

Spectrum-Efficient, High-Availability 5.4 and 5.8 GHz Wireless Ethernet Bridges

Reliable, High-Speed Solutions for Challenging Non-Line-of-Sight and Long-Range Line-of-Sight Environments, Including Those Over Water

DATA SHEET

**MOTOROLA POINT-TO-POINT
BROADBAND WIRELESS SOLUTIONS**

**MOTOROLA OS-SPECTRA AND
MOTOROLA OS-SPECTRA LITE**



You Shouldn't Need a License to Speed

With wireless Ethernet bridging, you have always needed a license to go fast. Because a license reserved a part of the radio spectrum just for you, wireless links encountered less interference, and, as a result, could go farther, faster, at higher capacity and with greater reliability.

Motorola has changed all that with its Motorola OS-Spectra products. The Motorola OS-Spectra (formerly Orthogon Systems OS-Spectra) point-to-point 5.4 GHz and 5.8 GHz wireless Ethernet bridges bring together the speed and reliability of licensed wireless with the flexibility of the unlicensed space. You no longer have to suffer the delay and expense of applying for a license to set up your IP and circuit-switched wireless networks. (It is recommended that regulatory conditions for radio-frequency bands be confirmed prior to system purchase.)

There are four products within the OS-Spectra line of point-to-point wireless Ethernet bridges:

- **Motorola OS-Spectra Integrated:** With up to 300 Mbps Ethernet data rate and a built-in antenna, the OS-Spectra Integrated is the perfect choice for any environment – near- or Non-Line-of-Sight, Line-of-Sight and high-interference environments – where high throughput is a major requirement and/or dual T1/E1 capability is needed.
- **Motorola OS-Spectra Lite Integrated:** The OS-Spectra Lite Integrated includes all the same robust technology of the OS-Spectra Integrated, but at less cost. It's an excellent solution in any environment where you need more speed and bandwidth than the 43 Mbps provided by the Motorola OS-Gemini Integrated system, and/or single T1/E1 capability is required. With up to 150 Mbps Ethernet data rate, the OS-Spectra Lite is software upgradeable to 300 Mbps as throughput requirements increase.
- **Motorola OS-Spectra Connectorized:** The OS-Spectra Connectorized combines all the innovative technology found in the OS-Spectra Integrated with the extra advantage of external antennas. Over long distances and in extremely adverse environments, including deep Non-Line-of-Sight, this solution lets you connect over greater distance and at a higher level of reliability and speed than other wireless bridges.
- **Motorola OS-Spectra Lite Connectorized:** With all the performance and reliability of the OS-Spectra Connectorized, this solution delivers up to 150 Mbps in extremely adverse environments – at less cost. Then as bandwidth requirements grow, you can easily upgrade from 150 Mbps to 300 Mbps.

In Non-Line-of-Sight environments, both Connectorized systems can increase link availability up to 99.999%. Prior to purchase, you can use Motorola's OS-Spectra Link Estimator to predict link reliability and throughput for your specific wireless application. (A list of approved antennas that meet FCC requirements is provided on our web site.)



Integrated



Connectorized

Higher Spectrum Efficiency

Utilizing only 30 MHz of the 5.4 or 5.8 band and delivering up to 300 Mbps Ethernet data rates, the Motorola OS-Spectra systems are over 300% more spectral-efficient than our nearest competitor. Network performance is significantly improved as a result of less crowding within the band and subsequently less interference.

Interference Mitigation

In the event the OS-Spectra does encounter interference, it automatically applies these mitigation techniques to vastly increase the likelihood that your wireless network will work:

- **Advanced Spectrum Management with *i*-DFS:** Our *intelligent* Dynamic Frequency Selection (*i*-DFS) is at the heart of our exceptional spectrum management capabilities. At power-up and all during operation, OS-Spectra scans the band – 500 times a second – and automatically switches to the clearest channel. Our 25-hour, time-stamped database alerts you to any interference that does exist and provides statistics that help you pinpoint which channels offer the clearest data paths. This is “licensed-band, interference-free performance in an unlicensed band!”
- **Adaptive Modulation:** Transmitter and receiver negotiate the highest mutually sustainable data rate – then dynamically “upshift” and “downshift” the rate as conditions change. OS-Spectra always provides the maximum performance possible within the current power limits.

Very High Throughput

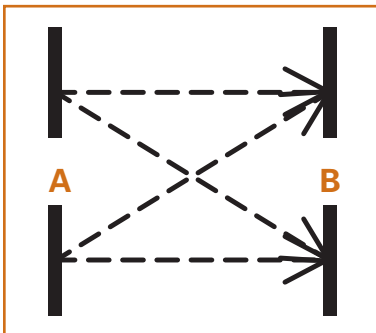
With 256 QAM modulation, OS-Spectra delivers a faster data stream using less of the available 5.4 GHz or 5.8 GHz frequency band. Its dual transceivers at each end of the link allow you to send two parallel data streams at once. These transceivers can also send redundant streams, offering much greater range compared to competitive solutions, especially over water or in Non-Line-of-Sight conditions.

More Range to Anywhere: OS-Spectra links have class-leading sensitivity and power output, which enable the links to go farther, regardless of conditions. Motorola is the only manufacturer to combine Multiple-Input Multiple-Output (MIMO), *intelligent* Orthogonal Frequency Division Multiplexing (*i*-OFDM) and our advanced signal-processing algorithms. This combination allows OS-Spectra to create four simultaneous channels between pairs of transceivers at each end of the link, without losing spectrum efficiency. This technique increases signal integrity by an unprecedented 300 times.

In non-adverse environments, each pair of transceivers can operate in parallel, in effect creating two links and doubling throughput.

T1/E1 Ports Mean More Ways to Use the Band: In a crowded radio-frequency (RF) area, the unlicensed spectrum may not allow for a wide channel, but that does not narrow your options. OS-Spectra’s innovative architecture combines an abundance of Ethernet and circuit-switched options. Whether your infrastructure is based on Ethernet over copper or multimode fiber...10/100/1000 Base T or 1000 Base SX...or even T1/E1 ports that bundle circuit switched connectivity with IP service, you can connect with one wireless solution: Motorola OS-Spectra.

Managing the Spectrum for Maximum Throughput and Reliability: OS-Spectra monitors all available channels and dynamically selects those over which it can sustain both the highest data rate and the most reliable availability. This means the bridge is very likely to find a clear channel (without operator intervention) even in a crowded space, allowing the transmitter and receiver to automatically use the frequency with the highest throughput. You can also lock the frequency manually (in either direction) and restrict each link to specified frequencies.



Data from A to B – or B to A – is sent on four channels, increasing by 300 times the likelihood data will get through



Reassuring, Robust Security

With Motorola's unique software, each wireless bridge will communicate only with its matched counterpart at the other end of the link – and with no other. That communication is also encoded using a unique scrambling mechanism. Another layer of security is provided with 128-bit and 256-bit AES encryption (optional).

Power Up and Point

A Motorola OS-Spectra link comprises two outdoor units (ODUs), two powered indoor units, called the Motorola OS-Spectra PIDU *Plus*, and the required mounting equipment. The systems also contain embedded web servers to manage the link either locally or remotely. Setup is simply "power up and point." Large antenna beam-width simplifies the initial connection, and an audio tone helps the installer optimize link alignment.

Productivity Payoff

OS-Spectra's performance means more productive users, less interference, lower cost of ownership and fewer connection points. Motorola OS-Spectra is often the lower-cost option when you consider:

- The business impact from being able to connect in an area already saturated with RF
- The capabilities to support more bandwidth-sensitive applications, such as multimedia or voice-over-IP
- The ability to backhaul more local loops using a single link
- The impact of having higher reliability and speed without having to pay licensed spectrum fees

Put Motorola OS-Spectra to Work for You

Service Providers: With its multi-level security, ability to connect T1/E1 ports for bundled connectivity and significant WiMAX backhaul capability, OS-Spectra supports sophisticated convergent, multimedia applications, supplying services to large, widespread customer bases.

Vertical Markets: Whether migrating from an analog to a digital network, linking separate networks within a building or linking networks in a campus setting, OS-Spectra offers high-throughput and reliability for multiple applications in a variety of markets, including utilities, transportation, healthcare, government and education.

Enterprises: OS-Spectra supports high-bandwidth enterprise applications in environments where wired networks are either too expensive or impossible to implement. It efficiently uses the frequency spectra to reduce interference and boost performance for business-critical applications.

The Motorola OS-Spectra products are available through value-added distributors around the world. Our Authorized Distributors can be found in our Partner section at <http://www.orthogonsystems.com/partners/partners.html>. Distributors are listed under the "Where to Buy" links within each respective Geographic Territory.

More than WiMAX-Compatible

The Motorola OS-Spectra is capable of backhauling the throughput requirements of up to 12 WiMAX base station sectors, occupying the equivalent of only three WiMAX channels. This leaves more channels available for WiMAX point-to-multipoint links with no performance penalty. Plus, OS-Spectra is designed to fully integrate with other WiMAX systems, allowing end-to-end management of your infrastructure.

Motorola OS-Spectra 5.4 Part Numbers

BP5530BH-2AA
OS-Spectra 5.4 Integrated
BP5530BHC-2AA
OS-Spectra 5.4 Connectorized
BP5530BH15-2AA
OS-Spectra Lite 5.4 Integrated
BP5530BHC15-2AA
OS-Spectra Lite 5.4 Connectorized

Motorola OS-Spectra 5.8 Part Numbers

2500 OS-Spectra 5.8 Integrated
2508 OS-Spectra 5.8 Connectorized
2505 OS-Spectra Lite 5.8 Integrated
2507 OS-Spectra Lite 5.8 Connectorized

Technical Specifications for the MOTOROLA OS-SPECTRA SYSTEMS

RADIO TECHNOLOGY	REMARKS
RF band	5.725 GHz–5.850 GHz* 5.470 GHz–5.725 GHz*
Channel size	30 MHz
Channel selection/ dynamic frequency control	By <i>Intelligent</i> Dynamic Frequency Selection (<i>i</i> -DFS) or manual intervention; automatic selection on start-up and continual adaptation to avoid interference; 10 MHz step size for WiMAX compatibility
Transmit power control	Varies with modulation mode and settings from 0 dBm to 25 dBm
System gain	Integrated: Varies with modulation mode; up to 163 dB using 23.5 dBi integrated antenna** Connectorized: Varies with modulation mode and antenna type**
Receiver sensitivity	Adaptive, varying between -91 dBm and -58 dBm
Modulation	Dynamic; adapting between BPSK single and 256 QAM dual
Error correction	FEC, ARQ
Duplex scheme	TDD ratio: Dynamic or Fixed; same or split frequency Tx/Rx
Antenna: type/gain/B/W	Integrated: Integrated flat plate 23 dBi / 7° Connectorized: Approved to operate with flat plate up to 28 dBi; Parabolic dish up to 37.7 dBi; connected via 2 x N-type female
Range	Up to 124 miles (200 km)***
Security & encryption	Proprietary scrambling mechanism; optional AES 128 and 256 Bit Encryption * Regulatory conditions for RF bands should be confirmed prior to system purchase ** Gain and maximum transmit power may vary based on regulatory domain *** In all cases the range limit is set by the latest software release

ETHERNET BRIDGING & T1/E1	REMARKS
Protocol	IEEE 802.3
User data throughput	OS-Spectra: Dynamically variable up to 300 Mbps at the Ethernet (aggregate) OS-Spectra Lite: Dynamically variable up to 150 Mbps at the Ethernet (aggregate)
Latency	<1 ms each direction typical
Interface	10 / 100 / 1000 Base T (RJ-45) – auto MDI/MDIX, 1000 Base SX option
T1/E1 Interface	G703/G704 G823/G824 OS-Spectra: Provides dual T1/E1 ports OS-Spectra Lite: Provides a single T1/E1 port

MANAGEMENT & INSTALLATION	REMARKS
LED indicators	Power status, Ethernet link status and activity
System management	Web or SNMP using MIBII, WiMAX and private MIB
Installation	Built-in audio assistance for link optimization
Connection	Distance between outdoor unit and primary network connection: up to 330' (100 meters)

PHYSICAL	REMARKS
Dimensions	Integrated outdoor unit (ODU): Width 14.5" (370 mm), Height 14.5" (370 mm), Depth 3.75" (95 mm) Connectorized ODU: Width 12.2" (309 mm), Height 12.2" (309 mm), Depth 4.1" (105 mm) Powered indoor unit (PIDU Plus): Width 9.75" (250 mm), Height 1.5" (40 mm), Depth 3" (80 mm)
Weight	Integrated ODU: 12.1 lbs (5.5 kg) including bracket Connectorized ODU: 9.1 lbs (4.3 kg) including bracket PIDU Plus: 1.9 lbs (864 g)
Wind speed	150 mph (242 kph)
Power supply	Integrated with Indoor Unit
Power source	90–240 VAC, 50–60 Hz / 36-60V DC; redundant powering configurations supported
Power consumption	55 W max

ENVIRONMENTAL & REGULATORY	REMARKS
Operating temperature	-40°F (-40°C) to +140°F (+60°C), including solar radiation
Protection & safety	UL60950; IEC60950; EN60950; CSA-C22.2 No. 60950
Radio	5.8 GHz: FCC Part 15, sub-part C 15.247, Eire ComReg 03/42, UK Approval to IR2007 5.4 GHz: EN 301 893
EMC	USA–FCC Part 15, Class B; Europe–EN 301 489-4



For more information about the Motorola Point-to-Point Solutions:

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formerly
Orthogon Systems
OS-Spectra

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