



airFiber[®] 4X

4 GHz Licensed
Backhaul Radio

Model: AF-4X

QUICK START GUIDE

Introduction

Thank you for purchasing the Ubiquiti Networks® airFiber® AF-4X. This Quick Start Guide is designed to guide you through installation. Warranty terms, safety notices, and compliance information are in the airFiber X User Guide, available at: **downloads.ubnt.com/airfiber**

Package Contents



airFiber AF-4X



GPS Antenna
Mount



External GPS
Antenna



Metal Strap



Cable Ties
(Qty. 2)



Universal Bracket



airFiber PoE (24V, 1A)
with Mounting Bracket



Power Cord



Quick Start Guide

TERMS OF USE: Ubiquiti radio devices must be professionally installed. Shielded Ethernet cable and earth grounding must be used as conditions of product warranty. TOUGHcable™ is designed for outdoor installations. It is the customer's responsibility to follow local country regulations, including operation within legal frequency channels, output power, and Dynamic Frequency Selection (DFS) requirements.

Antenna Compatibility

The airFiber AF-4X radio is designed for use with the following airFiber X antenna models:

- AF-5G30-S45
- AF-5G34-S45¹

The AF-4X can also operate with the following RocketDish™ antenna models:

- RD-5G30²
- RD-5G34²

Installation Requirements

- Clear line of sight between airFiber radios
- Clear view of the sky for proper GPS operation
- Vertical mounting orientation
- Mounting point:
 - At least 1 m below the highest point on the structure
 - For tower installations, at least 3 m below the top of the tower
- Ground wires – min. 10 AWG (5 mm²) and max. length: 1 m. As a safety precaution, ground the airFiber radio to grounded masts, poles, towers, or grounding bars.



WARNING: Failure to properly ground your airFiber radio will void your warranty.

- (Recommended) 2 Outdoor Gigabit PoE surge protectors



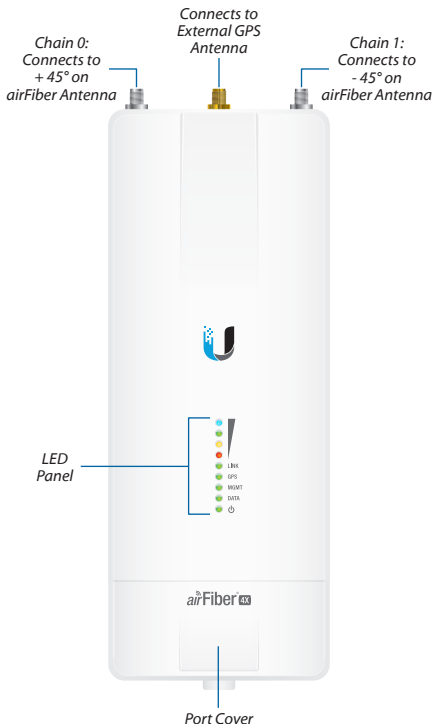
Note: For guidelines about grounding and lightning protection, follow your local electrical regulatory codes.

- Outdoor, shielded Category 6 (or above) cabling and shielded RJ-45 connectors are required for all wired Ethernet connections.

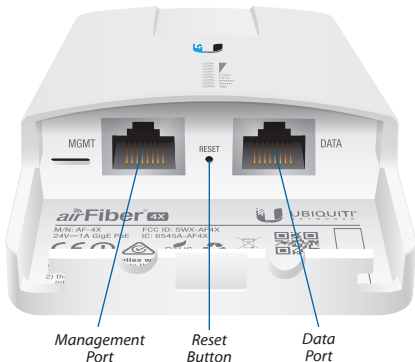
¹ Check your local/regional regulations for the maximum antenna gain allowed for your application.

² Requires *Universal Bracket* (included) or AF-5G-OMT-S45 Conversion Kit (not included).

Hardware Overview



Ports



Management Port 10/100 Mbps, secured Ethernet port for configuration. *In-Band Management* is enabled by default in the airFiber Configuration Interface. When *In-Band Management* is disabled, the *MGMT* port is the only port that can monitor, configure, and/or update firmware.

Reset Button To reset to factory defaults, press and hold the *Reset* button for more than 10 seconds while the device is already powered on.

Data Port Gigabit PoE port for handling all user traffic and powering the device.

LEDs

Signal LEDs

-  **Signal 4** LED will light blue when on.
-  **Signal 3** LED will light green when on.
-  **Signal 2** LED will light yellow when on.
-  **Signal 1** LED will light red when on.

Bootup to airOS When powering on, the *Power*, *GPS*, *LINK*, and *Signal 1-4* LEDs light on. Once the CPU code takes over, the *GPS*, *LINK*, and *Signal 1-3* LEDs turn off. *Signal 4* LED remains on to indicate the boot sequence is underway.

Initializing airFiber Software When the airFiber application begins to boot under airOS, the *Signal 4* LED goes from solidly on to a 2.5 Hz flash. This continues until the AF-4X is fully booted.

Signal Level Once fully booted, the *Signal 1-4* LEDs act as a bar graph showing how close the AF-4X is to ideal aiming. This is auto-scaled based on the link range, the antenna gains, and the configured TX power of the remote AF-4X. Each *Signal* LED has three possible states: *On*, *Flashing*, and *Off*. All *Signal* LEDs would be solidly on in an ideal link. If the link has a 1 dB loss, the *Signal 4* LED will flash; a 2 dB loss and the *Signal 4* LED will turn off. The full bar graph LED states are shown below.

dB loss	0	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13
	1	F	0	0	0	0	0	0	0	0	0	0	0	0
	1	1	1	F	0	0	0	0	0	0	0	0	0	0
	1	1	1	1	1	F	F	0	0	0	0	0	0	0
	1	1	1	1	1	1	1	1	1	1	F	F	F	0

0 = Off, 1 = On, F = Flashing

Additional LEDs

LED	State	Status
LINK	Off	RF Off
	Short Flash*	Syncing
	Normal Flash*	Beaconing
	Long Flash*	Registering
	On	Operational
GPS	Off	No GPS Synchronization
	Normal Flash*	Non-Operational (Weak Signal)
	On	Operational (Strong Signal)
MGMT	Off	No Ethernet Link
	On	Ethernet Link Established
	Random Flashing	Ethernet Activity
DATA	Off	No Ethernet Link
	On	Ethernet Link Established
	Random Flashing	Ethernet Activity
	Off	No Power
	On	Powered On

* Short Flash (1:3 on/off cycle)
Normal Flash (1:1 on/off cycle)
Long Flash (3:1 on/off cycle)

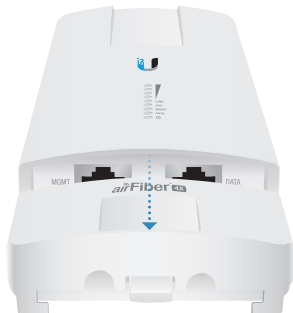
Installation Overview

We recommend that you configure your paired AF-4X radios before site installation. The overview below summarizes the installation procedure, and the subsequent sections provide detailed installation information.

- Connect the *airFiber PoE Adapter* to the *DATA* port, and connect your computer to the *MGMT* port.
- Configure the AF-4X.
- Install a ground wire and mount the AF-4X on an airFiber X or RocketDish antenna.
- At the installation site, install the airFiber X or RocketDish antenna with the mounted AF-4X radio (see the antenna's Quick Start Guide for installation instructions).
- Secure the ground wire and mount the GPS antenna.
- Establish and optimize the RF link.

Connecting Power over Ethernet

3. Lift the release latch on the bottom of the AF-4X and slide the *Port Cover* off.



4. Connect an Ethernet cable to the *DATA* port.

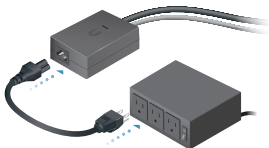


5. Connect the Ethernet cable from the *DATA* port of the AF-4X to the **POE** port of the adapter.

! **WARNING:** Use only the included adapter, model **GP-H240-100G-4**. Failure to do so can damage the unit and void the product warranty.



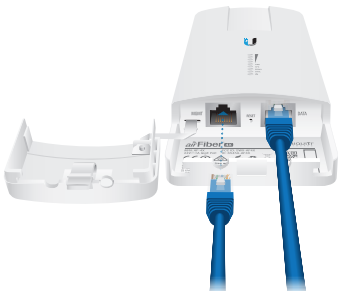
6. Connect the *Power Cord* to the adapter's power port. Connect the other end of the *Power Cord* to a power outlet.



airFiber Configuration

The instructions in this section explain how to access the airFiber Configuration Interface and configure the following settings:

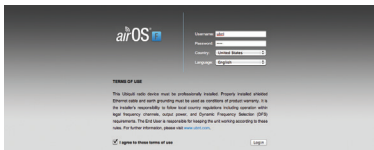
- **Wireless Mode** Configure one AF-4X as the *Master* and the other as the *Slave*.
 - **Frequency Setting** The operating *Frequency* must be the same on both the Master and the Slave.
1. Connect an Ethernet cable from your computer to the *MGMT* port on the AF-4X.



2. Configure the Ethernet adapter on your computer with a static IP address on the 192.168.1.x subnet.
3. Launch your web browser. Type **http://192.168.1.20** in the address field and press **enter** (PC) or **return** (Mac).



4. The login screen will appear. Enter **ubnt** in the *Username* and *Password* fields. Select your *Country* and *Language*. You must agree to the *Terms of Use* to use the product. Click **Login**.

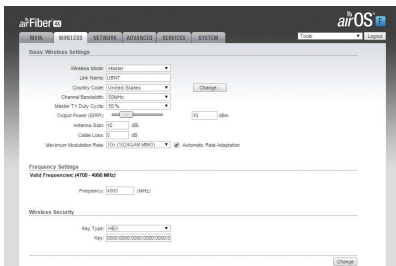


The login screen for Ubiquiti airOS. It features the airOS logo at the top left. On the right, there are input fields for Username (pre-filled with 'ubnt'), Password (pre-filled with 'ubnt'), Country (set to 'United States'), and Language (set to 'English'). Below these fields is a 'TERMS OF USE' section with a small disclaimer and a link to 'www.ubnt.com'. At the bottom, there is a checkbox labeled 'I agree to these terms of use' which is checked, and a 'Login' button.



Note: U.S. product versions are locked to the U.S. Country Code to ensure compliance with FCC regulations.

5. Click the **Wireless** tab.



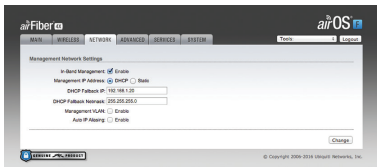
The 'Basic Wireless Settings' screen in the Ubiquiti airFiber airOS web interface. The top navigation bar includes tabs for MAIN, WIRELESS (selected), NETWORK, ADVANCED, SERVICES, and SYSTEM. The main content area is divided into sections: 'Basic Wireless Settings' with fields for Wireless Mode (Master), Link Name (UBNT), Country Code (United States), Channel Bandwidth (50MHz), Master TX Duty Cycle (50%), Output Power (ERP) (10 dBm), Antenna Gain (10 dB), Cable Loss (0 dB), and Maximum Modulation Rate (10x (1024QAM MM40)) with an 'Automatic Rate Adaptation' checkbox; 'Frequency Settings' with a 'Valid Frequency: (4700 - 4950 MHz)' label and a Frequency field set to 4800 MHz; and 'Wireless Security' with a Key Type (HEX) and a Key field containing '0000:0000:0000:0000:0000:0'. A 'Change' button is located at the bottom right.

6. Configure the *Basic Wireless Settings*:
 - a. For one AF-4X, select **Master** as the *Wireless Mode*. For the other AF-4X, keep the default, *Slave*.
 - b. Enter a name in the *Link Name* field. This should be the same on both the Master and the Slave.
 - c. If needed, change the *Channel Bandwidth*, *(Master) Duty Cycle*, *Output Power* and/or *Maximum Modulation Rate* settings.
7. Configure the *Frequency Setting*. The selected *Frequency* must be the same on both airFiber radios.
8. Configure the *Wireless Security*:
 - a. Select the *AES Key Type*, **HEX** or **ASCII**.
 - b. For the *Key* field:
 - **HEX** Enter 16 bytes (eight, 16-bit HEX values: 0-9, A-F, or a-f). You can omit zeroes and use colons, similar to the IPv6 format.

Note: The airFiber Configuration Interface supports IPv6 formats excluding dotted quad and “::” (double-colon) notation.

 - **ASCII** Enter a combination of alphanumeric characters (0-9, A-Z, or a-z).
9. Click **Change** and then click **Apply**.

10. *In-Band Management* is enabled by default, so each airFiber radio must have a unique *IP Address*. (If the airFiber radios use the same *IP Address*, you may lose access to the airFiber radios via the *DATA* ports.) Click the **Network** tab.



- a. For the *Management IP Address* option:
 - **DHCP** Keep the default, *DHCP*, to use DHCP reservation on your router to assign a unique *IP Address*.
 - **Static** Change the *IP Address*, *Netmask*, and other settings to make them compatible with your network.
- b. Click **Change** and then click **Apply**.

Repeat the instructions in the *airFiber Configuration* section on the other AF-4X radio.

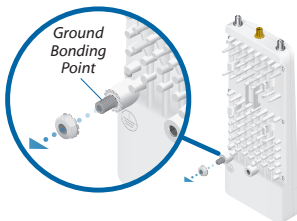
For details on the airFiber Configuration Interface, refer to the airFiber X User Guide, available at:

downloads.ubnt.com/airfiber

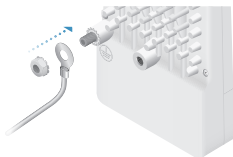
Hardware Installation

Install a Ground Wire

1. Remove the nut from the *Ground Bonding Point* located on the back of the AF-4X.



2. Attach a ground wire (min. 10 AWG or 5 mm²) to the lug and replace the nut to secure the wire.



3. At the installation site, secure the other end of the ground wire to a grounded mast, pole, tower, or grounding bar.



WARNING: Failure to properly ground your airFiber radio will void your warranty.



Note: The ground wire should be as short as possible and no longer than one meter in length.



640-00234-01

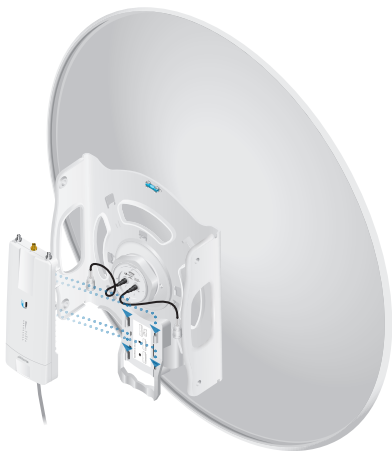
Mount to an airFiber X Antenna

Follow the instructions in this section to mount the AF-4X to an airFiber X antenna or to a RocketDish antenna equipped with the AF-5G-OMT-S45 Conversion Kit.

 **Note:** To mount the AF-4X to a RocketDish using the included *Universal Bracket*, see the *Mount to a RocketDish Antenna* section.

The airFiber X antenna AF-5G30-S45 is shown in this section:

1. Attach the airFiber X radio to the antenna by aligning the four tabs on the back of the radio with the slots of the radio mount. Then slide the radio down to lock it into place.



2. Attach the RF connectors to the radio in this combination: +45° to *Chain 0* and -45° to *Chain 1*. Then slide the jackets over the RF connectors to protect them.



3. Attach the *External GPS Antenna* (included with the radio) to the RF connector labeled *GPS* on the radio.



4. Attach the protective shroud.
 - a. Align the hash mark on the top of the shroud with the notch on the dish antenna.
 - b. Rotate the shroud clockwise until it locks into place.

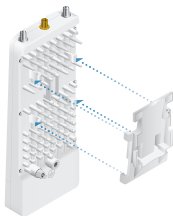


Mount to a RocketDish Antenna

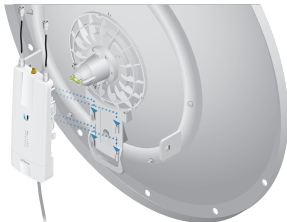
 **Note:** If you are mounting the AF-4X on a RocketDish equipped with the AF-5G-OMT-S45 Conversion Kit, the *Universal Bracket* is not needed. Refer instead to the *Mount to an airFiber X Antenna* section for instructions.

The RocketDish RD-5G30 antenna is shown in this section:

1. Position the *Universal Bracket* over the back of the AF-4X with the bracket clips over the AF-4X mounting tabs.
2. Push the bracket onto the AF-4X until it locks in place.



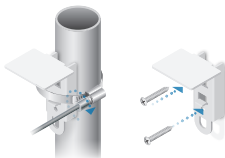
3. Attach the AF-4X to the RocketDish mounting bracket.
 - a. Align the mounting tabs on the *Universal Bracket* with the RocketDish mounting bracket.
 - b. Slide the AF-4X down to lock it into place.



Mount the External GPS Antenna

Locate a mounting point that has a clear view to the sky, and is above and as far away as possible from the AF-4X.

1. Attach the *GPS Antenna Mount* to the pole using the metal strap, or attach it to a wall using the appropriate fasteners (not included).



2. Place the *External GPS Antenna* on the mount.



3. Secure the cable of the *External GPS Antenna* to the mount with a *Cable Tie*.

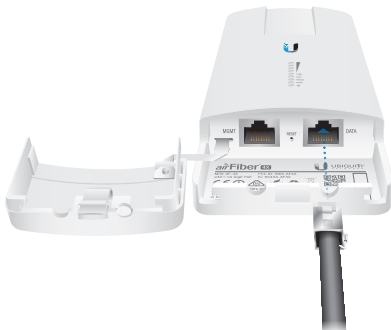


Connecting Power over Ethernet

1. Lift the release latch on the bottom of the AF-4X and slide the *Port Cover* off.



2. Connect an outdoor, shielded Ethernet cable to the *DATA* port.



3. Connect the Ethernet cable from the *DATA* port of the AF-4X to the **POE** port of the adapter.



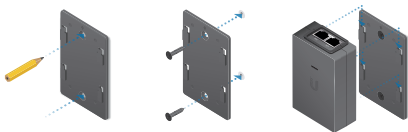
WARNING: Use only the included adapter, model **GP-H240-100G-4**. Failure to do so can damage the unit and void the product warranty.

4. Connect an Ethernet cable from your LAN to the adapter's **LAN** port.
5. Connect the *Power Cord* to the adapter's power port. Connect the other end of the *Power Cord* to a power outlet.



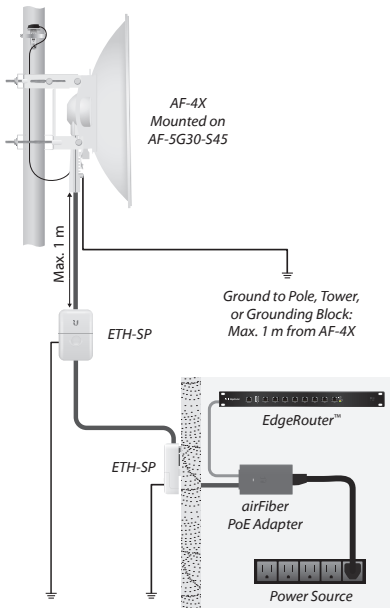
Mount the PoE Adapter (Optional)

1. Remove the *Mounting Bracket* from the adapter, place the bracket at the desired location, and mark the two holes.
2. Pre-drill the holes if necessary, and secure the bracket using two fasteners (not included).
3. Align the adapter's slots with the tabs of the *Mounting Bracket*, and then slide the adapter down.



Surge Protection

For added protection, install two surge suppressors, such as the Ubiquiti Ethernet Surge Protector, model ETH-SP, at the end of each link. Install the first surge protector within one meter of the airFiber *DATA* port, and install the second surge protector at the ingress point of the location housing the wired network equipment.



Alignment

Tips

- To accurately align the airFiber radios for best performance, you **MUST** align only one end of the link at a time.
- You may need to use additional hardware to compensate for issues such as the improper orientation of a mounting pole or significant elevation differences between airFiber radios.

Establishing a Link

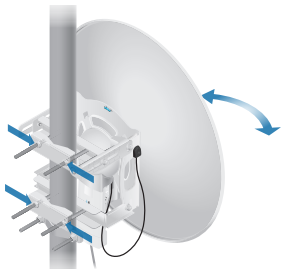
Adjust the positions of the *Master* and the *Slave* to establish a link. The following section features the airFiber X antenna, AF-5G30-S45:

 **Note:** The *Master* must be aimed first at the *Slave* because the *Slave* does not transmit any RF signal until it detects transmissions from the *Master*.

1. **Master** Visually aim the *Master* at the *Slave*. To adjust the *Master's* position, adjust the azimuth and the elevation.

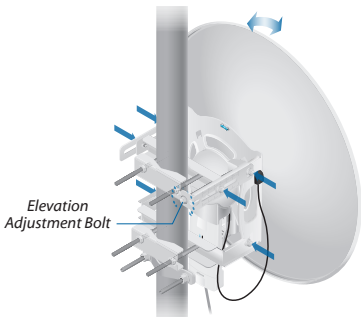
Adjust the azimuth:

- a. Loosen the four flange nuts on the two pole clamps.
- b. Rotate the antenna to point towards the other end of the link.
- c. Tighten the four flange nuts on the two pole clamps.



Adjust the elevation angle:

- Loosen the six hex head bolts to so that the washers can spin freely by hand.
- Tighten or loosen the *Elevation Adjustment Bolt* to set the desired tilt.
- Tighten the six hex head bolts.



Note: Do NOT make simultaneous adjustments on the *Master* and *Slave*.

- Slave** Visually aim the *Slave* at the *Master*. To adjust the *Slave*'s position, adjust the azimuth and elevation as described in step 1.
- Check to see if a link is established. Ensure that the *LINK* LED is solidly lit green and the *Signal* LEDs of the *Slave* are displaying signal levels.



4. **Slave** Aim the *Slave* at the *Master* to achieve the strongest signal level on the *Master*.



Note: Refer to the *Signal LEDs* section for details on the signal values.



Note: Maximum signal strength can best be achieved by iteratively sweeping through both azimuth and elevation.

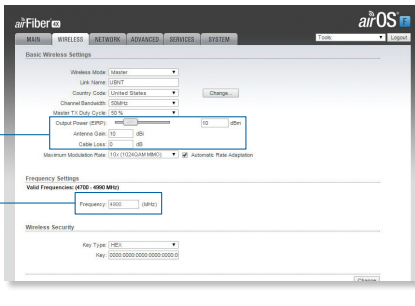
5. **Master** Aim the *Master* at the *Slave* to achieve the strongest signal level on the *Slave*.
6. Repeat steps 4 and 5 until you achieve an optimal link, with all four *Signal* LEDs solidly lit. This ensures the best possible data rate between the airFiber radios.
7. Lock the alignment on both airFiber antennas by tightening all the nuts and bolts.
8. Observe the *Signal* LEDs of each airFiber radio to ensure that the values remain constant while tightening the nuts and bolts. If any LED value changes during the locking process, loosen the nuts and bolts, finalize the alignment of each airFiber antenna again, and retighten the nuts and bolts.

For detailed information on setting up an airFiber link, see the airFiber X User Guide available at:

downloads.ubnt.com/airfiber

Installer Compliance Responsibility

Devices must be professionally installed and it is the professional installer's responsibility to make sure the device is operated within local country regulatory requirements.



The *Output Power*, *Antenna Gain*, *Cable Loss*, and *Frequency* fields are provided to the professional installer to assist in meeting regulatory requirements.

Specifications

airFiber AF-4X	
Dimensions	224 x 82 x 48 mm (8.82 x 3.23 x 1.89")
Weight	0.35 kg (0.77 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
Certifications	FCC Part 15.407 CE EN 302502 v1.2.1, EN 301 893 v1.7.1
Operating Temperature	-40 to 55° C (-40 to 131° F)
Networking Interface	
Data Port	(1) 10/100/1000 Ethernet Port
Management Port	(1) 10/100 Ethernet Port
System	
Processor	INVICTUS™ IC
Maximum Throughput	500+ Mbps
Encryption	128-bit AES
OS	airOS F
Wireless Modes	Master/Slave
Radio	
Operating Frequency	4700-4990 MHz (Depends on Regulatory Region ¹)
Max. Conducted TX Power	24 dBm (Depends on Regulatory Region ¹)
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

¹ For region-specific details, refer to the Compliance chapter of the airFiber X User Guide at downloads.ubnt.com/airfiber

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



www.ubnt.com

Online Resources

Support support.ubnt.com

Community community.ubnt.com

Downloads downloads.ubnt.com

©2016 Ubiquiti Networks, Inc. All rights reserved. Ubiquiti, Ubiquiti Networks, the Ubiquiti U logo, the Ubiquiti beam logo, airFiber, airOS, EdgeRouter, INVICTUS, Rocket, RocketDish, and TOUGH Cable are trademarks or registered trademarks of Ubiquiti Networks, Inc. in the United States and in other countries. All other trademarks are the property of their respective owners.

PH031116