USER MANUAL

EMERALD SE KVM OVER IP TECHNOLOGY

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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-T, EMD2000SE-R, EMD2002SE-T, EMD2002SE-R: (1) Power LED button (deactivated, not used); EMD200DV-T: (1) Power LED (green); NOTE: SE units automatically power on when plugged in; must be powered off at the power source. 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
Maximum Distance from CPU to Transmitter	EMD2000SE-T, EMD2002SE-T: 16 ft. (5 m), DVI-D and USB limitations; EMD200DV-T: 12" (30.48 cm) via connected cable harness
Maximum Distance between Transmitter 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, Server 2003, Server 2008, Server 2012, LInux®, Solaris, Mac OS
Connectors	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; 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; 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; 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; 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; NOTE: The ZeroU Transmitter can be powered via (2) USB Type A connectors or via an optional DC power adapter
Dimensions	EMD2000SE-T, EMD2000SE-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); EMD2002SE-R: 1.15" H x 6.2" W x 4.2" D (2.92 x 15.75 x 10.67 cm); EMD200DV-T: 0.98" H x 2.78" W x 6.12" D (2.5 x 7.07 x 15.55 cm)
Weight	EMD2000SE-T, EMD2000SE-R: 1.18 lbs (0.54 kg); EMD2002SE-T: 1.47 lb. (0.67 kg); EMD2002SE-R: 1.36 lb. (0.62 kg) EMD200DV-T: 0.474 lb. (0.215 kg)

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TABLE 1-1 (CONTINUED). SPECIFICATIONS

SPECIFICATION	DESCRIPTION
Operation	
Default IP Address	EMD2000SE-T, EMD2002SE-T, EMD200DV-T: 192.168.1.22; EMD2000SE-R, 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	Unit: 6.5 watts with keyboard and mouse attached; Power supply is 20 W to support USB based powered devices
Heat Dissipation	(5 VDC x 4 amps) x 3.41 = 68.2 BTU/hour maximum (Voltage x Nominal Current) x 3.41 = BTU/hr
Output Connector	2.5-mm barrel
Input Connector	IEC-320, C8
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) US Power Cord
- (4) rubber feet

EMD2002SE-T includes:
- (1) Emerald SE Transmitter, Dual-Head
- (1) 5 VDC Power Supply
- (1) US Power Cord
- (4) rubber feet

EMD2000SE-R includes:
- (1) Emerald SE Receiver, Single-Head
- (1) 5 VDC Power Supply
- (1) US Power Cord
- (4) rubber feet

EMD2002SE-R includes:
- (1) Emerald SE Receiver, Dual-Head
- (1) 5 VDC Power Supply
- (1) US Power Cord
- (4) rubber feet

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CHAPTER 1: SPECIFICATIONS

EMD2000SE-T-K includes:

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

EMD2000SE-K includes:

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

EMD200DV-T includes:

- (1) EMD200DV-T Transmitter

EMD2002SE-T-K includes:

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

EMD2002SE-K includes:

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

1.3 LICENSING

There are 2 options for managing Emerald SE Transmitters and Receivers:

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

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

Other available licenses for Boxilla are listed below:

- 50 Users, Devices or Connections (BXAMGR-50)
- 100 Users, Devices or Connections (BXAMGR-100)
- 200 Users, Devices or Connections (BXAMGR-200)
- 300 Users, Devices or Connections (BXAMGR-300)
- Unlimited Users, Devices or Connections (BXAMGR-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 Unlimited Users, Devices or Connections (BXAMGR-LIC-ULT)

The Emerald SE 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 SE 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 SE 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 Transmitter unit or Emerald ZeroU DVI Transmitter unit physically connected to provide communication over the TCP/IP network. The performance of Emerald SE 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 SE system.

NOTE: Some USB 2.0 devices have been found to be incompatible. Please report these devices to Black Box.

NOTE: References to the Emerald SE system in this document refer to both Receivers (EMD2000SE-R, EMD2002SE-R) and Transmitters (EMD2000SE-T, EMD2002SE-T, EMD200DV-T). The Emerald ZeroU DVI Transmitter (EMD200DV-T) can be used in place of the SE Transmitter where rack space is limited.

FIGURE 2-1. EMERALD SE EXAMPLE—INCLUDING PHYSICAL AND VIRTUAL DESKTOPS

2.1 EMERALD SE SYSTEM FEATURES

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

◆ Pixel-Perfect Video Quality: The Emerald SE 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. Emerald SE can support a 1080p HD movie in <40 Mbps.

◆ Uses M/C 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 SE 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.

CHAPTER 2: OVERVIEW

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- High Reliability and Highly Secure: The Emerald SE system minimizes maintenance for administrators. The intuitive On-Screen-Display 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 SE devices are encrypted using 128-bit SSL. Password protection is also provided to control access to all administration functions.

- Environmentally Optimized: The Emerald SE 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 SE 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 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 SE DEVICES

The Emerald SE family is composed of two Receivers, three Transmitters, and a Boxilla Managers.

TABLE 2-1. EMERALD MODELS

RECEIVER	NUMBER OF VIDEO HEADS	USB PORTS	SERIAL	AUDIO	DVI CPU CABLE	USB CPU CABLE
EMD2000SE-R	(1) DVI	(4) USB 2.0 Type A	Yes	Yes	Not applicable	Not applicable
EMD2002SE-R	(2) DVI	(4) USB 2.0 Type A	No	Yes	Not applicable	Not applicable
TRANSMITTER	NUMBER OF VIDEO HEADS	USB PORTS	SERIAL	AUDIO	DVI CPU CABLE	USB CPU CABLE
EMD2000SE-T	(1) DVI	(1) USB 2.0 Type B	Yes	Yes	Not included	Not included
EMD2002SE-T	(2) DVI	(1) USB 2.0 Type B	No	Yes	Not included	Not included
EMD200DV-T	(1) DVI	(1) USB 2.0 Type A, (1) USB 2.0 Type A for power only	No	Speakers only	Not included	Not included
MANAGER	NUMBER OF VIDEO HEADS	USB PORTS	SERIAL	AUDIO	DVI CPU CABLE	USB CPU CABLE
BXAMGR	(1) DVI	(4) USB 2.0 Type A	Yes	Yes	Not applicable	Not applicable

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

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2.2.1 VIDEO

The Emerald SE 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. One DVI-I connector is provided on the Boxilla Manager. See Appendix 1 - Emerald SE Video Resolutions Supported for the list of resolutions currently supported by Emerald SE. VGA or Analog video can be supported by using the KVGA-DVID VGA to DVI-D converter.

2.2.2 AUDIO

The Emerald SE 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 SE Receiver. The Emerald SE 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 SE 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 SE 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).

2.2.3 SUPPORT FOR KEYBOARDS, MICE AND USB DEVICES

USB keyboards and mice are fully supported by the Emerald SE 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.

Support for non-keyboard and mice devices is provided on an Emerald SE Receiver using USB re-direction. This capability can be enabled or disabled by the administrator. In an Emerald SE 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.

NOTE: A hub can be attached externally to an Emerald SE 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 SE 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 SE 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 SE 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.

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2.2.5 FIRMWARE UPGRADE

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

2.3 APPLICATION EXAMPLES

The Emerald SE 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 SE 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 SE 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 SE supports latency of <20 ms.

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.

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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 SE's intuitive On-Screen-Display (OSD). 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 SE SWITCHING EXAMPLE

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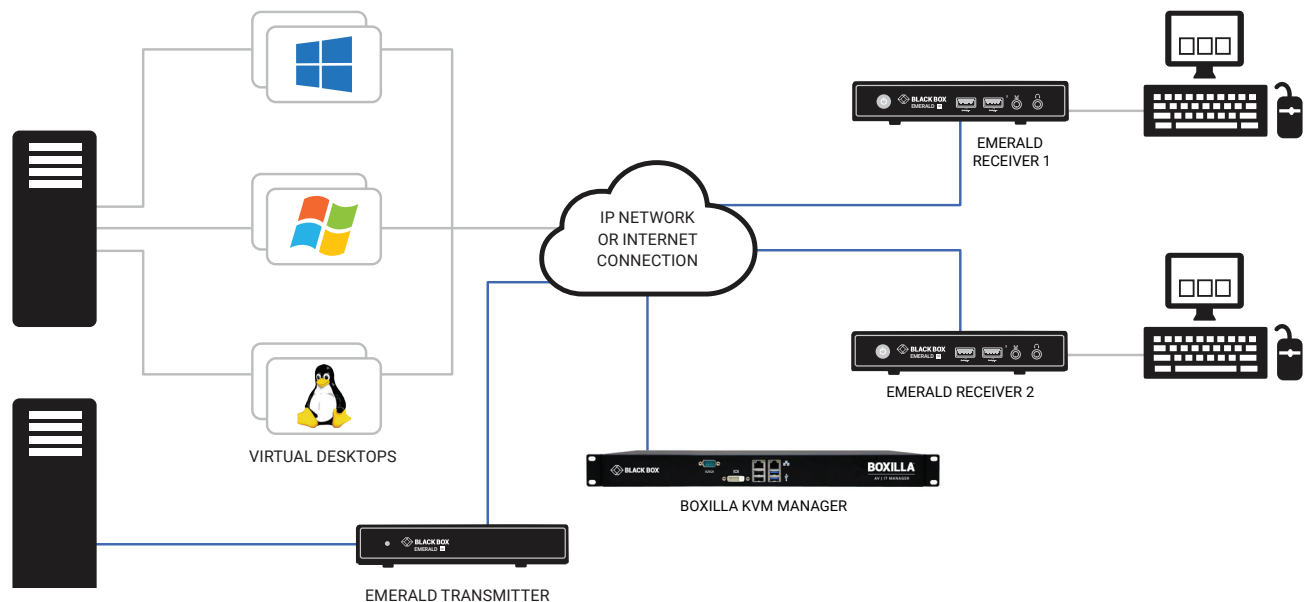1.877.877.2269

CHAPTER 3: CONFIGURATION

3.1 CONFIGURATION OF RECEIVER

An Emerald SE 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 SE 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 SE is compatible with the following operating systems:

- Microsoft® Windows Desktop Operating Systems (e.g. Windows 7, Windows 8, Windows 10) and Microsoft Server Operating Systems (e.g., 2003, Server 2008, Server 2012)
- Linux®
- Solaris®
- Mac OS®

The default keyboard drivers for these operating systems are supported by the Emerald SE 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 SE 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 SE 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 SE Receiver to interoperate seamlessly with Windows, Linux®, and Macintosh® workstations/servers.

CHAPTER 3: CONFIGURATION

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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) 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 SE system. For more information on Boxilla, refer to the Boxilla user manual.

CHAPTER 4: MODES OF OPERATION

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

4.1 AUTO LOGIN

In Auto-Login Mode, turning on the Emerald SE 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 SE 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 SE 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.

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CHAPTER 5: INSTALLATION

5.1 EMERALD SE RECEIVER (EMD2000SE-R, EMD2002SE-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 Receiver
- External power supply for the Emerald SE Receiver
- Power cord
- Emerald SE Quick Installation Guide (QIG)

5.2 EMERALD SE TRANSMITTER (EMD2000SE-T OR EMD2002SE-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 Transmitter
- External power supply for the Emerald SE Transmitter
- Power cord
- Emerald SE Quick Installation Guide (QIG)
- DVI and USB cables (not included, ordered separately)

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 TRANSMITTER (EMD200DV-T) CHECKLIST

- Emerald ZeroU DVI Transmitter (EMD200DV-T)

5.5 INSTALLATION OPTIONS

WARNING: To reduce the risk of electric shock or damage to your equipment, disconnect the power from the Emerald SE 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 SE Transmitter in the order described in the following procedures.

You can install the Emerald SE system either in a point-to-point or networked configuration.

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

- 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.

5.6 CONNECT THE EMERALD SE 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 SE 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 2.5-mm connector into the DC power jack on the rear of the Emerald SE 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 SE 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 SE Receiver by using a DVI-D to VGA converter (such as Black Box part number AC1038A).
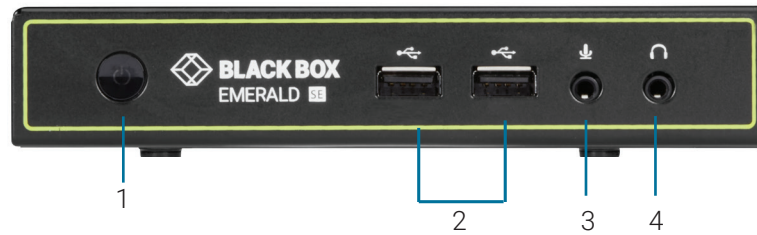
FIGURE 5-1. FRONT VIEW OF EMERALD SE RECEIVER, SINGLE-HEAD (EMD2000SE-R)
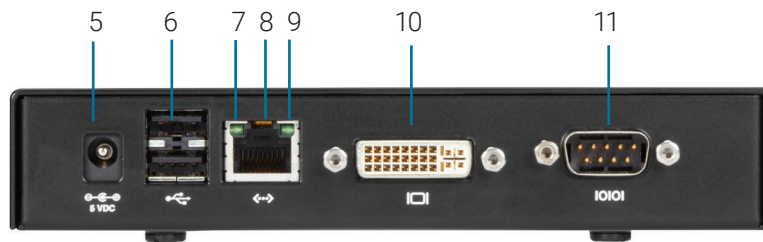
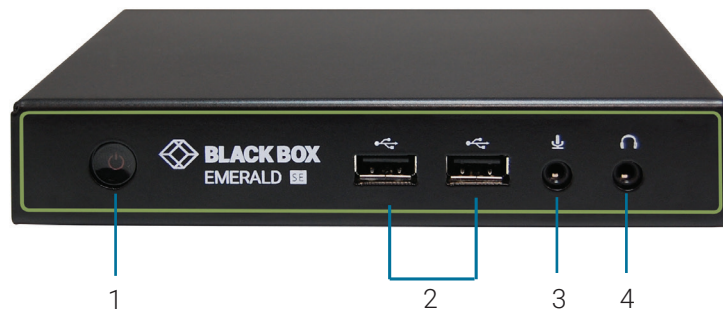FIGURE 5-2. REAR VIEW OF EMERALD SE RECEIVER, SINGLE-HEAD (EMD2000SE-R)

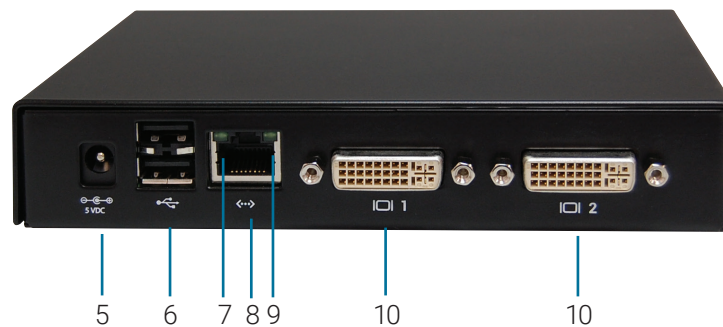FIGURE 5-3. FRONT VIEW OF EMERALD SE RECEIVER, DUAL-HEAD (EMD2002SE-R)

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

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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

CHAPTER 5: INSTALLATION

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5.7 CONNECT THE EMERALD SE TRANSMITTER

Before connecting the Emerald SE Transmitter to the remote workstation, ensure that the resolution and the refresh rate of the remote workstation are supported by the Emerald SE 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 SE 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 SE 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 SE 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. Plug the external power supply's 2.5-mm connector into the DC power jack on the rear of the Emerald SE 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.

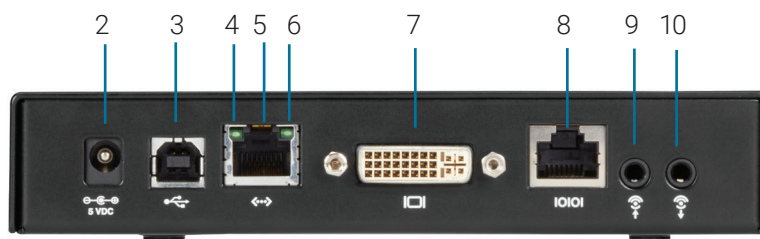FIGURE 5-5. FRONT VIEW OF THE EMERALD SE TRANSMITTER, SINGLE-HEAD (EMD2000SE-T)

FIGURE 5-6. REAR VIEW OF THE EMERALD SE TRANSMITTER, SINGLE-HEAD (EMD2000SE-T)

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FIGURE 5-7. FRONT VIEW OF THE EMERALD SE TRANSMITTER, DUAL-HEAD (EMD2002SE-T)
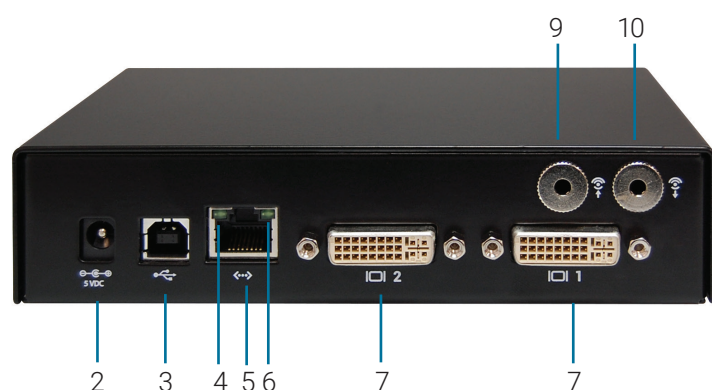

FIGURE 5-8. REAR VIEW OF THE EMERALD SE TRANSMITTER, DUAL-HEAD (EMD2002SE-T)

TABLE 5-2. EMERALD SE TRANSMITTER COMPONENTS

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

*Single-head model only

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5.8 CONNECT THE EMERALD ZEROU DVI TRANSMITTER

Before connecting the Emerald ZeroU DVI 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 Transmitter has two USB connectors. Connect them to the corresponding USB ports on the remote workstation.

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

4. Connect one end of the UTP cable to the Emerald ZeroU DVI 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 Transmitter can be powered via the USB ports. Optionally, plug an external power supply's 2.5-mm 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.

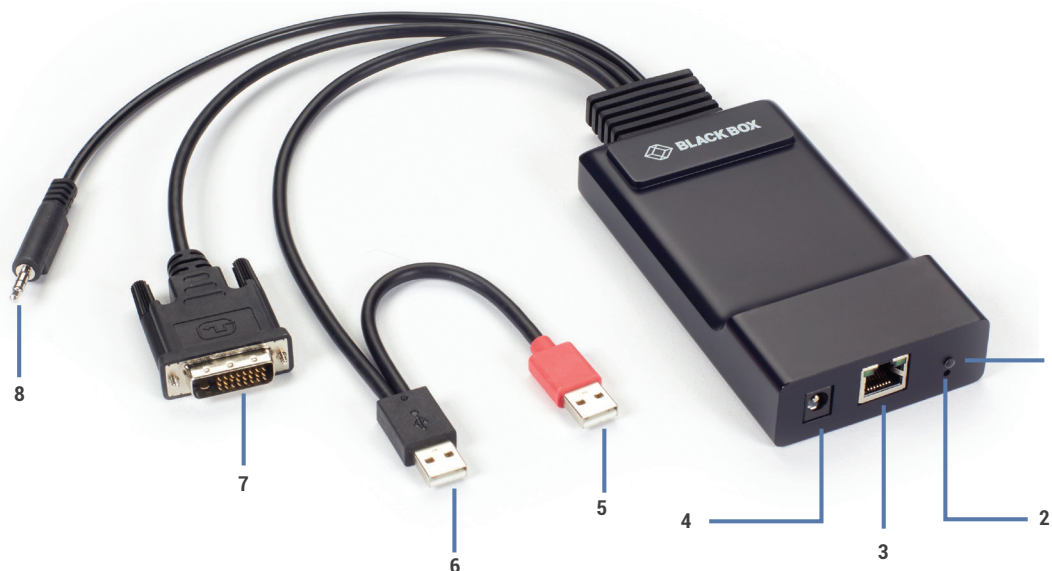NOTE: Use only the power supply provided by Black Box.

FIGURE 5-9. FRONT VIEW OF THE EMERALD ZEROU DVI TRANSMITTER, SINGLE-HEAD (EMD200DV-T)

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TABLE 5-3. EMERALD ZEROU DVI TRANSMITTER COMPONENTS

NUMBER IN FIGURES 5-9 THROUGH 5-10	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 DVI 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 input connector	Links to DVI input video source
8	(1) 3.5-mm connector	Links to speakers

6.1 POINT-TO-POINT INSTALLATION

In a point-to-point configuration, no administrator setup of the Emerald SE Transmitter or the Emerald SE 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 SE Transmitter and Emerald SE 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 SE Receiver and Emerald SE Transmitter in a networked configuration. In this installation, multiple Emerald SE Transmitters and Emerald SE 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 SE 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 SE Receiver and must be carried out before adding multiple devices on the same network.

TABLE 6-1. EMERALD SE 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 ZeroU DVI Transmitter (EMD200DV-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

Operating a workstation through the Emerald SE 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.

NOTE: The unit powers on automatically when plugged in and must be turned off at the power source.

The Emerald ZeroU DVI 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 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 SE Receiver or Boxilla Manager. Once you are connected, a series of messages will be displayed on the screen to inform you of the progress of the connection. 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 SE system will display a "black" screen for video when a connection is made.

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CHAPTER 8: OSD FUNCTIONS

The Emerald SE 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 SE 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 SE Receiver or Boxilla Manager to configure and manage the Emerald SE system. The log-on screen is shown in Figure 8-1. The username defines the access rights and configuration available to the user.
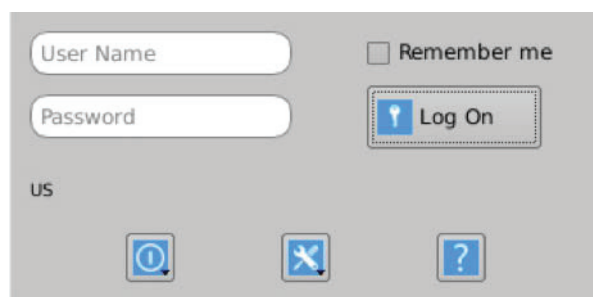

FIGURE 8-1. OSD LOG-ON SCREEN

The fields on this screen are:

◆ Username: the username to log-on as defined by the Administrator. Username is case-sensitive.

◆ Password: password for the user. Password is case-sensitive.

◆ 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.

◆ Power Button: This button allows the user to reboot the client.

CHAPTER 8: OSD FUNCTIONS

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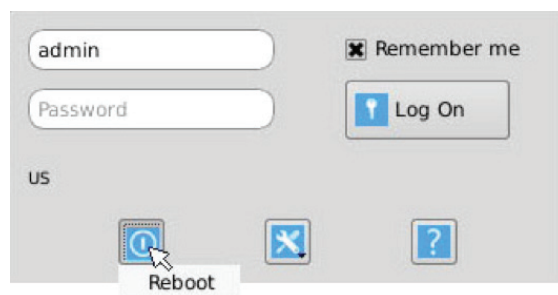**TECHNICAL**
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FIGURE 8-2. LOG-ON SCREEN - REBOOT BUTTON

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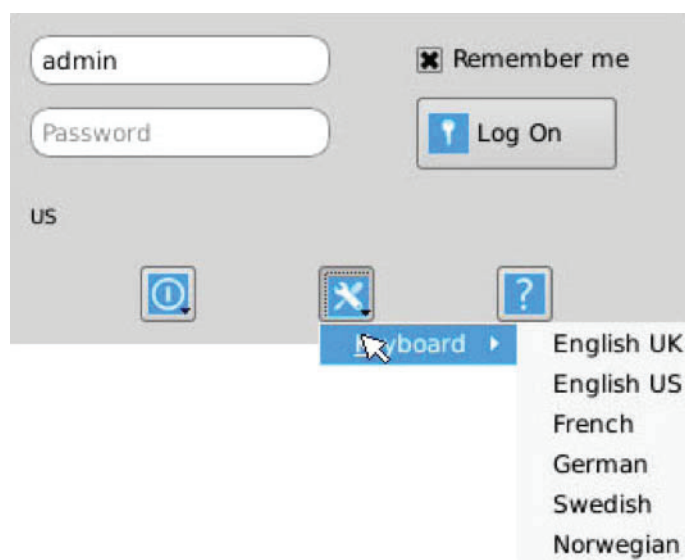

FIGURE 8-3. SETTING SYSTEMS KEYBOARD TYPE

Help: This button opens a pop-up window with help on that screen.

8.3 DEFAULT USERNAME AND PASSWORD

The Emerald SE 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.

8.4 USER VIEWS AND CAPABILITIES

There are three different types of users in the Emerald SE 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 SE 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 SE 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.

NOTE: Default_TX is 192.168.1.22

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.

By default, there is one connection called "Default Tx - 192.168.1.22" that defines a connection to an Emerald SE Transmitter with its factory defaults. A maximum of 32 connections can be defined for an Emerald SE 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.

CHAPTER 8: OSD FUNCTIONS

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8.5.1 CREATING A NEW CONNECTION

To allow an Emerald SE Receiver or Manager to connect to a target Emerald SE 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.
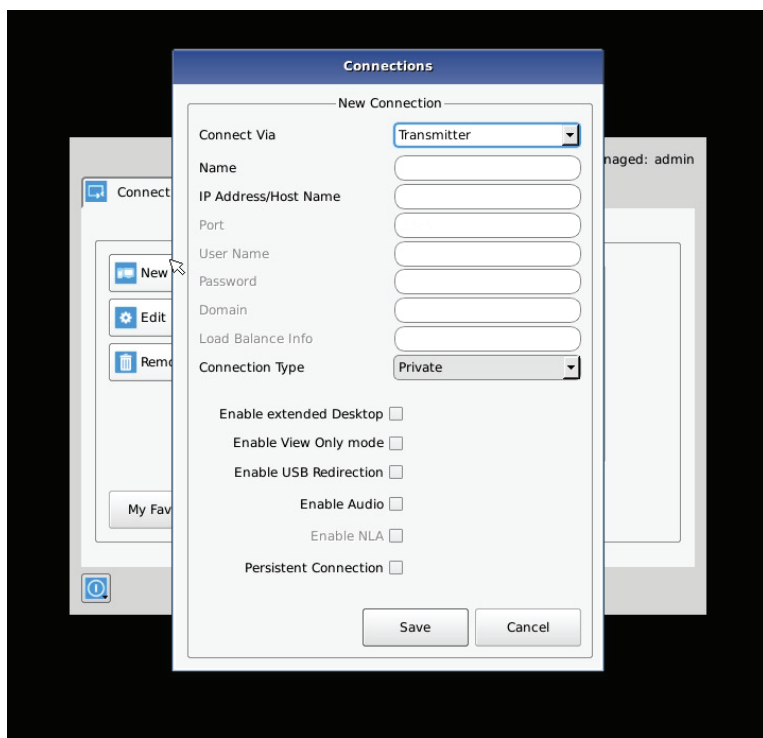

FIGURE 8-5. NEW CONNECTION WINDOW

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 SE 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;

◆ 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 resource on the broker (VM pool) that the Receiver will attempt to connect to after user credentials have been validated. Only used on connections via Broker;

◆ Connection Type: used to define whether a connection is Private or Shared (i.e. others connections of type Shared can join in session and share Keyboard, Video and Mouse). Only available if Connection Via is set to Transmitter;

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- 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 SE 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.
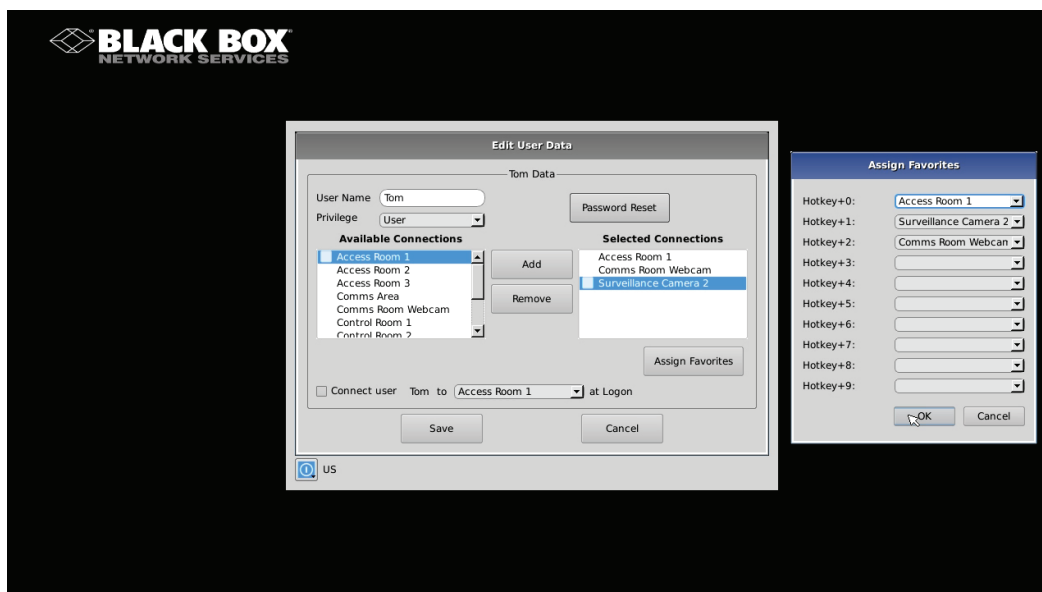

FIGURE 8-6. ASSIGNING CONNECTION FAVORITES

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Listing Connection Favorites:

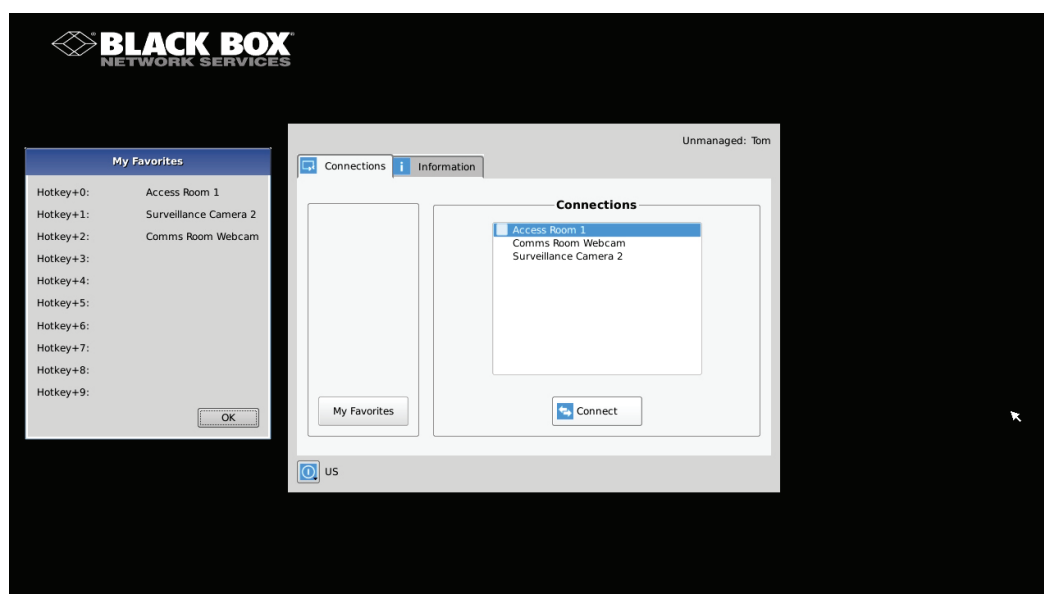When a user log in they can view their assigned favorites.

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 SE Receiver to attempt to connect to the target remote workstation or virtual machine. If the target is available, the connection will be made.

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.

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.

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8.6 CONTROL TAB

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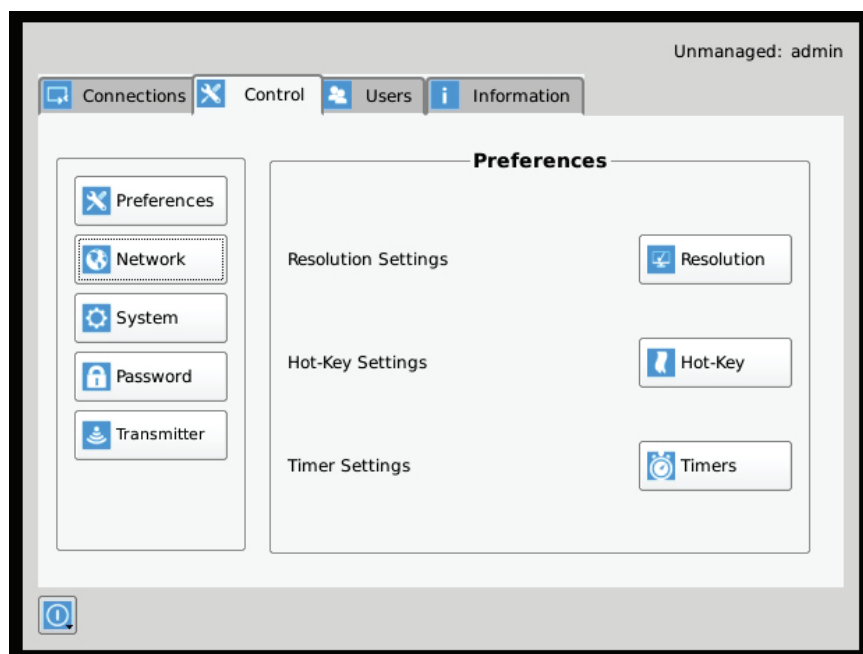

FIGURE 8-8. CONTROL TAB

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CHAPTER 8: OSD FUNCTIONS

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

2. Network – allows administrator to change network parameters for the Emerald SE 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 SE Transmitter.

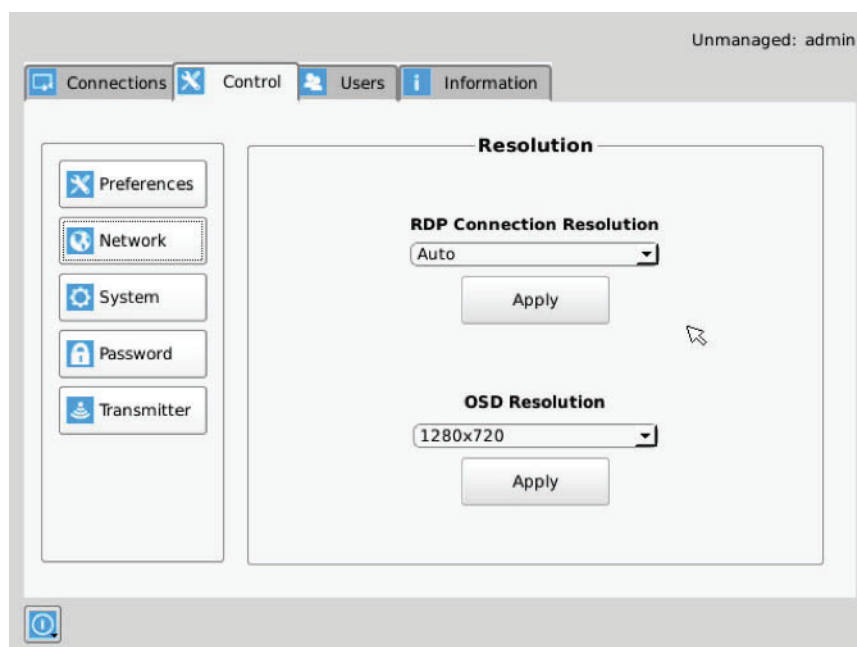Click Apply button to save the change.

FIGURE 8-9. RESOLUTION SCREEN

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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).
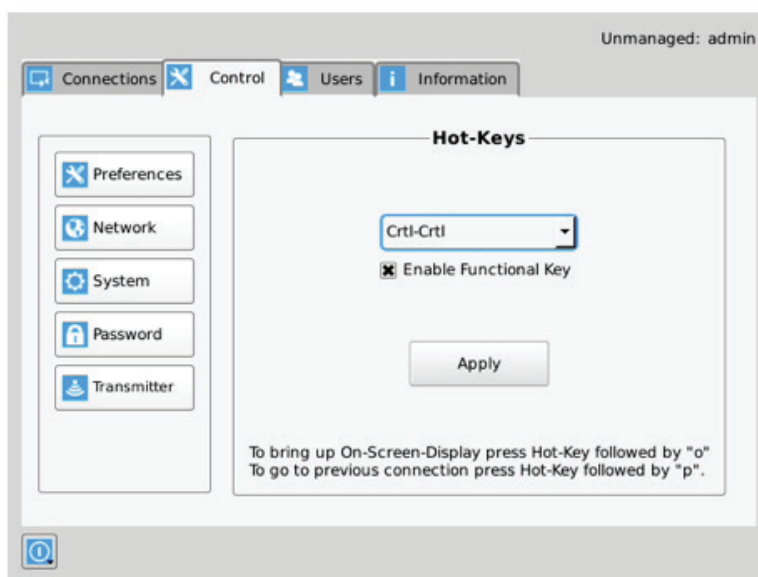

FIGURE 8-10. HOT KEY DEFINITION

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.

Timer Settings

There are 2 timer settings available to users as shown in Figure 8-12. 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.
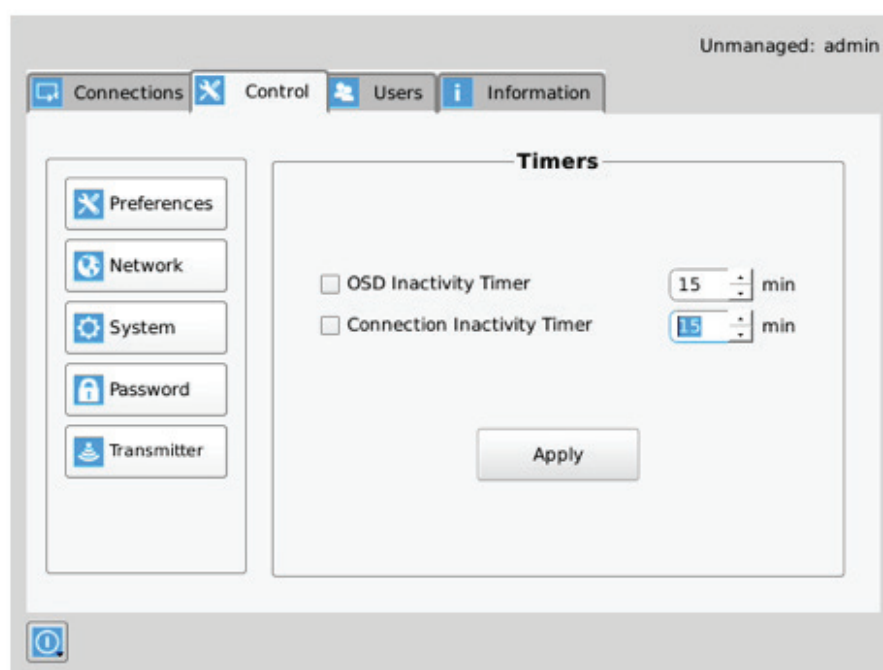

FIGURE 8-11. TIMER SETTINGS

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8.6.2 NETWORK

The network screen shown in Figure 8-13 allows an administrator to change the settings for the Emerald SE 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.

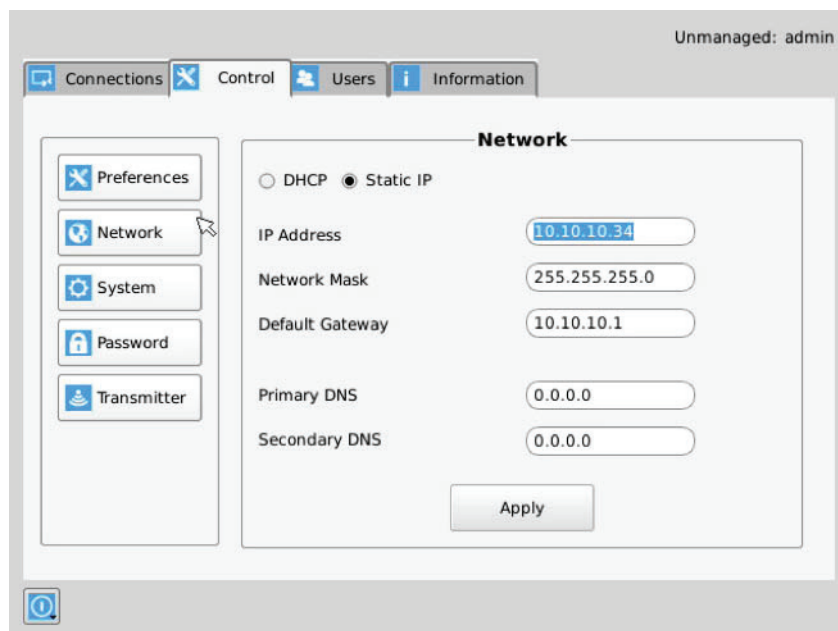NOTE: Only IPv4 addressing supported in current firmware version.

FIGURE 8-12. NETWORK SETTINGS

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8.6.3 SYSTEM

The System screen shown in Figure 8-14 allows an administrator to upgrade the firmware in the Emerald SE Receiver, reset it to factory defaults, import/export the configuration to an external USB drive, and perform a system diagnostic.
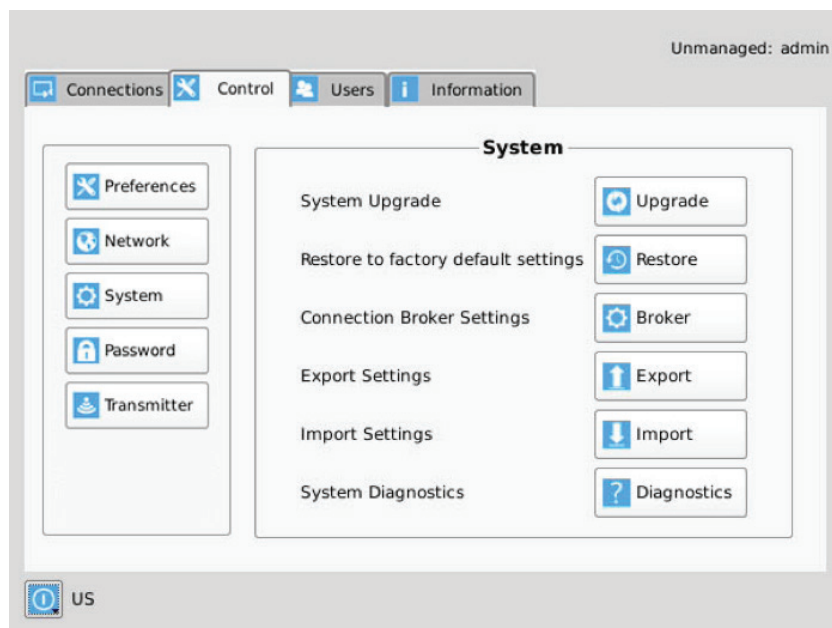

FIGURE 8-13. SYSTEM SCREEN

System Upgrade

The Emerald SE Receiver can be upgraded from a USB Flash drive. Simply take the "firmware.clu" 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 8-15. If the flash drive isn't recognized, format the drive using Fat32 file system.

FIGURE 8-14. UPGRADE FILES

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

Restore Factory Defaults

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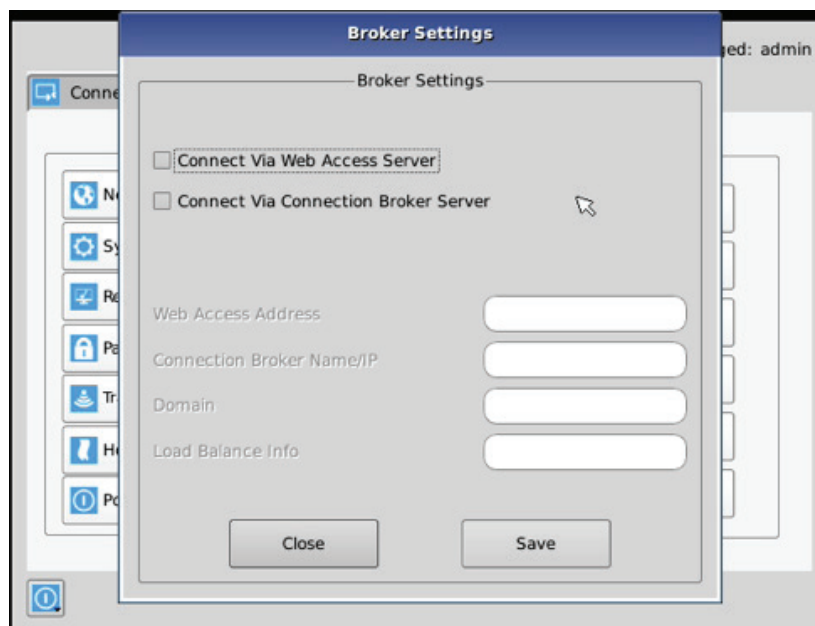
Connection Broker Settings

FIGURE 8-15. CONNECTION BROKER SETTING SCREEN

The Web Access Server setting is used to allow access to a local copy of Active Directory. If this setting is configured correctly, then if a user who is not configured in the local database attempts to login, the device will redirect the username and password to the local active directory installation and validate the user credentials.

If the user is validated, the Active Directory Server will return a valid VM pool-name to the device. The device sends this pool-name information to the Connection Broker which then allocates a Virtual Machine to the User, provided a VM is available.

On the Receiver when the user attempts to login, the login will now take the following steps in this order:

1. The login credentials are checked to see if the user is configured locally on the Receiver. Should the user exist, they will be logged in as normal. If not, then step two will occur. If neither "Connect via Web Access Server" nor "Connect via Connection Broker Server" is ticked, the Receiver at login will only attempt to authenticate the user locally. This is the default setting.

2. If the Web Access Settings are configured, the Receiver will attempt to launch a connection to an RD Web Access server. This will allow the user to be Authenticated against the Domain Controller (Active Directory) allowing the user to access Virtual Desktop Pools and Personal Virtual desktops.

To enable the receiver to access an RDWeb server at login, apply the following settings.

1. The Web Access Address should be the login page of the local RD Web Access Server using its IP address, e.g. https://192.168.10.7/RDWeb/Pages/en-US/login.aspx.

NOTE: We currently do not support hostnames in the web address so please use the IP of the Web Access server. You must place the full address to the login page of the RD Web Access server (https://*************.apsx).

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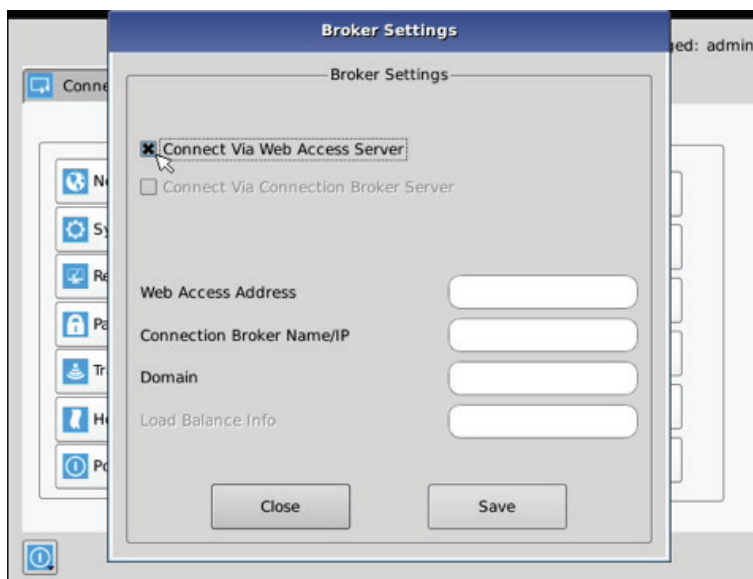**TECHNICAL**
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FIGURE 8-16. CONNECTION BROKER SETTINGS FOR WEB ACCESS SERVER

2. Enter the local Connection Broker IP address.

3. Enter in the local domain name.

Alternatively, the user credentials can be validated by using the local Connection Broker. In this case, the User Credentials are sent to the Connection Broker. If accepted, then the broker will return the IP address of a local VM from the pool and a connection is made.

NOTE: We currently do not support hostnames, so use the IP of the connection broker server.
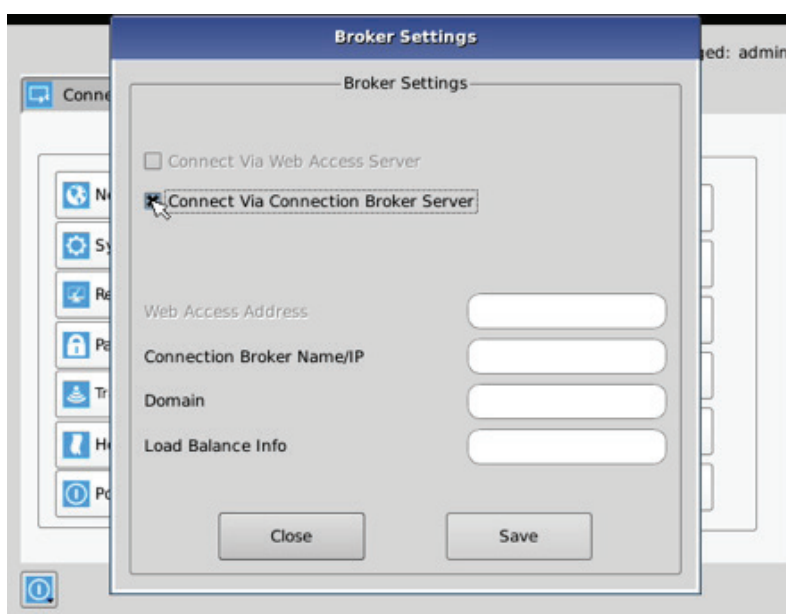

FIGURE 8-17. CONNECTION BROKER SETTINGS FOR CB SERVER

Tick the box "Connect Via Connection Broker Server" to enable connection using local Connection Broker Server. Then enter the following settings:

1. Enter in the domain name as defined on the local network.

2. Enter in your load balance address as defined in the local server configured, e.g. tsv://VMResource.1.Win7Pool.

Export Settings

The Export option exports an encrypted version of the Receiver configuration to an attached memory stick. This can be used as a backup mechanism for an individual receiver or manager or it can be used to port configurations from one Receiver to another.

The data in the export file consists of User, Connection and device information from the exporting device.

Import Settings

The Import option imports an encrypted version of a Receiver configuration from an attached memory stick. This can be used to recover an old backup from the same Receiver or it can be used to port configurations from another Receiver.

The data in the file consists of User, Connection and some device information from the exporting device.

The following settings are not imported.

1. OSD Preferred Resolution

2. Static IP address. In this case, if the importing device is set to static but the import file has a DHCP configuration, then the device configuration is changed to DHCP. Likewise, if the local device was DHCP and the import file was Static, the device configuration is change to Static but with its last configured Static IP address, not that of the imported file. If both local device and import file have a Static IP address configured, there is no change to the device configuration, i.e. the IP address is not changed.

NOTE: If the Import function is on the Manager, then the file must come from another Manager with the same Licensed Capabilities or the import will not proceed.

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 8-18. PASSWORD CHANGE

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Transmitter Button

The Transmitter button on the Control Tab allows administrators to change the configuration of an Emerald SE 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 8-20.

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.
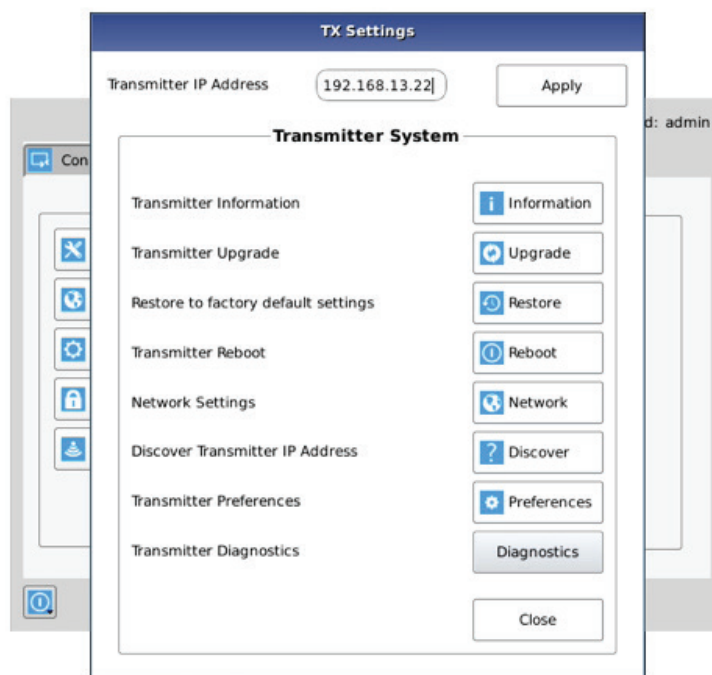

FIGURE 8-19. TRANSMITTER SETTINGS CONFIGURATION WINDOW - ACTIVE IP ADDRESS

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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 SE 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 SE 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 SE 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 SE 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 8-21 pops up.

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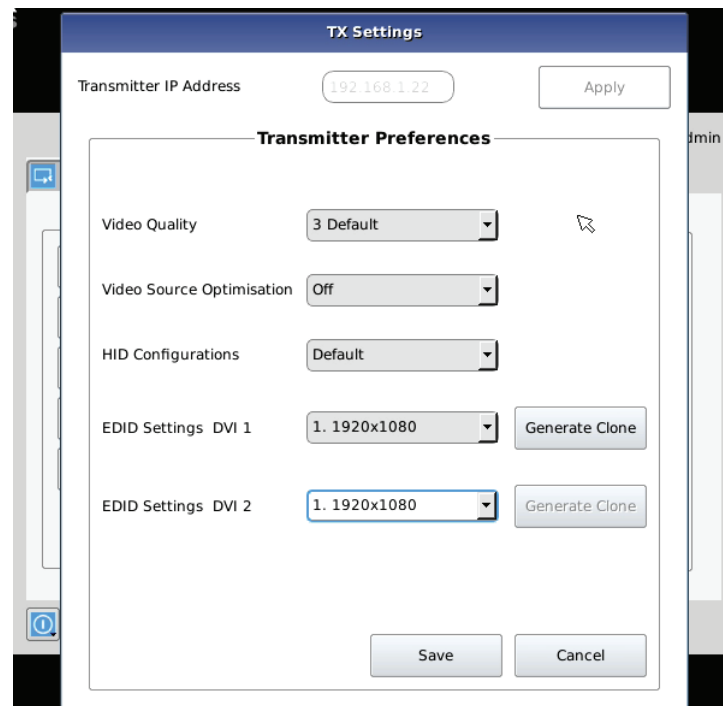**TECHNICAL**
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FIGURE 8-20.

Transmitter Video Quality Settings

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 SE Transmitter or this address is unreachable, an error message is returned.

HID Configurations

The HID configuration can be set to be default which allows Audio over USB as well as keyboard and mouse connections or Basic HID which provide 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.

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Absolute mouse:

This feature can be used to enable interoperability with KM switches with built-in "Glide & Switch" capability such as ServSwitchTC and Freedom. For normal usage, where mouse is directly connected to Receiver, then the Default or Basic options should be used.
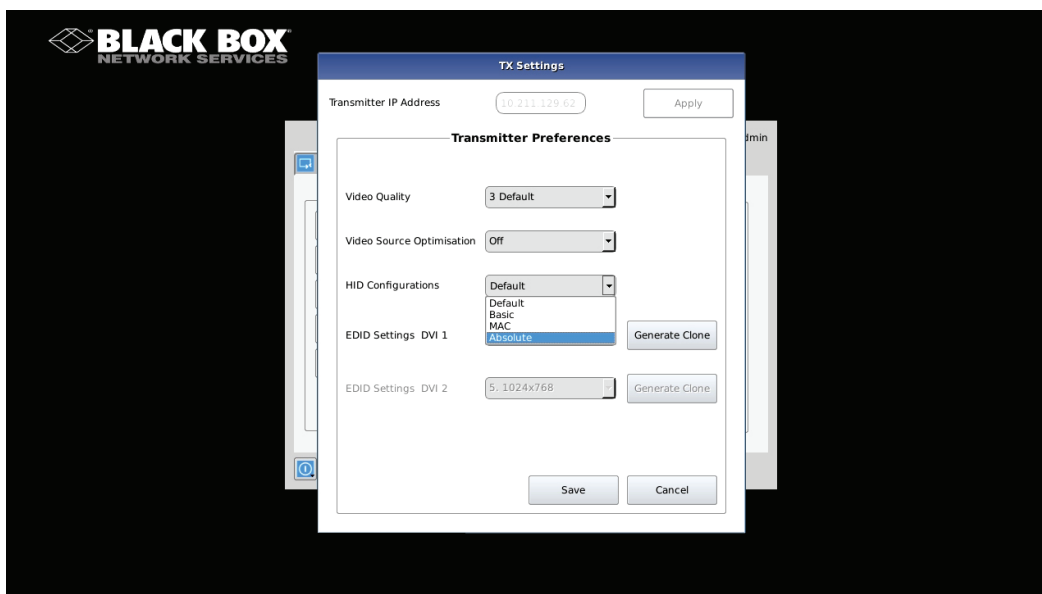
OSD option:

FIGURE 8-21. ABSOLUTE MOUSE OSD OPTION

Video Source Optimization

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.

EDID Settings

The transmitter can support native EDID options such as "1920x1080", "1920x1200", "1680x1050", "1280x1024", "1024x768", or you can choose to use the remote monitor EDID by clicking on the Generate Clone button which will copy the remote EDID to the transmitter. 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.

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.

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FIGURE 8-22. TRANSMITTER NETWORK SETTINGS WINDOW

If the new IP address for the Emerald SE 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 SE 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 SE 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 SE 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 SE Receiver and Boxilla have one default user – admin, which is a member of the administrator group. This user is defined by default and cannot be deleted. An Emerald SE 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.

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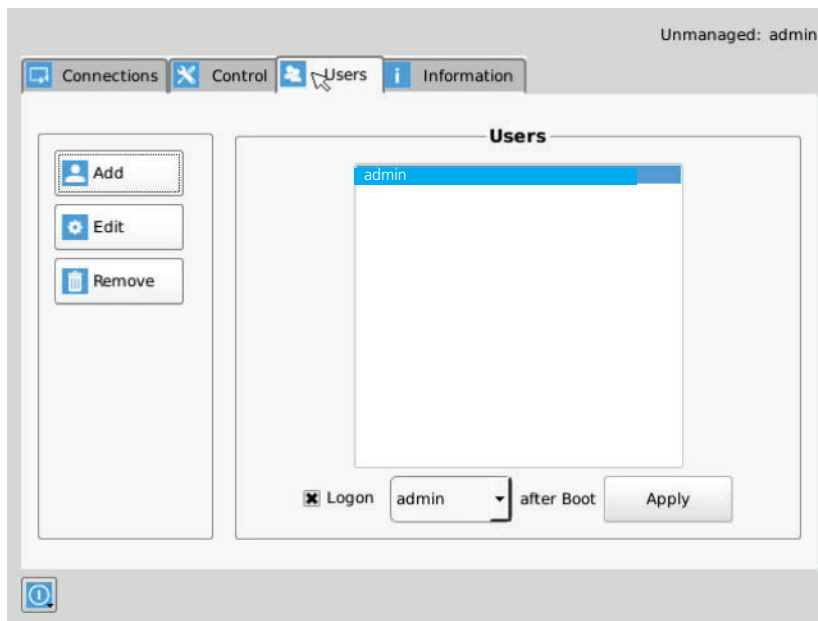

FIGURE 8-23. USER SCREENS

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.

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NOTE: Default_TX
is 192.168.1.22

FIGURE 8-24. 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 cannot 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. This 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 SE 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.

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8.7.3 EDIT A USER

To edit a user, click on the Edit button. This causes the Edit-User window (shown in Figure 8-26) to be displayed.

FIGURE 8-25. 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 8-26. 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 SE 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.

APPENDIX A: EMERALD SE VIDEO RESOLUTIONS SUPPORTED

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The Emerald SE 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 SE 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

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A few properties must be configured on a target Windows Virtual Machine for Emerald SE 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.

◆ Set this policy to enabled

3. 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 SE connections.

There are different settings to optimize the performance of Emerald SE with different Windows operating systems. These are defined in the application note – Emerald SE 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 SE NETWORK PROTOCOLS OVERVIEW

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

Once an Emerald SE 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 SE 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 SE discovery protocol to operate, Multicast routing should be enabled. Black Box's Emerald SE "discovery" protocol is not required for Emerald SE systems to operate but it is recommended to enable an Emerald SE 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.

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

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

TABLE D-1. OPERATING MODES CONFIGURATIONS

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

Sluggish Mouse: When using the Emerald SE, 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.

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.

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APPENDIX D. TROUBLESHOOTING

21   BRAND_CHECK_FAIL   This is not a correct upgrade file for Emerald SE   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.

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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.
Cet appareil numerique de la Classe A est conforme a la norme NMB-003 du Canada

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APPENDIX E. REGULATORY INFORMATION

E.2 NOM STATEMENT

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:
    A: El cable de poder o el contacto ha sido dañado; u
    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o
    C: El aparato ha sido expuesto a la lluvia; o
    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
    E: El aparato ha sido tirado o su cubierta ha sido dañada.

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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 Network Services may revise this document at any time without notice.

F.2 TRADEMARKS USED IN THIS MANUAL

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