BLACK BOX®
NETWORK SERVICES

IT-Infrastructure Guide

Structured Cabling

Infrastructure Hardware

Cabinets & Racks

Temperature Control

Power Management

Testers & Tools

The IT Infrastructure and Cabling Design

Your source for everything from the data centre 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 organisation'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 centre or some jacks for desktop connections, our Tech Support can help. And also, if you don't see what you need, call us. We can custom-design a solution just for you.

Page 8
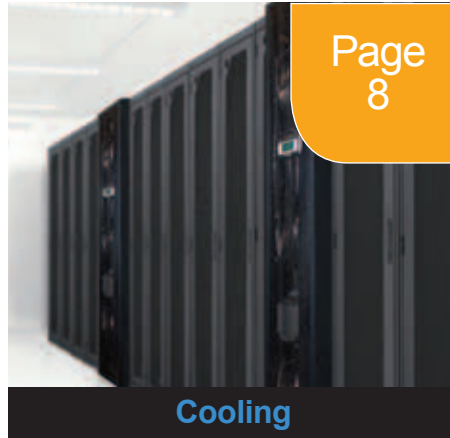
Cooling

- Cooling solutions for every application:
  –Data centres
  –Communications closets
  –Server rooms
- Need advice? Ask our Technical Support team.


Page 40

Power & Surge Protection

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

Page 18

Cabinets, Racks, & Accessories

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

and Sourcing Guide:
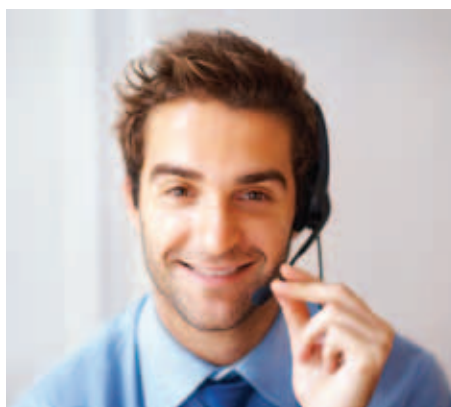## and beyond.

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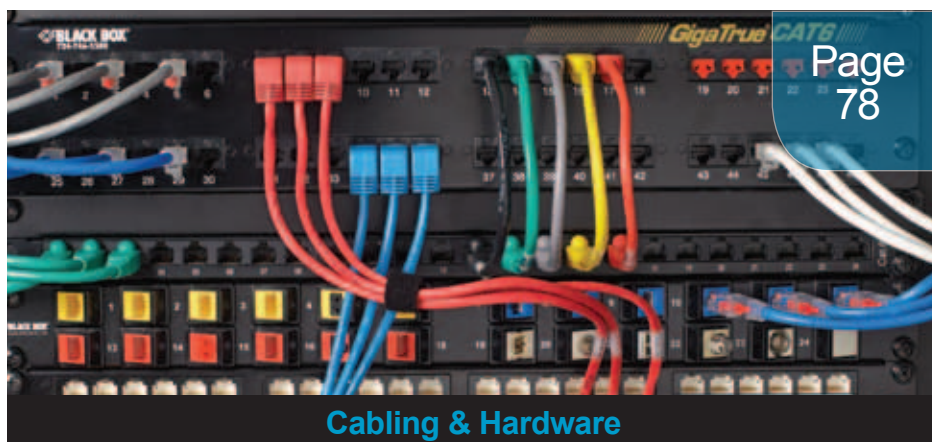
- Ensure optimum performance with ETL Verified CAT6A/6/5e channels.
- Secure network ports with CAT6A/6/5e lockable patch cables.
- Move to 10-GbE with OM3 fibre patch and bulk cables.
- Plan for future 40-/100-GbE migration now with MTP® MPO-style cassettes, trunk cables, panels, and enclosures.
- Complete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

FREE, live Tech Support is just 30 seconds away!

Let our experts help you find the right solutions—right now.
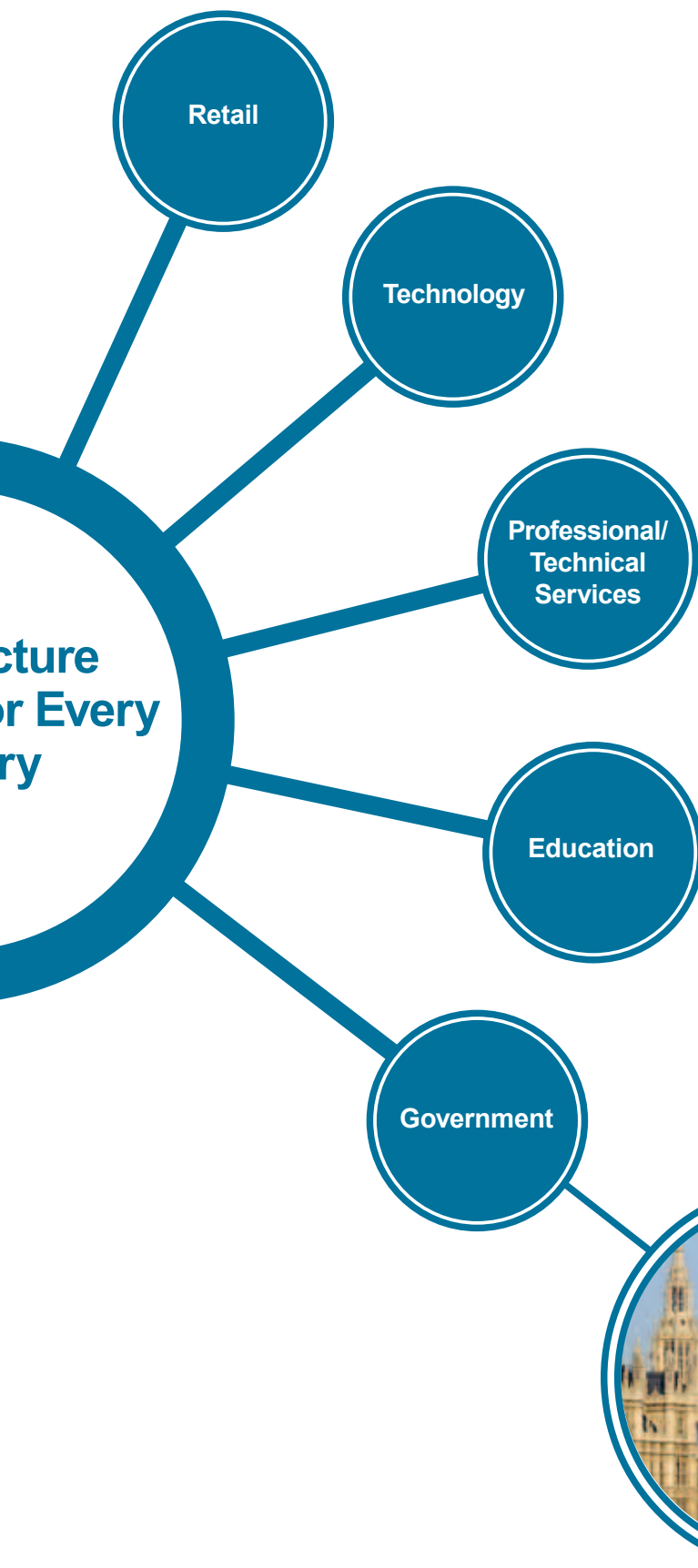
- FREE—The advice is absolutely FREE whether you buy or not!
- Live—Our techs answer your calls live
- 24/7—Call our product experts with questions anytime day or night.

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Government

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.
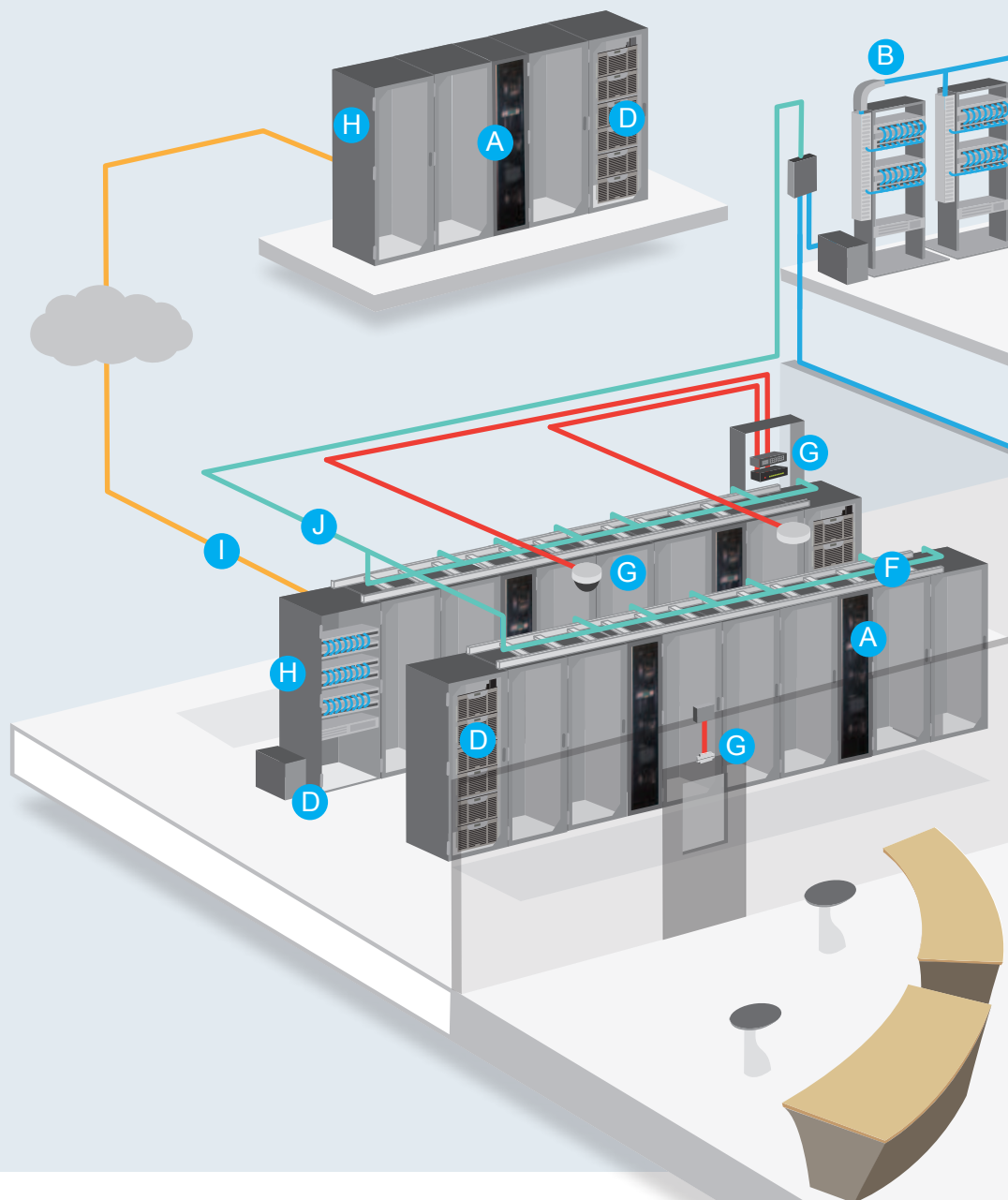
Physical network infrastructure

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 organisation. 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 centre 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 organisation'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 centre?
- How much power do you need in your data centre?
- What cooling methodology and solutions are best for your data centre/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? Fibre, copper, both?

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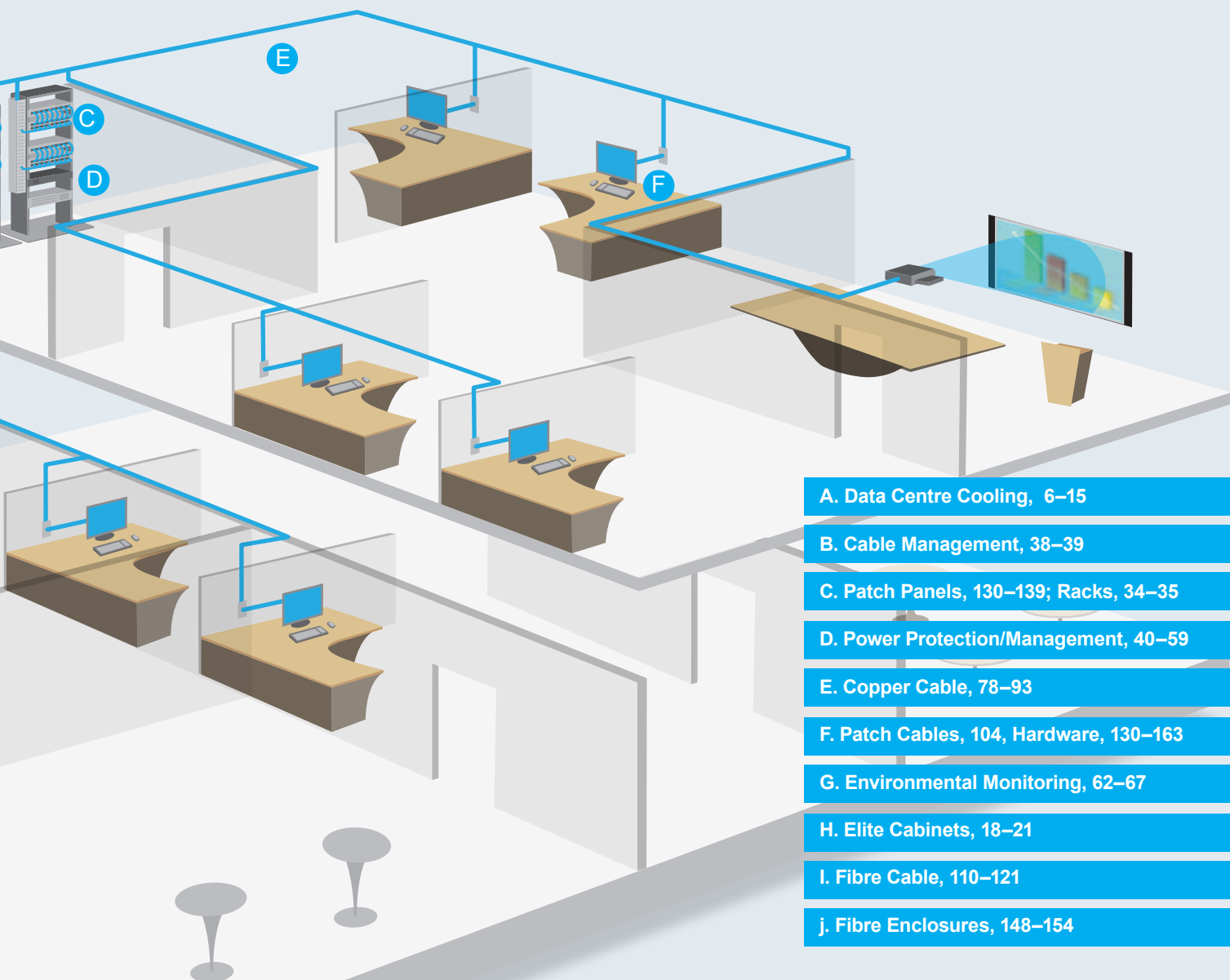
- Do you need to connect equipment in remote environments?
- Do you plan on using PoE for remote or VoIP phone connections?

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 and document your cabling system.

Guaranteed for life Infrastructure performance.
You'll find everything you need to build and upgrade your data centre right here. Better yet, most of Black Box's infrastructure components—cabinets, racks, cables, panels, etc.—are guaranteed for life.
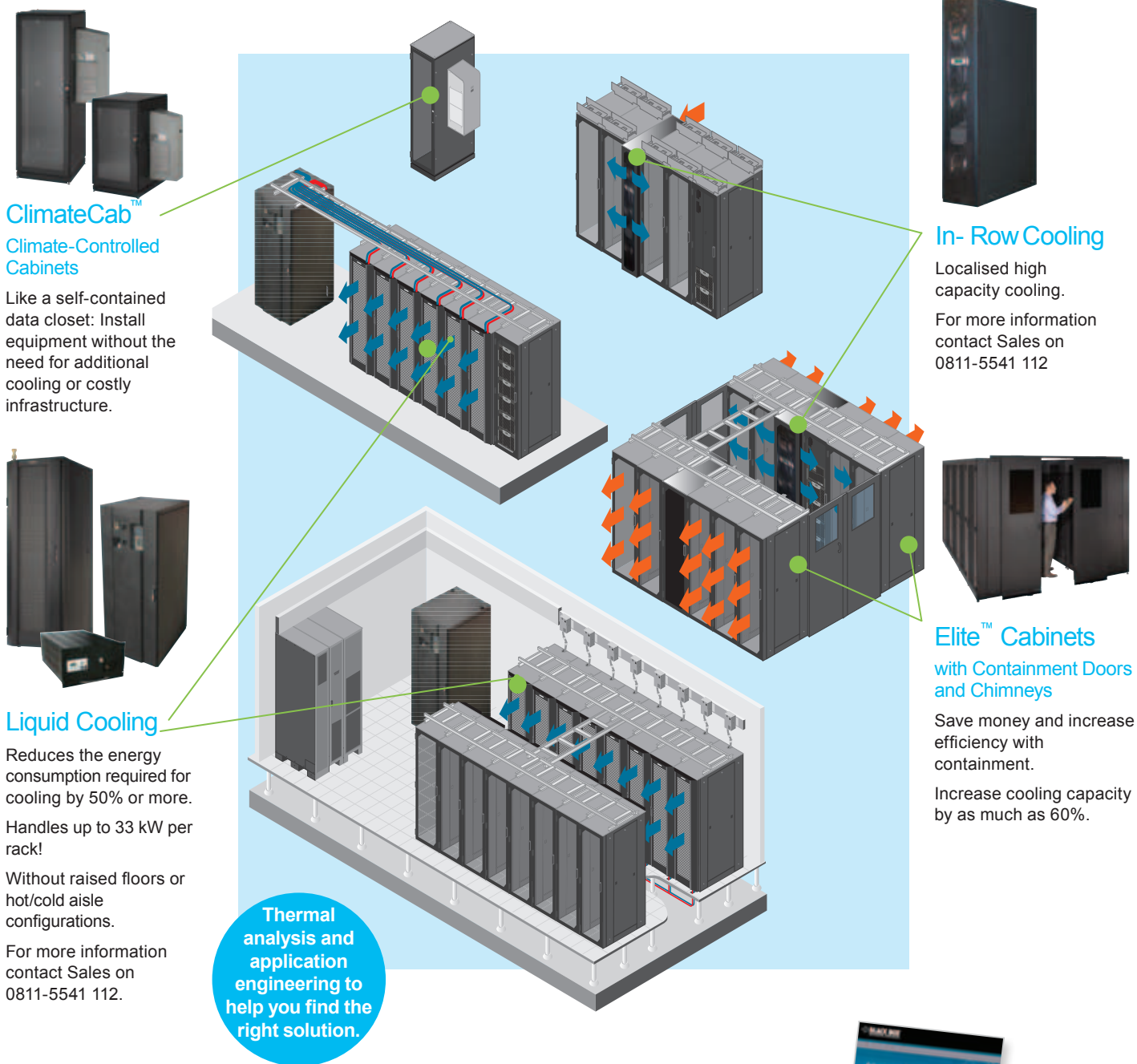
Free pre-sales application engineering support.
Need some assistance in planning your infrastructure? Call the experts at Black Box. Our engineers will work with you to help you assess, plan, and design your new or upgraded network infrastructure. Just call 0811-5541 112.

Complete, Customised Data Centre Solutions

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

Need additional cooling capacity in your data centre? Whether you have a couple of racks, a large data centre, 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.

Liquid Cooling

Reduces the energy consumption required for cooling by 50% or more.

Handles up to 33 kW per rack!

Without raised floors or hot/cold aisle configurations.

For more information contact Sales on 0811-5541 112.

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

In- Row Cooling

Localised high capacity cooling.

For more information contact Sales on 0811-5541 112

Elite™ Cabinets
with Containment Doors and Chimneys

Save money and increase efficiency with containment.

Increase cooling capacity by as much as 60%.

For a FREE white paper on localised cooling solutions, visit www.black-box.de
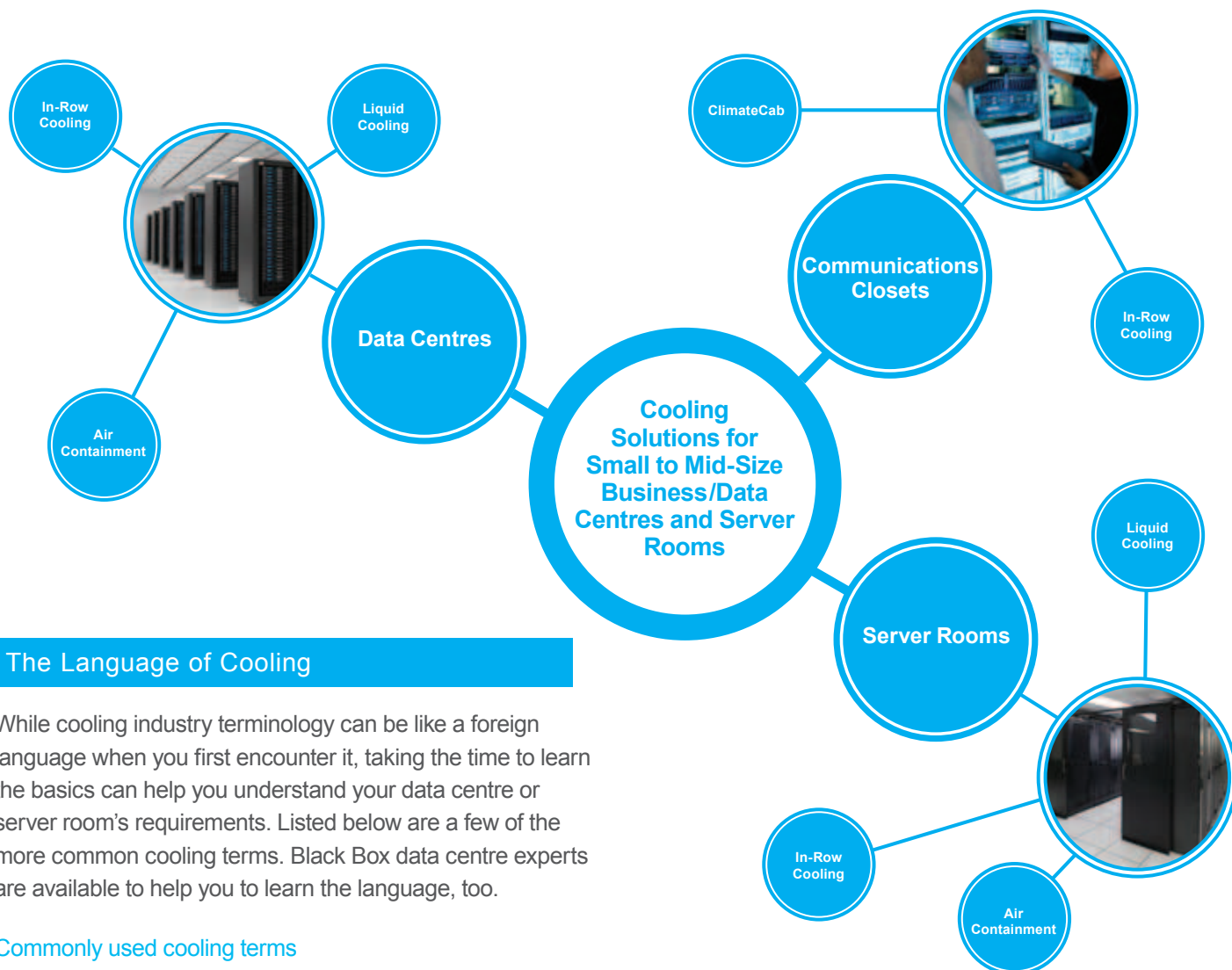
The Language of Cooling

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 centre or server room's requirements. Listed below are a few of the more common cooling terms. Black Box data centre 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° C.

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 vapour (100% relative humidity).

Direct Expansion System (DX)—A cooling system that utilises 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 vapour mixture.

MBTU – Thousands of BTUs.

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

Ton—The amount of heat required to melt a ton of ice in 24 hours at 30° C.

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: kW x 3,412=BTU/hr
- kW to Tons: kW x 0.2843=Tons
- BTU/hr to Tons: BTU/hr/12,000=Tons
- BTU/hr to kW: BTU/hr/3,412=kW
- Tons to kW: Tons x 3.513=kW
- Tons to BTU/hr: Tons x 12,000=BTU/hr

Determining the best way to cool your server room or data centre 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 minimise 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 centre'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.
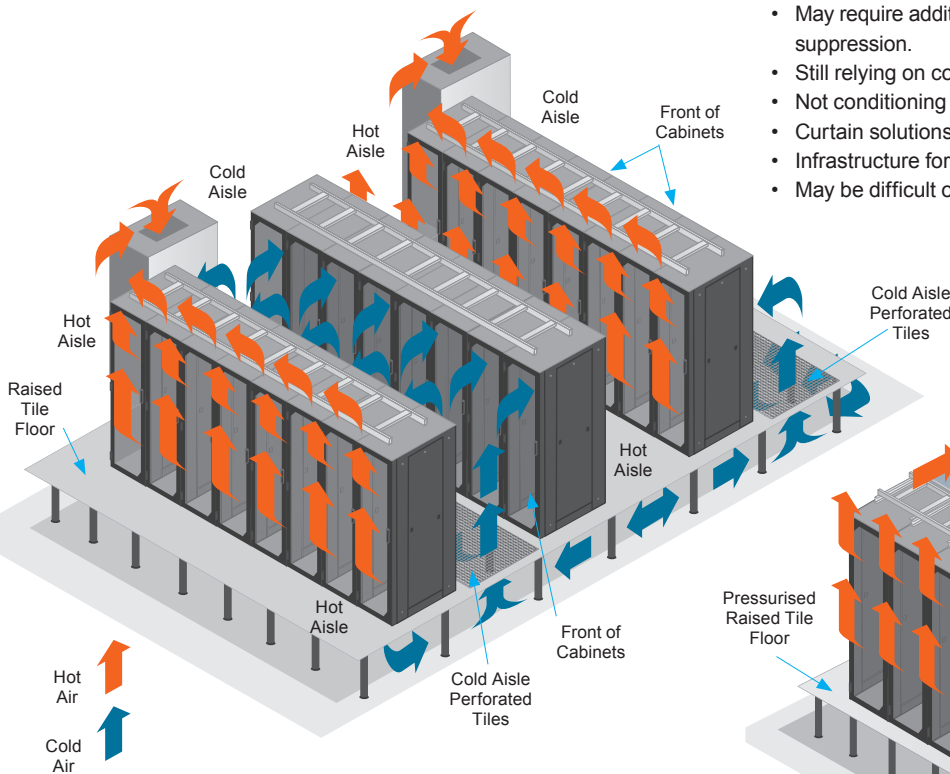
Advantages:
- No fans required.
- Isolation of hot exhaust from cool supply.
- Increases efficiency of computer room air conditioner/heater (CRAC/H).
- Easily deployed in existing data centres.
- More consistent predictable temperatures.
- Can be curtains, metal, plastic ceiling.

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

Hot Air
Cold Air

Cold Aisle Containment (CAC)

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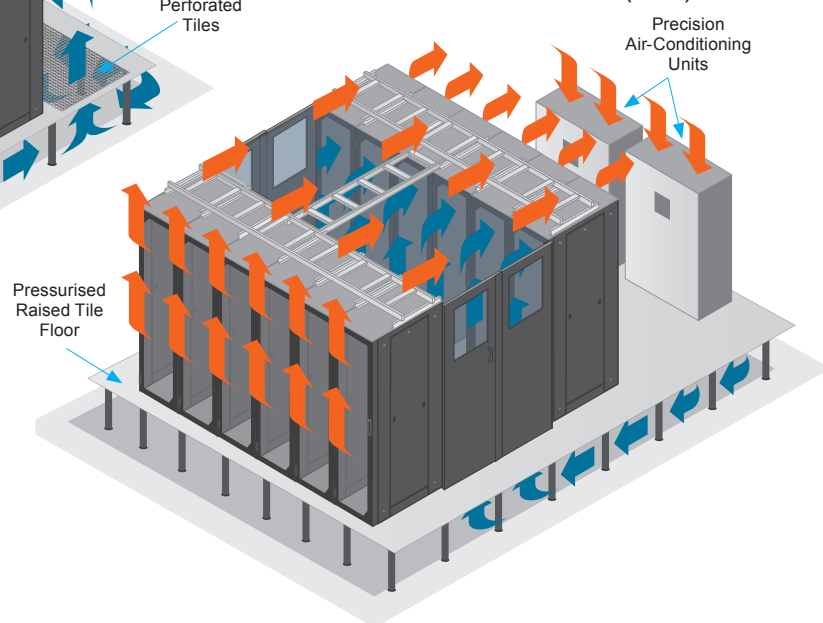
vital to its reliability and efficiency.

Row cooling, with and without containment.

Designed for scalability, reliability, and seamless integration into new or existing data centres, 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 entreprise-size data centres.
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 cooling.

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

Cooling Configuration vs. kW Per Rack
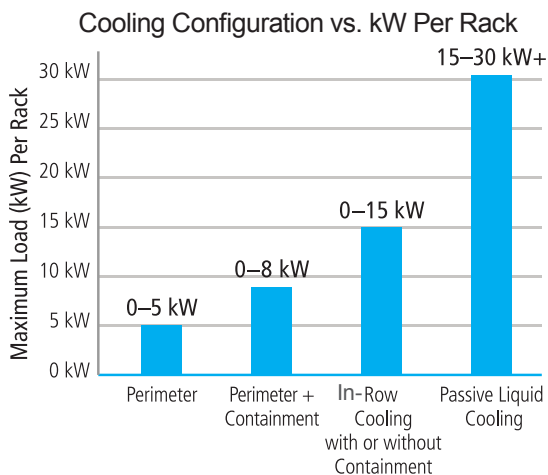
In-Row Cooling Intelligent Rack Cooling
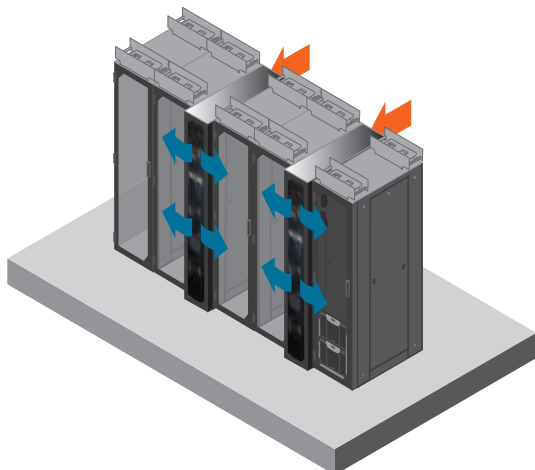
Passive Cooling.

Suitable for new data centres 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 centres, 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 centre.
Using passive cooling opens options in retrofitting for optimised performance, a comparable initial cost compared with traditional cooling options, and the opportunity to increase cooling capacity without disrupting operations. Long-term, cooling is significantly more cost-effective to data centre 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.
- Localised Cooling has been around for more than 45 years (IBM® mainframes, Cray super-computers, military electronics).

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

Contact us today for a data centre assessment.
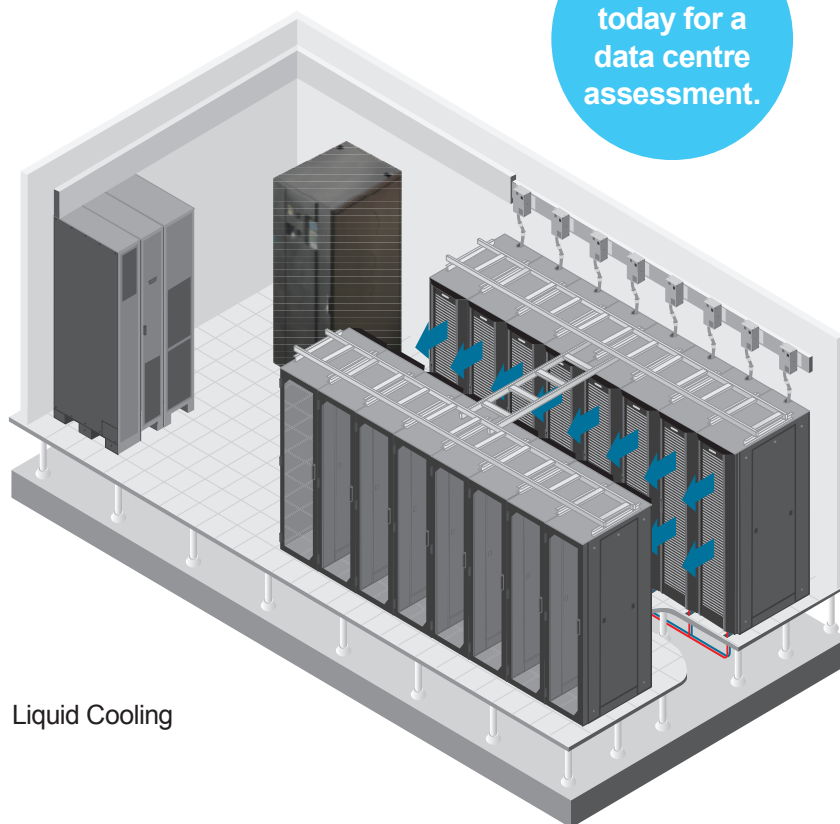
Liquid Cooling

Data Centre Design Tips

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

✓ Consider initial and future loads.

✓ Lower data centre 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 standardised operating envelope for the recommended IT operating temperature.

✓ Identify the class of your data centre 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 minimise 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 minimise 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 economisers.

✓ Choose an enclosure configuration that supports your cooling method.

✓ If using raised-floor cooling, carefully consider the location of perforated floor tiles to optimise 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 centre 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: 17.7- 27°C DB.

✓ Relative Humidity: 5.5°C DP to 60% RH and 15°C DP.

ASHRAE Allowable

✓ Server Inlet Air Temperature: 15-32°C DB.

✓ Relative Humidity: 20-80% RH up to 16.72°C DP.

How does raising air temperatures impact the data centre?

✓ Increases CRAC 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 centre, in the new corporate headquarters, that would be used to house the IT infrastructure for all of their facilities nationwide.

The Solution:

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

After learning about the hotel chain's situation and requirements, Black Box recommended a total infrastructure solution for their data centre, including cooling, cabinets and accessories, UPSs, PDUs, and environmental monitoring.
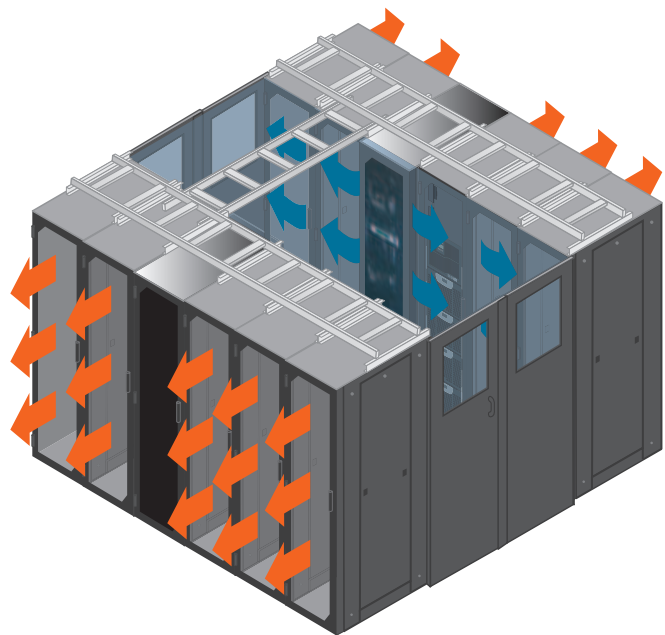
The implemented solution is a cold aisle containment configuration with overhead cable management. It doesn't require a raised floor and provides some redundancy. It can handle heat loads of up to 60 kW within the containment pod with just two In- Row chilled water units and has the UPS capacity to support 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 In- Row units.

The solution includes a 10-cabinet package with cold aisle containment, 2N cooling and n+1 power distribution:

- Ten (10) 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) In- Row chilled water units (with authorised 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, 750 mm wide, and 1000 mm deep.)
- Eighteen (18) metered PDUs—3-phase, 30 A/8.64-kW (24-A), 33-outlet (24) IEC-320-C13, (9) IEC-320-C19)], plug type: IEC60309 32A, 0U vertical mounting (2 per cabinet).
- AlertWerks™ ServSensor package with nine (9) temperature/ humidity sensors to monitor each cabinet.

- KVM tray—1U, 17" LCD display that includes keyboard and touchpad.

Additional information is available at www.black-box.de.

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

IP 52   **NEMA 12**

ClimateCab™ Server Cabinet

Save by cooling the cabinet, not the entire room

• IP52 / NEMA 12 rated for protection against falling dirt, circulating dust, lint debris, and splashing liquids in indoor environments.
• Includes 19" rails with M6 square mounting holes.
• Includes castors and levellers.
• 1m depth accommodates most servers.
• Fully welded body and door construction.
• Seamless door gaskets keep out dust and contaminants.
• Gland plate for sealed top or bottom cable entry / exit.
• Three-point locking handles on front and rear doors.
• Removable side panels enable easy attachment and relocation of air conditioning unit.
• **GO GREEN** – save energy and money by cooling only the cabinet rather than the whole room or IT centre.

When you need to install rackmount equipment in less-than-ideal environments or in areas without existing cooling infrastructure, ClimateCab Server Cabinets are your answer.
Their self-contained cooling system keeps your equipment housed in ideal conditions in virtually any location.

These units feature excellent access to equipment with removable, reversible doors and sides.

24U ClimateCab

Air-Conditioning

These models are perfect for harsh environments and remote locations without cooling infrastructure. Air-Conditioning units keep equipment cool even with temperatures up to 55°C. A closed-loop cooling system recirculates air in the cabinet and keeps outside air out, while an internal evaporator eliminates condensation.

NOTE: ClimateCab Server Cabinets ship without the air-conditioning mounted. Mounting the AC unit takes a few minutes.

Enclosure Airflow

Self-Contained AC

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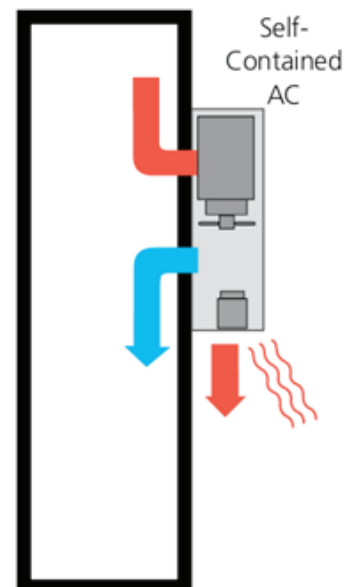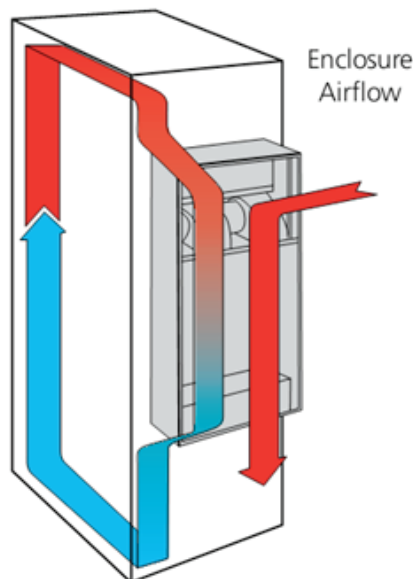
Additional Features

The cabinet includes front and rear rails and a bag of fixings for 19" equipment. Convenient studs are provided on the door and body for bonding and grounding, and earth bonding cables are also included.

The cabinet is finished in satin black with a RAL7035 grey air conditioner outer case. Other colours are available on request. The side panel features a pair of handles and location hooks to make fitting by a single engineer possible.

Front and rear doors feature three point locking. This ensures a tight seal around the entire edge of the door.

In order to eliminate condensation the air conditioner is equipped with a condensate evaporator. This prevents a build-up of condensed water on the condenser. The side location of the air conditioner is another safe-guard to condensation away from your valuable servers. The condensed mix is vented to the exterior of the cabinet to keep the interior completely dry.

NOTE: Air conditioner appearance varies depending on voltage range and cooling capacity.

Controls

The air conditioner can be run with no special controls set, however the settings may be modified to accommodate most applications by removing a panel and adjusting three DIP switches

A 5 wire connection block is supplied for wiring to a door open switch or alarm panel.

Door Open   A pair of connections may be used to stop the air conditioner from operating when the door is open. This prevents condensed water from collecting on the cold plates of the air conditioner.

Alarm   A pair of volt free contacts can be used to signal an alarm condition when the temperature exceeds 45, 55 or 60 °C.

Temperature   The internal temperature of the cabinet may be set to 25, 30, 35 or 40 °C by changing the position of the three DIP switches.

Applications

Remote buildings   When the IT for the building will fit into a single cabinet why build a data centre?

Manufacturing plants and Workshops.
          Protect control and monitoring equipment from airborne contaminants and temperature excesses. Heaters are available for low temperature applications.

In fact anywhere that needs a data centre environment on a small scale!
e.g. Educational Campuses, Comms closets, Car Parks, Electricity substations.

42U ClimateCab

Additional Features

Construction:

Body: Welded 14-gauge steel

Frame: Welded 12-gauge steel

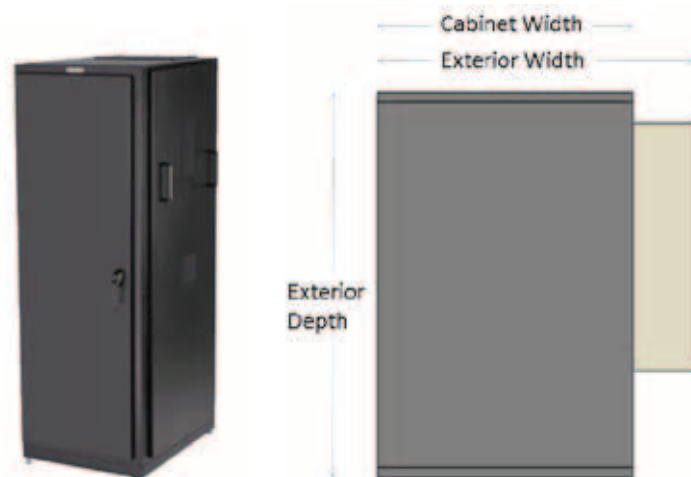**Doors:**   14-gauge solid steel

Weight Capacity: 680 kg

Rack Units: 14U 24U or 42U

Weight Capacity: 680 kg

Coating: Satin Black Powder Coat

IP/NEMA Rating: IP52/ NEMA-12

Rack Units	Exterior Height	Cabinet Width	Total Width	Exterior Depth	Combined Weight	Cooling Capacity	Code
14U	77.0	68.0	91.1	80.0	159.5 kg	2950 BTU (870W)	RM5008EU+ RMAC870EU
24U	129.5	71.1	95.9	106.6	225 kg	3240 BTU (950W)	RM5007EU + RMAC950EU
24U	129.5	71.1	95.9	106.6	228 kg	5120 BTU (1500W)	RM5007EU + RMAC1500EU
42U	213.4	71.1	95.9	106.6	295 kg	3240 BTU (950W)	RM5031EU + RMAC950EU
42U	213.4	71.1	95.9	106.6	298 kg	5120 BTU (1500W)	RM5031EU + RMAC1500EU
42U	213.4	71.1	95.9	106.6	328 kg	6825 BTU (2000W)	RM5030EU + RMAC2000EU
42U	213.4	71.1	95.9	106.6	328 kg	8530 BTU (2500W)	RM5030EU + RMAC2500EU

Air Conditioner Specification

	870W	950W	1500W	2000W	2500W	Unit
Rated Voltage +- 10%	230V (Other options available on request)					V
Cooling Performance (EN14511)						
35° inside, 35° outside	870	950	1500	2000	2500	W
35° inside, 50° outside	580	520	750	1440	1800	
Power Consumption 50/60 Hz	524	515/623	907/1047	950/1150	1250/1500	W
Current Consumption 50/60 Hz	3.06	2.98/3.25	5.4/6	5.13/6.1	6.75/8.5	A
Starting Current 50/60 Hz	22.1	23.3/25.4	33.2/27.6	23/23	33/31	A
Airflow internal/external	460/460	570/570				m3/h
AC Power Connection	Spring type terminal block included					
Noise Level	<62					dB(A)
Ambient Temperature Range	+15 - +55					°C
Control Temperature Range	25, 30, 35, 40, 45					°C
Refrigerant	R134a					
Weight (without packaging)	29.5	38	41	71	71	kg
Condensate Management	Internal Evaporation Included					
Protection	IP52(Cabinet) IP54 (Air Conditioner)					

BLACK BOX

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Air Conditioner Dimensions

	RMAC870EU	RMAC950EU RMAC1500EU	RMAC2000EU RMAC2500EU
X	38.0 cm	41.0 cm	48.5 cm
Y	59.9 cm	96.4 cm	154.3 cm
Z	23.1 cm	24.8 cm	24.0 cm

Commissioning

Cabinet sides are pre machined to match the air conditioner. The sides are fixed to the cabinet using screws and a rubber gasket. Sturdy handles and hooks at the base of the side panel reduce the physical effort required to fit the air conditioner. Sealing gaskets supplied with the air conditioner are inserted around the edges of both apertures. No specialist tooling or skills are required to install the Climatecab Server Cabinet

Item		
ClimateCab Server Cabinet, 14U		RM5008EU
870W Air Conditioner for ClimateCab 14U		RMAC870EU
ClimateCab Server Cabinet, 24U		RM5007EU
950W Air Conditioner for ClimateCab 24U		RMAC950EU
1500W Air Conditioner for ClimateCab 24U		RMAC1500EU
ClimateCab Server Cabinet, 42U (for 950W-1500W AC)		RMAC950EU
1500W Air Conditioner		RMAC1500EU
ClimateCab Server Cabinet, 42U for (2000- 2500W AC)		RM5030EU
2000W Air Conditioner for ClimateCab 42U		RMAC2000EU
2500W Air Conditioner for ClimateCab 42U		RMAC2500EU
AC Power Cord	IEC C20	RMAC-C20-05M
	BS1363 (UK)	RMAC-UK-05M
	Schuko (Europe)	RMAC-EU-05M

What's included:

- ClimateCab Server Cabinet
- Air conditioning unit
- Mounting hardware
- Gaskets
- Instructions
- Castors
- Levelling Feet
- Adjustable Rails
- Gland plate for floor or roof
- Earth bonding kit
- Power connector block
- Alarm connector block

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 centre.

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
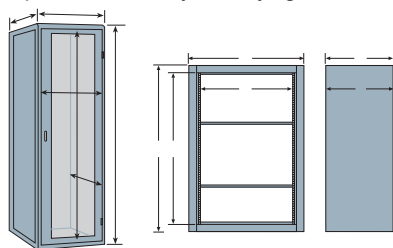
professional image, everything counts.

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 1000 mm deep. Bigger is better! Lastly, remember to allow space for cabling and power provisions.

A standard full-sized cabinet is 2 m high (42U). This is the height that makes the most

efficient use of floor space in rooms with standard-height 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".

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. 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 90 mm of rack space. A rack that's 20U high has 889 mm 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.
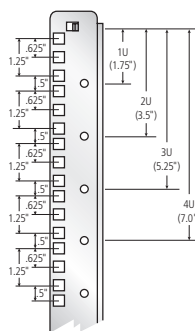
serve little use and just get in the way.

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 centres, 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 centres generally have special cooling equipment such as CRAC units, In-Row Cooling AC units, or Liquid Cooling to meet their high cooling requirements. But even if your data centre is cool, the inside of a cabinet may overheat if air distribution is inadequate.
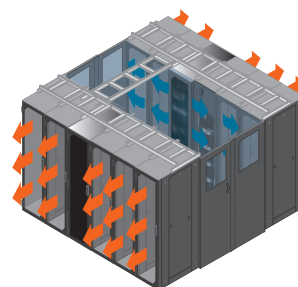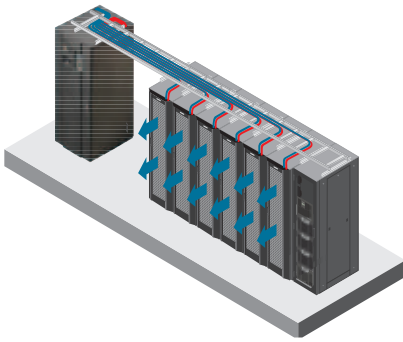
The temperature inside a cabinet is affected by many variables, including door type, air flow, and the equipment housed within the cabinet. The most direct way to keep network equipment cool is to ensure adequate airflow. The goal is to ensure that every server, every router, every switch has the necessary 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 roof door. Or you can use a fan or fan panel that mounts inside the cabinet or a specialised 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.
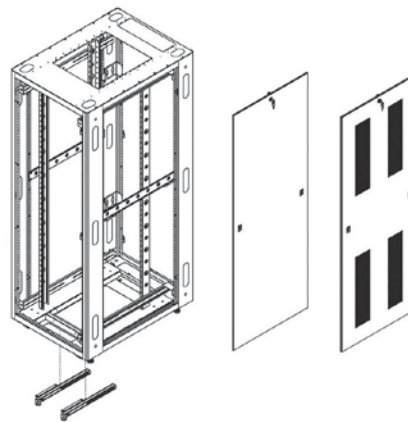
Moisture and dust resistance.

When you're housing delicate electronic components outside of a protected data centre—for instance on a factory floor—look for an IP rating.

The **IP Code, Ingress Protection Rating**, sometimes also interpreted as **International Protection Rating**, classifies and rates the degree of protection provided against the intrusion (including body parts such as hands and fingers), dust, accidental contact, and water in *mechanical* casings and with electrical enclosures. It is published by the International Electrotechnical Commission (IEC). Common IP ratings are IP52 and IP66: IP52 covers dripping water at up to 15 degrees from verical, and dust protection. IP66 ensures an enclosure that resists powerful water jets and is dust tight.
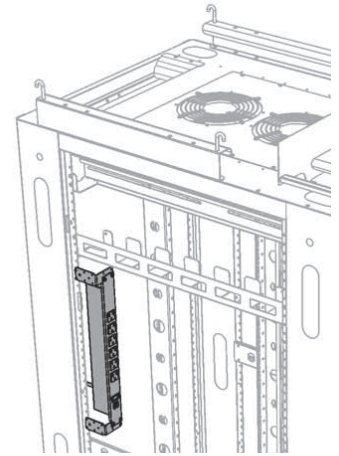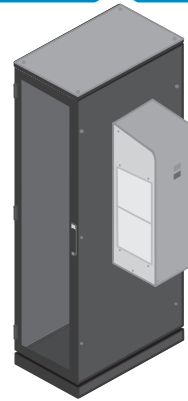
Assembled or not.

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.

Power provisioning.

Cabinets need provisions for powering enclosed equipment and for managing the cables associated with the equipment. Power distribution units (PDUs) mount either vertically or horizontally with a wide range of outlet counts, types, and spacing. High-end PDUs may 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 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 the cabinet because of their weight. Alternatively, several UPS units may be housed in a separate cabinet in the data centre.

Cable management.

Although most cabinets come with cable management features, you will still need to plan for some additional organisers to keep cables under control. Plotting your connections in advance helps you to decide how to organise 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.

Elite Cabinets

Configure a cabinet to support your cooling needs.

EC45U6090SMDSSNK: left: front view; right: rear view   *EC45U6090SPDS3NK: left: front view; right: rear view*

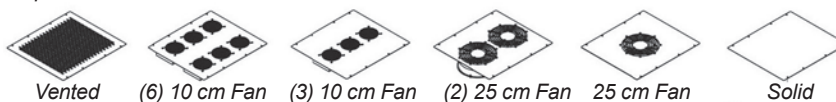## Elite Cabinets and data centre cooling.

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® 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 centre 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 customised to your specifications and shipped in only two business days. 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.

Top Panels:

Vented   (6) 10 cm Fan   (3) 10 cm Fan   (2) 25 cm Fan   25 cm Fan   Solid

Door Options:

Split Fan   Plexi   Solid   Split Mesh   Mesh   Base Unit   Solid and Vented Side Panels

Anti-Tip Legs

Configuring Elite Cabinets

Building an Elite Cabinet specific to your application is easy.

If one of our pre-configured cabinets doesn't work for you, it's easy to build your own Elite™ Cabinet to your specifications. Just use the codes (below) to fill in the line on, below, matching colours as you go. When you're done, just call your local Black Box with the number, and we'll have your custom-built cabinets on your doorstep in a flash.

The example below is a 42U x 75 cm W x 100 cm 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:

| E | C | 4 | 2 | U | 7 | 5 | 1 | 00 | S | M | D | S | M | Y | K |

Step 1:
Choose your enclosure.

24U x 60 cm W x 100 cm D

| E | C | 2 | 4 | U | 6 | 0 | 1 | 0 |

24U x 75 cm W x 80 cm D

| E | C | 2 | 4 | U | 7 | 5 | 8 | 0 |

38U x 75 cm W x 80 cm D

| E | C | 3 | 8 | U | 7 | 5 | 8 | 0 |

42U x 60 cm W x 100 cm D

| E | C | 4 | 2 | U | 6 | 0 | 1 | 00 |

42U x 75 cm W x 32 100 cm D

| E | C | 4 | 2 | U | 7 | 5 | 1 | 00 |

45U x 60 cm W x 90 cm D

| E | C | 4 | 5 | U | 6 | 0 | 9 | 0 |

45U x 60 cm W x 100 cm D

| E | C | 4 | 5 | U | 6 | 0 | 1 | 00 |

45U x 75 cm W x 80 cm D

| E | C | 4 | 5 | U | 7 | 5 | 8 | 0 |

45U x 75 cm W x 90 cm D

| E | C | 4 | 5 | U | 7 | 5 | 9 | 0 |

45U x 24 cm W x 100 cm D

| E | C | 4 | 5 | U | 7 | 5 | 1 | 00 |

45U x 75 cm W x 120 cm D

| E | C | 4 | 5 | U | 7 | 5 | 1 | 20 |

Fill in the blocks below to get your ideal cabinet's SKU. For help configuring your cabinet, call our FREE Tech Support at 0811-5541 112

* 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

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 (25 cm) 930 m3/h
2 2-Fan Unit (25 cm) 1860 m3/h
3 3-Fan Unit (10 cm) 380 m3/h
6 6-Fan Unit (10 cm) 760 m3/h

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™ FREE, live help in less than 30 seconds at 0811-5541 112

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 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 centre 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 40 mm 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.

Chimneys provide a closed hot air return between the top of a cabinet and a drop ceiling plenum. They can be used with fan trays to increase efficiency.

Chimney Top

Cable Trough Kit

Ladder Rack Brackets

Large top opening can be used as 12U of racking space

Horizontal Lacing Bar

Vertical Lacing Bar
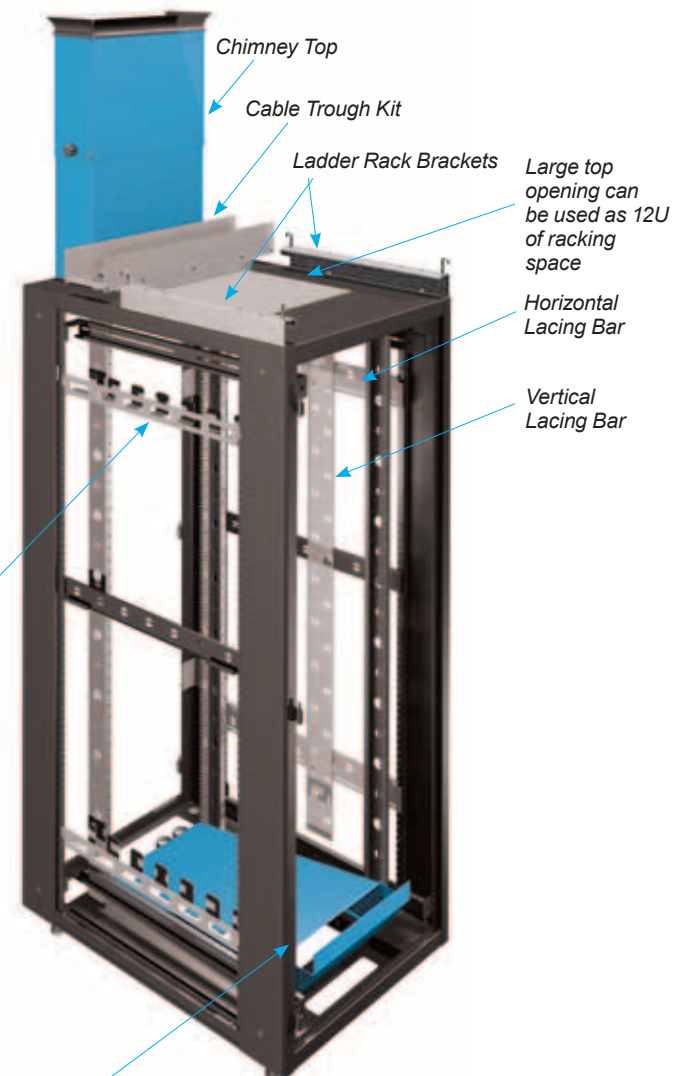
Front-to-Back Cable Manager

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 8° C, extending the life of servers, and minimising downtime.

◆ BLACK BOX
NETWORK SERVICES

phone 0811 - 5541 112 | usforces@black-box.de

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 500 mm, to 860 mm.

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 600 mm Wide 42U and 45U Cabinets	ECAD60
for 750 mm Wide 42U and 45U Cabinets	ECAD75

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	45 mm	RM1031
2U	89 mm	RM1032
3U	134 mm	RM1033
4U	178 mm	RM1034
5U	223 mm	RM1035

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

Related

For full features and specs, go to www.black-box.de

Brush Grommet Top Panel

• Top panel keeps your cable entry organised and clean.
• Fits top opening in Elite Cabinets.
• Includes grommet kit and mounting hardware.
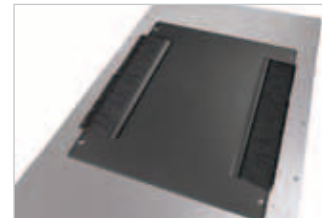
Brush Grommet Top Panel

	ECTOPB

Chimney Top (ECTOPCHIM)

Air Dam (ECAD60)

Filler Panel (RM1035)

Horizontal Cable Manager (RMT701)

Solid Rear Bottom Panel (ECBSKS60)

Solid Bottom Panel (ECBSKL7590)
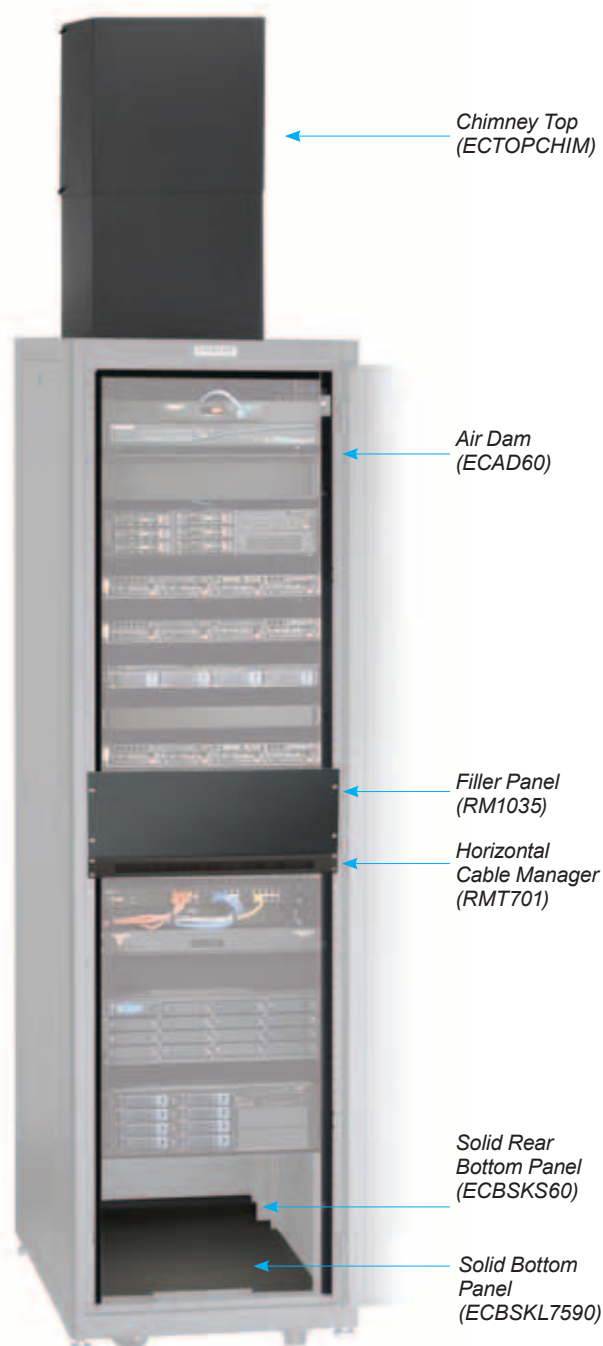
Cable Trough Kits

• **Standard Warranty** — All: Lifetime

EC24WTCTK

Cable Trough Kits
• Route cables across the top of an Elite Cabinet in multi-cabinet installations.
• Install anywhere along the top of the cabinet.

Cable Trough Kits

600 mm Wide	EC60WTCTK
750 mm Wide	EC75WTCTK

Horizontal Lacing Bars

• Attach cables to this bar to keep your Elite Cabinet organised and neat.

Horizontal Lacing Bars

for 750 mm W x 800 mm D Cabinets	ECHLB80
for 750 mm W x 900 mm D Cabinets	ECHLB90
for 750 mm W x 1000 mm D Cabinets	ECHLB100

ECHLB80

ECVCM

ECVLB42

CFB80

Vertical Lacing Bars

• Attach cables to this bar to keep your Elite cabinet organised.
• Requires a Horizontal Lacing Bar for mounting (ECHLB22, ECHLB36, ECHLB42, left).
• Order (2) for a 24U H cabinet, (3) for a 38U H or 42U H cabinet, or (4) for an 45U H cabinet.

Vertical Sectional Cable Manager

• Adds vertical cable management in 11U increments.

Vertical Lacing Bars for Elite Cabinets

for 24 U Cabinets	ECVLB24
for 38 U Cabinets	ECVLB38
for 42 U Cabinets	ECVLB42
for 45 U Cabinets	ECVLB45

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 750 mm W x 800 mm D Cabinets	ECFB80
for 750 mm W x 900 mm D Cabinets	ECFB90
for 750 mm W x 1000 mm D Cabinets	ECFB100

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).

ECBSKS60

Solid Rear Bottom Panels

600 mm W	ECBSKS60
750 mm W	ECBSKS75

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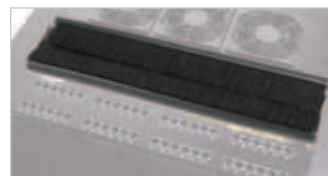
• Fits the small 3U opening on the top of Elite Cabinets.
• Brushes enable you to run cable into the cabinet while keeping out dust and contaminants.
• Can be installed along with the Elite Cabinet Waterfall Brackets for 3U Top Opening (ECW3U), facing page.

Brush Grommet Kit

for 3U Opening	ECBGK3U

Conduit Knockout Panel
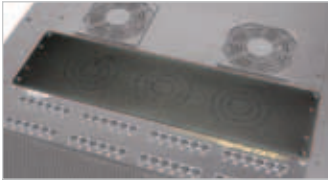
- Fits the small 3U opening on the top of Elite™ Cabinets.
- Three knockout plates on 125 mm centres enable you to route 25 mm, 50 mm, or 75 mm conduit.
- Includes eight screws.

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 centre-opening doors and all the parts you need for installation.

Elite Cold Aisle Containment System

42U	EC42U120WCD
45U	EC45U120WCD

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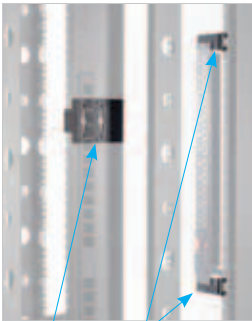
Vertical PDU Mounting Kit
- Mounts a PDU or other 19", 1U rackmount equipment behind the rails without using any rack space.
- Includes (2) 1U brackets.

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.

ECPDUMK
ECPDUMK60

Dual PDU Mounting Brackets

for 60 cm W x 100 cm D Elite Cabinets	ECPDUMK60100
for 75 cm W x 120 cm D Elite Cabinets	ECPDUMK60120
for 60cm W x 90 cm D Elite Cabinets	ECPDUMK6090
for 75cm W x 100 cm D Elite Cabinets	ECPDUMK75100
for 75cm W x 80 cm D Elite Cabinets	ECPDUMK7580
for 75 cm W x 90 cm D Elite Cabinets	ECPDUMK7590

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

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).

ECBSKL7590

Solid Bottom Panels

600 mm W x 900 mm D	ECBSKL6090
600 mm W x 1000 mm D	ECBSKL60100
750 mm W x 800 mm D	ECBSKL7580
750 mm W x 900 mm D	ECBSKL7590
750 mm W x 1000 mm D	ECBSKL75100

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

Bottom Filter Kits

ECBFKL3036
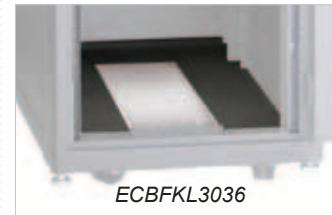
- Allow air circulation in Elite Cabinets.
- Filter out dust and other airborne debris.

Bottom Filter Kits

For 800 mm W x 900 mm D Elite Cabinet	ECBFKL6090
For 600 mm W x 1000 mm D Elite Cabinet	ECBFKL60100
For 750 mm W x 800 mm D Elite Cabinet	ECBFKL7580
For 750 mm W x 900 mm D Elite Cabinet	ECBFKL7590
For 750 mm W x 1000 mm D Elite Cabinet	ECBFKL75100

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 8° C, extending server life and minimising downtime.

ECAIRFLOW100

Air Funnel Kits

|	
for 600 mm W x 900 mm D	ECAIRFLOW90
for 600 mm W and 750 mm W x 1000 mm D	ECAIRFLOW100
with Dual Fan Tray	
for 600 mm W x 900 mm D	ECAIRFLOW6090FT
for 600 mm W x 1000 mm D	ECAIRFLOW60100FT
for 750 mm W x 1000 mm D	ECAIRFLOW75100FT

Bottom Brush Grommet Kits

ECBGKL60100

- 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.
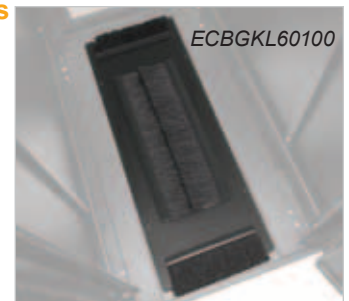
Bottom Brush Grommet Kits

for 600 mm W x 800 mm D Cabinets	ECBGKL6080
for 600 mm W x 900 mm D Cabinets	ECBGKL6090
for 600 mm W x 1000 mm D Cabinets	ECBGKL60100
for 750 mm W x 800 mm D Cabinets	ECBGKL7580
for 750 mm W x 900 mm D Cabinets	ECBGKL7590
for 750 mm W x 1000 mm D Cabinets	ECBGKL75100

Bottom Rear Brush Grommet Kits

for 600 mm W Cabinets	ECBBGKS60
for 750 mm W Cabinets	ECBBGKS75

Robust cabinets for any application
Select Cabinets

» Fully configurable for your specific applications.
» Numerous cooling options.
» Extensive cable management.
» Standard configurations for rapid turnaround.
» Lifetime guarantee.

SC18U6080SGSSMNK

SC42U60100SGVSMNK

SC42U60100SMVSMNK: front view

SC42U60100SGVSMNK: rear view showing perimeter-vented rear door

Features.

The Select Cabinet family from Black Box offers a wide range of features for regular office and IT applications. A strong 600-kilogram weight capacity supports all but the most demanding applications. The cabinets also feature welded steel construction and come with the protection of a lifetime Black Box® lifetime warranty. They arrive fully assembled and ready to populate.

Choices.

Select Cabinets are specifically designed to be adaptable to your exact needs. Whether you need a high airflow cabinet to cool your servers, or a small, secure cabinet for an office, the Select cabinet family has the solution for you. Select a pre-configured cabinet or have one customised to your specifications and shipped directly to you . Choose from a wide range of sizes to suit all your data and server cabinet needs. Our Tech Support experts will help you specify the cabinet you need —FREE of charge.

Cabinet doors are available in solid, high-flow mesh, split high-flow mesh, or toughened glass. You also can choose a cabinet with no doors. Side panels can be solid or vented, or you can leave them off. All mesh doors have our high-flow mesh, which improves airflow approximately 10% over typical cabinets.

Cabinet tops are customisable, too — choose a top panel with or without fans, or use the top opening to rackmount up to 12U of shallow components such as patch panels or power strips. For more information, call our FREE Tech Support.

Front-to-Back Cable Manager (Intermediate Bracket)

Vertical Cable Lacing Bar

Brush Grommet

Select cabinets come with leg levellers; castors are offered as accessories.
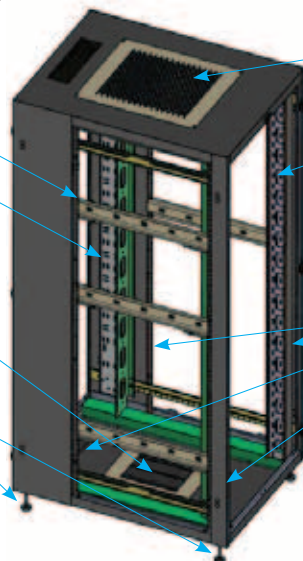
Choice of Mesh, Solid, or Fan Top Panel

Vertical Cable Trough

19" Full Height, Fully Adjustable Rails with Square-Hole Cutouts for Cage Nuts

Top Panels

SCTOPF60

SCTOPS60

SCTOPP60

Cable management.
Cable management is easy. The cabinets feature multiple lacedown points throughout. For even more cable management, add our Vertical Lacing Bars.
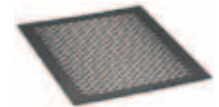
Wide Range of Sizes

Because the cabinets come with a wide range of choices in frame sizes, rails, doors, and top and side panels, they adapt to nearly every application.
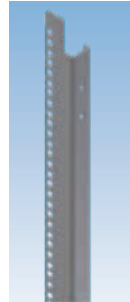
Select a pre-configured cabinet or have one customised to your specifications and shipped directly to you . Choose from a wide range of sizes to suit all your data and server cabinet needs. Our Tech Support experts will help you specify the cabinet you need —FREE of charge.

Step 1: Choose your enclosure. Examples:

Step 2: M6 rails are standard.

Step 3: Choose your front doors.

Step 4: Choose your rear doors.

Step 5: Choose your side panels.

Step 6: Choose your cabinet top.

Step 7: Decide on anti-tip legs.

Step 8: Choose your lock*.

18U x 60 cm W x 60 cm D

| S | C | 1 | 8 | U | 6 | 0 | 6 | 0 |

24U x 60 cm W x 80 cm D

| S | C | 2 | 4 | U | 6 | 0 | 8 | 0 |

24U x 75 cm W x 60 cm D

| S | C | 2 | 4 | U | 7 | 5 | 6 | 0 |

32U x 60 cm W x 80 cm D

| S | C | 3 | 2 | U | 6 | 0 | 8 | 0 |

37U x 60 cm W x 80 cm D

| S | C | 3 | 7 | U | 6 | 0 | 8 | 0 |

37U x 60 cm W x 100 cm D

| S | C | 3 | 7 | U | 6 | 0 | 1 | 00 |

42U x 60 cm W x 80 cm D

| S | C | 4 | 2 | U | 6 | 0 | 8 | 0 |

42U x 75 cm W x 100 cm D

| S | C | 4 | 2 | U | 7 | 5 | 1 | 00 |

47U x 75 cm W x 100 cm D

| S | C | 4 | 7 | U | 7 | 5 | 1 | 00 |

Available heights: 18U, 24U, 32U, 37U, 42U, 47U
Available widths: 60 cm, 75 cm
Available depths: 60 cm, 80 cm, 100 cm

S M6 rails with square holes

N None / **S** Solid
M Mesh / **D** Split Mesh
G Toughened Glass
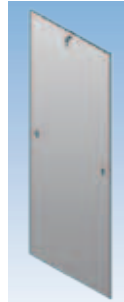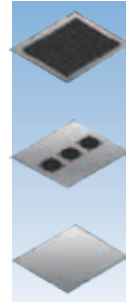
N None / **S** Solid
M Mesh / **D** Split Mesh
G Toughened Glass
V Perimeter Vented

N None / **S** Solid
M Mesh (Vented)

N None / **S** Solid
M Mesh / **3** 3-Fan Unit (10 cm) 380 m3/h

Y Yes / **N** No

N None / **K** Keyed
C Combination
B Biometric†
H Hybrid†

Example:

| S | C | 4 | 2 | U | 6 | 0 | 1 | 00 | S | M | M | S | N | N | K |

Select Cabinet Accessories

Heavy-Duty Sliding Adjustable Shelf

- Shelf slides out to provide
- easy access to your servers and other equipment.
- Use with 736 mm rails.
- Holds up to 125 kg.
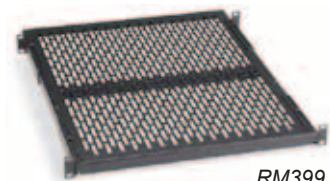- **WARRANTY** — Lifetime

RMT411-56

Fixed Vented Server Shelf

- Supports up to 90 kg
- For 19" rails.
- Mounts in 4-post racks and enclosures.
- **WARRANTY** — Lifetime
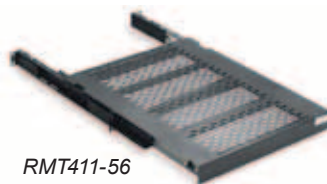
RM399

Item		
Heavy-Duty Sliding Adjustable Shelf		
56 kg Capacity	56 cm D	RM411-56 D
	66 cm D	RM411-66 D
	76 cm D	RM411-76 D

Item	
Fixed Vented Server Shelf	
	RM399
	RM403
	RM410- R2

Item	
Vertical Cable Management	
Vertical Lacing Bars	
For 18U Cabinets	SCVLB18
For 24U Cabinets	SCVLB24
For 32U Cabinets	SCVLB32
For 37U Cabinets	SCVLB37
For 42U Cabinets	SCVLB42
For 47U Cabinets	SCVLB47
Extra Pairs of M6 Rails	
For 18U Cabinets	SC18M6
For 24U Cabinets	SC24M6
For 32U Cabinets	SC32M6
For 37U Cabinets	SC37M6
For 42U Cabinets	SC42M6
For 47U Cabinets	SC47M6

Item	
Solid Bottom Panels	
for 60 cm W x 60 cm D Cabinets	SCBSKL6060
Brush Grommet Kit for 3U Top Opening	ECBGK3U
Anti-Tip Legs	
For 600D	(Not Available)
For 800 and 1000D	ECAT1
Networking Hardware/Baying Kit	ECNH
Vertical PDU 19" Mounting Kit, 0U	ECPDUMK
Dual PDU Mounting Brackets, 1 Pair	
For 60 cm W Cabinets	ECPDUMK60
For 75 cm W Cabinets	ECPDUMK75
Earth Bonding Kit (6 Straps)	SCG101

Reduce noise, keep equipment cool, increase productivity.

Acoustic Cabinets

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. These Black Box® Acoustic Cabinet reduce sound by an amazing 27–28.5 dB—the most you can get today in a soundproof enclosure. And, the cabinets go through independent, third-party testing to ensure it.

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.

A single server can generate 50dB of noise- as loud as the conversation making it difficult for people to talk on the phone.

An Acoustic Cabinet can reduce this noise to a whisper.

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

This heavy-duty, multilayer composite material covers all inside surfaces. Even the six cable routing panels on top and bottom (three each) are covered.

High Cooling Capacity.

Active cabinets have an incredible thermal load capacity of up to 7.2 kW. To cool equipment, Active cabinets feature two variable-speed fans on the rear doors that are controlled by a temperature sensor to ensure maximum energy efficiency.

Quiet Cab

- Put networking equipment where you need it—without the noise, space, or cost concerns.
- Acoustic foam lining reduces audible server and hardware noise by 28.5 dB to a whisper.
- Integrated ventilation fans keep equipment cool in active cabinets.
- Cabinets are optionally available in maple, oak, and cherry veneers.
- Optional chimney.
- 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 castors.
- 19" M6 rails are depth adjustable.
- Supplied with foam seeled floor cable entry panel.
- Generous cable management space is built in.
- Accommodates all leading servers, including blade servers.
- Fully assembled—just plug it in!

Cabinets are optionally available in Maple, Oak, and Cherry veneers.
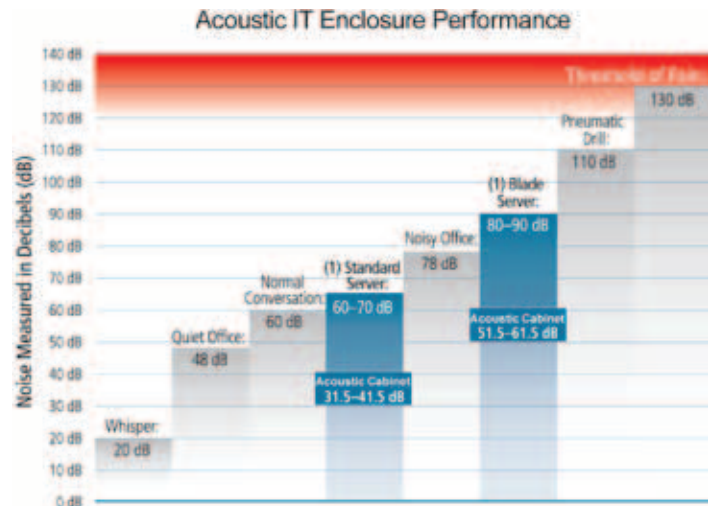
Acoustic Cabinet (QCE24U)

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Very accommodating.

This 19" cabinet is extremely well-designed and built to last. It can hold a very hefty 500Kg of equipment, including all leading servers—even blade servers. To accommodate different types of equipment, the 19" M6 mounting rails are adjustable. Load-bearing castors 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 wiring and patch cables.

A good fit in open environments.

Why spend money on a data centre when all you need is an Acoustic cabinet? 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.

Active Rear 12U
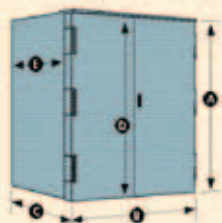
ⓐ Exterior Height

ⓑ Exterior Width

ⓒ Exterior Depth

ⓓ Useable Height (U)

ⓔ Useable Depth

* Call us for Acoustic Cabinet accessories such as dust filters Plinths, Bonding Kits, Blanking Panels and Trunking.

Buyer's Guide	Acoustic Cabinets					
Code	ACAB12UP	ACAB12UA	ACAB24UP	ACAB24UA	ACAB42UP	ACAB42UA
Active or Passive	Passive	Active	Passive	Active	Passive	Active
Exterior Height	716mm	716mm	1250mm	1250mm	2050mm	2050mm
Exterior Width	780mm	780mm	780mm	780mm	780mm	780mm
Exterior Depth	1100mm	1100mm	1100mm	1100mm	1100mm	1100mm
Useable Height	12U	12U	24U	24U	42U	42U
Useable Depth	850mm	850mm	850mm	850mm	850mm	850mm
Weight	110 kg	118 kg	167 kg	179 kg	275 kg	298 kg
Max. Load	500 kg	500 kg	500 kg	500 kg	500 kg	500 kg
Power Consumption	N/A	230W	N/A	230W	N/A	230W
Attenuation Performance	28.0dBA	28.5dBA	28.0dBA	28.5dBA	28.0dBA	28.5dBA
Maximum Heat Load	1.75kW	7.2kW	2.25kW	7.2kW	2.25kW	7.2kW

Inbound Air Flow.

Air is drawn in through the front doors. A U shaped duct prevents noise from escaping through the air passage. An optional filter is available for dusty environments.
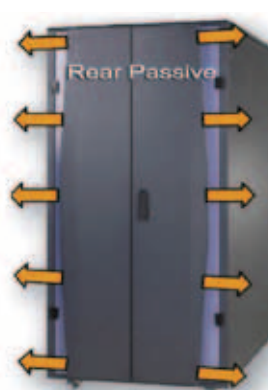
Passive Air Exhaust.

The passive cabinet uses the fans in the equipment to draw air in through the front and out through the rear. Warm air from the equipment is vented into the ambient environment to be cooled by the room's air conditioning system. Maximum power consumption in the passive cabinet is 1.75 kW (12U), 2.25 kW (24U), or 2.75 kW (42U).

Active Air Exhaust.

Large variable speed fans in the rear doors of the active cabinet draw air from the top of the cabinet and send it upwards through a U section in the rear doors. An optional chimney system may be used to channel the air outside the room, or it may be vented into the room to be cooled by the air conditioning system. Maximum power consumption in the active cabinet is 7.2 kW (all models).

Customise 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.

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.

Accessorise
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 20–23) 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 (RMT373AE-R2) 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.

3U opening for accessories or cable access on the top and bottom of cabinet.

Cutouts for ventilation.

Smoked Plexi or mesh front door.

Keylocks on side and front.

Openings on back enable you to insert loaded patch panels without rewiring.

The cabinet is reversible top to bottom, so the back section opens left or right.
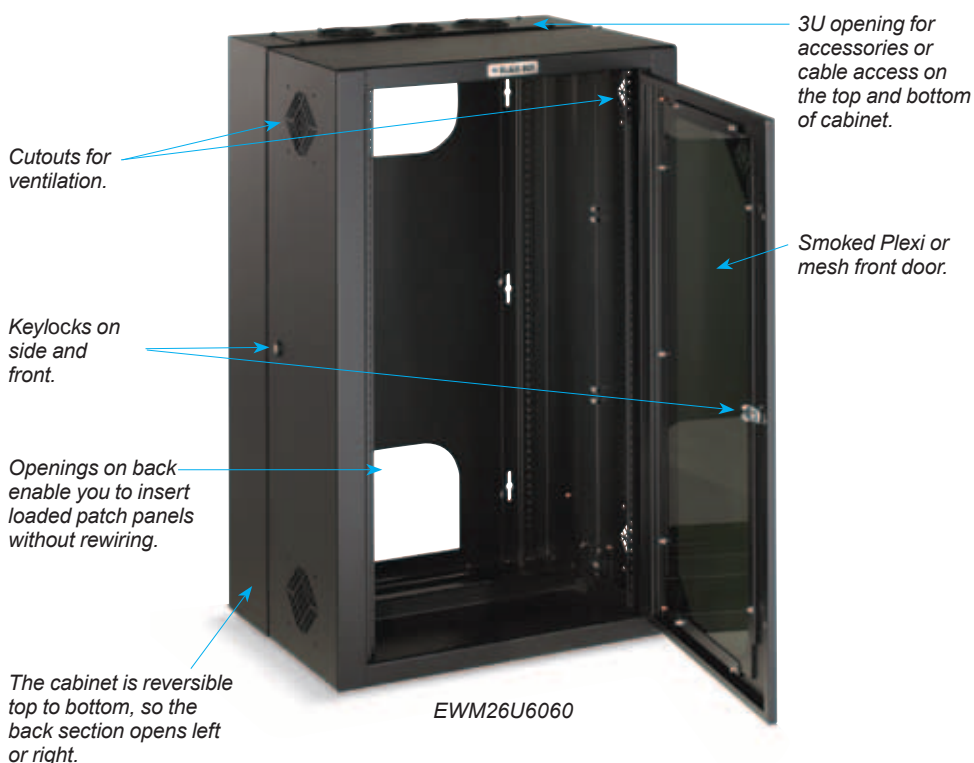
EWM26U6060

Optional Waterfall Radius Bracket (ECW3U)

Optional Brush Grommet Kit (ECBGK3U) in 3U opening.
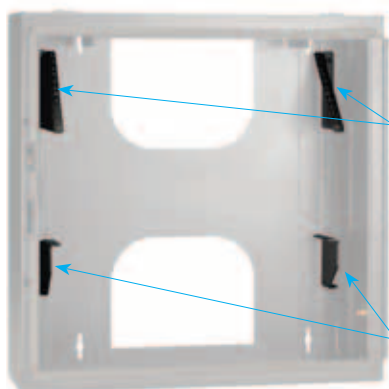
45° Brackets (EWM45DAB)

90° Brackets (EWM90DAB)

EWM12U6045

EWM20U6045

EWM26U6075

Elite Wallmount Cabinets

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Main Body Depth	Rear Section Depth	Code
60 cm	60 cm	45 cm	12U	59.4 cm	23.2 cm	18 cm	EWM12U6045
		60 cm			36.4 cm		EWM12U6060
		75 cm			53.7 cm		EWM12U6075
91.4 cm		45 cm	20U		23.2 cm		EWM20U6045
		60 cm			38.4 cm		EWM20U6060
		75 cm			53.7 cm		EWM20U6075
122 cm		45 cm	26U		23.2 cm		EWM26U6045
		60 cm			38.4 cm		EWM26U6060
		75 cm			53.7 cm		EWM26U6075

Elite Wallmount Cabinet Accessories

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

For full features and specs, go to black-box.de

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 at least 40 mm 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?
- IP Rating—Does the cabinet need an IP 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 the rear of equipment.

A good place to start is to talk to one of our Technical Engineers.

Protect and cool equipment in areas without air-conditioning.

Wallmount ClimateCab™

- IP52/ NEMA 12 rated for protection against falling dirt, circulating dust, lint, debris and splashing liquids in indoor enviroments
- Includes 19" rails with M6 mounting holes
- Scratch-resistant safety glass window provides easy viewing
- Fully welded body and door construction
- Robust 12-gauge frame and 14 or 16 gauge sides and doors. Seamless door gaskets keep out dust and contaminants.
- **GO GREEN**- save energy and money by cooling only the cabinet rather that the whole room or IT centre
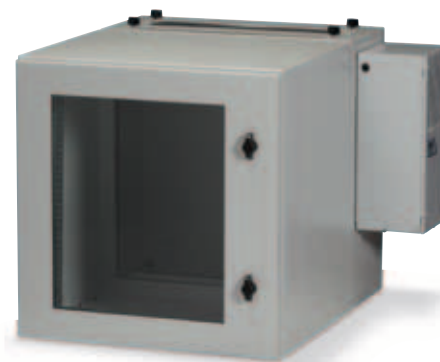
RMW5110ACG-R2
Shown with AC unit installed.

When you need to install rackmount equipment in less-than-ideal environments or in areas without existing cooling infrastructure, ClimateCab IP52/NEMA 12 Wallmount Cabinets are your answer. Their self-contained cooling system keeps your equipment housed in ideal conditions in virtually any location.

On the double-hinged models, the cabinet swings away from either a front or a rear door, enabling access to the rear of your equipment. Single-hinged models in which only the front door opens are also available.

ClimateCab with Air-Conditioning

The AC models (RMW5130ACE, RMW5110ACE, RMW5230ACE, RMW5210ACE) are perfect for harsh environments and remote locations without cooling infrastructure. Air-conditioning units keep equipment cool even with temperatures up to 54.4º C. A closed-loop cooling system recirculates air in the cabinet and keeps outside air out, while an internal evaporator eliminates condensation.

ClimateCab with Fan

Use the fan models (RMW5120AFE, RMW5100AFE) in areas where you need protection from the elements, but temperature control is not a significant issue. Air filters on the bottom can be easily removed for cleaning without opening the cabinet. A pagoda-style fan top provides protection from falling liquids and debris.
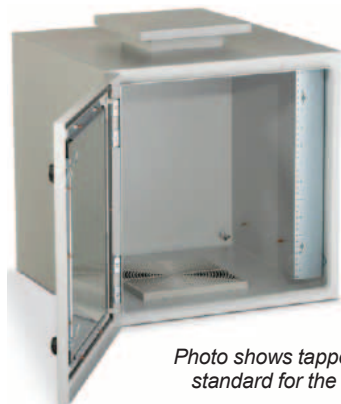
Photo shows tapped rails. M6 rails are standard for the European market.
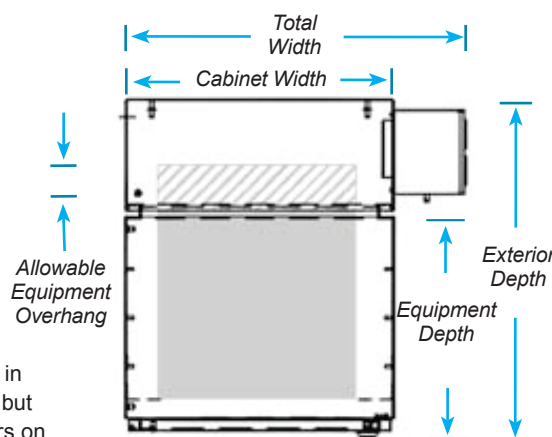
The gland plate closes around cables to keep them in place without damaging them and also helps to keep dust and debris out of the cabinet. Bottom gland plate is standard; top gland plate is optional.

Buyers Guide | Wallmount Climate Cabinets

Hinge	Exterior Height	Cabinet Width	Total Width	Exterior Depth	Rack Unit	Equipment Depth	Gland Plate	Colling Capacity	Code
Single			77 cm	61 cm		53.8 cm	--	800 BTU (235 W)	RMW5130ACE
Double			77 cm	61 cm		28.6 cm	--	800 BTU (235 W)	RMW5110ACE
Double			77 cm	61 cm		28.6 cm	**P**	800 BTU (235 W)	RMW5110ACGE
Single	61 cm	61 cm	86.1 cm	79 cm	12U	71.7 cm	--	2000 BTU (600 W)	RMW5230ACE
Double			86.1 cm	79 cm		41.4 cm	--	2000 BTU (600 W)	RMW5210ACE
Double			86.1 cm	79 cm		41.4 cm	**P**	2000 BTU (600 W)	RMW5210ACGE
Single			61 cm	61 cm		53.8 cm	--	Fan/ Ambient Air	RMW5210AFE
Double			61 cm	61 cm		40.2 cm	--	Fan/ Ambient Air	RMW5100AFE

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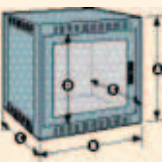phone 0811 - 5541 112 | usforces@black-box.de

Quality wall cabinets with premium features for a low price!

RAK-IT Wall Cabinets

- Fabricated from thick gauge steel with welded sub frames.
- Secure with locking sides and front door.
- 4 vertical mounting angles with front and side cage nut cut-outs and 'U' height marking.
- Passive side ventilation.
- Easy installation with wall hanger device and removable rear panel.
- Generous 325mm x 55mm roof and floor cable entry/ exit points.
- 360° access for ease of configuration
- Earth bonding kit included.

RAK-IT Wall Cabinets are engineered around two welded sub frames that run from front to back. Side panels feature twin latching fasteners for rapid removal and a cam lock for security. Front and rear rails are mounted on slotted horizontal rails that run from the front to the back of the cabinet for complete flexibility. On the roof, and underneath a large rectangular blanking panel may be left in situ or removed to allow cable entry / exit. Four screw holes at the rear of the cabinet enable easy wall mounting. Optional fans may be mounted in the roof of the cabinet for additional heat extraction.

		6U Cabinet	600 x 450	600 x 550	600 X 600
Ⓐ	Exterior Height	Code	RKTE66045	RKTE66055	RKTE66060
Ⓑ	Exterior Width	Exterior Height	360 mm	360mm	360mm
Ⓒ	Exterior Depth	Exterior Width	600mm	600mm	600mm
Ⓓ	Useable Height (U)	Exterior Depth	450 mm	550mm	600mm
Ⓔ	Useable Depth	Useable Height	6U	6U	6U

9U Cabinet	900 x 450	900 x 550	900 X 600
Code	RKTE96045	RKTE96055	RKTE96060
Exterior Height	495 mm	495mm	495mm
Exterior Width	600mm	600mm	600mm
Exterior Depth	450 mm	550mm	600mm
Useable Height	9U	9U	9U

What's included:

(1) Wall hanger for easy installation
(1) Glazed reversable front door.
(2) 19" Adjustable mounting profiles
(2) Lockable steel side doors
(2) Vertical cable management panels

12U Cabinet	600 x 450	600 x 550	600 X 600
Code	RKTE126045	RKTE126055	RKTE126060
Exterior Height	625 mm	625mm	625mm
Exterior Width	600mm	600mm	600mm
Exterior Depth	450 mm	550mm	600mm
Useable Height	12U	12U	12U

15 & 18U Cabinet	600 x 450	600 x 550	600 X 550
Code	RKTE156045	RKTE156055	RKTE186055
Exterior Height	780 mm	780mm	896 mm
Exterior Width	600mm	600mm	600 mm
Exterior Depth	450 mm	550mm	550 mm
Useable Height	15U	15U	18U

Select Double Hinged Wall Cabinets

Select Double Hinged Wall Mount/Swing Out Enclosures provide 19" mounting (includes two pairs of M6 mounting rails) in an accessible enclosure.
A simple snap latch located inside the cabinet opens the 457mmD centre swing section providing outstanding front and rear access to cables and equipment.
The reversible cabinet mounting design makes left or right-hand swing-out possible. This convenient feature also conserves valuable wall space. 25mm, 50mm, and 76mm knockouts can be found on the rear of the enclosure in addition to horseshoe knockouts found on the top and bottom of the rear section to make wiring, installation, and maintenance of equipment easy. Front and rear sections lock independently for added security.
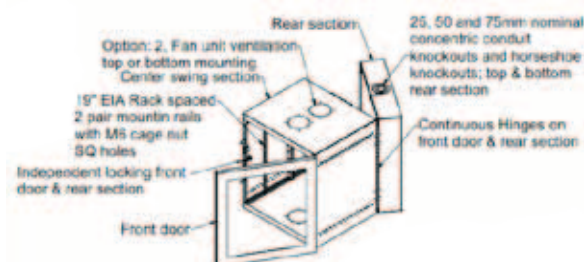
Dimensions of 12U, 19U and 25U Cabinet

Code	RM339A	RM412A	RM414A
Height mm	610	914	1219
Width mm	540	540	540
Useable Depth	495	495	495
Depth mm	622	622	622

For more information and our online store, visit www.black-box.de\USForces_Ger.

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31

Unique side mount design saves space when mounting servers.

Server Side Mount Wall Cabinet

- 10U or 8U of usable space.
- Weight capacity of 155kg 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 mounting locations.
- Internal depth of 860 mm with a maximum rail depth* of 736 mm.
- Flexible cable access features 25 mm, 50 mm, and 75 mm knockouts on the top, bottom, and rear of cabinet.
- Left and right doors, as well as the front panel, can be locked to safeguard your expensive servers and prevent tampering.

Front panel

New
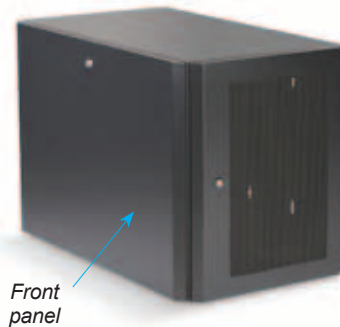
Left and right doors open for convenient access to server controls and cable connections.

* NOTE: At 750 mm rail spacing, the cabinet provides 50 mm of space in the front and 75 mm in the rear. The 10U of space isn't possible with all equipment configurations. For example, if you mount a 735 mm 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	RM610EU
To Add cooling to your cabinet order	
Wallmount Cabinet Dual Fan Kit	RME386

Squeezed for space? Mount your equipment sideways.

Low-Profile Side Wallmount Cabinets

- Weight capacity 35 kg.
- 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.

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 5 mm, 38 mm or 76 mm.

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

RMT355A-R2

Low-Profile Side Wallmount Cabinets

2U	RMT355A-R2
4U	RMT356A-R2

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

Compact cabinets designed for hubs, routers, and switches.

2U Wallmount Cabinets

- Weight capacity 23 kg.
- Constructed of rugged 16-gauge steel.
- Components mount in the cabinet vertically, facing up.
- Vented on both sides to cool equipment.
- Two built-in, 75 mm cable knockouts on each side bundles accommodate large cable runs.
- Perfect for small network equipment.
- Keyhole mounting holes make installation easy.
- **Standard Warranty** — Lifetime

2U Wallmount Cabinets

Black	RM425A-R3
Beige	RM525A-R2

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

BLACK BOX NETWORK SERVICES

ServShield

Protect your equipment from dust, dirt, and moisture.

- Weight capacity of 280 kilograms.
- 90 cm depth accommodates larger PCs and servers.
- Fully welded construction; 16 mm steel.
- Gasketed doors and a filtered air-intake system provide the best resistance to circulating dust and dripping water.
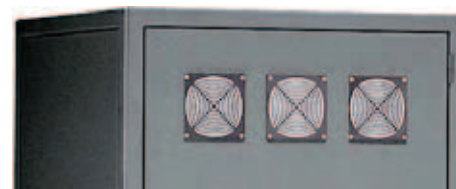
Three rear fans generate a cool 380 m3/h to keep your hardware healthy. Filters keep the air clean.

The vented, fixed monitor shelf holds 90 kilograms.

Isolated, steel locking drawer holds a keyboard up to 47 cm wide.

Side panels are removable.

Vented door features an air filter to protect against dust.

- Water-resistant gaskets and compression latches provide superior protection.
- Unique air-filtering system draws air through the front door filters and expels it through the rear.
- Bottom door features a separate key to keep hardware safe.
- Each compartment features two pairs of adjustable 19" rails with square M6 holes.
- Rear door features twin compression latches for a strong, water-resistant seal.
- Features cable access holes on the top and bottom.

Item	
ServShield	RM470A-R2
You may also need...	
19" W Rackmount, Sliding, Adjustable Tower	
Shelf with Fins, 560 mm D	RM471
Replacement Filters	
Rear Fan (Order One per Fan)	RM475
Front Door	RM476

Tough enclosures built to keep components safe.

NEMA 12 Wallmount Cabinets

- Weight capacity—RMN600A-R2: 68 kg; RMN625A-R2: 113 kg RMN650A-R2: 140 kg
- 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.

NOTE: Ships fully assembled. For full features and specs, go to www.black-box.de

NEMA 12

IP 52

RMN600A-R2

Front and back sections lock independently.

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

NEMA 12 Wallmount Cabinets

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Depth	Shipping	Code
610 mm	610 mm	610 mm	12U	584 mm	47.6 kg	RMN600A-R2
914 mm	610 mm	610 mm	19U	584 mm	63.54 kg	RMN625A-R2
1220 mm	610 mm	610 mm	26U	584 mm	79.4 kg	RMN650A-R2

BLACK BOX
NETWORK SERVICES

What to consider when choosing a rack.
By Dave Takach

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, racks offer 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 centres and closets with locked doors.

Types of racks.
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.

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. Most freestanding racks come in a standard 45U height, so they fit rooms with standard ceilings.

Wallmount racks.
Wallmount-style racks save floor space. They're very convenient for installing in cramped wiring closets or narrow hallways. Some even swing out for easy equipment installation and cable connections.
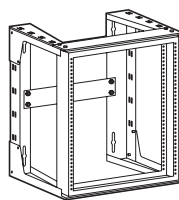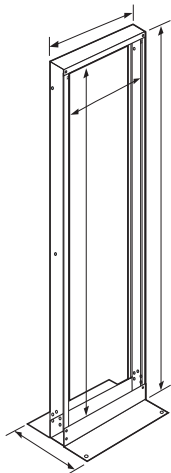
Other low-profile racks enable you to flushmount equipment vertically against a wall to further reduce the amount of space they take up. Wallmount racks typically require a solid or reinforced wall. To determine which wall rack is best for your application, measure the deepest piece of equipment and cable(s) out of the back end to be sure they will fit. Then verify the weight capacity needed.

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 organising 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.

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 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 centre-weight shelf. There are even panels designed to hold flat-screen monitors.

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

4-Post Racks
- Weight capacity of 1000 kg
- M6 mounting.
- Shipped unassembled.
- Assembly hardware and mounting hardware is included.
- Can be standalone, or bayed with other racks with optional Baying Kit.

4-Post Racks

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Weight	Code
2045 mm	523 mm	737 mm	42U	19"	37 kg	RM7000A
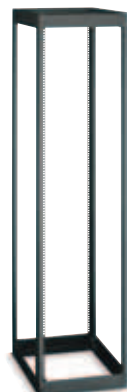
RM7000A-R3

4-Post Rack Accessories

Baying Kit	RM7002

You may also need:

Fixed Vented Server Shelves	
692 mm D	RM403
762 mm D	RM410-R2

For full features and specs, go to black-box.de

Related *Rack Accessories, p. 42.*

Additional front braces add extra stability on the RM391A-R2 and RM390A-R2.

RM392A-R2

RM391A-R2

RM390A-R2

Organise 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.

19" Steel Distribution Racks

Exterior Height	Exterior Width	Base Depth	Rack Units	Interior Width	Interior Depth	Weight	Code
991 mm	538 mm	533 mm	20U	19"	465 mm	15 kg	RM392A-R2
1880 mm	538 mm	533 mm	40U	19"	465 mm	27 kg	RM391A-R2
2197 mm	538 mm	533 mm	47U	19"	465 mm	28 kg	RM390A-R2

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

Wallmount Frames

- Weight capacity of 35 kg.
- 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.
- M6 rails including 50 cage nuts and screws.
- Easy rear access for punching down cable or troubleshooting.

Wallmount Frames

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Shipping Weight	Code
607 mm	526 mm	457 mm	12U	518 mm	12 kg	RM070A-R3-M6
963 mm	526 mm	457 mm	20U	518 mm	15 kg	RM069A-R3-M6
1188 mm	526 mm	457 mm	25U	518 mm	20 kg	RM080A-R3-M6

RM069A-R3-M6

Mount your heavy network equipment in tight spaces.

Ultra Wallmount Racks

- Weight capacity of 68 kg.
- 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 635 mm 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 ½" screws.
- Drilled with a universal hole pattern

Ultra Wallmount Racks

Exterior Height	Exterior Width	Exterior Depth	Rack Units	Interior Width	Weight	Code
622 mm	502.9 mm	736.6 mm	11U	495.3 mm	22.2 kg	RM050A-R2
980 mm	502.9 mm	736.6 mm	19U	495.3 mm	24.5 kg	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 23 kg.
- Constructed of 3mm thick aluminium 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 75 mm channels.

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.

Flushmount Wall Brackets

3U	RMT048
6U	RMT052

For full features and specs, go to black-box.de

RMT052

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

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

Heavy-Duty Equipment Shelves

RM114-R2   *RM116-R2*

- Put up to 68 kg of equipment on a single shelf.
- Store heavy equipment in one convenient place.
- Weight capacity of 68 kg.
- 552 mm 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 Fixed Shelves

RMTS01

- These sturdy shelves fit securely in your cabinets.
- Uses 3U of rack space.

Rackmount Fixed Shelves

Solid 16 kg Capacity	RMTS01
Vented 16 kg Capacity	RMTS02
Solid 23 kg Capacity	RMTS04

Vented Centre-Weight Shelf
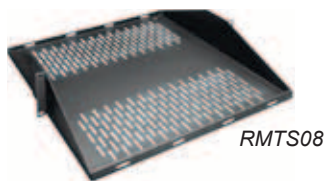
RMTS08

Two-Part Rackmount Server Shelves

19"	RMTS08

- Weight capacity 23 kg.
- Made of 1.6 mm steel, 47 cm deep.
- Uses 2U of rack space.
- Vented to improve air circulation

Elite™ Server mount Cabinet Heavy-Duty Solid Shelves

RM590-R2

Elite™ Server mount Cabinet Heavy-Duty Solid Shelves

19"W	RM590

* Includes (1) shelf and mounting hardware.

- Put this stationary shelf anywhere in your cabinet.
- Hold up to 136 kg.
- Perfect for mounting heavy servers and other equipment.
- Shelves are 527 mm deep.

Rackmount Keyboard Shelf with Trackball or Touchpad

Rackmount Keyboard Shelf

RM382-R2

RM382-R2

- Keyboard shelf for open racks.
- 45 kg capacity.
- Constructed of 1.0mm steel.
- Mouse pad
- 41.9 W x 31.5 D cm

Rackmount Vented Sliding Shelf

- This sliding shelf is vented for improved air circulation.
- Weight capacity of 23 kg
- Constructed of 18-gauge steel.

Rackmount Vented Sliding Shelf

RMTS06B

Rackmount Drawer with Writing Surface

- This 165 mm high drawer features a top that's a writing surface.
- Store important log books, manuals, and other documents.
- The drawer is 406 mm wide by 368 mm deep.

Rackmount Drawer with Writing Surface

19" Rackmount	RM595-R2

Filler Panels

RMTB05

- Keep your 19" cabinet or rack looking neat with the simple addition of Black Box® Filler Panel in unused spaces.
- Constructed of heavy metal with a matte black finish.

Filler Panels

Black	
1U	RMTB01
2U	RMTB02
3U	RMTB03
4U	RMTB04
5U	RMTB05
6U	RMTB06
White	
1U	RMTW01

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

Sliding Pivoting Keyboard Tray with Side Mouse Tray

RM385
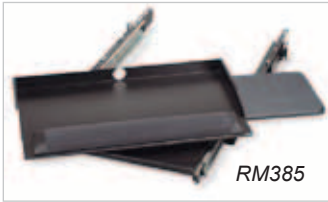
- Holds a keyboard up to 52 cm wide, so you can use a keyboard even if it's wider than your cabinet or rack.
- Cushioned wrist rest for more comfortable use.

- 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

2U (8.9 x 52.3 x 24.1 cm)	RM385

Rackmount shelves slide out for easy access to equipment.

Rackmount Sliding Vented 4-Point Shelves

RMS1924S

- Weight capacity of 23 kg.
- Shelves slide out for easy access.
- Vented for improved air circulation.
- 610 mm deep.

Rackmount Sliding Vented 4-Point Shelves

19" Rails	RMS1924S

Fixed shelf holds up to 23 kg.

Rackmount Fixed Vented 4-Point Shelf

- Weight capacity of 23 kg.
- Vents improve air circulation within the cabinet.
- Measure 62 cm deep.

Rackmount Fixed Vented 4-Point Shelf

	19" Rails	RMS1924F

This shelf separates smaller components.

Sliding Server Shelf with Fins

- Holds 56 kg.
- Shelf fits in a 19" rack.
- Choose from three depths.
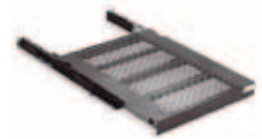
RMT411-56D

Sliding Server Shelf

Sliding Server Shelf 56 cm D	RMT411-56D
66 cm D	RMT411-66D
76 cm D	RMT411-76D

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

Fixed Vented 4-Point Shelves
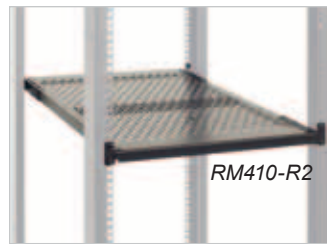
RM410-R2

Fixed Vented 4-Point Shelves

90 kg Capacity	
565 mm D	RM399
70 kg Capacity	
692 mm D	RM403
762 mm D	RM410-R2

- Weight capacity of 50 kg.
- Vents improve air circulation within the cabinet.

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 39.4–80 cm.
- Also compatible with any KVM switch.
- Use with a 15–19" LCD with a VESA mount.
- Articulated cable management included.

Sliding Monitor Mount

2-Post, 2U	SMM2-2U

For full features and specs, go to www.black-box.de.

Store and organise your media.

Rackmount Media Storage Drawers and Partitions

- Stores log books, manuals, and other documents.
- Use the top as a writing surface.
- For use with 19" rails.
- 165 mm H x 406 mm W x 368 mm D.

19" Rackmount Drawer with Writing Surface

	RM595

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

Tool-Less Filler Panels and Filler Panels

RM1031

RMTB04

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.

Tool-Less Filler Panels

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

Filler Panels

Black	
1U	RMTB01
2U	RMTB02
3U	RMTB03
4U	RMTB04
5U	RMTB05
6U	RMTB06
White	
1U	RMTW01
2U	RMTW02
3U	RMTW03
4U	RMTW04

For full features and specs, go to www.black-box.de

Secure and manage large numbers of cables.

Cable Management Tray

Cable Management Arm

New

CMT-1U

CMA-1U

- Tough solid-steel construction.
- Fits any standard 19" rack with square, round, or threaded holes.
- Measures 19" wide and 1U high.
- Has a 75 mm 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.

Cable Management Tray

1U, 19" W	CMT-1U

Cable Management Arm

1U (Extends from 724 mm to 838 mm)	CMA-1U

Eliminate cable congestion.

Patch Cable Management Panels

- Equipped with five sturdy steel rings.
- Rackmount panels organise your cables.

Patch Cable Management Panels
1U with 32 mm x 75 mm Rings	37803-R2
2U with 75 mm x 75 mm Rings	37804-R2

37804-R2

Put more equipment on your rack.

Uses no rack space!

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.
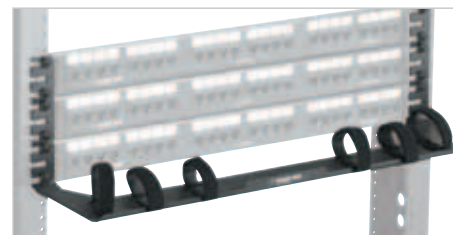
Mounts in front of the patch panel.

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.
- **Standard Warranty** — Lifetime

19" Wire Manager
	JPM140A

Route cables wherever there's room on your racks.

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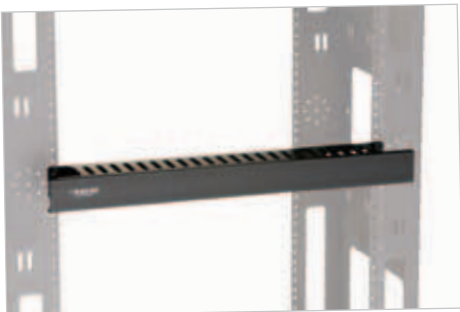
- Installation's a snap—mount it easily onto any distribution rack.
- Now with cable passthrough holes for improved cable runs.
- Perfect for tighter spaces where you may have less cable.
- **Standard Warranty** — Lifetime

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

BLACK BOX
NETWORK SERVICES

Power & Surge Protection

Opto-Isolators

PDUs
- Environmental Monitoring
- Basic
- Metered
- Managed

Power Cords
- Indoor/ Outdoor Extension
- IEC
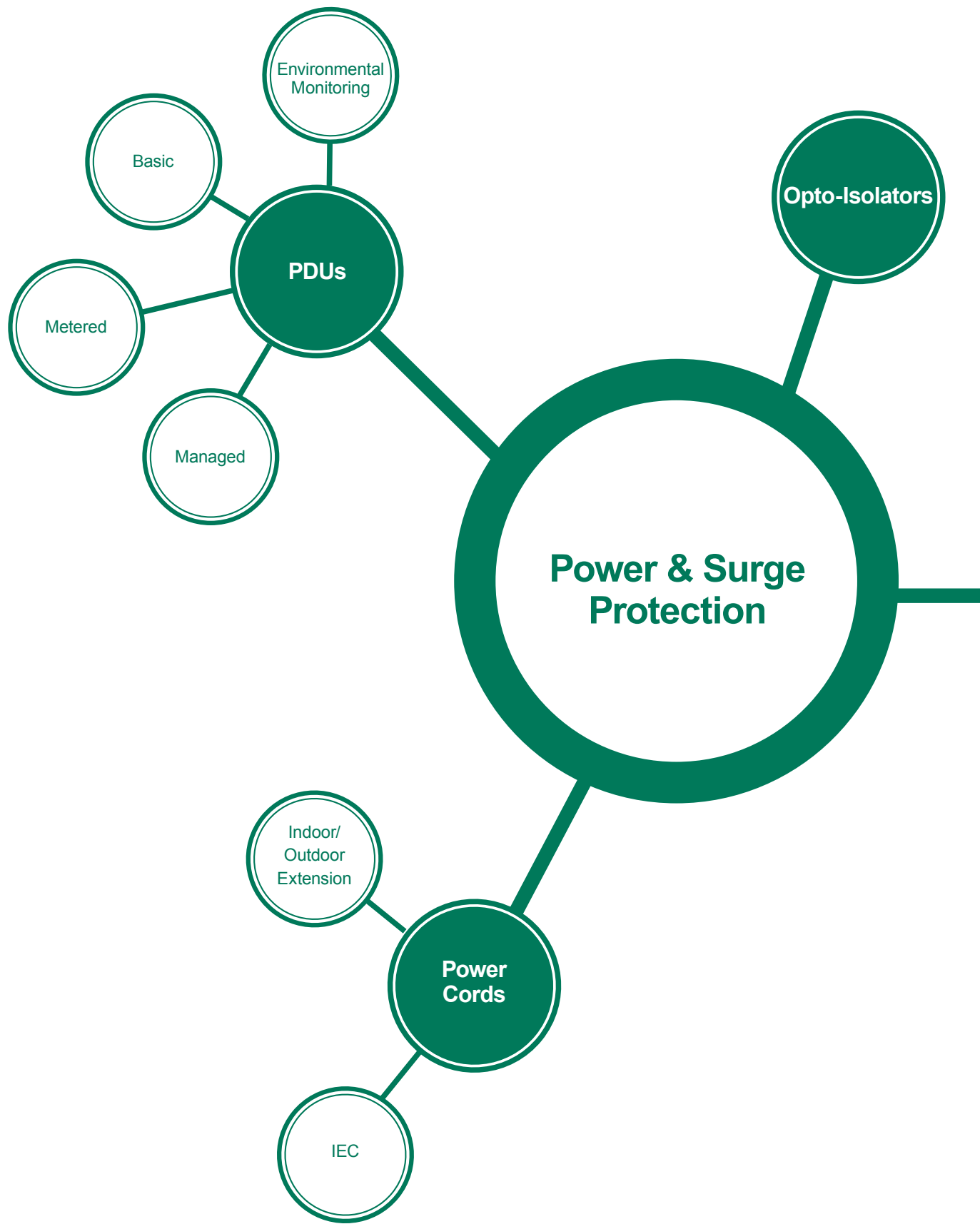
Power distribution and protection.

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

Distributing power throughout your data centre or server room is easy with Black Box PDUs. Standard 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 42-43.

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.

Data Line Surge

Serial

Coax

CATX

For more information and our online store, visit www.black-box.de\USForces_Ger.

◆ BLACK BOX
NETWORK SERVICES

41
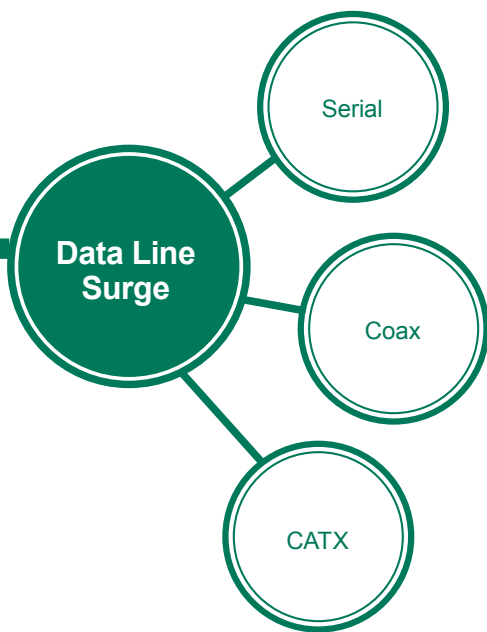
Standard
Horizontal and Vertical

Click Lock Switched PDU

BBIEC10VC19CLK

Individually Fused Switched PDU

BBIEC6HC19F

32A C13 C19 Mixed PDU

PDU14XC13

C13 Switched PDU

BBIEC16V

UK Switched PDU

BBPDU6H

Schuko PDU

POWL53237

IP Serial Managed
Remote Control/ Metered

Intelligent PDU

PSIV-12-16

Rackmount Remote Power Manager

PS583A-R2

Eco Power Switch

PSEC04

BLACK BOX
NETWORK SERVICES

IP Monitoring
PING reboot function

Outlet Managed PDU Dual-Circuit 20A

MPSH8-D

Outlet Managed PDU Single-Circuit 20A

MPSH8-S

IP & Serial Monitoring

Power Switch Cabinet NG

PSE544

Eco Power Switch Plus

PSEC04-PLUS

IP Environmental
External Sensors/ Relays

Secure Power Switch Master

PSE528MA

Power Switch NG

PSE554MA

Serial

Secure Power Switch Satellite

PSE518SA

Sensors

Digital Input Module

PSE518DIM

Temp / Humidity Sensor

PSE518-TH
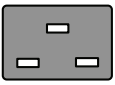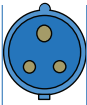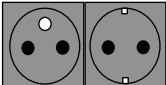
Plugs and receptacles.

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 outlet type is available at the location where the strip or PDU will be installed. You must match the plug type on the power strip or PDU to what you have available. For example, if you have a Schuko available on you wall, you can't plug a C14 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, C13, and C19. If required, locking outlets can be found on click lock PDUs. Locking plugs and receptacles prevent accidental disconnections and are preferred for higher voltage mission-critical devices.

Common IT Power Connectors

Plug Types

C14

C20

IEC60309
16A

IEC60309
32A

UK BS1363

Schuko

Switzerland

Receptacle Types

C13

C19

16A
→ 50mm ←

32A
→ 64mm ←

Switzerland

UK BS1363

France   Schuko

This is the maximum current rating for the PDU or power strip. It should match the receptacle it is plugged into.

This icon represents the outlet's type. See the explanation **above** for what the numbers and letters signify.

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE
230V	20	C14	C13	H	Standard

This is the voltage that the strip was designed for. It must match the voltage of the receptacle, PDU, or strip it is plugged into.

This icon represents the plug's type. See the explanation **above** for what the numbers and letters signify.

Horizontal (H) or Vertical (V).

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

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, unauthorised 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

VOLTAGE	AMPERAGE	INPUT TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
120 208– 240	20	C20	C13	H	Managed	—

Outlet Managed PDU (MPSH8-S20-120V)

Internet

Remote User

Power Cord

Router

Server

Switch

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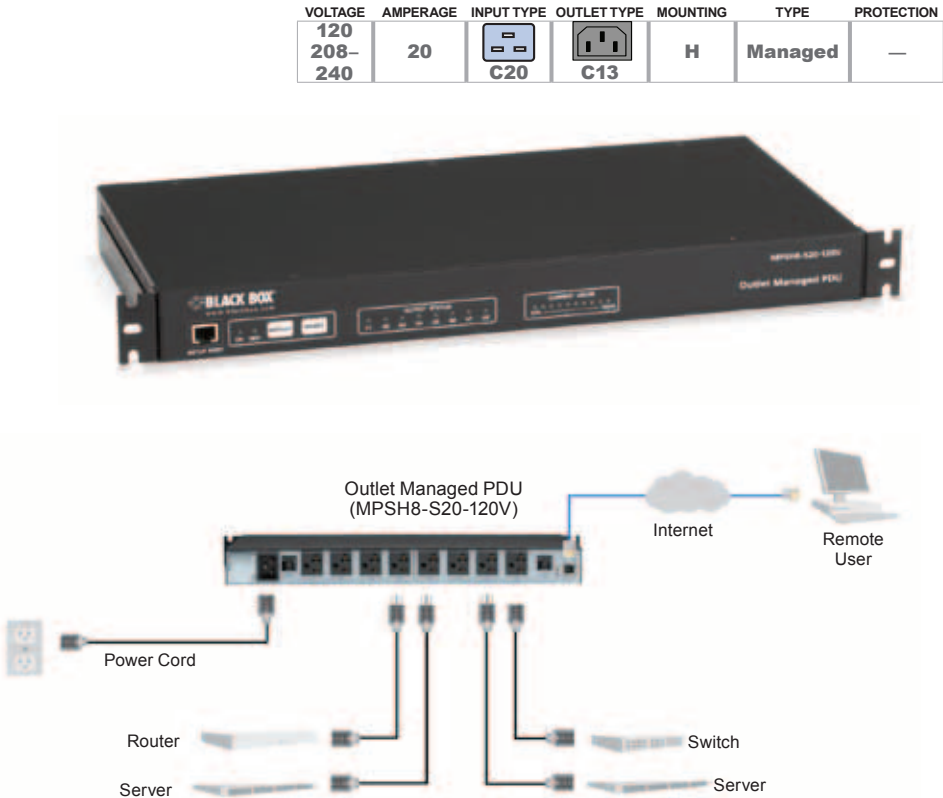
Networks today demand 98%+ uptime. When it's your job to make sure your network equipment is up and running, Black Box® Outlet- Managed PDUs can be one of your best friends in the data centre.

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 maximise uptime. You can customise 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		
	208+ VAC, 20-Amp	MPSH8-S20-208+V
8-Outlet, Dual-Circuit		
	208–240 VAC, 20-Amp	MPSH8-D20-208+V
16-Outlet, Dual-Circuit		
	208+ VAC, 20-Amp	MPSH16-D20-208+V

* Include (1) PDU and rackmount brackets

For full features and specs, go to www.black-box.de

Power four devices and control the power over IP or RS-232.

Power Switch Cabinet NG

- On, off and restart functions through an Ethernet or terminal connection.
- Turn computers on/off by network messages, or trigger a soft shutdown via the serial interface.
- Watchdog function to monitor all four devices .
- Programmable restart delay from 5 to 60 seconds.
- Easy-to-use GUI allows individual device names, up to 32 schedule and monitoring rules and control though own programs.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

VOLTAGE	AMPERAGE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
230	10		H/V	IP	C.B.

Power Switch Cabinet NG

Schuko Outlets PSE544-DE	PSE544-DE
Swiss Outlets PSE544-CH	PSE544-CH
French Outlets PSE544-FR	PSE544-FR
UK Outlets PSE544-UK	PSE544-UK

For full features and specs, go to www.black-box.de

Convenient power control over IP or a serial connection.

Power Switch NG

- Power management with remote control of 1, 4, and 8 power outlets or power outlet groups.
- Flexible and expandable system to set up a complete monitoring of your facilities.
- Control and configuration over IP and RS232 connection.
- On, off and restart functions per outlet or outlet group.
- Power up-down sequencing to avoid in-rush currents at start-up.
- Wake on LAN and soft shutdown function to turn the computer on/off by a network message.
- Monitoring of IP devices with automatic reboot in case of lock-up.
- Programmable device labels and rules to trigger schedules tasks or preterminated actions.
- Add up to four sensors or dry contacts for environmental monitoring.
- Easy and fast configuration through a web browser, windows tool or a terminal connection.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

VOLTAGE	AMPERAGE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
230	10		H/V	IP	C.B.

Power Switch NG allows remote power management of many devices over Intranet/Internet or locally through RS-232 serial connection. The power switches support the HTTP, DHCP, Syslog and SNTP protocols. Each power outlet or power outlet group can be individually controlled over IP. The serial interface also enables the power outlet management over a terminal connection and to trigger a soft shutdown of a server with shutdown capabilities. A sequential power up/down and a restart delay from 5 to 60 seconds can be set individually for each outlet to avoid the risk of a power inrush that can cause a fuse or circuit breaker to trip in the data centre. The A-xBus on the front panel enables you to connect up to 4 expansion units to increase the number of controlled power outlets and/or to set up remote monitoring of your facilities.

For a security, access to the Switch is protected by name and password. The administrator account allows complete configuration and control of all outlets. The configuration can be performed through a web browser, the provided Windows tool over the LAN or through a terminal connection. To avoid confusion during operation, you can attribute up to 32-character label on each device.

The Power Switch NG can automatically carry out up to 32 rules to trigger scheduled tasks or to take predetermined actions in response to a specific event. This event may be the result of environmental monitoring. A large variety of sensors,detectors and dry contacts can be used directly with this system to secure your facilities and automatically trigger emergency actions.

A Watchdog function lets you monitor 4 IP devices. In the case where the monitored device is locked-up it can be automatically rebooted.

Power Switch Cabinet NG

1-Port	PSE551-XX
4-Port	PSE554-XX
8-Port, 19"	PSE558-XX
Replace the XX with the outlet type.	
EU = Schuko CH = Swiss UK = British	

For xBus connections, you may also need:

Input Module for (8) dry contacts	PSE518-DIM
Output Module for (8) relays	PSE518-DOM
Push Button f/ emergency actions	PSE518-PB
xBus Sensors	See website

For full features, specs, delivery content and pricing, go to www.black-box.de

Manage up to 40 power outlets over IP or RS-232.

Power Switch Twin 32

VOLTAGE	AMPERAGE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
230	2 x 16	⊙ ⊙ ▦	H/V	IP	C.B.

- Flexible and expandable system for remote power distribution and control of 8 to40 power outlets or power outlet groups.
- 2x 16A power inputs with current probe.
- 8x 10A power outputs.
- On, off and restart functions per outlet or outlet group.
- Power up-down sequencing to avoid in-rush currents at start-up.
- Monitoring of 8 IP devices with automatic reboot in case of lock-up.
- Soft shutdown of a server with shutdown capabilities.
- 32 monitoring and schedule rules to trigger actions.
- 1 administrator account and 40 user accounts with concurrent access.
- Easy and fast configuration with password protected access over web browser, Windows tool over LAN or through a terminal connection.
- Status LEDs for power input, network and power outlets.
- Log file reporting.
- Developer facility allows for own programs.
- Capabilities to add sensors for environmental monitoring,

Power Switch Cabinet NG

1-Port	PSE551-XX
4-Port	PSE554-XX
8-Port, 19"	PSE558-XX

Replace the XX with the outlet type.
EU = Schuko CH = Swiss UK = British

For xBus connections, you may also need:

Input Module for (8) dry contacts	PSE518-DIM
Output Module for (8) relays	PSE518-DOM
Push Button f/ emergeny actions	PSE518-PB
xBus Sensors	See website
4-Port xBus Extension Hub	PSE500-XBX
Input Module for (8) dry contacts	PSE518-DIM
Output Module for (8) relays	PSE518-DOM
Push Button	PSE518-PB
Temperature Sensor	PSE518-T
Temperature/Humidity Sensor	PSE518-TH
Temperature/Ambient Light Sensor	PSE518-TL
Temperature/Proximity Sensor	PSE518-TP
Temperature/(1) Digital Sensor	PSE518-TDE
Temperature/(2) Digital Sensor	PSE518-TDT
Smoke Detector	PSE518-SD
Magnetic Door Contact	PSE518-MC
A/C Current Probe	PSE518-CP
Energy Meter	PSE518-EM

For full features, specs, accessory list and pricing, go to www.black-box.de

Power Switch Twin 32 Master is a power distribution and control unit that enables power management of 8 devices over a remote TCP/IP or local RS232 terminal connection. The number of controlled power outlets can be extended up to 40 by cascading up to four Power Switch Twin Satellites (PSE538SA) using standard RJ45 CAT5e network cables. Each power outlet can be individually controlled to turn it on, off, or restart the connected equipment. The current consumption of each input can be remotely monitored through the Power Switch Twin 32. The two separate 16A power inputs provide a total power-delivering capability of 7360 VA and can be used to control and measure the current of servers with redundant power supplies. Up to 20 groups of outlets can be created to control with only a single command servers with redundant power supplies.
The Watchdog function lets you monitor eight IP devices with specific services or ports. In case of a lock-up of the monitored device, it can be automatically rebooted and alerts can be sent to Syslog or SNMP servers.
Event logs can be sent to two Syslog Servers. An internal RTC clock allows to time stamp the events, messages and e-mails and to trigger user-specified actions according to a defined time table.

The Power Switch can automatically carry out up to 32 rules to trigger scheduled tasks or to take predetermined actions in response to a specific event if thresholds are exceeded.
The Power Switch Twin 32 feature a xBus at the front that accepts up to four additional xBus peripherals. Use this port to expand your system by connecting Satellite units units to it. With the xBus Xtender hub you can add a variety of sensors to secure your facilities and automatically trigger emergency actions. Or connect the Push Button that instantly triggers two emergency actions.
The administrator performs configuration and power outlet control through a web browser or through a convenient Windows tool. A power-up delay for each power outlet between 0 and 255 seconds can be set. Furthermore, a delayed restart between 1 and 3600 seconds or an outlet default status after a power failure. For more convenience, a 32-character label can be attributed to each switch and power outlet to avoid confusion during operation. A contextual on line help can be used anytime during the configuration.

Environmental Monitoring Cabilities via the xBus:

4- Port xBus Expansion Hub

Temperature Sensors with:
- Ambient Light
- Proximity
- Humidity

8- Port Digital In/Output Module

Push Button Emergency

Sensors with Temperature and digital in-/outputs

Smoke Detector

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 characterised 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., 230V versus 400V).

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 230V and it oscillates between its peaks of ±322V at 50 Hz (or 50 times a second).
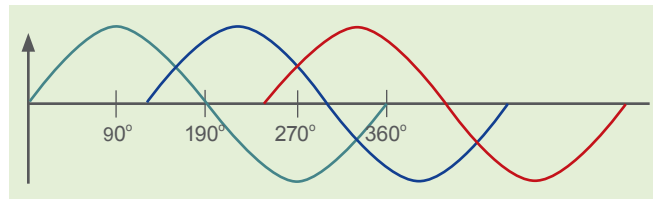
Figure 1. Three-phase power
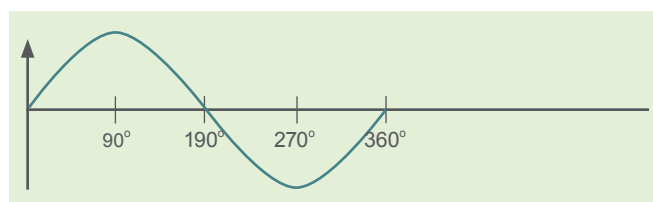
Figure 2. Single-phase power

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 authorised 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
208–240	20	1 or 2 x C14	H	Managed	C.B.

PS582A-R2

Horizontal Rackmount Remote Power Managers

208–240 VAC

Single Circuit, (4) IEC-320-C13 Outlets	PS581A-R2
Dual Circuit, (8) IEC-320-C13 Outlets	PS582A-R2
Dual Circuit, (16) IEC-320-C13 Outlets	PS583A-R2

For full features and specs, go to www.black-box.de

Intelligent PDU

Improve uptime, capacity planning and power use efficiency

- Metering of each outlet and the PDU.
- Remote switching via web browser.
- Secure 256-bit AES encryption.
- Staggered power switching to relieve surges.
- Power consumption monitoring through LCD display.
- GO GREEN — reduce travel and power consumption with intelligent monitoring and remote management.

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
230	16/32			H/V	IP Metered	-

Intelligent power distribution units give you the ability to manage all your power requirements from the comfort of your desk. These PDUs have an IP browser interface built-in, allowing the user to switch on, switch off or power cycle each socket individually. Featuring both serial access as well as IP access, these PDUs give you the connectivity and control you need. But more than that, these PDUs also feature real time power usage display through both the built-in LCD screen via push buttons, and via the web browser interface. Information on voltage, current drawn etc is available on a per port, and a per PDU basis.

Power Switch Cabinet NG

Vertical
(12) C13, 16A	PSIV-12-16
(20) C13, 16A	PSIV-20-16
(20) C13, 32A	PSIV-20-32

Horizontal
1U (8) C13, 16A	PSIH-8-16
2U (20) C13, 32A	PSIH-20-32

Eco Power Switch

- 2 x 10A Inputs for redundancy/ resilience.
- Control four outlets via RS-232 or Web interface.
- PING / TELNET / Multilevel Security on Plus model.
- Supports HTTP, DHCP, SNMP and IP protocols.
- Timer and scheduler functions, to automate the reboot On/Off.
- Firmware updates via Web interface.
- Software Development Kit (SDK) supplied for integration into your Web pages.
- Linux based with embedded Web server.
- Password protection to maintain system stability.
- Watchdog design avoids abnormal network interruptions.
- Set up e mail alerts for status changes.
- **Standard Warranty** — 1 Year.

VOLTAGE	AMPERAGE	PLUG TYPE	OUTLET TYPE	MOUNTING	TYPE	PROTECTION
230	10	C13	C14	H/V	Fallback	-

Eco Power Switch
Eco Power Switch	PSEC04
Eco Power Switch Plus	PSEC04-PLUS

The Black Box Eco Power Switch has an affordable price tag and will help you to reduce your running costs too. Eliminate out of hours journeys to the office to reboot devices and cut your energy bills by scheduling automatic power downs.

The Eco Power Switch has four IEC C13 outlets and dual redundant 10 AMP IEC C14 mains inputs and can be controlled in-band or out-of-band via RS-232 or IP.

Super reliable components achieve a Mean Time Between Failures (MTBF) certification of 200,00 hours+. Independently switched outlets offer increased electrical safety, cutting off the power to each bank of outlets and eliminating most electrical threats from other systems.

The Black Box Eco Power Switch Plus includes all the features of the Eco Power Switch but also additions such as ping functionality, Telnet support and the ability to have multi-level user login authentication. We have also built in a multi-event scheduler and the ability to black list numbers. The Eco Power Switch Plus also presents an auto-ping function, so that the switch can monitor attached devices, and automatically reboot them if they don't respond to a ping within a user defined period of time this makes the switch perfect for small 'lights out' environments.

C13 Switched PDU

IEC C13 Switched PDU

Outlets	Horizontal		Vertical	
	Dimensions	1U	Dimensions	CODE
6	485 x 44 x 50 mm	BBIEC6H	421 x 44 x 50 mm	BBIEC6V
8	485 x 44 x 50 mm	BBIEC8H	472 x 44 x 50 mm	BBIEC8V
10	485 x 44 x 50 mm	BBIEC10H	521 x 44 x 50 mm	BBIEC10V
12	485 x 44 x 50 mm	BBIEC12H	572 x 44 x 50 mm	BBIEC12V
16	485 x 44 x 50 mm	BBIEC16H	671 x 44 x 50 mm	BBIEC16V
20			721 x 44 x 50 mm	BBIEC20V
24			848 x 44 x 50 mm	BBIEC224V

* Models marked with and asterisk are unswitched.

Standard input plug is UK

For other plugs add suffix part number (eg BBIEC6HC14)

Options include SCH (Schuko), C14, C20, 16A, 32A

C13

- Covered switch prevents accidental power loss
- Rugged steel enclosure
- Flexible mounting options
- Choice of UK, C14, C20, Schuko, 16A, and 32A Commando
- Horizontal or vertical
- Neon Power indicator
- Length: 3 m

Individually Fused Switched C13 PDU

Individually Fused C13 Power Strips

Outlets	Horizontal		Vertical	
	Dimensions	1U	Dimensions	CODE
6	485 x 44 x 50 mm	BBIEC6H		
8	485 x 44 x 50 mm	BBIEC8H		
10	485 x 44 x 50 mm	BBIEC10H	667 x 44 x 50 mm	BBIEC10FV
12			776 x 44 x 50 mm	BBIEC12FV
16			930 x 44 x 50 mm	BBIEC16FV
20			1070 x 44 x 50 mm	BBIEC20FV
24			1240 x 44 x 50 mm	BBIEC224FV

Standard input plug is UK

For other plugs add suffix part number (eg BBIEC6HC20)

Options include SCH (Schuko), C14, C20, 16A, 32A

C13
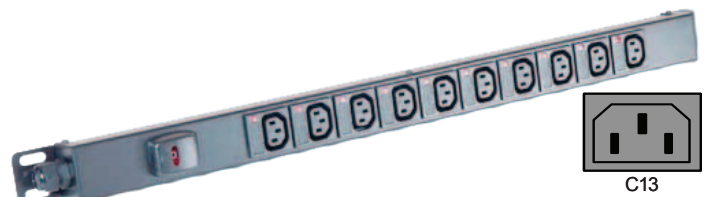
- Covered switch prevents accidental power loss
- Rugged steel enclosure
- Individual fuses reduce single points of failure
- Choice of UK, C14, C20, Schuko, 16A, and 32A Commando
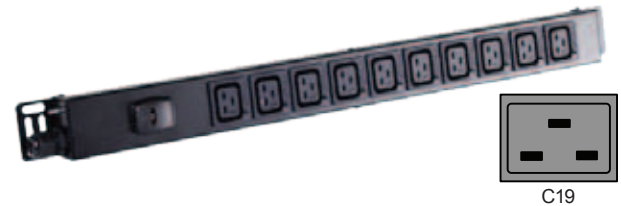- Horizontal or vertical
- Neon Power indicator
- Length: 3 m

C13 Click Lock Switched PDU

Click Lock PDUs

Outlets	Horizontal		Vertical	
	Dimensions	1U	Dimensions	CODE
6	485 x 44 x 50 mm	BBIEC6H		
8	485 x 44 x 50 mm	BBIEC8H		
10	485 x 44 x 50 mm	BBIEC10H	791 x 44 x 50 mm	BBIEC10VCLK
12			867 x 44 x 50 mm	BBIEC12VCLK
16			884 x 44 x 50 mm	BBIEC16VCLK
20			990 x 44 x 50 mm	BBIEC20VCLK
24			1160 x 44 x 50 mm	BBIEC224VCLK

Standard input plug is UK

For other plugs add suffix part number (eg BBIEC6HC20)

Options include SCH (Schuko), C14, C20, 16A, 32A

C13

- Click lock receptables prevent accidental disconnection and power loss
- Covered switch prevents accidental power loss
- Rugged steel enclosure
- Choice of UK, C14, C20, Schuko, 16A, and 32A Commando
- Neon Power indicator
- Length: 3 m

BLACK BOX
NETWORK SERVICES

C19 Switched PDU

IEC C19 PDUs Switched

Outlets	Horizontal		Vertical	
	Dimensions	1U	Dimensions	CODE
4	485 x 44 x 50 mm	BBIEC4C19H	445 x 44 x 50 mm	BBIEC4C19V
6	485 x 44 x 50 mm	BBIEC6C19H	612 x 44 x 50 mm	BBIEC6C19V
8	485 x 44 x 50 mm	BBIEC8C19H	620 x 44 x 50 mm	BBIEC8C19V
10	485 x 44 x 50 mm	BBIEC10C19H	667 x 44 x 50 mm	BBIEC10C19V
12	485 x 44 x 50 mm		889 x 44 x 50 mm	BBIEC12C19V

Standard input plug is UK

For other plugs add suffix part number (eg BBIEC6HC20)

Options include SCH (Schuko), C14, C20, 16A, 32A

C19

- Covered switch prevents accidental power loss
- C19 outlets for high current applications eg: UPS, feeding other PDUs
- Choice of UK, C14, C20, Schuko, 16A, and 32A Commando
- Length: 3 m

Individually Fused Switched C19 PDU

Individually Fused Switched C19 PDU

Outlets	Horizontal		Vertical	
	Dimensions	1U	Dimensions	CODE
4	485 x 44 x 50 mm	BBIEC4HC19F		
6	485 x 44 x 50 mm	BBIEC6HC19F		
8	485 x 44 x 50 mm	BBIEC8HC19F		
10			778 x 44 x 50 mm	BBIEC10VC19F
12			889 x 44 x 50 mm	BBIEC12VC19F
16			1090 x 44 x 50 mm	BBIEC16VC19F
20			1310 x 44 x 50 mm	BBIEC20VC19F
14			1510 x 44 x 50 mm	BBIEC14VC19F

Standard input plug is UK

For other plugs add suffix part number (eg BBIEC6HC20)

Options include SCH (Schuko), C14, C20, 16A, 32A

C19

- Covered switch prevents accidental power loss
- Individual fuses reduce single points of failure
- Choice of UK, C14, C20, Schuko, 16A, and 32A Commando
- Horizontal or vertical
- Length: 3 m

C19 Click Lock Switched PDU

IEC C19 Click Lock PDUs

Outlets	Horizontal		Vertical	
	Dimensions	1U	Dimensions	CODE
4	485 x 44 x 50 mm	BBIEC4HC19CLK		
6	485 x 44 x 50 mm	BBIEC6HC19CLK	521 x 44 x 50 mm	BBIEC6VC19CLK
8	485 x 44 x 50 mm	BBIEC8HC19CLK	590 x 44 x 50 mm	BBIEC8VC19CLK
12			780 x 44 x 50 mm	BBIEC10VC19CLK

Standard input plug is UK

For other plugs add suffix part number (eg BBIEC6HC20)

Options include SCH (Schuko), C14, C20, 16A, 32A

C19

- Covered switch prevents accidental power loss
- Rugged steel enclosure
- Choice of UK, C14, C20, Schuko, 16A, and 32A Commando
- Length: 3 m

UK Switched PDU

- Horizontal or vertical
- LH or RH cable exit option on Vertical PDUs
- UK plug, other plugs optional
- MS External Earth Stud
- Covered switch prevents accidental power loss
- Choice of UK, C14, C20, Schuko, 16A, and 32A Commando
- Neon Power indicator
- Length: 3 m

UK BS1363

UK PDUs Switched*

Outlets	Horizontal		Vertical		
	Dimensions	1U	Dimensions	Left- Hand	Right-Hand
4	485 x 44 x 50 mm	BBPDU4H	525 x 57 x 50 mm	BBPDU4VLH	BBPDU4V
5	485 x 44 x 50 mm	BBPDU5H	590 x 57 x 50 mm	BBPDU5VLH	BBPDU5V
6	485 x 44 x 50 mm	BBPDU6H	655 x 57 x 50 mm	BBPDU6VLH	BBPDU6
7	485 x 44 x 50 mm	BBPDU7H*			
8	485 x 44 x 50 mm	BBPDU8H*	785 x 57 x 50 mm	BBPDU8VLH	BBPDU8VLH
10	485 x 44 x 50 mm		915 x 57 x 50 mm	BBPDU10VLH	BBPDU10V
12	485 x 44 x 50 mm		1045 x 57 x 50 mm	BBPDU12VLH	BBPDU12V
15	485 x 44 x 50 mm		1285 x 57 x 50 mm	BBPDU15VLH	BBPDU15V
16	485 x 44 x 50 mm		1305 x 57 x 50 mm	BBPDU16VLH	BBPDU16V
20	485 x 44 x 50 mm		1562 x 57 x 50 mm	BBPDU20VLH	BBPDU20V
24	485 x 44 x 50 mm		1825 x 57 x 50 mm	BBPDU24VLH	BBPDU24V

* Models marked with and asterisk are unswitched.

Standard input plug is UK

For other pluggs add suffix part number (eg BBIEC6HC14)

Options include SCH (Schuko), C14, C20, 16A, 32A

Schuko Power Strip

- Basic EURO Power Strips - Basic EURO Power Strip, 5- and 6-Way
- 5 (with power switch) or
- 6 (no power switch) outlets.
- 1.5m power cable.
- Maximum load 16A

Schuko Power Strip

5 Outlets, 1 Switch Power Strip	POWL53237
6 Outlets, No Switch Power Strip	POWL53238

Schuko

Custom / Metered PDUs

Black Box can build a PDU to your specification including: A mixture of C13 / C19, Metered PDUs, PDUs with individual RCDs, 400VAC PDUs.

- Choose number of C13 outlets
- Choose number of C19 outlets
- Optional power meter
- Optional RCD
- UK, Schuko, c14, c20, 16a or 32A input plug options
- Switch
- Horizontal or vertical
- Rapid turnaround

Contact Technical Support for further details on 0811-5541 112

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.

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 minimise 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 stabilised, it can also automatically switch from the secondary power supply back to the primary power supply.

Power Cables

Schuko (Europe) to:	Length	Code
IEC C5	2 m	EPR-EU-C5-02M
IEC C7	2 m	EPR-EU-C7-02M
IEC C13	1.8 m	EPXSRO7-R2
IEC C19	2 m	EPR-EU-C19-02M

Schuko (Europe) to:	Length	Code
IEC C14 to:		
IEC C5	2 m	EPR=C14-C5-02M
IEC C7	2 m	EPR-C14-C7-02M
IEC C13		
	0.5 m	BC9001-0.5M
	1 m	BC9001-1M
	1.5 m	BC9001-1.5M
	2 m	BC9001-2M
	3 m	BC9001-5M
	5 m	BC9001-5M

Schuko (Europe) to:	Length	Code
IEC C20 to IEC C19		
	1 m	EPR-C20-C19-01M
	2 m	EPR-C20-C19-02M
	3 m	EPR-C20-C19-3M
	5 m	EPR-C20-C19-5M

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	C19	C13	H	Basic	—

NOTE: Switches do not include power cords.

Fallback Power Switches

240-VAC	PFBS240

For full features and specs, go to www.black-box.de
For pricing details, call 0811-5541 112

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 ionise 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, 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.

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

Fibre optic cable

Fibre 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 fibre 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, fibre optic cable is completely immune to interference. The fibre is made of glass, which is an insulator, so no electric current can flow through.

There are other reasons to choose fibre optic cable as well: Fibre offers greater bandwidth than copper and can operate over longer distances. With all these benefits and with the cost of fibre installation dropping,

fibre optic cable is rapidly becoming a top choice for new cable installations.

If you have existing copper cabling, fibre 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 fibre 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 entreing either building over the outdoor cable.

If you've already installed copper cable between buildings and decided that replacing it with fibre 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.

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 304.8 m on either side of the interface. The RS-422/485 Opto Isolator (SP401A) protects RS-422/485 lines up to 609.6 m.

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

SP340A-R3

Opto-Isolators	
High-Speed Opto-Isolator	SP340A-R3
RS-422/RS-485 Opto-Isolator	SP401A

For full features and specs, go to black-box.de

Grounding & Bonding

All metal components in data centre infrastructure (cabinets, racks, 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 °Ccur 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 entreing or exiting a building need protection at both ends!

Network Equipment

Metal Building Structure

Grounding Electrode Conductor

Grounding Bar

Bonding Jumper

Ground Rod

Metal Water Pipe
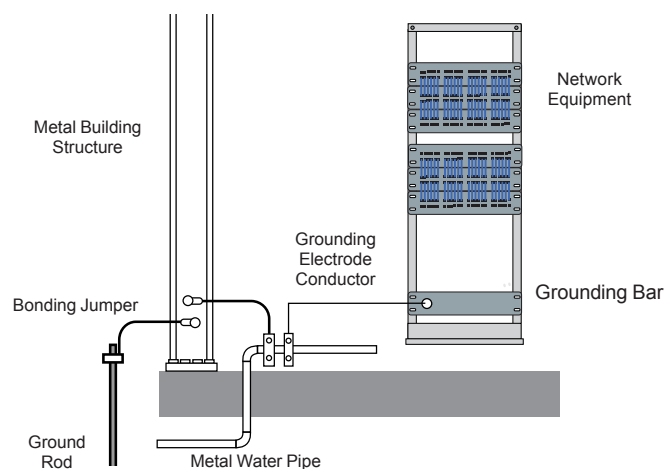
Protect computer and USB devices from voltage spikes and ground loops.

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 www.black-box. de For pricing details, call 0811-5541 112

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 black-box.de
For pricing details, call 0811-5541 112

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 black-box.de
For pricing details, call 0811-5541 112

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
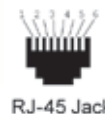
SP522A-R2

RJ-45 Jack

DB25

RS-232 Surge Protectors

DB15	SP507A
DB25 4-Wire Serial	SP141A
DB25	SP360A
RJ-45	SP522A-R2

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

Save space and stay organised 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

- Maximise 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

For full features and specs, go to www.black-box.de
For pricing details, call 0811-5541 112

Guard your fax machines, phone system, and modems.

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

- Overcurrent and overvoltage protection.
- Protects four centre 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 www.black-box.de.

Mining

The Challenge:

A mining company discovered that communication had been cut to several of their remote sites after a severe thunderstorm moved through the area. Upon inspection, the company realised 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 Pounds 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.
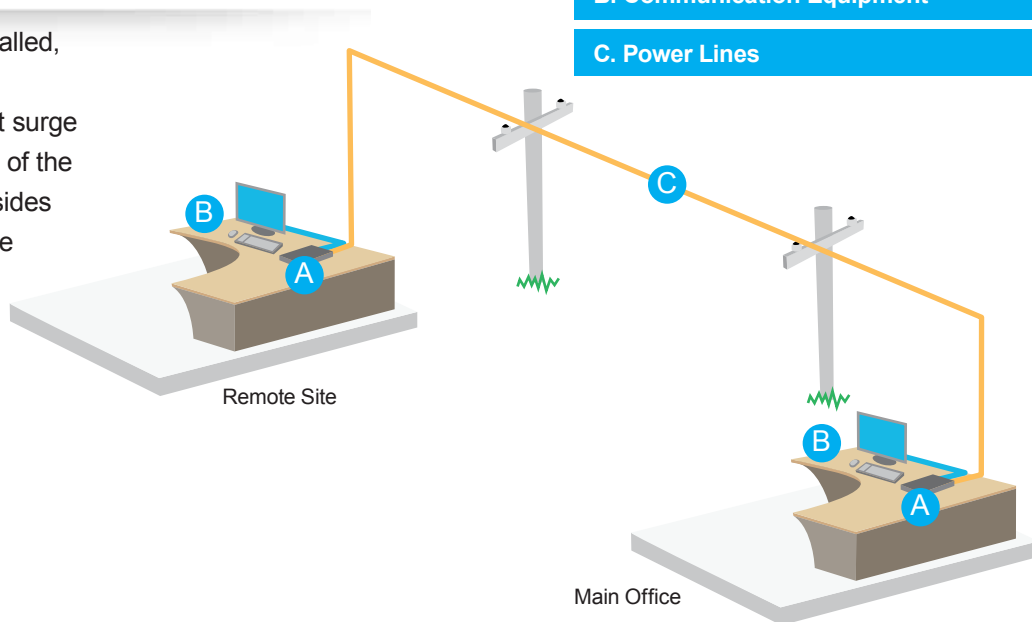
A. Surge Protection

B. Communication Equipment

C. Power Lines

Remote Site

Main Office

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 www.black-box.de.

Guard your mission-critical IT equipment against physical threats—

By Melissa Rohm

Beyond virus protection.

It has become almost automatic to protect your data centre 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 centre, 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 environmenta monitoring appliance can also activate an external alarm system like a siren or strobe light.

Temp Rack 03	19° C
Humidity Rack 03	34%

Measurement
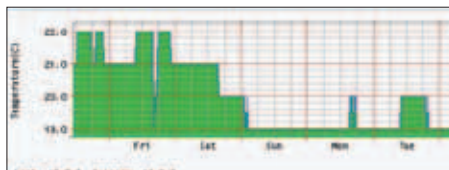
Data Collecting and Graphing

Benefits of environmental monitoring:

• Reduced downtime—When things go wrong, you're the first to know. Minimise 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 email, 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 centre 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

BLACK BOX
NETWORK SERVICES

phone 0811 - 5541 112 | usforces@black-box.de

from temperature extremes to water damage.

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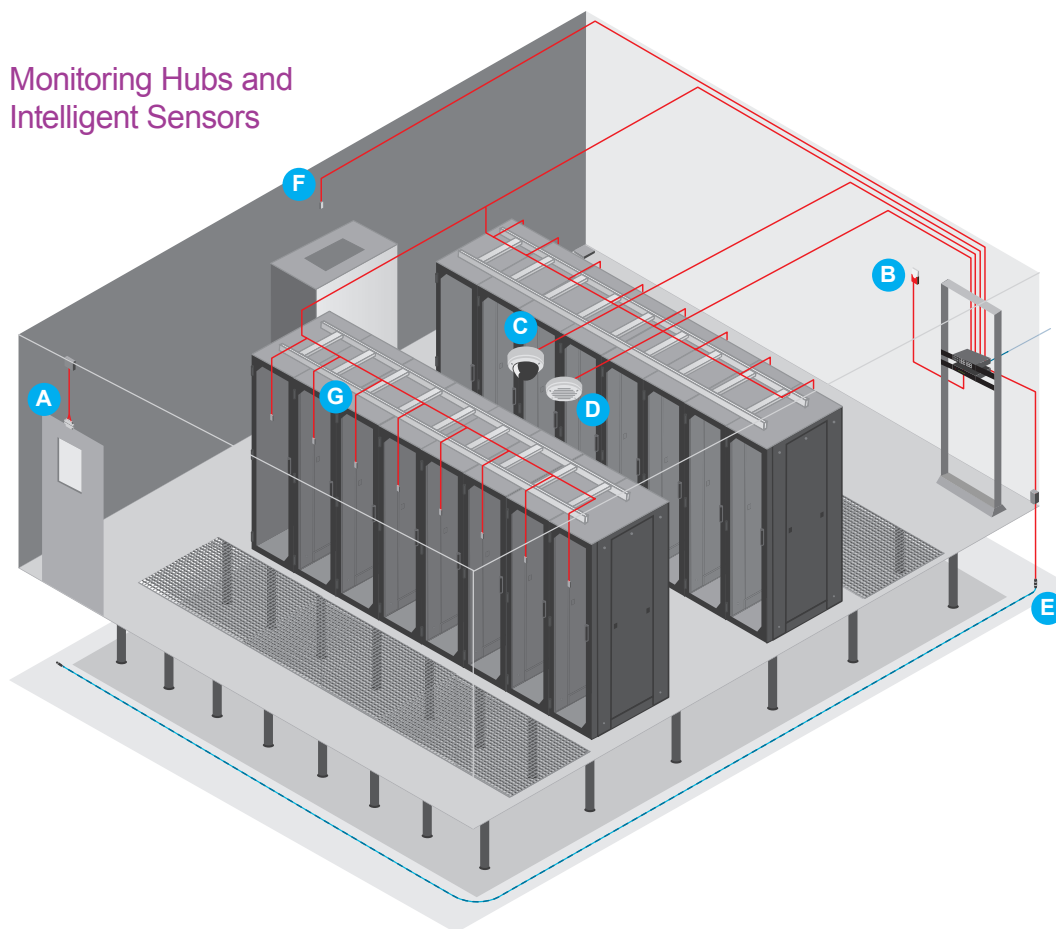
A. Security
B. Siren and Strobe Light
C. Camera
D. Smoke/Fire
E. Rope Water
F. Dual Temperature Humidity
G. Temperature

Selection Guide | AlertWerks Sensor Hub Features

For product details, see pages 64–67 or go to www.black-box.de

	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	4	4	4	4	4	4
Siren and strobe light	4	4	4	4	4	4
SNMP trap	4	4	4	4	4	4
E mail	4	4	4	4	4	4
SMS	4**	4**	4§	4§	4§	4§
MMS	4**	4**	—	—	—	—
Phone call	4††	4††	—	—	—	—
Skype® call	4	4	—	—	—	—
FTP upload	4	4	—	—	—	—
Picture log	4	4	—	—	—	—
Wakeup/shutdown	4	4	—	—	—	—
Virtual sensors	4	4	—	—	—	—

*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.

For more information and our online store, visit www.black-box.de\USForces_Ger.

◆ BLACK BOX
NETWORK SERVICES

61

Data Centre

The Challenge:

eASP.Net was launched in 2000 by Nortel Networks in Taiwan with a goal to be the premier carrier-neutral data centre and "Application Service Provider" (cloud computing) in Asia. Today, eASP.Net is still the top data centre 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 centre is on four floors in one building, with equipment located on multiple floors. They had an old environmental monitoring system which was using PLC (programmable Logic 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 centre 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.

PC

EME1TH2-005

37 Dry Contacts

EME1Y1-015

EME1W1-015

EME134A-60
(EME134A-R3 shown)

BLACK BOX
NETWORK SERVICES
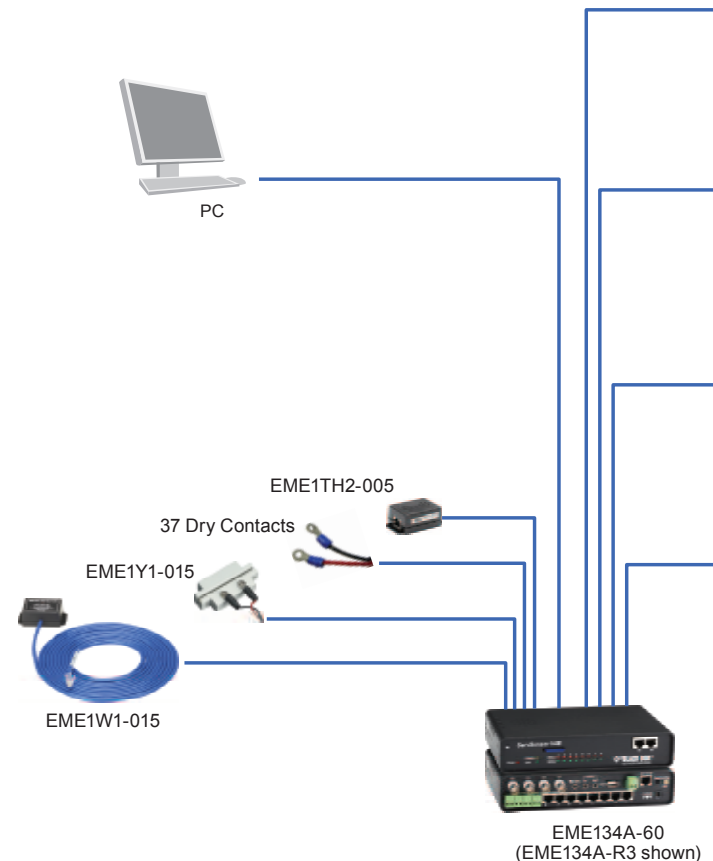
The solution includes:

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).

EME1TH2-005

EME1J8-005 (x5)

37 Dry Contacts

EME1X8

EME1TH2-005

EME1J8-005 (x5)

37 Dry Contacts

EME1X8

16 Dry Contacts

16 Dry Contacts

16 Dry Contacts

EME1TH2-005

EME1J8-005 (x3)

17 Dry Contacts

EME1DC16

EME1DC16

EME1DC16

EME1X8

14 Dry Contacts

EME1DC16
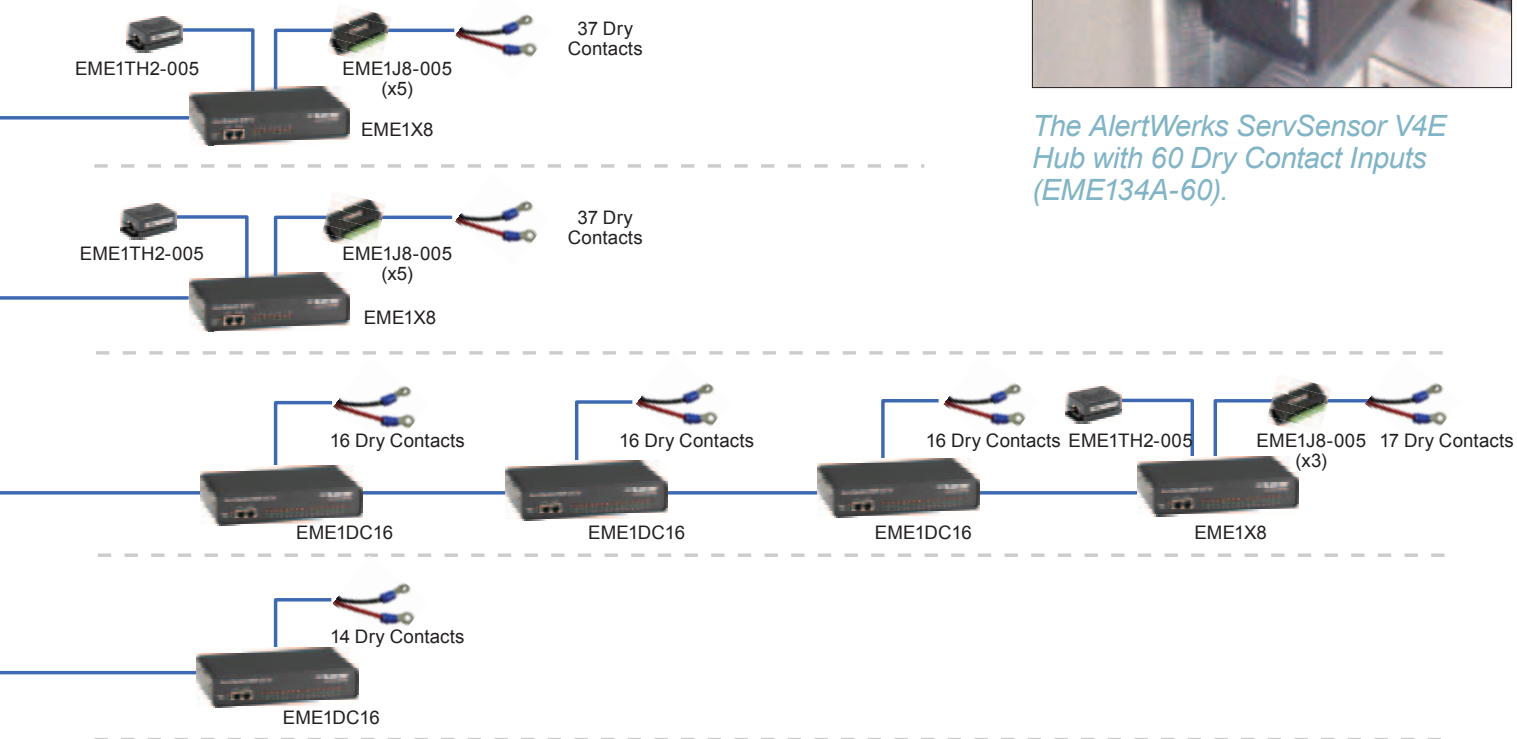
Real-time, extensive environmental and video monitoring and

*EME134A-R3: top: front view;
bottom: rear view*

*EME108A-R2: Top: front view;
bottom: rear view*
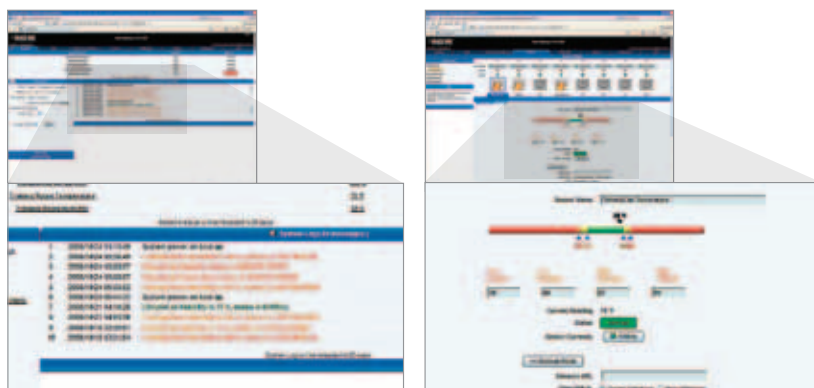
*Access the clear, easy-to-use graphical interface from your Web browser, like Alert log
(left) and Sensor configurations (right).*
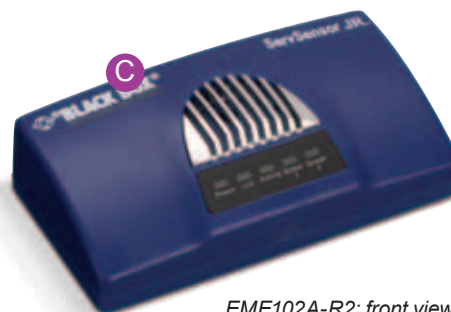
EME102A-R2: front view

• **Standard Warranty** — Lifetime

A. AlertWerks ServSensor V4E Hub, V4EL Hubs

• Support up to eight plug-and-play Intelligent Sensors (pages 66-67).
• 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 67 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 66-67). 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	EME134A-R3
AlertWerks ServSensor V4EL, No Video	
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 www.black-box.de

alerting system.

Up to 30 m

AlertWerks Sensor Expansion Hub (EME1X8) in Comm Closet

Remote Location A

AlertWerks ServSensor, 8-Port, (EME108A-R2) in ClimateCab™,

Dome Camera (SCE201)

Dome Camera (SCE201)

Smoke Detector

Dome Camera (SCE201)

Security
Smoke Detector
Temp./Humidity
Water
AC Voltage
Dry Contact to UPS

Temperature
AC Voltage
Temperature/Humidity
Water
Security
Security
Smoke Detector
Temperature

AlertWerks™ ServSensor V4E Hub (EME134A-R3)

Workstations

Switch

Firewall

Router

Internet

Remote Location B

AlertWerks ServSensor Junior, 2-Port, (EME102A-R2), below

Temperature/Humidity
Water

Security
AC Voltage
Security
Temperature
Temperature/Humidity
Smoke Detector

AlertWerks ServSensor Junior, 2-Port, (EME102A-R2, below)

Security
Smoke Detector

Digital 8

UPSs

Remote Workstation

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 www.black-box.de

C. AlertWerks ServSensor Junior

- Functions as a central hub for up to two AlertWerks Intelligent Sensors (pages 66–67).
- 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

4.5 m (Requires EME1DC-UPG, below)	EME1DC-015
18.2 m (Requires EME1DC-UPG, below)	EME1DC-060
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 www.black-box.de

For more information and our online store, visit www.black-box.de\USForces_Ger.

BLACK BOX
NETWORK SERVICES

65

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

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

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

4.5 m Cable	EME1K1-015
18.2 m Cable	EME1K1-060
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 -20 to +50° C.
- 150° detection angle.

AlertWerks Motion Detector Sensor

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 304.8 m.
- Can be triggered by any other sensor connected to the ServSensor hub.

AlertWerks Siren and Strobe Light

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

1.5 m Cable	EME1A1-005
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

1.5 m Cable		
	(8) Dry Contacts	EME1J8-005
	(2) 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 www.black-box.de. For pricing details, call 0811-5541 112.

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

4.5 m Cable	EME1W1-015
18.2 m Cable	EME1W1-060
30.4 m Cable	EME1W1-100

AlertWerks Rope Water Sensor

6.0 m Cable	EMERW-020
3.0 m Extension	EMERWE-010

AlertWerks Intelligent Rope Water Sensors

6.0 m Cable	EMELW-020

EME1TH2-005

EME1TH3-015

Dual Temperature/Humidity Sensors
- Measure temperature from -40 to +75° C in 1° C 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

4.5 m Cable	EME1Y1-015
18.2 m Cable	EME1Y1-060
30.4 m Cable	EME1Y1-100

All:
- **Standard Warranty** — Lifetime

EME1T2-005

Temperature Sensors
- Never need calibration.
- Measurement range of -55 to +75° C with 1° C resolution.
- Measurement accuracy of ±0.9° C from -10 to +75° C.
- Connect up to four daisychainable sensors with CAT5 cable for a total distance of up to 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 ⅓" 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.

Power Input

BNC Video Connector
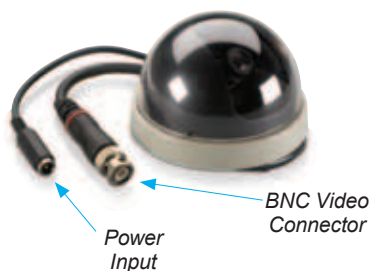
EME1FC-NTSC

AlertWerks Universal mount Cameras

PAL	EME1FC-PAL

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

Pan/Tilt Terminal Block

BNC Video Connector

Power Input
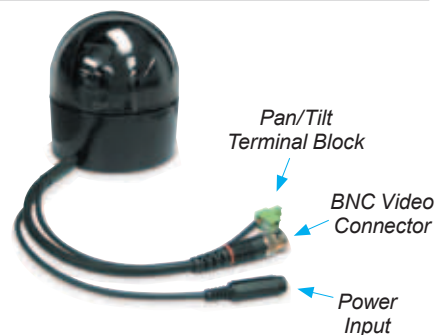
SCE201

AlertWerks PT Dome Cameras

PAL	SCE201

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

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 fibre cables, and infrastructure components are also guaranteed for life.

Channel and Permanent Link
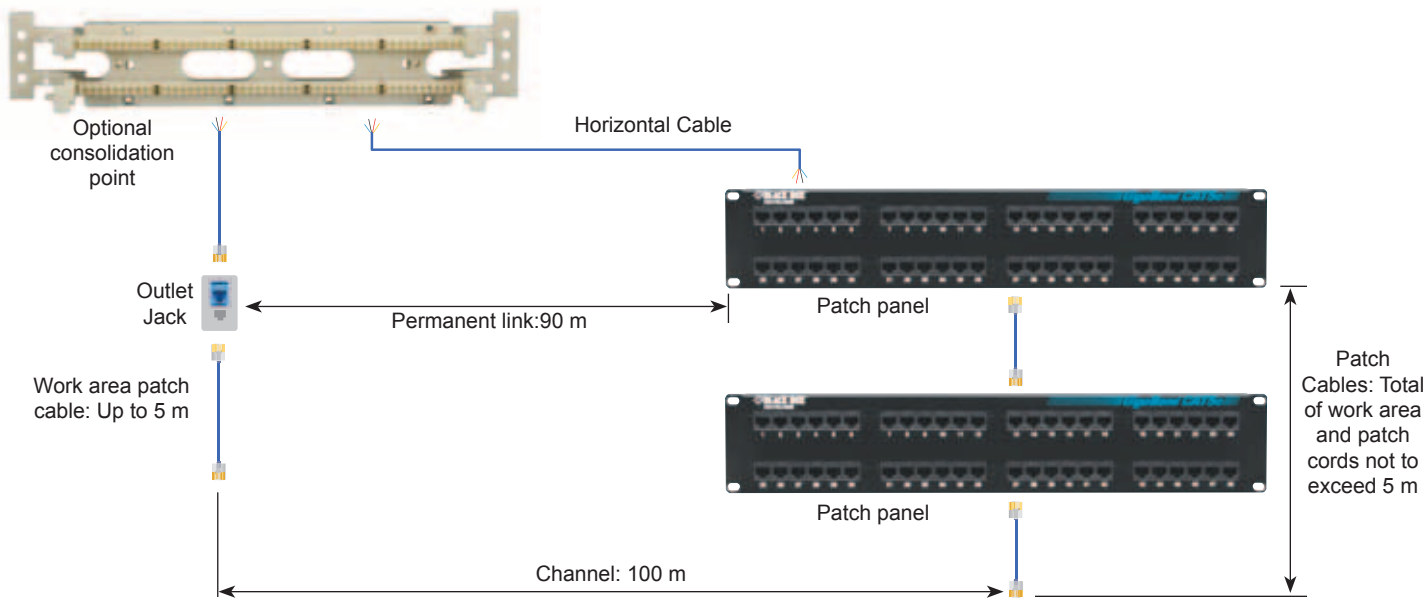
CAT6A Channel Solution	CAT6 Channel Solution	CAT5e Channel Solution
• Patch Panel • Patch Cable • Bulk Cable • Jack	• Patch Panel • Patch Cable • Bulk Cable, • Wiring Block • Jack	• Patch Panel • Patch Cable • Bulk Cable • Wiring Block • Jack

phone 0811 - 5541 112 | usforces@black-box.de

Guaranteed Performance.

| 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 PVC, 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 PVC cables 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 Tech Support on 0811-5541 112.

Black Box bulk LSZH cables are 3rd party tested to ensure compliance with:

• ISO/IEC 11801, also CENELEC and ANSI/TIA standards.

• Bulk cables also comply with the Low Voltage Directive.

• They are also fire tested according to IEC60332.

Security solutions that start at the port: Lockable cables and

CAT6A, CAT6, CAT5e Patch Cables with LockPORT™ technology boots

GigaTrue®3 CAT**6A**   *GigaTrue®3* CAT**6**   *GigaBase®3* CAT**5e**

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 unauthorised access and disconnects.

These 3-Series cables are ideal for protecting mission-critical network ports from unauthorised 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 centres.

- Data centres/wiring closets
- Wireless, security, and PoE connections
- Publicly accessible lobbies
- Medical facilities
- Classrooms/conference rooms
- Airports/transportation hubs
- Internet cafes
- Environmental monitoring
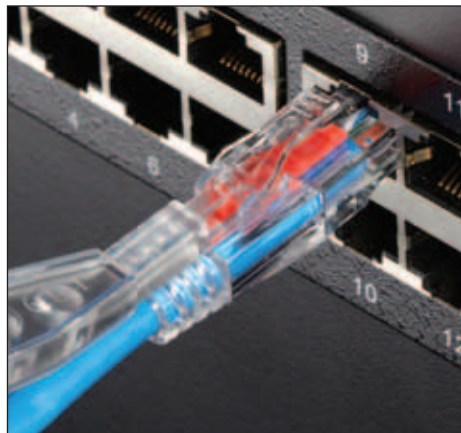
phone 0811 - 5541 112 | usforces@black-box.de

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 unauthorised access and tampering, especially in government offices, conference rooms, lobbies, hotels, airports, event centres, 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 critical network ports. The Removal Key (sold separately) is constructed of the same hard-polymer as the boot.

Removal Key

Locking Pin

Related
- CAT6A Patch Panels
- CAT6 Patch Panels
- CAT5e Patch Panels.
- Wallplates

Here's where to find them.
- CAT6A Patch Cables and Port Locks
- CAT6 Patch Cables and Port Locks
- CAT5e Patch Cables and Port Locks

Questions? Contact our FREE Tech Support at 0811-5541 112.

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.

Tame cable chaos in the data centre.

Without SpaceGAIN	With SpaceGAIN

Did this ever happen to you? These cables protrude so much you can't even close the cabinet door.

Gain up to 4" of valuable cabling space and keep cabinet doors securely l°Cked 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 centre?
Today, as more and more IT managers move to high-density configurations, space in the data centre is becoming more and more valuable. Keeping your data centre 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 centre 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.
- 6" Reduced-Length Patch Cables
- 45° Angled-Port Patch Panels
- Multimedia Patch Panels
- Angled Patch Panels
- 48-Port, 1U, High-Density Feed-Through Patch Panels, a Black Box Exclusive
- 24-Port ½ U Patch Panels

Best of all, SpaceGAIN products are guaranteed for life!

With some time, planning, and SpaceGAIN, you can turn this into a data centre showcase. Photo was submitted by a Black Box customer.

Resources

FREE, Live, 24/7 Tech Support
Talk with an expert in 30 seconds or less at 0811-5541 112 or go to www.black-box.de

For the SpaceGAIN brochure and SpaceGAIN video go to www.black-box.de
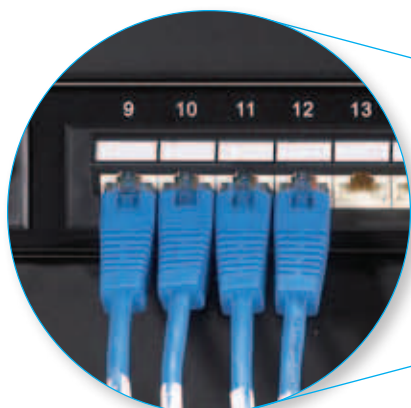
Cables flow downward—not out—saving even more space with our award-winning SpaceGAIN 45° Angled-Port Patch Panels.

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.

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.

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 for both rows.

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.

Make neat patches.

Follow data centre cabling best practices and use the right length cable. You'll avoid cable spaghetti and eliminate the use of cable management.
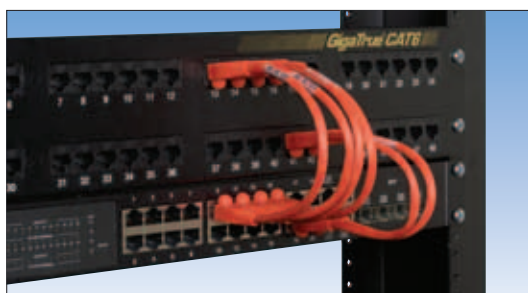
More space-saving panels.

Eliminate the need for horizontal cable managers with the SpaceGAIN Angled Patch Panels, page 139. Tight quarters in your rack? Free up space with the 1⁄2U SpaceGAIN Patch Pane.

JPM624-ANG

JPM5E24A-HU

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.

Data signals

Electrical power

Electrical power and data signals can also travel on all four pairs but don't interfere with each other.
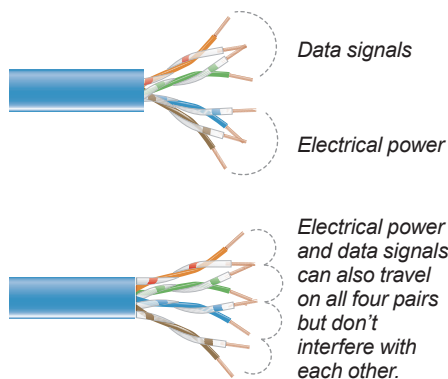
Electrical power has a frequency of 60 Hz or less.
Data signals travel at 10–100 MHz.

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 l°Cation, distance from the AC circuit, and l°Cal safety codes, the savings from using a PoE solution can be m200-m400 per AP. In harsh, outdoor, or industrial environments, you can save m600-m1200 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 l°Cated in data centres 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 entreprise.

Connect your PoE equipment.

Use high-quality Black Box CAT5e/6/6A cable to power your PoE phones, cameras, wireless access points and more.
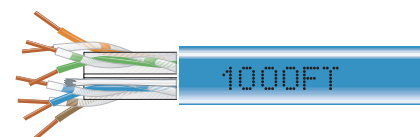
CAT6A Bulk Cable

GigaTrue® CAT6 Bulk Cable
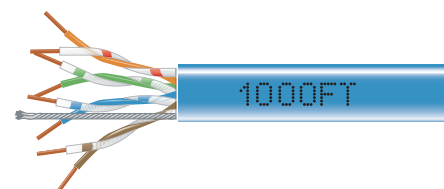
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Prevent PoE disconnects.

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

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
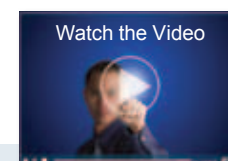
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- Nurse all cables.
- Special connectors and adaptors.
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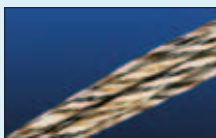
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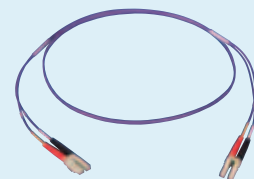
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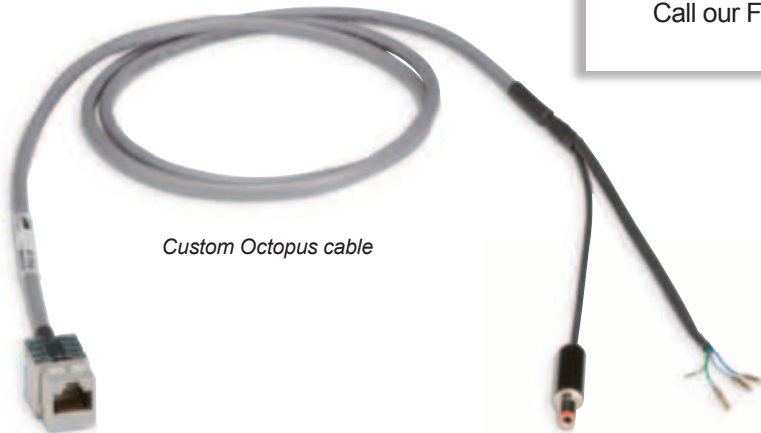
Custom Octopus cable

Custom modular to 3.5 mm adaptor
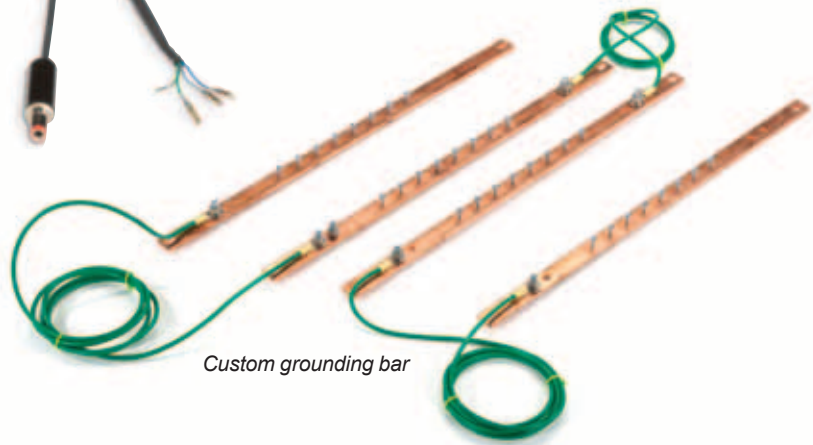
Custom grounding bar

DB25 to BNC Octopus cable

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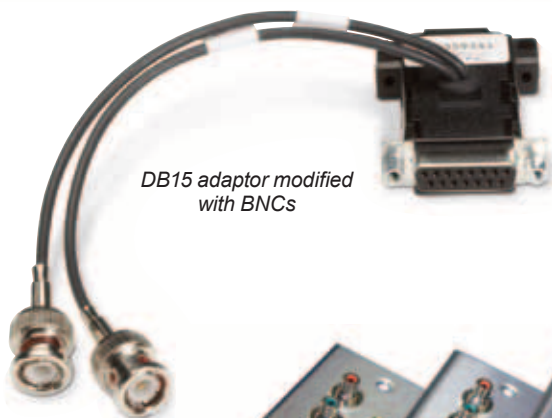
DB15 adaptor modified with BNCs
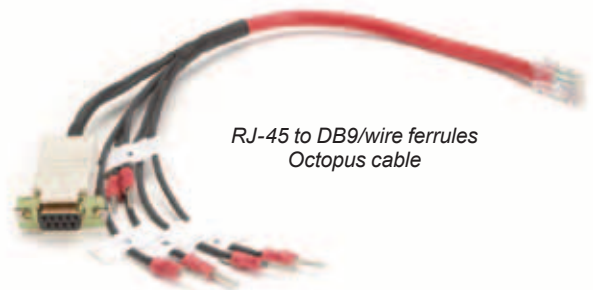
RJ-45 to DB9/wire ferrules Octopus cable

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Bulk Cable

CATx

LSZH
(CAT6A/6 /5e)

Premium
(CAT7/6A
CAT6/5e)

Shielded

Unshielded

Stranded

Solid

Stranded

Solid

COPPER

Patch Cables

CATx

Premium
(CAT7/6A
CAT6/5e)

Solid

Unshielded

Stranded

Shielded

Stranded

Solid

Value
(CAT6/5e)

LSZH
(CAT6A/6 /5e)

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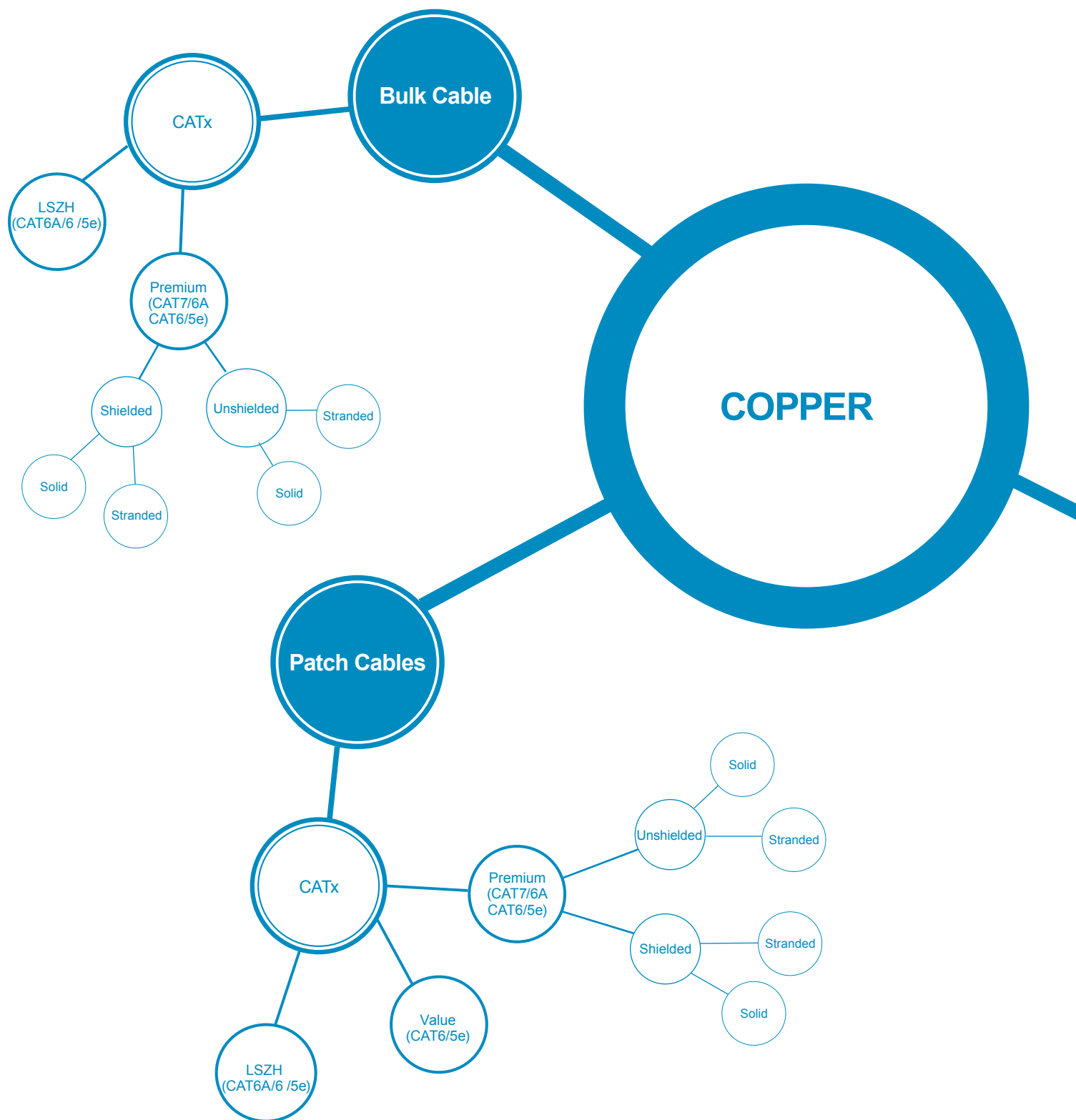
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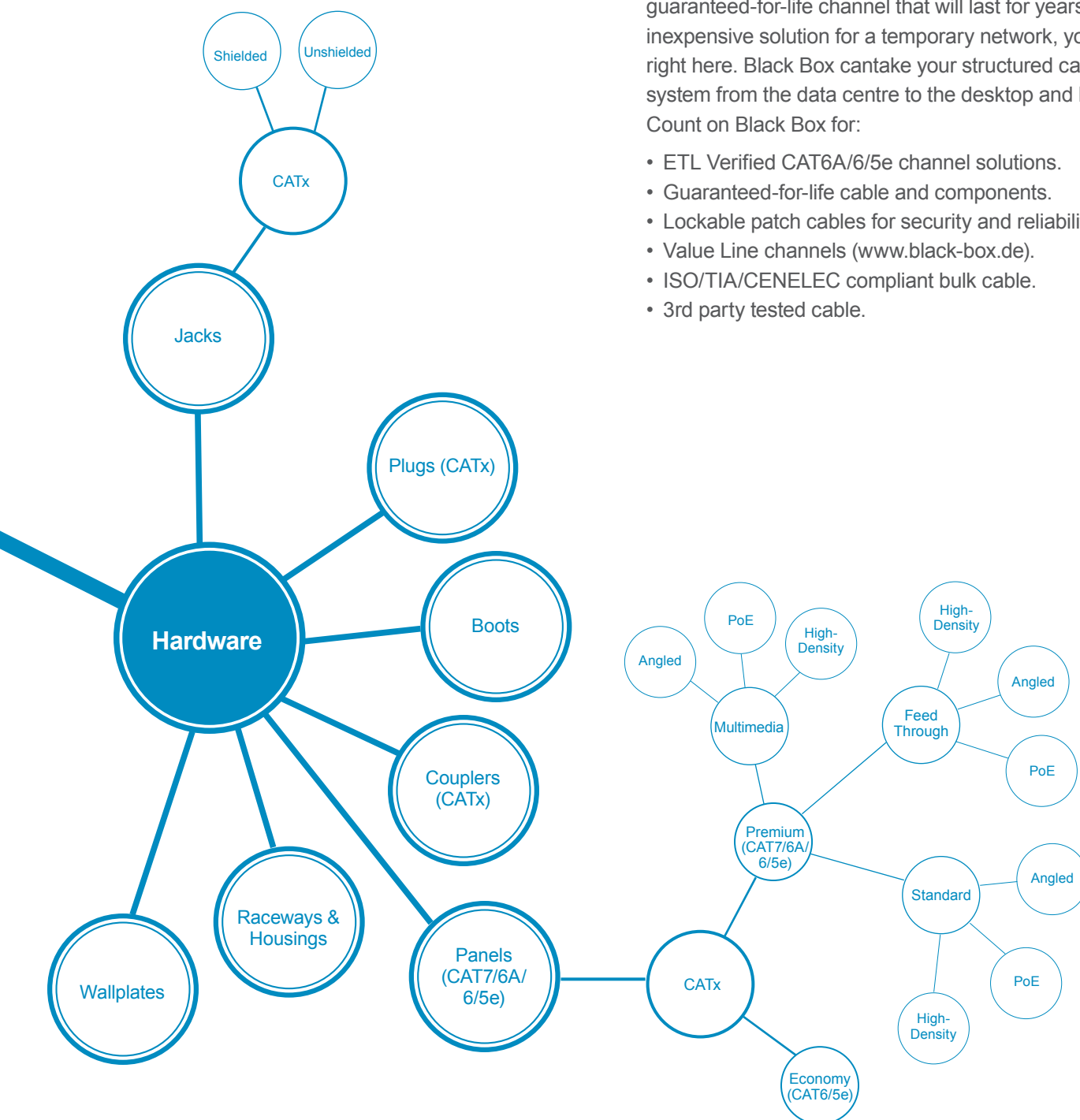
Copper Cabling

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 fibre optic 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 LSZH 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 minimising ANEXT in 10-GbE runs.

Shielded cable was traditionally used to extend distances and to minimise 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.

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   TP = Twisted Pair
Sc = Braiding or Screening   F = Foil

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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 centre 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 metre or less to reduce signal degradation.

PVC, 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.

Low Smoke, Zero Halogen (LS0H, LSZH) is a type of five rated 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.

Types of twisted-pair cables

Unshielded twisted-pair cable (UTP)

Foiled/unshielded twisted-pair cable (F/UTP)

Screened/foiled twisted-pair cable (Sc/FTP)

Stranded conductor

Solid conductor
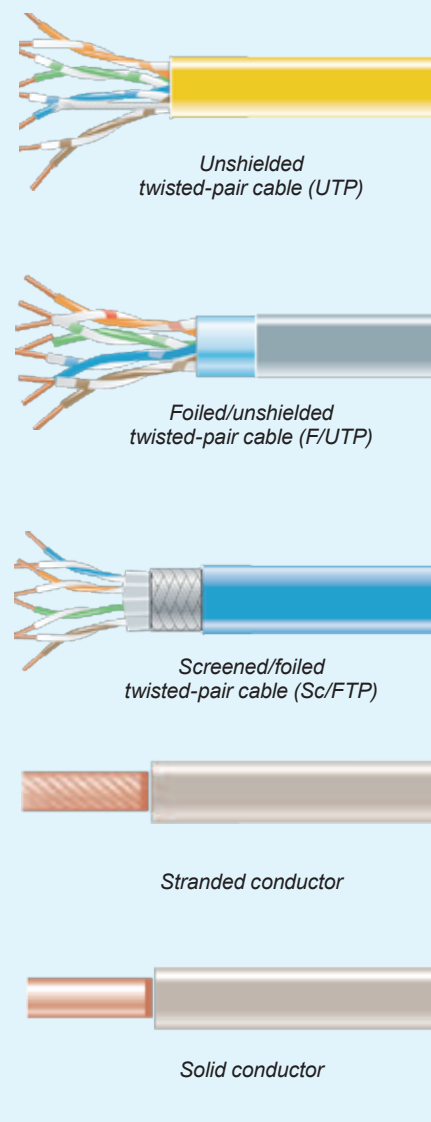
Hey, so what does AWG mean?

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.

24 AWG vs. 18 AWG wire

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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 organisations

Today, there are a few primary organisations involved in the development of structured cabling standards.

Globally, the organisations that issue standards are the International Organisation 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.

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.

Other organisations include the Canadian Standards Association (CSA), CENELEC (European Committee for Electrotechnical Standardizations), and the Japanese Standards Association (JSA/JSI).

The committees of all these organisations 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 E$_A$
600 MHz	—	CAT7	Class F
1000 MHz	—	CAT7A	Class F$_A$
1–2000 MHz	CAT8 (Proposed)		Category 8.1/Class I*
			Category 8.2/Class II*

*Under development.

The standards

Category 5 (CAT5), was ratified in 1991. It is no longer recognised 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 recognised for new installations. It is commonly used for 1-GbE installations.

CAT6 vs. CAT6A

CAT6
OD: 5.3–6.1 mm
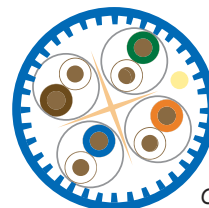
CAT6A UTP
OD: 7.3–8.9 mm

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 37 to 55 metres 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 metres. 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 23 AWG, and is designed with more space between the pairs to minimise ANEXT. The outside diameter of CAT6A cable averages 7.3–8.9 mm compared to 5.3–6.1 mm 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 20 mm conduit vs. five CAT6 cables.

CAT6A UTP vs. CAT6A F/UTP
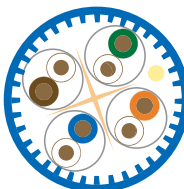
CAT6A UTP
OD: 9 mm
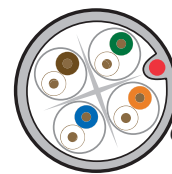
CAT6A F/UTP
OD: 7.4 mm

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 2 mm, from 7 mm to 9 mm 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.

Category 7 (CAT7)–Class F was published in 2002 by the ISO/IEC. It is not a TIA recognised 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 centre at 30 meter. 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.

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 Size	Fill*	CAT6A UTP 9.00 mm O.D.	CAT6A F/UTP 7.4 mm O.D.
53 mm	40%	13	20
	60%	20	30
78 mm	40%	30	45
	60%	45	66
103 mm	40%	51	80
	60%	78	116

*40% is the fil ratio recommended for initial runs to allow for growth. 60% is the maximum fil 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 E_A	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 F_A	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

Recommended channel and permanent link

Channel and Permanent Link

Optional consolidation point

Horizontal cable

Outlet jack

Permanent link: 90 m

Patch panel

Work area patch cable: Up to 5 m

Patch panel

Patch Cables: Total of work area and patch cords not to exceed 5 m

Channel: 100 m

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 recognised 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 Fibre Cabling Components Standard
ANSI/TIA-606-B: Administration Standard for Commercial Telecommunications Infrastructure	ANSI/TIA-942: Telecommunications Infrastructure Standard for Data Centres	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 from the point of termination. And remove as little of the sheath as possible.

When terminating cable, only strip back the cable sheath 25 mm. Keep pair untwists to a maximum of 13 mm.

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. Pulling too hard untwists the pairs, which can cause transmission problems, and can affect cable certification. Use supports and trays in cable runs to minimise 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 30 mm of slack cable behind wall outlets for possible future reterminations.

Keep jacket removal and untwists to a minimum.
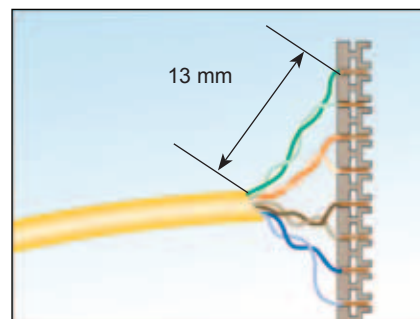
UTP bend radius = 4X cable diameter. Sc/UTP bend radius = 8X cable diameter.

UTP bend radius = 4X cable diameter. Observe proper bend radius.
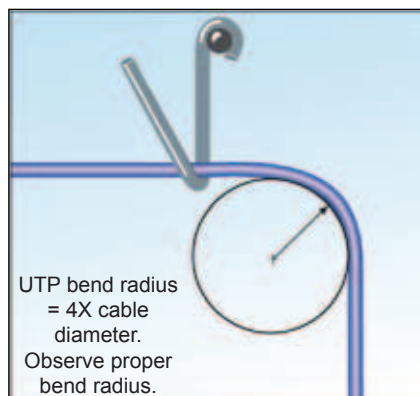
Keep cable wraps snug, but don't pull or crush cables. Wrap CAT6A cables loosely.
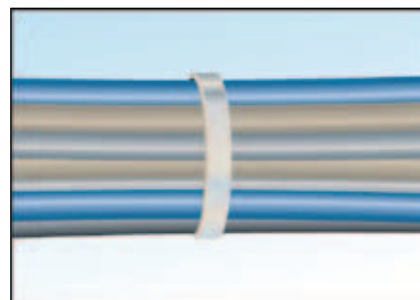
T568A, T568B, and USOC wiring
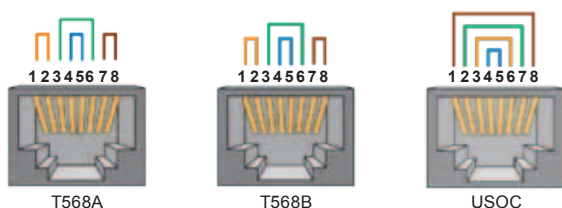
| 12345678 | 12345678 | 12345678 |
| T568A | T568B | USOC |

| Pair 1 ——— | Pair 3 ——— |
| Pair 2 ——— | Pair 4 ——— |

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 colour 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.

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)

1000FT

GigaTrue **CAT6A**

- 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: 8.5 mm.
- **Standard Warranty** — Lifetime

Rip Cord
Internal Separator
23 AWG Conductors
Insulation
Jacket

INTERTEK ETL VERIFIED CM
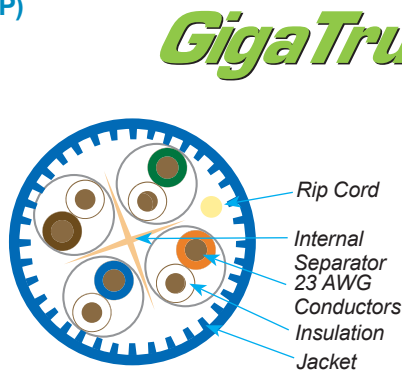
CAT6A 650 mHz Solid Bulk Cable (UTP)

23 AWG, Solid, 650 mHz, 304.8 m

Riser PVC CMR	C6ABC50-XX-1000

To order, replace the XX with the colour.
Blue = BL Black = BK Grey = GY White = WH

For specs, go to www.black-box.de.

Premium quality cable for future-proof 10G networking.

Cat6A LSZH UTP Bulk Cable

10-Gigabit CAT6A Solid Bulk Cable LSZH (UTP)

Cat6A LSZH Cable U/UTP Bulk Solid Conductor 305 m Spool Purple	EYNLS6A48AW-PB-1000

For specs, go to www.black-box.de.

GigaTrue **CAT6A**

- Meets Category 6A standards.
- Ideal for carrying data, audio, and video
- For use in 10 / 100 Mbps, and 1 / 10 Gbps networks.
- Solid Copper Conductors.
- Tested to 600 MHz
- 23 AWG.
- **Standard Warranty** — Lifetime

Premium quality shielded cable for noise immunity and 10G performance.

Cat6A LSZH F/UTP Bulk Cable

GigaTrue **CAT6A**

10-Gigabit CAT6A Solid Bulk Cable LSZH (UTP)

Cat6A LSZH Cable F/UTP Bulk Solid Conductor 305 m Spool Purple	EYNLSF6A48AW-PB-1000

For specs, go to www.black-box.de.

- Meets Category 6A standards.
- Ideal for carrying data, audio, video.
- For use in 10 / 100 Mbps, and 1 / 10 Gbps networks.
- Features aluminium Mylar® tape foil shield to protect against EMI/RFI.
- Solid Copper Conductors.
- 23 AWG.
- **Standard Warranty** — Lifetime

Eliminate ANEXT worries with a CAT6A shielded channel.

CAT6A 650 MHz F/UTP Bulk Cable
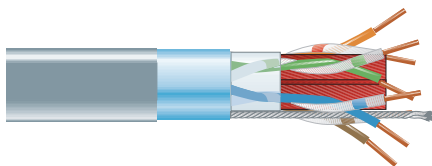
GigaTrue **CAT6A**

- Use with Black Box® CAT6A shielded components for a 10GBASE-T channel.
- Smaller outside diameter than CAT6A UTP.
- Diameter: 7 mm.
- Foil shield construction virtually eliminates alien crosstalk.
- **Standard Warranty** — Lifetime

Mylar
Drain Wire
Aluminum/Mylar®
Internal Separator Conductors
Insulation
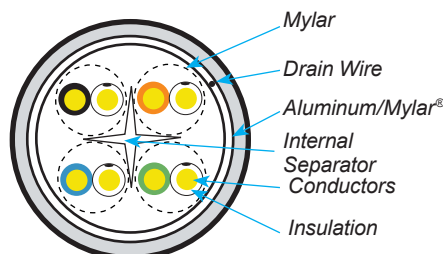
CAT6A F/UTP Bulk Cable

23 AWG, Solid, 650 MHz, 304.8 m, Blue

PVC	EYN770A-RL-1000

For specs, go to www.black-box.de.

◆ **BLACK BOX** NETWORK SERVICES

phone 0811 - 5541 112 | usforces@black-box.de

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

Drain wire
Internal separator
Conductors
Jacket

EYN870A-PB-1000
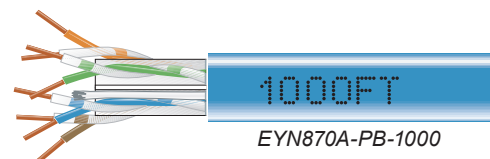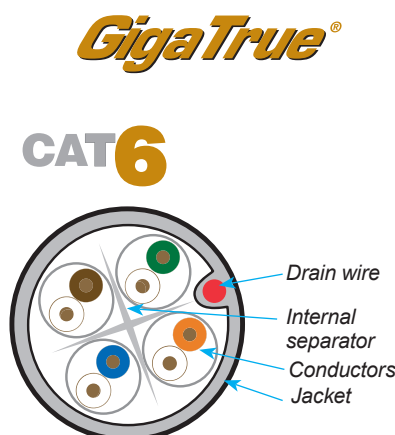
GigaTrue® 550 CAT6 550 MHz Solid Bulk Cable (UTP)

23 AWG, Pull Box, 1000-ft. (304.8 m)

| PVC CMR | EYN8**XX**A-PB-1000 |

PVC: replace the XX with the colour.
Blue = 70   Yellow = 72   White = 74   Grey = 76
Violet = 64   Green = 78   Orange = 66   Red = 68
Black = 80

For specs, go to www.black-box.de.

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 9 mm compared to 6.7 mm – 7.6 mm for CAT6A F/UTP, and 5.3 mm – 6.1 mm 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 2.5 mm, from 6.5 mm to 8.9 mm, represents a 21% increase in fill volume.

In general, CAT6A F/UTP cable provides a minimum of 35% more fill capacity that CAT6A UTP cable. For example, at a 40% fill ratio, you can run (3) CAT6A UTP cables in a 18 mm 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: 5.3–6.1 mm
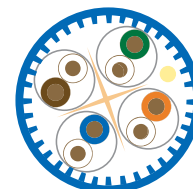
CAT6A UTP
OD: 7.3-8.9 mm (max.)

CAT6A F/UTP
OD: 7.4 mm

Conduit Trade Size	Fill*	No. of CAT6A UTP Cables 8.9 mm O.D.	No. of CAT6A F/UTP Cables 7.4 mm O.D.
53 mm	40%	13	20
	60%	20	30
78 mm	40%	30	45
	60%	45	66
103 mm	40%	51	80
	60%	78	116

*40% is the fil ratio recommended for initial runs to allow for growth. 60% is the maximum fil ratio.

For more information and our online store, visit www.black-box.de\USForces_Ger.

BLACK BOX NETWORK SERVICES   87

High Performance Cat6 bulk cable with low smoke zero halogen jacket
GigaTrue® Cat6 550 MHz LSZH UTP Bulk Cable

- Exceeds Category 6 standards.
- Manufactured in accordance with ISO/IEC 11801 & ANSI/ TIA/EIA 568-B.2.
- Ideal for carrying data, audio, video.
- For use in 10/ 100 Mbps, and 1 Gbps networks.
- Solid Copper Conductors.
- Packaged in 305 m pull box for quick dispensing.
- **Standard Warranty** — Lifetime

GigaTrue® CAT6

GigaTrue® Cat6 LSZH F/UTP Bulk Cable

305 m box

Blue	EYNLS641AW-PB-1000
Green	EYNLS642AW-PB-1000
Red	EYNLS643AW-PB-1000
Yellow	EYNLS644AW-PB-1000
Black	EYNLS647AW-PB-1000
Purple	EYNLS648AW-PB-1000

Shielded cable for long runs in electrically noisy areas.
GigaTrue® Cat6 LSZH F/UTP Bulk Cable

- Meets Category 6 standards.
- Features aluminium Mylar® tape foil shield to protect against noise and EMI/RFI interference.
- Manufactured in accordance with ISO/IEC 11801 & ANSI/ TIA/EIA 568-B.2.
- Ideal for carrying data, audio, video.
- For use in 10 / 100 Mbps, and 1 Gbps networks.
- Solid 23 AWG Copper Conductors.
- Packaged on a 305m spool for quick dispensing
- **Standard Warranty** — Lifetime

GigaTrue® CAT6

GigaTrue® Cat6 550 MHz LSZH UTP Bulk Cable

305 m box

Blue	EYNLSF641AW-PB-1000
Green	EYNLSF642AW-PB-1000
Red	EYNLSF643AW-PB-1000
Yellow	EYNLSF644AW-PB-1000
Black	EYNLSF647AW-PB-1000
Purple	EYNLSF648AW-PB-1000

CUSTOM SPOTLIGHT

When you need it made to order, count on us!

Special requirements? No problem! Black Box can build a custom cable or adaptor to your requirements. Every day, experienced technicians in our manufacturing facility, build custom cable assemblies, wallplates, switches, and more!

Customs can include:

- Certified CATx and fibre bulk cables.
- Coax cables for DAS systems.
- Pre-terminated fibre cables.
- Y and Octopus cables.
- Feed-through faceplates.
- Connectors and adaptors.

To Get Started   Call our Engineers at 0811-5541 112

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 aluminium Mylar® tape. Foil shield protects against noise and EMI/RFI interference.
- **Standard Warranty** — Lifetime

CAT**6**

Drain wire
Aluminum/Mylar®
Internal separator
Conductors
Jacket
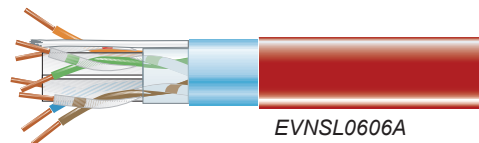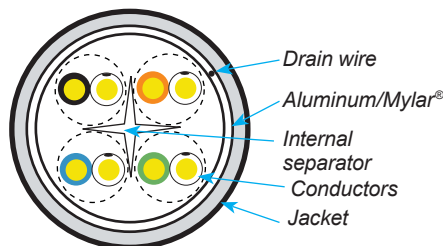
EVNSL0606A

CAT6 400 MHz Shielded Solid Bulk Cable (F/UTP)

24 AWG, 304.8 m

| PVC CM | EVNSL060XA-1000 |

To order, replace the X with the colour number.
Blue = 1   Yellow = 4   White = 5   Grey = 2
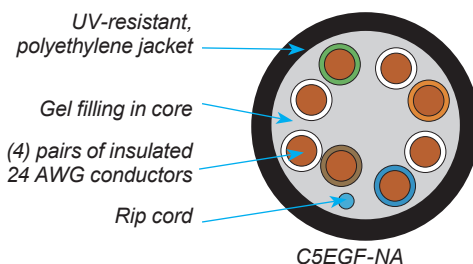Violet = 9   Green = 7   Red = 6   Orange = 0
Black = 8

For specs, go to www.black-box.de

GigaTrue CAT6 550 MHz Stranded Bulk Cable (UTP)
CAT6 stranded cable for making assemblies or short runs.

- 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

GigaTrue®

CAT**6**

Foam insulation
Rip cord
Jacket

EVNSL0641A
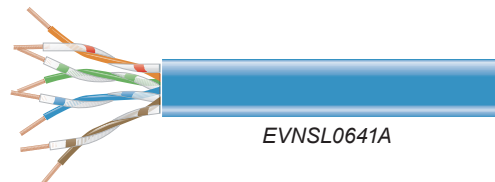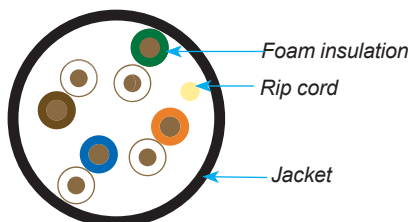
GigaTrue CAT6 550 MHz Stranded Bulk Cable (UTP)

24 AWG, PVC (CM)

76.2 m	EVNSL06XXA-0250
152.4 m	EVNSL06XXA-0500
304.8 m	EVNSL06XXA-1000

To order, replace the XX with the colour.
Grey = 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 www.black-box.de

## Double-shielded CAT6 cable for noisy data centre 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

CAT**6**

Foam insulation
Aluminum/Mylar tape
Tinned copper braid
Jacket
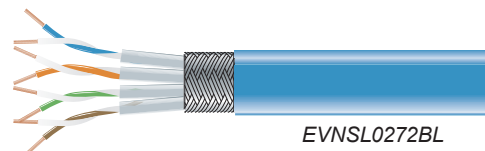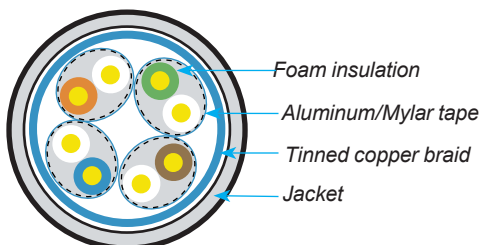
EVNSL0272BL

CAT6 250 MHz Shielded, Stranded Bulk Cable (Sc/FTP)

26 AWG, PVC 1000-ft. (304.8 m)

| | EVNSL0272XX-1000 |

To order, replace the XX with the colour.
Grey = GY   Blue = BL   Green = GN
Red = RD   Yellow = YL   Black = BK
Violet = VI   Orange = OR   White = WH

For specs, go to www.black-box.de

Save money! Run this armoured cable anywhere in your building, no innerducts required.

GigaTrue® Plus CAT6 Heavy-Duty, Armoured Indoor Cable

Armour
Drain wire
Internal tape
Conductors
Jacket

NOTE: Costs based on a 1000-foot run using Black Box materials. Labour costs are estimated and can vary widely based on the building and environment.
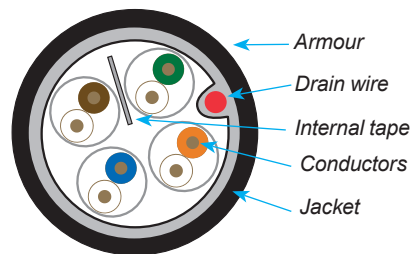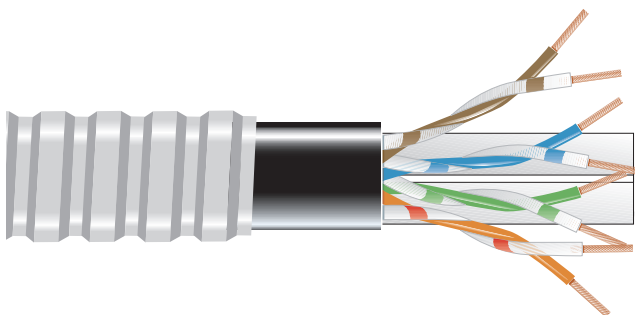
- Save money on labour and materials. Pull this cable once instead of pulling conduit and then pulling cable.
- Romex® aluminium armor also acts like a shield.
- Run anywhere in your building.
- Ideal for out-of-the-way areas and harsh and industrial environments.
- Well-suited for military, aerospace, energy, and manufacturing applications.
- **Standard Warranty** — Lifetime

CAT**6**

GigaTrue Plus CAT6 Heavy-Duty, Armoured Indoor Cable

250 MHz, PVC, Black

304.8 m	C6-IA-1000

For specs, see www.black-box.de

Tough cables that resist the elements, crushing, and EMI.

CAT6 Outdoor-Rated, Gel-Filled Armoured and Non-Armoured Cable
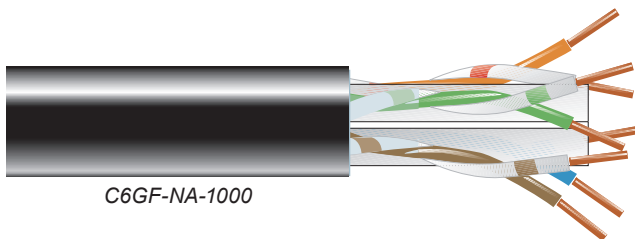
C6GF-NA-1000
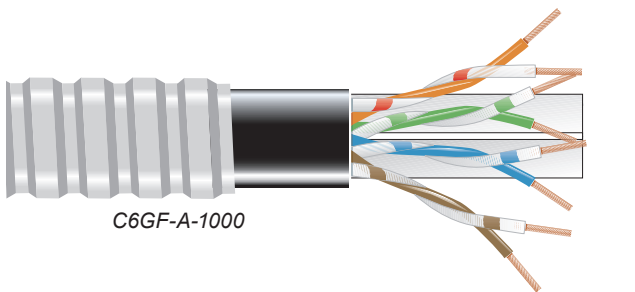
C6GF-A-1000

CAT**6**

UV-resistant, polyethylene jacket

Gel filling in core

(4) pairs of insulated 24 AWG conductors

Rip cord

C6GF-NA

- Use for direct burial, in ducts, or lashed to an aerial support member.
- Romex® aluminium armoured version also resists rodent damage.
- Gel-filled, solid-conductor cables feature UV- and abrasion-resistant jackets.
- Withstands extreme temperatures.
- Internal separator helps reduce crosstalk.
- Meets CAT6 250 MHz requirements.
- **Standard Warranty** — Lifetime
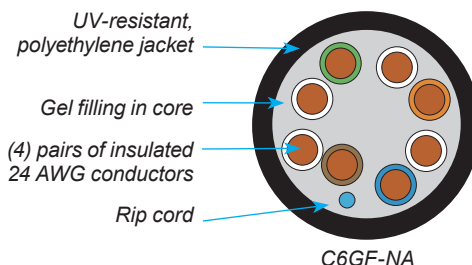
CAT6 Outdoor-Rated Solid, Gel-Filled Bulk Cable

Non-Armoured	
304.8 m	C6GF-NA-1000
Armoured	
304.8 m	C6GF-A-1000

For specs, go to www.black-box.de

◆ BLACK BOX
NETWORK SERVICES

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.
- 304.8 m cable is marked in two-foot increments so you always know how much you have left.
- **Standard Warranty** — Lifetime

EYN851A-PB-1000

Rip cord
Conductors
Insulation
Jacket
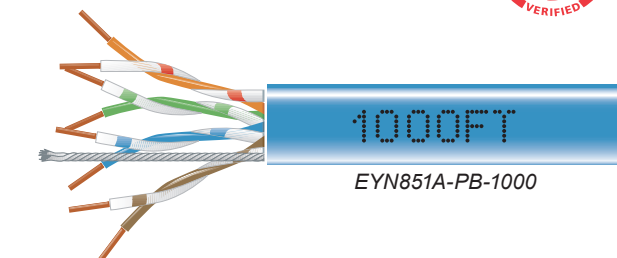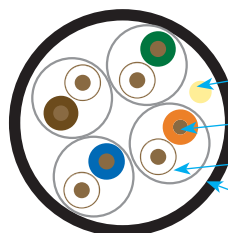
GigaBase® 350 CAT5e, 350 MHz Solid Bulk Cable (UTP)

24 AWG, Pull Box, 304.8 m	
PVC	EYN8XXA-PB-1000

PVC: replace the XX with the colour.
Blue = 51   White = 53   Yellow = 55   Grey = 57
Violet = 45   Green = 59   Red = 49   Orange = 47
Black = 61

For specs, go to www.black-box.de

High performance Cat5e bulk cable with low smoke zero halogen jacket.

GigaBase® 350 Cat5e 350 MHz LSZH UTP Bulk Cable

- Exceeds Category 5e standards.
- Manufactured in accordance with ISO/ IEC 11801 & ANS/ TIA/ EIA 568-B.2.
- Ideal for carrying data, audio, video.
- For use in 10/ 100 Mbps, and 1 Gbps networks.
- Solid Copper Conductors.
- Packaged in a box for quick dispensing.
- **Standard Warranty** — Lifetime

GigaBase® 350 Cat5e 350 MHz LSZH UTP Bulk Cable

305 m box	
Blue	EYNLS65E41AW-PB-1000
Green	EYNLS65E42AW-PB-1000
Red	EYNLS65E43AW-PB-1000
Yellow	EYNLS65E44AW-PB-1000
Purple	EYNLS65E48AW-PB-1000

GigaBase® Cat5e LSZH F/UTP Bulk Cable

Shielded cable for long runs in electrically noisy areas.

- Meets Category 5e standards.
- Features aluminium Mylar® tape foil shield to protect against noise and EMI/ RFI interference.
- Manufactured in accordance with ISO/ IEC 1801 & ANSI/ TIA/ EIA 568-B.2.
- Ideal for carrying data, audio, video.
- For use in 10/ 100 Mbps, and 1 Gbps networks.
- Solid Copper Conductors.
- Packeaged on a 305 m spool for quick dispensing.
- **Standard Warranty** — Lifetime

GigaBase® Cat5e LSZH F/UTP Shielded Bulk Cable

305 m box	
Blue	EYNLSF5E41AW-PB-1000
Green	EYNLSF5E42AW-PB-1000
Red	EYNLSF5E643AW-PB-1000
Yellow	EYNLSF5E644AW-PB-1000
Purple	EYNLSF5E648AW-PB-1000

Shielded cable for long runs in noisy environments.
CAT5e 350 MHz Shielded, Solid Bulk Cable (F/UTP)

- 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

Drain wire
Aluminum/Mylar® tape
Insulation
Conductors
Jacket
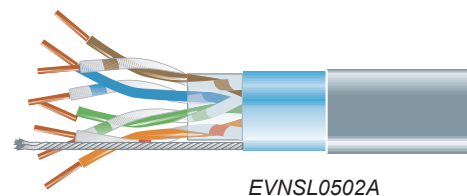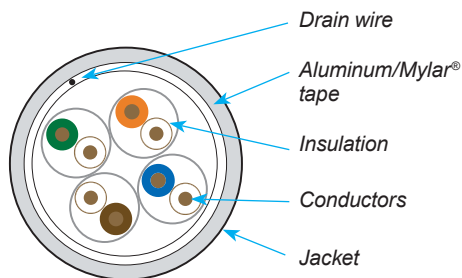
EVNSL0502A

CAT5e 350 MHz Shielded, Solid Bulk Cable (F/UTP)

24 AWG, 304.8 m	
PVC CM	EVNSL050XA-1000

To order, replace the X with the colour number.
Blue = 1   Yellow = 4   White = 5   Grey = 2
Violet = 9   Green = 7   Red = 6   Orange = 0
Black = 8

For specs, go to www.black-box.de

Tough cables that resist the elements, crushing, and EMI.
CAT5e Outdoor-Rated, Gel-Filled Armoured and Non-Amored Cables

- Use for direct burial, in ducts, or lashed to an aerial support member.
- Romex® aluminium armoured version also resists rodent damage.
- Gel-filled, solid-conductor cables feature UV- and abrasion-resistant jackets.
- Withstands extreme temperatures.
- **Standard Warranty** — Lifetime

C5EGF-NA-1000

C5EGF-A-1000

UV-resistant, polyethylene jacket
Gel filling in core
(4) pairs of insulated 24 AWG conductors
Rip cord
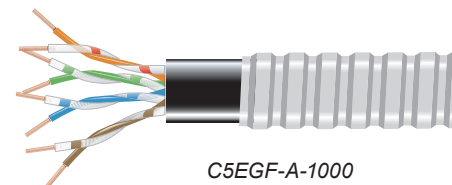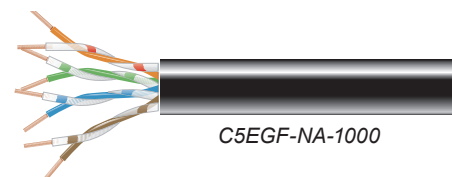
C5EGF-NA

CAT5e Outdoor-Rated, Gel-Filled Bulk Cable

100 MHz, Solid, 24 AWG	
Non-Armoured	
304.8 m	C5EGF-NA-1000
Armoured	
304.8 m	C5EGF-A-1000

For specs, go to www.black-box.de

Cable, connectors, and hardware for your legacy systems.
For more information, go to **www.black-bo**x.de

USOC Jacks
Make legacy USOC connections.
FMT238-25PAK

CAT5 Patch Cables
For legacy equipment connections.
EYN550MS-0002

CAT5 Modular Plugs
For legacy cable connections.
FMTP5U-STR

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)

GigaBase®

EVNSL084A

- Tested to 350 MHz.
- Meet or exceed CAT5e T568-C.2 standards.
- Use to make your own cable assemblies.
- **Standard Warranty** — Lifetime

CAT**5e**

Rip cord
Conductors
Insulation
Jacket
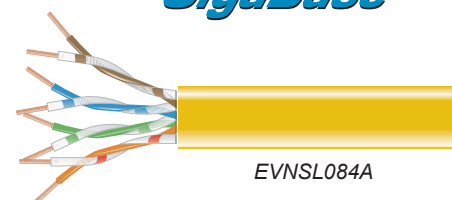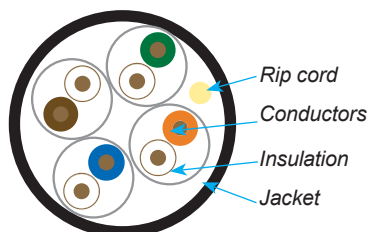
GigaBase® CAT5e 350 MHz Stranded Bulk Cable (UTP)

24 AWG, PVC	
152.4 m	EVNSL0XXA-0500
304.8 m	EVNSL0XXA-1000

Replace the XX with the colour.
Grey = 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 www.black-box.de

Shielded CAT5e cable for noisy data centre and workgroup connections.

CAT5e 100 Mhz Shielded, Stranded Bulk PVC Cable (F/UTP)

1000FT

EVNSL0172BL

- 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

CAT**5e**
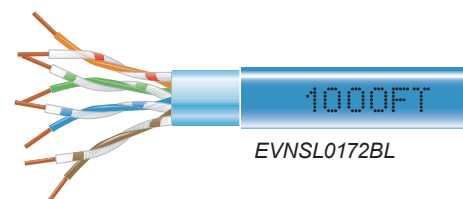
Twisted copper drain wire
Jacket
Mylar® tape
Aluminum/Mylar tape
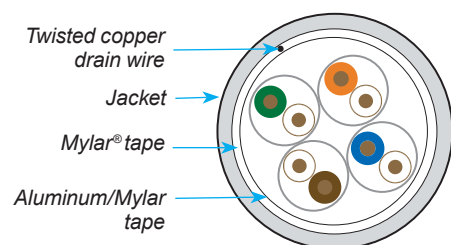
CAT5e 100 MHz Shielded, Stranded Bulk Cable (F/UTP)

26 AWG, PVC 304.8 m	
	EVNSL0172XX-1000

To order, replace the XX with the colour.
Grey = GY   Blue = BL   Green = GN
Red = RD   Yellow = YL   Black = BK
Violet = VI   Orange = OR   White = WH

For specs, go to www.black-box.de

Modular Adaptors and Couplers
Extend modular cable runs.
FM009

Telephone Bulk Cable
Cable for traditional phone lines.
EL04A-500

Cross-Connect Wire
Use in wiring closets.
EYN7001BL-1000

CAT3 Jacks
Make legacy CAT3 connections.
FMT364-R2

Telco Adaptors
For legacy telco connections.
FM052-R2

Telco Splice Blocks
For legacy interconnects.
JP600
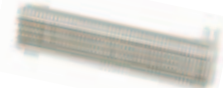
CAT6A: What you need to know.

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 metres. It extends electrical specifications to 500 MHz up from 250 MHz for CAT6. CAT6A supports bundled cable installations up to 100 metres 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 centre 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.
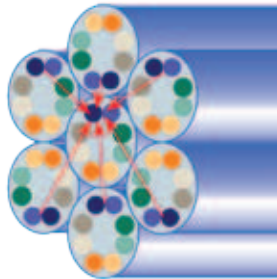
10-GbE

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
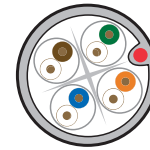
CAT6A F/UTP
OD: 7.4 mm
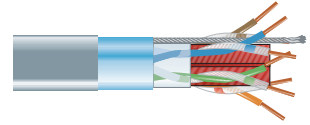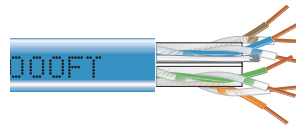
CAT6A UTP

CAT6A UTP cable is larger than CAT6A F/UTP and can have a diameter up to 9 mm. It's constructed to minimise 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.

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*

◆ BLACK BOX   NETWORK SERVICES

phone 0811 - 5541 112 | usforces@black-box.de

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 unauthorised 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.

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 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 unauthorised 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.

GigaTrue® 3 CAT6A TAA-Compliant 650 Mhz Component-Level Lockable Patch Cable (F/UTP)

26 AWG, PVC	
0.9 m	C6APC80S-XX-03
1.5 m	C6APC80S-XX-05
2.1 m	C6APC80S-XX-07
3.0 m	C6APC80S-XX-10
4.5 m	C6APC80S-XX-15
6.0 m	C6APC80S-XX-20

To order, replace the XX with the colour.
Blue = BL Black = BK Grey = GY White = WH

Related Products

Locking Pins	
10-Pack	LP50-RD-10PK
25-Pack	LP50-RD-25PK
Removal Key	KEY-CL

Call for custom lengths at competitive prices!

Cat6A S/FTP Shielded Patch Cables

Affordable Cat6A performance in a range of colours.

CAT6A Patch cables
• 100% Copper Conductors
• 50 Micron Gold Plug Conductors
• 27 AWG Stranded Copper Conductors
• Snagless Boots
• Available in 6 Colours
• Exceeds Cat6A Draft TIA/EIA 568-B 2-10 Performance
• S/FTP Shielded Twisted Pair Construction
• Low Smoke Zero Halogen
• **Standard Warranty** — Lifetime
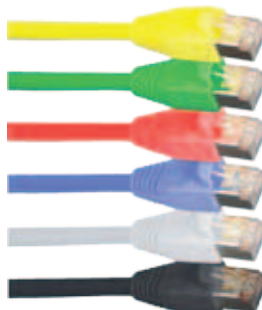
Cat6A Shielded S/FTP Patch Cables

1m	CAT6A-XX-1M
2m	CAT6A-XX-2M
3m	CAT6A-XX-3M
4m	CAT6A-XX-4M
5m	CAT6A-XX-5M
10m	CAT6A-XX-10M

To order, replace the XX with the colour.
Blue = BL Black = BK Grey = GY
Green =GN Red= RD Yellow= YL

Cable designed especially for blade servers and tight spaces.

CAT6A High-Density Data Centre Patch Cable (UTP)

- Patented, low-profile, push-pull boot design for use with high-density data centre 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 minimises ANEXT.
- **Standard Warranty** — Lifetime

High-Density Data Centre Patch Cable

Unique push-pull plug fits any standard RJ-45 opening.

To use, simply push the boot forward to latch into the outlet. Then pull back to release.

The push-pull design enables easy access and removal in tight areas, such as with blade servers.
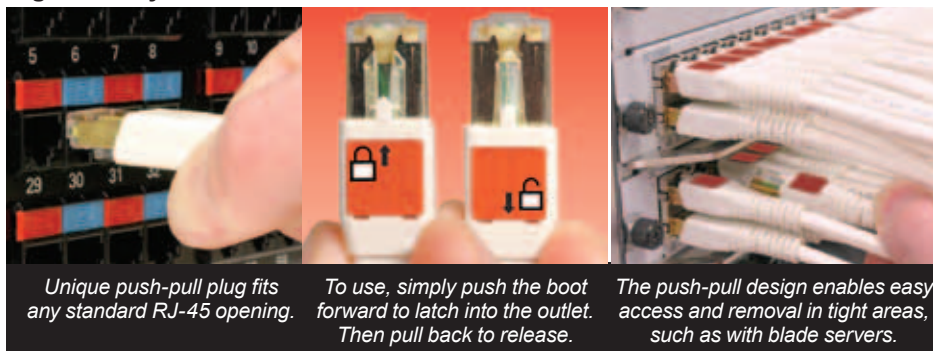
CAT6A High-Density Data Centre Patch Cable (UTP)

500 MHz, RJ-45, Stranded, PVC

0.9 m	EVNSL6A-XX-BS-0003
1.5 m	EVNSL6A-XX-BS-0005
2.1 m	EVNSL6A-XX-BS-0007
3.0 m	EVNSL6A-XX-BS-0010
4.5 m	EVNSL6A-XX-BS-0015
6.0 m	EVNSL6A-XX-BS-0020

Replace the XX with the colour.
Grey = 70   Blue = 71   White = 80

For specs, go to www.black-box.de

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

Foam insulation
Aluminum/Mylar® tape
Tinned-copper braid
Jacket
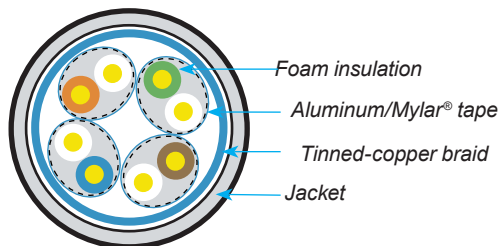
Performance Specifications

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

0.9 m	EVNSL741-0003
1.8 m	EVNSL741-0006
3.0 m	EVNSL741-0010
4.5 m	EVNSL741-0015

For more specs, go to www.black-box.de

CAT6 patch cables for all your high-performance applications.

GigaTrue CAT6 550 MHz Patch Cables (UTP)

GigaTrue ® CAT6

- 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!

Component Performance Moulded Boots

GigaTrue CAT6 Component 550 MHz Patch Cable (UTP)

Stranded, 24 AWG, RJ-45, PVC, Straight-Pinned

0.9 m	EVNSL6XX-0003
1.5 m	EVNSL6XX-0005
1.8 m	EVNSL6XX-0006
2.1 m	EVNSL6XX-0007
3.0 m	EVNSL6XX-0010
4.2 m	EVNSL6XX-0014
6.0 m	EVNSL6XX-0020

Replace the XX with the colour. For 25 packs, add -25PAK to the end of the code.

Grey = 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 www.black-box.de

Choose from as many as 12 colours.

Grey | Blue | Green | Red | Yellow | Beige | Pink | Black | Purple | Orange | White | Lilac

Channel Performance Snagless Boots

GigaTrue CAT6 Channel 550 MHz Patch Cable (UTP)

Stranded, 24 AWG, RJ-45, PVC, Straight-Pinned

0.3 m	EVNSL6XX-0001
0.6 m	EVNSL6XX-0002
0.9 m	EVNSL6XX-0003
1.2 m	EVNSL6XX-0004
1.5 m	EVNSL6XX-0005
1.8 m	EVNSL6XX-0006
2.1 m	EVNSL6XX-0007
3.0 m	EVNSL6XX-0010
4.5 m	EVNSL6XX-0015
6.0 m	EVNSL6XX-0020
7.6 m	EVNSL6XX-0025
9.1 m	EVNSL6XX-0030
15.2 m	EVNSL6XX-0050
30.4 m	EVNSL6XX-0100
Custom Lengths	EVNSL6XX

Replace the XX with the colour. For 25 packs, add -25PAK to the end of the code.

Grey = 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 www.black-box.de

Channel Performance Basic Connectors

GigaTrue CAT6 Channel 550 MHz Patch Cable (UTP)

Stranded, 24 AWG, RJ-45, PVC, Straight-Pinned

0.3 m	EVNSL6XX-0001
0.6 m	EVNSL6XX-0002
0.9 m	EVNSL6XX-0003
1.2 m	EVNSL6XX-0004
1.5 m	EVNSL6XX-0005
1.8 m	EVNSL6XX-0006
2.1 m	EVNSL6XX-0007
3.0 m	EVNSL6XX-0010
4.5 m	EVNSL6XX-0015
6.0 m	EVNSL6XX-0020
7.6 m	EVNSL6XX-0025
9.1 m	EVNSL6XX-0030
15.2 m	EVNSL6XX-0050
30.4 m	EVNSL6XX-0100
Custom Lengths	EVNSL6XX

Replace the XX with the colour. For 25 packs, add -25PAK to the end of the code.

Grey = 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 www.black-box.de

Get premium performance and lockability.

GigaTrue® 3 CAT6 550 MHz Lockable LSZH Patch Cables (UTP)

- Use for all your network connections.
- Low smoke zero halogen (LSZH) Jacket.
- Insert the optional Locking Pin into the patented boot to lock down ports.
- Secure network ports from unauthorised access and accidental disconnects.
- Cables stay locked in place—until YOU take them out.
- **Standard Warranty** — Lifetime
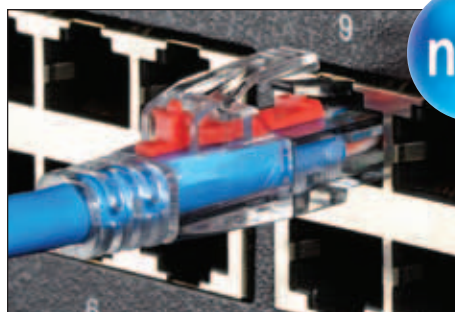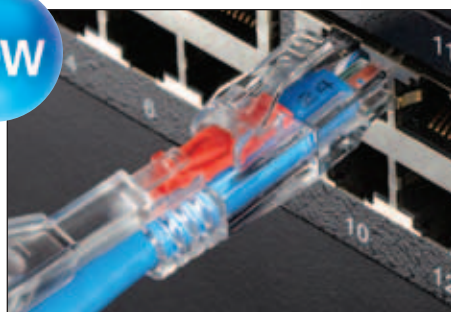
A locked-down cable with Pin inserted in the boot.

To unlock, insert the Key into the Pin until it clicks. Pull the Pin back and lift the Key to release.

Removal Key

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 unauthorised 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) LSZH

24 AWG, LSZH	
1.0 m	C6PC60-XX-01M
1.5 m	C6PC60-XX-01M5
2.0 m	C6PC60-XX-02M
3.0 m	C6PC60-XX-03M
5.0 m	C6PC60-XX-05M
7.5 m	C6PC60-XX-06M
10.0 m	C6PC60-XX-10M

Replace the XX with the colour.

Blue = BL	Black = BK	Grey = GY
Red = RD	Green = GN	Yellow = YL

For specs and the video, go to www.black-box.de

Call for custom lengths at competitive prices!

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 www.black-box.de

Call for custom lengths at competitive prices!

Double-shielded, lockable CAT6 cable for industrial environments.

GigaTrue 3 CAT6 250 MHz Lockable Shielded Stranded LSZH PVC Cable

- Ideal for noisy connections in data centres, 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

new

GigaTrue® 3 **CAT6**

Watch the Video

GigaTrue 3 Lockable Patch Cables
www.black-box.de

Conductors

Foam skin insulation

Aluminum/Mylar®

Tinned copper braiding

PVC jacket

GigaTrue 3 CAT6 250 MHz Lockable Shielded, Stranded LSZH Cable (Sc/FTP)

26 AWG, LSZH	
1.0 m	C6PC60S-XX-01M
2.0 m	C6PC60S-XX-02M
3.0 m	C6PC60S-XX-03M
5.0 m	C6PC60S-XX-05M
7.5 m	C6PC60S-XX-07M5
10.0 m	C6PC60S-XX-10M

Replace the XX with the colour.
Blue = BL   Black = BK   Grey = GY
Red = RD   Green = GN   Yellow = YL

For specs and the video, go to
www.black-box.de

Call for custom lengths at competitive prices!

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: 1.05 ± 0.02 mm.
- Moulded connectors.
- **Standard Warranty** — Lifetime

ABSOLUTELY GUARANTEED FOR LIFE

CAT6

Tinned-copper drain wire

Aluminum/Mylar® tape

HDPE insulation

Conductors

Jacket
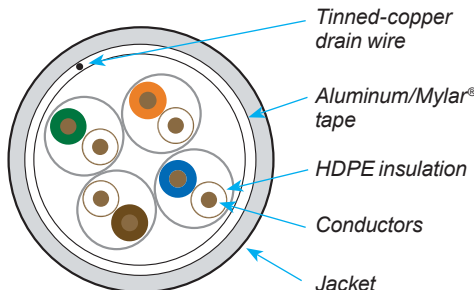
CAT6 400 Mhz Shielded, Solid Backbone Cable PVC (F/UTP)

24 AWG, PVC	
0.3 m	EVNSL06XXMS-0001
0.6 m	EVNSL06XXMS-0002
0.9 m	EVNSL06XXMS-0003
1.5 m	EVNSL06XXMS-0005
1.8 m	EVNSL06XXMS-0006
2.1 m	EVNSL06XXMS-0007
3.0 m	EVNSL06XXMS-0010
4.5 m	EVNSL06XXMS-0015
6.0 m	EVNSL06XXMS-0020
7.6 m	EVNSL06XXMS-0025
9.1 m	EVNSL06XXMS-0030

PVC: replace the XX with the colour number.
Blue = 01   Grey = 02   Yellow = 04   White = 05
Red = 06   Green = 07   Black = 08   Orange = 10

For specs, go to www.black-box.de

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

Rip Cord
Conductors
Insulation
Jacket
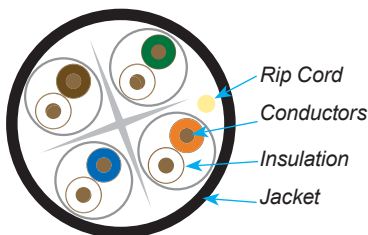
CAT6 550 MHz Solid Backbone Cable (UTP)
24 AWG, PVC CM

0.6 m	EYN9XXMS-0002
1.5 m	EYN9XXMS-0005
3.0 m	EYN9XXMS-0010
4.5 m	EYN9XXMS-0015
6.0 m	EYN9XXMS-0020
7.6 m	EYN9XXMS-0025
9.1 m	EYN9XXMS-0030
10.6 m	EYN9XXMS-0035
15.2 m	EYN9XXMS-0050
30.4 m	EYN9XXMS-0100

PVC: replace the XX with the colour.
Blue = 01   Green = 02   Red = 03
Yellow = 04   White = 06

For specs, go to www.black-box.de

EYN901MS

GigaTrue®

CAT6

Double Shielded CAT6 Cables

GigaTrue® Cat6 S/FTP LSZH Patch Cables.

- Meet and exceed ANSI/TIA/EIA- 568-B.2
- Category 6 component performance
- specifications.
- LSZH Jacket
- Superior construction offers significant headroom.
- Enhanced performance parameters and electrical characteristics.
- Deliver full Power Sum performance.
- High-quality foil and braid shield gives excellent immunity to external electromagnetic fields.
- Choice of colours.
- **WARRANTY** — Lifetime.

GigaTrue®

CAT6

GigaTrue® Cat6 S/FTP Patch Cable LSZH
Item

0.5 m	EVE63X-00M5
1 m	EVE63X-01M
1.5 m	EVE63X-01M5
2 m	EVE63X-02M
3 m	EVE63X-03M
5 m	EVE63X-05M
7.5 m	EVE63X-07M5
10 m	EVE63X-10M
15 m	EVE630-15M
20 m	EVE630-20M
25 m	EVE630-25M
30 m	EVE630-30M

Replace the X with the colour.
Grey = 0   Blue = 1   Green = 2
Red = 3   Yellow = 4   Beige = 5
Orange = 6 Black = 7

For specs, go to www.black-box.de

Ideal for use in data, audio, and video applications and for horizontal network connections up to 1000BASE-T.

Make blade server connections.

CAT6 High-Density Data Centre Patch Cable (UTP)

Grey	EVNSL6-70-BS series
Blue	EVNSL6-71-BS series
White	EVNSL6-80-BS series

For features, specs, and pricing, go to www.black-box.de
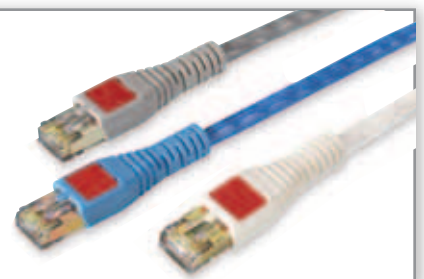
Make tight spaces right spaces with SpaceGAIN.

SpaceGAIN CAT6 90° Right-Angle Patch Cables (UTP, SC/FTP)

CAT6

GUARANTEED ABSOLUTELY FOR LIFE

Shielded

Gain up to 100 mm 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 100 mm 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

For the perfect fit, choose from a whole family of cables with almost every combination of right angles: down/down, down/straight, and down/up. The up and down cables are perfect for streamlining patch panel and switch connections

Up cable: Cable clip faces down and the cable angles up. Shown: EVNSL246-0003-90DU
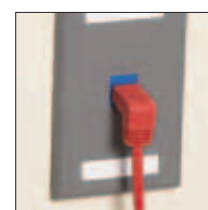
Down cable: Cable clip faces down and the cable angles down. Shown: EVNSL236-0003-90DD

SpaceGAIN CAT6 Unshielded 90° Right-Angle Patch Cables (UTP)

24 AWG, Stranded, 250 MHz

0.3 m	EVNSL2X6-0001-90YY
0.9 m	EVNSL2X6-0003-90YY
1.8 m	EVNSL2X6-0006-90YY
3.0 m	EVNSL2X6-0010-90YY
4.5 m	EVNSL2X6-0015-90YY

Replace the X with the colour: 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 www.black-box.de

SpaceGAIN CAT6 Shielded 90° Right-Angle Patch Cables (Sc/FTP)

26 AWG, Stranded, 250 MHz, Aluminium Mylar® Tape, Tinned Copper Braid

0.3 m	EVNSL21XS-0001-90YY
0.9 m	EVNSL21XS-0003-90YY
1.8 m	EVNSL21XS-0006-90YY
3.0 m	EVNSL21XS-0010-90YY
4.5 m	EVNSL21XS-0015-90YY

Replace the X with the colour:
Blue = 6 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 www.black-box.de

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 15cm long with 7.5cm of connectors, for an overall length of 22.3cm.
- Use for super-easy connections in relay racks and cabinets.
- **Standard Warranty** — Lifetime
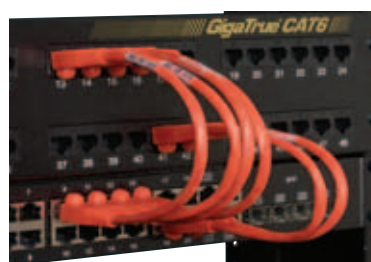
CAT6

Shown: CAT6 Reduced-Length Cable (EVNSL643-006IN) connecting our GigaTrue® CAT6 48-Port Patch Panel (JPM612A-R7)

SpaceGAIN CAT6 550 MHz Reduced-Length Patch Cable

24 AWG, Stranded, PVC, 15.2 cm   EVNSL6XX-06IN

Replace the XX with the colour.
Grey = 40 Blue = 41 Green = 42   Red = 43   Yellow = 44   Black = 47

For specs, go to www.black-box.de

Get channel-level performance with optional lockability, no need to replace existing cables.

GigaBase 3 CAT5e 350 MHz Lockable Patch Cables (UTP) LSZH

- 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 unauthorised access and accidental disconnects.
- Low Smoke Zero Halogen Jacket (LSZH).
- Cables stay locked in place—until YOU take them out.
- Tested to 350 MHz.
- **Standard Warranty** — Lifetime
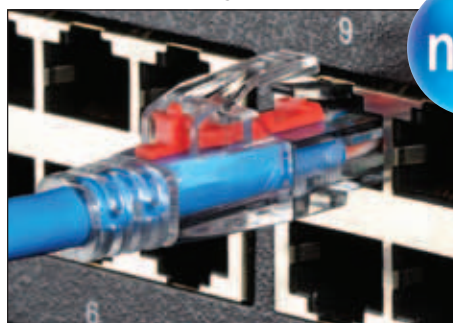
new

*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

GigaBase® 3 CAT5e 350 MHz LOCkable Patch Cables (UTP)

24 AWG, Stranded, LSZH	
1.0 m	C5EPC60-XX-01M
2.0 m	C5EPC60-XX-02M
3.0 m	C5EPC60-XX-03M
5.0 m	C5EPC60-XX-05M
7.5 m	C5EPC60-XX-07M5
10.0 m	C5EPC60-XX-10M

Replace the XX with the colour.
Blue = BL   Black = BK   Grey = GY
Red = RD   Green = GN   Yellow = YL
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
www.black-box.de.

Call for custom lengths at competitive prices!

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 unauthorised 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.

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

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 colours.

Grey | Blue | Green | Red | Yellow | Beige | Pink | Black | Purple | Orange | White

Snagless boots Straight-pinned

GigaBase 350 CAT5e Patch Cable (UTP)

Snagless Boots, Stranded, 24 AWG, RJ-45, 4-Pair, T568B, PVC, Straight-Pinned

Length	Code
0.3 m	EVNSLXX-0001
0.6 m	EVNSLXX-0002
0.9 m	EVNSLXX-0003
1.2 m	EVNSLXX-0004
1.5 m	EVNSLXX-0005
1.8 m	EVNSLXX-0006
2.1 m	EVNSLXX-0007
3.0 m	EVNSLXX-0010
4.5 m	EVNSLXX-0015
6.0 m	EVNSLXX-0020
7.6 m	EVNSLXX-0025
9.1 m	EVNSLXX-0030
15.2 m	EVNSLXX-0050
30.4 m	EVNSLXX-0100
Custom Lengths	EVNSLXX

Replace the XX with the colour. For 25 packs, add -25PAK to the code.

Grey = 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 www.black-box.de

Snagless boots Cross-pinned

GigaBase® 350 CAT5e Patch Cable (UTP)

Snagless Boots, Stranded, 24 AWG, RJ-45, 4-Pair, PVC, Cross-Pinned

Length	Code
0.3 m	EVCRBXX-0001
0.9 m	EVCRBXX-0003
1.8 m	EVCRBXX-0006
2.1 m	EVCRBXX-0007
3.0 m	EVCRBXX-0010
6.0 m	EVCRBXX-0020
Custom Lengths	EVCRBXX

Replace the XX with the colour. For 25 packs, add -25PAK to the code.

Grey = 80	Red = 83	Beige = 85
Blue = 81	Yellow = 84	White = 90
Green = 82		

For specs, go to www.black-box.de

Basic connectors Straight-pinned

GigaBase 350 CAT5e Patch Cable (UTP)

Basic Connectors, Stranded, 24 AWG, RJ-45, 4-Pair, T568B, PVC, Straight-Pinned

Length	Code
0.3 m	EVNSLXX-0001
0.6 m	EVNSLXX-0002
0.9 m	EVNSLXX-0003
1.2 m	EVNSLXX-0004
1.5 m	EVNSLXX-0005
1.8 m	EVNSLXX-0006
2.1 m	EVNSLXX-0007
3.0 m	EVNSLXX-0010
4.5 m	EVNSLXX-0015
6.0 m	EVNSLXX-0020
7.6 m	EVNSLXX-0025
9.1 m	EVNSLXX-0030
15.2 m	EVNSLXX-0050
30.4 m	EVNSLXX-0100
Custom Lengths	EVNSLXX

Replace the XX with the colour. For 25 packs, add -25PAK to the code.

White = 20	Yellow = 54	Grey = 58
Blue = 51	Beige = 55	Orange = 59
Green = 52	Pink = 56	Purple = 79
Red = 53	Black = 57	

For specs, go to www.black-box.de

CAT5e performance and a high protection against EMI interference

GigaBase® Cat5e LSZH F/UTP Patch

- Meets and exceeds ANSI/TIA/EI 568-B.2
- Category 5e component performance specifications.
- Support Gigabit Ethernet, 622/155 mbps
- ATM, Fast Ethernet and other high speed applications.
- High-quality foil shield gives excellent immunity to external electromagnetic fields.
- **Standard Warranty** — Lifetime

GigaBase® 350 F/UTP Patch Cable

24 AWG, Solid

0.5 m	EVE53X-00M5
1 m	EVE53X-01M
1.5 m	EVE53X-01M5
2 m	EVE53X-02M
3 m	EVE53X-03M
5 m	EVE53X-05M
7.5 m	EVE53X-07M5
10 m	EVE53X-10M
15 m	EVE53X-15M
20 m	EVE53X-20M
25 m	EVE53X-25M
30 m	EVE53X-30M

Replace the XX with the colour.
Grey = 0   Blue = 1   Green = 2
Red = 3   Yellow = 4   Beige = 5
Orange = 6   Black = 7

For specs and the video, go to www.black-box.de

GigaBase®
CAT5e

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, mouldedhoods.
- Shielding: Mylar® tape; tinned copper drain wire; aluminum/Mylar tape.
- HDPE insulation: 0.225 mm.
- **Standard Warranty** — Lifetime

GigaBase®
CAT5e

EVNSL0501MS

HDPE insulation
Drain wire
Mylar® tape
Aluminium/Mylar tape
PVC jacket
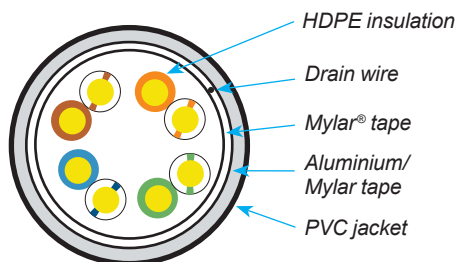
CAT5e 100 MHz Shielded Solid Backbone PVC Cable (F/UTP)

24 AWG, Solid, PVC

0.3 m	EVNSL0XXXMS-0001
0.6 m	EVNSL0XXXMS-0002
0.9 m	EVNSL0XXXMS-0003
1.5 m	EVNSL0XXXMS-0005
1.8 m	EVNSL0XXXMS-0006
2.1 m	EVNSL0XXXMS-0007
3.0 m	EVNSL0XXXMS-0010
4.5 m	EVNSL0XXXMS-0015

24 AWG, Solid, PVC

6.0 m	EVNSL0XXXMS-0020
7.6 m	EVNSL0XXXMS-0025
9.1 m	EVNSL0XXXMS-0030

Replace the XXX with the colour.
Blue = 501   Grey = 502   Yellow = 504
White = 505   Red = 506   Green = 507
Black = 508   Brown = 509   Orange = 510

For specs, go to www.black-box.de

Lockable, shielded CAT5e cable. Great for industrial connections.

GigaBase 3 CAT5e 100 MHz Shielded, Stranded, Lockable LSZH 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

Removal Key

Locking Pin

Mylar® tape

Drain wire

Aluminium/Mylar tape

PVC jacket
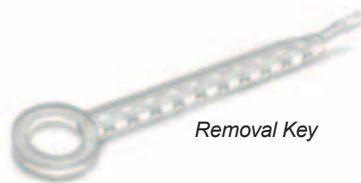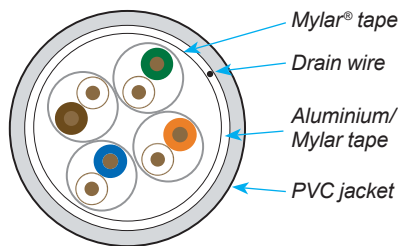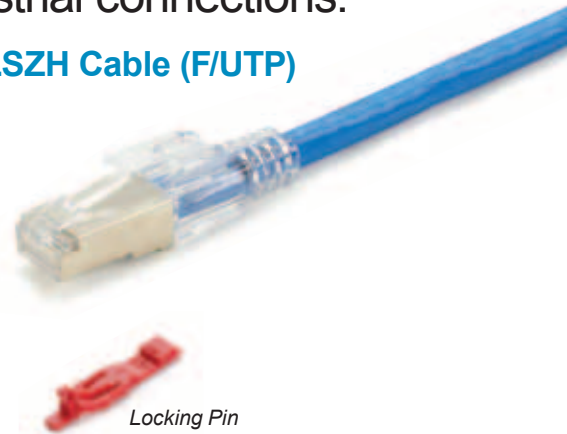
GigaBase 3 CAT5e 100 Mhz Shielded, Stranded, Lockable Cable (F/UTP)

26 AWG, PVC, CM

1.0 m	C5EPC60S-XX-01M
2.0 m	C5EPC60S-XX-02M
3.0 m	C5EPC60S-XX-03M
5.0 m	C5EPC60S-XX-05M
7.5 m	C5EPC60S-XX-07M5
10.0 m	C5EPC60S-XX-10M

Replace the XX with the colour.

Blue = BL	Black = BK	Grey = 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 www.black-box.de

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

- Solid, dependable CAT5e backbone cable.
- Meets or exceeds CAT5e specifications.
- Nonmolded, snag-free hoods prevent cable kinks. They also reduce crosstalk.
- **Standard Warranty** — Lifetime

Rip cord

Conductors

Insulation

Jacket
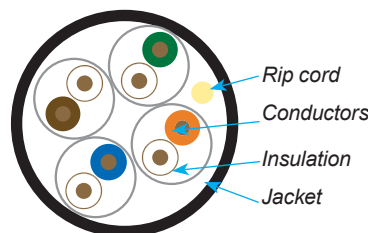
CAT5e 350 MHz Solid Backbone Cable (UTP)

24 AWG, PVC

0.6 m	EYN8XXMS-0002
1.5 m	EYN8XXMS-0005
3.0 m	EYN8XXMS-0010
4.5 m	EYN8XXMS-0015
6.0 m	EYN8XXMS-0020
7.6 m	EYN8XXMS-0025
9.1 m	EYN8XXMS-0030
10.6 m	EYN8XXMS-0035
15.2 m	EYN8XXMS-0050
30.4 m	EYN8XXMS-0100

PVC: replace the XX with the colour.

Blue = 51	Green = 59	Red = 49
Yellow = 55	White = 53	

CAT5e

Make tight spaces right spaces with SpaceGAIN.

SpaceGAIN CAT5e 90° Right-Angle Patch Cables (UTP, F/UTP)

CAT**5e**

Gain up to 100 mm 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).

Shielded

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: 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 100 mm 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 www.black-box.de/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

0.3 m	EVNSL2XE-0001-90YY
0.9 m	EVNSL2XE-0003-90YY
1.8 m	EVNSL2XE-0006-90YY
3.0 m	EVNSL2XE-0010-90YY
4.5 m	EVNSL2XE-0015-90YY

Replace the X with the colour:
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 www.black-box.de

SpaceGAIN CAT5e Shielded 90° Right-Angle Patch Cables (F/UTP)

100 MHz, 26 AWG, Stranded, Down–Up, Aluminium Mylar® Tape

0.3 m	EVNSL2XES-0001-90YY
0.9 m	EVNSL2XES-0003-90YY
1.8 m	EVNSL2XES-0006-90YY
3.0 m	EVNSL2XES-0010-90YY
4.5 m	EVNSL2XES-0015-90YY

Replace the X with the colour:
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 www.black-box.de

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 15 cm long with 7.5 cm of connectors,
  for an overall length of 22.5 cm.
- Use for super-easy connections in relay racks and cabinets.
- **Standard Warranty** — Lifetime

CAT**5e**

*Shown: CAT5e Reduced-Length Cable (EVNSL83-006IN) connecting our GigaBase® CAT5e 48-Port Patch Panel (JPM906A-R5), *

SpaceGAIN CAT5e 350 MHz Reduced-Length Patch Cable

24 AWG, Stranded, PVC, 15.2 cm	EVNSLXX-06IN

Replace the XX with the colour.
Grey = 80 Blue = 81 Green = 82   Red = 83   Yellow = 84   Black = 87

For specs, go to www.black-box.de

Custom-Length Patch and Power Cables

Get *exactly* the length you need, *when* you need it.

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 3 m cables when you really need 2.5 m cables? Plus you risk jeopardising your network organisation and performance. Keep your telecomm rooms and data centres well-organised, good-looking showpieces by using the right length cable. You'll save money, too, by buying exactly what you need and no more.

Take the risk out of custom-length cables.

Black Box eliminates long lead times for custom cables.

Custom Power Cables

Different length? LSZH Jacket?

Different connector? Click-lock?

Call Black Box and we'll build it for you!

Black Box offers a wide range of different lengths of power cables, from 0.5 to 10m, but if you don't see what you need we'll build it for you!

Call Technical Support on 0811-5541 112 for further information.

Custom Power Cable Options include:
- Custom Length
- Custom cable colour
- Custom labelling
- Right angled cable exit
- C13/ C14 connectors
- C19/ C20 connectors
- C5/ C7 connectors
- Schuko connector
- Click lock connectors
- Low Smoke Zero Halogen

Cable options.

You can order patch cables with the following options:

- With Test Report.
- CAT5e/CAT6/ Cat6A.
- PVC/ Low Smoke Zero Halogen.
- Shielded/unshielded.
- Solid/stranded conductor.
- Snagless boot/basic connector.
- Eight colours: blue, white, black, grey, green, orange, red, yellow.
- Lengths: 1–30 metres.

				IEC60309	IEC60309
C13	C19/C20	UK BS1363	Schuko	16A	32A
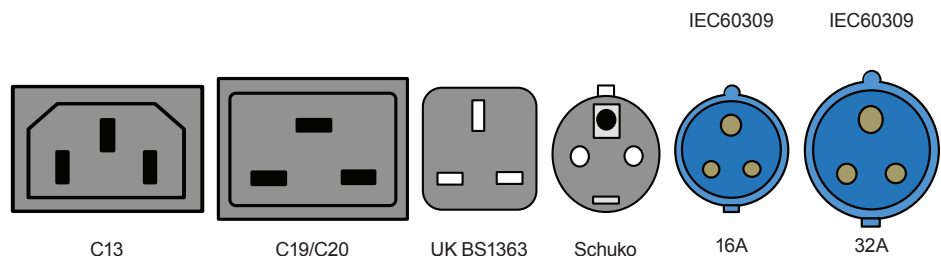
Note: There is no same day shipping of custom cables in Europe.

Guidelines for choosing fibre optic cable.

By Roberta Bowen Szyper

The advantages of fibre optic cable.

Greater bandwidth

Fibre provides far greater bandwidth than copper. Fibre 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. Fibre 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-optimised OM3 and OM4 50 micron multimode cables offer more distance and bandwidth than OM1 and OM2 cable and are less expensive than singlemode cable. In addition, fibre optic cable can carry more information with greater fidelity than copper wire. That's why phone and cable companies use fibre.

Low attenuation and greater distance

Because the fibre optic signal is made of light, very little signal loss occurs during transmission, and data can move at higher speeds and greater distances. Fibre does not have the 100 metre distance limitation of unshielded twisted-pair copper. Fibre distances can range from 100 metres to 40 kilometres, depending on the style of cable, wavelength, and network. (Fibre distances are typically measured in metric units.)

Security

Your data is safe with fibre 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 fibre system, you'll know it. Fibre 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

Fibre 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 fibre cable next to industrial equipment without worry. Fibre is also less susceptible to temperature fluctuations than copper and can be submerged in water.

Design

Fibre is lightweight, thin, and more durable than copper cable. Plus, fibre 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 fibre is still more difficult to terminate than copper, advancements in connectors are making termination easier. Fibre is actually easier to test than copper cable because only insertion loss and return loss are measured. Copper has many more electrical measurements.

Migration

The proliferation and lower costs of media converters are making copper to fibre migration, especially fibre to the desktop much easier. The converters provide seamless links and enable the use of existing hardware. Fibre can be incorporated into networks in planned upgrades.

Standards

The use of fibre in networks is covered in TIA-568-C.3.

Costs

The cost for fibre cable, components, and hardware is steadily decreasing. Installation costs for fibre are higher than copper because of the skill needed for terminations. Overall, fibre is more expensive than copper in the short run, but it may actually be less expensive in the long run. Fibre typically costs less to maintain, has less downtime, and requires less networking hardware.

Fibre 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 fibre 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-optimised OM3 and OM4 cable. OM1 and OM2 have a small defect in the core called an index depression. This enables them to

Core | *Coating* *Strengthening* *Cable jacket*
Cladding *Armid yarn (Kevlar®) fibres*

be used with LED light sources. OM3 and OM4 are manufactured without the centre defect to enable them to be used directly with VCSELS for greater speeds and distance.

Cladding—This is the thin layer that surrounds the fibre core and serves as a boundary that contains the light waves and causes the refraction, enabling light to travel the length of the fibre segment.

Coating—This is a layer of plastic that surrounds the core and cladding to reinforce and protect the fibre core. Coatings are measured in

microns and can range from 250 to 900 microns.

Strengthening fibres—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 or LSZH) Low Smoke Zero Halogen. It protects the fibre and enables easy handling.
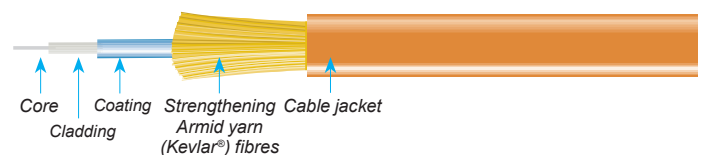
Multimode vs. single mode.

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 fibre cable has a smaller core (the light-carrying portion of the fibre). Although all can be used in the same way, 50 micron cable, particularly laser-optimised 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 114-115.

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 centre 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 111), 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 fibre.

Total internal reflection: multimode vs. single mode

62.5 micron multimode

• Use in general data and voice fibre applications.
• Used in LANs and over short distances.

50 micron multimode

• Use in new construction and installations.
• Provides more bandwidth than 62.5/125 at 850-nm wavelengths.

8.5–9 micron single mode

• Use in new construction and installations.
• Use for campus backbones and long-haul runs.
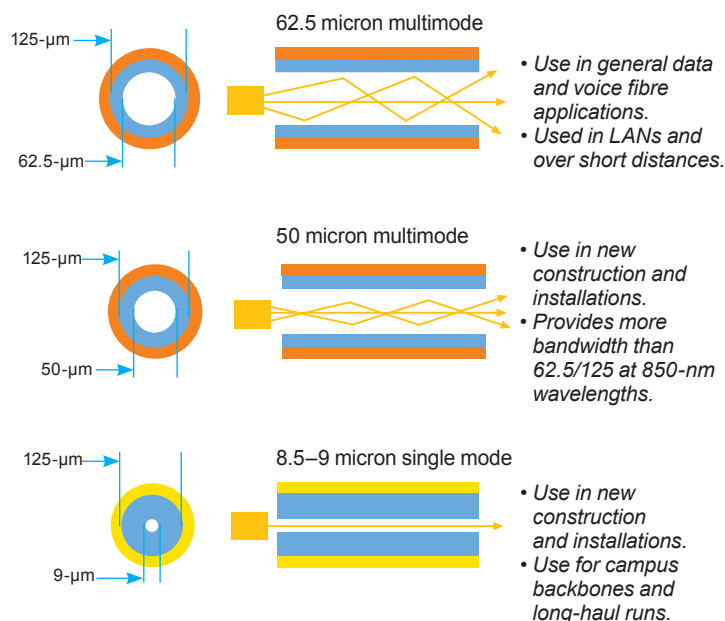
Colour Coding			
	Jacket	Jacket Nomenclature	Connector	Connector Body
OM1 62.5-µm Multimode	Orange	62.5/125	Beige	Beige
OM2 50-µm Multimode	Orange	50/125	Black	Black
OM3 LO 50-µm Multimode	Aqua	850 LO 50/125	Aqua	Black
OS1 APC Single mode	Yellow	SM/NZDS, SM	Green (MPO is black)	Green
OS1 UPC Single mode	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;*

Fibre connectors

The ST® connector uses a bayonet locking system.

The SC connector features a mouldedbody 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 moulded body, a small-form RJ-style connector, and uses cleave-and-leave splicing.

The MPO/MTP®-style connector is a high-fibre-count cable. It's used in high-density applications.

The MU connector resembles a small SC connector, has a simple push-pull latching connection; and is for high-density areas.

Guidelines for choosing fibre optic cable. (continued)

The basics of fibre optic cable.

Simplex vs. duplex patch cables

Multimode and single mode patch cables can be simplex or duplex. Simplex cable has one fibre, while duplex (zipcord) cable has two fibres 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 fibre optic cable consists of only one fibre 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 fibre optic cable for applications that require simultaneous, bidirectional data transfer. Workstations, fibre switches and servers, Ethernet switches, backbone ports, and similar hardware require duplex cable.

Simplex

Duplex
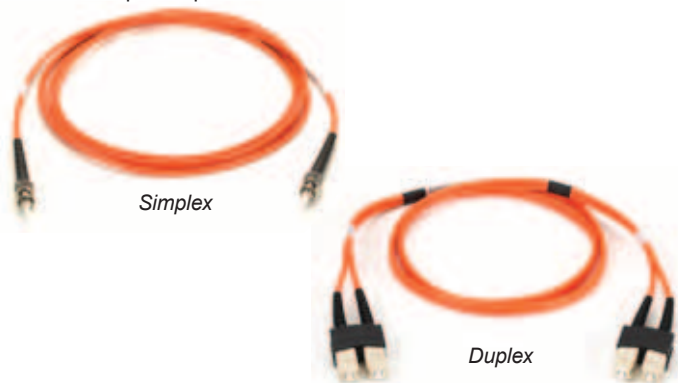
Indoor/outdoor cable

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 armoured cable is jacketed in aluminium 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 labour- and money-saving alternative to using innerducts for fibre cable runs.

Outside-plant cable is used in direct burials. It delivers optimum performance in extreme conditions and is terminated within 15 meters of a building entrance. It blocks water with dry blocking, absorbent tape, or powder. If it is armoured, it will require grounding. Outside-plant cables are also rodent resistant. If they are to used in aerial applications, they will have a messenger strength member.

Indoor/outdoor

Interlocking armoured

Outside plant
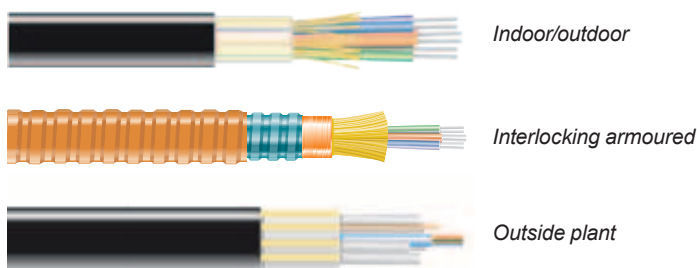
Distribution-style vs. breakout-style

Distribution-style cables have several tight-buffered fibres bundled under the same jacket with Kevlar® or fibreglass rod reinforcement. These cables are small in size and are used for short, dry conduit runs in either riser or plenum applications. The fibres can be directly terminated, but because the fibres 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.

Distribution-style

Breakout-style
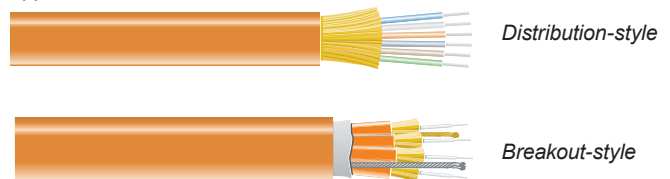
Loose-tube vs. tight-buffered

There are two types of fibre 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 fibre 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 fibres. This gel helps protect the fibres 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 fibres to emerge from the gel.

Tight-buffered cable is optimised 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 fibre.

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.

Loose-tube

Tight-buffered

Multimode Fibre Types and Standards

Industry Standards				Attenuation† Typical Cable Max. (dB/km)		Bandwidth (MHz/km): Overfille Launch (OFL)		Bandwidth (MHz/km): Effective Modal Bandwidth (EMB) (also known as Laser BW)
ISO/IEC 11801	IEC 60793-2-10	TIA	Fibre Type (µm)	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 Fibres"
TIA-492-AAAx "Detail Specification for Class 1a Graded-Index Multimode Optical Fibres"
† The ISO/IEC 11801 standard stipulates maximum cable attenuation. The IEC and TIA fibre standards call for lower (and varied) bare fibre attenuation.

Laser-optimised cable

Laser-optimised multimode fibre cable differs from standard multimode cable because it has graded refractive index profile fibre 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 fibre travel more quickly than the other paths. This increase in speed equalises the travel time for both short and long light paths, ensuring accurate information transmission and receipt over much greater distances, up to 300 metres at 10 Gbps. Laser-optimised cable is aqua coloured.

Laser-optimised 50 micron

Fibre Ethernet Standards

Network	Standard	IEEE	Media	Speed	Distance
Ethernet	10BASE-F, -FB, FL, FP	802.3	Fibre	10 Mbps	2000 m/500 m
Fast Ethernet	100BASE-FX	802.3u	MM Fibre	100 Mbps	400 m half-duplex, 2 km full-duplex
Gigabit Ethernet	1000BASE-LX	802.3z	MM, SM Fibre	1000 Mbps	550 m/2 km
	1000BASE-LX-10		SM Fibre	1000 Mbps	10 km
	1000BASE-SX		MM Fibre	1000 Mbps	550 m
10-Gigabit Ethernet	10GBASE-SR, -LR, LX, -ER, -SW, -LW, -EW 10GBASE-CX4	802.3ae	CAT6, MM, SM Fibre	10 Gbps	65 m to 40 km
	10-BGASE-LX4		MM, SM Fibre	10 Gbps	400 m/10 km
	10GBASE-LR		SM Fibre	10 Gbps	10 km
	10GBASE-ER		SM Fibre	10 Gbps	40 km
	10GBASE-SR		OM3 MMF	10 Gbps	26–82 m
	10GBASE-KRN	802.3aq	500 Mhz MMF	10 Gbps	220 m
40-Gigabit Ethernet	40GBASE-SR4	802.3-bm	MMF	40 Gbps	100 m
	40GBASE-SR4		(8) OM3 lanes	40 Gbps	125 m
	—		SM Fibre	40 Gbps	10 km
	40GBASE-FR		SM Fibre	40 Gbps	2 km
	40GBASE-LR4		SMF	40 Gbps	10 km
	40GBASE-FR		SMF	40 Gbps	2 km
100-Gigabit Ethernet	100GBASE-SR10		(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	

Internal/ External cables for backbone applications.

OM1 Multimode 62.5 Micron Fibre Optic Bulk Cable LSZH

- Ideal for runs between wiring closets and equipment rooms.
- Terminate into loaded patch panels and equipment.
- Rated for indoor/ outdoor use.
- Three different construction types.
- Colour-Coded fibres for easy identifcation.
- Universal Low Smoke Zero Halogen (ULSZH).
- E Glass strength members on loose tube cables provide.rodent resistance and moisture protection.
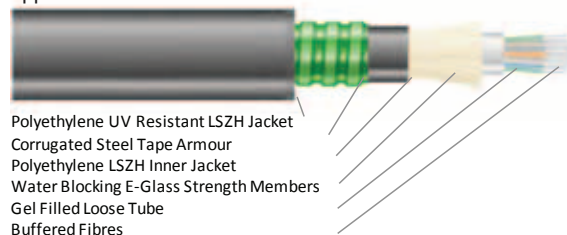- Black UV resistant jacket.
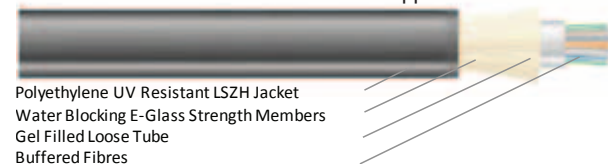- **Standard Warranty** — Lifetime

OM1	100 M	1G	10G
	2 km	300 m	25 m

Armoured Loose Tube - for indoor / outdoor direct burial applications.

Polyethylene UV Resistant LSZH Jacket
Corrugated Steel Tape Armour
Polyethylene LSZH Inner Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Loose Tube - for indoor / outdoor duct applications.

Polyethylene UV Resistant LSZH Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Tight Buffer - for indoor use in trunking/ under floor/ in ceiling spaces.

Polyethylene UV Resistant LSZH Jacket
E-Glass Strength Members
Buffered Fibres

Core	Length	Tight Buffered	Loose Tube	Armoured Loose Tube
4-Fibre	Custom Length	EXE16004A	EXE6004A	EXE6104A
	200 m	EXE16004A-0200M	EXE6004A-0200M	EXE6104A-0200M
	300 m	EXE16004A-0300M	EXE6004A-0300M	EXE6104A-0300M
8-Fibre	Custom Length	EXE16008A	EXE6008A	EXE6108A
	200 m	EXE16008A-0200M	EXE6008A-0200M	EXE6108A-0200M
	300 m	EXE16008A-0300M	EXE6008A-0300M	EXE6108A-0300M
12-Fibre	Custom Length	EXE16012A	EXE6012A	EXE6112A
	200 m	EXE16012A-0200M	EXE6012A-0200M	EXE6112A-0200M
	300 m	EXE16012A-0300M	EXE6012A-0300M	EXE6112A-0300M
24-Fibre	Custom Length	EXE16024A	EXE6024A	EXE6124A
	200 m	EXE16024A-0200M	EXE6024A-0200M	EXE6124A-0200M
	300 m	EXE16024A-0300M	EXE6024A-0300M	EXE6124A-0300M

General-use zipcord cable for patching, desktop, and backbone connections.

OM1 62.5 micron Multimode Zipcord Fibre Optic Bulk Cable

EXN0625A

PVC jacket   *Aramid yarn*   *Buffered fibres*
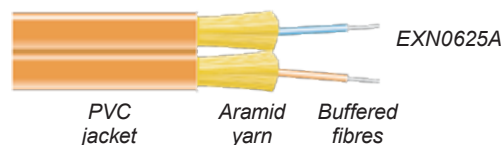
- Use the PVC cable for horizontal and backbone network runs.
- Fibre is surrounded with aramid yarn for tensile strength.
- Feature a 900-µm coating for easy stripping and handling.
- **Standard Warranty** — Lifetime

Cut-to-length cables

OM1 62.5 micron Multimode Zipcord Fibre Optic Bulk Cable		
PVC	152.4 m	EXN0625A-0500
	304.8 m	EXN0625A-1000
	Cut-to-Length	EXN0625A

For specs, go to www.black-box.de

Patch Panels and Fibre Cabinets for the perfect termination…

Sliding Fibre Optic Patch Panel, page 150-151.

Fibre Wall Cabinet, page 152.

Internal/External cables for backbone applications.

OM2 Multimode 50 Micron Fibre Optic Bulk Cable LSZH

- Ideal for runs between wiring closets and equipment rooms.
- Terminate into loaded patch panels and equipment
- Rated for indoor / outdoor use.
- Three different construction types.
- Colour-Coded fibres for easy identification.
- Universal Low Smoke Zero Halogen (ULSZH).
- E Glass strength members on loose tube cables provide rodent resistance and moisture protection
- Black UV resistant jacket.
- **Standard Warranty** — Lifetime

OM2

100 M	1G	10G
2 km	600 m	82 m

Armoured Loose Tube - for indoor / outdoor direct burial applications.

Polyethylene UV Resistant LSZH Jacket
Corrugated Steel Tape Armour
Polyethylene LSZH Inner Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Loose Tube - for indoor / outdoor duct applications.

Polyethylene UV Resistant LSZH Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Tight Buffer - for indoor use in trunking/ under floor/ in ceiling spaces.

Polyethylene UV Resistant LSZH Jacket
E-Glass Strength Members
Buffered Fibres

Core	Length	Tight Buffered	Loose Tube	Armoured Loose Tube
4-Fibre	Custom Length	EXE15004A	EXE5004A	EXE5104A
	200 m	EXE15004A-0200M	EXE5004A-0200M	EXE5104A-0200M
	300 m	EXE16004A-0300M	EXE6004A-0300M	EXE6104A-0300M
8-Fibre	Custom Length	EXE15008A	EXE5008A	EXE5108A
	200 m	EXE15008A-0200M	EXE5008A-0200M	EXE5108A-0200M
	300 m	EXE15008A-0300M	EXE5008A-0300M	EXE5108A-0300M
12-Fibre	Custom Length	EXE15012A	EXE5012A	EXE5112A
	200 m	EXE15012A-0200M	EXE5012A-0200M	EXE5112A-0200M
	300 m	EXE15012A-0300M	EXE5012A-0300M	EXE5112A-0300M
24-Fibre	Custom Length	EXE15024A	EXE5024A	EXE5124A
	200 m	EXE15024A-0200M	EXE5024A-0200M	EXE5124A-0200M
	300 m	EXE15024A-0300M	EXE5024A-0300M	EXE5124A-0300M

General-use zipcord cable for patching, desktop, and backbone connections.

OM2 50 micron Multimode General-Purpose Fibre Optic Bulk Cable

PVC jacket   Aramid yarn   Buffered fibres

EXN050A

- **Standard Warranty** — Lifetime
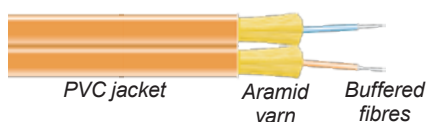
OM2 50 micron Multimode General-Purpose Fibre Optic Bulk Cable

200 m	EXN050A-200M
300 m	EXN050A-300M
PVC, Cut-to-Length	EXN050A

For specs, go to www.black-box.de

Let us terminate your trunk cable for you.…
Pre-Terminated Cables

For a rapid installation Black Box can provide ready-terminated trunk cables built to your specification.

You can specify:
- Number of fibres
- Number of tails
- Tail length
- Type of connector
- Type of cable (Jacket – LSZH, Armoured, Gel filled, E-Glass etc.)
- Type of fibre (OM/OS rating)
- Pulling eye

For a quote and further informatiom call our sales team on 0811-5541 112, and visit online at www.black-box.de

For more information and our online store, visit www.black-box.de\USForces_Ger.

BLACK BOX
NETWORK SERVICES

113
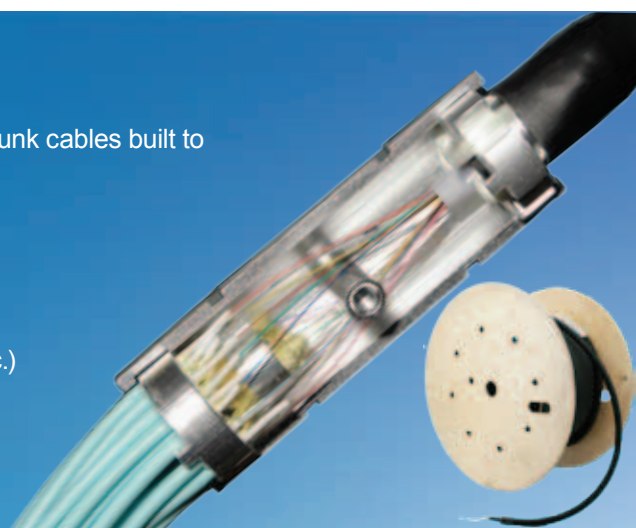
Internal/External cables for backbone applications.

OM3 Multimode 50 Micron Fibre Optic Bulk Cable LSZH- Optimised for 10G

- Laser enhanced for 10-Gigabit Ethernet Applications
- Ideal for runs between wiring closets and equipment rooms.
- Terminate into loaded patch panels and equipment
- Rated for indoor / outdoor use.
- Three different construction types.
- Colour-Coded fibres for easy identification.
- Universal Low Smoke Zero Halogen (ULSZH).
- E Glass strength members on loose tube cables provide rodent resistance and moisture protection
- Black UV resistant jacket.
- **Standard Warranty** — Lifetime

OM3

100 M	1G	10G	40 G	100 G
2 km	1000 m	400 m	100 m	100 m

Armoured Loose Tube - for indoor / outdoor direct burial applications.
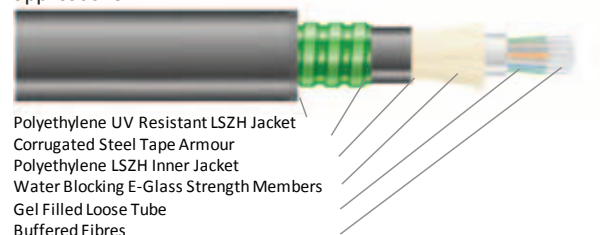
Polyethylene UV Resistant LSZH Jacket
Corrugated Steel Tape Armour
Polyethylene LSZH Inner Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Loose Tube - for indoor / outdoor duct applications.

Polyethylene UV Resistant LSZH Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Tight Buffer - for indoor use in trunking/ under floor/ in ceiling spaces.

Polyethylene UV Resistant LSZH Jacket
E-Glass Strength Members
Buffered Fibres

Core	Length	Tight Buffered	Loose Tube	Armoured Loose Tube
4-Fibre	Custom Length	EXE15304A	EXE5304A	EXE5204A
	200 m	EXE15304A-0200M	EXE5304A-0200M	EXE5204A-0200M
	300 m	EXE15304A-0300M	EXE5304A-0300M	EXE5204A-0300M
8-Fibre	Custom Length	EXE15308A	EXE5308A	EXE5208A
	200 m	EXE15308A-0200M	EXE5308A-0200M	EXE5208A-0200M
	300 m	EXE15308A-0300M	EXE5308A-0300M	EXE5208A-0300M
12-Fibre	Custom Length	EXE15312A	EXE5312A	EXE5212A
	200 m	EXE15312A-0200M	EXE5312A-0200M	EXE5212A-0200M
	300 m	EXE15312A-0300M	EXE5312A-0300M	EXE5212A-0300M
24-Fibre	Custom Length	EXE15324A	EXE5324A	EXE5224A
	200 m	EXE15324A-0200M	EXE5324A-0200M	EXE5224A-0200M
	300 m	EXE15324A-0300M	EXE5324A-0300M	EXE5224A-0300M

OM3 zipcord cable for patching, desktop, and backbone connections.

OM3 50 micron Multimode 10-GbE Laser-Optimised OM3 Zipcord Fibre Optic Bulk Cable

PVC jacket   *Aramid yarn*   *Buffered fibres*

- **Standard Warranty** — Lifetime

Laser-optimised OM3

OM3 50 micron Multimode 10-GbE Laser Optimised Zipcord Fibre Optic Cable
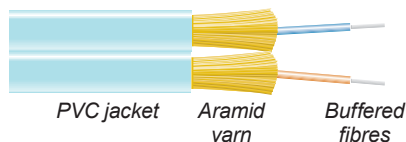
200 m	EXN1000A-200A
300 m	EXN1000A-300A
PVC, Cut-to-Length	EXN10000A
For specs, go to www.black-box.de	

OM3/OM4

By Roberta Bowen Szyper

The demand for increased network bandwidth is driving the migration towards 40- and 100-GbE networks.

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 for the next 15 to 20 years.

The cables of choice for data centre connectivity and what is recommended by the TIA are OM3 and OM4 laser-optimised multimode fibre.

OM3 and OM4

OM3 is specified in ISO 11801. OM3 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 fibre optic cable.

OM3 and OM4 are both laser-optimised 50 micron multimode fibre (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-optimised 50 micron cable with an effective modal bandwidth (EMB) of 2000 MHz/km. It can support 100-Gbps link distances up to 100 metre.

OM4 specifies a high-bandwidth 850-nm laser-optimised 50 micron cable with an EMB of 4700 MHz/km.

Internal/External cables for backbone applications.

OM4 Multimode 50 Micron Fibre Optic Bulk Cable LSZH- Optimised for 10G

- Laser enhanced for 10 40/100 Gigabit Ethernet Applications
- Ideal for runs between wiring closets and equipment rooms.
- Terminate into loaded patch panels and equipment
- Rated for indoor / outdoor use.
- Three different construction types.
- Colour-Coded fibres for easy identification.
- Universal Low Smoke Zero Halogen (ULSZH).
- E Glass strength members on loose tube cables provide rodent resistance and moisture protection
- Black UV resistant jacket.
- **Standard Warranty** — Lifetime

OM4

100 M	1G	10G	40 G	100 G
2 km	1000 m	550 m	150 m	150 m

Armoured Loose Tube - for indoor / outdoor direct burial applications.
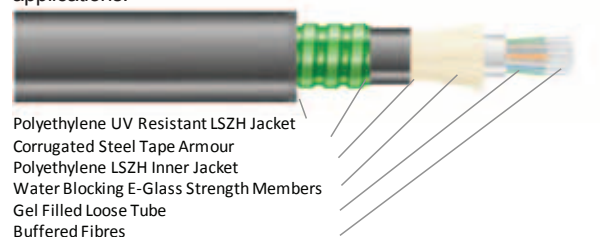
Polyethylene UV Resistant LSZH Jacket
Corrugated Steel Tape Armour
Polyethylene LSZH Inner Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Loose Tube - for indoor / outdoor duct applications.

Polyethylene UV Resistant LSZH Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Tight Buffer - for indoor use in trunking/ under floor/ in ceiling spaces.
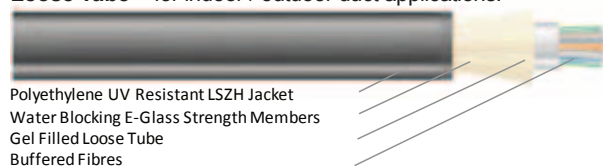
Polyethylene UV Resistant LSZH Jacket
E-Glass Strength Members
Buffered Fibres

Code	Length	Tight Buffered	Loose Tube	Armoured Loose Tube
4-Fibre	Custom Length	EXE15404A	EXE5404A	EXE5504A
	200 m	EXE15404A-0200M	EXE5404A-0200M	EXE5504A-0200M
	300 m	EXE15404A-0300M	EXE5404A-0300M	EXE5504A-0300M
8-Fibre	Custom Length	EXE15408A	EXE5408A	EXE5508A
	200 m	EXE15408A-0200M	EXE5408A-0200M	EXE5508A-0200M
	300 m	EXE15408A-0300M	EXE5408A-0300M	EXE5508A-0300M
12-Fibre	Custom Length	EXE15412A	EXE5412A	EXE5512A
	200 m	EXE15412A-0200M	EXE5412A-0200M	EXE5512A-0200M
	300 m	EXE15412A-0300M	EXE5412A-0300M	EXE5512A-0300M
24-Fibre	Custom Length	EXE15424A	EXE5424A	EXE5524A
	200 m	EXE15424A-0200M	EXE5424A-0200M	EXE5524A-0200M
	300 m	EXE15424A-0300M	EXE5424A-0300M	EXE5524A-0300M

It can support 100-Gbps link distances of 150 metre. OM3 allows for 1.5 dB of connector loss at 100 metre at all speeds; OM4 allows for 1.0 dB of loss at 150 metre for 40-100-GbE. Both OM3 and OM4 rival single mode fibre 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.

Manufacturing process

Laser-optimised OM3 and OM4 are manufactured without the centre 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 centre 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 fibres. 40-GbE consists of (4) 10-Gbps fibre channels each way, for a total of 8 fibres. 100-GbE consists of 10 fibre channels each way, for a total of 20 fibres. The signals are then aggregated at each end in an arrayed transceiver (connector) containing 4 or 10 VCSELs and detectors. For multimode fibre, the Media Dependent Interface (MDI) is the MPO adaptor (IEC 61754-7).

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 metre.

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 Typical Cabled Max (dB/km)		Bandwidth (MHz-km) Overfill Launch (OFL) 850/1300 nm	Bandwidth (MHz-km) Effective Modal Bandwidth (EMB) at 850 nm
OM3	3.5	1.5	1500/500	2000
OM4	3.5	1.5	3500/500	4700

Number of Fibres				
	1-GbE	10-GbE	40-GbE	100-GbE
OM3	2	2	8	20
OM4	2	2	8	20

Internal/External cables for backbone applications.

OS1/2 Single Mode 9 Micron Fibre Optic Bulk Cable LSZH

- Ideal for runs between wiring closets and equipment rooms.
- Terminate into loaded patch panels and equipment
- Rated for indoor / outdoor use.
- Three different construction types.
- Colour-Coded fibres for easy identification.
- Universal Low Smoke Zero Halogen (ULSZH).
- E Glass strength members on loose tube cables provide rodent resistance and moisture protection
- Black UV resistant jacket.
- **Standard Warranty** — Lifetime

OS1/2

100 M	1G	10G	40 G	100 G
		> 10 km		

Armoured Loose Tube - for indoor / outdoor direct burial applications.

Polyethylene UV Resistant LSZH Jacket
Corrugated Steel Tape Armour
Polyethylene LSZH Inner Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Core	Length	Tight Buffered	Loose Tube	Armoured Loose Tube
4-Fibre	Custom Length	EXE190004A	EXE9004A	EXE9104A
	200 m	EXE19004A-0200M	EXE9004A-0200M	EXE9104A-0200M
	300 m	EXE19004A-0300M	EXE9004A-0300M	EXE9104A-0300M
8-Fibre	Custom Length	EXE19008A	EXE9008A	EXE9108A
	200 m	EXE19008A-0200M	EXE9008A-0200M	EXE9108A-0200M
	300 m	EXE19008A-0300M	EXE9008A-0300M	EXE9108A-0300M
12-Fibre	Custom Length	EXE19012A	EXE9012A	EXE9112A
	200 m	EXE19012A-0200M	EXE9012A-0200M	EXE9112A-0200M
	300 m	EXE19012A-0300M	EXE9012A-0300M	EXE9112A-0300M
24-Fibre	Custom Length	EXE19024A	EXE9024A	EXE9124A
	200 m	EXE19024A-0200M	EXE9024A-0200M	EXE9124A-0200M
	300 m	EXE19024A-0300M	EXE9024A-0300M	EXE9124A-0300M

Loose Tube - for indoor / outdoor duct applications.

Polyethylene UV Resistant LSZH Jacket
Water Blocking E-Glass Strength Members
Gel Filled Loose Tube
Buffered Fibres

Tight Buffer - for indoor use in trunking/ under floor/ in ceiling spaces.

Polyethylene UV Resistant LSZH Jacket
E-Glass Strength Members
Buffered Fibres

Laser enhanced for 10-Gigabit Ethernet application.

MPO/MTP Trunk Cable
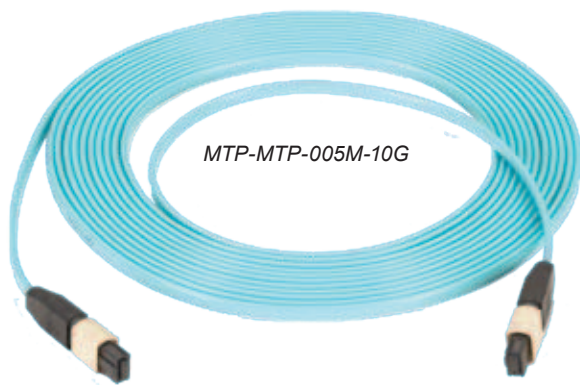
MTP-MTP-005M-10G

10-GbE, MTP Fibre Optic Cable, 12-Strand

Item	OM3	OM4	OS1/2
5 m	MTP-MTP-005M-10G	MTP-MTP005M-OM4	MTP-MTP-005M-OS1
10 m	MTP-MTP-010M-10G	MTP-MTP010M-OM4	MTP-MTP-010M-OS1
15 m	MTP-MTP-015M-10G	MTP-MTP015M-OM4	MTP-MTP-015M-OS1
20 m	MTP-MTP-020M-10G	MTP-MTP020M-OM4	MTP-MTP-020M-OS1
30 m	MTP-MTP-030M-10G	MTP-MTP030M-OM4	MTP-MTP-030M-OS1
50 m	MTP-MTP-050M-10G	MTP-MTP050M-OM4	MTP-MTP-050M-OS1
Custom	MTP-MTP-XXXM-10G	MTP-MTP0XXXM-OM4	MTP-MTP-XXXM-OS1

- 12-fibre cable pre terminated with MPO/MTP Female connectors at both ends.
- For use with MTP Fibre Optic Cassette and fan out cables.
- Polarity A (standard), B or C (optional)
- **Standard Warranty** — Lifetime

BLACK BOX
NETWORK SERVICES

OM1, 62.5 micron fibre patch cable with ceramic connectors.

OM1 62.5 micron Multimode Premium Ceramic Fibre Optic Patch Cable

- Ceramic connectors provide low signal loss of 0.3 dB, high reliability, and a long life.
- All feature multimode 62.5-µm/125-µm construction and aramid strength elements.
- Choose from duplex or simplex and from PVC or LSZH.
- Available in ST®, SC, LC, and MT-RJ connector styles.
- **Standard Warranty** — Lifetime

EFN110-001M-STSC

Low 0.3-dB insertion loss

OM1 62.5 micron Multimode Premium Ceramic Fibre Optic Patch Cables

PVC Duplex	ST-ST	SC-SC	ST-SC	LC-LC	ST-LC	SC-LC
1 m	EFN110-001M-STST	EFN110-001M-SCSC	EFN110-001M-STSC	EFN110-001M-LCLC	EFN110-001M-STLC	EFN110-001M-SCLC
2 m	EFN110-002M-STST	EFN110-002M-SCSC	EFN110-002M-STSC	EFN110-002M-LCLC	EFN110-002M-STLC	EFN110-002M-SCLC
3 m	EFN110-003M-STST	EFN110-003M-SCSC	EFN110-003M-STSC	EFN110-003M-LCLC	EFN110-003M-STLC	EFN110-003M-SCLC
5 m	EFN110-005M-STST	EFN110-005M-SCSC	EFN110-005M-STSC	EFN110-005M-LCLC	EFN110-005M-STLC	EFN110-005M-SCLC
10 m	EFN110-010M-STST	EFN110-010M-SCSC	EFN110-010M-STSC	EFN110-010M-LCLC	EFN110-010M-STLC	EFN110-010M-SCLC
15 m	EFN110-015M-STST	EFN110-015M-SCSC	EFN110-015M-STSC	EFN110-015M-LCLC	EFN110-015M-STLC	EFN110-015M-SCLC
20 m	EFN110-020M-STST	EFN110-020M-SCSC	EFN110-020M-STSC	EFN110-020M-LCLC	EFN110-020M-STLC	EFN110-020M-SCLC
30 m	EFN110-030M-STST	EFN110-030M-SCSC	EFN110-030M-STSC	EFN110-030M-LCLC	EFN110-030M-STLC	EFN110-030M-SCLC
Custom Lengths	EFN110-STST	EFN110-SCSC	EFN110-STSC	EFN110-LCLC	EFN110-STLC	EFN110-SCLC

PVC Simplex		
1 m	EFN110-001M-ST	
2 m	EFN110-002M-ST	
3 m	EFN110-003M-ST	EFN110-003M-SC
5 m	EFN110-005M-ST	

LSZH Duplex	ST-ST	SC-SC	ST-SC	LC-LC	LC-ST	LC-SC
1 m	EFE073-001M	EFE075-001M	EFE074-001M	EFE070-001M	EFE072-001M	EFE071-001M
2 m	EFE073-002M	EFE075-002M	EFE074-002M	EFE070-002M	EFE072-002M	EFE071-002M
3 m	EFE073-003M	EFE075-003M	EFE074-003M	EFE070-003M	EFE072-003M	EFE071-003M
5 m	EFE073-005M	EFE075-005M	EFE074-005M	EFE070-005M	EFE072-005M	EFE071-005M
10 m	EFE073-010M	EFE075-010M	EFE074-010M	EFE070-010M	EFE072-010M	EFE071-0010M
15 m	EFE073-015M	EFE075-015M	EFE074-015M	EFE070-015M	EFE072-015M	EFE071-0015M
20 m	EFE073-020M	EFE075-020M	EFE074-020M	EFE070-020M	EFE072-020M	EFE071-0020M
30 m	EFE073-030M	EFE075-030M	EFE074-030M	EFE070-030M	EFE072-030M	EFE071-0030M
Custom Lengths	EFE073	EFE075	EFE074	EFE070	EFE072	EFE071

* MTRJ Fibre Optic Patch Cables are available online, visit www.black-box.de.

NOTE: Above part numbers are for Aqua coloured Zipcord. For Ruggedised cables add the suffix -R to the above numbers e.g. EFE073-001M-R

Black Box Explains... OS1 and OS2

OS1 is based on a specification from ISO/IEC 118.1: 1995 supporting 1310 and 1550 nm.
OS2 was introduced in 2006 supporting transmissions at 1310, 1550, and additionally 1383 nm
 (i.e. a low water peak suitable for CWDM).
OS2 offers a lower maximum attenuation is only achieved in loose-tube outdoor and not tight-buffered indoor constructions.

Get more bandwidth and distance than OM1 with 50 micron cable.

OM2 50 micron Multimode, Duplex Fibre Optic Patch Cable

ST (EFN6023)

Ultra-low insertion loss

- This 50 micron fibre 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-µm buffered fibres 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 Fibre Optic Patch Cables

PVC	ST-ST	SC-SC	ST-SC	LC-LC	ST-LC	SC-LC		
1 m	EFN6023-001M	EFN6025-001M	EFN6024-001M	EFN6020-001M	EFN6022-001M	EFN6021-001M		
2 m	EFN6023-002M	EFN6025-002M	EFN6024-002M	EFN6020-002M	EFN6022-002M	EFN6021-002M		
3 m	EFN6023-003M	EFN6025-003M	EFN6024-003M	EFN6020-003M	EFN6022-003M	EFN6021-003M		
5 m	EFN6023-005M	EFN6025-005M	EFN6024-005M	EFN6020-005M	EFN6022-005M	EFN6021-005M		
10 m	EFN6023-010M	EFN6025-010M	EFN6024-010M	EFN6020-010M	EFN6022-010M	EFN6021-010M		
15 m	EFN6023-015M	EFN6025-015M	EFN6024-015M	EFN6020-015M	EFN6022-015M	EFN6021-015M		
20 m	EFN6023-020M	EFN6025-020M	EFN6024-020M	EFN6020-020M	EFN6022-020M	EFN6021-020M		
30 m	EFN6023-030M	EFN6025-030M	EFN6024-030M	EFN6020-030M	EFN6022-030M	EFN6021-030M		
Custom Lengths	EFN6023	EFN6025	EFN6024	EFN6020	EFN6022	EFN6021		

LSZH	ST-ST	SC-SC	ST-SC	LC-LC	LC-ST	LC-SC	E2000-E2000	E2000-SC
1 m	EFE053-001M	EFE055-001M	EFE054-001M	EFE050-001M	EFE052-001M	EFE051-001M	EFE063-001M	EFE062-001M
2 m	EFE053-002M	EFE055-002M	EFE054-002M	EFE050-002M	EFE052-002M	EFE051-002M	EFE063-002M	EFE062-002M
3 m	EFE053-003M	EFE055-003M	EFE054-003M	EFE050-003M	EFE052-003M	EFE051-003M	EFE063-003M	EFE062-003M
5 m	EFE053-005M	EFE055-005M	EFE054-005M	EFE050-005M	EFE052-005M	EFE051-005M	EFE063-005M	EFE062-005M
10 m	EFE053-010M	EFE055-010M	EFE054-010M	EFE050-010M	EFE052-010M	EFE051-010M	EFE063-010M	EFE062-010M
15 m	EFE053-015M	EFE055-015M	EFE054-015M	EFE050-015M	EFE052-015M	EFE051-015M	EFE063-015M	EFE062-015M
20 m	EFE053-020M	EFE055-020M	EFE054-020M	EFE050-020M	EFE052-020M	EFE051-020M	EFE063-020M	EFE062-020M
30 m	EFE053-030M	EFE055-030M	EFE054-030M	EFE050-030M	EFE052-030M	EFE051-030M	EFE063-030M	EFE062-030M
Custom Lengths	EFE053	EFE055	EFE054	EFE050	EFE052	EFE051		

* MTRJ Fibre Optic Patch Cables are available on www.black-box.de.

NOTE: Above part numbers are for Zipcord. For Ruggedised cables in LSZH add the suffix -R to the above numbers e.g. EFE063-001M-R

Tight-buffered, 50 micron multimode cable that's laser optimised for 10-Gigabit Ethernet.

OM3 50 micron Multimode 10-Gigabit Fibre Optic Patch Cable

EFNT010-SCLC

Laser-optimised OM3
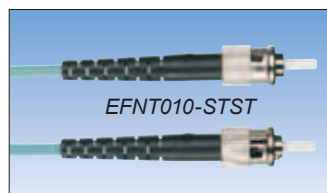
EFNT010-SCSC

- Available with PVC or LSZH (Low Smoke Zero Halogen) jacket.
- Features tight-buffered fibre with an acrylate fibre 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 fibre in performance while being significantly less expensive to implement.
- **Standard Warranty** — Lifetime

EFNT010-STST

EFNT010-LCLC

NOTE: Also available in distribution-style and zipcord bulk lengths. For cables with MT-RJ connectors, call our FREE Tech Support.

OM3 50 micron Multimode, Duplex Fibre Optic Patch Cables

PVC	ST-ST	SC-SC	ST-SC	LC-LC	ST-LC	SC-LC
1 m	EFNT010-001M-STST	EFNT010-001M-SCSC	EFNT010-001M-STSC	EFNT010-001M-LCLC	EFNT010-001M-STLC	EFNT010-001M-SCLC
2 m	EFNT010-002M-STST	EFNT010-002M-SCSC	EFNT010-002M-STSC	EFNT010-002M-LCLC	EFNT010-002M-STLC	EFNT010-002M-SCLC
3 m	EFNT010-003M-STST	EFNT010-003M-SCSC	EFNT010-003M-STSC	EFNT010-003M-LCLC	EFNT010-003M-STLC	EFNT010-003M-SCLC
5 m	EFNT010-005M-STST	EFNT010-005M-SCSC	EFNT010-005M-STSC	EFNT010-005M-LCLC	EFNT010-005M-STLC	EFNT010-005M-SCLC
10 m	EFNT010-010M-STST	EFNT010-010M-SCSC	EFNT010-010M-STSC	EFNT010-010M-LCLC	EFNT010-010M-STLC	EFNT010-010M-SCLC
15 m	EFNT010-015M-STST	EFNT010-015M-SCSC	EFNT010-015M-STSC	EFNT010-015M-LCLC	EFNT010-015M-STLC	EFNT010-015M-SCLC
20 m	EFNT010-020M-STST	EFNT010-020M-SCSC	EFNT010-020M-STSC	EFNT010-020M-LCLC	EFNT010-020M-STLC	EFNT010-020M-SCLC
30 m	EFNT010-030M-STST	EFNT010-030M-SCSC	EFNT010-030M-STSC	EFNT010-030M-LCLC	EFNT010-030M-STLC	EFNT010-030M-SCLC
Custom Lengths	EFNT010-STST	EFNT010-SCSC	EFNT010-STSC	EFNT010-LCLC	EFNT010-STLC	EFNT010-SCLC

LSZH	ST-ST	SC-SC	ST-SC	LC-LC	LC-ST	LC-SC	E2000-E2000	E2000-SC
1 m	EFE353-001M	EFE355-001M	EFE354-001M	EFE350-001M	EFE352-001M	EFE351-001M	EFE363-001M	EFE362-001M
2 m	EFE353-002M	EFE355-002M	EFE354-002M	EFE350-002M	EFE352-002M	EFE351-002M	EFE363-002M	EFE362-002M
3 m	EFE353-003M	EFE355-003M	EFE354-003M	EFE350-003M	EFE352-003M	EFE351-003M	EFE363-003M	EFE362-003M
5 m	EFE353-005M	EFE355-005M	EFE354-005M	EFE350-005M	EFE352-005M	EFE351-005M	EFE363-005M	EFE362-005M
10 m	EFE353-010M	EFE355-010M	EFE354-010M	EFE350-010M	EFE352-010M	EFE351-010M	EFE363-010M	EFE362-010M
15 m	EFE353-015M	EFE355-015M	EFE354-015M	EFE350-015M	EFE352-015M	EFE351-015M	EFE363-015M	EFE362-015M
20 m	EFE353-020M	EFE355-020M	EFE354-020M	EFE350-020M	EFE352-020M	EFE351-020M	EFE363-020M	EFE362-020M
30 m	EFE353-030M	EFE355-030M	EFE354-030M	EFE350-030M	EFE352-030M	EFE351-030M	EFE363-030M	EFE362-030M
Custom Lengths	EFE353	EFE355	EFE354	EFE350	EFE352	EFE351	EFE363	EFE362

* MTRJ Fibre Optic Patch Cables are available online, visit www.black-box.de.

NOTE: Above part numbers are for Aqua coloured Zipcord. For Ruggedised cables in Aqua add the suffix -AQ-R to the above numbers e.g. EFE073-001M-AQ-R

Transmit at higher rates than with Single Mode fibre—and choose from

OS1/2 Single Mode, 9 micron, Duplex Fibre Optic Cable

Zipcord
EFN310-001M-STST

Ruggedised
EFE088-020M-R
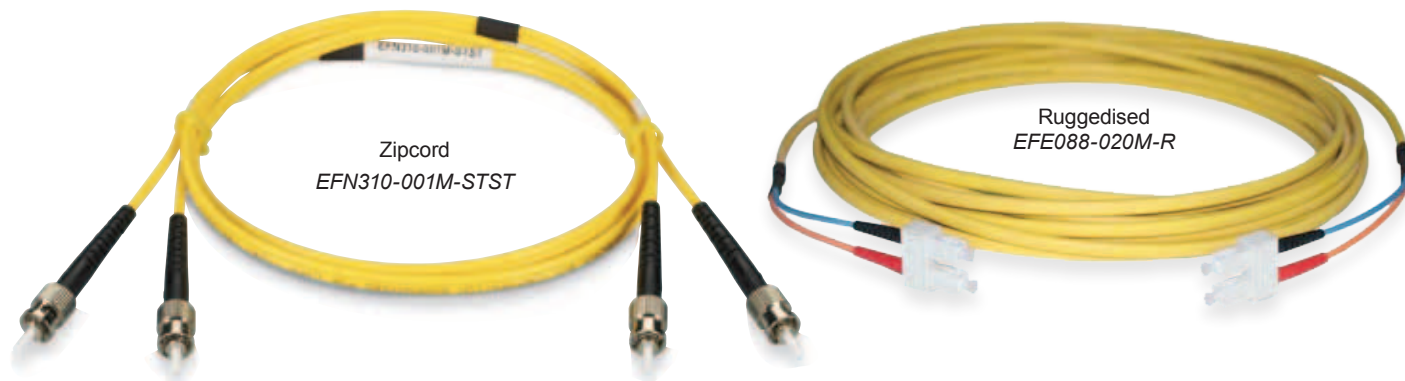
- Get long-distance transmission—50 times farther than multimode.
- PVC cable is certified OFNR for use as riser cable.
- LSZH Cable is tested to IEC60332-1.

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 Fibre Optic Cable PVC

PVC	ST-ST	SC-SC	ST-SC	LC-LC	ST-LC	SC-LC
1 m	EFN310-001M-STST	EFN310-001M-SCSC	EFN310-001M-STSC	EFN310-001M-LCLC	EFN310-001M-STLC	EFN310-001M-SCLC
2 m	EFN310-002M-STST	EFN310-002M-SCSC	EFN310-002M-STSC	EFN310-002M-LCLC	EFN310-002M-STLC	EFN310-002M-SCLC
3 m	EFN310-003M-STST	EFN310-003M-SCSC	EFN310-003M-STSC	EFN310-003M-LCLC	EFN310-003M-STLC	EFN310-003M-SCLC
5 m	EFN310-005M-STST	EFN310-005M-SCSC	EFN310-005M-STSC	EFN310-005M-LCLC	EFN310-005M-STLC	EFN310-005M-SCLC
10 m	EFN310-010M-STST	EFN310-010M-SCSC	EFN310-010M-STSC	EFN310-010M-LCLC	EFN310-010M-STLC	EFN310-010M-SCLC
15 m	EFN310-015M-STST	EFN310-015M-SCSC	EFN310-015M-STSC	EFN310-015M-LCLC	EFN310-015M-STLC	EFN310-015M-SCLC
20 m	EFN310-020M-STST	EFN310-020M-SCSC	EFN310-020M-STSC	EFN310-020M-LCLC	EFN310-020M-STLC	EFN310-020M-SCLC
30 m	EFN310-030M-STST	EFN310-030M-SCSC	EFN310-030M-STSC	EFN310-030M-LCLC	EFN310-030M-STLC	EFN310-030M-SCLC
Custom Lengths	EFN310-STST	EFN310-SCSC	EFN310-STSC	EFN310-LCLC	EFN310-STLC	EFN310-SCLC

MU-MU PVC	Custom Lengths	EFN095
MU-SC	Custom Lengths	EFN096
MU-MT-RJ	Custom Lengths	EFN099

For specs, go to www.black-box.de

six different connector types!

ST connector

SC connector

MT-RJ connector

LC connector

MU connector

E2000
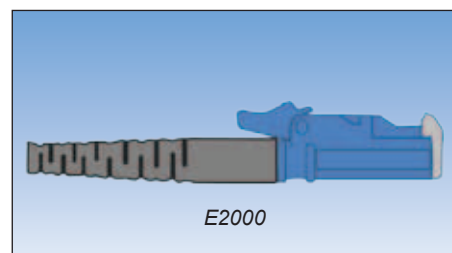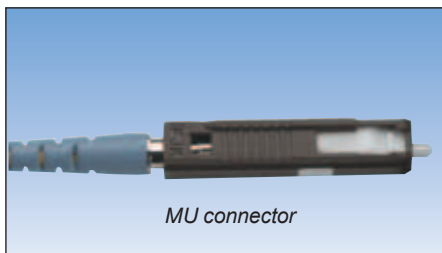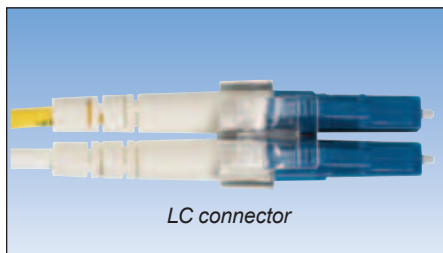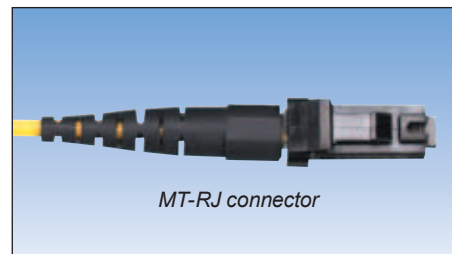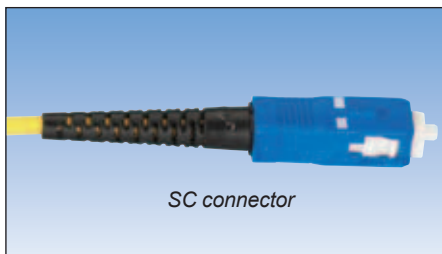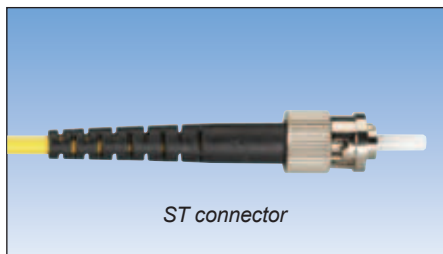
Technical Specification

	PVC	LSZH
Cladding	125 µm	125 mm
Core	9 µm	9 mm
Crush Resistance	750 N/cm	1000 N/cm
Ferrule	Ceramic	
Housing	Composite	
Insertion Loss	0.2 dB typical	0.18 typical

	PVC	LSZH
OperatingTemperature	-20 to +70° C	-20 to +60 ° C
Return Loss	≥ 55 typical	≥ 55 typical
Tensile Strength	240 N (54 lb./24.5 kg)	
Wavelength	1310 nm, 1550 nm	1310 nm, 1550 nm
Altenuation (db/km)		0.38@1330nm.0.25@1150nm
Fire Specification	-	1EC6332-1
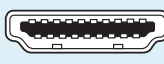
OS1/2 Single Mode 9 Micron LSZH Duplex Fibre Optic Cable

LSZH	ST-ST	SC-SC	ST-SC	LC-LC	LC-ST	LC-SC
1 m	EFE083-001M	EFE088-001M	EFE087-001M	EFE080-001M	EFE082-001M	EFE081-001M
2 m	EFE083-002M	EFE088-002M	EFE087-002M	EFE080-002M	EFE082-002M	EFE081-002M
3 m	EFE083-003M	EFE088-003M	EFE087-003M	EFE080-003M	EFE082-003M	EFE081-003M
5 m	EFE083-005M	EFE088-005M	EFE087-005M	EFE080-005M	EFE082-005M	EFE081-005M
10 m	EFE083-010M	EFE088-010M	EFE087-010M	EFE080-010M	EFE082-010M	EFE081-0010M
15 m	EFE083-015M	EFE088-015M	EFE087-015M	EFE080-015M	EFE082-015M	EFE081-0015M
20 m	EFE083-020M	EFE088-020M	EFE087-020M	EFE080-020M	EFE082-020M	EFE081-0020M
30 m	EFE083-030M	EFE088-030M	EFE087-030M	EFE080-030M	EFE082-030M	EFE081-0030M
Custom Lengths	EFE083	EFE088	EFE087	EFE080	EFE082	EFE081

LSZH	E2000-E2000	E2000-LC Duplex	E2000-SC Duplex
1 m	EFE093-001M	EFE092-001M	EFE091-001M
2 m	EFE093-002M	EFE092-002M	EFE091-002M
3 m	EFE093-003M	EFE092-003M	EFE091-003M
5 m	EFE093-005M	EFE092-005M	EFE091-005M
10 m	EFE093-0010M	EFE092-0010M	EFE091-0010M
15 m	EFE093-0015M	EFE092-0015M	EFE091-0015M
20 m	EFE093-0020M	EFE092-0020M	EFE091-0020M
30 m	EFE093-0030M	EFE092-0030M	EFE091-0030M
Custom Lengths	EFE093	EFE092	EFE091

NOTE: Above part numbers are for yellow coloured zipcord. For Ruggedised cables add the suffix -R to the above numbers e.g. EFE080-001M-R

Selection Guide | Audio/Video Cables

	Interface	0.3 m	1 m	2 m	3 m	5 m	
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**
DisplayPort	Interface		0.9 m	1.8 m	3.0 m	4.5 m	
	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**
HD15	DisplayPort M to HDMI F	EVNDPHDMI mF-R3	—	—	—	—	DisplayPort Adaptor Cable, **below**
	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 Adaptor 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 colour depths of 6, 8, 10, 12, and 16 bits and two-way connectivity.
- Adaptors are interface powered and require no separate power supply.
- **Standard Warranty** — Lifetime

EVNDPDVI mF-R3

VCB-DP-0006 mm

DisplayPort Adaptor Cables, 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 www.black-box.de

DisplayPort Cable, Male/Male, 32 AWG

0.9 m	VCB-DP-0003 MM
1.8 m	VCB-DP-0006 MM
3.0 m	VCB-DP-0010 MM
4.5 m	VCB-DP-0015 MM

For specs, go to www.black-box.de

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 metres with maximum resolutions at cable lengths up to 3 metres. Bidirectional signaling enables DisplayPort to both send and receive data from an attached device.

With the proper adaptors, 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 adaptors doesn't need a separate power supply.
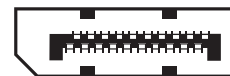
Transmit your digital video and digital audio signals over one cable.

HDMI Cables and Adaptors

- 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 adaptors 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 Colour 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

Adaptor. Swivelling 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	VCB-HDMI-001M
2 m	VCB-HDMI-002M
3 m	VCB-HDMI-003M
5 m	VCB-HDMI-005M
7 m	VCB-HDMI-007M
10 m	VCB-HDMI-010M
15 m	VCB-HDMI-015M
20 m	VCB-HDMI-020M
25 m	VCB-HDMI-025M
30 m	VCB-HDMI-030M

Standard HDMI to HDMI Cable, Swivel/Swivel, Male/Male	
1 m	EVHDMI04-DS-001M
2 m	EVHDMI04-DS-002M
3 m	EVHDMI04-DS-003M

HDMI to HDMI, Swivel/Straight, Male/Male	
1 m	EVHDMI04-SS-001M
2 m	EVHDMI04-SS-002M
3 m	EVHDMI04-SS-003M

Standard HDMI to HDMI MIcro Cable, PVC, Male/Male	
0.9 m	VCB MHDMI-0003
1.8 m	VCB MHDMI-0006

Standard HDMI to DVI-D Cable, PVC, Male/Male	
1 m	EVHDMI02T-001M
2 m	EVHDMI02T-002M
3 m	EVHDMI02T-003M
5 m	EVHDMI02T-005M

Standard HDMI Adaptors	
HDMI Male to DVI Female	FA790
HDMI Female to DVI Male	FA795-R2

Standard HDMI Swivel Adaptor, 24-Pin	
HDMI Male to DVI Female	FA791

For specs, go to www.black-box.de

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 Colour. 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 on www.black-box.de.

Get high-speed digital communications and improved video.

DVI Cables and Adaptors

- Supports dual-link digital transmissions up to 9.9 Gbps and single-link digital transmissions up to 4.95 Gbps.
- Optimises computer-to-projector connections, eliminating resolution or colour changes and pixel-lock adjustments.
- DVI/DVI cables meet the requirements of digital video, digital telecommunications, and parallel computing.
- **Standard Warranty** — Lifetime

EVNDVI02

FA461

FA462
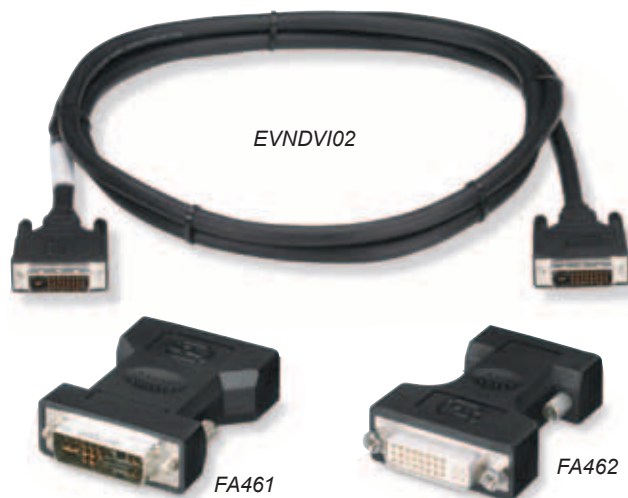
DVI Cables

DVI-A Male, Single-Link, Straight Hood/VGA HD15 Male	
1.8 m	EVNDVI01-0006
3.0 m	EVNDVI01-0010
4.5 m	EVNDVI01-0015
7.6 m	EVNDVI01-0025

DVI-I Male Dual-Link, 90°/ VGA HD15 Male	
1.8 m	EVNDVI04-0006
Custom Lengths	EVNDVI04

DVI-D Male/DVI-D Male, Dual-Link, Straight Hoods	
1.8 m	EVNDVI02-0006
3.0 m	EVNDVI02-0010
4.5 m	EVNDVI02-0015
7.6 m	EVNDVI02-0025
10.6 m	EVNDVI02-0035
15.2 m	EVNDVI02-0050

For specs, go to www.black-box.de.

DVI-D Male/DVI-D Female Extension	
1.8 m	EVNDVI03-0006
3.0 m	EVNDVI03-0010

DVI-I Male/DVI-I Male, Dual-Link, Straight Hoods	
1.0 m	DVI-I-DL-001M
1.5 m	DVI-I-DL-001.5M
2.0 m	DVI-I-DL-002M
3.0 m	DVI-I-DL-003M
5.0 m	DVI-I-DL-005M
10.0 m	DVI-I-DL-010M

DVI Adaptors, Single-Link	
DVI-I Male–VGA HD15 Female	FA461
DVI-I Female–VGA HD15 Male	FA462

For specs, go to www.black-box.de.

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 adaptor 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.

DVI-I, Single-Link
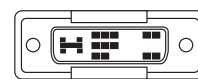
DVI-A
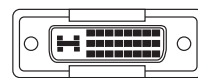
DVI-I, Dual Link

DFP
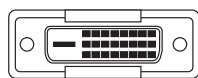
DVI-D, Dual LInk

DVI-D, Single-Link

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 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.

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.
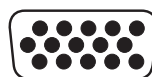
HD15 Male—VGA   HD15 Female—VGA

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

15.2 cm	EVN21VGA

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

0.9 m	EVNPS06-0003 MM
	EVNPS06-0003 MF
	EVNPS06-0003-FF
1.5 m	EVNPS06-0005 MM
	EVNPS06-0005 MF
	EVNPS06-0005-FF
3.0 m	EVNPS06-0010 MM
	EVNPS06-0010 MF
	EVNPS06-0010-FF
6.0 m	EVNPS06-0020 MM
	EVNPS06-0020 MF
	EVNPS06-0020-FF
7.6 m	EVNPS06-0025 MM
15.2 m	EVNPS06-0050 MM
22.8 m	EVNPS06-0075 MM
30.4 m	EVNPS06-0100 MM
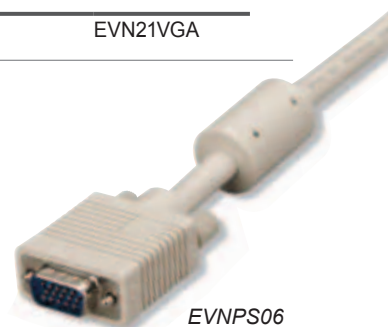
EVNPS06

HD15, PVC, Black, M/M

0.9 m	EVNPS06B-0003 MM
1.5 m	EVNPS06B-0005 MM
3.0 m	EVNPS06B-0010 MM
6.0 m	EVNPS06B-0020 MM
7.6 m	EVNPS06B-0025 MM
15.2 m	EVNPS06B-0050 MM
22.8 m	EVNPS06B-0075 MM
30.4 m	EVNPS06B-0100 MM

For specs, go to www.black-box.de

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 aluminium 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

0.9 m	EVNPS09-0003
1.5 m	EVNPS09-0005
3.0 m	EVNPS09-0010
4.5 m	EVNPS09-0015
6.0 m	EVNPS09-0020
7.6 m	EVNPS09-0025
10.6 m	EVNPS09-0035
15.2 m	EVNPS09-0050
22.8 m	EVNPS09-0075
30.4 m	EVNPS09-0100

For specs, go to www.black-box.de

Make USB 2.0 connections.

Universal Serial Bus (USB) Cables

USBR01-R3

USB05E

USB06

USRBR08

USB05

Right-Angle Type A Male Connector

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 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

0.9 m	USB05-0003
1.8 m	USB05-0006
3.0 m	USB05-0010
3.9 m	USB05-0013
4.6 m	USB05-0015

Type A Male – Type Mini B Male

1.8 m	USB06-0006

Right-Angle Type A Male to Type A Female

1.2 m	USBR08-0004

Right-Angle Type B Male to Type A Male

1.2 m	USBR09-0004

For specs, go to www.black-box.de

USB 2.0 Passive Extension Cable

Type A Male – Type A Female

0.9 m	USB05E-0003
1.8 m	USB05E-0006
3.0 m	USB05E-0010

USB 2.0 Active Extension Cable

Type A Male – Type A Female

2.4 m	USBR01-0008-R3
4.8 m	USBR01-0016-R3

For specs, go to www.black-box.de

Connect the latest USB equipment.

USB 3.0 Cables

- 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

See the difference. More pins and a blue bar distinguish USB 3.0 from USB 2.0.

USB Version 3.0 Cables

Type A Male – Type B Male

0.9 m	USB30-0003-MM
1.8 m	USB30-0006-MM
3.0 m	USB30-0010-MM

Type A Male – Type A Female

0.9 m	USB31-0003-MF
1.8 m	USB31-0006-MF

Type A Male – Type Mini B Male

0.9 m	USB32-0003-MM
1.8 m	USB32-0006-MM

For specs, go to www.black-box.de

Break the distance barrier and extend

USB 2.0 CATx Extender

IC254A-EU

IC253A-EU

To view more, go to www.black-box.de

◆ **BLACK BOX** NETWORK SERVICES   phone 0811 - 5541 112 | usforces@black-box.de

Connect your PS/2 keyboard via the USB port on your computer.

USB Keyboard Adaptor

- 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 Adaptor

USB Type A to 6-Pin Mini DIN Female	
	USBPS2

For specs, go to www.black-box.de

The simple solution for incompatible USB connections.

USB Gender Changers

- Connect like-gendered cables and solve gender mismatches.
- Feature durable, fully mouldedhoods with internal shielding to protect signals from EMI/RFI interference.
- **Standard Warranty** — Lifetime

FAUSB01 *FAUSB06* *FAUSB07*

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 www.black-box.de

A brief overview of USB

The Universal Serial Bus (USB) hardware 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. US3.0, introduced in 2008, 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.

1.1 and 2.0 Type A *1.1 and 2.0 Type B* *1.1 and 2.0 Mini A* *1.1 and 2.0 Mini B*

3.0 Type A *3.0 Type B* *3.0 Mini B*
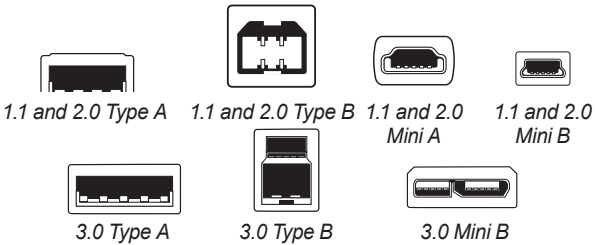
Cable length/node:
5 metre (3 metre for 3.0 devices requiring higher speeds.
Devices/bus: 127
Tier/bus: 5

Transmission rate:
3.0: 4.8 Gbps
2.0: 480 Mbps
1.1: 12 Mbps

Call Tech Support for more information on, 0811-5541 112

Terminate RG-6 and RG-59 cable.

Coax Connectors

FCF02   *FCBNC04*   *FCBNC03*

- 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
		F-Type	FCF01
RG-59 Bare Copper	PVC	BNC	FCBNC04
		F-Type	FCF04
RG-59/2x18	PVC	BNC	FCBNC04
		F-Type	FCF04
Coax Crimp Tool for all listed connectors			CCC01

The right connections for high-speed DS-3 equipment.

High-Speed DS-3 Coax Cable

- Also available in 7.62 m, 15.24 m, 22.86 m, and 30.48 m lengths.
- **Standard Warranty** — Lifetime

High-Speed DS-3 Coax Cable, BNC-BNC, 26 AWG

0.6 m	DS3-0002-BNC
1.5 m	DS3-0005-BNC
3.0 m	DS3-0010-BNC

For specs, go to www.black-box.de

100% foil-shielded with removable EMI/RFI hoods.

DB9 Interface Cable with EMI/RFI Hoods

EDN12BLK

DB9 Male   DB9 Female

- Pins are wired straight through.
- **Standard Warranty** — Lifetime

DB9 Interface Cable with EMI/RFI Hoods

Black	
1.5 m	EDN12BLK-0005-XX
3.0 m	EDN12BLK-0010-XX
6.0 m	EDN12BLK-0020-XX
7.6 m	EDN12BLK-0025-XX

Replace the XX with the gender: MM, MF, FF.

Beige	
1.5 m	EDN12H-0005-XX
3.0 m	EDN12H-0010-XX
6.0 m	EDN12H-0020-XX
7.6 m	EDN12H-0025-XX
15.2 m	EDN12H-0050-XX
22.8 m	EDN12H-0075-XX
30.4 m	EDN12H-0100-XX
45.7 m	EDN12H-0150-XX
60.9 m	EDN12H-0200-XX
Custom Lengths	EDN12H-XX

Replace the XX with the gender: MM, MF, FF.

For specs, go to www.black-box.de

Extend connections to serial devices.

DB9 Serial Interface Cable

BC00240

DB9 Male   DB9 Female

- Wired straight through.
- Mylar® shielding.
- **Standard Warranty** — Lifetime

DB9 Serial Interface Cable

26 AWG, Male/Female	
1.8 m	BC00200
3.0 m	BC00230
4.5 m	BC00231
6.0 m	BC00232
7.6 m	BC00233

NOTE: For longer lengths, call Tech Suport.

28 AWG, Male/Male, Female/Female

1.8 m	BC00XXX-0006
3.0 m	BC00XXX-0010
4.5 m	BC00XXX-0015
6.0 m	BC00XXX-0020
7.6 m	BC00XXX-0025

Replace the XXX with the gender:
Male/Male = 240   Female/Female = 242

For specs, go to www.black-box.de

Extend existing parallel or serial connections.

DB25 Interface Cable

BC00702

DB25 Male   DB25 Female

- Wired straight through.
- Foil shielded.
- **Standard Warranty** — Lifetime

DB25 Interface Cable

Female/Female	
1.8 m	BC00701
3.0 m	BC00704
4.5 m	BC00707
7.6 m	BC00713

NOTE: For longer lengths, call Tech Support.

Male/Female	
1.8 m	BC00702
3.0 m	BC00705
4.5 m	BC00708
6.0 m	BC00711
7.6 m	BC00714

Male/Male	
1.8 m	BC00703
3.0 m	BC00706
4.5 m	BC00709
6.0 m	BC00712
7.6 m	BC00715

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 www.black-box.de

Bulk Individually Shielded Twisted-Pair Cable

Each pair has a foil shield and drain wire. 4, 6, 12, and 24 Conductors	ESN24A-0500

For lengths, specs, and product codes, go to www.black-box.de

Individually Shielded Low-Capacitance Cable, Extra Distance

Each pair has a foil shield and drain wire. 4, 6, 12, and 24 Conductors	ERN24A Series

For lengths, specs, and product codes, go to www.black-box.de

Bulk Extended-Distance Cable, Industrial and Office

Office cable (EDN50A series)

Industrial cable (EDN25A series)

Offic Environment; Foil Shield; PVC; 4, 7, 12, 16, 25, 37, and 50 Conductors

EDN04A Series

Industrial Environment; Braided Foil Shield; PVC; 4, 7, 12, 16, and 25 Conductors

EDN25A Series

For lengths, specs, and product codes, go to www.black-box.de.

Standard RS-232 Low-Noise Cable

ECM25T

Removable hoods for repinning

DB25, 22 AWG, 25 Conductors	ECM25T Series

For lengths, specs, and product codes, go to www.black-box.de

Extended-Distance Data Cables with Removable Hoods

EDN25T

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 www.black-box.de

Extended-Distance/Quiet (ED/Q) Cables with MouldedHoods

EMN25T

Extra shielding, moulded hoods

Foil shield, 85% Tinned Copper Braid, Molded, Nonremovable Hoods	EMN25T Series

For features, specs, and product codes, go to www.black-box.de

Custom Cables…

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.

The right panel for your Shielded 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 Warrant**y — Lifetime
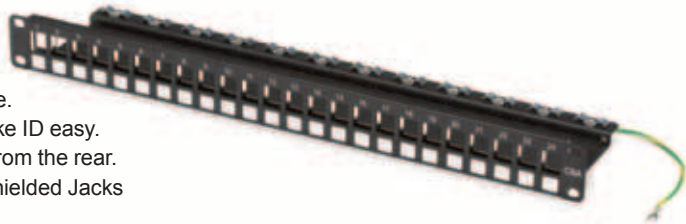
CAT 6A

CAT6A Patch Panel

24-Port, Blank
19", 45 mm H, 1U   JPMT700A

For specs, go to www.black-box.de

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 5 mm– 9 mm.
- 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 Warrant**y — Lifetime

CAT 6A

CAT6A Shielded Jack

Universal Wiring, 4-Pair
     FMT700

Easy CAT6A connectivity—no punchdowns needed.

CAT6A Shielded Feed-Through Patch Panels

C6AFP70S-24: above: rear view with cable management bar; right: front view

CAT 6A

- Shielded RJ-45 couplers on each side minimise ANEXT.
- Provides easy patching without punching down wires.
- Staggered-port design provides more space between ports to minimise 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*

new

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 www.black-box.de

Staggered design helps minimise ANEXT in UTP CAT6A 10-GbE applications.

GigaTrue® **CAT6A**

GigaTrue® CAT6A Staggered Blank Multimedia Patch Panels

new
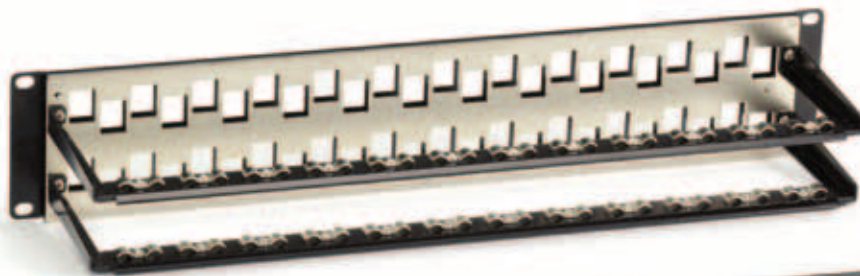
C6AMP70-48: left: rear view with cable management bar; below: front view
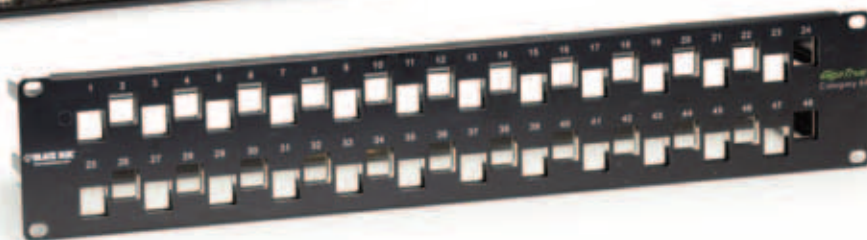
- Staggered-port design provides more space between ports to minimise ANEXT and improve performance.
- Designed to hold GigaTrue®2 CAT6A jacks, but will hold any GigaTrue2 CATx jack. (Sold separately.)
- Constructed of cold-rolled steel.
- Includes a rear cable management bar.
- Use in standard 19" racks.
- **Standard Warranty** — Lifetime

NOTE: Panel comes unpopulated.

GigaTrue® CAT6A Staggered Blank Multimedia Patch Panels

24 Port, 1U	C6AMP70-24
48 Port, 2U	C6AMP70-48

For specs, go to www.black-box.de

Complete your ETL Verified CAT6A channel.

GigaTrue Component-Level CAT6A Jack

GigaTrue **CAT6A**

- Use with the CAT6A Patch Panel (above).
- 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 5 mm–9 mm and conductor diametre of 0.5 mm– 0.65 mm.
- Feature RJ-45 to IDC terminal block connectors. Is labeled with T568A and T568B wiring.
- Includes a stuffer cap.
- **Standard Warranty** — Lifetime

new   ETL

Related

The ETL Verified GigaTrue CAT6A channel consists of:
- *GigaTrue CAT6A Bulk Cable*
- *GigaTrue 3 CAT6A Patch Cable*
- *CAT6A Patch Panel*

GigaTrue Component-Level CAT6A Jack

Single	C6AJA70-XX
25-Pack	C6AJA70-XX-25PAK

Replace the XX with the colour.
Blue = BL   Black = BK
White = WH   Office White = OW

For Wallplates, see page 141. ▶

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-connector twisted-pair copper cable for a distance of 100 metres 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 neighbouring 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.

Get component-level CAT6A performance beyond 625 MHz.

10-Gigabit CAT6A Patch Panels

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 adaptor protects circuit board from damage.
- **Standard Warranty** — Lifetime

10-Gigabit CAT6A Patch Panels
19", Universal Wiring

24-Port, 45 mm H, 1U	JPM10G24-R2
48-Port, 90 mm H, 2U	JPM10G48-R2

For specs, go to www.black-box.de

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
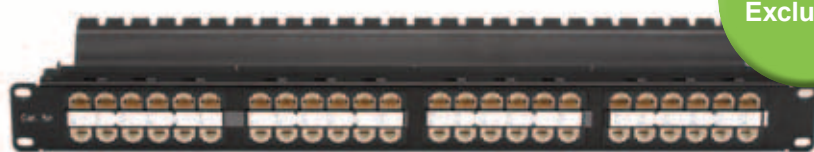
JPM820A-HD: front view

- 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
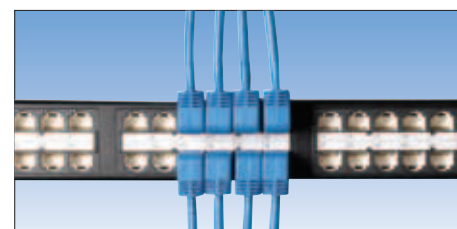
Save even more space with this SpaceGAIN combo! Use the High-Density Feed-Through Patch Panels with our 90° Down Patch Cables (EVNSL21E-0001-90DD).

Watch the Video

Visit online, fore more information on, www.black-box.de

SpaceGAIN CAT6 High-Density Feed-Through Patch Panels
48-Port, 1U

Shielded	JPM816A-HD
Unshielded	JPM820A-HD

For specs, go to www.black-box.de

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** — Lifetime

NOTE: Does not support PoE or PoE+ operation.

CAT6 Feed-Through Protector Panel

16-Port, 1U	JPM812A

For specs, go to www.black-box.de

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phone 0811 - 5541 112 | usforces@black-box.de

Get component-level and ETL Verified channel performance.

GigaTrue CAT6 Patch Panels

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 12 mm of termination.
- Universal wiring—panels are supplied with labelling 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*
- *GigaTrue CAT6 Patch Cable*
- *CAT6 Wiring Block Kit*
- *GigaTrue CAT6 Jacks*

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 www.black-box.de

No punchdowns needed with these feed-through panels.

CAT6 Feed-Through Patch Panels

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 T658B 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"

Unshielded	
24-Port, 1U	JPM818A
48-Port, 2U	JPM820A
Shielded	
24-Port, 1U	JPM814A
48-Port, 2U	JPM816A

For specs, go to www.black-box.de

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 centre 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 www.black-box.de

Save rack space—get 24 ports in only a half U.

SpaceGAIN 24-Port ½U Patch Panel
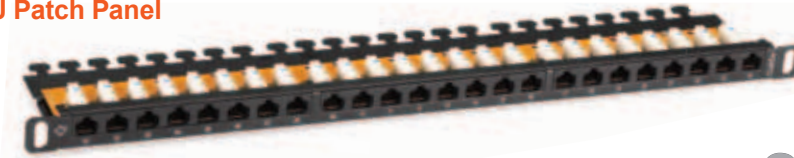
- Really tight quarters? Stack two panels and fit 48 ports in one U.
- Ideal for retrofitting data cabinets and high-density data centres.
- Termination is different from standard patch panels. Cable terminates to the 110 blocks in a 90-degree, top-down manner.
- To save space, you terminate the cable 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 www.black-box.de

Angled design eliminates horizontal cable managers.

SpaceGAIN CAT6 Angled Patch Panels

CAT6

JPM624-ANG: front view
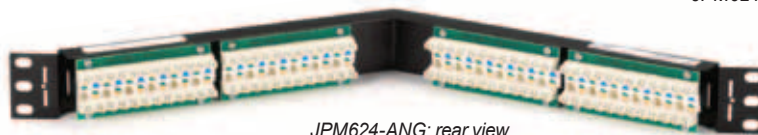
JPM624-ANG: rear view

- 128° Forward angle provides better cable organisation.
- 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 www.black-box.de

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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 (included).
- Use with CAT6 Shielded Keystone Jacks at the wall outlet for a complete shielded solution.
- **Standard Warranty** — Lifetime

CAT6

JPS60A-24

FMS300

CAT6 Shielded Patch Panel

24-Port, 19", 1U	JPS60A-24

CAT6 Shielded Jack

	FMS300

For specs, go to www.black-box.de

For Wallplates, see page 141. ▶

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.
- Swivelling guides keep cables organised within panel's interior.
- Feature built-in cable management.
- Labels are on the front cover for identification.
- **Standard Warranty** — Lifetime

CAT6

JPM185A-R2

Technical Specifications	
Size	Both: 43.2 cm W x 7.9 cm D JPM183A-R2: 10.4 cm H JPM185-R2: 20.6 cm H
Weight	JPM183A-R2: 1.8 kg JPM185-R2: 3.1 kg

Wallmount CAT6 Patch Panels

Universal Wiring

12-Port	JPM183A-R2
24-Port	JPM185A-R2

For specs, go to www.black-box.de

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

ETL
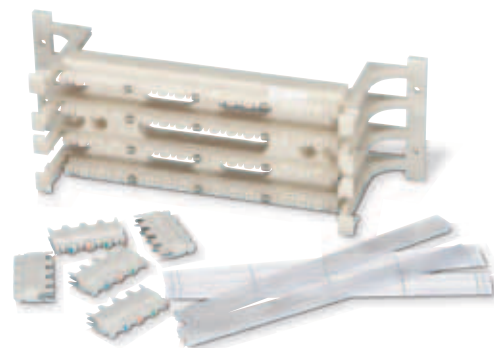
CAT6 Wiring Block Kit, 64-Pair

	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 www.black-box.de

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, fibre, 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 adaptors for copper UTP and STP, S-Video, and fibre.

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 (www.black-box.de).
- GigaStation2 Snap Fittings (right).

GigaStation2 High-Density Multimedia Patch Panels Hold:
- GigaTrue®2 CAT6A Jacks.
- GigaTrue 2 CAT6 and GigaBase2 CAT5e Jacks.
- Giga2-Style CAT3 and USOC Jacks (www.black-box.de).
- 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
Grey	FM336

F-Connector (Female/Female)

Black	FM360
Office White	FM331
Electric Ivory	FM338
Grey	FM337
White	FM361

S-Video

Black	FM363-R2

ST® Adaptor

Offic White	FM333
Grey	FM342

SC Simplex

Office White	FM343
Grey	FM345
White	FM346

MT-RJ (Female/Female)

Office White	FM347
White	FM350

MT-RJ Flush Adaptor (Female/Female)

Office White	FM351
Orange	FM352
Yellow	FM353

LC, Non-Flush Mount

Office White	FM354
Telco Ivory	FM355
Grey	FM356
White	FM357

NOTE: For maximum port density, the 36-port GigaStation model (JPM193A) doesn't have port numbers or labelling tags.

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® Adaptor

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
Grey	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.

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

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 www.black-box.de

ETL

The right combo for eliminating crosstalk.

High-Density Shielded Patch Panel • CAT5e Shielded Jack

CAT5e

JPS5E0A

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 www.black-box.de

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, fibre, and video.
- Solid steel construction.
- **Standard Warranty** — Lifetime

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.
  - –GigaTrue 2 CAT6 and GigaBase2 CAT5e Jacks.
  - –Giga2-Style CAT3 and USOC Jacks
- GigaStation2 Snap Fittings.
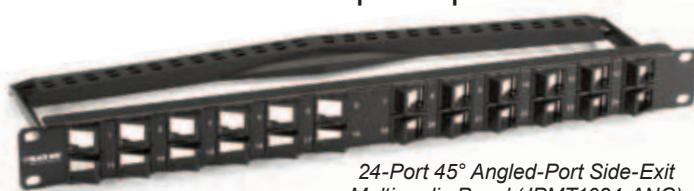
24-Port 45° Angled-Port Side-Exit Multimedia Panel (JPMT1024-ANG)
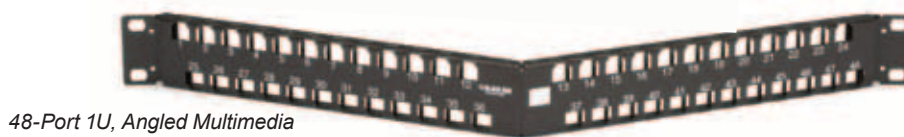
48-Port 1U, Angled Multimedia Panel (JPM481U-ANG)

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 US°C Jacks

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 www.black-box.de

For more information and our online store, visit www.black-box.de\USForces_Ger.

◆ BLACK BOX
NETWORK SERVICES

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Save rack space—get 24 ports in only a half U.

SpaceGAIN CAT5e 24-Port ½U Patch Panel

CAT5e

- 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
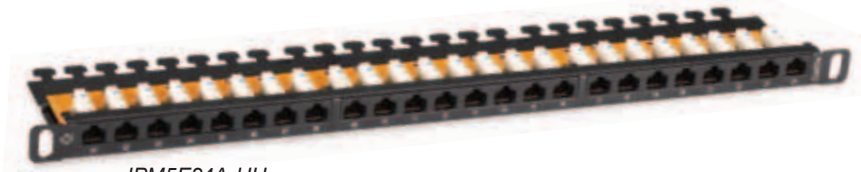
JPM5E24A-HU

SpaceGAIN 24-Port ½U Patch Panel

Unshielded	JPM5E24A-HU

For specs, go to www.black-box.de

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

CAT5e

- 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.

- **Standard Warranty** — Lifetime

Save even more space with this SpaceGAIN combo!

The SpaceGAIN solution.
Use the patch panel with SpaceGAIN cables.
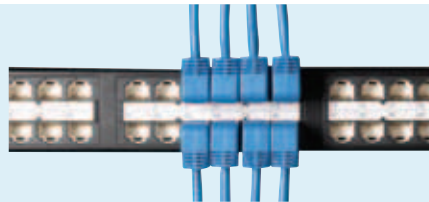
SpaceGAIN CAT5e High-Density Feed-Through Patch Panels, 48-Port, 1U

Shielded	JPM806A-HD
Unshielded	JPM810A-HD

For specs, go to www.black-box.de

No punchdowns needed with these feed-through panels.

CAT5e Feed-Through Patch Panels

CAT5e

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,*

CAT5e Feed-Through Patch Panels

Unshielded		
24-Port	1U	JPM808A-R2
48-Port	2U	JPM810A-R2
Sheilded		
24-Port	1U	JPM804A-R2
48-Port	2U	JPM806A-R2

For specs, go to www.black-box.de

Go with the flow—save space, time, and money.

SpaceGAIN CAT5e 45° Angled-Port Patch Panels

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

CAT5e

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-DU

For specs, go to www.black-box.de

Angled design eliminates the need for horizontal cable managers.

SpaceGAIN CAT5e Angled Patch Panels

JPM5E24-ANG: front view

CAT5e
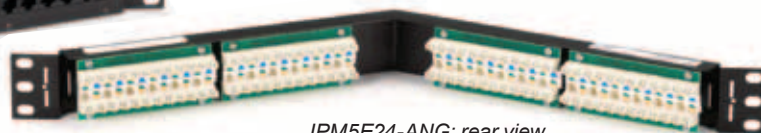
JPM5E24-ANG: rear view

- 128° Forward angle provides better cable organisation 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.
- **Standard Warranty** — Lifetime

SpaceGAIN CAT5e Angled Patch Panels, Universal Wiring

24-Port	JPM5E24-ANG
48-Port	JPM5E48-ANG

For specs, go to www.black-box.de

Do your own wiring.

CAT5e Wiring Blocks

- Kits include label holders, and labels.
- **Standard Warranty** — Lifetime
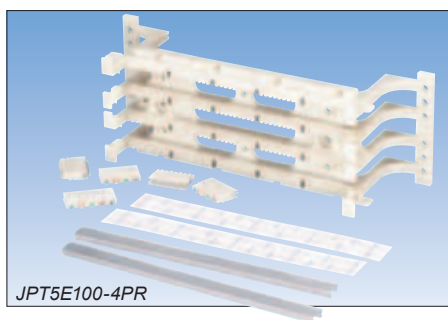
JPT5E100-4PR

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

CAT5e Wiring Block Kits

Kits	Type 110 CAT5e Wiring Blocks	Included CAT5e Connecting Bllocks		Kit Codes
		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

Wiring Block Cable Manager

JPTWBMGR

Punchdown Tool with 110 Blade and Light Pack

FT025A

For specs, go to www.black-box.de

Complete your ETL Verified CAT6A channel.

GigaTrue Component-Level CAT6A Jack

GigaTrue CAT**6A**

new   ETL

- 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 5 mm–9 mm and conductor diameter of 0.5 mm– 0.65 mm.
- Feature RJ-45 to IDC terminal block connectors. Is labelled 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*
- *GigaTrue 3 CAT6A Patch Cable*
- *CAT6A Staggered Patch Panel*

GigaTrue Component-Level CAT6A Jack

Single	C6AJA70-XX
25-Pack	C6AJA70-XX-25PAK

Replace the XX with the colour.
Blue = BL   Black = BK
White = WH   Office White = OW

Fully shielded for CAT6A F/UTP channels.

CAT6A Shielded Jack

CAT**6A**

- Use with the CAT6A Patch Panel (page 130).
- 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 5 mm– 9 mm.
- 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 Shielded Jack, Universal Wiring

	FMT700

Prevent interference and crosstalk in your network runs.

CAT6 and CAT5e Shielded Jacks

CAT**6**

FMS300

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

CAT**5e**

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

Related

These jacks work with:
CAT6 Shielded Patch Panel
CAT5e Shielded Patch Panel

Shielded Jacks

CAT6	FMS300
CAT5e	FMS200

Get component-level and ETL Verified channel performance.

GigaTrue2 CAT6 Jacks

GigaTrue 2
CAT**6**

FMT630-R3

- Part of our ETL Verified channel.
- Data transmission rates up to 250 MHz.
- Labeled with T568A and T568B wiring.
- Fits Wallplates and Housings below (www.black-box.de).
- **Standard Warranty** — Lifetime

Related

The GigaTrue® CAT6 ETL Verified channel consists of:
- *GigaTrue CAT6 Bulk Cable*   *• Patch Panel*
- *GigaTrue Patch Cable*
- *GigaTrue CAT6 Wiring Block*

GigaTrue2 CAT6 Jacks

FMT6XX-R3	FMT6XX-R3-25PAK

Replace the XX with the colour.
Blue = 30   Black = 31   Ivory = 32   Grey = 33   Green = 34
Orange = 36   Red = 37   White = 39   Yellow = 40   Office White = 35

Get component-level and ETL Verified channel performance.

GigaBase2 CAT5e Jacks

GigaBase®2
CAT**5e**

FMT925-R2

- Part of our ETL Verified channel.
- Make easy terminations using a 110 tool.
- Data transmission rates up to 100 MHz.
- Is labelled with T568A and B wiring.
- **Standard Warranty** — Lifetime

Related

The GigaBase® CAT5e ETL Verified channel consists of:
- *GigaBase CAT5e Bulk Cable*   *• Patch Cable*
- *GigaBase CAT5e Wiring Block*

GigaBase2 CAT5e Jacks

FMT9XX-R2	FMT9XX-R2-25PAK

Replace the XX with the colour.
Blue = 20   Black = 21   Ivory = 22   Grey = 23   Green = 24
Orange = 26   Red = 27   White = 29   Yellow = 30   Office White = 25

Face Plates, Adaptors, and Back Boxes.

For use with GigaBase2, GigaTrue2, and Cat6A Unshielded and Shielded Jacks.

Item		Code
A	Keystone Jack	See CAT5e, CAT6, CAT6A for Solutions
B	Adaptor Plate Shuttered	ADAPT
	Angled Adaptor Plate Shuttered	ADAPT-ANG
	Quarter Blank 12.5 x 5.0	QUARB
C	Single Gang Face Plate	FPLASD
D	Bevelled SG Face Plate	FLASDBV
E	Single Gang Back Box	BACKBS
F	Double Gang Face Plate	FPLADQ
G	Double Gang Back Box	BACKBD

◆ BLACK BOX

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 centre. 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.

Wiring Standards

US°C   T568B   T568A

Pair 1   Pair 2   Pair 3   Pair 4
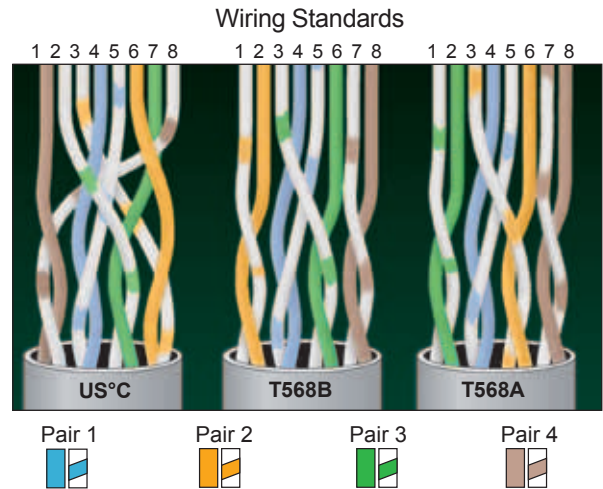
Follow these step-by-step instructions.

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.
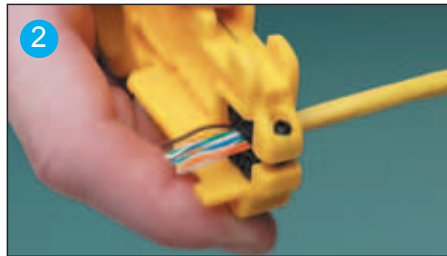
Untwist each pair of conductors to within 3 mm of the jacket with a stripping tool. Do not untwist the conductors more than 12 mm. Arrange the wires according to the cable spec you're using (T568B in this case). Check the wiring standards above if you're not sure. Flatten and align the wires. Use your 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.
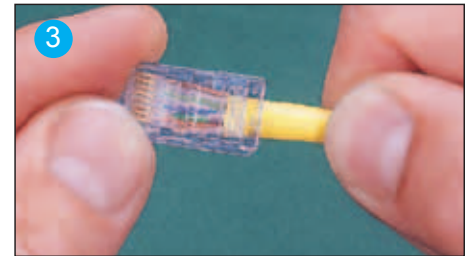
Orient the wires so the cable's Pin 1 connector aligns correctly with the RJ-45 connector's Pin 1, and do the same for all pins. (To maintain the correct alignment, see "Rule of Thumb".) While carefully maintaining the proper position of each conductor, slide the wires into an RJ-45 connector.
All connectors 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 6 mm 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 Stranded Bulk Cable (page 89), 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 Termination Kit. Don't forget—Black Box can make terminated cables for you. Just call our FREE Tech Support at 0811-5541 112.

CAT6 Installation Kit (FT490A-R3), **p. 177**

EZ Check Cable Tester (EZCT)

CAT6 Modular Plugs (FMTP6-R2-25PAK)

Crimp Tool (FT046A)

Multi-Strip (FT231A)

4

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.

5

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 standardised minimum performance levels.

For questions or to learn more about building and testing a patch cable, call our FREE Tech Support at 0811-5541 112.

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.

Pin 1
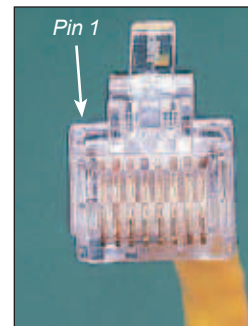
Make faster terminations and reduce waste.

CAT5e and CAT6 EZ-RJ45 Modular Plugs and Boots

CAT**5e** CAT**6**

- 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

C5EEZUP *C6EZUP* *C6EZSP*

C5EEZ-BOOT-CL *C6EZ-BOOT-CL* *C6EZ-BOOT-BL* *C6EZ-BOOT-BK*

C6EZ-BOOT-GY *C6EZ-BOOT-GN* *C6EZ-BOOT-RD* *C6EZ-BOOT-YL*

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
Grey	C6EZ-BOOT-GY
Green	C6EZ-BOOT-GN
Red	C6EZ-BOOT-RD
Yellow	C6EZ-BOOT-YL

For specs, go to www.black-box.de

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 moulded rubber grip handles for extra comfort.
- **Standard Warranty** — FT1200AKIT-R2: Lifetime; FT1100A, FT1200A: 5 Years
- **Extended Warranty** — 1 or 3 Years
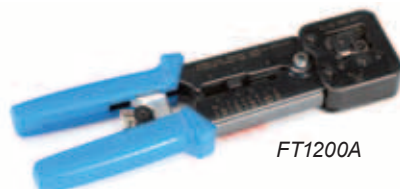
What's in the Kit (FT1200AKIT-R2)

- EZ RJPRO (FT1200A)
- Stripper (FT231A)
- (60) CAT5e Plugs
- EZ Check Cable Tester (EZCT)
- Case (FT390)

FT1200AKIT-R2

FT1101

FT1200A

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 www.black-box.de

BLACK BOX
NETWORK SERVICES

phone 0811 - 5541 112 | usforces@black-box.de

Everything you need to cut, strip, and terminate UTP cable.

Modular Plug Kit

- Loading bars for CAT6 plugs maintain 12 mm 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: 5 cm H x 30 cm W x 20.3 cm D
- **Standard Warranty** — Lifetime

Modular Plug Kit	
	FTM650-R2

For specs, go to www.black-box.de

Eight-conductor plugs for high-speed applications.

CAT6 and CAT5e Modular Plugs

FMTP6S   *FMTP6-R2*

- 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	FMTP6S-10PAK
25-Pack	FMTP6S-25PAK
50-Pack	FMTP6S-50PAK
100-Pack	FMTP6S-100PAK
250-Pack	FMTP6S-250PAK
Unshielded	
10-Pack	FMTP6-R2-10PAK
25-Pack	FMTP6-R2-25PAK
50-Pack	FMTP6-R2-50PAK
100-Pack	FMTP6-R2-100PAK
250-Pack	FMTP6-R2-250PAK

CAT5e Modular Plugs	
Shielded	
10-Pack	FMTP5ES-10PAK
25-Pack	FMTP5ES-25PAK
50-Pack	FMTP5ES-50PAK
100-Pack	FMTP5ES-100PAK
250-Pack	FMTP5ES-250PAK
Unshielded	
10-Pack	FMTP5E-10PAK
25-Pack	FMTP5E-25PAK
50-Pack	FMTP5E-50PAK
100-Pack	FMTP5E-100PAK
250-Pack	FMTP5E-250PAK

For specs, go to www.black-box.de

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
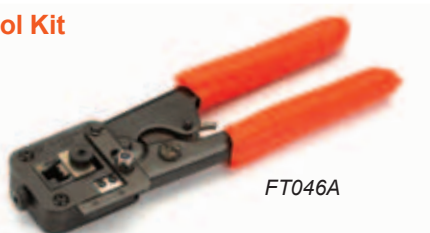
FT046A

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 www.black-box.de

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

To order, replace the XX with the colour.
Blue = 17 Black = 18 Grey = 21 White = 23
Green = 19 Red = 20 Yellow = 22 Beige = 35

For specs, go to www.black-box.de

Rubber boots protect connector tabs on cables.

- **Standard Warranty** — Lifetime

Colour-Coded Pre-Plugs

Colour-Coded Pre-Plugs	
50-Pack	FMT7XX

To order, replace the XX with the colour.
Blue = 17 Black = 18 Grey = 21 White = 23
Green = 19 Red = 20 Yellow = 22 Beige = 35
Purple = 24 Pink = 34 Orange = 36 Brown = 37

For specs, go to www.black-box.de

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

CAT**6A**
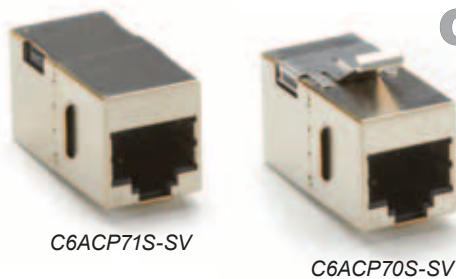
C6ACP71S-SV

C6ACP70S-SV

CAT6A Shielded Straight-Through Couplers

Metal		C6ACP71S-SV	C6ACP71S-SV-10PAK

CAT6A Keystone Feed-Through, Straight-Pinned Couplers

Metal		C6ACP70S-SV	C6ACP70S-SV-10PAK

CAT6 Straight-Through and Keystone Couplers

CAT**6**

FM606

FM693
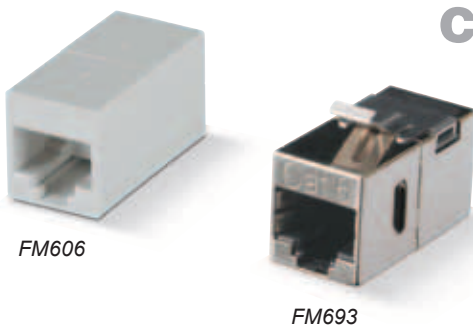
CAT6 Straight-Through Couplers

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

CAT**5e**

FMT1000
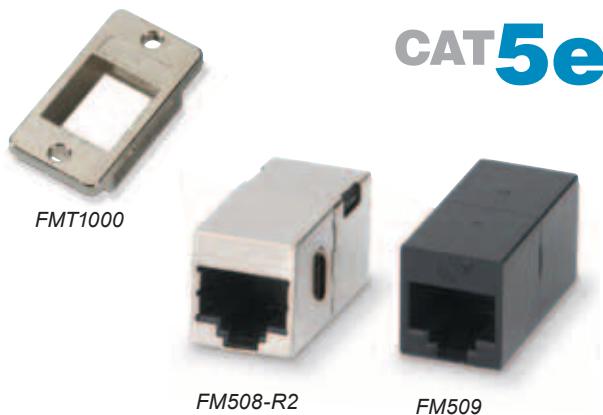
FM508-R2

FM509

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
Shielded	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
Shielded	Black	FM598	FM598-10PAK

Panel mount Bezel

			FMT1000

Related
- *GigaTrue® 2 and GigaBase® 2 Jacks*
- *GigaStation Snap Fittings*

For use with GigaBase2, GigaTrue2, and Cat6A unshielded and shielded Jacks.

Face Plates, Adaptors, and Back Boxes
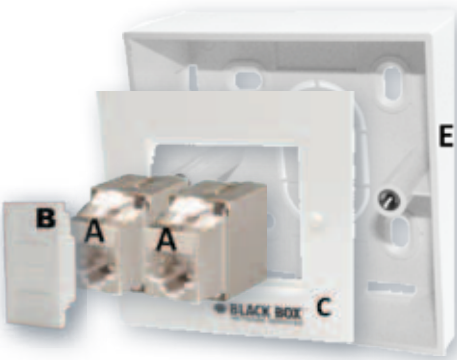
Item		Code
A	Keystone Jack	See below.
B	Adaptor Plate Shuttered	ADAPT
	Angled Adaptor Plate Shuttered	ADAPT-ANG
	Quarter Blank 12.5 x 5.0	QUARB
	Adaptor Plate Unshuttered	ADAPT-US
C	Single Gang Face Plate	FPLASD
D	Bevelled SG Face Plate	FLASDBV
E	Single Gang Back Box	BACKBS
F	Double Gang Face Plate	FPLADQ
G	Double Gang Back Box	BACKBD

Install these jacks in a snap.

GigaStation2 Snap Fittings

- Convenient snap-in jacks for multimedia or fibre optic connection capabilities.
- Work with:
  - GigaStation2 Surface mount Housings (below).
  - Multimedia Patch Panels (pages 136).
- Adaptor Plate unshuttered (above).
- **Standard Warranty** — Lifetime

FMT362-R2

FMT350-R2

FMT361-R2

FMT354-R3

FMT359-R2
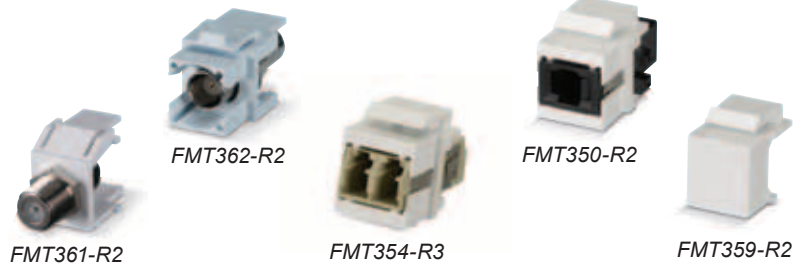
GigaStation2 Snap Fittings

HDMI, Female/Female		ST® Adaptor		MT-RJ, Female/Female	
Office White	FMT1001	Office White	FMT333-R2	Office White	FMT347-R2
F-Connector, Female/Female		Ivory	FMT324-R2	Ivory	FMT326-R2
Office White	FMT331-R2	White	FMT323-R2	White	FMT350-R2
Ivory	FMT338-R2	SC Simplex		Blank, 10-Pack	
White	FMT361-R2	Office White	FMT343-R3	Office White	FMT330-R2
BNC, Female/Female		Ivory	FMT325-R3	Ivory	FMT335-R2
Office White	FMT332-R2	White	FMT346-R3	White	FMT359-R2
Ivory	FMT322-R2	LC			
White	FMT362-R2	Office White	FMT354-R3		
S-Video, 110-Punchdown		Ivory	FMT320-R3		
Black	FMT375	White	FMT357-R3		

Install connections in areas with limited clearance.

GigaStation2 Surface Mount Housings

- Require only 3.8 cm of clearance.
- Work with:
  - GigaTrue2 CAT6A/6 Jacks (page 140).
  - GigaBase2 CAT5e Jacks (page 141).
  - Giga2-Style CAT3 Jacks and USOC RJ-11 Jacks (www.black-box.de).
  - GigaStation2 Snap Fittings (above).
  - Keystone CAT5e Couplers (page 146).
  - Hinged Raceways (www.black-box.de).
- **Standard Warranty** — Lifetime

WPT902 shown with a jack and snap fitting inserts (not included).
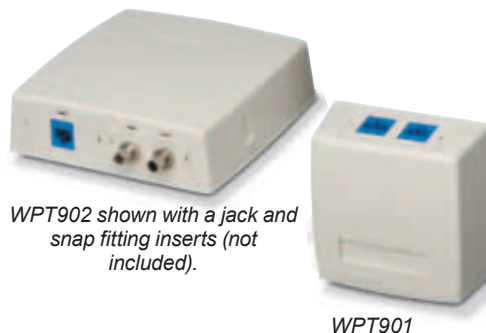
WPT901

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

For more information and our online store, visit www.black-box.de\USForces_Ger.

147

Make 108 high-density fibre connections in only 1U.

High-Density Fibre Optic Enclosure, 1U

- Slide-out tray makes high-density data centre connections easy.
- To access cables in the enclosure, simply pull out the tray.
- Three slots accept LC Fibre 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.
- Rail stops prevent the tray from being pulled out too far and damaging fibre splices.
- 16-gauge, cold-rolled steel construction.
- **Standard Warranty** — Lifetime

NOTE: Comes unloaded. Use with the Fibre Cassette below.

High-Density Fibre Optic Enclosure, 1U

	FOEN50HD-3H-1U
Blank Panel	FOAP10-HD

For specs, go to www.black-box.de

Get 36 LC connectors in one pre-wired OM3 fibre cassette.

OM3 High-Density Fibre 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 Fibre Optic Cassette, 3 MTP® Connectors to 36 LCs

3 x 12 Strand	
	F°CA20M3-3MP12-36LC

For specs, go to www.black-box.de

Economical open panel supports up to 288 fibres.

Universal Fibre Patch Panel, 12 Vertical LGX Slots

Holds cassettes and panels

- Holds up to 12 adaptor panels or cassettes.
- Super versatile. Mix and match adaptor 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
- *Fibre Adaptor Panels*
- *Fibre Cassettes*

Universal Fibre Patch Panel, 3U

12 Vertical LGX Slots	
	FOPP50-12V-3U

For specs, go to www.black-box.de

Super versatility. Connect up to 288 fibres for high-density applications.

Rackmount Fibre 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 adaptor panels.

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

JPM418A-R4

JPM406A-R6

Super versatility! This model holds standard fibre adaptor panels or cassettes for high-density applications.

- The 3U Enclosure holds both Fibre Adaptor Panels and MTP® MPO-style fibre cassettes.
- When used with LC duplex fibre cassettes, the 3U Enclosure can hold 288 fibres!
- The 2U Enclosure holds Fibre Adaptor Panels only. With a 12 LC Duplex Panel (page 153), it can accommodate up to 144 fibres.

- Smoked-plastic, lockable front door makes it easy to view connections.
- Fits 19" or 23" racks.
- **Standard Warranty** — Lifetime

Related
- *Fibre Adaptor Panels*
- *MTP® MPO-style Cassettes*

Rackmount Fibre Cabinets

2U	6-Adaptor Panel	JPM418A-R4
3U	12-Adaptor Panel	JPM406A-R6

For specs, go to www.black-box.de

For convenience, order a rackmount panel that's preloaded with adaptors.

Rackmount Fibre Panels, Loaded

- Adaptors feature high-retention phosphor bronze alignment sleeves.
- Swing-out fibre management tray makes it easy to maintain fibre optic cable bend-radius requirements.
- Only 1U high.
- Fit in 19" or 23" racks.
- **Standard Warranty** — Lifetime

Preloaded

Top: JPM375A-R2; bottom: JPM370A-R2.

Panels come pre-loaded with a variety of fibre connectors and are suitable for multimode applications. They occupy only one rack space and include mounting hardware.
All feature a swing-out fibre management tray for full front access to both front and rear interconnections, making it easier to maintain fibre optic cable bend-radius requirements.

NOTE: Custom configurations are available for these panels and all the fibre termination enclosures featured on pages 152. For details, call our FREE Tech Support.

Rackmount Fibre 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 www.black-box.de

No more pinched fingers. This shelf slides out for easy fibre access.

Rackmount Fibre 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 fibre splices.
- Three slots accept three snap-in Adaptor Panels (page 151) or Cassettes (page 154).
- Can hold two Mini Splice Trays (page 159).
- Features two separate Kevlar® clamps to secure the fibre trunk to the enclosure.
- Supports 19" and 23" widths and can be front or centre mounted.
- Includes two sets of cable distribution rings.
- Accepts an optional fibre tray splicing.
- 16-gauge, cold rolled steel enclosure.
- **Standard Warranty** — Lifetime

This compact 1U shelf accepts Fibre Adaptor Panels or MTP®, MPO-Style Fibre Cassettes.

This compact fibre shelf conveniently slides out so you can easily access the fibres.

Holds cassettes and panels

Related
- *Fibre Adaptor Panels*
- *MTP® MPO-style Cassettes*
- *12-Strand Fibre Splice Tray*

Rackmount Fibre Shelf, Pull-Out Tray, 1U

	JPM427A-R2

For specs, go to www.black-box.de

Limited rack space? Our most popular 1U enclosure is the solution.

Rackmount Fibre Shelf, 1U

- Tray swings out for cable access.
- Accepts three snap-in Adaptor Panels (page 153).
- Panels are recessed horizontally.
- Splice tray stud enables you to install pigtail splice trays.
- Mount on 19" or 23" rails.
- **Standard Warranty** — Lifetime

Now holds cassettes and panels

Related
- *Fibre Adaptor Panels, page 153.*
- *12-Strand Fibre Splice Tray, page 159.*

Rackmount Fibre Shelf, 1U

1U 3-Adaptor Panel	JPM407A-R5

For specs, go to www.black-box.de

Customise these guaranteed-for-life panels to your specific applications.

Fibre Patch Panels, 1U

JPM395A

JPM430A

JPM390A

JPMT-Fibre-3

- Panels feature feed-through connectors.
- LC connectors feature ceramic ferrules to withstand frequent plugging and unplugging.
- The modular design supports custom configurations with fibre (page 147) and copper (page 140) jacks.
- Blank panel holds Fibre Adaptor Panels (page 153).

- Built tough of cold-rolled steel.
- **Standard Warranty** — All: Lifetime

NOTE: Panels come unassembled. Jacks need to be snapped in.

Fibre 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 Fibre Patch Panel	
3 Adaptor Panel	JPMT-Fibre-3

For specs, go to www.black-box.de

BLACK BOX
NETWORK SERVICES

phone 0811 - 5541 112 | usforces@black-box.de

Protect your fibre terminations in damp environments.

NEMA 4/ IP56 Rated Fibre 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 entreing.
- Can be mounted on solid surfaces, such as cinder block walls.
- **Standard Warranty** — All: Lifetime

Adaptor Panel Enclosures
- Panels hold two or four Fibre Adaptor Panels (page 153).
- Support one or two incoming fibre trunks and patch cables going out.
- Include an area to mount a Splice Tray (JPM440A - page 159).

Splice Tray Enclosure
- Use to make fibre cabling transition from outdoors to indoors.
- Supports one incoming fibre trunk and/or one outgoing trunks.
- Includes a splice tray.

NEMA 4

IP 56

Wallmount

JPM4001A-R2

JPM4002A

NEMA-4 Rated Fibre Wallmount Enclosures

2 Panel/Cassette	JPM4001A-R2
4 Panel/Cassette	JPM4000A-R2
NEMA 4 Splice Tray	JPM4002A

For full features and specs, go to www.black-box.de.

Technical Specifications

Dimensions	JPM4000A-R2: 39.9 x 48.3 x 10 cm; JPM4001A-R2: 32.2 x 35 x 9.9 cm; JPM4002A: 39.9 x 48.3 x 10 cm

A sliding fibre patch panel to your precise specification

Modular Fibre Optic Patch Panels 1U

Type A – ST and FC

Type B – LC Duplex, SC Simplex

Type C – LC Quad, SC Duplex
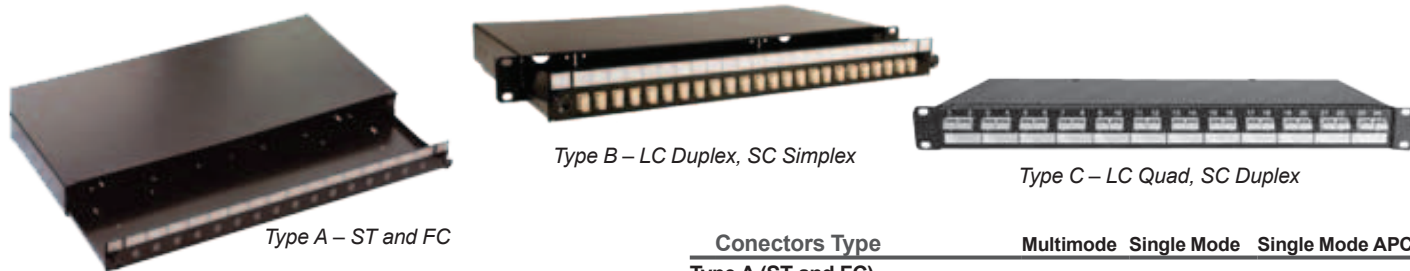
These Sliding Tray Patch Panels are suitable for all rack mount Fibre Backbone terminations.

Panels feature
- Write-on labelling area.
- A sliding tray with Pre-formed tie-downs.
- Knock-out cable openings.
- Wide range of adaptors.

Conectors Type	Multimode	Single Mode	Single Mode APC
Type A (ST and FC)			
Sliding Panel for 16 Adaptors	JPE004F		
ST Adaptor Simplex	FOE401	FOE402	
FC Adaptor Simplex	FOE403		
Type B (SC, LC, MT-RJ)			
Sliding Panel for 24 Adaptors	JPE005F		
SC Multimode Simplex Adaptor	FOE501	FOE502	FOE503
MT-RJ Duplex	FOE504		
LC Duplex	FOE505	FOE506	FOE507
E2000 Simplex	FOE511	FOE512	FOE513
Type C (SC Duplex , LC Quad, ST)			
Sliding Panel for 12 Adaptors	JPE006F		
SC Duplex	FOE601	FOE602	FOE603
LC Quad	FOE604	FOE605	
Duplex ST - SC	FOE610		

Low-profile fibre enclosures for limited-space areas.

Fibre 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 Fibre Adaptor Panels (page 153) or Fibre Cassettes (page 154).

Lock-Style Cabinets
- Use when installing secure fibre networks.
- Separate lockable covers provide access to the users' side and the technician's side.
- Feature full front access.
- Holds Fibre Adaptor Panels (page 153) or Fibre Cassettes (page 154).
- **Standard Warranty** — All: Lifetime

Wallmount

JPM402A-R2

JPM400A-R2

JPM401A-R2

Technical Specifications

Material	16-gauge cold-rolled steel
Dimensions	JPM400A-R2: 21.6 x 27.9 x 8.9 cm; JPM401A-R2–JPM402A-R2: 30.5 x 35.6 x 8.9 cm ; JPM403A-R2: 30.5 x 35.6 x 8.9 cm

Fibre Wall Cabinets

Open-Style	
2-Adaptor Panel	JPM400A-R2
4-Adaptor Panel	JPM401A-R2
Lock-Style	
4-Adaptor Panel	JPM402A-R2
12-Adaptor Panel	JPM403A-R2

Secure and protect fibre connections in limited-space areas.

Wallmount Z-Hinged Fibre Enclosure

- Z-design enclosure features two compartments: the front holds fibre assemblies, the rear holds the fibre splices.
- Only 20 cm high, 30 cm wide and 12 cm 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

new

Wallmount Z-Hinged Fibre Enclosure

JPM450A

For full features and specs,
go to www.black-box.de.

The economical solution for extending a fibre run.

Mini Wallmount Fibre Enclosure, One Adaptor Panel

- Holds one Fibre Adaptor Panel (page 153).
- Ideal for extending a fibre run to a remote area of your facility or in areas where you don't need security.
- **Standard Warranty** — Lifetime

new

Mini Wallmount Fibre Enclosure, One Adaptor Panel

JPM399A

For full features and specs,
go to www.black-box.de.

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Adaptor panels fit standard fibre enclosures.

Fibre Adaptor Panels

JPM450B

JPM450C

JPM451B

JPM451C

JPM480A

JPM455C

JPM460B

JPM460C

JPM461C

JPM456C

JPM463B

JPM466B

JPM467B

JPM467C

JPM468C

JPM470

- Adaptor Panels snap easily into fibre 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 Adaptor Panels are for use in 10-GbE networks.
- **Standard Warranty** — Lifetime

Standard Fibre Optic Adaptor Panels

Connectors	Colour	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 Fibre Optic Adaptor Panels

Connectors	Colour	Sleeve	
(6) ST Duplex	Beige	Bronze	JPM460B
	Blue	Ceramic	JPM460C
(6) SC Duplex	Blue	Ceramic	JPM461C
	Grey	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 www.black-box.de

Fibre Optic Wall Box and Adaptor Panel

OS1/2   **OM1/2/3**

Secure termination box.

- Cable management kit included.
- Interchangeable modular adaptor panels.
- Pre-loaded with an adaptor panel.
- Accepts one fibre adaptor panel (supplied).
- Fitted with security screws.
- Extended lid protects patch cords from being accidentally disconnected.
- Strength member tie position.
- Suitable for pre-terminated cable or splicing.
- IP20 rated.

Tamper Resistant Fibre Wall Box Grey

Item	Code
(6) LC Single Mode	FPU-6LCSM-GY
(8) ST Single Mode	FPU-8STSM-GY
(6) LC Multi Mode	FPU-6LCMM-GY
(6) SC Multi Mode	FPU-6SCMM-GY
(8) ST Multi Mode	FPU-8STMM-GY

For specs, go to www.black-box.de

Get up to 24 fibres in one cassette.

OM3 50 micron Multimode Fibre Optic Cassettes, MTP®-Style Connector

- Use to make high-density blade server, patch panel, and switch connections.
- Choose from multiple fibre 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 Fibre Enclosure (JPM406A-R6)*
- *Rackmount Fibre Shelf (JPM427A-R2)*
- *Universal Fibre Patch Panel (FOPP50-12V-3U)*

OM3 50 micron Multimode Fibre 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 www.black-box.de

Simplify high-density deployments with a preterminated trunk cabling system.

SIngle and Multimode Laser-Optimised MTP/MPO Trunk and Fan Out Cables

- Full traceability and test certification supplied with each assembly.
- Long-distance transmission capabilities.
- All patch cables terminated with minimum UPC finish (ultra polish connector).
- Certificate with insertion loss and return loss included for every termination.
- Low Smoke Zero Halogen
- US Conec MPO/MTP® Connector
- Polarity A (standard), B or C (optional)
- **Warranty** — Lifetime.

- 12-fibre cable pre terminated with MPO/MTP Female connectors and LC or SC connectors trunck cable.
- For use with MTP Fibre Optic Cassette and fan out cables.
- **Standard Warranty** — Lifetime

OM3, OM4, OS1/2 MTP Fibre Optic Cable, 12-Strand

Length	OM3	OM4	OS1/2
5 m	MTP-MTP-005M-10G	MTP-MTP-005M-OM4	MTP-MTP-005M-OS1
10 m	MTP-MTP-010M-10G	MTP-MTP-010M-OM4	MTP-MTP-010M-OS1
15 m	MTP-MTP-015M-10G	MTP-MTP-015M-OM4	MTP-MTP-015M-OS1
20 m	MTP-MTP-020M-10G	MTP-MTP-020M-OM4	MTP-MTP-020M-OS1
30 m	MTP-MTP-030M-10G	MTP-MTP-030M-OM4	MTP-MTP-030M-OS1
50 m	MTP-MTP-050M-10G	MTP-MTP-050M-OM4	MTP-MTP-050M-OS1
Custom	MTP-MTP-XXXM-10G	MTP-MTP-XXXM-OM4	MTP-MTP-XXXM-OS1

Fibre Optic MTP Fan Out Cable 1m

MTP Male to

(6) LC Duplex OM3 Aqua	MTPOM312FOMLC
(12) SC Simplex OM3Aqua	MTPOM312FOMSC
(6) LC Duplex OM4 Aqua	MTPOM412FOMLC
(12) SC Simplex OM4 Aqua	MTPOM412FOMSC
(6) LC Duplex OS1/2 Yellow	MTPOS112FOMLC
(12) SC Simplex OS1/2 Yellow	MTPOS112FOMSC

BLACK BOX NETWORK SERVICES

The easy way to mate fibre connectors.

Fibre Optic Couplings and Adaptors

FOT118 *FOT100* *FOT126* *FOT101* *FOT122* *FOT117*

FOT104 *FOT113*
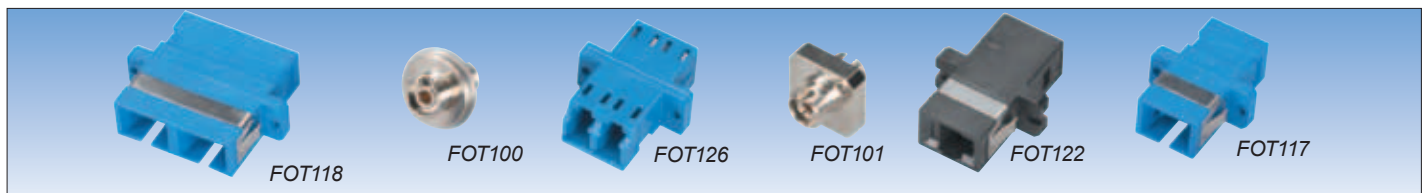
- Use the couplings to mate two fibre cables.
- Convert ST, SC, and FC connectors with the Adaptors.
- All feature a panel mount design.
- The bronze sleeves are better for multimode fibre applications where alignment is not crucial.
- The ceramic sleeves offer precise alignment and are better for single mode applications.
- Ceramic sleeves are more durable and provide better alignment than bronze sleeves.
- **Standard Warranty** — All: Lifetime

Fibre Optic Couplings		Description	Sleeve	Flange	
FC-FC	10 mm Diameter Mounting	Multimode, Simplex	Bronze	Metal	FOT100
		Single mode, Simplex	Ceramic	Metal	FOT102
	Square Mounting	Multimode, Simplex	Bronze	Metal	FOT101
		Single mode, Simplex	Ceramic	Metal	FOT103
ST-ST	10 mm Diameter Mounting	Multimode, Simplex	Bronze	Metal	FOT109
		Single mode, Simplex	Ceramic	Metal	FOT110
	Rectangular Mounting	Single mode, Duplex	Ceramic	Plastic	FOT111
		Multimode, Duplex	Bronze	Plastic	FOT112
SC-SC	Rectangular Mounting	Multimode, Simplex	Bronze	Plastic	FOT117
		Multimode, Duplex	Bronze	Plastic	FOT118
		Single mode, Simplex	Ceramic	Plastic	FOT119
		Single mode, Duplex	Ceramic	Plastic	FOT120
LC-LC	SC Footprint	Multimode, Duplex	Bronze	Plastic	FOT123
		Single mode, Duplex	Ceramic	Plastic	FOT126
	Panel Mount	Multimode, Simplex	Bronze	Plastic	FOT127
		Multimode, Duplex	Bronze	Plastic	FOT128
	Panel Mount	Single mode, Simplex	Ceramic	Plastic	FOT124
		Single mode, Duplex	Ceramic	Plastic	FOT125
MT-RJ–MT-RJ (Guide pins not included.)					
	Rectangular Mounting	Multimode, Simplex		Plastic	FOT121
	with Cap	Multimode, Duplex		Plastic	FOT122
Fibre Optic Adaptors					
ST-FC	Square Mounting	Multimode, Simplex	Bronze	Metal	FOT104
	Rectangular Mounting	Multimode, Simplex	Bronze	Metal	FOT105
		Single mode, Simplex	Ceramic	Metal	FOT106
SC-FC	Square Mounting	Multimode, Simplex	Bronze	Metal	FOT107
		Single mode, Simplex	Ceramic	Metal	FOT108
ST-SC	Rectangular Mounting	Multimode, Simplex	Bronze	Plastic	FOT115
		Multimode, Duplex	Bronze	Plastic	FOT116
	Rectangular Mounting	Single mode, Simplex	Ceramic	Plastic	FOT113
		Single mode, Duplex	Ceramic	Plastic	FOT114
MTP–MTP Bulkhead Adaptor with Cap, Panel mount				Plastic	FOT129
For specs, go to www.black-box.de					

Fibre Optic Adaptor Kit

- Eleven different couplings and adaptors.
- All adaptors 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
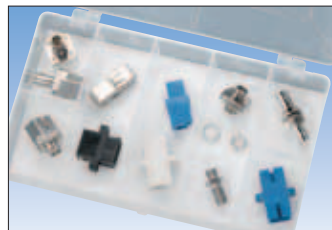
Fibre Optic Adaptor Kit

FO217

For specs, go to www.black-box.de

Fibre Adaptor Cable Kits

- Use the LC–SC Adaptor Cable (FO215) to convert a female LC connector into a simplex SC female connector.
- Use the LC–ST® Adaptor Cable (FO216) to convert a female LC connector into a simplex ST female connector.
- **Standard Warranty** — Lifetime

FO215

FO216

Fibre Adaptor Cable Kits

LC–SC	FO215
LC–ST	FO216

For specs, go to black-box.de

For more information and our online store, visit www.black-box.de\USForces_Ger.

◆ BLACK BOX
NETWORK SERVICES

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Terminate fibre in a minute—no more hand polishing in the field.

Pre-Polished Fibre Connectors

- Pre-polished ferrules for fast field connections.
- Easy assembly with no need for epoxy.
- Fibre can be reseated.
- Factory polishing eliminates loss concerns.
- Optical multimode 3 (OM3) compliant for 10-Gigabit Ethernet support.
- Meet TIA 568C performance requirements and TIA/EIA 604 (f°Cis) connector interface specifications.
- Use to terminate 2 mm, 3 mm, 250 micron, or 900 micron fibre.
- **Standard Warranty** — Lifetime
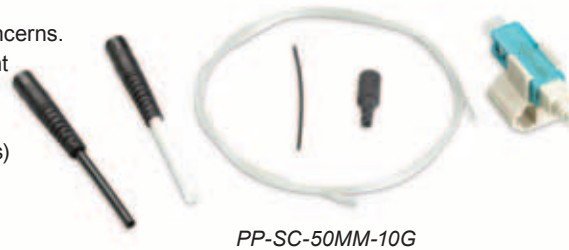
PP-SC-50MM-10G

Pre-Polished Fibre 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 www.black-box.de

More than a few ways to connect multimode and single mode cabling.

Fibre 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

FOT209

FOT203-R2

FOT226-R2

FO221

FO110

Fibre Optic Connectors

Ceramic Ferrule	
ST Single mode Simplex	
126-µm/0.9 mm, 2.0 mm, 3.0 mm	
	FOT200-R2
126-µm/2.0 mm	FOT201
126-µm/3.0 mm	FOT202
ST Multimode Simplex	
126-µm/0.9 mm, 2.0 mm, 3.0 mm	
	FOT203-R2
10-Pack	FOT203-R2-10PAK
SC Single mode Simplex	
126-µm/0.9 mm	FOT206
126-µm/2.0 mm, 3.0 mm	
	FOT207-R2

Ceramic Ferrule	
SC Multimode Simplex	
126-µm/3.0 mm	FOT208
126-µm/0.9 mm	FOT209
126-µm/2.0 mm, 3.0 mm	FOT210-R2
FC Multimode Simplex	
126-µm/2.0 mm	FOT216
LC Single mode Simplex	
125-µm/0.9 mm	FOT218
125-µm/2.0 mm	FOT219
126-µm/2.0 mm, 3.0 mm	FOT219-R2

Ceramic Ferrule	
LC Multimode Simplex	
127-µm/0.9 mm	FOT221
127-µm/3.0 mm	FOT222-R2
LC Single mode Duplex	
125-µm/3.0 mm	FOT225
LC Multimode Duplex	
127-µm/2.0 mm, 3.0 mm	FOT226-R2
UV-Curable, Reduced-Piece-Part, Preassembled, Glass-Insert	
ST Multimode	FO110

For specs, go to www.black-box.de

Ceramic-ferrule connectors for 50 micron cable.

50 micron Connectors

- Offer quick installation with no epoxy or polishing needed.
- For use with the Fibre Connector Tool Kit (FT535-R3, see www.black-box.de).
- Require no consumables.
- **Standard Warranty** — 1 Year

FO042

FO043

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 www.black-box.de

Verify fibre equipment by looping the signal back.

Fibre Optic Loopbacks

- Test and troubleshoots fibre 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

FOLB50M1-SC

FOLB50S1-LC

Fibre 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 fibre signals and eliminate errors.

Fibre Optic In-Line Attenuators

- Provides loss to a fibre 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

GR-910 Compliant

FOAT50S1-LC-20DB   *FOAT55S1-LC-5DB*   *FOAT55S1-FC-2DB*   *FOAT50S1-SC-10DB*
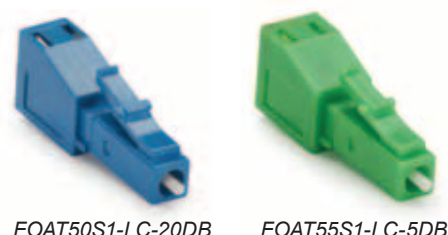
Fibre Optic In-Line Attenuators

Single mode, Male, Female			Single mode, Male, Female			Single mode, Male, Female	
FC APC	2 dB	FOAT55S1-FC-2DB	SC APC	2 dB	FOAT55S1-SC-2DB	LC APC	2 dB	FOAT55S1-LC-2DB
	5 dB	FOAT55S1-FC-5DB		5 dB	FOAT55S1-SC-5DB		5 dB	FOAT55S1-LC-5DB
	10 dB	FOAT55S1-FC-10DB		10 dB	FOAT55S1-SC-10DB		10 dB	FOAT55S1-LC-10DB
	15 dB	FOAT55S1-FC-15DB		15 dB	FOAT55S1-SC-15DB		15 dB	FOAT55S1-LC-15DB
	20 dB	FOAT55S1-FC-20DB		20 dB	FOAT55S1-SC-20DB		20 dB	FOAT55S1-LC-20DB
UPC	2 dB	FOAT50S1-FC-2DB	UPC	2 dB	FOAT50S1-SC-2DB	UPC	2 dB	FOAT50S1-LC-2DB
	5 dB	FOAT50S1-FC-5DB		5 dB	FOAT50S1-SC-5DB		5 dB	FOAT50S1-LC-5DB
	10 dB	FOAT50S1-FC-10DB		10 dB	FOAT50S1-SC-10DB		10 dB	FOAT50S1-LC-10DB
	15 dB	FOAT50S1-FC-15DB		15 dB	FOAT50S1-SC-15DB		15 dB	FOAT50S1-LC-15DB
	20 dB	FOAT50S1-FC-20DB		20 dB	FOAT50S1-SC-20DB		20 dB	FOAT50S1-LC-20DB

Prepare 6- or 12-fibre loose-tube cables for field termination.

Fan-Out Kits

- Colour-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

Fan-Out Kits

6-Fibre Buffer Tube	
63.5 cm	EFN06-24
91.4 cm	EFN06-36
12-Fibre Buffer Tube	
63.5 cm	EFN12-24
91.4 cm	EFN12-36

For specs, go to www.black-box.de

EFN06
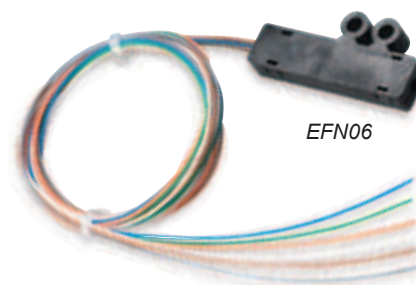
NOTE: For indoor use only.

The Black Box® Fan-Out Kit is specifically designed to enable you to terminate fibre oose-tube cables. Loose-tube distribution cable protects each strand of fibre in its own buffer sheath. Although the buffers are ideal for protecting each strand of fibre in multifibre cables, they're too narrow to terminate with standard fibre 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 colour-coded to match your fibre cable's colour scheme and it's available in lengths of 63.5 or 91.4 cm for 6- or 12-fibre cables.

For more information and our online store, visit www.black-box.de\USForces_Ger.

BLACK BOX

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Make 6 or 12 connections in no time at all.

Fibre Optic Pigtails- Multicore

- Use in fibre termination enclosures or cable management boxes.
- One end gets spliced to the trunk cable. The other end has preterminated connectors, which feed into an adaptor panel.
- **Standard Warranty** — Lifetime

Fibre Optic Pigtails

OM1 62.5 micron Multimode, 3 m		OM3 50 micron Multimode, 3 m		OS1 Single mode, 3 m	
6 Strand		6 Strand		6 Strand	
LC	FOPT50M1-LC-6OR-3	LC	FOPT50M3-LC-6AQ-3	LC	FOPT50S1-LC-6YL-3
ST	FOPT50M1-ST-6OR-3	ST	FOPT50M3-ST-6AQ-3	ST	FOPT50S1-ST-6YL-3
SC	FOPT50M1-SC-6OR-3	SC	FOPT50M3-SC-6AQ-3	SC	FOPT50S1-SC-6YL-3
12 Strand		12 Strand		12 Strand	
LC	FOPT50M1-LC-12OR-3	LC	FOPT50M3-LC-12AQ-3	LC	FOPT50S1-LC-12YL-3
ST	FOPT50M1-ST-12OR-3	ST	FOPT50M3-ST-12AQ-3	ST	FOPT50S1-ST-12YL-3
SC	FOPT50M1-SC-12OR-3	SC	FOPT50M3-SC-12AQ-3	SC	FOPT50S1-SC-12YL-3

Get the best terminations for your fibre installation.

Fibre Optic Pigtails- Individual

- Single Mode OS1/2
- Fully loaded with couplers
- Slide out tray with space for splice trays / cable spools
- LC connectors SC & ST also available.
- **Standard Warranty** — Lifetime

Fibre Optic Pigtails are essential when terminating cables within splice enclosures. Using these pre-polished assemblies reduces the risk of poor connector termination.

Plus, in addition to the standard versions shown here, we can also make customised pigtails that meet your needs. From industry-standard 62.5-/125-µm multimode to 9-/125-µm single mode alll the way up to state-of-the-art OM3 50-/125-µm cable assemblies, we can supply them all.

NOTE: Other lengths and connector versions available on request.

Pigtails, OS1/2 Single mode

ST, 1 m	EFE186-001M-P
SC, 1 m	EFE188-001M-P
LC, 1 m	EFE180-001M-P
MT-RJ, 1 m	EFE187-001M-P
MT-RJ, 1 m	EFE189-001M-P
MT-RJ, 1 m	EFE183-001M-P

Pigtails, OM1 62.5-/125-pm Multimode

ST, 1 m	EFE173-001M-P
SC, 1 m	EFE175-001M-P
LC, 1 m	EFE170-001M-P
MT-RJ, 1 m	EFE176-001M-P

Pigtails, OM2 50-/125-pm Multimode

ST, 1 m	EFE273-001M-P
SC, 1 m	EFE275-001M-P
LC, 1 m	EFE270-001M-P
MT-RJ, 1 m	EFE276-001M-P
E-2000, 1 m	EFE279-001M-P

Pigtails, OM3 50-/125-pm Multimode

ST, 1 m	EFE373-001M-P
SC, 1 m	EFE175-001M-P
LC, 1 m	EFE170-001M-P
MT-RJ, 1 m	EFE176-001M-P
E-2000, 1 m	EFE379-001M-P

The practical accessories for your fibre 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 organises your cables.

No-Adhesive Mechanical Splice (FO030)

Splice Trays
- Make splices on up to 12 or 24 strands of single mode or multimode fibre optic cable.
- The Splice Trays mount inside fibre enclosures and come with a lid to protect your splices.
- The JPM440A works with the following fibre 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 fibre cable into each end of the splice and twist. A cam locks the fibres into position for accurate alignment.
- Make quick, clean, no-adhesive splices.
- Works with 250- or 900-µm cladding.
- Use the WP602 to protect and organise 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 www.black-box.de
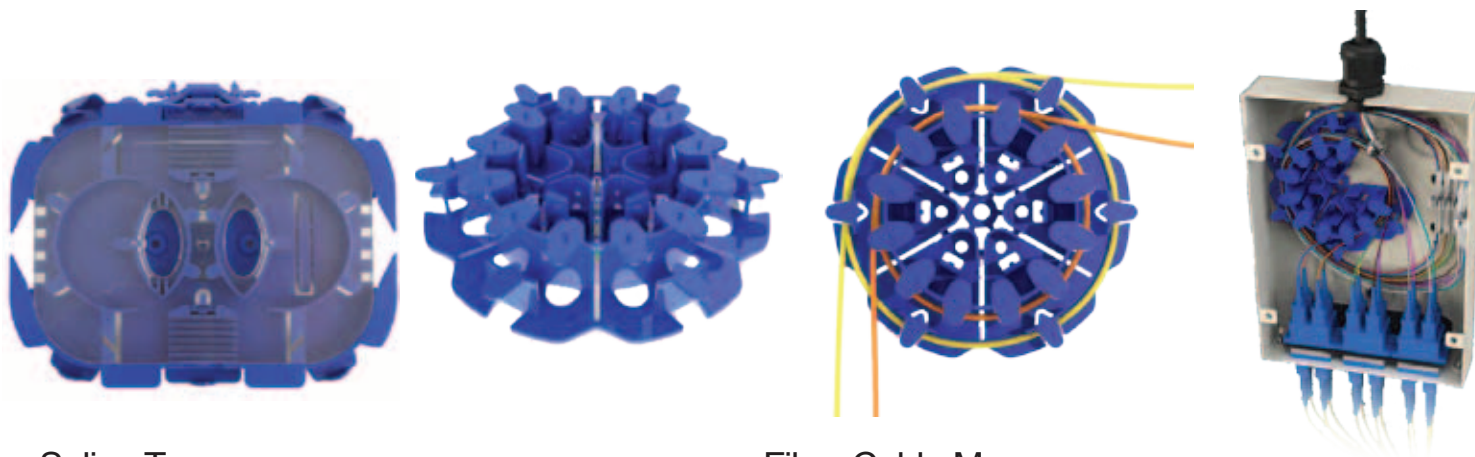
Splice Tray

Terminate long runs in this compact unit.

- Supports up to 24 splices.
- Maintains 30-mm bend radius.
- Allows storage of 250µm or 900µm fibre.
- Supports either heatshrink or crimp style splice protector.
- Clips together to form a stack.
- Cable diameters up to 3 mm.

Splice Trays	
Fibre Splice Tray, Heatshrink Style	JPU001-H
Fibre Splice Tray, Crimp Style	JPU002-C

For specs, go to www.black-box.de

Fibre Cable Manager

Maintain correct bend radius with this versatile manager.

- Maintains 30-mm bend radius.
- Six segments — may be split.
- Includes self-adhesive mounting pad.
- May be stacked.

Fibre Cable Manager	JPU006

For specs, go to www.black-box.de

Connector Guide

Coax & Twinax Connectors

TNC

BNC

Twinax

F-Type Coax

N-Type Coax

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)
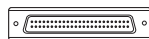
Micro D 50 M
Thumbscrew (HP® Male)

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
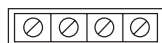
Terminal Bl°Ck

Current Loop

SDL

IEC

Need help identifying a connector? Call Tech Support at 0811-5541 112 or go to www.black-box.de

D-Style Connectors

DB9   DB15   DB25   DB37   DB50

Keyboard/Video/Audio

S-Video   BNC   RCA Jack   HD15   HD15 Video (Pin 9 Keying)
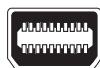
HDMI Micro   Mini Display Port   HDMI   Display Port
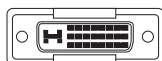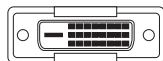
DVI-I, Dual Link   DVI-D, Dual LInk   DVI-D, Single-Link   DVI-A   DVI-I, Single-Link

Fibre Connectors

ST®   SC   LC   MT–RJ
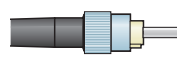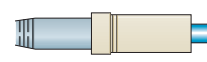
E2000   FC   MPO   MU

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
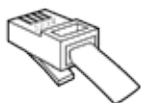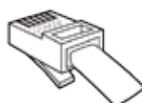
RJ-11 4-Wire Plug   RJ-12 6-Wire Plug   RJ-45 8-Wire Plug
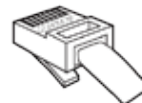
RJ-11 Jack   RJ-12 Jack   RJ-45 Jack   MMJ

Interface Pinouts

Video Interface Pinouts

VGA interface

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
Reserved	15		5	Ground
			10	Ground
Vertical Sync	14		4	ID Bit
Plug	9		9	Plug (No Pin)
Horizontal Sync	13		3	Blue
			8	Blue Ground
Monitor Sense 1	12		2	Green
			7	Green Ground
Monitor Sense 0	11		1	Red
			6	Red Ground

HDMI interface

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
TMDS Data2+ (HDMI)	1		2	TMDS Data 2 Shield
TMDS Data 2–	3		4	TMDS Data 1+
TMDS Data1 Shield	5		6	TMDS Data 1–
TMDS Data 0+	7		8	TMDS Data 0 Shield
TMDS Data 0–	9		10	TMDS Clock+
TMDS Clock Shield	11		12	TMDS Clock–
CEC	13		14	Reserved
SCL	15		16	SDA
DDC/CEC Ground	17		18	+5 V Power
Hot Plug Detect	19			

DVI interface

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
TMDS Data 2–	1		17	TMDS Data 0–
TMDS Data 2+	2		18	TMDS Data 0+
TMDS Data 2/4 Shield	3		19	TMDS Data 0/5 Shield
TMDS Data 4–	4		20	TMDS Data 5–
TMDS Data 4+	5		21	TMDS Data 5+
DDC Clock	6		22	TMDS Data Cl°Ck Shield
DDC Data	7		23	TMDS Clock +
Analog Vertical Sync	8		24	TMDS Clock –
			16	
Analog Red Video Out (DVI-I)	C1		C3	Analog Blue Video Out (DVI-I)
Analog Green Video Out (DVI-I)	C2		C4	Analog Horizontal Sync (DVI-I)
			C5	Analog Common Ground

Centre PINS

TMDS Data 1–	9	+5 V Power	14	
TMDS Data 1+	10	Ground	15	
TMDS Data 1/3 Shield	11	Hot Plug Detect	16	
TMDS Data 3–	12			
TMDS Data 3+	13			

DisplayPort interface

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
Main Link Lane 0+	1		2	Ground
Main Link Lane 0–	3		4	Main Link Lane1+
Ground	5		6	Main Link Lane1–
Main Link Lane 2+	7		8	Ground
Main Link Lane 2–	9		10	Main Link Lane 3+
Ground	11		12	Main Link Lane 3–
Configuratio 1	13		14	Configuratio 2
Auxiliary Channel+	15		16	Ground
Auxiliary Channel–	17		18	Hot Plug Detect
Return	19		20	Connector Power (3.3 V, 500 mA)

USB Interface Pinouts

USB 3.0 Type A

4 Ground	3+ Data	2 - Data	1 + 5 Volts

5 RX–	6 RX+	7 TX–	8 TX–	9 TX+

USB 3.0 Type B

9 RX+	8 RX–	7 Ground	6 TX+	5 TX–

1 +5 Volts   2 D–

4 Ground   3 D+

USB 3.0 Mini B

1 2 3 4 5   6 7 8 9 10

1: VBUS	6: TX–
2: D-	7: TX+
3: D+	8: Ground
4: ID	9: RX–
5: Ground	10: RX+

USB 1.1 & 2.0 Type A

1 +5 Volts	2 – Data	3 + Data	4 Ground

USB 1.1 & 2.0 Type B

2 – Data	3 + Data	4 Ground	1 +5 Volts

USB 1.1 & 2.0 Mini Type A

5 Ground	4 ID	3 + Data	2 – Data	1 +5 Volts

USB 1.1 & 2.0 Mini Type B

5 Ground	4 (Not Used)	3 + Data	2 – Data	1 +5 Volts

IBM Interface Pinouts

IBM PS/2® Keyboard Interface (6-Pin Mini DIN)

6 Reserved		5 Cl°Ck
4 +5 Volts		3 Ground
2 Reserved		1 Data

IBM® PC Keyboard Interface (5-Pin DIN)

3 Keyboard Reset
5 +5 Volts
2 Keyboard Data
1 Keyboard Clock
4 Ground

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Interface Pinouts

Data Interface Pinouts

RS-232 Interface (DB25)

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
Secondary Transmitted Data	14		1	Protective Ground
DCE Transmitter Signal Element Timing	15		2	Transmitted Data
Secondary Received Data	16		3	Received Data
Receiver Signal Element Timing	17		4	Request to Send
	18		5	Clear to Send
Secondary Request to Send	19		6	Data Set Ready
Data Terminal Ready	20		7	Signal Ground/Common Return
Signal Quality Detector	21		8	Received Line Signal Detector
Ring Indicator	22		9	+ Voltage
Data Signal Rate Selector	23		10	– Voltage
DTE Transmitter Signal Element Timing	24		11	
	25		12	Secondary Received Line Signal Indicator
			13	Secondary Clear to Send

RS-232 Interface (DB9)

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
			1	Received Line Signal Detector (Data Carrier Detect)
Data Set Ready	6		2	Received Data
Request to Send	7		3	Transmitted Data
Clear to Send	8		4	Data Terminal Ready
Ring Indicator	9		5	Signal Ground

RS-449 Interface (DB37)

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
Receive Common	20		1	Shield
	21		2	Signaling Rate Indicator
Send Data	22		3	
Send Timing	23		4	Send Data
Receive Data	24		5	Send Timing
Request to Send	25		6	Receive Data
Receive Timing	26		7	Request to Send
Clear to Send	27		8	Receive Timing
Terminal in Service	28		9	Clear to Send
Data Mode	29		10	L°Cal Loopback
Terminal Ready	30		11	Data Mode
Receiver Ready	31		12	Terminal Ready
Select Standby	32		13	Receiver Ready
Signal Quality	33		14	Remote Loopback
New Signal	34		15	Incoming Call
Terminal Timing (B)	35		16	Select Frequency
Standby/Indicator	36		17	Terminal Timing
Send Common	37		18	Test Mode
			19	Signal Ground

Centronics® Parallel Interface

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
Undefined	36		18	(+) 5 Volts
Undefined	35		17	Chassis Ground
Undefined	34		16	Logic Ground
Undefined	33		15	Oscillator Transmit
Fault (Active LOW)	32		14	Supply Ground
Input Prime (Active LOW)	31		13	Select (Active HIGH)
Input Prime (RETURN)	30		12	Paper End (Active HIGH)
Busy (RETURN)	29		11	Busy (Active HIGH)
Acknowledge (RETURN)	28		10	Acknowledge (Active LOW)
Data Bit 8 (RETURN)	27		9	Data Bit 8 (MSB)
Data Bit 7 (RETURN)	26		8	Data Bit 7
Data Bit 6 (RETURN)	25		7	Data Bit 6
Data Bit 5 (RETURN)	24		6	Data Bit 5
Data Bit 4 (RETURN)	23		5	Data Bit 4
Data Bit 3 (RETURN)	22		4	Data Bit 3
Data Bit 2 (RETURN)	21		3	Data Bit 2
Data Bit 1 (RETURN)	20		2	Data Bit 1 (LSB)
Data Strobe (RETURN)	19		1	Data Strobe (Active LOW)

V.35 Interface (M/34)

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
Signal Ground	B		A	Chassis Ground
Clear to Send	D		C	Request to Send
Receive Line Signal Detect			E	Data Set Ready
Local Loopback	J		H	Data Terminal Ready
Test Pattern	L		K	Test Mode
Received Data (A)	R		P	Transmitted Data (A)
Received Data (B)	T		S	Transmitted Data (B)
Receive Timing (A)	V		U	Terminal Timing
Receive Timing (B)	X		W	Terminal Timing
			Y	Transmit Timing (A)
Remote Loopback	BB		AA	Transmit Timing (B)

RS-530 Interface (DB25)

SIGNAL DESIGNATION	PIN		PIN	SIGNAL DESIGNATION
Transmitted Data (B)	14		1	Shield (A)
Transmitted Signal Element DCE (A)	15		2	Transmitted Data (A)
Received Data (B)	16		3	Received Data (A)
Receiver Signal Element Timing DCE(A)	17		4	Request to Send (A)
Local Loopback	18		5	Clear to Send (A)
Request to Send	19		6	DCE Ready (A)
DTE Ready (A)	20		7	Signal Ground
Remote Loopback	21		8	Received Line Signal Detector (A)
DCE Ready (B)	22		9	Receiver Signal Element Timing—DCE (B)
DTE Ready (B)	23		10	Received Line Signal Detector (B)
Transmitter Signal Element Timing DTE (A)	24		11	Transmitter Signal Element Timing—DTE (B)
Test Mode	25		12	Transmitter Signal Element Timing—DCE (B)
			13	Clear to Send (B)

1394 (FireWire®) 4-Wire Interface

TPB-1   2   TPB+

TPA-3   4   TPA+

Pinout Checkers

Monitors

Taps

Serial

Fault Detection

PoE

CATx

Network Analysers

Tone/Probe

Copper

Testers

Network Taps

Video

BLACK BOX
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Testers & Tools

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Whether you need to maintain a small office or a large entreprise, Black Box has the professional testing solutions for you. With the latest products, a great selection, and free, 24/7 tech support, we're your go-to source.

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And when you're out in the field, no need to muddle through a manual—just call us!

Fibre

Fault Detection

Light Sources

Power Metre

Network Analysers

Working with Fibre

Core   Cladding Coating   Strengthening   Cable Jacket
                             Fibres
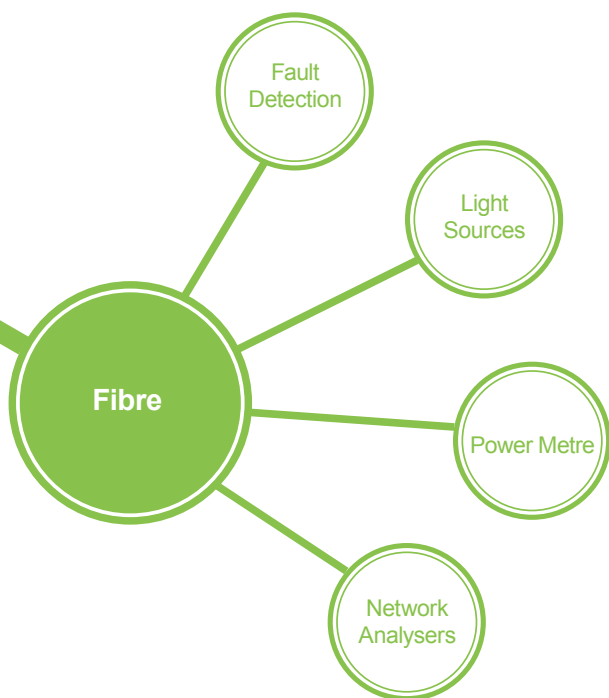
Fibre's ability to carry light signals, with very low losses, is based on some fundamental physics associated with the refraction and reflection of light. Whenever a ray of light passes from one transparent medium to another, the light is affected by the interface between the two materials. This occurs 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 fibre 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.

Fibre Optic Characteristics

Optical fibre   allow data signals to propagate through them by ensuring that the light signal entres the fibr   at an angle greater than the critical angle of the interface between two types of glass. The centre 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 fibres and a jacket.

When light is introduced into the end of an optical fibre any ray of light that hits the end of the fibr   at an angle greater than the critical angle will propagate through the fibre Each time it hits the interface between the core and the cladding it is reflecte   back into the fibre The angle of acceptance for the fibr   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 fibr   within this cone of acceptance will travel through the fibre Once the light is inside the fibre it "bounces" through the core, reflectin   inward each time it hits the interface.

The illustration below depicts how light rays travel through the fibre reflectin   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 reflec at different angles. Because they travel different paths
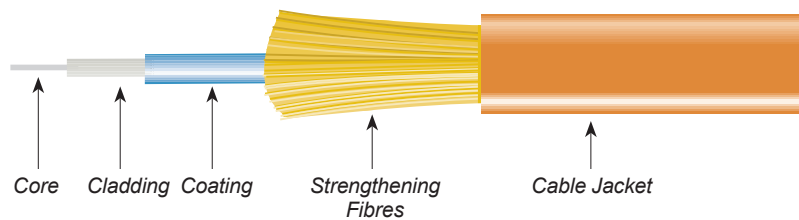
through the fibre the distance they travel also varies. As a result, they arrive at the receiver at different times. A pulse signal sent through the fibr will emerge wider than it was sent, deteriorating the quality of the signal. This is called modal dispersion.

Another effect that causes deterioration of the signal is chromatic dispersion. Chromatic dispersion is caused by light rays of different wavelengths travelling at different speeds through the fibre When a series of pulses is sent through the fibre 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 fibr   is attenuation. Although the glass used in the core of optical fibr   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 fibr 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 moulded and fit closer to the fibre, which gives the fibre 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 characterised by low loss, good quality, and a long life. However, they are not as precisely moulded and slightly easier to damage, so they aren't as well-suited for critical connections.

Signal Sources and Detectors

To use fibre 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.

Permitted angle

Coating and strengthening fibres
Cladding (1.45 refractive index)

Core (1.5 refractive
index) (8.5–62.5 μm)

Light Traveling Through a Fibre
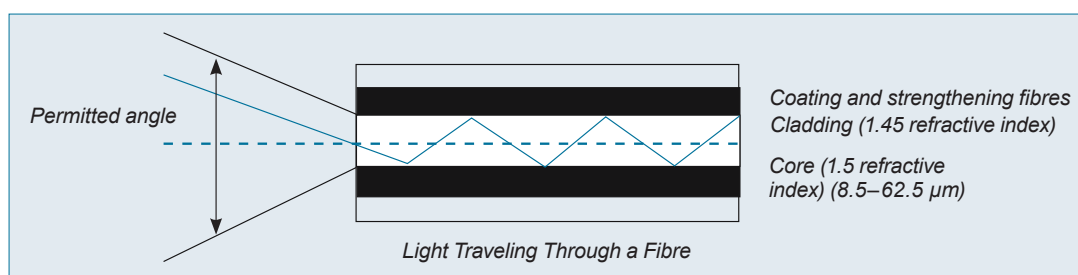
Signal detectors also fall into two main categories—PIN photodiodes and avalanche photodiodes.

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 Fibres

In practical situations, fibre optic cables exhibit signal power losses based on both the fibre and connections from the fibre to sensors or other fibre segments. Typically fibre losses run at about 10 decibels (dB) per kilometer.

Whenever a fibre must be terminated, the goal is to produce a perfectly transparent end to the fibre. 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 fibre together. Others mechanically align the fibres and use a transparent gel to couple the ends of the fibre together.

Early fibre optic connections involved cutting the fibre, epoxying a special connector, and polishing the end of the fibre. 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 fibres 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 Fibre Optic Link

The most important consideration in planning a fibr optic link is the power budget specificatio 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.

Fibre attenuators are used with single mode fibr optic devices and cable to filte the strength of the fibr optic signal. Depending on the type of attenuator attached to the devices at each end of the fibr optic cable, you can diminish the strength of the light signal a variable amount, measured in decibels (dB). Why would you want to filte the strength of the fibr optic signal?

Single mode fibr is designed to carry a fibr optic signal long distances— as much as 70 kilometres. Fibre devices send this signal with great force to ensure that the signal, and your data, arrive at the other end intact.

But when two fibr devices connected with single mode fibr cable are close to each other, the signal may be too strong. As a result, the light signal reflect back down the fibr 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 fibr equipment farther apart, the easiest solution is to attach an attenuator to each fibr device.

Just as sunglasses filte the strength of sunlight, attenuators filte the strength of the light signal transmitted along single mode fibr cable. Within the attenuator, there's doping that reduces the strength of the signal passing through the fibr connection and minute air gaps where the two fibre meet. Fibre grooves may also be intentionally misaligned by several microns—but only enough to slow the fibr optic signal to an acceptable rate as it travels down the cable.

Before selecting an attenuator, you need to check the type of adaptor on your fibr devices. Attenuators typically fi into any patch panel equipped with FC, SC, or LC adaptors that contain either PC or APC contacts.

In addition to the type of adaptor, you also need to determine the necessary attenuation value, such as 5 or 10 dB. This value varies, depending on the strength of fibr 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 fibre optic cable because it's immune to electrical interference. You only need to check a few measurements.

Attenuation (or decibel loss)—Measured in decibels/kilometre (dB/km), this is the decrease of signal strength as it travels through the fibre cable. Generally, attenuation problems are more common on multimode fibre 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 fibre. This is commonly measured at wavelengths of 850 and 1300 nanometre. Compared to other operating frequencies, these two ranges yield the lowest intrinsic power loss. (NOTE: This is valid for multimode fibre 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 fibre optic cable because the OTDR value includes the distance the optic signal travels.

There are many fibre optic testers on the market today. Basic fibre 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 fibre 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 Fibre

A few properties particular to fibre optic cable can cause problems if you aren't careful during installation:

Intrinsic power loss—As the optic signal travels through the fibre 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 fibre caused by excessive bends, pinches, and kinks. Using cable with reinforcing fibres and other special manufacturing techniques minimises this problem.

Connector loss—Connector loss occurs when two fibre 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 fibre cable. Use clean components. Keep dirt and dust to a minimum. Don't pull the cable excessively or bend it too sharply around corners.

Confirm correct installation of your copper and fibre cabling supporting voice, video, data and CCTV applications.

SignalTEK II

- Tests copper and fibre optic networks.
- Supports voice, video, data and CCTV applications over 10/100/1000M Ethernet.
- Excellent wire mapping by pin and pair with distance to fault.
- IPv6 and IPv4 compatible.
- Full Gigabit bi-directional load cable tests.
- Detects and runs load test on Power over Ethernet.
- Simplified network load testing through hubs and switches.
- Document the network connectivity and generate detailed reports.
- **Standard Warranty** — 1 Year

Ports for both copper and fibre
Save money by employing a single device to test entire networks

Interchangeable fibre optic interface

User-exchangeable RJ45 inserts
Reduce downtime by not needing to send tester to a service centre

Interchangeable RJ45 socket

Virtual keyboard
Work efficiently, quickly and easily input data

Virtual keyboard

Autotest function
Reduce network downtime by speeding up testing of common applications

AUTO
Autotest

A choice of power inputs
Flexibility of working environment through options of rechargeable or alkaline batteries and mains power

Mains

Internal memory

USB interface and internal memory
Generate accurate customer reports more easily by exporting data via memory sticks

Backlit screen

2.8″ colour screen
Reduce the chance of false readings with a clear, bright and backlit screen

Cursor keys

Multifunction softkeys

Multifunction and cursor keys
Intuitive interface minimises user training requirements, plus improves productivity in the field as tests can be completed in minimal time

Durable moulding

Durable rubber moulded housing
Robust tester that stands up to demands of the user

SignalTEK II is a handheld cable and network qualifier designed to confirm correct installation of copper and fibre cabling capable of supporting voice, video, data and CCTV applications up to Gigabit Ethernet. SignalTEK II is a cost-effective way to test network links to performance standards including IEEE 802.3ab. With multiple network troubleshooting features including wiremap by pin with distance to fault, cable tracing and verifying Ethernet connectivity, SignalTEK II is a highly versatile and cost effective tool. The tester design is perfect for the cabling installer whose workplace requires a rugged and robust tool. When working in poorly lit areas the bright, backlit colour screen displays test results clearly. User-exchangeable RJ45 inserts and intuitive screen icons ensure the installer maximises productivity. Capable of multiple performance testing, the administrator operates, with confidence in the accuracy of

the results, both rapidly and with minimal user training. Completed jobs can be reported upon, using the internal memory and USB interface to export results.

SignalTEK II performs active network testing through hubs and switches all the way to the server. Not only does it detect and run load testing on PoE and PoE+, the tester is specifically capable of running full bi-directional Gigabit tests, providing time savings and assurance of network performance. Incorporating IPv6 compatibility, SignalTEK II provides a future-proof investment for all who need a cable qualifier. Simplify customer reporting and create accurate documentation on jobs undertaken using SignalTEK II to generate and store test results in standards compliant XML format. Additionally, view and export results to enable report printing.

SignalTEK II

SignalTEK II (copper)	156000
SIgnalTEK II FO (copper & fibre)	156001

You may also need:

Active Remote Adaptor #1	150054
Active Remote Adaptor #2-6	150059
Active Remote Adaptor #2-12	150050
(10) Spare RJ-45 Jacks with Tool	150058
Amplifie Probe	62-164

Accessories for fibr tests with SignalTEK II FO

1000Base-SX Fibre SFP	MGKSX1
1000Base-LX Fibre SFP	MGKLX2
1000Base-ZX Fibre SFP	MGKZX3

For full features, specs, delivery content and pricing, go to www.black-box.de

Choose your power level: from basic for occasional testing, all the way up to a combo meter/light source for advanced field testing.

Power Meter

FOPM-100 *FOPM-200* *FOPM-210* *FOMM-200*

Basic Optical Power Meter
- Use to identify optical fibre 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 parametre 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 savedas an Excel® file or plain text.
- FOPM-100, FOPM-200, and FOPM-210 work with our fibre Light Sources (below).

- **Standard Warranty** — All: 2 Years
- **Extended Warranty** — Add 1 or 3 Years

Optical Power Metre

Basic	FOPM-100
Deluxe	FOPM-200
with Memory	FOPM-210
with Memory and Light Source	FOMM-200

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

Choose the right light for you: basic for occasional testing, deluxe for advanced field testing.

Light Sources

FOLS-SM-100 *FOLS MM-100* *FOLS-SM-200* *FOLS MM-200*

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 Fibre Optic Power Meter (above) to measure optical loss.

Deluxe Light Sources
- Auto wavelength recognition automatically uses the proper calibration parametre.
- 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 black-box.de
For pricing details, call 0811-5541 112

Locate faults in your fibre cables with this handy pocket tool

Visual Fault Finder

- Works up to 5km.
- Rugged metal housing.
- Carry case with belt loop included.
- 30 hours continuous use from two AA batteries.
- 2.5mm adaptor for all ST, SC and FC connectors.

Visual Fault Finder

TSVFF

For full features and specs, go to black-box.de.
For pricing details, call 0811-5541 112.

Safely repair a problem fibre without disrupting live fibres.

Live Traffic Identifier

- Identifies bad connectors and splice points.
- For single-mode and multimode fibre.
- Detects low frequency tones at 270 Hz, 1 kHz, and 2 kHz.
- Includes three field-interchangeable adaptor heads to accommodate 900-µm buffered fibre, ribbon or 250-µm coated fibre, and 3-mm jacketed fibre.
- **Standard Warranty** — 2 Years
- **Extended Warranty** — Add 1 or 3 Years

Live Traffic Identifier

FOLTI

* Includes (1) fibre optic probe; (3) adaptor heads for jacketed, coated, and ribbon fibre; (1) carrying case.

For full features and specs, go to black-box.de.
For pricing details, call 0811-5541 112.

Identify faults and leaks in fibre cable.

Visual Light Source Pen for Fibre

- Isolates light leaks or breaks in single- or multimode fibre optic cable.
- Identifies bad connectors and poor splices.
- Works with jacketed and bare fibre.
- 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

Visual LIght Source Pen for Fibre (FOVFL-PEN)

Break

Fibre Cable

Having trouble with data getting garbled over your fibre 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 fibre 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 fibre optic network.

You'll be able to locate sharp bends and breaks in jacketed or bare fibre connections in patch panels and fanouts.

Visual Light Source Pen for Fibre

FOVFL-PEN

For full features and specs, go to black-box.de.
For pricing details, call 0811-5541 112.

Professionally clean your fibre optic installation.

Fibre Optic Cleaning Kit

What's included:

- 100 x Lint free cleaning tissues
- 100 x 2.5mm foam cleaning buds
- 10 x 1.25mm MicroFibre Cleaning Sticks
- 1 x IPA cleaning wipes
- 1 x FibreCare Connector Cleaning Fluid
- 1 x FibreCare Fibre Prepartion Fluid
- 1 x Black Carry Case

Fibre Optic Cleaning Kit

FOU-CL1

For full features and specs, go to black-box.de.
For pricing details, call 0811-5541 112.

Modular Fibre Optic Cleaner

Modular MPO/MTP Cleaner

These tools are capable of cleaning MT based connector systems loaded in a bulkhead adaptor, on the card edge, the backplane and on unmated cable assemblies.

MPO Alcohol-free Cleaner

MTPCL1

For full features and specs, go to black-box.de.
For pricing details, call 0811-5541 112.

Fibre Cleaver

- The intuitive design of the single-pass cleave mechanism ensures the Fibre Cleaver is reliable, quick, and easy to use in the field.
- Diamond blade can perform up to 60,000 cleaves with a typical angle of 90±0.5°.
- Blade is adjustable and replaceable.
- Includes a leather carrying case.

Fibre Cleaver

FOCLVR

Carbide Pen Cleaver

This well presented pen-style scribe uses a 30° wedge shaped carbide tip. Its design makes for quick and preceise cleaving of optical fibre.

Carbide Pen Cleaver

FOUPC

Fibre Optic Stripper

This hard wearing, easy to handle fibre optic stripping tool includes three stripping guides for 2-mm outer jacket, 900-pm Buffer and 250-pm acrylic coating, afety catch and factory set adjuster.

Fibre Optic Stripper

FOUS

Jacket Stripper

Ideal for stripping jackets from backbone cable between 4.5-mm and 25-mm in diameter. A small rotating blade accurately splits the circumference of the jacket, then by flicking a switch, the same blade will rotate 90° and is used to split the jacket down one side for easy removai.

Jacket Stripper

FOUJS

Kevlar® Scissors

Light-weight shears ideal for cutting the Kevlar® strength members found in fibre optic cables. Ergonomic, moulded handles provide comfort for both right and left-handed users. The one micro-serrated blade reduces slipping for more positive cutting action.

Kevlar® Scissors

FOUKS

Fibre Crimp Tool

- Includes a ratchet mechanism for consistent crimping.

Fibre Crimp Tool

FOUCT

Best Practices: Copper

By Doug Matovich, Tech Support Specialist

Cable being stripped.
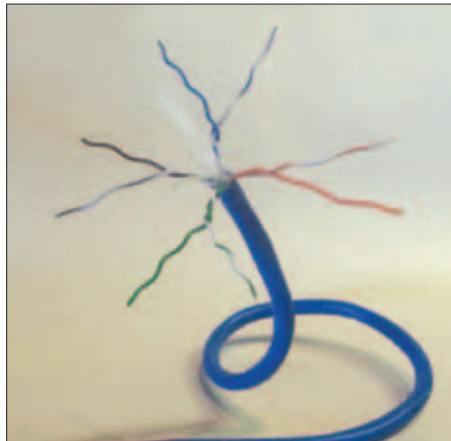
Cable pairs being twisted to a half-inch maximum.

Cable being punched down.
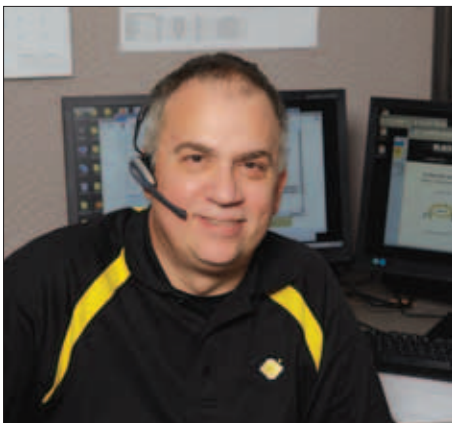
Doug Matovich, Tech Support Specialist

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 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's better have the right fire rating on the jacket. It is expensive and time consuming to remove thousands of metres 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: LSZH, PVC, UV-resistant, mould-resistant, low temperature, to name a few.

Use the proper jacket for the job at hand. Learn about LSZH versus PVC jackets.

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 basket.

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 fibre optic 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 labelled 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 It is the same as AT&T's old 258A colour 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 colour code on the jack and patch panel (T568A or B).

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 30 cm 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.

Comprehensive and user friendly in-line end-point tester for Ethernet connectivity and cabling issues including copper, fibre and Wi-Fi.

LanXPLORER

- Intuitive operation via a full-colour 3 1/2" touchscreen display.
- A single tester for network tests over copper, MM/SM fibre or Wi-Fi.
- Support of 10/100/1000 Ethernet.
- Inline tests and PC diagnostics through dual RJ-45 copper ports (top talker, protocol, packet size distribution etc.).
- Wire mapping by pin and pair with distance to fault.
- Scan the network for Wi-Fi access points and pinpoint issues incl. rogue devices.
- PoE/PoE+ testing.
- Monitor calls and quality of VoIP, including RTP jitter.
- Full bandwidth Layer 1, 2 and 3 Loopback device.
- DHCP client, Ping and Traceroute tests with VLAN support.
- Identify active devices on the network and compare with historical data.
- Detailed network statistics and device mapping that can be stored and exported.
- **Standard Warranty** — 1 Year

LanXPLORER is a versatile handheld network maintenance and troubleshooting tool capable of testing active and passive LAN connections over both copper and fibre. Most tests can also be performed through a Wi-Fi connection liberating the user from having to a make physical connection to the network.

LAN management professionals will benefit greatly from the sizeable time-saving potential and multifunction capabilities of LanXPLORER. Highly valuable in multimedia environment, the network tester provides active and passive troubleshooting capabilities for cabling issues and Ethernet connectivity. Systems integrators particularly would bene-fit from the in-line test capabilities to measure voice Quality of Service (QoS) between VoIP phones and the network.

Or use LanXPLORER as an essential tool to diagnose low level Ethernet issues by connecting in-line between devices, and identify errors that cannot be detected by Windows applications or managed switches. Applications that require increased network bandwidth are becoming more prevalent. IT consultants are needed to troubleshoot network access problems, bad quality of VoIP calls and other network bandwidth issues. LanXPLORER determines whether the issue lies within the network or attached devices. For facility maintenance and Industrial Ethernet, LanXPLORER documents network mapping and Ethernet statistics.

Improve productivity over the large back-lighted colour screen with easy navigation.
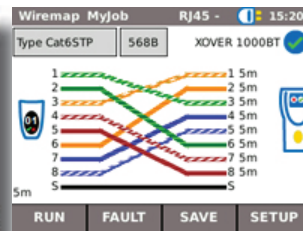
Clearly see cable faults, know where they are and validate repairs.
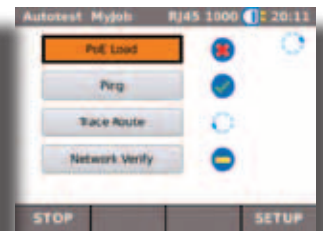
Test and validate any network, and PoE resources.

In loopback mode it can partner transmission testers to measure Ethernet throughput up to 1 Gbps.

For IT professional carrying out Moves, Adds or Changes to their existing network, LanXPLORER is the perfect single device companion to test copper, fibre and Wi-Fi. As a fully-featured tester, LanXPLORER is a future-proofed investment to deliver against IPv6 internet addresses, plus PoE+ detection and PoE+ current tests including load and in-line. Thanks to its Autotest functions, a virtual keyboard and intuitive screen icons, the tester is an essential portable troubleshooting device that is easy to use and understand.

LanXPLORER

BASIC (copper)	150002
PLUS (copper, Wi-Fi)	150004
PRO (copper, fibre, Wi-Fi)	150001

You may also need:

Active Remote Adaptor #2-6	150059
Active Remote Adaptor #2-12	150050
(10) Spare RJ-45 Jacks with Tool	150058
Amplifie Probe	62-164

Accessories for fibr   tests with LanXPLORER PRO

1000Base-SX Fibre SFP	MGKSX1
1000Base-LX Fibre SFP	MGKLX2
1000Base-ZX Fibre SFP	MGKZX3

For full features, specs, delivery content and pricing, go to black-box.de

Front line technician's versatile troubleshooter for LAN Management and Monitoring Services.

NaviTEK II

- Maintain active and passive networks across copper and fibre.
- Pinpoint and solve networking issues quickly and efficiently.
- Test Power over Ethernet and LAN/Internet connectivity when installing new devices.
- Detect cable issues and split pairs with wire mapping by pin as well as pair including the distance to fault.
- VLAN support (PLUS, PRO only).
- Generate, store and export test results in standard compliant XML formats (PLUS, PRO only).
- Log onto 802.1x secured networks (PRO only).
- Future-proof investment with support of IPv4 and IPv6 addresses as well as user replaceable RJ-45 jacks.
- Intuitive and easy to use with large backlit colour screen.
- **Standard Warranty** — 1 Year

NaviTEK II is a highly cost efficient solution, comprising multiple advanced test capabilities in just one robust, handheld tester. The tester is the perfect companion for IT Professionals who maintain and troubleshoot issues on copper and fibre networks. It's network scanning and auto-test functions quickly verify the connectivity after carrying out moves, adds or changes.

With wire mapping by pin and pair including the distance to fault, PoE capabilities, and support for VLAN and 802.1x secured networks, the tester pinpoints Ethernet and PoE issues completely to enable rapid fault finding and highly productive verifications.

NaviTEK II

BASIC (copper)	153000
PLUS (copper, VLAN, test export)	151001
PRO (a.a. + 802.1x, loopback)	151002

For full features, specs, accessories, and pricing, go to black-box.de

Quick and efficient Ethernet Service Testing

UniPRO

- Test or prove that services perform according to SLA.
- OneTouch to run multiple auto tests unattended.
- Industry Recognised Y.1564 and RFC2544 Tests.
- BERT and SLA-Tick Tests.
- Multi service stream test.
- Copper and Fibre Interfaces.
- Monitor top talkers and top VPNs.
- IPV4 and IPV6 support.
- Tests PoE and PoE+.
- Single and Dual Port models available.

Standard Warranty — 1 Year

The UniPRO Tester is a handheld Carrier Gigabit Ethernet tester and an intelligent loopback device for access and metro networks that allows you to get to the heart of "slow network" issues.
The UniPro tester is designed for full Ethernet testing of carrier service turn-up, mobile backhaul link, microwave and wireless link and for enterprise users to monitor carriers' SLA performance.

Use the UniPro if your service provider doesn't meet the SLA or you have a high WAN utilization where issues appear only at peak times when provider reduces bandwidth to committed information rate.

UniPRO

MGig1 Solo	152001
MGig1 Solo PLUS	152002
MGig1 Solo PRO	152003
MGig1 Duo	152008
MGig1 Duo PLUS	152009
MGig1 Duo PRO	152010
SEL1 Loopback Device	154000

For full features, specs, delivery content and pricing, go to black-box.de

Get big 10BASE-T, 100BASE-TX, and 1000BASE-T handheld testing with a small price tag.

TVR 10/100/1000 Tester

Remote Probe

Main 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

TVR 10/100/1000 Tester

TS029A-R5

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

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) RJ-45 to RJ-45 jumper cables
- (2) 9-V batteries
- Protective felt carrying case
- User manual

Locate cable runs and test for continuity and voltage.

Net Tone

What's included

- Tone generator
- Probe
- Carrying pouch
- (2) 9-V batteries

- 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 bl°Cks.
- **Standard Warranty** — 1 Year
- **Extended Warranty** — Add 1 or 3 Years

TS300A

Net Tone

TS300A

Power Panel CAT5/CAT6 DVM and Network PoE Tester

TS150A-R2

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

Gives accurate pass/fail results in one second.

EZ Check Cable Tester

EZ Check Cable Tester

EZCT

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

- 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

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NETWORK SERVICES

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 black-box.de
For pricing details, call 0811-5541 112

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 Termination Kit

FT490A-R3

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

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 Termination Kit

FT480A-R3

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

All the tools the pros use for PC repair.

Professional's Tool Kit

- **Standard Warranty** — Lifetime

Professional's Tool Kit

FT805-R2

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

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, www.black-box.de
- Crimp tool
- UTP/STP Cable Cutter/Stripper (FT116), www.black-box.de
- Type 110 and Type 66 reversible blades
- Punchdown Tool (FT025A)

- (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 www.black-box.de

For full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

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, adaptors, 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 full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

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 full features and specs, go to black-box.de
For pricing details, call 0811-5541 112

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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 mouldedrubber grip handles for extra comfort.
- **Standard Warranty** — 5 Years
- **Extended Warranty** — Add 1 or 3 Years
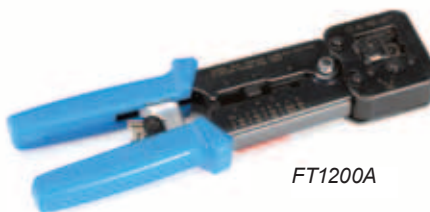
FT1200A
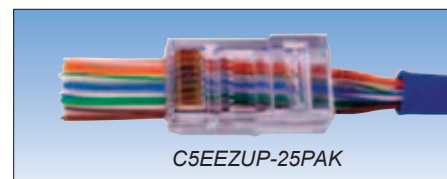
C5EEZUP-25PAK

EZ-RJPRO™ High-Density Crimp Tool

EZ-RPRO 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 www.black-box.de
For pricing details, call 0811-5541 112.

CAT6 EZ-RJ45 Modular Plugs, Unshielded, 25-Pack	C6EZUP-25PAK
CAT5e EZ-RJ45 Modular Plugs, Unshielded, 25-Pack	C5EEZUP-25PAK

For full features and specs, go to www.black-box.de
For pricing details, call 0811-5541 112

Related

Shielded and unshielded plugs, plus CAT6 EZ-RJ45 Boots

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
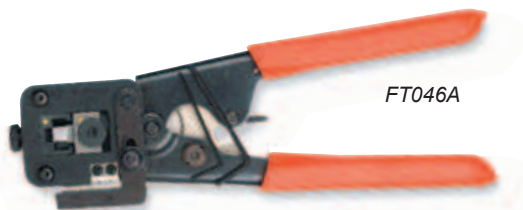
FT046A

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 www.black-box.de
For pricing details, call 0811-5541 112

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-l°Ck 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

For pricing details, call 0811-5541 112

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