Manuals+ — User Manuals Simplified.

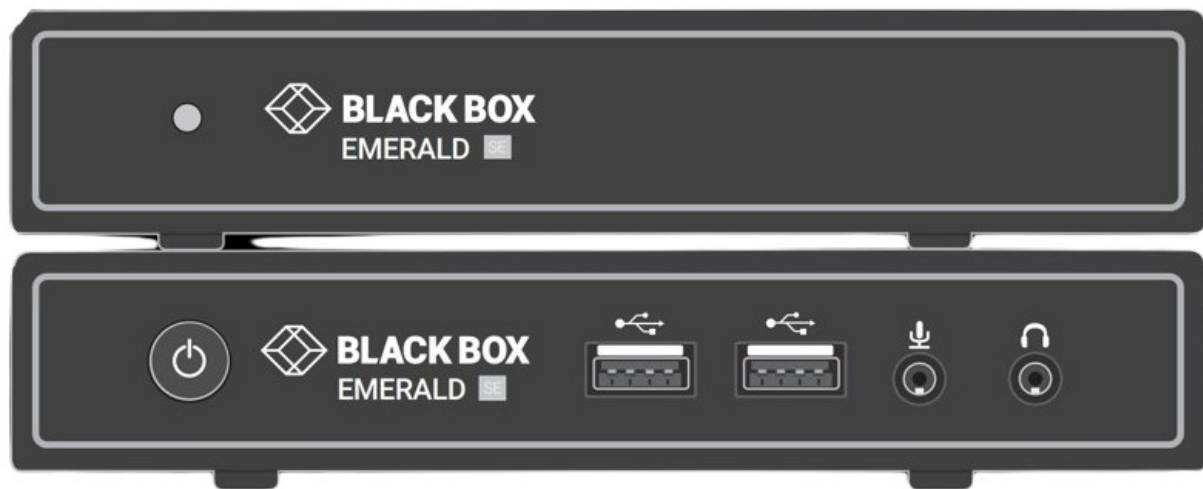# Black Box EMD200DP-T Emerald Zero U DP KVM-over-IP Transmitter User Manual

USER MANUAL

Contents

EMD200DP-T Emerald Zero U DP KVM-over-IP Transmitter

EMERALD KVM OVER IP TECHNOLOGY

EMD200DP-T, EMD200DV-T, EMD2000PE-DP-T, EMD2000PE-R, EMD2000PE-R-P, EMD2000PE-T, EMD2000SE-DP-T. EMD2000SE-R, EMD2000SE-T, EMD2002PE-DP-T, EMD2002PE-R, EMD2002PE-R-P, EMD2002PE-T, EMD2002SE-DP-T, EMD2002SE-R, EMD2002SE-T

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⚠ **WARNING** (PoE): The EMD-PE units conform to IEEE 802.3af but do not meet the isolation barrier requirements specified in subsection 33.4.1 – Isolation. The units meet the Safety Requirements of IEC 62368.

CHAPTER 1: SPECIFICATIONS

1.1 GENERAL SPECIFICATIONS
TABLE 1-1. SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Approvals	
Unit	FCC, CE, CSA, RoHS, WEEE
Power Supply	TUV, UL
Physical	

LED Interface	EMD2000SE-R, EMD2000SE-T, EMD2002SE-R, and EMD2002SE-T: (1) Power LED button (deactivated, not used); EMD200DV-T, EMD2000PE-DP-T, EMD2000PE-R, EMD2000PE-R-P, EMD2000PE-T, EMD2000SE-DP-T, EMD2002PE-DP-T, EMD2002PE-R, EMD2002PE-R-P, EMD2002PE-T, EMD2002SE-DP-T (1) Power LED (green); **NOTE:** SE and PE units automatically power on when plugged in. **NOTE:** EMD200DV-T can be powered by the USB connectors, or via an optional DC power supply. (1) RJ-45 Speed LED (green, located on top left of RJ-45 connector): Blinks three times when the network connection is 1000 Mbps, Blinks two times when network connection is 100 Mbps, Blinks once when the network connection is 10 Mbps, Not blinking: No Link to network; (1) Activity LED (green, located on top right of RJ-45 connector): Solid green: Link up, Blinking: Activity on the link, OFF: No link **NOTE:** EMD2002PE-DP-T and EMD2002SE-DP-T have (2) video LEDs on the front panel. EMD2000PE-DP-T and EMD2000SE-DP-T have one video LED on the front panel. The following items apply to EMD2000PE-DP-T, EMD2000PE-R, EMD2000PE-R-P, EMD2000PE-T, EMD2002DE-DP-T, EMD2002PE-DP-T, EMD2002PE-R, EMD2002PE-R-P, EMD2002PE-T: (1) SFP Speed LED (green, located above SFP cage, Left Hand side) Solid green: Link up 1Gbps, OFF: No link (1) SFP Activity LED (green, located above SFP cage, Right Hand side) Green Blinking: Activity on the link, OFF: No activity
Maximum Distance from CPUto Transmitter	EMD2000SE-T, EMD2002SE-T, EMD2000PE-T, EMD2002PE-T: 16 ft. (5 m), DVI-D and USB limitations; EMD2000PE-DP-T, EMD2000SE-DP-T, EMD2002PE-DP-T, EMD2002SE-DP-T: 16 ft. (5 m) maximum distance from DisplayPort cable to CPU; EMD200DV-T: 12" (30.48 cm) via connected cable harness
Maximum Distance betweenTransmitter and Receiver	328 ft. (100 m), use a network switch to get farther distances
Operating System Support	Microsoft Windows® Vista, XP, Windows 7, Windows 8, Windows 10, Windows 11, Server 2003, Server 2008, Server 2012, LInux ®, Mac OS

Connectors	EMD200DP-T: (1) DisplayPort input, (2) USB Type A female, (1) RJ-45 network, (1) 2.5 mm barrel for power; **NOTE:** The ZeroU Transmitter can be powered via (2) USB Type A connectors or via an optional DC power adapter. EMD200DV-T: (1) DVI input, (2) USB Type A female, (1) RJ-45 network, (1) 3.5 mm audio for speakers, (1) 2.5 mm barrel for power; EMD2000PE-DP-T: (1) DisplayPort input, (1) USB Type B (1) RJ45 Network, (1) 3.5mm Audio, (1) SFP Cage, (1) Snap and Lock Power Connector, (1) Micro USB Connector EMD2000PE-R: (1) DVI output, (4) USB Type A female, (1) RJ-45 network, (1) SFP network, (2) 3.5 mm audio for SPK and MIC, (1) Micro USB connector, (1) 3-pin Snap and Lock Jack for power; EMD2000PE-R-P: (1) DVI output, (4) USB Type A female, (1) RJ-45 PoE network, (1) SFP network, (2) 3.5 mm audio for SPK and MIC, (1) Micro USB connector, (1) 3-pin Snap and Lock Jack for power; EMD2000PE-T: (1) DVI input, (1) USB Type B female, (1) RJ-45 PoE network, (1) SFP network, (2) 3.5 mm audio, (1) Micro USB connector, (1) 3-pin Snap and Lock Jack for power; EMD2000SE-DP-T: (1) DisplayPort input, (1) USB Type B (1) RJ45 Network, (1) 3.5mm Audio, (1) Barrel Power Connector, (1) RJ45 Serial Console Connector EMD2000SE-R: (1) DVI output, (4) USB Type A female, (1) RJ-45 network, (1) DB9 serial, (2) 3.5 mm audio for SPK and MIC, (1) 2.5 mm barrel for power; EMD2000SE-T: (1) DVI input, (1) USB Type B female, (1) RJ-45 network, (1) RJ-45 serial, (2) 3.5 mm audio, (1) 2.5 mm barrel for power; EMD2002PE-DP-T: (2) DisplayPort input, (1) USB Type B (1) RJ-45 Network, (1) 3.5mm Audio, (1) SFP Cage, (1) Snap and Lock Power Connector, (1) Micro USB Connector EMD2002PE-R: (2) DVI outputs, (4) USB Type A female, (1) RJ-45 network, (1) SFP network, (2) 3.5 mm audio for SPK and MIC, (1) Micro USB connector, (1) 3-pin Snap and Lock Jack for power; EMD2002PE-R-P: (2) DVI outputs, (4) USB Type A female, (1) RJ-45 PoE network, (1) SFP network, (2) 3.5 mm audio for SPK and MIC, (1) Micro USB connector, (1) 3-pin Snap and Lock Jack for power EMD2002PE-T: (2) DVI inputs, (1) USB Type B female, (1) RJ-45 PoE network, (1) SFP network, (2) 3.5 mm audio, (1) Micro USB connector, (1) 3-pin Snap and Lock Jack for power; EMD2002SE-DP-T: (2) DisplayPort input, (1) USB Type B (1) RJ45 Network, (1) 3.5mm Audio, (1) Snap and Lock Power Connector, (1) Micro USB Connector EMD2002SE-R: (2) DVI output, (4) USB Type A female, (1) RJ-45 network, (1) DB9 serial, (2) 3.5 mm audio for SPK and MIC, (1) 2.5 mm barrel for power; EMD2002SE-T: (2) DVI input, (1) USB Type B female, (1) RJ-45 network, (1) RJ-45 serial, (2) 3.5 mm audio, (1) 2.5 mm barrel for power;
Dimensions	EMD200DP-T: 0.98" H x 2.78" W x 6.12" D (2.5 x 7.07 x 15.55 cm); EMD200DV-T: 0.98" H x 2.78" W x 6.12" D (2.5 x 7.07 x 15.55 cm); EMD2000PE-DP-T, EMD2000SE-DP-T, EMD2002PE-DP-T, and EMD2002SE-DP-T: 1.32" H x 6.07" W x 1.32" D (3.36 x 13.7 x 15.42 cm); EMD2000PE-R, EMD2000PE-R-P, and EMD2000PE-T: 1.15" H x 6.2" W, 4.2" D (2.92 x 15.75 x 10.67 cm); EMD2000SE-R, EMD2000SE-T: 1.15″ H x 6.2″ W x 4.2″ D (2.92 x 15.75 x 10.67 cm); EMD2002PE-R, EMD2002PE-R-P: 1.15" H x 6.2" W x 4.2" D (2.92 x 15.75 x 10.67 cm); EMD2002PE-T: 1.43" H x 6.2" W x 4.2" D (3.65 x 15.75 x 10.67 cm); EMD2002SE-R: 1.15" H x 6.2" W x 4.2" D (2.92 x 15.75 x 10.67 cm); EMD2002SE-T: 1.43″ H x 6.2″ W x 4.2″ D (3.65 x 15.75 x 10.67 cm)

Weight	EMD200DP-T: 0.400 lb. (0.181 kg); EMD200DV-T: 0.474 lb. (0.215 kg); EMD2000PE-DP-T, EMD2002SE-DP-T 0.772 lb. (0.35 kg); EMD2000PE-R, EMD2000PE-R-P, EMD2000PE-T: 1.18 lbs (0.54 kg); EMD2000SE-DP-T: 0.75 lb. (0.34 kg); EMD2000SE-T, EMD2000SE-R: 1.18 lbs (0.54 kg); EMD2002PE-DP-T: 0.816 lb. (0.37 kg) EMD2002PE-R, EMD2002PE-R-P: 1.36 lb. (0.62 kg) EMD2002PE-T: 1.47 lb. (0.67 kg); EMD2002SE-R: 1.36 lb. (0.62 kg); EMD2002SE-T: 1.47 lb. (0.67 kg)
Operation	
Default IP Address	EMD200DV-T, EMD2000PE-DP-T, EMD2000PE-T, EMD2000SE-DP-T, EMD2000SE-T, EMD2002PE-DP-T, EMD2002PE-T, EMD2002SE-DP-T, EMD2002SE-T: 192.168.1.22; EMD2000PE-R, EMD2000PE-R-P, EMD2000SE-R, EMD2002PE-R, EMD2002PE-R-P, EMD2002SE-R: 192.168.1.21
Encryption	Secure Sockets Layer (SSL) over TCP/IP, 128-bit between TX and RX, user set between RX and Hyper-V
Default Username	admin
Default Password	The password is blank by default
DDC Support	Built-in/clone of remote
Switching Time	<1 sec
Power	
Power Source	External in-line power supply (EMD200DV-T optionally powered by USB connectors)
Input Voltage	100–240 VAC, 50/60 Hz
Input Current	0.9 amps maximum
Power Consumption	Unless stated otherwise: Unit: 6.5 watts with keyboard and mouse attached; Power supply is 20 W to support USB based powered devices EMD2000PE-DP-T, EMD2002SE-DP-T: 9 watts; 12V/36W power adapter EMD2000SE-DP-T: 6 watts ; 5V/20W power adapter EMD2002PE-DP-T: 9.5 watts; 12V/36W power adapter
Heat Dissipation	Unless stated otherwise: (5 VDC x 4 amps) x 3.41 = 68.2 BTU/hour maximum (Voltage x Nominal Current) x 3.41 = BTU/hr EMD2000PE-DP-T, EMD2002SE-DP-T: (12 VDC x 0.75A) x 3.41 = 30.7 BTU/hour maximu EMD2000SE-DP-T: (5 VDC x 1.2A) x 3.41 = 20.46 BTU/hour maximum EMD2002PE-DP-T: (12 VDC x 0.8A) x 3.41 = 32.7 BTU/hour maximum
Power Adapter Output Connector	EMD200DP-T,EMD200DV-T, EMD2000SE-R,EMD2000SE-T,EMD2002SE-R,EMD2002SE-T:2.5-mmbarrel EMD2000PE-DP-T, EMD2002PE-DP-T, EMD2000PE-R, EMD2000PE-T, EMD2002PE-T, EMD2002PE-R, EMD2002SE-DP-T: 3-pin Snap and Lock Connector
Power Adapter Input Connector	Unless stated otherwise: IEC-320, C8 EMD2000PE-R, EMD2000PE-R-P, EMD2000PE-T, EMD2002PE-R, EMD2002PE-R-P: IEC-320, C13/C14 EMD2000SE-DP-T: IEC-320, C7/C8 EMD2000PE-DP-T, EMD2002PE-DP-T, EMD2002SE-DP-T: IEC-320, C13/C14

Power Supply Cord Length	6 ft. (1.8 m)
Environmental	
Operating Temperature	32 to 104° F (0 to 40° C)
Storage Temperature	-4 to +140° F (-20 to 60° C)
Operating Humidity	5 to 95%, noncondensing

1.2 WHAT'S INCLUDED IN THE KITS

NOTE: Does not include local CPU cables, order separately
EMD2000SE-T includes:

- (1) Emerald® SE Transmitter, Single-Head
- (1) 5-VDC Power Supply
- (1) Power Cord
- (4) rubber feet

EMD2000SE-R includes:

- (1) Emerald SE Receiver, Single-Head
- (1) 5-VDC Power Supply
- (1) Power Cord
- (4) rubber feet

EMD2000SE-T-K includes:

- (1) Emerald SE Transmitter, Single-Head
- (1) 5-VDC Power Supply
- (1) Power Cord
- (4) rubber feet
- (1) EHN900025U-0006
- (1) USB05E-0006
- (1) EJ110-0005

EMD2000SE-K includes:

- (1) EMD2000SE-T
- (1) EMD2000SE-R

EMD200DV-T includes:

- (1) EMD200DV-T Transmitter

EMD2000PE-T includes:

- (1) Emerald PE or PE PoE Transmitter, Single-Head
- (1) 12-VDC Power Adapter and Power Cord
- (1) DVI Cable
- (1) USB 2.0 Type B Cable

EMD2000PE-R or EMD2000PE-R-P includes:

- (1) Emerald PE or PE PoE Receiver, Single-Head
- (1) 12-VDC Power Adapter and Power Cord

EMD2002SE-T includes:

- (1) Emerald SE Transmitter, Dual-Head
- (1) 5-VDC Power Supply
- (1) Power Cord
- (4) rubber feet

EMD2002SE-R includes:

- (1) Emerald SE Receiver, Dual-Head
- (1) 5-VDC Power Supply
- (1) Power Cord
- (4) rubber feet

EMD2002SE-T-K includes:

- (1) Emerald SE Transmitter, Dual-Head
- (1) 5-VDC Power Supply
- (1) Power Cord
- (4) rubber feet
- (2) EHN900025U-0006
- (1) USB05E-0006
- (1) EJ110-0005

EMD2002SE-K includes:

- (1) EMD2002SE-T
- (1) EMD2002SE-R

EMD200DP-T includes:

- (1) EMD200DP-T Transmitter

EMD2002PE-T includes:

- (1) Emerald PE or PE PoE Transmitter, Dual-Head
- (1) 12-VDC Power Adapter and Power Cord
- (2) DVI Cables
- (1) USB 2.0 Type B Cable

EMD2002PE-R or EMD2002PE-R-P includes:

- (1) Emerald PE or PE PoE Receiver, Dual-Head
- (1) 12-VDC Power Adapter and Power Cord

EMD2000PE-K includes:

- (1) Emerald PE Transmitter, Single-Head
- (1) Emerald PE PoE Receiver, Single-Head
- (2) 12-VDC Power Adapters and Power Cords
- (1) DVI Cable
- (1) USB 2.0 Type B Cable

EMD2002PE-K includes:

- (1) Emerald PE Transmitter, Dual-Head
- (1) Emerald PE PoE Receiver, Dual-Head
- (2) 12-VDC Power Adapters and Power Cords
- (2) DVI Cables
- (1) USB 2.0 Type B Cable

1.3 LICENSING
There are 2 options for managing Emerald Transmitters and Receivers:

- Option 1 (for small unmanaged matrices): Using built-in receiver manager
- Option 2 (for large managed matrices): Using Boxilla BXAMGR or BXAMGR-R2

NOTE: For managed installations with more than 32 users, you will need to use Boxilla KVM Manager. The basic Boxilla license (BXAMGR-R2) supports 25 users.

Other available licenses for Boxilla are listed below:

- Boxilla Manager w/ 25 Endpoint License (BXAMGR-R2)
- Boxilla Manager with 75 Endpoint License (BXAMGR-R2-75)
- Boxilla Manager with 125 Endpoint License (BXAMGR-R2-125)
- Boxilla Manager with 225 Endpoint License (BXAMGR-R2-225)
- Boxilla Manager with 325 Endpoint License (BXAMGR-R2-325)
- Boxilla Manager with Unlimited Endpoint License (BXAMGR-R2-ULT)

Available upgrade licenses for Boxilla are listed below:

- Add 25 Users, Devices or Connections (BXAMGR-LIC-25)
- Add 100 Users, Devices or Connections (BXAMGR-LIC-100)
- Add 200 Users, Devices or Connections (BXAMGR-LIC-200)
- Add 300 Users, Devices or Connections (BXAMGR-LIC-300)
- Add Unlimited Users, Devices or Connections (BXAMGR-LIC-ULT)

Licenses for Active and Standby Boxilla are listed below:

- 25 Devices (BXAMGR-LICBAK25)
- 100 Devices (BXAMGR-LICBAK100)
- 200 Devices (BXAMGR-LICBAK200)
- 300 Devices (BXAMGR-LICBAK300)

CHAPTER 2: OVERVIEW

The Emerald® system provides users with a seamless desktop experience anywhere on a TCP/IP network, while allowing the actual hardware to be securely housed in a corporate data center or in the cloud. Emerald enables the same high fidelity experience of a
desktop PC even for media-rich applications, for example, watching videos, photo editing with Photoshop or 3D design with AutoCAD. The remote desktops may be hosted on a physical PC / workstation or may be a virtual desktop hosted on a private server or in the cloud. The Emerald system provides its users with Receivers that communicate with target computer nodes (whether physical PC or virtual desktop) over a standard TCP/IP network. Physical PCs/Workstations/Servers have an Emerald SE or PE Transmitter unit or Emerald ZeroU DVI or DisplayPort Transmitter unit physically connected to provide communication over the TCP/IP network. The performance of Emerald allows them to be deployed on standard corporate networks and even across Wide-Area-Networks (WANs).
Desktop users can access remote keyboard, mouse, video, audio, USB mass storage devices, headsets and other USB devices from the Receiver unit to the remote PC/workstations or Virtual Desktop via the Emerald system.
NOTE: Not all USB 2.0 devices are supported depending on how they negotiate/communicate with the host. If you find your USB 2.0 device isn't working properly, please report these devices to Black Box.
NOTE: References to the Emerald system in this document refer to both Receivers (EMD2000PE-R, EMD2000SE-R, EMD2002PE-R,
EMD2000PE-R-P, EMD2002PE-R-P, EMD2002SE-R) and Transmitters (EMD200DV-T, EMD2000PE-DP-T, EMD2000PE-T,
EMD2000SE-DP-T, EMD2000SE-T, EMD2002PE-DP-T, EMD2002PE-T, EMD2002SE-DP-T, EMD2002SE-T). The Emerald ZeroU DVI or DisplayPort Transmitter (EMD200DP-T, EMD200DV-T) can be used in place of the SE Transmitter where rack space is limited, but these devices cannot support USB-redirection.
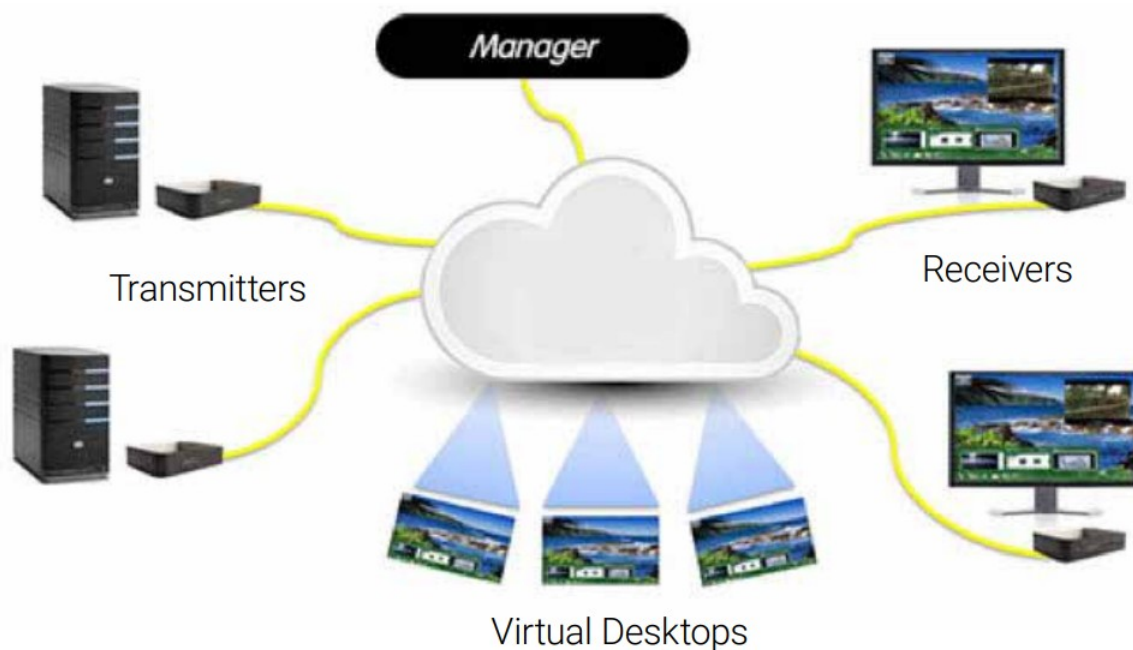
FIGURE 2-1. EMERALD EXAMPLE—INCLUDING PHYSICAL AND VIRTUAL DESKTOPS

2.1 EMERALD SYSTEM FEATURES

Emerald leverages state-of-the-art technologies in compression, networking, and latency management. Some of the key features of Emerald are:

- Pixel-Perfect Video Quality: The Emerald system uses a compound compression algorithm to provide a lossless video experience at a low network bandwidth. None of the bandwidth variability and noise effects of analog extension schemes exist.

- Uses Unicast stream for shared mode to allow scaling of # of users that can share a transmitter. Analog audio can now be shared in a shared mode connection.

- Seamless integration of Physical and Virtual Desktops: The Emerald system connects to physical PCs, servers, and video sources as well as virtual desktops hosted on servers or in the cloud. This allows seamless connection to physical resources and virtual resources from the same Receiver unit. IT professionals use this capability to optimize their deployments and migrations to cloud services.

- High Reliability and Highly Secure: The Emerald system minimizes maintenance for administrators. The intuitive On-ScreenDisplay is simple to learn and understand. The individual units have no moving parts to minimize potential for hardware failures. All media streams transmitted between the Emerald devices are encrypted using 128-bit SSL. Password protection is also provided to control access to all administration functions.

- Environmentally Optimized: The Emerald system is optimized to minimize power requirements and eliminate noise. All Receivers and Transmitters consume less than 6 Watts and are completely silent.

- Easy Deployment: The Emerald system is designed to be easily and quickly deployed. No new drivers or software need to be installed on target PCs or Virtual Desktops. The system uses standard networking protocols and cabling. Users and connections are defined using an intuitive On-Screen-Display (OSD). Connections can be made via simple "click on target." Multiple modes of operation such as private connections, shared connections, auto-login, and auto-connect enable various workflows and collaborations to be supported. Analog audio can now be shared in a shared mode connection.

- The Emerald ZeroU DVI or DisplayPort Transmitter features a small form factor to use zero rack space—you save money when rack space is expensive. This Transmitter can be powered over USB or via an optional

power supply.

2.2 OVERVIEW OF EMERALD DEVICES

The Emerald family is composed of six Receivers, six Transmitters, and a Boxilla Manager.
TABLE 2-1. EMERALD MODELS

RECEIVER	NUMBER OF VIDEO HEADS	USB PORTS	SERIAL	AUDIO	POE	DVI CPU CABLE	DISPLAYPORT CPU CABLE	USB CPU CABLE
EMD2000SE-R	(1)DVI	(4) USB 2.0 Type A	Yes	Yes	No	Not applicable	Not applicable	Not applicable
EMD2002SE-R	(2)DVI	(4) USB 2.0 Type A	No	Yes	No	Not applicable	Not applicable	Not applicable
EMD2000PE-R	(1)DVI	(4) USB 2.0 Type A	No	Yes	No	Not applicable	Not applicable	Not applicable
EMD2002PE-R	(2)DVI	(4) USB 2.0 Type A	No	Yes	No	Not applicable	Not applicable	Not applicable
EMD2000PE-R-P	(1)DVI	(4) USB 2.0 Type A	No	Yes	Yes	Not applicable	Not applicable	Not applicable
EMD2002PE-R-P	(2)DVI	(4) USB 2.0 Type A	No	Yes	Yes	Not applicable	Not applicable	Not applicable
TRANSMITTER	NUMBER OF VIDEO HEADS	USB PORTS	SERIAL	AUDIO	POE	DVI CPU CABLE	DISPLAYPORT CPU CABLE	USB CPU CABLE
EMD2000SE-T	(1)DVI	(1) USB 2.0 Type B	Yes	Yes	No	Not included	Not applicable	Not included
EMD2002SE-T	(2)DVI	(1) USB 2.0 Type B	No	Yes	No	Not included	Not applicable	Not included
EMD2000PE-T	(1) DVI	(1) USB 2.0 Type B	No	Yes	Yes	(1) included	Not applicable	Not included
EMD2002PE-T	(2) DVI	(1) USB 2.0 Type B	No	Yes	Yes	(2) included	Not applicable	Not included
EMD200DV-T	(1) DVI	(1) USB 2.0 Type A, (1) USB 2.0 Type A for power only	No	Speakers only	No	Not included	Not applicable	Not included
EMD200DP-T	(1) Display Porr	(1) USB 2.0 Type A, (1) USB 2.0 Type A for power only	No	Yes, Embedded	No	Not included	Not applicable	Not included

EMD2000PE -DP-T	(1) Display Port	(1) USB 2.0 Type B	No	Yes	No	Not included	Included	Included
EMD2000SE -DP-T	(1)Display Port	(1) USB 2.0 Type B	Yes	Yes	No	Not included	Not included	Not included
EMD2002PE -DP-T	(2)Display Port	(1) USB 2.0 Type B	No	Yes	No	Not included	Included	Included
EMD2002SE -DP-T	(2) Display Port	(1) USB 2.0 Type B	No	Yes	No	Not included	Not included	Not included
MANAGER	NUMBER OF VIDEO HEADS	USB PORTS	SERIAL	AUDIO	POE No	DVI CPU CABLE	DISPLAYPORT CPU CABLE	USB CPU CABLE
BXAMGR-R 2	(1) VGA	(4) USB 2.0 Type A	Yes	Yes		Not applicable	Not applicable	Not applicable

NOTE: Serial Port is not supported yet to pass RS-232 data between TX and RX. A USB Serial Converter must be used with USB-Redirection.

Some of the key capabilities and operation of Emerald devices are described next. These capabilities are supported across all Emerald devices.

2.2.1 VIDEO
The Emerald® system supports 24-bit color depth digital video up to a maximum resolution of 1920 x 1200 at 60 Hz for any video head on both Transmitter and Receiver. One or two DVI-I connectors is provided on the Receiver or Transmitter for cable
compatibility, but only digital video is supported. See Appendix 1 – Emerald Video Resolutions Supported for the list of resolutions currently supported by Emerald. VGA or Analog video can be supported by using the KVGA-DVID VGA to DVI-D converter but should only be used with Single Head transmitters because of the dithering options. If used with a Dual-Head transmitter, the video quality will not be as good as it is with the Single Head model.

2.2.2 AUDIO
The Emerald system supports CD-quality stereo audio from the remote workstation (with the Transmitter connected) or virtual desktop to peripheral speakers connected to the USB connector on the Emerald Receiver. The Emerald Transmitter uses its USB
interface to capture audio from the remote workstation. This increases audio quality by eliminating analog audio noise issues and removing the need for a sound card in PC/Workstation.
The Emerald Receiver connects audio from a peripheral microphone connected via the USB connector on the Receiver to the remote workstation or a virtual desktop. The Emerald Transmitter uses USB to supply the microphone data to the remote workstation. Higher quality audio can be obtained using USB re-direction for USB headsets or speakers.
The Emerald ZeroU DVI Transmitter has just one audio connector (used to connect speakers). The Emerald ZeroU DisplayPort Transmitter has embedded audio over the DisplayPort connector.

2.2.3 SUPPORT FOR KEYBOARDS, MICE, AND USB DEVICES
Standard 104/105 keyed keyboards and USB keyboards and mice are fully supported by the Emerald system. Composite mouse and keyboard devices are supported, along with other types of USB devices such as Flash/Thumb Drives, CD and DVD/ROM drives,
printers, pen tablets, touch-panels, and isochronous USB devices such as headsets. Specialized keyboards that support LCD panels, macro keys, card readers, and internal USB hubs typically require additional support.
Support for non-keyboard and mice devices is provided on an Emerald Receiver using USB re-direction. This capability can be enabled or disabled by the administrator. In an Emerald Receiver, the first two devices that are not keyboard or mouse are assigned to the USB re-direction channel automatically and passed to the remote

computer when connected via a Transmitter. When connecting to a non-Transmitter target (i.e. virtual desktop), up to eight USB devices can be re-directed. The EMD200DV/ EMD200DP series does not support USB-Redirection and only supports keyboard and mouse devices.

NOTE: A hub can be attached externally to an Emerald Receiver, but a maximum of two devices can be assigned to USB re-direction on connections to Transmitters. Multiple keyboard and mice can additionally be supported—though all use the default drivers on the target PC.

2.2.4 IP ADDRESSING

The Emerald devices are IP-addressable, giving you the flexibility to locate workstations anywhere within your enterprise and at any distance from your desktop users. The Emerald devices use standard network protocols to transfer data between the remote
Workstation/Virtual Desktop and the peripheral devices located at the user's desk. The Emerald system can operate on a network connection of 100 Mbps or 1 Gbps.

The receiver can be configured using a static or DHCP assigned IP address while the transmitter requires a static IP address only.

It is strongly recommended to use Static IP addresses for the Receivers.

2.2.5 FIRMWARE UPGRADE

Upgrade your firmware at any time using Boxilla or using a USB flash-drive in an Emerald Receiver unit to ensure that your Emerald system is always running the most current version available. The Emerald devices —Receiver and Transmitter—are upgradable.

2.3 APPLICATION EXAMPLES

The Emerald system is built to be flexible so that it can be deployed in many different types of applications such as basic extension, switching applications (sometimes called matrix), cloud-based desktops, control rooms, digital signage, and kiosk applications and other applications in banking, financial services, broadcast, network operations, industrial, government and enterprise computing sectors. Emerald provides the state-of-the art performance by:

- using digital sources for video and audio, hence removing analog noise issues or other potential environmental issues

- using advanced optimized compression to enable visually lossless video over standard low-bandwidth networks rather than a proprietary connection or dedicated gigabit networks of many systems

2.3.1 VIDEO, AUDIO, AND USB EXTENSION

Many applications require Video, Audio, or USB extension (or all three together) such as PC back-racking, board-room fit-out, remote monitoring, and digital signage.

The Emerald system is set up to connect the Transmitter to the Receiver straight out of the box on a point-to-point network.

The Transmitter and Receiver can be attached to standard Ethernet IP networks to increase the distance between units – within a building, between buildings, or across a country. Only standard Ethernet/IP rules and the maximum latency the application can
tolerate need to be considered. If video and/or audio extension only is being used, latency rarely is a consideration as the traffic is typically one-way. When USB-based peripheral devices are also required, a network latency of <50 ms is recommended to avoid user issues with "poor mouse response", etc. For some applications, such as graphic design network latency ,<20 ms may be required to ensure user satisfaction. Latency normally is only an issue when extending across a WAN, because latency inside modern buildings or on dedicated networks is much less than 1 ms.

NOTE: Emerald supports latency of <100ms although <20ms is recommended and anything above 100ms will have undesired results.

In Figure 2-2, a typical deployment is shown in a basic extender application. In this deployment, only one Transmitter and Receiver are used to allow remote access to a single workstation.
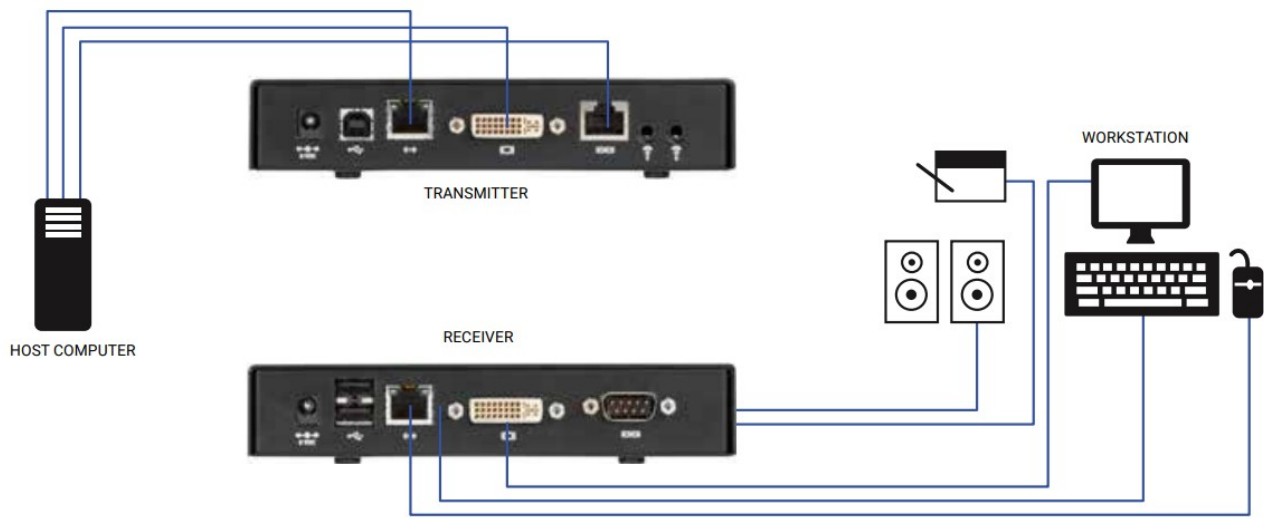
FIGURE 2-2. BASIC EXTENDER APPLICATION

2.3.2 VIDEO, AUDIO, AND USB SWITCHING

Numerous applications require being able to switch between different target PCs or Virtual Desktops. The user wants to be able to change the source of Video, Audio, or USB extension (or all three together).

Connections can be made to a target using Emerald's intuitive On-Screen-Display (OSD), Boxilla Viewer (if using Boxilla), or Favorites Hotkeys. In Figure 2-3, a larger scale system is shown. This is referred to as a switching or matrix type of deployment. In this deployment, there are several Receivers and Transmitters and a manager, as well as virtual desktops.
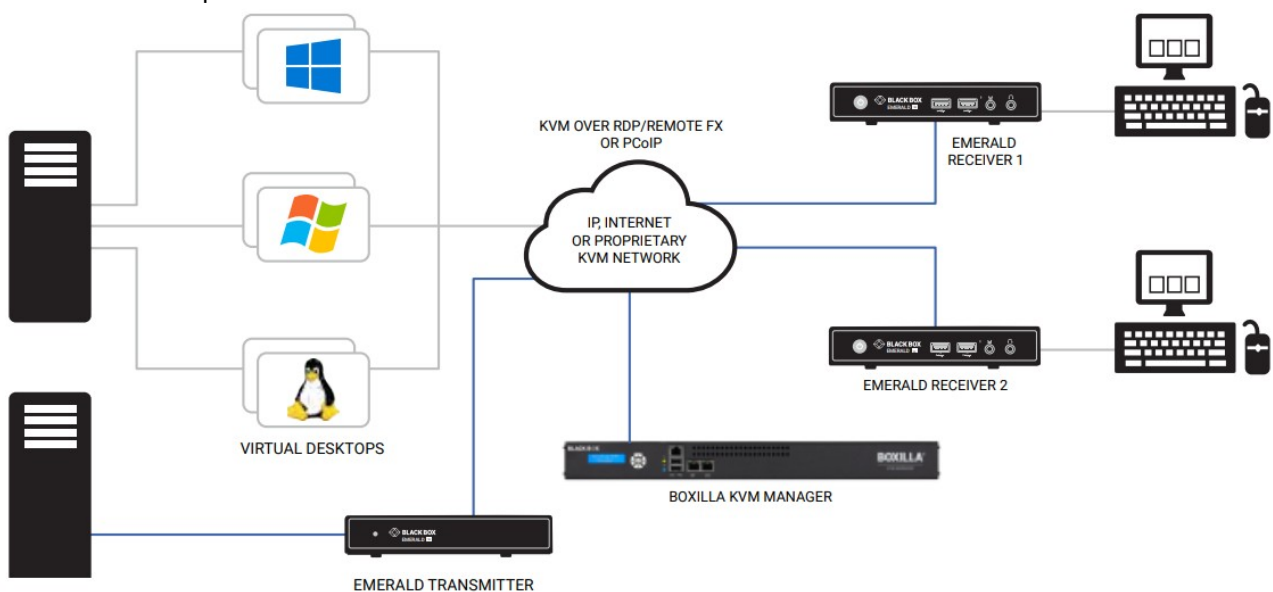
FIGURE 2-3. EMERALD SWITCHING EXAMPLE

CHAPTER 3: CONFIGURATION

3.1 CONFIGURATION OF RECEIVER

An Emerald Receiver connects to a physical PC or a virtual desktop over a TCP/IP network and decrypts and decompresses the streams to provide video, audio, and USB connections to a user. The user is presented with typical PC connections—video out
(typically DVI), USB (typically 4 ports of USB 2.0), line out, and microphone in (see individual Receiver's data-sheets for specific ports provided).

The Transmitter-Receiver connection uses Black Box's compound compression algorithm for video called Dynamic Content Optimized Compression (DCOC). This algorithm optimizes compression based on content in the video stream and on available network bandwidth. Standard Microsoft RDP is used for connections to Virtual Desktops.

Multiple versions of RDP are supported from RDP 8.1 to legacy versions. This allows Emerald Receivers to connect to Microsoft Hyper-V, VMWare ESX, and Citrix XEN based virtual desktops as well as session host based desktops (previously called Terminal Services).

The Receiver is configured using an On-Screen Display (OSD) built into the Receiver or using the Boxilla Manager. The network settings and unit name among others can be configured for a Receiver. The target connections are defined by their target name or IP address, log-in username/password, and TCP port number to be used. Users can be created and specific connections may be allocated to the different users.

A Receiver user profile is protected by username and password to permit different users to access the same unit securely.

Multiplatform support

Emerald is compatible with the following operating systems:

- Microsoft® Windows Desktop Operating Systems (e.g. Windows 7, Windows 8, Windows 10. and Windows 11) and Microsoft Server Operating Systems (e.g., 2003, Server 2008, Server 2012, Server 2016, or Server 2020)

- Linux®

- Mac OS®

The default keyboard drivers for these operating systems are supported by the Emerald system.

NOTE: For virtual desktops, typically Pro or Enterprise versions of the Windows operating system are required for VDI to support RemoteFX™. See www.microsoft.com for Terminal Services (RDSH) or VDI (RDVH) requirements.

3.2 CONFIGURATION OF TRANSMITTER

An Emerald Transmitter converts the video, audio, and USB connections of a PC or Workstation to a format that can be connected and controlled over a TCP/IP network. The Transmitter connects to the DVI and USB ports of a PC or workstation.

The Transmitter controls the connection to a remote Receiver and manages the flow of information to it. It converts and compresses video and audio information for transmission over standard TCP/IP networks, along with USB peripheral communications. All data communication uses 128-bit encryption.

The Transmitter uses Black Box's compound compression algorithm for video called Dynamic Content Optimized Compression (DCOC). This algorithm optimizes compression and latency on a frame-by-frame basis, depending on content in the video stream and on available network bandwidth. This enables an optimal user experience in challenging network environments.

The Transmitter is configured from an Emerald Receiver or Boxilla Manager. The network settings, unit name, and video quality are among the parameters that can be configured on a Transmitter.

Multiplatform support

The Transmitter is connected to the remote workstation via USB and DVI connectors. This enables the Emerald Receiver to interoperate seamlessly with Windows, Linux® , and Macintosh© workstations/servers.

3.3 CONFIGURATION OF BOXILLA MANAGER

In a basic installation, you can configure Emerald via an Emerald receiver's built-in OSD display. For larger installations, a Boxilla Manager (BXAMGR and BXAMGR-R2) can manage a network of Emerald Receivers and Transmitters. The BXAMGR can manage

25 transmitters/receivers by default. It can manage an unlimited number of Emerald transmitters/receivers when using an upgrade license.

A Boxilla user profile is protected by username and password to permit different users to access the same unit securely. It maintains the central database that is distributed to all Receivers in the "domain" of the Boxilla (i.e. discovered and added to manager) – called the "managed domain". This distribution ensures that there is no single point of failure in the Emerald system – each Receiver has a copy of the database. This enables each Receiver to continue operation – log users in, make connections as required – even if the Boxilla goes off-line.

Using the intuitive Boxilla web-based interface, one or more administrators can manage potentially thousands of users who are interacting with an almost unlimited number of devices. Boxilla operates as a self-contained compact server unit that can be located anywhere within your network. Boxilla is supplied pre-loaded and is straightforward to deploy, requiring only a network connection and a power input to begin operation.

The current version of Boxilla provides management of Black Box's Emerald system. For more information on Boxilla, refer to the Boxilla user manual.

CHAPTER 4: MODES OF OPERATION

The Emerald system has various modes of operation such as Auto-Login, Auto-Connect, Private Connection, Shared Connection, and Video Source Optimization modes.

4.1 AUTO LOGIN
In Auto-Login Mode, turning on the Emerald Receiver automatically causes a login as a pre-defined user. The user is presented with the permitted connections that have been predefined.

4.2 AUTO CONNECT
In Auto-Connect Mode, when a user logs-in to the Emerald Receiver, it causes an automatic connection to their pre-allocated workstation or virtual desktop. Auto-Login and Auto-Connect are defined independent of each other, but can be used together to auto login/auto connect devices that are difficult to reach.

4.3 PRIVATE CONNECTION
In Private Connection Mode, when a user makes a connection to a target workstation/virtual desktop, this connection is only accessible by this user. All other users will receive a "busy" message if they attempt to connect to the same workstation/virtual machine. This is the default mode for connections.

4.4 SHARED CONNECTION
In Shared Connection Mode, multiple users can connect to the audio and video of the same target computer over the network. They arbitrate for control of the keyboard and mouse of that computer. Non-keyboard and mice devices are not supported
on shared connections (such as USB 2.0 devices due to the timing/OS limitations). Analog audio can now be shared in a shared mode connection.

These various modes can be mixed on a particular Receiver and connection. For example Auto-Login and Auto-Connect can be combined to enable an Emerald Receiver to automatically connect to a specific target workstation/virtual desktop when power is applied without any user intervention that might be required for Digital Signage or Kiosk type of deployments.

4.5 VIDEO SOURCE OPTIMIZATION
Off: In this mode, the transmitter does not perform any additional video functions to manage the video input bandwidth, this mode assumes you are not using any Analog to Digital converters or Temporal Dithering GPU. If you are using converters or have a GPU that does Temporal Dithering, this setting will not work very well as it will saturate the transmitter and cause severe latency. DVI Optimized: This mode is designed to be used with GPUs that support Temporal Dithering. When the GPU updates every pixel
on every frame to show a more vibrant video output, the transmitter in this mode can now ignore certain pixel updates to reduce the risk of GPU bandwidth saturation that can lead to severe latency.

VGA
A: VGA High Performance: When using an analog to digital video converter, these devices can cause video noise to be injected on the signal. The transmitter will view this as a noisy source or a GPU that is using Temporal Dithering. This option is designed more
for VGA to DVI/HDMI converters and will perform the function at a Low capacity.
B: VGA Optimized: When using an analog to digital video converter, these devices can cause video noise to be injected on the signal. The transmitter will view this as a noisy source or a GPU that is using Temporal Dithering. This option is designed more for VGA to DVI/HDMI converters and will perform the function at a Medium capacity
C: VGA Low Bandwidth: When using an analog to digital video converter, these devices can cause video noise to be injected on the signal. The transmitter will view this as a noisy source or a GPU that is using Temporal Dithering. This option is designed more for
VGA to DVI/HDMI converters and will perform the function at a High capacity, filtering the most pixels this setting is considered to be the most aggressive out of the other 2 modes.

CHAPTER 5: INSTALLATION

5.1 EMERALD RECEIVER (EMD2000SE-R, EMD2002SE-R, EMD2000PE-R, EMD2002PE-R) CHECKLIST
Before installing your Emerald SE Receiver, refer to the list below to ensure that you have all the items necessary for installation:

- Emerald SE or PE Receiver
- External power supply for the Emerald SE or PE Receiver

- Power cord
- Emerald SE or PE Quick Installation Guide (QIG)

5.2 EMERALD TRANSMITTER (EMD2000SE-T, EMD2002SE-T, EMD2000PE-T, EMD2002PE-T) CHECKLIST

Before installing your Emerald SE Transmitter, refer to the list below to ensure that you have all the items necessary for installation:

- Emerald SE or PE Transmitter
- External power supply for the Emerald SE or PE Transmitter
- Power cord
- Emerald SE or PE Quick Installation Guide (QIG)
- DVI and USB cables (USB cables are not included with the SE or PE, but PE does include one or two DVI cables for single-head or dual-head models)

5.3 EMERALD SE TRANSMITTER KIT (EMD2000SE-T-K OR EMD2002SE-T-K) CHECKLIST

Before installing your Emerald SE Transmitter, refer to the list below to ensure that you have all the items necessary for installation:

- Emerald SE Transmitter
- External power supply for the Emerald SE Transmitter
- Power cord
- DVI cable(s) (One DVI-D cable included for single-head [EMD2000SE-T], two DVI-D cables included for dual-head [EMD2002SE-T])
- USB A to USB B Device cable
- Emerald SE Quick Installation Guide (QIG)

5.4 EMERALD ZEROU DVI OR DP TRANSMITTER (EMD200DV-T OR EMD200DP-T) CHECKLIST

- Emerald ZeroU DVI Transmitter (EMD200DV-T) or Emerald ZeroU DisplayPort Transmitter (EMD200DP-T)

5.5 EMERALD DISPLAYPORT SE AND PE TRANSMITTERS (EMD2000PE-DP-T, EMD2000SE-DP-T, EMD2002PE-DP-T, EMD2002SE-DP-T) CHECKLIST

- Emerald EMD2000PE-DP-T, EMD2000SE-DP-T, EMD2002PE-DP-T, or EMD2002SE-DP-T

5.6 INSTALLATION OPTIONS

⚠ **WARNING:** To reduce the risk of electric shock or damage to your equipment, disconnect the power from the Emerald device by unplugging the power supply from the electrical outlet. To reduce the risk of electric shock or damage to your equipment, turn on the remote workstation and the Emerald Transmitter in the order described in the following procedures.
You can install the Emerald system either in a point-to-point or networked configuration.

⚠

WARNING: To avoid potentially fatal shock hazard and possible damage to equipment, please observe the following precautions:

- These devices contain no user-serviceable technology. Do not open the enclosure.
- Test AC outlets at the workstation and monitor for proper polarity and grounding.
- Use only with grounded outlets at both the workstation and monitor. When using a backup Uninterruptible Power Supply (UPS), power the workstation and the Transmitter from the same supply.

NOTE: The AC outlet is the main disconnect.

LASER WARNING
WARNING: Laser. If using an optical fiber SFP+ adapter when connecting an Emerald to a switch or other device, the user must observe precautions for working with a Class 1 laser product.
The EMD-PE units conform to IEEE802.3af but do not meet the isolation barrier requirements specified in subsection 33.4.1 – Isolation. The units meet the Safety Requirements of IEC 62368.

5.7 CONNECT THE EMERALD RECEIVER
The recommended sequence to connect the receiver is:

1. Connect your keyboard, monitor, mouse, and other peripheral cables to the appropriately labeled ports on the Emerald Receiver. On the dual-head model, video output #1 is closest to the USB ports on the receiver.
2. Connect the UTP cable to the RJ-45 port on the back of the Receiver.
3. Plug the external power supply's connector into the DC power jack on the rear of the Emerald Receiver.
4. Connect the detachable power cord to the power supply.
5. Plug the power cord into an appropriate wall outlet. The unit automatically powers on.
6. A default connection is available to allow connection to a default Emerald Transmitter. You can use the OSD to add a different connection to a remote Transmitter or virtual desktop. The default Transmitter IP address is 192.168.1.22.
7. Once a Connection has been defined, use the OSD to make connection.

NOTE: VGA or analog video monitors can be connected to the Emerald Receiver by using a DVI-D to VGA converter (such as Black Box part number AC1038A or KVGA-DVID).
CAUTION: When using PoE to power the Emerald PE Receiver, the appliance will supply up to 1 Watt of power to attached USB devices. If the connected USB devices consume more than 1 Watt in total, you must use the external power supply that was supplied with this appliance. The Receiver may not operate reliability if excess power is drawn.
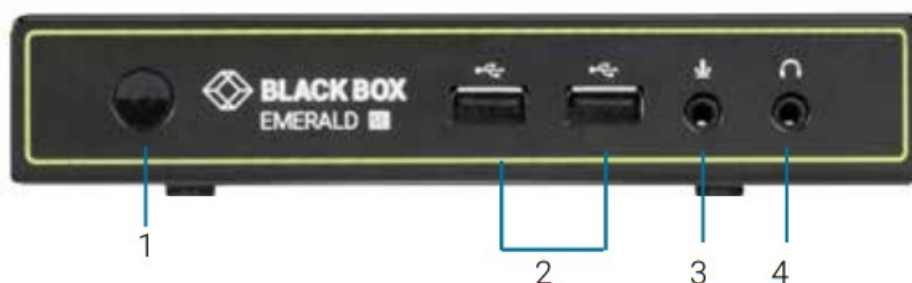
5.7.1 EMERALD SE RECEIVER

FIGURE 5-1. FRONT VIEW OF EMERALD SE RECEIVER, SINGLE-HEAD (EMD2000SE-R)
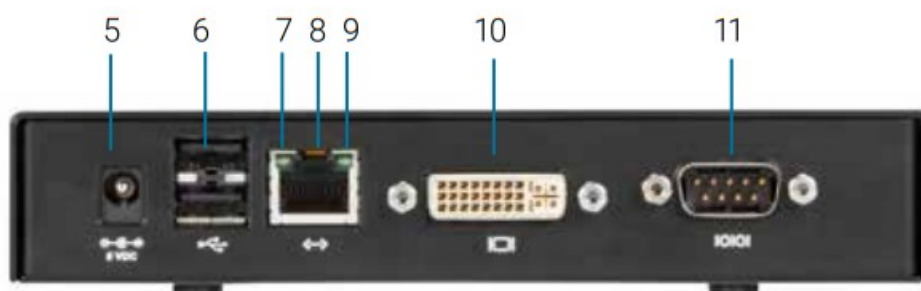

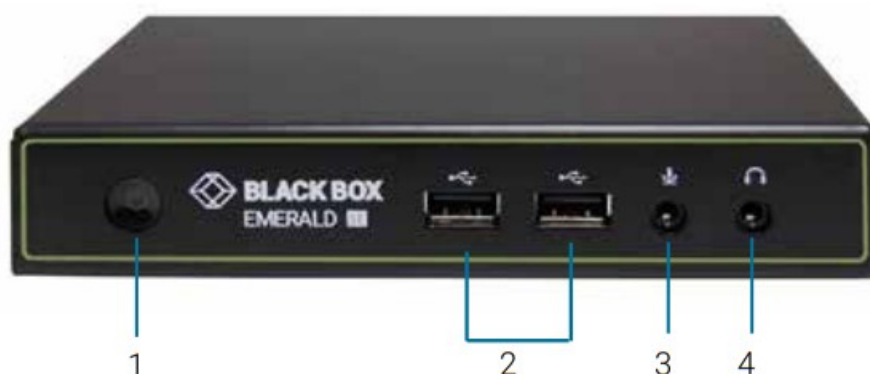FIGURE 5-2. REAR VIEW OF EMERALD SE RECEIVER, SINGLE-HEAD (EMD2000SE-R)

FIGURE 5-3. FRONT VIEW OF EMERALD SE RECEIVER, DUAL-HEAD (EMD2002SE-R)
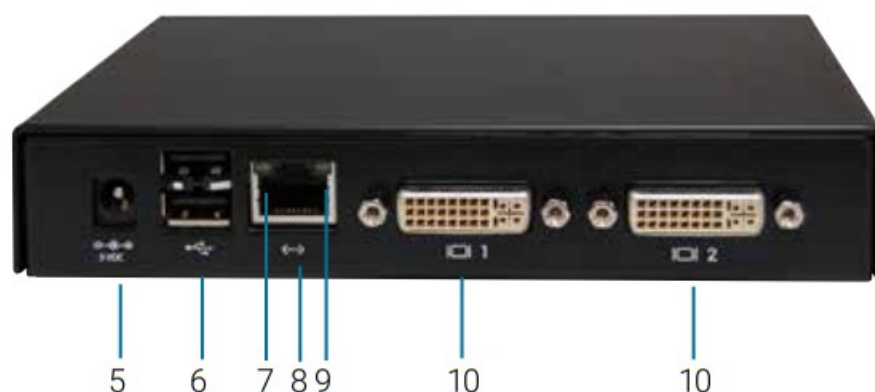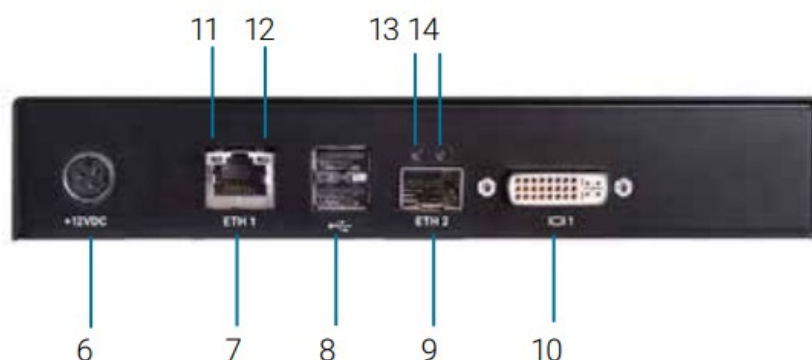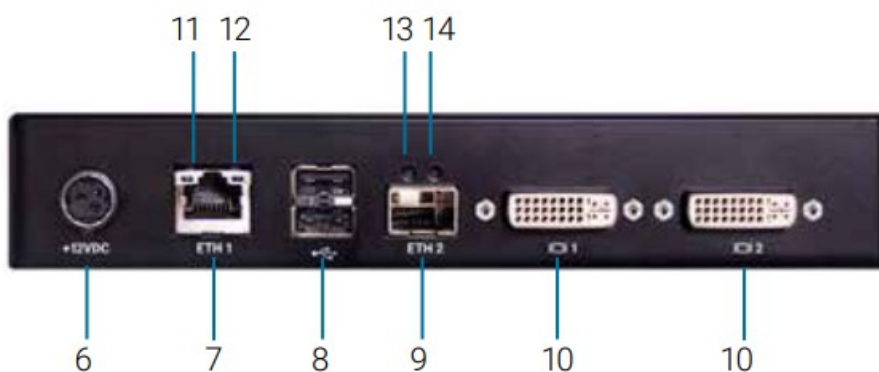

FIGURE 5-4. REAR VIEW OF EMERALD SE RECEIVER, DUAL-HEAD (EMD2002SE-R)

TABLE 5-1. EMERALD SE RECEIVER COMPONENTS

NUMBER IN FIGURES 5-1 THROUGH 5-4	COMPONENT	DESCRIPTION
1	Power button	Disabled; NOTE: The unit automatically powers on; it must be turned off at the power source.
2, 6	(4) USB Type A connectors	Link to USB devices
3	(1) 3.5-mm connector	Connects to microphone
4	(1) 3.5-mm connector	Connects to speakers
5	(1) 2.5-mm barrel connector for power	Links to 5-VDC external in-line power supply
7	(1) Link/Activity LED	Lights green when there is activity on the link
8	(1) RJ-45 connector	Links to 10-/100-/1000-Mbps network
9	(1) Link Speed LED	LED blinks green 1= 10 Mbps, 2 = 100 Mbps and 3= 1 Gbps in a 1.5 second interval. No blinking means no valid link
10	(1) or (2) DVI output connectors	Links to DVI output(s)
11	(1) DB9 connector*	Links to RS-232 serial interface

*Single-head model only

5.7.2 EMERALD PE OR PE POE RECEIVER

FIGURE 5-5. FRONT VIEW OF EMERALD PE RECEIVER, SINGLE-HEAD (EMD2000PE-R, EMD2000PE-R-P)

FIGURE 5-6. REAR VIEW OF EMERALD PE RECEIVER, SINGLE-HEAD (EMD2000PE-R, EMD2000PE-R-P)

FIGURE 5-7. FRONT VIEW OF EMERALD PE RECEIVER, DUAL-HEAD (EMD2002PE-R, EMD2002PE-R-P)

FIGURE 5-8. REAR VIEW OF EMERALD PE RECEIVER, DUAL-HEAD (EMD2002PE-R, EMD2002PE-R-P)

TABLE 5-2. EMERALD PE OR PE POE RECEIVER COMPONENTS

NUMBER IN FIGURES 5-5 THROUGH 5-8	COMPONENT	DESCRIPTION
1	Power LED	Lights when power is ON
2	Micro USB connector	Links to console
3	(2) USB Type A connectors	Connect to USB peripherals
4	Microphone	Connects to microphone
5	Speakers	Connects to speakers
6	12 VDC Power In connector	Connects to supplied power adapter
7	RJ-45 port	EMD2000PE-R, EMD2002PE-R: Connects to network; EMD2000PE-R-P, EMD2002PE-R-P: Connects to network and supports Power over Ethernet (PoE)
8	(2) USB Type A connectors	Connect to USB peripherals
9	SFP cage	Holds fiber network SFP module
10	(1) or (2) DVI Video connectors	Connects to monitor(s)
11	TP port Speed LED	Indicates 10/100/1000 Mbps
12	TP port Activity LED	Indicates activity on the link
13	Fiber SFP port Speed LED	Indicates 10/100/1000 Mbps
14	Fiber SFP port Activity LED	Indicates activity on the link

5.8 CONNECT THE EMERALD TRANSMITTER

Before connecting the Emerald Transmitter to the remote workstation, ensure that the resolution and the refresh rate of the remote workstation are supported by the Emerald system. Set the screen resolution and refresh rate of the remote workstation or, optionally, you can clone the attached monitors' EDID table under Control -> Transmitter -> Preferences. Unsupported settings will cause blank or distorted video at the Receiver.

The recommended sequence to connect the Transmitter is:

1. Turn off the remote workstation.

2. The Emerald Transmitter has one USB connector. Connect it to a corresponding USB port on the remote workstation.

3. Connect the video connector(s) on the Emerald Transmitter to the appropriately labeled port on the workstation(s) using the DVI cable(s).

4. Connect one end of the UTP cable to the Emerald Transmitter's RJ-45 connector and turn on the workstation.

5. Route the other end of the UTP cable to the location you have chosen for the Emerald Receiver. If necessary, you can extend the UTP cable via an Ethernet switch (subject to normal Ethernet cabling practices).

6. Plug the external power supply's connector into the DC power jack on the rear of the Emerald Transmitter.

7. Connect the detachable power cord to the power supply.

8. Plug the power cord into an appropriate wall outlet. The transmitter powers on automatically.

9. Turn on power for the remote workstation.

NOTE: Use only the power supply provided by Black Box.

5.8.1 EMERALD SE TRANSMITTER

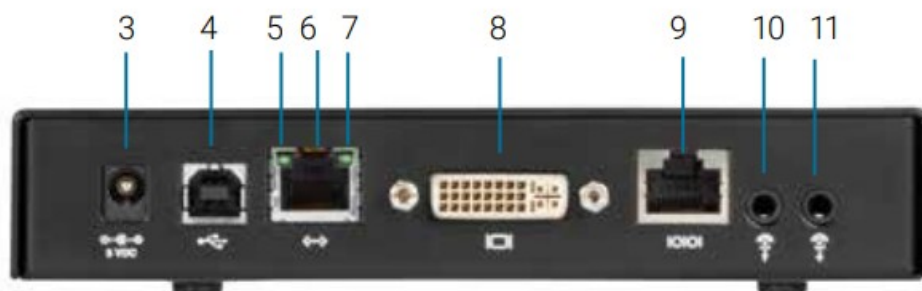FIGURE 5-9. FRONT VIEW OF THE EMERALD SE TRANSMITTER, SINGLE-HEAD (EMD2000SE-T)

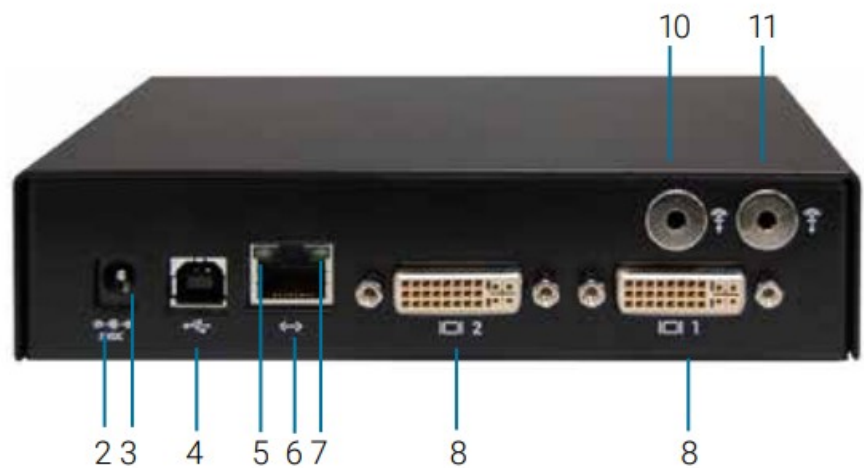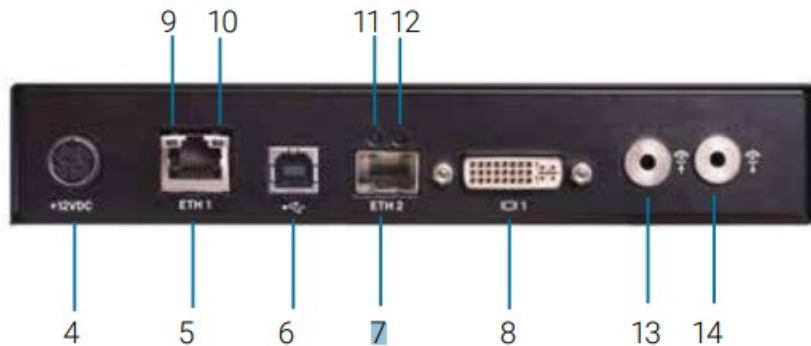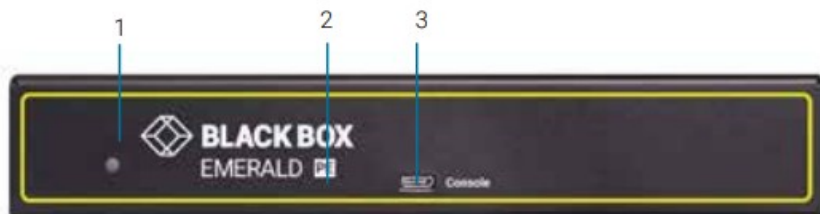FIGURE 5-10. REAR VIEW OF THE EMERALD SE TRANSMITTER, SINGLE-HEAD (EMD2000SE-T)

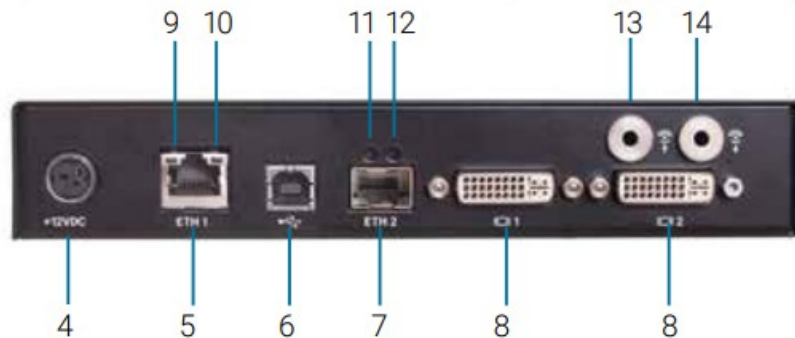FIGURE 5-11. FRONT VIEW OF THE EMERALD SE TRANSMITTER, DUAL-HEAD (EMD2002SE-T)

FIGURE 5-12. REAR VIEW OF THE EMERALD SE TRANSMITTER, DUAL-HEAD (EMD2002SE-T)

TABLE 5-3. EMERALD SE TRANSMITTER COMPONENTS

NUMBER IN FIGURES 5-9 THROUGH 5-12	COMPONENT	DESCRIPTION
1	Power LED	Disabled; NOTE: The unit automatically powers on; it must be turned off at the power source.
2	Reset button	Resets the unit to factory default when pressed for five seconds when unit is on
3	(1) 2.5-mm barrel connector for power	Links to 5-VDC external in-line power supply
4	(1) USB Type B connector	Links to USB input source
5	(1) Link/Activity LED	Lights green when there is activity on the link
6	(1) RJ-45 connector	Links to 10-/100-/1000-Mbps network
7	(1) 10/100/1000-Mbps LED	Lights green when data is being transmtted at 1000 Mbps
8	(1) or (2) DVI input connectors	Links to DVI input sources
9	(1) RJ-45 connector*	Links to RS-232 serial interface
10	(1) 3.5-mm connector	Links to audio
11	(1) 3.5-mm connector	Links to audio

*Single-head model only

5.8.2 EMERALD PE OR POE TRANSMITTER

FIGURE 5-13. FRONT VIEW OF THE EMERALD PE TRANSMITTER, SINGLE-HEAD (EMD2000PE-T)

FIGURE 5-14. REAR VIEW OF THE EMERALD PE TRANSMITTER, SINGLE-HEAD (EMD2000PE-T)

FIGURE 5-15. FRONT VIEW OF THE EMERALD PE TRANSMITTER, DUAL-HEAD (EMD2002PE-T)

FIGURE 5-16. REAR VIEW OF THE EMERALD PE TRANSMITTER, DUAL-HEAD (EMD2002PE-T)

TABLE 5-4. EMERALD PE OR PE POE TRANSMITTER COMPONENTS

| NUMBER IN FIGURES 5-13 THROUGH 5-16	COMPONENT	DESCRIPTION
1	Power LED	Lights when power is ON
2	Micro USB connector	Links to console
3	12 VDC Power In connector	Connects to supplied power adapter
4	RJ-45 port	EMD2000PE-T, EMD2002PE-T: Connects to network and supports Power over Ethernet (PoE)
5	USB Type B connector	Connects to PC/workstation USB connector
6	SFP cage	Holds fiber network SFP module
7	(1) or (2) DVI Video connectors	Connect to PC Video
8	TP port Speed LED	Indicates 10/100/1000 Mbps
9	TP port Activity LED	Indicates activity on the link
10	Fiber port Speed LED	Indicates 10/100/1000 Mbps
11	Fiber port Activity LED	Indicates activity on the link
12	Audio Line In	Connects to speakers
13	Audio Line Out	Connects to speakers

### 5.8.3. EMERALD PE SINGLE-HEAD DisplayPort™ TRANSMITTER

FIGURE 5-17. FRONT VIEW OF THE EMERALD PE TRANSMITTER, SINGLE-HEAD (EMD2000PE-DP-T)

TABLE 5-5. EMERALD PE DISPLAYPORT TRANSMITTER COMPONENTS

NUMBER IN FIGURES 5-17	COMPONENT	DESCRIPTION
1	Factory Reset Switch	Press and hold this switch to return the unit to factory defaults.
2	Power LED	Lights when power is ON.
3	Network LED	OFF: No network connection Solid ON: Network connection Blinking: Network Activity
4	Video LED	OFF: No valid video input detected. ON: Valid video input detected.
5	Console Connector	Reserved for future use

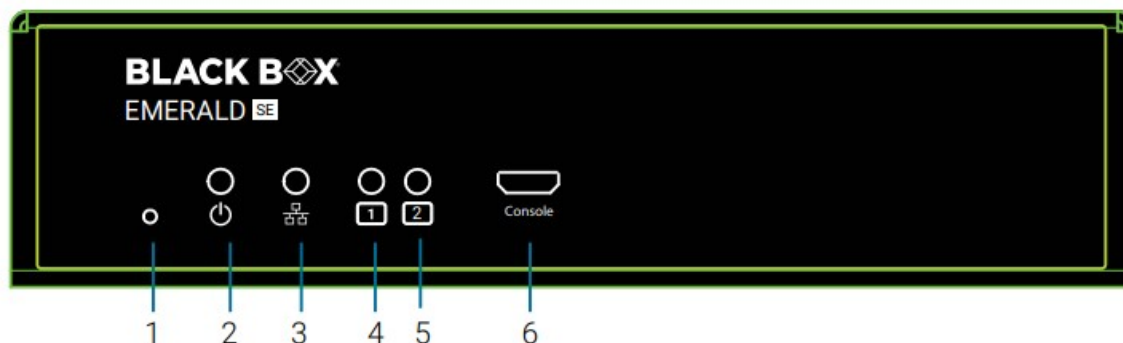5.8.4. EMERALD PE DUAL-HEAD DisplayPort™ TRANSMITTER
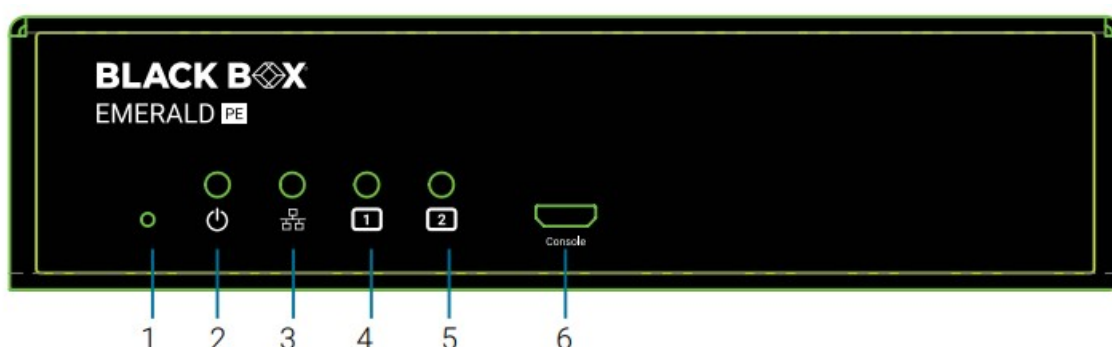
FIGURE 5-18. FRONT VIEW OF THE EMERALD PE TRANSMITTER, DUAL-HEAD (EMD2002PE-DP-T)

TABLE 5-6. EMERALD PE DUAL HEAD DisplayPort TRANSMITTER COMPONENTS

NUMBER IN FIGURE 5 -18	COMPONENT	DESCRIPTION
1	Factory Reset Switch	Press and hold this switch to return the unit to factory defaults.
2	Power LED	Lights when power is ON.
3	Network LED	OFF: No network connection Solid ON: Network connection Blinking: Network Activity
4 & 5	VIDEO LED	4 OFF: No valid video input detected on Video Head 1. 4 ON: Valid video input detected on Video Head 1. 5 OFF: No valid video input detected on Video Head 2. 5 ON: Valid video input detected on Video Head 2.
6	Console Connector	Reserved for future use

5.8.5 EMERALD SE SINGLE-HEAD DisplayPort™ TRANSMITTER
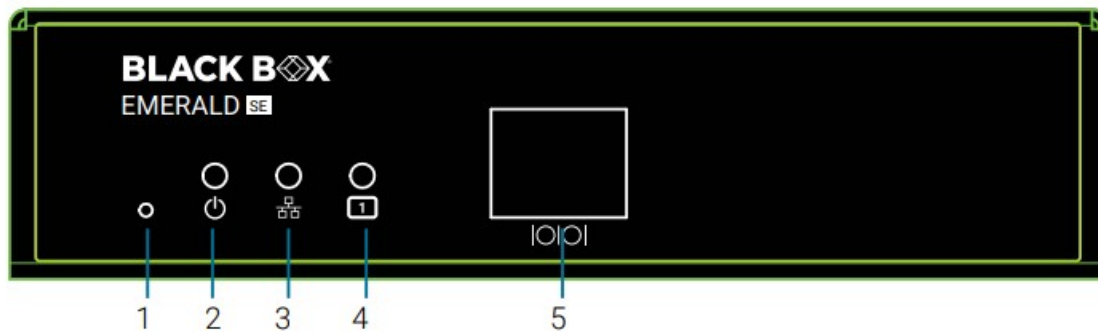
FIGURE 5-19. FRONT VIEW OF THE EMERALD SE TRANSMITTER, SINGLE-HEAD (EMD2000SE-DP-T)

TABLE 5-7. EMERALD SE TRANSMITTER COMPONENTS

NUMBER IN FIGURES 5-19	COMPONENT	DESCRIPTION
1	Factory Reset Switch	Press and hold this switch to return the unit to factory defaults.
2	Power LED	Lights when power is ON.
3	Network LED	OFF: No network connection Solid ON: Network connection Blinking: Network Activity
4	Video LED	OFF: No valid video input detected. ON: Valid video input detected.
5	Serial	Reserved for future use

5.8.6 EMERALD SE DUAL-HEAD DisplayPort™ TRANSMITTER

FIGURE 5-20. FRONT VIEW OF THE EMERALD SE TRANSMITTER, DUAL-HEAD (EMD2002SE-DP-T)

TABLE 5-8. EMERALD SE DUAL-HEAD DisplayPort TRANSMITTER COMPONENTS

NUMBER IN FIGURE 5-20	COMPONENT	DESCRIPTION
1	Factory Reset Switch	Press and hold this switch to return the unit to factory defaults.
2	Power LED	Lights when power is ON.
3	Network LED	OFF: No network connection Solid ON: Network connection Blinking: Network Activity
4 & 5	VIDEO LED	4 OFF: No valid video input detected on Video Head 1. 4 ON: Valid video input detected on Video Head 1. 5 OFF: No valid video input detected on Video Head 2. 5 ON: Valid video input detected on Video Head 2.
6	Console Connector	Reserved for future use

5.9 CONNECT THE EMERALD ZEROU DVI OR DisplayPort™ TRANSMITTER

Before connecting the Emerald ZeroU DVI or DisplayPort Transmitter to the remote workstation, ensure that the resolution and the refresh rate of the remote workstation are supported by the Emerald system. Set the screen resolution and refresh rate of the remote workstation. Unsupported settings will cause blank or distorted video at the Receiver.

The recommended sequence to connect the Transmitter is:

1. Turn off the remote workstation.

2. The Emerald ZeroU DVI or DisplayPort Transmitter has two USB connectors. Connect them to the corresponding USB ports on the remote workstation.

3. Connect the DVI or DisplayPort video connector on the Emerald ZeroU DVI or DisplayPort Transmitter to the appropriately labeled port on the workstation using the DVI or DisplayPort cable.

4. Connect one end of the UTP cable to the Emerald ZeroU DVI or DisplayPort Transmitter's RJ-45 connector and turn on the workstation.

5. Route the other end of the UTP cable to the location you have chosen for the Emerald SE Receiver. If necessary, you can extend the UTP cable via an Ethernet switch (subject to normal Ethernet cabling practices).

6. The Emerald ZeroU DVI or DisplayPort Transmitter can be powered via the USB ports. Optionally, plug an external power supply's connector into the DC power jack on the rear of the Emerald SE Transmitter.
   NOTE: The power supply is not included and must be ordered separately (part number EMD2000-PSU).

7. Optionally, connect the detachable power cord to the power supply.

8. Optionally, plug the power cord into an appropriate wall outlet. The transmitter powers on automatically.

9. Turn on power for the remote workstation.
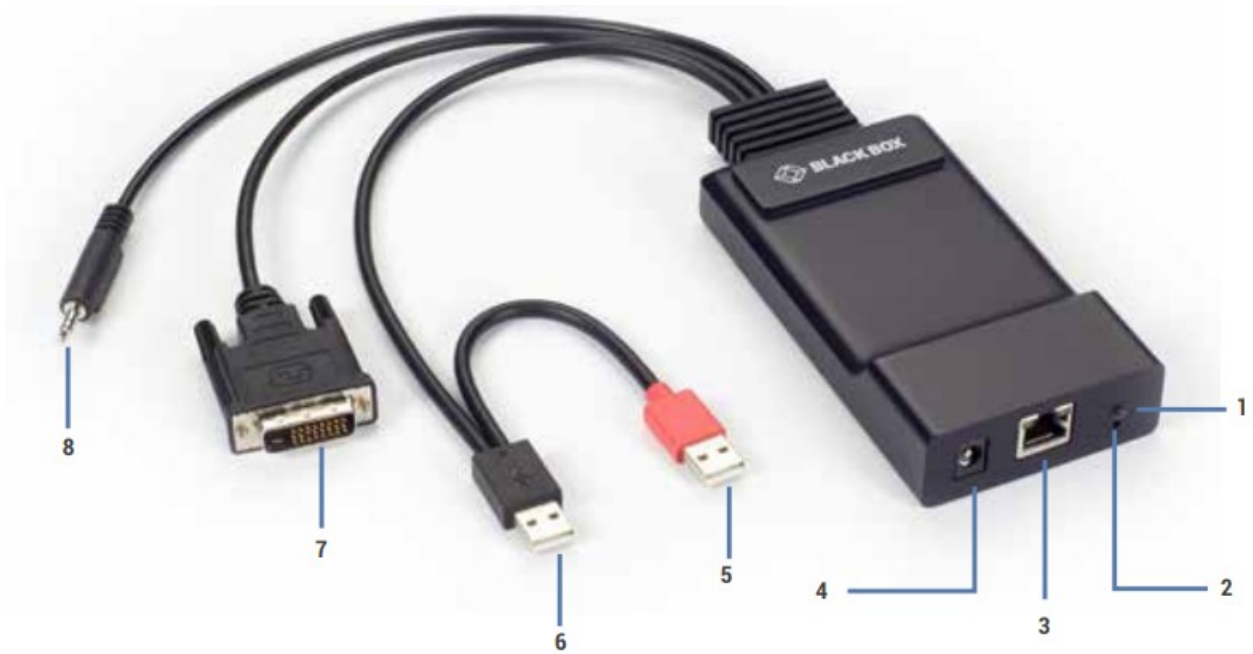   **NOTE:** Use only the power supply provided by Black Box.

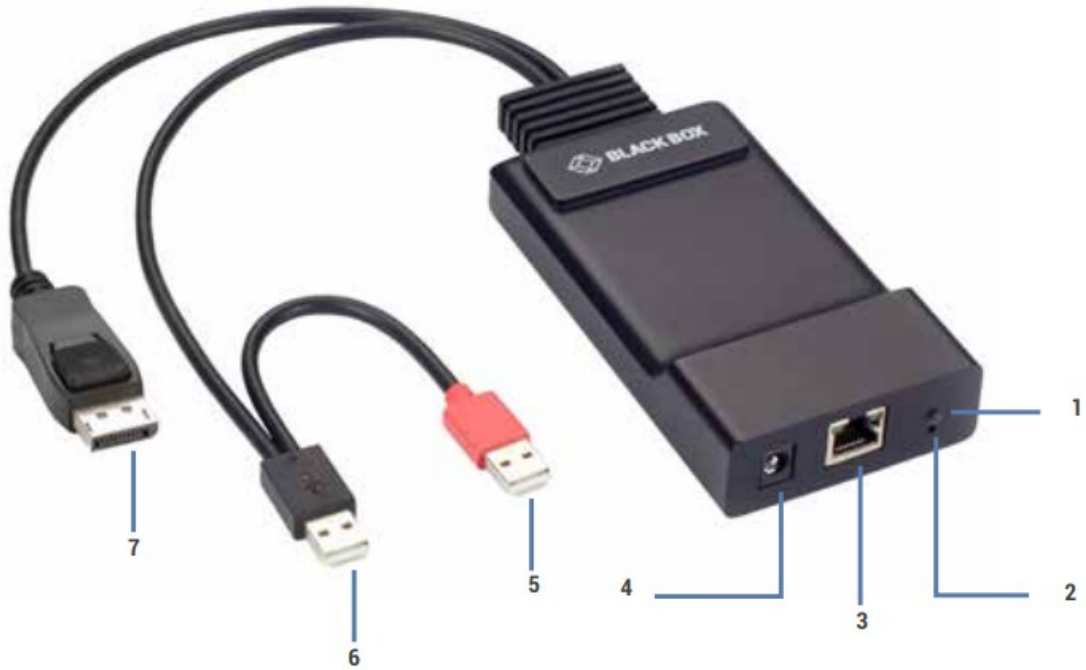FIGURE 5-21 FRONT VIEW OF THE EMERALD ZEROU DVI TRANSMITTER, SINGLE-HEAD (EMD200DV-T)

FIGURE 5-22. FRONT VIEW OF THE EMERALD ZEROU DP TRANSMITTER, SINGLE-HEAD (EMD200DP-T)

TABLE 5-9. EMERALD ZEROU DVI OR DisplayPort™ TRANSMITTER COMPONENTS

NUMBER IN FIGURES 5-21 THROUGH 5-22	COMPONENT	DESCRIPTION
1	Power LED	Lights green when power is on
2	Reset button	Press to reset the unit
3	(1) RJ-45 connector	Links to 10-/100-/1000-Mbps network
4	(1) 2.5-mm barrel connector for power	Links to an optional 5-VDC external in-line power supply NOTE: The ZeroU Transmitter can be powered via the USB connectors.
5	(1) USB Type A connector	Connects to PC/workstation or USB power hub
6	(1) USB Type A connector	Connects to PC/workstation USB device
7	(1) DVI or DisplayPort input connector	Links to DVI or DisplayPort input video source NOTE: DisplayPort connector also supports embedded audio
8	(1) 3.5-mm connector	Links to speakers (on DVI model only)

CHAPTER 6: NETWORKED INSTALLATION

6.1 POINT-TO-POINT INSTALLATION

In a point-to-point configuration, no administrator setup of the Emerald Transmitter or the Emerald Receiver is required.

This enables you to install the system quickly, directly out-of-the-box. However, in the point-to-point configuration, you can install only one Emerald Transmitter and Emerald Receiver pair on a subnet, and both must be on the same subnet unless a router is

present in the network to span subnets.

Also if there are other devices with 192.168.1.21 (default Receiver IP address) or 192.168.1.22 (default Transmitter IP address) on the network, then the IP addresses for Receiver and/or Transmitter should be changed to unused IP addresses.

6.2 UNMANAGED OR MANAGED MATRIX INSTALLATION

The following instructions will enable you to install your Emerald Receiver and Emerald Transmitter in a networked configuration. In this installation, multiple Emerald Transmitters and Emerald Receivers are attached via the same Ethernet network. In this case, it is important for each unit to be configured with a unique IP address.

The Emerald Receiver has been preconfigured with factory-default network settings. If you install multiple units on the same network, you will need to assign a unique IP address to each unit or configure the Receiver for DHCP. This can be done via the On-Screen Display (OSD) on the Emerald Receiver and must be carried out before adding multiple devices on the same network. It is strongly recommended that all device IP addresses be configured using a static IP address.TABLE 6-1. EMERALD SYSTEM **DEFAULT NETWORK SETTINGS**

COMPONENT	IP ADDRESS	TYPE	DEFAULT GATEWAY	SUBNET MASK
Emerald SE Receiver (EMD2000SE-R, EMD2002SE-R)	192.168.1.21	Static	192.168.1.1	255.255.255.0
Emerald SE Transmitter (EMD2000SE-T, EMD2002SE-T)	192.168.1.22	Static	192.168.1.1	255.255.255.0
Emerald PE & SE DisplayPort Transmitters (EMD2000PE-DP-T, EMD2000SE-DP-T, EMD2002PE-DP-T, EMD2002SE-DP-T)	192.168.1.22	Static	192.168.1.1	255.255.255.0
Emerald PE Receiver (EMD2000PE-R, EMD2002PE-R)	192.168.1.21	Static	192.168.1.1	255.255.255.0
Emerald PE PoE Transmitter (EMD2000PE-T, EMD2002PE-T)	192.168.1.22	Static	192.168.1.1	255.255.255.0
Emerald PE PoE Receiver (EMD2000PE-R-P, EMD2002PE- R-P)	192.168.1.21	Static	192.168.1.1	255.255.255.0
Emerald ZeroU DVI Transmitter (EMD200DV-T)	192.168.1.22	Static	192.168.1.1	255.255.255.0
Emerald ZeroU DisplayPort Transmitter (EMD200DP-T)	192.168.1.22	Static	192.168.1.1	255.255.255.0
Boxilla Manager (BXAMGR)	192.168.1.24	Static	192.168.1.1	255.255.255.0
Boxilla Manager (BXAMGR-R2)	192.168.1.24	Static	192.168.1.1	255.255.255.0

CHAPTER 7: OPERATION OF EMERALD SYSTEM

Operating a workstation through the Emerald system is no different than working directly connected to a PC desktop.
All peripherals operate as if directly connected, even though the workstation is located at a distance.

7.1 LED IDENTIFICATION
Front panel
There is a Power button on the front panel of an Emerald SE unit. This button is disabled. The Emerald PE unit has a power LED but does not have a power button.
NOTE: The SE or PE unit powers on automatically when plugged in and must be turned off at the power source.
The Emerald ZeroU DVI or DP Transmitter unit has a Power LED. It can be powered either via USB or via an optional power supply.
Rear panel
Two LEDs are built into the RJ-45 connectors on the Emerald SE Receiver, Emerald SE Transmitter, and Emerald ZeroU DVI or DisplayPort Transmitter. The definition of the operation of these LEDs is shown in Table 7-1.
TABLE 7-1. RJ-45 CONNECTOR LEDS ON THE REAR PANEL OF THE EMERALD SE RECEIVER AND TRANSMITTER

LED	STATUS	DESCRIPTION
Activity	Green ON	Linked OK
	Green Flashing	Transmit/Receive activity
	Green OFF	No Link
Link Speed	Blinks green one time	10 Mbps
	Blinks green two times	100 Mbps
	Blinks green three times	1000 Mbps
	No blinking	No valid link

7.2 ACCESSING THE SYSTEM

A connection is established using the OSD on an Emerald Receiver or Boxilla Manager. You will be able to interact with the remote workstation as if it were located at your desk.

NOTE: If the remote workstation is powered off, the Emerald system will display a "black" screen for video when a connection is made.

CHAPTER 8: OSD FUNCTIONS

The Emerald Receiver and Boxilla Manager incorporate an On-Screen Display (OSD) that allows you to view information about the configuration of your system and potentially also allows for setting connections and configuration parameters such as the IP address, depending on the type of user. The following sections describe the operation common on a Receiver.

8.1 USER TYPES

The Emerald system supports three classes of users for Matrix products:

1. Administrator – users of this class have full rights to configure the system. They can create/modify/delete new users and connections, change network settings, etc.

2. Power User – users of this class can modify resolution for connections to virtual desktops and change his/her local password.

3. Standard User – users of this class can only select from a list of pre-defined connections to access and view system information. They cannot change any configuration settings.

8.2 LOG ON

A user must log-on to the Emerald Receiver or Boxilla Manager to configure and manage the Emerald system. The log-on screen is shown in Figure 8-1. The username defines the access rights and configuration available to the user.
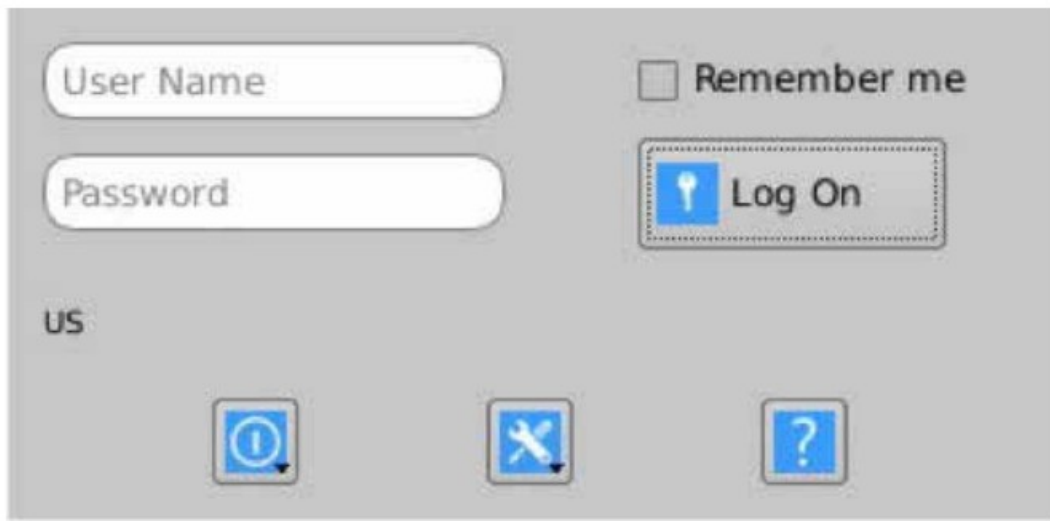
FIGURE 8-1. OSD LOG-ON SCREEN

The fields on this screen are:

1. Username: the username to log-on as defined by the Administrator. Username is case-sensitive.
2. Password: password for the user. Password is case-sensitive.
3. Remember Me: When this box is checked, the unit keeps the username between log-ons and power-cycles. When this box is not checked, the username field is always presented as blank when powered-up and after a log-out. This tick-box only affects the username – the password is never preserved.
4. Power Button: This button allows the user to reboot the client.
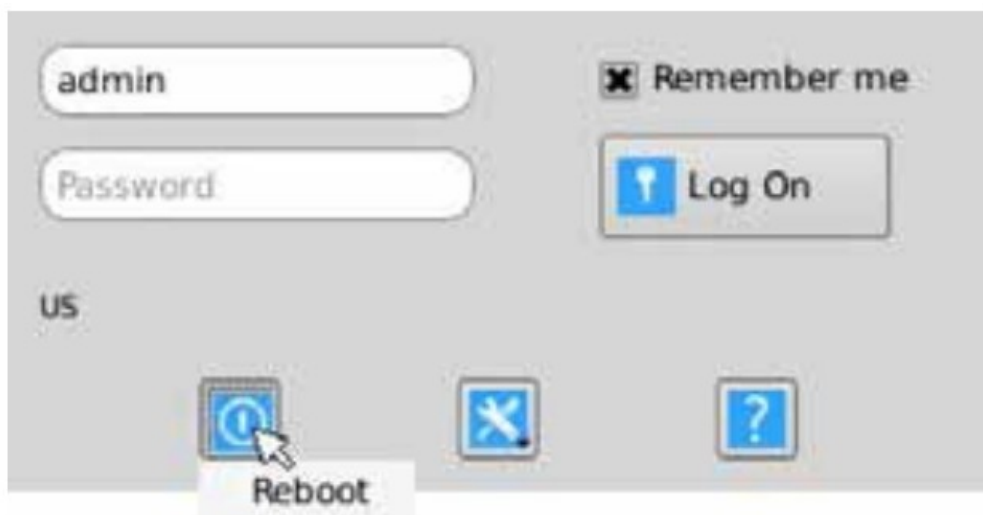
FIGURE 8-2. LOG-ON SCREEN - REBOOT BUTTON

- System Preferences: This button has a drop down menu that allows the user to define system preferences for the Emerald Receiver. Figure 8-3 shows how the keyboard type can be selected.
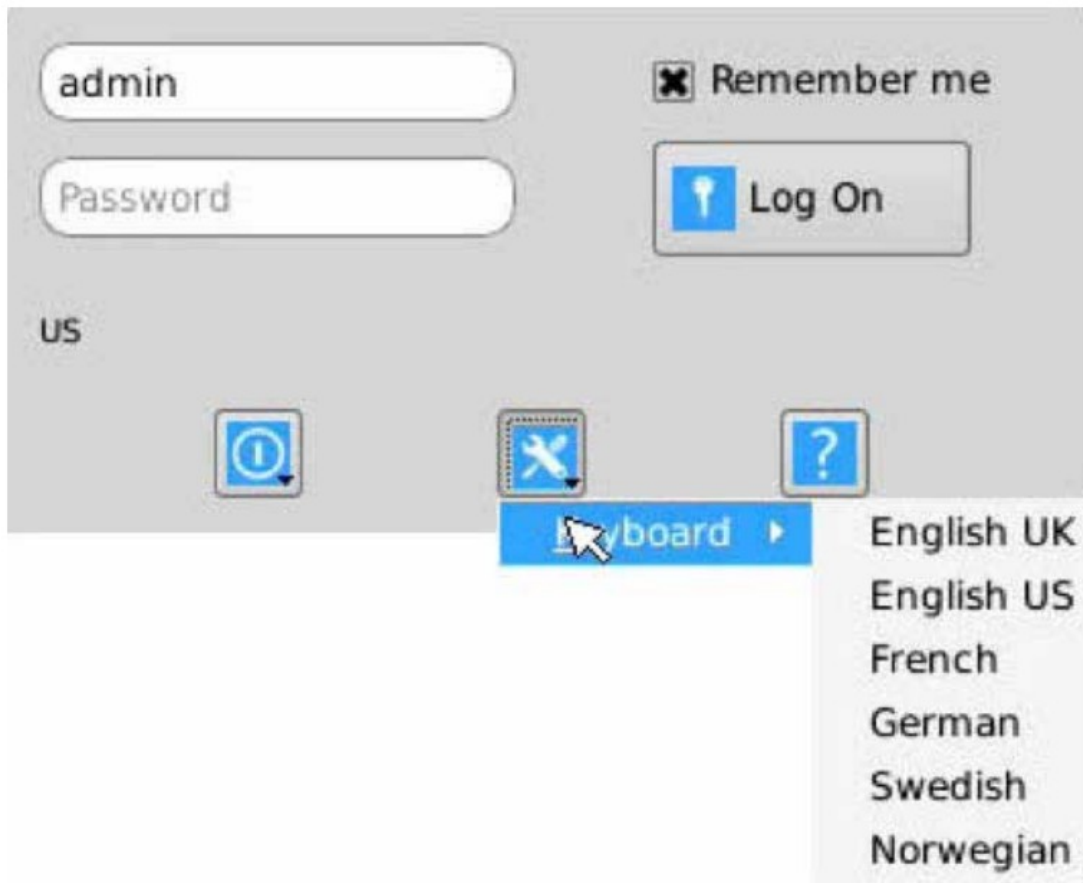
FIGURE 8-3. SETTING SYSTEMS KEYBOARD TYPE

Help: This button opens a pop-up window with our website address (blackbox.com) on that screen.

8.3 DEFAULT USERNAME AND PASSWORD

The Emerald Receiver ships with a default username of admin with a blank password (i.e. no password). This user cannot be deleted, but the password can be changed.

NOTE: If you create a password for the default Admin account and forget it, there is no way to reset / retrieve it unless using a Boxilla manager. We recommend that the administrator creates a second Admin account for critical systems in case the main Admin account is locked out. In the event you still cannot gain access, a factory reset may be required.

8.4 USER VIEWS AND CAPABILITIES

There are three different types of users in the Emerald System. Your user type will determine what exactly you will see on your OSD.

For the purpose of this Manual, we show the screen of an Administrator. This means that some buttons shown here may not be available to other users.

The Emerald comes as an unmanaged system and as a managed system. There are some differences in the OSD for these systems which you may see here..

8.5 CONNECTIONS SCREEN

When a user successfully logs on to the Emerald Receiver or Manager, the Connection screen is displayed. This is shown in Figure 8-4. The connections that a user can make are listed in the connection window. The user logged on is shown in the top right corner of the OSD.
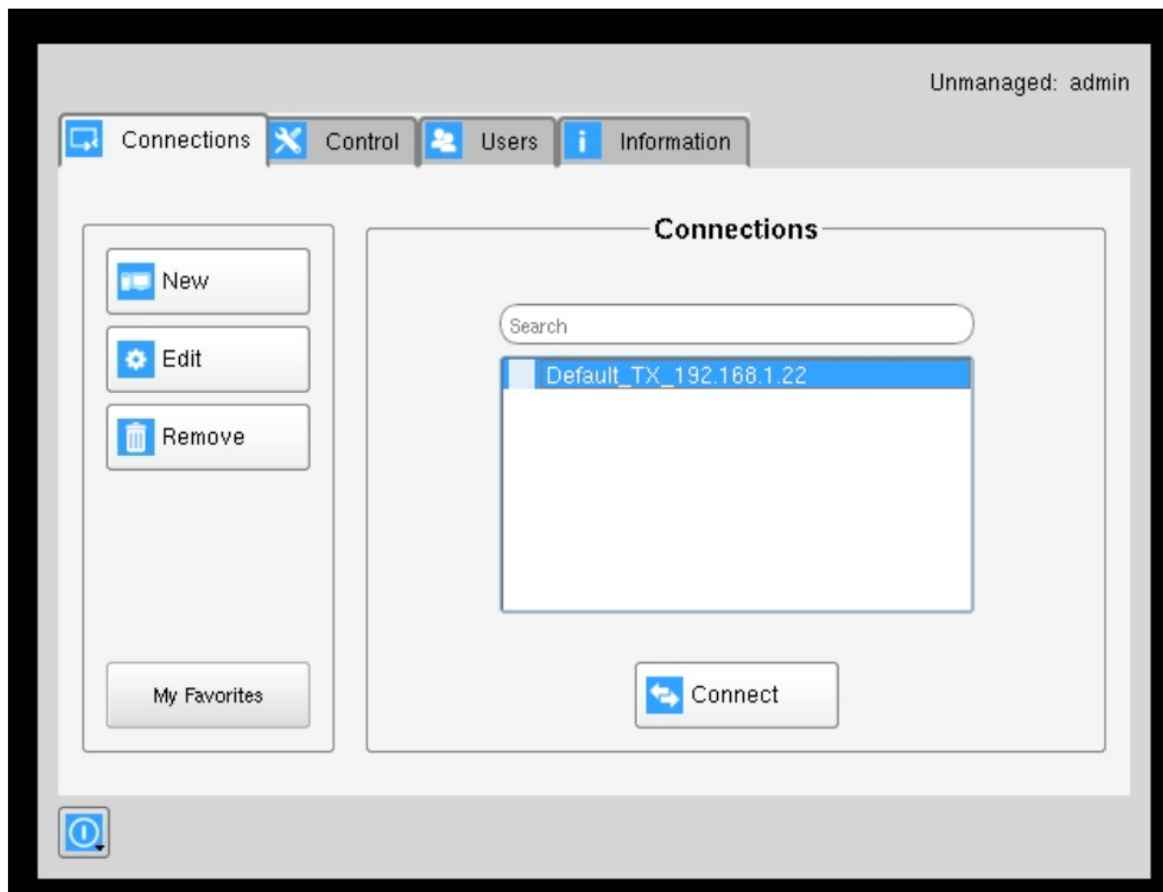
FIGURE 8-4. CONNECTION SCREEN

If the user is an Administrator type, the three buttons on the left (New, Edit, and Remove) will be displayed. These allow the user to create, edit, or remove connections. For Standard User types, no connections can be created, edited, or removed, so these buttons are not displayed or are greyed out. The user will also not see the "Control," "Users," and "Information" tabs. By default, there is one connection called "Default Tx – 192.168.1.22" that defines a connection to an Emerald Transmitter with its factory defaults. A maximum of 32 connections can be defined for an Emerald Receiver by default, and these connections can be shared by users as defined by an administrator (different users can have the same connection). The number of connections can be increased to unlimited in a managed domain via Boxilla upgrade licenses.

8.5.1 CREATING A NEW CONNECTION

To allow an Emerald Receiver or Manager to connect to a target Emerald Transmitter, an administrator must create a connection.

The administrator clicks on the New button on the Connections screen. This causes the New Connections pop-up window to appear as shown in Figure 8-5.
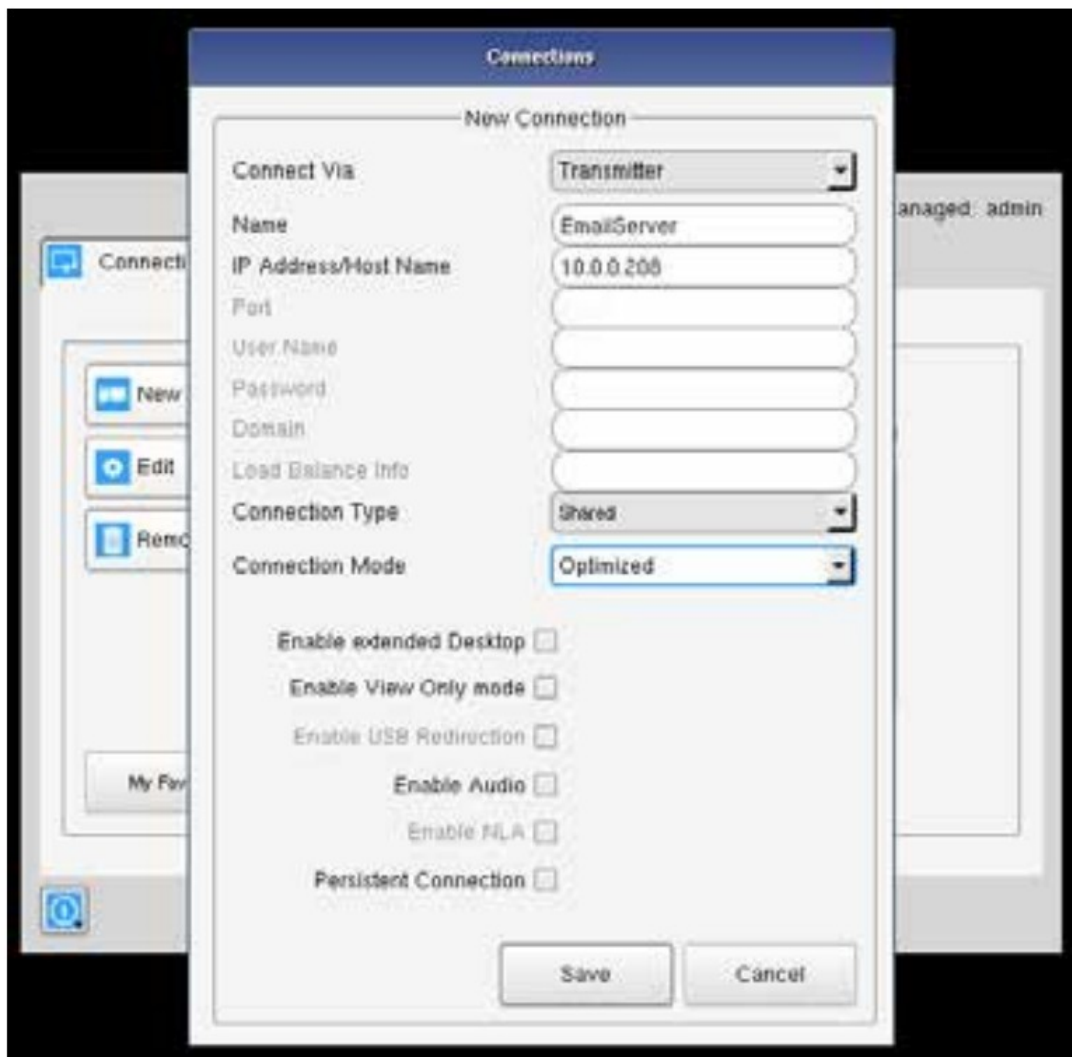
FIGURE 8-5. NEW CONNECTION WINDOW

The fields on this screen are:

- Name: this is a unique name for the new connection. The name can be between 1 and 32 characters. The name can be composed of any Alphanumeric characters and special characters except for " "/ \ [ ] : ; | = , + * ? < > `'.
- IP Address/Host Name: IP Address of Emerald Transmiter (if Connection Via set to Transmitter) or VM in IP v4 format. Alternatively it can be the Host Name if this can be resolved in the local DNS server. Note: Using Host Name will increase the switching time by the time needed to resolve the Host Name to an IP address; Š Port: defines the port to be used for the RDP connection for connections via VM Direct or Broker. Uses 3389 by default;
- Username: defines username to be used on a VM connection. Only used for connections via VM Direct or Broker. If left "blank" on VM Direct – user will be presented with Windows Login screen on VM;
- Password: defines username to be used on a VM connection. Only used for connections via VM Direct or Broker;
- Domain: defines domain that a Virtual Machine is part of (if part of a windows domain). Not used for connections to Transmitters.
- Load Balance Info: Defines resources on the broker (VM Pool that the receiver will attempt to connect to after

user credentials have been validated. Only used on connection via Broker.

- Connection Type: Used to define whether a connection is Private or Shared (i.e. other connections of type Shared can join in session and share keyboard, mouse, and video). Only available if connection via set to Transmitter.

- Connection Mode: To allow users to connect from a 4K Receiver to connect to Emerald SE, PE, and ZeroU transmitters: The connection on the 2K transmitter must be set to Optimized. Go to Connections and create a new connection (or Edit an existing

  connection). Enter all of the connection details (or confirm they are correct) and a new option can be selected for Compression Mode. For 4K RX to 2K TX: Compression Mode = Optimized.

- Enable Extended Desktop: Remote connections can be extended for dual-head Emerald units by enabling the option Extended Desktop. Enable Extended Desktop setting enables the second video head of a dual head Transmitter. Make sure both the video heads on the Transmitter are connected to the source. Video heads on the receiver are connected to respective monitors.

- Enable View Only mode: View only setting for a connection allows user to monitor what is been transmitted from a source without being able to interact with the source. This feature allows a user or administrator to monitor the actions on the network without accidentally interacting with other users. View only connection is available in both private and shared mode connections with or without analog audio.

- Enable USB Redirection: when set, this enables non-keyboard and non-mice devices (such as tablets and USB headsets) to be redirected for this connection.

- Enable Audio: when set, this enables audio to be supplied to the remote audio connectors.

- Enable NLA: when set, this enables Network Level Authentication requiring that the user be authenticated to the RD Session Host server before the session is created. This is not used for when Connection Via is set to Transmitter.

- Persistent Connection: When turned on, Persistent Connection will constantly try to connect the Receiver with the Transmitters until successful. This is useful when using Emerald for digital signage or an application that does not need a keyboard/mouse   to stay connected to a defined source.

8.5.2 CONNECTION FAVORITES

Connection favorites provide a quick convenient mechanism for users to switch between their pre-defined connections. Favorites are configured by the administrator where a maximum of 10 favorites can be assigned to users using a combination of hotkey and [0-9].
Assigning Connection Favorites
A pre-requiste is that the user exists and has connects assigned.
The following screenshot demonstrates the administrator assigning connections for the user to the available hotkeys. Favorites do not need to be allocated sequentially and hotkeys can be skipped.
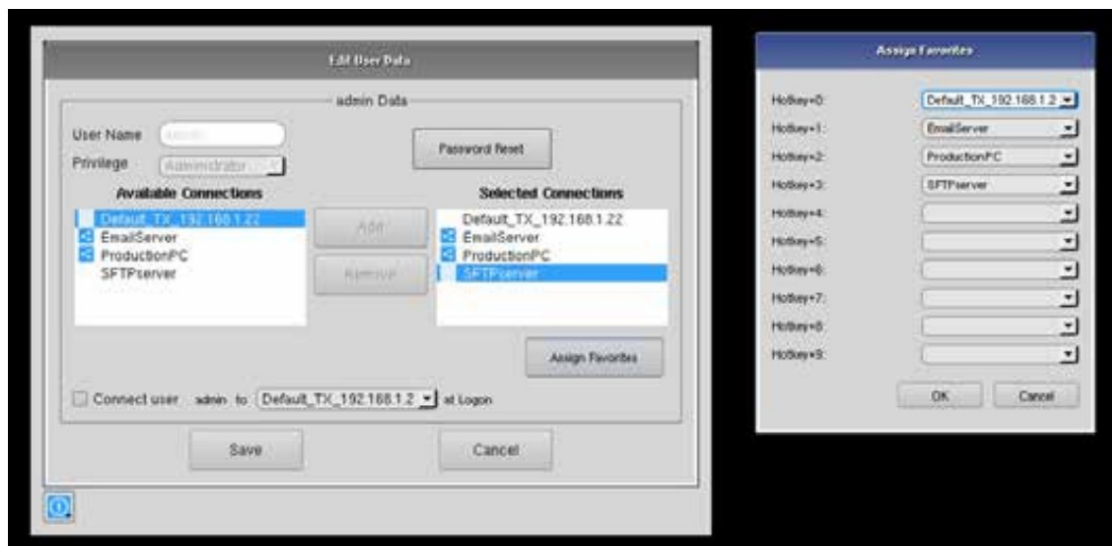
FIGURE 8-6. ASSIGNING CONNECTION FAVORITES

Listing Connection Favorites:

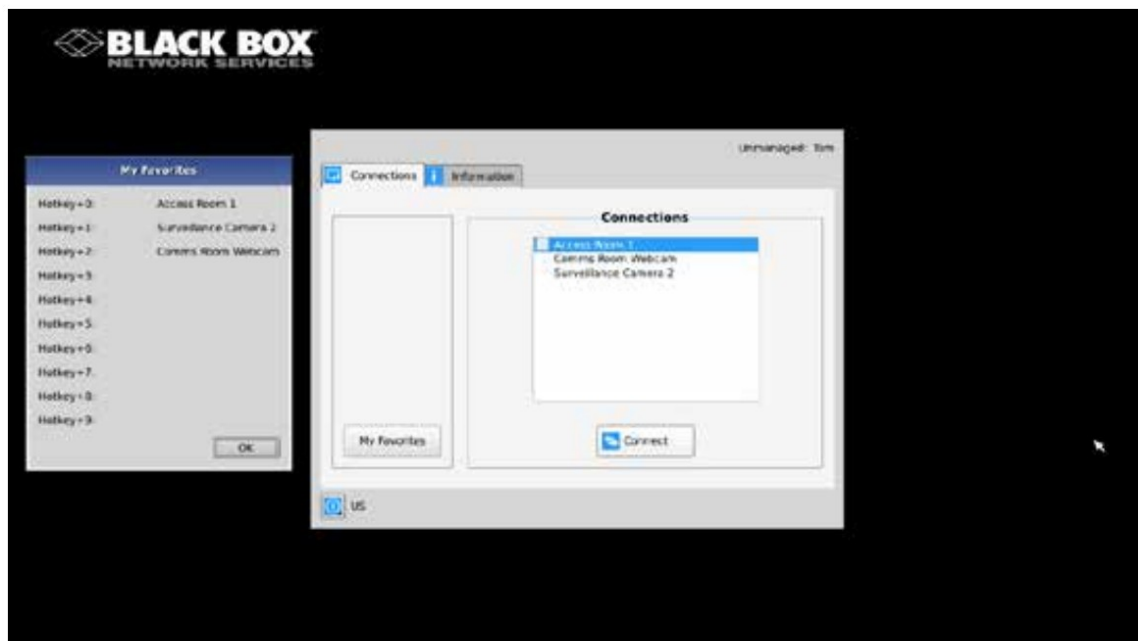When a user logs in, they can view their assigned favorites.

FIGURE 8-7. LISTING CONNECTION FAVORITES

8.5.3 CONNECTING

To make a connection, the user highlights the required "connection" in the window and then clicks on the " Connect" button.

Alternatively, a user can double-click on the connection. This action causes the Emerald Receiver to attempt to connect to the target remote workstation or virtual machine. If the target is available, the connection will be made. The user can also use the arrow and Enter keys on a keyboard to select a connection.

If another user is already connected to the target defined in the connection, the user will receive a pop-up window indicating the target device is already allocated. If connection errors occur, they will be displayed in an error popup window.

8.5.4 EDIT CONNECTION

To edit a connection and change its parameters, an administrator clicks on the Edit button on the Connections screen. The Edit Connections pop-up window appears.

The administrator changes required fields and clicks Save to confirm or Cancel to discard any changes.

8.5.5 REMOVE CONNECTION

To remove or delete a connection, an administrator highlights a connection in the list and then clicks on the Remove button on the Connections screen (shown in Figure 8-8). This causes the Remove Connection pop-up window to appear where a user confirms the removal or cancels the attempt.

8.5.6 BONDING

NOTE: Bonding requires the Boxilla manager.

This assumes that setup is complete on Boxilla and a user has permission to connect to a Bonded connection. See the setup instructions in the Boxilla user manual.

When the user selects a "bonded connection" from any Receiver that is part of a bonded group, Receiver 1 will connect to Connection 1, and receiver 2 will connect to connection 2, and so on, up to 8 bonded links.

Connections will all be made assuming they are available using the normal rules — e.g., If one connection is in a private connection and therefore cannot be connected to — all connections within the bond will fail. The user will get an error message from the user

station they requested explaining why connection could not be made and will identify the user in private connection. Once the user has a successful connection, if they disconnect using the OSD, all connections will be terminated.

While the user is in a bonded connection and if they wish to switch one of the receivers to another connection without dropping the full bonded setup, they shall use favorites and this receiver will switch to the desired target without calling the OSD and leaving all other connections in the bonded connection up and running. The exception to this is that favorites cannot be used from receivers that launched connections via Boxilla.NOTE: Bonding requires the Boxilla manager.

This assumes that setup is complete on Boxilla and a user has permission to connect to a Bonded connection. See the setup instructions in the Boxilla user manual. When the user selects a "bonded connection" from any Receiver that is part of a bonded group, Receiver 1 will connect to Connection 1, and receiver 2 will connect to connection 2, and so on, up to 8 bonded links. Connections will all be made assuming they are available using the normal rules — e.g., If one connection is in a private connection and therefore cannot be connected to — all connections within the bond will fail. The user will get an error message from the user station they requested explaining why connection could not be made and will identify the user in private connection. Once the user has a successful connection, if they disconnect using the OSD, all connections will be terminated.

While the user is in a bonded connection and if they wish to switch one of the receivers to another connection without dropping the full bonded setup, they shall use favorites and this receiver will switch to the desired target without calling the OSD and leaving all other connections in the bonded connection up and running. The exception to this is that favorites cannot be used from receivers that launched connections via Boxilla.

8.6 CONTROL TAB

The Control Tab on the OSD enables an administrator to change the configuration of the Emerald system. The Control Tab is shown in Figure 8-8.
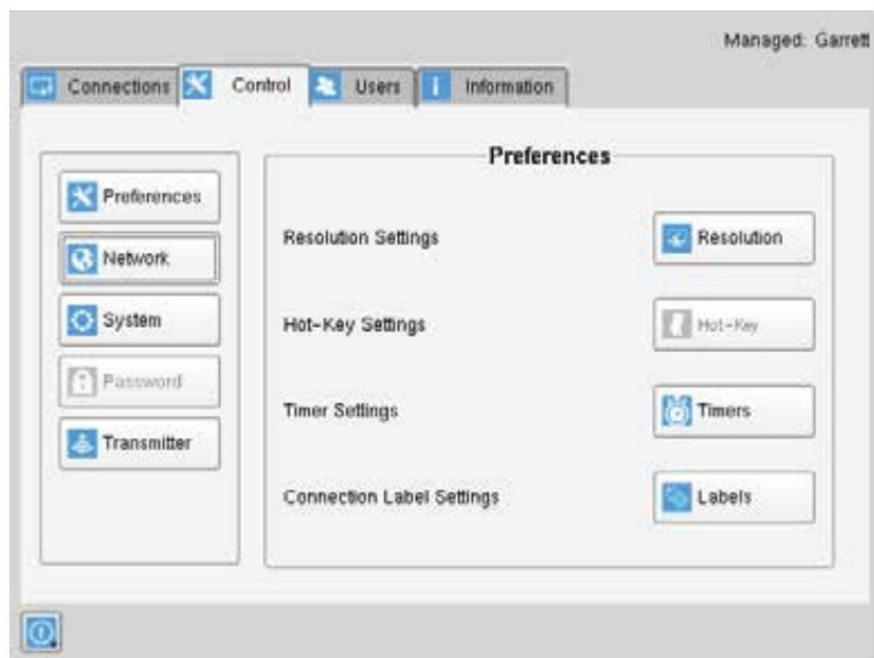

FIGURE 8-8. CONTROL TAB

There are five functions that can be accessed on this tab:

1. Preferences – allows users to change preference settings for:

i. Resolution Settings – allows change of preferred resolution for OSD screens and Virtual connections.

ii. Hot-Key Settings – allows changing of the active hot-key for keyboard short-cuts.

iii. Timer Settings – allows setting of pre-emption timer and various inactivity timers

iv. Connection Label Settings – allows activation/deactivation of connection label and set label preferences

2. Network – allows administrator to change network parameters for the Emerald Receiver or Manager.

3. System – allows upgrading of unit firmware, reset unit to factory defaults, and to save/restore unit configuration to a USB drive.

4. Password – change the administrator or user password.

5. Transmitter – allows changing of Transmitter parameters.

8.6.1 PREFERENCES

Resolution

The Resolution button allows an administrator or power user to set the preferred resolution for the RDP Connection and for the OSD. By default, both the RDP Resolution and the OSD Resolution are set to Auto.

The RDP Connection Resolution allows the resolution to be changed for an RDP connection, (i.e. defines the resolution that the virtual desktop will be accessed with). If the preferred resolution is not supported, the Receiver will use the next highest resolution
supported by both monitor and Receiver.

The OSD Resolution is set to Auto by default, but can be changed to the available OSD resolutions if the user wants to set a specific resolution. This setting has no effect when connecting to an Emerald Transmitter.

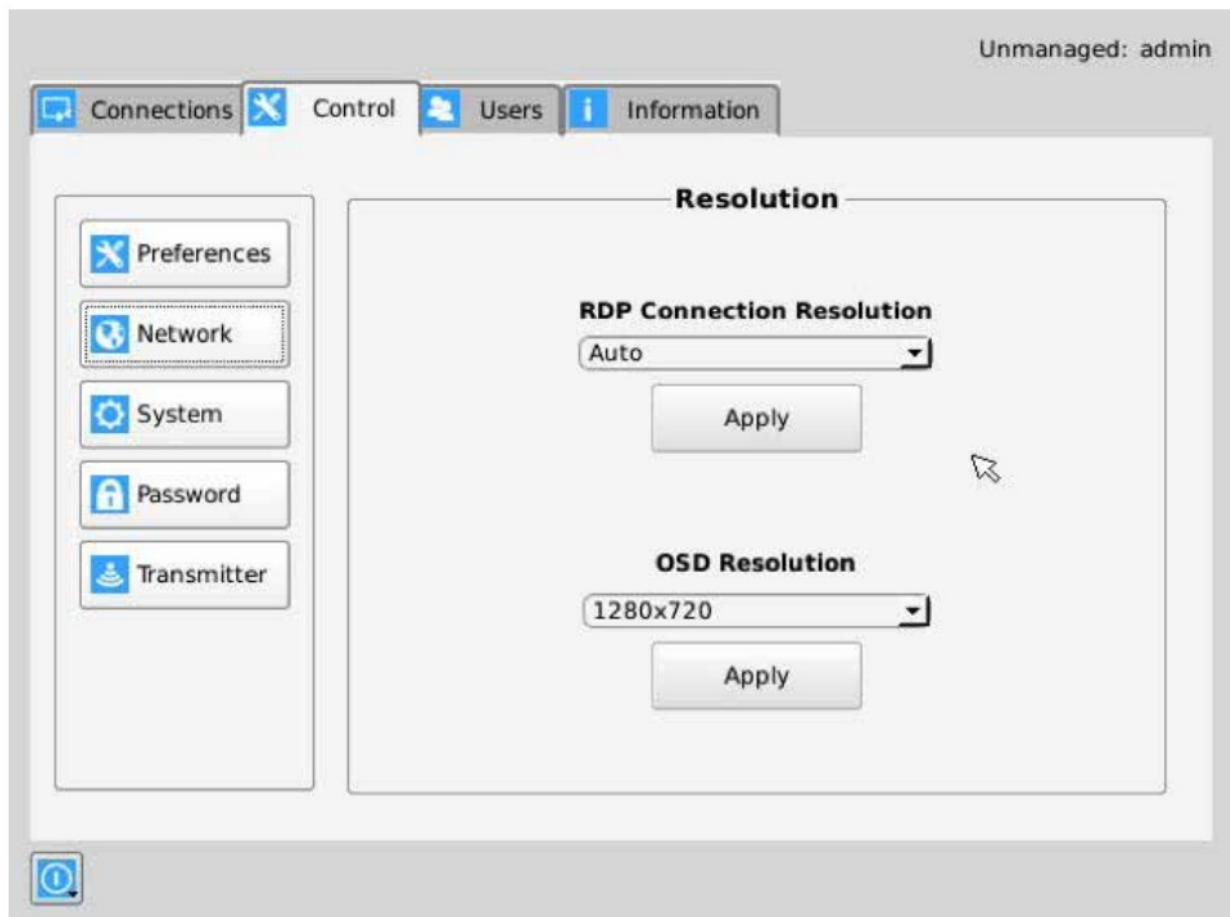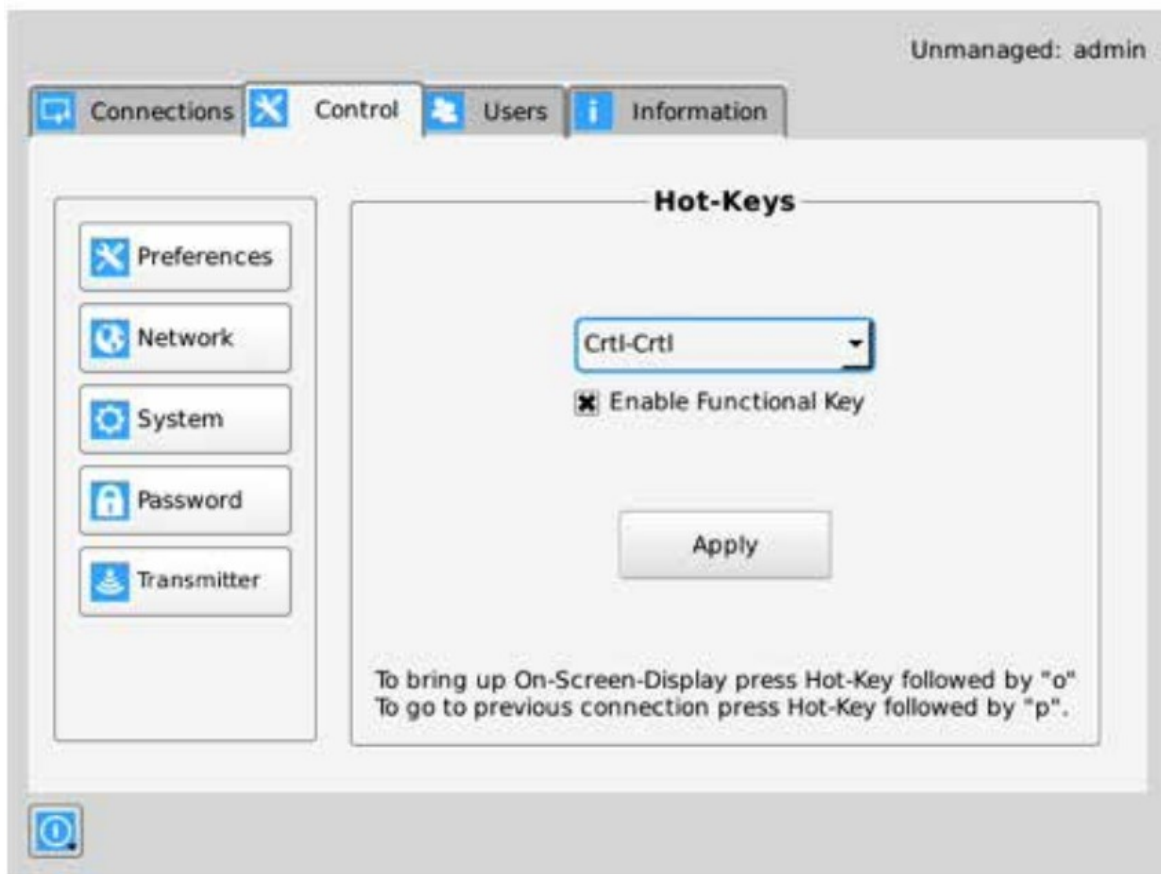Click Apply button to save the change.

FIGURE 8-9. RESOLUTION SCREEN

Hot-Key

The Hot-Key button allows the administrator to change the hot-key configuration. The hot-key is used with the "o" key to terminate the current connection and bring up the OSD. The hot-key with "p" key is used to switch to the previous connection without loading the OSD. Example: PrtScrn, O (default).

FIGURE 8-10. HOT KEY DEFINITION

The default hot-key is Print-Screen (PrntScrn). The alternatives are shown in the table. Click the Apply button to confirm a hot-key change.

TABLE 8-1. HOTKEY SEQUENCES

SEQUENCE	ACTION
Print Screen (Default)	-press Prnt Scrn key
Ctrl + Ctrl	-press Ctrl key twice within 1 second
Alt + Alt	-press Alt key twice within 1 second
Shift + Shift	-press Shift key twice within 1 second
Open OSD: Hotkey O	Switch to previous target: Hotkey P
Mouse-Left + Right	-press mouse left and right buttons at the same time for 2 seconds

The "Enable Functional Key" tick-box is used to disable the use of the function keys after the hot-key. So only the Hot-Key is required to bring up the OSD. The Enable functional Key is set by default. If using Favorities, the Enable Functional Key must be enabled.

Timer Settings

There are 2 timer settings available to users as shown in Figure 8-11. By default, they are turned off. If you wish to turn them on, you have to select the desired timer, set the time you wish, and click apply. The three timer settings are:

1. OSD Inactivity Timer – This sets a limit on how long a user can be logged on to the OSD without any keyboard or mouse activity. Once the user reaches the inactivity timer, he/she will be logged out of the OSD. The timer value can be set to a number from 2 to 60 minutes.

2. Connection Inactivity Timer – This sets a limit on how long a user can be connected to a source (virtual machine, Transmitter etc.) without any keyboard or mouse activity. Once the session reaches the inactivity timer, he/she will be logged out of their connection and return to the OSD. The timer value can be set to a number from 2 to 60 minutes.

NOTE: Inactivity occurs when the mouse or keyboard is not pressed or moved for a set period of time. The OSD Inactivity Timer and Connection Inactivity Timer can be used together to disconnect a session and log out of the user session.
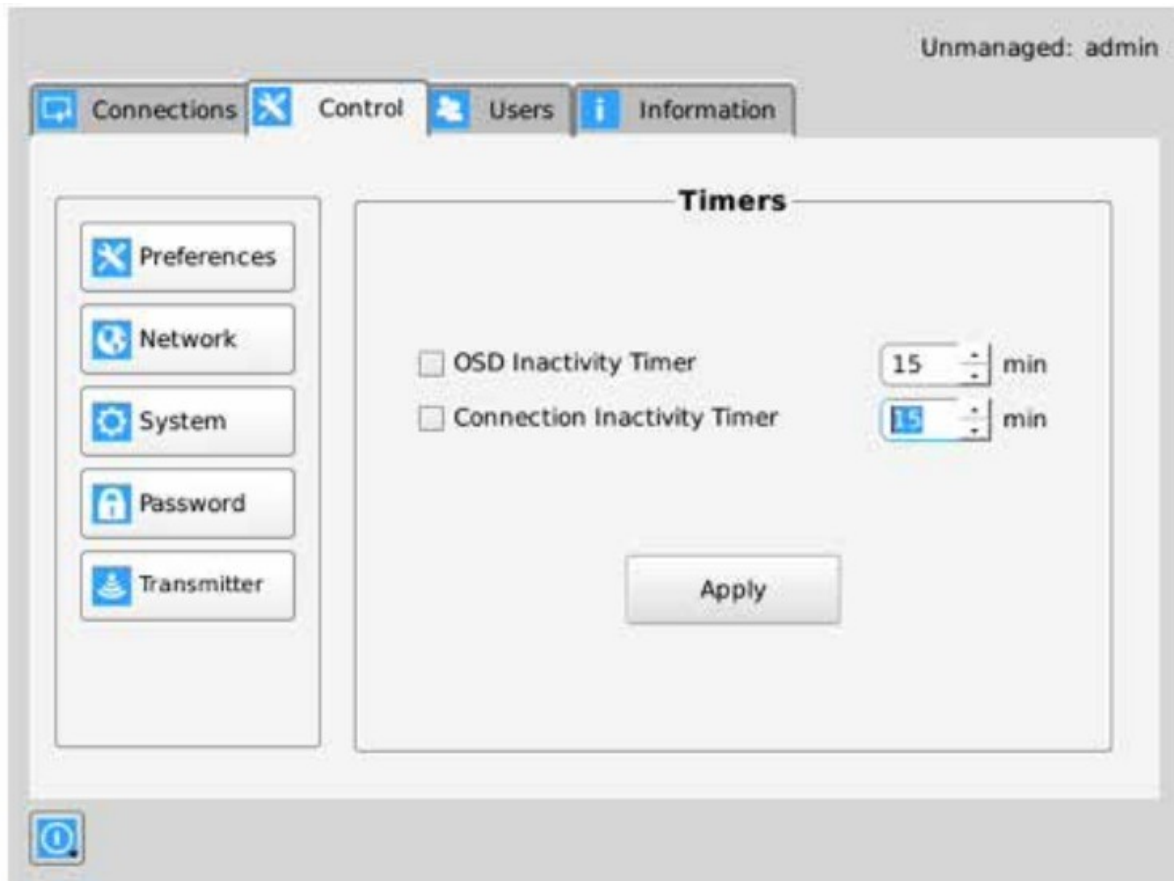
FIGURE 8-11. TIMER SETTINGS

NOTE: There is no screensaver option built into the receivers. If screen burning is a problem, we strongly recommend turning off the displays after use.

Connection Label Settings

The connection label can be enabled to help the user identify what connection is currently being used. This feature can only be enabled per receiver station by a power user or an administrator user. By default the feature is off, and the user can enable it and set
the label to stay for 5 seconds after a connection or stay on screen permanently.

Note: This feature is available on all Emerald receivers with the exception of the EMD2002SE.

The Connection Label is enabled through the Control Tab. The Control Tab's Preferences options are shown in Figure 8-12.
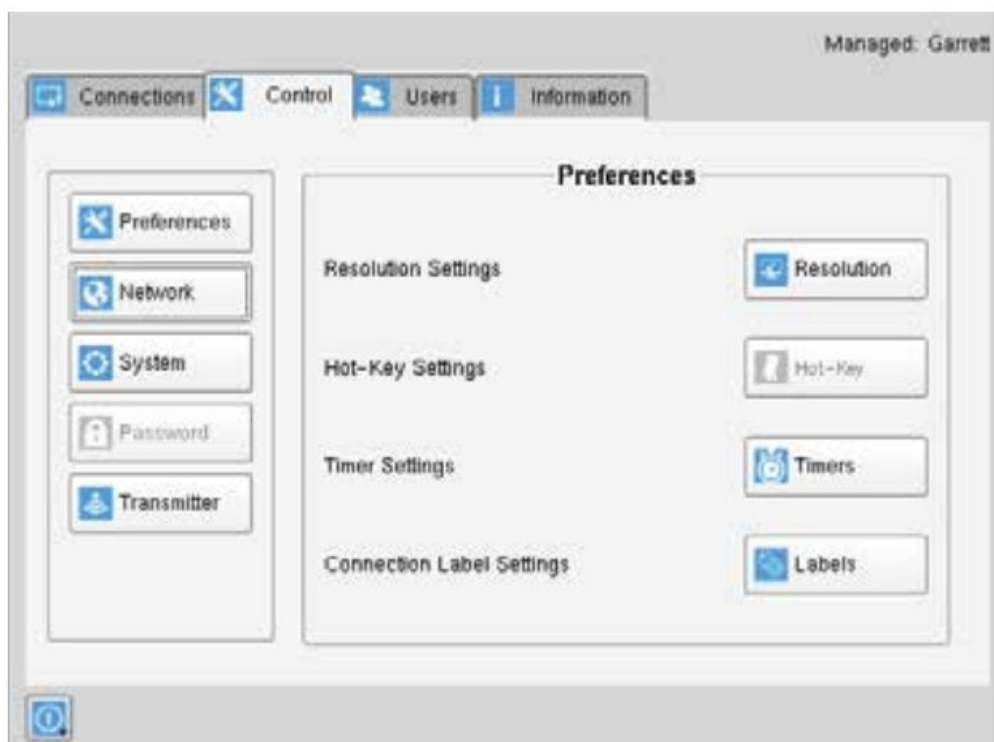
FIGURE 8-12. CONNECTION LABEL SETTINGS OPTION IN PREFERENCES SECTION

The user can toggle the label on or off by using their hotkey and pressing "L". In Figure 8-13, the Connection Label is enabled.
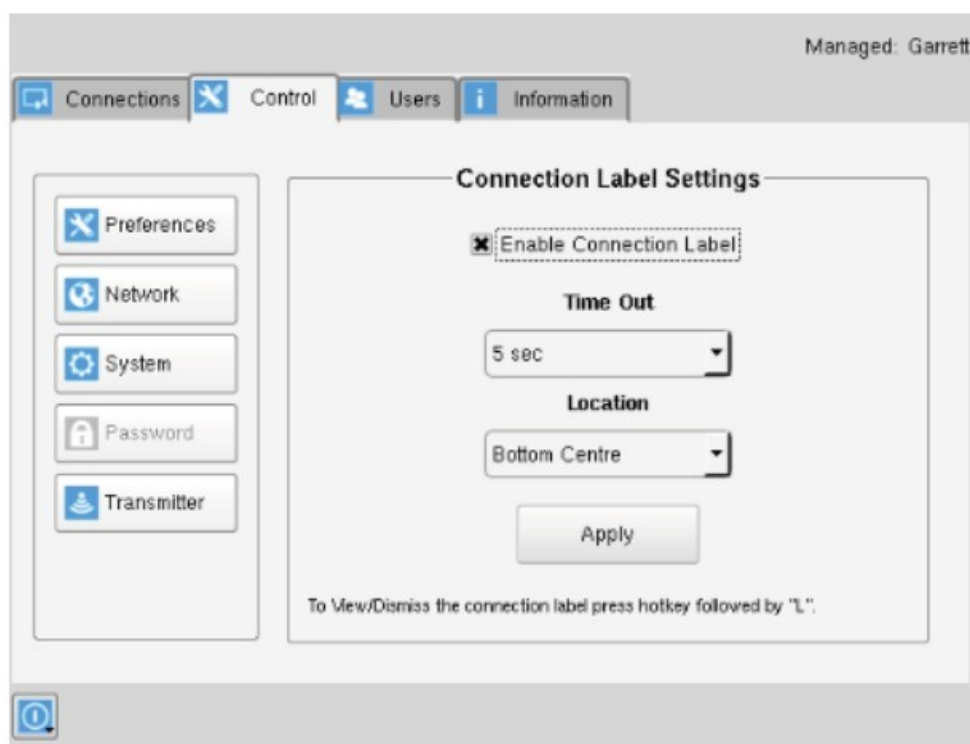

FIGURE 8-13. CONNECTION LABEL OPTION ENABLED

The user can select to always display the connect label or to display it for 5 seconds. In Figure 8-14, a 5 second time out is selected.
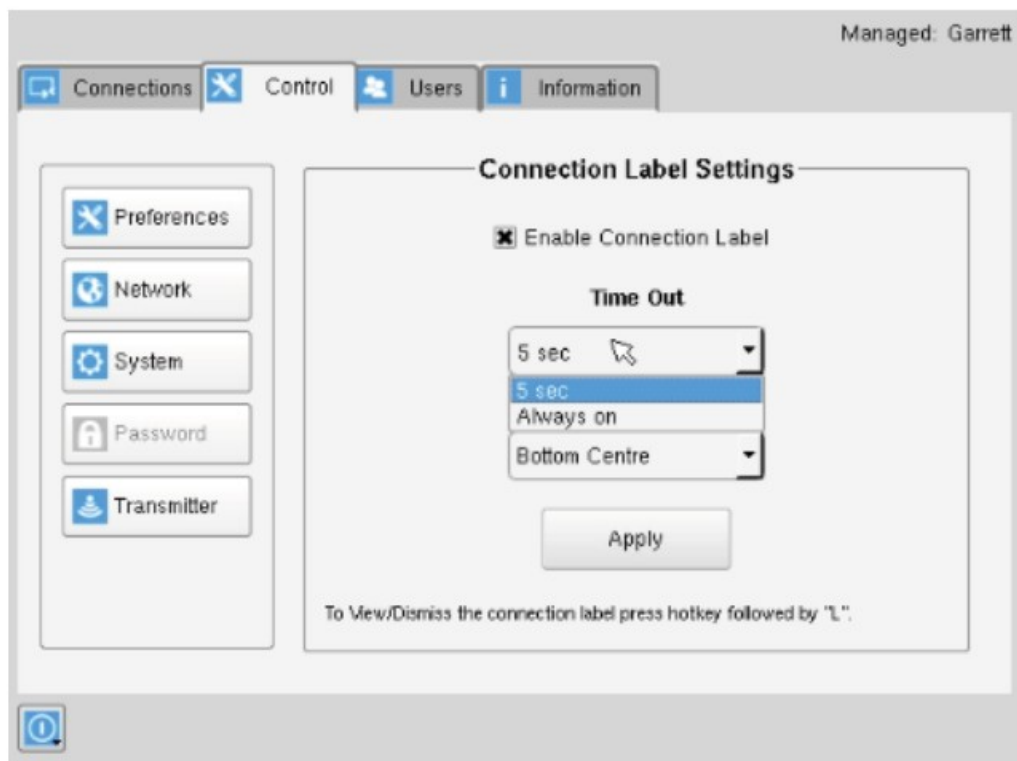
FIGURE 8-14. CONNECTION LABEL TIME OUT OPTIONS

The user can also select where the label will appear on the screen. In Figure 8-15, "Bottom Centre" is selected for the location.
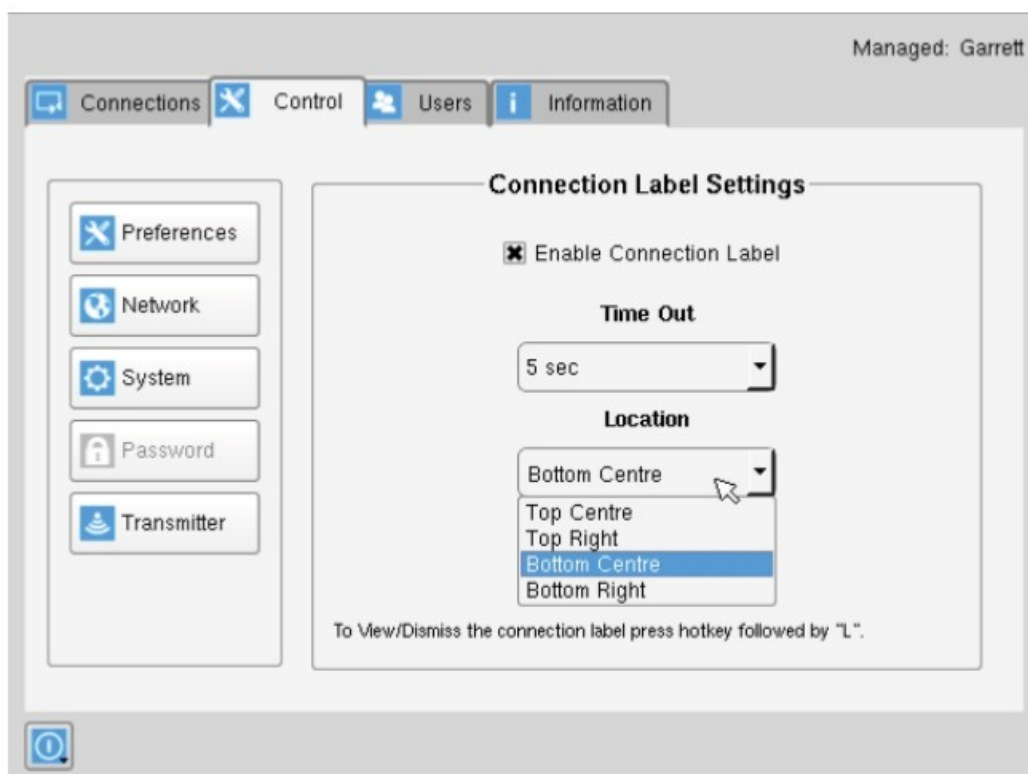
FIGURE 8-15. CONNECTION LABEL LOCATION OPTIONS

Figure 8-16 shows the connection label located in the bottom center of the screen, based upon the location selected in Figure 8-15.

FIGURE 8-16. CONNECTION LABEL SHOWN IN BOTTOM CENTER OF SCREEN

8.6.2 NETWORK

The network screen shown in Figure 8-17 allows an administrator to change the settings for the Emerald Receiver or Manager. The default network setting for the Receiver is a static IP address of 192.168.1.21. It has a Network Mask of 255.255.255.0 and a Gateway 192.168.1.1. If DHCP is selected, the Receiver gets its IP address from the DHCP server. Click the Apply button to confirm any changes to network settings.

NOTE: We strongly recommend using Static IP addresses on the receivers. Also, only IPv4 addressing supported in the current firmware version.
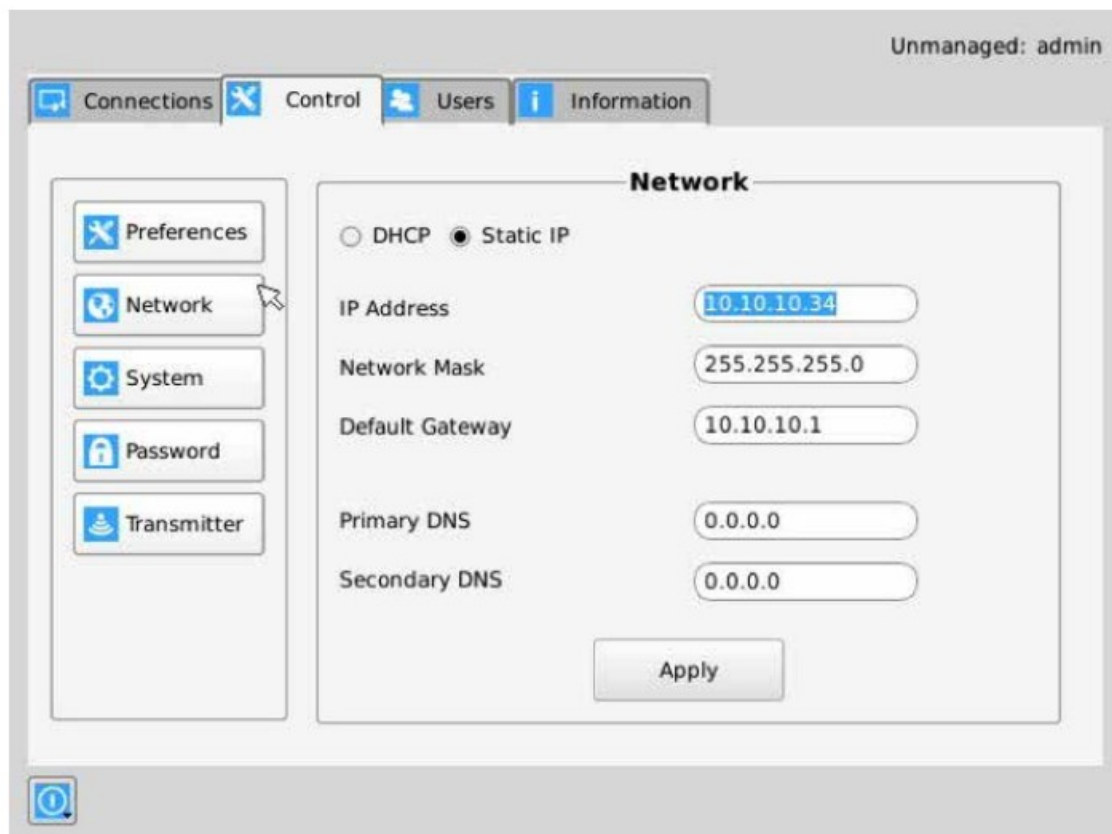
FIGURE 8-17. NETWORK SETTINGS

8.6.3 SYSTEM

The System screen shown in Figure 8-18 allows an administrator to upgrade the firmware in the Emerald Receiver, reset it to factory defaults, import/export the configuration to an external USB drive, and perform a system diagnostic.
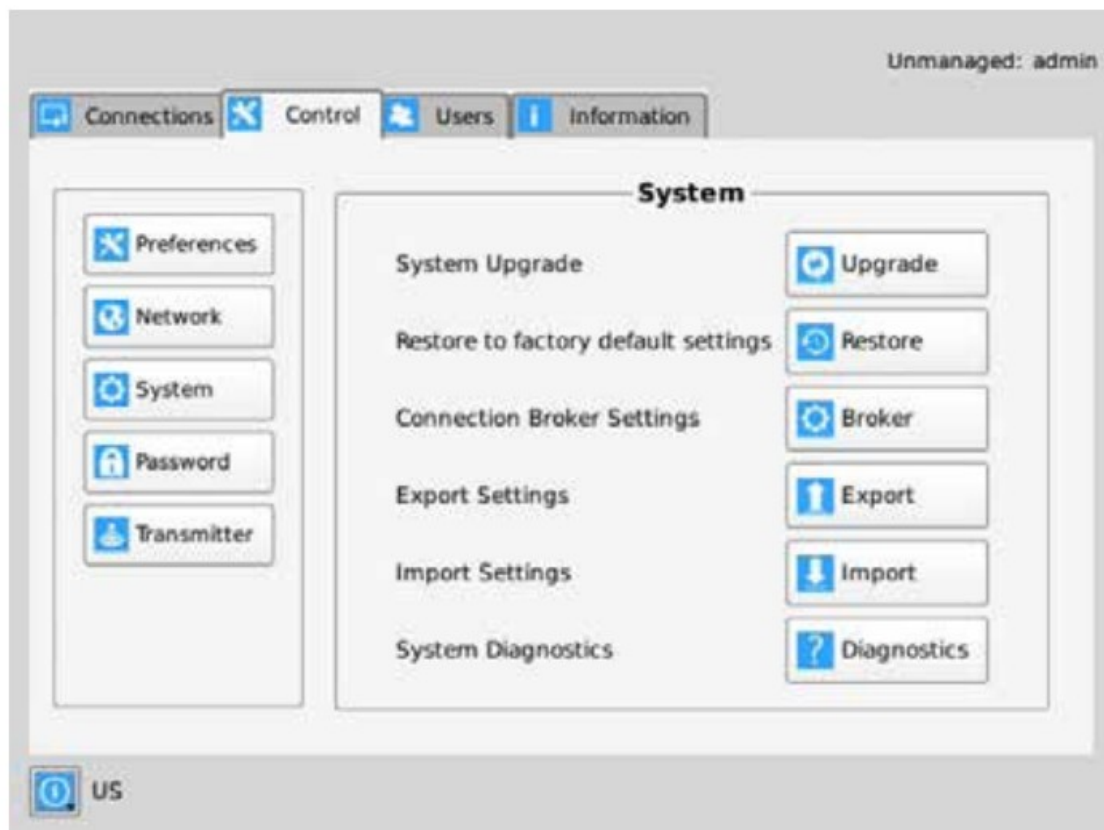
FIGURE 8-18. SYSTEM SCREEN

System Upgrade

The Emerald Receiver can be upgraded using a FAT32-formatted USB Flash drive. Simply take the firmware file and place it in the root directory of the flash drive. When you click the Upgrade button, the "valid" upgrade files on the USB drive are displayed. A valid file has the extension .clu – an example is shown in Figure 8-19. NOTE: There can only be one USB key/pendrive inserted in the RX and that key must contain the upgrade files. If the user has two keys inserted , and the second key has the upgrade files, the system will not locate the required files.

FIGURE 8-19. UPGRADE FILES

Once the administrator has selected the file and clicked Ok, the system checks that the selected file has no errors before upgrading the Emerald Receiver. The configuration of the unit is preserved through the upgrade.

NOTE: Always update the Transmitter first before the Receiver.

Restore Factory Defaults

The administrator can click the Restore button to reset the Receiver back to factory defaults.

System Diagnostics

The diagnostics provides information for Black Box to debug customer encountered issues. When this button is clicked the user is asked to save the diagnostics onto a memory stick in the Receiver unit. This file should be sent back to Black Box for analysis.

There is a similar diagnostic that can be run on a transmitter.

Password

The Password button when clicked allows the current user's password to be changed. This button is only visible to Administrators.

FIGURE 8-20. PASSWORD CHANGE

Transmitter Button

The Transmitter button on the Control Tab allows administrators to change the configuration of an Emerald Transmitter (this button is only visible to administrators). The following options are available when the Transmitter button has been activated:

1. Transmitter Information

2. Transmitter Firmware Upgrade

3. Transmitter restore factory defaults

4. Transmitter reboot

5. Transmitter Preferences

6. Network Settings

7. Discover Transmitter IP address

Configuring a Transmitter

To configure a Transmitter, the IP address must be defined for the target Transmitter. When there is no active IP address defined, the TX Setting window has all the buttons grayed out except for the Apply and Discover buttons. The IP address for the transmitter can be entered into the field at the top of window and click Apply button to activate. If a valid IP address is entered, the Transmitter settings window makes all the options available for the administrator shown in Figure 8-24.

Alternatively the Discover button can be used to find the IP address of a transmitter. First click the Discover button and follow the instructions. Basically once in discovery mode, the Receiver (or Boxilla Manager) can capture the IP address from a Transmitter once it has been power-cycled.

NOTE: The default network setting for the Transmitter is a static IP address of 192.168.1.22. It has a Network Mask of 255.255.255.0 and a Gateway 192.168.1.1.
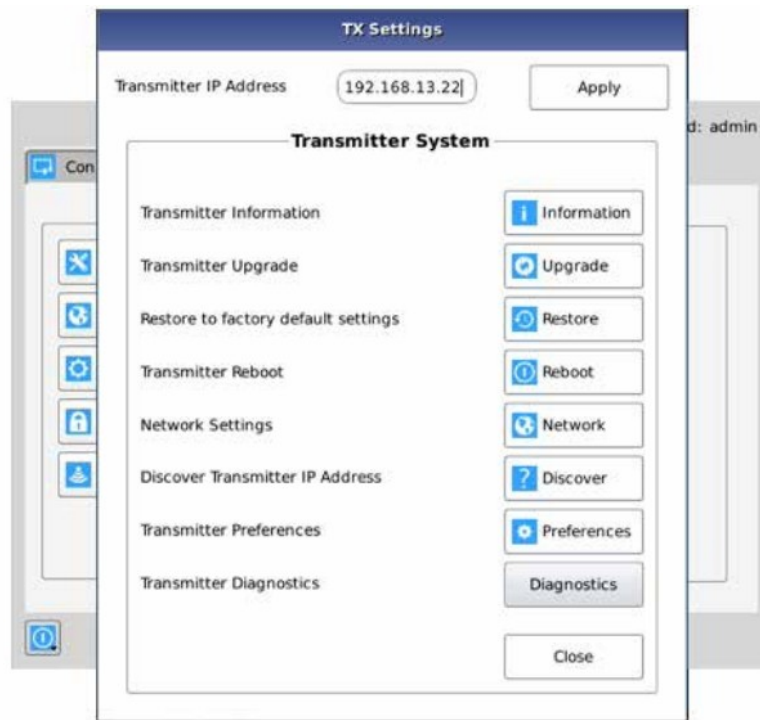
FIGURE 8-21. TRANSMITTER SETTINGS CONFIGURATION WINDOW - ACTIVE IP ADDRESS

If the IP address of the Receiver and Transmitter are not on the same subnet, a router is required to allow them to communicate.

This is true even when the Receiver "discovers" the Transmitter's IP address. One way to avoid this is to change the Receiver address to be on the same subnet as the Transmitter, make the required configuration changes to the Transmitter, and then change
the Receiver back to its required IP address.

Transmitter Information

The Information button provides Transmitter related information such as Device Model, Serial Number, MAC address, and current Firmware Version to the administrator.

If the active IP address is not the address of a valid Emerald Transmitter or this address is unreachable, an error message is returned.

Transmitter Upgrade

The administrator can click the Upgrade button to change the firmware on a Transmitter. The upgrade file is selected from the set of files on an attached USB drive. These files will have the extension .clu . The selected file is checked to be a valid Transmitter
upgrade file before starting the upgrade. The OSD provides a series of screens to walk the user through the process.

The upgrade can take a few minutes to complete and the power to the Transmitter and the Receiver must not be disconnected during the upgrade. During the upgrade process, the Transmitter may reboot.

If the active IP address is not the address of a valid Emerald Transmitter or this address is unreachable, an error message is returned.

Transmitter Restore Factory Defaults

The administrator can click the Restore button to reset the Transmitter back to factory defaults. If the active IP address is not the address of a valid Emerald Transmitter or this address is unreachable, an error message is returned.

Transmitter Reboot

The administrator can click the Reboot button to power-cycle the Transmitter. If the active IP address is not the address of a valid Emerald Transmitter or this address is unreachable, an error message is returned.

Transmitter Preferences

The administrator can click the Transmitter Preferences to change Video Quality Setting or HID Configuration. When the Transmitter Preferences button is clicked the window shown in Figure 8-25 pops up.

FIGURE 8-22. TRANSMITTER PREFERENCES

Transmitter Video Quality Settings

The transmitter uses a progressive compression algorithm with 5 stages to reduce the bandwidth and increase the frame rate while sacrificing quality. At stage 5, which uses the best compression, you may achieve a higher frame rate and lower bandwidth, but the
video output may show blocks of pixilation or screen artifacts as those parts of the screen are not being repainted because they didn't update. At the highest setting of stage 1, which is best quality, you will not see these screen artifacts as much, but you will be using a higher bandwidth with reduced frames potentially based upon your application. Frames are not always reduced; it just depends on the source and network.

Options:

1. Best Quality – lossless compression, pixel-perfect mode of operation. Generally needs dedicated network to ensure no frame loss.

2. Visually Lossless Compression – high quality visual image. Some compression on stream to reduce bandwidth to allow operation on standard corporate networks. Compression does not vary based on available network bandwidth, so may lead to some dropped frames during network congestion periods.

3. Optimized Quality (default) – system tuned to maintain visually lossless compression while increasing compression level during periods of network congestion to reduce frame loss. Balances visual quality with frame loss in periods of congestion (i.e. attempts to reduce/eliminate frame loss).

4. Optimized Bandwidth – system tuned to maintain visually lossless compression but increased levels of compression level during periods of network congestion to reduce frame loss. Optimized towards lower bandwidth during congestion periods compared to level 3.

5. Lowest Bandwidth – high level of compression to minimize average network bandwidth. No dynamic change to compression levels – always seeking to reduce bandwidth.

   If the active IP address is not the address of a valid Emerald Transmitter or this address is unreachable, an error message is returned.

Video Source Optimization

This is a progressive algorithm which helps to reduce unwanted noise coming from a GPU or Video Converters. The transmitter can be configured to handle different applications by changing the way it handles the video signal if it natively has embedded noise
(i.e. from a VGA to DVI converter). You can choose to use "DVI optimized", "VGA high performance", "VGA optimized", or "VGA low bandwidth" settings. You may change these options to get the best performance out of the transmitter. When the option is "off,"

no dithering/noise techniques are enabled. "DVI optimized", which is the least aggressive technique, uses a digital anti-dithering/ anti-noise technique to reduce the extra noise which will allow the Transmitter to operate at a normal pace and have better network

performance. "High performance" is best used when there is an analog to digital video converter between the GPU and Transmitter. It uses a low level technique. "VGA optimized" is best used when there is an analog to digital video converter between the GPU and Transmitter. It uses a medium level technique. "VGA low bandwidth" is best used when there is an analog to digital video converter between the GPU and Transmitter. It uses a high level technique. This would be considered the most aggressive technique to handle video dithering/noise.

NOTE: VGA Optimization is only supported on Single Head Transmitters; the Dual Head Transmitters and Emerald4K do not support it.The Dual Head Emerald SE / PE may not be the best option for sources that use Video Dithering technology.

HID Configurations

This setting applies to all transmitters. It changes the USB communication between the Emerald transmitter and the target computer/device. "Default" will pass all available signals including audio, USB-R, USB HID as well as keyboard and mouse connections. "Basic" will pass USB HID only. It provides compatibility with DKM, DCX and older servers that require a keyboard and mouse HID only. Basic HID is also required to access any computer's BIOS menus. "MAC" supports MacOS users. "Absolute" will be used with Windows® /Linux when RemoteApp or Freedom are being used in the setup. For normal usage, where mouse is directly connected to Receiver, then the "Default" or "Basic" options should be used. "Absolute MAC" will be used with MacOS when used with Remote App or Freedom. "Absolute Basic" allows you to set the mouse to absolute while disabling the emulated audio device.

This setting will typically be used where you wish to use the remote app and integrate the Emerald system with DKM and other systems that may be disrupted with audio enabled.
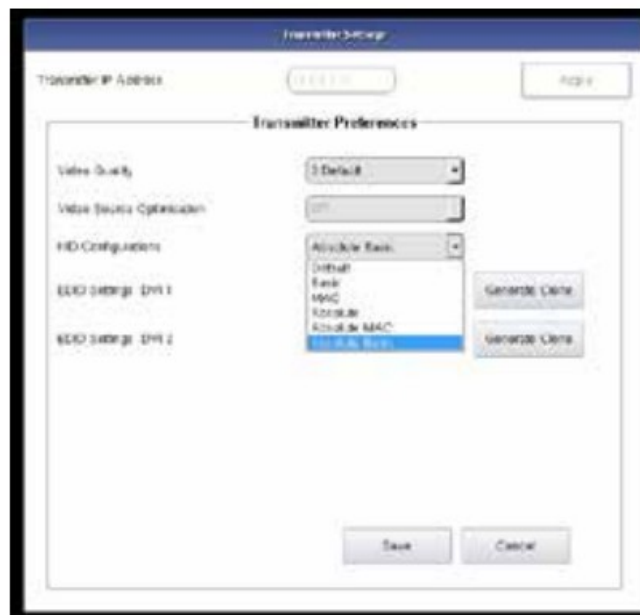
OSD option:

FIGURE 8-23. HID CONFIGURATION OSD OPTIONS

EDID Settings

The transmitter can support native EDID options such as "1920×1080", "1920×1200", "1680×1050", "1280×1024", "1024×768", or you can choose to use the remote monitor EDID by clicking on the "Generate Clone" button which will copy the desired video resolution to display at the receiver. The new EDID option will be added to the drop-down list, and it must be selected and saved before it is applied. This information is then shared with the computers GPU so it sends the correct resolution and refresh rate. The Clone EDID 2 option applies to all dual-head transmitters and allows the administrator to choose the desired video resolution to display at the receiver's second output.

NOTE: The computer may need to be restarted in order for the settings to work. If you find that changing the EDID settings makes the remote monitor blank out, you may need to select a different option to make it work. Once the Generate Clone EDID process is finished, it needs to be selected in the drop down list and is not automatically applied until then.

Transmitter Network Settings
The administrator can click the Network Settings button to edit the Transmitter Network Settings.
To change the IP address settings for a Transmitter, the administrator can enter the new IP address, subnet mask, and gateway, and then click on the Apply button.

FIGURE 8-24. TRANSMITTER NETWORK SETTINGS WINDOW

If the new IP address for the Emerald Transmitter is on a different subnet than the Receiver, the Receiver or Manager will not be able to communicate with it without going through a router. This is the case even on a point-to-point link between devices.
If the entered IP address is not the address of a valid Emerald Transmitter or this address is unreachable, an error message is returned.
Discover Transmitter IP Address This requires the Transmitter to be connected to the Receiver on a point-to-point link or be the only Transmitter on the attached network. in this case, the administrator can click on the Discover button and follow the wizard to discover the IP address of the attached Transmitter. This is required in the case when an administrator does not know the IP address of the Transmitter.
Transmitter Diagnostics
The Transmitter provides diagnostics information for Black Box to debug customer encountered issues. When this button is clicked the user is asked to save the diagnostics onto a memory stick in the Receiver unit. Send this file back to Black Box for analysis.

8.7 MANAGING USERS
Users are defined in the Emerald system to provide rights to manage the system, rights to connect to different target devices and set parameters for connections. There are three types of users that can be created in an Emerald system.

1. Administrator – users of the class have full rights to configure the system. They can create/modify/delete new

    users and connections, change network settings, etc.

2. Power User – users of this class can modify resolutions for connections to virtual desktops and change his/her

    local password.

3. Standard Users – users of this class can only select from a list of pre-defined connections to access and view

    system information. They cannot change any configuration settings.

The Emerald Receiver has one default user – admin, which is a member of the administrator group. This user is defined by default and cannot be deleted. An Emerald Receiver or Manager can have a maximum of 32 users defined, unless in a manager domain with an "upgrade" license installed. With the upgrade license installed, unlimited users can be defined.

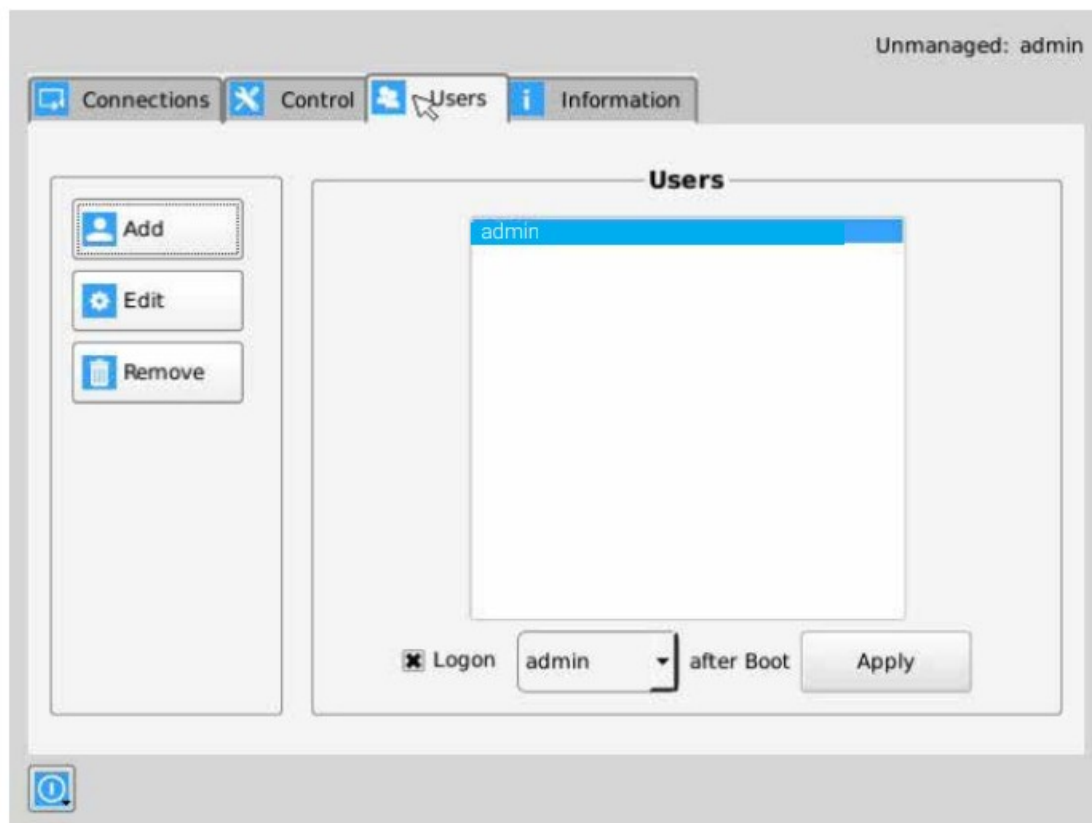To manage users, an administrator selects the Users tab (this Tab is only visible to Administrator class users).

FIGURE 8-25. USER SCREENS

8.7.1 ADD A USER
To add a user, click the add button. This causes the New-User window to be displayed.
8.7.2 AUTO LOG ON
When the Log-on button is selected and a user is chosen, this user will be automatically logged on after power is applied to unit or after a reboot.

FIGURE 8-26. NEW USER WINDOW

When adding a new user, the following fields are used to define the user:

- User Name: This is a unique name that uses 1–32 characters. The username can be any valid username for a Microsoft O/S.
  This means the username MAY NOT contain " "/ \ [ ] : ; | = , + * ? < > `'.

- Password: This field can be a minimum of 0 characters (i.e. blank) and a maximum of 32 characters. The password can be any valid password for a Microsoft O/S. The user password MAY contain the following special characters , ~ : ! @ # $ % ^ & ' { } which means the password cannot contain " "/ \ [ ] : ; | = , + * ? < > `'

- Confirm Password: This field must match the Password field. If there is a mismatch, a message is presented to the user in a pop-up screen.

- Privilege: This field, which is a drop-down list, defines the type of user the new user will be—Administrator or User.

- Selected Connections: The new user must be allocated Connections that he/she can access. These are selected from the Available Connections window by the user selecting a set of connections (click on the connection in the Available Connection window and then click the "Add" button). This causes the selected connections to be "added" to a user's selected connection window.

- Connect to at login: This tick box defines whether the Emerald Receiver or Manager attempts to connect immediately to the selected connection after a logon by the user. This automatic connection only occurs after a logon. If a user exits the connection, the connection tab is displayed to the user for selection of a connection. This Connect to at Login is only saved when the Save button is clicked. If not clicked and another tab is selected, the changes are ignored. If not ticked, no automatic connection is made on log-in.

Once the new user fields have been filled out, the Save button must be clicked to create the new user. Clicking the

Save button causes the validation of the new username checking that it is unique and that the two password entries match. If this validation

fails, a pop-up window displays the reason for the failure – and the new user is not created. After dismissing the pop-up window, the user can fix the error and click Save again.

The Cancel button should be clicked if the new user is not to be created.

8.7.3 EDIT A USER

To edit a user, click on the Edit button. This causes the Edit-User window (shown in Figure 8-30) to be displayed.

FIGURE 8-27. EDIT USER WINDOW

This window allows the user privilege type, the permitted connections available, the password, and the auto-connect option to be changed.

The default "admin" account gets access to all connections; this list cannot be modified. Other administrator-type users can have their connection list modified.
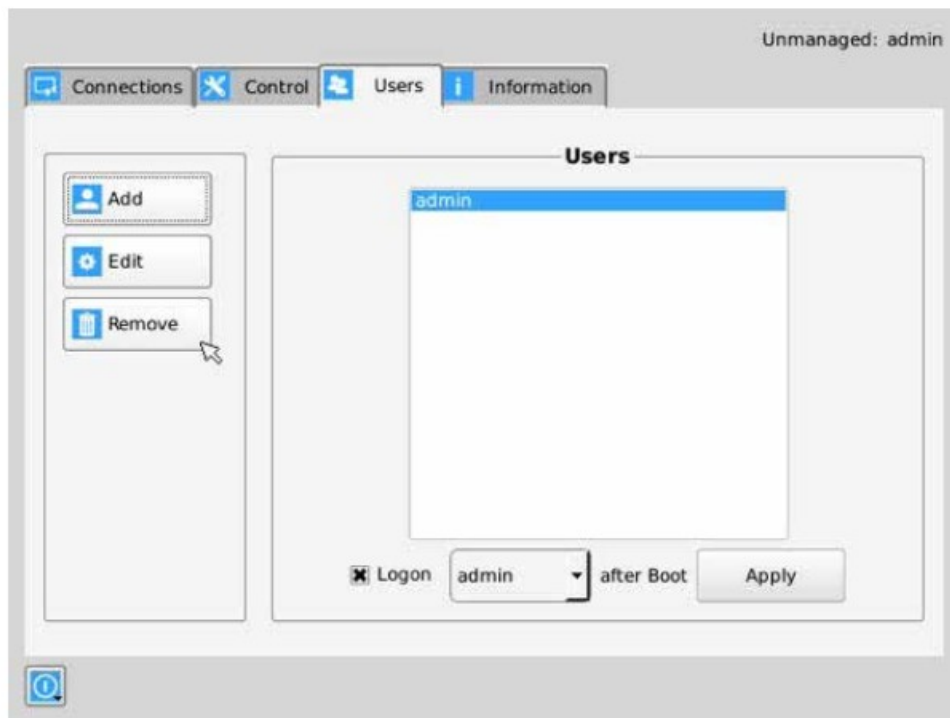
Once the changes have been made for a user, they only become active once the Save button has been clicked. The changes can be abandoned by clicking the Cancel button.

8.7.4 REMOVE A USER

To remove a user, highlight the user's name and press "Remove."

FIGURE 8-28. REMOVE USER

When the Remove button is clicked, a pop-up window is displayed to prompt confirmation that this user is to be deleted. Click the Yes button to remove the user. Clicking the No button causes this action to be aborted and the user is not removed.

NOTE: There must always be a user of the name admin in the Emerald system so the system can always be administrated. When attempting to remove the user, the system checks if the username is admin before it will allow the user to be removed.

8.8 LACP

NOTE: LACP requires the Boxilla manager.

To find out more information about the status of the Emerald network interface(s), the Boxilla administrator can navigate to Devices>>Settings, and click on the "LACP info" panel. This will give a summary of the status of each Emerald NIC interface. Some
of the information that can be found on this page is:
Active: Is the Ethernet port currently active

- Status: If the link is up or down
- Link Speed: The negotiated speed of the NIC
- Media: The type of network cable being used
- LACP: If the data is using LACP traffic

The Emerald LACP features do not support aggregation of the network ports to support two active ports. Only one network port is active at the same time, and both network ports will use the same IP settings. This protocol enables a network device to automatically bundle links by sending LACP packets to a directly-connected device that also uses LACP.

APPENDIX A: EMERALD VIDEO RESOLUTIONS SUPPORTED

Emerald supports the resolutions listed below:

- 640 x 480 @ 60 Hz
- 640 x 480 @ 75 Hz

- 800 x 600 @ 60 Hz
- 800 x 600 @ 70 Hz
- 800 x 600 @ 72 Hz
- 800 x 600 @ 75 Hz
- 800 x 600 @ 85 Hz
- 1024 x 768 @ 60 Hz
- 1024 x 768 @ 75 Hz
- 1024 x 768 @ 85 Hz
- 1280 x 800 @ 60 Hz
- 1280 x 960 @ 60 Hz
- 1280 x 960 @ 85 Hz
- 1280 x 1024 @ 60 Hz
- 1280 x 1024 @ 75 Hz
- 1280 x 1024 @ 85 Hz
- 1366 x 768 @ 60 Hz
- 1400 x 1050 @ 60 Hz
- 1440 x 900 @ 60 Hz
- 1600 x 900 @ 60 Hz
- 1680 x 1050 @ 60 Hz
- 1600 x 1200 @ 60 Hz
- 1680 x 1050 @ 60 Hz
- 1280 x 720 @ 60 Hz
- 1920 x 1080 @ 60Hz
- 1920 x 1200 @ 60 Hz

Emerald also will pass all the above resolutions at refresh frequencies from 15 Hz to 60 Hz. Those with non-defined VESA resolutions will be displayed at 60 Hz even if the incoming resolution is not 60 Hz.

APPENDIX B. CONFIGURING WINDOWS 7 VIRTUAL MACHINES

A few properties must be configured on a target Windows Virtual Machine for Emerald to connect with it.
On the Windows Virtual Machine click on the Start button and launch a command window. Then launch group policy editor – gpedit.msc.
Start >> Run >> "cmd" >> "gpedit.msc"
Once the Local group Policy editor is open follow this path:
Computer Configuration >> Administrative Templates >> Windows Components >> Remote Desktop Services >> Remote Desktop Session Host >> Remote Session Environment
Ensure the following three policies are set as follows:

1. Optimize visual experience when using RemoteFX.
   - For this policy set both the "Screen Capture Rate" and "Screen Image Quality" to Highest.
2. Configure RemoteFX.
3. • Set this policy to enabled
4. Limit maximum color depth.
   - Set this policy to "Client Compatible."

Once the above policies have been applied, reboot the Virtual Machine. It is now enabled for Emerald connections.

There are different settings to optimize the performance of Emerald with different Windows operating systems. These are defined in the application note – Emerald Group Policies for Optimal Performance for Windows Targets. It is not possible to connect to a transmitter from a computer/laptop running RDP. A receiver is always required.

APPENDIX C. EMERALD NETWORK PROTOCOLS OVERVIEW

Emerald uses standard IP protocols for communication between Receivers and Transmitters. Port 3389 is used for unicast communications.

For management purposes some other ports are used. The Black Box Discovery protocol used UDP Multicast Group 224.0.1.249 (port 39150). This is sent by the Boxilla Manager to discover Emerald devices in the network. The router must allow UDP Multicast forwarding to allow devices on subnet different to where Manager is located to be discovered.

Emerald devices respond to the discovery multicast by sending a UDP unicast back to Manager IP address on the same port (Por t 39150).

Once an Emerald device is part of the managed domain, the Manager periodically "audits" the device to determine information such as if the device on-line, who is logged into devices, device statistics, etc. These audit requests and responses are unicast UDP to specific IP addresses (responses are sent back to Manager's IP address) on port 39150.

On power-up, a Transmitter sends out a "here I am" multicast message on multicast group 225.0.0.37 on port 12345.

As part of management configuration, the Manager may communicate to a specific device on port 22 (TCP unicast communications).

Emerald can operate across multiple VLANs or subnets. Basic IP networking rules need to be followed; there should be a router in the network to enable the various devices on different subnets to communicate with each other.

To allow Black Box's Emerald discovery protocol to operate, Multicast routing should be enabled. Black Box's Emerald "discovery" protocol is not required for Emerald systems to operate but it is recommended to enable an Emerald Manager to search for devices across the network. If the Emerald SE discovery protocol is not enabled, i.e. router does not have multicast routing enabled, the administrator will have to manually add in all devices not on its subnet, i.e. add in each device individually by its IP address.

APPENDIX D. TROUBLESHOOTING

This page covers some basic notes & troubleshooting when using the Emerald.

Operating Modes: Connecting to an Emerald transmitter from an RDP client that is from a laptop / computer is not possible; you must use an Emerald receiver for this. An Emerald receiver can connect to an Emerald transmitter and RDP server.

TABLE D-1. OPERATING MODES CONFIGURATIONS

USER SIDE	COMPUTER SIDE	OPERATION
Laptop/Computer w/RDP Client	Emerald SE or PE Transmitter or Emerald ZeroU T ransmitter	This is not supported and will n ot work
Emerald SE Receiver	Emerald SE or PE Transmitter or Emerald ZeroU T ransmitter	Fully supported
Emerald SE Receiver	RDP Server on VM or OS	Fully supported

Sluggish Mouse: When using the Emerald, you may find that the mouse is not being very responsive, or has a noticeable delay.

This can typically occur if the video card is using Dithering technology. You can contact Black Box to get a small utility to disable video card dithering on AMD graphics cards or use Video Optimization, which is set on the

Transmitter -> Preferences page for Single Head Transmitters only.
Error Codes: The following error codes expanded.

1. GENERAL_ERROR Connection protocol failure. Are units at the correct and compatible software version?
2. INIT_FAIL Can't start protocol. Is the receiver at the correct software version?
3. GET_SOCKET Protocol Start Failure Are units at the correct and compatible software version?
4. CREATE_SESSION_FAIL Can't create session. Is transmitter connected and powered on?
5. CONNECT_FAIL Can't create session. "Is transmitter connected and powered on? Is port 22 open between units."
6. TX_CHECK_FAIL Target device is not a transmitter. Is transmitter IP address correct?
7. VER_CHECK_FAIL Can't read device Version. Is transmitter connected and powered on?
8. LED_FLASH_FAIL Start LED Flash command failed on remote device Is transmitter connected and powered on?
9. FILE_SEND_FAIL Can't send upgrade file to transmitter. Is transmitter connected and powered on?
10. PERMISSION_CHANGE_FAIL Update to change settings on Transmitter Is transmitter connected and powered on?
11. EXTRACT_UPGRADE_FAIL Failed to extract upgrade file. Is upgrade file correct or damaged?
12. RUN_UPGRADE_FAIL Upgrade failed Is upgrade file correct or damaged?
13. REBOOT_FAIL Failed to reboot remote device unit. Is remote device connected and powered on?
14. FILE_SEARCH_FAIL Upgrade file format failed Is upgrade file correct or damaged?
15. LISTEN_ERROR Connection protocol failure. "Are units at the correct and compatible software version? Is transmitter connected and powered on?"
16. SOCKET_OPTION_ERROR Connection protocol failure. "Are units at the correct and compatible software version?
Is transmitter connected and powered on?"
17. SOCKET_BIND_ERROR Connection protocol failure. "Are units at the correct and compatible software version?
Is transmitter connected and powered on?"
18. RECVFROM_ERROR Connection protocol failure. "Are units at the correct and compatible software version? Is transmitter connected and powered on?"
19. GET_INFO_FAIL Failed to retrieve Info tab from remote device "Are units at the correct and compatible software version?
Is transmitter connected and powered on?"
20. COMPATIBILITY_FAIL Upgrade file is incompatible with version on unit Please check release notes for correct version and compatibility information.
21. BRAND_CHECK_FAIL This is not a correct upgrade file for Emerald Please check release notes for correct version and compatibility information.
22. CLASS_CHECK_FAIL Can't upgrade Transmitter with Receiver file or visa versa. Please check release notes for correct version and compatibility information.
23. PACKAGE_CHECK_FAIL Incorrect upgrade file for this model Please check release notes for correct version and compatibility information.
24. NO_UPGRADE_REQUIRED No upgrade required. This version of code is already on thedevice. No upgrade required.

APPENDIX E. REGULATORY INFORMATION

E.1 FCC STATEMENT
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
This Class A digital apparatus complies with Canadian ICES-003.

APPENDIX F. DISCLAIMER/TRADEMARKS

F.1 DISCLAIMER
Black Box Network Services shall not be liable for damages of any kind, including, but not limited to, punitive, consequential or cost of cover damages, resulting from any errors in the product information or specifications set forth in this document and Black Box
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NEED HELP?
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TECHNICAL SUPPORT
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EN_KVM_MANUAL_EMD2000SE_USER_WITH EMD 2000
PE-DP-T -DP-R -DP-T AND DP-R REV6.3.11_2312.PDF

Documents / Resources

Black Box EMD200DP-T Emerald Zero U DP KVM-over-IP Transmitter [pdf] User Manual
EMD200DP-T Emerald Zero U DP KVM-over-IP Transmitter, EMD200DP-T, Emerald Zero U DP KVM-over-IP Transmitter, Zero U DP KVM-over-IP Transmitter, KVM-over-IP Transmitter, IP Tran smitter, Transmitter

References

- ◇ **Global IT Products & Network Solutions Provider | Black Box**
- ■ **Microsoft – Cloud, Computers, Apps & Gaming**

- **User Manual**