

# RAPTOR XR<sup>®</sup>

Extended Range

HIGH-SPEED UHF  
PEER-TO-PEER & MESH  
NETWORKING RADIO

A COMPLETE BROADBAND NETWORKING BACKHAUL AND MESH INFRASTRUCTURE SOLUTION PROVIDING SUPERIOR RANGE, COVERAGE, AND RELIABILITY FOR WILDERNESS, RURAL, AND URBAN OPERATIONS



Raptor XR Full-Duplex UHF Digital Radio

## MAJOR CAPABILITIES

- UHF operating band - superior range and coverage performance
- 35+ Mbps full-duplex links
- Scalable point-to-point to wide-area mesh network configurations
- Robust suite of physical security and data encryption services
- End-to-end data reliability



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## RAPTOR XR SYSTEM OVERVIEW

THE RAPTOR XR IS AN INDUSTRIAL-GRADE WIRELESS NETWORKING SYSTEM DESIGNED TO MEET THE RIGORS AND CONNECTIVITY REQUIREMENTS OF CRITICAL BACKHAUL AND INFRASTRUCTURE OPERATIONS.

RAPTOR XR FEATURES A MODULAR HARDWARE AND FIRMWARE SYSTEM CONCEPT THAT KEEPS PACE WITH EVER INCREASING TRANSPORT AND SECURITY REQUIREMENTS.

### RAPTOR XR UHF BROADBAND DIGITAL RADIO



## RAPTOR XR STANDARD CONFIGURATIONS AND APPLICATIONS

### STANDARD AND OPTIONAL CONFIGURATIONS

#### BROAD SPECTRUM OPERATING SUPPORT

- UHF operation:
  - Channels
    - Low Band: 14–35 (473–599 MHz)
    - High Band: 40–51 (629–698 MHz)
- Power output:
  - Standard: 28 dBm, EIRP 36–40 dB
- Dynamic link performance engine continuously maintains end-to-end signal integrity
- Spectrum Management System works to avoid interference and sustain connectivity

#### NETWORK ARCHITECTURE

- Pre or field-configurable architectures: point-to-point, broadcast, and ad hoc peer-to-peer mesh topologies
- Compatible with all IP-based routers, hosts, and clients
- Bonded channel aggregation capability increases system reliability, payload capacity, and interference resistance

#### ANTENNA OPTIONS

- Standard: Common (Tx/Rx) antenna (with integrated duplexer)
- Option: External duplexer extended range

#### SECURITY

- Robust suite of physical, firmware, and software tools to defend against wireline and wireless threats.

### APPLICATIONS

#### TELECOMMUNICATIONS

- LTE/4G/GSM Range Extension
- Remote WiFi/WiMax Off-load
- Rural Internet infrastructure
- Superior in-building RF penetration and coverage
- Video streaming infrastructure

#### NATIONAL INFRASTRUCTURE

- Border networks to support VoIP, video, data, and ISR systems
- Oil and gas production and distribution
- Water and waste water infrastructure
- Electric power transmission and distribution
- Chemical and pharmaceutical processing facilities

#### TRANSPORTATION SYSTEMS

- Public and safety backhaul
- Highway infrastructure networks
- Rail monitoring and control systems
- Harbor and waterways network

#### OPTIONS

- Mobile and explosion resistant packaging
- Interfaces for legacy (non-IP) devices
- DC input support from 12 to –48 VDC

# RAPTOR XR NETWORK DESIGN

RAPTOR XR WIRELESS NETWORK TECHNOLOGY OFFERS THE NETWORK DESIGNER, OPERATOR AND SERVICE PROVIDER MAJOR PERFORMANCE ADVANTAGES OVER CONVENTIONAL LTE/4G, MICROWAVE, AND SATELLITE SYSTEMS.

## Spectrum Advantage

- Up to 5 times the range and coverage of WiMax, cell, and WiFi in urban and rural settings (see Table 1)
- Superior RF reach and coverage within structures and vegetative areas
- Spectrum Agility and Frequency Diversity to increase throughput, and avoid or by-pass on-air interference

TABLE 1. RAPTOR XR RANGE AND COVERAGE ADVANTAGE

FREQUENCY MHz	BAND/ TECHNOLOGY	NOMINAL RANGE (km)	
		IN-CITY	RURAL
470–698	UHF	7	25
903–928	UHF	4	10
2400	802.11g/n WiFi	2.5	7
5800	802.11a WiFi	1	4

Table 1 Analysis Parameters

- Tx and Rx antenna height: 20 meters; Rx sensitivity: -85 dBm at 6 MHz bandwidth
- VHF/UHF power out: 28 dBm; Single link full-duplex payload rate: 10 Mbps
- 0.9, 2.4, 5.8 GHz systems at 27 dBm output.

Tx Channel 16:485 MHz  
Rx Channel 46:665 MHz



## Network Advantage

Raptor XR's embedded physical and network level peer-to-peer and ad hoc mesh routing capability supports all network topologies—point-to-point, mesh, star and tree network configurations. With these configurations nearly any real-world connectivity challenge can be solved.

## Network Management Advantage

SafariView, RAPTOR XR's embedded Operations, Administration and Maintenance (OAM) tool provides total secure administration and control of each RAPTOR XR node and the network.

## Cyber Advantage

RAPTOR XR's suite of security-focused hardware, firmware, and software assists in defending critical operations and information from internal and external wireless and network threats.

## Application Versatility Advantage

RAPTOR XR's network of scalability and versatility allows system planners to meet specific range, coverage, security, and mission requirements with minimum life cycle cost and system interruption.

## Capital Advantage

RAPTOR XR is the economic solution of choice. Its broad operating spectrum capability and longer reach mean quicker deployment with less equipment and required infrastructure. Raptor XR offers a real alternative to VSAT and microwave in terrain-challenging environments.

Need more information? Email us at [info@metricsystems.com](mailto:info@metricsystems.com)



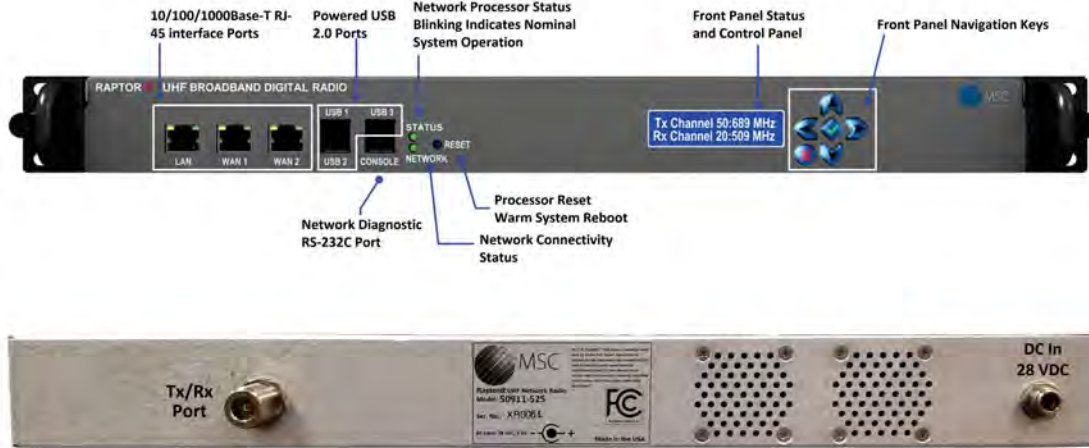


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## RAPTOR XR UHF Front and Rear Panel Layout



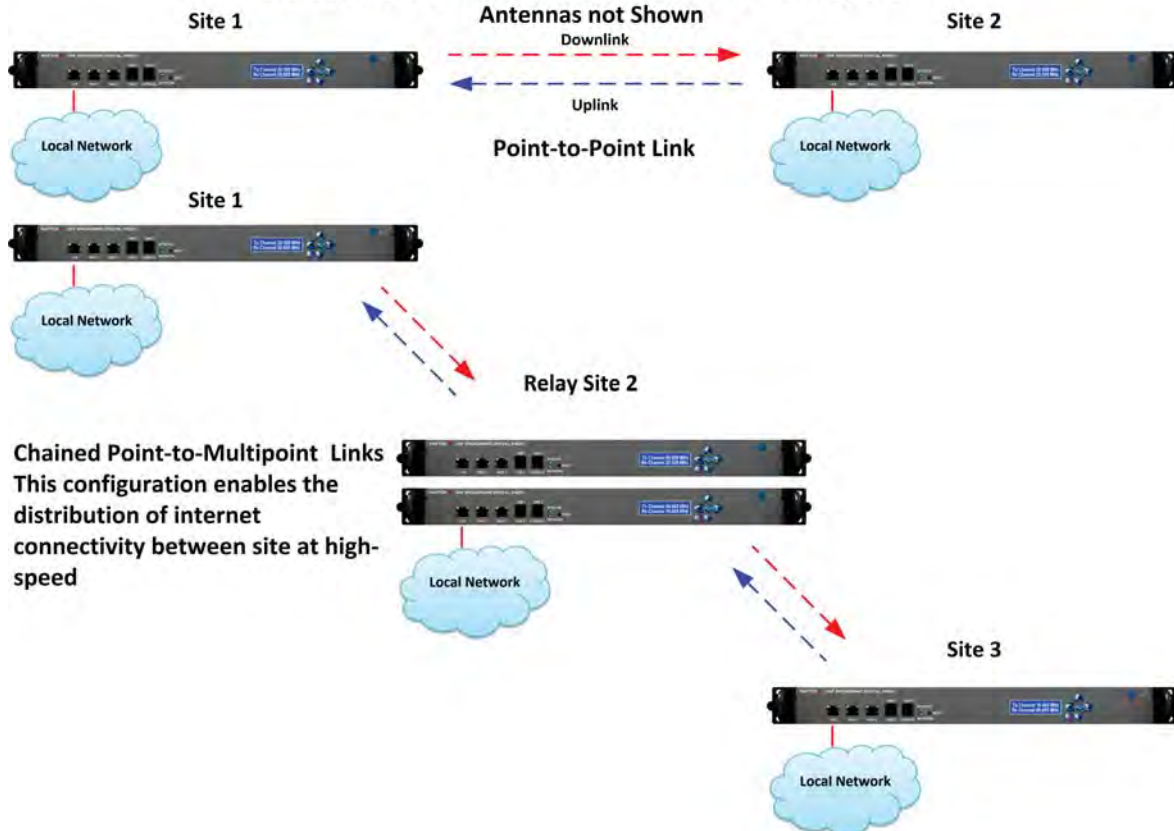
An Internal Duplexer is Standard on the UHF RaptorXR

UHF Directional Antennas



(Shown horizontally polarized)

## UHF RaptorXR Configurations: Point-to-Point and Relay Chain





## NETWORK SECURITY AND MAINTENANCE TOOLS

RAPTOR XR DUAL CPU CORE, CRYPTO-ACCELERATED NETWORK PROCESSOR SUPPORTS DEPLOYMENT IN CRITICAL INFRASTRUCTURE APPLICATIONS.

Standard network architecture and security capabilities include:

### FIREWALL/DMZ

- Robust firewall rule construction
- Secure download of firewall rule sets

### AUTHENTICATION

- Multi-factor authentication
- Remote access token-based authentication

### MALICIOUS CODE DETECTION

- Deep packet inspection

### EVENT/STATUS MONITORING AND LOGGING

- SNMPV3 enhanced security and remote configuration
- Maintenance logs
- Authentication
- Traffic monitoring and analysis
- Intrusion detection

### WIRELESS MAINTENANCE SUPPORT

- Secure password support for remote management and configuration of wireless and network elements

### FAULT TOLERANT AND REDUNDANCY SUPPORT

- Dual channel option supports frequency and space diversity providing high reliability data transfer over long and NLOS paths

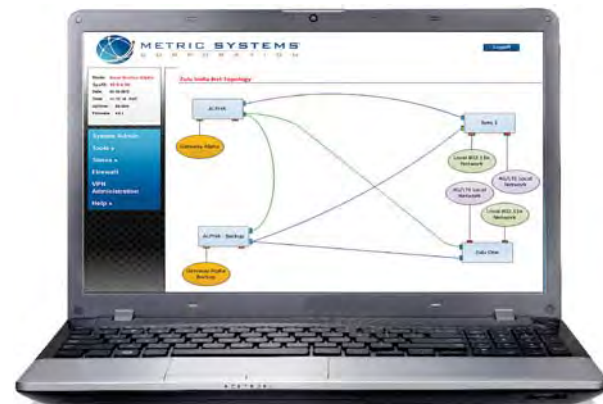
### VLAN SUPPORT

- Multiple independent VLANs
- VLAN trunking
- 

### CYBER DEFENSE TOOLS:

- Static Coding of ARP Tables
- Embedded encryption along with strong authentication provides resilience to Man-in-the-Middle attacks
- Embedded ARPWatch tool monitors and logs Ethernet traffic activity e.g. changing IP and MAC addresses. Raptor XR will notify and react if non-approved Ethernet/IP pairings occur.

Need more information? Email us at [info@metricsystems.com](mailto:info@metricsystems.com)



SafariView Network Graph UI provides a visual monitor of all levels of connectivity and key statistics

## INTERFACING WITH RAPTOR XR

Raptor XR Network Radio Shelves are bundled with SafariView, an embedded web-based UI for supporting standard Operations, Administration, and Maintenance (OA&M) activities.

### SafariView | Raptor XR Operations, Administration, and Maintenance (OAM) Tool

Embedded in each Raptor XR is a robust suite of network tools and applications to configure, monitor, administer, and control each Raptor XR within the network. Capabilities under password and secure control include:

- Ability to configure any Raptor XR within a network locally or remotely
- Robust firewall defense at each Raptor XR WAN and LAN gateway
- Support for multiple secure VPN circuits
- Redundant and alternative fault-tolerant network and link support
- Manual or automatic control of radio link services for each Raptor XR site
- Embedded wireless AP controller support for secure WiFi and third party wireless systems
- Factory support for non-IP devices and proprietary wireless voice and data systems
- Deployment Aids:
  - Over-the-air antenna aiming tools
  - Link quality measurement system



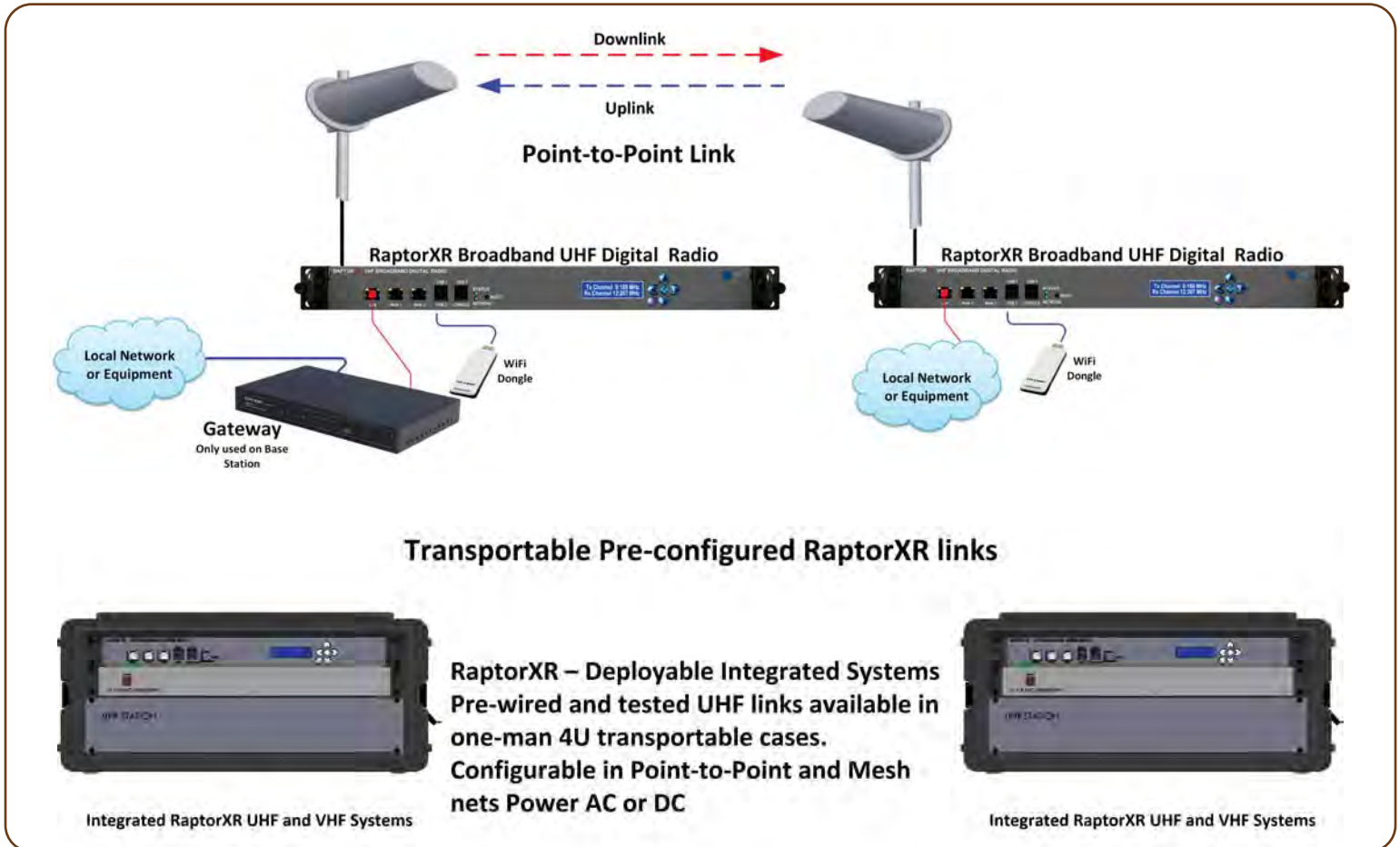
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## Typical Raptor XR UHF Installation Configuration

Duplexer and Protection Shelf included with Radio



Raptor XR VHF and UHF Systems can be provided as separate components or as rugged integrated 4U systems. These systems include all components and are ready for immediate use.

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Raptor XR Standard  
Single Link Configuration

Primary Wireless  
Link and Network  
Processor.....



## OPERATING AND TECHNICAL SPECIFICATIONS

GENERAL			
Standard Frequency Range			
UHF Low-Band	470–602 MHz		
UHF High-Band	620–698 MHz		
Dynamic Frequency Agility (DFA) option	Provides active broad spectrum operation to avoid fading and interference		
Frequency tuning steps	1 kHz		
Weight			
Primary link	5 lbs (2.27 kg)		
Dimensions			
Primary link	14 in. D x 19 in. W x 1.75 in. H (355.6 mm x 482.6 mm x 44.45 mm)		
Operating temperature	Standard: -10° to +55°C Optional: -35° to +65°C		
RECEIVER/TRANSMITTER MINIMUM SPECIFICATIONS			
Modulation Waveform COFDM: Coded Orthogonal Frequency Division Multiplexing	Minimum Rx Signal Level dBm	Minimum Required SNR (dB)	Full-Duplex Link Rate (Mbps)
QPSK (4 QAM)	-92	10	15
16 QAM	-86	12	30
64 QAM	-80	18	30
Adjacent channel rejection (6 MHz channel VHF/UHF)	> 70 dB (100 kHz off-channel)		
Image rejection	> 70 dB		
Average conductive RF power output per VHF/UHF 6 MHz channel	28 dBm		

Need more information?  
Email us at [info@metricsystems.com](mailto:info@metricsystems.com)

POWER	
AC Input	110/240 VAC 50/60 Hz
Power consumption:	65 Watts
SECURITY	
Encryption	128/256-bit Advanced Encryption Standard (AES)
Authorization and Accounting	Protects against unauthorized administration/maintenance and over-the-air access
System access/authentication capabilities	Multi-factor authentication. Remote access token-based authentication
System access/authentication capabilities	Integrated firewall and Information Assurance tools
NETWORK ARCHITECTURE	
VLAN	Supports multiple vlans; static and dynamic
	System integrity logs
Firewall	Robust rule support and encrypted download
Dynamic ad hoc network	Adaptive, self-forming, self-healing network
Network size	Limited only by available RF channels
Network capabilities/single channel	Point-to-point, point-to-multipoint, and mesh
Network capabilities/dual channel	Point-to-point, multipoint, and mesh
Maintenance/diagnostics	Over-the-air programming, integrated web-based administration, monitoring, and reconfiguration
System logs	System. security, authentication, information flow, traffic monitoring, and intrusion detection
Network timing	Multiple network timing protocol options (NTP)
STANDARD ANTENNA INTERFACES	
Standard	Common Tx/Rx antenna (with diplexer)
Optional	Separate Tx and Rx antennas
FREQUENCY STABILITY	
Internal (standard)	±2.5 ppm, ±25 Hz
External GPS (optional)	High stability reference, ±0.25 Hz
SUPPORT ACCESSORIES	
Antennas	Directional or sector



3055 Enterprise Court Vista, CA 92081  
TEL: (760) 845-1874  
email: [info@metricsystems.com](mailto:info@metricsystems.com)  
web: [www.metricsystems.com](http://www.metricsystems.com)

Raptor XR  
Domestic Version  
170803  
MADE IN USA

## CHANNEL SELECTION

### How do I choose what channel to use?

Operating channels should match your application.

## INTERFERENCE

### What happens if there is interference on a channel I am using?

When communication is degraded, the Raptor XR can be pre-configured to manually, or automatically do the following:

- Switch to an alternate authorized clear channel using Raptor XR's embedded SafariView Spectrum Management tools.
- Automatically or manually change modulation format to maintain maximum data flow.
- Increase power to legal maximum to overcome the interference.

## SPECIALIZED SOLUTIONS

### Can Metric Systems provide Raptor XR solutions to fit specialized applications?

Yes, Metric Systems welcome the opportunity to work with your organization to deliver application-specific solutions to meet your specific needs.

## CHANNEL AVAILABILITY

### Channel availability anywhere in the US can be determined at:

<http://www.google.com/get/spectrumdatabase>  
or <http://whitespaces.spectrumbridge.com/whitespace/home.aspx>

## NETWORK CAPABILITIES

### Can I use multiple VHF/UHF channels to increase transport speed and reliability?

Yes. Adjacent or non-adjacent channels in the same or different VHF/UHF bands can be bonded to increase data speeds and system reliability in the event of channel degradation by noise or fading.

### Can I change channels remotely?

Yes. Raptor XR network access is controlled by a secure over-the-air via an encrypted channel.

### Can a Raptor XR network integrate into an existing RF data network or microwave infrastructure network?

Yes. The Raptor XR is an Internet Protocol (IP) device using Ethernet interconnect technology which is compatible with all other network devices including WiFi and LTE/4G systems.

## ANTENNAS

### How do I determine what antenna to use?

Antenna choice is based primarily on two factors:

- In a point-to-point application, directional gain antennas are recommended.
- Metric Systems offers or can recommend the appropriate antenna for your environment.

## LICENSING

### Is an export license required?

An export license for the Raptor XR is only required if it is used for military applications.



3055 Enterprise Court Vista, CA 92081  
TEL: (760) 845-1874  
email: [info@metricsystems.com](mailto:info@metricsystems.com)  
web: [www.metricsystems.com](http://www.metricsystems.com)

Raptor X and XR are covered under one or more of the following U.S. patents: 6952563, 7013345, 7089014, and Canadian patents 2417931, 2444805, and 2444643.  
Specifications subject to change without notice.

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