

# DATA SHEET

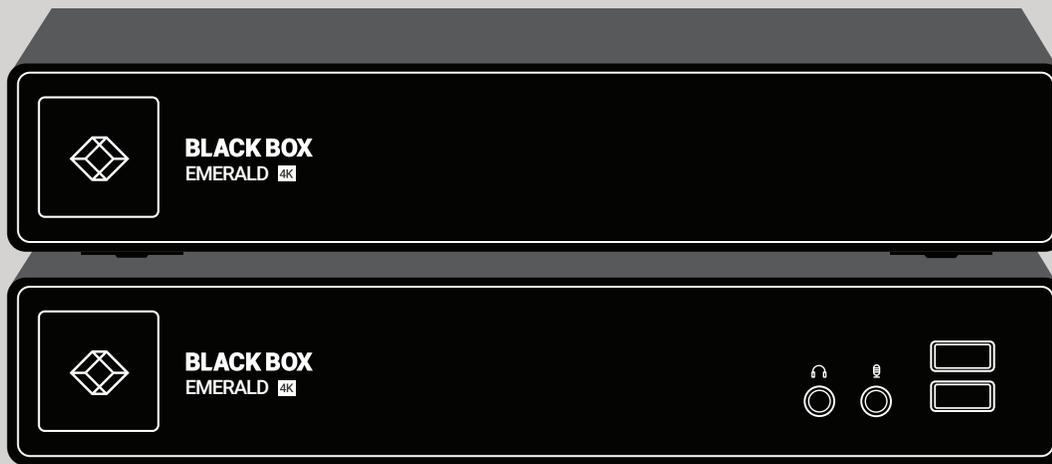
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EMD SERIES

# EMERALD UNIFIED KVM FAMILY

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24/7 TECHNICAL SUPPORT AT 877.877.2269 OR VISIT [BLACKBOX.COM](http://BLACKBOX.COM)



# OVERVIEW

## EMERALD UNIFIED KVM FAMILY DATA SHEET

### INTRODUCTION

Emerald High-Performance KVM provides KVM over an existing or dedicated IP network. Extension and switching of 4K video and access to physical and virtual machines from one console ensures a future-proof system. Six transmitters, six receivers and five Ethernet switches are available.

- EMERALD 4K SINGLE-HEAD TRANSMITTER (EMD4000T) AND RECEIVER (EMD4000R)
- EMERALD PE SINGLE-HEAD TRANSMITTER (EMD2000PE-T) AND RECEIVER (EMD2000PE-R)
- EMERALD PE DUAL-HEAD TRANSMITTER (EMD2002PE-T) AND RECEIVER (EMD2002PE-R)
- EMERALD SE SINGLE-HEAD TRANSMITTER (EMD2000SE-T) AND RECEIVER (EMD2000SE-R)
- EMERALD SE DUAL-HEAD TRANSMITTER (EMD2002SE-T) AND RECEIVER (EMD2002SE-R)
- EMERALD ZEROU DVI TRANSMITTER (EMD200DV-T)
- EMERALD REMOTE APP SOFTWARE (RECEIVER) (EMDRM)
- 1G 48-PORT NETWORK SWITCH (EMS1G48)
- 1G 24-PORT NETWORK SWITCH (EMS1G24F)
- 10G 12-PORT NETWORK SWITCH (EMS10G12)
- 10G 28-PORT NETWORK SWITCH (EMS10G28)
- 100G 32-PORT NETWORK SWITCH (EMS100G32)

### FEATURES

- 4K VIDEO, 10 BIT COLOR @ 60 FPS
- PIXEL PERFECT VIDEO—MATHEMATICALLY LOSSLESS
- ACCESS TO VIRTUAL MACHINES USING RDP/REMOTEFX AND PCOIP SUPPORTING MICROSOFT®, VMWARE® AND CITRIX®
- 4K VERSION HAS DUAL NETWORK OPTION FOR REDUNDANCY
- PE VERSION HAS DUAL NETWORK INTERFACES – (1) 1GBASE-T AND SFP
- ACCESS RESOURCES ANYWHERE VIA WAN
- CENTRALIZED MANAGEMENT, ACCESS CONTROL, MONITORING AND UPGRADES
- OPTION TO USE EXISTING NETWORK INFRASTRUCTURE
- CHOOSE COPPER OR FIBER CONNECTIONS
- TRANSPARENT USB 2.0 – CONNECT ANY USB DEVICE
- SUPPORT AUDIO OVER DISPLAYPORT, USB AND ANALOG
- ZEROU TRANSMITTER HAS A SMALL FORM FACTOR SO IT USES ZERO RACKSPACE—YOU SAVE MONEY WHEN RACK SPACE IS EXPENSIVE
- ZEROU TRANSMITTER IS POWERED OVER USB OR VIA A SEPARATE POWER SUPPLY

## COMPARISON CHART: TRANSMITTERS AND RECEIVERS

SPECIFICATION COMPARISON CHART: TRANSMITTERS AND RECEIVERS								
	NUMBER OF VIDEO HEADS	USB PORTS	NETWORK	POE	SERIAL	AUDIO	SFP+	RESOLUTION
<b>RECEIVERS</b>								
4K RECEIVER (EMD4000R)	(1) DISPLAYPORT	(4) USB TYPE A	(1) RJ-45*	NO	(1) DB9	(2) 3.5-MM	(2)	4096 x 2160
PE RECEIVER, SINGLE-HEAD (EMD2000PE-R)	(1) DVI	(4) USB TYPE A	(1) RJ-45, (1) SFP	NO	NONE	(2) 3.5-MM	NONE	1920 x 1200
PE RECEIVER, DUAL-HEAD (EMD2002PE-R)	(2) DVI	(4) USB TYPE A	(1) RJ-45, (1) SFP	NO	NONE	(2) 3.5-MM	NONE	1920 x 1200
SE RECEIVER, SINGLE-HEAD (EMD2000SE-R)	(1) DVI	(4) USB TYPE A	(1) RJ-45	NO	(1) DB9	(2) 3.5-MM	NONE	1920 x 1200
SE RECEIVER, DUAL-HEAD (EMD2002SE-R)	(2) DVI	(4) USB TYPE A	(1) RJ-45	NO	NONE	(2) 3.5-MM	NONE	1920 x 1200
<b>TRANSMITTERS</b>								
4K TRANSMITTER (EMD4000T)	(1) DISPLAYPORT	(1) USB TYPE B	(1) RJ-45*	NO	(1) DB9	(2) 3.5-MM	(2)	4096 x 2160
PE TRANSMITTER, SINGLE-HEAD (EMD2000PE-T)	(1) DVI	(1) USB TYPE B	(1) RJ-45, (1) SFP	NO	NONE	(2) 3.5-MM	NONE	1920 x 1200
PE TRANSMITTER, DUAL-HEAD (EMD2002PE-T)	(2) DVI	(1) USB TYPE B	(1) RJ-45, (1) SFP	NO	NONE	(2) 3.5-MM	NONE	1920 x 1200
SE TRANSMITTER, SINGLE-HEAD (EMD2000SE-T)	(1) DVI	(1) USB TYPE B	(1) RJ-45	NO	(1) RJ-45	(2) 3.5-MM	NONE	1920 x 1200
SE TRANSMITTER, DUAL-HEAD (EMD2002SE-T)	(2) DVI	(1) USB TYPE B	(1) RJ-45	NO	NONE	(2) 3.5-MM	NONE	1920 x 1200
ZEROU DVI TRANSMITTER (EMD200DV-T)	(1) DVI	(2) USB TYPE A	(1) RJ-45	NO	NONE	(1) 3.5-MM	NONE	1920 x 1200

\*Reserved for future use



# COMPARISON CHART: SWITCHES

SPECIFICATION COMPARISON CHART: SWITCHES							
NETWORK SWITCHES	SPEED	PORTS	CASCADE PORTS	CAPACITY	MAC ADDRESSES	CPU MEMORY	BUFFER
EMS1G24F	1G	(24) 1G SFP	(2) 10G SFP+	212 GBPS	56 K	2 GB	4 MB
EMS1G48	1G	(48) 10/100/1000BT RJ-45	(4) 10G SFP+	260 GBPS	UP TO 80 K	2 GB	4 MB
EMS10G12	10G	(12) 10GbE SFP+	(3) 100G QSFP28	840 GBPS	272 K	4 GB	12 MB
EMS10G28	10G	(28) 10GbE SFP+	(2) 100G QSFP28	960 GBPS	272 K	4 GB	12 MB
EMS100G32	100G	(32) 100G QSFP28	—	6.4 TBPS	136 K	8 GB	16 MB

## COMPATIBLE SFPS

COMPATIBLE SFPS		
PART NUMBER	DESCRIPTION	DISTANCE
<b>1-GBPS CONNECTIONS</b>		
LFP441	SFP, Gigabit Ethernet, 850-nm Multimode Fiber, LC	550 m
LFP442	SFP, Gigabit Ethernet, 1310-nm Single-mode Fiber, LC	20 km
LFP443	SFP, 10/100/1000BASE-T RJ-45 SGMII	100 m
<b>10-GBPS CONNECTIONS</b>		
LSP441	SFP+ - 10-Gb, Extended Diagnostics, 850-nm Multimode Fiber, LC	300 m
LSP442	SFP+ - 10-Gb, Extended Diagnostics, 1310-nm Single-mode Fiber, LC	10 km
LSP443	SFP+, 10GBASE-T, RJ-45	30 m
<b>40-GBPS CONNECTIONS</b>		
QSFP541	QSFP+ Transceiver – 40GBASE-SR4, Multimode Fiber, 850-nm	100 m
<b>100-GBPS CONNECTIONS</b>		
QSFP441	QSFP28 100GBASE-SR4, 850-nm Multimode, MPO	100 m
QSFP442	QSFP28 100GBASE-LR4, DWM Single-mode, LC	10 km

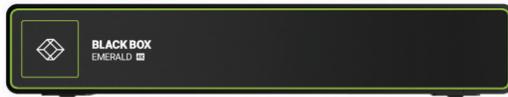
NOTE: Black Box switches will also support generic SFP+ modules.



# SPECIFICATIONS

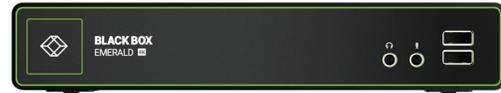
## 4K SINGLE-HEAD TRANSMITTER AND RECEIVER (EMD4000T AND EMD4000R)

FRONT VIEW



EMD4000T

FRONT VIEW



EMD4000R

BACK VIEW



EMD4000T

BACK VIEW



EMD4000R

### WHAT'S INCLUDED WITH THE TRANSMITTER

- (1) TRANSMITTER
- (1) 12-VDC POWER SUPPLY WITH POWER CORD

### WHAT'S INCLUDED WITH THE RECEIVER

- (1) RECEIVER
- (1) 12-VDC POWER SUPPLY WITH POWER CORD

4K SINGLE-HEAD EXTENDER (EMD4000R AND EMD4000T)	
<b>APPROVALS</b>	Unit: FCC, CE, RoHS Power Supply: 12 VDC, 3 A
<b>CONNECTORS</b>	Transmitter: (1) DisplayPort, (1) Power, (1) DB9 serial, (1) USB Type B, (1) RJ-45, (2) SFP+ cages (10GBASE-X), (2) 3.5-mm audio; Receiver: (1) DisplayPort, (1) Power, (1) DB9 serial, (4) USB Type A, (1) RJ-45, (2) SFP+ cages, (2) 3.5-mm audio;
<b>DISTANCE</b>	Distance between Transmitter and Receiver: in IP mode: Unlimited using IP rules; in DX mode: CATx: 328 ft. (100 m); Fiber: 984.2 ft. to 6.2 mi. (300 m to 10 km), based on SFP used
<b>INDICATORS</b>	(1) single bi-color LED (red/green)
<b>MAXIMUM RESOLUTION</b>	4096 x 2160 @ 60 Hz
<b>MATERIAL</b>	Aluminum outer case with plastic bezel
<b>OPERATING SYSTEMS SUPPORTED</b>	Microsoft Windows Vista, XP, Windows 7, Windows 8, Server 2003, Server 2008, Server 2012, Linux, Solaris, Mac OS
<b>OPERATION</b>	Default IP Address for Transmitter: 192.168.1.22; Default IP Address for Receiver: 192.168.1.21; Default Username: admin; Default Password: Blank password by default, just press the Enter key; EDID Support: Internal EDID table in Transmitter (can be updated from a Receiver or manager); Encryption: Secure Sockets Layer (SSL) over a TCP/IP up to 128-bit for transmitter to receiver with virtualized targets, depending on configuration
<b>ENVIRONMENTAL</b>	Operating Temperature: 32 to 104° F (0 to 40° C); Storage Temperature: -4° F to 140° F (-20° C to 60° C); Operating Humidity: 5–95%
<b>POWER</b>	External desktop-style adapter, 100–240 VAC input, 12 VDC, 3 A connection to unit
<b>DIMENSIONS</b>	Each unit: 1.5" H x 8.5" W x 7.4" D (3.9 x 21.6 x 18.7 cm)
<b>WEIGHT</b>	TX: 2.50 lb. (1.14 kg); RX: 2.55 lb. (1.16 kg)



# SPECIFICATIONS

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## EMERALD PE SINGLE-HEAD TRANSMITTER AND RECEIVER (EMD2000PE-T AND EMD2000PE-R)

TRANSMITTER FRONT VIEW



RECEIVER FRONT VIEW



TRANSMITTER BACK VIEW



RECEIVER BACK VIEW



### WHAT'S INCLUDED WITH THE TRANSMITTER (EMD2000PE-T)

- (1) EMERALD PE TRANSMITTER, SINGLE-HEAD
- (1) 12-VDC POWER ADAPTER AND POWER CORD
- (1) DVI CABLE
- (1) USB 2.0 TYPE B CABLE

### WHAT'S INCLUDED WITH THE RECEIVER (EMD2000PE-R)

- (1) EMERALD PE RECEIVER, SINGLE-HEAD
- (1) 12-VDC POWER ADAPTER AND POWER CORD

# SPECIFICATIONS

## EMERALD PE SINGLE-HEAD TRANSMITTER AND RECEIVER (EMD2000PE-T AND EMD2000PE-R)

SPECIFICATIONS FOR EMERALD PE TRANSMITTER AND RECEIVER, SINGLE-HEAD (EMD2000PE-T AND EMD2000PE-R)	
<b>APPROVALS</b>	
<b>UNIT</b>	FCC, CE, RoHS, WEEE
<b>POWER SUPPLY</b>	TUV, UL
<b>PHYSICAL</b>	
<b>LED INTERFACE</b>	(1) Power LED (lights when power is on); NOTE: Unit automatically powers on when plugged in; must be powered off at the power source. (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
<b>MAXIMUM DISTANCE FROM CPU TO TRANSMITTER</b>	EMD2000PE-T: 16 ft. (5 m), DVI-D and USB limitations
<b>MAXIMUM DISTANCE BETWEEN TRANSMITTER AND RECEIVER</b>	328 ft. (100 m), use a network switch to get farther distances
<b>OPERATING SYSTEM SUPPORT</b>	Microsoft Windows® Vista, XP, Windows 7, Windows 8, Windows 10, Server 2003, Server 2008, Server 2012, Linux®, Mac OS
<b>CONNECTORS</b>	EMD2000PE-T: (1) DVI input, (1) USB Type B female, (1) RJ-45 network, (1) SFP network, (2) 3.5 mm audio, (1) 2.5 mm barrel for power, (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) 2.5 mm barrel for power, (1) Micro USB connector
<b>DIMENSIONS</b>	EMD2000PE-T, EMD2000PE-R: 1.32" H x 7.62" W x 5.79" D (3.36 x 19.36 x 14.73 cm)
<b>WEIGHT</b>	EMD2000PE-T, EMD2000PE-R: 1.18 lbs (0.54 kg)
<b>OPERATION</b>	
<b>DEFAULT IP ADDRESS</b>	EMD2000PE-T: 192.168.1.22; EMD2000PE-R: 192.168.1.21
<b>ENCRYPTION</b>	Secure Sockets Layer (SSL) over TCP/IP, 128-bit between TX and RX, user set between RX and Hyper-V
<b>DEFAULT USERNAME</b>	admin
<b>DEFAULT PASSWORD</b>	The password is blank by default
<b>DDC SUPPORT</b>	Built-in/clone of remote
<b>POWER</b>	
<b>POWER SOURCE</b>	External in-line power supply
<b>INPUT VOLTAGE</b>	100–240 VAC, 50/60 Hz
<b>INPUT CURRENT</b>	0.9 amps maximum
<b>POWER CONSUMPTION</b>	Unit: 7.5 watts with keyboard and mouse attached; Power supply is 20 W to support USB based powered devices
<b>HEAT DISSIPATION</b>	(12 VDC PSU x 4 amps) x 3.41 = 68.2 BTU/hour maximum (Voltage x Nominal Current) x 3.41 = BTU/hr
<b>OUTPUT CONNECTOR</b>	DIN locking connector
<b>INPUT CONNECTOR</b>	IEC-320, C8
<b>POWER SUPPLY CORD LENGTH</b>	6 ft. (1.8 m)
<b>ENVIRONMENTAL</b>	
<b>OPERATING TEMPERATURE</b>	32 to 104° F (0 to 40° C)
<b>STORAGE TEMPERATURE</b>	-4 to +140° F (-20 to 60° C)
<b>OPERATING HUMIDITY</b>	5 to 95%, noncondensing



# SPECIFICATIONS

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## EMERALD PE DUAL-HEAD TRANSMITTER AND RECEIVER (EMD2002PE-T AND EMD2002PE-R)

TRANSMITTER FRONT VIEW



RECEIVER FRONT VIEW



TRANSMITTER BACK VIEW



RECEIVER BACK VIEW



### WHAT'S INCLUDED WITH THE TRANSMITTER (EMD2002PE-T)

- (1) EMERALD PE TRANSMITTER, DUAL-HEAD
- (1) 12-VDC POWER ADAPTER AND POWER CORD
- (2) DVI CABLES
- (1) USB 2.0 TYPE B CABLE

### WHAT'S INCLUDED WITH THE RECEIVER (EMD2002PE-R)

- (1) EMERALD PE RECEIVER, DUAL-HEAD
- (1) 12-VDC POWER ADAPTER AND POWER CORD

# SPECIFICATIONS

## EMERALD PE DUAL-HEAD TRANSMITTER AND RECEIVER (EMD2002PE-T AND EMD2002PE-R)

SPECIFICATIONS FOR EMERALD PE TRANSMITTER AND RECEIVER, DUAL-HEAD (EMD2002PE-T AND EMD2002PE-R)	
<b>APPROVALS</b>	
<b>UNIT</b>	FCC, CE, RoHS, WEEE
<b>POWER SUPPLY</b>	TUV, UL
<b>PHYSICAL</b>	
<b>LED INTERFACE</b>	(1) Power LED (lights when power is on); NOTE: Unit automatically powers on when plugged in; must be powered off at the power source. (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
<b>MAXIMUM DISTANCE FROM CPU TO TRANSMITTER</b>	EMD2002PE-T: 16 ft. (5 m), DVI-D and USB limitations
<b>MAXIMUM DISTANCE BETWEEN TRANSMITTER AND RECEIVER</b>	328 ft. (100 m), use a network switch to get farther distances
<b>OPERATING SYSTEM SUPPORT</b>	Microsoft Windows® Vista, XP, Windows 7, Windows 8, Windows 10, Server 2003, Server 2008, Server 2012, Linux®, Mac OS
<b>CONNECTORS</b>	EMD2002PE-T: (2) DVI inputs, (1) USB Type B female, (1) RJ-45 network, (1) SFP network, (2) 3.5 mm audio, (1) 2.5 mm barrel for power, (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) 2.5 mm barrel for power, (1) Micro USB connector
<b>DIMENSIONS</b>	EMD2002PE-T, EMD2002PE-R: 1.32" H x 7.62" W x 5.79" D (3.36 x 19.36 x 14.73 cm)
<b>WEIGHT</b>	EMD2002PE-T: 1.47 lb. (0.67 kg); EMD2002PE-R: 1.36 lb. (0.62 kg)
<b>OPERATION</b>	
<b>DEFAULT IP ADDRESS</b>	EMD2002PE-T: 192.168.1.22; EMD2002PE-R: 192.168.1.21
<b>ENCRYPTION</b>	Secure Sockets Layer (SSL) over TCP/IP, 128-bit between TX and RX, user set between RX and Hyper-V
<b>DEFAULT USERNAME</b>	admin
<b>DEFAULT PASSWORD</b>	The password is blank by default
<b>DDC SUPPORT</b>	Built-in/clone of remote
<b>POWER</b>	
<b>POWER SOURCE</b>	External in-line power supply
<b>INPUT VOLTAGE</b>	100–240 VAC, 50/60 Hz
<b>INPUT CURRENT</b>	0.9 amps maximum
<b>POWER CONSUMPTION</b>	Unit: 7.5 watts with keyboard and mouse attached; Power supply is 20 W to support USB based powered devices
<b>HEAT DISSIPATION</b>	(12-VDC PSU x 4 amps) x 3.41 = 68.2 BTU/hour maximum (Voltage x Nominal Current) x 3.41 = BTU/hr
<b>OUTPUT CONNECTOR</b>	DIN locking connector
<b>INPUT CONNECTOR</b>	IEC-320, C8
<b>POWER SUPPLY CORD LENGTH</b>	6 ft. (1.8 m)
<b>ENVIRONMENTAL</b>	
<b>OPERATING TEMPERATURE</b>	32 to 104° F (0 to 40° C)
<b>STORAGE TEMPERATURE</b>	-4 to +140° F (-20 to 60° C)
<b>OPERATING HUMIDITY</b>	5 to 95%, noncondensing



# SPECIFICATIONS

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## EMERALD SE SINGLE-HEAD TRANSMITTER AND RECEIVER (EMD2000SE-T AND EMD2000SE-R)

TRANSMITTER FRONT VIEW



RECEIVER FRONT VIEW



TRANSMITTER BACK VIEW



RECEIVER BACK VIEW



### WHAT'S INCLUDED WITH THE TRANSMITTER (EMD2000SE-T)

- (1) EMERALD SE TRANSMITTER, SINGLE-HEAD
- (1) 5 VDC POWER SUPPLY
- (1) US POWER CORD

### WHAT'S INCLUDED WITH THE RECEIVER (EMD2000SE-R)

- (1) EMERALD SE RECEIVER, SINGLE-HEAD
- (1) 5 VDC POWER SUPPLY
- (1) US POWER CORD

# SPECIFICATIONS

## EMERALD SE SINGLE-HEAD TRANSMITTER AND RECEIVER (EMD2000SE-T AND EMD2000SE-R)

SPECIFICATIONS FOR EMERALD SE TRANSMITTER AND RECEIVER, SINGLE-HEAD (EMD2000SE-T AND EMD2000SE-R)	
<b>APPROVALS</b>	
<b>UNIT</b>	FCC, CE, RoHS, WEEE
<b>POWER SUPPLY</b>	TUV, UL
<b>PHYSICAL</b>	
<b>LED INTERFACE</b>	(1) Power LED button (deactivated, not used); NOTE: Unit automatically powers on when plugged in; must be powered off at the power source. (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
<b>MAXIMUM DISTANCE FROM CPU TO TRANSMITTER</b>	EMD2000SE-T: 16 ft. (5 m), DVI-D and USB limitations
<b>MAXIMUM DISTANCE BETWEEN TRANSMITTER AND RECEIVER</b>	328 ft. (100 m), use a network switch to get farther distances
<b>OPERATING SYSTEM SUPPORT</b>	Microsoft Windows® Vista, XP, Windows 7, Windows 8, Windows 10, Server 2003, Server 2008, Server 2012, Linux®, Mac OS
<b>CONNECTORS</b>	EMD2000SE-T: (1) DVI input, (1) USB Type B female, (1) RJ-45 network (10/100/1000BASE-T), (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 (10/100/1000BASE-T), (1) DB9 serial, (2) 3.5 mm audio for SPK and MIC, (1) 2.5 mm barrel for power
<b>DIMENSIONS</b>	EMD2000SE-T, EMD2000SE-R: 1.15" H x 6.2" W x 4.2" D (2.92 x 15.75 x 10.67 cm)
<b>WEIGHT</b>	EMD2000SE-T, EMD2000SE-R: 1.18 lbs (0.54 kg)
<b>OPERATION</b>	
<b>DEFAULT IP ADDRESS</b>	EMD2000SE-T: 192.168.1.22; EMD2000SE-R: 192.168.1.21
<b>ENCRYPTION</b>	Secure Sockets Layer (SSL) over TCP/IP, 128-bit between TX and RX, user set between RX and Hyper-V
<b>DEFAULT USERNAME</b>	admin
<b>DEFAULT PASSWORD</b>	The password is blank by default
<b>DDC SUPPORT</b>	Built-in/clone of remote
<b>POWER</b>	
<b>POWER SOURCE</b>	External in-line power supply
<b>INPUT VOLTAGE</b>	100–240 VAC, 50/60 Hz
<b>INPUT CURRENT</b>	0.9 amps maximum
<b>POWER CONSUMPTION</b>	Unit: 6.5 watts with keyboard and mouse attached; Power supply is 20 W to support USB based powered devices
<b>HEAT DISSIPATION</b>	(5 VDC x 4 amps) x 3.41 = 68.2 BTU/hour maximum (Voltage x Nominal Current) x 3.41 = BTU/hr
<b>OUTPUT CONNECTOR</b>	2.5-mm barrel
<b>INPUT CONNECTOR</b>	IEC-320, C8
<b>POWER SUPPLY CORD LENGTH</b>	6 ft. (1.8 m)
<b>ENVIRONMENTAL</b>	
<b>OPERATING TEMPERATURE</b>	32 to 104° F (0 to 40° C)
<b>STORAGE TEMPERATURE</b>	-4 to +140° F (-20 to 60° C)
<b>OPERATING HUMIDITY</b>	5 to 95%, noncondensing



# SPECIFICATIONS

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## EMERALD SE DUAL-HEAD TRANSMITTER AND RECEIVER (EMD2002SE-T AND EMD2002SE-R)

TRANSMITTER FRONT VIEW



RECEIVER FRONT VIEW



TRANSMITTER BACK VIEW



RECEIVER BACK VIEW



### WHAT'S INCLUDED WITH THE TRANSMITTER (EMD2002SE-T)

- (1) EMERALD SE TRANSMITTER, DUAL-HEAD
- (1) 5 VDC POWER SUPPLY
- (1) US POWER CORD

### WHAT'S INCLUDED WITH THE RECEIVER (EMD2002SE-R)

- (1) EMERALD SE RECEIVER, DUAL-HEAD
- (1) 5 VDC POWER SUPPLY
- (1) US POWER CORD

# SPECIFICATIONS

## EMERALD SE DUAL-HEAD TRANSMITTER AND RECEIVER (EMD2002SE-T AND EMD2002SE-R)

SPECIFICATIONS FOR EMERALD SE TRANSMITTER AND RECEIVER, DUAL-HEAD (EMD2002SE-T AND EMD2002SE-R)	
<b>APPROVALS</b>	
<b>UNIT</b>	FCC, CE, RoHS, WEEE
<b>POWER SUPPLY</b>	TUV, UL
<b>PHYSICAL</b>	
<b>LED INTERFACE</b>	(1) Power LED button (deactivated, not used); NOTE: Unit automatically powers on when plugged in; must be powered off at the power source. (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
<b>MAXIMUM DISTANCE FROM CPU TO TRANSMITTER</b>	EMD2002SE-T: 16 ft. (5 m), DVI-D and USB limitations
<b>MAXIMUM DISTANCE BETWEEN TRANSMITTER AND RECEIVER</b>	328 ft. (100 m), use a network switch to get farther distances
<b>OPERATING SYSTEM SUPPORT</b>	Microsoft Windows® Vista, XP, Windows 7, Windows 8, Windows 10, Server 2003, Server 2008, Server 2012, Linux®, Mac OS
<b>CONNECTORS</b>	EMD2002SE-T: (2) DVI inputs, (1) USB Type B female, (1) RJ-45 network (10/100/1000BASE-T), (2) 3.5 mm audio, (1) 2.5 mm barrel for power; EMD2002SE-R: (2) DVI outputs, (4) USB Type A female, (1) RJ-45 network (10/100/1000BASE-T), (2) 3.5 mm audio for SPK and MIC, (1) 2.5 mm barrel for power
<b>DIMENSIONS</b>	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)
<b>WEIGHT</b>	EMD2002SE-T: 1.47 lb. (0.67 kg); EMD2002SE-R: 1.36 lb. (0.62 kg)
<b>OPERATION</b>	
<b>DEFAULT IP ADDRESS</b>	EMD2002SE-T: 192.168.1.22; EMD2002SE-R: 192.168.1.21
<b>ENCRYPTION</b>	Secure Sockets Layer (SSL) over TCP/IP, 128-bit between TX and RX, user set between RX and Hyper-V
<b>DEFAULT USERNAME</b>	admin
<b>DEFAULT PASSWORD</b>	The password is blank by default
<b>DDC SUPPORT</b>	Built-in/clone of remote
<b>POWER</b>	
<b>POWER SOURCE</b>	External in-line power supply
<b>INPUT VOLTAGE</b>	100–240 VAC, 50/60 Hz
<b>INPUT CURRENT</b>	0.9 amps maximum
<b>POWER CONSUMPTION</b>	Unit: 6.5 watts with keyboard and mouse attached; Power supply is 20 W to support USB based powered devices
<b>HEAT DISSIPATION</b>	(5 VDC x 4 amps) x 3.41 = 68.2 BTU/hour maximum (Voltage x Nominal Current) x 3.41 = BTU/hr
<b>OUTPUT CONNECTOR</b>	2.5-mm barrel
<b>INPUT CONNECTOR</b>	IEC-320, C8
<b>POWER SUPPLY CORD LENGTH</b>	6 ft. (1.8 m)
<b>ENVIRONMENTAL</b>	
<b>OPERATING TEMPERATURE</b>	32 to 104° F (0 to 40° C)
<b>STORAGE TEMPERATURE</b>	-4 to +140° F (-20 to 60° C)
<b>OPERATING HUMIDITY</b>	5 to 95%, noncondensing



# SPECIFICATIONS

## EMERALD ZEROU DVI TRANSMITTER (EMD200DV-T)

### TRANSMITTER



### WHAT'S INCLUDED WITH THE TRANSMITTER (EMD200DV-T)

- (1) EMERALD ZEROU DVI TRANSMITTER

NOTE: The Emerald ZeroU DVI Transmitter (EMD200DV-T) must be used with the Emerald SE Receiver (EMD2000SE-R).

The Emerald ZeroU DVI Transmitter (EMD200DV-T) and the Emerald SE Receiver (EMD2000SE-R) must be purchased separately.

SPECIFICATIONS FOR EMERALD ZEROU DVI TRANSMITTER (EMD200DV-T)	
<b>APPROVALS</b>	
<b>UNIT</b>	FCC, CE, RoHS, WEEE
<b>PHYSICAL</b>	
<b>LED INTERFACE</b>	(1) Power LED (green); (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
<b>MAXIMUM DISTANCE FROM CPU TO TRANSMITTER</b>	EMD200DV-T: 12" (30.48 cm) via connected cable harness
<b>MAXIMUM DISTANCE BETWEEN TRANSMITTER AND RECEIVER</b>	328 ft. (100 m), use a network switch to get farther distances
<b>OPERATING SYSTEM SUPPORT</b>	Microsoft Windows® Vista, XP, Windows 7, Windows 8, Windows 10, Server 2003, Server 2008, Server 2012, Linux®, Mac OS
<b>CONNECTORS</b>	EMD200DV-T: (1) DVI input, (2) USB Type A female, (1) RJ-45 network (10/100/1000BASE-T), (1) 3.5 mm audio for speakers (only on 12" version), (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;
<b>DIMENSIONS</b>	0.98" H x 2.78" W x 6.12" D (2.5 x 7.07 x 15.55 cm)
<b>WEIGHT</b>	0.474 lb. (0.215 kg)
<b>OPERATION</b>	
<b>DEFAULT IP ADDRESS</b>	EMD200DV-T: 192.168.1.22
<b>ENCRYPTION</b>	Secure Sockets Layer (SSL) over TCP/IP, 128-bit between TX and RX, user set between RX and Hyper-V
<b>DEFAULT USERNAME</b>	admin
<b>DEFAULT PASSWORD</b>	The password is blank by default
<b>DDC SUPPORT</b>	Built-in/clone of remote
<b>POWER</b>	
<b>POWER SOURCE</b>	Via USB or an optional 5-VDC power adapter
<b>INPUT VOLTAGE</b>	5 VDC
<b>ENVIRONMENTAL</b>	
<b>OPERATING TEMPERATURE</b>	32 to 104° F (0 to 40° C)
<b>STORAGE TEMPERATURE</b>	-4 to +140° F (-20 to 60° C)
<b>OPERATING HUMIDITY</b>	5 to 95%, noncondensing

# SPECIFICATIONS

## EMERALD REMOTE APP RECEIVER (EMDRM)

### OVERVIEW

The Emerald™ Remote App is new software from Black Box that allows users to access their Emerald connections, both physical and virtual, from any Windows 10 device. This increases mobility and device access and monitoring in full HD video on the Emerald System. And multiple connections can be launched simultaneously to facilitate multiple device management.

Available licenses are listed below:

- EMDRMDEMO-LIC: Emerald Remote Access, 30-day Trial (4 Connections)
- EMDRM1-LIC: Emerald Remote Access, 1 Connection
- EMDRM5-LIC: Emerald Remote Access, 5 Connections
- EMDRM10-LIC: Emerald Remote Access, 10 Connections
- EMDRM20-LIC: Emerald Remote Access, 20 Connections

### FEATURES

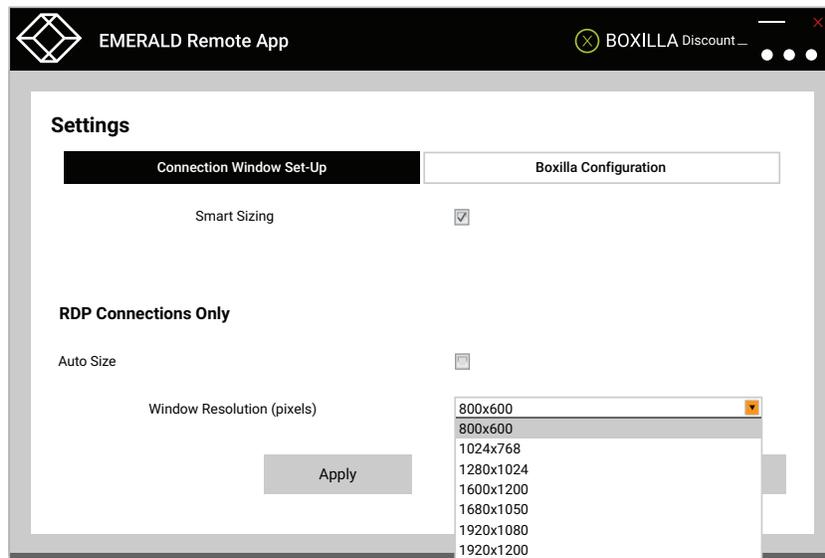
- **HIGH-QUALITY USER EXPERIENCE: SUPPORTS HD VIDEO UP TO 1920 X 1200 WITH ACCESS TO BOTH PHYSICAL MACHINES AND VIRTUAL MACHINES**
- **NO HARDWARE REQUIRED: WORKS ON ANY LAPTOP, TABLET AND DESKTOP DEVICES RUNNING WINDOWS 10**
- **MULTIPLE CONNECTIONS: OPEN CONNECTIONS TO MULTIPLE DEVICES SIMULTANEOUSLY. THIS ALLOWS YOU TO INTERACT OR MONITOR MANY SYSTEMS FROM YOUR OWN DEVICE. PURCHASE THE APPROPRIATE NUMBER OF SIMULTANEOUS CONNECTION LICENSES**
- **SECURITY: ALL ACCESS IS AUTHENTICATED BY BOXILLA IN REAL TIME, ENSURING THAT THE EMERALD ADMINISTRATOR HAS FULL CONTROL AND CAN DEFINE ONLY THE USERS REQUIRED TO HAVE REMOTE ACCESS**
- **WAN SUPPORT: USERS CAN CONNECT FROM ANYWHERE WITH ACCESS TO ALL CONNECTED RESOURCES, ONCE THEY CAN AUTHENTICATE VIA BOXILLA**

### SPECIFICATIONS FOR EMERALD REMOTE APP (EMDRM)

#### HARDWARE/SOFTWARE REQUIREMENTS

<b>HARDWARE</b>	PC, laptop or tablet
<b>SOFTWARE</b>	Windows® 10

### REMOTE APP SCREEN



# SPECIFICATIONS

## 48-PORT 1G NETWORK SWITCH (EMS1G48)

### FEATURES

- **NON-BLOCKING SWITCHING ARCHITECTURE WITH OS 10.X SOFTWARE DELIVERS LINE-RATE L2/L3 FEATURES**
- **HAS (48) 10/100/1000 MBPS TWISTED-PAIR PORTS**
- **ALSO HAS (4) SFP+ 10 GBE UPLINK PORTS FOR MAXIMUM FLEXIBILITY AND INVESTMENT PROTECTION**
- **I/O PANEL TO PSU AIRFLOW**
- **HOT-SWAPPABLE POWER SUPPLIES AND FANS**
- **SUPPORTS JUMBO FRAMES FOR HIGH-END PERFORMANCE IN VIRTUALIZED ENVIRONMENTS AND IP STORAGE/SERVER COMMUNICATION**

### WHAT'S INCLUDED WITH THE SWITCH

- (1) SWITCH
- (1) POWER SUPPLY
- (4) FANS
- (1) RACKMOUNT KIT

### 48-PORT 1G NETWORK SWITCH (EMS1G48) SPECIFICATIONS

<b>APPROVALS</b>	Environmental Compliances: Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A; RoHS EMI Certifications: Australia/New Zealand: AS/NZS CISPR 32: Class A; Canada: ICES-003, Issue-4, Class A; Europe: EN 55032: 2015+A1:2007 (CISPR 32); Class A; Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A Safety Certifications: UL/CSA, EN 60959-1, EN 60825-1, FDA Regulation 21 CFR 1040.10 and 1040.11
<b>ENVIRONMENTAL</b>	Operating Humidity: 5 to 85%, relative humidity, non-condensing Operating Temperature: 32 to 113° F (0 to 45° C) Storage Humidity: 5 to 95%, relative humidity, non-condensing Storage Temperature: -40 to +158° F (-40 to +70° C)
<b>MANAGEMENT</b>	Console port management: (1) RJ-45 console management port with RS-232 signaling; Protocols: UDP, TCP, Ethernet, Telnet, FTP, IPv4, IPv6; IPv4: ICMP, ARP, DNS (client), NTPv3, CIDR, BOOTP (relay) IPv6: Telnet, FTP, TACACS, RADIUS, SSH, NTP
<b>PERFORMANCE</b>	Switching Capacity: 260 Gbps (full-duplex); Forwarding capacity: 131 Mpps; Packet Buffer Memory: 4 MB; CPU Memory: 2 GB MAC Addresses: Up to 80 K IPv4 Routes: 16 K; IPv6 Routes: 8K (Shared CAM space with IPv4); Link aggregation: 16 links per group, 128 groups per stack; Queues per port: 8 queues; Layer 2 VLANs: 4K; MSTP: 64 instances; VRF-lite: 64 instances; Line-rate Layer 2 switching: all protocols, including IPv4 and IPv6; Line-rate Layer 3 routing: IPv4 and IPv6; IPv4 host table size up to 40k max; IPv6 host table size 8K; IPv4 Multicast table size 8K; LAG load balancing: based on Layer 2, IPv4 or IPv6 headers; Latency: 3.7 µsec for 1000BASE-T, 1.8 µsec for SFP+;



# SPECIFICATIONS

## 48-PORT 1G NETWORK SWITCH (EMS1G48)

48-PORT 1G NETWORK SWITCH (EMS1G48) SPECIFICATIONS (CONTINUED)	
<b>PHYSICAL</b>	Connectors/Interfaces: (48) 10/1000/1000BASE-T RJ-45 ports, (4) 10 GbE SFP+ uplink ports, (1) RJ-45 RS-232 serial console port Dimensions: 1.71" H (1 RU) x 17.09" W x 12.6" D (4.4 x 43.4 x 32 cm) Indicators: (1) Power LED, (48) TP Link/Activity LEDs, (48) Speed LEDs, (4) SFP Link LEDs; Mounting: Rackmounted Weight: 12.8 lb. (5.84 kg)
<b>POWER</b>	Input: 90–264 VAC, 50/60 Hz Maximum Power Consumption: 87 W Typical Power Consumption: 65 W Max. Thermal Output: 290 BTU/hr.; Max. Current Draw per System: <1 A at 100/120 VAC, <0.5 A at 200/240 VAC Power Supply Type: Hot-swappable redundant AC power (one power supply provided; optional redundant) Fans: (4) hot-swappable redundant fans
<b>STANDARDS</b>	IEEE: IEEE 802.1ab LLDP; 802.1D Bridging, STP; 802.1p L2 Prioritization; 802.1Q VLAN Tagging, Double VLAN Tagging, GVRP; 802.1s MSTP; 802.1w RSTP; 802.1X Network Access Control; 802.3ab Gigabit Ethernet (1000BASE-T); 802.3ac Frame Extensions for VLAN Tagging; 802.3ad Link Aggregation with LACP; 802.3ae 10 Gigabit Ethernet (10GBASE-X) on optical ports; 802.3az Energy Efficient Ethernet (EEE); 802.3u Fast Ethernet (100BASE-TX) on mgmt ports; 802.3x Flow Control; 802.3z Gigabit Ethernet (1000BASE-X); ANSI/TIA-1057 LLDP-MED, Force10 PVST+, MTU 12,000 bytes; RFC and I-D compliance



# SPECIFICATIONS

## 12-PORT 10G NETWORK SWITCH (EMS10G12)

### FEATURES

- (1) RU HIGH-DENSITY 12-PORT 10 GBE SWITCH
- 840 GBPS (FULL-DUPLEX) NON-BLOCKING, CUT-THROUGH SWITCHING FABRIC DELIVERS LINE-RATE PERFORMANCE UNDER FULL LOAD
- SUPPORTS 10GBASE FIBER OPTICS
- COMPLIES WITH IEEE 1588V2
- VXLAN GATEWAY SUPPORT FOR BRIDGING AND ROUTING NON-VIRTUALIZED AND VIRTUALIZED OVERLAY NETWORKS WITH LINE-RATE PERFORMANCE
- I/O PANEL TO PSU AIRFLOW
- CONVERGED NETWORK SUPPORT WITH DCB

### WHAT'S INCLUDED WITH THE SWITCH

- (1) SWITCH
- (2) POWER SUPPLIES
- (3) FANS
- (1) RACKMOUNT KIT

FRONT VIEW



EMS10G12

### 12-PORT 10G NETWORK SWITCH (EMS10G12) SPECIFICATIONS

<b>APPROVALS</b>	Environmental Compliances: Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A; RoHS EMI Certifications: Australia/New Zealand: AS/NZS CISPR 32: Class A; Canada: ICES-003, Issue-4, Class A; Europe: EN 55032: 2015+A1:2007 (CISPR 32); Class A; Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A Safety Certifications: UL/CSA, EN 60959-1, EN 60825-1, FDA Regulation 21 CFR 1040.10 and 1040.11
<b>ENVIRONMENTAL</b>	Operating Humidity: 5 to 85%, relative humidity, non-condensing Operating Temperature: 41 to 104° F (5 to 40° C) Storage Humidity: 5 to 90%, relative humidity, non-condensing Storage Temperature: -40 to +149° F (-40 to +65° C) NOTE: Reduce maximum temperature by 1°/228 ft. (1°/125 m) above 3117 ft. (950 m) Maximum Operating Altitude: 10,000 ft. (3048 m) Maximum Non-operating Altitude: 39,370 ft. (12,000 m) Shock: Dell EMC Spec SV0115
<b>MANAGEMENT</b>	Console port management: (1) RJ-45 serial Security/Authentication: RADIUS, RADIUS and IPv6, SSHv2, Security Architecture for IPSec, IPSec Authentication Header, ESP Protocol Network Management: SNMPv1/2, SSHv2, FTP, TFTP, SCP, Syslog, Port Mirroring, RADIUS, 802.1X, Support Assist (Phone Home, Netconf APIs, XML Schema, CLI Commit (Scratchpad), sFlow Automation: Control Plane Services APIs, Linux Utilities and Scripting Tools Quality of Service (QoS): Access Control Lists, Prefix List, Route-Map, Rate Shaping (Egress), Rate Policing (Ingress); Scheduling Algorithms: Round Robin, Weighted Round Robin, Deficit Round Robin, Strict Priority, Weighted Random Early Detect
<b>PERFORMANCE</b>	Switching Capacity: 840 Gbps; Forwarding Capacity: 720 Mpps; Frame Size: 9416 bytes; Packet Buffer Memory: 12 MB; CPU Memory: 4 GB; MAC Addresses: 272K (in Scaled L2 mode); ARP Table: 200K (in Scaled L3 routes mode); IPv4 routes: 200K (in Scaled L3 routes mode); IPv6 hosts: 64K; IPv6 routes: 130K (in scaled L3 routes mode); Multicast hosts: 8K Link aggregation: 16 links per group, 128 groups; Layer 2 VLANs: 4K; MSTP: 32 instances; LAG load balancing: Based on layer 2, IPv4 or IPv6 headers

# SPECIFICATIONS

## 12-PORT 10G NETWORK SWITCH (EMS10G12)

<b>12-PORT 10G NETWORK SWITCH (EMS10G-28) SPECIFICATIONS (CONTINUED)</b>	
<b>PHYSICAL</b>	Connectors/Interfaces: (12) 10GbE SFP+, (3) 100GbE QSFP28, (1) Micro USB-B console port, (1) RJ-45 Ethernet management port, (1) RS-232 console port, (2) AC PSUs, (3) Fan modules, I/O Panel to PSU Airflow Dimensions: 1.75" H (1 RU) x 17.7" W x 8.2" D (4.4 x 45 x 20.9 cm) Mounting: Rackmounted Rack Clearance Required: Front: 5" (12.7 cm) Back: 5" (12.7 cm) Weight: 8.3 lb. (3.76 kg) with (2) PSUs and (3) fans
<b>POWER</b>	Input: 100–240 VAC, 50/60 Hz Maximum Current Draw per System: 2 A/1.7 A at 100/120 VAC; 1 A/0.8 A at 200/240 VAC Maximum Power Consumption: 180 W Typical Power Consumption: 90 W Max. Thermal Output: 180 W, 614 BTU/hr. Power Supply Type: (2) hot-swappable redundant AC power Fans: (3) hot-swappable redundant fans
<b>STANDARDS</b>	IEEE Compliance: 802.1ab LLDP; TIA-1057 LLDP-MED; 802.1s MSTP; 802.1w RSTP; 802.3ab Gigabit Ethernet (1000BASE-T); 802.3ad Link Aggregation with LACP; 802.3ae 10 Gigabit Ethernet (10GBASE-X); 802.3i Ethernet (10BASE-T); 802.3u Fast Ethernet (100BASE-TX); 802.3z Gigabit Ethernet (1000BASE-X); 802.1D Bridging, STP; 802.1p L1 Prioritization; 802.1Q VLAN Tagging, Double VLAN Tagging, GVRP; 802.1Qbb PFC; 801.2Qaz ETS; 802.1s MSTP; 802.1w RSTP; PVST+; 802.1X Network Access Control; 802.3ac Frame Extensions for VLAN Tagging; 802.3u Fast Ethernet (100BASE-TX) on mgmt ports; 802.3x Flow Control; 802.3z Gigabit Ethernet (1000BASE-X) with QSA; ANSI/TIA-1057, Jumbo MTU support 9416 bytes



# SPECIFICATIONS

## 28-PORT 10G NETWORK SWITCH (EMS10G28)

### FEATURES

- (1) RU HIGH-DENSITY 28-PORT 10 GBE SWITCH
- 960 GBPS (FULL-DUPLEX) NON-BLOCKING, CUT-THROUGH SWITCHING FABRIC DELIVERS LINE-RATE PERFORMANCE UNDER FULL LOAD
- REDUNDANT, HOT-SWAPPABLE POWER SUPPLIES AND FANS
- SUPPORTS 10GBASE FIBER OPTICS
- COMPLIES WITH IEEE 1588V2
- VXLAN GATEWAY SUPPORT FOR BRIDGING AND ROUTING NON-VIRTUALIZED AND VIRTUALIZED OVERLAY NETWORKS WITH LINE-RATE PERFORMANCE
- I/O PANEL TO PSU AIRFLOW
- CONVERGED NETWORK SUPPORT WITH DCB

### WHAT'S INCLUDED WITH THE SWITCH

- (1) SWITCH
- (2) POWER SUPPLIES
- (4) FANS
- (1) RACKMOUNT KIT

FRONT VIEW



EMS10G28

### 28-PORT 10G NETWORK SWITCH (EMS10G28) SPECIFICATIONS

<b>APPROVALS</b>	Environmental Compliances: Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A; RoHS EMI Certifications: Australia/New Zealand: AS/NZS CISPR 32: Class A; Canada: ICES-003, Issue-4, Class A; Europe: EN 55032: 2015+A1:2007 (CISPR 32); Class A; Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A Safety Certifications: UL/CSA, EN 60959-1, EN 60825-1, FDA Regulation 21 CFR 1040.10 and 1040.11
<b>ENVIRONMENTAL</b>	Operating Humidity: 10 to 85%, relative humidity, non-condensing Operating Temperature: 32 to 104° F (0 to 40° C) Storage Humidity: 5 to 95%, relative humidity, non-condensing Storage Temperature: -40 to +158° F (-40 to +70° C)
<b>MANAGEMENT</b>	Console port management: (1) RJ-45 serial Security/Authentication: RADIUS, RADIUS and IPv6, SSHv2, Security Architecture for IPSec, IPSec Authentication Header, ESP Protocol Network Management: SNMPv1/2, SSHv2, FTP, TFTP, SCP, Syslog, Port Mirroring, RADIUS, 802.1X, Support Assist (Phone Home, Netconf APIs, XML Schema, CLI Commit (Scratchpad), sFlow Automation: Control Plane Services APIs, Linux Utilities and Scripting Tools Quality of Service (QoS): Access Control Lists, Prefix List, Route-Map, Rate Shaping (Egress), Rate Policing (Ingress); Scheduling Algorithms: Round Robin, Weighted Round Robin, Deficit Round Robin, Strict Priority, Weighted Random Early Detect
<b>PERFORMANCE</b>	Switching Capacity: 960 Gbps; Forwarding Capacity: 720 Mpps; Frame Size: 9416 bytes; Packet Buffer Memory: 12 MB; CPU Memory: 4 GB; MAC Addresses: 160 K; ARP Table: 128 K; IPv4 routes: 128K; IPv6 hosts: 64K; IPv6 routes: 64K; Multicast hosts: 8K Link aggregation: 16 links per group, 128 groups; Layer 2 VLANs: 4K; MSTP: 64 instances; LAG load balancing: Based on layer 2, IPv4 or IPv6 headers

# SPECIFICATIONS

## 28-PORT 10G NETWORK SWITCH (EMS10G28)

28-PORT 10G NETWORK SWITCH (EMS10G28) SPECIFICATIONS (CONTINUED)	
<b>PHYSICAL</b>	Connectors/Interfaces: (28) 10GbE SFP+, (2) 100GbE QSFP28, (2) AC PSUs, (4) Fan modules, I/O Panel to PSU Airflow Dimensions: 1.75" H (1 RU) x 17" W x 18" D (4.4 x 43.1 x 45.7 cm) Mounting: Rackmounted Weight: 19.66 lb. (8.92 kg)
<b>POWER</b>	Input: 100–240 VAC, 50/60 Hz Maximum Power: 290 W Typical Operating Power: 260 W Max. Thermal Output: 886 BTU/hr. Power Supply Type: (2) hot-swappable redundant AC power Fans: (4) hot-swappable redundant fans
<b>STANDARDS</b>	IEEE Compliance: 802.1ab LLDP; TIA-1057 LLDP-MED; 802.1s MSTP; 802.1w RSTP; 802.3ab Gigabit Ethernet (1000BASE-T); 802.3ad Link Aggregation with LACP; 802.3ae 10 Gigabit Ethernet (10GBASE-X); 802.3i Ethernet (10BASE-T); 802.3u Fast Ethernet (100BASE-TX); 802.3z Gigabit Ethernet (1000BASE-X); 802.1D Bridging, STP; 802.1p L1 Prioritization; 802.1Q VLAN Tagging, Double VLAN Tagging, GVRP; 802.1Qbb PFC; 801.2Qaz ETS; 802.1s MSTP; 802.1w RSTP; PVST+; 802.1X Network Access Control; 802.3ac Frame Extensions for VLAN Tagging; 802.3u Fast Ethernet (100BASE-TX) on mgmt ports; 802.3x Flow Control; 802.3z Gigabit Ethernet (1000BASE-X) with QSA; ANSI/TIA-1057, Jumbo MTU support 9416 bytes



# SPECIFICATIONS

## 32-PORT 100G NETWORK SWITCH (EMS100G32)

### FEATURES

- (1) RU HIGH-DENSITY (32) ULTRA-SPEED PORTS (CAN ALSO CONNECT TO HIGH-SPEED)
- UP TO 6.4 TBPS OF SWITCHING I/O BANDWIDTH (FULL DUPLEX) AVAILABLE
- SCALABLE L2 AND L3 ETHERNET SWITCHING WITH QOS AND A FULL COMPLEMENT OF STANDARDS-BASED IPV4 AND IPV6 FEATURES, INCLUDING OSPF AND BGP ROUTING SUPPORT
- L2 MULTIPATH SUPPORT VIA VIRTUAL LINK TRUNKING (VLT) AND MULTIPLE VLT (MVL) MULTI-CHASSIS LINK AGGREGATION TECHNOLOGY
- VRF-LITE ENABLES SHARING OF NETWORKING INFRASTRUCTURE AND PROVIDES L3 TRAFFIC ISOLATION ACROSS TENANTS
- OPEN AUTOMATION FRAMEWORK ADDING AUTOMATED CONFIGURATION AND PROVISIONING CAPABILITIES TO SIMPLIFY THE MANAGEMENT OF NETWORK ENVIRONMENTS
- JUMBO FRAME SUPPORT FOR LARGE DATA TRANSFERS
- 128 LINK AGGREGATION GROUPS WITH UP TO EIGHT MEMBERS PER GROUP, USING ENHANCED HASHING
- REDUNDANT, HOT-SWAPPABLE POWER SUPPLIES AND FANS
- I/O PANEL TO PSU AIRFLOW
- TOOL-LESS MOUNTING KITS REDUCE TIME AND RESOURCES FOR SWITCH RACK INSTALLATION
- POWER-EFFICIENT OPERATION UP TO 45°C HELPING REDUCE COOLING COSTS IN TEMPERATURE-CONSTRAINED DEPLOYMENTS

### WHAT'S INCLUDED WITH THE SWITCH

- (1) SWITCH
- (2) POWER SUPPLIES
- (5) FANS
- (1) RACKMOUNT KIT

### 32-PORT 100G NETWORK SWITCH (EMS100G32) SPECIFICATIONS

<b>APPROVALS</b>	Environmental Compliances: Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A; RoHS EMI Certifications: Australia/New Zealand: AS/NZS CISPR 32: Class A; Canada: ICES-003, Issue-4, Class A; Europe: EN 55032: 2015+A1:2007 (CISPR 32); Class A; Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A Safety Certifications: UL/CSA, EN 60959-1, EN 60825-1, FDA Regulation 21 CFR 1040.10 and 1040.11
<b>ENVIRONMENTAL</b>	Operating Humidity: 10 to 90% (RH), noncondensing Operating Temperature: 32 to 113° F (0 to 45° C) Storage Humidity: 5 to 95% (RH), noncondensing Storage Temperature: -40 to +158° F (-40 to +70° C)
<b>MANAGEMENT</b>	Network Management: SMIv1, SNMPv1, Concise MIB Definitions, SNMP Traps, Bridges MIB, OSPFv2 MIB, Community-Based SNMPv2, IP MIB, IP Forwarding Table MIB, SMIv2, Textual Conventions for SMIv2; Security/Authentication: RADIUS, RADIUS and IPv6, Radius support for EAP, 802.1X with RADIUS, EAP, AES Cipher Algorithm in the SNMP User Base Security Model, SSHv2, Security Architecture for IPsec, IPsec Authentication Header, ESP Protocol, IPsec Security Policy DB MIB Type



# SPECIFICATIONS

## 32-PORT 100G NETWORK SWITCH (EMS100G32)

32-PORT 100G NETWORK SWITCH (EMS100G32) SPECIFICATIONS (CONTINUED)	
<b>PERFORMANCE</b>	<p>Switching Capacity: 6.4 Tbps;            Forwarding capacity: Up to 4400 Mpps (Full Duplex);            Packet buffer memory: 16MB;            CPU memory: 8GB;            MAC addresses: 136 K;            ARP entries: 128K;            IPv4 Unicast routes: 136 K;            IPv6 Unicast routes: 68K;            IPv4 Multicast routes: 68K;            IPv6 Multicast routes: Not supported;            Multicast Hosts: 8K;            Layer 2 VLANs: 4K per port;            Layer 3 VLANs: Standalone 1K/VLT 4K;            MSTP: 64 instances;            PVST+: 128 instances;            LAG: 128 groups, 16 members per LAG group;;            LAG load balancing: Based on layer 2, IPv4 or IPv6 headers;;            Latency: Sub 500 ns;            QOS data queues: 8;            QOS control queues: 12;            QOS: Default 1024 entries scalable to 2.5K;            ACL Support: 3K</p>
<b>PHYSICAL</b>	<p>Connectors/Interfaces: (32) 100 Gbps Ethernet SFP ports, (2) SFP+ 10 GbE/1 GbE cages, (1) RJ-45 serial console management port, (1) 10/100/1000BT Ethernet port for management, (1) USB 2.0 Type A storage port, (1) micro USB Type B for console/management port access            Dimensions: 1.75" H (1 RU) x 17.08" W x 18.11" D (4.4 x 43.4 x 46 cm)            Mounting: Rackmounted            Weight: 20.1 lb. (9.12 kg), including power modules</p>
<b>POWER</b>	<p>Input: 100–240 VAC, 50/60 Hz            Max. Power Consumption: 605 W;            Min. Power Consumption: 195 W;            Power Supply Type: (2) hot-swappable redundant AC power            Fans: (4) hot-swappable redundant fans</p>
<b>STANDARDS</b>	<p>LLDP, Bridging, STP, L2 Prioritization, VLAN Tagging, Double VLAN Tagging, GVRP, PFC, ETS, MSTP, RSTP, Network Access Control, Gigabit Ethernet (1000BASE-T) or breakout, Frame extensions for VLAN Tagging, Link Aggregation with LACP, MORE;            ANSI/TIA-1057 LLDP-MED, Force10 PVST+. Jumbo MTU support 9.416 bytes</p>



# SPECIFICATIONS

## 24-PORT 1G NETWORK SWITCH (EMS1G24F)

### FEATURES

- (1) RU SWITCH HAS (24) LINE-RATE FIBER PORTS AND (2) INTEGRATED 10G SFP+ PORTS
- NON-BLOCKING ACCESS
- I/O PANEL TO PSU AIRFLOW
- HOT-SWAPPABLE POWER SUPPLIES

### WHAT'S INCLUDED WITH THE SWITCH

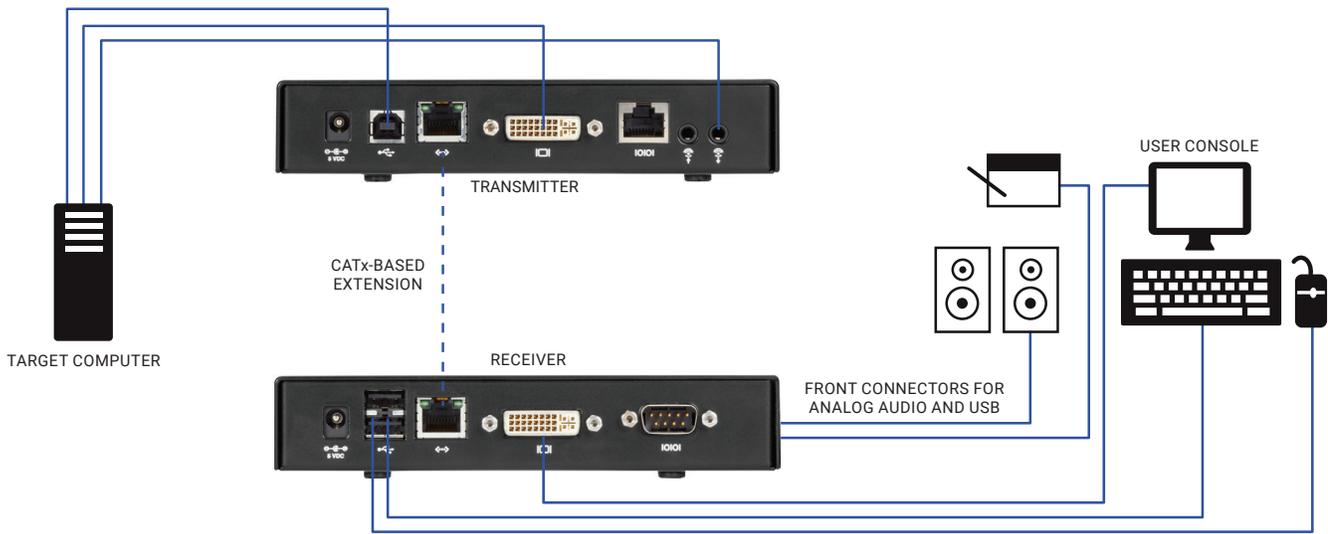
- (1) SWITCH
- (1) RJ-45 TO DB9 FEMALE CABLE
- (1) POWER SUPPLY
- (1) RACKMOUNT KIT
- (1) SET OF SELF-ADHESIVE RUBBER PADS FOR DESKTOP MOUNTING

24-PORT 1G NETWORK SWITCH (EMS1G24F) SPECIFICATIONS	
<b>APPROVALS</b>	Environmental Compliances: Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A; RoHS EMI Certifications: Australia/New Zealand: AS/NZS CISPR 32: Class A; Canada: ICES-003, Issue-4, Class A; Europe: EN 55032: 2015+A1:2007 (CISPR 32); Class A; Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A Safety Certifications: UL/CSA, EN 60959-1, EN 60825-1, FDA Regulation 21 CFR 1040.10 and 1040.11
<b>ENVIRONMENTAL</b>	Operating Humidity: 8 to 85% (RH), noncondensing Operating Temperature: 32 to 113° F (0 to 45° C) Storage Humidity: 5 to 90% (RH), noncondensing Storage Temperature: -40 to +158° F (-40 to +70° C)
<b>MANAGEMENT</b>	Network Management: SMIv1, SNMPv1, Concise MIB Definitions, SNMP Traps, Bridges MIB, OSPFv2 MIB, Community-Based SNMPv2, IP MIB, IP Forwarding Table MIB, SMIv2, Textual Conventions for SMIv2; Security/Authentication: RADIUS, RADIUS and IPv6, Radius support for EAP, 802.1X with RADIUS, EAP, AES Cipher Algorithm in the SNMP User Base Security Model, SSHv2, Security Architecture for IPsec, IPsec Authentication Header, ESP Protocol, IPsec Security Policy DB MIB Type
<b>PERFORMANCE</b>	Switching Capacity: 212 Gbps; Forwarding capacity: Up to 158 Mpps (Full Duplex); Packet buffer memory: 4 MB; CPU memory: 2 GB; Flash memory: 256 MB; MAC addresses: 56 K
<b>PHYSICAL</b>	Connectors/Interfaces: (24) 1-Gbps Ethernet SFP ports, (2) SFP+ 10 GbE/1 GbE cages, (1) RJ-45 serial console management port, (1) 10/100/1000BT Ethernet port for management, (1) USB 2.0 Type A storage port, (1) micro USB Type B for console/management port access Dimensions: 1.71" H (1 RU) x 17.09" W x 16.02" D (4.4 x 43.4 x 40.7 cm) Mounting: Rackmounted Weight: 13.45 lb. (6.1 kg), including power modules
<b>POWER</b>	Input: 100–240 VAC, 50/60 Hz Max. Power Consumption: 63 W; Max.Current Draw per System: 0.40 W at 40.41 W/100 VAC; Power Supply Type: (2) hot-swappable redundant AC power
<b>STANDARDS</b>	LLDP, Bridging, STP, L2 Prioritization, VLAN Tagging, Double VLAN Tagging, GVRP, PFC, ETS, MSTP, RSTP, Network Access Control, Gigabit Ethernet (1000BASE-T) or breakout, Frame extensions for VLAN Tagging, Link Aggregation with LACP, MORE; ANSI/TIA-1057 LLDP-MED, Force10 PVST+. Jumbo MTU support 9.416 bytes



# APPLICATION DIAGRAMS

## BASIC EXTENDER APPLICATION



## EMERALD SE SINGLE-HEAD TRANSMITTER AND RECEIVER MANAGED APPLICATION

