

# Peregrine BreadCrumb®

## Mobile Wireless Mesh Network Node

The Rajant Peregrine BreadCrumb® is Rajant's new quad transceiver industrial-grade, high-performance BreadCrumb platform. The Peregrine supports a maximum combined data rate of 3.5 Gbps and up to 9X enhanced throughput performance over existing BreadCrumbs. It offers multiple MIMO radio interfaces, high throughput, and enhanced security performance with up to 1024-QAM and 80 MHz channels.

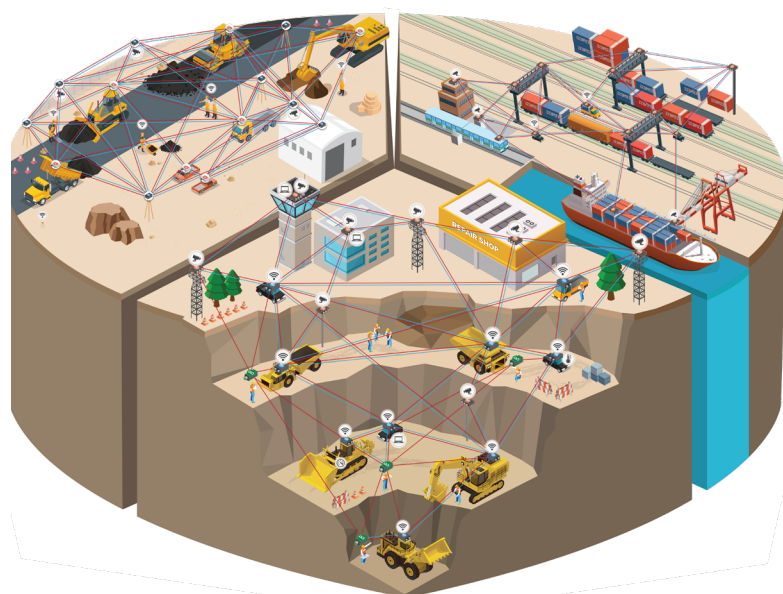


### Peregrine BreadCrumb Platform Key Features

- Rajant's patented<sup>1</sup> InstaMesh® networking software enables the network to quickly adapt to rapidly-deployed and quickly (or constantly) moving network elements
- Multiple concurrent transceivers for high levels of network reliability, redundancy and diversity, and fewer problems due to interference, congestion, and equipment outages
- Up to 3.5 Gbps of physical layer data rate combined over four transceivers
- Multiple radio frequencies – 2.4 GHz, 4.9 GHz, 5 GHz as well as military, licensed, public service, and other proprietary radio frequencies
- Multiple antenna-port configurations with 2x2 MIMO (multiple-input, multiple-output), substantially increasing the capacity of transceivers
- Support for several strong cryptographic options used for data and MAC-address encryption and per-hop, per-packet authentication
- Rugged and environmentally sealed enclosures
- High bandwidth for data, voice, and video applications
- Scalability to hundreds of mobile, high-bandwidth nodes
- Integrated 802.11ac or 802.11ax Wi-Fi Access Point and client mode service for compatibility with millions of commercial off-the-shelf Wi-Fi client and access point devices such as laptops, tablets, smartphones, IP cameras, sensors, and other IP devices
- Self-forming and self-healing operation for fast and easy deployments
- Reliable and fast off-loading to Ethernet via multiple, simultaneous bridge-mode links through the Automatic Protocol Tunneling (APT) feature

### Utilizing the Peregrine Platform to Your Advantage

The Peregrine is our high-performance BreadCrumb platform. Combined with Rajant's patented InstaMesh protocol, the Peregrine can integrate Kinetic Mesh wireless networks with other networks such as LTE/5G. The Peregrine is part of Rajant's initiative to develop deeply integrated solutions that securely combine data from connected people, vehicles, machines, and sensors, with machine learning. This data combination unlocks the benefits of process optimization, digital twins, predictive analytics, condition-based maintenance, augmented reality, and virtual reality while improving worker safety. The Peregrine is interoperable with all of our BreadCrumb models to expand market capabilities for industries like rail, shipping ports, military, mining, and heavy construction.



The Peregrine BreadCrumb is designed to perform flawlessly in various environments and integrate seamlessly with all Rajant BreadCrumb models to form a complete solution.

<sup>1</sup> U.S. Patent 9,001,645

## InstaMesh®

InstaMesh is the advanced, patented<sup>1</sup> protocol developed by Rajant that directs the continuous and instantaneous forwarding of packets from wireless and wired connections. It enables complete network mobility, high throughput, and low latency with very low maintenance and administrative requirements. Operating at Layer 2 and not requiring a root node or LAN Controller, InstaMesh provides robust fault tolerance even if there is a connection or node outage. No matter how you configure your network, InstaMesh networking software always determines the most efficient pathway between any two points, even when those points are in motion.

Model	Description
<b>FE1—2255B</b>	Peregrine with two 2.4 GHz, 2x2 MIMO, 300 Mbps and two 5 GHz, 2x2 MIMO, 866.7 Mbps transceivers. Up to 2.3 Gbps of data rate combined over four transceivers.
<b>FE1—2255X</b>	Peregrine with two 2.4 GHz, 2x2 MIMO, 573.5 Mbps and two 5 GHz, 2x2 MIMO, 1201 Mbps transceivers. Up to 3.5 Gbps of data rate combined over four transceivers.

Wireless	2.4 GHz		5 GHz	
	<b>FE1—2255B</b>	<b>FE1—2255X</b>	<b>FE1—2255B</b>	<b>FE1—2255X</b>
<b>Antenna Connector</b>	(2) Type N (female)			
<b>Frequency<sup>2</sup></b>	2402 – 2482 MHz	2402 – 2482 MHz	U-NII-1: 5150 – 5250 MHz U-NII-2A: 5250 – 5350 MHz U-NII-2C: 5470 – 5725 MHz U-NII-3: 5725 – 5850 MHz	4.9 GHz U-NII-1: 5150 – 5250 MHz U-NII-2A: 5250 – 5350 MHz U-NII-2C: 5470 – 5725 MHz U-NII-3: 5725 – 5850 MHz
<b>Modulation</b>	DSSS, CCK, OFDM with up to 64-QAM	DSSS, CCK, OFDM with up to 1024-QAM	OFDM with up to 256-QAM	OFDM with up to 1024-QAM
<b>Max. Physical Layer Data Rate</b>	300 Mbps (throughput varies)	573.5 Mbps (throughput varies)	866.7 Mbps (throughput varies)	1201 Mbps (throughput varies)
<b>Max. RF Transmit Power<sup>3,4</sup></b>	30 dBm			
<b>Receive Sensitivity<sup>5,6</sup></b>	-100 dBm (@ 1 Mbps, 20 MHz channel bandwidth) to -76 dBm (@ 300 Mbps, 40 MHz channel bandwidth)	-100 dBm (@ 1 Mbps, 20 MHz channel bandwidth) to -64 dBm (@ 573.5 Mbps, 40 MHz channel bandwidth)	-94 dBm (@ 6 Mbps, 20 MHz channel bandwidth) to -68 dBm (@ 866.7 Mbps, 80 MHz channel bandwidth)	-94 dBm (@ 6 Mbps, 20 MHz channel bandwidth) to -59 dBm (@ 1201 Mbps, 80 MHz channel bandwidth)

<sup>2</sup> Channel, frequency and bandwidth options vary based upon regional and local regulations and certifications

<sup>3</sup> RF transmit power is governed by local regulations and varies by frequency

<sup>4</sup> Transmit power tolerance is  $\pm 2$  dB

<sup>5</sup> Receive sensitivity tolerance is  $\pm 2$  dB

<sup>6</sup> Receive sensitivity criteria is less than 10% packet error rate (PER)

## Network & Security

<b>Network Functionality</b>	VLAN and QoS support; Access Point; Bridge; Gateway; DHCP; NAT and Port Forwarding; Automatic Protocol Tunneling (APT).
<b>Security<sup>7</sup></b>	<ul style="list-style-type: none"> <li>Multiple cryptographic options, including NSA Suite B algorithms (implementation not certified). For information on models with full Suite B certification, contact Rajant or your authorized Rajant partner.</li> <li>Separately configurable data and MAC address encryption via AES256-GCM, AES192-GCM, AES128-GCM, AES256-CTR, AES192-CTR, AES128-CTR, XSalsa20, XSalsa20/12, and XSalsa20/8.</li> <li>Configurable per-hop, per-packet authentication between BreadCrumbs via AES256-GMAC, AES192-GMAC, AES128-GMAC, HMAC-SHA512, HMAC-SHA384, HMAC-SHA256, HMAC-SHA224, HMAC-SHA1, and Poly-1305-AES.</li> <li>Supports IEEE 802.11i: AES-CCMP and TKIP encryption, WPA-Personal/Enterprise, WPA2-Personal/Enterprise, iPSK, 802.1x; 64/128-bit WEP; Access Control Lists; Compatible with Layer-2 and Layer-3 client/server and peer-to-peer security solutions.</li> </ul>

## Power

	<b>FE1—2255B</b>	<b>FE1—2255X</b>
<b>DC Power</b>	20 — 60 VDC	
<b>PoE</b>	IEEE 802.3bt Type 3 / PoE++ or 38 — 60 VDC Passive PoE	IEEE 802.3bt Type 4 / PoE++ or 38 — 60 VDC Passive PoE
<b>Power Consumption</b>	10 W (average, idle); 34 W (maximum, peak) @ 48 V	15 W (average, idle); 65 W (maximum, peak) @ 56 V

## Input/Output

	<b>FE1—2255B</b>	<b>FE1—2255X</b>
<b>Ethernet</b>	(2) M12 X-Code female connector, 10/100/1000 Mbps, IEEE 802.3, auto MDI/MDIX	
<b>USB</b>	USB 2.0 Type A female host port for firmware upgrade, USB-based zeroize and GPS device add-on	
<b>LED</b>	(2) Status LED	
<b>Switch</b>	LED configuration / zeroize keys and restore factory defaults (reset) switch	
<b>PWR</b>	M12 L-Code male connector for DC power	

<sup>7</sup> 64/128-bit WEP and TKIP encryption are supported by the FE1-2255B model only. FE1-2255X does not support these security protocols.

## Physical

	FE1—2255B	FE1—2255X
<b>Dimensions</b>	264.9 mm x 253.7 mm x 46.2 mm (10.43 in x 9.99 in x 1.82 in)	
<b>Weight</b>	2946 g (6 lbs 7.9 oz)	3136 g (6 lb 14.6 oz)
<b>Temperature</b>	Startup: -40 °C to +70 °C (-40 °F to 158 °F) Ambient (operating): -40 °C to +70 °C (-40 °F to 158 °F) Storage: -40 °C to +80 °C (-40 °F to 176 °F)	
<b>Enclosure</b>	Designed for IP67 (6: Dust-tight, 7: Waterproof)	
<b>Certification</b>	FCC (US): FE1-2255B IC (Canada): FE1-2255B AS/NZS 4268 (Australia): FE1-2255B CE mark (European Economic Area, Switzerland and Turkey): FE1-2255B (in progress) IFT/NOM (Mexico): FE1-2255B Peru: FE1-2255B Philippines: FE1-2255B ICASA (South Africa): FE1-2255B MIC (Japan): FE1-2255B Indonesia: FE1-2255B Chile: FE1-2255B Singapore: FE1-2255B Zambia: FE1-2255B	FCC (US): FE1-2255X IC (Canada): FE1-2255X
<b>Warranty</b>	1 year	
<b>MTBF</b>	139,907 hours (Telcordia SR-332, Issue 4, Temp +40°C, Ground Mobile 2, 100% duty cycle, 90% confidence).	