DATASHEET

airFiber® X

Carrier Backhaul Radio

Model: AF-2X, AF-3X, AF-5X

Up to 687 Mbps Real Throughput, Up to 200+ km Range

2.4, 3, or 5 GHz (Full-Band Certification including DFS)

Ubiquiti's INVICTUS™ Custom Silicon

UBIQUITI® NETWORKS

Overview

Ubiquiti Networks continues to disrupt the wireless broadband market with revolutionary technology at breakthrough pricing by introducing the airFiber® X, a modular airFiber radio system that will serve a wide range of frequencies and is designed to be compatible with a variety of Ubiquiti® antennas.

Building upon the proven design of the airFiber system, the airFiber X allows you to customize airFiber backhaul links or upgrade existing Rocket Point-to-Point (PtP) links.

The airFiber X is available in three frequency bands:

- 2.4 GHz, model AF-2X
- 3 GHz, model AF-3X
- 5 GHz, model AF-5X

Engineered for Performance

Ubiquiti's INVICTUS™ custom silicon and proprietary radio architecture are designed specifically for long-distance, outdoor wireless applications.

Our INVICTUS core communications processing engine surpasses all of the limitations inherent to generic Wi-Fi chips to provide superior performance, long-range capability, DFS flexibility, and higher delivered throughput.

The airFiber X features industry-leading spectral efficiency of up to 17.1 Mbps/MHz, line-rate data packet processing of up to 687 Mbps of real data throughput, and innovative xtreme Range Technology (xRT™) for up to 200+ km in range.

Ultra-Low Latency with HDD Technology

The airFiber X is designed to provide the highest TDD throughput and lowest latency available using proprietary Hybrid Division Duplexing (HDD) technology.

Co-Location

With tower space at a premium, the importance of being able to co-locate equipment is becoming an essential attribute for modern wireless networks. The airFiber X is engineered to permit multiple radios to operate side by side, allowing maximum spectral efficiency.

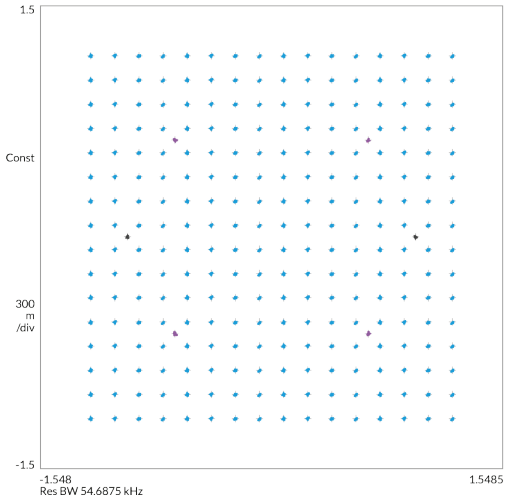
GPS Synchronization

Precise GPS frame synchronization enables co-located airFiber X radios to transmit and receive data without interfering with each other, enabling better frequency reuse and increased network stability.

Clean Power Output

Using advanced digital signal processing, the innovative airFiber X radio design has an ultra-clean transmitter output, reducing broadband noise, facilitating co-location, and enabling higher-order modulations like 1024QAM for greater throughput.

CONSTELLATION PLOT | 256QAM



Backhaul

2.4 GHz

The 2.4 GHz frequency band is free to use, worldwide; and with its proprietary protocol, the AF-2X increases both range and delivered throughput in this popular band.

3 GHz

The 3 GHz frequency band offers interference-free operation, enabling the AF-3X to provide a high-reliability backhaul solution, although a license may be required in some regions.

5 GHz Full-Band Certification with DFS

The AF-5X covers the entire, license-free, 5 GHz spectrum and includes DFS approval. Anyone around the world can deploy and operate the AF-5X in the 5 GHz range practically anywhere they choose (subject to local country regulations).

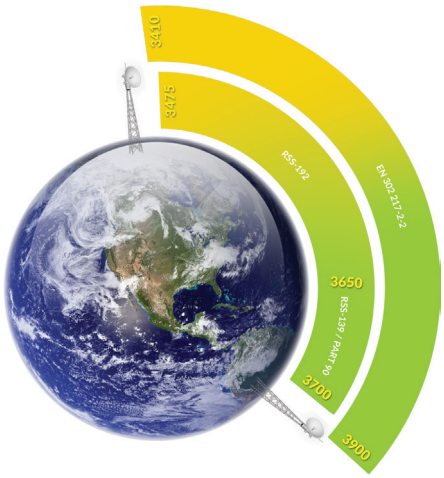
Optimal Operation in Unlicensed Bands

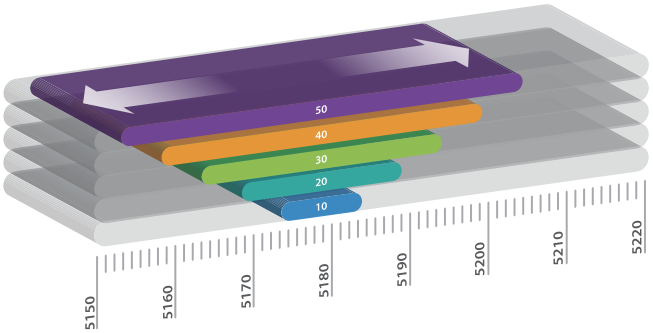
Channel width flexibility* allows independent TX and RX channel frequency configurations anywhere within the radio band to avoid local interference, and the channel centers are selectable in 1 MHz increments.

- **AF-2X/AF-3X** 3.5, 5, 7, 10, 14, 20, 28, 30, 40, 50, or 56 MHz
- **AF-5X** 10, 20, 30, 40, or 50 MHz

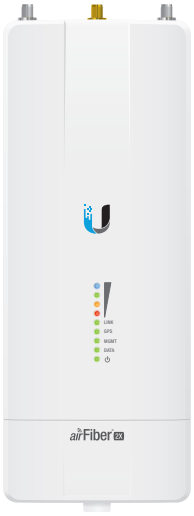
You also have the ability to program different uplink and downlink duty cycles to support asymmetric traffic requirements.

* Channel widths may vary according to country/region regulations.





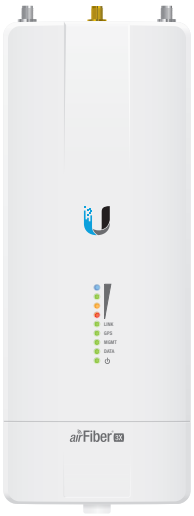
2.4 GHz Model



airFiber 2X

Model	Frequency	Antenna Compatibility
AF-2X	2.4 GHz	AF-2G24-S45

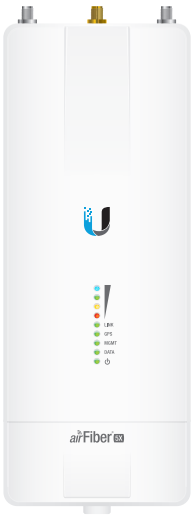
3 GHz Model



airFiber 3X

Model	Frequency	Antenna Compatibility
AF-3X	3 GHz	AF-3G26-S45

5 GHz Model



airFiber 5X

Model	Frequency	Antenna Compatibility
AF-5X	5 GHz	• AF-5G23-S45 • AF-5G30-S45 • AF-5G34-S45 • RD-5G30* • RD-5G34*

* Additional performance available with RocketDish to airFiber Conversion Kit

Deployment Flexibility

The airFiber X supports ± 45° slant polarization for improved noise immunity and Signal-to-Noise Ratio (SNR). The compact form factor of the airFiber X allows it to fit into the radio mount of Ubiquiti antennas, so installation requires no special tools.

The airFiber X antennas are purpose-built with 45° slant polarity for seamless integration with the airFiber X.

airFiber X Antenna

2.4 GHz Model

Model	Frequency	Gain
AF-2G24-S45	2.4 GHz	24 dBi

The AF-2G24-S45 offers 24 dBi of gain in a 650-mm diameter size.

airFiber X Antenna

3 GHz Model

Model	Frequency	Gain
AF-3G26-S45	3 GHz	26 dBi

The AF-3G26-S45 offers 26 dBi of gain in a 650-mm diameter size.

airFiber X Antenna

5 GHz Models

Model	Frequency	Gain
AF-5G23-S45	5 GHz	23 dBi

Housed in a compact form factor (378-mm diameter size), the AF-5G23-S45 offers 23 dBi of gain and features the following advantages:

- Low sidelobes reduce interference from other transmitters in the area.
- High isolation enhances performance for co-location in tower-mounted installations.
- The low-profile design with integrated radome reduces wind-loading.

Model	Frequency	Gain
AF-5G30-S45	5 GHz	30 dBi

The AF-5G30-S45 offers 30 dBi of gain in a 650-mm diameter size. It is compatible with the IsoBeam™ (model ISO-BEAM-620), an optional isolator radome that delivers superior noise immunity in co-location deployments.

Model	Frequency	Gain
AF-5G34-S45	5 GHz	34 dBi

The AF-5G34-S45 offers 34 dBi of gain in a 1050-mm diameter size.

RocketDish™

You can also pair the AF-5X with one of the following RocketDish™ antennas by using a kit to convert the RocketDish to 45° slant polarity.

Model	Frequency	Gain
RD-5G30	5 GHz	30 dBi

The RD-5G30 offers 30 dBi of gain in a 650-mm diameter size.

Model	Frequency	Gain
RD-5G34	5 GHz	34 dBi

The RD-5G34 offers 34 dBi of gain in a 1050-mm diameter size.

Conversion Kit

The 5 GHz RocketDish to airFiber Antenna Conversion Kit converts the RocketDish RD-5G30 or RD-5G34 antenna for use with the AF-5X.

Model	RD-5G30	RD-5G34
AF-5G-OMT-S45	✓	✓

Specifications

AF-2X	
Dimensions Radio Box	 224 x 82 x 48 mm (8.82 x 3.23 x 1.89") 261 x 107 x 107 mm (10.28 x 4.21 x 4.21")
Weight Radio Box	 0.35 kg (0.77 lb) 1.1 kg (2.43 lb)
RF Connectors	(2) RP-SMA Weatherproof (CH0, CH1) (1) SMA Weatherproof (GPS)
GPS Antenna	External, Magnetic Base
Power Supply	24V, 1A PoE Gigabit Adapter (Included)
Power Method	Passive Power over Ethernet Pins 1, 2, 4, 5 (+) and Pins 7, 8, 3, 6 (-)
Max. Power Consumption	17W @ Max. Power/Duty Cycle
Supported Voltage Range	+18 to +54VDC[1]
Automatic Transmit Power Control (ATPC)	Yes
Mounting	airFiber X Mount (Rocket Mount Compatible) GPS Pole Mount (Included)
Certifications	CE, FCC, IC
Operating Temperature	-40 to 55° C (-40 to 131° F)

AF-2X Networking Interface	
Data Port	(1) 10/100/1000 Ethernet Port
Management Port	(1) 10/100 Ethernet Port

AF-2X System	
Processor	INVICTUS IC
Maximum Throughput	687 Mbps[2]
Maximum Range	200+ km[2]
Packets per Second	1+ Million
Encryption	128-bit AES
OS	airOS F
Wireless Modes	Master/Slave
Latency Half Duplex Mode	 < 2 ms at Full Throughput
MTU (Maximum Transmission Unit)	Up to 9600

[1] Full range depends on Ethernet cable length..

[2] Throughput and range values may vary depending on the environmental conditions..

AF-2X Radio	
Frequency Range	2300-2700 MHz (Dependent on Regulatory Region)[1]
Max. Conducted TX Power	30 dBm[1] (Dependent on Regulatory Region)
Frequency Accuracy	± 2.5 ppm without GPS Synchronization ± 0.2 ppm with GPS Synchronization
Channel Bandwidth	3.5/5/7/10/14/20/28/30/40/50/56 MHz Selectable[2] Programmable Uplink and Downlink Duty Cycles Independently Programmable TX and RX Frequencies

[1] For region-specific details, refer to the *Compliance* chapter of the airFiber X User Guide at **www.ubnt.com/download/airfiber**

[2] Channel widths may vary according to country/region regulations.

AF-2X Suggested Max. TX Power	
8x	23 - 24 dBm
6x	25 - 26 dBm
4x	27 - 28 dBm
2x	30 dBm
1x	30 dBm

AF-2X Receive Sensitivity						
Rate	Modulation	Sensitivity (10 MHz)	Sensitivity (20 MHz)	Sensitivity (30 MHz)	Sensitivity (40 MHz)	Sensitivity (50 MHz)
8x	256QAM MIMO	-66 dBm	-64 dBm	-62 dBm	-61 dBm	-60 dBm
6x	64QAM MIMO	-74 dBm	-71 dBm	-69 dBm	-68 dBm	-67 dBm
4x	16QAM MIMO	-81 dBm	-78 dBm	-76 dBm	-75 dBm	-74 dBm
2x	QPSK MIMO	-88 dBm	-85 dBm	-83 dBm	-82 dBm	-81 dBm
1x	½ Rate QPSK xRT	-90 dBm	-87 dBm	-85 dBm	-84 dBm	-83 dBm

AF-2X Capacity (Mbps)												
		Channel Width (MHz)										
Rate	Modulation	3.5	5	7	10	14	20	28	30	40	50	56
10x	1024 QAM MIMO	38.4	60.8	86.4	128.0	182.4	259.2	361.6	384.0	502.4	617.6	687.9
8x	256 QAM MIMO	30.7	48.7	69.1	102.4	145.9	207.3	289.3	307.2	401.8	494.1	550.4
6x	64 QAM MIMO	23.0	36.5	51.8	76.8	109.4	155.5	216.9	230.4	301.4	370.6	412.8
4x	16 QAM MIMO	15.4	24.3	34.6	51.2	72.9	103.7	144.6	153.6	200.9	247.0	275.2
2x	QPSK MIMO	7.7	12.1	17.3	25.6	36.5	51.8	72.3	76.8	100.4	123.5	137.6
1x	½ Rate QPSK xRT	3.8	6.1	8.6	12.8	18.2	25.9	36.2	38.4	50.2	61.8	68.8

Specifications

AF-3X	
Dimensions Radio Box	 224 x 82 x 48 mm (8.82 x 3.23 x 1.89") 261 x 107 x 107 mm (10.28 x 4.21 x 4.21")
Weight Radio Box	 0.35 kg (0.77 lb) 1.1 kg (2.43 lb)
RF Connectors	(2) RP-SMA Weatherproof (CH0, CH1) (1) SMA Weatherproof (GPS)
GPS Antenna	External, Magnetic Base
Power Supply	24V, 1A PoE Gigabit Adapter (Included)
Power Method	Passive Power over Ethernet Pins 1, 2, 4, 5 (+) and Pins 7, 8, 3, 6 (-)
Max. Power Consumption	17W @ Max. Power/Duty Cycle
Supported Voltage Range	+18 to +54VDC[1]
Automatic Transmit Power Control (ATPC)	Yes
Mounting	airFiber X Mount (Rocket Mount Compatible) GPS Pole Mount (Included)
Certifications	CE, FCC, IC
Operating Temperature	-40 to 55° C (-40 to 131° F)

AF-3X Networking Interface	
Data Port	(1) 10/100/1000 Ethernet Port
Management Port	(1) 10/100 Ethernet Port

AF-3X System	
Processor	INVICTUS IC
Maximum Throughput	687 Mbps[2]
Maximum Range	200+ km[2]
Packets per Second	1+ Million
Encryption	128-bit AES
OS	airOS F
Wireless Modes	Master/Slave
Latency Half Duplex Mode	 < 2 ms at Full Throughput
MTU (Maximum Transmission Unit)	Up to 9600

[1] Full range depends on Ethernet cable length..

[2] Throughput and range values may vary depending on the environmental conditions..

AF-3X Radio	
Frequency Range	3300-3900 MHz (Dependent on Regulatory Region)[1]
Max. Conducted TX Power	29 dBm[1] (Dependent on Regulatory Region)
Frequency Accuracy	± 2.5 ppm without GPS Synchronization ± 0.2 ppm with GPS Synchronization
Channel Bandwidth	3.5/5/7/10/14/20/28/30/40/50/56 MHz Selectable[2] Programmable Uplink and Downlink Duty Cycles Independently Programmable TX and RX Frequencies

[1] For region-specific details, refer to the *Compliance* chapter of the airFiber X User Guide at **www.ubnt.com/download/airfiber**

[2] Channel widths may vary according to country/region regulations.

AF-3X Suggested Max. TX Power	
8x	21 - 22 dBm
6x	23 - 24 dBm
4x	25 - 26 dBm
2x	29 dBm
1x	29 dBm

AF-3X Receive Sensitivity						
Rate	Modulation	Sensitivity (10 MHz)	Sensitivity (20 MHz)	Sensitivity (30 MHz)	Sensitivity (40 MHz)	Sensitivity (50 MHz)
8x	256QAM MIMO	-66 dBm	-64 dBm	-62 dBm	-61 dBm	-60 dBm
6x	64QAM MIMO	-74 dBm	-71 dBm	-69 dBm	-68 dBm	-67 dBm
4x	16QAM MIMO	-81 dBm	-78 dBm	-76 dBm	-75 dBm	-74 dBm
2x	QPSK MIMO	-88 dBm	-85 dBm	-83 dBm	-82 dBm	-81 dBm
1x	½ Rate QPSK xRT	-90 dBm	-87 dBm	-85 dBm	-84 dBm	-83 dBm

AF-3X Capacity (Mbps)												
		Channel Width (MHz)										
Rate	Modulation	3.5	5	7	10	14	20	28	30	40	50	56
10x	1024 QAM MIMO	38.4	60.8	86.4	128.0	182.4	259.2	361.6	384.0	502.4	617.6	687.9
8x	256 QAM MIMO	30.7	48.7	69.1	102.4	145.9	207.3	289.3	307.2	401.8	494.1	550.4
6x	64 QAM MIMO	23.0	36.5	51.8	76.8	109.4	155.5	216.9	230.4	301.4	370.6	412.8
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2x	QPSK MIMO	7.7	12.1	17.3	25.6	36.5	51.8	72.3	76.8	100.4	123.5	137.6
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Specifications

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RF Connectors	(2) RP-SMA Weatherproof (CH0, CH1) (1) SMA Weatherproof (GPS)
GPS Antenna	External, Magnetic Base
Power Supply	24V, 1A PoE Gigabit Adapter (Included)
Power Method	Passive Power over Ethernet Pins 1, 2, 4, 5 (+) and Pins 7, 8, 3, 6 (-)
Max. Power Consumption	15W @ Max. Power/Duty Cycle
Supported Voltage Range	+18 to +54VDC[1]
Automatic Transmit Power Control (ATPC)	Yes
Mounting	airFiber X Mount (Rocket Mount Compatible) GPS Pole Mount (Included)
Certifications	CE, FCC, IC
Operating Temperature	-40 to 55° C (-40 to 131° F)

AF-5X Networking Interface	
Data Port	(1) 10/100/1000 Ethernet Port
Management Port	(1) 10/100 Ethernet Port

AF-5X System	
Processor	INVICTUS IC
Maximum Throughput	500+ Mbps[2]
Maximum Range	300+ km[2]
Packets per Second	1+ Million
Encryption	128-bit AES
OS	airOS F
Wireless Modes	Master/Slave
Latency Half Duplex Mode	 < 2 ms at Full Throughput
MTU (Maximum Transmission Unit)	Up to 9600

[1] Full range depends on Ethernet cable length..

[2] Throughput and range values may vary depending on the environmental conditions..

AF-5X Radio	
Frequency Range FCC 15.407 IC RSS-210 ETSI EN 301 893, EN 302 502 Other Regions	5150 - 5350 MHz, 5470 - 5850 MHz 5470 - 5600 MHz, 5650 - 5850 MHz 5470 - 5875 MHz 5150 - 5950 MHz*
Max. Conducted TX Power	26 dBm* (Dependent on Regulatory Region)
Frequency Accuracy	± 2.5 ppm without GPS Synchronization ± 0.2 ppm with GPS Synchronization
Channel Bandwidth	10/20/30/40/50 MHz Selectable Programmable Uplink and Downlink Duty Cycles

* For region-specific details, refer to the *Compliance* chapter of the airFiber X User Guide at **www.ubnt.com/download/airfiber**

AF-5X Suggested Max. TX Power	
8x	19 - 20 dBm
6x	21 - 22 dBm
4x	23 - 24 dBm
2x	26 dBm
1x	26 dBm

AF-5X Receive Sensitivity						
Rate	Modulation	Sensitivity (10 MHz)	Sensitivity (20 MHz)	Sensitivity (30 MHz)	Sensitivity (40 MHz)	Sensitivity (50 MHz)
8x	256QAM MIMO	-66 dBm	-64 dBm	-62 dBm	-61 dBm	-60 dBm
6x	64QAM MIMO	-74 dBm	-71 dBm	-69 dBm	-68 dBm	-67 dBm
4x	16QAM MIMO	-81 dBm	-78 dBm	-76 dBm	-75 dBm	-74 dBm
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1x	½ Rate QPSK xRT	-90 dBm	-87 dBm	-85 dBm	-84 dBm	-83 dBm

AF-5X Capacity (Mbps)						
		Channel Width (MHz)				
Rate	Modulation	10	20	30	40	50
10x	1024 QAM MIMO	128.0	259.2	384.0	502.4	617.6
8x	256 QAM MIMO	102.4	207.3	307.2	401.8	494.1
6x	64 QAM MIMO	76.8	155.5	230.4	301.4	370.6
4x	16 QAM MIMO	51.2	103.7	153.6	200.9	247.0
2x	QPSK MIMO	25.6	51.8	76.8	100.4	123.5
1x	½ Rate QPSK xRT	12.8	25.9	38.4	50.2	61.8

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