edge of the core as multimode does. OS1 is applied to inside-plant tight-buffered cable. OS2 is applied to loose-tube cables.

Single-mode provides far greater distances than multimode cable and can go as far as 40 km (see the chart on [page 127](#)), so it's typically used in long-haul network links spread out over extended areas, including CATV and campus backbone applications. Single-mode cable also provides higher bandwidth than multimode fiber.

Total internal reflection: multimode vs. single-mode



	Color Coding			Connector Body
	Jacket	Jacket Nomenclature	Connector	
OM1 62.5-µm Multimode	Orange	62.5/125	Beige	Beige
OM2 50-µm Multimode	Orange	50/125	Black	Black
OM3 LO 50-µm Multimode	Aqua	850 LO 50/125	Aqua	Black
OS1 APC Single-mode	Yellow	SM/NZDS, SM	Green (MPO is black)	Green
OS1 UPC Single-mode	Yellow	SM/NZDS, SM	Blue	Blue

UPC vs. APC connectors

UPC stands for Ultra Physical Contact. APC stands for Angled Physical Contact. Both describe the polish style of the connector endface. The UPC endface is polished at a 0° angle. The APC endface is polished at an 8° angle preventing light from reflecting and traveling back up the interface. Single-mode UPC connector bodies are blue, while single-mode APC connector bodies are green. Never mix the two.



UPC polish;
Typical return loss: -55 dB;



APC polish;
Typical return loss: -65 dB;

Fiber connectors

- The ST® connector** uses a bayonet locking system.
- The SC connector** features a molded body and a push-pull locking system.
- The LC connector**, with a small-form-factor connector, is becoming the connector of choice.
- The MT-RJ connector** has a molded body, a small-form RJ-style connector, and uses cleave-and-leave splicing.
- The MPO/MTP®-style connector** is a high-fiber-count cable. It's used in high-density applications. See [pages 175, 181](#).
- The MU connector** resembles a small SC connector, has a simple push-pull latching connection; and is for high-density areas.

Guidelines for choosing fiber optic cable. (continued)

The basics of fiber optic cable.

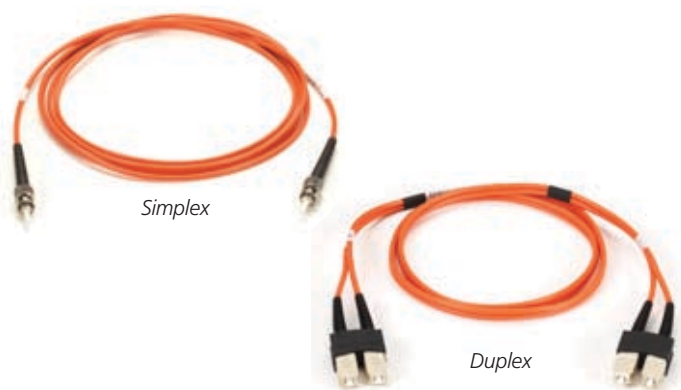
Simplex vs. duplex patch cables

Multimode and single-mode patch cables can be simplex or duplex.

Simplex cable has one fiber, while **duplex** (zipcord) cable has two fibers joined with a thin web. Simplex (also known as single strand) and duplex zipcord cables are tight-buffered and jacketed, with Kevlar strength members.

Because simplex fiber optic cable consists of only one fiber link, you should use it for applications that only require one-way data transfer. For instance, an interstate trucking scale that sends the weight of the truck to a monitoring station or an oil line monitor that sends data about oil flow to a central location.

Use duplex multimode or single-mode fiber optic cable for applications that require simultaneous, bidirectional data transfer. Workstations, fiber switches and servers, Ethernet switches, backbone ports, and similar hardware require duplex cable.

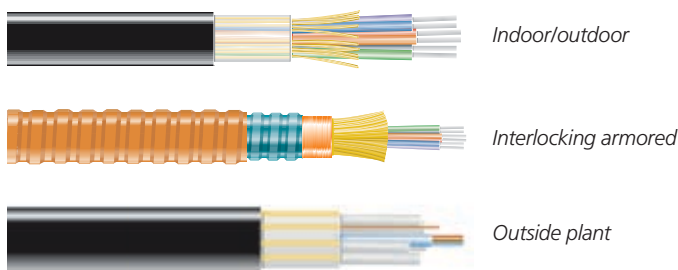


Indoor/outdoor cable

Indoor/outdoor cable uses dry-block technology to seal ruptures against moisture seepage and gel-filled buffer tubes to halt moisture migration. Comprised of a ripcord, core binder, a flame-retardant layer, overcoat, aramid yarn, and an outer jacket, indoor/outdoor cable is designed for aerial, duct, tray, and riser applications.

Interlocking armored cable is jacketed in aluminum interlocking armor so it can be run just about anywhere in a building. Ideal for harsh environments, it is rugged and rodent resistant. No conduit is needed, so it's a labor- and money-saving alternative to using innerducts for fiber cable runs.

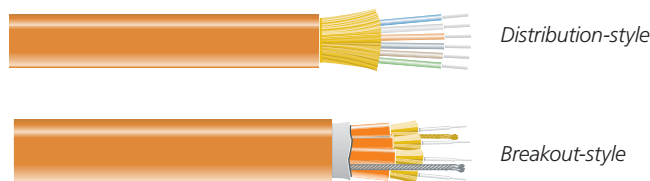
Outside-plant cable is used in direct burials. It delivers optimum performance in extreme conditions and is terminated within 50 feet of a building entrance. It blocks water with dry blocking, absorbent tape, or powder. If it is armored, it will require grounding. Outside-plant cables are also rodent resistant. If they are to be used in aerial applications, they will have a messenger strength member.



Distribution-style vs. breakout-style

Distribution-style cables have several tight-buffered fibers bundled under the same jacket with Kevlar® or fiberglass rod reinforcement. These cables are small in size and are used for short, dry conduit runs in either riser or plenum applications. The fibers can be directly terminated, but because the fibers are not individually reinforced, these cables need to be broken out with a "breakout box" or terminated inside a patch panel or junction box.

Breakout-style cables are made of several simplex cables bundled together, making a strong design that is larger than distribution cables. Breakout cables are suitable for conduit runs and riser and plenum applications.



Loose-tube vs. tight-buffered

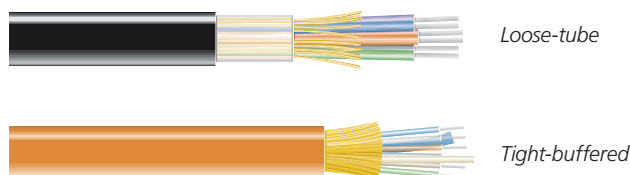
There are two types of fiber optic cable construction: loose-tube and tight-buffered. Both contain some type of strengthening member, such as aramid yarn, stainless steel wire strands, or even gel-filled sleeves. But each is designed for different environments.

Loose-tube cable is specifically designed for harsh outdoor environments. It protects the fiber core, cladding, and coating by enclosing everything within semi-rigid protective sleeves or tubes. Many loose-tube cables also have a water-resistant gel that surrounds the fibers. This gel helps protect the fibers from moisture, which makes loose-tube cable great for harsh, high-humidity environments where water or condensation can be a problem. The gel-filled tubes can also expand and contract with temperature changes.

But gel-filled loose-tube cable is not the best choice when cable needs to be routed around multiple bends, which is often true in indoor applications. Excess cable strain can force fibers to emerge from the gel.

Tight-buffered cable is optimized for indoor applications. Because it's sturdier than loose-tube cable, it's best suited for moderate-length LAN/WAN connections or long indoor runs. It's easier to install because there's no messy gel to clean up and it doesn't require a fan-out kit for splicing or termination. You can install connectors directly to each fiber.

When making the transition from outdoor cable to indoor, the loose-tube will be connected to a box in the entrance point. Then, the run will be connected to tight-buffered cable for indoor use.



Multimode Fiber Types and Standards

Industry Standards			Fiber Type (µm)	Attenuation† Typical Cable Max. (dB/km)		Bandwidth (MHz/km): Overfilled Launch (OFL)		Bandwidth (MHz/km): Effective Modal Bandwidth (EMB) (also known as Laser BW)
ISO/IEC 11801	IEC 60793-2-10	TIA		850 nm	1300 nm	850 nm	1300 nm	850 nm
OM1	A1b	492-AAAA	62.5/125	3.5	1.5	200	500	—
OM2	A1a.1	492-AAAB	50/125	3.5	1.5	500	500	—
OM3	A1a.2	492-AAAC	50/125	3.5	1.5	1500	500	2000
OM4	A1a.3	492-AAAD	50/125	3.5	1.5	3500	500	4700

ISO/IEC 11801 "Generic Cabling for Customer Premises"

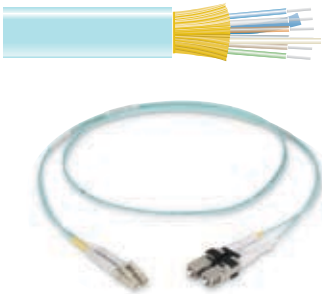
IEC 60793-2-10 "Product Specifications - Sectional Specification for Category A1 Multimode Fibers"

TIA-492-AAAx "Detail Specification for Class 1a Graded-Index Multimode Optical Fibers"

† The ISO/IEC 11801 standard stipulates maximum cable attenuation. The IEC and TIA fiber standards call for lower (and varied) bare fiber attenuation.

Laser-optimized cable

Laser-optimized multimode fiber cable differs from standard multimode cable because it has graded refractive index profile fiber optic cable in each assembly. This means that the refractive index of the core glass decreases toward the outer cladding, so the paths of light towards the outer edge of the fiber travel more quickly than the other paths. This increase in speed equalizes the travel time for both short and long light paths, ensuring accurate information transmission and receipt over much greater distances, up to 300 meters at 10 Gbps. Laser-optimized cable is aqua colored.



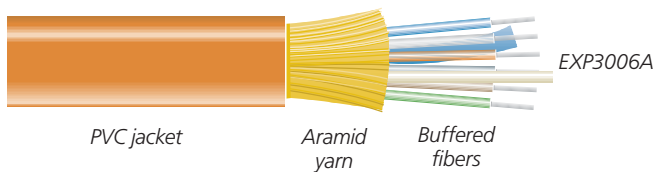
Laser-optimized 50-micron

Fiber Ethernet Standards

Network	Standard	IEEE	Media	Speed	Distance
Ethernet	10BASE-F, -FB, FL, FP	802.3	Fiber	10 Mbps	2000 m/500 m
Fast Ethernet	100BASE-FX	802.3u	MM Fiber	100 Mbps	400 m half-duplex, 2 km full-duplex
Gigabit Ethernet	1000BASE-LX	802.3z	MM, SM Fiber	1000 Mbps	550 m/2 km
	1000BASE-LX-10		SM Fiber	1000 Mbps	10 km
	1000BASE-SX		MM Fiber	1000 Mbps	550 m
10-Gigabit Ethernet	10GBASE-SR, -LR, LX, -ER, -SW, -LW, -EW, 10GBASE-CX4	802.3ae	CAT6, MM, SM Fiber	10 Gbps	65 m to 40 km
	10-BGASE-LX4		MM, SM Fiber	10 Gbps	400 m/10 km
	10GBASE-LR		SM Fiber	10 Gbps	10 km
	10GBASE-ER		SM Fiber	10 Gbps	40 km
	10GBASE-SR		OM3 MMF	10 Gbps	26–82 m
	10GBASE-KRN		802.3aq	500-MHz MMF	10 Gbps
40-Gigabit Ethernet	40GBASE-SR4	802.3-bm	MMF	40 Gbps	100 m
	40GBASE-SR4		(8) OM3 lanes	40 Gbps	125 m
	—		SM Fiber	40 Gbps	10 km
	40GBASE-FR		SM Fiber	40 Gbps	2 km
	40GBASE-LR4		SMF	40 Gbps	10 km
	40GBASE-FR		SMF	40 Gbps	2 km
100-Gigabit Ethernet	100GBASE-SR10	802.3-bm	(10) OM3 MM pairs	100 Gbps	100 m
	—		(10) OM4 MM pairs	100 Gbps	150 m
	100GBASE-LR4		(4) SMF lanes	100 Gbps	10 km
	100GBASE-ER4		(4) SMF lanes	100 Gbps	40 km
1-Terabit Ethernet		Expected by 2015		400-Gbps to 1 TB	

Tight-buffered cable designed for backbone applications.

OM1 Multimode, 62.5-Micron, Distribution-Style Fiber Optic Bulk Cable



Cut-to-length cables

in-stock

Custom-length cables: call for lead times.

- Ideal for runs between wiring closets and equipment rooms.
- Terminate into loaded patch panels and equipment.
- Rated for indoor use.
- Construction consists of an outer jacket, aramid yarn, and tight-buffered fibers.
- A 900- μ m coating provides easy stripping and handling.
- **Standard Warranty** — Lifetime

OM1 62.5-Micron Multimode Distribution-Style, Tight-Buffered Fiber Optic Bulk Cable

Plenum		
6-Fiber	Cut-to-Length (OFNP)	EXP3006A
12-Fiber	Cut-to-Length (OFNP)	EXP3012A
PVC (OFNR)		
2-Fiber	Custom Lengths	EXN2002A
4-Fiber	500-ft. (152.4-m)	EXN2004A-0500
	Custom Lengths	EXN2004A
6-Fiber	Custom Lengths	EXN2006A
8-Fiber	Custom Lengths	EXN2008A
24-Fiber	500-ft. (152.4-m)	EXN2024A-0500
	Custom (152.4-m)	EXN2024A
36-Fiber	Custom Lengths	EXN2036A
Plenum (OFNP)		
4-Fiber	500-ft. (152.4-m)	EXP2004A-0500
	Custom Lengths	EXP2004A
8-Fiber	Custom Lengths	EXP2008A
24-Fiber	Custom Lengths	EXP2024A
36-Fiber	Custom Lengths	EXP2036A

For specs, go to blackbox.com.

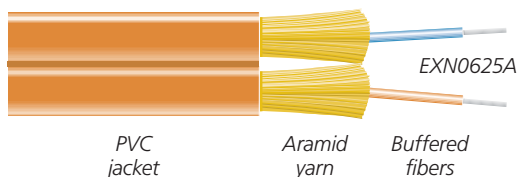
NOTE: Longer minimum lengths may apply for the Custom Length cables above.

Cut-to-Length vs. Custom Length

- Cut-to-length cables are in-stock.
- Custom-length cables are not in stock, but come with many more fiber counts. Please call for lead times.

General-use zipcord cable for patching, desktop, and backbone connections.

OM1 62.5-Micron Multimode Zipcord Fiber Optic Bulk Cable



Cut-to-length cables

in-stock

- Use the PVC cable for horizontal and backbone network runs.
- Use the plenum cable in harsh environments or where fire ordinances require plenum.
- Fiber is surrounded with aramid yarn for tensile strength.
- Feature a 900- μ m coating for easy stripping and handling.
- **Standard Warranty** — Lifetime

OM1 62.5-Micron Multimode Zipcord Fiber Optic Bulk Cable

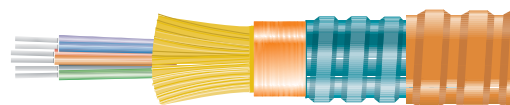
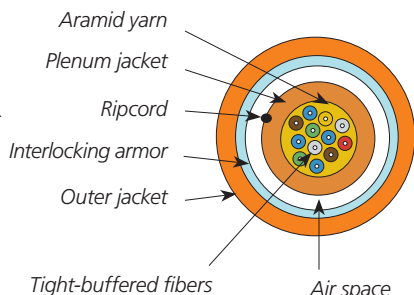
PVC, Riser (OFNR)		
500-ft. (152.4-m)		EXN0625A-0500
1000-ft. (304.8-m)		EXN0625A-1000
	Cut-to-Length	EXN0625A
Plenum (OFNP)		
500-ft. (152.4-m)		EXP0625A-0500
1000-ft. (304.8-m)		EXP0625A-1000
	Cut-to-Length	EXP0625A

For specs, go to blackbox.com.

Run this armored cable anywhere in your building—no ducts required!

OM1 62.5-Micron Multimode Interlocking Armored, 12-Strand Fiber Optic Cable

- Save a minimum of 28% on labor and materials. Pull this cable once instead of pulling conduit and then pulling cable!
- Built tough to go anywhere in your building.
- UL® Listed with aluminum interlocking armor covering an internal plenum jacket.
- Ideal for harsh environments, these cables are rugged and rodent resistant.
- Lightweight and flexible but also extraordinarily strong.
- Save plenum space, too. Cables are almost an inch smaller than innerducts!
- **Standard Warranty** — Lifetime



Cable is jacketed in aluminum interlocking armor. There's no need to pull innerduct!

OM1 62.5-Micron Multimode Interlocking Armored, 12-Strand Fiber Optic Cable

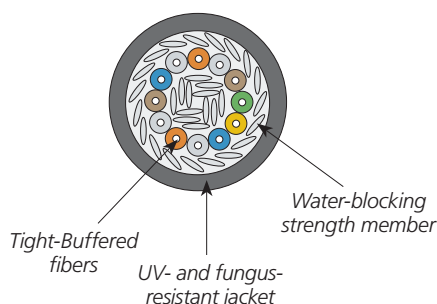
Plenum (OFCP), Cut-to-Length
EXPIA3012A

For specs, go to blackbox.com.

With their plenum-rated, UV-resistant jacket, these cables perform indoors and out.

OM1 62.5-Micron Multimode Indoor/Outdoor, 12-Strand Fiber Optic Cable

- Can be pulled anywhere—between and within buildings.
- Moisture resistant with water-blocking strength member.
- Meet GR-20-CORE water penetration requirements, which also helps ensure that any cable damage can be contained to a repairable length.
- Outer jacket resists fungus—ideal for humid climates and underground runs.
- UV stabilizer guards against sun exposure.
- No need to terminate within 50 feet (15.2 m) of its building entrance.
- **Standard Warranty** — Lifetime



Run this tight-buffered fiber cable anywhere—indoors and outdoors.

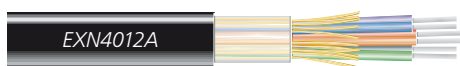
OM1 62.5-Micron Multimode Indoor/Outdoor 12-Strand, Fiber Optic Cable

Plenum (OFNP), Cut-to-Length
EXPIO3012A

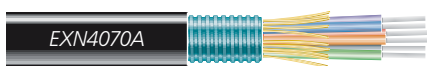
For specs, go to blackbox.com.

Run multiple fiber strands with one pull—even in the harshest conditions.

OM1 62.5-Micron Multimode Loose-Tube Multistrand Fiber Optic Bulk Cable



- Suitable for inter- and intrabuilding runs.
- **Standard Warranty** — Lifetime



- Consists of color-coded fibers in buffer tubes stranded around a central member. Also has steel armor and steel strength members.
- **Standard Warranty** — Lifetime



- Use in extreme conditions—airial installations, ducts, or buried.
- **Standard Warranty** — Lifetime

OM1 62.5-Micron Multimode Loose-Tube Indoor/Outdoor Fiber Optic Bulk Cable

1000-ft. (304.8-m)
12-Fiber EXN4012A-1000

For specs, go to blackbox.com.

OM1 62.5-Micron Multimode Armored Loose-Tube Outside-Plant Fiber Optic Bulk Cable

1000-ft. (304.8-m)
6-Fiber EXN4070A-1000
12-Fiber EXN4075A-1000

For specs, go to blackbox.com.

OM1 62.5-Micron Multimode Loose-Tube Outside-Plant Fiber Optic Bulk Cable

Custom Lengths
6-Fiber EXN3006A
12-Fiber EXN3012A
18-Fiber EXN3018A
24-Fiber EXN3024A
30-Fiber EXN3030A

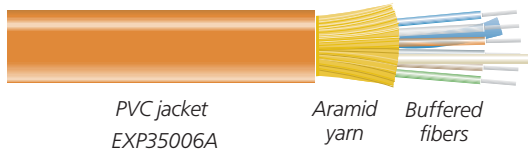
For specs, go to blackbox.com.

NOTE: Higher fiber count and custom lengths available—call our FREE Tech Support. Longer minimums may apply. Cables are shipped in large protective reels, and spools can weigh more than 100 pounds (45.4 kg.).

Tight-buffered, 50-micron cable in the exact lengths you want.

OM2 50-Micron Multimode Distribution-Style Fiber Optic Bulk Cable

Cut-to-length cables



- Ideal for runs between wiring closets and equipment rooms.
- Terminate into loaded patch panels and equipment.
- Rated for indoor use. Perfect for backbone, horizontal, and intrabuilding applications.
- **Standard Warranty** — Lifetime

OM2 50-Micron Multimode Distribution-Style, Tight-Buffered Fiber Optic Cable

Plenum (OFNP), Cut-to-Length	
6-Fiber	EXP35006A
12-Fiber	EXP35012A
PVC (OFNR), Custom Lengths	
2-Fiber	EXN25002A
4-Fiber	EXN25004A
6-Fiber	EXN25006A
8-Fiber	EXN25008A
12-Fiber	EXN25012A
24-Fiber	EXN25024A
36-Fiber	EXN25036A
Plenum (OFNP), Custom Lengths	
4-Fiber	EXP25004A
8-Fiber	EXP25008A
12-Fiber	EXP25012A
24-Fiber	EXP25024A
36-Fiber	EXP25036A

For specs, go to blackbox.com.

Cut-to-Length vs. Custom Length

- Cut-to-length cables are in-stock.
- Custom-length cables are not in stock, but come with many more fiber counts. Please call for lead times.

General-use zipcord cable for patching, desktop, and backbone connections.

OM2 50-Micron Multimode General-Purpose Fiber Optic Bulk Cable



- **Standard Warranty** — Lifetime

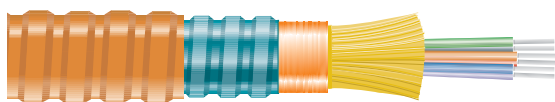
OM2 50-Micron Multimode General-Purpose Fiber Optic Bulk Cable

PVC, Riser (OFNR), Cut-to-Length	EXN050A
Plenum (OFNP), Cut-to-Length	EXP050A

For specs, go to blackbox.com.

Run this armored cable anywhere in your building—no ducts required.

OM2 50-Micron Multimode Interlocking Armored, 12-Strand, Fiber Optic Bulk Cable



- Aluminum interlocking armor covering an internal plenum jacket.
- **Standard Warranty** — Lifetime

OM2 50-Micron Multimode Interlocking Armored, 12-Strand, Fiber Optic Bulk Cable

Plenum (OFNP), Cut-to-Length	EXP1A35012A
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For specs, go to blackbox.com.

With a plenum-rated, UV-resistant jacket, this cable performs indoors and out.

OM2 50-Micron Multimode Indoor/Outdoor 12-Strand, Fiber Optic Bulk Cable



- Meets GR-20-CORE water penetration requirements.
- **Standard Warranty** — Lifetime

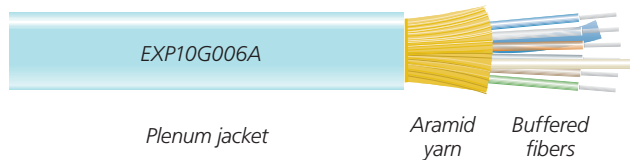
OM2 50-Micron Multimode Indoor/Outdoor, 12-Strand, Fiber Optic Bulk Cable

Plenum (OFNP), Cut-to-Length	EXP1O35012A
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For specs, go to blackbox.com.

Tight-buffered, laser-optimized OM3 cable in multiple strand counts and lengths.

OM3 50-Micron Multimode 10-Gigabit Laser-Optimized Fiber Optic Bulk Cable



- OM3 cable rivals single-mode fiber cable for performance but at a better price.
- Use with either LED or laser light sources.
- With a laser light source, bandwidth increases to 2000 MHz/km.
- Works in 10-Gigabit Ethernet runs up to 300 meters, making this cable ideal for backbone and campus connections.
- **Standard Warranty** — Lifetime

Cut-to-Length vs. Custom Length

- Cut-to-length cables are in-stock.
- Custom-length cables are not in stock, but come with many more fiber counts. Please call for lead times.

OM3 50-Micron 10-GbE Laser-Optimized Distribution-Style Fiber Optic Bulk Cable

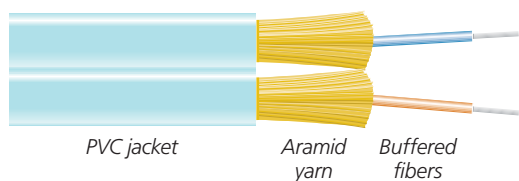
Plenum (OFNP), Cut-to-Length	
6-Fiber	EXP10G006A
12-Fiber	EXP10G012A
PVC (OFNR), Custom Lengths	
2-Fiber	EXN10002A
4-Fiber	EXN10004A
6-Fiber	EXN10006A
8-Fiber	EXN10008A
12-Fiber	EXN10012A
24-Fiber	EXN10024A
36-Fiber	EXN10036A
Plenum (OFNP), Custom Lengths	
2-Fiber	EXP10002A
4-Fiber	EXP10004A
8-Fiber	EXP10008A
24-Fiber	EXP10024A
36-Fiber	EXP10036A

For specs, go to blackbox.com.

NOTE: Longer minimum cable lengths may apply for all except the 6-Fiber and 12-Fiber PVC Cut-to-Length cable.

OM3 zipcord cable for patching, desktop, and backbone connections.

OM3 50-Micron Multimode 10-GbE Laser-Optimized OM3 Zipcord Fiber Optic Bulk Cable



- **Standard Warranty** — Lifetime

NOTE: For zipcord patch cables, see page 137.

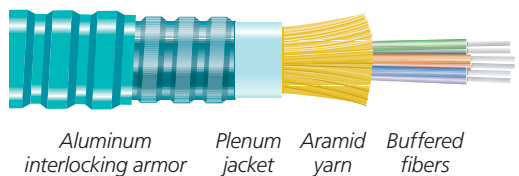
OM3 50-Micron Multimode 10-GbE Laser Optimized Zipcord Fiber Optic Cable

PVC, Riser (OFNR), Cut-to-Length	EXN10000A
Plenum (OFNP), Cut-to-Length	EXPOM3A

For specs, go to blackbox.com.

Run this OM3 armored cable anywhere in your building—no ducts required.

OM3 50-Micron Multimode Interlocking Armored, 10-GbE, 12-Strand, Fiber Optic Bulk Cable



- Save on labor! Pull this cable once instead of pulling conduit and then pulling cable.
- Use in 10-GbE runs up to 300 meters.
- **Standard Warranty** — Lifetime

OM3 50-Micron Multimode Interlocking Armored, 10-GbE Laser-Optimized, 12-Strand, Fiber Optic Bulk Cable

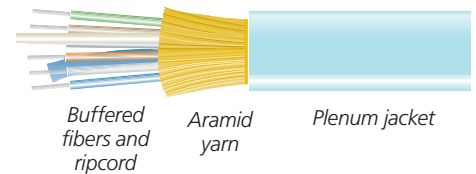
Plenum (OFNP), Cut-to-Length	EXPIA10G12A
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For specs, go to blackbox.com.

Prepare for your migration to 40- and 100-GbE today with OM4 cable.

OM4 50-Micron Multimode 10-GbE Laser-Optimized Fiber Optic Bulk Cable

- Use in 10-GbE runs up to 550 meters today.
- Migrate to 40-/100-GbE 150-meter runs later.
- OM4 cable rivals single-mode performance, yet is much more economical.
- Overfilled Launch (OFL) of 4700/500 MHz/km @ 850/1300 nm.
- Use with LED or VCSEL (laser) light sources.
- With a laser light source, bandwidth increases to 4700 MHz/km.
- **Standard Warranty** — Lifetime



OM4 50-Micron Multimode 10-GbE Laser-Optimized Distribution-Style Fiber Optic Bulk Cable

Plenum (OFNP), Cut-to-Length	
6-Fiber	EXP4006A
12-Fiber	EXP4012A

For specs, go to blackbox.com.

OM3/OM4

By Roberta Bowen Szyper

The demand for increased network bandwidth is driving the migration towards 40- and 100-GbE networks. This demand is being fueled by multiple factors, including ever-growing global IP traffic; greater switching, routing, virtualization, and data center connections; higher bandwidth applications; video-on-demand; convergence; and more.

When planning your 40-/100-GbE migration, consider your cabling infrastructure and how it will meet your current and future data requirements. What you install today needs to give you the scalability to accommodate the need for higher bandwidth for the next 15 to 20 years. The cables of choice for data center connectivity and what is recommended by the TIA are OM3 and OM4 laser-optimized multimode fiber.

OM3 and OM4

OM3 is specified in ISO 11801. OM4 was ratified by the TIA in August 2009 (TIA/EIA 492-AAAD). The IEEE ratified OM4 (802.3ba 40G/100G Ethernet) in June 2010. It was amended in 2012 to IEEE 802.3-2012. The 802.3-bm Task Force is currently working on updates. The standard provides detailed guidelines for 40-/100-GbE transmission over OM3 and OM4 multimode cable and single-mode fiber optic cable. OM1, OM2, and copper are not included.

OM3 and OM4 are both laser-optimized 50-micron multimode fiber (LOMMF) and were developed to accommodate faster networks such as 10-, 40-, and 100-GbE. They also support existing networks.

Both OM3 and OM4 are designed for use with 850-nm vertical-cavity surface-emitting lasers (VCSELS) and have aqua sheaths.

OM3 specifies an 850-nm laser-optimized 50-micron cable with an effective modal bandwidth (EMB) of 2000 MHz/km. It can support 100-Gbps link distances up to 100 meters.

OM4 specifies a high-bandwidth 850-nm laser-optimized 50-micron cable with an EMB of 4700 MHz/km. It can support 100-Gbps link distances of 150 meters.

OM3 allows for 1.5 dB of connector loss at 100 meters at all speeds; OM4 allows for 1.0 dB of loss at 150 meters for 40-/100-GbE.

Both OM3 and OM4 rival single-mode fiber in performance while being significantly less expensive to implement. In addition, single-mode electronics are also expensive.

OM3 and OM4 cable are made with a different process than OM1 and OM2, which are made with a small defect in the core called an index depression. LED light sources are used with OM1 and OM2.

Manufacturing process

Laser-optimized OM3 and OM4 are manufactured without the center defect. As networks migrated to higher speeds, VCSELS became more commonly used rather than LEDs, which have a maximum modulation rate of 622 Mbps and can't be turned on and off fast enough to support higher-speed applications. Thus manufacturers changed the production process to eliminate the center defect and enable OM3 and OM4 cables to be used directly with the VCSELS.

Parallel transmission

40- and 100-GbE over OM3 and OM4 uses parallel optics where data is simultaneously transmitted and received over multiple fibers. 40-GbE consists of (4) 10-Gbps fiber channels each way, for a total of 8 fibers. 100-GbE consists of 10 fiber channels each way, for a total of 20 fibers. The signals are then aggregated at each end in an arrayed transceiver (connector) containing 4 or 10 VCSELS and detectors. For multimode fiber, the Media Dependent Interface (MDI) is the MPO adapter (IEC 61754-7). See [page 137](#).

	850-nm Ethernet Distance			
	1-GbE	10-GbE	40-GbE	100-GbE
OM3	1000 m	400 m*	100 m	100 m
OM4	1000 m	550 m	150 m	150 m

* In July 2012, IEEE 802.3-2012 extended the distance for OM3 at 10-GbE from 300 to 400 meters.

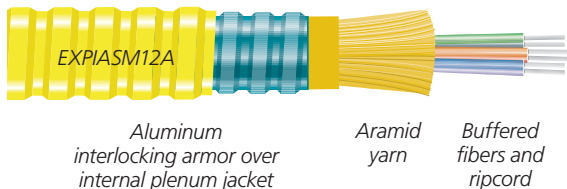
	Maximum Channel Insertion Loss		
	10-GbE	40-GbE	100-GbE
OM3	2.6 dB	1.9 dB	1.9 dB
OM4	—	1.5 dB	1.5 dB

	Attenuation		Bandwidth (MHz-km) Overfill Launch (OFL) 850/1300 nm	Bandwidth (MHz-km) Effective Modal Bandwidth (EMB) at 850 nm
	Typical	Cabled Max (dB/km)		
OM3	3.5	1.5	1500/500	2000
OM4	3.5	1.5	3500/500	4700

	Number of Fibers			
	1-GbE	10-GbE	40-GbE	100-GbE
OM3	2	2	8	20
OM4	2	2	8	20

Save 40% or more. Run this armored cable anywhere in your building—no ducts needed.

Single-Mode, 9-Micron, Interlocking Armored Fiber Optic Bulk Cable



- Save 40% or more on labor and materials. Pull this flexible, lightweight cable once instead of pulling conduit and then pulling cable!
- UL® Listed with aluminum interlocking armor covering an internal plenum jacket.
- Lightweight and flexible but also very strong.
- Rugged and rodent resistant.
- Ideal for out-of-the-way Ethernet links.

- Standard Warranty — Lifetime

NOTE: Costs based on a 500-foot run using Black Box materials. Labor costs are estimated and can vary widely based on the building and environment.

Check out how you can save or more on labor and materials!

The Expensive Way:
12-fiber plenum cable (500 ft.)
Plenum innerduct
Labor to pull cable and innerduct

The Interlocking Armored Way:
Interlocking Armored Cable (500-ft.)
Labor to pull cable

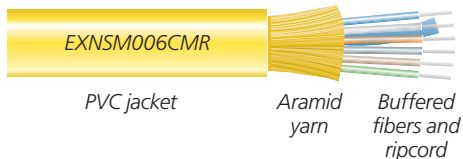
Single-Mode, 9-Micron, Interlocking Armored Fiber Optic Bulk Cable

Plenum (OFCP), Cut-to-Length
12-Strand EXPIASM12A

For specs, go to blackbox.com.

Save money and order single-mode cable cut to the exact lengths you need.

Single-Mode, 9-Micron, Distribution-Style Fiber Optic Bulk Cable



- Ideal for intrabuilding backbones.
- Run between telecommunications closets and equipment rooms.
- Terminate directly into loaded panels.

- Tested to meet or exceed TIA 568-A/GR-409-CORE standards.
- Standard Warranty — Lifetime

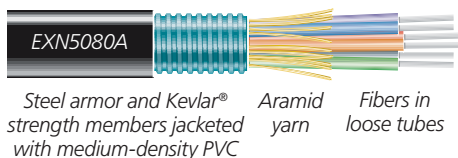
Single-Mode, 9-Micron Distribution-Style Fiber Optic Bulk Cable, Cut-to-Length

PVC CMR (OFNR)	
6-Strand	EXNSM006CMR
12-Strand	EXNSM012CMR
Plenum CMP (OFNP)	
6-Strand	EXPSM006CMP
12-Strand	EXPSM012CMP

For specs, go to blackbox.com.

Outdoor fiber cable with a built-in conduit.

Single-Mode, 9-Micron, Armored Loose-Tube Outside-Plant Fiber Optic Bulk Cable



- Consists of color-coded fibers in buffer tubes stranded around a central member.
- Steel armor and steel strength members with medium-density PVC jacket.
- Standard Warranty — Lifetime

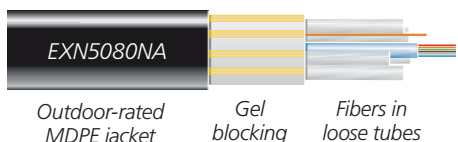
Single-Mode, 9-Micron, Armored Loose-Tube Outside-Plant Fiber Optic Bulk Cable

Cut-to-Length
24-Fiber EXN5080A

For specs, go to blackbox.com.

Outdoor fiber cable for going from building to building.

Single-Mode, 9-Micron, Loose-Tube Outside-Plant Fiber Optic Bulk Cable



- Single-mode 9/125-µm fiber.
- Optimum performance in extreme conditions— aerial installations, ducts, or buried.
- FDDI compliant.
- Standard Warranty — Lifetime



Single-Mode, 9-Micron Loose-Tube Outside-Plant Fiber Optic Bulk Cable

Cut-to-Length
24-Fiber EXN5080NA

For specs, go to blackbox.com.

OM1, 62.5-micron fiber patch cable with ceramic connectors.

OM1 62.5-Micron Multimode Premium Ceramic Fiber Optic Patch Cable

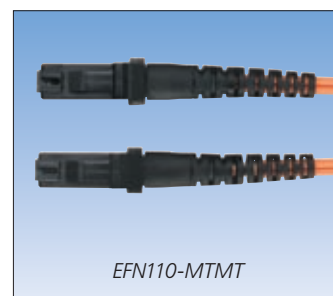
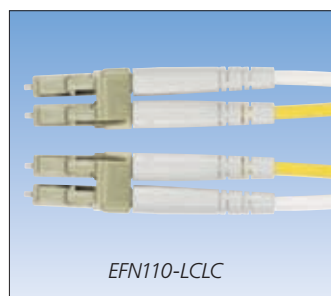
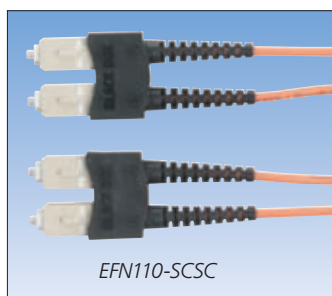


- Ceramic connectors provide low signal loss of 0.3 dB, high reliability, and a long life.
- All feature multimode 62.5- μ m/125- μ m construction and aramid strength elements.
- Choose from duplex or simplex and from riser (PVC) or plenum.
- Available in ST®, SC, LC, and MT-RJ connector styles.
- **Standard Warranty** — Lifetime



OM1 62.5-Micron Multimode Premium Ceramic Fiber Optic Patch Cable

ST-ST				SC-SC					
Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-STST	Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-SCSC		
		2-m (6.5-ft.)	EFN110-002M-STST			2-m (6.5-ft.)	EFN110-002M-SCSC		
		3-m (9.8-ft.)	EFN110-003M-STST			3-m (9.8-ft.)	EFN110-003M-SCSC		
		5-m (16.4-ft.)	EFN110-005M-STST			5-m (16.4-ft.)	EFN110-005M-SCSC		
		10-m (32.8-ft.)	EFN110-010M-STST			10-m (32.8-ft.)	EFN110-010M-SCSC		
		15-m (49.2-ft.)	EFN110-015M-STST			15-m (49.2-ft.)	EFN110-015M-SCSC		
		20-m (65.6-ft.)	EFN110-020M-STST			20-m (65.6-ft.)	EFN110-020M-SCSC		
		30-m (98.4-ft.)	EFN110-030M-STST			30-m (98.4-ft.)	EFN110-030M-SCSC		
		Custom Lengths	EFN110-STST			Custom Lengths	EFN110-SCSC		
	Plenum	5-m (16.4-ft.)	EFP110-005M-STST		Plenum	5-m (16.4-ft.)	EFP110-005M-SCSC		
		15-m (49.2-ft.)	EFP110-015M-STST			10-m (32.8-ft.)	EFP110-010M-SCSC		
		30-m (98.4-ft.)	EFP110-030M-STST			15-m (49.2-ft.)	EFP110-015M-SCSC		
		Custom Lengths	EFP110-STST			30-m (98.4-ft.)	EFP110-030M-SCSC		
						Custom Lengths	EFP110-SCSC		
	Simplex	Riser	1-m (3.2-ft.)	EFN110-001M-ST		Simplex	Riser	3-m (9.8-ft.)	EFN110-003M-SC
			2-m (6.5-ft.)	EFN110-002M-ST					
			3-m (9.8-ft.)	EFN110-003M-ST					
			5-m (16.4-ft.)	EFN110-005M-ST					
ST-SC				LC-LC					
Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-STSC	Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-LCLC		
		2-m (6.5-ft.)	EFN110-002M-STSC			2-m (6.5-ft.)	EFN110-002M-LCLC		
		3-m (9.8-ft.)	EFN110-003M-STSC			3-m (9.8-ft.)	EFN110-003M-LCLC		
		5-m (16.4-ft.)	EFN110-005M-STSC			5-m (16.4-ft.)	EFN110-005M-LCLC		
		10-m (32.8-ft.)	EFN110-010M-STSC			10-m (32.8-ft.)	EFN110-010M-LCLC		
		15-m (49.2-ft.)	EFN110-015M-STSC			15-m (49.2-ft.)	EFN110-015M-LCLC		
		20-m (65.6-ft.)	EFN110-020M-STSC			20-m (65.6-ft.)	EFN110-020M-LCLC		
		30-m (98.4-ft.)	EFN110-030M-STSC			30-m (98.4-ft.)	EFN110-030M-LCLC		
		Custom Lengths	EFN110-STSC			Custom Lengths	EFN110-LCLC		
	Plenum	10-m (32.8-ft.)	EFP110-010M-STSC		Plenum	5-m (16.4-ft.)	EFP110-005M-LCLC		
		15-m (49.2-ft.)	EFP110-015M-STSC			10-m (32.8-ft.)	EFP110-010M-LCLC		
		30-m (98.4-ft.)	EFP110-030M-STSC			15-m (49.2-ft.)	EFP110-015M-LCLC		
		Custom Lengths	EFP110-STSC			20-m (65.6-ft.)	EFP110-020M-LCLC		
						30-m (98.4-ft.)	EFP110-030M-LCLC		
						Custom Lengths	EFP110-LCLC		



LC-ST®

Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-STLC
		2-m (6.5-ft.)	EFN110-002M-STLC
		3-m (9.8-ft.)	EFN110-003M-STLC
		5-m (16.4-ft.)	EFN110-005M-STLC
		10-m (32.8-ft.)	EFN110-010M-STLC
		15-m (49.2-ft.)	EFN110-015M-STLC
		20-m (65.6-ft.)	EFN110-020M-STLC
		30-m (98.4-ft.)	EFN110-030M-STLC
		Custom Lengths	EFN110-STLC
		Plenum	
10-m (32.8-ft.)	EFP110-010M-STLC		
15-m (49.2-ft.)	EFP110-015M-STLC		
30-m (98.4-ft.)	EFP110-030M-STLC		
Custom Lengths	EFP110-STLC		

LC-SC

Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-SCLC		
		2-m (6.5-ft.)	EFN110-002M-SCLC		
		3-m (9.8-ft.)	EFN110-003M-SCLC		
		5-m (16.4-ft.)	EFN110-005M-SCLC		
		10-m (32.8-ft.)	EFN110-010M-SCLC		
		15-m (49.2-ft.)	EFN110-015M-SCLC		
		20-m (65.6-ft.)	EFN110-020M-SCLC		
		30-m (98.4-ft.)	EFN110-030M-SCLC		
		Custom Lengths	EFN110-SCLC		
		Plenum		5-m (16.4-ft.)	EFP110-005M-SCLC
				15-m (49.2-ft.)	EFP110-015M-SCLC
				20-m (65.6-ft.)	EFP110-020M-SCLC
				30-m (98.4-ft.)	EFP110-030M-SCLC
Custom Lengths	EFP110-SCLC				

LC-MT-RJ

Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-LCMT		
		2-m (6.5-ft.)	EFN110-002M-LCMT		
		3-m (9.8-ft.)	EFN110-003M-LCMT		
		5-m (16.4-ft.)	EFN110-005M-LCMT		
		10-m (32.8-ft.)	EFN110-010M-LCMT		
		15-m (49.2-ft.)	EFN110-015M-LCMT		
		20-m (65.6-ft.)	EFN110-020M-LCMT		
		30-m (98.4-ft.)	EFN110-030M-LCMT		
		Custom Lengths	EFN110-LCMT		
		Plenum		5-m (16.4-ft.)	EFP110-005M-LCMT
				15-m (49.2-ft.)	EFP110-015M-LCMT
				30-m (98.4-ft.)	EFP110-030M-LCMT
				Custom Lengths	EFP110-LCMT

MT-RJ-MT-RJ

Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-MTMT		
		2-m (6.5-ft.)	EFN110-002M-MTMT		
		3-m (9.8-ft.)	EFN110-003M-MTMT		
		5-m (16.4-ft.)	EFN110-005M-MTMT		
		10-m (32.8-ft.)	EFN110-010M-MTMT		
		15-m (49.2-ft.)	EFN110-015M-MTMT		
		20-m (65.6-ft.)	EFN110-020M-MTMT		
		30-m (98.4-ft.)	EFN110-030M-MTMT		
		Custom Lengths	EFN110-MTMT		
		Plenum		15-m (49.2-ft.)	EFP110-015M-MTMT
				20-m (65.6-ft.)	EFP110-020M-MTMT
30-m (98.4-ft.)	EFP110-030M-MTMT				
Custom Lengths	EFP110-MTMT				

MT-RJ-ST

Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-STMT		
		2-m (6.5-ft.)	EFN110-002M-STMT		
		3-m (9.8-ft.)	EFN110-003M-STMT		
		5-m (16.4-ft.)	EFN110-005M-STMT		
		10-m (32.8-ft.)	EFN110-010M-STMT		
		15-m (49.2-ft.)	EFN110-015M-STMT		
		20-m (65.6-ft.)	EFN110-020M-STMT		
		30-m (98.4-ft.)	EFN110-030M-STMT		
		Custom Lengths	EFN110-STMT		
		Plenum		5-m (16.4-ft.)	EFP110-005M-STMT
				15-m (49.2-ft.)	EFP110-015M-STMT
				20-m (65.6-ft.)	EFP110-020M-STMT
				30-m (98.4-ft.)	EFP110-030M-STMT
Custom Lengths	EFP110-STMT				

MT-RJ-SC

Duplex	Riser	1-m (3.2-ft.)	EFN110-001M-SCMT		
		2-m (6.5-ft.)	EFN110-002M-SCMT		
		3-m (9.8-ft.)	EFN110-003M-SCMT		
		5-m (16.4-ft.)	EFN110-005M-SCMT		
		10-m (32.8-ft.)	EFN110-010M-SCMT		
		15-m (49.2-ft.)	EFN110-015M-SCMT		
		20-m (65.6-ft.)	EFN110-020M-SCMT		
		30-m (98.4-ft.)	EFN110-030M-SCMT		
		Custom Lengths	EFN110-SCMT		
		Plenum		5-m (16.4-ft.)	EFP110-005M-SCMT
				15-m (49.2-ft.)	EFP110-015M-SCMT
				20-m (65.6-ft.)	EFP110-020M-SCMT
				30-m (98.4-ft.)	EFP110-030M-SCMT
Custom Lengths	EFP110-SCMT				

For specs, go to blackbox.com.

Get more bandwidth and distance with 50-micron cable.

OM2 50-Micron Multimode, Duplex Fiber Optic Patch Cable



ST (EFN6023)

Ultra-low insertion loss



- This 50-micron fiber cable provides three times the bandwidth of standard 62.5-micron cable.
- Boasts an ultra-low insertion loss of less than 3 dB.
- Features two 900- μ m buffered fibers surrounded by aramid yarn strength members.
- Ceramic connectors provide low signal loss, high reliability, and long life.
- **Standard Warranty** — Lifetime

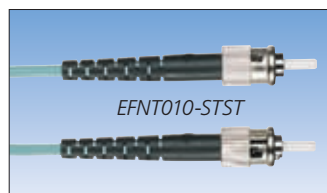
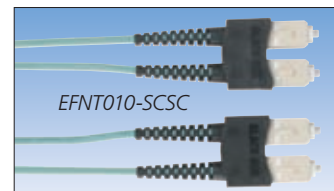
OM2 50-Micron Multimode, Duplex Fiber Optic Patch Cable, PVC

LC-LC	1-m (3.2-ft.)	EFN6020-001M	SC-SC	1-m (3.2-ft.)	EFN6025-001M
	2-m (6.5-ft.)	EFN6020-002M		2-m (6.5-ft.)	EFN6025-002M
	3-m (9.8-ft.)	EFN6020-003M		3-m (9.8-ft.)	EFN6025-003M
	5-m (16.4-ft.)	EFN6020-005M		5-m (16.4-ft.)	EFN6025-005M
	10-m (32.8-ft.)	EFN6020-010M		10-m (32.8-ft.)	EFN6025-010M
	Custom Lengths	EFN6020		Custom Lengths	EFN6025
LC-SC	1-m (3.2-ft.)	EFN6021-001M	MT-RJ-MT-RJ	1-m (3.2-ft.)	EFN6026-001M
	2-m (6.5-ft.)	EFN6021-002M		2-m (6.5-ft.)	EFN6026-002M
	3-m (9.8-ft.)	EFN6021-003M		3-m (9.8-ft.)	EFN6026-003M
	5-m (16.4-ft.)	EFN6021-005M		5-m (16.4-ft.)	EFN6026-005M
	10-m (32.8-ft.)	EFN6021-010M		10-m (32.8-ft.)	EFN6026-010M
	Custom Lengths	EFN6021		Custom Lengths	EFN6026
LC-ST®	1-m (3.2-ft.)	EFN6022-001M	MT-RJ-ST	1-m (3.2-ft.)	EFN6027-001M
	2-m (6.5-ft.)	EFN6022-002M		2-m (6.5-ft.)	EFN6027-002M
	3-m (9.8-ft.)	EFN6022-003M		3-m (9.8-ft.)	EFN6027-003M
	5-m (16.4-ft.)	EFN6022-005M		5-m (16.4-ft.)	EFN6027-005M
	10-m (32.8-ft.)	EFN6022-010M		10-m (32.8-ft.)	EFN6027-010M
	Custom Lengths	EFN6022		Custom Lengths	EFN6027
ST-ST	1-m (3.2-ft.)	EFN6023-001M	MT-RJ-SC	1-m (3.2-ft.)	EFN6028-001M
	2-m (6.5-ft.)	EFN6023-002M		2-m (6.5-ft.)	EFN6028-002M
	3-m (9.8-ft.)	EFN6023-003M		3-m (9.8-ft.)	EFN6028-003M
	5-m (16.4-ft.)	EFN6023-005M		5-m (16.4-ft.)	EFN6028-005M
	10-m (32.8-ft.)	EFN6023-010M		10-m (32.8-ft.)	EFN6028-010M
	Custom Lengths	EFN6023		Custom Lengths	EFN6028
ST-SC	1-m (3.2-ft.)	EFN6024-001M	MT-RJ-LC	1-m (3.2-ft.)	EFN6029-001M
	2-m (6.5-ft.)	EFN6024-002M		2-m (6.5-ft.)	EFN6029-002M
	3-m (9.8-ft.)	EFN6024-003M		3-m (9.8-ft.)	EFN6029-003M
	5-m (16.4-ft.)	EFN6024-005M		5-m (16.4-ft.)	EFN6029-005M
	10-m (32.8-ft.)	EFN6024-010M		10-m (32.8-ft.)	EFN6029-010M
	Custom Lengths	EFN6024		Custom Lengths	EFN6029

For specs, go to blackbox.com.

Tight-buffered, 50-micron multimode cable that's laser optimized for 10-Gigabit Ethernet.

OM3 50-Micron Multimode 10-Gigabit Fiber Optic Patch Cable



- Features tight-buffered fiber with an acrylate fiber coating and aramid yard strength members.
- Use with either LED or laser light sources. With a laser light source, bandwidth increases to 2000 MHz/km.
- Meets Optical Multimode 3 (OM3) standard for high-bandwidth communications. Rivals single-mode fiber in performance while being significantly less expensive to implement.
- **Standard Warranty** — Lifetime

NOTE: Also available in distribution-style and zipcord bulk lengths (pages 130–131). For cables with MT-RJ connectors, call our FREE Tech Support.

OM3 50-Micron Multimode 10-Gigabit Fiber Optic Patch Cable

Zipcord, PVC			
ST-ST	1-m (3.2-ft.)	EFNT010-001M-STST	
	2-m (6.5-ft.)	EFNT010-002M-STST	
	3-m (9.8-ft.)	EFNT010-003M-STST	
	5-m (16.4-ft.)	EFNT010-005M-STST	
	10-m (32.8-ft.)	EFNT010-010M-STST	
	Custom Lengths	EFN010-STST	
ST-SC	1-m (3.2-ft.)	EFNT010-001M-STSC	
	2-m (6.5-ft.)	EFNT010-002M-STSC	
	3-m (9.8-ft.)	EFNT010-003M-STSC	
	5-m (16.4-ft.)	EFNT010-005M-STSC	
	10-m (32.8-ft.)	EFNT010-010M-STSC	
	Custom Lengths	EFN010-STSC	
ST-LC	1-m (3.2-ft.)	EFNT010-001M-STLC	
	2-m (6.5-ft.)	EFNT010-002M-STLC	
	3-m (9.8-ft.)	EFNT010-003M-STLC	
	5-m (16.4-ft.)	EFNT010-005M-STLC	
	10-m (32.8-ft.)	EFNT010-010M-STLC	
	Custom Lengths	EFN010-STLC	

Zipcord, PVC			
SC-SC	1-m (3.2-ft.)	EFNT010-001M-SCSC	
	2-m (6.5-ft.)	EFNT010-002M-SCSC	
	3-m (9.8-ft.)	EFNT010-003M-SCSC	
	5-m (16.4-ft.)	EFNT010-005M-SCSC	
	10-m (32.8-ft.)	EFNT010-010M-SCSC	
	Custom Lengths	EFN010-SCSC	
SC-LC	1-m (3.2-ft.)	EFNT010-001M-SCLC	
	2-m (6.5-ft.)	EFNT010-002M-SCLC	
	3-m (9.8-ft.)	EFNT010-003M-SCLC	
	5-m (16.4-ft.)	EFNT010-005M-SCLC	
	10-m (32.8-ft.)	EFNT010-010M-SCLC	
	Custom Lengths	EFN010-SCLC	
LC-LC	1-m (3.2-ft.)	EFNT010-001M-LCLC	
	2-m (6.5-ft.)	EFNT010-002M-LCLC	
	3-m (9.8-ft.)	EFNT010-003M-LCLC	
	5-m (16.4-ft.)	EFNT010-005M-LCLC	
	10-m (32.8-ft.)	EFNT010-010M-LCLC	
	Custom Lengths	EFN010-LCLC	

For specs, go to blackbox.com.

◀ For info on OM3 and OM4, turn to p. 132.

Call. Click. Chat. Connect.

Get the help, support, products, and services you need, when and how you want them.



Transmit at higher rates than with multimode fiber—and choose from OS1 Single-Mode, 9-Micron, Duplex Fiber Optic Cable



- Get long-distance transmission—50 times farther than multimode.
- PVC cable is certified OFNR for use as riser cable.
- Plenum cable is certified OFNP for use in air plenums.

ST and SC Connectors

- Ideal for patching single-mode backbones to high-speed network devices, such as Gigabit Ethernet switches.

MT-RJ Connectors

- Small, snag-proof RJ-style connectors enable you to fit more terminations in a limited area than with SC connectors.

LC Connectors

- Almost half the size of standard ST and SC terminations.
- Ideal for high-density applications.

MU Connectors

- This small-form connector resembles the larger SC connector and also features a simple push-pull latching connection.
- Ideal for high-density applications, CATV, video, and more.
- **Standard Warranty** — Lifetime

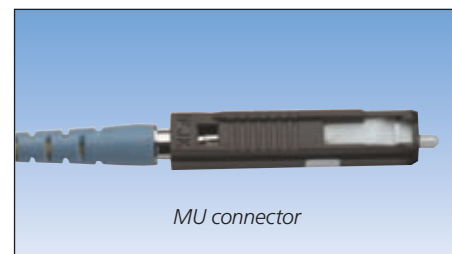
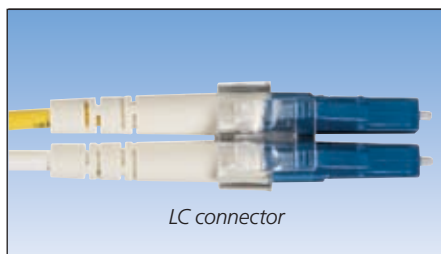
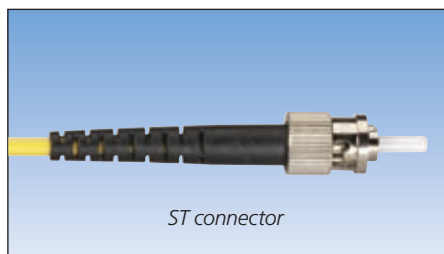
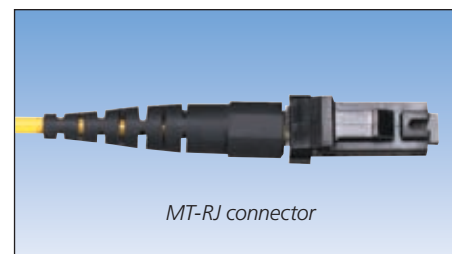
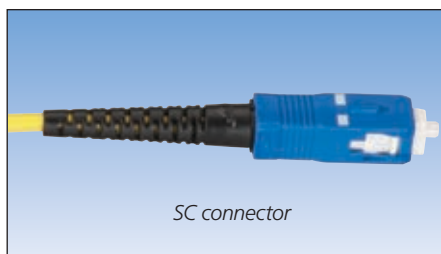
OS1 Single-Mode 9-Micron Duplex Fiber Optic Cable

ST-ST	PVC	1-m (3.2-ft.)	EFN310-001M-STST
		2-m (6.5-ft.)	EFN310-002M-STST
		3-m (9.8-ft.)	EFN310-003M-STST
		5-m (16.4-ft.)	EFN310-005M-STST
		10-m (32.8-ft.)	EFN310-010M-STST
		15-m (49.2-ft.)	EFN310-015M-STST
		20-m (65.6-ft.)	EFN310-020M-STST
		30-m (98.4-ft.)	EFN310-030M-STST
	Custom Lengths	EFN5009	
ST-SC	PVC	1-m (3.2-ft.)	EFN310-001M-STSC
		2-m (6.5-ft.)	EFN310-002M-STSC
		3-m (9.8-ft.)	EFN310-003M-STSC
		5-m (16.4-ft.)	EFN310-005M-STSC
		10-m (32.8-ft.)	EFN310-010M-STSC
		15-m (49.2-ft.)	EFN310-015M-STSC
		20-m (65.6-ft.)	EFN310-020M-STSC
		30-m (98.4-ft.)	EFN310-030M-STSC
	Custom Lengths	EFN5011	
MT-RJ-MT-RJ	PVC	2-m (6.5-ft.)	EFN310-002M-MTMT
		Custom Lengths	EFN5013

ST-MT-RJ	PVC	1-m (3.2-ft.)	EFN310-001M-STMT
		2-m (6.5-ft.)	EFN310-002M-STMT
		3-m (9.8-ft.)	EFN310-003M-STMT
		5-m (16.4-ft.)	EFN310-005M-STMT
		10-m (32.8-ft.)	EFN310-010M-STMT
		15-m (49.2-ft.)	EFN310-015M-STMT
		Custom Lengths	EFN5014
SC-SC	PVC	1-m (3.2-ft.)	EFN310-001M-SCSC
		2-m (6.5-ft.)	EFN310-002M-SCSC
		3-m (9.8-ft.)	EFN310-003M-SCSC
		5-m (16.4-ft.)	EFN310-005M-SCSC
		10-m (32.8-ft.)	EFN310-010M-SCSC
		15-m (49.2-ft.)	EFN310-015M-SCSC
		20-m (65.6-ft.)	EFN310-020M-SCSC
		30-m (98.4-ft.)	EFN310-030M-SCSC
	Custom Lengths	EFN5010	
SC-MT-RJ	PVC	2-m (6.5-ft.)	EFN310-002M-SCMT
		3-m (9.8-ft.)	EFN310-003M-SCMT
		5-m (16.4-ft.)	EFN310-005M-SCMT
		30-m (98.4-ft.)	EFN310-030M-SCMT
		Custom Lengths	EFN5015

For specs, go to blackbox.com.

five different connector types!



Technical Specifications

Cladding	125 μm
Core	9 μm
Crush Resistance	750 N/cm
Ferrule	Ceramic
Housing	Composite
Insertion Loss	0.2 dB typical

Operating Temperature	-4 to +158° F (-20 to +70° C)
Return Loss	≥ 55 typical
Tensile Strength	240 N (54 lb./24.5 kg)
Wavelength	1310 nm, 1550 nm
Approvals	RoHS

OS1 Single-Mode 9-Micron Duplex Fiber Optic Cable

LC-LC	PVC	1-m (3.2-ft.)	EFN310-001M-LCLC
		2-m (6.5-ft.)	EFN310-002M-LCLC
		3-m (9.8-ft.)	EFN310-003M-LCLC
		5-m (16.4-ft.)	EFN310-005M-LCLC
		10-m (32.8-ft.)	EFN310-010M-LCLC
		15-m (49.2-ft.)	EFN310-015M-LCLC
		20-m (65.6-ft.)	EFN310-020M-LCLC
		30-m (98.4-ft.)	EFN310-030M-LCLC
		Custom Lengths	EFN092
		MU-MU	PVC
MU-SC	PVC	Custom Lengths	EFN096
MU-MT-RJ	PVC	Custom Lengths	EFN099

LC-ST	PVC	1-m (3.2-ft.)	EFN310-001M-STLC
		2-m (6.5-ft.)	EFN310-002M-STLC
		3-m (9.8-ft.)	EFN310-003M-STLC
		5-m (16.4-ft.)	EFN310-005M-STLC
		10-m (32.8-ft.)	EFN310-010M-STLC
		15-m (49.2-ft.)	EFN310-015M-STLC
		20-m (65.6-ft.)	EFN310-020M-STLC
		30-m (98.4-ft.)	EFN310-030M-STLC
		Custom Lengths	EFN093
		LC-SC	PVC
2-m (6.5-ft.)	EFN310-002M-SCLC		
3-m (9.8-ft.)	EFN310-003M-SCLC		
5-m (16.4-ft.)	EFN310-005M-SCLC		
10-m (32.8-ft.)	EFN310-010M-SCLC		
15-m (49.2-ft.)	EFN310-015M-SCLC		
20-m (65.6-ft.)	EFN310-020M-SCLC		
30-m (98.4-ft.)	EFN310-030M-SCLC		
Custom Lengths	EFN094		

For specs, go to blackbox.com.



Resources

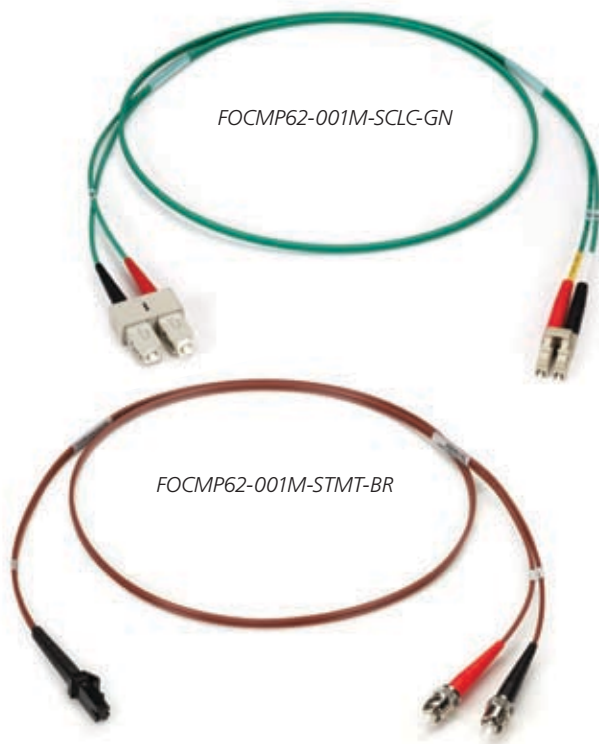
White Paper
Fiber Optic Technology blackbox.com/go/WP

Hey, so what does simplex and duplex mean?

Simplex fiber cable has one fiber, while duplex (zipcord) has two fibers in two jackets joined by a thin web. Use simplex cable for applications that require a one-way data transfer, such as a remote monitoring station. Use duplex fiber or single-mode fiber for applications that require simultaneous, bidirectional data transfer.

Fiber patch cable in 12 colors—built to your specifications.

Multicolor Fiber Optic Patch Cables



- Match Black Box fiber cable to your organization’s departmental colors.
- Ideal for color-coded networking applications.
- It’s easy to build your own cable. Select from:
 - Glass type: –OM1 62.5-micron multimode
 - OM2 50-micron multimode
 - OM3 50-micron 10-GbE laser-optimized multimode
 - OS1 9-micron single-mode
 - Length: –13 lengths ranging from 1 to 30 meters
 - Connectors: –Four connectors (ST, SC, LC, and MT-RJ) in 10 different combinations.
 - Colors: –12 colors
- Get high performance at data rates up to 10-Gbps at 850 nm.
- Higher data aggregation in the backbone, riser, and high-speed parallel interconnects (HSPIs).
- Full compatibility with a broad range of laser-based and legacy protocols and applications.
- Industry-leading CPC® coatings for superior microbend and environmental performance.
- **Standard Warranty** — Lifetime

Buyer's Checklist

- ✓ Glass Type: 62.5-micron multimode (OM1), 50-micron multimode (OM2), 10-GbE laser-optimized 50-micron multimode (OM3), or 9-micron single-mode (OS1).
- ✓ Length: 13 lengths are available ranging from 1 to 30 meters.
- ✓ Four connectors: ST, SC, LC, and MT-RJ in 10 different combinations.
- ✓ 12 colors: Match cables to your favorite team, company, or school colors.



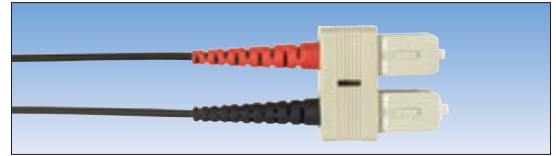
FREE Tech Support
Talk with an expert or go to blackbox.com.

How to order these cables:

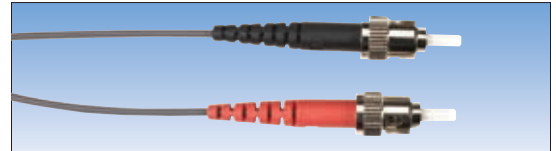
FO	CMR	50	-001	M-	STST-	BL
Constant	Jacket	Glass Type	Length	Constant	Connectors	Color

- 1 FO (constant).
- 2 Pick your jacket type.
- 3 Select the appropriate glass type.
- 4 Determine length.
- 5 M- (constant for meters).
- 6 Pick your connectors.
- 7 Decide on the cable color.

(For the range of choices, see right.)



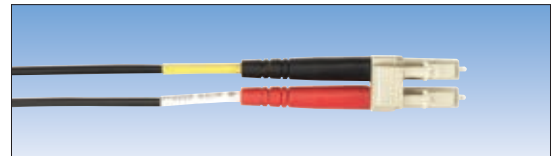
SC connector



ST connector



MT-RJ connector



LC connector

Quick Facts

Multicolor Fiber Optic Patch Cables

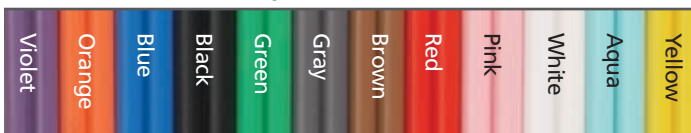
NOTE: If you wish to order a cable with a length other than those specified here, such as 12 feet, please call Customer Service.

1 (Constant)	2 Jacket	3 Glass Type	4 Length*	5 Connectors	6 Color
FO	CMR (PVC)	62- (62.5 Micron) (OM1)	001M- (1 Meter)	STST- (ST to ST)	BL (Blue)
	CMP (Plenum)	50- (50 Micron) (OM2)	002M- (2 Meters)	SCSC- (SC to SC)	OR (Orange)
		10- (10-GbE OM3 Laser Optimized 50 Micron) (OM3)	003M- (3 Meters)	LCLC- (LC to LC)	GN (Green)
	SM- (Single-Mode) (OS1)		004M- (4 Meters)	MTMT- (MT-RJ to MT-RJ)	BR (Brown)
			005M- (5 Meters)	STSC- (ST to SC)	GR (Gray)
			006M- (6 Meters)	STLC- (ST to LC)	WH (White)
			007M- (7 Meters)	STMT- (ST to MT-RJ)	RD (Red)
			008M- (8 Meters)	SCLC- (SC to LC)	BK (Black)
			010M- (10 Meters)	LCMT- (LC to MT-RJ)	YL (Yellow)
			015M- (15 Meters)	SCMT- (SC to MT-RJ)	VT (Violet)
			020M- (20 Meters)		PK (Pink)
			025M- (25 Meters)		AQ (Aqua)
030M- (30 Meters)					

Examples of fiber optic cable codes:

- FOCMR62-001M-STST-BL = Cable with a PVC jacket, 62.5-micron core, 1-meter length, ST-ST connectors in blue.
- FOCMP50-008M-STLC-OR = Cable with a plenum jacket, 50-micron core, 8-meter length, ST-LC connectors in orange.
- FOCMRSM-030M-SCLC-YL = Cable with a PVC jacket, 9-micron core, 30-meter length, SC-LC connectors in yellow.

Choose from as many as 12 colors!



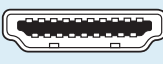


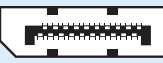

Multicolor Fiber Optic Patch Cables

[See chart above.](#)

To order, call Customer Service or click on the type of cable you want at blackbox.com/go/ColorFiber.

For specs, go to blackbox.com.

Selection Guide | Audio/Video Cables

Interface		12" (0.3-m)	1-m (3.2-ft.)	2-m (6.5-ft.)	3-m (9.8-ft.)	5-m (16.4-ft.)	
 HDMI	Premium High-Speed HDMI M to High-Speed HDMI M	—	VCB-HDMI-001M	VCB-HDMI-002M	VCB-HDMI-003M	VCB-HDMI-005M*	HDMI Cable, facing page (*10-, 15-, 20-25-, and 30-m also available.)
 DVI-D Single-Link	HDMI M to DVI M	—	EVHDMI02T-001M	EVHDMI02T-002M	EVHDMI02T-003M	EVHDMI02T-005M	HDMI Cable with Swivel Hoods, facing page
	HDMI M (Swivel) to HDMI M (Straight)	—	EVHDMI04-SS-001M	EVHDMI04-SS-002M	EVHDMI04-SS-003M	—	
	HDMI M (Swivel) to HDMI M (Swivel)	—	EVHDMI04-DS-001M	EVHDMI04-DS-002M	EVHDMI04-DS-003M	—	
 HDMI Micro	HDMI M to HDMI Micro M	—	VCB-MHDMI-0003	VCB-MHDMI-0006	—	—	HDMI Micro Cable, facing page
Interface		3-ft. (0.9-m)		6-ft. (1.8-m)	10-ft. (3.0-m)	15-ft. (4.5-m)	
 DisplayPort	DisplayPort M to DisplayPort M	—	VCB-DP-0003-MM	VCB-DP-0006-MM	VCB-DP-0010-MM	VCB-DP-0015-MM	DisplayPort Cable, Male/Male, below
	DisplayPort M to HDMI F	EVNDPHDMI-MF-R3	—	—	—	—	DisplayPort Adapter Cable, below
 HD15	DisplayPort M to DVI-D F	EVNDPDVI-MF-R3	—	—	—	—	
	DisplayPort M to HD15 (VGA) F	EVNDPVGA-MF-R3	—	—	—	—	

The fast, compact digital interface.

DisplayPort Cables and Adapter Cables

- Transmit both digital video and audio in one cable.
- Support video with up to 1080p resolution plus digital audio.
- Version 1.1 supports 10.8 Gbps.
- Compact latching connectors.
- Support color depths of 6, 8, 10, 12, and 16 bits and two-way connectivity.
- Adapters are interface powered and require no separate power supply.
- **Standard Warranty** — Lifetime



DisplayPort Adapter Cables, 12" (30.5 cm)

DisplayPort Male	
to HDMI Female	EVNDPHDMI-MF-R3
to DVI-D Female	EVNDPDVI-MF-R3
to HD15 (VGA) Female	EVNDPVGA-MF-R3

For specs, go to blackbox.com.

DisplayPort Cable, Male/Male, 32 AWG

3-ft. (0.9-m)	VCB-DP-0003-MM
6-ft. (1.8-m)	VCB-DP-0006-MM
10-ft. (3.0-m)	VCB-DP-0010-MM
15-ft. (4.5-m)	VCB-DP-0015-MM

For specs, go to blackbox.com.

DisplayPort

DisplayPort is a digital video interface that was designed by the Video Electronics Standards Association (VESA) in 2006 and has been produced since 2008. It competes directly with HDMI®. Unlike HDMI, however, DisplayPort is an open standard with no royalties.

DisplayPort is incredibly versatile, with the capability to deliver digital video, audio, bidirectional communications, and accessory power over a single connector. It's targeted at the computer world rather than at consumer electronics. It is used to connect computers, monitors, projectors, etc. DisplayPort connectors are found on newer computers and displays. The Mini DisplayPort connector is also found on Apple® products.

DisplayPort v1.1 supports a maximum of 10.8 Gbps over a 2-meter cable; v1.2 supports up to 21.6 Gbps. DisplayPort v1.2 enables you to daisychain up to four monitors with only a single output cable. It also

offers the future promise of DisplayPort Hubs that would operate much like a USB hub.



The standard DisplayPort connector is very compact and features latches that don't add to the connector's size—a quick squeeze of the connector releases the latch.

DisplayPort supports cable lengths of up to 15 meters with maximum resolutions at cable lengths up to 3 meters. Bidirectional signaling enables DisplayPort to both send and receive data from an attached device.

With the proper adapters, DisplayPort cable can carry DVI and HDMI signals, although this doesn't work the other way around—DVI and HDMI cable can't carry DisplayPort. Because DisplayPort can provide power to attached devices, DisplayPort to HDMI or DVI adapters doesn't need a separate power supply.

Transmit your digital video and digital audio signals over one cable.

HDMI Cables and Adapters

- Transmit compressed video, multichannel digital audio, and intelligent format and command data.
- Connect HDTV set-top boxes, digital TVs, DVDs, and other equipment with HDMI interfaces.
- Premium High-Speed HDMI Cables with Ethernet also transmit network data.
- HDMI-to-DVI cables and adapters enable you to connect mismatched interfaces.
- **Standard Warranty** — Lifetime



VCB-HDMI



EVHDMI04-DS



To transmit network data over the same cable, and for high-resolution 1080p displays, as well as 4K, 3D, and Deep Color order Premium High-Speed HDMI cable.

Order Standard HDMI to HDMI Cable for most HDTV connections with resolutions up to 1080i or 720p video from cable, satellite, or Blu-ray players.

To connect HDMI to DVI or vice versa, use the HDMI to DVI Swivel

Adapter. Swiveling connectors rotate 90° up and down and are ideal for rear equipment connections in tight areas.

Use an HDMI Micro Cable to connect a smartphone, digital camera, tablet, and other devices to a TV or HDMI display. The connector features all 19 pins, but is approximately a quarter the size of the HDMI connector. It supports full HDMI specs and delivers high-resolution 1080p video.

HDMI Cables

Premium High-Speed HDMI Cable with Ethernet, PVC, Male/Male

1-m (3.2-ft.)	VCB-HDMI-001M
2-m (6.5-ft.)	VCB-HDMI-002M
3-m (9.8-ft.)	VCB-HDMI-003M
5-m (16.4-ft.)	VCB-HDMI-005M
7-m (23.0-ft.)	VCB-HDMI-007M
10-m (32.8-ft.)	VCB-HDMI-010M
15-m (49.2-ft.)	VCB-HDMI-015M
20-m (65.6-ft.)	VCB-HDMI-020M
25-m (82.0-ft.)	VCB-HDMI-025M
30-m (98.4-ft.)	VCB-HDMI-030M

Standard HDMI to HDMI Cable, Swivel/Swivel, Male/Male

1-m (3.2-ft.)	EVHDMI04-DS-001M
2-m (6.5-ft.)	EVHDMI04-DS-002M
3-m (9.8-ft.)	EVHDMI04-DS-003M

HDMI to HDMI, Swivel/Straight, Male/Male

1-m (3.2-ft.)	EVHDMI04-SS-001M
2-m (6.5-ft.)	EVHDMI04-SS-002M
3-m (9.8-ft.)	EVHDMI04-SS-003M

Standard HDMI to HDMI Micro Cable, PVC, Male/Male

0.9-m (3.0-ft.)	VCB-MHDMI-0003
1.8-m (6.0-ft.)	VCB-MHDMI-0006

Standard HDMI to DVI-D Cable, PVC, Male/Male

1-m (3.2-ft.)	EVHDMI02T-001M
2-m (6.5-ft.)	EVHDMI02T-002M
3-m (9.8-ft.)	EVHDMI02T-003M
5-m (16.4-ft.)	EVHDMI02T-005M

Standard HDMI Adapters

HDMI Male to DVI Female	FA790
HDMI Female to DVI Male	FA795-R2

Standard HDMI Swivel Adapter, 24-Pin

HDMI Male to DVI Female	FA791
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For specs, go to blackbox.com.

HDMI Connections

High-Definition Multimedia Interface® (HDMI) was the first digital interface to combine uncompressed high-definition video, up to eight channels of uncompressed digital audio, and intelligent format and command data in a single cable.

HDMI offers significant benefits over older analog A/V connections. It provides superior video and audio clarity because there's no signal loss from digital-to-analog conversions.

HDMI is the de facto standard for consumer electronics. It is backward compatible with DVI equipment such as PCs, TVs, and other electronic devices using the DVI standard (the DVI device simply ignores the extra data).

Recently, classic Standard HDMI has been joined by High-Speed HDMI. Standard HDMI cable is designed for use with digital broadcast

TV, cable TV, satellite TV, Blu-ray and upscale DVD players to reliably transmit up to 1080i or 720p video.

High-Speed HDMI reliably transmits video resolutions of 1080p and beyond, including advanced display technologies such as 4K, 3D, and Deep Color. High-Speed HDMI is the recommended cable for 1080p video.

Buy only tested cables with the HDMI logo. This guarantees the cable will perform to specification, especially because there is no maximum length specified in the HDMI standard. And because longer lengths require a larger cable, HDMI cables usually have 24–28 AWG copper conductors.

Additional resources are available at HDMI.org.

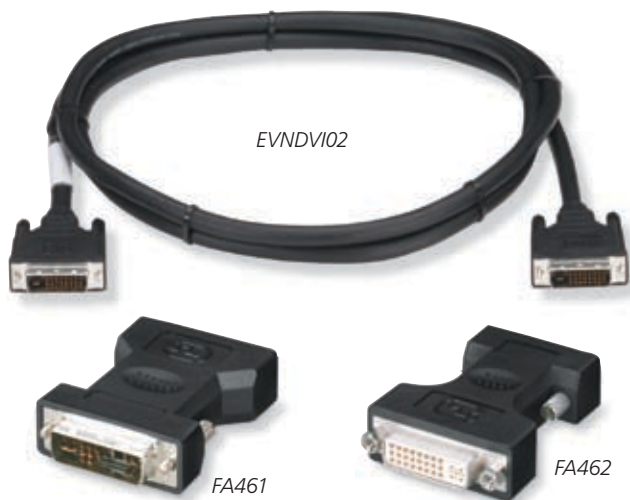


Get high-speed digital communications and improved video.

DVI Cables and Adapters



- Supports dual-link digital transmissions up to 9.9 Gbps and single-link digital transmissions up to 4.95 Gbps.
- Optimizes computer-to-projector connections, eliminating resolution or color changes and pixel-lock adjustments.
- DVI/DVI cables meet the requirements of digital video, digital telecommunications, and parallel computing.
- **Standard Warranty** — Lifetime



DVI Cables

DVI-A Male, Single-Link, Straight Hood/VGA HD15 Male

6-ft. (1.8-m)	EVNDV101-0006
10-ft. (3.0-m)	EVNDV101-0010
15-ft. (4.5-m)	EVNDV101-0015
25-ft. (7.6-m)	EVNDV101-0025

DVI-I Male Dual-Link, 90° VGA HD15 Male

6-ft. (1.8-m)	EVNDV104-0006
Custom Lengths	EVNDV104

DVI-D Male/DVI-D Male, Dual-Link, Straight Hoods

6-ft. (1.8-m)	EVNDV102-0006
10-ft. (3.0-m)	EVNDV102-0010
15-ft. (4.5-m)	EVNDV102-0015
25-ft. (7.6-m)	EVNDV102-0025
35-ft. (10.6-m)	EVNDV102-0035
50-ft. (15.2-m)	EVNDV102-0050

DVI-D Male/DVI-D Female Extension

6-ft. (1.8-m)	EVNDV103-0006
10-ft. (3.0-m)	EVNDV103-0010

DVI-I Male/DVI-I Male, Dual-Link, Straight Hoods

3.2-ft. (1.0-m)	DVI-I-DL-001M
4.9-ft. (1.5-m)	DVI-I-DL-001.5M
6.6-ft. (2.0-m)	DVI-I-DL-002M
9.8-ft. (3.0-m)	DVI-I-DL-003M
16.4-ft. (5.0-m)	DVI-I-DL-005M
32.8-ft. (10.0-m)	DVI-I-DL-010M

DVI Adapters, Single-Link

DVI-I Male-VGA HD15 Female	FA461
DVI-I Female-VGA HD15 Male	FA462

For specs, go to blackbox.com.

For specs, go to blackbox.com.

DVI

The DVI (Digital Video Interface) technology is the standard digital transfer medium for computers, while the HDMI interface is more commonly found on HDTVs and other high-end displays. These high-speed cables have the bandwidth necessary for high-definition video. There are several types of DVI connectors.

DVI-D (digital) is a digital-only connector for use between a digital video source and monitors. DVI-D eliminates analog conversion and improves the display. It can be used when one or both connections are DVI-D.

DVI-I (integrated) supports both digital and analog RGB connections. It can transmit either a digital-to-digital signal or an analog-to-analog signal. It is used by some manufacturers on products instead of separate analog and digital connectors. If both connectors are DVI-I, you can use any DVI cable, but DVI-I is recommended.

DVI-A (analog) is used to carry a DVI signal from a computer to an analog VGA device, such as a display. If one connection is DVI and the other is VGA HD15, you need a cable or adapter with both connectors.

DFP (Digital Flat Panel) was an early digital-only connector used on some displays. EVC (also known as P&D, for Plug & Display), another older connector, handles digital and analog connections.

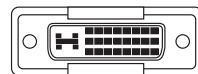
There are two DVI formats: Single-Link and Dual-Link. Single-link cables use one TMDS-165 MHz transmitter and dual-link cables use two. Dual-link cables double



DVI-I, Single-Link



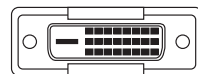
DVI-A



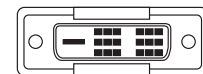
DVI-I, Dual Link



DFP



DVI-D, Dual Link



DVI-D, Single-Link

the power of the transmission. A single-link cable can transmit a resolution of 1920 x 1200 vs. 2560 x 1600 for a dual-link cable.

Healthcare: Custom Adapters

One of the many services and products Misys Healthcare Systems provides for healthcare organizations is the development of software and instrumentation for medical labs.

Recently, Misys developed a new system for one of its clients that involved new instrumentation and software at three different sites. For the system to be properly connected, it required adapters with custom pinning. Based on previous experience, Misys recommended Black Box to its client for the custom adapters.

The Misys rep called Black Box and explained what type of adapters and special pinning was needed. Black Box provided the quote for the custom order and told Misys the adapters would take a week or more to be shipped. Unfortunately, critical system testing was about to begin in a few days. When the Black Box rep heard about the tight time frame, she went the extra mile to get the adapters produced and shipped in two days—plenty of time for the system launch.

“The crunch was on when the Black Box rep called back. She worked magic and was able to get the custom adapters out to us in two days—literally! Not only were we here at Misys ecstatic, but the client was very happy and relieved. Awesome teamwork!”

Jaime Schisel
Instrument Specialist
Misys Healthcare Systems

VGA

The VGA (Video Graphics Array) interface was developed to support traditional CRT monitors. VGA cables transmit analog component RGBHV signals and VESA Display Data Channel data. VGA cables can support resolutions ranging from 640 x 500 up to 2048 x 1536. They can contain both 28 AWG mini coax and 24 AWG tinned-copper VGA conductors to provide support for all control leads, including Pins 9 and 15 for DCC compliance. This cable transmits analog video signals. It does not support audio.







HD15 Male—VGA



HD15 Female—VGA

Selection Guide | VGA Cable

			
HD15	HD15	3.5-mm	HD15 6-Pin Mini DIN
VGA Splitter Cable, below (EVN21VGA) VGA Video Cable with Ferrite Core, p. 146 (EVNPS06-0003-MM)	Premium VGA Cable with Audio p. 146 (EVNPS09-0003)		Easy-Pull VGA Cable p. 146 (EVNPS80-0015-MM)

Send VGA video from one CPU to two displays.

VGA Video Splitter Cable

- Ideal for splitting VGA video signals.
- Send analog video signals from one CPU or other video source to two VGA displays.
- Provides DDC support. If you have questions about DDC support, call our FREE Tech Support.
- One monitor connector processes signals from all 15 leads and sets the resolution for both monitor connectors. The second monitor connector does not have Pin 15.
- **Standard Warranty** — Lifetime



NOTE: Not recommended in video extension applications.

VGA Video Splitter Cable

6" (15.2 cm)	EVN21VGA
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High-quality cable for superior video transmissions.

VGA Video Cable with Ferrite Core



HD15 Male-VGA



HD15 Female-VGA

- Ferrite core offers extra protection against external interference.
- Features tinned copper braid and outer braid for signal shielding.
- HD15 video connectors have Pins 9 and 15 enabled for compliance with the Display Data Channel (DDC) standard.
- Custom lengths also available. Call for details.
- **Standard Warranty** — Lifetime

VGA Video Cable with Ferrite Core

HD15, PVC, Beige, M/M, M/F, F/F		
3-ft. (0.9-m)	EVNPS06-0003-MM	EVNPS06-0003-MF
	EVNPS06-0003-FF	
5-ft. (1.5-m)	EVNPS06-0005-MM	EVNPS06-0005-MF
	EVNPS06-0005-FF	
10-ft. (3.0-m)	EVNPS06-0010-MM	EVNPS06-0010-MF
	EVNPS06-0010-FF	
20-ft. (6.0-m)	EVNPS06-0020-MM	EVNPS06-0020-MF
	EVNPS06-0020-FF	
25-ft. (7.6-m)	EVNPS06-0025-MM	
50-ft. (15.2-m)	EVNPS06-0050-MM	
75-ft. (22.8-m)	EVNPS06-0075-MM	
100-ft. (30.4-m)	EVNPS06-0100-MM	



EVNPS06

HD15, PVC, Black, M/M		
3-ft. (0.9-m)	EVNPS06B-0003-MM	
5-ft. (1.5-m)	EVNPS06B-0005-MM	
10-ft. (3.0-m)	EVNPS06B-0010-MM	
20-ft. (6.0-m)	EVNPS06B-0020-MM	
25-ft. (7.6-m)	EVNPS06B-0025-MM	
50-ft. (15.2-m)	EVNPS06B-0050-MM	
75-ft. (22.8-m)	EVNPS06B-0075-MM	
100-ft. (30.4-m)	EVNPS06B-0100-MM	

For specs, go to blackbox.com.

Make audio and video connections with one cable.

Premium VGA Cable with Audio

- Cable construction consists of 28 AWG tinned copper coax and 24 AWG stranded copper audio, plus an aluminum foil/Mylar® shield.
- Pins 9 and 15 are enabled for compliance with the Display Data Channel (DDC) standard.
- **Standard Warranty** — Lifetime



HD15 Male-VGA



3.5-mm Audio



Premium VGA Cable with Audio

(2) HD15 Male/(2) 3.5-mm Male, PVC		
3-ft. (0.9-m)	EVNPS09-0003	
5-ft. (1.5-m)	EVNPS09-0005	
10-ft. (3.0-m)	EVNPS09-0010	
15-ft. (4.5-m)	EVNPS09-0015	
20-ft. (6.0-m)	EVNPS09-0020	
25-ft. (7.6-m)	EVNPS09-0025	
35-ft. (10.6-m)	EVNPS09-0035	
50-ft. (15.2-m)	EVNPS09-0050	
75-ft. (22.8-m)	EVNPS09-0075	
100-ft. (30.4-m)	EVNPS09-0100	

For specs, go to blackbox.com.

Run VGA cable through walls or inside tight conduits. This cable goes 150 feet or more.

Easy-Pull VGA Cable

- Super flexible. You can pull it through 3/4" conduits.
- Connects PC or RGB video sources to display devices like projectors, flat screens, and more.
- Provides 1024 x 768 video resolution up to 150 feet and 800 x 600 video resolution up to 200 feet.
- Plenum-rated jacket.
- Includes heat shrink tubing for permanent installation.
- **Standard Warranty** — Lifetime



HD15 Male-VGA



HD15 Female-VGA

Easy-Pull VGA Cable

HD15		
15-ft. (4.5-m)	EVNPS80-0015	
25-ft. (7.6-m)	EVNPS80-0025	
35-ft. (10.6-m)	EVNPS80-0035	
50-ft. (15.2-m)	EVNPS80-0050	
100-ft. (30.4-m)	EVNPS80-0100	
150-ft. (45.7-m)	EVNPS80-0150	
Custom Lengths	EVNPS80	



EVNPS80

You may also need a wallplate.

DB9 Wallplates			
Single-Width	(1) Punch	WP070	
	(2) Punch	WP071	
Double-Width	(1) Punch	WP072	
	(2) Punch	WP073	

For specs, go to blackbox.com.

A brief overview of USB

By Black Box Engineering

The Universal Serial Bus (USB) hardware (plug-and-play) standard makes connecting peripherals to your computer easy. **USB 1.1**, introduced in 1995, is the original USB standard. It has two data rates: 12 Mbps and 1.5 Mbps.

USB 2.0, or Hi-Speed USB 2.0, was released in 2000. It increased the peripheral-to-PC speed from 12 Mbps to 480 Mbps, or 40 times faster than USB 1.1. This increase in bandwidth enabled the use of peripherals requiring higher throughput, such as CD/DVD burners, scanners, digital cameras, and video equipment. It is backward-compatible with USB 1.1.

The newest USB standard, introduced in 2008, **USB 3.0** (or SuperSpeed USB), provides vast improvements over USB 2.0. It promises speeds up to 5 Gbps, nearly ten times that of USB 2.0.

USB 3.0 has the flat USB Type A plug, but inside there is an extra set of connectors and the edge of the plug is blue instead of white. The Type B plug looks different with an extra set of connectors.

USB 3.0 adds a physical bus running in parallel with the existing 2.0 bus. USB 3.0 cable contains nine wires—four wire pairs plus a ground. It has two more data pairs than USB 2.0, which has one pair for data and one pair for power. The extra pairs enable USB 3.0 to support bidirectional async, full-duplex data transfer instead of USB 2.0's half-duplex polling method.

USB 3.0 provides 50% more power than USB 2.0 (150 mA vs. 100 mA) to unconfigured devices and up to 80% more power (900 mA vs. 500 mA) to configured devices. Also, USB 3.0 conserves more power when compared to USB 2.0, which uses power when the cable isn't being used.

Transmission rate:

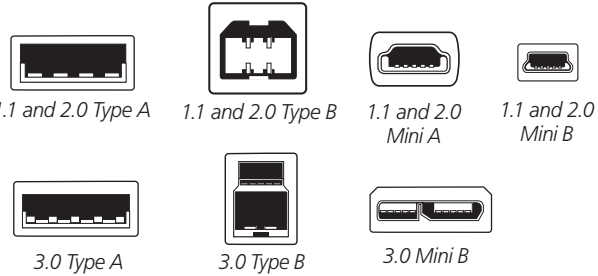
- 3.0: 4.8 Gbps
- 2.0: 480 Mbps
- 1.1: 12 Mbps

Cable length/node:

5 meters (3 meters for 3.0 devices requiring higher speeds).

Devices/bus: 127

Tier/bus: 5



Super speed. Super convenient.

Retractable USB Cable



- USB 3.0 cable extends from both ends for a total length of one meter.
- USB 2.0 cables extend up to 48" (121.9 cm) from both ends.
- Backwards compatible with USB 1.0 and 1.1 devices.
- Guaranteed to extend and retract at least 3000 times.
- **Standard Warranty** — 2 Years
- **Extended Warranty** — Add 1 Year or 3 Years

Retractable USB Cables

USB 3.0 Type A Male/Type B Male	RET-USB3-CABLE
USB 2.0 Type A Male to Type B Male	RET-USB2-CABLE
USB 2.0 Type A Male to Mini B Male	RET-USB2-MINICABLE

For specs, go to blackbox.com.

Connect the latest USB equipment.

USB 3.0 Cables



See the difference. More pins and a blue bar distinguish USB 3.0 from USB 2.0.

- Have 9 conductors for high speeds and bidirectional data transfer.
- Support data transfer rates up to 5 Gbps.
- Use with the latest hard drives, storage docks, notebooks, and multimedia devices.
- **Standard Warranty** — Lifetime

USB Version 3.0 Cables

Type A Male – Type B Male	
3-ft. (0.9-m)	USB30-0003-MM
6-ft. (1.8-m)	USB30-0006-MM
10-ft. (3.0-m)	USB30-0010-MM
Type A Male – Type A Female	
3-ft. (0.9-m)	USB31-0003-MF
6-ft. (1.8-m)	USB31-0006-MF
Type A Male – Type Mini B Male	
3-ft. (0.9-m)	USB32-0003-MM
6-ft. (1.8-m)	USB32-0006-MM

For specs, go to blackbox.com.

Make USB 2.0 connections.

Universal Serial Bus (USB) Cables



USB Version 2.0 Cable

- Supports rates up to 480 Mbps.
- Backward compatible with USB 1.1 devices.
- Connects hubs and peripherals, such as printers, scanners, and storage drives.
- Shielded twisted-pair construction.

USB 2.0 Passive Extension Cable

- Use for simple USB cable extensions.

USB 2.0 Active Extension Cable

- Connect up to four cables to drive data up to 64 feet (19.5 m).
- Hub controller technology chip for better compatibility with USB devices.
- Buffers all data traffic.
- Embedded ASIC boosts signals.

- **Standard Warranty** — Lifetime

USB Version 2.0 Cable

Type A Male – Type B Male	
3-ft. (0.9-m)	USB05-0003
6-ft. (1.8-m)	USB05-0006
10-ft. (3.0-m)	USB05-0010
13-ft. (3.9-m)	USB05-0013
15-ft. (4.6-m)	USB05-0015

Type A Male – Type Mini B Male	
6-ft. (1.8-m)	USB06-0006

Right-Angle Type A Male to Type A Female	
4-ft. (1.2-m)	USBR08-0004

Right-Angle Type B Male to Type A Male	
4-ft. (1.2-m)	USBR09-0004

For specs, go to blackbox.com.



Right-Angle Type A Male Connector

USB 2.0 Passive Extension Cable

Type A Male – Type A Female	
3-ft. (0.9-m)	USB05E-0003
6-ft. (1.8-m)	USB05E-0006
10-ft. (3.0-m)	USB05E-0010

USB 2.0 Active Extension Cable

Type A Male – Type A Female	
8-ft. (2.4-m)	USBR01-0008-R3
16-ft. (4.8-m)	USBR01-0016-R3

For specs, go to blackbox.com.

Get the CATx and custom cable you need—fast.

Use these handy, on-line tools to find the solutions you want.

CATx Cable Selector—Quickly find the exact CAT5/5e/6/6A/7 cable you want.

Custom Cable and Adapter Configurator— Design your custom cable or adapter on-line.

Call or visit blackbox.com/go/Configurators.



Connect your PS/2 keyboard via the USB port on your computer.



USB Keyboard Adapter

- Perfect for when you want to use a full-size keyboard and mouse with your laptop.
- Plug your PS/2 compatible mouse and keyboard into one USB port on your computer.
- Plug-and-play installation—no rebooting required.
- Compliant with USB 1.0 and 2.0.
- No power needed.
- **Standard Warranty** — Lifetime



USB Keyboard Adapter

USB Type A to 6-Pin Mini DIN Female
USBPS2

For specs, go to blackbox.com.

The simple solution for incompatible USB connections.



USB Gender Changers

- Connect like-gendered cables and solve gender mismatches.
- Feature durable, fully molded hoods with internal shielding to protect signals from EMI/RFI interference.
- **Standard Warranty** — Lifetime



USB Gender Changers

Type A/Type A	
Female/Female	FAUSB01
Male/Female	FAUSB02
Type A/Type B	
Female/Female	FAUSB06
Male/Female	FAUSB07
Male/Male	FAUSB08
Type B/Type B	
Female/Female	FAUSB11

For specs, go to blackbox.com.

Portable, flexible light plugs right into your USB port.

USB LED Light

- Plugs into your laptop's USB port for convenient light; perfect for traveling.
- 18"-long light has a USB connector on one end and a white LED light on the other.
- Bendable metal arm enables you to position the light as you need.
- No power needed.
- **Standard Warranty** — 2 Years

USB LED Light

USB Type A to 6-Pin Mini DIN Female
USBLIGHT



**Call. Click.
Chat. Connect.**

Get the help, support, products, and services you need, when and how you want them.



Quad-shielded, copper-coated steel for CATV, digital satellite, and antennas.

RG-6 Quad-Shielded Coax Cable

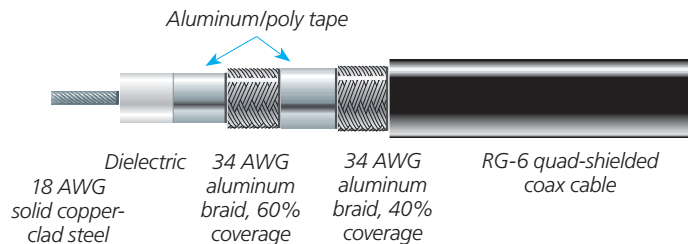
- Lower attenuation than RG-59 cable for longer distances.
- 75 ohms. PVC tested to 3 GHz; plenum tested to 1 GHz.
- **Standard Warranty** — Lifetime



RG-6 Quad-Shielded Coax Cable, 1000-ft. (304.8-m)

PVC, Black	RG6-QS-CMR-CCS
Plenum, White	RG6-QS-CMP-CCS

For specs, go to blackbox.com.



The right choice for CATV, CCTV, and security systems.

RG-59 Coax Cable

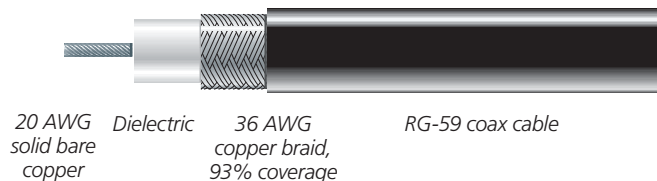
- Ideal for security systems.
- Tested to 1 GHz. 75 ohms.
- **Standard Warranty** — Lifetime



RG-59 Coax Cable, 1000-ft. (304.8-m)

PVC, Black	RG59-CMR-BC
Plenum, White	RG59-CMP-BC

For specs, go to blackbox.com.



Save time and money by running power and video over one cable.

RG-59/2x18 Coax Cable

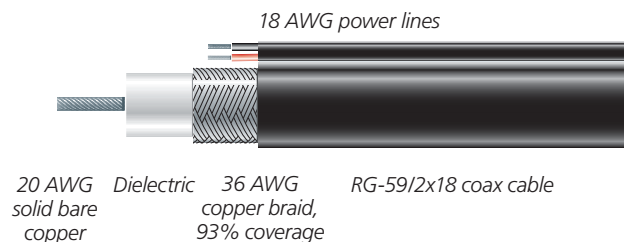
- Ideal for surveillance systems where there are no power connections.
- Tested to 1 GHz. 75 ohms.
- **Standard Warranty** — Lifetime



RG-59/2x18 Coax Cable, 1000-ft. (304.8-m)

PVC, Black	RG592X18-CMR-BC
Plenum, White	RG592X18-CMP-BC

For specs, go to blackbox.com.



Terminate RG-6 and RG-59 cable.

Coax Connectors



- 75-ohm construction.
- Compression-style connectors.
- Work with the cables above.
- **Standard Warranty** — Lifetime



Coax Connectors

RG-6 Quad Shield	PVC	BNC	FCBNC02
		F-Type	FCF02
	Plenum	BNC	FCBNC01
		F-Type	FCF01
RG-59 Bare Copper	PVC	BNC	FCBNC04
		F-Type	FCF04
	Plenum	BNC	FCBNC03
		F-Type	FCF03
RG-59/2x18	PVC	BNC	FCBNC04
	Plenum	BNC	FCBNC03
Coax Crimp Tools	For FCBNC03		CCC02
	For all other connectors listed here		CCC01

The right connections for high-speed DS-3 equipment.

High-Speed DS-3 Coax Cable

- Also available in 25-, 50, 75-, and 100-ft. lengths.
- **Standard Warranty** — Lifetime

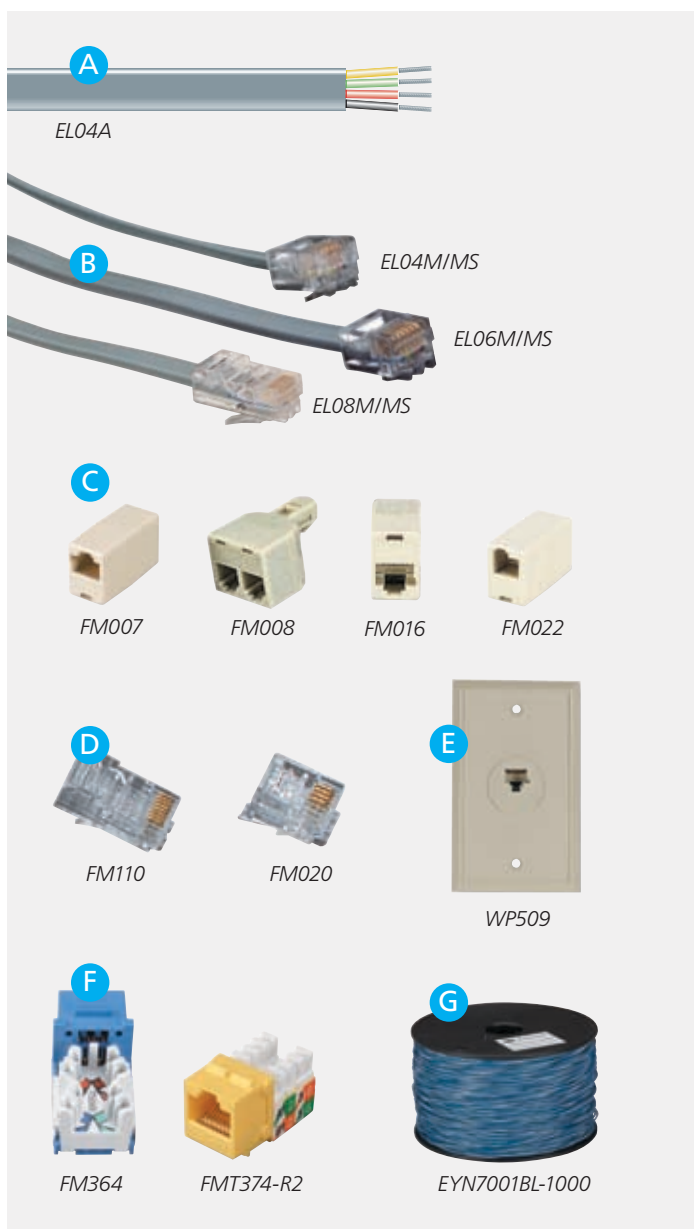
High-Speed DS-3 Coax Cable, BNC-BNC, 26 AWG

2-ft.	(0.6-m)	DS3-0002-BNC
5-ft.	(1.5-m)	DS3-0005-BNC
10-ft.	(3.0-m)	DS3-0010-BNC

For specs, go to blackbox.com.



Legacy cables and connectors—here today, maybe gone tomorrow.



A. Telephone Bulk Cable EL04A, EL06A, EL08A series.

B. RJ-11/RJ-45 Modular Flat Satin Cable
EL04M/MS, EL06M/MS, EL08M/MS series.

C. Modular Adapters and Couplers FM007 series.

D. RJ-11, RJ-45, and MMJ Modular Connectors
FM110 series.

E. Modular Wallplates WP509 series.

F. CAT3 Jacks and USOC Jacks FM364 and FM238 series.

G. Cross-Connect Wire EYN7001 series.

H. Telco Connector Cables ELN27T and ELN28T series.

I. Telco Octopus Cable ELNOCT series.

J. CAT5 Telco Patch Panel JPMT090A and JPMT152A series.

K. 25-Pair Patch Panel JPMT090A series.

L. Deluxe RJ-11 Modular Plug Kit FMT600 series.

M. Telco Splice Block JP600 series.

 [More legacy products at blackbox.com.](https://www.blackbox.com)

100% foil-shielded with removable EMI/RFI hoods.

DB9 Interface Cable with EMI/RFI Hoods



DB9 Male



DB9 Female

- Pins are wired straight through.
- **Standard Warranty** — Lifetime

DB9 Interface Cable with EMI/RFI Hoods

Black	
5 ft. (1.5 m)	EDN12BLK-0005-XX
10 ft. (3.0 m)	EDN12BLK-0010-XX
20 ft. (6.0 m)	EDN12BLK-0020-XX
25 ft. (7.6 m)	EDN12BLK-0025-XX

Replace the **XX** with the gender: MM, MF, FF.

Beige	
5 ft. (1.5 m)	EDN12H-0005-XX
10 ft. (3.0 m)	EDN12H-0010-XX
20 ft. (6.0 m)	EDN12H-0020-XX
25 ft. (7.6 m)	EDN12H-0025-XX
50 ft. (15.2 m)	EDN12H-0050-XX
75 ft. (22.8 m)	EDN12H-0075-XX
100 ft. (30.4 m)	EDN12H-0100-XX
150 ft. (45.7 m)	EDN12H-0150-XX
200 ft. (60.9 m)	EDN12H-0200-XX
Custom Lengths	EDN12H-XX

Replace the **XX** with the gender: MM, MF, FF.
For specs, go to blackbox.com.

Extend connections to serial devices.

DB9 Serial Interface Cable



DB9 Male



DB9 Female

- Wired straight through.
- Mylar® shielding.
- **Standard Warranty** — Lifetime

DB9 Serial Interface Cable

26 AWG, Male/Female	
6 ft. (1.8 m)	BC00200
10 ft. (3.0 m)	BC00230
15 ft. (4.5 m)	BC00231
20 ft. (6.0 m)	BC00232
25 ft. (7.6 m)	BC00233

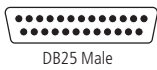
NOTE: For longer lengths, call Tech Support.

28 AWG, Male/Male, Female/Female	
6 ft. (1.8 m)	BC00XXX-0006
10 ft. (3.0 m)	BC00XXX-0010
15 ft. (4.5 m)	BC00XXX-0015
20 ft. (6.0 m)	BC00XXX-0020
25 ft. (7.6 m)	BC00XXX-0025

Replace the **XXX** with the gender:
Male/Male = 240 Female/Female = 242
For specs, go to blackbox.com.

Extends existing parallel or serial connections.

DB25 Interface Cable



DB25 Male



DB25 Female

- Wired straight through.
- Foil shielded.
- **Standard Warranty** — Lifetime

DB25 Interface Cable

Female/Female	
6 ft. (1.8 m)	BC00701
10 ft. (3.0 m)	BC00704
15 ft. (4.5 m)	BC00707
25 ft. (7.6 m)	BC00713

NOTE: For longer lengths, call our FREE Tech Support.

Male/Female	
6 ft. (1.8 m)	BC00702
10 ft. (3.0 m)	BC00705
15 ft. (4.5 m)	BC00708
20 ft. (6.0 m)	BC00711
25 ft. (7.6 m)	BC00714

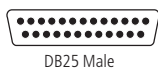
Male/Male	
6 ft. (1.8 m)	BC00703
10 ft. (3.0 m)	BC00706
15 ft. (4.5 m)	BC00709
20 ft. (6.0 m)	BC00712
25 ft. (7.6 m)	BC00715

For specs, go to blackbox.com.

The quick solution when RS-232 connectors don't match.

Universal DB25 RS-232 Cable Adapters

- Use in place of gender changers and standard RS-232 ribbon cables.
- Male and female DB25 connectors on both ends.
- Straight-through pinning.
- **Standard Warranty** — Lifetime



DB25 Male



DB25 Female



Universal DB25 RS-232 Cable Adapters

2-ft. (0.6-m)	EY236
5-ft. (1.5-m)	EY237

For specs, go to blackbox.com.

RS-232 cable for office and industrial environments.



Bulk Standard RS-232 Cable



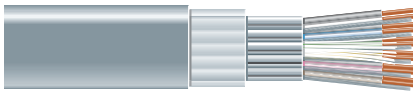
4, 7, 12-, 16, and 25 Conductors ECN25A Series
 For lengths, specs, and product codes, go to blackbox.com.

Bulk RS-232 Plenum Cable, Office Environment



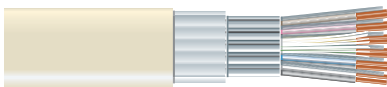
Foil Shielded, 4, 12, and 25 Conductors EYN25A Series
 For lengths, specs, and product codes, go to blackbox.com.

Bulk Individually Shielded Twisted-Pair Cable



Each pair has a foil shield and drain wire. ESN24A-0500
 4, 6, 12, and 24 Conductors
 For lengths, specs, and product codes, go to blackbox.com.

Individually Shielded Low-Capacitance Cable, Extra Distance



Each pair has a foil shield and drain wire. ERN24A Series
 4, 6, 12, and 24 Conductors
 For lengths, specs, and product codes, go to blackbox.com.

Bulk Extended-Distance Cable, Industrial and Office



Office cable
(EDN50A series)



Industrial cable
(EDN25A series)

Office Environment; Foil Shield; PVC; 4, 7, 12, 16, 25, 37, and 50 Conductors EDN50A Series
 Industrial Environment; Braided Foil Shield; PVC; 4, 7, 12, 16, and 25 Conductors EDN25A Series
 For lengths, specs, and product codes, go to blackbox.com.

Standard RS-232 Low-Noise Cable



Removable hoods for repinning

DB25, 22 AWG, 25 Conductors ECM25T Series
 For lengths, specs, and product codes, go to blackbox.com.

Extended-Distance/Quiet Cable, Stranded



EMI/RFI hoods

DB25 Die-Cast Removable Metallic EMI/RFI Hoods, 25 Pins EBN25C Series
 DB25 Nonremovable EMI/RFI Hoods, 9 Pins EGM12D Series
 For lengths, specs, and product codes, go to blackbox.com.

Extended-Distance Data Cables with Removable Hoods



Shielded, repinnable

Aluminum-Foil Shield, 25 conductors EDN25T Series
 4, 7, 12, and 16 conductor cables available.
 For features, specs, and product codes, go to blackbox.com.

Extended-Distance/Quiet (ED/Q) Cables with Molded Hoods



Extra shielding, molded hoods

Foil shield, 85% Tinned Copper Braid, Molded, Nonremovable Hoods EMN25T Series
 For features, specs, and product codes, go to blackbox.com.

Get component-level CAT6A performance beyond 625 MHz.

10-Gigabit CAT6A Patch Panels

CAT6A



JPM10G24-R2:
top: front view;
bottom: rear view



- Feature controlled Alien Crosstalk (ANEXT).
- PoE rated to four times the standard.
- 14-gauge steel rolled-edge construction.
- 625-MHz rating.
- Include a universal wiring insert, clear plastic label holders, and hardware.
- Sealed adapter protects circuit board from damage.
- **Standard Warranty** — Lifetime

10-Gigabit CAT6A Patch Panels

19", Universal Wiring	
24-Port, 1.75"H, 1U	JPM10G24-R2
48-Port, 3.5"H, 2U	JPM10G48-R2

For specs, go to blackbox.com.

The right panel for your CAT6A channel.

CAT6A Patch Panel

- Features built-in rear cable management bar and a grounding wire.
- Large port numbers make ID easy.
- Shielded jacks snap in from the rear.
- Populate with CAT6A Shielded Jacks (below).
- **Standard Warranty** — Lifetime



CAT6A



CAT6A Patch Panel

24-Port, Blank	
19", 1.75"H, 1U	JPMT700A

For specs, go to blackbox.com.

Populate your blank CAT6A panel.

CAT6A Shielded Jack

- Use with the CAT6A Patch Panel (above).
- Fully shielded.
- Use with shielded or foiled 22–24 AWG cable with a diameter of 0.196"– 0.354".
- To terminate, slip the cable through the stuffer cap. Lace the wires. Press onto the jack body. Close the outer butterfly doors. Secure with the cable tie.
- RJ-45 to IDC terminal block connectors.
- **Standard Warranty** — Lifetime



CAT6A



CAT6A Shielded Jack

Universal Wiring, 4-Pair	
	FMT700

For Wallplates, see page 176.

Augmented CAT6A over F/UTP

CAT6A is a 10-Gigabit Ethernet (10-GbE) over copper standard. Its requirements are covered in ANSI/TIA-568-C.2 (Balanced Twisted-Pair Telecommunications Cabling and Components Standard) published in August 2009. The standard defines 10-Gigabit data transmission over a 4-conductor twisted-pair copper cable for a distance of 100 meters on CAT6A copper cabling. This ensures that the system is ready to support IEEE 802.3an, the IEEE standard for 10GBASE-T, which specifies using Class E-augmented cable.

CAT6A extends electrical specifications from 250 MHz to 500 MHz. It also features Power-Sum Alien Crosstalk (PS-ANEXT) to 500 MHz. Alien Crosstalk (ANEXT) is a coupled signal in a disturbed pair arising from a signal in a neighboring cable.

To virtually eliminate the problem of ANEXT, use CAT6A F/UTP cable. The F indicates an overall foil shield that eliminates PS-ANEXT. In addition, CAT6A F/UTP cable works well in noisy environments with a lot of EMI.

Staggered design helps minimize ANEXT in CAT6A 10-GbE applications.

GigaTrue® CAT6A

GigaTrue® CAT6A Staggered Blank Multimedia Patch Panels



C6AMP70-48: left: rear view with cable management bar; below: front view



- Staggered-port design provides more space between ports to minimize ANEXT and improve performance.
- Designed to hold GigaTrue®2 CAT6A jacks, but will hold any GigaTrue2 CATx jack. (Sold separately.)
- Constructed of cold-rolled steel.
- Includes a rear cable management bar.
- Use in standard 19" racks.
- **Standard Warranty** — Lifetime

Related

This panel holds:
 GigaTrue2 CAT6A Jacks, p. 164.
 GigaTrue2 CAT6 Jacks, p. 165.
 GigaBase®2 CAT5e Jacks, p. 165.

GigaTrue® CAT6A Staggered Blank Multimedia Patch Panels

24 Port, 1U	C6AMP70-24
48 Port, 2U	C6AMP70-48

For specs, go to blackbox.com.

NOTE: Panel comes unpopulated.

Easy CAT6A connectivity—no punchdowns needed.

CAT6A Shielded Feed-Through Patch Panels

CAT6A



C6AFP70S-24: above: rear view with cable management bar; right: front view



- Shielded RJ-45 couplers on each side minimize ANEXT.
- Provides easy patching without punching down wires.
- Staggered-port design provides more space between ports to minimize ANEXT.
- Use in high-speed 10-Gigabit Ethernet networks.
- Rated to 500 MHz.
- Constructed of cold-rolled steel.
- **Standard Warranty** — Lifetime



C6ACP70S-SV



C6ACP71S-SV

NOTE: Panels come preloaded with couplers.

CAT6A Shielded Feed-Through Patch Panels

24 Port, 1U	C6AFP70S-24
48 Port, 2U	C6AFP70S-48

CAT6A Shielded Couplers
 Keystone, Feed-Through

	C6ACP70S-SV
Straight-Through	C6ACP71S-SV

For specs, go to blackbox.com.

Fit 48 ports in only 1U of rack space—and no punchdowns needed.

SpaceGAIN CAT6 High-Density Feed-Through Patch Panels

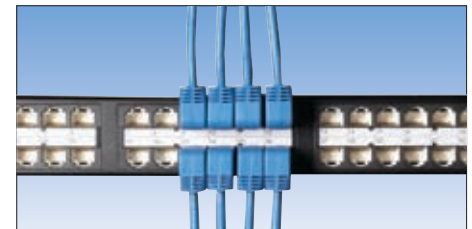


A Black Box Exclusive



JPM820A-HD: front view

- Feature 48 easy-to-use RJ-45 to RJ-45 feed-through ports—all in 1U.
- Save space in crowded data cabinets.
- Patch without punching down wires.
- Cable management bar helps support cables in the rear of the panel.
- Meet or exceed CAT6 requirements.
- **Standard Warranty** — Lifetime



Save even more space with this SpaceGAIN combo! Use the High-Density Feed-Through Patch Panels with our 90° Down Patch Cables (EVNSL21E-0001-90DD) (p. 117).

SpaceGAIN CAT6 High-Density Feed-Through Patch Panels

48-Port, 1U	
Shielded	JPM816A-HD
Unshielded	JPM820A-HD

For specs, go to blackbox.com.



blackbox.com/go/SpaceGAIN

Built-in all-wire protection on each port makes this panel a time and money saver.

CAT6 Protector Panels



JSM114A



- Protect sensitive equipment and data lines from damaging lightning strikes, power surges, and electrostatic discharge.
- Feature 110 IDC to RJ-45 straight-wired ports.
- Panels feature a self-resetting, 2000-watt, bidirectional circuit.
- Overvoltages are safely shunted to a ground.
- Fail-safe design destroys the port rather than the equipment.
- If a port fails, just pop in a new connector.
- **Standard Warranty** — 10 Years

NOTE: Does not support PoE or PoE+ operation.

CAT6 Protector Panels

Universal Wiring	
12-Port, 1U	JSM112A
24-Port, 2U	JSM114A
48-Port, 4U	JSM116A

For specs, go to blackbox.com.

Get reliable surge protection plus the convenience of feed-through connectors.

CAT6 Feed-Through Protector Panel



- Built-in, all-wire protection on each port guards against lightning strikes, surges, overvoltages, and electrostatic discharge.
- Stops surges to protect hubs, switches, concentrators, and data lines.
- Easy feed-through design. Patch cables without punching down wires.
- **Standard Warranty** — 10 Years

NOTE: Does not support PoE or PoE+ operation.

CAT6 Feed-Through Protector Panel

16-Port, 1U	JPM812A
-------------	---------

For specs, go to blackbox.com.

Get component-level and ETL Verified channel performance.

GigaTrue CAT6 Patch Panels



GigaTrue® CAT6



JPM610A-R7: top: front view;
bottom: rear view



- Use in 250-MHz applications.
- CAT6 component-level performance.
- ETL Verified as part of our CAT6 channel.
- Meet and exceed TIA-568-C.2 CAT6 performance specs.
- Tested for NEXT, PS-NEXT, FEXT, return loss, and attenuation.
- Paired punchdown sequence enables pair twist within 1/2" of termination.
- Universal wiring—panels are supplied with labeling for both T568A and T568B.
- IDC-110 block has peaks for easier lacing.
- Stuffer caps hold the wires securely.
- Rolled-edge construction provides superior panel rigidity.
- **Standard Warranty** — Lifetime

Related

The ETL Verified channel consists of:

- GigaTrue CAT6 Bulk Cable, p. 103
- GigaTrue CAT6 Patch Cable, p. 113
- CAT6 Wiring Block Kit, p. 159
- GigaTrue CAT6 Jacks, p. 165

GigaTrue® CAT6 Patch Panels

Universal Wiring

24-Port, 1U	JPM610A-R7
48-Port, 2U	JPM612A-R7
96-Port, 4U	JPM614A-R7

For specs, go to blackbox.com.

No punchdowns needed with these feed-through panels.

CAT6 Feed-Through Patch Panels

CAT6



JPM818A

- Feed-through design features RJ-45 plugs on both sides of the patch panels.
- Provide super-easy patching. Just plug in cables. No punchdowns needed.
- Patch cables without punching down wires.
- Feed-through design simplifies cable management.
- Compliant with CAT6 specs.
- Perfect for data and voice transmissions.
- Work with either T568A or T568B wiring.
- Use in relay racks or comm cabinets.
- The 24-port models include one cable management bar. The 48-port models include two.
- **Standard Warranty** — Lifetime

CAT6 Feed-Through Patch Panels, 19"W

Unshielded

24-Port, 1U	JPM818A
48-Port, 2U	JPM820A

Shielded

24-Port, 1U	JPM814A
48-Port, 2U	JPM816A

For specs, go to blackbox.com.

Go with the flow—save space, time, and money.

SpaceGAIN CAT6 45° Angled-Port Patch Panel

CAT6



45° angled ports allow for patch cables to flow freely, saving cabinet space and reducing stress on the cable.

You'll also save time and money by eliminating horizontal cable managers in front of the panel.

Shown: JPM648-45ANG



- Close quarters? These patch panels feature 45° angled connector modules to conserve space.
- Save the time and cost of installing cable managers.
- Reduce cable stress and bend radius.
- Choose from up and down ports.
- Standard Warranty — Lifetime

Save space and time in the data center with these 45° Angled-Port Patch Panels. The connectors tilt either down or up at a 45° angle, making patching easier.

24-port panels have one row of ports and are 1U. 48-port panels have two rows of ports and are 2U. All ports in the Down panels tilt down, and all ports in the Up panels tilt up. In the Down/Up panel, the bottom row tilts down and the top row tilts up.

SpaceGAIN CAT6 45° Angled-Port Patch Panels

Down	
24-Port	JPM624-45ANG
48-Port	JPM648-45ANG
Up	
24-Port	JPM624-45ANG-U
48-Port	JPM648-45ANG-UU
Down/Up	
48-Port	JPM648-45ANG-DU

For specs, go to blackbox.com.

Save rack space—get 24 ports in only a half U.

SpaceGAIN 24-Port ½U Patch Panel



- Really tight quarters? Stack two panels and fit 48 ports in one U.
- Ideal for retrofitting data cabinets and high-density data centers.
- Termination is different from standard patch panels. Cable terminates to the 110 blocks in a 90-degree, top-down manner.

- To save space, you terminate the cable perpendicularly to the 110 blocks on the rear of the panel.
- To terminate, slide the panel forward.
- Includes rear cable management.
- Steel construction.
- Standard Warranty — Lifetime

CAT6



SpaceGAIN 24-Port ½U CAT6 Patch Panel

JPM624A-HU

For specs, go to blackbox.com.

Angled design eliminates horizontal cable managers.

SpaceGAIN CAT6 Angled Patch Panels

CAT6



JPM624-ANG: front view



JPM624-ANG: rear view

- 128° forward angle provides better cable organization.
- Route cables directly into the ports.
- Rolled-edge, 16-gauge steel construction provides superior strength to eliminate flexing during termination.
- Standard Warranty — Lifetime

Meets standards for:

- CAT6 component (TIA-568-C.2)
- CAT6 channel (ISO 11801 Class EA)
- PoE (IEEE 802.3af) and PoE+ (IEEE 802.3at)

SpaceGAIN CAT6 Angled Patch Panels

24-Port	JPM624-ANG
48-Port	JPM648-ANG

For specs, go to blackbox.com.

Eliminate interference in high-performance CAT6 applications.

CAT6 Shielded Patch Panel and Jack

- Use in high-speed data, voice, and multimedia applications.
- Ideal for noisy environments.
- 110-type IDC terminations enable connections with 22–26-AWG cable.
- Front features (24) RJ-45 ports.
- Use with CAT6 Shielded Jacks for a complete shielded solution.
- **Standard Warranty** — Lifetime



Technical Specifications

Current Rating	1.5 amps
----------------	----------

CAT6 Shielded Patch Panel

24-Port, 19", 1U JPS60A-24

CAT6 Shielded Jack

FMS300

For specs, go to blackbox.com.

Mount directly on the wall where it's convenient.

Wallmount CAT6 Patch Panels

- Support bandwidths up to 250 MHz.
- Make terminations to 110 clips and 8-position modular jacks from the front.
- Swiveling guides keep cables organized within panel's interior.
- Feature built-in cable management.
- Labels are on the front cover for identification.
- **Standard Warranty** — Lifetime



Technical Specifications

Size	Both: 17" W x 3.1"D (43.2 x 7.9 cm) JPM183A-R2: 4.1"H (10.4 cm) JPM185-R2: 8.1"H (20.6 cm)
Weight	JPM183A-R2: 4 lb. (1.8 kg) JPM185-R2: 6.8 lb. (3.1 kg)

Wallmount CAT6 Patch Panels

Universal Wiring	
12-Port	JPM183A-R2
24-Port	JPM185A-R2

For specs, go to blackbox.com.

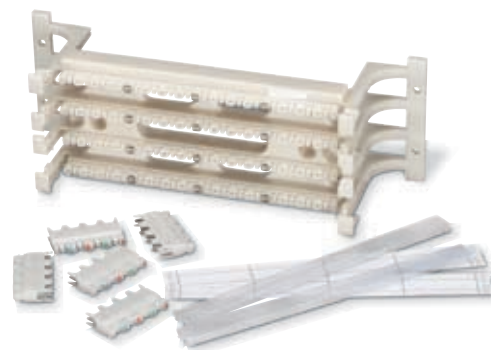
Related

- *GigaTrue® 3 Lockable CAT6 Patch Cable*, p. 114
- *GigaTrue CAT6 Patch Cable*, p. 113
- *GigaTrue CAT6 Jacks*, p. 165

ETL Verified as part of the GigaTrue CAT6 channel.

CAT6 Wiring Block Kit

- Guaranteed to perform above Category 6 NEXT standards by 13 dB (worst case).
- Wide pair-spacing design separates paired conductors for easier installation and better performance.
- Cable access openings enable cables to be routed through the rear of the block directly to the point of termination.
- Internal crosstalk barriers provide 360-degree pair isolation for superior NEXT ratings.
- Legs can be detached before, during, or after installation.
- Termination is easy with our Punchdown Tool with 110 Blade and Light Pack (FT025A).
- **Standard Warranty** — Lifetime



CAT6 Wiring Block Kit, 64-Pair

JP061

- ◆ Includes (1) wiring block with legs (detachable), connecting blocks, label holders, and labels.

Punchdown Tool with 110 Blade and Light Pack
FT025A

For specs, go to blackbox.com.

Related

- The ETL Verified channel consists of:
- *GigaTrue CAT6 Bulk Cable*, p. 103
 - *GigaTrue CAT6 Patch Cable*, p. 113
 - *GigaTrue CAT6 Jacks*, p. 165
 - *GigaTrue CAT6 Patch Panel*, p. 157

Set up multiple applications in these high-density panels.

High-Density Multimedia Patch Panels



JPM192A with Snap Fittings



JPM193A with Snap Fittings

- Support UTP, STP, fiber, and S-Video applications.
- High-density design for optimum use of rack space.
- Durable steel construction.
- Choose from panels designed for our Giga-system jacks and snap fittings, and panels designed for our Giga2-system jacks and snap fittings.
- **Standard Warranty — Lifetime**

Black Box® High-Density Multimedia Patch Panels have the flexibility, modularity, and connection density you need. They support many media types, including jacks and adapters for copper UTP and STP, S-Video, and fiber.

The patch panels' maximum-density design makes the most of your rack space—they hold from 16 to 48 or 96 connectors in just one or two rack units of space! The industry-standard keystone openings enable flush fitting of jacks, which makes connections look neat.

GigaStation High-Density Multimedia Patch Panels Hold:

- GigaTrue CAT6, GigaBase® CAT5e, Giga-Style CAT3, and USOC Jacks (blackbox.com).
- GigaStation2 Snap Fittings (right).

GigaStation2 High-Density Multimedia Patch Panels Hold:

- GigaTrue®2 CAT6A Jacks ([page 164](#)),
- GigaTrue2 CAT6 and GigaBase2 CAT5e Jacks ([page 165](#))
- Giga2-Style CAT3 and USOC Jacks (blackbox.com).
- GigaStation2 Snap Fittings (right)

GigaStation High-Density Multimedia Patch Panels

16-Port, 1U	JPM191A
24-Port, 1U	JPM192A
36-Port, 1U	JPM193A
48-Port, 2U	JPM194A

GigaStation Snap Fittings

Blank, 10-Pack	
Black	FM358
Office White	FM330
Telco Ivory	FM334
Electric Ivory	FM335
Gray	FM336
F-Connector (Female/Female)	
Black	FM360
Office White	FM331
Electric Ivory	FM338
Gray	FM337
White	FM361
S-Video	
Black	FM363-R2
ST® Adapter	
Office White	FM333
Gray	FM342
SC Simplex	
Office White	FM343
Gray	FM345
White	FM346
MT-RJ (Female/Female)	
Office White	FM347
White	FM350
MT-RJ Flush Adapter (Female/Female)	
Office White	FM351
Orange	FM352
Yellow	FM353
LC, Non-Flush Mount	
Office White	FM354
Telco Ivory	FM355
Gray	FM356
White	FM357

GigaStation2 High-Density Multimedia Patch Panels

16-Port, 1U	JPMT1016A
24-Port, 1U	JPMT1024A
36-Port, 1U	JPMT1036A
48-Port, 2U	JPMT1048A

GigaStation2 Snap Fittings

F-Connector, Female/Female	
Office White	FMT331-R2
Ivory	FMT338-R2
White	FMT361-R2
BNC, Female/Female	
Office White	FMT332-R2
Ivory	FMT322-R2
White	FMT362-R2
S-Video, 110-Punchdown	
Black	FMT375
ST® Adapter	
Office White	FMT333-R2
Ivory	FMT324-R2
White	FMT323-R2
SC Simplex	
Office White	FMT343-R3
Ivory	FMT325-R3
White	FMT346-R3
LC	
Office White	FMT354-R3
Ivory	FMT320-R3
White	FMT357-R3
MT-RJ (Female/Female)	
Office White	FMT347-R2
Ivory	FMT326-R2
White	FMT350-R2
Blank, 10-Pack	
Office White	FMT330-R2
Telco Ivory	FMT335-R2
Gray	FMT359-R2

NOTE: GigaStation2 Snap Fittings 10-packs are available.

For the GigaStation2 High Density 36-Port Panel (JPMT1036A), contact our FREE Tech Support for snap-fitting compatibility.

NOTE: For maximum port density, the 36-port GigaStation model (JPM193A) doesn't have port numbers or labeling tags.

Get component-level and ETL-verified channel performance.

GigaBase Component-Level CAT5e Patch Panels

GigaBase® CAT5e



JPM906A-R5



- Component-level rating provides better performance and stability in the overall channel; the panel by itself can pass CAT5e.
- Provide significant headroom over CAT5e specs.
- Universal wiring.
- Wide spacing between IDCs means increased room for cable.
- Rolled-edge construction provides superior panel rigidity.
- **Standard Warranty** — Lifetime

Related

The ETL Verified channel consists of:

- GigaBase CAT5e Bulk Cable, p. 107
- GigaBase CAT5e Patch Cable, p. 119
- GigaBase2 CAT5e Jacks, p. 165
- CAT5e Wiring Block, p. 163

GigaBase CAT5e Component-Level Patch Panels

24-Port 1U	JPM902A-R5
48-Port 2U	JPM906A-R5
96-Port 4U	JPM910A-R5

For specs, go to blackbox.com.

The right combo for eliminating crosstalk.

High-Density Shielded Patch Panel • CAT5e Shielded Jack



JPS5E0A

CAT5e



FMS200

High-Density Shielded Patch Panel

- Only 1U high with 24 ports.
- Jacks snapmount into keystone openings.
- 14-gauge all-steel construction for strength.
- A preloaded, 12-gauge, UL® rated grounding strap makes termination easy.
- Built-in cable management shelf provides strain relief for each cable.

CAT5e Shielded Jack

- Shield housing made of die-cast solid zinc.
- Tool-less termination cap maintains pair twists.
- Wire management stuffer cap separates pairs, prevents crossed pairs, and reduces crosstalk.
- Inversely oriented, right-angled IDC contacts prevent NEXT.
- Features a quick grounding mechanism.

- **Standard Warranty** — Lifetime

High-Density Shielded Patch Panel

24-Port	JPS5E0A
CAT5e Shielded Jack, T568B	FMS200

For specs, go to blackbox.com.

NOTE: Panel comes unloaded. It holds only FMS200 CAT5e Shielded Jacks. It will not hold other jacks.

Crowded cabinets? Save space with these multimedia patch panels.

SpaceGAIN Multimedia Patch Panels

- Only 1U for the best use of rack space.
- Mix and match jacks: UTP, STP, fiber, and video.
- Solid steel construction.
- **Standard Warranty** — Lifetime



24-Port 45° Angled-Port Side-Exit Multimedia Panel (JPMT1024-ANG)



24-Port 45° Angled-Port Side-Exit

- Connector ports angle to the side.
- Eliminate horizontal cable managers.
- Great for strain relief and bend radius.
- Features removable rear cable bar.
- Works with:
 - GigaTrue®2 CAT6A Jacks (page 164)
 - GigaTrue 2 CAT6 and GigaBase2 CAT5e Jacks (page 165)
 - Giga2-Style CAT3 and USOC Jacks (blackbox.com).
- GigaStation2 Snap Fittings (page 160).

48-Port 1U, Angled Multimedia Panel (JPM481U-ANG)



48-Port Angled or Flat

- 48 ports in only 1U.
- Staggered design simplifies jack installation.
- Rear snap-in design simplifies installation.
- Works with:
 - GigaTrue CAT6, GigaBase® CAT5e, Giga-Style CAT3, and USOC Jacks (blackbox.com).

SpaceGAIN™ Multimedia Patch Panels, 1U

24-Port, 45° Angled-Port Side-Exit	JPMT1024-ANG
48-Port	
Angled	JPM481U-ANG
Flat	JPM481U

For specs, go to blackbox.com.

Save rack space—get 24 ports in only a half U.

SpaceGAIN CAT5e 24-Port ½U Patch Panel

- Save rack space. Stack two panels and fit 48 ports in one U.
- To save space, the rear 110 blocks protrude horizontally.
- Termination is different from standard patch panels. Cable terminates to the 110 blocks in a 90-degree, top-down manner.
- To terminate, slide the panel forward.
- Includes rear cable management.
- **Standard Warranty** — Lifetime



JPM5E24A-HU

CAT5e



SpaceGAIN 24-Port ½U Patch Panel

Unshielded	JPM5E24A-HU
------------	-------------

For specs, go to blackbox.com.

Fit 48 ports into only 1U of rack space—and no punchdowns needed.

SpaceGAIN™ CAT5e High-Density Feed-Through Patch Panels



JPM806A-HD: front view

- Save space in crowded data cabinets with 48 easy-to-use RJ-45 to RJ-45 feed-through ports—all in 1U!
- Provide patching without punching down the wires to the ports.
- Use this sturdy panel for high-density applications in all 19" relay racks or communications cabinets.
- Cable management bar helps support cables attached to the rear of the panel.

CAT5e



- **Standard Warranty** — Lifetime

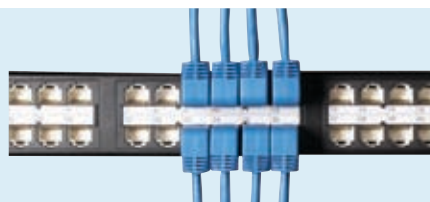
SpaceGAIN CAT5e High-Density Feed-Through Patch Panels, 48-Port, 1U

Shielded	JPM806A-HD
Unshielded	JPM810A-HD

For specs, go to blackbox.com.

Save even more space with this SpaceGAIN combo!

The SpaceGAIN solution. Use the patch panel with SpaceGAIN cables, page 122.



No punchdowns needed with these feed-through panels.

CAT5e Feed-Through Patch Panels



JPM806A-R2: front view



JPM810A-R2: rear view

- Feed-through design features RJ-45 ports on both sides of the patch panels.
- Feed-through connectors provide super-easy cable management.
- Perfect for voice and data transmission up to 1 Gigabit.

- The 24-port models include one cable management bar. The 48-port models include two cable management bars.
- **Standard Warranty** — Lifetime

Related

GigaBase CAT5e patch cables, see p. 119.

CAT5e



CAT5e Feed-Through Patch Panels

Unshielded		
24-Port	1U	JPM808A-R2
48-Port	2U	JPM810A-R2
Shielded		
24-Port	1U	JPM804A-R2
48-Port	2U	JPM806A-R2

For specs, go to blackbox.com.

Go with the flow—save space, time, and money.

SpaceGAIN CAT5e 45° Angled-Port Patch Panels

CAT5e



JPM5E48-45ANG-UU

- Close quarters? These patch panels feature 45° angled connector modules to conserve space.
- Eliminate horizontal cable managers.
- Feature angled RJ-45 connectors on one side and straight Krone/110 dual IDC connectors on the other.
- Reduce cable stress and bend radius.
- Rolled-metal construction provides strength.
- **Standard Warranty** — Lifetime



JPM5E48-45ANG

SpaceGAIN CAT5e 45° Angled-Port Patch Panels

Down		
24-Port	JPM5E24-45ANG	
48-Port	JPM5E48-45ANG	
Up		
24-Port	JPM5E24-45ANG-U	
48-Port	JPM5E48-45ANG-UU	
Down/Up		
48-Port	JPM5E48-45ANG-UU	

For specs, go to blackbox.com.

Angled design eliminates the need for horizontal cable managers.

SpaceGAIN CAT5e Angled Patch Panels



CAT5e



JPM5E24-ANG: front view



JPM5E24-ANG: rear view

- 128° forward angle provides better cable organization in high-density applications.
- Rolled-edge, solid-steel construction provides superior strength to eliminate flexing during termination.
- Route cables directly into the ports.
- Meet CAT5e and PoE and PoE+ standards.
- Include (4) 10-32 and (4) 12-24 screws.
- **Standard Warranty** — Lifetime

SpaceGAIN CAT5e Angled Patch Panels, Universal Wiring

24-Port	JPM5E24-ANG
48-Port	JPM5E48-ANG

For specs, go to blackbox.com.

Do your own wiring.

CAT5e Wiring Blocks

- Kits include label holders, and labels.
- **Standard Warranty** — Lifetime

CAT5e



CAT5e Wiring Blocks

Wiring Block with Legs		
50-Pair	JPT5E050	
100-Pair	JPT5E100	
300-Pair	JPT5E300	

CAT5e Connecting Blocks

4-Pair	10-Pack	JPT5E-4PR-10PAK
	25-Pack	JPT5E-4PR-25PAK
	100-Pack	JPT5E-4PR-100PAK
5-Pair	10-Pack	JPT5E-5PR-10PAK
	25-Pack	JPT5E-5PR-25PAK
	100-Pack	JPT5E-5PR-100PAK

Wiring Block Cable Manager

JPTWBMGR

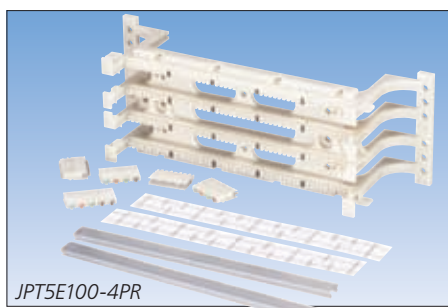
Punchdown Tool with 110 Blade and Light Pack

FT025A

For specs, go to blackbox.com.

Related

For cross-connect cable, see p. 151.



JPT5E100-4PR

CAT5e Wiring Block Kits

Kits	Type 110 CAT5e Wiring Blocks	Included CAT5e Connecting Blocks		Kit Codes	List Price
		4-Pair	5-Pair		
50-Pair	(1)	(10)	(2)	JPT5E050-4PR	
	(1)	—	(10)	JPT5E050-5PR	
100-Pair	(1)	(10)	(4)	JPT5E100-4PR	
	(1)	—	(20)	JPT5E100-5PR	
300-Pair	(1)	(12)	—	JPT5E300-3PR	
	(1)	(60)	(12)	JPT5E300-4PR	
	(1)	—	(60)	JPT5E300-5PR	

Complete your ETL Verified CAT6A channel.

GigaTrue Component-Level CAT6A Jack



GigaTrue CAT6A



- Offers component level performance.
- Meets and exceeds CAT6A requirements.
- Supports transmissions to 500 MHz.
- Ideal for 10-Gbps links.
- Use with 22–24 AWG cable with a diameter of 0.197"–0.354" and conductor diameters of 0.020"–0.025".
- Feature RJ-45 to IDC terminal block connectors. Is labeled with T568A and T568B wiring.
- Includes a stuffer cap.
- **Standard Warranty** — Lifetime

Related

The ETL Verified GigaTrue CAT6A channel consists of:

- *GigaTrue CAT6A Bulk Cable*, p. 102.
- *GigaTrue 3 CAT6A Patch Cable*, p. 111.
- *CAT6A Patch Panel*, p. 155.

GigaTrue Component-Level CAT6A Jack

Single	C6AJA70-XX
25-Pack	C6AJA70-XX-25PAK

Replace the **XX** with the color.
 Blue = BL Black = BK
 White = WH Office White = OW

Fully shielded for CAT6A F/UTP channels.

CAT6A Shielded Jack

- Use with the CAT6A Patch Panel (page 154).
- Meets and exceeds CAT6A requirements.
- Fully shielded to protect against EMI and alien crosstalk.
- Use with shielded or foiled 22–24 AWG cable with a diameter of 0.196"–0.354".
- To terminate, slip the cable through the stuffer cap. Lace the wires. Press onto the jack body. Close the outer butterfly doors. Secure with the cable tie.
- Feature RJ-45 to IDC terminal block connectors.
- **Standard Warranty** — Lifetime



CAT6A



CAT6A Shielded Jack, Universal Wiring

FMT700

NOTE: this jack does not fit the 3- and 6-port GigaStation2 Wallplates, page 172.

Prevent interference and crosstalk in your network runs.

CAT6 and CAT5e Shielded Jacks

CAT6

FMS300



CAT5e

FMS200



CAT6 Shielded Jack

- Shield housing made of zinc-copper alloy for ANEXT and EMI protection.
- Perfect for applications up to 1000BASE-T.
- Complies fully with CAT6 specifications for attenuation, Near- and Far-end crosstalk (NEXT and FEXT), and return loss.
- Has a grounding belt.
- **Standard Warranty** — Lifetime

CAT5e Shielded Jack

- Shield housing made of die-cast solid zinc for ANEXT and EMI protection.
- Stuffer cap separates pairs, prevents crossed pairs, and reduces crosstalk.
- Inversely oriented, right-angled IDC contacts prevent NEXT.
- Features a quick grounding mechanism.
- **Standard Warranty** — Lifetime

Related

These jacks work with:
GigaStation2 Wallplates, p. 172.
CAT6 Shielded Patch Panel, p. 159.
CAT5e Shielded Patch Panel, p. 161.
How to terminate cable, pp. 166–167.

Shielded Jacks

CAT6	FMS300
CAT5e	FMS200



Get component-level and ETL Verified channel performance.

GigaTrue2 CAT6 Jacks

GigaTrue² CAT6



FMT630-R3

- Part of our ETL Verified channel.
- Data transmission rates up to 250 MHz.
- Labeled with T568A and T568B wiring.
- Fits GigaStation2 Wallplates (page 172) and Housings (blackbox.com).
- Standard Warranty — Lifetime



Related

The GigaTrue[®] CAT6 ETL Verified channel consists of:

- GigaTrue CAT6 Bulk Cable, p. 103.
- GigaTrue Patch Cable, p. 113.
- GigaTrue CAT6 Wiring Block, p. 159.
- Patch Panel, p. 157.

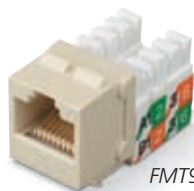
GigaTrue2 CAT6 Jacks

FMT6XX-R3	FMT6XX-R3-25PAK
Replace the XX with the color.	
Blue = 30	Black = 31
Orange = 36	Red = 37
Ivory = 32	White = 39
Gray = 33	Yellow = 40
Green = 34	Office White = 35

Get component-level and ETL Verified channel performance.

GigaBase2 CAT5e Jacks

GigaBase² CAT5e



FMT925-R2

- Part of our ETL Verified channel.
- Make easy terminations using a 110 tool.
- Data transmission rates up to 100 MHz.
- Fits GigaStation2 Wallplates (page 172) and Housings (blackbox.com).
- Is labeled with T568A and B wiring.
- Standard Warranty — Lifetime



Related

The GigaBase[®] CAT5e ETL Verified channel consists of:

- GigaBase CAT5e Bulk Cable, p. 107.
- GigaBase CAT5e Wiring Block, p. 163.
- Patch Cable, p. 118.

GigaBase2 CAT5e Jacks

FMT9XX-R2	FMT9XX-R2-25PAK
Replace the XX with the color.	
Blue = 20	Black = 21
Orange = 26	Red = 27
Ivory = 22	White = 29
Gray = 23	Yellow = 30
Green = 24	Office White = 25

The right jacks for your GigaTrue Plus systems.

GigaTrue Plus CAT6 Jacks

GigaTrue[®] Plus



FM633C

- Low-profile wire cap protects against contamination.
- Terminate with a 110-style impact tool or a wire cap.
- Data transmission rates up to 250 MHz.
- Standard Warranty — Lifetime

CAT6



Related

GigaTrue Plus components include:

- GigaTrue Plus CAT6 Bulk Cable, p. 104.
- GigaStation Plus Wallplates and Surface-Mount Housings, p. 173.

GigaTrue Plus CAT6 Jacks

FM6XXC	FM6XXC-25PAK
Replace the XX with the color.	
Blue = 30	Black = 31
Orange = 36	Red = 37
Ivory = 32	White = 39
Gray = 33	Yellow = 40
Green = 34	Office White = 35

The right jack for GigaBase Plus systems.

GigaBase Plus CAT5e Jacks

GigaBase[®] Plus



FM920C

- Low-profile wire cap protects against contamination.
- Terminate with a 110-style impact tool or a wire cap.
- Data transmission rates up to 100 MHz.
- Standard Warranty — Lifetime

CAT5e



Related

GigaBase Plus components include:

- GigaBase Plus CAT5e Bulk Cable, p. 107.
- GigaStation Plus Wallplates and Surface-Mount Housings, p. 173.

GigaBase Plus CAT5e Jacks

FM9XXC	FM9XXC-25PAK
Replace the XX with the color.	
Blue = 20	Black = 21
Orange = 26	Red = 27
Ivory = 22	White = 29
Gray = 23	Yellow = 30
Green = 24	Office White = 25

How to terminate your own patch cable.

Start with the right equipment.

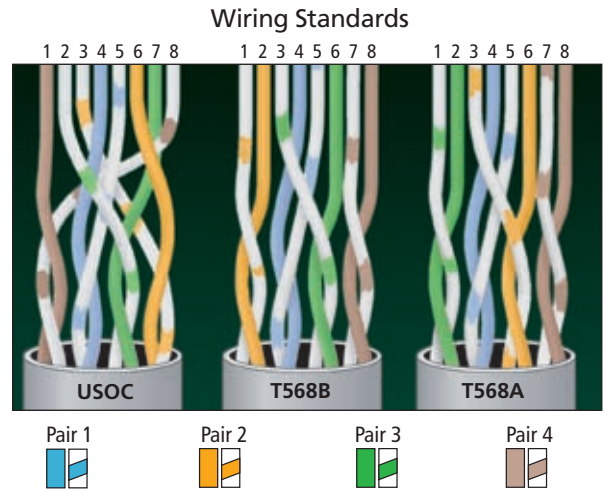
Terminating twisted-pair cable with RJ modular connectors.

Of all the components in your network, none is arguably more underrated than the RJ-45 connector. Simplicity incarnate, this transparent marvel literally defines plug-and-play connectivity—from the desktop to the data center. Yet it defies the obvious: How'd they get those wires in there? Who puts these things together? Where are the seams?

So, in the spirit of demystifying one more aspect of modern-day communications, we give you this behind-the-scenes look at terminating twisted-pair cable using RJ connectors.

The challenge: Do it right the first time.

That means you must take time to install each connector carefully, according to the specifications of the wiring system you're installing. Then test each cable to certify that it supports the specified performance levels—in this case, the TIA specs for CATx cabling. The wiring standards illustration (right) indicates proper T568A, T568B, and USOC pairing and pinning for twisted pair cable. T568B wiring is most commonly used in North America for networking.



Follow these step-by-step instructions.



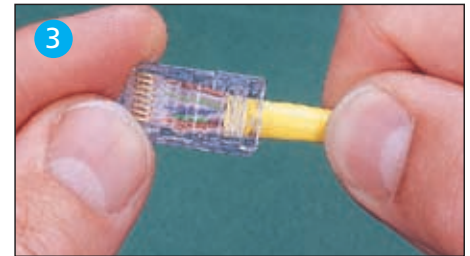
First, start with a wire stripping tool, such as the Multi-Strip (FT231A). Next, put the tool around the cable, squeeze, and carefully remove the jacketing from the cable. You'll want to expose about one inch of the insulated wire conductors.

Do not remove any insulation from the conductors.

When you crimp the RJ-45 connector, the contacts inside will pierce the conductor insulation to make contact, so there's no need to do it here.



Untwist each pair of conductors to within $\frac{1}{8}$ " of the jacket with a stripping tool. Do not untwist the conductors more than $\frac{1}{2}$ ". Arrange the wires according to the cable spec you're using (T568B in this case). Check the wiring standards above if you're not sure. Flatten and align the wires. Use your wire cutters and make one straight cut across all the conductors. Trim the ends to ensure they're all of equal length. Once you cut the cable, make sure you flatten out the wires.



Orient the wires so the cable's Pin 1 connector aligns correctly with the RJ-45 connector's Pin 1, and do the same for all pins. (To maintain the correct alignment, see "Rule of Thumb".) While carefully maintaining the proper position of each conductor, slide the wires into an RJ-45 connector.

All connectors must extend all the way into the conductor so they're flush against the back and aligned underneath the contacts within the plastic connector housing. The cable jacket should also extend into the connector about $\frac{1}{4}$ " for strain relief.

The prep work.

The majority of RJ-45 cables are terminated by machine. But field technicians and professional cable installers crimp on modular connectors every day. You can terminate cables, too. Once you do, you'll gain a new appreciation for the skill it takes to successfully terminate these cables inside a connector the size of a jelly bean.

First, gather your materials. You'll need bulk cable, such as the GigaTrue® CAT6 550-MHz Solid Bulk Cable (page 104), a cable cutter and stripper, a connector, a pre-plug (optional), a crimp tool, and a continuity tester. All these items—except the cable and the pre-plugs—are in our CAT6 and CAT5e Terminations Kit. See page 211 for both.

Don't forget—Black Box can make terminated cables for you. Just call our FREE Tech Support.



CAT6 Installation Kit
(FT490A-R3), p. 211

EZ Check
Cable Tester
(EZCT)

Carrying Case
(FT390)

CAT6 Modular Plugs
(FMTP6-R2-25PAK)

Multi-Strip
(FT231A)

Crimp Tool
(FT046A)



Insert the connector into an RJ-45 crimp tool. Make sure you're using the proper die for the type of connector you're using. For instance, connectors that use a load bar require a different crimp die than connectors that don't feature a load bar. If you don't use the right die, you'll damage the connector when you try to crimp it.

Firmly squeeze the crimp tool handles together. They'll lock in a ratcheting action as you crimp the connector. A final click indicates the connector is firmly latched, and you can release the handles.



Check your work using a continuity tester or cable certifier rated for the cable standard you're installing. Your tester should be able to check for shorts, opens, or miswires.

For network certification, more expensive testers can even store and download test results based on standardized minimum performance levels.

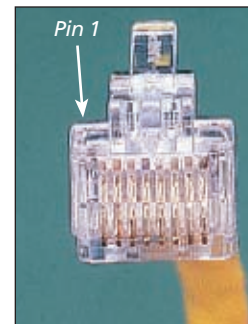
For questions or to learn more about building and testing a patch cable, call our FREE Tech Support.

Rule of Thumb

Many people miswire RJ-45 connectors because they're careless about proper conductor alignment. Before terminating connectors, be sure they're oriented properly so connector Pin 1 aligns with cable Pin 1, etc.

To determine which RJ-45 contact is Pin 1 in CATx applications, hold the connector in front of your face as if you were going to plug it onto

the tip of your nose. With the locking thumb tab up, connector Pin 1 is on the far left.



Make faster terminations and reduce waste.

CAT5e and CAT6 EZ-RJ45 Modular Plugs and Boots

- Simple one-piece design eliminates loading bar and liners.
- Insert wires right through the connector.
- Trim the wires and crimp the connector in one step.
- Use with solid or stranded cable.
- Boots maintain proper bend radius.
- Once crimped, the strain-relief boot becomes an integral part of the connector and will not pull off.
- **Standard Warranty** — Lifetime

CAT5e CAT6



EZ-RJ45 Modular Plugs and Boots

CAT5e EZ-RJ45 Modular Plugs

Unshielded	
25-Pack	C5EEZUP-25PAK
50-Pack	C5EEZUP-50PAK
100-Pack	C5EEZUP-100PAK
Shielded	
25-Pack	C5EEZSP-25PAK
50-Pack	C5EEZSP-50PAK
100-Pack	C5EEZSP-100PAK

CAT5e EZ-RJ45 Boot, Clear, 25-Pack

C5EEZ-BOOT-CL

CAT6 EZ-RJ45 Modular Plugs

Unshielded	
25-Pack	C6EZUP-25PAK
50-Pack	C6EZUP-50PAK
100-Pack	C6EZUP-100PAK
Shielded	
25-Pack	C6EZSP-25PAK
50-Pack	C6EZSP-50PAK
100-Pack	C6EZSP-100PAK

CAT6 EZ-RJ45 Boots, 25-Pack

Clear	C6EZ-BOOT-CL
Blue	C6EZ-BOOT-BL
Black	C6EZ-BOOT-BK
Gray	C6EZ-BOOT-GY
Green	C6EZ-BOOT-GN
Red	C6EZ-BOOT-RD
Yellow	C6EZ-BOOT-YL

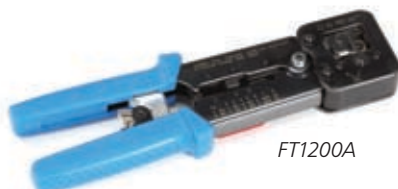
For specs, go to blackbox.com.



Crimp and trim EZ-RJ45 connectors in one step.

EZ-RJ45 and EZ-RJPRO Crimp Tools

- Use with EZ-RJ45 Modular Plugs.
- Get a uniform crimp each time with the ratcheted straight action motion.
- Features precision-cast crimping dies and a built-in wire cutter and stripper for silver satin cable.
- Rugged all-steel frame construction.
- The Pro model has molded rubber grip handles for extra comfort.
- **Standard Warranty** — FT1200AKIT-R2: Lifetime; FT1100A, FT1200A: 5 Years
- **Extended Warranty** — 1 or 3 Years



What's in the Kit (FT1200AKIT-R2)

- EZ RJPRO (FT1200A)
- Stripper (FT231A)
- (60) CAT5e Plugs
- EZ Check Cable Tester (EZCT)
- Case (FT390)

EZ-RJ45 and EZ-RJPRO Crimp Tools

EZ-RJ45 Crimp Tool	
	FT1100A
EZ-RJPRO™ High-Density Crimp Tool	
	FT1200A
EZ-RJPRO™ Crimp Tool Kit	
	FT1200AKIT-R2
EZ-RJPRO Crimp Tool Replacement Blades	
EZ-RJ45, 2-Pack	FT1101
EZ-RJ12/11, 2-Pack	FT1151
EZ-RJPRO High-Density Crimp Tool Replacement Blade Set	
	FT1200BLD

For specs, go to blackbox.com.

Everything you need to cut, strip, and terminate UTP cable.

Modular Plug Kit

- Loading bars for CAT6 plugs maintain ½" twist.
- Includes:
 - Deluxe Modular Plug Termination Tool
 - (50) RJ-45 CAT5e modular plugs
 - (50) RJ-45 CAT6 modular plugs
 - (50) loading bars
 - Hard plastic case: 2"H x 11.8"W x 8"D
- **Standard Warranty** — Lifetime



Modular Plug Kit

FTM650-R2

For specs, go to blackbox.com.



Eight-conductor plugs for high-speed applications.

CAT6 and CAT5e Modular Plugs



- 24 or 26 AWG solid or stranded cable.
- The CAT6 plugs include a conductor load bar.
- **Standard Warranty** — Lifetime

CAT6 Modular Plugs

Shielded	
10-Pack	FMT6P6S-10PAK
25-Pack	FMT6P6S-25PAK
50-Pack	FMT6P6S-50PAK
100-Pack	FMT6P6S-100PAK
250-Pack	FMT6P6S-250PAK
Unshielded	
10-Pack	FMT6P6-R2-10PAK
25-Pack	FMT6P6-R2-25PAK
50-Pack	FMT6P6-R2-50PAK
100-Pack	FMT6P6-R2-100PAK
250-Pack	FMT6P6-R2-250PAK

Shielded	
10-Pack	FMT6P5ES-10PAK
25-Pack	FMT6P5ES-25PAK
50-Pack	FMT6P5ES-50PAK
100-Pack	FMT6P5ES-100PAK
250-Pack	FMT6P5ES-250PAK
Unshielded	
10-Pack	FMT6P5E-10PAK
25-Pack	FMT6P5E-25PAK
50-Pack	FMT6P5E-50PAK
100-Pack	FMT6P5E-100PAK
250-Pack	FMT6P5E-250PAK

For specs, go to blackbox.com.

The most versatile kit for all your RJ crimping.

Universal RJ Crimp Tool and Tool Kit

- Make your own RJ connections.
- Constructed of tool-grade steel.
- Kit includes Crimp Tool and RJ-11, RJ-22, RJ-45 and 10-position dies.
- **Standard Warranty** — Lifetime



Universal RJ Crimp Tool and Kit

Universal RJ Crimp Tool	FT046A
Universal RJ Tool Kit	FT047A
Replacement Blade Set	FT048
Replacement Die Sets	
RJ-22 4-Position	FT051
RJ-11 4-/6-Position	FT052
RJ-45 8-Position	FT053
Snagless Standard	FT054
RJ 10-Position Modular	FT055

For specs, go to blackbox.com.

Identify patch cords at a glance.

Snap-On Patch-Cable Boots



FMT717-50-50PAK

- Hinged plastic boots go over the connector of a terminated cable to protect its tab.
- **Standard Warranty** — Lifetime



Snap-On Patch-Cable Boots

50-Pack	FMT7XX-SO-50PAK
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To order, replace the **XX** with the color.
 Blue = 17 Black = 18 Gray = 21 White = 23
 Green = 19 Red = 20 Yellow = 22 Beige = 35

For specs, go to blackbox.com.

Rubber boots protect connector tabs on cables.

Color-Coded Pre-Plugs



- **Standard Warranty** — Lifetime

Color-Coded Pre-Plugs

50-Pack	FMT7XX
---------	--------

To order, replace the **XX** with the color.
 Blue = 17 Black = 18 Gray = 21 White = 23
 Green = 19 Red = 20 Yellow = 22 Beige = 35
 Purple = 24 Pink = 34 Orange = 36 Brown = 37

For specs, go to blackbox.com.

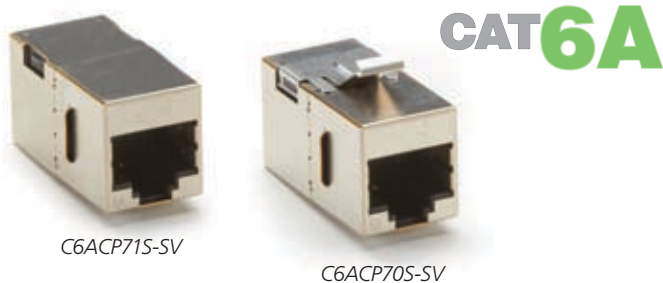
Join UTP or STP cables in-line or in wallplates.

- All feature two female RJ-45 (8-wire) modular jacks.
- Use couplers to connect two straight-pinned cables and extend the distance of your run.
- Feed-through couplers can be mounted in keystone wallplates.

- Use the Bezel (bottom of the page) to make custom connections in enclosures, walls, and panels.
- **Standard Warranty** — Lifetime



CAT6A Shielded Straight-Through and Keystone Couplers



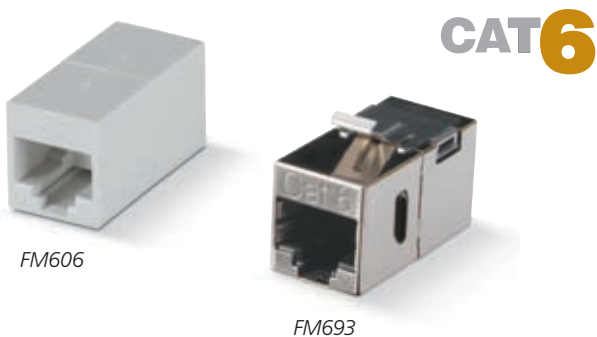
CAT6A Shielded Straight-Through Couplers

Metal	C6ACP71S-SV	C6ACP71S-SV-10PAK
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CAT6A Keystone Feed-Through, Straight-Pinned Couplers

Metal	C6ACP70S-SV	C6ACP70S-SV-10PAK
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CAT6 Straight-Through and Keystone Couplers



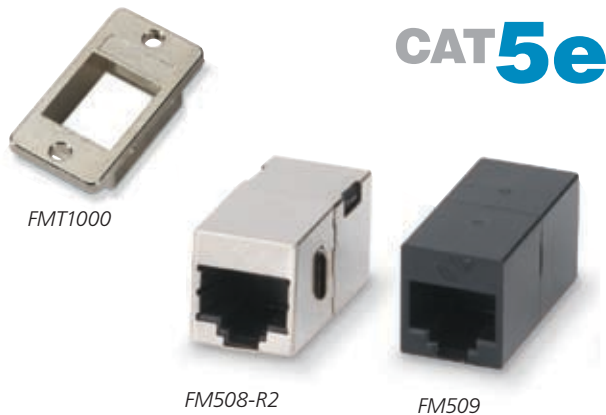
CAT6 Straight-Through Couplers

Unshielded	White	FM606	FM606-10PAK
	Off-White	FM607	FM607-10PAK
	Black	FM609	FM609-10PAK
Shielded	Metal	FM608	FM608-10PAK

CAT6 Keystone Feed-Through, Straight-Pinned Couplers

Unshielded	White	FM690	
	Black	FM692	
Shielded	Silver	FM693	

CAT5e Straight-Through and Keystone Couplers



CAT5e Straight-Through Couplers

Straight-Pinned			
Unshielded	White	FM506-R2	FM506-R2-10PAK
	Beige	FM507-R2	FM507-R2-10PAK
	Black	FM509	FM509-10PAK
Shielded	Silver	FM508-R2	FM508-R2-10PAK
Cross-Pinned			
Unshielded	White	FM566-R2	FM566-R2-10PAK
	Beige	FM567-R2	FM567-R2-10PAK
	Black	FM568-R2	FM568-R2-10PAK

CAT5e Keystone Feed-Through, Straight-Pinned Couplers

Straight-Pinned			
Unshielded	White	FM590	FM590-10PAK
	Beige	FM591	FM591-10PAK
	Black	FM592	FM592-10PAK
Shielded	Silver	FM593	FM593-10PAK
Cross-Pinned			
Unshielded	White	FM596	FM596-10PAK
	Beige	FM597	FM597-10PAK
	Black	FM598	FM598-10PAK

Panel-Mount Bezel

			FMT1000
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Related

- *GigaTrue® 2 and GigaBase® 2 Jacks, p. 165*
- *GigaStation Snap Fittings, p. 172*
- *GigaStation 2 Wallplates, p. 172*

Giga2 and Giga Plus— what you need to know:

Our Giga2 and Giga Plus systems feature jacks, wallplates, surface-mount boxes, and other accessories. Components of each system are designed to work together. And they all work with our GigaTrue®3 CAT6A/6, GigaBase®3 CAT5e, GigaTrue CAT6, and GigaBase CAT5e cable. Here are the differences between the systems so you can make the right decision when choosing hardware.

Giga2

- Giga2 products, such as jacks and wallplates, are designed to work with other Giga2 products.
- Giga2 hardware works with our GigaTrue3, GigaTrue2, and GigaBase patch cables.

Giga Plus

- Giga Plus is entirely made in the U.S. So if you need to buy American-made products, choose this line.
- Giga Plus products are designed to work with Giga Plus products.



Related

Giga2 Products

- GigaStation2 Wallplates, p. 172
- GigaStation2 Snap Fittings, p. 172
- GigaStation2 Surface-Mount Housings, p. 172
- GigaTrue3 CAT6A Jacks, p. 164
- GigaTrue2 CAT6 and GigaBase2 CAT5e Jacks, p. 165
- Hinged Raceways, [blackbox.com](#)

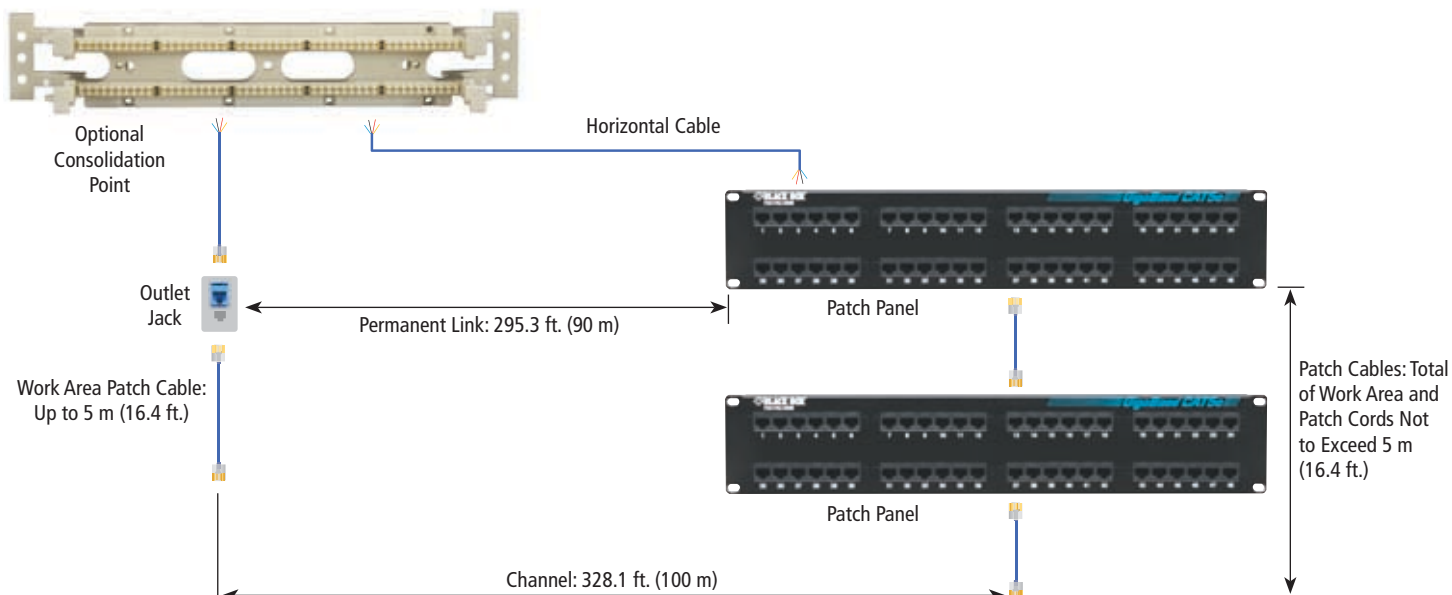
Giga Plus Products

- GigaStation Plus Wallplates, p. 173
- GigaStation Plus Blank Panels, p. 173
- GigaStation Plus Surface-Mount Housings, p. 173
- GigaTrue Plus CAT6 Jacks, p. 165
- GigaBase Plus CAT5e Jacks, p. 165

The Cabling Channel

- Horizontal cable, up to 90 meters (295.3 ft.).
- Work area patch cord, up to 5 meters (16.4 ft.).
- Work area telecommunications outlet connector.
- Optional consolidation point connection.
- Two TR patch cord connections.

The total length of the channel must not exceed 100 meters (328 ft.). The total length of equipment, patch, and work area cords must not exceed 10 meters (33 ft.).



Wallplates for GigaTrue2 and GigaBase2 systems.

GigaStation2 Wallplates

- Include paper labels with clear covers and color-matched covers.
- Work with:
 - GigaTrue2 CAT6A/6 Jacks (page 165).
 - GigaBase2 CAT5e Jacks (page 165).
 - Giga2-Style CAT3 Jacks and USOC RJ-11 Jacks (blackbox.com).
 - GigaStation2 Snap Fittings (below).
 - CAT6/5e Couplers (page 170).



Color Guide



- **Standard Warranty** — Lifetime

NOTE: 3- and 6-port do not accept FMT700 CAT6A jacks.

Rear-loading, snap-in ports provide extra security at the workstation.



NOTE: Does not include or come loaded with jacks or snap fittings.

GigaStation2 Wallplates

	1-Port <i>Single-Gang</i>	2-Port <i>Single-Gang</i>	3-Port <i>Single-Gang</i>	4-Port <i>Single-Gang</i>	6-Port <i>Single-Gang</i>	9-Port <i>Dual-Gang</i>	12-Port <i>Dual-Gang</i>
Ivory	WPT454	WPT460	WPT466	WPT472	WPT478	WPT484	WPT490
Office White	WPT456	WPT462	WPT468	WPT474	WPT480	WPT486	WPT492
White	WPT458	WPT464	WPT470	WPT475	WPT482	WPT488	WPT494

Install these jacks in a snap.

GigaStation2 Snap Fittings

- Convenient snap-in jacks for multimedia or fiber optic connection capabilities.
- Work with:
 - GigaStation2 Wallplates (above),
 - GigaStation2 Surface-Mount Housings (below),
 - Multimedia Patch Panels (pages 155 and 160).
- **Standard Warranty** — Lifetime



GigaStation2 Snap Fittings

HDMI, Female/Female Office White FMT1001	ST® Adapter Office White FMT333-R2 Ivory FMT324-R2 White FMT323-R2	MT-RJ, Female/Female Office White FMT347-R2 Ivory FMT326-R2 White FMT350-R2
F-Connector, Female/Female Office White FMT331-R2 Ivory FMT338-R2 White FMT361-R2	SC Simplex Office White FMT343-R3 Ivory FMT325-R3 White FMT346-R3	Blank, 10-Pack Office White FMT330-R2 Ivory FMT335-R2 White FMT359-R2
BNC, Female/Female Office White FMT332-R2 Ivory FMT322-R2 White FMT362-R2	LC Office White FMT354-R3 Ivory FMT320-R3 White FMT357-R3	
S-Video, 110-Punchdown Black FMT375		

Install connections in areas with limited clearance.

GigaStation2 Surface-Mount Housings

- Require only 1.5" (3.8 cm) of clearance.
- Work with:
 - GigaTrue2 CAT6A/6 Jacks (page 165).
 - GigaBase2 CAT5e Jacks (page 165).
 - Giga2-Style CAT3 Jacks and USOC RJ-11 Jacks (blackbox.com).
 - GigaStation2 Snap Fittings (above).
 - Keystone CAT5e Couplers (page 170).
 - Hinged Raceways (blackbox.com).
- **Standard Warranty** — Lifetime



WPT902 shown with a jack and snap fitting inserts (not included).



NOTE: Does not include jacks or inserts.

GigaStation2 Surface-Mount Housings

1-Insert (up to 2 Ports)	WPT901
2-Insert (up to 4 Ports)	WPT902
3-Insert (up to 6 Ports)	WPT903
Inserts for GigaStation2 Surface-Mount Housings	
1-Port	FMT901
2-Port	FMT902
Blank	FMT900

Wallplate is designed for our made-in-the-USA Giga Plus line.

GigaStation Plus Wallplates

- Includes label covers, label cards, and screws.
- Work with:
 - GigaTrue Plus CAT6 Jacks (page 165).
 - GigaBase Plus CAT5e Jacks (page 165).
- **Standard Warranty** — Lifetime



WP454C

GigaStation Plus Wallplates

	1-Port <i>Single-Gang</i>	2-Port <i>Single-Gang</i>	3-Port <i>Single-Gang</i>	4-Port <i>Single-Gang</i>	6-Port <i>Single-Gang</i>
Ivory	WP454C	WP460C	WP466C	WP472C	WP478C
Office White	WP456C	WP462C	WP468C	WP474C	WP480C
White	WP458C	WP464C	WP470C	WP475C	WP482C

Use with our GigaStation Plus Jacks.

GigaStation Plus Surface-Mount Housings

- Cable can enter through the base, rear, or sides.
- Mounts on walls, desks, and other flat surfaces.
- Includes mounting hardware and dust covers
- Work with:
 - GigaTrue Plus CAT6 Jacks (page 165).
 - GigaBase Plus CAT5e Jacks (page 165).



WP901C



- **Standard Warranty** — Lifetime

GigaStation Plus Surface-Mount Housings

Office White	
One-Port	WP901C
Two-Port	WP902C

Fill in the blanks in GigaStation Plus Wallplates.

GigaStation Plus Blank Wallplate Inserts

- Fill unused slots for a clean look.
- Work with:
 - GigaStation Plus Wallplates (above).
 - GigaStation Plus Surface-Mount Housings (above).
- **Standard Warranty** — Lifetime



FM330C



GigaStation Plus Blanks Wallplate Inserts

20-Pack	
Office White	FM330C
Ivory	FM334C
White	FM359C

Boxes, blocks, and housings for wall and furniture connections.

For more information and more styles, go to blackbox.com.



JPB654

Surface-Mount
Box, Single-Gang,
Office White

JPB654



31225

FM012

110 Punchdown
Block
31225

Terminal Block
FM012



WP461-MF

Modular Furniture
Faceplate
WP461-MF

Feed-through, stainless wallplates for all your A/V connections.

A/V Wallplates



WP800



WP803



WP830



WP831



WPVGA04



WP820



WP840



WP841



WP842

- Tough, 20-gauge stainless steel construction provides durability, especially in commercial environments.
- Most wallplates feature feed-through couplers.
- WPVGA04 features a female HD15 VGA connector and screw-down terminals for customizing individual pins.
- Laser-engraved labels make port identification easy.
- **Standard Warranty** — Lifetime

A/V Stainless Wallplates

Single-Gang, VGA HD15

(1) VGA HD15 F, (1) RCA F Feed-Through Couplers	WP800
(1) VGA HD15 F, (1) 3.5-mm F Feed-Through Couplers	WP801
(1) VGA HD15 F, (1) 3.5-mm F, (3) RCA F Feed-Through Couplers	WP802
(1) VGA HD15 F, (1) S-Video F, (3) RCA F Feed-Through Couplers	WP803
(1) VGA HD15 F, (1) S-Video F, (1) 3.5mm F, (3) RCA F Feed-Through Couplers	WP804
(1) VGA HD15 F, (1) S-Video F, (1) 3.5mm F, (5) RCA F Feed-Through Couplers	WP805
(1) VGA HD15 F/M Gender Changer	WPVGA02-R2
(1) VGA HD15 F/F Feed-Through Coupler	WPVGA03-R2
(1) VGA HD15 F, (1) Screw-Down Terminal (15 leads)	WPVGA04

Single-Gang, Miscellaneous

(1) USB Type A F Feed-Through Coupler	WP830	
(1) HDMI F Feed-Through Coupler	WP831	
Rubber Grommet	1" Hole	WP840
	¼" -1-¾" Hole	WP841
	1-½" Hole, Split Wallplate	WP842

Double-Gang

(1) VGA HD15 F, (1) 3.5-mm F, (3) RCA F Feed-Through Couplers	WP820
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For specs, go to blackbox.com.

Make VoIP phone connections.

CAT5e and CAT6 Wallphone Plates

- Jack features universal wiring.
- Keystone-style wallplate has a flushmount finish and mushroom-style hooks for wallmounting.
- **Standard Warranty** — Lifetime



WP369C5E



CAT5e

CAT6

CAT5e and CAT6 Wallphone Plates

Wallphone Plates	
CAT5e	WP369C5E
CAT6	WP369C6

For specs, go to blackbox.com.

Customize these durable, stainless steel wallplates with color-coded jacks.

Keystone Wallplates

- Stainless is ideal for clean rooms and food-service facilities—it's easy to clean and sterilize.
- All Keystone Wallplates hold all Giga2- and GigaPlus-style jacks, [pages 165](#).
- For a custom configuration and D-Sub punches, contact our FREE Tech Support.
- **Standard Warranty** — Lifetime



WP370



WP371



WP372



WP373



WP369

Keystone Wallplates

Single Width	
(1) Punch	WP370
(2) Punch	WP371
(3) Punch	WP372
(4) Punch	WP373
(6) Punch	WP374
Double-Width	
(6) Punch	WP375

Keystone Wallplate for Mounting Wall-Style Telephone (Flushmount with Mushroom)

Single Width	
(1) Punch	WP369

For specs, go to blackbox.com.

Click and find at blackbox.com:
Coax, D-style, and VGA wallplates.

Make 108 high-density fiber connections in only 1U.

High-Density Fiber Optic Enclosure, 1U

- Slide-out tray makes high-density data center connections easy.
- To access cables in the enclosure, simply pull out the tray.
- Three slots accept LC Fiber Cassettes (below).
- Adjustable-depth mounting enables you to recess the enclosure to protect LC connectors from enclosure door damage.
- Recessed mounting also enables you to better dress LC zipcords (page 137).
- Rail stops prevent the tray from being pulled out too far and damaging fiber splices.
- 16-gauge, cold-rolled steel construction.
- **Standard Warranty** — Lifetime



NOTE: Comes unloaded. Use with the Fiber Cassette below.

High-Density Fiber Optic Enclosure, 1U

	FOEN50HD-3H-1U
Blank Panel	FOAP10-HD

For specs, go to blackbox.com.

Get 36 LC connectors in one pre-wired OM3 fiber cassette.

OM3 High-Density Fiber Optic Cassette, 3 x 12 Strand, 3 MTP® Connectors to 36 LCs

- Made especially for the High-Density 108 LC Enclosure (above).
- Get 36 LC connectors (18 duplex pairs).
- Features three 12-strand MTP® MPO-style connectors, which are wired to method A.
- LC connector insertion loss is 0.3 dB (max.) at 850/1210 nm.
- MTP connector insertion loss is 0.75 dB (max.) at 850/1210 nm.
- **Standard Warranty** — Lifetime



NOTE: Only works with the enclosure above.



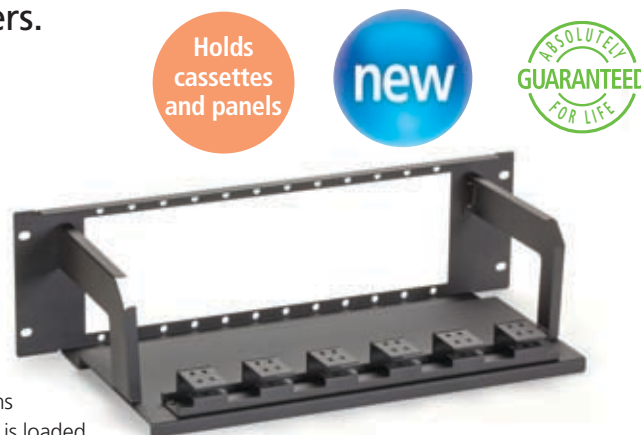
OM3 High-Density Fiber Optic Cassette, 3 MTP® Connectors to 36 LCs

3 x 12 Strand	FOCA20M3-3MP12-36LC
---------------	---------------------

For specs, go to blackbox.com.

Economical open panel supports up to 288 fibers.

Universal Fiber Patch Panel, 12 Vertical LGX Slots



- Holds up to 12 adapter panels or cassettes.
- Super versatile. Mix and match adapter panels and/or cassettes.
- Panels and cassettes mount vertically.
- Open-panel design makes cable management much easier.
- Cable management brackets in the rear can be used with cable ties or hook and loop ties.
- Two heavy-duty support arms add stability when the panel is loaded.
- Strong, 16-gauge steel construction.
- **Standard Warranty** — Lifetime

Related

- *Fiber Adapter Panels, page 180.*
- *Fiber Cassettes, page 181.*

Universal Fiber Patch Panel, 3U

12 Vertical LGX Slots	FOPP50-12V-3U
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For specs, go to blackbox.com.

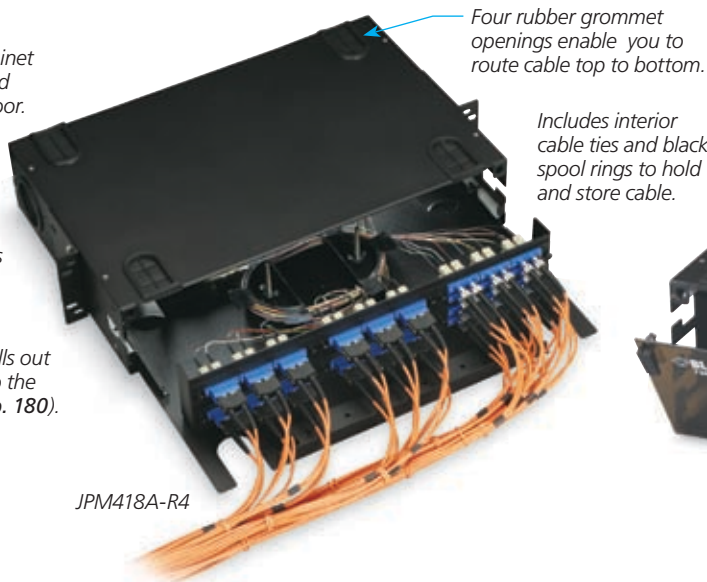
Super versatility. Connect up to 288 fibers for high-density applications.

Rackmount Fiber Enclosures

To access the cabinet from the rear, fold open the back door.

Each side has a large cable access opening for routing cables horizontally.

The inner tray pulls out for easy access to the adapter panels (p. 180).



JPM418A-R4

Four rubber grommet openings enable you to route cable top to bottom.

Includes interior cable ties and black spool rings to hold and store cable.

Now holds cassettes and panels



JPM406A-R6

Super versatility! This model holds standard fiber adapter panels or cassettes for high-density applications.

- The 3U Enclosure holds both Fiber Adapter Panels and MTP® MPO-style fiber cassettes.
- When used with LC duplex fiber cassettes, the 3U Enclosure can hold 288 fibers!
- The 2U Enclosure holds Fiber Adapter Panels only. With a 12 LC Duplex Panel (page 180), it can accommodate up to 144 fibers.
- Smoked-plastic, lockable front door makes it easy to view connections.
- Fits 19" or 23" racks.
- **Standard Warranty** — Lifetime

Related

- *Fiber Adapter Panels, page 180.*
- *MTP® MPO-style Cassettes, page 181.*

Rackmount Fiber Cabinets

2U	6-Adapter Panel	JPM418A-R4
3U	12-Adapter Panel	JPM406A-R6

For specs, go to blackbox.com.

For convenience, order a rackmount panel that's preloaded with adapters.

Rackmount Fiber Panels, Loaded

- Adapters feature high-retention phosphor bronze alignment sleeves.
- Swing-out fiber management tray makes it easy to maintain fiber optic cable bend-radius requirements.
- Only 1U high.
- Fit in 19" or 23" racks.
- **Standard Warranty** — Lifetime

Panels come pre-loaded with a variety of fiber connectors and are suitable for multimode applications. They occupy only one rack space and include mounting hardware.

All feature a swing-out fiber management tray for full front access to both front and rear interconnections, making it easier to maintain fiber optic cable bend-radius requirements.



Top: JPM375A-R2;
bottom: JPM370A-R2.

Preloaded



NOTE: Custom configurations are available for these panels and all the fiber termination enclosures featured on pages 176–178. For details, call our FREE Tech Support.

Rackmount Fiber Panels, Loaded

1U, with Single-Mode/Multimode Connectors with	
(24) Simplex ST	JPM370A-R2
(12) Duplex SC Pairs	JPM375A-R2
(12) Duplex LC Pairs	JPM380A
(24) Duplex LC Pairs	JPM385A

For specs, go to blackbox.com.

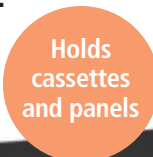
No more pinched fingers. This shelf slides out for easy fiber access.

Rackmount Fiber Shelf, Pull-Out Tray, 1U

- To access cables in the enclosure, simply pull out the tray.
- Rail stops prevent the tray from being pulled out too far and damaging your fiber splices.
- Three slots accept three snap-in Adapter Panels (page 180) or Cassettes (page 181).
- Can hold two Mini Splice Trays (page 179).
- Features two separate Kevlar® clamps to secure the fiber trunk to the enclosure.
- Supports 19" and 23" widths and can be front or center mounted.
- Includes two sets of cable distribution rings.
- Accepts an optional fiber tray splicing.
- 16-gauge, cold rolled steel enclosure.
- **Standard Warranty** — Lifetime



This compact 1U shelf accepts Fiber Adapter Panels or MTP®, MPO-Style Fiber Cassettes.



This compact fiber shelf conveniently slides out so you can easily access the fibers.

Related

- *Fiber Adapter Panels, page 180.*
- *MTP® MPO-style Cassettes, page 181.*
- *12-Strand Fiber Splice Tray, page 179.*

Rackmount Fiber Shelf, Pull-Out Tray, 1U

JPM427A-R2

For specs, go to blackbox.com.

Limited rack space? Our most popular 1U enclosure is the solution.

Rackmount Fiber Shelf, 1U

- Tray swings out for cable access.
- Accepts three snap-in Adapter Panels (page 180).
- Panels are recessed horizontally.
- Splice tray stud enables you to install pigtail splice trays.
- Mount on 19" or 23" rails.
- **Standard Warranty** — Lifetime



Related

- *Fiber Adapter Panels, page 180.*
- *12-Strand Fiber Splice Tray, page 179.*

Rackmount Fiber Shelf, 1U

1U 3-Adapter Panel JPM407A-R5

For specs, go to blackbox.com.

Customize these guaranteed-for-life panels to your specific applications.

Fiber Patch Panels, 1U



JPM395A



JPM430A



JPM390A



JPMT-FIBER-3

- Panels feature feed-through connectors.
- LC connectors feature ceramic ferrules to withstand frequent plugging and unplugging.
- The modular design supports custom configurations with fiber (page 160) and copper (page 165) jacks.
- Blank panel holds Fiber Adapter Panels (page 180).

- Built tough of cold-rolled steel.
- **Standard Warranty** — All: Lifetime

NOTE: Panels come unassembled. Jacks need to be snapped in.

Fiber Patch Panels, 1U

ST to (16) Simplex ST JPM395A

(24) Simplex ST JPM425A

SC to (16) Simplex SC JPM430A

LC to (16) Duplex LC Pairs JPM390A

Blank Fiber Patch Panel

3 Adapter Panel JPMT-FIBER-3

For specs, go to blackbox.com.

Protect your fiber terminations in damp environments.

NEMA 4 Rated Fiber Wallmount Enclosures

- NEMA 4 rated for use in damp environments, basements, and below-ground floors prone to water leakage and seeping.
- Water-tight cable openings prevent condensation and moisture from entering.
- Can be mounted on solid surfaces, such as cinder block walls.
- **Standard Warranty** — All: Lifetime

Adapter Panel Enclosures

- Panels hold two or four Fiber Adapter Panels (page 180).
- Support one or two incoming fiber trunks and patch cables going out.
- Include an area to mount a Splice Tray (JPM440A) (page 185).

Splice Tray Enclosure

- Use to make fiber cabling transition from outdoors to indoors.
- Supports one incoming fiber trunk and/or one outgoing trunks.
- Includes a splice tray.

NEMA 4

Wallmount

ABSOLUTELY
GUARANTEED
FOR LIFE



JPM4001A-R2



JPM4002A

Technical Specifications

Dimensions	JPM4000A-R2: 15.7"H x 19"W x 3.9"D (39.9 x 48.3 x 10 cm); JPM4001A-R2: 12.7"H x 13.8"W x 3.9"D (32.2 x 35 x 9.9 cm); JPM4002A: 15.7"H x 19"W x 3.9"D (39.9 x 48.3 x 10 cm)
------------	--

NEMA-4 Rated Fiber Wallmount Enclosures

2 Panel/Cassette	JPM4001A-R2
4 Panel/Cassette	JPM4000A-R2
NEMA 4 Splice Tray	JPM4002A

For full features and specs, go to blackbox.com.

NEMA Enclosure Types

By Black Box Media Services

The National Electrical Manufacturers' Association (NEMA) issues guidelines and ratings for an enclosure's level of protection against contaminants that might come in contact with its enclosed equipment.

There are many numerical NEMA designations: Type 3, Type 3R, Type 4, Type 4X, and Type 12.

Type 3 enclosures, designed for both indoor and outdoor use, provide protection against falling dirt, windblown dust, rain, sleet, and snow, as well as ice formation.

The Type 3R rating is identical to Type 3 except that it doesn't specify protection against windblown dust.

Type 4 and 4X enclosures, also designed for indoor and outdoor use, protect against windblown dust and rain, splashing and hose-directed water, and ice formation. Type 4X goes further than Type 4, specifying that the enclosure will also protect against corrosion caused by the elements.



NEMA 4 and 4X enclosures, designed for indoor and outdoor use, protect against windblown dust and rain, splashing and hose-directed water, and ice formation.

Type 12 enclosures are constructed for indoor use only and are designed to provide protection against falling dirt, circulating dust, lint, fibers, and dripping or splashing noncorrosive liquids. Protection against oil and coolant seepage is also a prerequisite for Type 12 designation.

Low-profile fiber enclosures for limited-space areas.

Fiber Wall Cabinets

Open-Style Cabinets

- Low-profile cabinets conserve wall space and can be mounted almost anywhere.
- Interconnect to active equipment or patch vertical or horizontal runs.
- Use with Fiber Adapter Panels (page 180) or Fiber Cassettes (page 181).

Lock-Style Cabinets

- Use when installing secure fiber networks.
- Separate lockable covers provide access to the users' side and the technician's side.
- Feature full front access.
- Holds Fiber Adapter Panels (page 180) or Fiber Cassettes (page 181).
- **Standard Warranty** — All: Lifetime



Wallmount



Technical Specifications

Material	16-gauge cold-rolled steel
Dimensions	JPM400A-R2: 8.5"H x 11"W x 2.9"D (21.6 x 27.9 x 8.9 cm); JPM401A-R2–JPM402A-R2: 12"H x 14"W x 3.5"D (30.5 x 35.6 x 8.9 cm); JPM403A-R2: 12"H x 14"W x 3.5"D (30.5 x 35.6 x 8.9 cm)

Fiber Wall Cabinets

Open-Style	
2-Adapter Panel	JPM400A-R2
4-Adapter Panel	JPM401A-R2
Lock-Style	
4-Adapter Panel	JPM402A-R2
12-Adapter Panel	JPM403A-R2

Secure and protect fiber connections in limited-space areas.

Wallmount Z-Hinged Fiber Enclosure

- Z-design enclosure features two compartments: the front holds fiber assemblies, the rear holds the fiber splices.
- Only 8" high, 12" wide and 4.8" deep, it's perfect for areas where you don't have room for a full-size enclosure.
- Ideal for applications where you do not have access to the rear of the enclosure.
- Rear compartment features two cable management rings.
- Includes space for an optional splice tray.
- **Standard Warranty** — Lifetime



Wallmount Z-Hinged Fiber Enclosure

JPM450A

For full features and specs, go to blackbox.com.

The economical solution for extending a fiber run.

Mini Wallmount Fiber Enclosure, One Adapter Panel

- Holds one Fiber Adapter Panel (page 180).
- Ideal for extending a fiber run to a remote area of your facility or in areas where you don't need security.
- **Standard Warranty** — Lifetime



Mini Wallmount Fiber Enclosure, One Adapter Panel

JPM399A

For full features and specs, go to blackbox.com.

Adapter panels fit standard fiber enclosures.

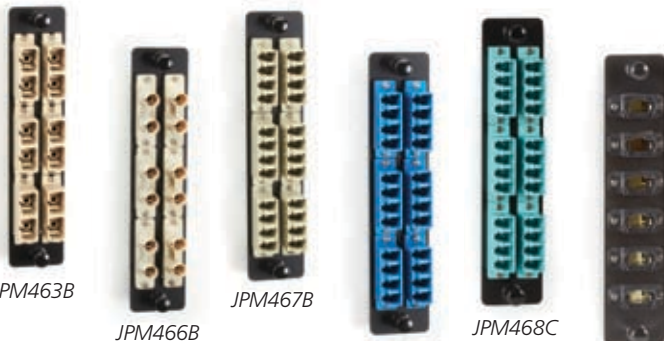
Fiber Adapter Panels



JPM450B JPM450C JPM451B JPM451C JPM480A



JPM455C JPM460B JPM460C JPM461C JPM456C



JPM463B JPM466B JPM467B JPM467C JPM468C JPM470 JPM467A

- Adapter Panels snap easily into fiber enclosures.
- Use the Standard Panels for traditional (low-density) applications.
- Use the High-Density Panels for connections with blade servers and other equipment in congested racks and cabinets.
- Aqua Adapter Panels are for use in 10-GbE networks.
- **Standard Warranty — Lifetime**

Standard Fiber Optic Adapter Panels

Connectors	Color	Sleeve	
(3) ST Duplex	Beige	Bronze	JPM450B
	Blue	Ceramic	JPM450C
(3) SC Duplex	Beige	Bronze	JPM451B
	Blue	Ceramic	JPM451C
(6) LC Duplex	Beige	Bronze	JPM455B
	Blue	Ceramic	JPM455C
	Aqua	Ceramic	JPM456C

High-Density Fiber Optic Adapter Panels

Connectors	Color	Sleeve	
(6) ST Duplex	Beige	Bronze	JPM460B
	Blue	Ceramic	JPM460C
(6) SC Duplex	Blue	Ceramic	JPM461C
	Gray	Bronze	JPM462B
	Beige	Bronze	JPM463B
	Yellow	Bronze	JPM413A
	Orange	Bronze	JPM414A
(6) ST-SC Duplex	Beige	Bronze	JPM466B
(12) LC Duplex	Beige	Bronze	JPM467B
	Blue	Ceramic	JPM467C
(12) LC Duplex	Aqua	Ceramic	JPM468C
(6)MTP® Connector	Black		JPM470
Blank Panel	Black		JPM480A

For specs, go to blackbox.com.

Convert a Corning CCH box to an LGX-compatible box.

Fiber Optic Bracket Adapter, Corning CCH to LGX®

- Adapts plates for interconnects such as Corning CCH series boxes to LGX-compatible boxes.
- Enables you to use LGX-style (120 mm x 29 mm) cassettes with older Corning CCH boxes.
- **Standard Warranty — Lifetime**



NOTE: Does not work with Black Box fiber enclosures.



Fiber Optic Bracket Adapter, Corning CCH to LGX

FOBR10

For specs, go to blackbox.com.

Get up to 36 fibers in one cassette.

OM3 50-Micron Multimode Fiber Optic Cassettes, MTP®-Style Connector

- Use to make high-density blade server, patch panel, and switch connections.
- Choose from multiple fiber strand counts.
- Feature high-performance MTP® MPO-style male connectors.
- Connectors are oriented key up/key down or opposed.
- MTP connector insertion loss is 0.75 dB (max.) at 850/1310 nm.
- LC insertion loss is 0.3 dB (max.) at 850/1310 nm.
- **Standard Warranty** — Lifetime



FOCA20M3-1MP24-24LC
Left: Front; Right: Rear

Related

These Cassettes fit:

- *Rackmount Fiber Enclosure (JPM406A-R6), p. 176*
- *Rackmount Fiber Shelf (JPM427A-R2), p. 177*
- *Universal Fiber Patch Panel (FOPP50-12V-3U), p. 175*

OM3 50-Micron Multimode Fiber Optic Cassettes (LGX), MTP® Connector to LC

12 Strand MTP to (6) LC Duplex Pairs	FOCA20M3-1MP12-12LC
24 Strand MTP to (12) LC Duplex Pairs	FOCA20M3-1MP24-24LC
2 x 12 Strand MTP to (12) LC Duplex Pairs	FOCA20M3-2MP12-24LC

For specs, go to blackbox.com.

Simplify high-density deployments with a preterminated trunk cabling system.

OM3 50-Micron Multimode Laser-Optimized Harness and Trunk Cables



FOHC20M3-MPLC-12AQ-2



FOTC20M3-MP-12AQ

- Streamline network cabling in high-density data centers.
- Use to simplify high-density blade server, patch panels, and switch connections.
- Pre-terminated cable eliminates costly and error-prone field terminations.
- Reduce installation time.
- Harness Cables facilitate moves, adds, and changes.
- Round cables are all a small diameter (3.0-mm).
- Cables feature high-performance MTP® MPO-style connectors.
- **Standard Warranty** — Lifetime

OM3 50-Micron Multimode Laser-Optimized Fiber Optic Harness Cables

MTP® Connector/6 LC Duplex Pairs, Plenum
12 Strand, with Pins

- 1-m (3.3-ft.) FOHC20M3-MPLC-12AQ-1
- 2-m (6.6-ft.) FOHC20M3-MPLC-12AQ-2
- 3-m (9.8-ft.) FOHC20M3-MPLC-12AQ-3

For specs, go to blackbox.com.

OM3 50-Micron Multimode Laser-Optimized Fiber Optic Trunk Cables, MTP® Connectors

Plenum, without Pins, 12 Strand

Key Up/Down, Straight-Pinned

- 1-m (3.2-ft.) FOFC20M3-MP-12AQ-1
- 3-m (9.8-ft.) FOFC20M3-MP-12AQ-3
- 5-m (16.4-ft.) FOFC20M3-MP-12AQ-5
- 10-m (32.8-ft.) FOFC20M3-MP-12AQ-10
- 15-m (49.2-ft.) FOFC20M3-MP-12AQ-15
- 20-m (65.6-ft.) FOFC20M3-MP-12AQ-20
- 30-m (98.4-ft.) FOFC20M3-MP-12AQ-30
- 50-m (164-ft.) FOFC20M3-MP-12AQ-50

Key Up/Up, Cross-Pinned

- 1-m (3.2-ft.) FOFC30M3-MP-12AQ-1
- 3-m (9.8-ft.) FOFC30M3-MP-12AQ-3
- 5-m (16.4-ft.) FOFC30M3-MP-12AQ-5
- 10-m (32.8-ft.) FOFC30M3-MP-12AQ-10
- 15-m (49.2-ft.) FOFC30M3-MP-12AQ-15
- 20-m (65.6-ft.) FOFC30M3-MP-12AQ-20
- 30-m (98.4-ft.) FOFC30M3-MP-12AQ-30
- 50-m (164-ft.) FOFC30M3-MP-12AQ-50

For specs, go to blackbox.com.

Plenum, without Pins, 24 Strand

Key Up/Down, Straight-Pinned

- 1-m (3.2-ft.) FOFC20M3-MP-24AQ-1
- 3-m (9.8-ft.) FOFC20M3-MP-24AQ-3
- 5-m (16.4-ft.) FOFC20M3-MP-24AQ-5
- 10-m (32.8-ft.) FOFC20M3-MP-24AQ-10
- 15-m (49.2-ft.) FOFC20M3-MP-24AQ-15
- 20-m (65.6-ft.) FOFC20M3-MP-24AQ-20
- 30-m (98.4-ft.) FOFC20M3-MP-24AQ-30
- 50-m (164-ft.) FOFC20M3-MP-24AQ-50

Key Up/Up, Cross-Pinned

- 1-m (3.2-ft.) FOFC30M3-MP-24AQ-1
- 3-m (9.8-ft.) FOFC30M3-MP-24AQ-3
- 5-m (16.4-ft.) FOFC30M3-MP-24AQ-5
- 10-m (32.8-ft.) FOFC30M3-MP-24AQ-10
- 15-m (49.2-ft.) FOFC30M3-MP-24AQ-15
- 20-m (65.6-ft.) FOFC30M3-MP-24AQ-20
- 30-m (98.4-ft.) FOFC30M3-MP-24AQ-30
- 50-m (164-ft.) FOFC30M3-MP-24AQ-50

For specs, go to blackbox.com.

The easy way to mate fiber connectors.

Fiber Optic Couplings and Adapters



- Use the couplings to mate two fiber cables.
- Convert ST, SC, and FC connectors with the Adapters.
- All feature a panel mount design.
- The bronze sleeves are better for multimode fiber applications where alignment is not crucial.
- The ceramic sleeves offer precise alignment and are better for single-mode applications.
- Ceramic sleeves are more durable and provide better alignment than bronze sleeves.
- **Standard Warranty** — All: Lifetime

Fiber Optic Couplings		Description	Sleeve	Flange	
FC-FC	3/8" Diameter Mounting	Multimode, Simplex	Bronze	Metal	FOT100
		Single-Mode, Simplex	Ceramic	Metal	FOT102
	Square Mounting	Multimode, Simplex	Bronze	Metal	FOT101
ST-ST	3/8" Diameter Mounting	Single-Mode, Simplex	Ceramic	Metal	FOT103
		Multimode, Simplex	Bronze	Metal	FOT109
	Rectangular Mounting	Single-Mode, Duplex	Ceramic	Plastic	FOT111
		Multimode, Duplex	Bronze	Plastic	FOT112
		Multimode, Simplex	Bronze	Plastic	FOT117
SC-SC	Rectangular Mounting	Single-Mode, Simplex	Ceramic	Plastic	FOT119
		Multimode, Duplex	Bronze	Plastic	FOT118
	Panel Mount	Multimode, Duplex	Bronze	Plastic	FOT120
		Single-Mode, Duplex	Ceramic	Plastic	FOT123
		Multimode, Simplex	Bronze	Plastic	FOT126
		Multimode, Duplex	Bronze	Plastic	FOT127
		Single-Mode, Duplex	Ceramic	Plastic	FOT128
MT-RJ—MT-RJ (Guide pins not included.)	Rectangular Mounting with Cap	Multimode, Simplex		Plastic	FOT121
		Multimode, Duplex		Plastic	FOT122

Fiber Optic Adapters		Description	Sleeve	Flange	
ST-FC	Square Mounting	Multimode, Simplex	Bronze	Metal	FOT104
	Rectangular Mounting	Multimode, Simplex	Bronze	Metal	FOT105
SC-FC	Square Mounting	Single-Mode, Simplex	Ceramic	Metal	FOT106
		Multimode, Simplex	Bronze	Metal	FOT107
ST-SC	Rectangular Mounting	Single-Mode, Simplex	Ceramic	Metal	FOT108
		Multimode, Simplex	Bronze	Plastic	FOT115
	Rectangular Mounting	Multimode, Duplex	Bronze	Plastic	FOT116
		Single-Mode, Simplex	Ceramic	Plastic	FOT113
		Single-Mode, Duplex	Ceramic	Plastic	FOT114
MTP—MTP Bulkhead Adapter with Cap, Panel-Mount				Plastic	FOT129

For specs, go to blackbox.com.

Fiber Optic Adapter Kit

- Eleven different couplings and adapters.
- All adapters feature bronze alignment sleeves and are compatible with single-mode or multimode connectors.
- The kit includes a handy, seven-compartment, plastic storage case that's small enough to fit in your toolbox.
- **Standard Warranty** — Lifetime



Fiber Optic Adapter Kit

FO217

For specs, go to blackbox.com.



Fiber Adapter Cable Kits

- Use the LC—SC Adapter Cable (FO215) to convert a female LC connector into a simplex SC female connector.
- Use the LC—ST® Adapter Cable (FO216) to convert a female LC connector into a simplex ST female connector.
- **Standard Warranty** — Lifetime



Fiber Adapter Cable Kits

LC—SC FO215
LC—ST FO216

For specs, go to blackbox.com.

Terminate fiber in a minute—no more hand polishing in the field.

Pre-Polished Fiber Connectors

- Pre-polished ferrules for fast field connections.
- Easy assembly with no need for epoxy.
- Fiber can be resealed.
- Factory polishing eliminates loss concerns.
- Optical multimode 3 (OM3) compliant for 10-Gigabit Ethernet support.
- Meet TIA 568C performance requirements and TIA/EIA 604 (focis) connector interface specifications.
- Use to terminate 2-mm, 3-mm, 250-micron, or 900-micron fiber.
- **Standard Warranty** — Lifetime



PP-SC-50MM-10G

Pre-Polished Fiber Optic Connectors

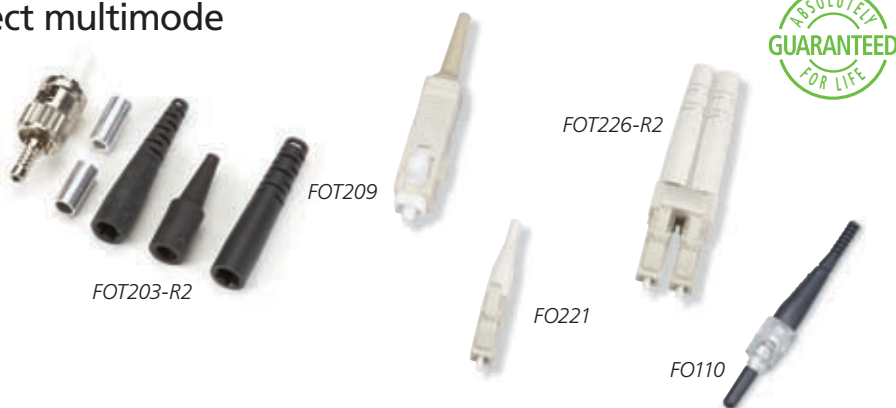
6-Pack	
OM1 62.5-Micron	
SC	PP-SC-625MM-6PAK
ST	PP-ST-625MM-6PAK
LC	PP-LC-625MM-6PAK
OM2 50-Micron	
SC	PP-SC-50MM-6PAK
LC	PP-LC-50MM-6PAK
OM3 50-Micron, 10-GbE	
SC	PP-SC-50MM-10G-6PAK
ST	PP-ST-50MM-10G-6PAK
LC	PP-LC-50MM-10G-6PAK
OSI Single-Mode	
SC	PP-SC-SM-6PAK
LC	PP-LC-SM-6PAK

For specs, go to blackbox.com.

More than a few ways to connect multimode and single-mode cabling.

Fiber Optic Connectors

- Ceramic ferrule boot openings measure 0.9-, 2.0-, and 3.0-mm.
- UV-curable connector contains three pieces to assemble: boot, strain relief, and connector body.
- UV adhesive cures in one minute or less.
- **Standard Warranty** —Lifetime



Fiber Optic Connectors

Ceramic Ferrule

ST Single-Mode Simplex	
126- μ m/0.9-mm, 2.0-mm, 3.0-mm	FOT200-R2
126- μ m/2.0-mm	FOT201
126- μ m/3.0-mm	FOT202
ST Multimode Simplex	
126- μ m/0.9-mm, 2.0-mm, 3.0-mm	FOT203-R2
10-Pack	FOT203-R2-10PAK
SC Single-Mode Simplex	
126- μ m/0.9-mm	FOT206
126- μ m/2.0-mm, 3.0-mm	FOT207-R2

Ceramic Ferrule

SC Multimode Simplex	
126- μ m/3.0-mm	FOT208
126- μ m/0.9-mm	FOT209
126- μ m/2.0-mm, 3.0-mm	FOT210-R2
FC Multimode Simplex	
126- μ m/2.0-mm	FOT216
LC Single-Mode Simplex	
125- μ m/0.9-mm	FOT218
125- μ m/2.0-mm	FOT219
126- μ m/2.0-mm, 3.0-mm	FOT219-R2

Ceramic Ferrule

LC Multimode Simplex	
127- μ m/0.9-mm	FOT221
127- μ m/3.0-mm	FOT222-R2
LC Single-Mode Duplex	
125- μ m/3.0-mm	FOT225
LC Multimode Duplex	
127- μ m/2.0-mm, 3.0-mm	FOT226-R2
UV-Curable, Reduced-Piece-Part, Preassembled, Glass-Insert	
ST Multimode	FOT110

For specs, go to blackbox.com.

Ceramic-ferrule connectors for 50-micron cable.

50-Micron Connectors

- Offer quick installation with no epoxy or polishing needed.
- For use with the Fiber Connector Tool Kit (FT535-R2, see blackbox.com).
- Require no consumables.
- **Standard Warranty** — 1 Year



50-Micron Connectors

Single-Pack	
ST	FO041
SC	FO042
LC	FO043
10-Pack	
ST	FO041-10PAK
SC	FO042-10PAK
LC	FO043-10PAK
MT-RJ	FO044-10PAK

For specs, go to blackbox.com.

Verify fiber equipment by looping the signal back.

Fiber Optic Loopbacks

- Test and troubleshoots fiber optic links in networks or devices.
- The Loopbacks “loop back” the signals from the transmit to the receive pairs.
- Use to locate faults.
- Feature ceramic ferrules.
- Multimode loopbacks feature an insertion loss of <0.3 dB and a return loss of >35 dB.
- Single-mode loopbacks feature an insertion loss of <0.3 dB and a return loss of >50 dB.
- **Standard Warranty** — All: Lifetime



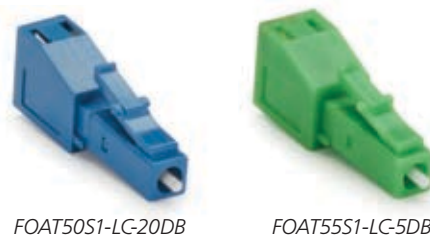
Fiber Optic Loopbacks

OM1 62.5-Micron Multimode, Beige	
LC	FOLB50M1-LC
SC	FOLB50M1-SC
OM3 50-Micron Multimode, Black	
LC	FOLB50M3-LC
SC	FOLB50M3-SC
Single-Mode, Blue	
LC	FOLB50S1-LC
SC	FOLB50S1-SC

Buffer overpowering fiber signals and eliminate errors.

Fiber Optic In-Line Attenuators

- Provides loss to a fiber cable if the dB power is too great.
- Protect equipment from being overpowered.
- Ideal for use when equipment is too close to each other.
- Ceramic ferrules.
- Choose from five fixed attenuation values.
- **Standard Warranty** — Lifetime



Fiber Optic In-Line Attenuators

Single-Mode, Male, Female

FC APC	2 dB	FOAT55S1-FC-2DB
	5 dB	FOAT55S1-FC-5DB
	10 dB	FOAT55S1-FC-10DB
	15 dB	FOAT55S1-FC-15DB
	20 dB	FOAT55S1-FC-20DB
UPC	2 dB	FOAT50S1-FC-2DB
	5 dB	FOAT50S1-FC-5DB
	10 dB	FOAT50S1-FC-10DB
	15 dB	FOAT50S1-FC-15DB
	20 dB	FOAT50S1-FC-20DB

Single-Mode, Male, Female

SC APC	2 dB	FOAT55S1-SC-2DB
	5 dB	FOAT55S1-SC-5DB
	10 dB	FOAT55S1-SC-10DB
	15 dB	FOAT55S1-SC-15DB
	20 dB	FOAT55S1-SC-20DB
UPC	2 dB	FOAT50S1-SC-2DB
	5 dB	FOAT50S1-SC-5DB
	10 dB	FOAT50S1-SC-10DB
	15 dB	FOAT50S1-SC-15DB
	20 dB	FOAT50S1-SC-20DB

Single-Mode, Male, Female

LC APC	2 dB	FOAT55S1-LC-2DB
	5 dB	FOAT55S1-LC-5DB
	10 dB	FOAT55S1-LC-10DB
	15 dB	FOAT55S1-LC-15DB
	20 dB	FOAT55S1-LC-20DB
UPC	2 dB	FOAT50S1-LC-2DB
	5 dB	FOAT50S1-LC-5DB
	10 dB	FOAT50S1-LC-10DB
	15 dB	FOAT50S1-LC-15DB
	20 dB	FOAT50S1-LC-20DB

Make 6 or 12 connections in no time at all.

Fiber Optic Pigtails

- Use in fiber termination enclosures or cable management boxes.
- One end gets spliced to the trunk cable. The other end has preterminated connectors, which feed into an adapter panel.
- **Standard Warranty** — Lifetime



Fiber Optic Pigtails

OM1 62.5-Micron Multimode, 3-m (9.8-ft.)

6 Strand	
LC	FOPT50M1-LC-6OR-3
ST	FOPT50M1-ST-6OR-3
SC	FOPT50M1-SC-6OR-3
12 Strand	
LC	FOPT50M1-LC-12OR-3
ST	FOPT50M1-ST-12OR-3
SC	FOPT50M1-SC-12OR-3

OM3 50-Micron Multimode, 3-m (9.8-ft.)

6 Strand	
LC	FOPT50M3-LC-6AQ-3
ST	FOPT50M3-ST-6AQ-3
SC	FOPT50M3-SC-6AQ-3
12 Strand	
LC	FOPT50M3-LC-12AQ-3
ST	FOPT50M3-ST-12AQ-3
SC	FOPT50M3-SC-12AQ-3

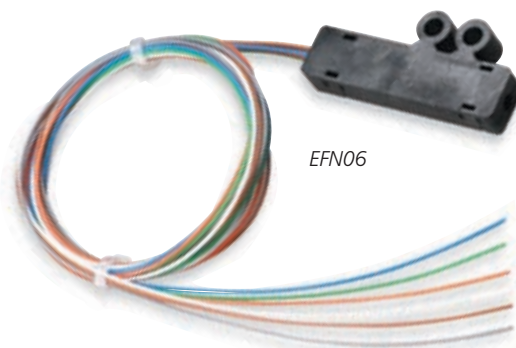
OS1 Single-Mode, 3-m (9.8-ft.)

6 Strand	
LC	FOPT50S1-LC-6YL-3
ST	FOPT50S1-ST-6YL-3
SC	FOPT50S1-SC-6YL-3
12 Strand	
LC	FOPT50S1-LC-12YL-3
ST	FOPT50S1-ST-12YL-3
SC	FOPT50S1-SC-12YL-3

Prepare 6- or 12-fiber loose-tube cables for field termination.

Fan-Out Kits

- Color-coded fan-out tubing makes it easy to keep track of your connections.
- Snap-together unit— no need for epoxy.
- Can be screwed to a wall or bolted to your hardware for extra stability.
- **Standard Warranty** — Lifetime



EFN06

The Black Box® Fan-Out Kit is specifically designed to enable you to terminate fiber loose-tube cables.

Loose-tube distribution cable protects each strand of fiber in its own buffer sheath. Although the buffers are ideal for protecting each strand of fiber in multifiber cables, they're too narrow to terminate with standard fiber optic connectors.

The Fan-Out Kit solves that problem. Just strip the buffer sheath off the cable and thread each

strand through the fan-out assembly. You don't need any more space than you would for any other cable termination or any additional hardware. And because the fan-out assembly snaps together, you don't even need epoxy!

The fan-out is color-coded to match your fiber cable's color scheme and it's available in lengths of 25 or 36 inches (63.5 or 91.4 cm) for 6- or 12-fiber cables.

NOTE: For indoor use only.

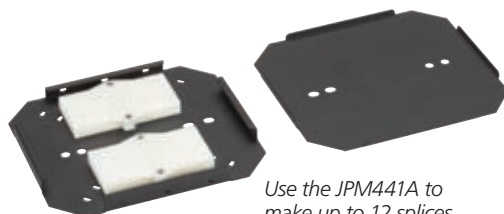
Fan-Out Kits

6-Fiber Buffer Tube		
25-in.	(63.5-cm)	EFN06-24
36-in.	(91.4-cm)	EFN06-36
12-Fiber Buffer Tube		
25-in.	(63.5-cm)	EFN12-24
36-in.	(91.4-cm)	EFN12-36

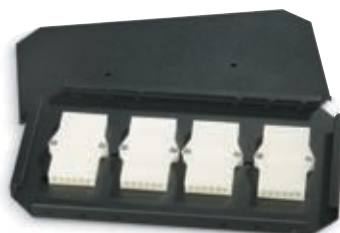
For specs, go to blackbox.com.

The practical accessories for your fiber enclosures.

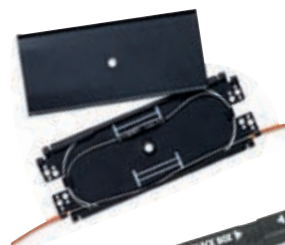
Splice Trays



Use the JPM441A to make up to 12 splices.



Use the JPM440A to make up to 24 splices.



The Mechanical 6-Splice Tray (WP602) protects and organizes your cables.

No-Adhesive Mechanical Splice (FO030)

Splice Trays

- Make splices on up to 12 or 24 strands of single-mode or multimode fiber optic cable.
- The Splice Trays mount inside fiber enclosures and come with a lid to protect your splices.
- The JPM440A works with the following fiber enclosures:
 JPM401A-R2 JPM407A-R2
 JPM402A-R2 JPM418A
 JPM403A-R2 JPM4000A-R2
 JPM406A-R2
- The JPM441A works with all of the above enclosures, plus the JPM4001A.

Mechanical Splice and Tray

- Use the FO030 for fast, twist-action multi-mode or single-mode splices on up to six cables.
- Insert a stripped and cleaved fiber cable into each end of the splice and twist. A cam locks the fibers into position for accurate alignment.
- Make quick, clean, no-adhesive splices.
- Works with 250- or 900- μ m cladding.
- Use the WP602 to protect and organize up to six splices.

- **Standard Warranty** — All: Lifetime

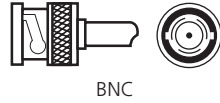
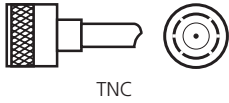
Splice Trays

12-Strand	JPM441A
24-Strand	JPM440A
Mechanical Splice and Tray	
No-Adhesive Mechanical Splice, 6-Pack	
	FO030
Mechanical 6-Splice Tray	
	WP602

For specs, go to blackbox.com.

Connector Guide

Coax & Twinax Connectors



DIN-Type Connectors



4-Pin Mini DIN (Female)



5-Pin DIN (Female)



6-Pin Mini DIN (Female)



8-Pin Mini DIN (Female)

Centronics Connectors



Centronics® 36 (Male) (Telco 36)



Centronics 50 (Male)



MDR 36 (Male) (IEEE 1284)

SCSI Connectors



Telco or Centronics 50 (SCSI-1 Male)



Mini D 50 or Micro DB50 (SCSI-2 Male)



Micro D 68 (SCSI-3 Male)



DB50 (SCSI-1, Sun® Male)



Micro D 50 M Thumbscrew (HP® Male)



Burndy 68 (IBM® Male)



Burndy 60 (IBM Male)



VHDCI 68 (0.8-mm Champ-Style Male)

M-Block Connectors



M/34 (V.35)

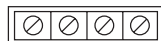


M/50 (Winchester®)

Miscellaneous Connectors



IEEE 488



Terminal Block



Current Loop



SDL



IEC

Need help identifying a connector? Call Tech Support or go to blackbox.com.



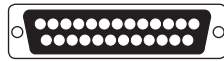
D-Style Connectors



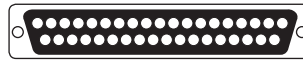
DB9



DB15



DB25



DB37



DB50

Keyboard/Video/Audio



S-Video



BNC



RCA Jack



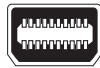
HD15



HD15 Video (Pin 9 Keying)



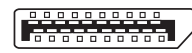
HDMI Micro



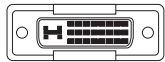
Mini Display Port



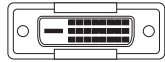
HDMI



Display Port



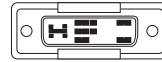
DVI-I, Dual Link



DVI-D, Dual Link



DVI-D, Single-Link



DVI-A



DVI-I, Single-Link

Fiber Connectors



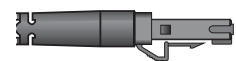
ST®



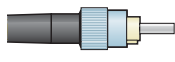
SC



LC



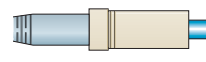
MT-RJ



FC



MPO



MU

USB & FireWire Connectors



USB 1.0/2.0 Type A (Host)



USB 1.0/2.0 Type Mini A



USB 3.0 Type A (Host)



USB 3.0 Type Micro B (Device)



FireWire, 9-Pin



USB 1.0/2.0 Type B (Device)



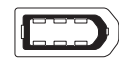
USB 1.0/2.0 Type Mini B



USB 3.0 Type B (Device)

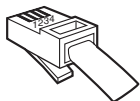


FireWire®, 4-Pin

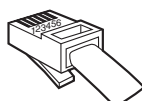


FireWire, 6-Pin

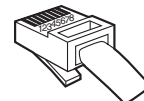
Modular Connectors



RJ-11 4-Wire Plug



RJ-12 6-Wire Plug



RJ-45 8-Wire Plug



RJ-11 Jack



RJ-12 Jack



RJ-45 Jack

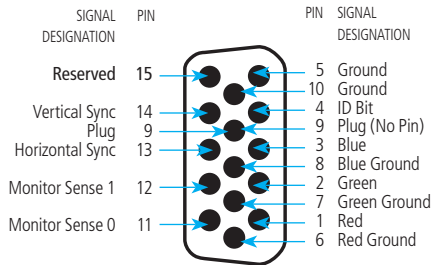


MMJ

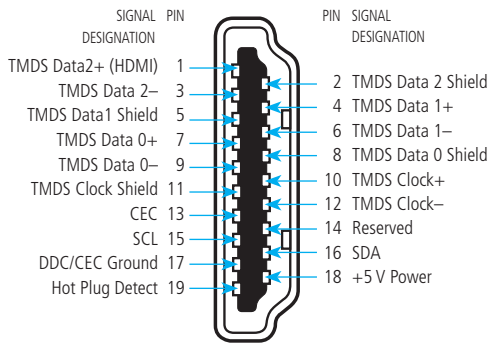
Interface Pinouts

Video Interface Pinouts

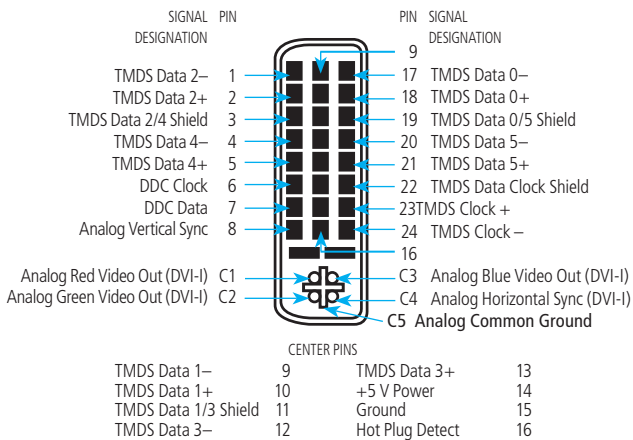
VGA interface



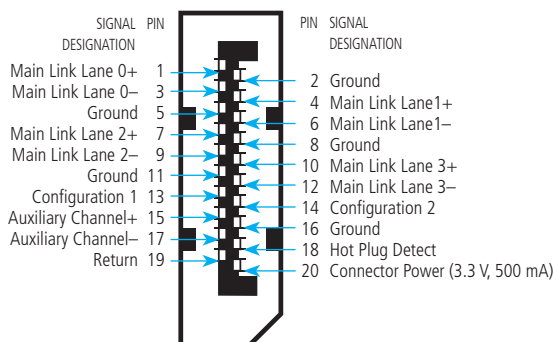
HDMI interface



DVI interface

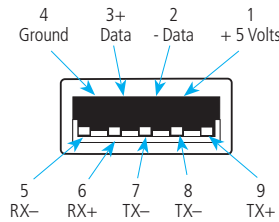


DisplayPort interface (1.1a)

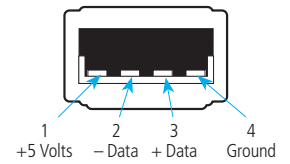


USB Interface Pinouts

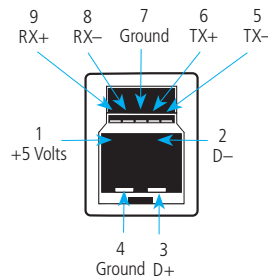
USB 3.0 Type A



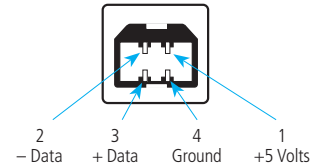
USB 1.1 & 2.0 Type A



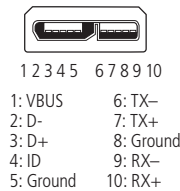
USB 3.0 Type B



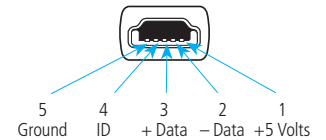
USB 1.1 & 2.0 Type B



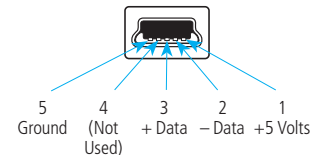
USB 3.0 Mini B



USB 1.1 & 2.0 Mini Type A

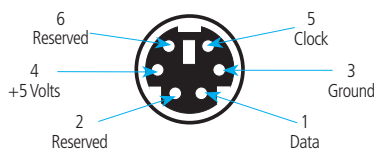


USB 1.1 & 2.0 Mini Type B

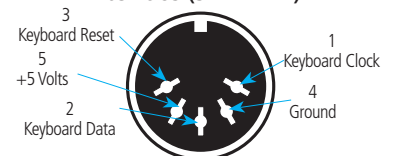


IBM Interface Pinouts

IBM PS/2® Keyboard Interface (6-Pin Mini DIN)



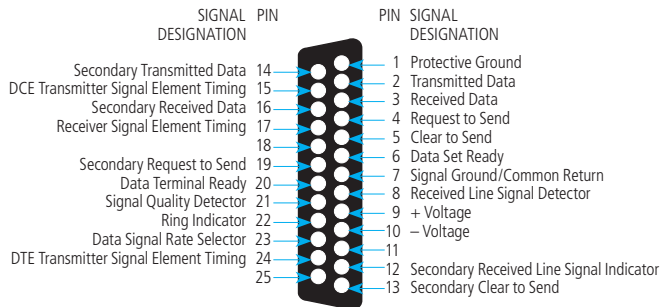
IBM® PC Keyboard Interface (5-Pin DIN)



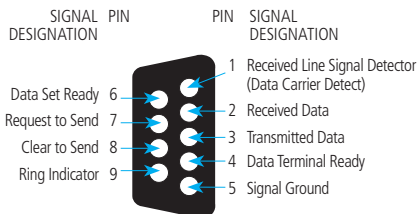
Interface Pinouts

Data Interface Pinouts

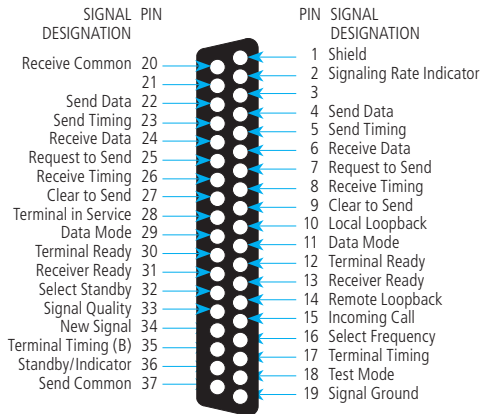
RS-232 Interface (DB25)



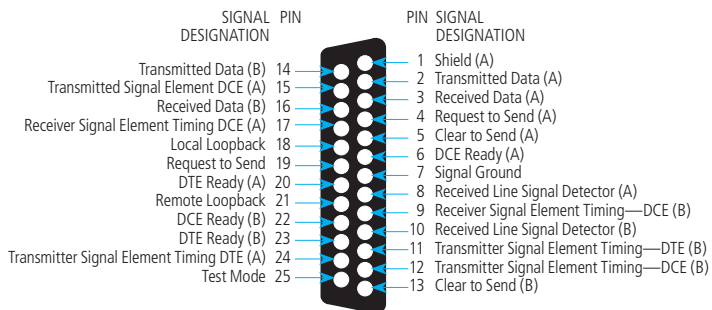
RS-232 Interface (DB9)



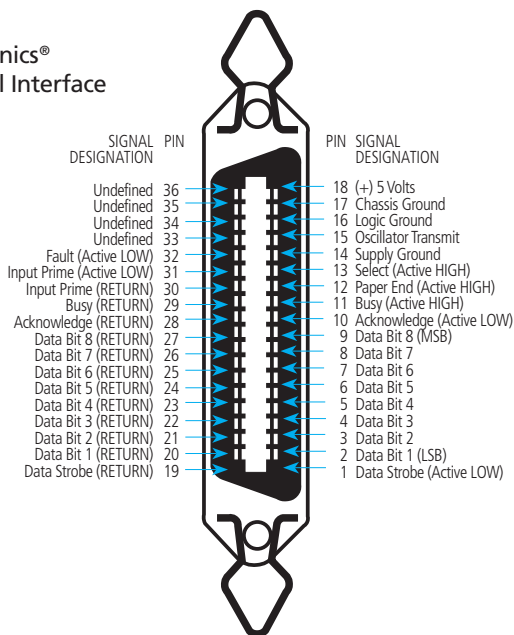
RS-449 Interface (DB37)



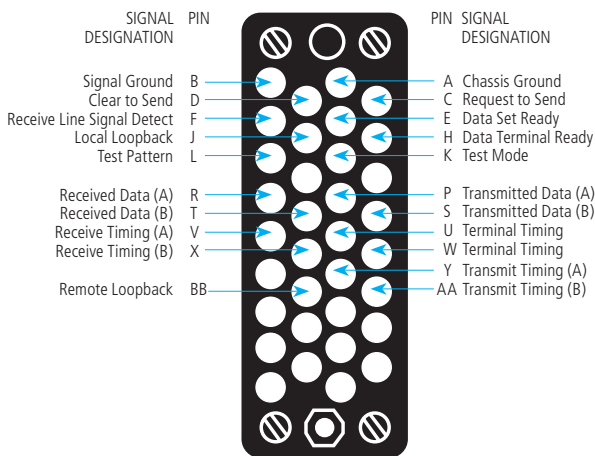
RS-530 Interface (DB25)



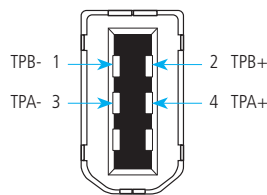
Centronics® Parallel Interface

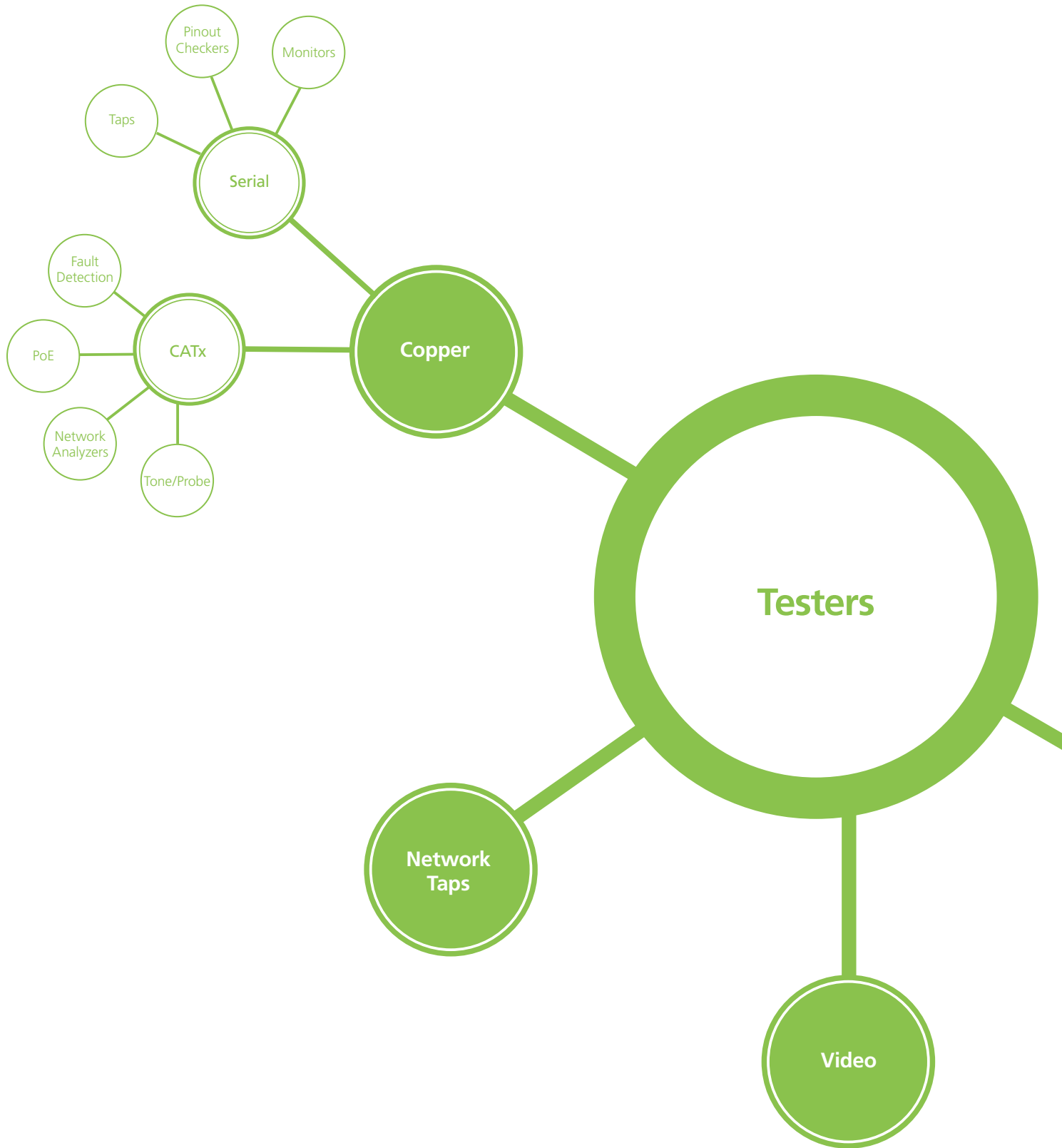


V.35 Interface (M/34)



1394 (FireWire®) 4-Wire Interface





Testers & Tools

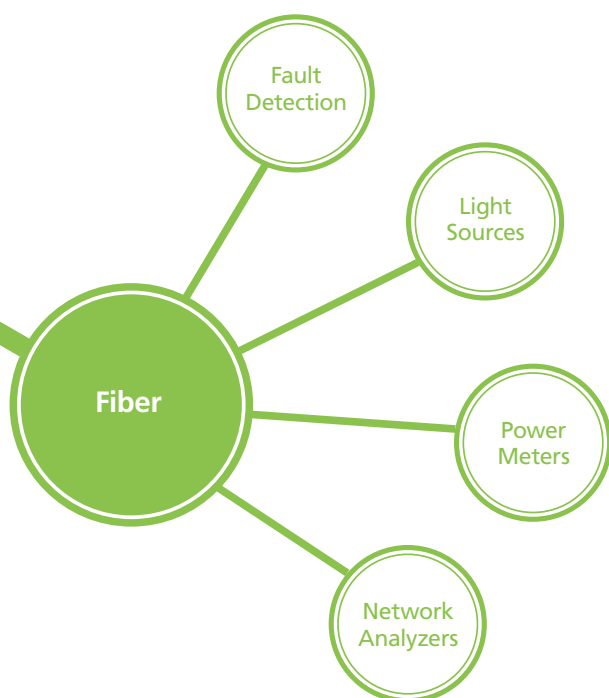
Solutions for every application.

Whether you need to maintain a small office or a large enterprise, Black Box has the professional testing solutions for you. With the latest products, a great selection, and free, tech support, we're your go-to source.

We can customize a tool kit to fit your needs, help you choose the right tester for your application, and then help you use it most effectively.

Plus, the Resources section at blackbox.com has videos, data sheets, and white papers so you can get the most from your testers and tools.

And when you're out in the field, no need to muddle through a manual—just call us!



Working with Fiber

Fiber's ability to carry light signals, with very low losses, is based on some fundamental physics associated with the refraction and reflection of light. Whenever a ray of light passes from one transparent medium to another, the light is affected by the interface between the two materials. This occurs because of the difference in speeds that the light can travel through different materials. Each material can be described in terms of its refractive index, which is the ratio of the speed of light in the material to its speed in free space. The relationship between these two refractive indices determines the critical angle of the interface between the two materials.

Three things can happen when a ray of light hits an interface. Each depends on the angle of incidence of the ray of light with the interface. If the angle of incidence is less than the critical angle, the light ray will refract, bending toward the material with the higher refractive index. If the angle of incidence is exactly equal to the critical angles, the ray of light will travel along the surface of the interface. If the angle of incidence is greater than the critical angle, the ray of light will reflect.

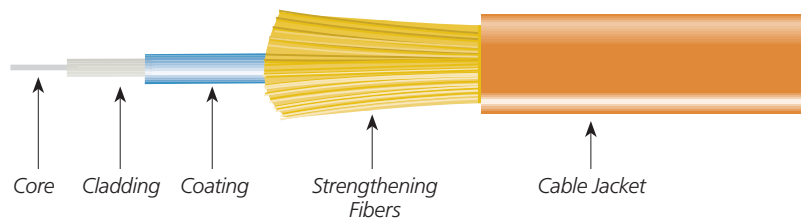
The refractive index of a vacuum is considered to be 1. Often, we consider the refractive index of air also to be 1 (although it is actually slightly higher). The refractive index of water is typically about 1.33. Glass, which is used in fiber cabling, has a refractive index in the range of 1.5, a value that can be manipulated by controlling the composition of the glass itself.

Fiber Optic Characteristics

Optical fibers allow data signals to propagate through them by ensuring that the light signal enters the fiber at an angle greater than the critical angle of the interface between two types of glass. The center core is composed of very pure glass with a refractive index of 1.5. Core dimensions are usually in the range of 8 to 62.5 μm . The surrounding glass, called cladding, is a slightly less pure glass with a refractive index of 1.45. The diameter of the core and cladding together is in the range of 125 to 440 μm . Surrounding the cladding is a coating, strengthening fibers, and a jacket.

When light is introduced into the end of an optical fiber, any ray of light that hits the end of the fiber at an angle greater than the critical angle will propagate through the fiber. Each time it hits the interface between the core and the cladding it is reflected back into the fiber. The angle of acceptance for the fiber is determined by the critical angle of the interface. If this angle is rotated, a cone is generated. Any light falling on the end of the fiber within this cone of acceptance will travel through the fiber. Once the light is inside the fiber, it "bounces" through the core, reflecting inward each time it hits the interface.

The illustration below depicts how light rays travel through the fiber, reflecting off the interface. If the physical dimensions of the core are relatively large, individual rays of light will enter at slightly different angles and will reflect at different angles. Because they travel different paths through the fiber, the distance they travel also varies. As a result, they arrive at the receiver



at different times. A pulse signal sent through the fiber will emerge wider than it was sent, deteriorating the quality of the signal. This is called modal dispersion.

Another effect that causes deterioration of the signal is chromatic dispersion. Chromatic dispersion is caused by light rays of different wavelengths traveling at different speeds through the fiber. When a series of pulses is sent through the fiber, modal and chromatic dispersion can eventually cause the pulse to merge into one long pulse and the data signal is lost.

Another characteristic of optical fiber is attenuation. Although the glass used in the core of optical fiber is extremely pure, it is not perfect. As a result, light can be absorbed within the cable. Other signal losses include bending and scattering losses as well as losses from poor connections. Connection losses can be caused by misalignment of the ends of the fiber or end surfaces that are not properly polished.

The Ferrules: Ceramic or Composite?

As a general rule, use ceramic ferrules for critical network connections such as backbone cables or for connections that will be moved frequently, like those in wiring closets. Ceramic ferrules are more precisely molded and fit closer to the fiber, which gives the fiber optic cables a lower optical loss.

Use composite ferrules for connections that are less critical to the network's overall operation and less frequently moved. Like their ceramic counterparts, composite ferrules are characterized by low loss, good quality, and a long life. However, they are not as precisely molded and slightly easier to damage, so they aren't as well-suited for critical connections.

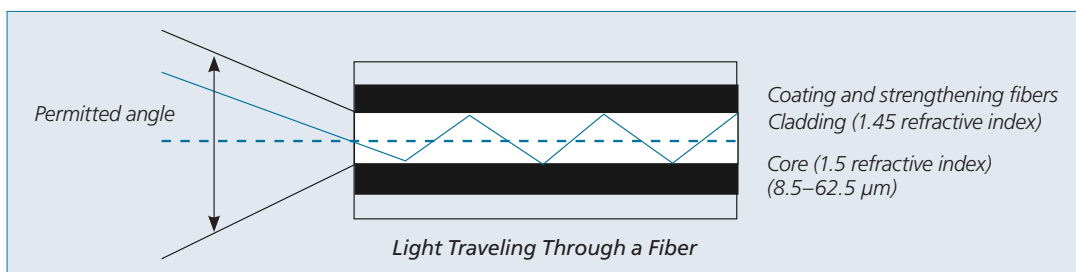
Signal Sources and Detectors

To use fiber optic cables for communications, electrical signals must be converted to light, transmitted, received, and converted back from light to electrical signals. This requires optical sources and detectors that can operate at the data rates of the communications system.

There are two main categories of optical signal sources—light emitting diodes and infrared laser diodes.

Light emitting diodes (LEDs) are the lower-cost, lower-performance source. They're used in applications where lower data rates and/or shorter distances are acceptable. Infrared laser diodes operate at much higher speeds, dissipate higher power levels, and require temperature compensation or control to maintain specified performance levels. They are also more costly.

Signal detectors also fall into two main categories—PIN photodiodes and avalanche photodiodes.



Similar to sources, the two types provide much different cost/performance ratios. PIN photodiodes are more commonly used, especially in less stringent applications. Avalanche photodiodes, on the other hand, are very sensitive and can be used where longer distances and higher data rates are involved.

Slicing and Terminating Optical Fibers

In practical situations, fiber optic cables exhibit signal power losses based on both the fiber and connections from the fiber to sensors or other fiber segments. Typically fiber losses run at about 10 decibels (dB) per kilometer.

Whenever a fiber must be terminated, the goal is to produce a perfectly transparent end to the fiber. The end-face should be square, clear, and physically mated to the receiving optical device. In some cases, cables are permanently joined by splicing or gluing the ends of the fiber together. Others mechanically align the fibers and use a transparent gel to couple the ends of the fiber together.

Early fiber optic connections involved cutting the fiber, epoxying a special connector, and polishing the end of the fiber. This operation required special tools and testing equipment to ensure a good connection. While this technique is still used, devices used to cleave, align, and join fibers have been improved and simplified. Connection losses vary, depending on the type of connection, but typically range from 0.2 to 1 dB.

Planning a Fiber Optic Link

The most important consideration in planning a fiber optic link is the power budget specification of the devices being connected. This value tells you the amount of loss in dB that can be present in the link between the two devices before the units fail to perform properly. This value will include inline attenuation as well as connector loss.

Fiber attenuators are used with single-mode fiber optic devices and cable to filter the strength of the fiber optic signal. Depending on the type of attenuator attached to the devices at each end of the fiber optic cable, you can diminish the strength of the light signal a variable amount, measured in decibels (dB).

Why would you want to filter the strength of the fiber optic signal? Single-mode fiber is designed to carry a fiber optic signal long distances—as much as 70 kilometers (or 43.4 miles). Fiber devices send this signal with great force to ensure that the signal, and your data, arrive at the other end intact.

But when two fiber devices connected with single-mode fiber cable are close to each other, the signal may be too strong. As a result, the light signal reflects back down the fiber cable. Data can be corrupted and transmissions can be faulty. A signal that is too strong can even damage the attached equipment.

Because it's probably not feasible to move your fiber equipment farther apart, the easiest solution is to attach an attenuator to each fiber device. Just as sunglasses filter the strength of sunlight, attenuators filter the strength of the light signal transmitted along single-mode fiber cable. Within the attenuator, there's doping that reduces the strength of the signal passing through the fiber connection and minute air gaps where the two fibers meet. Fiber grooves may also be intentionally misaligned by several microns—but only enough to slow the fiber optic signal to an acceptable rate as it travels down the cable.

Before selecting an attenuator, you need to check the type of adapter on your fiber devices. Attenuators typically fit into any patch panel equipped with FC, SC, or LC adapters that contain either PC or APC contacts. In addition to the type of adapter, you also need to determine the necessary attenuation

value, such as 5 or 10 dB. This value varies, depending on the strength of fiber optic signal desired.

Testing and Certifying

If you're accustomed to certifying copper cable, you'll be pleasantly surprised at how easy it is to certify fiber optic cable because it's immune to electrical interference. You only need to check a few measurements.

Attenuation (or decibel loss)—Measured in decibels/kilometer (dB/km), this is the decrease of signal strength as it travels through the fiber cable. Generally, attenuation problems are more common on multimode fiber optic cables.

Return loss—This is the amount of light reflected from the far end of the cable back to the source. The lower the number, the better. For example, a reading of -60 decibels is better than -20 decibels. Like attenuation, return loss is usually greater with multimode cable.

Graded refractive index—This measures how the light is sent down the fiber. This is commonly measured at wavelengths of 850 and 1300 nanometers. Compared to other operating frequencies, these two ranges yield the lowest intrinsic power loss. (NOTE: This is valid for multimode fiber only.)

Propagation delay—This is the time it takes a signal to travel from one point to another over a transmission channel.

Optical time-domain reflectometry (OTDR)—This enables you to isolate cable faults by transmitting high-frequency pulses onto a cable and examining their reflections along the cable. With OTDR, you can also determine the length of a fiber optic cable because the OTDR value includes the distance the optic signal travels.

There are many fiber optic testers on the market today. Basic fiber optic testers function by shining a light down one end of the cable. At the other end, there's a receiver calibrated to the strength of the light source. With this test, you can measure how much light is going to the other end of the cable. Generally these testers give you the results in dB lost, which you then compare to the loss budget. If the measured loss is less than the number calculated by your loss budget, your installation is good.

Newer fiber optic testers have a broader range of capabilities. They can test both 850- and 1300-nanometer signals at the same time and can check your cable for compliance with specific standards.

Precautions to Take When Using Fiber

A few properties particular to fiber optic cable can cause problems if you aren't careful during installation:

Intrinsic power loss—As the optic signal travels through the fiber core, the signal inevitably loses some speed through absorption, reflection, and scattering. This problem is easy to manage by making sure your splices are good and your connections are clean.

Microbending—Microbends are minute deviations in fiber caused by excessive bends, pinches, and kinks. Using cable with reinforcing fibers and other special manufacturing techniques minimizes this problem.

Connector loss—Connector loss occurs when two fiber segments are misaligned. This problem is commonly caused by poor splicing. Scratches and dirt introduced during the splicing process can also cause connector loss.

Coupling loss—Similar to connector loss, coupling loss results in reduced signal power and is from poorly terminated connector couplings. Remember to be careful and use common sense when installing fiber cable. Use clean components. Keep dirt and dust to a minimum. Don't pull the cable excessively or bend it too sharply around corners.

Advanced Gigabit network and copper and fiber testers provide expert help at an affordable price.

LanScopePro Copper Fiber Network Analyzers

- Analyze and troubleshoot networks from the cabling to the packet.
- Quickly change interface modules to instantly connect to single-mode, multimode, and bidirectional fiber with data rates up to 1.25 Gbps, as well as 10/100/1000BASE-T devices.
- Enables LAN installers, technicians, managers, and service providers to quickly maintain and optimize 10/100/1000BASE-T networks with a single tester.
- **Standard Warranty — 1 Year**



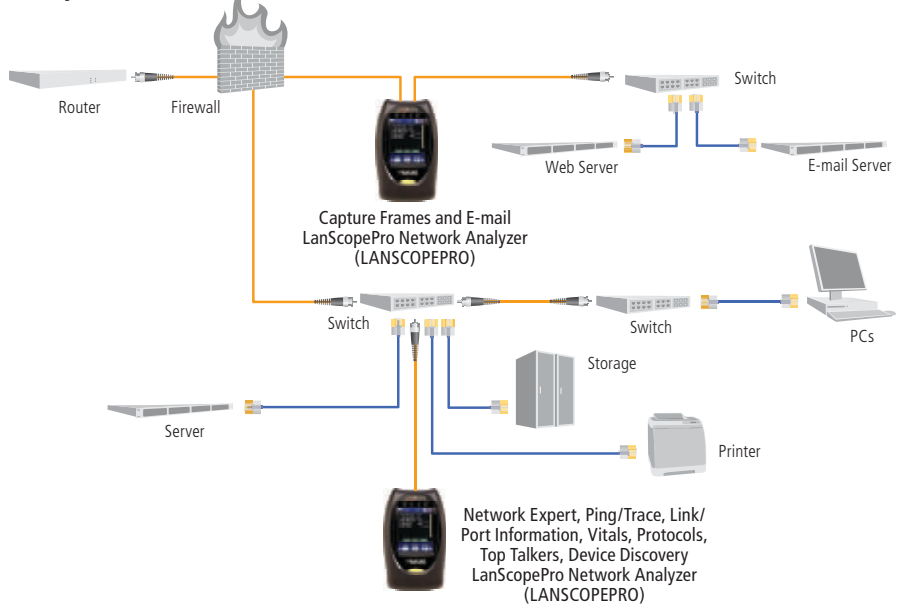
Make the LanScopePro Copper Fiber Network Analyzer an essential part of your tool kit. Use it for installing, monitoring, maintaining, upgrading, and troubleshooting any network. With this one tool, you have one of the most complete suites of testing and analysis functions available at a very affordable price.

Use the Inline mode to non-intrusively monitor network traffic (10/100/1000BASE-T) to identify protocols, port usage, VoIP statistics, and network utilization. The LanScopePro can capture and store up to 10,000 packets with user-defined filters for detailed analysis in the field. Or download test results over the network or to a flash drive.

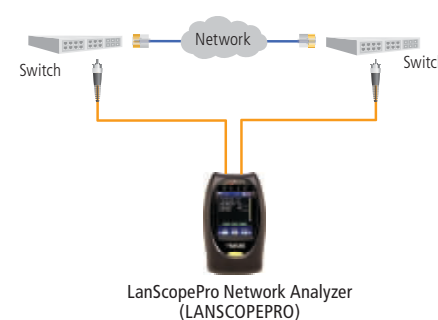
The analyzer features two RJ-45 ports, which you can use for tests such as PING, Link, Trace, DHCP, and Discovery to quickly identify network problems. The LanScopePro can also generate up to 100% traffic loading with control of packet rate and size to demonstrate network performance at various traffic levels.

You can perform a stress test that generates traffic and measures performance in accordance with RFC 2544. Run the test using the two independent ports on a single unit or run it with a second unit located remotely on the network.

Analyze Network



Network Stress Test



LanScope Pro Network Analyzers

Multimode	LANSCOPEPRO-MM
Single-Mode	LANSCOPEPRO-SM

You may also need:

LanScopePro SFPs 10/100/1000BASE-T RJ-45 [LSPGIG](#)

Multimode, 1.25 Gbps 100BASE-FX, 1310-nm, 2 km [LSPMM1310](#)

100BASE-FX, 850-nm, 550 m [LSPMM850](#)

Single-Mode, 1.25 Gbps, 1310-nm, 20 km [LSPSM1310](#)

For full features and specs, go to blackbox.com.

Point and shoot to detect leaks in your network.

F3X Fiber Fault Finder Gun

- Just point and shoot to identify fiber, plus detect leaks, breaks, bad splices, bends, and connector loss in fiber cable up to 300 kilometers away.
- Pinpoint faults to within inches.
- Use in premise and outdoor applications—even in bright daylight.
- Identify aerial breaks and leaks from the ground.
- Locate signals through bulkheads, patch panels, even dust caps.
- See faults and breaks in dark blue, green, and black coated fibers.
- Works where VFLs do not, even in OTDR dead zones.
- Gives an audio/visual fault indication.
- **Standard Warranty — 1 Year**

Suspect your fiber network is compromised? Do some fiber espionage with the F3X Fiber Fault Finder Gun. Use this infrared light detection probe to gather the intelligence you need to ID leaks, breaks, bends, and faults in your fiber network.

You'll save hours of your time in trouble-shooting and hours in network downtime, saving your organization tens of thousands of dollars in lost productivity. With this patent-pending technology, you'll be able to pinpoint faults in your fiber network to within inches.

Point and shoot.

To find leaks, just point your F3X at a fiber cable run and squeeze the trigger. Then sweep it over the fiber. Get ready to be amazed. The F3X can actually see light emanating from any faults, breaks, and bends in the cable. It works in bright daylight, too, eliminating the need to turn off the lights or wait until nightfall to work on outdoor cable.

In the closet, you'll be able to uncover hard-to-find light loss points in connectors mated in bulkhead adapters, patch panels, boots, fanouts, even some dust caps.

With the F3X Fiber Fault Finder Gun, you'll find problems that you previously were unable to diagnose with traditional methods. It offers far more functionality than a visible laser light source. Plus you can use it in OTDR dead zones and in splice enclosures where it's critical to pinpoint the exact location of faults. Once the gun detects a light loss point, it gives you an audio/visual fault indication.

The F3X is great for troubleshooting all fiber networks. But it's particularly beneficial for mission-critical and secure fiber networks, such as in government, military, education, healthcare, finance, etc.

Highly sensitive to signals.

The F3X is so sensitive, it will pick up light signals other fault finders can't—saving you a bundle of time. Use it to pinpoint faults through most jacket types and buffer colors. It will even

The F3X Fiber Fault Finder Gun is all you need to find leaks in fiber cable up to 300 kilometers away. F3X shown with High-Power Light Source (F3XLS2) and Aerial Filter and Scope (F3XAFS).



Outfit your F3X Fiber Fault Finder Gun with an Aerial Filter and Scope, and all you need to do to detect leaks in overhead fiber is point and shoot.

uncover leaks in fibers with dark blue, green, and black buffer coatings.

The F3X can also identify damaged splices through the splice jacket. And it can pick up signals from bends several times more gentle than those induced by many fiber identifiers.

The F3X can also help you locate inefficient and poorly mated connectors, bad splices, and much, much more.

F3X Fiber Fault Finder Gun

F3X

- ◆ Includes (1) F3X fiber optic leak detector pistol probe, (1) hard carrying case, (1) 9-V battery, and (1) user's manual.



Call. Click. Chat. Connect.

Discover many more applications, watch the video, and read the case study at www.blackbox.com/go/F3X



The F3X is so sensitive and versatile you can use it in bright daylight to detect faults. No need to wait until dark or to block out ambient light.

Many more applications.

To learn more about the F3X, visit blackbox.com/go/F3X.

F3X Light Sources

Medium-Power Laser	F3XLS1
High-Power Laser	F3XLS2

Filters

1280 nm–1680 nm	F3XFSTD
1310 nm	F3XF-1310NM
1490 nm	F3XF-1490NM
1550 nm	F3XF-1550NM

Aerial Filter and Scope

[F3XAFS](#)

F3X Fiber Fault Finder Kits

Includes F3XLS1	F3XKIT1
Includes F3XLS2	F3XKIT2
Includes F3XLS1 and F3XAFS	

[F3XKIT1SCOPE](#)

Includes F3XLS2 and F3XAFS

[F3XKIT2SCOPE](#)

For full features and specs, go to blackbox.com.

Everything you need for advance field testing of fiber.

Deluxe Fiber Optic Test Kits

- Choose the kit you need: Single-Mode, Multimode, or Single-Mode/Multimode.
- All kits include Light Source, Power Meter, Scope, and case.
- **Standard Warranty** — 2 Years
- **Extended Warranty** — Add 1 or 3 Years



Deluxe Fiber Optic Test Kits

Single-Mode	FODTK-SM
Multimode	FODTK-MM
SM/MM	FODTK-SMMM

For full features and specs, go to [blackbox.com](#).

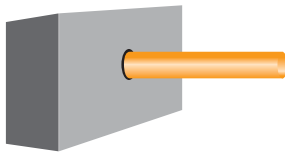
Deluxe Fiber Optic Test Kits

with Visual Fault Locators

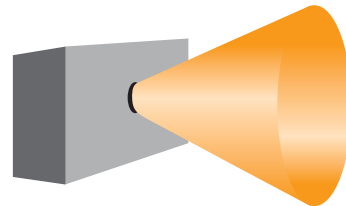
Single-Mode	FODTK-SM-VFL
Multimode	FODTK-MM-VFL
SM/MM	FODTK-SMMM-VFL

For full features and specs, go to [blackbox.com](#).

Fiber Light Sources



Laser light sources have a tight, focused light pattern.



LED light sources have a wide output pattern.

After every fiber optic cable installation or repair, you need to test for continuity and end-to-end loss. You may also need to troubleshoot installed fiber that's not performing up to expectations.

To check fiber, you need to test it with a light source and a power meter, then compare your results with an estimate of what a reasonable loss for that cable or link is. This estimate is called a loss budget and is calculated using typical losses expected for each part of the cable: the fiber itself, connectors, and splices, if any. If the measured loss exceeds the loss budget by a significant amount, there is a problem with the cable, most often at the connectors or a splice rather than with the cable itself.

A fiber light source is used to inject light into a fiber optic cable for the purpose of testing it. They come in two basic varieties: light emitting diodes (LEDs) and laser diodes. They're further differentiated by the wavelength they produce and the type of cable they test.

LEDs are low cost, slower speed, easy to use, multimode-only, and have a wide output pattern. Because LEDs produce a less concentrated light than lasers and have a much lower power output than lasers, they're difficult to couple into fibers, limiting them to multimode fibers. LEDs have less bandwidth than lasers and can achieve a maximum throughput of 1 Gbps.

Laser diodes are higher cost and faster speed, allow single-mode or multimode, and have a narrow output pattern. Lasers can achieve throughput up to and beyond 10 Gbps.

The three kinds of lasers in use for fiber optic transmission are Fabry-Perot lasers, distributed feedback (DFB) lasers, and vertical cavity surface-emitting lasers (VCSELs). Fabry-Perot lasers are the most versatile, operating over both multimode and single-mode cable. DFB lasers are used for very long-distance applications over single-mode fiber. VCSELs can carry very high speeds. They're usually used only for multimode fiber, although they can also support 1310 single-mode fiber.

Because the light source used for testing should work with the fiber being tested, as well as the power meter, it's important to read the light source's specifications to ensure that it works with the cable you have (multimode or single-mode) and the wavelength you're using.

Although fiber optic light sources are usually too low in power to cause much eye damage, some high-powered sources can cause retina damage and blind spots. Never look directly into a light source or into the end of a fiber cable unless you're sure it's dark. Always check fiber with a power meter or traffic identifier before looking into it.

Choose your power level: from basic for occasional testing, all the way up to a combo meter/light source for advanced field testing.

Power Meters



Basic Optical Power Meter

- Use to identify optical fiber strands, measure optical attenuation, verify continuity, and test transmission quality.
- Works at six wavelengths.

Deluxe Optical Power Meter

- Get all the features of the Basic model, plus:
- Auto wavelength recognition automatically uses the proper calibration parameters and decreases the potential for errors.
- Ideal for testing transmission quality in LANs,

WANs, telecommunications networks, and other long-distance applications.

Deluxe Optical Power Meter with Memory

- Get all the features of the Deluxe model, plus:
- Boasts a data storage capacity of 999 items.
- Transfer data to a PC via a USB connection.
- With the included software, data can be saved as an Excel® file or plain text.
- FOPM-100, FOPM-200, and FOPM-210 work with our fiber Light Sources (below).

- **Standard Warranty** — All: 2 Years
- **Extended Warranty** — Add 1 or 3 Years

Optical Power Meters

Basic	FOPM-100
Deluxe	FOPM-200
with Memory	FOPM-210
with Memory and Light Source	FOMM-200

For full features and specs, go to blackbox.com.

Choose the right light for you: basic for occasional testing, deluxe for advanced field testing.

Light Sources



Basic Light Sources

- Operate in continuous wave (CW) or modulated mode.
- Choose from three output frequencies.
- A single-output connector provides stable power at dual wavelengths.
- Include a FC/PC interchangeable connector.
- Work with our Basic Fiber Optic Power Meter (above) to measure optical loss.

Deluxe Light Sources

- Auto wavelength recognition automatically uses the proper calibration parameters.
- Adjust the output power up and down in 0.1 dB increments from -2 to -8 dBm, reducing errors and communication time between two techs.
- **Standard Warranty** — All: 2 Years
- **Extended Warranty** — Add 1 or 3 Years

Light Sources

Basic Light Sources	
Single-Mode	FOLS-SM-100
Multimode	FOLS-MM-100
Deluxe Light Sources	
Single-Mode	FOLS-SM-200
Multimode	FOLS-MM-200

For full features and specs, go to blackbox.com.

An essential tool for inspecting fiber optic terminations.

By Monty Wilsher, Product Engineer

Visual Inspection Probes

A visual inspection probe, an essential tool for people working with optical components or systems, is a portable video microscope used to inspect fiber optic terminations for cleanliness or damage. It can also be used to check hard-to-reach connectors that are installed on the back of patch panels or inside hardware devices, saving you the need to access the back side of the panels or to disassemble hardware devices before

inspecting fiber optic terminations. The probe is inserted through the bulkhead adapters.

Visual inspection probes enable you to inspect connector endfaces for debris or damage, the leading causes of transmission failure, prior to mating them.

For example, the 400x power probe and 3.5-inch display of the Visual Inspection Probe (**below**) make it easy to view small particles

that may exist on connectors. Using adapter tips, you can inspect patch cords, pigtails, and cable assemblies as well.

A visual inspection probe provides a fast and effective way to install, troubleshoot, or maintain fiber optic patch panels.

Dig up the dirt on your endfaces.

Visual Inspection Probe

- Inspect connector endfaces for debris, the leading cause of transmission failure.
- 400x power probe and 3.5" screen make it easy to spot particles, cracks, and chips.
- Probe tips (included) enable you to check the quality of both the cable and bulkhead connectors.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



The 400x power probe and 3.5-inch display of the Visual Inspection Probe make it easy to view small particles that may exist on your connectors. Use the included probe tips to check the quality of both the cable and bulkhead connectors.



Visual Inspection Probe

FOVIS400

For full features and specs, go to blackbox.com.

Avoid the #1 cause of transmission failure with this powerful tool.

Fiber Inspection Scope

- Enables you to inspect your fiber connectors every time you reconnect so that you can avoid contamination — the primary cause of transmission failure.
- Uses 400x magnification and white LED light to provide coaxial illumination of connector endfaces.
- Durable design.
- Features high-quality glass optics.
- Ergonomic design for comfortable operation and safety filter for eye protection.
- **Standard Warranty** — 3 Years
- **Extended Warranty** — Add 1 or 3 Years



Industry reports show contamination is the primary cause of transmission failure. The Fiber Inspection Scope helps you avoid contamination by ensuring your fiber end-faces are clean.

Fiber Inspection Scope

FOIS400

For full features and specs, go to blackbox.com.

Isolates light leaks or breaks in single- or multimode fiber optic cable.

Visual Fault Locator for Fiber

- Tests longer distances with three output levels: 0 dBm, +3 dBm, and +8 dBm.
- Features a 650-nm wavelength and a switch-selectable CW/2-Hz modulated frequency.
- Includes an FC/PC connector. SC/PC and ST/PC interchangeable connectors are available.
- Identify fiber breaks, tight bends, bad connectors, and poor splices.
- Verify continuity.
- Finds faults in the dead zone of an OTDR.

- **Standard Warranty** — 2 Years
- **Extended Warranty** — Add 1 or 3 Years

Use the Visual Fault Locator for Fiber to determine if the problem is a leak, a break, bad connectors, or poor splices in your fiber optic network. You'll be able to locate sharp bends and breaks in jacketed or bare fiber connections in patch panels and fanouts.



Visual Fault Locator for Fiber

FOVFL

For full features and specs, go to blackbox.com.

Safely repair a problem fiber without disrupting live fibers.

Live Traffic Identifier

- Identifies bad connectors and splice points.
- For single-mode and multimode fiber.
- Detects low frequency tones at 270 Hz, 1 kHz, and 2 kHz.
- Includes three field-interchangeable adapter heads to accommodate 900- μ m buffered fiber, ribbon or 250- μ m coated fiber, and 3-mm jacketed fiber.
- **Standard Warranty** — 2 Years
- **Extended Warranty** — Add 1 or 3 Years



Live Traffic Identifier

FOLTI

◆ Includes (1) fiber optic probe; (3) adapter heads for jacketed, coated, and ribbon fiber; (1) carrying case. For full features and specs, go to blackbox.com.

Identify faults and leaks in fiber cable.

Visual Light Source Pen for Fiber

- Isolates light leaks or breaks in single- or multimode fiber optic cable.
- Identifies bad connectors and poor splices.
- Works with jacketed and bare fiber.
- Finds faults in the dead zone of an OTDR.
- Features a 650-nm wavelength and a 2-Hz modulated frequency.
- Includes a universal SC/ST®/FC connector.
- Provides 1 mW/0 dBm of output power.
- **Standard Warranty** — 2 Years
- **Extended Warranty** — Add 1 or 3 Years



Having trouble with data getting garbled over your fiber optic network? Not sure if the problem is equipment or cable? Start troubleshooting with the Visual Light Source. This compact, pen-style light source is a must-have in every fiber technician's tool kit.

Use the Visual Light Source to determine if the problem is a leak, a break, bad connectors, or poor splices in your fiber optic network. You'll be able to locate sharp bends and breaks in jacketed or bare fiber connections in patch panels and fanouts.



Visual Light Source Pen for Fiber

FOVFL-PEN

For full features and specs, go to blackbox.com.

Best practices for fiber optic installation start with inspection &

By Fluke Networks

For centuries, optics have been inspected and cleaned to ensure the proper passage of light. The advent of fiber optic cabling systems resulted in one more application where optical care and cleanliness are important. While inspecting and cleaning fiber connectors is not new, it is growing in importance, as links with increasingly higher data rates are driving decreasingly small loss budgets. The increasing popularity of virtualization in data centers also means there will be more fiber connectors used. Any single, dirty connector can significantly impact the performance of applications running over that link. With less tolerance for overall light loss, the attenuation through adapters must get lower and lower. This is achieved by properly inspecting and cleaning when necessary. Yet there is no reason to feel intimidated by these tighter loss budgets because inspecting and cleaning connections is straightforward and easy.

What's the problem?

Fiber basics

Fiber optic cabling carries pulses of light between transmitters and receivers. These pulses represent the data being sent across the cable. In order for the data to be transmitted successfully, the light must arrive at the far end of the cable with enough power to be measured. Light loss between the ends of a fiber link comes from multiple sources, such as the attenuation of the fiber itself, fusion splices, macrobends, and loss through adapter couplings where end-faces meet.

In lower data rate networks with shorter lengths, loss budgets may be generous enough to allow for significant attenuation throughout the link and still the link will function properly. However, there is one perpetual trend in structured cabling: the constant push for greater bandwidth. As fiber links are pushed to carry higher data rates, loss budgets get correspondingly smaller, requiring all loss events to be minimized.

Enemy #1—a dirty face

Among key sources of loss that can bring a fiber network down, dirty and damaged end-faces are the most underestimated threat. Dirty end-faces are a leading cause of fiber link failure for both installers and private network owners. Contaminated end-faces were the cause of fiber links failing 85% of the time. It's easy to prevent, but there continues to be a lack of appreciation for this crucial issue and lots of misinformation about proper techniques.

What to look for and when.

There are two types of problems that will cause loss as light leaves one end-face and enters another inside an adapter: contamination and damage.

Contamination

Contamination comes in many forms, from dust to oils to buffer gel. Simply touching the ferrule will immediately deposit an unacceptable amount of body oil on the end-face. Dust and small static-charged particles float through the air and can land on any exposed termination. This can be especially true in facilities undergoing construction or renovation. In new installations, buffer gel and pulling lube can easily find its way onto an end-face.

Ironically, protective caps—also called “dust caps”—are one of the most common contributors to contamination. These caps are made in high-speed production processes that use a mold release compound that will contaminate end-faces on contact. Further, as the plastic cap ages, the plasticizers deteriorate resulting in an outgas residue. Last, airborne dust itself will find its way into the protective cap and will move to the end-face when the cap is pushed onto a ferrule. It's a very common mistake to assume that end-faces

are clean when patch cords or pre-terminated pigtails are removed from a sealed bag with protective caps in place.

Inspection of the end-face should verify that no contaminants are within the field of view. The most crucial area to clean is the core of the fiber, followed by the cladding. Yet contamination on the ferrule—outside of the end-face – could slide towards to core as the fiber is mated or handled. Therefore, all visible contamination should be removed if possible.

Damage

Deciding to mate every connection first and then inspecting only those that fail is a dangerous approach, as the physical contact of mated contaminants can cause permanent damage. This permanent damage would require more costly and time consuming retermination or replacement of pre-terminated links.

Damage will appear as scratches, pits, cracks or chips. These end-face surface defects could be the result of poor termination or mated contamination. Regardless of the cause, damage must be evaluated to determine if action is required, as some of it can be ignored or remedied. Up to 5% of the outer edge of fiber cladding generally may be chipped; this is a common result of the polishing process. Any chips on the core are unacceptable. If scratches or excess epoxy bleed is found, repolishing with fine lapping paper can eliminate the problem. If the end-face is cracked or shattered, the fiber must always be reterminated.

In every instance, all end-faces should be inspected before insertion. If a connector is being mated to a port, then the port should be inspected as well. Inspecting one side of a connection is ineffective because contamination inside a port can not only cause damage but also migrate to the connector being inserted. Too often equipment ports are overlooked not only as contaminated themselves but also as a source of contamination for test cords.

How to inspect.

Fiber microscope choices

Microscopes can be divided into two basic groupings: optical and video. Optical microscopes incorporate an objective lens and an eyepiece lens to allow you to view the end-face directly through the device. Today, the barrel-shaped microscopes are ubiquitous in termination kits and used to inspect patch cords during troubleshooting. The best feature of these microscopes is their price, as they are the least expensive way to see end-face details. Their drawback is that they are unable to view end-faces through bulkheads or inside equipment. As a result, you will sometimes hear these microscopes referred to as “patch cord scopes.”

Video microscopes incorporate both an optical probe and a display for viewing the probe's image. Probes are designed to be small so that they can reach ports in hard-to-access places. The screens allow images to be expanded for easier identification of contaminants and damage. Because the end-face is viewed on a screen instead of directly, probes eliminate any chance of harmful laser light from reaching a person's eye.



End-face inspection, using either a handheld optical or video microscope (the latter is shown here), should be done both during and after termination to check for contaminated or improperly polished connector end-faces.

cleaning.

Microscope evaluation

What matters most about a microscope is what it shows the user. In the case of fiber optic inspection, the goal is to identify all contaminants and damage of a minimum size and within a critical area. Users must first identify the appropriate minimum size contaminant or defect that will affect their system. The smallest-sized item that a microscope can detect is referred to as its detection capability. Next, look for the microscope that has the largest field of view while also maintaining the necessary detection capability. It is preferable to see as much of the surface area as possible while maintaining requisite detection capability. Detection capability and field of view require a trade-off as improving on one dimension tends to require a detriment to the other.

If detection capability and field of view are the most appropriate measurements of a microscope, then why is magnification the prevalent metric? Magnification is perfectly applicable to optical microscopes as performance is a direct function of the objective and eyepiece lens inside the device. Where magnification becomes less applicable is in video microscopes where the size of the image is a function of both the magnification of the lens as well as the size of the screen. Complicating matters further is the effect of contrast on the ultimate goal of detection capability. Magnification specifications for video microscopes are a vestige of the historical prevalence of optical microscopes. Though magnification is directly related to detection capability, it is a less precise measure of a fiber microscope's capabilities than detection capability and field of view.

How to clean.

Beware of bad habits

Because cleaning has been part of fiber maintenance for years, most people have their own approaches for cleaning end-faces. However, beware of bad habits. Many have developed in the industry over time. With an evolving base of knowledge, the industry has moved recently towards new best practices. One common approach to cleaning end-faces is to blast them with canned air, either on a connector or inside a port. Canned air is only effective on one type of contaminant: large dust particles. Canned air is ineffective not only on oils and residues but also on smaller, charged dust particles. Moreover, canned air will tend to blow large particles around inside ports rather than carefully remove them.

Dry cleaning

Traditionally, dry cleaning is proven to be only partially effective in eliminating contaminants from fiber end-face and connectors. The challenges had been that the dry cleaning materials are either not good enough to uplift the various types of dirt or greasy contaminants over fiber end-faces, or they actually introduce static to the fiber ferrule that attract dust. Technological advancements and better dry cleaning materials introduce a new class of fiber cleaning tools that are cost effective and efficient in cleaning more than 50% of contaminants from fiber. These tools become a perfect complement to the fiber wet cleaning solution to cover the cleaning needs in almost all situations and environments.

Use of solvent.

Some contaminants, like greasy and sticky materials, are difficult to uplift without the use of a solvent. Solvents provide multiple benefits, the most important being their ability to dissolve dried contaminants that have adhered onto the end-face. In addition, solvents will envelop particles and debris to effectively lift them from the ferrule surface so that they can be carried away without damaging the end-face. Last, solvents will prevent a static charge

from developing during cleaning with a dry wipe or reel that are not optimized for dry cleaning. There are many stories of end-faces becoming statically charged during solvent-free cleanings such that they were strongly attracting static-charged dust floating in the air. The developed charge can be so strong that static dust accumulates on the end-face during the short move from a microscope into port.

Solvent selection

Isopropyl alcohol (IPA) has been used for years in the fiber cabling industry to successfully clean end-faces and continues to find broad use today. But there are solvents specially formulated for fiber end-face cleaning that are far superior to IPA. These new solvents are more effective at dissolving virtually every contaminant than IPA. Further, these custom solvents will dissolve non-ionic compounds such as pulling lube and buffer gel that IPA will not. With a specified lower surface tension, the specialized solvents will do a better job of enveloping debris for removal than IPA. When cleaning inside ports, evaporation rates become important as lingering solvents can become trapped during mating, resulting in a harmful residue. Fiber-specific solvents have tailored evaporation rates that give them time to work yet disappear before mating. Last, IPA is highly hygroscopic, which means it will draw water moisture from the air and onto the end-face. This water mixes with the IPA and leaves a residue if it dries on the end-face. To be safe, leave the IPA in the medicine cabinet.

Cleaning tools

There are a wide variety of tools available to clean end-faces. The most basic tools are wipes and swabs used to clean patch cords and inside ports, respectively. More involved approaches include mechanical, hand-held tools designed to make easier work of cleaning (e.g. the IBC OneClick cleaners). The most complex devices incorporate blasted solvents or ultrasound in water to achieve the best result. While the more complex systems may achieve better results, they cost far more money. Individuals should determine the best approach for their application and budget. The one key criterion for wiping materials is that they be lint-free. Shirt sleeves are unacceptable!



The newly developed dry cleaning tool provides an economical and easy way to remove contaminants from fiber end-faces.



Solvent from a fiber optic solvent pen, applied to a special purpose, disposable cleaning pad, is a best-practice method for cleaning fiber optic cabling.

Reduce end-face contamination.

Fiber Optic Starter Cleaning Kit

- Clean fiber optic endfaces to reduce the #1 cause of link failure—contamination.
- Enables a wet and dry, lint-free cleaning process.
- Cleaning cassette minimizes static charge to ensure dust is not attracted back to the fiber after cleaning.
- Refill supplies are available.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



Fiber Optic Starter Cleaning Kit

FOCS

You can also order refills:

Optic Prep Tissues, 50-Pack	FOPT
Hollow Point Swabs, 200-Pack	FOHPS
Microcare 1.25-mm Connector Cleaning Sticks LC, MU, 50-Pack	FO125CCS
2.5-mm Mini Foam Swabs, 50-Pack	FO25FS
Electro-Wash Wipes, 25-Pack	FOWW
Fiber Optic Cleaning Cassette	FOCC
Cleaning Cassette Replacement Reel	FOCCR

For full features and specs, go to blackbox.com.

Remove oil and dust contaminants from ferrules.

Fiber Optic Deluxe Cleaning Kit



- Features all the contents in the Starter Cleaning Kit (above) plus (2) IBC™ cleaners for removing oil and dust contaminants from ferrules.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

Fiber Optic Deluxe Cleaning Kit

FOCD

You can also order refills:

Optic Prep Tissues, 50-Pack	FOPT
Hollow Point Swabs, 200-Pack	FOHPS
Microcare 1.25-mm Connector Cleaning Sticks LC, MU, 50-Pack	FO125CCS
2.5-mm Mini Foam Swabs, 50-Pack	FO25FS
Electro-Wash Wipes, 25-Pack	FOWW
Fiber Optic Cleaning Cassette	FOCC
Cleaning Cassette Replacement Reel	FOCCR
IBC 2.5-mm Cleaner	FOIBCS-R2
IBC 1.25-mm Cleaner	FOIBCL-R2

For full features and specs, go to blackbox.com.

Strip, clean, and terminate—with just one kit.

Deluxe Fiber Termination Kit



- All the basics plus lots of extras for stripping, polishing, cleaning, and terminating.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

NOTE: All items not shown.

Deluxe Fiber Termination Kit

FOTKD

For full features and specs, go to blackbox.com.

Make anaerobic fiber terminations for about 100 connectors.

Fiber Optic Installation Kits



- Tools, case, and work space—all in one!
- Choose the kit that's right for your needs—from Starter to Professional Plus.
- The Professional Plus Kit has everything you need to make anaerobic fiber terminations for approximately 100 connectors.
- All kits feature a compact design and a flexible yet rugged case.
- Heavy-duty nylon case has a fold-out work surface for working in tight spaces.
- VELCRO® loop attaches to work belts as wide as 3".
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

Fiber Optic Installation Kits

Starter	FT503A
Basic	FT505A
Professional	FT507A
Professional Plus	FT500A

You can also order refills and the Polishing Tool separately:

Fiber Optic Refill Kit	FT550A
◆ Includes (50) sheets of 5.5" x 5.5" 1- μ m polishing paper (FT551A), (50) sheets of 5.5" x 5.5" 5- μ m polishing paper (FT552A), (100) 4" x 4" wipes (FT553A), (20) syringes (FT554A), and (20) needle tips.	
Individual Refills for Fiber Optic Installation Kit	FT551A
5- μ m Polishing Paper, 5.5" x 5.5", 50-Pack	FT552A
Wipes, 4" x 4", 100-Pack	FT553A
Syringes, 20-Pack	FT554A

For full features and specs, go to [blackbox.com](#).

Make fiber connections at lightning speed with the high-precision cleaver.

Quick-Connect Termination Kit



- Use with Pre-Polished Fiber Optic Connectors (PP-SC-X, PP-ST-X, PP-LC-X).
- Cut down on overall fiber installation cost by sharply reducing termination time.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

Quick-Connect Termination Kit

[FOTKQ](#)

For full features and specs, go to [blackbox.com](#).

Prepare fibers for FAST connectors.

FAST Fiber Connector Kit

- Has a storage area for extra FAST connectors so you'll have them at the job site if needed.
- Features a compact design and a flexible yet rugged case.
- Applications include premise environments, LAN fiber-to-the-desktop environments, patch panel/wiring closets, FTTx applications, and quick repair and replacement situations.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

The FAST Fiber Connector Kit provides all the installation tools required to prepare 250- μ m or 900- μ m fibers, or 2-mm or 3-mm cabling for AFL's pre-polished FAST connectors.

The kit includes a universal multimode/single-mode cleaver with a 16-position blade and built-in fiber scrap collector, a fiber stripper, a strip/cleave template, and much more.



FAST Fiber Connector Kit

[CS001201](#)

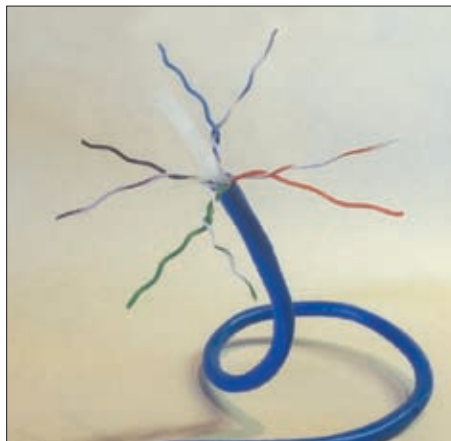
For full features and specs, go to [blackbox.com](#).

Best Practices: Copper

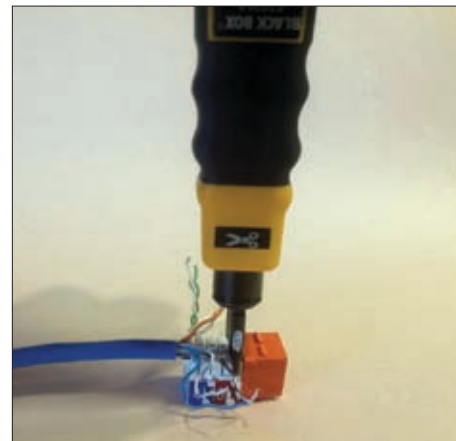
By Doug Matovich, Tech Support Representative



Cable being stripped.



Cable pairs being twisted to a half-inch maximum.



Cable being punched down.



Doug has been a Tech Support Specialist for more than 15 years.

Cable in an ideal world

Ideally, every cable ever installed would be a solid conductor cable and it would have the proper category rating for the communication speeds required. The installation would have cable paths with smooth radius bends. The cable would be installed without nicks in the jackets. AC wiring or voltage sources would be far away from the communication cable. Fire code jackets would be used when required. Twist rates would be maintained all the way to the jacks or plugs.

When the punchdowns were done, the cable channel would be tested with a tester capable of all the certification tests and the channel

would be documented to meeting the category certification requirements.

The ideal world is what everyone wants, and what everyone demands, thus driving the industry to create expensive test equipment used by qualified professional personnel. This is the best practice for new installations.

When the network is signed over from professionals with certified credentials to the customer after installation, the customer typically has but one goal: To use the network.

Best practice in cable installation is a professional with the proper tools and certifications to ensure the proper installation of the network cabling. Many businesses aren't willing to pay for this level of service. Often it falls on the IT department to install or supervise moves, adds, and changes to the network by unqualified personnel.

The trade-off in time and possible lost production is a business judgment exercised by management and is a reality of every network.

Still, quality testing and following a few simple rules will result in a network link or repair that can provide years of high-speed network performance.

Best practices

First, know your job. Is this a repair of a failed network link or a whole new cable run? Where is the cable going? Is it just a short hop up and over the equipment rack to the next one? Or is it a couple of hundred feet up a riser

and across the plenum ceiling to a medical room? Careful here—there are no Etherpolice, but there is a fire marshal who doesn't care anything about how much work it was to install a cable—it better have the right fire rating on the jacket. It is expensive and time consuming to remove thousands of feet of cable because a non-smoke-/flame-resistant cable was used.

The cable must have the proper jacket material for the job. There are many types of jacket materials: Plenum, PVC, UV-resistant, mold-resistant, low temperature, to name a few. Use the proper jacket for the job at hand. Learn about plenum versus PVC jackets on [page 97](#).

The cable will have to be cut to length, the ends stripped off of the outer jacket material, and the connectors attached. The cable may very likely be pulled directly off the reel or spool into position through conduit, onto a cable tray or hung on J-hooks.

All cable should be laid in as smoothly as possible, without damage to the jacket.

When going around corners, a smooth radius should be maintained in accordance with the cable manufacturers' specification. Remember that an Ethernet copper cable holds four twisted pairs of wire. A kink or sharp bend will affect the relationship of the twisted pairs, allowing electrical noise or crosstalk into the communication signals.

Route your network cables away from power lines, fluorescent lights, and industrial equipment,

as electrical coupling increases with proximity and voltage. There is raceway designed to combine power cables and data cables in the same raceway; it will have a divider to keep the two separate. If you must lay a data cable across a cable carrying AC power, do it at a right angle. Power AC wiring and low voltage data cable don't mix well; this is where fiber data cables really shine.

You will have to strip the outer jacket off of the ends of the cable. Be careful not to nick the individual data conductors when doing so. There are many stripping tools designed for doing this properly. The standards require that no more than a half-inch of the individual twisted pairs be untwisted at the connectors, and the cable jacket really should reach all the way up to the connectors or punch blocks.

Add jacks or connectors

So you have your cables installed, and you've avoided AC wiring and other sources of electrical noise along the run. The cable has no kinks or sharp bends.

If only one cable has been run, then your next step is to add jacks or connectors as the job requires. With a bundle, it is a bit more difficult. If the cables were labeled on both ends before pulling, and the labels are still intact, then cable identification is simplified. But this often isn't practical, or is overlooked until after the cable is in place. In this case a tone probe comes in really handy. It sends a signal down the wire that a probe can convert to an audio signal for identification.

There are two approved pinning methods in the TIA-568-C.2 standard for terminating network cable to 8-position RJ-45 jacks and connectors: T568A and T568B. The difference between the two is the pin position of the orange and green pairs.

The T568B wiring scheme is the de facto standard for communications networking in the U.S. It is the same as AT&T's old 258A color scheme. T568B offers backward compatibility with USOC through one pair. T568A is backward compatible with both one- and two-pair USOC connections.

Whichever pinning scheme you choose to use, stick with it. T568A and T568B pinnings are not interchangeable. Mixing the two can cause crossed pairs, which just don't work. Strip the jacket back and punch down the wires according to the color code on the jack and patch panel (T568A or B). Read about how to terminate fiber cable on [pages 166–167](#).

Use connecting hardware of the same category or higher. The transmission of your components will always be the lowest category in the link. So, if you're using CAT6 cable, use CAT6 connectors.

Visually inspect the cable for proper terminations, bend radius, tension, nicks, etc. Don't uncoil UTP cable on a spool. It can cause kinks. Rotate the spool instead. Plan for 12 inches of slack cable behind wall outlets for possible future reterminations.

Time to test

It would now be a good idea to check the cable. Ideally, a good cable tester that is certified for your cable type should be used. They are expensive for the casual user, but a tester checking for continuity and split pairs is reasonably priced and highly recommended. They are simple to use, and often offer go/no-go testing or simple readouts showing which wire conductors are connected properly or not.

Some use lights, as simple as green is good and red is not, or they step through each pair giving a go/no-go result. Others have LCD screens with the conductor number of both ends of the cable reflecting the connections.

Testing is important; it prevents possible damage to equipment due to wiring faults. In the 10BASE-T world, only two pair were actually in use. Gigabit requires all four pairs, as does PoE.

Newer Power-over-Ethernet equipment uses voltages over the twisted pairs to power remote equipment. It can damage equipment to put even these low AC voltages on equipment not designed for it. A simple test can save the embarrassment and expense of damaged equipment.

Industry Requirements

The industry requirements for certification require testing of the following signals on the cable under test:

- Wiremap
- Propagation Delay
- Delay Skew
- Cable Length
- Insertion Loss (IL)
- Return Loss (RL)
- Near-End Crosstalk (NEXT)
- Power Sum NEXT (PSNEXT)
- Equal-Level Far-End Crosstalk (ELFEXT)
- Power Sum ELFEXT (PSELFEXT)

All of these tests pass or fail based on the manner in which the cable is installed and the quality of workmanship of the installer.

Failing to pass these tests will result in failed links or slow connections. Very often, 100BASE-T is better than NO BASE-T, and the work continues another day when it can be scheduled instead of scrambling around when the network completely fails, stopping production at a critical time.

The average in-house repair of network cable is done with a simplified tester that only does a continuity check by tone or LED. Following best practices and a good work ethic for the installation of the cable is required no matter the test. The industry has done a good job of simplifying cable installation. By following a few simple rules and using a low-cost tester, most people can install an Ethernet cable.

Maintain and optimize 10/100/1000BASE-T networks with a single tester.

LanScope Network Analyzer

- Features include cable testing, link detection, ping and trace, packet monitoring, traffic generation, VoIP, e-mail, inline PoE tests, device discovery, and more.
- Tests your network under load with flexible traffic generation.
- Processes VoIP traffic to determine call statistics and quality.
- Automatically identifies standard link, frame, and traffic problems.
- Identifies connected network devices by type, IP address, or MAC address.
- Tests cables for opens, shorts, reversed pairs, split pairs, and length.
- For fiber capabilities, see the LanScopePro on page 194.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



Make the LanScope Network Analyzer an essential part of your tool kit. Use it for installing, monitoring, maintaining, upgrading, and troubleshooting any network. With this one tool, you have one of the most complete suites of testing and analysis functions available at a very affordable price.

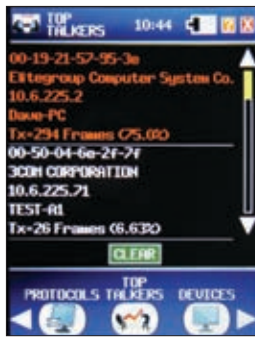
Use the Inline mode to non-intrusively monitor network traffic (10/100/1000BASE-T) to identify protocols, port usage, VoIP statistics, and network utilization. The LanScope can capture and store up to 10,000 packets with user-defined filters for detailed analysis in the field. Or download test results over the network or to a flash drive.

The analyzer features two RJ-45 ports, which you can use for tests such as PING, Link, Trace, and Discovery to quickly identify network problems. The LanScope can also generate up to 100% traffic loading with control of packet rate and size to demonstrate network performance at various traffic levels.

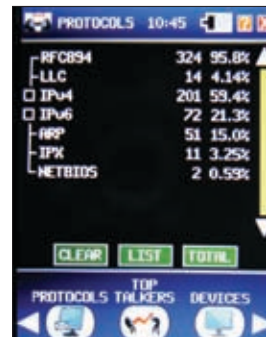
You can perform a stress test that generates traffic and measures performance in accordance with RFC 2544. Run the test using the two independent ports on a single unit or run it with a second unit located remotely on the network.

PoE tests include voltage and inline current measurement to determine the actual power used by a device.

Lastly, use the LanScope to test cables for shorts, opens, split pairs, and reversed pairs; measure cable length; and to generate tones for cable tracing.



Identify the top talkers on your network.



Identify network protocols being used.



The Expert feature provides solutions to common network problems.

Fiber network? Use the LanScopePro.

The LanScopePro has almost all of the features of the LanScope, plus fiber testing capabilities. Use it to detect up to 40 different network problems in both fiber and copper segments. Detect and resolve connectivity problems with Link, Ping, and Trace Route tools. Keep your network healthy with the Vitals feature that monitors good and bad packet statistics. See more on [page 194](#).

To see the LanScopePro video, go to blackbox.com/go/Videos.

LanScope Network Analyzer

LANSCOPE

You may also need:

10/100 Copper Tap

[TS230A-R2](#)

10/100/1000 Copper Tap

[TS250A](#)

For full features and specs, go to blackbox.com.

Digitally certify UTP cables and devices in Gigabit Ethernet networks— and do it on a budget.

CAT5/5e/6 LAN Performance Verifier

- Verify that UTP cables and LAN devices perform at promised speeds.
- Level 1 and Level 2 certifications.
- High-speed TDR provides nanosecond-accurate results.
- Locates opens, shorts, and splits—and pinpoints the exact distance to the fault or split.
- Converts results into graphs showing the cable's speed capability.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

What's included

- LAN Performance Verifier
- Probe unit
- (2) CAT5e cables
- Test summary tablet
- "Passed" stickers
- USB cable
- (2) 9-volt batteries
- Coax to RJ-45 adapter
- Zippered carrying case
- Software CD
- User manual

Ideal for IT managers and technicians responsible for cabling and network hardware, the CAT5/5e/6 LAN Performance Verifier enables you to quickly spot UTP cable connection problems.

Use the included data cable to transfer the test results from up to 250 stored tests to your PC's Excel® spreadsheet.

NOTE: Not recommended for use with shielded cable. Use with 4-pair, unshielded twisted-pair cable only.



CAT5/5e/6 LAN Performance Verifier

TS580A-R4

For full features and specs, go to blackbox.com.

A hi-res, full-color screen sets this cable tester and report manager apart.

Cable Inspector Cable Tester

- Combines the functions of a high-end cable tester and length measurement tester, with the capability to identify link status, link capability, and PoE detection.
- Displays length measurement for each pair in feet or meters using TDR technology.
- Detects presence of PoE and class of PoE per IEEE 802.3af/at with load test for voltage drop.
- Reports current link speed and link capabilities for active Ethernet drops up to 1 Gbps
- Has a link light to identify location on a hub/switch/router port.
- Tests cabling configuration and verifies connectivity while conducting tests for opens, shorts, miswires, split pairs, and reverses.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

The Cable Inspector provides full cable testing, displaying wire map, numbered ID remotes, and any faults, including shorts, opens, miswires, split pairs, and reverses. It also measures cable length using TDR technology and generates tone levels for signal tracing and cable identification on all pairs, a selected pair, or a selected pin. A full-color graphical display provides for easy viewing in any environment. The Cable Inspector also has the ability to label each cable and save all test results in a professional report. Cable reports can be exported to a computer via micro USB cable for record keeping and printing.



Cable Inspector Cable Tester

CICT

For full features and specs, go to blackbox.com.

Get big 10BASE-T, 100BASE-TX, and 1000BASE-T handheld testing with a small price tag.

TVR 10/100/1000 Tester

- Performs verification for 10BASE-T/100BASE-TX/1000BASE-T hubs and PCs.
- Indicates the negotiated speed and duplex between two LAN devices.
- Simulates straight-through or crossover cable.
- Locates cables or hub ports using the included remote probe to detect a tone generated by the main tester.
- Verifies terminated pairs in hubs or PCs, wired pairs, and pair reversals.
- Detects PoE.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



Remote Probe

Main Tester

Capabilities

This low-cost tester combines the functions of seven test sets:

- A switch/PC verifier
- A LAN speedometer to verify link speed
- A straight-through/crossover cable simulator
- An on-line network activity monitor
- A tone probe/tone generator
- A cable pairs tester
- A cable termination tester

It helps you answer these device questions:

- Is my hub or PC operational?
- Does it appear as a hub or a PC?
- Does it use 2- or 4-pair cable?
- Which hub port is my PC using?
- Is my LAN speed 10, 100, or 1000 Mbps?

It also helps answer these cabling questions:

- What pairs are terminated in the wiring?
- Where is my cable in the wiring closet?
- Is my cable straight through or crossover?
- Does my cable have inverted pairs?

What's included

- Main tester unit
- Remote probe unit
- (2) 9-V batteries
- (2) RJ-45 to RJ-45 jumper cables
- Protective felt carrying case
- User manual

TVR 10/100/1000 Tester

[TS029A-R5](#)

For full features and specs, go to [blackbox.com](#).

Test, identify, and detect potential faults in voice, video, and data cables.

SOHO Plus Tester Kit

- Includes SOHO Plus Tester and ten RJ-45 modules.
- Has the added feature of length measurement, allowing users to measure the length of a cable as a whole or by individual wire pairs located within a cable.
- Continuity testing discerns if the voice, data, and/or video cables being tested have been wired correctly with no faults.
- ID Mapping identifies cables and determines their exact location. Map up to 19 locations at one time.
- Tone Mode verifies cable wiring paths by sound.
- Length Measurement determines the length (in feet or meters) of an entire cable and/or individual wire pairs within the cable.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



What's included

- Main tester unit
- Master remote
- (10) RJ-45 remotes
- (1) set of coax remotes (1-5)
- (1) F-connector coupler
- (1) RJ-45 alligator clip cable assembly

SOHO Plus Tester Kit

[SOHOTEST-KIT](#)

For full features and specs, go to [blackbox.com](#).

Locate cable runs and test for continuity and voltage.

Net Tone

- Place the tone generator on one end of the cable and use the tone probe to find the other.
- Make connections to RJ-11 and RJ-45 jacks and to any wire pair using alligator clips.
- Works on both Ethernet and telco cabling.
- Switch-selectable tone and large LED display.
- Tone Probe has ultrabright LED tip for visibility in dark spaces, filtered circuitry for elimination of fluorescent hum, and safety LED.
- Tone Probe also has volume control and insulated tip to stop accidental shorts when probing punchdown blocks.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



TS300A

What's included

- Tone generator
- Probe
- Carrying pouch
- (2) 9-V batteries

Net Tone

[TS300A](#)

Power Panel CAT5/CAT6 DVM and Network PoE Tester (For details, see [blackbox.com](#).)

[TS150A-R2](#)

For full features and specs, go to [blackbox.com](#).

Gives accurate pass/fail results in one second.

EZ Check Cable Tester

- Affordable, rugged tester for RJ-45 CAT5e or CAT6 and coax cables.
- Performs complete testing for continuity, opens/shorts, reversals, and split pairs.
- Each pair's status is highlighted with LEDs.
- Features a "tone" mode for tracing and troubleshooting, compatible with most tone probes.



- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

EZ Check Cable Tester

[EZCT](#)

For full features and specs, go to [blackbox.com](#).

Here to help you.

Questions about which tester or tool is right for your application? Need a custom tool kit?

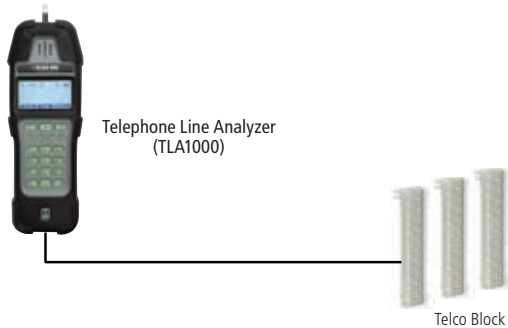
Call our FREE Tech Support and talk with an expert.



A rugged field tester with innovative feature sets.

Telephone Line Analyzer

- Features the latest embedded process technology to provide a smart, powerful telephone test set that can be easily modified with feature sets.
- Ideal for field use in extreme conditions.
- Data-line-in-use capability.
- High line voltage detection with next step options.
- Active monitor circuitry minimizes load on subscriber line.
- DTMF digit detection and display in monitor mode.
- DTMF decode detects DSL and T1 lines.
- Sees defects on customer equipment while dialing out.
- Soft key menu system simplifies user interface and customization.
- Includes 60-inch angled bed of nails with piercing clip cord set.
- English, French, and Spanish language compatible.
- Large, lighted LCD and glow-in-the-dark keypad.
- Rainproof and highly water- and dust-resistant to the IP54 Standard.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



Telephone Line Analyzer

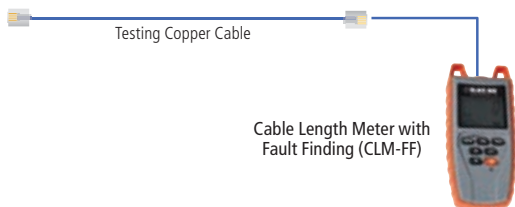
TLA1000

For full features and specs, go to blackbox.com.

Measure and find faults in data, power, and communications/video cable.

Cable Length Meter with Fault Finding

- Determines cable length with 1% accuracy, identifies cable faults, and can be calibrated to the Nominal Velocity of Propagation (NVP) for any cable.
- Holds up to two different NVP values for multiple cable tests.
- Tests length, opens, or shorts present on voice, data, and video cables up to 3000 feet long.
- Spread Spectrum Time Domain Reflectometry (SSTDR) works in all wire environments and is immune to voltage, current, or data disruptions.
- Able to measure cables with voltage.
- Features an extra-large, backlit LCD screen.
- Tests any copper cable including data, voice, video, lamp wire, and Romex®.
- Discovers NVP value for cables with known lengths.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years



Cable Length Meter with Fault Finding

CLM-FF

For full features and specs, go to blackbox.com.

The complete kit for crimping, punching down, testing, and mapping your copper cables.

Premise Tool Kit



- All the tools you need to prepare and install CATV coax cables, flat satin telephone cables, and data network (USOC, TIA-568A, or TIA-568B) cables.
- Use tone generator/probe to test RJ-11 and RJ-45 connections, and map data and telephone installations.
- **Standard Warranty** — 1 Year



Premise Tool Kit

[FT145A-R3](#)

For full features and specs, go to [blackbox.com](#).

The tools for terminating CAT6 cable.

CAT6 Termination Kit

- Terminate cable perfectly and ensure compliance with the Category 6 standard.
- The kits' tester identifies shorts, opens, and miswires while checking Ethernet 10BASE-T, Token Ring, and T568A or T568B cabling.
- The tester splits apart for benchtop and remote testing functions.
- Each kit comes complete with a sturdy, black carrying case.
- **Standard Warranty** — Lifetime



CAT6

CAT6 Termination Kit

[FT490A-R3](#)

For a complete list of kit contents, go to [blackbox.com](#).

Do-it-yourselfers: Order a kit for BIG savings.

CAT5e Termination Kit

- Our best CAT5e tools—guaranteed for life!
- Terminate cable perfectly and ensure compliance with the Category 5e standard.
- Locate shorts, opens, and miswires, and verify 10BASE-T cable runs with the included tester.
- Tester also splits into master and remote units for remote and benchtop testing of patch cords or premise cabling.
- For extra convenience, the kits come complete with a sturdy, black carrying case.
- **Standard Warranty** — Lifetime



CAT5e

CAT5e Termination Kit

[FT480A-R3](#)

For a complete list of kit contents, go to [blackbox.com](#).

All the tools the pros use for PC repair.

Professional's Tool Kit

- **Standard Warranty** — Lifetime



Professional's Tool Kit

[FT805-R2](#)

For a complete list of kit contents, go to [blackbox.com](#).

The complete kit for assembling and testing UTP/STP cables.

Data Pro Kit

- Everything for cutting, stripping, terminating, and testing cables, and modular plug systems.
- Includes the LAN Pro (TD050A) for fast, convenient testing of twisted-pair and coax wiring.
- Contains five die sets for easy crimping of modular cable connectors.
- All tools feature soft handles for comfort and an easy grip.
- Adjust the impact level on the punchdown tool for different cable types.
- **Standard Warranty** — Lifetime

What's included

- LAN Pro tester (TD050A), including main tester and remote, blackbox.com
- Crimp tool
- UTP/STP Cable Cutter/Stripper (FT116), blackbox.com
- Type 110 and Type 66 reversible blades
- Punchdown Tool (FT025A), p. 213
- (5) die sets:
 - RJ-45 WE/SS style
 - RJ-45 AMP style
 - RJ-22 handset
 - RJ-11 DEC/MMJ
 - RJ-11/RJ-12 WE/SS style
- Soft carrying case with wrist strap



Data Pro Kit

[FT115A](#)

Need Bix or Krone blades? See blackbox.com.

For full features and specs, go to blackbox.com.

Tools for working on both phone lines and LANs.

Voice/Data Tool Kit

- Features telephone line installation, termination, and testing components,
- Also has stripping tools, adapters, and more for easy network installation and repair.
- **Standard Warranty** — Lifetime



Voice/Data Tool Kit

[FT103A-R2](#)

Hard Shell Case for Voice/Data Tool Kit

[FT106A](#)

For a complete list of kit contents, go to blackbox.com.

The compact kit for PC repair.

Technician's Tool Kit

- Includes the most popular tools for repairing and upgrading PCs.
- A wrench, nutdrivers, screwdrivers, pliers, and a reversible Torx® tool manage general repairs.
- Includes a soldering iron for repairing loose connections.
- **Standard Warranty** — Lifetime



Technician's Tool Kit

[FT812-R2](#)

For a complete list of kit contents, go to blackbox.com.

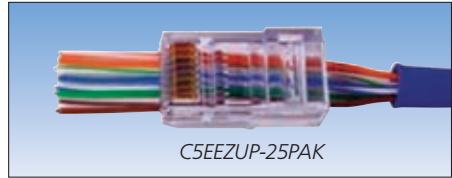
Crimp and trim EZ-RJ45 connectors in one step.

EZ-RJPRO and EZ-RJ45 Crimp Tools

- Use with EZ-RJ45® Modular Plugs.
- Get a uniform crimp each time with the ratcheted straight action motion.
- Features precision-cast crimping dies and a built-in wire cutter and stripper for silver satin cable.
- Rugged all-steel frame construction.
- The Pro model has molded rubber grip handles for extra comfort.
- **Standard Warranty** — 5 Years
- **Extended Warranty** — Add 1 or 3 Years



FT1200A



C5EEZUP-25PAK

EZ-RJPRO™ High-Density Crimp Tool

[FT1200A](#)

EZ-RJ45 Crimp Tool

[FT1100A](#)

EZ-RPRO High-Density Crimp Tool Replacement Blade Set

[FT1200BLD](#)

For full features and specs, go to [blackbox.com](#).

CAT6 EZ-RJ45 Modular Plugs, Unshielded, 25-Pack

[C6EZUP-25PAK](#)

CAT5e EZ-RJ45 Modular Plugs, Unshielded, 25-Pack

[C5EEZUP-25PAK](#)

Related

For more shielded and unshielded plugs, plus CAT6 EZ-RJ45 Boots, go to **p. 168**.

The most versatile tool kit for all your RJ crimping.

Universal RJ Crimp Tool and Tool Kit

- Tool Kit includes Universal RJ Crimp Tool and RJ-11, RJ-22, RJ-45, and 10-position dies.
- **Standard Warranty** — Lifetime



FT046A



Universal RJ Crimp Tool and Tool Kit

Universal RJ Crimp Tool

[FT046A](#)

Universal RJ Tool Kit

[FT047A](#)

Replacement Blade Set

[FT048](#)

Replacement Die Sets

RJ-22 4-Position

[FT051](#)

RJ-11 4-/6-Position

[FT052](#)

RJ-45 8-Position

[FT053](#)

Snagless Standard

[FT054](#)

RJ 10-Position Modular

[FT055](#)

For full features and specs, go to [blackbox.com](#).

Throw fast punches with this non-slip, easy-grip tool.

Punchdown Tool with 110 Blade

- This non-slip punchdown tool includes a 110-style blade.
- Accepts all manufacturers' twist-and-lock style blades.
- The handle is designed with finger grips and non-slip cushioned sides. Also provides blade storage.
- Includes a multiuse spudger—it works as a screwdriver or as an IDC contact insertion tool.
- A built-in pick and hook help you separate twisted pairs and feed wires through holes.
- The impact force is adjustable for use with all types of cables.
- **Standard Warranty** — Lifetime



Punchdown Tool with 110 Blade

[FT025A](#)

Punchdown Tool (Handle Only)

[FT024](#)

Type 110 Blade

[FT026](#)

Type 66 Blade

[FT027](#)

Bix Blade

[FT028](#)

Krone Blade

[FT029](#)

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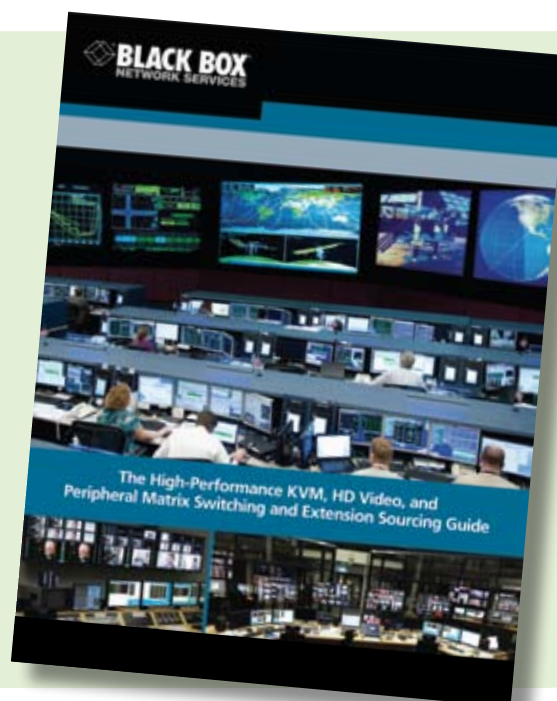
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