



APPLICATIONS

- Emergency First Responders**
 Critical information delivery such as medical data and video feeds during in-progress events
- Enterprise Campus Connectivity**
 Extend main network to remote branch offices, warehouses or other out buildings without leased line
- Mobile Hot Spot**
 On-demand entertainment and broadband access solutions for ferry, transit busses and railway system commuters
- Security and Surveillance**
 Wireless solutions for bandwidth-intensive and high-definition IP-surveillance cameras located at important city and transportation infrastructure such as airports, bridges and trains
- Business and Residential Last Mile Access**
 Competitive broadband service alternative to DSL or cable modems for residences and T1 or Ethernet for businesses
- Metropolitan Area Networks**
 Secure and reliable connectivity between city buildings

<p>Part Numbers</p> <p>(North America region)</p>	<p><u>Model 2454-R Base Station Unit</u></p> <ul style="list-style-type: none"> 2454-BSUR-US-WORLD Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – US PSU -WORLD <p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> 2454-SUA-US-WORLD Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – US PSU -WORLD 2454-SUR-US-WORLD Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – US PSU -WORLD <p><u>Model 5054-R Base Station Unit</u></p> <ul style="list-style-type: none"> 5054-BSUR-US Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – US PSU <p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> 5054-SUA-US Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – US PSU 5054-SUR-US Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – US PSU
<p>Part Numbers</p> <p>(Europe and Middle East regions)</p>	<p><u>Model 2454-R Base Station Unit</u></p> <ul style="list-style-type: none"> 2454-BSUR-EU Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – Europe PSU 2454-BSUR-UK Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – UK PSU <p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> 2454-SUA-EU Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – Europe PSU 2454-SUA-UK Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – UK PSU 2454-SUR-EU Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – Europe PSU 2454-SUR-UK Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – UK PSU <p><u>Model 5054-R Base Station Unit</u></p> <ul style="list-style-type: none"> 5054-BSUR-EU Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – Europe PSU 5054-BSUR-UK Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – UK PSU <p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> 5054-SUA-EU Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – Europe PSU 5054-SUA-UK Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – UK PSU 5054-SUR-EU Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – Europe PSU 5054-SUR-UK Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – UK PSU

<p>Part Numbers</p> <p>(Asia Pacific region)</p>	<p><u>Model 2454-R Base Station Unit</u></p> <ul style="list-style-type: none"> • 2454-BSUR-AU Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – Australia PSU • 2454-BSUR-UK Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – UK PSU • 2454-BSUR-US Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – US PSU • 2454-BSUR-EU Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – Europe PSU • 2454-BSUR-CN Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – China PSU • 2454-BSUR-SK Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – South Korea PSU • 2454-BSUR-US-WORLD Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – US/CAN PSU – WORLD
	<p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> • 2454-SUA-AU Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – Australia PSU • 2454-SUA-UK Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – UK PSU • 2454-SUA-US Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – US PSU • 2454-SUA-EU Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – EU PSU • 2454-SUA-CN Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – China PSU • 2454-SUA-SK Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – South Korea PSU • 2454-SUA-US WORLD Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – US/CAN PSU – WORLD • 2454-SUR-AU Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – Australia PSU • 2454-SUR-UK Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – UK PSU • 2454-SUR-US Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – US PSU • 2454-SUR-EU Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – EU PSU • 2454-SUR-CN Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – China PSU • 2454-SUR-SK Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – South Korea PSU • 2454-SUR-US-WORLD Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – US/CAN PSU - WORLD
	<p><u>Model 5054-R Base Station Unit</u></p> <ul style="list-style-type: none"> • 5054-BSUR-AU Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – Australia PSU • 5054-BSUR-UK Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – UK PSU • 5054-BSUR-US Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – US PSU • 5054-BSUR-EU Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – Europe PSU • 5054-BSUR-CN Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – China PSU • 5054-BSUR-SK Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – South Korea PSU • 5054-BSUR-US-WORLD Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – US/CAN PSU - WORLD
	<p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> • 5054-SUA-AU Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – Australia PSU • 5054-SUA-UK Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – UK PSU • 5054-SUA-US Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – US PSU • 5054-SUA-EU Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – EU PSU • 5054-SUA-CN Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – China PSU • 5054-SUA-SK Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – South Korea PSU • 5054-SUA-US-WORLD Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – US/CAN PSU - WORLD • 5054-SUR-AU Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – Australia PSU • 5054-SUR-UK Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – UK PSU • 5054-SUR-US Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – US PSU • 5054-SUR-EU Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – EU PSU • 5054-SUR-CN Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – China PSU • 5054-SUR-SK Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – South Korea PSU • 5054-SUR-US-WORLD Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – US/CAN PSU - WORLD

<p>Part Numbers</p> <p>(Caribbean and Latin America region)</p>	<p><u>Model 2454-R Base Station Unit</u></p> <ul style="list-style-type: none"> • 2454-BSUR-US-WORLD Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – US PSU - WORLD • 2451-BSUR-BR Tsunami MP.11 Model 2454-R Base Station Unit with Type-N Connector – Brazil PSU <p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> • 2454-SUA-US-WORLD Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – US PSU - WORLD • 2454-SUA-BR Tsunami MP.11 Model 2454-R Subscriber Unit with Type-N Connector – Brazil PSU • 2454-SUR-US-WORLD Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – US PSU - WORLD • 2454-SUR-BR Tsunami MP.11 Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna – US PSU <p><u>Model 5054-R Base Station Unit</u></p> <ul style="list-style-type: none"> • 5054-BSUR-US Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – US PSU • 5054-BSUR-BR Tsunami MP.11 Model 5054-R Base Station Unit with Type-N Connector – Brazil PSU <p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> • 5054-SUA-US Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – US PSU • 5054-SUA-BR Tsunami MP.11 Model 5054-R Subscriber Unit with Type-N Connector – Brazil PSU • 5054-SUR-US Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – US PSU • 5054-SUR-BR Tsunami MP.11 Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna – Brazil PSU
<p>Part Numbers</p> <p>(Universal)</p>	<p><u>Accessories</u></p> <ul style="list-style-type: none"> • 5054-SURGE Surge Arrestor 5 GHz - Standard-N Female to Female • 848 274 171 20 ft Low Loss Antenna Cable St-N - Male-Male LMR 200 • 848 332 789 20 ft Low Loss Antenna Cable St-N - Male-Male LMR 400 • 5054-U4A400-50 50 ft Low Loss Antenna Cable St-N - Male-Male LMR 400 • 848 274 205 75 ft Low Loss Antenna Cable St-N - Male-Male LMR 400 • 69828 6 ft Low Loss Antenna Cable St-N - Male-Male LMR 600 • 5054-LMR600-50 50 ft Low Loss Antenna Cable St-N - Male-Male LMR 600 • 70251 PoE (Power over Ethernet) Surge Arrestor for Tsunami MP.11 and QuickBridge.11 <p><u>Outdoor Ethernet Cables</u></p> <ul style="list-style-type: none"> • 69819 25m outdoor, terminated CAT5 cable for Tsunami MP.11 or QB.11 with three RJ-45 and one weather-proof Ethernet port cap • 69820 50m outdoor, terminated CAT5 cable for Tsunami MP.11 or QB.11 with three RJ-45 and one weather-proof Ethernet port cap • 69821 75m outdoor, terminated CAT5 cable for Tsunami MP.11 or QB.11 with three RJ-45 and one weather-proof Ethernet port cap <p><u>Power Injector</u></p> <ul style="list-style-type: none"> • 69823 Spare Power DC Injector for Tsunami MP.11 or QB.11 (-R model ONLY) <p><u>2.4 GHz Antennas</u></p> <ul style="list-style-type: none"> • 848 515 722 5 dBi Omni-Directional Vehicle Antenna w/Integrated 250 cm cable • 848 312 591 7 dBi Omni-Directional Base Station Antenna - St-N Female • 848 515 698 10 dBi Omni-Directional Base Station Antenna - St-N Female • 848 515 706 12 dBi Directional Wide Angle Antenna (120 degrees) - St-N Female • 848 515 714 24 dBi Directional Antenna (Parabolic Grid) - St-N Female • 2400-SA60-14 14 dBi Directional Sector Antenna (60 degrees) 2.4GHz St-N Female • 1086-PA24-14 14 dBi Panel Antenna - St-N Female <p><u>5 GHz Antennas</u></p> <ul style="list-style-type: none"> • 5054-PA-18 18 dBi Panel Antenna - St-N Female - 5.25 - 5.875 GHz • 5054-PA-23 23 dBi Panel Antenna - St-N Female - 5.725 - 5.875 GHz • 5054-OA-8 8 dBi Omni Directional Antenna - St-N Female - 5.47-5.850 GHz • 5054-OA-10 10 dBi Omni Directional Antenna - St-N Female - 5.47-5.850 GHz • 5054-SA120-14 14 dBi Sector Antenna - St-N Female - 5.25-5.850 GHz - 120 degrees • 5054-SA60-17 17 dBi Sector Antenna - St-N Female - 5.25-5.850 GHz - 60 degrees

Regulatory Approvals and Frequency Ranges for 2454-R¹	Model 2454-R					
	Country	Number of Channels				Certification
	North America					
	USA	(GHz)	5MHz	10MHz	20MHz	Yes
	Canada	2.40 - 2.4835	11	Up to 11	Up to 11	
	Mexico	2.40 - 2.472	13	Up to 13	Up to 13	
	EU Countries					
	Austria	(GHz)	5MHz	10MHz	20MHz	Yes
	Belgium					
	Cyprus					
	Czech Republic					
	Denmark					
	Estonia					
	Finland					
	France					
	Germany					
	Greece					
	Hungary					
	Ireland					
	Italy					
	Latvia					
	Luxemburg					
	Lithuania					
	Malta					
	Netherlands					
	Poland					
	Portugal					
	Spain					
	Sweden					
	Slovakia					
Slovenia						
United Kingdom	(GHz)	5MHz	10MHz	20MHz	Yes	
• 2.40 - 2.4835	13	Up to 13	Up to 13			
Other European Countries						
Iceland	(GHz)	5MHz	10MHz	20MHz	Yes	
Liechtenstein						
Norway						
Switzerland						
South America						
Brazil	(GHz)	5MHz	10MHz	20MHz	Yes	
2.40 - 2.4835	13	Up to 13	Up to 13			
APAC						
Australia	(GHz)	5MHz	10MHz	20MHz	Yes	
New Zealand						
Japan						
Hong Kong						
S. Korea						
China						
Taiwan	2.40 - 2.4835	13	Up to 13	Up to 13		

Regulatory Approvals and Frequency Ranges for 5054-R ¹	Model 5054-R					Certification				
	Country	Number of Channels								
North America	USA	(GHz)	5MHz	10MHz	20MHz	Yes				
		5.25 - 5.35	Up to 15	Up to 7	Up to 3					
Canada	(GHz)	5MHz	10MHz	20MHz						
	5.25 - 5.35	Up to 15	Up to 7	Up to 3						
Mexico	(GHz)	5MHz	10MHz	20MHz						
	5.725 - 5.85	Up to 21	Up to 11	Up to 5						
EU Countries										
Austria	<table border="1"> <thead> <tr> <th>(GHz)</th> <th>5MHz</th> <th>10MHz</th> <th>20MHz</th> </tr> </thead> <tbody> <tr> <td>5.47 - 5.70</td> <td>Up to 46</td> <td>Up to 23</td> <td>Up to 11</td> </tr> </tbody> </table>	(GHz)	5MHz	10MHz	20MHz	5.47 - 5.70	Up to 46	Up to 23	Up to 11	Yes
(GHz)		5MHz	10MHz	20MHz						
5.47 - 5.70		Up to 46	Up to 23	Up to 11						
Belgium										
Cyprus										
Czech Republic										
Denmark										
Estonia										
Finland										
France										
Germany										
Greece										
Hungary										
Italy										
Latvia										
Luxemburg										
Lithuania										
Malta										
Netherlands										
Poland										
Portugal										
Spain										
Sweden										
Slovakia										
Slovenia										
United Kingdom	(GHz)	5MHz	10MHz	20MHz	Yes					
Ireland	5.47 - 5.70	Up to 46	Up to 23	Up to 11						
Other European Countries										
Iceland	<table border="1"> <thead> <tr> <th>(GHz)</th> <th>5MHz</th> <th>10MHz</th> <th>20MHz</th> </tr> </thead> <tbody> <tr> <td>5.47 - 5.70</td> <td>Up to 46</td> <td>Up to 23</td> <td>Up to 11</td> </tr> </tbody> </table>	(GHz)	5MHz	10MHz	20MHz	5.47 - 5.70	Up to 46	Up to 23	Up to 11	Yes
(GHz)		5MHz	10MHz	20MHz						
5.47 - 5.70		Up to 46	Up to 23	Up to 11						
Liechtenstein										
Norway										
Switzerland										
Russia	(GHz)	5MHz	10MHz	20MHz	Yes					
	5.15 - 5.85	Up to 141	Up to 71	Up to 36						
South America										
Brazil	(GHz)	5MHz	10MHz	20MHz	Yes					
	5.47-5.70	Up to 46	Up to 23	Up to 11						
	5.725 - 5.85	Up to 19	Up to 10	Up to 5						
Argentina	(GHz)	5MHz	10MHz	20MHz	Yes					
	5.25-5.35	Up to 9	Up to 5	Up to 3						
	5.725 - 5.85	Up to 13	Up to 7	Up to 4						
Colombia	(GHz)	5MHz	10MHz	20MHz	Yes					
	5.25-5.35	Up to 15	Up to 7	Up to 3						
	5.725 - 5.85	Up to 21	Up to 11	Up to 5						
APAC										
Australia	<table border="1"> <thead> <tr> <th>(GHz)</th> <th>5MHz</th> <th>10MHz</th> <th>20MHz</th> </tr> </thead> <tbody> <tr> <td>5.725 - 5.85</td> <td>Up to 21</td> <td>Up to 11</td> <td>Up to 5</td> </tr> </tbody> </table>	(GHz)	5MHz	10MHz	20MHz	5.725 - 5.85	Up to 21	Up to 11	Up to 5	Yes
(GHz)		5MHz	10MHz	20MHz						
5.725 - 5.85		Up to 21	Up to 11	Up to 5						
New Zealand										
Hong Kong										
S. Korea	(GHz)	5MHz	10MHz	20MHz	Yes					
China	5.725-5.85	Up to 17	Up to 9	Up to 5						
Taiwan	(GHz)	5MHz	10MHz	20MHz	Yes					
	5.25-5.35	Up to 15	Up to 7	Up to 3						
	5.725-5.85	Up to 17	Up to 9	Up to 5						
Singapore	(GHz)	5MHz	10MHz	20MHz	In Process					
	5.15-5.25	Up to 13	Up to 7	Up to 4						
	5.725-5.825	Up to 17	Up to 9	Up to 5						
India	(GHz)	5MHz	10MHz	20MHz	In Process					
	5.15-5.35	Up to 32	Up to 16	Up to 7						
	5.725-5.825	Up to 17	Up to 9	Up to 5						

<p>Integrated Antenna Specification</p>	<p>Model 2454-R Subscriber Unit with Integrated 18-dBi Antenna</p> <ul style="list-style-type: none"> • Part Number 2454-SUR-xx • Frequency range 2.4 to 2.5 GHz • Nominal Impedance 50 Ohms • Gain 18 dBi • Front-to-Back Ratio 25 dB • HPBW/vertical 22 degrees • HPBW/horizontal 15 degrees • Cross Polarization 20 dB • Power handling 1 W • VSWR 1.5 : 1 Max <p>Model 5054-R Subscriber Unit with Integrated 23-dBi Antenna</p> <ul style="list-style-type: none"> • Part Number 5054-SUR-xx • Frequency range 5250 - 5875 MHz • Nominal Impedance 50 ohms • Gain 23 dBi • Front-to-Back Ratio 35 dB • HPBW/vertical 9 degrees • HPBW/horizontal 9 degrees • Cross Polarization 23 dB • Power handling 1 W (cw) • VSWR 2.0 : 1 Max 																								
<p>RF Modulation and over-the-air rates</p>	<p>Model 2454-R and 5054-R OFDM (Orthogonal Frequency Division Multiplexing)</p> <table border="1" data-bbox="688 1016 1474 1171"> <thead> <tr> <th></th> <th><u>20 MHz Channels</u></th> <th><u>10 MHz Channels</u></th> <th><u>5 MHz Channels</u></th> </tr> </thead> <tbody> <tr> <td>• BPSK</td> <td>6 and 9 Mbps</td> <td>3 and 4.5 Mbps</td> <td>2.25 and 1.5 Mbps</td> </tr> <tr> <td>• QPSK</td> <td>12 and 18 Mbps</td> <td>6 and 9 Mbps</td> <td>3 and 4.5 Mbps</td> </tr> <tr> <td>• 16-QAM</td> <td>24 and 36 Mbps</td> <td>12 and 18 Mbps</td> <td>6 and 9 Mbps</td> </tr> <tr> <td>• 64-QAM</td> <td>48 and 54 Mbps</td> <td>24 and 36 Mbps</td> <td>12 and 18 Mbps</td> </tr> <tr> <td>• Maximum Packet Size</td> <td colspan="3">1522 Bytes</td> </tr> </tbody> </table>		<u>20 MHz Channels</u>	<u>10 MHz Channels</u>	<u>5 MHz Channels</u>	• BPSK	6 and 9 Mbps	3 and 4.5 Mbps	2.25 and 1.5 Mbps	• QPSK	12 and 18 Mbps	6 and 9 Mbps	3 and 4.5 Mbps	• 16-QAM	24 and 36 Mbps	12 and 18 Mbps	6 and 9 Mbps	• 64-QAM	48 and 54 Mbps	24 and 36 Mbps	12 and 18 Mbps	• Maximum Packet Size	1522 Bytes		
	<u>20 MHz Channels</u>	<u>10 MHz Channels</u>	<u>5 MHz Channels</u>																						
• BPSK	6 and 9 Mbps	3 and 4.5 Mbps	2.25 and 1.5 Mbps																						
• QPSK	12 and 18 Mbps	6 and 9 Mbps	3 and 4.5 Mbps																						
• 16-QAM	24 and 36 Mbps	12 and 18 Mbps	6 and 9 Mbps																						
• 64-QAM	48 and 54 Mbps	24 and 36 Mbps	12 and 18 Mbps																						
• Maximum Packet Size	1522 Bytes																								
<p>Wireless Protocol</p>	<ul style="list-style-type: none"> • WORP (Wireless Outdoor Router Protocol) 																								
<p>Device Interface</p>	<p>Ethernet</p> <ul style="list-style-type: none"> • Auto-sensing 10/100BASE-TX Ethernet <p>Antenna Connector for BSU and SU with Type-N Connector</p> <ul style="list-style-type: none"> • Standard Type-N Female 																								
<p>Network Architecture Type</p>	<ul style="list-style-type: none"> • Infrastructure 																								

Receive Sensitivity (BER=10-6)	Model 2454-R				
	Modulation	40 MHz Channels Turbo Mode	20 MHz Channels Standard Mode	10 MHz Channels Standard Mode	5 MHz Channels Standard Mode
	64QAM 3/4	N/A	-71 dBm @54 Mbps	-74 dBm @36 Mbps	-77 dBm @18 Mbps
	64QAM 1/2		-74 dBm @48 Mbps	-77 dBm @24 Mbps	-80 dBm @12 Mbps
	16QAM 3/4		-79 dBm @36 Mbps	-82 dBm @18 Mbps	-85 dBm @9 Mbps
	16QAM 1/2		-84 dBm @24 Mbps	-87 dBm @12 Mbps	-90 dBm @6 Mbps
	QPSK 3/4		-87 dBm @18 Mbps	-90 dBm @9 Mbps	-93 dBm @4.5 Mbps
	QPSK 1/2		-89 dBm @12 Mbps	-92 dBm @6 Mbps	-95 dBm @3 Mbps
	BPSK 3/4		-91 dBm @9 Mbps	-94 dBm @4.5 Mbps	-97 dBm @2.25 Mbps
	BPSK 1/2		-91 dBm @6 Mbps	-94 dBm @3 Mbps	-97 dBm @1.5 Mbps
	Model 5054-R				
	Modulation	40 MHz Channels Turbo Mode	20 MHz Channels Standard Mode	10 MHz Channels Standard Mode	5 MHz Channels Standard Mode
	64QAM 3/4	-66 dBm @108 Mbps	-69 dBm @54 Mbps	-72 dBm @36 Mbps	-75 dBm @18 Mbps
	64QAM 1/2	-68 dBm @96 Mbps	-72 dBm @48 Mbps	-75 dBm @24 Mbps	-78 dBm @12 Mbps
	16QAM 3/4	-75 dBm @72 Mbps	-77 dBm @36 Mbps	-80 dBm @18 Mbps	-83 dBm @9 Mbps
	16QAM 1/2	-78 dBm @48 Mbps	-80 dBm @24 Mbps	-83 dBm @12 Mbps	-86 dBm @6 Mbps
	QPSK 3/4	-81 dBm @36 Mbps	-83 dBm @18 Mbps	-86 dBm @9 Mbps	-89 dBm @4.5 Mbps
	QPSK 1/2	-83 dBm @24 Mbps	-86 dBm @12 Mbps	-89 dBm @6 Mbps	-92 dBm @3 Mbps
	BPSK 3/4	-84 dBm @18 Mbps	-87 dBm @9 Mbps	-90 dBm @4.5 Mbps	-93 dBm @2.25 Mbps
	BPSK 1/2	-85 dBm @12 Mbps	-88 dBm @6 Mbps	-91 dBm @3 Mbps	-94 dBm @1.5 Mbps
Maximum Throughput (Mbps)	Model 2454-R				
	Data rate	20 MHz Channels	10 MHz Channels	5 MHz Channels Standard Mode	
	54Mbps	30 Mbps			
	48Mbps	28 Mbps			
	36Mbps	18 Mbps			
	24Mbps	14 Mbps			
	18Mbps	12 Mbps	12 Mbps		
	12Mbps	9 Mbps	9 Mbps		
	9Mbps	7 Mbps	7 Mbps	6.8 Mbps	
	6Mbps	5 Mbps	5 Mbps	5 Mbps	
	4.5Mbps		4 Mbps	4 Mbps	
	3Mbps		2 Mbps	2.7 Mbps	
	2.25Mbps			2 Mbps	
	1Mbps			1.4 Mbps	
	Model 5054-R				
	Data rate	40 MHz Channels Turbo Mode (US Only)	20 MHz Channels Standard Mode	10 MHz Channels Standard Mode	5 MHz Channels Standard Mode
	108Mbps Turbo 54	35 Mbps			
	96Mbps Turbo 48	35 Mbps			
	72Mbps Turbo 36	35 Mbps			
	48Mbps Turbo 24	27 Mbps			
	36Mbps Turbo 18	22 Mbps			
	24Mbps Turbo 12	16 Mbps			
	54Mbps		29 Mbps		
	48Mbps		27 Mbps		
	36Mbps		22 Mbps		
	24Mbps		16 Mbps	16 Mbps	
	18Mbps		13 Mbps	13 Mbps	
	12Mbps		9 Mbps	9 Mbps	
	9Mbps		7 Mbps	7 Mbps	7 Mbps
	6Mbps		5 Mbps	5 Mbps	4.7 Mbps
	4.5Mbps			3.6 Mbps	3.8 Mbps
	3Mbps			2.4 Mbps	2.7 Mbps
	2.25Mbps				2.7 Mbps
	1Mbps				1.2 Mbps
	*Maximum throughput data with release of 2.3, as mentioned with test equipment under controlled lab conditions and best performance packet size. In some instances, data compression yields throughput equal to configured data rate. Actual throughput performance in the field may vary.				
Latency	< 10ms typical at maximum throughput*				
	*under throughput test cconditions indicated above.				

<p>Transmit Power Settings</p>	<p>Model 2454-R</p> <table border="1"> <thead> <tr> <th></th> <th>6-24 Mbps @ 20 MHz 16QAM ½, QPSK ¾, QPSK ½ BPSK ¾ BPSK ½</th> <th>36 Mbps @ 20 MHz 16QAM ¾</th> <th>48 Mbps @ 20 MHz 64QAM ½</th> <th>54 Mbps @ 20 MHz 64QAM ¾</th> </tr> </thead> <tbody> <tr> <td>2.400-2.483 GHz</td> <td>16 dBm</td> <td>16 dBm</td> <td>14 dBm</td> <td>13 dBm</td> </tr> </tbody> </table> <p>Output Power Attenuation: 0 - 18dB, in 3dB steps Output Power Values will have a tolerance of +/- 1.5 dB</p> <p>Model 5054-R</p> <table border="1"> <thead> <tr> <th></th> <th>6-24 Mbps @ 20 MHz 16QAM ½, QPSK ¾, QPSK ½ BPSK ¾ BPSK ½</th> <th>36 Mbps @ 20 MHz 16QAM ¾</th> <th>48 Mbps @ 20 MHz 64QAM ½</th> <th>54 Mbps @ 20 MHz 64QAM ¾</th> </tr> </thead> <tbody> <tr> <td>5.15-5.35 GHz</td> <td>15 dBm</td> <td>13 dBm</td> <td>12 dBm</td> <td>11 dBm</td> </tr> <tr> <td>5.47-5.725 GHz</td> <td>16 dBm</td> <td>13 dBm</td> <td></td> <td></td> </tr> <tr> <td>5.725-5.850 GHz</td> <td>16 dBm</td> <td>13 dBm</td> <td></td> <td></td> </tr> </tbody> </table> <p>Output Power Attenuation: 0 - 18dB, in 3dB steps Output Power Values will have a tolerance of +/- 1.5 dB</p>		6-24 Mbps @ 20 MHz 16QAM ½, QPSK ¾, QPSK ½ BPSK ¾ BPSK ½	36 Mbps @ 20 MHz 16QAM ¾	48 Mbps @ 20 MHz 64QAM ½	54 Mbps @ 20 MHz 64QAM ¾	2.400-2.483 GHz	16 dBm	16 dBm	14 dBm	13 dBm		6-24 Mbps @ 20 MHz 16QAM ½, QPSK ¾, QPSK ½ BPSK ¾ BPSK ½	36 Mbps @ 20 MHz 16QAM ¾	48 Mbps @ 20 MHz 64QAM ½	54 Mbps @ 20 MHz 64QAM ¾	5.15-5.35 GHz	15 dBm	13 dBm	12 dBm	11 dBm	5.47-5.725 GHz	16 dBm	13 dBm			5.725-5.850 GHz	16 dBm	13 dBm				
	6-24 Mbps @ 20 MHz 16QAM ½, QPSK ¾, QPSK ½ BPSK ¾ BPSK ½	36 Mbps @ 20 MHz 16QAM ¾	48 Mbps @ 20 MHz 64QAM ½	54 Mbps @ 20 MHz 64QAM ¾																													
2.400-2.483 GHz	16 dBm	16 dBm	14 dBm	13 dBm																													
	6-24 Mbps @ 20 MHz 16QAM ½, QPSK ¾, QPSK ½ BPSK ¾ BPSK ½	36 Mbps @ 20 MHz 16QAM ¾	48 Mbps @ 20 MHz 64QAM ½	54 Mbps @ 20 MHz 64QAM ¾																													
5.15-5.35 GHz	15 dBm	13 dBm	12 dBm	11 dBm																													
5.47-5.725 GHz	16 dBm	13 dBm																															
5.725-5.850 GHz	16 dBm	13 dBm																															
<p>Range Information for 5054-R²</p>	<table border="1"> <thead> <tr> <th>Integrated Antenna</th> <th>54 Mbps - Line of Sight</th> <th>36 Mbps - Line of Sight</th> <th>6 Mbps - Near Line of Sight</th> </tr> </thead> <tbody> <tr> <td>5.15-5.35 GHz (US)</td> <td>3mi/4.8km</td> <td>6mi/9.6km</td> <td>3mi/4.8km</td> </tr> <tr> <td>5.47-5.7 GHz (ETSI)</td> <td>3mi/4.8km</td> <td>6mi/9.6km</td> <td>2.1mi/3.8km</td> </tr> <tr> <td>5.725-5.850 GHz (US)</td> <td>3mi/4.8km</td> <td>6mi/9.6km</td> <td>3mi/4.8km</td> </tr> <tr> <th>External Antenna</th> <th>54 Mbps - Line of Sight</th> <th>36 Mbps - Line of Sight</th> <th>6 Mbps - Near Line of Sight</th> </tr> <tr> <td>5.15-5.35 GHz (US)</td> <td>5mi/8.05km</td> <td>10mi/16.1km</td> <td>2.1mi/3.8km</td> </tr> <tr> <td>5.47-5.7 GHz (ETSI)</td> <td>5mi/8.05km</td> <td>10mi/16.1km</td> <td>1.1mi/1.8km</td> </tr> <tr> <td>5.725-5.850 GHz (US)</td> <td>5mi/8.05km</td> <td>10mi/16.1km</td> <td>2.1mi/3.8km</td> </tr> </tbody> </table> <p><i>Minimum fade margin; 99.995% or better availability; average terrain/climate; no unusual multipath; proper path clearance (0.6F1).</i></p> <p><i>Distance calculations for 5 and 10 MHz channels are comparable for ETSI regulatory domains. Proper TPC settings (-9dB@20MHz, -12dB@10MHz, -15dB@5MHz), should be set to meet power density rules. Increased distances are possible in the US with proper engineering.</i></p>	Integrated Antenna	54 Mbps - Line of Sight	36 Mbps - Line of Sight	6 Mbps - Near Line of Sight	5.15-5.35 GHz (US)	3mi/4.8km	6mi/9.6km	3mi/4.8km	5.47-5.7 GHz (ETSI)	3mi/4.8km	6mi/9.6km	2.1mi/3.8km	5.725-5.850 GHz (US)	3mi/4.8km	6mi/9.6km	3mi/4.8km	External Antenna	54 Mbps - Line of Sight	36 Mbps - Line of Sight	6 Mbps - Near Line of Sight	5.15-5.35 GHz (US)	5mi/8.05km	10mi/16.1km	2.1mi/3.8km	5.47-5.7 GHz (ETSI)	5mi/8.05km	10mi/16.1km	1.1mi/1.8km	5.725-5.850 GHz (US)	5mi/8.05km	10mi/16.1km	2.1mi/3.8km
Integrated Antenna	54 Mbps - Line of Sight	36 Mbps - Line of Sight	6 Mbps - Near Line of Sight																														
5.15-5.35 GHz (US)	3mi/4.8km	6mi/9.6km	3mi/4.8km																														
5.47-5.7 GHz (ETSI)	3mi/4.8km	6mi/9.6km	2.1mi/3.8km																														
5.725-5.850 GHz (US)	3mi/4.8km	6mi/9.6km	3mi/4.8km																														
External Antenna	54 Mbps - Line of Sight	36 Mbps - Line of Sight	6 Mbps - Near Line of Sight																														
5.15-5.35 GHz (US)	5mi/8.05km	10mi/16.1km	2.1mi/3.8km																														
5.47-5.7 GHz (ETSI)	5mi/8.05km	10mi/16.1km	1.1mi/1.8km																														
5.725-5.850 GHz (US)	5mi/8.05km	10mi/16.1km	2.1mi/3.8km																														
<p>Range information for 2454-R²</p>	<table border="1"> <thead> <tr> <th>Integrated Antenna</th> <th>54 Mbps - Line of Sight</th> <th>36 Mbps - Line of Sight</th> <th>6 Mbps - Near Line of Sight</th> </tr> </thead> <tbody> <tr> <td>2.4-2.4835 GHz (US)</td> <td>3mi/4.8km</td> <td>5mi/8.05km</td> <td>3mi/4.8km</td> </tr> <tr> <td>2.4 - 2.8 GHz (ETSI)</td> <td>1mi/1.6km</td> <td>2.6mi/4.2km</td> <td>2.6mi/4.2km</td> </tr> <tr> <th>External Antenna</th> <th>54 Mbps - Line of Sight</th> <th>36 Mbps - Line of Sight</th> <th>6 Mbps - Near Line of Sight</th> </tr> <tr> <td>2.4-2.4835 GHz (US)</td> <td>5mi/8.05km</td> <td>7mi/11.2km</td> <td>3.1mi/5km</td> </tr> <tr> <td>2.4 - 2.8 GHz (ETSI)</td> <td>2.6mi/4.2km</td> <td>3.1mi/5km</td> <td>2.6mi/4.2km</td> </tr> </tbody> </table> <p><i>Minimum fade margin; 99.995% or better availability; average terrain/climate; no unusual multipath; proper path clearance (0.6F1).</i></p>	Integrated Antenna	54 Mbps - Line of Sight	36 Mbps - Line of Sight	6 Mbps - Near Line of Sight	2.4-2.4835 GHz (US)	3mi/4.8km	5mi/8.05km	3mi/4.8km	2.4 - 2.8 GHz (ETSI)	1mi/1.6km	2.6mi/4.2km	2.6mi/4.2km	External Antenna	54 Mbps - Line of Sight	36 Mbps - Line of Sight	6 Mbps - Near Line of Sight	2.4-2.4835 GHz (US)	5mi/8.05km	7mi/11.2km	3.1mi/5km	2.4 - 2.8 GHz (ETSI)	2.6mi/4.2km	3.1mi/5km	2.6mi/4.2km								
Integrated Antenna	54 Mbps - Line of Sight	36 Mbps - Line of Sight	6 Mbps - Near Line of Sight																														
2.4-2.4835 GHz (US)	3mi/4.8km	5mi/8.05km	3mi/4.8km																														
2.4 - 2.8 GHz (ETSI)	1mi/1.6km	2.6mi/4.2km	2.6mi/4.2km																														
External Antenna	54 Mbps - Line of Sight	36 Mbps - Line of Sight	6 Mbps - Near Line of Sight																														
2.4-2.4835 GHz (US)	5mi/8.05km	7mi/11.2km	3.1mi/5km																														
2.4 - 2.8 GHz (ETSI)	2.6mi/4.2km	3.1mi/5km	2.6mi/4.2km																														
<p>System Processor and Memory</p>	<ul style="list-style-type: none"> • 166MHz Motorola 8241 processor • 16 Mbytes RAM • 8 Mbytes FLASH 																																
<p>Software Specification</p>	<p>Base Station and Subscriber Units</p> <ul style="list-style-type: none"> • Key Features <ul style="list-style-type: none"> - WOPR protocol - Dynamic Data Rate Selection - Transmit Power Control - Antenna Alignment - Integrity Check for Software Upload - 5, 10, and 20MHz channels - Mobility with auto-scanning, 40 ms handoff times - QoS Support; up to 8 classes of service, up to 8 service flows per class* 																																

*Available with version 2.5 software release

	<ul style="list-style-type: none"> • Satellite Density <ul style="list-style-type: none"> • Dynamic Frequency Selection • Redundancy <ul style="list-style-type: none"> • Spanning Tree (802.1D) • Bridging and Routing <ul style="list-style-type: none"> • Bridge (802.1d) • IP/ RIPv1 (RFC 1058) • IP/ RIPv2 (RFC 1388) • CIDR (RFC 1519) • ICMP (RFC 792) • IP (RFC 791) • ARP (RFC 826) • Filtering <ul style="list-style-type: none"> • Ethernet protocol (Ethertype) • Static MAC • Storm threshold • IP address • Broadcast protocol • Services <ul style="list-style-type: none"> • DHCP Server (RFC 2131) • DHCP Client (RFC 2131) • Bi-Directional Bandwidth Control • VLAN <ul style="list-style-type: none"> • 802.1Q • Security Features <ul style="list-style-type: none"> • MAC Authentication • Radius MAC Access Control • WEP/AES-OCB encryption • RADIUS (RFC 2138) • Mobility <ul style="list-style-type: none"> • Subscriber Unit Roaming <p><u>Base Station Unit</u></p> <ul style="list-style-type: none"> • Filtering <ul style="list-style-type: none"> • Intra Cell Blocking <p><u>Subscriber Unit</u></p> <ul style="list-style-type: none"> • Services <ul style="list-style-type: none"> • NAT (RFC 3022) • DHCP Relay (RFC 2131)
<p>Security</p>	<ul style="list-style-type: none"> • WORP provides critical feature support for secure long-range wireless deployments in unlicensed frequency spectrum. • MD5 (embedded in WORP) authentication between BSU and SU. • Filter based on packet information such as unicast/multicast/ broadcast MAC or IP. • Secure "over the air encryption" with WEP, WEP+, and AES, and AES-CCB. • Authentication via Radius • Intracell blocking allows the BSU to act as the central policy enforcer for SU to SU communications.

<p>Management</p>	<ul style="list-style-type: none"> • SU/BSU statistics • Link Test • Temperature logging • SNMPv1/v2 RFC 1157 • SNMP v2c RFC 1907 • HTTP Server RFC 2616 • Telnet RFC 855 • TFTP client RFC 783 • CLI • MIB-II RFC 1213 • Ethernet-like MIB RFC 1643 • Bridge MIB RFC 1493 • 802.3MAU RFC 2668 • 802.11 MIB • Remote reboot (reload) or reset to factory default via power injector • Private MIB • Orinoco MIB
<p>Antenna Alignment Tools</p>	<ul style="list-style-type: none"> • Audible Tone • CLI output
<p>Status LEDs</p>	<ul style="list-style-type: none"> • Two indicators on the RJ-45 connector to indicate power, wireless traffic, and Ethernet traffic
<p>Local Configuration Support</p>	<p><u>RS-232 Serial port</u></p> <ul style="list-style-type: none"> • RJ11 port built-into the unit • DB9 Female via a converter (included)
<p>Compliance and Standards</p>	<p><u>Safety</u></p> <ul style="list-style-type: none"> • UL 60950, UL50 • CSA 22.2 No. 60950-00 • IEC 60950 3rd Ed (1999) <p><u>Radio Approvals</u></p> <ul style="list-style-type: none"> • USA FCC 15.107, 15-109; 15-203-15.205, 15.207, 15.209; 15.247; 15.401-15.407 • Canada RSS-102; RSS-210; ICES-003 • Europe (ETSI) EN 301.893; EN 300.328; EN 301.489-1; EN 301.489-17; EN 300-440; EN50371 • ARIB STD-T71, STD 33, STD 66 <p><u>EMI and Susceptibility (Class B)</u></p> <ul style="list-style-type: none"> • USA FCC Part 15.107 • Canada ICES-003 <p><u>Water and Dust Proof</u></p> <ul style="list-style-type: none"> • NEMA4/IP56
<p>Electrical</p>	<p><u>5054-R / 2454-R POE Power Injector</u></p> <ul style="list-style-type: none"> • Custom Power over Ethernet (802.3af compatible) • Input: Voltage 110 to 250 VAC (47-63Hz) • Output: 48V @ 420mA MAX (injected into the Cat-5 Cable) • Pin for Remote reboot (reload) or reset to factory default <p><u>5054-R / 2454-R Outdoor Radio Unit</u></p> <ul style="list-style-type: none"> • Power Consumption: 7.5W typical. Up to 20 Watts across full operating temperature range. • Input: Voltage 42 to 60 VDC

Dimensions	<p><u>Base Station and Subscriber Unit</u></p> <ul style="list-style-type: none"> • Packaged: 14.57 in x 13.70 in x 8.19 in (370 mm x 348 mm x 208 mm) <p><u>Base Station and Subscriber Unit with Type-N Connector</u></p> <ul style="list-style-type: none"> • Unpackaged: 10.5 in x 10.5 in x 3.25 in (267 mm x 267 mm x 83 mm) <p><u>Subscriber Unit with Integrated 23-dBi Antenna</u></p> <ul style="list-style-type: none"> • Unpackaged: 12.60 in x 12.60 in x 3.50 in (320 mm x 320 mm x 89 mm)
Weight	<p><u>Base Station and Subscriber Unit with Type-N Connector</u></p> <ul style="list-style-type: none"> • Packaged weight: 9.2 lbs (4.2 kg) • Unpackaged weight: 5.5 lbs (2.49 kg) Unit-only, .45 lbs (.20 kg) for power supply <p><u>Subscriber Unit with Integrated 23-dBi or 16-dBi Antenna</u></p> <ul style="list-style-type: none"> • Packaged weight: 10.1 lbs (4.6 kg) • Unpackaged weight: 6.0 lbs (2.72 kg) Unit-only, .45 lbs (.20 kg) for power supply
Environmental	<p><u>Operating</u></p> <ul style="list-style-type: none"> • -33° to 60°C (-27.5° to 140° Fahrenheit) • 100% humidity • Wind loading: 125mph <p><u>Storage</u></p> <ul style="list-style-type: none"> • -55° to 80°C (-41° to 176° Fahrenheit) • 100% humidity
Packaging Contents	<p><u>Base Station or Subscriber Unit</u></p> <ul style="list-style-type: none"> • One Tsunami MP.11 Model 2454-R or 5054-R Base Station or Subscriber Unit • One wall/ pole mounting bracket • One Power-Over-Ethernet injector for Model 2454-R or 5054-R • One country specific power cord • One Ethernet cable weather-proof plug • One Documentation and Software CD-ROM
MTBF	<ul style="list-style-type: none"> • 100,000 hrs
Warranty	<ul style="list-style-type: none"> • One year
	<ol style="list-style-type: none"> 1 Check with the local regulatory agency for certain restrictions 2 PMP configuration (1BS to 4 SU) using USA regulations for L and U bands, ETSI regulations for M bands <ul style="list-style-type: none"> - Base Station Antenna (60-degrees Sector, 17dBi) with short 1dB jumper cable - Subscriber Antenna, external 5Ghz (23dB Directional Patch antenna) with short 1dB jumper cable - Subscriber Antenna, external 2.4Ghz (12dB Directional Patch antenna) with short 1dB jumper cable <p>PTP - (1BS to 1 SU) using USA regulations for L and U bands, ETSI regulations for M bands</p> <ul style="list-style-type: none"> - Base Station external Antenna (Parabolic Grid 29dB) - Subscriber Antenna, external 5Ghz (29dB Parabolic Grid antenna) with short 1dB jumper cable - Subscriber Antenna, external 2.4Ghz (24dB Parabolic Grid antenna) with short 1dB jumper cable <p>Clear LOS (Line of Sight)</p> <ul style="list-style-type: none"> - 99.995% availability - Fade margin minimum of 10dB to 2 miles, 0.2dB additional fade margin for every 0.1 mile to 15dB - Predicted availability >99.990% (one-way) for all configurations - Distance calculations for 5 and 10 MHz channels are comparable for ETSI regulatory domains. Proper TPC settings (3 and 6dB) respectively, should be set to meet power density rules. Increased distances are possible in the US with proper link engineering <p>Near LOS (Line of Sight)</p> <ul style="list-style-type: none"> - 40-50% visibility - Distance, Typically <2.5miles

