Emerald® IP KVM

Empowering Modern Control Rooms with Scalability, Efficiency, & Security

Bogged down by legacy hardware in your control room? Step into the future with a move to virtualization. Concerned about security? Maintain use of proven IP software diagnostic tools to safeguard your network. Looking for a simple solution? Reduce complexity with solutions that combine premium functionality into less hardware.

BLACKBOX.COM/EMERALD

Challenges of Modern Control Rooms

Control rooms, critical for operations in many industries, face several persistent challenges that hinder efficiency and scalability. Legacy hardware remains a significant obstacle, as many control rooms rely on outdated systems that struggle to meet modern demands. These older systems often lack the flexibility and performance needed to handle increasingly complex workflows or integrate seamlessly with emerging technologies. This results in performance bottlenecks, higher maintenance costs, and limited scalability, leaving organizations ill-equipped to adapt to evolving requirements.

The shift toward virtualization introduces both opportunities and challenges. While virtualization offers unparalleled flexibility and efficiency, integrating virtual machines (VMs) with existing physical infrastructure can be complex and resource-intensive. Many organizations face difficulties in ensuring seamless access to both physical and virtual desktops, which is essential for maintaining productivity. Plus, managing these hybrid environments requires advanced tools and expertise, which can stretch IT teams thin and increase operational costs.

Security is another critical concern for modern control rooms, especially as cyberthreats become more sophisticated. Sensitive data and mission-critical systems are prime targets for malicious actors, and ensuring robust protection requires a combination of physical isolation, strict access controls, and comprehensive monitoring. Organizations must also contend with compliance requirements and the challenge of managing security across distributed networks. Without the right tools, these tasks can become overwhelming and leave vulnerabilities exposed.

Finally, the sheer complexity of managing diverse systems and technologies in control rooms can be a major pain point. Operators often need to navigate between multiple tools, platforms, and workflows, leading to inefficiencies and potential errors. This complexity not only impacts day-to-day operations but also increases downtime and maintenance requirements. Simplifying these environments through streamlined architectures and intuitive interfaces is critical to enabling operators to focus on their core tasks and ensuring smooth, efficient operations.

Addressing these challenges as a whole is key to transforming control rooms into resilient and adaptable hubs for modern operations.

Why Emerald?

In today's fast-paced and interconnected world, control rooms must adapt to increasing complexity, heightened security needs, and rapid technological advancements. The Emerald® IP KVM platform delivers a suite of solutions designed to address these challenges while offering unparalleled scalability, security, and efficiency. Here's why Emerald stands out:

Seamless Connectivity and Scalability

For multisite operations spanning multiple locations, centralized control and seamless communication are essential. Emerald's infinitely scalable design supports a wide range of deployments, from single offices to global multisite networks. By leveraging existing infrastructure and ultra-low bandwidth technology, Emerald eliminates distance constraints, enabling real-time access to physical and virtual machines across geographically dispersed locations.

Emerald's support for 4K and HD systems ensures full interoperability and high-performance visualization. Whether monitoring operations in a single room or across a global network, Emerald provides operators with the tools needed to streamline processes, enhance oversight, and improve decision-making.

Advanced Security

Security is non-negotiable in modern control rooms. Emerald's centralized IT resource management ensures sensitive equipment and data remain secure, physically isolating critical systems from operational workstations to prevent unauthorized access. With features like Active Directory integration, tracked user access, and rigorous cybersecurity testing, Emerald adheres to the highest security standards.

Emerald also supports isolated KVM networks, ideal for industries with stringent data confidentiality requirements such as healthcare, finance, and government. By integrating advanced tools like the Wazuh Server & Agent for incident response and compliance monitoring, Emerald ensures a robust security posture for critical environments.

Virtual Machines (VM) Support

Virtualization is a cornerstone of modern operations, and Emerald excels in supporting both current and future virtualization needs. It provides real-time access to VMware® and Microsoft® VMs, allowing operators to switch effortlessly between physical and virtual desktops. Its innovative components, such as the Emerald GE Gateway, enable multiple users to collaborate on the same VM while maintaining seamless functionality. With upcoming features such as multi-head VM support and AI tool integration, Emerald ensures that organizations can easily adopt the next wave of virtualization advancements.

Cost Efficiency and Seamless Integration

Emerald redefines cost efficiency by reducing hardware complexity and consolidating functionalities into fewer components. Its embedded VM client eliminates the need for additional licenses and transmitter units, minimizing infrastructure costs and maintenance requirements. This design supports centralized operations while optimizing workflows for better productivity.

Emerald's seamless integration with various IT infrastructures and third-party systems allows organizations to unify their control environments. The intuitive Boxilla® KVM Manager further enhances efficiency by enabling IT administrators to monitor and manage deployments from a single interface, ensuring consistent performance and reducing on-site troubleshooting.

Futureproof

Whether deployed in a single-office environment or a multisite operation spanning global locations, Emerald seamlessly scales with operational growth. This flexibility allows organizations to add new endpoints, expand their systems, or integrate emerging technologies without overhauling their infrastructure.

Emerald's compatibility with public and private cloud systems ensures that it remains relevant as organizations increasingly move toward cloud-based operations. Its robust architecture supports seamless integration with a wide range of third-party tools and systems, allowing organizations to unify their control environments and adopt new technologies without disruption.

Emerald's support for isolated KVM networks and advanced threat detection ensures protection against emerging cybersecurity risks.

By reducing hardware complexity and streamlining workflows, Emerald minimizes maintenance requirements and associated costs. Its design eliminates unnecessary components, such as transmitter units for VMs, making it easier to manage and adapt as operational demands change. This efficiency ensures that the system remains a cost-effective solution over time.

Emerald's combination of connectivity, security, scalability, and cost efficiency makes it the ideal choice for modern control room operations. By addressing the challenges of today and anticipating the needs of tomorrow, Emerald empowers organizations to achieve smarter, more connected workflows while remaining secure and efficient.

The Future of Control Rooms

147 Zettabytes

The amount of data created by humans grows at an exponential rate. In 2020, there were 64.2 ZB of data in the digital universe. In 2024, that figure more than doubled to an estimated 147 ZB. By 2028, global data creation is projected to grow to more than 394 zettabytes.

There are currently over 147 zettabytes of data in the entire digital universe.

66.7% growth in the next 8 years

The Global Control Room Solution Market is expected to grow 66.7% from USD $53 billion in 2024 to USD $88.3 billion by 2032, with a CAGR " of 6.6.
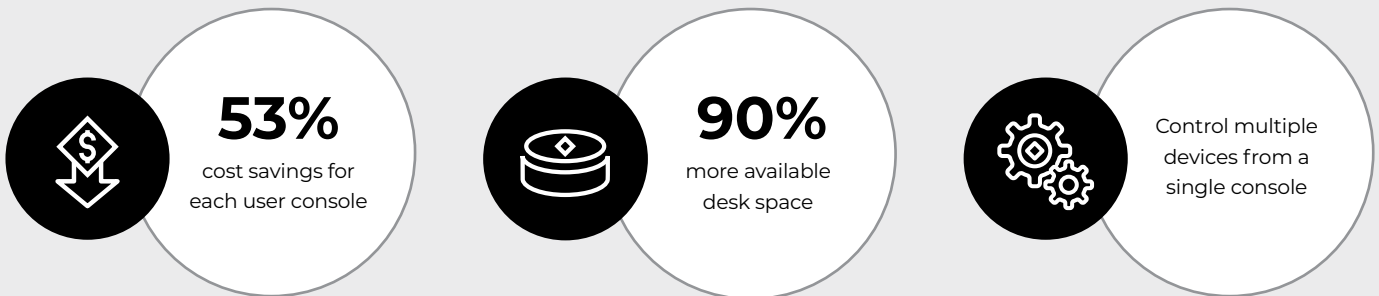
https://www.credenceresearch.com/report/control-room-solution-market

$1128 Million

The Global KVM Extender Market is expected to grow 21% from US $1128 million in 2024 to US $1362.7 million by 2030, with a CAGR of 3.2.

https://reports.valuates.com › Market Reports

Streamline your workspace with Emerald DESKVUE vs. traditional KVM

53% cost savings for each user console

90% more available desk space

Control multiple devices from a single console

Emerald IP KVM:
Your Control Room Solution

Security

- Tracked Access: Monitor and control who accesses your systems.
- AD Integration: Seamless enforcement of corporate access policies.
- Standards-Compliant: Meets ISO27001 and IEC62443-4 standards for top-tier security.

Resilience

- No Single Point of Failure: Designed for uninterrupted operations.
- 24/7 Operation: Built for mission-critical environments.

Efficiency

- Streamlines Workflows: Optimized for faster, smarter operations.
- Increases Situational Awareness: Enhanced visualization and access to critical information.

Simplicity

- Reduces System Complexity: Tailored workspaces for maximum operator comfort and usability.

Use Cases

Planning Remote Redundant Control Rooms

These industries use Emerald: Command and Control Rooms, Broadcast and Post-Production, Medical, Traffic Control, Public Safety, and Industrial.

Case Study: Broadcast and Post-Production

## The Nine Network's New Emerald IP KVM System Delivers Fail-proof Broadcasting

The Nine Network, Australia's leading media company, required a reliable system to connect high-powered computer workstations in a data center with operators across multiple building floors. Legacy KVM systems posed challenges with reliability, switching, and endpoint connectivity, prompting Nine to seek a modern solution capable of transporting data over standard IP networks with redundant paths.

The Emerald® IP KVM system emerged as the ideal choice. This new setup integrates Boxilla® KVM Manager with Emerald 2K and 4K transmitters and receivers, ensuring stable, high-performance connectivity. The system also successfully integrates with LAWO VSM via Boxilla's API, offering seamless control over active Emerald KVM receiver connections.

Designed to function within a Cisco® corporate network infrastructure, the solution supports Nine's demanding broadcast environment, enabling the production of 12–14 hours of live television daily and high-definition promotional content. Operators benefit from the ability to access different machines securely and efficiently, regardless of location.

Matt Benson, Group Enterprise Architect, praised Black Box® for their collaborative approach: "The willingness and ability of the development teams to resolve issues and include required features was very reassuring. This collaboration ensured the solution met our needs."

With the Emerald IP KVM system, The Nine Network has achieved a fail-proof broadcasting workflow, delivering unmatched reliability, scalability, and seamless integration into their production processes.
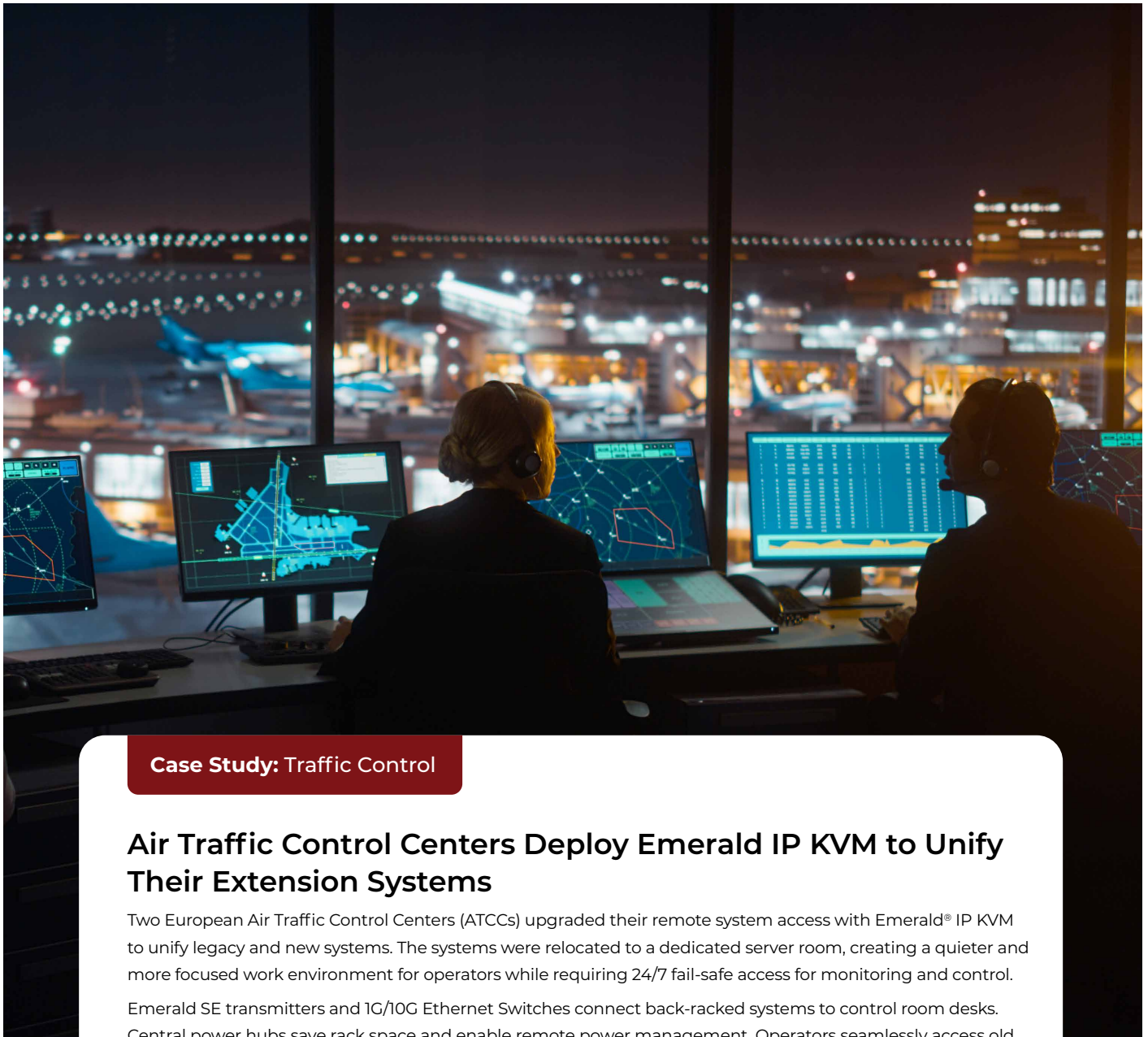
Case Study: Traffic Control

Air Traffic Control Centers Deploy Emerald IP KVM to Unify Their Extension Systems

Two European Air Traffic Control Centers (ATCCs) upgraded their remote system access with Emerald® IP KVM to unify legacy and new systems. The systems were relocated to a dedicated server room, creating a quieter and more focused work environment for operators while requiring 24/7 fail-safe access for monitoring and control.

Emerald SE transmitters and 1G/10G Ethernet Switches connect back-racked systems to control room desks. Central power hubs save rack space and enable remote power management. Operators seamlessly access old and new systems unified under the Emerald platform, while Boxilla managers in a redundant setup monitor and control the entire system. Boxilla's intuitive dashboards enable remote configuration from any location. Even if both Boxilla managers fail, Emerald ensures uninterrupted access.

Control rooms feature an open office design with multiple monitors at each desk connected to remote systems via redundant Emerald SE receivers. Freedom KM switches allow fast, error-free switching between targets by simply moving the mouse. Both ATCCs follow the same architecture, meeting the customer's request for standardized management and maintenance across more than 100 endpoints.

Emerald's secure, redundant, and scalable solution met all the customer's requirements, simplifying operator training and improving workflows. The Black Box account manager commented, "Our key differentiator was an IP-based KVM solution. This is an existing customer with whom we have a great relationship. They had a lot of hesitation regarding redundancy, but we built a redundant solution into our quote. IP-based KVM functionality with security, high redundancy, unified system access, and room for upgrades were their demands and we naturally chose our proven Emerald KVM platform, which could handle their demands. The customer will gain a much smoother workflow and overview of all of their functions with the Emerald KVM solution."

Case Study: Command and Control Room

Government Organization Improves Reaction Time in Command and Negotiation Room

A government organization needed a faster, more responsive KVM solution for their command and negotiation room. Their original setup, with equipment hosted in a side room, included a video wall, a conference table with multiple monitors, and a video wall controller. The process of switching video sources required an operator to use the video wall controller, causing delays during critical emergencies where seconds matter.
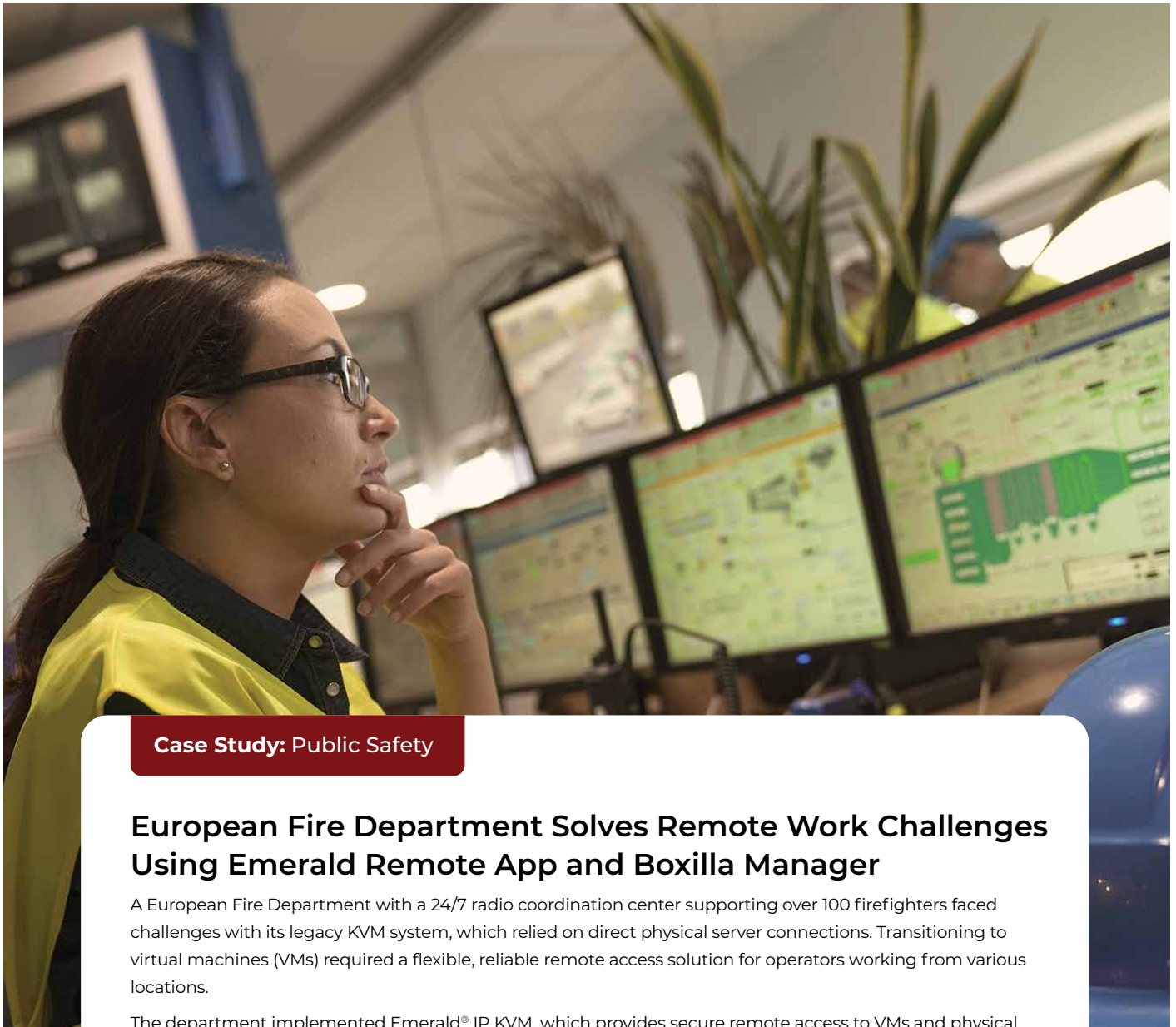
To address this challenge, the organization adopted the Emerald IP KVM system with DESKVUE. The new setup connects local systems via Emerald transmitters and integrates three 4K monitors, a keyboard, and a mouse on the table. DESKVUE's fourth video port links to a large video wall, allowing any desired multiview layout.

In emergencies, operators now control systems instantly from the table console. By simply moving the mouse over a target source window, they gain immediate control and can respond without delay. Drag-and-drop functionality lets operators transfer video wall content to the tabletop monitors quickly, eliminating the need for complex video wall controller configurations.

This streamlined workflow dramatically reduces reaction times and enhances crisis management. The customer praised the system, saying, "With DESKVUE, we have all features of a video wall we need on our table and on the wall at the same time, and now with instant control over any system."

Emerald DESKVUE empowers operators with seamless control, faster decision-making, and a simplified user experience, ensuring critical operations run efficiently and effectively.

European Fire Department Solves Remote Work Challenges Using Emerald Remote App and Boxilla Manager

A European Fire Department with a 24/7 radio coordination center supporting over 100 firefighters faced challenges with its legacy KVM system, which relied on direct physical server connections. Transitioning to virtual machines (VMs) required a flexible, reliable remote access solution for operators working from various locations.

The department implemented Emerald® IP KVM, which provides secure remote access to VMs and physical servers. Operators now connect through the Emerald Remote App, a software-based solution that eliminates the need for hardware at user workstations. Users access up to nine connections simultaneously, displayed on dual monitors, using VPN-secured connectivity.

Emerald transmitters connect remaining physical servers, while VMs are accessed directly via the Emerald IP network. The entire system is centrally managed through Boxilla® KVM Manager, configured in a redundant setup to ensure reliability. Boxilla also monitors system performance and sends alerts for predictive maintenance, ensuring seamless operation.

The Emerald system's low bandwidth usage and simplicity were key factors in the department's decision. Operators can switch between virtual machines instantly, and camera and video feeds are smoothly integrated into their workflows.

The fire department chief praised the solution, stating, "Our fire station now has an integrated remote access system, improving reaction times and enabling us to serve the public more effectively by reducing injury and loss of life."

The Emerald Remote App and Boxilla provide the fire department with a robust, secure, and efficient remote access system, enhancing their ability to respond to emergencies swiftly and effectively.
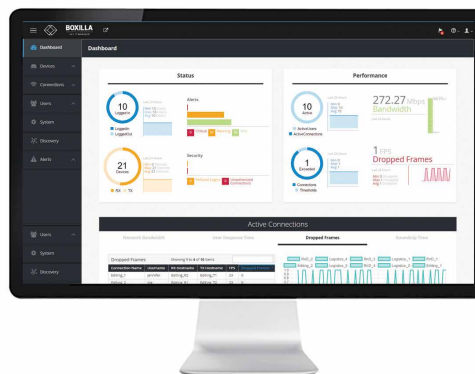
Emerald IP KVM Product Family

Boxilla KVM Manager

Boxilla® is a centralized KVM management appliance that enables remote management and monitoring of your complete enterprise KVM network. When connected to an Emerald® KVM Matrix, Boxilla provides a user-friendly web-based GUI that allows users to auto-detect and connect new endpoints, update firmware, adjust bandwidth consumption, set up automated security alerts, and much more. Boxilla comes with multiple license types to accommodate different KVM network sizes.
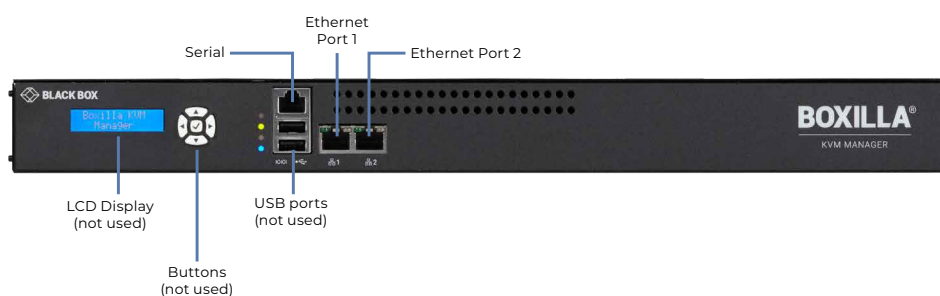
- Manage deployments and user access rights, monitor KVM status, upgrade firmware, facilitate troubleshooting, and provide network security - all from one central command center dashboard.

- Provides auto device discovery and configuration and advanced user authentication.

- Supports Active Directory for user authentication and mapping to groups.

- Enables connections between multiple Black Box® KVM systems, such as DKM and Emerald.

- Dual network ports allow management of Boxilla via a second network.

- Add redundant Boxilla devices to a KVM matrix for enhanced network security.

- Zoning of receivers and connections allows users to access target computers based on the location they login from.

- Manage Emerald systems over multiple sites (NAT).

Learn more at **blackbox.com/boxilla** ▸

Boxilla's web browser-based user interface

Serial · Ethernet Port 1 · Ethernet Port 2 · LCD Display (not used) · Buttons (not used) · USB ports (not used)

Product Code	Description
BXAMGR-R2	KVM management platform that supports 25 end points
BXAMGR-R2-X (1)	KVM management platform that supports 75, 125, 225, 325, or unlimited endpoints
BXAMGR-LIC-X (2)	Licenses for 25, 100, 200, 300, or unlimited additional endpoints on top of what manager already supports
BXAMGR-LICBAK-X (3)	Licenses for 25, 100, 200, or 300 additional active and standby end points on top of what manager already supports

(1) X = 75, 125, 225, 325, ULT
(2) X = 25, 100, 200, 300, ULT
(3) X = 25, 100, 200, 300

Emerald DESKVUE

KVM users today need to remotely access, monitor, and interact with multiple systems concurrently that can reside on various networks like data, cloud-based appliances, alarm systems, video feeds, and many more, leading to an increasing migration from physical servers to virtual machines (public and/or private), and larger visualization landscapes on desktops and video walls. Creating workspaces optimized for operator efficiency, comfort, and collaboration is just as important as seamless system integration and 24/7 reliable operations with reduced system complexity and costs.

The award-winning Emerald® DESKVUE emerges as a game-changer offering customized workspaces with unparalleled versatility and reliability. DESKVUE enables users to arrange their individual workspace for optimal simultaneous interaction with up to 16 different systems.
It connects to physical systems via any Emerald transmitter unit, Virtual Machines, H.264/265, and Virtual Network Computing (VNC).

Desktop Visualization

DESKVUE uniquely allows users to tailor their workspace by connecting a single keyboard, mouse, audio, and up to four 4K/5K monitors. Each system's information can be positioned on and across the screens with predefined layouts or freely movable and sizeable windows. For desktop monitor setups with 8 or even 16 monitors, DESKVUE units can be easily aggregated. To interact with each system in real-time, simply move the mouse over the window. Each operator has situational awareness and control via a personalized, comfortable workspace with next to no learning curve.

- Interact with up to 16 systems simultaneously.
- Connect to physical systems via Emerald transmitters, and Virtual Machines using RDP, PCoIP (Ultra), H.264/5, and VNC.
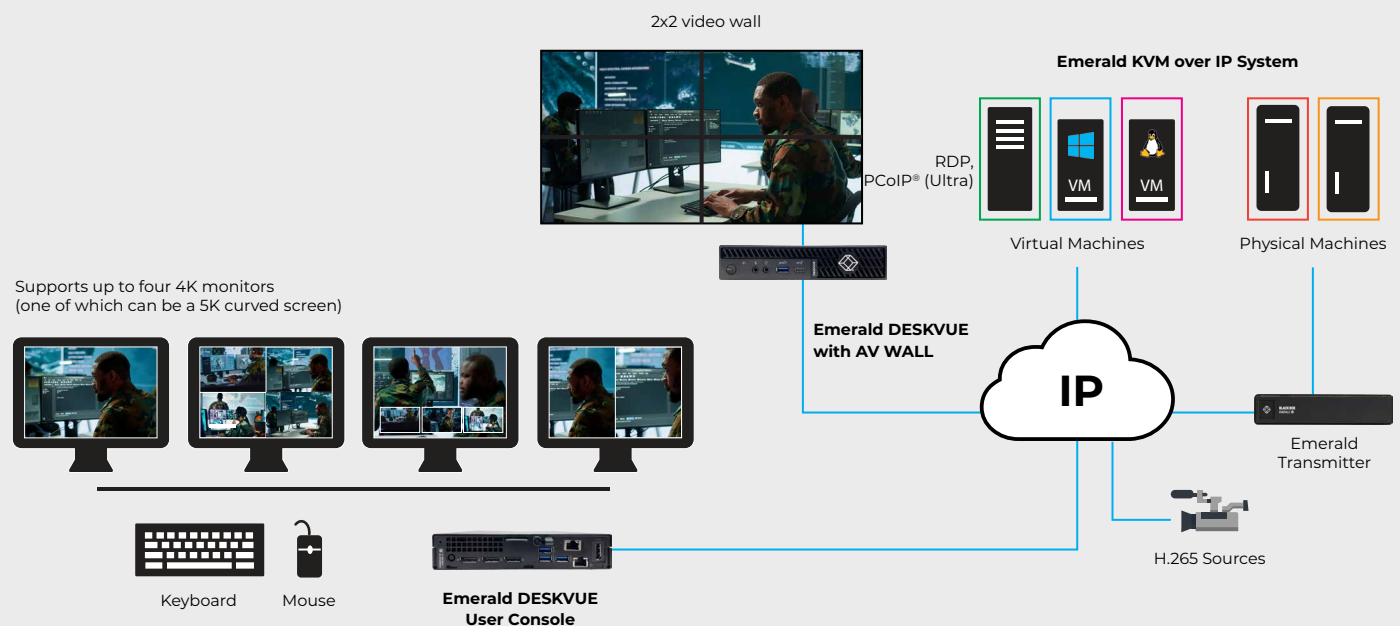
- Freely place and size your your systems across up to four 4K monitors (one monitor can be 5K); view and interact with them in the most efficient way.
- Provides highly Secure KVM over IP.
- Fully integrates with Emerald Extenders and the Boxilla KVM manager for device configuration, monitoring, and authentication.
- TAA-compliant

Integrated Video Wall Control

Emerald AV WALL is a free software feature of all DESKVUE models that displays a dominant source from an Emerald DESKVUE user station on a 2x2 video wall. Aggregating DESKVUE units allows even larger video wall arrays with 2x4, 2x8, or 3x4 displays. Any DESKVUE user can control the target source and share the result with the group.

Emerald AV WALL is a software feature of DESKVUE that displays a single source from an Emerald DESKVUE user station on a 2x2 video wall. Any Emerald user can control the target source and share the result with the group.

- Send content from a single source to a 2x2 video wall.
- Seamlessly integrates with Emerald and Boxilla.
- Expandable, add further video wall displays through additional Emerald DESKVUE units.
- Less complex, video wall processing controlled via Boxilla KVM Manager.
- Learn more at **blackbox.com/deskvue** ▸

2x2 video wall

Emerald KVM over IP System

RDP, PCoIP® (Ultra)

Virtual Machines

Physical Machines

Supports up to four 4K monitors (one of which can be a 5K curved screen)

Emerald DESKVUE with AV WALL

IP

Emerald Transmitter

H.265 Sources

Keyboard

Mouse

Emerald DESKVUE User Console
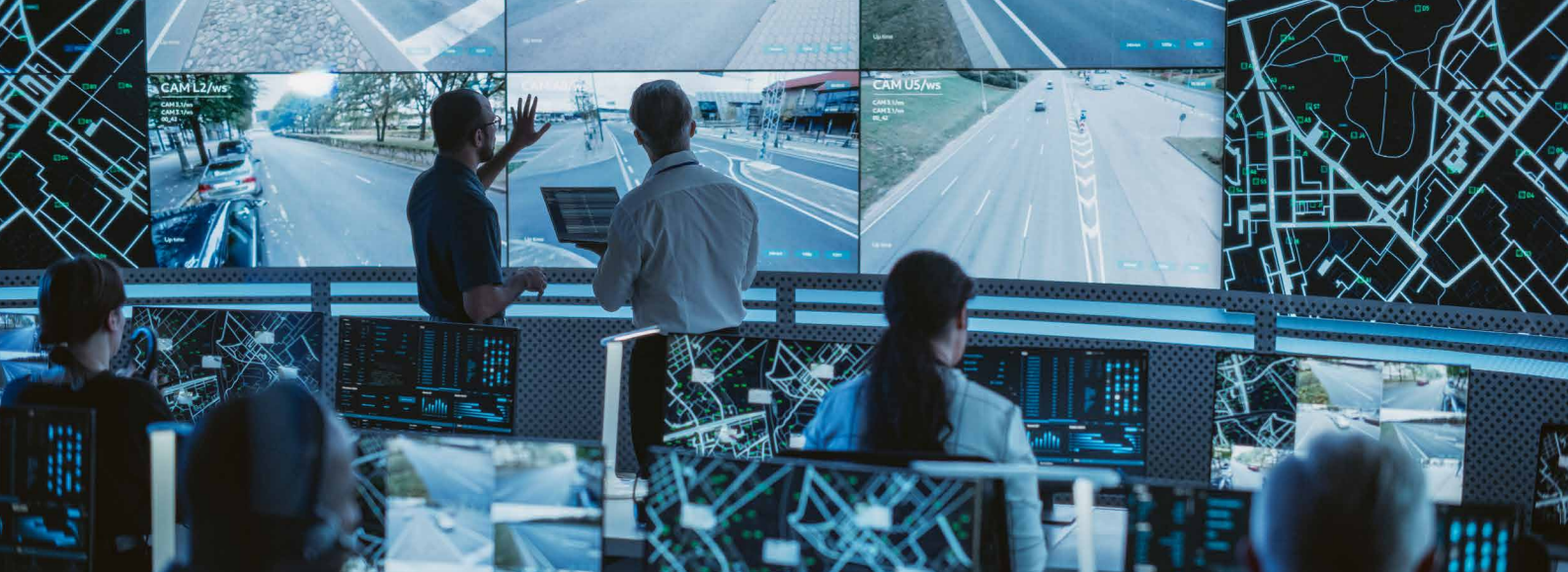
Emerald follows user needs - Select the DESKVUE model for your perfect match:

Emerald DESKVUE

Provides the ideal solution for users who need to monitor multiple sources with multiple screens with UHD resolutions and actively engage with a smaller amount of systems concurrently. It perfectly serves in a DESKVUE aggregation to add additional ports for video wall connections.

Emerald DESKVUE PE

Offers the same benefits as DESKVUE, but features a strong video processor for users who require precise 4K video processing and need to actively control multiple systems simultaneously.

Emerald DESKVUE Technical Specifications and Interfaces

Product Code	Description	Max Resolution	USB Ports	Network Ports	Audio
EMD5104-R	(4) DisplayPort™	(3) 3840 X 2160 at 30 Hz; (1) 5120 X 1440 at 30 Hz	(3) USB 3.2 Gen 2x1, Type A; (1) USB 3.2 Gen 1x1, Type A; (1) USB 3.2 Gen 2x2 ; USB-C	(2) RJ-45 1G	(1) 3.5-mm Audio OUT; (1) 3.5-mm Microphone IN
EMD5004PE-R	(4) mini DisplayPort	(2) 4096 X 2160 at 60 Hz; (2) 5120 X 1440 at 60 Hz	(4) USB 2.0, Type A; (2) USB 3.2 Gen 2, Type A; (3) USB 3.2 Gen 1, Type A; (1) USB Gen 3.2, USB-C	(1) RJ-45 1G; (1) RJ-45 2.5G	(1) 3.5-mm Audio Out

Product Code	Description
EMD5104-R	Emerald DESKVUE Receiver 4K/Quad Monitor TAA-compliant
EMD5004PE-R	Emerald DESKVUE Receiver 4K60/Quad Monitor, Premium Edition
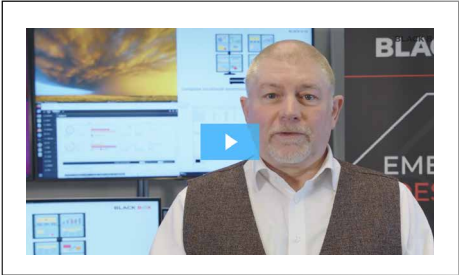
Watch our Emerald DESKVUE Demo Video ▶

Emerald 4K

Emerald® 4K transmitters and receivers connect users and computers through a 1-Gigabit IP-based KVM matrix switching network. The KVM units support various video resolutions up to 4K/60 or 5K, high-speed USB 2.0 devices, and bidirectional analog stereo audio through redundant SFP+ ports. Emerald enables remote, BIOS-level computer access to both physical and virtual machines.
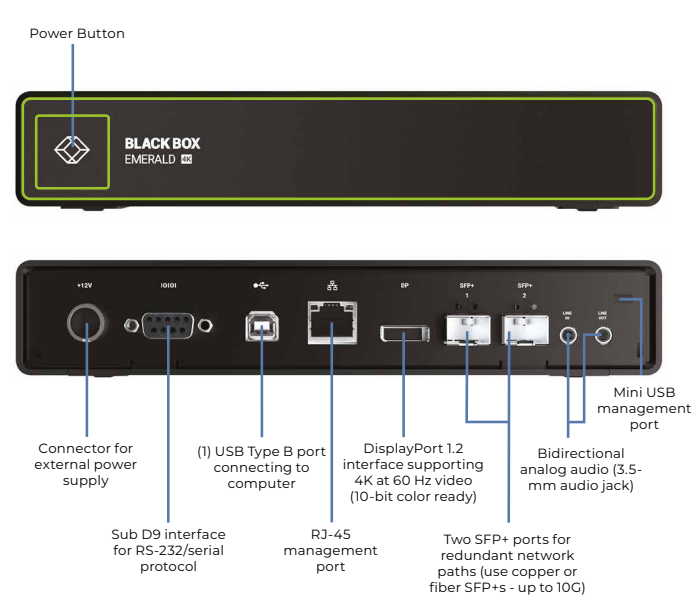
- Switch and extend pixel-perfect video; bidirectional analog audio; and up to four USB devices (HID and/or high-speed, transparent USB 2.0), such as keyboards, mice, Wacom® tablets, touch interfaces, and flash drives

- Supports up to 4K/60 video (lossless compression, 10-bit color ready); or 5K (5120x1440) over 1-Gigabit networks, reducing IP-infrastructure costs

- EDID pass-through feature supports a wide range of resolutions, ensuring video signals display correctly at all times

- Connect Emerald 4K Receiver units with any other type of Emerald Transmitter unit (PE, SE, and ZeroU) as well as virtual machines in a single system. All 4K and HD models are fully interoperable with each other

- Build a KVM matrix that supports up to 32 endpoints through the built-in management interface, or use the Boxilla® KVM Manager to create even larger matrices

- Transmit KVM signals over IP and securely access critical devices over a WAN or the internet

- Embedded VM clients such as RDP/Remote FX or PCoIP (ultra) simplify real time VM-Access, reduce system complexity, and reduce the ToC

- OS-agnostic technology allows you to connect any system, including Windows®, macOS®, or Linux®

- Dual network ports connect to a primary and secondary LAN for fail-safe operation

- SFP+ ports allow secure fiber connectivity

- Supports Active Directory (Boxilla required)

- Connect a Dual Head receivers to two single-head transmitters and glide and switch between the systems

- Combine with Switchable USB Extenders (EMD100USB) to extend and switch USB 2.0 signals up to 480 Mbps
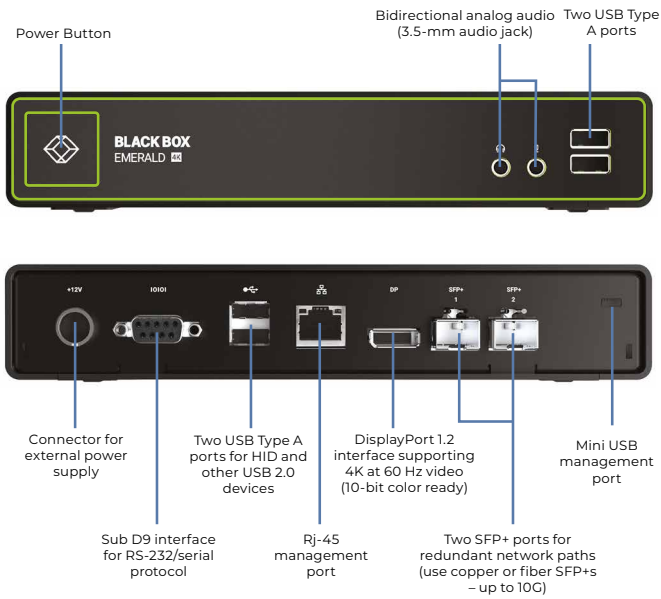
Emerald 4K Technical Specifications and Interfaces

Product Code	Video Heads	Max Resolution	USB Ports	Network Ports	Serial/Analog Audio	Power Connectors
EMD4000T	(1) DisplayPort 1.2™	4096 X 2160 at 60 Hz	(1) USB 2.0 Type B	(1) RJ-45, (2) SFP+	(1) DB9, (2) 3.5-mm audio jack	(1) 12-VDC, 3A
EMD4000R	(1) DisplayPort 1.2	4096 X 2160 at 60 Hz	(4) USB 2.0 Type A	(1) RJ-45, (2) SFP+	(1) DB9, (2) 3.5-mm audio jack	(1) 12-VDC, 3A

Emerald 4K Transmitter (EMD4000T)

Power Button

Connector for external power supply

Sub D9 interface for RS-232/serial protocol

(1) USB Type B port connecting to computer

RJ-45 management port

DisplayPort 1.2 interface supporting 4K at 60 Hz video (10-bit color ready)

Two SFP+ ports for redundant network paths (use copper or fiber SFP+s - up to 10G)

Bidirectional analog audio (3.5-mm audio jack)

Mini USB management port

Emerald 4K Receiver (EMD4000R)

Power Button

Bidirectional analog audio (3.5-mm audio jack)

Two USB Type A ports

Connector for external power supply

Sub D9 interface for RS-232/serial protocol

Two USB Type A ports for HID and other USB 2.0 devices

Rj-45 management port

DisplayPort 1.2 interface supporting 4K at 60 Hz video (10-bit color ready)

Two SFP+ ports for redundant network paths (use copper or fiber SFP+s – up to 10G)

Mini USB management port

Emerald PE

Emerald® PE transmitters and receivers are ideal extenders for customers seeking superior KVM performance, system redundancy, and crystal-clear HD video. Extend and switch pixel-perfect DisplayPort™ or DVI video up to 1920 x 1200 at 60 Hz, high-speed USB 2.0 devices, and bidirectional analog stereo audio through redundant network ports. With a similar feature set as Emerald 4K units, these extenders are ideal for critical 24/7 applications including process monitoring, broadcast production, and medical imaging. Emerald PE is available as a single-head or dual-head version.
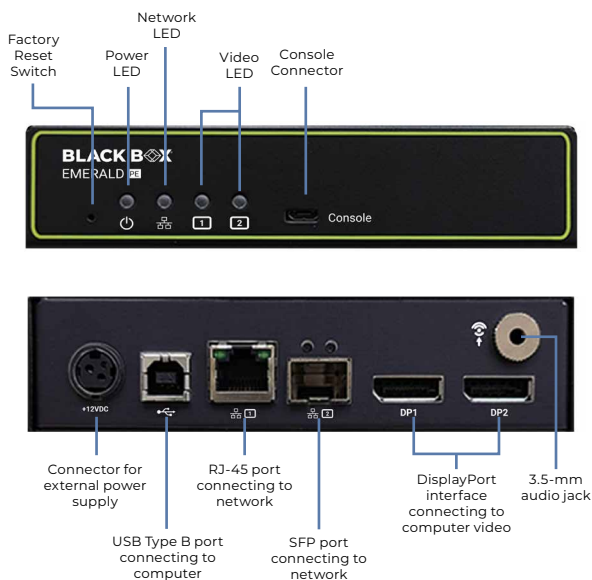
- Switch and extend up to pixel-perfect HD video (lossless compression), bidirectional analog audio, and up to four USB devices.

- Connect Emerald PE Transmitters with any type of Emerald Receiver as well as virtual machines in a single system. All 4K and HD models are fully interoperable with each other.

- EDID pass-through feature supports a wide range of resolutions, ensuring video signals display correctly at all times.

- Choose from five video compression settings to balance video quality and bandwidth consumption.

- Transmit KVM signals over IP and securely access critical devices over a WAN or the internet.

- Get real-time virtual machine access via RDP 8.1/RemoteFX/PCoIP (ultra).

- DisplayPort Receivers feature redundant power connections for critical 24/7 consoles.

- Connect via copper or fiber to a primary and secondary network for a fail-safe operation.

- Supports Active Directory (Boxilla required)
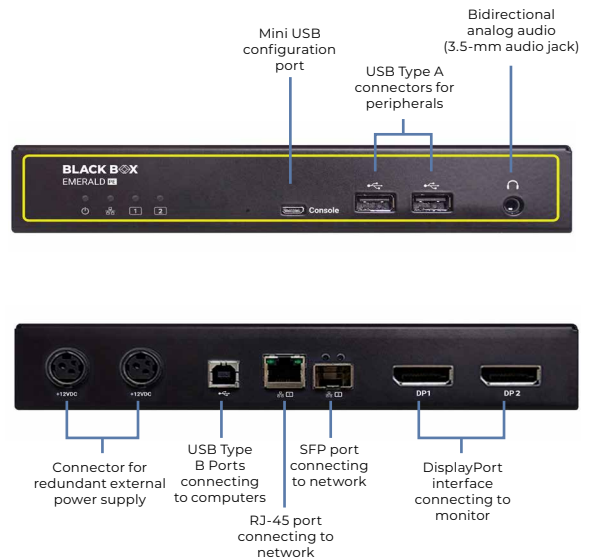
- Mount up to three PE units on only 1RU rack space.

Emerald PE Technical Specifications and Interfaces

Product Code	Video Heads	Max Resolution	USB Ports	Network Ports	Serial/Analog Audio	Power Connectors
EMD2000PE-DP-T	(1) DisplayPort	1920 X 1200 at 60 Hz	(1) USB 2.0 Type B	(1) RJ-45, (1) SFP	(1) Micro USB, (1) 3.5-mm audio jack	(1) 12-VDC, 3A
EMD2002PE-DP-T	(2) DisplayPort	1920 X 1200 at 60 Hz	(1) USB 2.0 Type B	(1) RJ-45, (1) SFP	(1) Micro USB, (1) 3.5-mm audio jack	(1) 12-VDC, 3A
EMD2000PE-DP-R	(1) DisplayPort	1920 X 1200 at 60 Hz	(2) USB 2.0 Type A	(1) RJ-45, (1) SFP	(1) Micro USB, (1) 3.5-mm audio jack	(2) 12-VDC, 3A
EMD2002PE-DP-R	(2) DisplayPort	1920 X 1200 at 60 Hz	(2) USB 2.0 Type A	(1) RJ-45, (1) SFP	(1) Micro USB, (1) 3.5-mm audio jack	(2) 12-VDC, 3A
EMD2000PE-T-R2	(1) DVI	1920 X 1200 at 60 Hz	(1) USB 2.0 Type B	(1) RJ-45, (1) SFP	(1) Micro USB, (1) 3.5-mm audio jack	(1) 12-VDC, 3A
EMD2002PE-T-R2	(2) DVI	1920 X 1200 at 60 Hz	(1) USB 2.0 Type B	(1) RJ-45, (1) SFP	(1) Micro USB, (1) 3.5-mm audio jack	(1) 12-VDC, 3A
EMD2000PE-R-P	(1) DVI	1920 X 1200 at 60 Hz	(4) USB 2.0 Type B	(1) RJ-45 PoE (1) SFP	(1) Micro USB, (2) 3.5-mm audio jack	(1) 12-VDC, 3A
EMD2002PE-R-P	(2) DVI	1920 X 1200 at 60 Hz	(4) USB 2.0 Type B	(1) RJ-45 PoE (1) SFP	(1) Micro USB, (2) 3.5-mm audio jack	(1) 12-VDC, 3A

Emerald PE Dual DP Transmitter (EMD2002PE-DP-T)

Factory Reset Switch
Power LED
Network LED
Video LED
Console Connector

Console

Connector for external power supply
USB Type B port connecting to computer
RJ-45 port connecting to network
SFP port connecting to network
DisplayPort interface connecting to computer video
3.5-mm audio jack

Emerald PE Dual DP Receiver (EMD2002PE-DP-R)

Mini USB configuration port
USB Type A connectors for peripherals
Bidirectional analog audio (3.5-mm audio jack)

Console

Connector for redundant external power supply
USB Type B Ports connecting to computers
RJ-45 port connecting to network
SFP port connecting to network
DisplayPort interface connecting to monitor

Emerald SE

Emerald® SE transmitters and receivers are your entry into the world of IP KVM. Extend and switch DVI or DisplayPort™ video up to HD resolutions, USB 2.0 devices, and bidirectional analog stereo audio. Pair transmitter and receiver units to create a P2P connection or build an IP-based KVM matrix switching setup. Take advantage of the USB-powered ZeroU Transmitter that saves valuable rack space. Or add licenses for the Emerald Remote App to connect an Emerald SE transmitter directly to any Windows® 10, 11, or macOS® device – without the need for an additional hardware receiver unit. Emerald SE is available as single-head or dual-head versions.
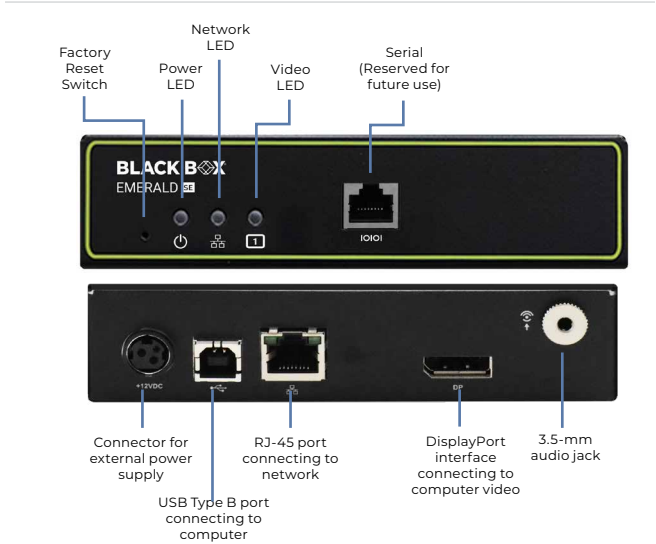
- Switch and extend up to visually lossless HD video and up to four USB devices (HID and/or high-speed, transparent USB 2.0)

- Connect Emerald SE Transmitter units with any other type of Emerald Receiver unit. All 4K and HD models are fully interoperable with each other

- Get real-time virtual machine access via RDP/RemoteFX and PCoIP (ultra) from any Emerald SE receiver

- Choose from five video compression settings to balance video quality and bandwidth consumption

- EDID pass-through feature ensures video signals display correctly at all times

- Build a KVM matrix that supports up to 32 endpoints through the built-in management interface, or use the Boxilla® KVM Manager to create even larger matrices

- Transmit signals over IP and securely access critical devices over a WAN or the internet at very low bandwidth consumption

- OS-agnostic technology allows you to connect any system, including Windows, macOS, or Linux®

- Supports Active Directory (Boxilla required)

- Mount up to three DisplayPort units on only 1RU rack space

- Combine with Switchable USB Extenders (EMD100USB) to extend and switch USB 2.0 signals up to 480 Mbps

- Connect a Dual Head receivers to two single-head transmitters and glide and switch between the systems
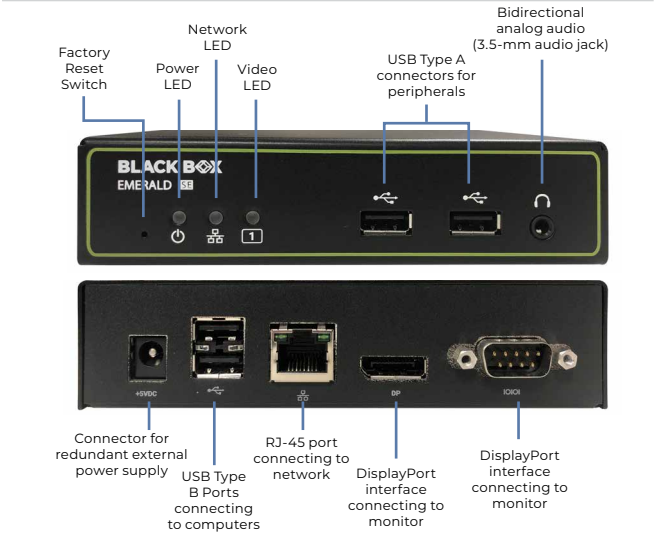
Emerald SE Technical Specifications and Interfaces

Product Code	Video Heads	Max Resolution	USB Ports	Network Ports	Serial/Analog Audio	Power Connectors
EMD2000SE-DP-T	(1) DisplayPort	1920 X 1200 at 60 Hz	(1) USB 2.0 Type B	(1) RJ-45	(1) RJ-45 serial, (1) 3.5-mm audio jack	(1) 5-VDC, 4A
EMD2002SE-DP-T	(2) DisplayPort	1920 X 1200 at 60 Hz	(1) USB 2.0 Type B	(1) RJ-45	(1) RJ-45 serial, (1) 3.5-mm audio jack	(1) 12-VDC, 3A
EMD2000SE-DP-R	(1) DisplayPort	1920 X 1200 at 60 Hz	(4) USB 2.0 Type A	(1) RJ-45	(1) RJ-45 serial, (1) 3.5-mm audio jack	(1) 5-VDC, 4A
EMD2002SE-DP-R	(2) DisplayPort	1920 X 1200 at 60 Hz	(4) USB 2.0 Type A	(1) RJ-45	(1) RJ-45 serial, (1) 3.5-mm audio jack	(1) 12-VDC, 3A
EMD2000SE-T-R2	(1) DVI	1920 X 1200 at 60 Hz	(1) USB 2.0 Type B	(1) RJ-45	(1) RJ-45 serial, (1) 3.5-mm audio jack	(1) 5-VDC, 4A
EMD2000SE-R	(1) DVI	1920 X 1200 at 60 Hz	(4) USB 2.0 Type A	(1) RJ-45	(1) DB9 serial, (2) 3.5-mm audio jack	(1) 12-VDC, 4A
EMD2002SE-R	(2) DVI	1920 X 1200 at 60 Hz	(4) USB 2.0 Type A	(1) RJ-45	(1) DB9 serial, (2) 3.5-mm audio jack	(1) 12-VDC, 4A

Emerald SE DisplayPort Single Transmitter (EMD2000SE-DP-T)

Factory Reset Switch
Power LED
Network LED
Video LED
Serial (Reserved for future use)

Connector for external power supply
USB Type B port connecting to computer
RJ-45 port connecting to network
DisplayPort interface connecting to computer video
3.5-mm audio jack

Emerald SE DisplayPort Single Receiver (EMD2000SE-DP-R)

Factory Reset Switch
Power LED
Network LED
Video LED
USB Type A connectors for peripherals
Bidirectional analog audio (3.5-mm audio jack)

Connector for redundant external power supply
USB Type B Ports connecting to computers
RJ-45 port connecting to network
DisplayPort interface connecting to monitor
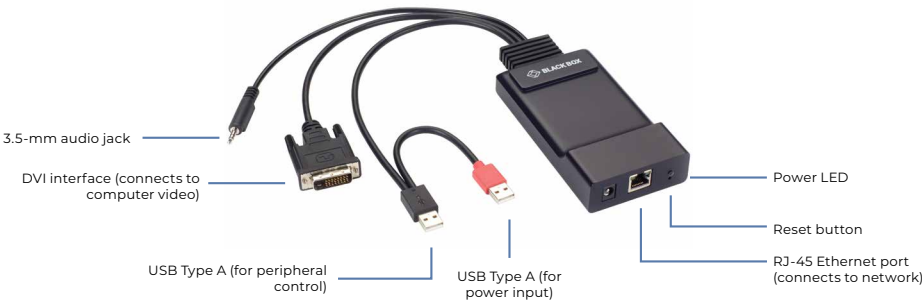DisplayPort interface connecting to monitor

Emerald ZeroU Transmitters

The small form factor Emerald® ZeroU DVI or DisplayPort™ transmitters consume zero rack space, enabling you to add more critical IT equipment to your data center. These transmitters work with all Emerald receivers to provide a seamless desktop experience anywhere on a TCP/IP network while allowing the actual hardware to be securely housed in a corporate data center. They support visually lossless full HD 1080p video, audio, and USB HID devices.

- ZeroU form factor KVM transmitter eliminates the need for costly rack space

- Low power consumption and integrated cables reduce energy, cooling and installation costs
- USB power option avoids the need for PDUs and further reduces space requirements
- Supports any type of Emerald receivers — fully interoperable with all 4K models
- Easily retrofits into any existing Emerald IP KVM deployment
- Share mode allows multiple operators to simultaneously use one source

3.5-mm audio jack

DVI interface (connects to computer video)

USB Type A (for peripheral control)

USB Type A (for power input)

Power LED

Reset button

RJ-45 Ethernet port (connects to network)

| Product Code	Video Heads	Max Resolution	USB Ports	Network Ports	Audio	Power Connectors
EMD200DV-T	(1) DVI	1920 X 1200 at 60 Hz	(1) USB HID and (1) USB for power	(1) RJ-45	(1) 3.5-mm audio jack	Via USB or (1) 5-VDC, 4A DC Adapter
EMD200DP-T	(1) DisplayPort	1920 X 1200 at 60 Hz	(1) USB HID and (1) USB for power	(1) RJ-45	Embedded DisplayPort audio	(1) 5-VDC, 4A

Emerald Remote App

The Emerald Remote App is a license-enabled KVM application that allows remote computer access through Emerald transmitters and the use of virtual machines from any Windows® 10, 11, or macOS® device in full HD resolution. Through the Remote App, multiple connections can be launched simultaneously, which makes remote monitoring of connected devices even more flexible. Simply add a license for one, five, 10, or 20 Remote App users to your Boxilla® KVM Manager.

- Provides secure software KVM connection from Windows 10/11 or macOS-based PCs or laptops
- Open up to 9 connections simultaneously to manage and view multiple sources

- Access KVM resources over VPN
- Save the location and size of connection windows
- Connect to Emerald PE, SE, and ZeroU Transmitter units as well as virtual machines
- OS-agnostic technology allows you to connect any target system, including Windows, macOS, or Linux®
- Supports video resolutions up to 1920 x 1200, audio, and USB HID
- Requires Boxilla KVM Manager for license management

Request a free Remote App trial **here** ▸

Product Code	Description
EMDRM1-LIC	Emerald Remote App – license for one connection
EMDRM5-LIC	Emerald Remote App – license for five connections
EMDRM10-LIC	Emerald Remote App – license for 10 connections
EMDRM20-LIC	Emerald Remote App – license for 20 connections
EMDRMDEMO-LIC	Emerald Remote App – 30-day demo license for four connections
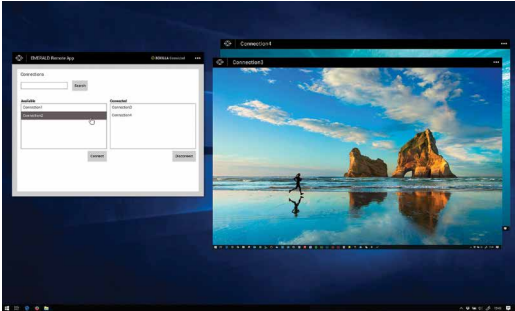
Remote App runs multiple KVM connections simultaneously

Emerald GE Gateway

Emerald® GE simply connects to the Emerald IP network giving multiple Emerald users enhanced connectivity with Virtual Machine (VM) sharing and physical machine access, saving the costs of PCoIP/PCoIP Ultra clients. Up to eight users can simultaneously access and collaborate on up to eight virtual machine sessions with a seamless desktop experience, which is no different when compared to connecting to a physical computer. Users obtain low-latency, real-time remote access with lossless pixel-perfect video up to 4K.

- Cost-efficient remote access saving costs on multiple PCoIP clients

- Better collaboration through VM sharing – up to eight users

- Each user can access up to eight virtual machine sessions

- Best remote desktop supporting RDP, PCoIP, and PCoIP Ultra protocols delivering a seamless, secure user experience with up to 4K video

- Simplified workflows with access to both physical computers and VMs

- Centralized management and system monitoring through integration with the Boxilla® KVM Manager

Product Code	Description
EMD3000GE	Emerald GE Gateway

EMD3000GE

Download our Whitepaper **Leveraging PCoIP® for Virtual-Machine Sharing** ▸
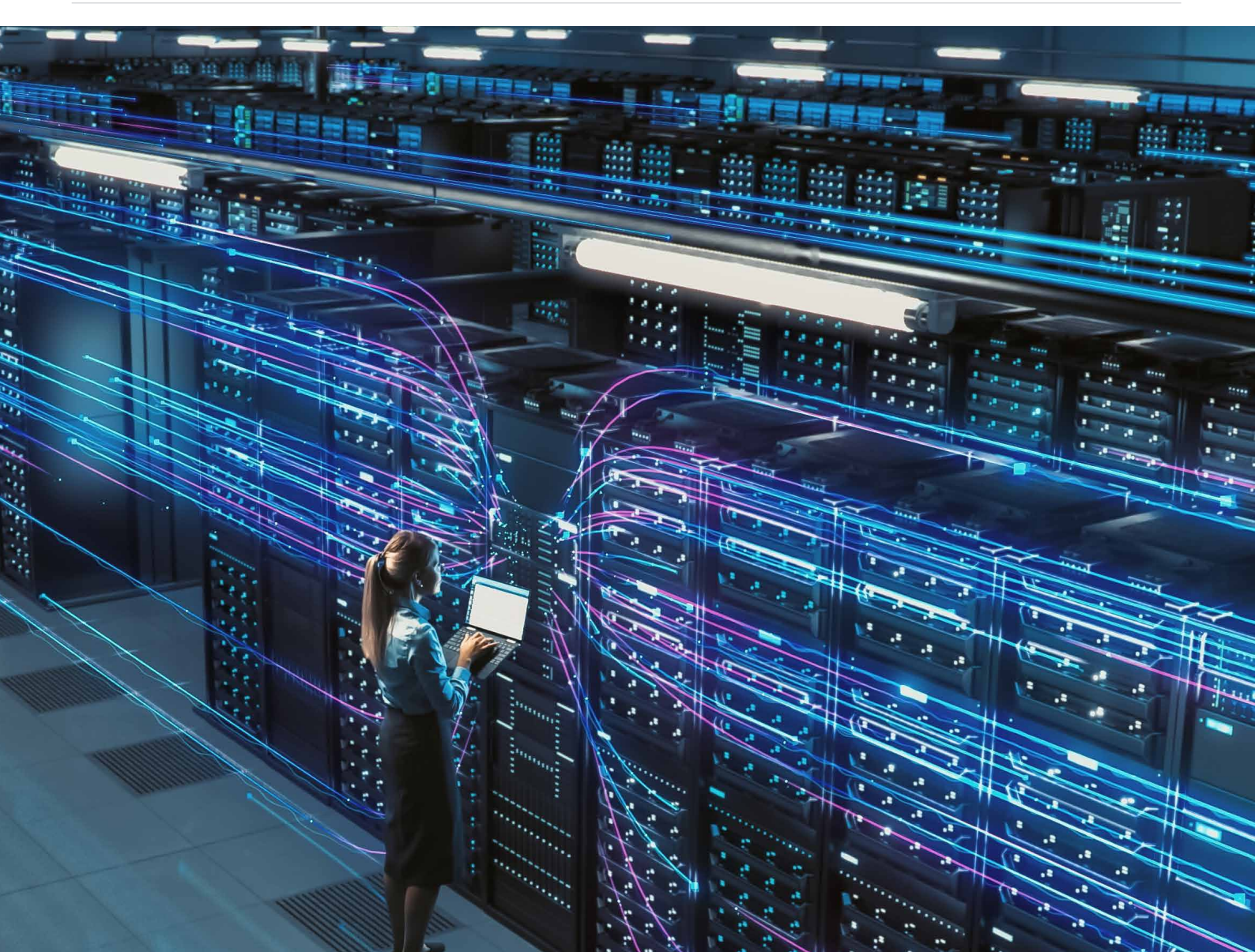
Emerald Accessories

Switchable High-Speed USB Extenders

This USB extender adds high-speed USB 2.0 support to your Emerald® KVM system.

· Switch between high-speed USB 2.0 devices over an IP network.

· Supports full-speed USB 2.0 up to 480 Mbps at 4 ports

· Supports simultaneous USB sharing

· Connect to an Emerald KVM system to automatically switch when target changes.

Learn more at **blackbox.com/emd100usb** ▸

Switchable High-Speed USB Extenders (EMD100USB)

Product Code	Description
EMD100USB	Switchable USB Extender

Video Cables and Adapters

Use high-quality Black Box® cables and adapters to connect your Emerald KVM System with computers and user consoles. Choose from an extensive product portfolio that includes the following items:

DisplayPort 1.2 Video Cable

| Product Code	Description
Video Cables	
VCB-DP2 Series (various lengths)	DisplayPort™ 1.2 (4K60)
EVNDVI02 Series (various lengths)	DVI SL/DL Cable
Video Adapters	
KVGA-DVID	VGA to DVI-D Video Converter, USB Powered (1920 X 1200)
VA-MDP12-DP12	Mini DisplayPort-to-DisplayPort Adapter (3840 X 2160)
VA-DP-DVID-A	DisplayPort to DVI (1920 X 1200)
VA-DP12-HDMI4K-A	DisplayPort to HDMI (4090 X 2160)

Emerald Mounting Kits

Use these 19-inch rackmount kits to mount Emerald units on or below tables, behind screens, or in racks. The 1U mounting kits are ideal for space-saving installations because they provide space for up to two or three extender units. Emerald was designed with optimal airflow in mind, so the units will not overheat when placed alongside other components in the rackmounting shelf.

Emerald 4K Rackmount Kit, 2 units (EMD4000-RMK1)

Product Code	Description
EMD4000-RMK1	Emerald 1RU Rackmount Kit for (1) or (2) Emerald 4K units (EMD4000T, EMD4000R)
EMD4000-RMK2-SLIM	Spare Rackmount Blanking Plate for EMD4000-RMK1
EMD2000-RMK2	Emerald 1RU Rackmount Kit for (2) Emerald PE DVI units (EMD2000PE-T, EMD2002PE-T, EMD2000-PE-R-P, EMD2002PE-R-P)
EMD2000-RMK3	Emerald 1RU Rackmount Kit for (3) Emerald SE/PE DP transmitters (EMD2000PE-DP-T, EMD2002PE-DP-T, EMD2000SE-DP-T, EMD2002SE-DP-T)
DTX1000-RMK1	Emerald 1RU Rackmount Kit for (1) Emerald SE DVI unit (EMD2000SE-T, EMD2002SE-T EMD2000SE-R, EMD2002SE-R)
DTX1000-RMK2	Emerald 1RU Rackmount Kit for (2) Emerald SE DVI units (EMD2000SE-T, EMD2002SE-T EMD2000SE-R, EMD2002SE-R)
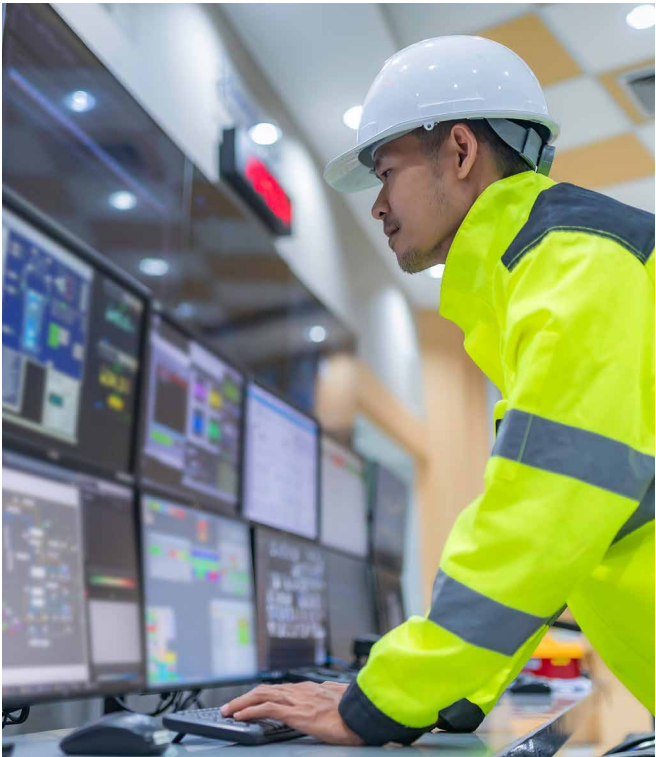
Additional Products

ControlBridge Control Processor and Touchscreen

ControlBridge® is a versatile control processor and touchscreen-based appliance for intuitive operations control, and room automation. It allows you to control all aspects of your workspace or control room, including KVM switching, lighting, window shutters, automated furniture position, and video walls.

· 7" and 10" touchscreens and multiple control processors available

· Bidirectional control of any IP-enabled or I/O device

· Active matrix touchscreen display offers resolutions of 1280 x 800, 32-bit (true color) images, and full-motion streaming video preview

· Includes built-in microphone, speakers, and light and motion sensors

· Set up through a standard web browser

· Mobile device support through optional app license

· Available with Individual pre-configuration and branded touchscreen layouts for your specific requirements

Learn more at **blackbox.com/controlbridge** ▸

ControlBridge 10" touchscreen

Product Code	Description
CB-TOUCH7-T	ControlBridge Touch Panel, 7"
CB-TOUCH10-T	ControlBridge Touch Panel, 10"
CB-CP100	Control Processor for Small-Sized Applications
CB-APP-LIC	ControlBridge Single-Seat Mobile Device License

Central Power Hub

For improved power management and fail-safe operation, use the optional central power hub for 8 or 16 units.

· Central power feed to 5-volt or 12-volt DC devices with up to 30 watts per port.

· Web UI for configuration and monitoring of systempower status.

· Highest resilience when equipped with second, hot-swappable 600-k hours power supply.

Learn more at **blackbox.com/cph** ▸


Central Power Hub, 16 units (ACR1000-CPH16R-R2)

Product Code	Description
ACR1000-CPH16R-R2	Central Power Hub, 16 Ports
ACR1000-CPH8R-R2	Central Power Hub, 8 Ports
ACR1000-CPH-PS-R2	Central Power Hub Redundant Power Supply
ACR1000-12V5-CBL3M	Central Power Hub Power Converter Cable - 12 VDC to 5 VDC, 3-m

Freedom II KM Switches

Freedom KM Switches support the powerful Glide and Switch technology that allows operators to switch between computers by moving a mouse from one screen to another - without pressing hotkeys or additional buttons.

Learn more at **blackbox.com/freedom** ▸

Product Code	Description
KV0004A-R2	Freedom II KM Switch, 4 Ports
KV0008A-R2	Freedom II KM Switch, 8 Ports
KV0004A-LED	Freedom LED Monitor Identification Kits
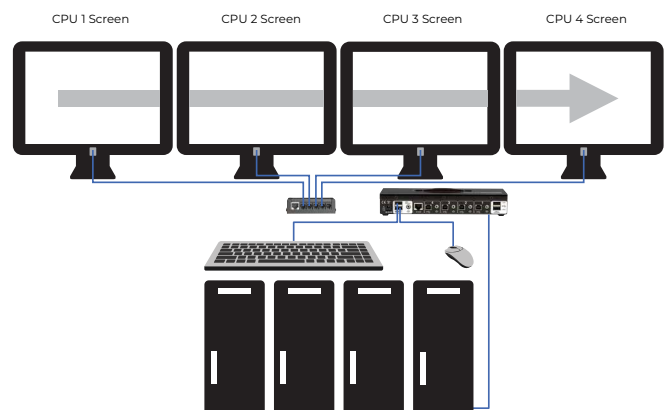
Emerald Network Components

Emerald IP Switches

Emerald® was designed with the needs of IT planners and integrators in mind. To build an Emerald KVM matrix, choose from a variety of our tested 1-, 10-, and 100-Gbps switches. Or use your preferred third-party IP switches. Make sure to use managed IP switches that support IP multicast and IGMP at full-wire speed and ensure sufficient bandwidth for the required video quality, resolutions, and USB devices.

Learn more at **blackbox.com/ems** ▸

10G 28-Port IP Switch (EMS10G28)

Product Code	EMS1G48	EMS1G24F	EMS10G12	EMS10G28	EMS100G32-R2
Speed	1 Gbps	1 Gbps	10 Gbps	10 Gbps	100 Gbps
Ports	(48) 10/100/1000BT RJ-45, 1.25 Gbps	(24) 1-GbE SFP	(12) 10-GbE SFP+	(28) 10-GbE SFP+	(32) 100-GbE SFP+ or (128) 10-GbE SFP+
Cascade Ports	(4) 10G SFP+	(2) 10-GbE SFP+	(3) 100G QSFP28	(2) 100G QSFP28	—
Capacity	260 Gbps	260 Gbps	840 Gbps	960 Gbps	6.4 Tbps
Dimensions	4.4 (1 RU) x 43.4 x 32 cm (HxWxD)	4.4 (1 RU) X 43.4 X 41 cm (HxWxD)	4.4 (1 RU) x 45 x 20.9 cm (HxWxD)	4.4 (1 RU) x 43.1 x 45.7 cm (HxWxD)	4.4 (1 RU) x 43.4 x 46 cm (HxWxD)
Max Power Consumption	87 W	63 W	180 W	290 W	605 W
Power Input	(2) 90–264 VAC, 50/60 Hz	100–240 VAC 50/60 Hz	(2) 100–240 VAC, 50/60 Hz	(2) 100–240 VAC, 50/60 Hz	(2) 100–240 VAC, 50/60 Hz

SFP Modules

Emerald 4K and PE Extenders as well as Emerald IP Switches provide a high level of flexibility by offering SFP (1-Gbps), SFP+ (10-Gbps), and QSFP28 (100-Gbps) ports (depends on the type of extender and system application). Use SFPs for HD signal transmissions. Use SFP+ or QSFP28 modules to transmit 4K 60 signals and aggregate multiple connections through a 100-Gbps IP switch. Emerald Extenders and Switches support connectivity through copper, fiber multimode, or fiber singlemode cables using a variety of Black Box® and third-party SFP modules.

Learn more at **blackbox.com/sfp** ▸

Various SFP modules

Product Code	Description	Supported Distance
1-Gbps Connections		
LFP441	SFP, 1250-Mbps, 850-nm Multimode Fiber, LC	550 m
LFP413	SFP, 1250-Mbps, 1310-nm Single-Mode Fiber, LC	10 km
LFP442	SFP, 1250-Mbps, 1310-nm Single-Mode Fiber, LC	20 km
LFP415	SFP, 1000-Mbps, SGMII Interface, RJ-45	100 m
LFP443	SFP, 1250-Mbps, SGMII Interface, RJ-45	100 m
10-Gbps Connections		
LSP441	SFP+ 10-Gbps, 850-nm Multimode Fiber, LC	300 m
LSP442	SFP+ 10-Gbps, 1310-nm Single-Mode Fiber, LC	20 km
LSP443	SFP+ 10-Gbps, RJ-45	30m
100-Gbps Connections		
QSFP441-R2	QSFP28 100-Gbps, 850-nm Multimode Fiber, MPO	100 m
QSFP442	QSFP28 100-Gbps, WDM Single-Mode Fiber, LC	10 km

Notes: (1) All Black Box SFP Modules feature Extended Diagnostics; (2) Black Box Switches also support generic SFP(+) modules.

Active Optical and Direct Attach Cables

Black Box® Active Optical Cables (AOCs) and Direct Attach Cables (DACs) provide an all-in-one, easy-to-install, and cost-effective solution for connecting Emerald® 4K Extender units to a network switch or interconnecting switches through their SFP+ or QSFP network ports.
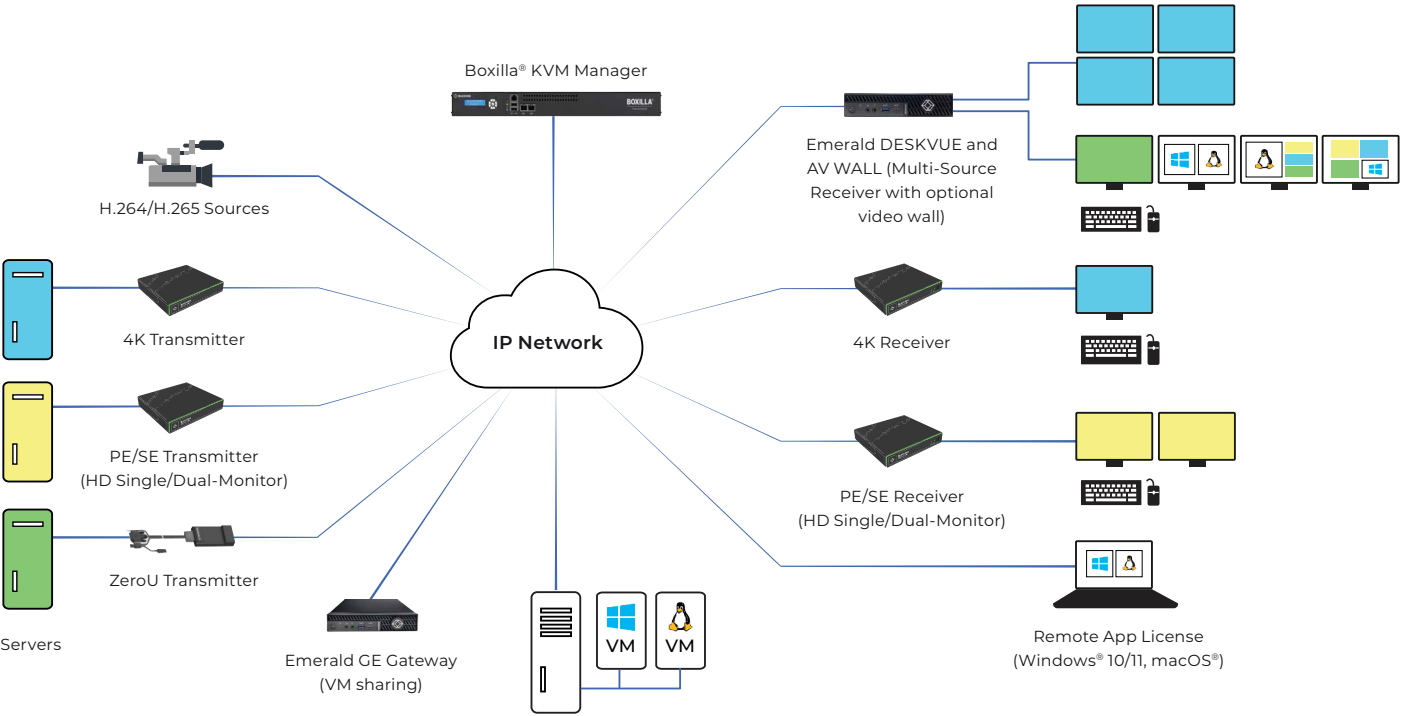
Learn more at **blackbox.com/sfpaoc** ▸

SFP-10G-AOC2M-BB

Product Code	Description
AOC	
SFP-10G-AOCxM-BB	AOC, SFP+ 10-Gbps, various lengths (in meters); x = 1, 2, 3, 5, 7, or 10
QSFP-100G-AOCxM-BB	AOC, QSFP 100-Gbps, various lengths (in meters); x = 3, 5, 7, 10, 15, or 30
DAC	
SFP-H10GB-CUxxxx-BB	DAC, SFP+ 10-Gbps, various lengths; xxxx = 50CM, 1M5, 1M, 2M, 3M, or 5M

Emerald Concept Diagram

Boxilla® KVM Manager

H.264/H.265 Sources

4K Transmitter

PE/SE Transmitter
(HD Single/Dual-Monitor)

ZeroU Transmitter

Servers

Emerald GE Gateway
(VM sharing)

IP Network

Emerald DESKVUE and
AV WALL (Multi-Source
Receiver with optional
video wall)

4K Receiver

PE/SE Receiver
(HD Single/Dual-Monitor)

Remote App License
(Windows® 10/11, macOS®)

BLACK BOX®

Why Black Box?

Expertise

Black Box project engineers can assist with system assessment, design, deployment, and training.

Breadth

Black Box offers the most comprehensive suite of engineered KVM solutions in the industry.

Support

Reflecting our commitment to complete satisfaction, our dedicated team of highly trained support technicians is available by phone free of charge, every day of the year.

Warranties

Multi-year guarantees with multi-year extension and replacement options are available.

Experience

Providing leading technology solutions since 1976, Black Box helps more than 175,000 customers in 150 countries build, manage, optimize, and secure IT infrastructures.

Center of Excellence

Black Box offers a Center of Excellence featuring professional services and support agreements that help optimize customers' systems and maximize uptime.

Service Level Agreements

Our Service Level Agreements give customers access to technical support, product training, dedicated application engineers, and more.