



KVM Switching and Extension Guide

Desktop | Data Center | Enterprise



KVM Switching and Extension Guide

This guide presents education resources and the technology solutions needed to set up high-performance KVM extension and switching applications. Black Box simplifies the job of having to configure KVM, extension, and peripheral matrix switching systems, making it easier for users to plan and launch fully integrated extension and switching systems for their specific industry.



Technology Overview

Learn about some of the emerging technologies to be aware of as systems are designed.



Application Solutions

Find application diagrams and case studies from specific industries.



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Products

Enterprise

Share PCs, servers and video content among multiple users.



Data Center

Manage local and remote servers from a central location.



Desktop

Reduce costs and clutter, improve productivity and manage workflow.



Extension

Improve office ergonomics and equipment safety by backracking servers and CPUs while getting the benefits of high-definition digital video, audio and USB signal extension.



FREE, Live Application Engineering



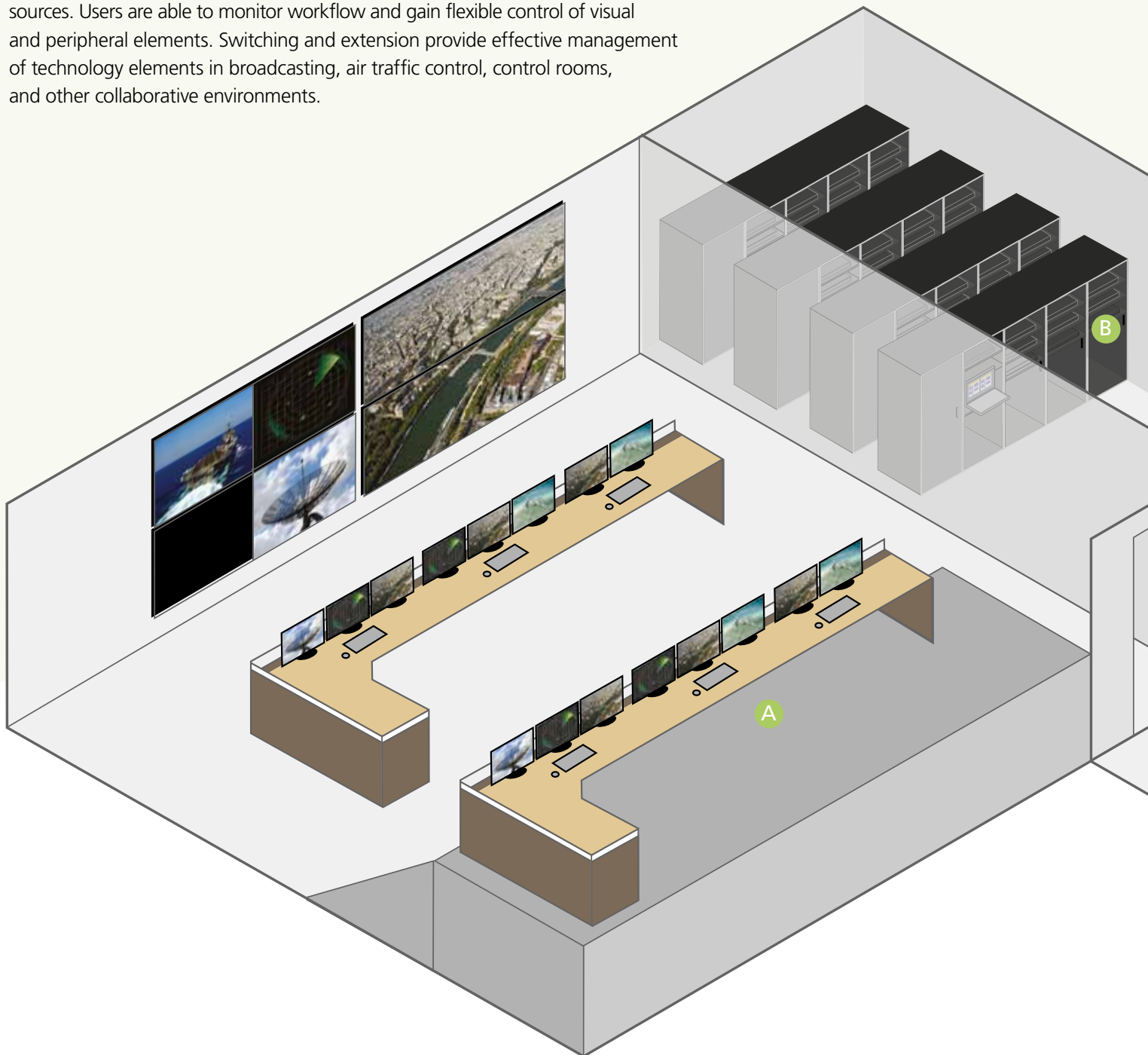
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Control, Convenience and Total Cost Savings

KVM (Keyboard, Video and Mouse) switches and extenders give users access to a variety of target devices, such as CPUs, digital signage, servers and other sources. Users are able to monitor workflow and gain flexible control of visual and peripheral elements. Switching and extension provide effective management of technology elements in broadcasting, air traffic control, control rooms, and other collaborative environments.



Additionally, KVM technology gives users:

- A small total cost of ownership (TCO).
- Improved operability and quick ROI.
- Maximum flexibility, scalability and improved reliability.
- Green IT solutions with energy-saving design and distribution.

A Command and Control Room with Remote KVM User Stations

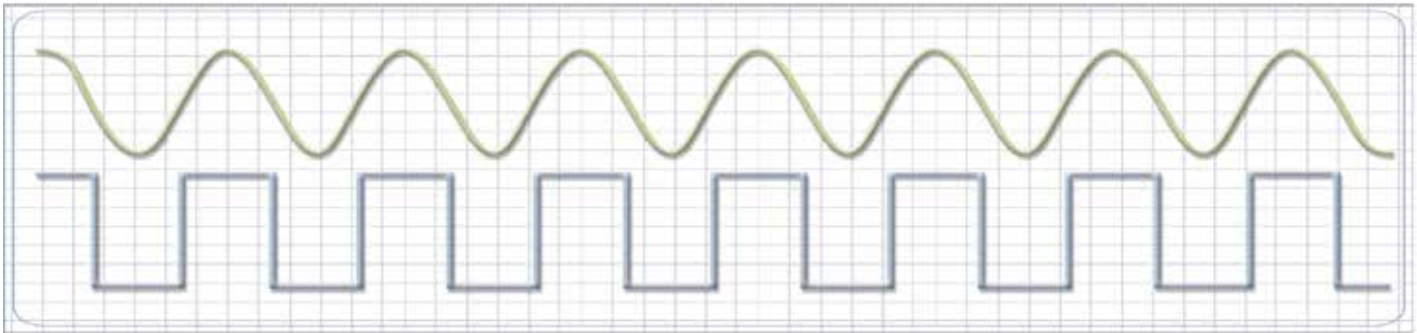
B Data Centre with Target Sources

C Office with Desktop KVM



Taking Video Extension the Distance It Needs to Go

By Erik Indresøvdé, KVM Product Manager



Analog versus Digital Video

Analog video (VGA)

An analog signal is continuously variable. Composite video, Component video, RGBHV, and VGA are types of analog video signals, with VGA being the most common video format used with PCs—at least until recently.

An analog video signal can be run over long lengths of native VGA cable as long as the diameter and shielding of the cable are good enough. However, regardless of the cable quality, signal attenuation increases with video frequency and cable length. This means that after 10 to 15 metres, the image quality will start to degrade.

This leads to color skew and smeared-looking text. To solve for signal degradation in VGA applications, use an extender that compensates for signal loss. A good extender has separate adjustments for high and low frequencies; HF loss is usually greater than LF loss.

Digital video

While analog video signals travel in a sine-like wave form, digital signals travel in a square-like waveform. A digital signal is broken into a binary format where the audio or video data is represented by a series of 1s and 0s. Like analog signals, digital video also suffers from loss, but as long as the cable is of sufficient quality and within the maximum supported distance, the signals don't suffer from blurring or color skew.

However, what you will get when the maximum supported cable length is exceeded is the "cliff" effect, where the digital signal drops off and the picture is completely lost. To overcome distance limitations, use extenders or repeaters.

DVI and HDMI Interfaces

Digital Video Interface (DVI)

DVI is the standard digital interface for PCs. The DVI standard is based on transition-minimized differential signaling (TMDS). DVI comes in two formats: single-link and dual-link. Single-link DVI has a maximum frequency of 165 MHz and dual-link DVI, as one would expect, has double the maximum frequency. A single-link interface can transmit a resolution of 1920 x 1200 vs. 2560 x 1600 for dual link.

The most common DVI connectors are:

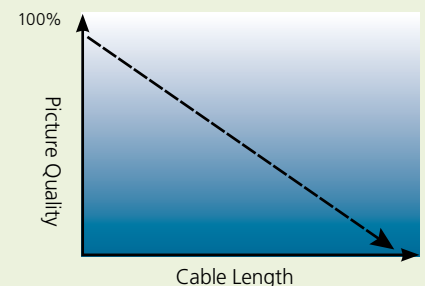
- DVI-D: A digital-only connector for use between a digital video source and monitors. DVI-D eliminates the analog pins.
- DVI-I (integrated): Supports both digital and analog RGB connections. It can transmit either a digital-to-digital signal or an analog-to-analog signal. It is used on products instead of separate analog and digital connectors.

High-Definition Multimedia Interface (HDMI)

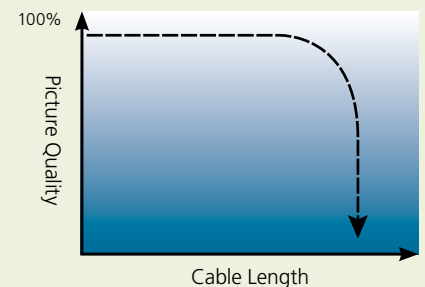
HDMI® is the standard digital interface for HDTV. It was the first digital interface to combine uncompressed HD video, up to eight channels of uncompressed digital audio and intelligent format and command data in a single cable. It is now the de facto standard for consumer electronics and HD video, although it is beginning to face competition from the newer DisplayPort (DP) interface. In addition, HDMI also uses TMDS signaling, like DVI and is backward compatible.

HDMI offers an easy, standardized way to set up AV equipment over one cable. Use it to connect equipment such as digital signage players, set-top boxes and AV receivers with HD TVs and video projectors. If the HDMI equipment supports higher-resolution HDMI standards, 3D displays can also be connected.

Analog vs. Digital Picture Quality



Picture quality of an analog signal gradually declines over longer lengths of cable.



Picture quality of digital signal (e.g. HDMI) suddenly drops at a certain length of cable (cliff effect).

HDMI also supports multiple audio formats, from standard stereo to multichannel surround sound. In addition, the interface provides two-way communications between the video source and HDTV, enabling simple, remote, point-and-click configurations.

HDMI supports high-bandwidth digital content protection (HDCP), which prevents distribution and copying of digital audio and video content sent over HDMI cable. If a device between the source and the display supports HDMI but not HDCP, the transmission won't work if the content is copyright protected.

HDMI is backward compatible with DVI equipment because, like DVI, it uses TMDS signaling. A DVI-to-HDMI adapter can be used without a loss of video quality to enable the connection. Because DVI only supports video signals, not audio, the DVI device simply ignores the extra audio data. However, dual link is not common in HDMI. DVI displays usually also are not able to display HDCP protected and/or component encoded (YCbCr) HDMI signals.

DisplayPort Interface

DisplayPort is the most recent digital video interface to be developed for commercial use. It is a standard for PCs.

The DisplayPort standard was designed as a replacement for DVI connectors on computer hardware. The connector is smaller and screwless for easier installation. The connector still has a locking mechanism to hold it in place, addressing a weakness of the HDMI connector. It is similar in specifications to HDMI, but it is more common for computers than for televisions.

DisplayPort uses a packet type of interface, just like an IP network does. The network-like design means a single connection can send multiple streams, so a single DisplayPort port can connect to more than one display.

DisplayPort uses very high speeds, enabled by the packet-type delivery that is implemented through chipsets. One can think of it as a high-speed network for digital video. DisplayPort uses a serial interface with up to four main data lanes that can carry multiplexed video and audio data. Each data lane supports a raw data rate of 1.62 Gbps, 2.7 Gbps, or 5.4 Gbps (DisplayPort 1.2 or later). Additionally, unlike with DVI, an audio channel is supported — up to eight channels of 16- or 24-bit at 48 KHz, 96 KHz, or 192 KHz.



DisplayPort and DVI

DisplayPort and DVI use different signal processing methods, but converting between the two can be done with adapters. Some DisplayPort ports have internal components to make them passively compatible with DVI signals, but this is not a DisplayPort requirement. This is known as Dual Mode, or DP++. It appears that DisplayPort is converted to DVI, but the hardware outputs a DVI signal through a DisplayPort port. If the hardware in use can't output the DVI signal, then a DisplayPort-to-DVI adapter won't operate. Users should look for the DP++ symbol.

DVI offers no audio support, which gives another advantage to DisplayPort. An additional advantage for DisplayPort is that packetizing data lowers demand on bandwidth. DVI uses separate data channels for each color, requiring high bandwidth all the time.

DisplayPort and HDMI

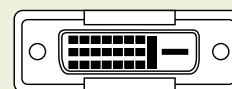
Since HDMI and DVI use the same signal technology, HDMI and DisplayPort have similar compatibility issues noted already.

HDMI is the digital standard targeted to home theater and DisplayPort was developed for use with computer electronics. However, feature-wise, DisplayPort is very similar to HDMI, including the inclusion of the HDCP content-protection standard. Some differences include:

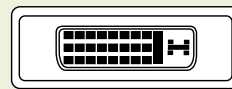
- DisplayPort has a maximum bandwidth that is larger than the maximum bandwidth of HDMI (10.8 Gbit/sec, compared to HDMI at 10.2).

- DisplayPort supports the DPCP (DisplayPort Content Protection) standard in addition to HDCP.
- DisplayPort is an open standard, available to all manufacturers at no cost; HDMI is licensed, which raises costs.
- DisplayPort supports resolutions up to 4K.

Connector Types



DVI-D Receptacle Connector



DVI-I Receptacle Connector



HDMI Connector



DisplayPort Connector

Taking Video Extension the Distance (continued from previous page)

Technical Aspects of Digital Video Extension

Lossless proprietary extension

When the TMDS signal collapses because of attenuation or too long of a cable it is no longer readable by a display. However, an extender or repeater uses a proprietary digital algorithm to transmit and receive signals over a specific distance and can equalize and reshape the TMDS signal for the end display. Proprietary extension technology enables users to extend HDMI or DVI to a remote display up to 30–35 metres away without any loss or signal degradation. Extension is possible over native HDMI or DVI cabling with a repeater device equalizing the signal, or over CATx with an extender setup that consists of transmitter and receiver devices.

HDBaseT extension

HDBaseT™ is the first technology to enable long-reach wired connectivity of uncompressed HD multimedia content via a single LAN cable. HDBaseT enables transmission of DVI or HDMI video and audio, 100BASE-T Ethernet, power and control signals from a source to a display over a standard CATx cable. By using sophisticated encoding and equalization techniques, it is possible to transmit the video signal as well as the peripheral signals uncompressed up to 100 metres. The chip has proven to be very reliable and is the only solution on the market today allowing transmission of uncompressed video on standard CATx cables at that distance.

Compressed digital extension and IP extension

Another technique to extend video over longer distances using reduced bandwidth is to use compression. Compression makes it possible to run the signal over longer-distance cable, up to 120 metres; to transmit it wirelessly; or to send it over a standard IP network, the local area network (LAN).

Compression does not have to mean low-quality video. Compressions may be lossy or lossless. The compressions used on cable TV or Internet video streams are usually lossy compressions, such as H.264. Although these compressions give sufficient image quality for digital signals, they are not suitable for high-quality computer images in control rooms or medical applications. These applications require higher bandwidth but usually run over a LAN where bandwidth is not an issue, not over the Internet. The best compression algorithms today make it possible to run Full HD computer images and video over the local network without any visual loss in quality.

IP extension is a way to extend an application over long distances. IP extension is flexible and expandable and provides the option of using either CATx or fibre optic cabling, depending how far the video has to go. IP-based extenders usually send data over a 100 metres segment, but can be extended farther by using Ethernet switches as repeaters; or, if using fibre cable, go even farther, up to 16 km.

Fibre optic extension

For the really long runs exceeding 120 metres, the best option is fibre optic extension, unless multiple repeaters can be used or the signal is run over an IP network. The biggest advantage with optical extension is the very high bandwidth compared to copper cable. This makes it possible to transmit lossless, full HD signals over great distances—up to hundreds of metres. Furthermore, using a fibre cable makes the connection optically isolated, getting rid of any issues with ground loops, etc. This is usually required in hospitals and other critical applications. An optical connection is also immune to EMI noise, making it the perfect choice for industrial applications.



Lossy to lossless compression.

6 Reasons to Switch to Digital KVM Today

By Dawn Mangine, KVM Marketer



Analog technology can't keep up in the digital marketplace. Digital video is sharper and digital KVM is faster.

1. The VGA standard is being discontinued.

As of 2015, the VGA standard is no longer supported by leading manufacturers. Analog KVM and video won't work any longer either. VGA sources and displays are getting increasingly difficult to find. Black Box recently heard from a customer who had to buy VGA parts on eBay.

2. Digital technology provides better image quality.

Digital technology improves users' experiences by providing crystal-clear images at any supported distance. HD video is delivered pixel by pixel to digital displays at higher resolutions and increased color depth.

3. Digital systems are more scalable and flexible.

New larger switching matrices and IP-based systems increase flexibility and enable connecting to a much higher number of endpoints. Thousands of devices can be incorporated into one unified system. On a digital matrix system, I/O ports are interchangeable, making changes and adds as simple as plugging a device into a port.

4. HD video switching is faster than analog switching.

Digital systems provide instantaneous HD video switching with no delay. Digital KVM switching is much faster, too, nearly instant rather than having to wait several seconds for video to show up.

5. Digital KVM improves the user experience.

Digital KVM systems feature improved USB support and compatibility with most other USB devices on the market: touchscreens, flash drives, tablet computers, as well as the workhorses, keyboards and mice.

6. Higher resolutions mean better images.

Increased bandwidth gives users the capability to work with images at higher detail levels as well as fit more content on the desktop for a more efficient workflow. Future-proof systems accommodate support for WQXGA (2560 x 1600) and 4K/UHD (3840 x 2160). Wherever users need pixel-perfect image transmission, they can now get it via CATx or fibre cabling. Plus, send USB, serial and digital audio signals.

Making the Transition to 4K Video

By Dawn Mangine, KVM Marketer



ProAV, media and broadcasting professionals should be aware of developments in 4K, the most recent video standard to reach audiences. Even though it is currently being adopted by a small group of technology enthusiasts, the larger mainstream market isn't far behind.

Display technology is evolving and 4K screens are already available from most display manufacturers. The giant leaps in resolution quality coupled with declining prices make this technology very attractive to the consumer market.

4K video, also referred to as Ultra High Definition (UHD), delivers stunning beauty and resolution in digital signage and video extension applications. As with all disruptive innovation, it presents issues that can make deployment tricky.

Enormous bandwidth is required to deliver 4K video at 30 frames per second (fps) — 10 Gbits/second. For 4K at 50–60 fps, the bandwidth requirements are greater. This places unprecedented demands on infrastructure. To be successful in real-world applications, 4K distribution systems must be designed and engineered to address some challenging issues.

Manufacturers of 4K sources and displays must take a holistic approach to testing their products to ensure that they are up to the challenges of an integrated 4K system, liberating system designers and integrators from having to take on this daunting challenge themselves.

4K Technology Overview

4K refers to video signals with a horizontal resolution on the order of 4,000 pixels (generally 3840 pixels). Previous generations of video resolutions were described by the vertical resolutions (e.g. 1080p refers to a signal with 1080 vertical lines).

The increase in resolution presented by 4K is tremendous. An increasing number of displays show resolutions that fall between 1080p and 4K; these resolutions are referred to as "tweener resolutions." Even if a given system is not being designed for 4K content, hardware designed for 2K signals will not carry higher resolutions.

In some professional spheres, the terms 4K and UHD have become conflated; however,

they are not interchangeable. As far as a consumer is concerned, there is little practical difference, but they do mean different things.

Simply put, 4K is a professional production and cinema standard. UHD is the standard for consumer displays and broadcast. To get a better understanding of 4K technology, the following puzzle pieces need to be addressed:

- Mismatched resolutions
- Bandwidth requirements
- Supporting 4K with multiple AV interfaces
- New cable lengths

These technology challenges are addressed in a white paper from Black Box, *Piecing Together the 4K Puzzle*. Learn more and download the white paper at www.black-box.de/KG24K.



A Brief Overview of Video and Peripheral Extension

One of the most common types of video and peripheral extension is keyboard, video and mouse (KVM) technology extension.

These types of extenders connect users via human interface devices (HIDs), like keyboards, monitors, touchscreens and mice, to target devices — servers, workstations, computers— without the need for drivers to be installed on the target devices. Although these solutions primarily extend or switch HD video and KVM

signals, most extenders also support audio, RS-232 and USB signals. The goal of video and peripheral extension technology is to share resources and improve operability transparently.

In general, good extension solutions have a low total cost of ownership (TCO) because they last seven to ten years. This means they survive at least two generations of targets (PCs or servers) and peripheral devices, which usually are updated much more quickly. Good video and peripheral extension devices shouldn't need to

be replaced that soon. They should demonstrate future compatibility through connections, cascability and scalability. Video and peripheral extension solutions should also offer a quick return on investment (ROI). By improving operability, ergonomics and work time savings, this type of extension leads to a more efficient use of human resources. In addition, video and peripheral extension is a green IT solution, leading to energy and cost savings.

A Brief Overview of USB Peripheral Extension

USB Essentials

USB's main attraction is that it makes adding peripherals to your computer incredibly easy. A USB peripheral plugs right into the port and works.

Virtually every operating system (OS) on the market today is USB enabled. USB technologies come in a variety of versions and speeds, from standard USB 1.1 to USB 3.1, the latest technology. The most common version in use today is USB 2.0.

USB Extension

Although USB is a versatile serial interface, it's subject to an inherent distance limitation of five metres. With USB 3.0 and 3.1 devices, the distance limitation is 3 metres, plus they require higher speeds. USB extenders enable USB peripherals to be placed wherever users need them, up to 2 kilometres from a host computer. With a USB extender, peripheral devices function

as if they were within the five-metre limit specified by USB Implementors' Forum (USB-IF), which prepares the specifications for USB technology.

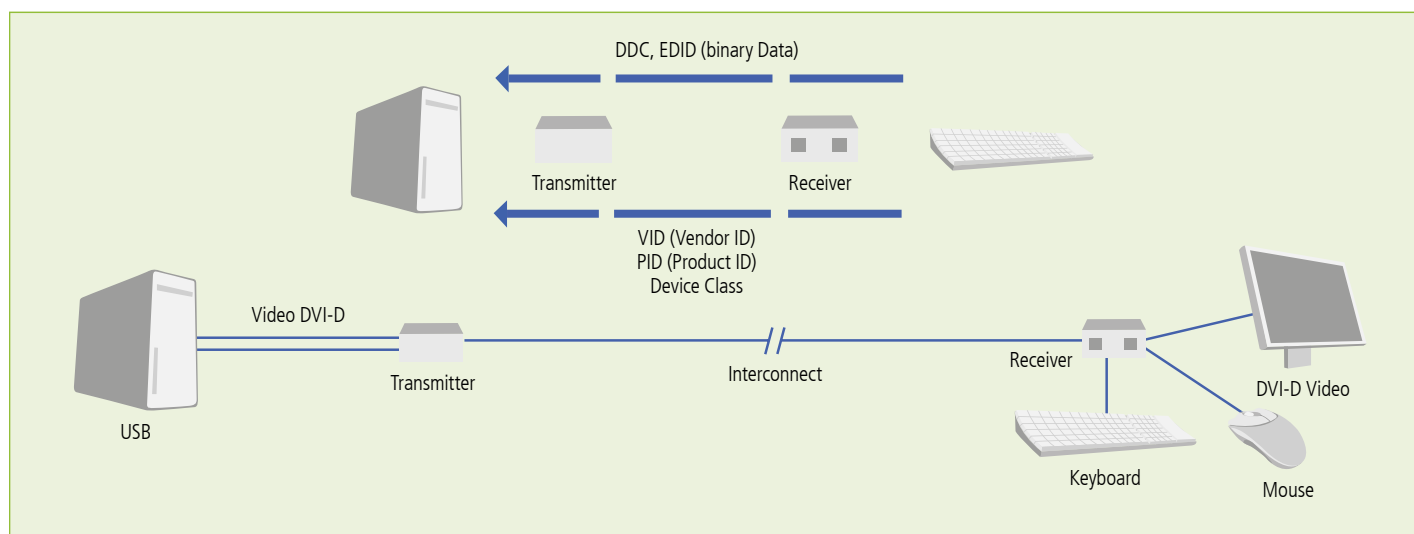
USB extenders preserve standard USB functionality and timing restrictions while accommodating the increased signal propagation delay incurred in extended-range transmissions.

USB extenders are composed of two units connected by a transmission line. These units are referred to as the local extender and remote extender. The local unit is connected to a downstream-facing port of a USB host controller or hub; the remote unit is connected to the upstream-facing port of a USB hub or device. Once operational, the entire USB extender system operates like a single standard USB hub. As a standard USB hub, the USB extender system is compatible with all operating systems

that support USB hubs and requires no additional software to be loaded.

Because the system appears to be a conventional hub (albeit a very long one), it can be connected to other hubs to the full depth permitted by USB. The system can be used as the first, last, or any intermediate hub in a chain. Multiple systems can also be used in parallel within a single domain—a common situation when opposite ends of a building need to be reached from a central computer room or telecom closet.

The only restriction placed on the configuration is that multiple USB extenders cannot be connected in series. Most USB extenders use CAT5 cable; if you require extra distance, you might need to consider a different cable type, such as fibre.



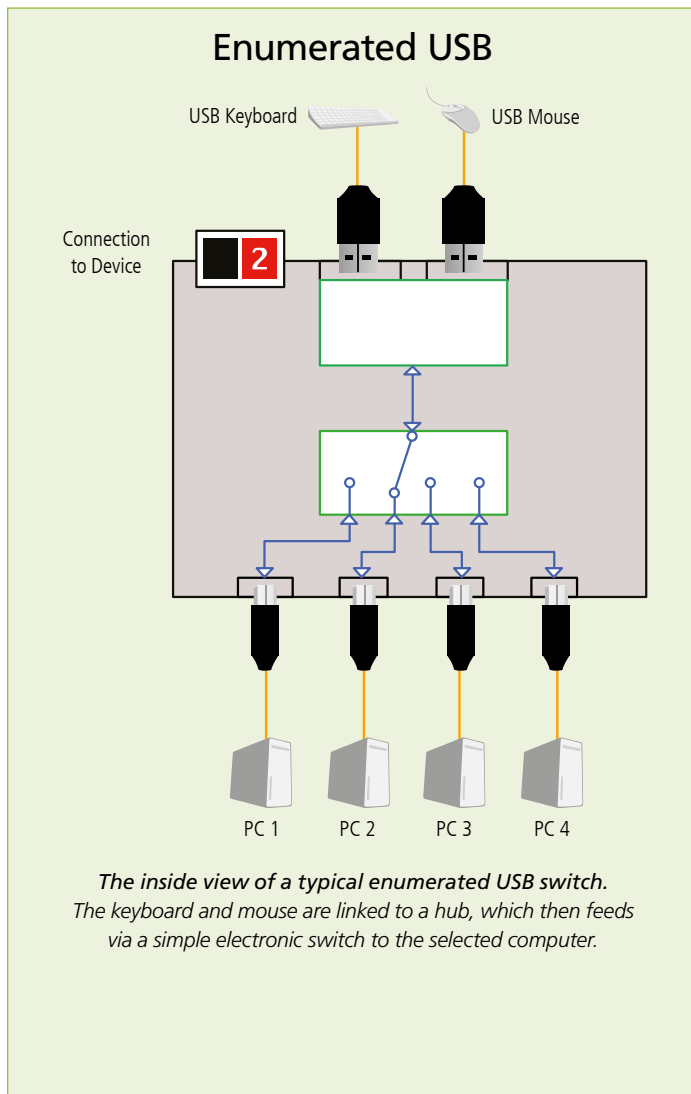
The Development of True USB Emulation for Better Switching

By Black Box Engineering

The earliest USB KVM switches relied upon standard keyboard and mouse templates to tell each computer system how to deal with the connected peripherals. High-performance KVM switches and HD video and peripheral matrix switches that support true USB emulation technology channel the identities of the connected keyboard and mouse and present those “real” profiles to every connected system concurrently. This means even specialized keyboards and mice (i.e. USB Sun keyboards, Glidepoint® mice, jog wheels and more) are fully supported.

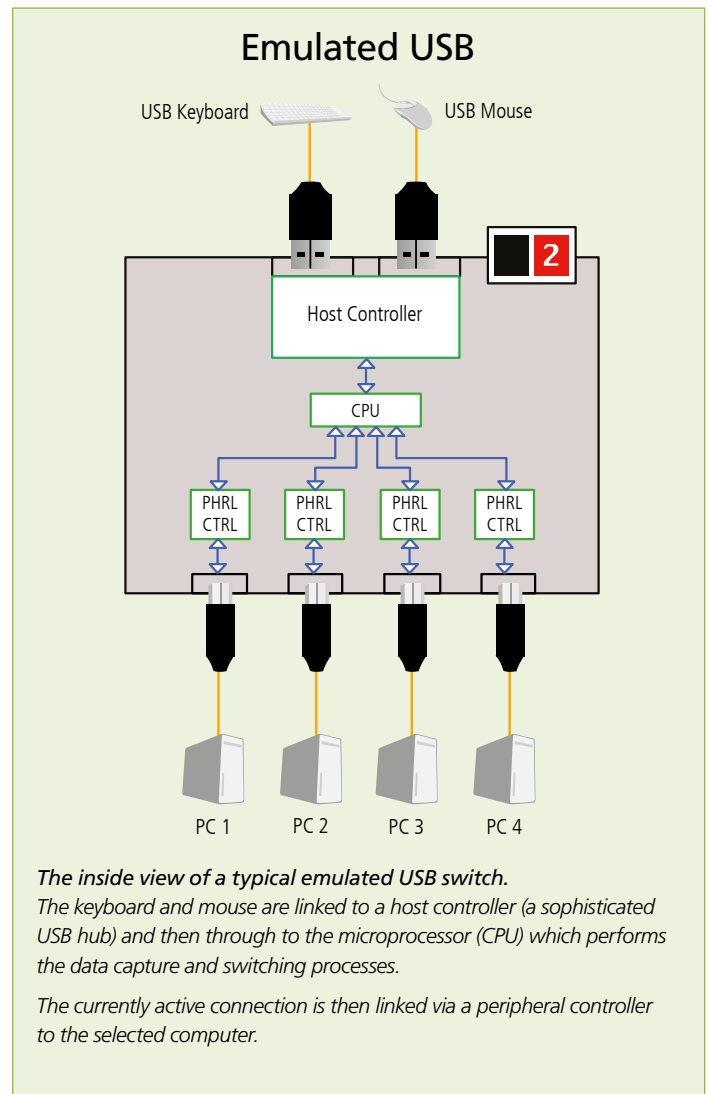
Enumerated USB

In the beginning, when USB connectors first were becoming common, there was simply enumerated USB. The name is derived from the initiation process (enumeration) that every USB device goes through each time it is connected to a computer. With enumerated switches, a connected USB device is required to perform a full initiation every time it is switched. This leads to latency issues, especially with mice and keyboards.



Emulated USB

Due to the complexity of the USB signals and standards, a straightforward way to read inputs of USB data streams, strip out the switching control information and then repackage the remainder for the computer had been difficult to achieve. Eventually, emulated USB solved the problem. Now, USB devices became, in effect, “hot-swappable” —each time they are switched, the initiation process doesn’t need to be performed again. In other words, in emulated, or basic, USB switching, the characteristics of the attached USB device are recreated once the required switching control information has been removed from the data stream. A neat side effect of the technique is that each computer can be “fooled” into thinking that the USB device is permanently connected to it, even when the device is switched to another computer.





Learn more

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However, although emulated switches cured a number of shortfalls associated with their enumerated cousins, there was still one main limitation to their operation. It remained a complex task to dynamically assume the identity of a USB device, distribute it among the connected computers and maintain all the necessary signals, states and processes.

True USB Emulation

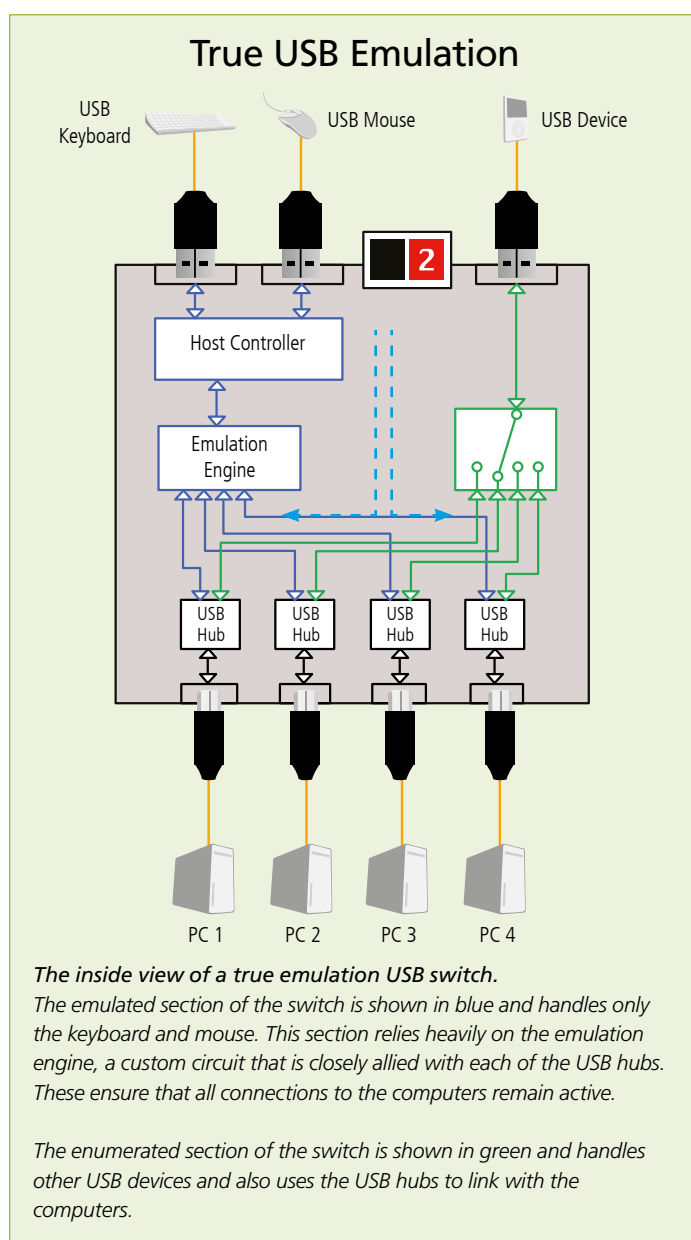
True USB emulation was developed to overcome the limitations associated with even emulated USB switching techniques.

With true USB emulation, or advanced USB switching, the complete identity of the keyboard and mouse can be copied and then presented, fully supported, to all the connected computers. This means that any keyboard offering special function keys or any mouse with extra features will be fully supported at each computer instantly, with no latency. As with the previous emulation method, the unselected computers continue to see the identities of the keyboard and mouse, which means that no enumeration is necessary when their link becomes active once again. This not only helps to make reconnecting faster, it also increases switching reliability. This is important because USB links are at their most vulnerable during the enumeration process.

A high-speed circuit fully emulates the USB device identities and it interprets keyboard and mouse data streams. The result is full support for KVM switching via hotkey presses or the third button/scroll wheel of a mouse. For local installations, this is useful; for remote applications, such as KVM over IP, it's essential.

Because other USB devices don't necessarily need the benefits of true emulation like USB keyboards and mice do, there are one or even two enumerated circuits along the true USB emulation feature. This enables the other USB devices to operate at their highest speeds without any intervention. The enumerated circuits benefit greatly from the USB hubs that are jointly used with the true emulation system. Because they interface directly and permanently with each computer, they help to stabilize the dormant links, making errors during enumeration much less likely.

The dual switching arrangement provides further flexibility because the true emulation and enumerated sections can be switched in unison or independently of each other, as required. Thus, various peripherals can operate with different computers at the same time.



Extension Technology and Ergonomics

By Mark Hempel, KVM Product Manager

Whether your extension and switching application is digital high-definition video or KVM and matrix peripheral switching, using extenders enables you to remove computer noise and heat from your work area. HD video and peripheral matrix switching and extension enable effective management of broadcast, command and control and other collaborative environments; flexible control of visual and peripheral elements; and real-time, instant switching and display of HD video and peripherals.

The current four trends in control and monitoring solutions are:

- An increase in digital switching applications.
- An increase in digital video distribution applications.
- A desire for flexibility in controlling visual and peripheral elements.
- A requirement to simplify complex system designs and increase functionality.

Becoming Ergonomic

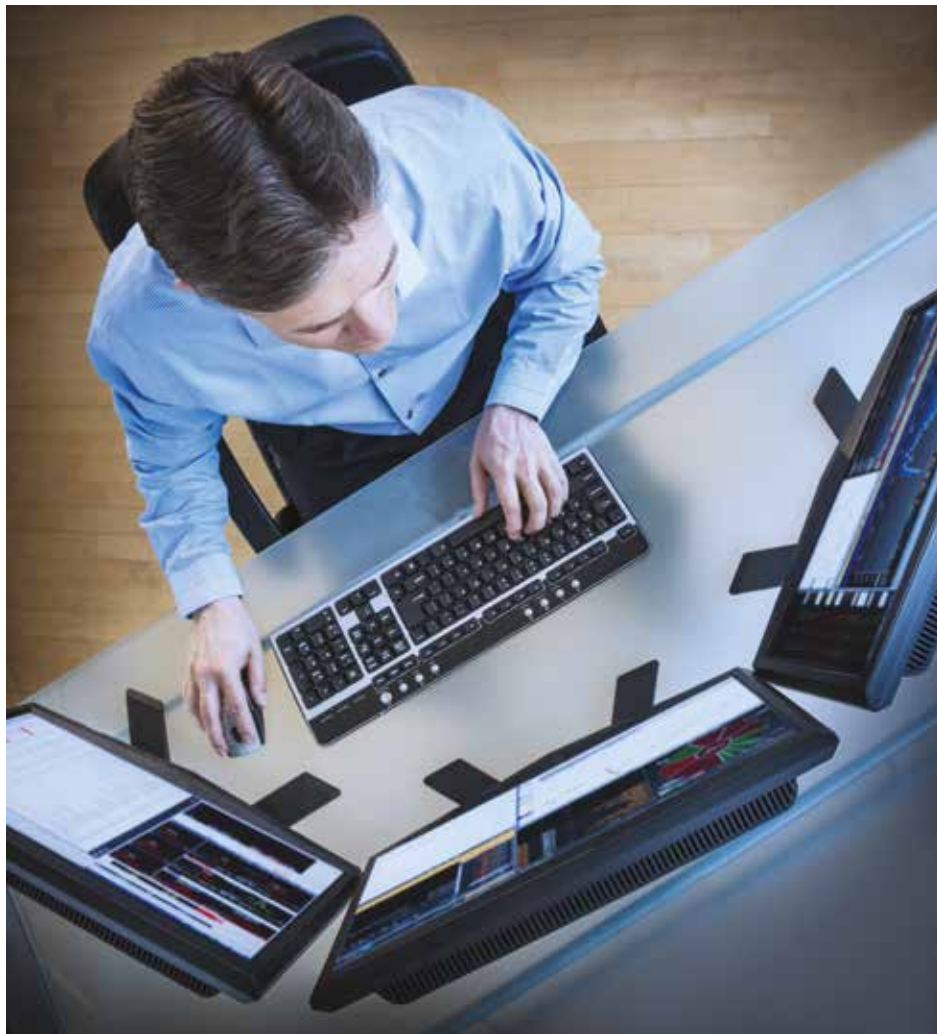
All control applications serve one purpose: to help people focus on the applications and processes of their jobs. Ergonomics, or the science of adapting the job and/or equipment and the operator to each other for optimal safety and productivity¹, is the end goal.

Ergonomics is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system.

The science of designing user interaction with equipment and workplaces to fit the user has been the cornerstone of technological advances in automation and computer-based systems.

The key elements of ergonomics are silence, a comfortable room climate, flexibility, scalability, service friendliness and ease of use.

Results will enable the operator to focus more closely on his or her work, rather than on the equipment affecting his/her work. Taking these steps ensures a rich desktop experience. However, you have to be careful to not sacrifice signal quality when bridging the distance between the operator and the equipment.



1. Silence and room climate:

- Remove noisy equipment from the operator's desk.
- Prevent rooms from becoming too warm.
- Backrack servers in environmentally friendly, climate-controlled server rooms.

2. Flexibility and scalability means equipment should:

- Enable relocation and backups easily.
- Leave room for expansion.
- Be able to share systems, signals and resources.

3. Ease of use and service:

- Enable easy control, steering and operation.
- Create no technical overhead.
- Keep service and maintenance out of sight of operators.

1. <http://www.osha.gov/SLTC/ergonomics/>

KVM and Peripheral Matrix Switching: What You Need to Know

By Dawn Patton Mangine, KVM Marketing

Extension Basics

Modern digital extension and switching technology emphasizes the movement from analog to digital video and also away from fixed-user-to-computer KVM switching toward nearly freely scalable matrices (matrix switching). These new proprietary (using CATx or fibre optic cables) and IP-based digital technologies offer real-time solutions—no delay, no skew. Along with extending digital video, these applications extend keyboard and mouse, digital or analog audio, serial and USB.

Additionally, the designs that apply to the technologies outlined provide a quieter workplace and remove excess heat from the area by placing computers in low-dust, climate-controlled equipment rooms without sacrificing video quality, picture resolution, or real-time switching of peripherals. Finally, server maintenance, software updates and network administration become centralized, plus time and cost associated with support is reduced.

Matrix Switch Technology

A matrix switch (also called a router or a crosspoint switch) is an assembly of individual switches between multiple inputs and outputs. In KVM and peripheral switching and extension, matrix switches offer the most flexible, extendable and efficient configurations for HD video, audio, USB and RS-232 switching and extension. These new configurations bring better functionality and increased productivity to organizations, especially in the broadcasting and professional audio-visual industries.

The most advanced matrix switches support an array of ports that can be dynamically allocated as input or output. This means that ports can be connected to a CPU or connected to a console and ports can be switched according to the users' requirements. As long as you have available ports, you can switch in any combination of inputs and outputs—it doesn't need to be a one-to-one configuration (i.e. a 160-port chassis equals 80 inputs and 80 outputs; you can configure it to have 159 outputs and one input if that's what is needed).

The technology supports numerous data streams in varied combinations through extenders: video, KVM, audio, serial, USB 2.0. Because of this updated technology, switching is instantaneous, with no delay.



KVM switching in general is an efficiency-creating solution. These matrix switching systems take this flexibility and efficiency even further, especially for A/V professionals. Instead of a patchwork of switches and cables, matrix switching systems come with digital or analog audio, serial RS-232, high-speed USB 2.0 and HID tablet support. Additionally, matrix switches free up space in your data centre. And they're cooler and quieter, eliminating excess noise and heat in the workplace environment.

Along with dynamically allocated I/O ports, some matrix switches enable mixing copper (CATx) and fibre optic cabling. For video-heavy extension over short distances, you can incorporate an HDMI or DVI repeater using native cabling, or an extender kit using proprietary uncompressed technology. For optimal performance over long distances and between buildings, fibre optic cabling is an option as well. Using proprietary cable infrastructure makes collaborative editing much more efficient. Flexible matrix switches enable you to access your expensive editing hardware from remote locations, reducing

travel and meeting times and making the approval process quicker and easier. In addition to digital video extension, the extenders offer top-quality digital audio support. Actually, the extensive range of extenders available to use with a chassis-based matrix switch offers connections from CPUs and other video sources to monitors, projectors, video walls and other high-quality displays.

Seamless sharing capabilities enable you to show a video across campus while working with the audio team three doors down the hallway from your office. The HD video and digital audio extension and switching capabilities in a system of chassis, modular interface cards and extenders gives users an almost endless number of configurations for their applications. Simply put, using a KVM switching solution that is also a matrix switch means zero connectivity barriers. Extenders that work with a matrix switch even operate as standalone point-to-point extenders, over CATx or fibre cables—or any combination of cabling an organization wants to use.

High-Performance KVM Solutions: Control and Monitoring for Efficient Workflow

KVM and matrix switching gives multiple users access to a variety of target devices (CPUs, digital signage, servers, displays), the ability to monitor workflow and flexible control of visual and peripheral elements. Switching and extension provide effective management of technology elements in broadcasting, healthcare, law enforcement, retail, energy and control rooms.



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Broadcasting



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Law Enforcement



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Retail



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Energy

Broadcast: Live, Pre-, and Post-Production

Fast switching, multiuser sharing.

Directors, presenters and editors require an undisturbed work environment. They need to work away from loud or continuous outside noise and unnecessary heat. A distraction-free workplace is key to productivity and error-free results.



- A** Transmitters Back-Racked with Servers
- B** Presenters, Editors and Other Users
- C** The System Administrator

Broadcast is a collaborative environment. Many people need access to video and sound for review and editing. They need this access immediately in real time and the quality of the work has to be very high.

KVM and HD video peripheral switching and extension solutions are ideal for broadcasting environments.

They enable access to many users at once, in real time, and to high-definition video signals, audio, serial and USB peripherals. The configuration possibilities are endless. KVM and video peripheral switching and extension also offer flexible transmission options: CATx cable, fibre optic cable, or IP-based extension.

See products on pages 32–35.

www.black-box.de/KG2DKM

Broadcasting and Post-Production Solutions

Empowering clients with technology, support, and expertise.

Black Box helps clients in the post-production and broadcasting industry design, build, deploy and upgrade mission-critical monitoring and control solutions, video processing and distribution infrastructure and high-performance networking systems to improve collaboration and productivity, lower operating costs and simplify back-end support systems to deliver clear competitive advantages.

The research and design of fast, flexible and reliable tools assist our clients in supporting instantaneous switching, HD video signal transmission and SDI, HD-SDI and 3G SDI signal distribution. Create a competitive advantage through ergonomic, efficient workflows by planning, integrating and deploying switching and extension solutions. The key to success is to deploy proven technology solutions in proven ways.



Broadcasting and production studios need access for multiple users and instantaneous switching for live broadcasts and updates.

Black Box is committed to helping our customers succeed as you transition to the digital media environment.

- Collaboration is supported between broadcast personnel and studio teams without a major redeployment of equipment for infrastructure redesign, saving time and money.
- Editors, directors, live production, post-production and broadcast engineers have full access to all equipment allocated to them via KVM peripheral matrix switching.
- Desktop peripherals function with no latency and desktop users have access to multi-screen and dual-link capable equipment.
- Extend and distribute completely lossless, pristine video quality regardless of format: DVI, SDI, HDMI and HD SDI, 3G, VGA and more.

Black Box Solutions

- KVM and hybrid KVM peripheral switching platforms
- HD video extension, including DVI, HDMI, DisplayPort, SDI, HD SDI, 3G
- Signal conversion and signal distribution
- Support for 4K and 1080p resolutions
- Multiscreen viewing, instantaneous switching, multiple monitor viewing
- Video delivery via IP multicast
- Whisper racks and seismic cabinets
- High availability with multiple redundancy levels

Applications

- Master control rooms/studios
- Post-production suites and service bureaus
- Encoder and transcoder farms
- Trucks and mobile broadcasting vans
- Equipment rooms
- Display and signage

Benefits

- Transparent, effective collaboration for broadcast professionals.
- Control and monitoring of mission-critical workflow.
- Flexible control of visual tools and peripheral elements
- Real-time instant switching and display of HD video and peripherals
- Reliable system with convenient maintenance

www.black-box.de/KG2Broadcast

Case Studies

Broadcasting: Video Control Room

The Challenge:

The Dayton Dragons are the very successful Single-A affiliate of the Cincinnati Reds and currently hold the longest sell-out streak in all of North American professional sports. They were even voted one of the top ten hottest tickets to get in all of professional sports in 2007 by Sports Illustrated^[1].

Owned and operated by Mandalay Baseball Properties, the team continues to produce high-quality, family-friendly entertainment and provide unsurpassed customer service to a large, loyal fan base. Mandalay Creative Services, a division of Mandalay Baseball, helps meet that goal by providing in-house system design, technical integration and production services. The Dragons are committed to creating an unmatched fan experience, which led them to upgrade their video, audio and control systems prior to the start of the 2014 season.



*"No other solution...passed our test."
— Scott Rohrer, Mandalay Creative Services*

The Solution:

The team produces two separate productions—an in-house and a broadcast feed—with two separate crews sharing core system components. The crews and components were split between two rooms: one space for each production.

Mandalay Creative sought to enable the two small but efficient teams to work across multiple systems, producing shows that would normally require big-league budgets and staffing. Their high standards demanded the highest video quality, maximum uptime and enterprise-grade reliability.

The Dragons also required a scalable solution, providing easy and cost effective ways to add additional servers and users to the matrix routing system.

With that in mind, Mandalay Creative sought out Black Box to create an innovative and flexible digital KVM

matrix solution using the DKM FX family of products.

Designed through a partnership between Mandalay Creative and Black Box and installed by Alpha Video, the solution provides connectivity for up to 48 users and computers (they currently have 17 users and 24 computer stations). Users can work on the same servers simultaneously. Advanced access right management reduces conflicts and bars unauthorized access.

A mix of single- and dual-monitor user stations were configured with the option of creating larger setups. All the switching and routing can be done instantaneously with preset configurations. These can be activated with keyboard hotkeys or optional integration with third-party controller systems. The Dayton Dragons backracked all their servers; the DKM FX

system includes extenders that provide up to 140 metres extension over CAT5e. This enabled them to secure and cool the servers more efficiently while also creating a quieter work environment for their production team.

"The demands of producing multiple productions simultaneously each night require a control system that is flexible and bulletproof," comments Scott Rohrer, Creative Technologist with Mandalay Creative Services.

"The solution that Black Box provided has given us major league capability on our minor league budget. Not only is the DKM FX system flexible and solid, the video and control quality is exactly what you'd expect if you were right next to the machine. No other solution on the market passed our test."

1. http://sportsillustrated.cnn.com/multimedia/photo_gallery/0704/gallery.hottest.tickets/content.10.html

See products on pages 32–35.

www.black-box.de/KG2DKMFX

Case Studies

Broadcasting: Studio with Live Production

The Challenge:

A major network broadcasting studio wanted to set up a video extension and matrix switching system over its existing Ethernet network. The system needed to enable forty producers, directors, studio technicians and operators to gain access to more than sixty computers, servers, video sources and camera feeds from any desk location.

The previous system caused daily problems, including delayed switching times, lack of simultaneous access for multiple users, limited device support for USB peripherals, uneven video and audio quality and unreliable system durability. Additionally, it used an older infrastructure that needed to be updated.



Live production in a broadcast studio means instantaneous video switching has to be reliable.

The Solution:

The Chief Hardware Engineer of the studio came to Black Box because he had worked with us on another project for digital signage. He wanted an entire switching and extension solution suite that included a management interface for easy migration and maintenance. The studio is responsible for producing live broadcasts and the list of issues that needed to be addressed was long. The system needed to be as free of glitches as possible, plus extremely reliable and flexible. The current system and its faults left end users frustrated and had IT

support dealing with endless trouble tickets. Plus, technical support had to be available 24/7 all the way through the process (pre- and post-sale).

The solution decided upon was the Agility IP-Based KVM Extension and Switching platform, which is a system of single-head and dual-head transmitters and receivers that extend DVI, USB, and audio over the local area network (LAN). Agility transmitters were installed at each server, computer, video source and camera feed; receivers were connected to each user station.

A single point of management and control, the Agility iPATH™ controller, was installed in the server room and deployed over the existing network. A second iPath controller provides a backup for 24/7 reliability.

Because this IP-based KVM matrix switching system is incredibly flexible and scalable, the engineer is able to continue to expand his broadcast configuration, adding equipment and users as required.

See products on pages 38–39.

www.black-box.de/KG2Agility

Energy Industry Solutions

Digital KVM control and monitoring solutions: Automation, processes and workflow.

Black Box helps clients in the energy industry design and deploy mission-critical monitoring and control solutions. In 2014, the United States produced 9.2 million barrels of crude oil a day. The U.S. is now the largest producer of oil and gas, overtaking Saudi Arabia and Russia due to production from the Marcellus Shale.

However, reservoirs of oil are becoming more difficult to access and increasingly less productive. To keep pace with global consumption, oil companies must constantly look for new sources of petroleum, as well as improve the production of existing wells.



Black Box is committed to helping our customers succeed as they transition to the digital media environment.

- In drilling operations, KVM systems provide high-quality and instant access to video and control signals from multiple sources to multiple users.
- In oil and gas exploration, rapid access to graphical data and processes throughout a seismic survey and the ability to respond quickly to status changes are crucial for safe and efficient operation.
- Remote monitoring solutions in control rooms provide users with better overview, quicker access to data and failover connectivity.
- Switch and extend real-time HD video and USB HID over LAN/WAN for remote monitoring.

Black Box KVM Solutions

- KVM and hybrid KVM peripheral switching platforms
- Virtual desktop remote management
- Signal conversion and signal distribution
- KVM extension to improve ergonomics by reducing heat and noise in the workplace
- KVM extension over fibre for long distances

Applications

- Real-time Operating Centres (ROCs)
- Oil refineries
- Seismic surveys
- 3D modeling and visualization
- Hydraulic fracturing

Benefits

- Updating current analog systems to faster and more reliable digital KVM.
- Remote monitoring operations reduce risk for injuries in dangerous areas.
- Reduced risk for downtime and accidents or environmental disasters.
- Asset Integrity Management (AIM).
- Maximize human capital by running parallel tasks with fewer users who have instantaneous access to critical resources.

www.black-box.de/KG2Oil-Gas

Case Studies

Petroleum Company NOC

The Challenge:

A petroleum oil company used several buildings to house high-end monitoring equipment, which are computer systems that need to be viewed and managed by users in the main office building. Multiuser access, high-definition video and extension distance all needed to be available on a flexible, scalable switching and extension system.



The Solution:

Black Box project engineers and product managers proposed deploying the DKM FX HD Video Matrix Switching system after an on-site visit made the requirements clear. The DKM FX system enables multiple users to connect and share target computers and uses a mix of copper and fibre cabling so distances can be extended within and between buildings. Additionally, fibre optic extension protects against ground loops and lightning strikes, so it optimal to use when extending switching and video signals between buildings.

The DKM FX system connects to fibre optic cable and CATx cable through different ports on one chassis. In this configuration, the 80-port DKM FX chassis was installed. Eight-port copper and fibre I/O cards connected DKM FX receivers and transmitters across campus. Within the main building, the network operations centre (NOC) used CAT6 copper cabling because the distance was shorter.



This flexible and scalable setup enables users in the NOC to select, view and control any of the connected computers on campus. The DKM FX components have redundant power supplies to prevent downtime in this mission-critical monitoring operation. Users switch among the computers with no delay regardless of distance.

See products on pages 32–35.

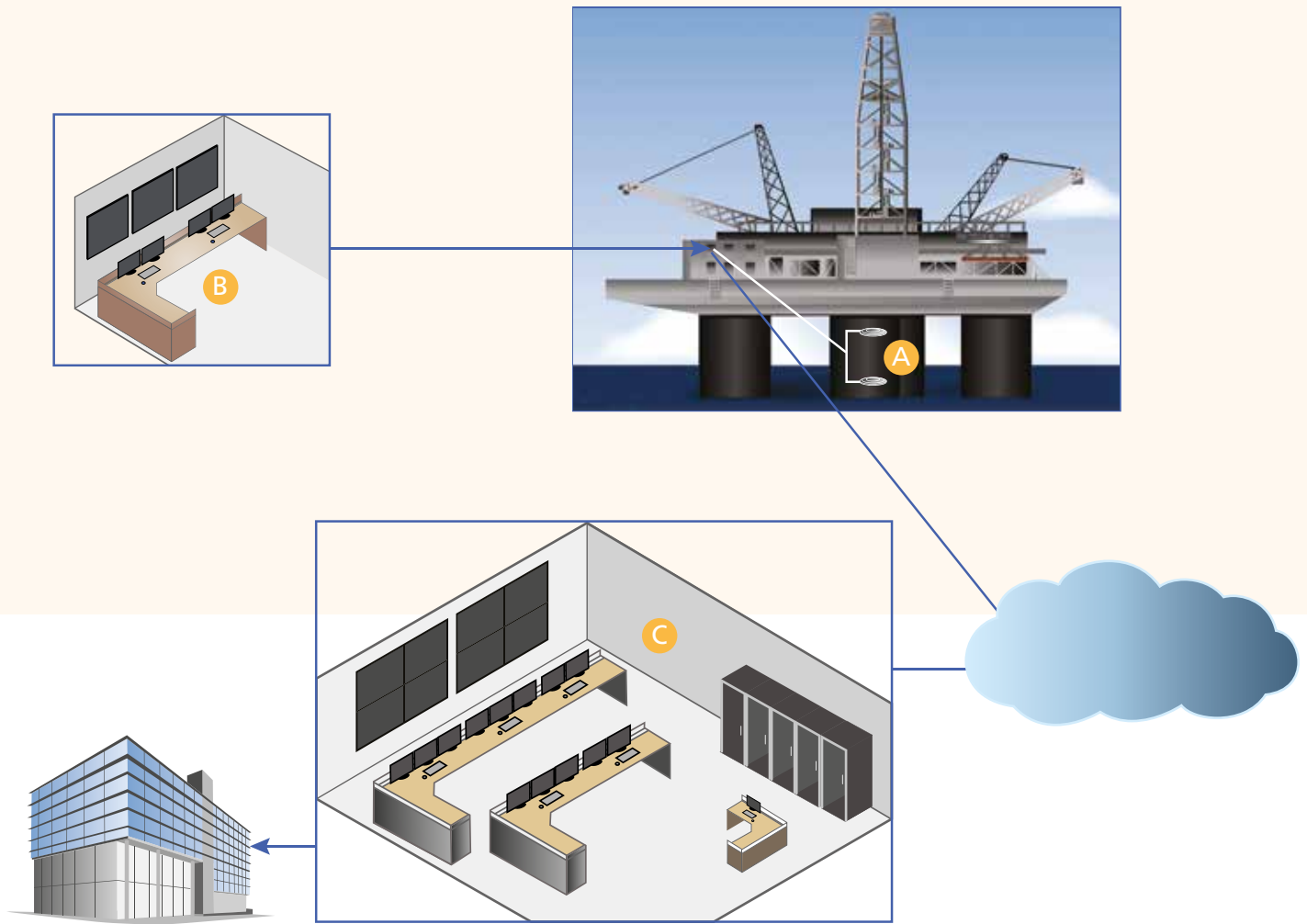
www.black-box.de/KG2DKMFX

Energy

Control and monitoring for ROCs.

Safety and productivity issues are the topmost concerns for operators and owners of oil and gas industry companies. Engineers in today's control rooms and Real-Time Operating Centre (ROCs) need instantaneous access to critical monitoring systems.

- A** Sensors to Measure Drilling Functions
- B** Oil Rig Control Room
- C** On-shore Real-Time Operating Centre



In drilling operations, sensors measure pressure data, gas or hydrocarbon levels and other critical functions. Information is sent to a local control room, a centralized operations centre—which can be kilometres away—and to executive

offices. KVM matrix switching solutions from Black Box improve efficiency and accuracy by enabling oil and gas engineers to monitor multiple sources of information simultaneously, share resources and access remote systems.

See products on pages 40–41. www.black-box.de/KG2InvisaPC

Case Studies

Transportation NOCs

The Challenge:

Airports can be confusing and unsettling and not just for passengers. Employees can be beset as well, by crowded operation centres, expanding monitoring needs and overheated workstations.

Norway had two such airports. At one airport, the network operations centre (NOC) faced a challenging work environment because the airport was expanding its terminal and adding gates to accommodate the growing number of passengers. Technical support staff experienced an overly warm and crowded workplace as they monitored access control, fire prevention and general airport security.

The other airport had similar issues and needed to design a more efficient airport operations centre as well. This NOC is more compact, but still needed to use space efficiently for multiple users who are monitoring a lot of activity.

The Solution:

Both airport NOCs deployed the DKM FX HD Video and Extension System in order to improve the staff environments and, at the same time, make it easier to monitor the hardware platforms that were responsible for system management. The NOCs backracked transmitters in the data centre and placed receivers at the monitors in different rooms. One airport used the chassis-based DKM FX Matrix Switches and a mix of copper (CATx) and fibre cabling, because they had a larger deployment and had monitors in different buildings. The second airport was smaller and used the DKM FX Compact Matrix Switches and only CATx cabling to extend signals.

These fully digital matrix switch solutions offer switching, extension and distribution of video, KVM, USB and audio



signals over copper and fibre with maximum distances ranging from 280 metres to 10 kilometres. The system provides redundancy power for continual operation combined with instantaneous switching of high-resolution images.

See products on pages 32–35.

www.black-box.de/KG2DKMFX

Case Studies

Medical Centre: High-Tech Imaging

The Challenge:

At a medical centre in the Netherlands, images from MRI machines need to be sent to a number of different stations for diagnosis and surgical preparation. Instead of the usual prints, the images will be distributed electronically to the radiologists, surgeons and meeting and operating rooms, along with the electronic patient records.

The most important factor is a pixel-perfect reproduction of images at all locations; pixel loss could lead to misdiagnosis.

The new system needs to include four servers distributing the images to a total of 22 stations on the campus. Keyboard and mouse signals need to be transmitted to user consoles as well, so staff can add notes to the patient files.



Screens, USB keyboard and mouse are connected through a Modular DKM FX 4-Port receiver to the central switch for image distribution.

The Solution:

The required long distance and the environment with high interferences lead to a solution that uses fibre-optic cable as transmission media. Fibre optics technology is based on light pulses and is completely immune to all EMI/RFI interference. In addition, fibre optics allows much greater distances than a CATx infrastructure, without loss of the signal quality.

To distribute the images and peripheral data, Black Box recommended the DKM FX Compact Matrix Switch with 32 fibre SFPs. The DKM FX gives reliable access to high-quality, real-time digital video and a whole host of peripherals across the campus. It routes DisplayPort 1.1 resolutions up to RGB 3:3:3 and HDMI or DVI resolutions with Full HD 1080p.

The distributed locations are connected through the DKM FX Modular Extenders that provide the necessary interfaces and signal extension depending on the individual location. Four operating rooms, each equipped with four large HDMI displays, receive the images through extenders with quad-head video in a pixel-perfect quality. Additional keyboard and mouse

access enables the team to protocol the operation process.

Two meeting rooms receive all required data from the image and patient data servers. Dual-head DKM FX HDMI Extenders give full USB-keyboard/mouse control and display the images on two 40" LCD displays. For patient stations and the patient data archive, the extenders provide high-quality images and USB-keyboard and mouse control as well as USB 2.0 extension for barcode readers and printer access.

The medical centre is impressed by the high quality of the diagnostic images and the future-proof design of the DKM FX system. The DKM FX switch leaves room for future expansion via the unused ports or the cascading option. Dual power supplies provide the necessary, 24/7 availability of the system.

The modular DKM FX Extenders can be adapted to future requirements just by replacing the existing cards if new or changed interfaces or additional video channels and video formats or peripherals are required.

See products on pages 32–35.

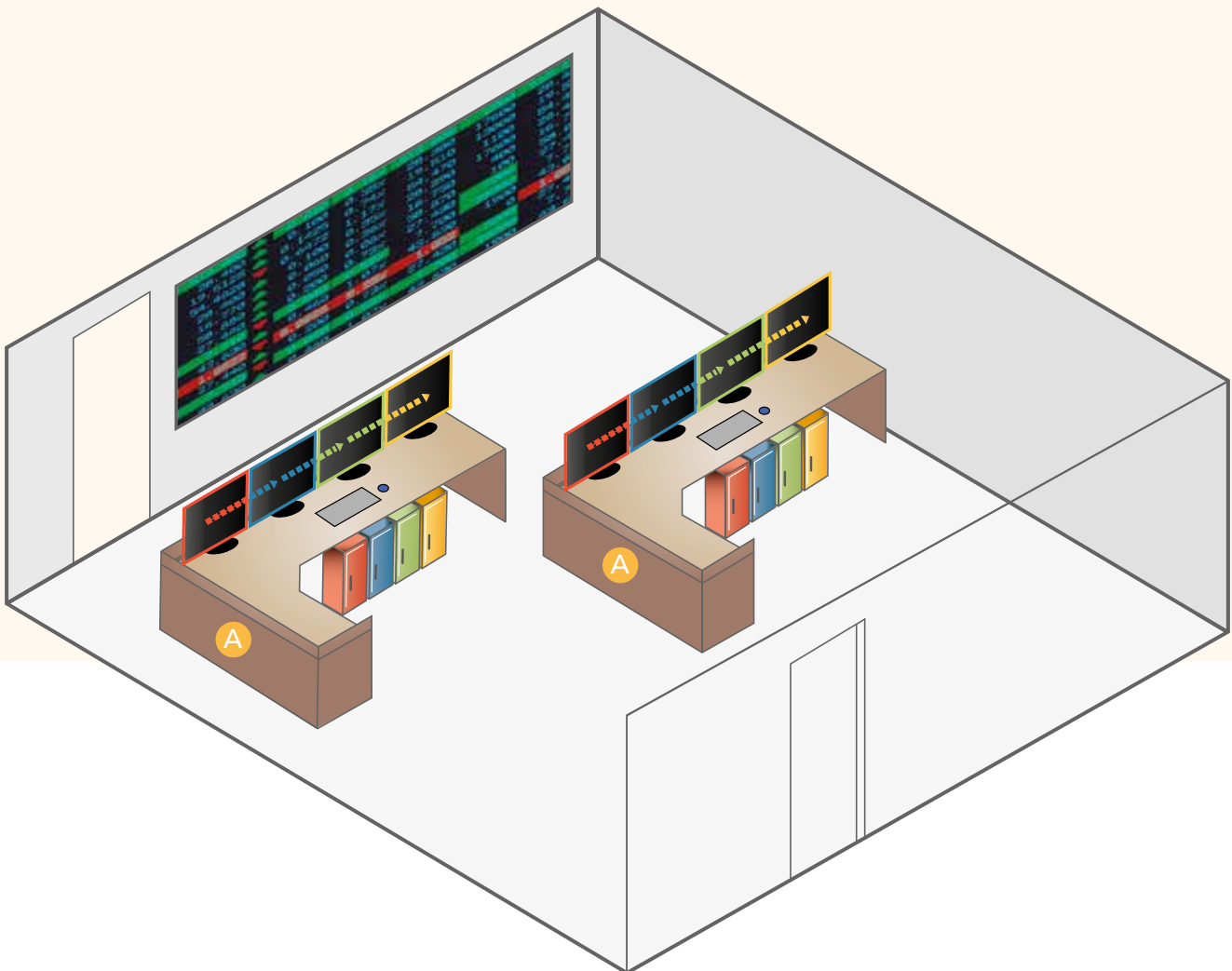
www.black-box.de/KG2DKMFX

Financial Trading

Fast reliable switching for a quick-moving environment.

While some high-priced stocks are still traded on the floor, the majority of trades at stock exchanges are electronic. Traders manage a great deal of fast-moving information and need to make quick decisions.

A CPUs Managed by a Single Keyboard/Mouse



A multiple monitor/CPU configuration is managed through a single keyboard and mouse. Using the mouse to move from one monitor to another switches the connected system,

and enables management by one person of a lot of information without a lot of clutter.

See products on pages 54–55.

www.black-box.de/KG2Freedom

TEMPEST Security Criteria

By Dawn Mangine, KVM Marketer

Security at Every Step

TEMPEST-Secure Desktop KVM Switches

TEMPEST testing, while classified, is regarded as a process that assesses the port-to-port isolation required for certain KVM switches. A TEMPEST approval means the necessary isolation is achieved and qualified. Additionally, the threat of data linking by various covert electromagnetic eavesdropping mechanisms has been evaluated and found to be secure.

The TEMPEST designation is often required by military organizations. TEMPEST, as a security standard, pertains to technical security countermeasures, standards and instrumentation that prevent or minimize the exploitation of vulnerable data communications equipment by technical surveillance or eavesdropping.

Secure desktop KVM switches fill a special need in switching for users, such as those in the military, government agencies, or law enforcement, who need to access information stored at different classification levels on physically separate systems. A secure desktop KVM switch is usually a two- or four-port switch that provides control and separation of PCs connected to networks of differing security classifications. TEMPEST-approved switches offer the following features.

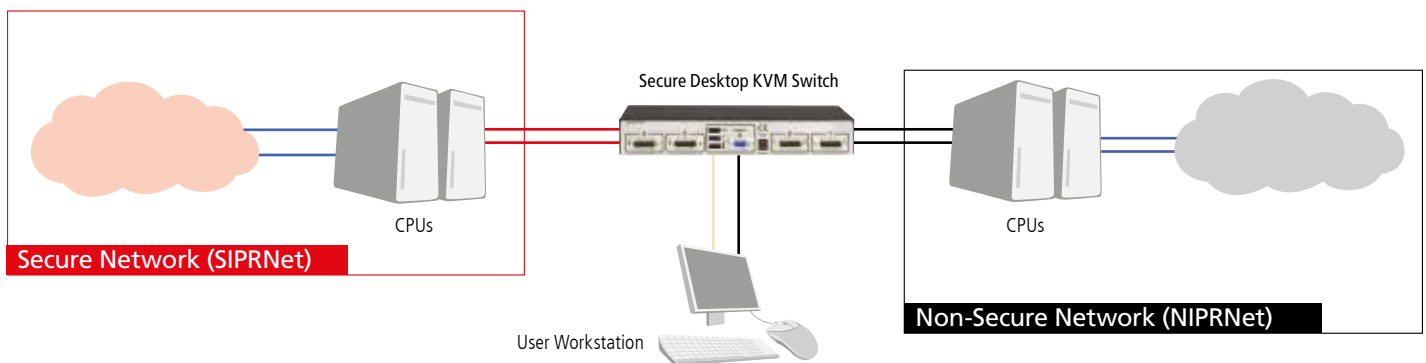
- High port-to-port electrical isolation, which facilitates data separation (RED/BLACK). Channel-to-channel -80 -dB to -60 -dB crosstalk isolation protects against channel-to-channel crosstalk and software tools and applications cannot be used to access any connected computer from another connected computer.



- Switches are permanently hard wired, preventing access from one CPU to the others or access from one network to others.
- External tamper-evident seals make it easy to spot attempted tampering.
- Users can safely switch among as many as four computers operating at different classification levels.
- Unidirectional flow of keyboard and mouse data means the computer cannot leak data along K/M signaling channels.
- USB host controller erases entire RAM at each channel switchover. This prevents residual data from remaining in the channel after a channel change and being transferred to another computer.
- Only keyboard and mouse devices can be enumerated at the keyboard and mouse ports. Any other USB peripheral connected will be inhibited from operating, preventing the upload or download of unauthorized data.

The Secure Desktop KVM Switches with USB surpass the security profiles of most other KVM switches because they have received approvals and certifications in the TEMPEST testing standard.

Safely access servers between secure and non-secure networks.



See products on pages 56–57.

www.black-box.de/KG2SecureKVM

Case Studies

Police Station Command and Control Room

The Challenge:

As part of the move to a completely new building, the Østfold Police District in Norway wanted to completely overhaul their technology. Their old command and control room used old analog technology. The KVM setup was a mix of VGA/PS2 and VGA/USB point-to-point extension, plus smaller desktop KVM switches to give a single user access to one or two remote systems.



The Østfold Police District control room.

The Solution:

The needs of the customer included fast switching times, redundancy and hot swappability to avoid downtime—which, in an emergency, is a disaster. As a result, the Black Box Norway office suggested the DKM FX matrix switching system be deployed.

One of the advantages of the DKM FX system is that it is scalable and flexible. The DKM FX switches are a great command and control room solution for multiple users, simultaneous access, and a mix of proprietary cabling (copper and fibre).

The DKM FX solution is configured with two video walls, one 4-by-2 and one 2-by-2, in connecting rooms with five desks

and multiple users throughout 24/7 shifts. The DKM FX was also configured with a Media Control System from a third-party provider. This Media Control System integrates with the DKM FX in order to bring touchscreen compatibility to switching and control for the video wall. The larger video wall has a tile function, where an image can be sent to a 2-by-2 area. The different operators have a mix of systems on their desk. Some of the extension systems are integrated to transmit to the video walls, but not all them need to be connected to displays; some of them are simply connected to remote CPUs or servers.

See products on pages 32–35.

Emergency Call Centre

The Challenge:

An emergency call centre staffed by a single person at a time to handle various types of emergency calls needed a fast, reliable way to organize emergency calls, including those to police and fire departments. Information had to be sorted, the appropriate response had to be initiated and communications with the response team had to be clear and accurate.



Emergency personnel need accurate information fast.

The Solution:

By connecting computers in sets of four to monitors and then connecting the Black Box Freedom KVM Switch, a large amount of incoming information can be managed by simply navigating a mouse over the configured screens. A single call centre staff person can now quickly track the necessary response to the

emergency. Other attached systems can transcribe phone calls and communicate the conditions of the emergency to responding personnel. With another monitor set up to receive information about traffic and weather conditions, all the vital information is at the fingertips of a single person.

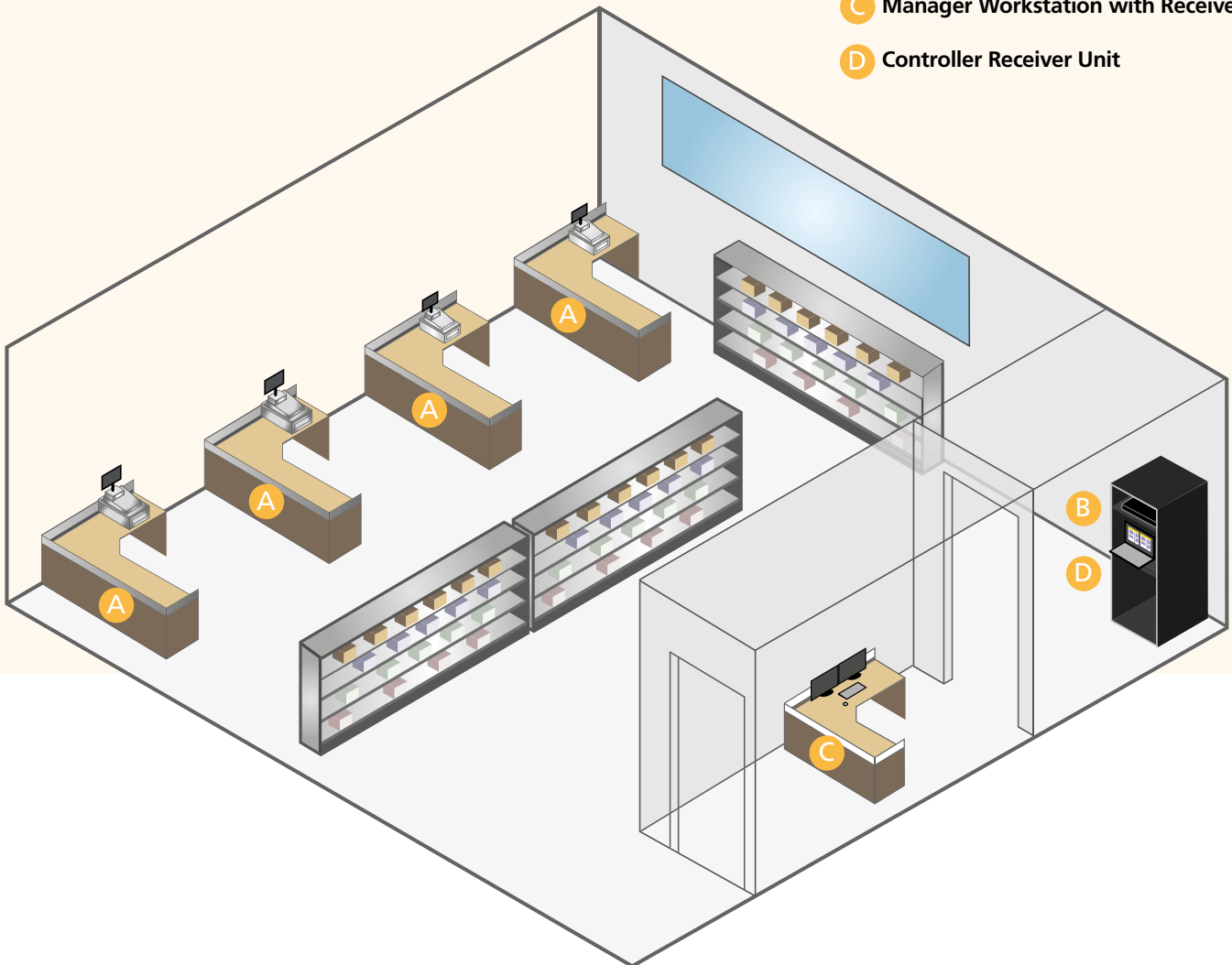
See products on pages 54–55.

Retail Point-of-Sale (PoS)

Virtualized remote computing for retail outlets.

Deploying a KVM extension system that operates over a local area network (LAN) and incorporates virtual and physical CPUs gives retailers access options and reduces clutter in workplace settings.

- A** Cash Registers with Receivers
- B** Server with Virtualized CPUs
- C** Manager Workstation with Receiver
- D** Controller Receiver Unit



With a virtualized extension system, receiver units at the cash registers have the option to access information on a database from a virtualized machine on a server appliance or to access information on a physical CPU. The information could be specialized software for the specific retail outlet

containing, for example, customer data, bar codes, prices, or inventory levels. Moving the database onto a remote server makes it more secure, creates more room at the workstations and lowers hardware costs.

See products on pages 40–41.

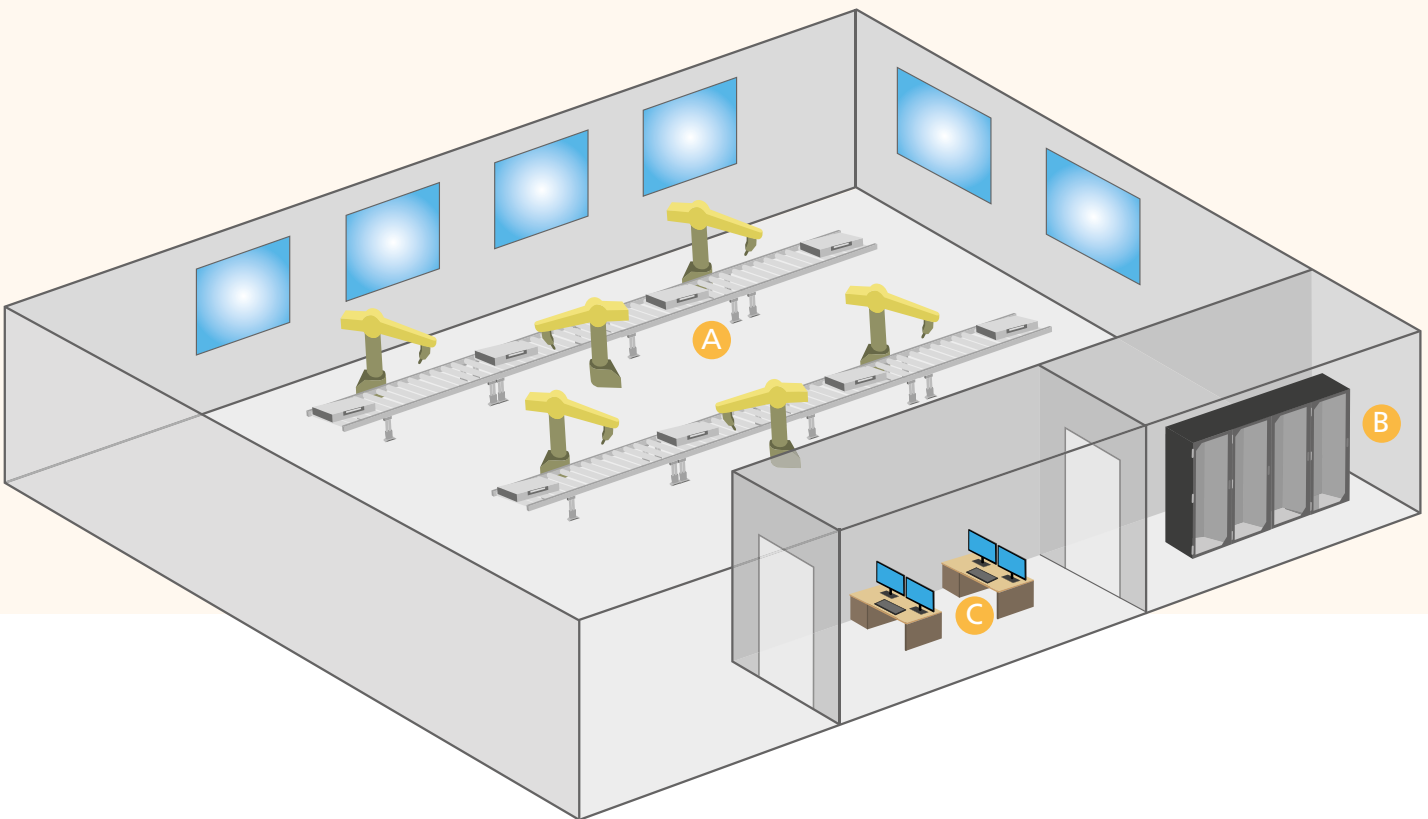
www.black-box.de/KG2InvisaPC

Manufacturing

KVM extension in an industrial workspace.

Manufacturing floors can be dirty or dusty and can be filled with noise and vibration. KVM extenders enable workers at desktops away from the factory floor to monitor manufacturing processes.

- A** Factory Floor
- B** Server Room
- C** Desktop Workstations



Moving production CPUs to a server room keeps dust out of CPU units that use internal fans for cooling. By using fibre optic cabling, signals are protected against EMI/RFI. Workers have a quiet, comfortable place to monitor manufacturing automation.

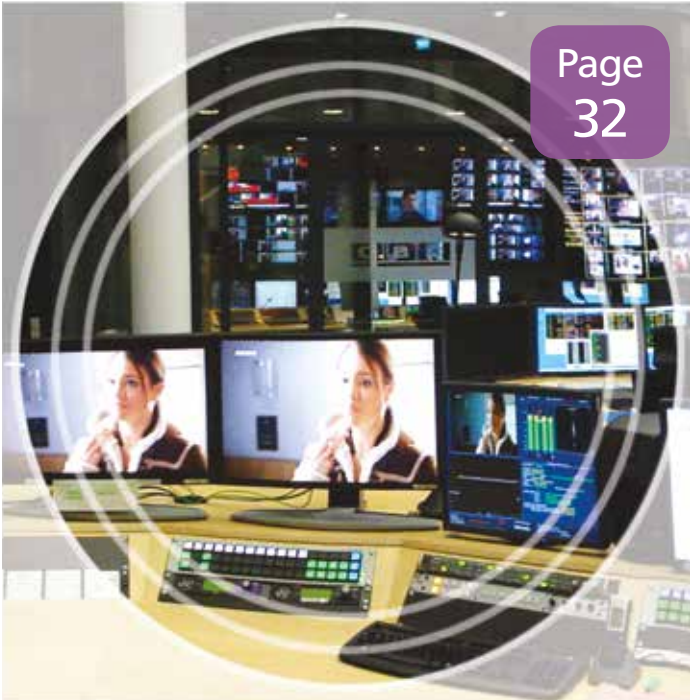
See products on pages 60–71.

www.black-box.de/KG2KVMExtender

Reliable switching and extension technology solutions from Black Box's portfolio of KVM products.

Whether you have a large enterprise application or an office management application, KVM fits. Extend and switch high-definition video and USB technology, control and monitor screens and workflows, remotely manage servers, reduce clutter, save on costs and improve ergonomics with KVM switches and KVM extenders.





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KVM Switches for Enterprise Solutions



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KVM Switches for Desktops



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KVM Switches for Data Centres



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KVM Extenders

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Multiviewer KVM72–73
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Flexible and instantaneous switching of high-definition video signals and KVM operability with options for serial and audio.

DKM FX Matrix Switches



Give multiple users fast, reliable access to high-quality, real-time digital video—plus a whole host of peripherals across the enterprise—with the DKM FX HD Video and Peripheral Matrix Switching system.

This chassis-based, modular switching system enables switching and extension of HD video, audio and serial data over long distances. Use it in any application where many users have to access CPUs and other high-end AV equipment supporting high-definition video.

The high available system offers three levels of redundancy with multiple configuration backups, dual or triple power inputs and hot swappable components.

Using non-blocking switch technology, the DKM FX processes and routes DVI single- and dual-link resolutions, including Full HD 1080p and 4K. Switch DisplayPort, SDI and HDMI signals instantaneously via interface cards and compact extenders, with little or no delay.

It not only supports digital video, but also VGA video and connections to a wide array of peripherals, including USB HID, USB 2.0, RS-232, RS-422 and IR devices, Wacom® tablets and even legacy PS/2 keyboards and mice.

It's especially ideal for mission-critical control/command rooms, as well as video production or broadcasting applications. Many users can connect

their consoles to various multimedia sources either locally or in a distant room or office via the switch.

And it's very flexible. All ports operate as inputs or outputs in a copper- or fibre-based router (**ACX048, ACX080, ACX160, ACX288, ACX576**).

OS platform independent, the switch and its controller card can be accessed by Windows®, Linux® and/or Mac OS® users.

Users can switch seamlessly and almost instantaneously with hotkey or on-screen display (OSD) selections. Modular in design, the DKM FX enables you to change peripheral and CPU connections on the fly and ensure zero downtime. Add or remove cards and SFPs in the slots and reroute inputs and outputs while the DKM FX system is up and running.

Add connections and change inputs/outputs as your enterprise needs to evolve. Integrate new hardware by updating interface cards. Cascade multiple switch chassis, up to 4000 I/O ports, while the DKM FX system is up and running.

See applications on pages 16–18, 21 and 23–24.

www.black-box.de/KG2DKMFX

Instantaneous HD video switching in a compact hybrid switch with copper or fiber ports, or a combination of both.

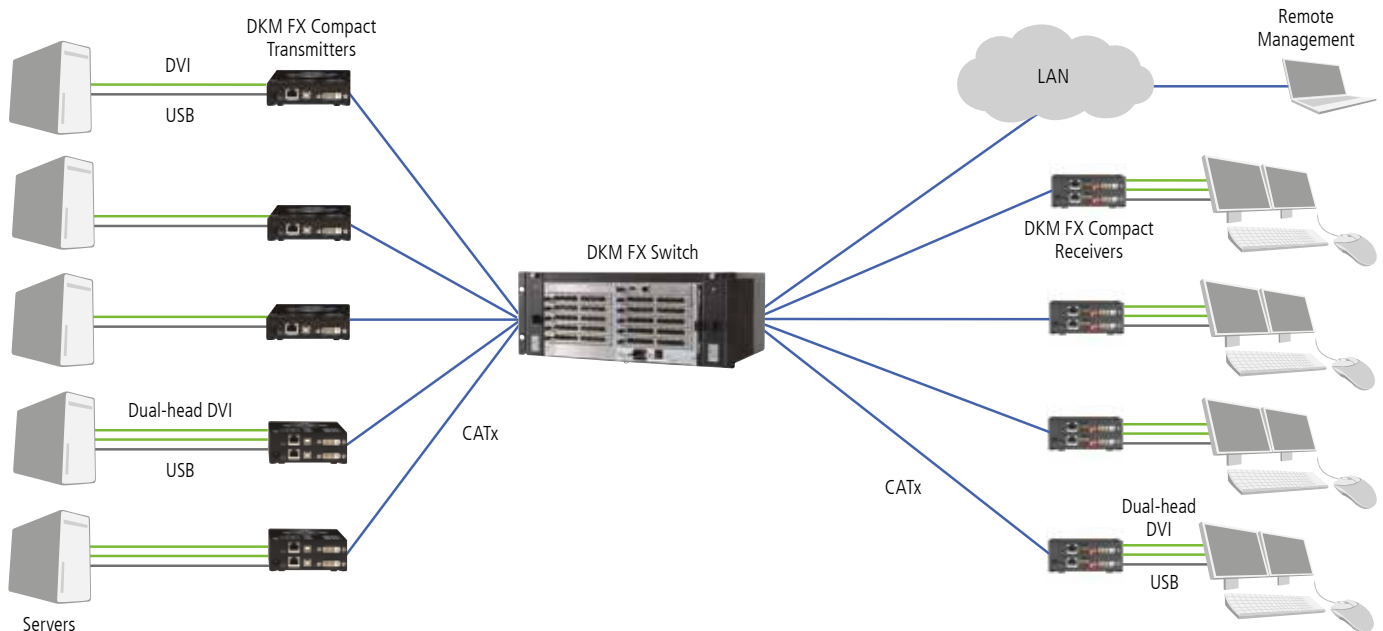
DKM FX Compact Matrix Switches



Scan code for more information.



- Establish connections from consoles to various sources.
- CATx options up to 80 ports (**ACXC8, 16, 32, 48, 64, 80**).
- Fibre options up to 80 ports (**ACXC8F, 16F, 32F, 48F, 64F, 80F**).
- Mixed I/O with 48 CATx ports and 16 or 32 fibre ports (**ACXC48F16, 48F32**).
- Chassis are 1U or 2U for easy mounting in server cabinets or racks.
- Use with DKM FX Compact Extenders (**ACX1T** and **ACX1R** series) to extend video, KVM and USB 2.0 signals.
- Also can be used with DKM FX Modular Housing and Extenders.



For DKM FX extenders, see pages 34–35.

Modular KVM extension system transmits high-definition video, USB and serial signals over copper or fibre cabling.

DKM FX Modular KVM Extension



Scan code to configure a Modular KVM system.



- Choose 2-, 4-, 6-, or 21-port housing available with or without redundant AC power (**ACXMODH2-R2, ACXMODH2R-R2, ACXMODH4-R2, ACXMODH4R-R2, ACXMODH6R-R2, ACXMODH21R**) and DC power (**ACXMODH2R-P12, -P24, -P48, ACXMODH6-P12, -P24-, P48**).
- Options for housings with a backplane (**ACXMODH6BPAC-R2**), (**ACXMODH6FPAC-R2**).
- Distances depend on the the medium. Over CATx, go up to 140 metres; over multimode fibre, go up to 1000 metres; and over single-mode fibre, go up to 10 kilometres.
- Mix and match modular interface cards to extend DVI, HDMI, DisplayPort SDI, USB, serial and audio signals, plus more (**ACX1MT, ACX1MR, ACX2MT and ACX2MR** series).
- Video standards and resolutions include DVI-D up to 2560 x 1600; HDMI up to 2560 x 1440; and DisplayPort resolutions up to 4K.
- Modular housing can also be used with chassis-based and compact matrix switches.

See products on pages 32–33.

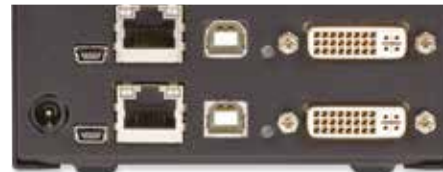
www.black-box.de/KG2DKMExtenderTool

Expand signal extension options in the DKM FX matrix switching system.

DKM FX Compact KVM Extenders

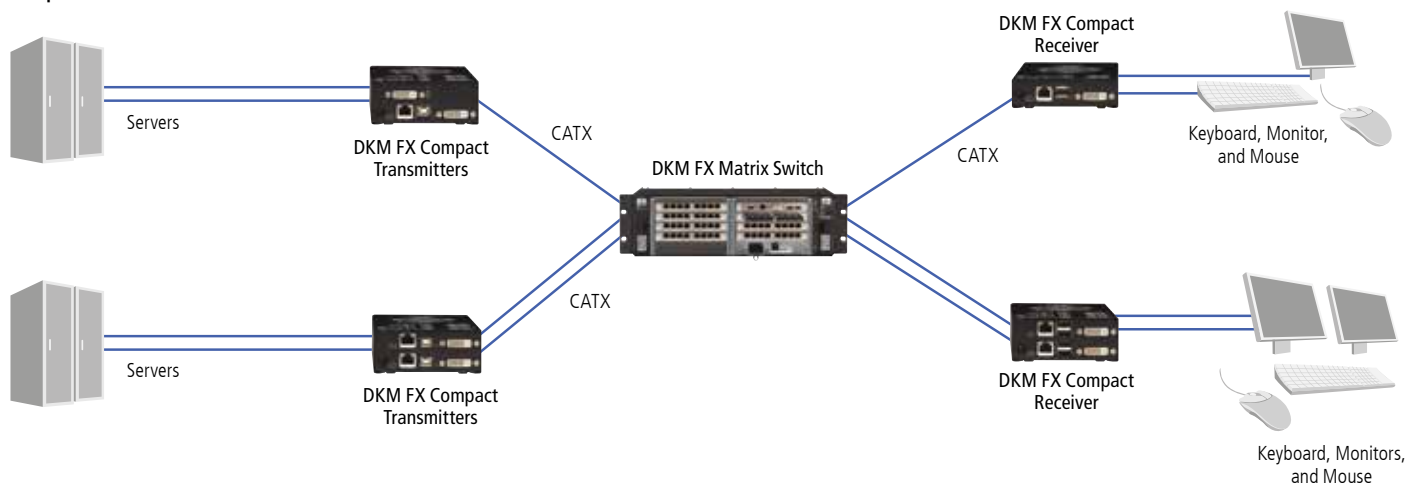


Scan code for more information.



Connect users and computers to your DKM FX or DKM FX Compact Matrix Switch Chassis. These compact extenders can also be used as point-to-point extenders (**ACX1K**, **ACX1T** and **ACX1R** series). Transmit a mix of signals over CATx or fibre cabling. Signal types include DVI, HDMI, SDI, DisplayPort, USB HID, USB 2.0, serial and audio. Compact and modular extenders are fully compatible with each other.

Compact Extender Units with DKM FX Chassis



www.black-box.de/KG2DKMFX

Digital high performance KVM switching

DCX3000 Digital KVM Matrix



Scan code for more information.



The DCX3000 is a flexible 30 port high-performance KVM matrix. This cost-effective switch is designed for small and medium-sized applications where fast and reliable switching of digital HD video, audio and USB is essential. "Zero U" interface powered Server Access Modules (SAMs) extend DVI or DisplayPort signals and USB over standard CATx cabling.

Small, yet powerful

Small in terms of cost and size, yet large in feature and performance, the DCX3000 is the ideal solution for process monitoring and control, broadcast studios, medical labs, test beds and advanced data centers. Use it in any high performance KVM application where up to 23 target computers and multiple users are connected over distances up to 50 metres from the central switch.

Intuitive User Interface

The unique graphical user interface moves away from the tradition of text only OSD menus, using auto refreshed preview thumbnails, giving an intuitive user experience. Devices may also be switched by using "quick-fire" keyboard hotkeys.

All connected devices are automatically up-dated on the layout, allowing an "at a glance" view of the matrix and giving a rich desktop experience.

Zero Compression, Pixel Perfection

Unlike other digital KVM systems, the DCX3000 delivers every pixel of every video frame with zero compression and zero latency, fulfilling the needs of even the most demanding graphical applications and guaranteeing perfect video synchronisation for multiple display applications.

Secure Configuration

Secure system configuration is provided by the tablet and mobile compatible WebUI. The UI also gives an administrator choice of control for all device connections, allowing for video only, shared, private and exclusive access modes to be setup (In private mode other users are able to view the shared video but have no keyboard and mouse access to the target. In exclusive mode no access is offered to any other user).

24/7 reliability

The DCX3000 switch utilises locking dual power connections to enable redundant power whilst providing continuous status updates to ensure true 24/7 operation and reliability.

Switch like never before

- Intuitive GUI, easy, clear and obvious to use.
- Mouse or keyboard operation.
- Auto-configuration for the number of connected computers.
- Auto refreshed UI thumbnails.



DCX3000 Digital Remote Unit

- Switch via Unique UI or quick-fire hotkeys.
- Supports HDMI Displays and DVI connections.
- Desk, Rack or DIN mounting options.



DCX3000 KVM Matrix Switch, 30-Port

- 30-port slim matrix switch.
- 10 metres to switch, 50 metres to desk (using CAT6/7 cable).
- Scalable CPU/user matrix (up to 23 computers).
- Zero latency control with zero compression video.
- Single or multi-head operation.
- Configuration via WebUI.



DCX3000 Server Access Module

- Connection for DVI or DisplayPort and USB.
- Zero RU.
- Interface powered.



Unit	Part #
30-port Matrix KVM Switch	DCX3000
Remote User Station	DCX3000-DVR
Server Access Module, DVI and USB	DCX3000-DVT
Server Access Module, DisplayPort and USB	DCX3000-DPT

www.black-box.de/KG2DCX3000

Transmit DVI, USB and audio signals in real time over an Ethernet LAN.

Agility IP-Based KVM Switching and Extension



Scan code for more information.



Agility IP-Based KVM Switching and Extension enables you to do more and go farther with perfect digital video in real time. Standard CATx cabling delivers IP traffic up to 100 metres. For longer distances, add a network switch, which will give you an additional 100 metres per switch segment.

The flexible topology of the Agility gives you extension option applications beyond keyboard-monitor-mouse. This high-performance KVM system enables KVM switching, target sharing, DVI extension with full HD 60fps and multicasting. Share real-time video over an IP network with Agility, making it ideal for use in digital signage and healthcare, education and corporate applications where you need to share video content with distant users. To prevent saturating the network, when, for example, a receiver isn't set up to explicitly receive a multicast, an installed network switch should feature Internet Group Management Protocol (IGMP) snooping. This prevents an IP switch from passing on multicast data onto every port.

The Agility IP-Based system consists of a series of transmitters and receivers, including single- and dual-head models. All transmitters and receivers support link aggregation and link redundancy, Magic Eye to minimize dithering bandwidth usage, high resolution DVI video and keyboard/mouse extension.

In matrix high-performance applications, you will also need an Agility iPATH Controller Unit. It includes a management suite for remotely and securely managing the transmitter and receiver units. Define new content channels, restrict and enable access privileges, push control and more.

Once you plug the controller into your network, you can begin managing devices, users and channels. The iPATH™ interface features a useful on-screen dashboard that gives you a current overview of the system.

In a single target-sharing configuration, multiple users can share a single remote computer. View-only shows only the video feed. In Share Mode, an open connection is available for all users to use the connected devices at the same time. In Exclusive Mode, one user locks out the other users, preventing them from viewing or sharing the connection, with the exception of network administrators.

The Agility high-performance KVM system freely scales from a point-to-point extension system to a HD video and peripheral matrix switching system over Ethernet.

See application on page 19.

www.black-box.de/KG2Agility

Single-Head Transmitters and Receivers

- Single-head DVI video and keyboard/mouse extension.

Agility single-head units support DVI-D resolutions up to 1920 x 1200.

Additionally, since some graphics cards use dithering to give the appearance of deeper color, single-head units feature Magic Eye.

Dithering can significantly increase the normal video data rates.

Magic Eye supports dithering while retaining overall link performance.



Dual-Head and Dual-Link Transmitters and Receivers

- Dual-head DVI video and keyboard/mouse extension.
- Dual-head with VNC port for remote access and management.

Dual-head Agility units also support DVI-D resolutions up to 1920 x 1200 per channel, link aggregation and link redundancy. Dual-link units support 2560 x 1600 to one display, or dual-head resolutions to 1920 x 1200.



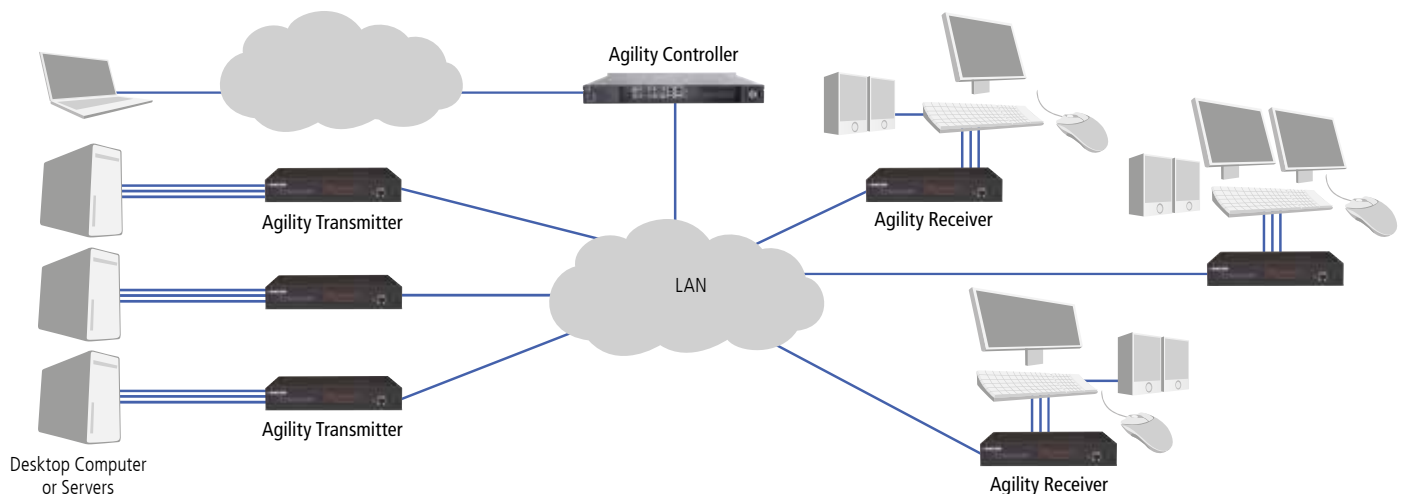
Controller Unit

- Turns Agility IP-Based KVM system into a managed matrix switching system.

This management system controls transmitters, receivers, users, passwords and access rights when using multiple transmitters and receivers on a single IP network. The Agility system uses standard Ethernet protocol to operate. The maximum distance supported is 100 metres; to go farther, add an Ethernet switch or fibre optic connectivity.



Single-Head	Dual-Head	Dual-Link	Transmitter	Receiver	Part #
•			•		ACR1000A-T-R2
•				•	ACR1000A-R-R2
	•		•		ACR1020A-T
	•			•	ACR1020A-R
	•	•	•		ACR1002-T
	•	•		•	ACR1002-R
	with VNC port	•	•		ACR1012A-T
Controller Unit				•	ACR1000A-CTL-24



Remotely access physical or virtualized CPUs over a LAN/WAN. Switch and extend real-time HD video and USB HID.

InvisaPC Zero-Client, Virtual Remote Desktop



Scan code for more information.



The InvisaPC is a zero-client, remote desktop solution. Computers are connected to an InvisaPC transmitter and each user has his/her own keyboard, monitor, mouse and peripheral setup connected to an InvisaPC receiver. Desktop computers can be relocated to a secure, climate-controlled equipment room. The receiver delivers a high performance, real-time experience, just like running any application on a local CPU without any performance issues.

The clients and the remote servers are connected via standard LAN or WAN infrastructure. The bandwidth requirements of the system are very low. For example, with the InvisaPC, transmitting a 1080p movie only requires 35 Mbps bandwidth. The low bandwidth requirements enable extension over the Internet with very low latency and sharing over corporate networks.

Connected to a virtual machine (VM), one InvisaPC receiver supports up to 16 RDP, RDP 7.1/8 targets, or can connect to a

VM pool via a connection broker. Classic RDP is supported on top of the remote FX feature. The same receiver can also be connected with up to 16 InvisaPC transmitters/servers. That way each InvisaPC receiver supports switching between 32 soft and hard targets. The setting can be copied from one receiver to another to simplify setup, while user profiles may be configured on the receiver to restrict targets. Multiple receivers may be used to create a matrix switch via the network, too, without any management requirements.

The clients operate extremely quietly—no fan noise to distract users from their work. The power consumption is about 3 watts per unit which, compared to a desktop PC, is 100 times more energy efficient. The InvisaPC client, with its space-saving design, can even be mounted behind the monitor screen.

Moving to cloud computing with a zero client device like the InvisaPC enables IT managers to make their department more flexible and responsive.

See application on pages 22 and 28.

www.black-box.de/KG2InvisaPC

Single-Head Transmitter, Receiver

- The InvisaPC system is simple to expand as new users or servers are added. Single-head and dual-head units integrate easily and the system does not need a hardware refresh when it grows.

Using an InvisaPC transmitter, the system supports digital video, digital audio and USB peripheral extension across IP networks. There are no upgrades to equipment, software licensing, or remote management—plus, no time-consuming IT visits.



Dual-Head Transmitter, Receiver

- Includes a second video head channel for dual monitor desktop workstations.

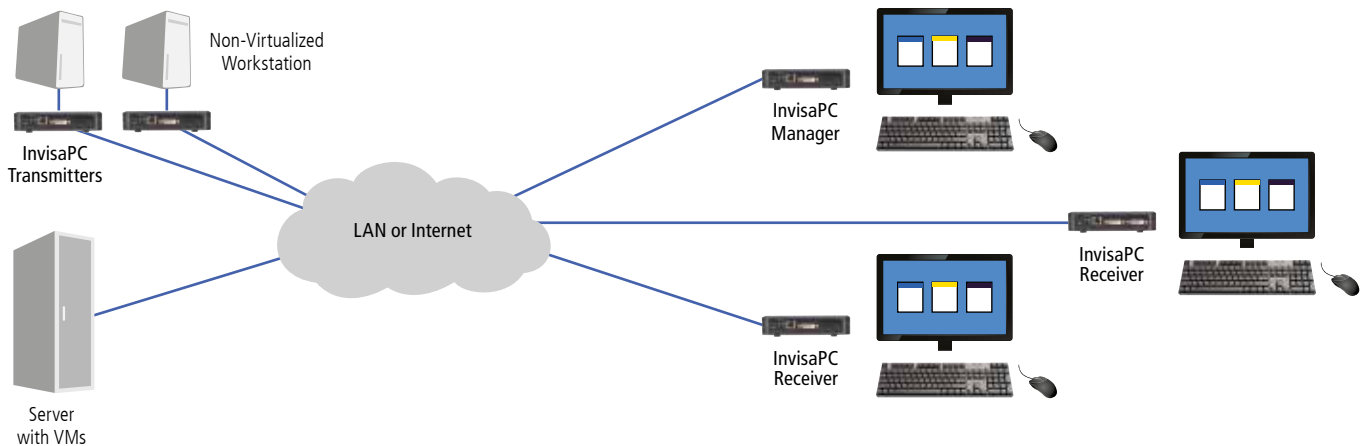


Manager Unit, Single-Head Receiver

- Manage and configure up to 32 endpoints.

Adapts to growing needs.

InvisaPC can easily be adapted to meet your requirements. Start with a small switching system that enables one user access to different computers and virtual machines. Gradually, the system can be expanded into a switching matrix. Management software will also enable larger switching matrices, as well as integration into existing network authentication systems such as LDAP or Active Directory.



Head	Transmitter	Receiver	Part #
Single-Head	•		DTX1000-T
Single-Head		•	DTX1000-R
Dual-Head	•		DTX1002-T
Dual-Head		•	DTX1002-R
Single-Head, Manager Unit		•	DTX1032

Product Selection Guide for Black Box Data Centre KVM Switches



Scan to read our Buyer's Tips.

User	PC		Common						Cable Part Number	Part Number	Page #
	No. of Users	No. of Computers	Computer Connections	Video Interface	RS-232	Audio	IP Access	Firmware Upgradeable			
1	1	PS/2 or USB	VGA			•	•	—		ACR101A	43
1	1	PS/2 or USB	VGA			•	•	—		ACR201A	43
1	1	USB	DVI-I		•	•	•	—		ACR101A-DVI	43
1	8	PS/2 or USB	VGA		•		•	USB	KV1401A–1409A	KV0081A	44–45
1	16	PS/2 or USB	VGA		•		•	USB	KV1401A–1409A	KV0161A	44–45
1	8	PS/2 or USB	VGA		•	•	•	USB	KV1401A–1409A	KV1081A	44–45
1	16	PS/2 or USB	VGA		•	•	•	USB	KV1401A–1409A	KV1161A	44–45
1	16	PS/2 or USB	VGA	•	•	•	•	USB	KV1401A–1409A	KV4161A	44–45
4	16	PS/2 or USB	VGA		•		•	USB or PS/2	KV1401A–1409A	KV0416A-R2	44–45
4	24	PS/2 or USB	VGA		•		•	USB or PS/2	KV1401A–1409A	KV0424A-R2	44–45
4	16	PS/2 or USB	VGA		•	•	•	USB or PS/2	KV1401A–1409A	KV1416A-R2	44–45
4	24	PS/2 or USB	VGA		•	•	•	USB or PS/2	KV1401A–1409A	KV1424A-R2	44–45
1	4	PS/2	VGA					PS/2	EHN70001, EHN9000P, EHN9000U	KV9004A	46–47
1	8	PS/2	VGA					PS/2	EHN70001, EHN9000P, EHN9000U	KV9008A	46–47
1	16	PS/2	VGA					PS/2	EHN70001, EHN9000P, EHN9000U	KV9016A	46–47
1	4	PS/2	VGA					USB	EHN70001, EHN9000P, EHN9000U	KV9104A	46–47
1	8	PS/2	VGA					USB	EHN70001, EHN9000P, EHN9000U	KV9108A	46–47
1	16	PS/2	VGA					USB	EHN70001, EHN9000P, EHN9000U	KV9116A	46–47
1	4	PS/2 or USB	VGA					USB	EHN70001, EHN9000P, EHN9000U	KV9204A	46–47
1	8	PS/2 or USB	VGA					USB or PS/2	EHN70001, EHN9000P, EHN9000U	KV9208A	46–47
1	16	PS/2 or USB	VGA					USB or PS/2	EHN70001, EHN9000P, EHN9000U	KV9216A	46–47
1	8	USB	DVI-D					USB	EHN70001, EHN9000P, EHN9000U	KV9508A	46–47
1	16	USB	DVI-D					USB	EHN900024U	KV9516A	46–47

Secure, high performance KVM over IP for remote server management.

Wizard IP DXS Gateways

- Easily log into and control a computer via the Internet or a corporate network.
- Enables direct KVM-over-IP (KVMoIP) computer management.
- DVI gateway supports single-link resolutions up to 1920 x 1200. With adapter, supports HDMI or DisplayPort DP++ (dual-mode) output.
- Enterprise-grade security with AES 128-bit encryption.



The Wizard IP DXS Gateways eliminate bottlenecks in mission-critical server administration. Connected to each of your servers, these small-form-factor IP engines provide system administrators with full non-blocking remote access from anywhere in the world. With them, you get full control of a connected CPU or server down to the BIOS level.

Their small size and included Windows® VNC viewer application make this KVM-over-IP solution ideal for enterprise remote management.

The IP gateways enable an authorized remote user to transfer files and folders to a host computer just as if the files and folders were presented locally on a removable CD-ROM or other storage media. Files can be transferred via IP onto the gateway and onto the target computer by means of a USB virtual media port.

Use them, for instance, to remotely upgrade or patch host systems in another location—a real time-saver when this has to be done on many computers in many offices.

Plus, they offer high-quality video performance. This makes them ideal for healthcare imaging, graphics studio, engineering visualization, control room and similar HD video applications. The Wizard IP DXS, single-server IP Gateway with DVI (**ACR101A-DVI**) accepts any single-link DVI-D input at up to 1920 x 1200 resolution, but with the addition of a video adapter,

it can also be attached to a computer with HDMI® or DisplayPort DP++ (dual-mode) output. The other two gateways are VGA only.

Use the gateways anywhere on your network. They can be placed within a LAN behind any firewall or router connection to the Internet, or be placed externally to the local network, on a separate subnetwork, or with an open Internet connection.

Connect directly to your PC for direct single target access, or connect an existing KVM switch to support more than one server or computer. With a dual access gateway you can connect one local user to a KVM and one remote user via IP.

The IP gateways include a downloadable Windows VNC Viewer for configuring and managing remote connections using a computer or mobile device. Or you can use it with a VNC viewer program of your choice. You can create up to 16 user profiles with defined access rights and the gateway itself can be accessed by up to four users simultaneously, with each user viewing and controlling the same session.

Single Access	Dual Access	VGA	DVI	Part #
•		•		ACR101A
	•	•		ACR201A
•			•	ACR101A-DVI

www.black-box.de/KG2WizardDXS

CATx-based local and remote user KVM access to multiple CPUs or servers.

CX Series KVM Switches



Scan code for more information.



The CX KVM switches enable a single user or up to four users to connect to the switch via CAT5, CAT5e, or CAT6 cable—no bulky, proprietary KVM cables to deal with.

In addition, you can mix and match different kinds of servers on the same CX switch. Just run CATx cables from the switch's server ports to the Server Access Modules (SAMs) that connect to your servers. Simply choose the appropriate SAM for each server.

What's more, you can connect the CX to either a PS/2 or USB keyboard and mouse—it includes both connector types.

Whether you're working at a user station or the local analog console port in the server room, you can select a server to access and control via on-screen menus or hotkeys. On-screen menus make server selection simple because you can give each server a name that makes sense to you.

The CX series provide super-sharp resolutions up to 1900 x 1200 for all users up to 50 metres away. And at up to 300 metres away, or over IP connections, the CX displays 1024 x 1280 video resolution.

By choosing a SAM with audio, you add support for stereo speakers, enabling you to hear audible alerts.

For even greater versatility, you can cascade non-IP-enabled CX switches with IP-enabled versions. This gives you remote server management over the IP network.

See SAMs on page 74.

www.black-box.de/KG2CX

CX Uno, Single User KVM Switch

- Set up CATx-based local and remote KVM access.
- Resolutions up to 1920 x 1200 at 60 Hz and DDC EDID support.
- IP support enables remote server access over an IP network.

Less than half the width of a standard 19" mountable device, the ServSwitch CX Uno supports up to 31 cascaded servers in 1U of rack space.



8-port	16-port	IP, 8-port	IP, 16-port
KV0081A	KV0161A	KV1081A	KV1161A

CX, Multiuser KVM Switch

- Easy connections over CATx cable; one local console port, four remote CATx user ports.
- Maximum resolution of 1900 x 1200.
- Ideal for small and mid-size data centres.

Whether you're working at a user station or the local analog console port in the server room, you can select a server to access and control via on-screen menus or hotkeys. On-screen menus make server selection simple because you can give each server a name that makes sense to you.



16-port	24-port	IP, 16-port	IP, 24-port
KV0416A-R2	KV0424A-R2	KV1416A-R2	KV1424A-R2

CX Quad IP KVM Switch

- Remote server access over the Internet for up to four simultaneous remote users and one local user.

The CX Quad IP KVM switch is compatible with all major computer platforms; connects via lightweight, inexpensive twisted-pair cable; and enables you to access servers across any IP network, either a private intranet or the Internet.

The CX Quad IP connects four IP users, plus one local user, to up to 16 servers, with the ability to cascade units up to 256 servers. Access servers across any IP network using a Java-enabled Web browser or VNC client.

Additionally, the switch supports Display Data Channel (DDC) emulation. DDC enables your monitor to communicate with the attached CPUs' video cards and configure the CPUs' video drivers automatically at boot up.

You can set up the CX switches behind the security of your network firewall and it also has the security features it needs to be safe on its own. This enterprise-grade KVM switch uses AES128 bit encryption and RSA2048 authentication, ensuring your control system remains secure at all times.

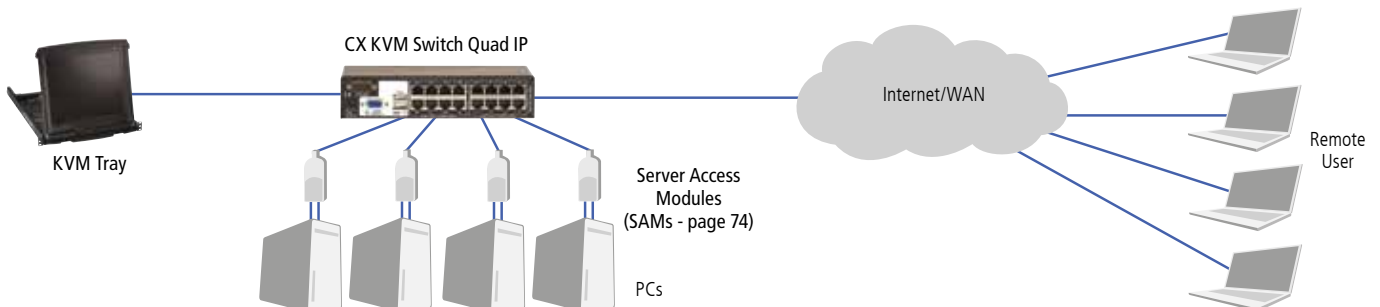


You can also configure eight separate users internally with unique access privileges, all of which are stored only within the switch.

Connect user stations and servers via lightweight and inexpensive CAT5, CAT5e, or CAT6 UTP cable—no bulky KVM cables needed. UTP cable provides more distance than KVM cable to connect the servers. Use SAMs (page 74) to provide keyboard, video, mouse and speaker connections. Servers may be placed 10 metres from the switch.

The ServSwitch CX switches feature Ecopulse circuitry, which powers down unused circuits when they are not required. Over the life of the switches, this reduction of power saves significant resources.

16-port
KV4161A



Manage multiple CPUs from a single workstation with these PS/2 and USB console/server switches.

EC Series KVM Switches



Scan code for more information.



These basic KVM switches are ideal for businesses ready to expand into multiple server management KVM systems using native cable. The EC KVM switches are very cost effective because they work with PS/2 and/or USB consoles (computer workstations) and servers, making them perfect for basic data centre switching.

Additionally, the EC series is ideal for areas where you have a limited amount of space. The 1U-high ECs can be used on a desktop or mounted in a rack or cabinet. (Brackets are included with the 8- and 16-port models.)

To save more space, the KVM circuitry is concentrated in a single connector at the server end. This way, you have fewer cables to install when making server connections.

Because the EC is plug-and-play, you can add or subtract servers almost as quickly as you can plug and unplug cables.

Switch between servers using front-panel buttons or hotkeys. Or with autoscan, the EC will scan and switch between servers, one by one, at an interval that you determine. When autoscan detects any keyboard or mouse activity, it suspends the scanning until activity stops and then resumes with the next computer in sequence.

In addition, all models feature on-screen display. Through this OSD, you can assign 14-character server names that make sense to you, view the connection status by port, and lock servers from unauthorized users.

What's more, the EC stores system settings and name entries in nonvolatile memory and saves your keyboard settings for each server, restoring them when you come back to that machine.

www.black-box.de/KG2ECswitch

EC KVM Switch with DVI + USB



- Resolutions up to 1920 x 1200.
- Single-link DVI USB KVM switch with USB/DVI console connections.
- OS independent and transparent to all applications.
- DDC2B compatible for use with the latest digital monitors.
- 1U or 2U switches for mounting in server room racks or cabinets.

The EC KVM Switch DVI + USB steps up the video resolution, giving users sharp, clear DVI single-link signals. These switches ensure superb video quality and video resolutions up to 1920 x 1200 and they are DDC2B compatible. Use them with digital monitors without worrying about delay or skew.

Servers	Video	8-port	16-port
USB	DVI-D	KV9508A	KV9516A

EC KVM Switch For PS/2 and USB Servers and PS/2 and USB Consoles



- Manage multiple CPUs from a single desktop.
- Ideal for non-mission critical installations.
- VGA resolutions up to 1920 x 1440.
- OS independent and transparent to all applications.

These switches are ideal for small or medium business offices ready to expand into multiple server management KVM systems using native cable. EC KVM Switches for PS/2 and USB servers and PS/2 and USB consoles are very cost effective because they work with PS/2 and/or USB consoles and servers, making them perfect for basic data centre KVM switching.

Servers	Console	Video	4-port	8-port	16-port
PS/2	PS/2	VGA	KV9004A	KV9008A	KV9016A
PS/2, USB	PS/2	VGA	KV9104A	KV9108A	KV9116A
PS/2, USB	PS/2, USB	VGA	KV9204A	KV9208A	KV9216A

For CPU Cables, see page 77.

Product Selection Guide for Black Box Desktop KVM Switches

User	PC		Common								
No. of Users	No. of Computers	Computer Connections	Video Interface	Video Heads	RS-232	Audio	Firmware Upgradeable	USB Compatability	Cable Part #	Part #	Page #
1	4	USB	DVI-I	1		●		Basic	EHN900024U	KV9604A	50-51
1	2	USB	DVI-D	1		●		Basic	EHN900025U	KV9612A	50-51
1	4	USB	DVI-I	1		●		Basic	EHN900024U	KV9614A	50-51
1	2	USB	DisplayPort	1		●		Basic	VCB-DP	KV9702A	50-51
1	4	USB	DisplayPort	1		●		Basic	VCB-DP	KV9704A	50-51
1	2	USB	DVI-D	2		●		Basic	EHN900025U	KV9622A	50-51
1	4	USB	DVI-I	2				Basic	EHN900024U	KV9624A	50-51
1	8	USB	DVI-D	2				Basic	EHN900025U	KV9628A	50-51
1	4	USB	DisplayPort	1	●	●	●	Advanced	VCB-DP	KV9804A	52-53
1	4	USB	DVI-I	1	●	●	●	Advanced	EHN900024U	KV2004A	52-53
1	4	USB	DVI-I	2	●	●	●	Advanced	EHN900024U	KV2204A	52-53
1	4	USB	DVI-I	3	●	●	●	Advanced	EHN900024U	KV2304A	52-53
1	4	USB	DVI-I	4	●	●	●	Advanced	EHN900024U	KV2404A	52-53
1	8	USB	DVI-I	1	●	●	●	Advanced	EHN900024U	KV2008A	52-53
1	4	USB	VGA	1	●	●	●	Advanced		KV3004A	52-53
1	4	USB	VGA	2	●	●	●	Advanced		KV3204A	52-53
1	4	USB	VGA	3	●	●	●	Advanced		KV3304A	52-53
1	4	USB	VGA	4	●	●	●	Advanced		KV3404A	52-53
1	4	USB			●	●	●	Advanced		KV0004A-R2	54-55
1	2	PS/2 or USB	VGA	1				Basic	Included	KV401A-KV408A	49



Control two computers with our low-cost KVM switch in a cable.

Micro KVM Switch

- Access two computers from a single shared monitor, keyboard and mouse.
- Video resolutions up to 1920 x 1440.
- Ultra-small size makes it perfect for tight spaces.
- Plug-and-play install and set up.
- Powered from the keyboard and mouse interface.



Console	Computer	Audio	Part #
PS/2	(2) PS/2		KV401A
PS/2	(2) USB		KV402A
PS/2	(1) PS/2, (1) USB		KV403A
PS/2	(2) PS/2	•	KV404A
PS/2	(2) USB	•	KV405A
PS/2	(1) PS/2, (1) USB	•	KV406A
USB	(2) USB		KV407A
USB	(2) USB	•	KV408A

Access to multiple systems with high-definition video is easy through these desktop KVM switches.

DT Series Desktop KVM Switches



Scan code for more information.



Set up basic desktop KVM switching with high-resolution digital video. Through the use of these entry-level KVM switches, even small and home offices can benefit from reduced clutter and lower energy costs. The DT Series KVM switches support resolutions of 1920 x 1200 at 60 Hz while managing up to eight separate CPUs. Each desktop switch supports keyboard and mouse plug-and-play.

For best results, these switches can be used with DT Series CPU cables (**EHN900024U**, see page 77), DVI-D to DVI-D male-to-male cables (**EVNDVI02**) and Black Box audio cables (**EJ110**).

www.black-box.de/KG2DTSwitch

DisplayPort, USB and Audio

- Support for DisplayPort with high resolutions up to UXGA (1600 x 1200), full HD (1920 x 1200), WUXA (1920 x 1200), and WQXGA (2560 x 1600, dual-link.)
- Switching system enables the USB or audio devices to operate independently.

DT DisplayPort KVM Desktop Switches support one of the current highest video resolution standards. Along with high resolution video, switch other peripherals collectively or independently, depending on whether you want to do parallel tasks on different machines, or target a single computer with multiple peripherals. Switching is controlled by front-panel buttons or hotkeys.



2-Port	4-Port
KV9702A	KV9704A

DVI and USB

- Switch two or four PCs with DVI and USB.
- Supports resolutions up to 1920 x 1200 at 60 Hz.
- Hotkey switching.
- Kits available with CPU cables included.

Access up to four CPUs with high-resolution DVI video connectors from a single workstation with the USB desktop KVM switches. DT DVI switches support full HD video at resolutions up to 1920 x 1200.

Choose from transparent USB 2.0 switches or emulated USB keyboard/mouse (K/M). Emulated USB means unselected computers continue to see the identities of the keyboard and mouse, which means that no enumeration is necessary when their link becomes active once again. This makes reconnecting faster and increases switching reliability.



USB	2-Port	4-Port	2-Port Kit	4-Port Kit
Transparent USB 2.0		KV9604A		KV9604A-K
Emulated USB	KV9612A	KV9614A	KV9612A-K	KV9614A-K

Dual-Head DVI and Audio

- Two-, four-, or eight-port KVM switches provide control of up to eight dual-head and USB-enabled multimedia computers.
- Support digital resolutions up to a 1920 x 1200.
- USB 2.0 device hub ports support high-speed USB device sharing.

Control up to eight multimedia computers. The switches support digital resolutions up to 1920 x 1200 for sharp video plus stereo audio. The DVI-I Dual-Head switches also support analog video resolution up to 1920 x 1200.

In addition to multimedia capabilities, these desktop KVM switches feature four USB ports. The device hub port supports USB 1.1 or 2.0 high-speed device sharing. The switches are truly plug-and-play with DDC2B emulation.



Dual-Head DVI	Audio	2-Port	4-Port	8-Port
DVI-D	•	KV9622A		
DVI-I	•		KV9624A	
DVI-I	•			KV9628A
DVI with Bidirectional Audio	•		KV9634A	

Multilayered switching with True USB Emulation in desktop switches for multiple video heads.

Wizard Series Desktop KVM Switches



Scan code for more information.



Black Box Wizard Desktop Switches are professional-grade compact desktop KVM switches for control of multiple CPUs. The key feature of the Wizard series is the advanced USB emulation and the extension to multiple video heads. True USB Emulation ensures the full characteristics of the connected USB peripherals, including keyboards and mice, are passed to every system concurrently, so specialized features are quickly recognized on the attached devices. True USB Emulation supports a wide array of USB devices and KVM extenders without any delay in USB switching. Each Wizard switch supports multilayered switching, so users can switch video,

audio and USB signals together or separately. These desktop KVM switches also work well with KVM extenders in configurations that need to go a little farther.

The switches support resolutions up to 2560 x 1600 on dual-link DVI or DisplayPort. Multihead video channel access enables a single KVM workstation user to control separate computer systems or servers and flexibly share peripherals among them. The switches support a wide range of USB devices, including high-speed USB 2.0 peripherals. Printers, scanners and non-standard HID devices can all be connected.

www.black-box.de/KG2WizardSwitching

Dual-Link DVI and USB

- Supports dual-link DVI, single-link DVI and VGA; maximum resolutions are 2560 x 1600 at 60 Hz via DVI-D.
- Stereo audio and USB 2.0 switch independently from the video signal.
- Combines transparent USB 2.0 with emulated USB HID.

You can switch up to eight PCs via OSD, hotkeys, mouse, or RS-232/V.24. The switch provides resolutions up to 2560 x 1600 Hz at 60 Hz. Plus, it supports dual-link DVI-D and single-link DVI-D.



8-Port X
KV2008A

Multihead Video with USB

- High-performance multihead KVM switching with True USB Emulation.
- Enables a single user to control four computers fitted with dual-head, tri-head, or quad-head video and share USB peripherals between them.

This highly flexible KVM switch centralizes and simplifies high-end, multihead video switching access at a single user console with multiple DVI screens.

Plus, with advanced support for multiple high-speed USB devices, the Wizard DVI Multihead KVM Switch serves today's busy multitaskers quite well. It's ideal for IT administrators and medical imaging, graphic design and broadcast studio professionals who not only require quick, reliable access to multiple computer CPUs and multiple video channels, but also need simultaneous access to a mix of USB peripherals.



DVI	VGA	USB	Video Heads	Part #
•		•	1	KV2004A
•		•	2	KV2204A
•		•	3	KV2304A
•		•	4	KV2404A
	•	•	1	KV3004A
	•	•	2	KV3004A
	•	•	3	KV3304A
	•	•	4	KV3404A

DisplayPort and USB

- 4-port switch with DisplayPort connections.
- Supports DisplayPort video standard for high-resolution video from full HD up to 2560 x 1600 dual-link.

This compact unit enables a single operator to control up to four computer systems and share peripherals between them. Switch KVM signals, audio and two USB devices in unison or independently between all the connected systems.

This desktop KVM switch supports DisplayPort 1.1, four lanes at 2.7 Gb/s. Video resolutions supported include UXGA (1600 x 1200), full HD (1920 x 1080), WUXA (1920 x 1200) and WQXGA (2560 x 1600, dual-link).



4-ports
KV9804A

Fast, reliable switching between computer systems simply by moving a mouse from screen to screen.

Freedom II KVM Switch



Scan code for more information.



Create a unified desktop system across up to four separate computers with similar or different operating systems.

The Freedom II KVM Switch enables a single user to easily access information and control operations across four computer systems and monitors, saving time, money and space. The Freedom II works like an extended desktop switch. With it, you can perform functions that ordinarily would require four separate keyboard/mouse sets—freeing up valuable desktop space and simplifying your work. Once the screen layout is configured for the attached PCs, switching between PCs is as simple as moving your mouse from screen to screen.

It's ideal for professionals in command and control applications, such as those in broadcast or in finance on a trading room floor. Not only can users switch between several computers, but they get access to a mix of USB peripherals, including USB 2.0 devices. When properly configured, the switch has two switched USB Type A ports for the USB 2.0 peripheral connectivity, in addition to its four USB Type B ports for computer channels and two USB type A ports for USB keyboard/mouse connections.

Additionally, because of the TC/IP port the Freedom II integrates with the Black Box Agility IP-based KVM system. The Freedom II can interface with up to four Agility receivers that are connected to remote servers or PCs over an Ethernet LAN and then switch the Agility targets using just one keyboard and mouse.

The Freedom LED system is a 10-port accessory that supports up to 10 LEDs of variable brightness and colors. Connected to the Freedom, the LEDs show where the keyboard/mouse (K/M) controls are located. Each LED designates a monitor connection, so this device can support up to 10 monitors.

No software is needed for single-head support, so setup is simplified and you won't create any security issues in the process—a real concern in government, healthcare and banking environments. Additionally, the Freedom II works with all known software and operating systems, including Windows®, Linux®, Mac®, Sun™, UNIX® and NetWare® systems. Multi-head support with Glide-and-Switch is only supported on Windows OS.

See applications on pages 25, 27.

www.black-box.de/KG2Freedom



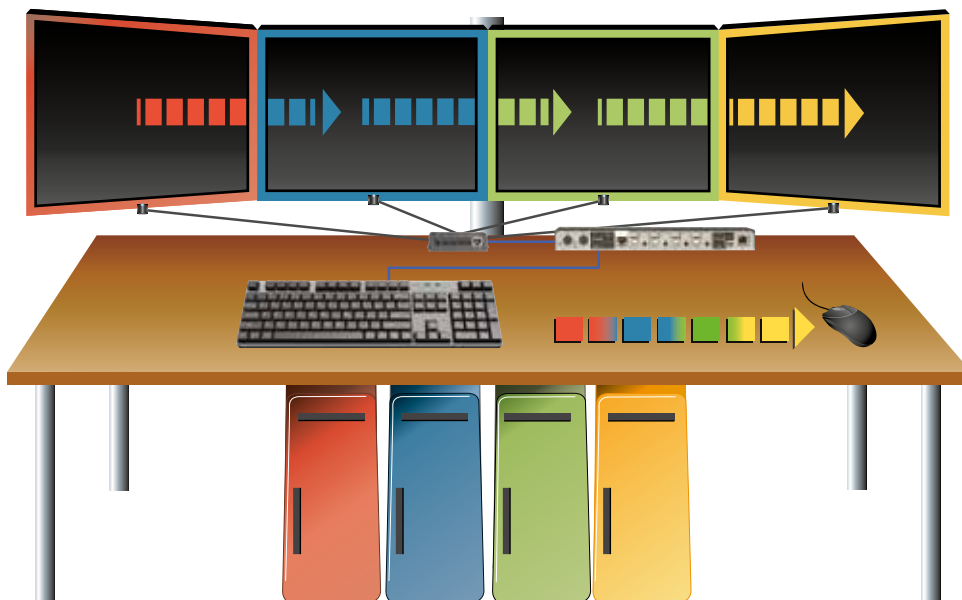
Freedom II

- Simplifies USB keyboard/mouse access across four computers, and supports analog audio.
- With Windows OS, up to four monitors can be supported on each system.
- Includes push button control.
- **KV0004A-R2**



Freedom II LED Monitor ID Kit

- Be aware of which screen is active and the location of the mouse pointer when using the Freedom switch.
- LED attaches to monitor and is lit when screen is active.
- Controller unit and 4 LEDs with 3 metres cables (**KV0004A-LED**); cascable to support more monitors.



Safely access servers between secure and non-secure networks; superior data isolation and protection for government agencies.

Secure Desktop KVM Switches



Scan code for more information.



- High port-to-port electrical isolation, which facilitates data separation (RED/BLACK). Channel-to-channel –80-dB to –60-dB crosstalk isolation provides robust isolation between networks, so they're ideal for government applications that access classified networks in addition to public networks such as the Internet.
- The low radiated emissions profile protects against electronic snooping.
- Switches are permanently hard wired, preventing access from one CPU or network to the others.
- External tamper-evident seals.
- Support DVI-I video, which is DC balanced and may be encoded for security.

Threat: Microprocessor malfunction or unanticipated software bugs cause data to flow between ports.

Solution: Unidirectional keyboard and mouse data flow is enforced by hardware "data diodes" so data isolation doesn't rely on software integrity. This makes it impossible for the computer to send data along the keyboard and mouse signaling channel. This advanced design also ensures data isolation through hardware and prevents the keyboard and mouse interfaces from becoming covert computer-to-computer signaling channels because of software holes or unanticipated bugs.

Threat: Physical proximity between ports enables data leakage.

Solution: Isolation is improved by placing the red and black ports at the opposite edges of the switch.

Threat: Accidental port switching.

Solution: Locked-down operation disables all keyboard hotkey and mouse switching functions in both software and hardware so that data corruption can't inadvertently cause an unanticipated channel change. The only way to change the channels is with the front-panel keys. There is only one button per channel, so channel selection is clear. Color-coded visual feedback confirms the channel selection.

Threat: Signaling by shorting the power supply or loading the power.

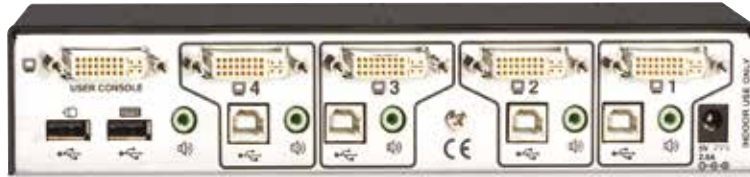
Solution: Each port is independently powered by its USB port. Shorting the power supply on one port will not cause the power on the other ports to be switched off. The shared keyboard, mouse and monitor circuitry are powered by the power supply. The lack of a common power supply minimizes electronic signaling.

Threat: Detection of signals on one computer by monitoring for crosstalk (leakage) signals on another computer.

Solution: Minimum crosstalk separation of 60 dB provided between signals from one computer and input or I/O signals to another. There are no connections to sensitive analog inputs, such as computer microphone ports. Microphone circuitry enables sensitive recording of small analog signals. Even very low crosstalk levels could be recorded and act as a means by which a non-selected computer could read data being sent to another computer.

See application on page 26.

www.black-box.de/KG2SecureKVM



USB, DVI-I, TEMPEST Level 2

- NSA tested and TEMPEST approved for and by the U.S. Air Force. Other agencies under review for approval.
- Switches are designed with tamper-proof seals fitted over countersunk screws to prevent physical tampering.



USB, VGA, TEMPEST Level 1

- VGA-supported resolutions up to 1920 x 1280.

Secure Desktop KVM Switches come with a range of important security features, making them ideal in military and government applications. Altogether, they surpass the security profiles of competitors' KVM switches. Black Box switches are TEMPEST approved (except SW2008A-USB-EAL and SW4008-USB-EAL)

The Secure Desktop KVM Switches with USB provide control and separation of up to four PCs connected to secure and non-secure networks through just one keyboard, monitor and mouse. Users can safely switch among as many as four computers operating at different classification levels without worry.



USB, DVI

- In evaluation for updated security criteria from NIAP (EAL).
- Shielded metal case on all models features double shielding in critical areas.

# of Ports	DVI	VGA	TEMPEST	EAL	Part #
2	•	via adapter	Level 2		SW2007A-USB
4	•	via adapter	Level 2		SW4007A-USB
2		•	Level 1	•	SW2006A-USB-EAL
4		•	Level 1	•	SW4006A-USB-EAL
2	•	via adapter		•	SW2008A-USB-EAL
4	•	via adapter		•	SW4008A-USB-EAL

Reduce clutter and save space in the server room with a rackmountable KVM console tray.

KVM Drawers, USB and PS/2, VGA and Wide-Screen (ServView Series)



Scan code for more information.



These Black Box KVM console drawers offer server management in a space-saving, streamlined package. The trays include a keyboard, touchpad mouse and high-resolution TFT LCD panel screen (standard or wide-screen) housed in an industry-standard 19" 1U rack drawer, which saves valuable cabinet space. A front-panel USB port remains accessible to peripherals even when the keyboard and mouse tray are stored.

- For remote server control, consider CATx Integrated KVM Tray Modules, 8- or 16-port, over CATx or CATx with IP (**KVT517A-8CATX**, **16CATX**, **8CATX-1IP**, **16CATX-1IP**, **16CATX-4IP**). Users can control up to 16 multiplatform computers from the console tray via CATx patch cables (**EVNSL81**) and Server Access Modules (SAMs).

See SAMs on page 74.

www.black-box.de/KG2KVMTrays

Dual-rail Console Drawers

- Flip-open 17" LCD panel.
- Keyboard and mouse pad can be stored with the monitor still open.

Standard Monitor

- Resolutions up to 1280 x 1024.
- Stand-alone tray with no KVM switch; VGA or DVI, USB, PS/2 connectors (**KVT517A-1UV-R2**).
- Trays with integrated KVM switches, 8 ports or 16 ports; VGA, USB, PS/2 connectors (**KVT517A-8UV**, **KVT517A-16UV**).



Wide-Screen Monitor

- Resolutions up to 1920 x 1200.
- Stand-alone tray with no KVM switch; VGA or DVI, USB, PS/2 connectors (**KVT517A-1UV-WIDE**).
- Trays with integrated KVM switches, 8 ports or 16 ports; VGA, USB, PS/2 connectors (**KVT517A-8UV-WIDE**, **KVT517A-16UV-WIDE**).
- Tray with integrated 8-port KVM switch; DVI, USB connectors (**KVT517A-8DV-WIDE**).



All models have an LED bar on the front that enables you to easily find your closed tray in a darkened server room or data centre.



KVM switch selection buttons on the monitor bezel enable switching between servers with only the LCD panel open.

Single-rail Console Drawers with native 1920 x 1200 images

- Ideal to control our Enterprise KVM systems from the central server room.
- 17" display with full sized keyboard and glide pad.
- HDCP support and picture-in-picture display.
- Multiple keyboard languages.
- Stand-alone tray with no KVM switch; VGA, DVI, S-Video & composite video, USB or PS/2 connectors (**KVT1920E**).



USB Laptop Console Crash Cart Adapter

A compact, easy way to remedy a server problem when no KVM tray is available. Plug a laptop into the server with this adapter for quick BIOS-level control. This handheld adapter (**KVT100A**) plugs into the server on one end and a laptop on the other.

- Makes it simple to troubleshoot or service a system after a crash.
- Includes software for viewing server video without needing to reboot or change server.
- No drivers to install on target computer.

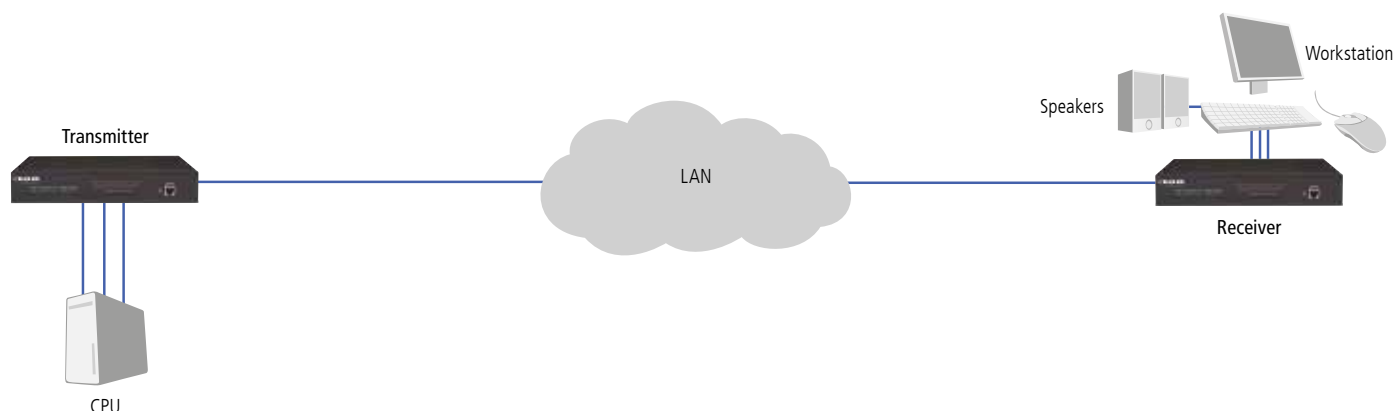


Product Selection Guide for KVM Extenders

Interface	RS-232	Analog Audio	Medium	USB Support	Video Heads	Dual Access	Maximum Distance	Maximum Resolution	Part #	Page #
DVI-D		●	CAT6/6a/7 Shielded	2.0	1		50 metres	1920 x 1200	ACU5501A-R4	62
DVI-D		●	CAT6/6a/7 Shielded	2.0	2		50 metres	1920 x 1200	ACU5502A-R3	62
DVI-D		●	CATx	2.0	1		50 metres	2560 x 1600	ACU5520A	63
DVI-D		●	IP via CATx	HID	1		100 metres	1920 x 1200	DTX1000	40–41, 61
DVI-D		●	IP via CATx	HID	2		100 metres	1920 x 1200	DTX1002	40–41, 61
DVI-D	●	●	IP via CATx or fibre	2.0	1		100 metres	1920 x 1080	ACR1000A-R2	38–39, 68
DVI-D	●	●	IP via CATx or fibre	2.0	2		100 metres	1920 x 1200	ACR1020A	38–39, 68
DVI-D	●	●	IP via CATx or fibre	2.0	2		100 metres	2560 x 1600	ACR1002A	38–39, 68
DVI/HDMI			CATx	2.0	1	●	120 metres	1920 x 1200	ACX300	64–65
DVI-D		●	CATx	2.0	1	●	120 metres	1920 x 1200	ACX310	64–65
DVI-D			Fibre	2.0	1	●	400 metres	1920 x 1200	ACX310F	64–65
DVI-I		●	Fibre	2.0	1	●	400 metres	1920 x 1200	ACX310FIA	64–65
DVI-D		●	CAT6/6a/7 Shielded	2.0	1		150 metres	1920 x 1200	ACU5700A	66
DisplayPort		●	CAT6/6a/7 Shielded	2.0	2		100 metres	3840 x 2160	ACU5800A	67
VGA			CATx	HID	1		50 metres	1600 x 1200	ACU4001A	69
VGA			CATx	HID	2		50 metres	1600 x 1200	ACU4201A	69
VGA	●	●	CATx	HID	2		50 metres	1600 x 1200	ACU4222A	69
VGA		●	CATx	HID	1		50 metres	1920 x 1440	ACU5051A	70
VGA	●	●	CATx	HID	1		50 metres	1920 x 1440	ACU5052A	70
VGA	●		CATx	HID	1		150 metres	1920 x 1200	ACU5050A-R2	71
VGA	●	●	CAT6	HID	2		300 metres	1920 x 1200	ACU5250A-R2	71

Extend video over a LAN or combine CATx and fibre cabling with these extender options.

Extender options for scalable systems that need to go farther.



- Point-to-point KVM and HD video extension over an IP network with Agility IP-Based KVM Switch system.
- Transmitters and receivers install directly into existing LAN infrastructure.
- Or choose to extend KVM and video over a LAN/WAN with InvisaPC.

See products on pages 38–39, 40–41 and 68.



DKM FX Housing for Modular DKM Extenders (ACXMODH4-R2)



ACX1MR-DVHID-C

For more flexible extender options, this system uses a 2-, 4-, 6-, or 21-slot chassis and interface cards to transmit a variety of signals over a mix of CATx and fibre cable. Choose from more than 30 interface cards that carry digital video signals, including SDI, DisplayPort and HDMI, as well as audio, USB HID, USB 2.0 and serial signals. Contact Black Box pre-sales engineers to configure the ideal system for the extender application.

See products on page 34.

www.black-box.de/KG2DKMExtenders

Pure, digital video retains crisp, clean clarity for DVI-D signals over CATx—no loss, no conversion.

Wizard DVI-D and USB KVM Extender



- Send perfect 1080p digital video up to 50 metres over CAT6/7 without compression or delay of video data.
- Resolutions up to 165 Megapixels per second per video head, the maximum rate available on single-link DVI connections.
- Bidirectional USB support.
- Carry extended DDC EDID data from display device to display adapter.

	DVI	USB	Part #
Single-head	•	•	ACU5501A-R4
Dual-head	•	•	ACU5502A-R3
19" Chassis for up to 16 units			ACU5000A

High-performance KVM extension with dual-link DVI over CATx cable.

Dual-link KVM Extender, DVI + USB and Audio

The Dual-link KVM Extender DVI + USB transmits lossless DVI video up to 50 metres, enabling workstations to be put in quiet, climate controlled areas while CPUs are housed separately and securely. Lossless video ensures a high image quality, without delay or visible artifacts.



- Transmit dual-link DVI, USB 2.0 and analog audio over a single CATx cable up to 50 metres.
- Maximum resolution of 2560 x 1600 at 60 Hz.
- Remote unit features 4-port USB hub.
- Use of one CATx cable means this extender integrates seamlessly in your infrastructure.
- No software, drivers, or configuration needed. Plug-and-play.
- USB 2.0 supports HID devices such as keyboards, mouse, touchscreens and tablets.
- USB 2.0 also supports full speed (12Mbps) isochronous devices, such as a mass storage device.
- Intelligent EDID management.
- **ACU5520A**

DVI and USB KVM extension in a point-to-point configuration; point-to-multipoint with a switching option; choose copper or fibre cabling.

KVM Extenders for DVI + USB (ACX300 series)



Scan code for more information.



These small form factor extenders are designed for high-definition video and USB KVM extension. They support Full HD 1080p resolutions at 1920 x 1200, plus extend audio and RS-232. The USB interface enables USB HID and USB 2.0, including touchscreens, graphic tablets, sound modules and serial adapters. A support license enables external USB 2.0 storage devices to be added as well, including hard drives or USB memory sticks.

With a switching upgrade, the ACX300 series extenders become a cost effective entry into digital KVM extension and matrix switching for VGA and DVI sources. Extend and switch a single user console to up to 48 targets with the upgrade.

Mounting options for the ACX300 extender series include a 19" rackmount kit for four extenders, DIN-rail mounting and table or wall mounts.

The ACX300 series is our product of choice for remote control in industrial applications. They feature a compact, robust design, can be mounted to DIN rails and incorporate all capabilities required.

www.black-box.de/KG2ACX300



DVI/HDMI + USB 2.0 over CATx

- Extend signals up to 125 metres over copper cable.
- Supports DVI-D to HDMI with adapter cable. (HDCP is not supported.)
- Remote unit includes a four-port USB hub, (4) USB Type A ports.



DVI-D + USB 2.0 over Fibre

- DVI-D resolutions up to 1920 x 1200.
- Extend signals up to 400 metres over multimode fibre.
- Distances up to 20 km over single mode fibre, with optional SFP.
- Remote unit includes a four-port USB hub, (4) USB Type A ports.



DVI-I, USB 2.0 and Audio over CATx or Fibre

- Extends digital video up to 400 metres over multimode or longer distances via single-mode fibre cable with optional SFP.
- DVI-I signals in, DVI-D signals out via local feed-through port.
- Bidirectional stereo audio extension for speakers and a microphone is supported.
- Supports legacy VGA signal input with VGA to DVI adapter.
- Remote unit includes a four-port USB hub, (4) USB Type A ports.

Video	USB	Audio	CATx	Fibre	Part #
DVI/HDMI	2.0		•		ACX300
DVI-I	2.0	•	•		ACX310
DVI-I	2.0			•	ACX310F
DVI-I	2.0	•		•	ACX310FIA

Accessories	Part #
USB 2.0 Storage License for ACX300	ACX300-U2
USB 2.0 Storage License for ACX310	ACX310-U2
KVM Switching Upgrade	ACX3-SW
19" Rackmount Kit	ACX300-RMK
DIN-rail Mount Kit	ACX300-DRM
Table/Wall Mount Kit	ACX300-TMK

Long-distance extender transmits DVI-D, USB, serial, and audio over a single CATx cable up to 150 metres.

DVI-D/USB LRX KVM Extender



Scan code for more information.



- Extension distance is 150 metres to a single screen; maximum resolution is 1920 x 1080.
- Higher resolution (1920 x 1200) is possible over a shorter cable (100 metres).
- Supports USB 2.0 for keyboard and mouse, as well as for storage devices, touch screens and web cameras.
- Transmits pixel-perfect digital video with no compression and enables real-time control of USB devices.
- Includes intelligent EDID management.
- Includes a 4-port USB hub on the receiver, which enables several USB devices to be connected.
- **ACU5700A**

www.black-box.de/KG2LRX

Extend DisplayPort video signals over CATx cable; supports resolutions up to 4K.

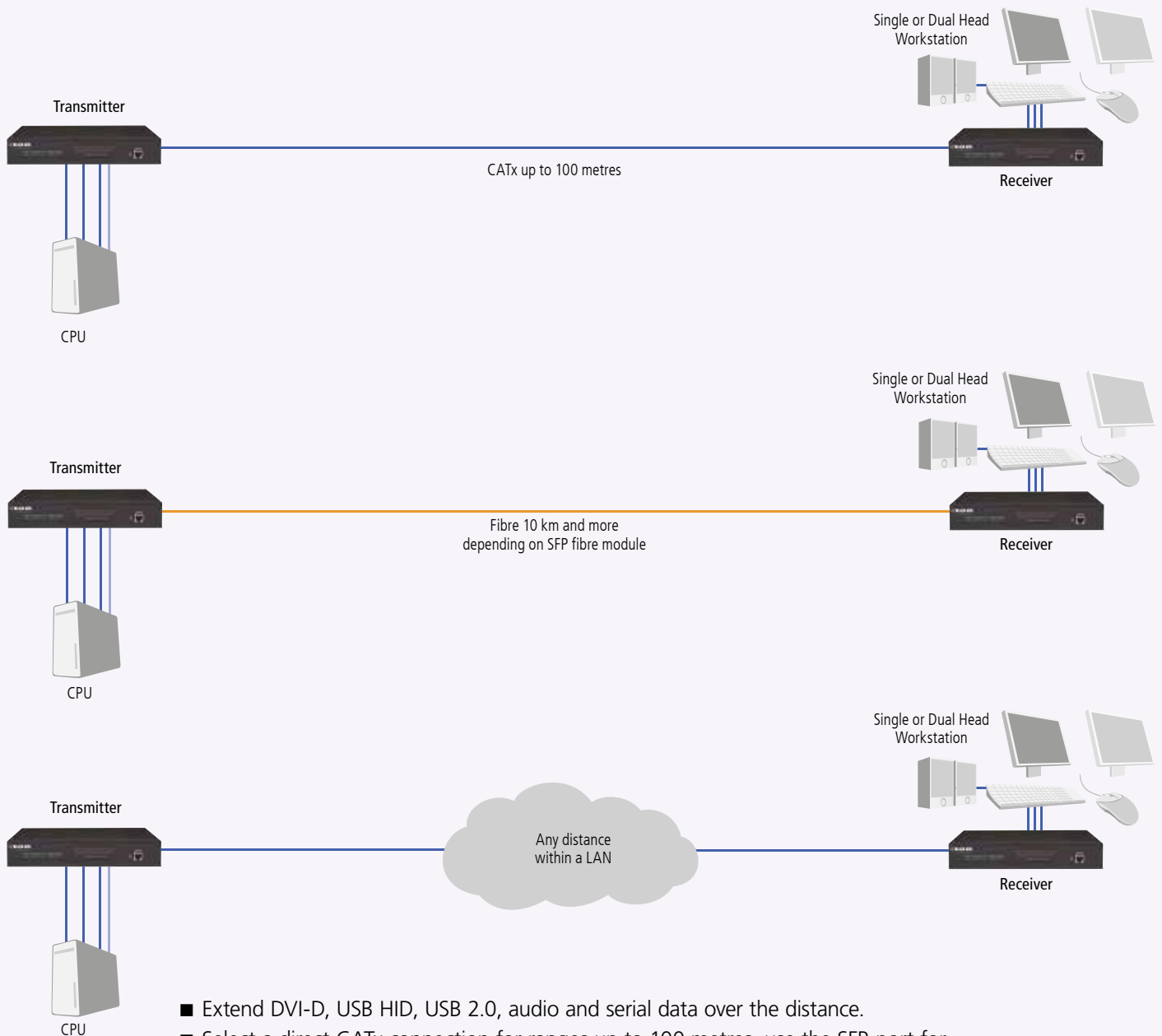
KVM Extender DisplayPort Dual-Head



- Extension distance is up to 150 metres for a single 1920 x 1080 screen.
- For two 1920 x 1200 screens, extension distance is 100 metres. Or at that distance, extend higher resolution signals, up to 3840 x 2160 (4K), to a single screen.
- Supports USB 2.0 for storage devices, as well as S/PDIF and analog audio.
- The receiver supports DisplayPort Dual Mode, which enables monitors that only support HDMI or DVI to be used.
- Includes intelligent EDID management.
- **ACU5800A**

www.black-box.de/KG2DisplayPort

One product - Three extension modes with maximum reliability: Direct connect CATx, direct connect fibre or via an Ethernet LAN Agility



- Extend DVI-D, USB HID, USB 2.0, audio and serial data over the distance.
- Select a direct CATx connection for ranges up to 100 metres, use the SFP-port for EMI/RFI resistant purposes and longer fibre links or connect the extender units throughout an TCP/IP network.
- Choose between Single Link DVI (**ACR1000A**) up to 1920x1200/1080p, Dual Head DVI (**ACR1020A**) with two 1920x1200/1080p channels and Dual Link DVI (**ACR1002A**) up to 2560x1600/2kx2k versions.
- Use the alternative link port to establish link redundancy or link aggregation.
- No-loss compression, low latency, pixel-perfect video and control.

www.black-box.de/KG2Agility

Sharp, clear VGA resolutions transmitted up to 50 metres. USB Micro KVM Extender Kits



- Transmit VGA video, keyboard and mouse signals up to 50 metres over CATx UTP cable.
- Support VGA resolutions up to 1600 x 1200.
- Kits come with (1) local and (1) remote unit.
- Remote units include a built-in 4-port USB hub to connect keyboards, mouse, monitors and other USB 1.1 HIDs.
- Provide local passthrough for video signals to connect a local VGA monitor for administration.
- Additional keyboard and mice can be attached directly to the spare USB ports on the server for local access.

	VGA	Serial	Audio	Part #
Single Access	•			ACU4001A
Dual-Head	•			ACU4201A
Dual-Head	•	•	•	ACU4222A

Remote control up to 50 metres with crystal-clear VGA in dense applications.

Wizard SRX KVM Extenders



- Control a remote computer up to 50 metres away over a single CATx cable.
- Extends video, audio and transparent USB for keyboard, mouse and two further peripherals.
- USB fulfills the USB 1.1 specification on both 1,5 Mbit (low speed) and 12 Mbit (full speed).
- Support VGA resolutions up to 1920 x 1200 at 60 Hz.
- True DDC support for ease of use with plug-and-play CRTs/LCDs.
- VGA and stereo audio feed through for local monitoring.
- Dual-head model also transmits serial RS-232 data up to 19.2 Kbit/s.
- Extender Kits come with (1) local and (1) remote unit.
- Rack up to 16 transmitter units with the optional 19" consolidation chassis (ACU5000A).

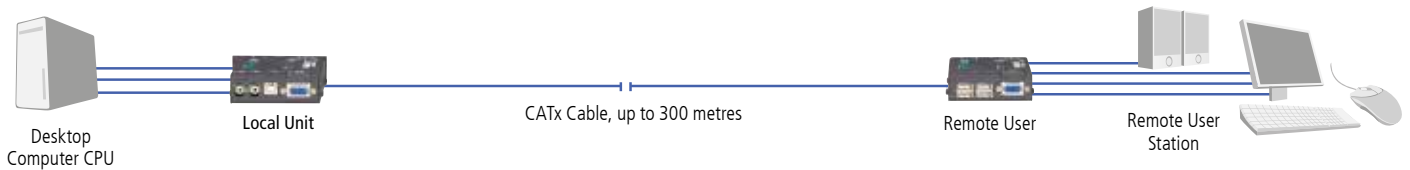
	VGA	Serial	Audio	Distance	Part #
Single Access	•		•	50 m	ACU5051A
Dual-Head	•	•	•	50 m	ACU5052A
Chassis for up to 16 units					ACU5000A

Extend high-resolution VGA signals over varying distances in high-density applications.

Wizard USB KVM Extenders, up to 300 metres

Wizard KVM Extender, Single-Head

- A single CATx cable carries USB, Audio and VGA signals from a backracked computer to the operator's desk.
- Support VGA resolutions up to 1920 x 1200.
- Remote unit features 4-port USB hub for attaching multiple USB devices.
- Supports all USB 1.1 devices and USB devices that run in low or full speed USB 1.1 modes.
- CD quality of audio with local monitoring.
- True DDC support for ease of use with plug-and-play CRTs/LCDs.
- Compact space saving design - consolidate up to 16 extender units using the 19" Wizard rack-mount chassis (**ACU5000A**).



Wizard KVM Extender, Dual-Head

- Extend transmissions up to 300 metres over CAT6 or 250 metres over CAT5/5e.
- Support VGA resolutions up to 1920 x 1200.
- Remote unit features 4-port USB hub for attaching multiple USB 2.0 devices.
- Features dual-head VGA support for workstations with two monitors.
- Requires two CATx links for the video channels.
- Up to 16 Wizard Extenders can be rackmounted in the Wizard Extender Chassis (**ACU5000A**).



	VGA	Audio	Distance	Part #
Single-Head	•	•	300 metres	ACU5050A-R2
Dual-Head	•	•	300 metres	ACU5250A-R2

Video processing and KVM switching for monitoring and control.

4Site Multiviewer KVM Switches



The 4Site provides control and real-time monitoring for up to four PCs from one console with a keyboard, video and mouse. This classic four-port KVM switch also features simultaneous monitoring of up to four different computer video sources on a single screen.

The two most important differences in the 4Site models are that the Flex supports High-Bandwidth Digital Content Protection (HDCP) transmission and offers an additional viewing mode, Windows Mode. The Flex offers extension of full HD video at 60 fps in PIP, Windows and Quad viewing modes.

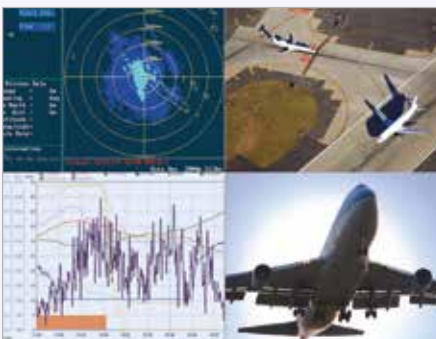
The 4Site gives you true USB emulation for controlling four servers from one USB keyboard and mouse. The switch offers fluid video performance at full refresh rates without frame dropping, perfect for movies and animated content. HDCP support means the digital data will not be interrupted between the source and the display. This makes video playing during conferences smoother and is a

boon in mission-critical areas that need to be constantly monitored. Additionally, the integrated support for HDCP encryption prevents non-licensed devices from receiving content.

The switches are ready-to-use hardware solutions with a high level of reliability and they are OS independent. Other ideal applications include working in a control room, or wherever you need to keep track of multiple screens. View them all on one monitor at your workstation instead of setting up a bank of monitors.

4Site Flex and 4Site II process analog (VGA) and digital video signals (DVI, HDMI by adapter) via DVI-I ports as both input and output. Various video modes, including HDTV up to 1920 x 1200, are supported in any combination as input and output.

The 4Site Flex also enables switching via a serial port using the protocol DCP XML and by using a USB touchscreen.



Quad Mode



Picture-in-Picture (PiP) Mode



Window Mode

www.black-box.de/KG24Site



Scan code for more information.



4Site Flex

- View video in four modes: Full Screen, Quad Screen, PiP and Windows.
- In Window Mode, all video sources can be displayed at once and freely scaled and resized.
- Supports 7.1 Surround Sound via the HDMI interface and HDCP.



4Site II

- View video in three modes: Full Screen, Quad Screen and PiP.
- Supports combinations of analog VGA and digital DVI video cards, monitors, even cameras.

Features	4Site Flex	4Site II
Full-screen Mode	•	•
Quad-Screen Mode	•	•
PiP Mode	•	•
Window Mode	•	
Maximum Resolution	1920 x 1200	1920 x 1200
Supported Video Formats	DVI, VGA and HDMI via Adapter	DVI, VGA and HDMI via Adapter
Supported Audio	Embedded Digital Audio	
Touchscreen Compatibility	•	•
USB 2.0	•	•
HDCP Support	•	
Transparent, High-speed USB Matrix	•	•
Part #	KVP4004A	KVP4000A-R3

Server Access Modules for CX and CX Uno KVM Switches

- Connect servers and CX KVM Switches using Server Access Modules (SAMs).
- Use CATx to connect the SAM and the CX KVM Switch server port.
- Place CX switches up to 50 metres from users.
- “Keep alive” feature enables nonstop server operation in case of power loss to the switch or link loss when disconnecting CATx cable.
- Flash upgradable.
- Order one SAM for each server-to-switch connection.
- Also works as a cost-efficient stand-alone KVM extender with the Remote Acces Modules (see page 75).



Server Access Module Product Selection Guide

Connector	Audio	Function	Dual Access	CX Compatibility	Part #
PS/2		KVM VGA		CX, CX Uno	KV1400A
USB		KVM VGA		CX, CX Uno, CX Uno with IP, CX Quad IP	KV1401A
PS/2	•	KVM VGA		CX, CX Uno, CX Uno with IP, CX Quad IP	KV1402A
USB	•	KVM VGA		CX, CX Uno, CX Uno with IP, CX Quad IP	KV1403A
Sun	•	KVM VGA		CX, CX Uno, CX Uno with IP, CX Quad IP	KV1404A
USB		KVM VGA	•	CX, CX Uno, CX Uno with IP, CX Quad IP	KV1405A
USB	•	KVM VGA	•	CX, CX Uno, CX Uno with IP, CX Quad IP	KV1406A
USB		Serial		CX Quad IP	KV1407A
USB	•	KVM DisplayPort		CX, CX Uno	KV1408A
USB	•	KVM Mini DisplayPort		CX, CX Uno, CX Uno with IP, CX Quad IP	KV1409A

See products on pages 44–45.

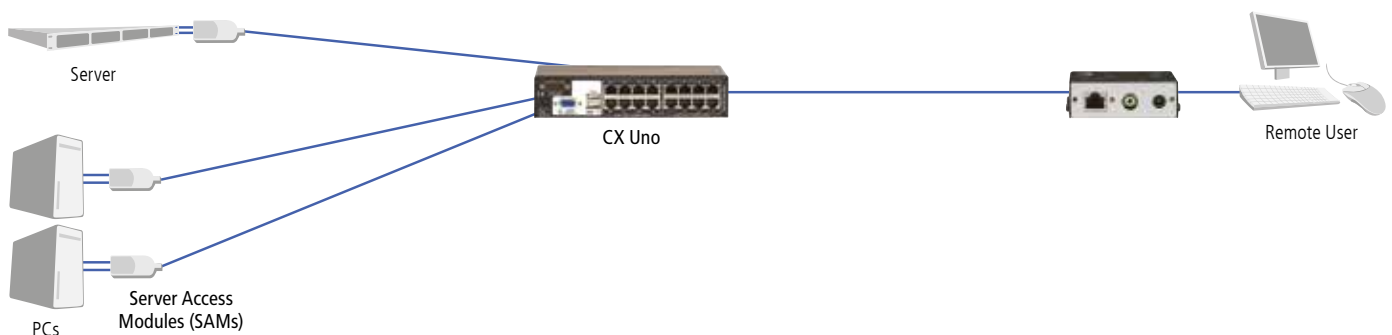
Remote Access Modules for CX and CX Uno KVM Switches

- For remote CPU/server access up to 300 metres away.
- Use CATx to connect the remote access module and the CX KVM Switch server port.
- Work well with multimedia workstations.
- Order one remote module for each console-to-switch connection.



Remote Access Module Product Selection Guide

Connector	Audio	Skew Compension	CX Compatibility	Part #
PS/2			CX, CX Uno	KV04-REM
PS/2	•		CX, CX Uno	KV04A-REM
PS/2	•	•	CX, CX Uno	KV04AS-REM
USB			CX, CX Uno	KV04U-REM
USB	•		CX, CX Uno	KV04UA-REM
USB	•	•	CX, CX Uno	KV04AUS-REM



See products on pages 44–45.

DVI-D to VGA Converter

- Converts single link DVI signals from a graphics card on a computer for display on an analog VGA monitor or projector.
- Performs digital-to-analog conversion. Built-in “virtual DDC” converts VGA analog DDC signals to DVI digital DDC signals. **(AC1038A)**



VGA EDID Ghost

- Helps prevent boot problems.
- Plug it into a display. It reads all EDID information.
- Then install it between a graphics card and a KVM switch or KVM extender.
- Ideal for multimedia or KVM systems with newer monitors supporting only a few high resolution formats. **(ACS2100A)**



DVI-D EDID Ghost

- Learns EDID data from a DVI-D display, so your video source conforms to optimal resolution settings.
- Ghost function saves the EDID of your displays, so the source boots with correct settings.
- EDID learning functionality prevents computers from deactivating ports.
- Supports resolutions up to 2560 x 1600. **(VG-DVI)**



Single Link DVI-D Splitter Cable 1-to-2

- Splits one DVI-D output port on your computer into two monitor connections.
- Full adjustable EDID support with resolutions up to 1920 x 1200.
- Small form factor, powered through USB.
- Ideal for KVM extension applications to connect a local monitoring station. **(ACXSPL12)**



DVI/USB Cable for KVM Switches

- This 2-in-1 cable links two DVI/USB devices.
- Each end of this cable features (1) DVI-I connector and (1) USB connector.
- Works well with our KVM Switch series EC, DT and 4Site.



Computer Connect	Switch Connect	Part #		
DVI-I and USB Type A	DVI-I and USB Type B	(1.8-m) EHN900024U-0006	(3-m) EHN900024U-0010	(4.5-m) EHN900024U-0015

DVI/USB Cable for Desktop KVM Switches

- Connect desktop KVM switches and DVI/USB CPUs.
- Works well with our KVM Switch series EC, DT and 4Site.
- Guaranteed for life!



Computer Connect	Switch Connect	Part #		
DVI-D and USB Type A	DVI-D and USB Type B	(1.8-m) EHN900025U-0006	(3-m) EHN900025U-0010	(4.5-m) EHN900025U-0015

PS/2 CPU Cable, Short

- Connect an EC KVM Switch for data centres to a PS/2 server.
- Guaranteed for life!



Computer Connect	Switch Connect	Part #	
VGA and PS/2	HD15 M	(1.8-m) EHN70001-0006	(3-m) EHN70001-0010

PS/2 CPU Cable, Long

- Connect an EC KVM Switch for data centres to a PS/2 server.
- Guaranteed for life!



Computer Connect	Switch Connect	Part #	
VGA and PS/2	HD15 M	(4.5-m) EHN9000P-0015	(9.1-m) EHN9000P-0030

USB CPU Cable for EC

- Connect USB servers to EC KVM Switches.
- Guaranteed for life!

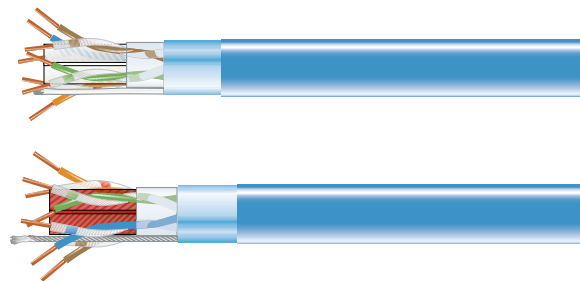


Computer Connect	Switch Connect	Part #		
VGA and PS/2	HD15 M	(1.8-m) EHN9000U-0006	(3-m) EHN9000U-00010	(4.5-m) EHN9000U-00015

Copper and Fibre Cable for KVM Extenders

Black Box carries a variety of cables to meet your infrastructure connectivity needs. The small selection of cables on this page are only a sample of the Black Box cables that work with our KVM extenders.

CAT6 and CAT6A shielded cable deliver a channel performance beyond the standard. Use them with digital video and KVM extenders for excellent results. CAT5e cable works with VGA extenders. Patch cables come in a variety of lengths and colors. Fibre cable is ideal for long runs between buildings or in industrial settings. See www.black-box.de for more.

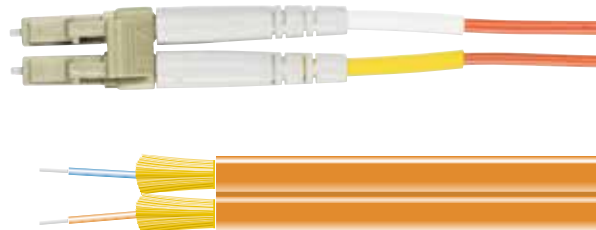


- CAT6 Shielded 400-MHz Solid Conductor Bulk Cable, 24 AWG
- CAT6 Shielded 550-MHz Solid Conductor Bulk Cable, 24 AWG
- CAT6A 650-MHz Solid Bulk Cable
- CAT5e Shielded 350 MHz Solid Bulk Cable, 24 AWG
- GigaTrue3 CAT6 550-MHz Patch Cable.
- GigaTrue3 CAT6A 650-MHz Patch Cable
- GigaTrue3 CAT5e 100-MHz Patch Cable

www.black-box.de/KG23Series

Fibre Cable for Digital KVM

- For use with fibre KVM extenders.
- Use for long runs between buildings or in industrial settings.
- More colors and connectors available online.
- Call us for bulk cables.



Mode	Core Size	Part #
Multimode OM3	50/125 u	EFE350 Series
Multimode OM1	62.5/125u	EFE070 Series
Single-Mode OS1/2	9/125u	EFE080 Series

www.black-box.de/KG2Cables

Copper Bulk	MHz	Type	Jacket	Part #
CAT6	400 MHz	F/UTP	PVC	EVNSL0601A-1000
CAT6	550 MHz	UTP	PVC	EYN870A-PB-1000
CAT6a	650 MHz	F/UTP	PVC	EYN770A-RL-1000
CAT5e	350 MHz	F/UTP	PVC	EVNSL0501A-1000

- All cables are guaranteed for life!
- Other colors are available at black-box.de

Copper Patch	MHz	Type	Part #
CAT6	550 MHz	UTP	C6PC60-BL-01M
CAT6A	550 MHz	F/UTP	C6APC80S-BL-03
CAT5e	100 MHz	F/UTP	C5EPC60S-BL-01M

- All cables are guaranteed for life!
- Other colors and lengths are available at black-box.de

HDMI Cable, 180° Swivel Hood

- Transmit high-bandwidth compressed video, multichannel digital audio, and intelligent format and command data.
- Swiveling hood have connectors that turn 90° for tight installations.
- Connect digital KVM switches and HDMI displays.



Computer Connect	Switch Connect	Part #		
HDMI Swivel Hood M	HDMI Swivel Hood M	(1-m) EVHDMI04-DS-001M	(2-m) EVHDMI04-DS-002M	(3-m) EVHDMI02-DS-003M

High-Speed HDMI Cable

- Transmit high-bandwidth compressed video, multichannel digital audio, and intelligent format and command data.
- HDMI is the recommended cable for 1080p and beyond.
- Connect digital KVM switches and HDMI displays.



Computer Connect	Switch Connect	Part #			
HDMI M	HDMI F	(1-m) VCB-HDMI-001M	(3-m) VCB-HDMI-003M	(10-m) VCB-HDMI-010M	(30-m) VCB-HDMI-030M

DisplayPort Adapters

- Supports video up to 1080p.
- Version 1.1 supports 10.8 Gbps.
- 32 AWG adapter cable is 30 cm long.
- Convert VGA, HDMI, or DVI for DisplayPort displays.



Male Connect	Female Connect	Part #
DisplayPort	DVI	EVNDPDVI-MF-R3
DisplayPort	VGA	EVNDPVGA-MF-R3
DisplayPort	HDMI	EVNDPHDMI-MF-R3

DisplayPort Cable, M/M

- Transmit digital video and audio in one cable.
- Supports video with up to 2560 x 1600 resolution plus digital audio.
- Version 1.1 supports 10.8 Gbps.



Computer Connect	Switch Connect	Part #			
DisplayPort M	DisplayPort M	(0.9-m) VCB-DP-0003-MM	(1.8-m) VCB-DP-0006-MM	(3-m) VCB-DP-0010-MM	(4.5-m) VCB-DP-0015-MM

DVI Cables

- Supports dual-link digital transmissions up to 9.9 Gbps and single-link transmissions up to 4.95 Gbps.
- Designed specifically for high-performance data-transmission applications



Computer Connect	Switch Connect	Part #			
DVI-A M	VGA M	(1.8-m) EVNDVI01-0006	(3-m) EVNDVI01-0010	(4.5-m) EVNDVI01-0015	(7,6-m) EVNDVI01-0025
DVI-D M	DVI-D M	(1.8-m) EVNDVI02-0006	(3-m) EVNDVI02-0010	(4.5-m) EVNDVI02-0015	(7,6-m) EVNDVI02-0025
DVI-D M	DVI-D F	(1.8-m) EVNDVI03-0006	(3-m) EVNDVI03-0010	-	-

VGA Video Cable

- Ferrite core offers extra protection against external interference.
- Features tinned copper braid and outer braid for signal shielding.



Computer Connect	Switch Connect	Part #			
VGA (HD15) M	VGA (HD15) M	(0.9-m) EVNPS06-0003-MM	(1.5-m) EVNPS06-0005-MM	(3-m) EVNPS06-0010-MM	(6-m) EVNDPDVI-0020-MM
		(7,6-m) EVNPS06-0025-MM	(15.2-m) EVNPS06-0050-MM	(22.8-m) EVNPS06-0075-MM	(30.4-m) EVNPS06-0100-MM
VGA (HD15) M	VGA (HD15) F	(0.9-m) EVNPS06-0003-MF	(1.5-m) EVNPS06-0005-MF	(3-m) EVNPS06-0010-MF	(6-m) EVNPS06-0020-MF
VGA (HD15) F	VGA (HD15) F	(0.9-m) EVNPS06-0003-FF	(1.5-m) EVNPS06-0005-FF	(3-m) EVNPS06-0010-FF	(6-m) EVNPS06-0020-FF

DisplayPort to DVI Cable

- Connect digital DVI monitors to computers with DisplayPort connectors.
- Supports data-transfer rates of up to 10.8 Gbps.
- Plug-and-play and simple to install.
- DP++ standard.



Computer Connect	Switch Connect	Part #			
DisplayPort M	DVI M	(0.9-m) EVNDPDVI-0003-MM	(1.8-m) EVNDPDVI-0006-MM	(3-m) EVNDPDVI-0010-MM	(4.5-m) EVNDPDVI-0015-MM

Mini DisplayPort to DisplayPort

- Link a DisplayPort device to a computer, table, or phone with a Mini DisplayPort connector.
- Meets DisplayPort 1.1 standards; supports data transfer rates of up to 5.4 Gbps for high-resolution displays.
- Requires no drivers or adapters—plug and play.



Computer Connect	Switch Connect	Part #			
Mini DisplayPort M	DisplayPort M	(0.9-m) ENVMDPDP-0003-MM	(1.8-m) ENVMDPDP-0006-MM	(3-m) ENVMDPDP-0010-MM	(4.5-m) ENVMDPDP-0015-MM

Black Box Technology Solutions.

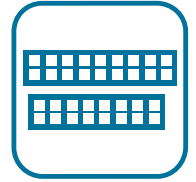
Cabinets and Racks

Full-sized, climate-controlled, and wallmount cabinets, open racks, plus hardware and accessories. Unparalleled selection and service.



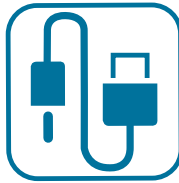
Jacks, Panels, Hardware

Connect your network with copper and fibre patch panels, jack, adapters, connectors, and infrastructure hardware.



Cables

High-performance copper and fibre solutions for structured cabling systems, industrial environments, multimedia systems, and more. Custom cables available.



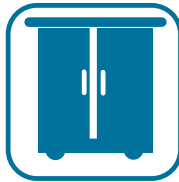
KVM

Get access to a variety of target devices, the ability to monitor workflow, and flexible control of visual and peripheral elements with high-performance KVM solutions.



Carts and Storage

Easily store, charge, and sync all mobile devices. Carts and lockers adapt to changing technology, have a small footprint, and are scalable and secure.



Networking

The right technologies to build and expand networks of all sizes, from small offices to global enterprises.



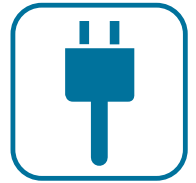
Cooling Solutions

Climate-controlled cabinets are like self-contained data closets: Install equipment without the need for additional cooling or costly infrastructure.



Power

Get power control with Black Box power solutions, including management, protection, and opto-isolation.



Data Communications

Devices designed for commercial and industrial networks, from sophisticated switching systems to tried-and-true short-haul modems.



Testers and Tools

Find the right tools and testers to check, troubleshoot, and certify copper and fibre network cabling.



Digital Signage

Inform, persuade, and engage an audience with dynamic, efficient, and eye-catching digital signage.



Video and Multimedia

Set up video and audio distribution systems to deploy digital signage, enhance presentations, and extend HD video beyond the boardroom.



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

FREE, Application Engineering and System Design!

Call 0811/5541-551 or visit black-box.de.

