AF-24HD Quick Start Guide

Package Contents

airFiber AF-24HD

Pole Mount Bracket

Pole Clamps (Qty. 2)

Carriage Bolts (Qty. 4)

Flat Washers (Qty. 4)

Split Lock Washers (Qty. 4)

Hex Nuts (Qty. 4)

Metal Strap

GPS Antenna Mount

External GPS Antenna

Zip Ties (Qty. 3)

Gigabit PoE Adapter (50V, 1.2A)

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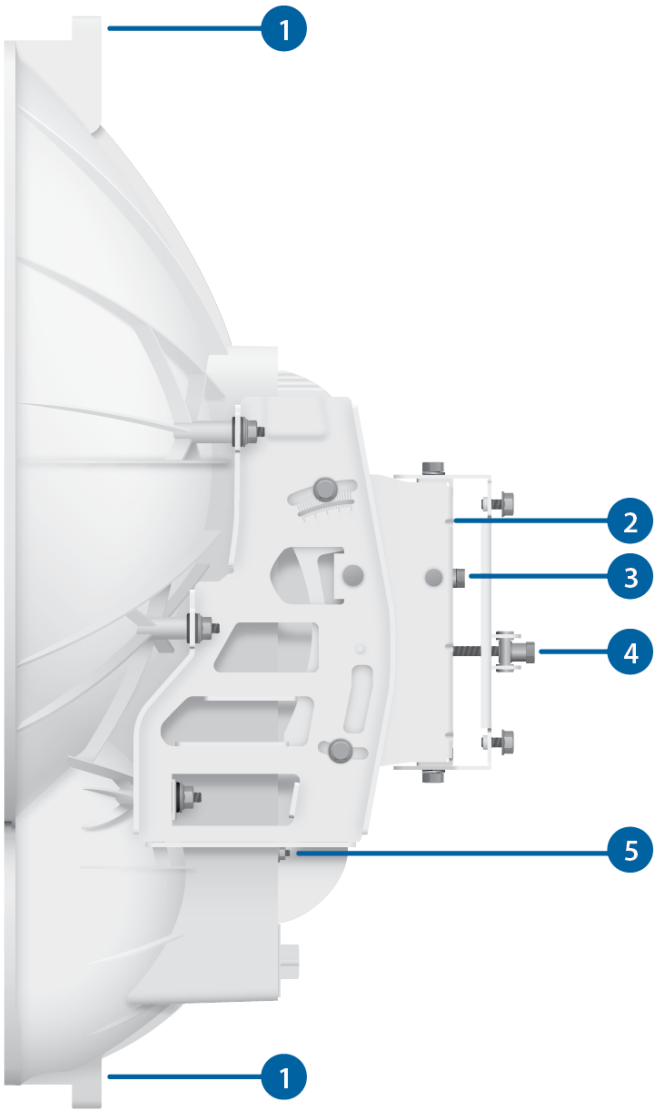
Power Cord

Hardware Overview



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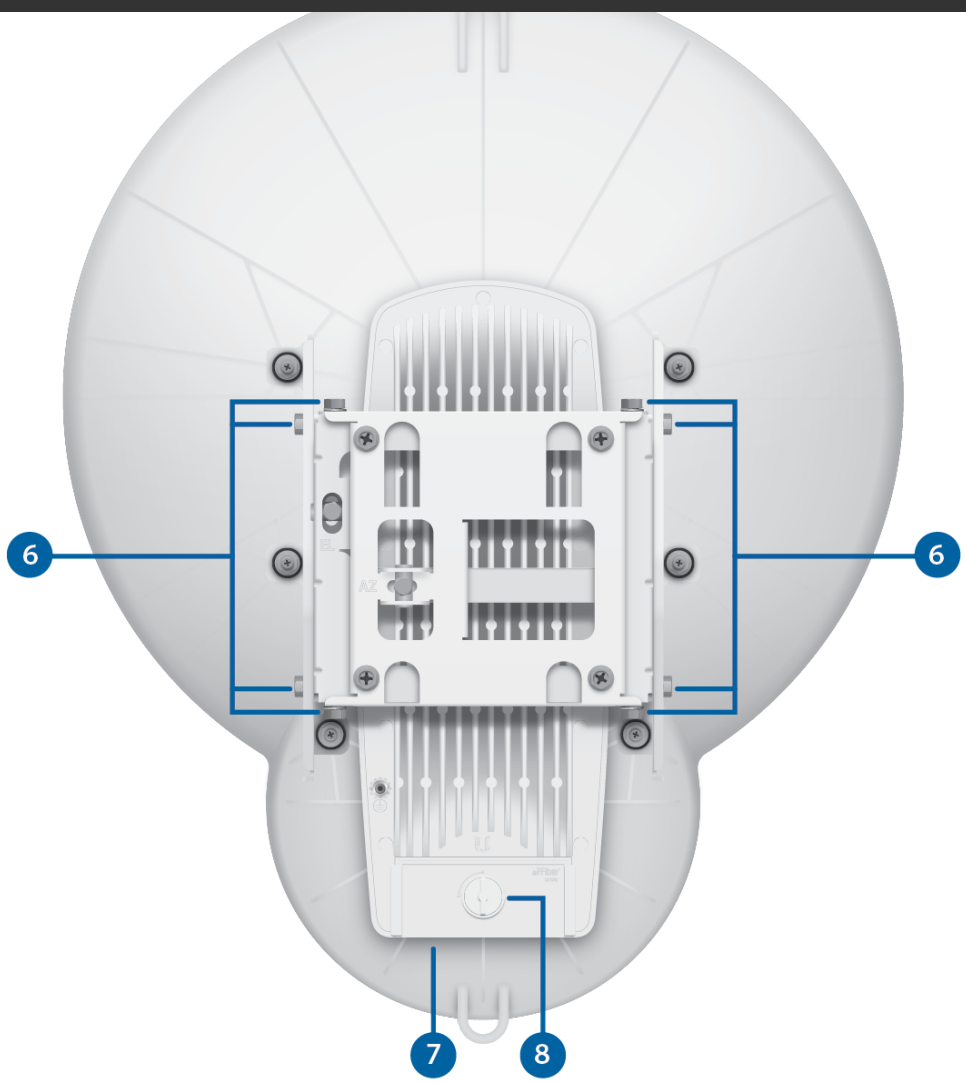

1	Alignment Bracket
2	Elevation Adjustment
3	Azimuth Adjustment
4	Ground Bonding Point
5	Lock Bolts
6	Lanyard Loops
7	Port Cover
8	Cover Lock

LEDs, Ports, and Display

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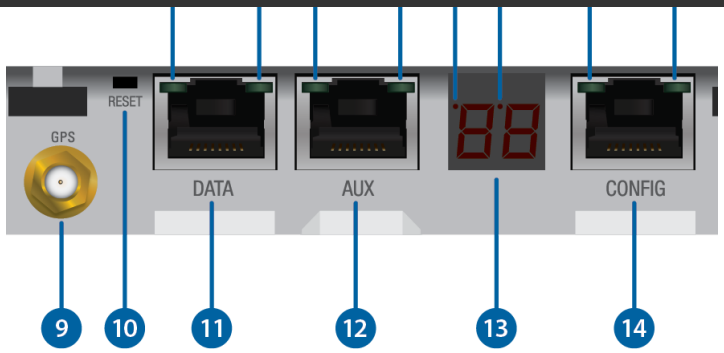

1 Speed LED (Data Port)	
Off	10/100 Mbps
On	1000 Mbps
2 Link/Activity LED (Data Port)	
Off	No Ethernet Link
On	Ethernet Link Established
Random Flashing	Ethernet Activity
3 GPS LED (Auxiliary Port)	
Off	No GPS Synchronization
On	Operational (Strong Signal)
Normal Flash*	Operational (Weak Signal)
4 Modulation LED (Auxiliary Port)	
Off	¼x or 1x (QPSK SISO)
Short Flash*	2x (QPSK MIMO)
Normal Flash*	4x (16QAM MIMO)
Long Flash*	6x (64QAM MIMO)
On	8x (256QAM MIMO)
5 Master/Slave LED	
Off	Slave Mode

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6 RF Link Status LED	
Off	RF Off
Short Flash*	Syncing
Normal Flash*	Beaconing
Long Flash*	Registering
On	Operational
7 Speed LED (Configuration Port)	
Off	10 Mbps
On	100 Mbps
8 Link/Activity LED (Configuration Port)	
Off	No Ethernet Link
On	Ethernet Link Established
Random Flashing	Ethernet Activity
9 GPS Port	
Connect the External GPS Antenna to this SMA connector.	
10 Reset Button	
To reset to factory defaults, press and hold the Reset button for more than five seconds while the unit is powered on.	
11 Data Port	
10/100/1000 Mbps port handles all user traffic.	
12 Auxiliary Port	
Port for audio tone aiming.	
13 LED Display	
Digital display used for power, status, and mode information.	

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	Flashing Number	Undecodable RX Signal
	oL	Overload Condition

14 Configuration Port

10/100 Mbps, secured port for configuration. By default, this is the only port that can monitor, configure, and/or update firmware.

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

Installation Requirements

- 17 mm wrench
- 13 mm socket wrench or driver
- Clear line of sight between airFiber radios
- Clear view of the sky for proper GPS operation
- Mounting location with < 0.5° displacement due to twist and sway under wind loading
- Mounting point:
  - At least 1 meter below the highest point on the structure
  - For tower installations, at least 3 meters below the top of the tower
- Ground wires – min. 8 AWG (10 mm^2) and max. length: 1 meter. As a safety precaution, ground the airFiber radios to grounded masts, poles, towers, or grounding bars.

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

- (Recommended) 2 Outdoor Gigabit PoE surge protectors – Ubiquiti® Ethernet Surge Protector, model ETH-SP-G2.

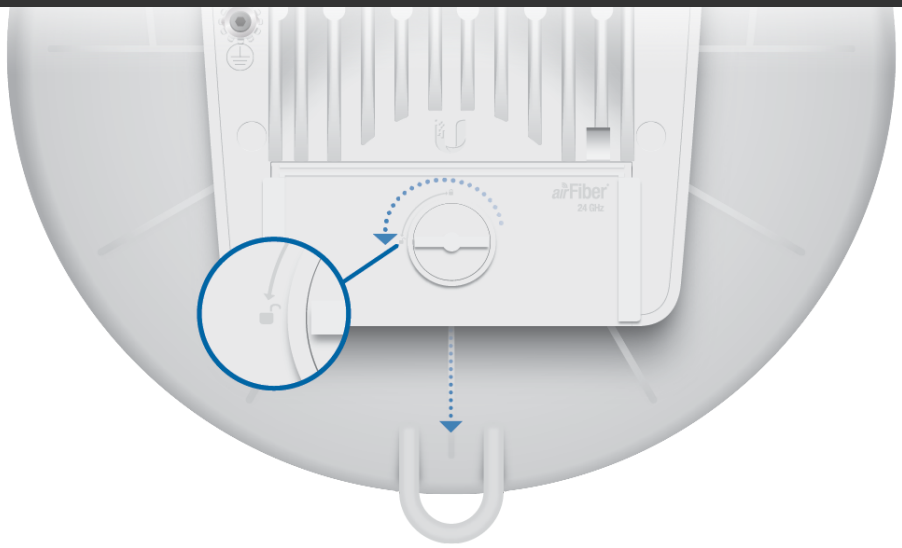
  Note: For guidelines about grounding and lightning protection, follow your local electrical regulatory codes.

- Outdoor, shielded Category 5e (or above) cabling and shielded RJ-45 connectors should be used for all wired Ethernet connections. Category 6 is required for installations with long cable runs (up to 100 m).

  We recommend that you protect your networks from harmful outdoor environments and destructive ESD events with industrial-grade, shielded Ethernet cable from Ubiquiti. For more details, visit ui.com/toughcable

Connecting Power over Ethernet

AF-24HD Quick Start Guide



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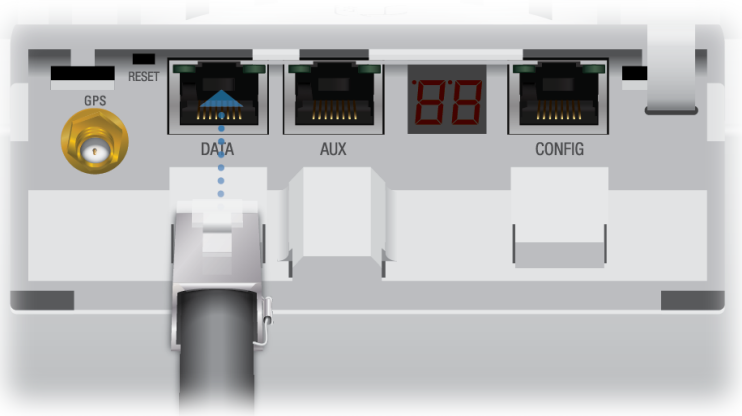

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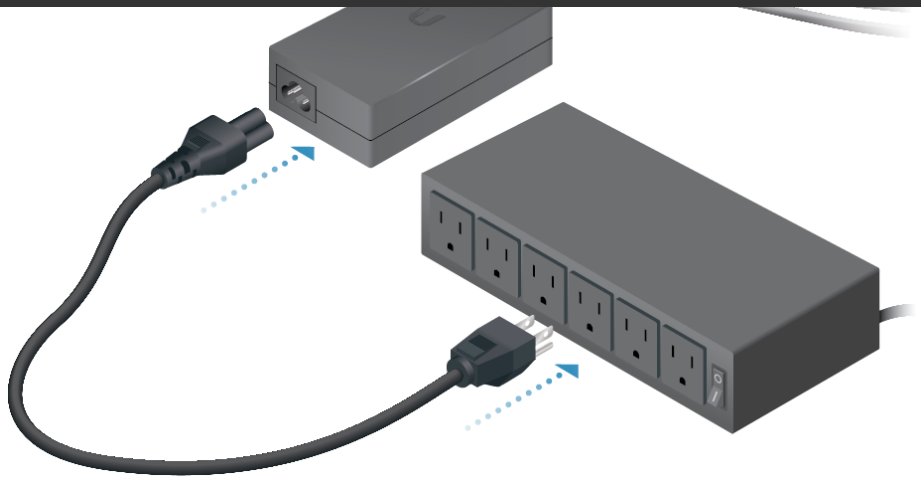
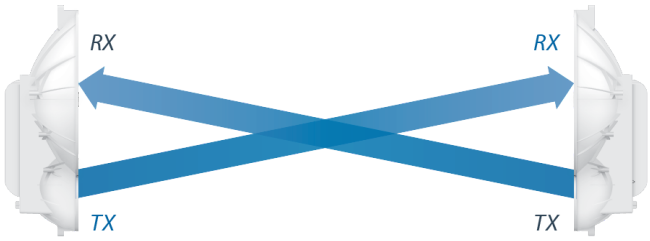


airFiber Configuration

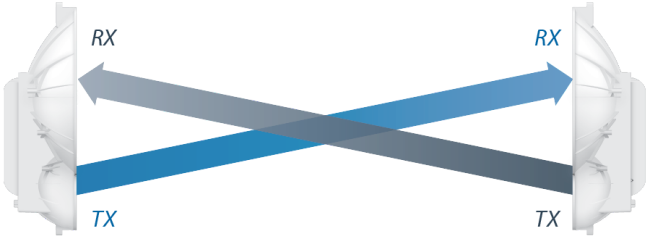
The instructions in this section explain how to access the airFiber Configuration Interface and configure the following settings:

- Wireless Mode Configure one airFiber AF-24HD as the Master and the other as the Slave.
- Duplex The airFiber AF-24HD supports both half-duplex and full-duplex operation. Half-duplex operation provides more frequency planning options at the cost of higher latency and throughput. Full-duplex operation provides the highest throughput and lowest latency; however, you have fewer frequency management options.
  - Half Duplex (default) The TX and RX Frequencies can be the same or different to suit local interference.



Half-Duplex Diagram

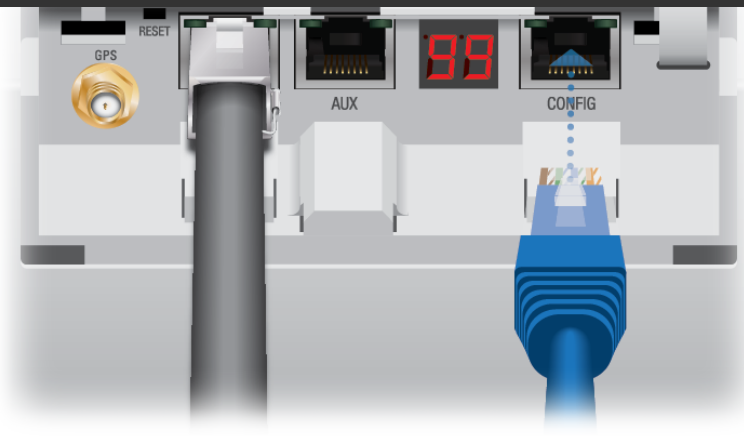
  - Full Duplex The TX and RX Frequencies should be different.



Full-Duplex Diagram

- TX and RX Frequencies The TX Frequency on the Master must match the RX Frequency on the Slave, and vice versa.

1. Connect an Ethernet cable from your computer to the CONFIG port on the airFiber AF-24HD.



2. Configure the Ethernet adapter on your computer with a static IP address on the 192.168.1.x subnet (for example, 192.168.1.100).
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.

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

5. Click the Wireless tab.
6. Enter the Basic Wireless Settings:
   a. For one airFiber AF-24HD, select Master from the Wireless Mode drop-down. For the other airFiber AF-24HD, 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. For the Duplex drop-down:
      - Half Duplex The default mode. The TX and RX Frequencies can be the same or different to suit local interference.
      - Full Duplex The TX and RX Frequencies should be different.
   d. Select a TX Frequency. This must match the RX Frequency of your other airFiber AF-24HD.
   e. Select a RX Frequency. This must match the TX Frequency of your other airFiber AF-24HD.
   f. If needed, change the Output Power, Maximum Modulation Rate, and/or RX Gain settings.
7. Configure the Wireless Security:
   a. Select the AES Key Type, HEX or ASCII.
   b. For the Key field:

IPv6 format.

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

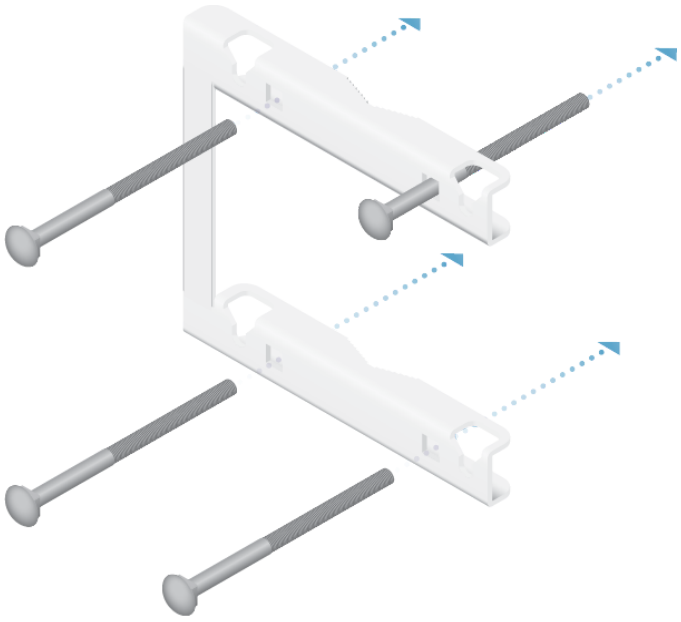
- ASCII Enter a combination of alphanumeric characters (0-9, A-Z, or a-z).

8. Click Change and then click Apply.
9. 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, then you may lose access to the airFiber radios via the DATA ports.) To change the network settings:
   a. Click the Network tab.
   b. Change the IP Address, Netmask, and other settings to make them compatible with your network.
   c. Click Change and then click Apply.

Repeat the instructions in the airFiber Configuration section on your other airFiber radio. After you have configured the airFiber radios, disconnect them and move them to your installation site.

Hardware Installation

1.



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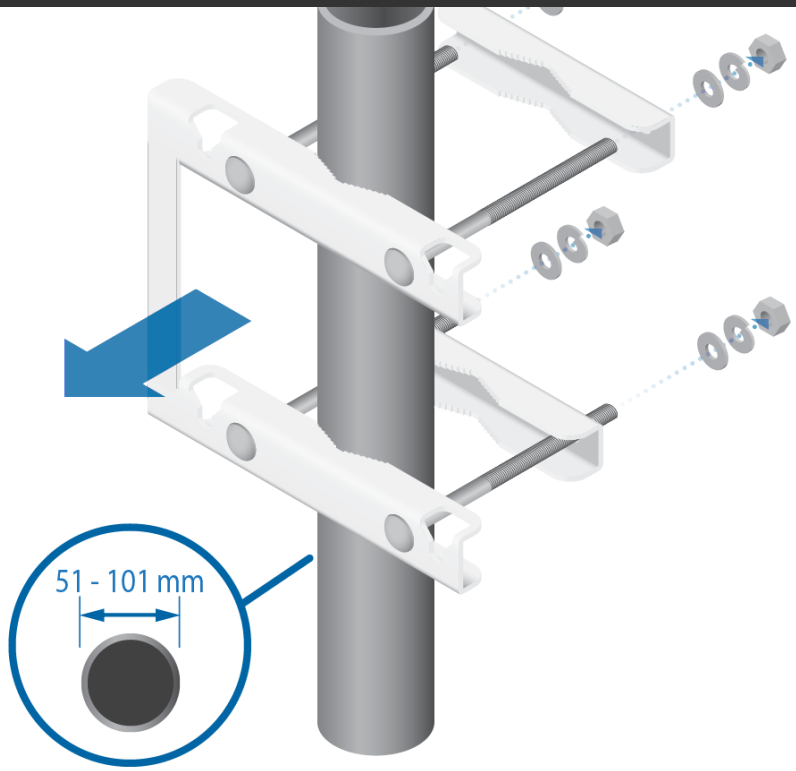
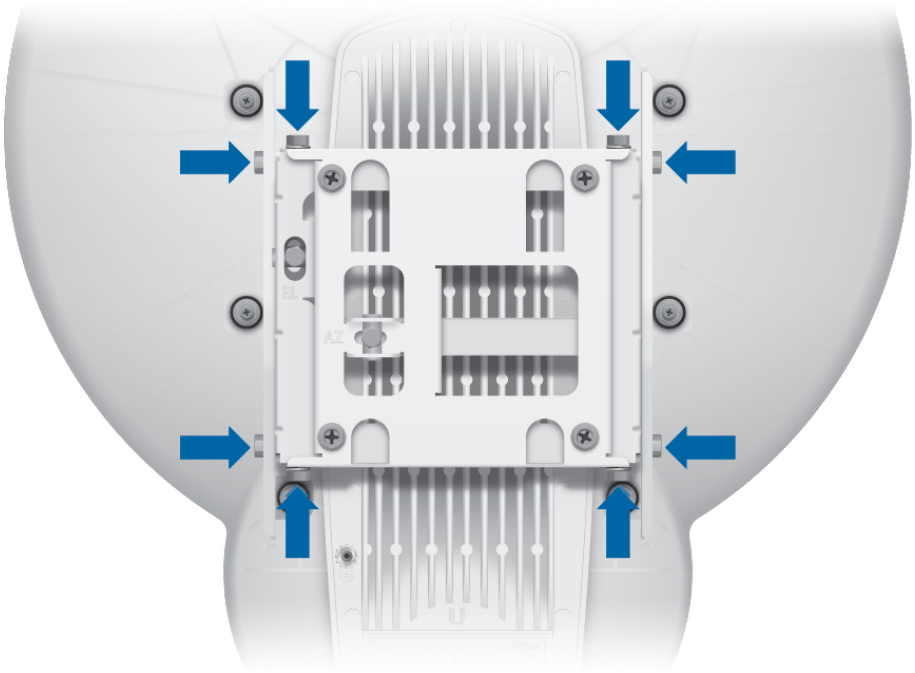


Note: Orient the Pole Mount Bracket around the pole so it is aimed in the direction of the other airFiber AF-24HD.

3.



Note: Loosen, but do NOT remove the eight Lock Bolts located on the Alignment Bracket.

4.

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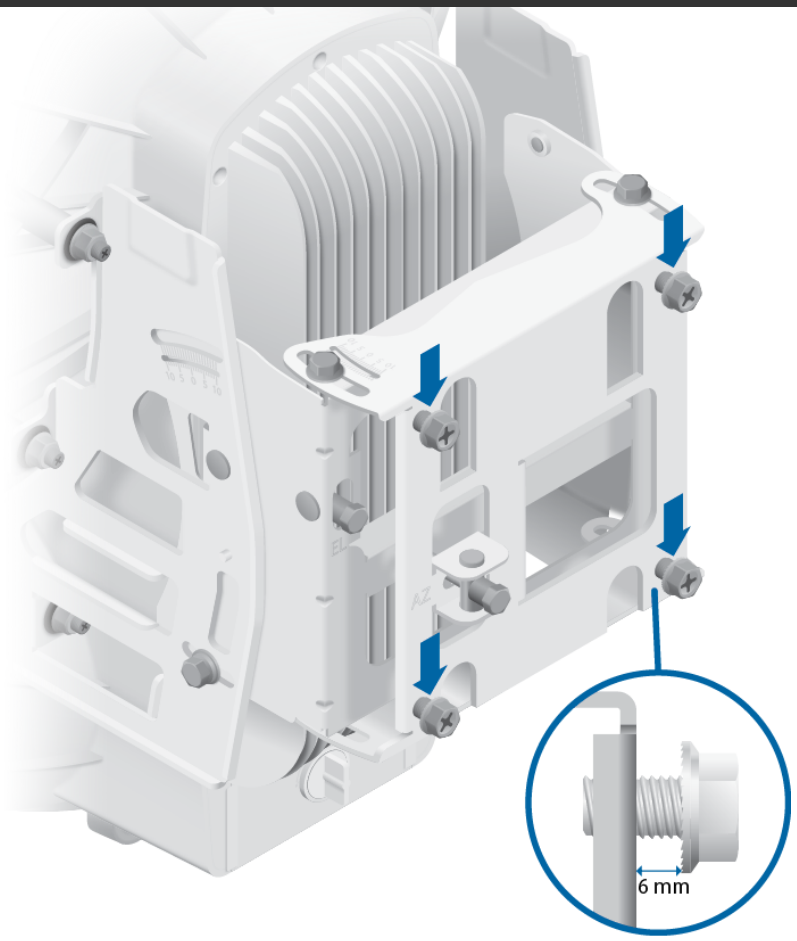

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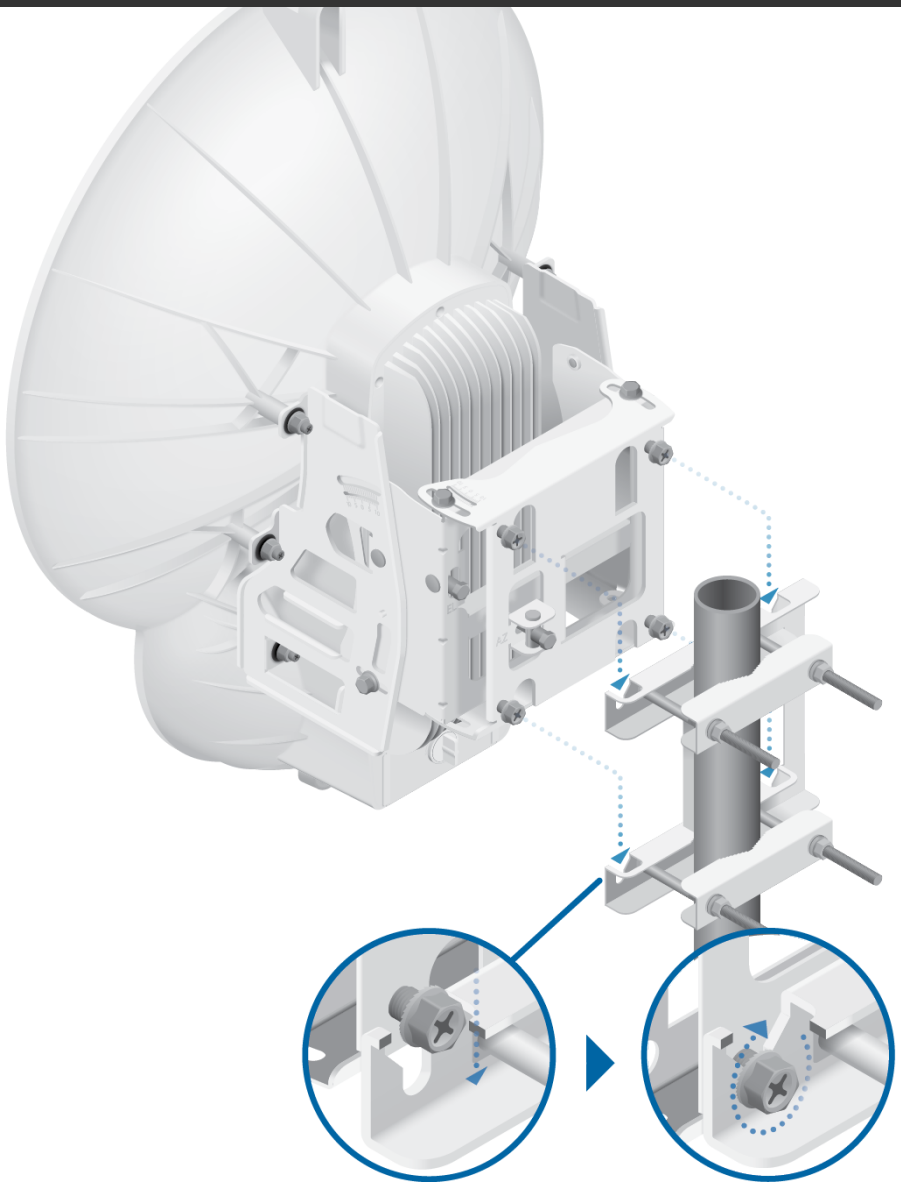
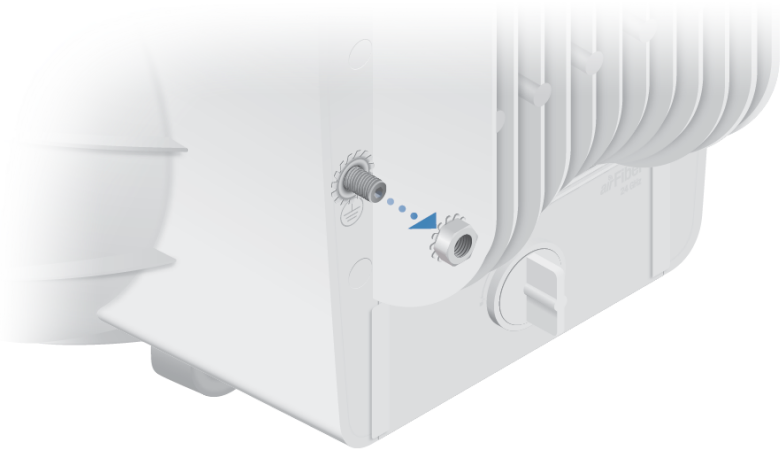


WARNING: To prevent injury, ensure that all four screws are seated and fully tightened.

6.



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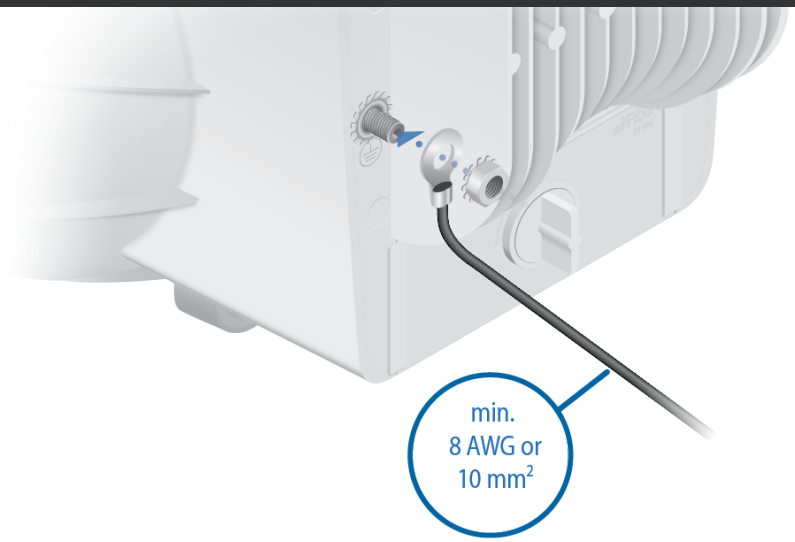


8. Secure the other end of the ground wire to a grounded mast, pole, tower, or grounding bar.

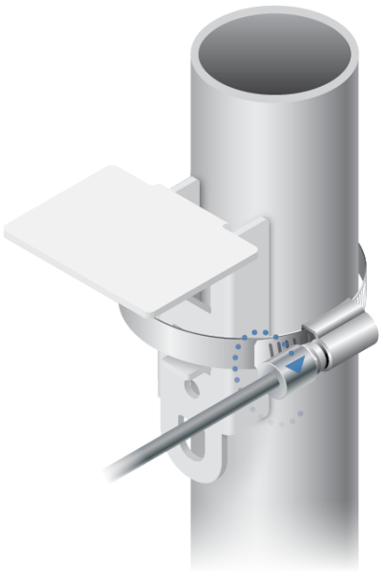
WARNING: Failure to properly ground your airFiber units will void your warranty.

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

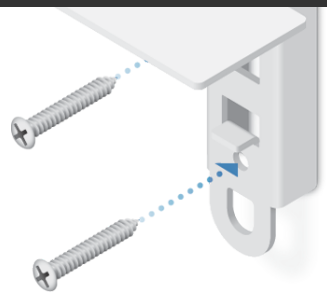
Connecting the GPS Antenna

Locate a mounting point for the External GPS Antenna that has a clear view to the sky, and is above and as far away as possible from the AF-24HD.

1.



OR



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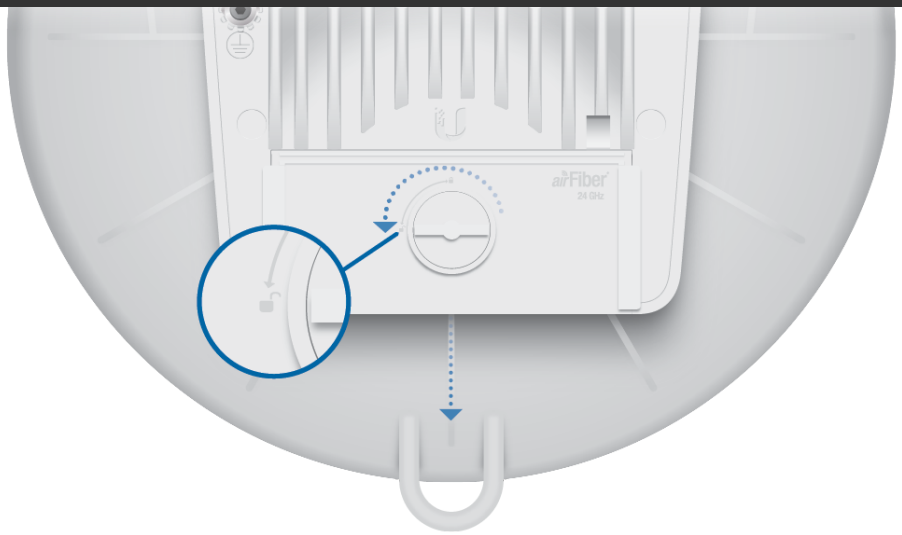
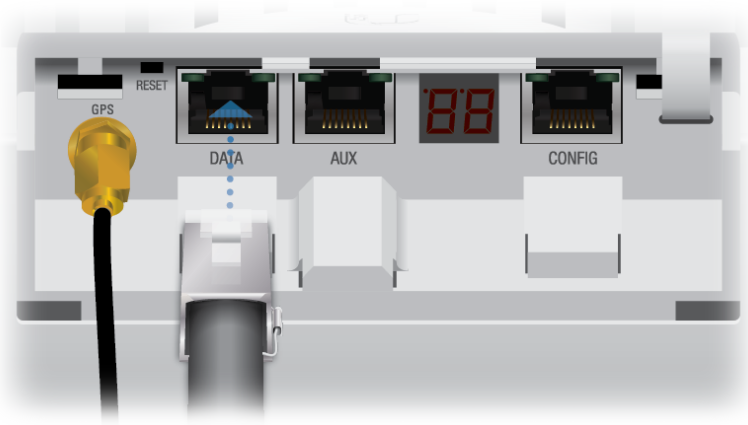


Connecting Ethernet

1.



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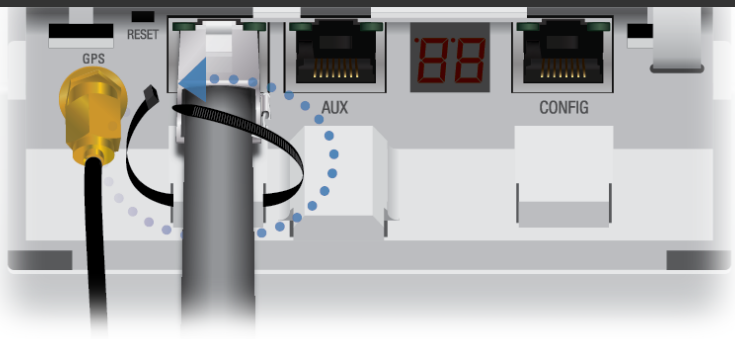

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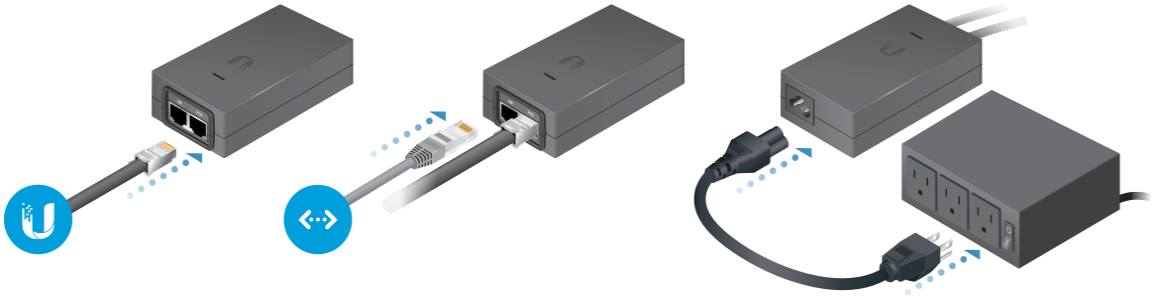
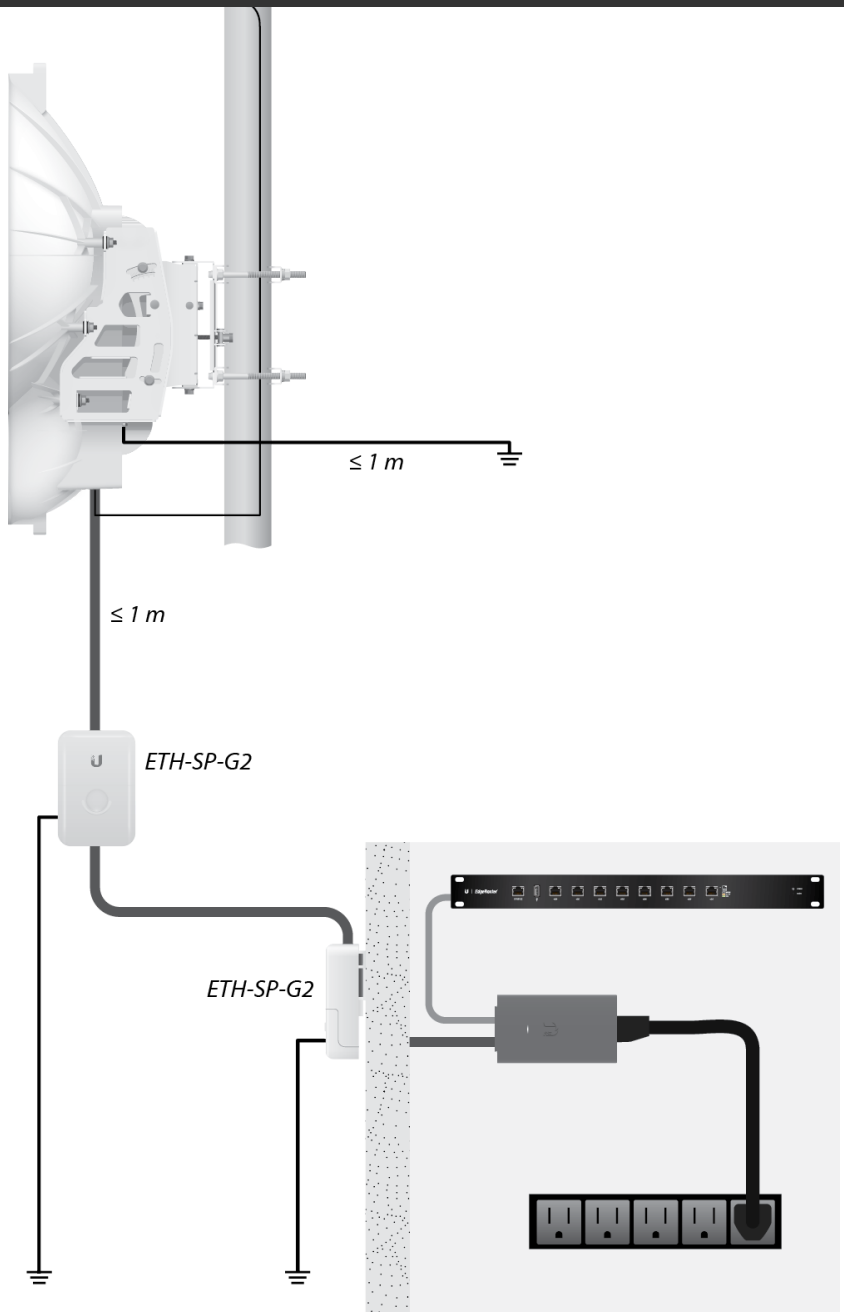


Note: For added protection, we recommend installing two surge surpressors, such as the Ubiquiti Ethernet Surge Protector, model ETH-SP-G2. Install the first surge protector within one meter of the airFiber DATA port, and install the second surge protector at the ingress point of the location housing the wired network equipment.

Below is a diagram of a finished installation with recommended surge protectors installed.



Alignment

Tips

- Fine-tuning is best achieved by a pair of installers with a dedicated, two-way communication link: one installer makes adjustments on one airFiber radio while the other installer reports the received signal level at the other airFiber radio. Fine-tuning (see "Fine-Tuning the Link") is necessary because the main lobe of the receiver is narrower than that of the transmitter, in both azimuth and elevation.
- To accurately align the airFiber radios for best performance, you MUST align only one end of the link at a time.
- For more convenient alignment, you may consider using long-range scopes (not included) temporarily attached to your airFiber radios.

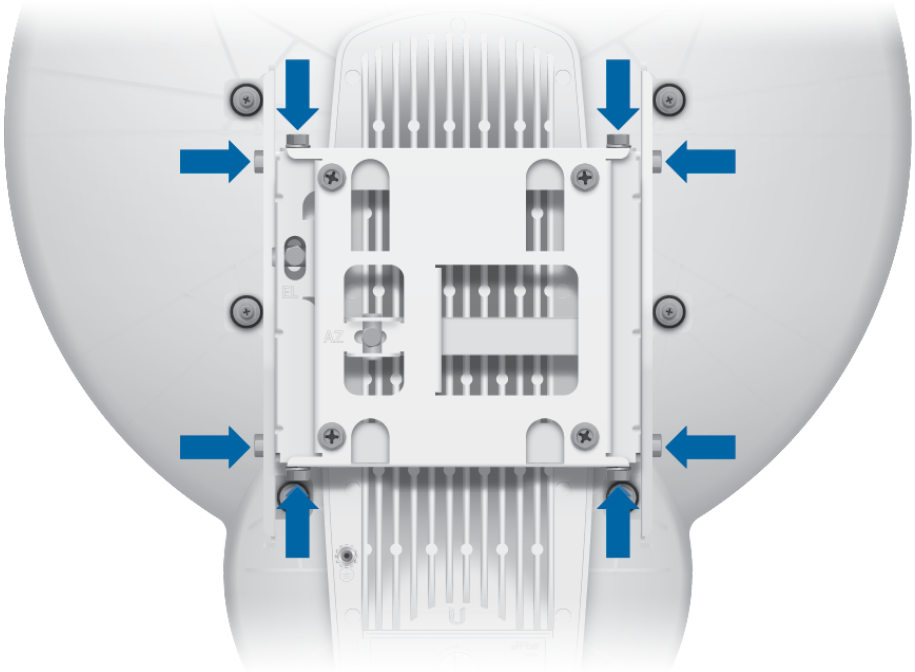
between the airFiber radios.

Establishing a Preliminary Link

Adjust the positions of the Master and the Slave to establish a preliminary link. This requires the Master and Slave to be within a few degrees of the line of sight between the airFiber radios.

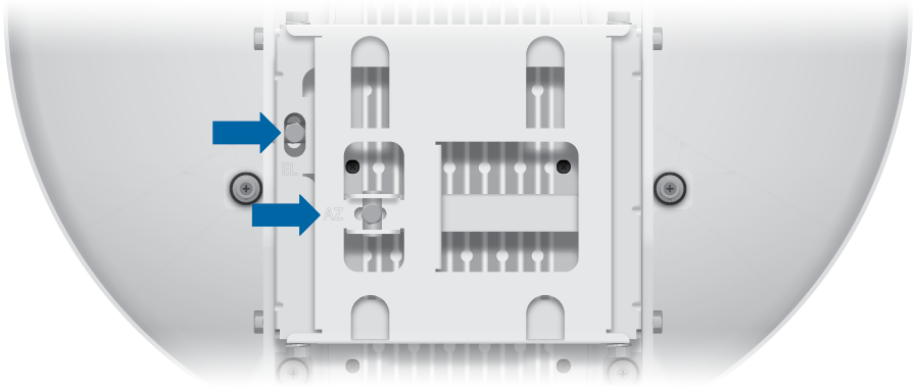
Note: The Master must be aimed first at the Slave because the Slave does not transmit any RF signal until it detects transmissions from the Master.

1. For the Master and Slave, ensure the eight Lock Bolts on the Alignment Bracket are sufficiently loose by spinning each washer by hand.

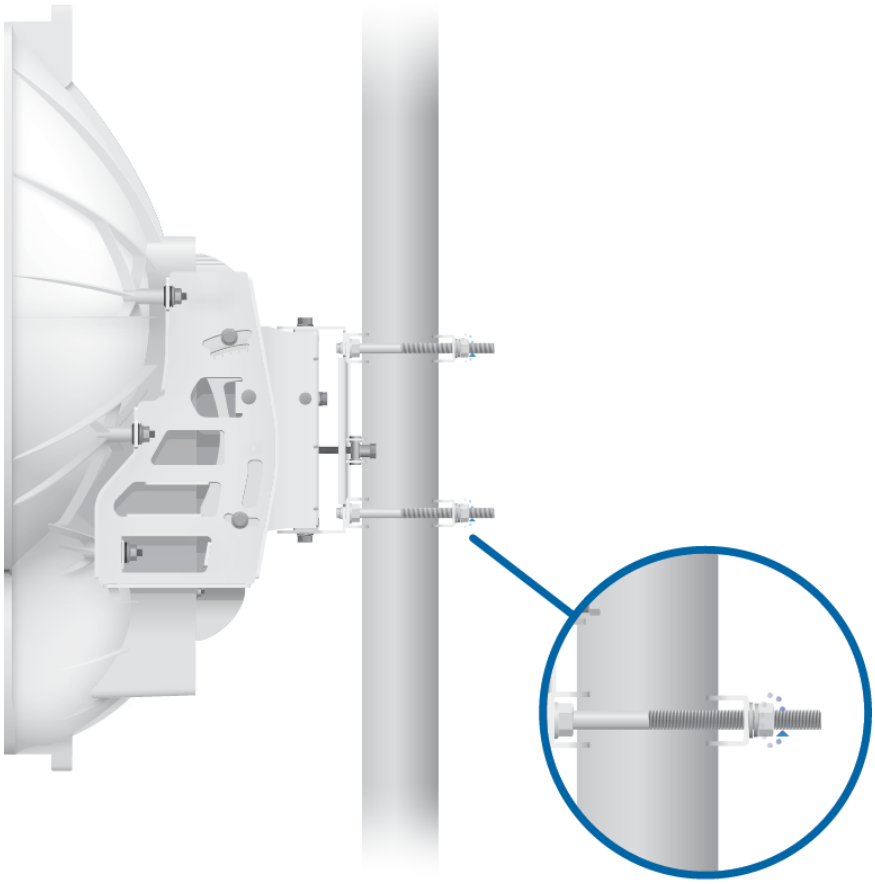


WARNING: All Lock Bolts MUST be loose to avoid damage to the airFiber housing.

2. For the Master and Slave, ensure the Azimuth (AZ) and Elevation (EL) Adjustment Bolts are in the middle of their adjustment ranges.



a. Loosen the Hex Nuts.



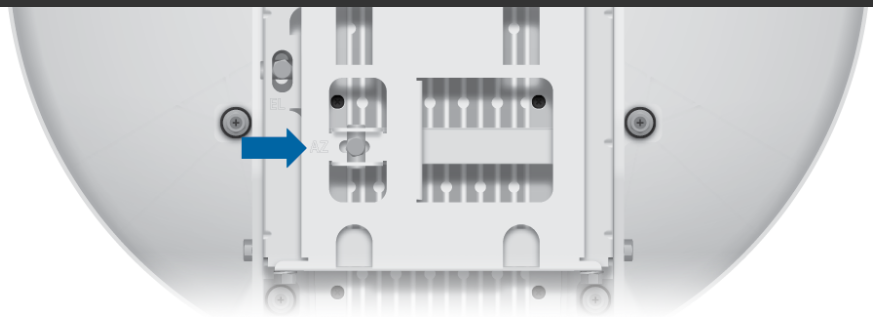
b. Adjust the Pole Mount Bracket and Pole Clamps.

c. Tighten the Hex Nuts.

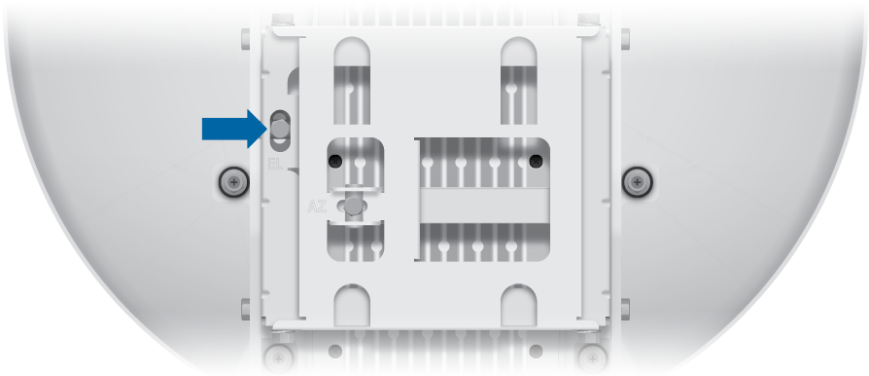
4. Slave Aim the Slave at the Master to achieve the strongest received signal level on the Slave's numeric LED Display, which is located next to the CONFIG port. If necessary, adjust the Slave's position on the pole.

Note: Values on the LED Display are displayed in negative (-) dBm. For example, 61 represents -61 dBm, which is stronger than -72 dBm.

5. Master Adjust the azimuth and elevation of the Master until the strongest received signal level is displayed on the LED Display of the Master.
   a. Sweep the Azimuth (AZ) Adjustment Bolt of the Master through its adjustment range.



b. Sweep the Elevation (EL) Adjustment Bolt of the Master through its adjustment range.



Note: If the LED Display indicates an overload condition , refer to the following section, Adjusting RX Gain.

Adjusting RX Gain

Access airOS® and click the Wireless tab to select the appropriate gain for your RX antenna: High (default) or Low. If the link is very short or being tested, select Low, so your signal does not get distorted.

Note: Minimum link distance is approximately 100 m (328 ft).

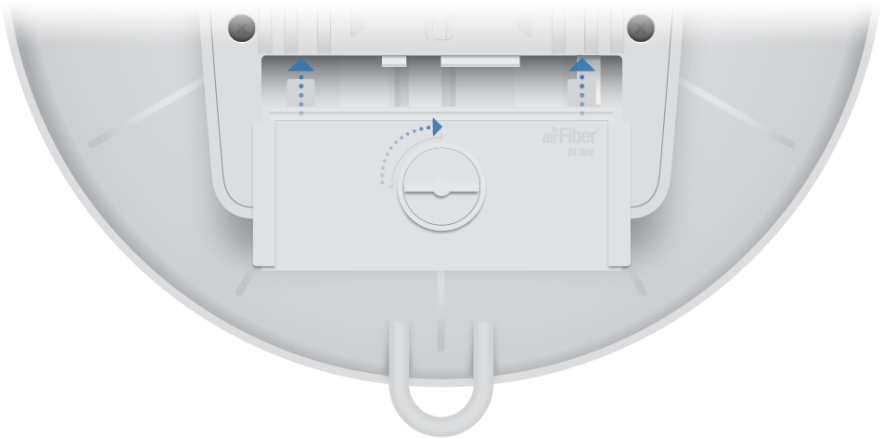
For links between 100 m (328 ft) and 800 m (2,625 ft):

- Target -40 dBm.
- Decrease RX Gain to overcome overload condition ( ).
- For short ranges or strong signal conditions, adjust the power to be 3-5 dB below overload condition ( ).
- Decrease RX Gain first.
- Never mitigate overload condition ( ) by misaligning antennas.

Link Distance	RX Gain Setting	Approximate TX Power Setting
d > 1 km (d > 3,281 ft)	High	> 25 dBm
0.5 km < d < 1 km (1,640 ft < d < 3,281 ft)	Low	19-25 dBm
0.25 km < d < 0.5 km (820 ft < d < 1,640 ft)	Low	12-18 dBm
0.1 km < d < 0.25 km (328 ft < d < 820 ft)	Low	3-11 dBm

Fine-Tuning the Link

The Azimuth (AZ) and Elevation (EL) Adjustment Bolts of the Alignment Bracket adjust the azimuth and elevation within a range of ±10°. For accurate alignment, make adjustments on one end of the link while the other installer reports the received signal level at the other end of the link. Do NOT make simultaneous adjustments on the Master and Slave.

1. Slave Adjust the azimuth and elevation of the Slave until the other installer sees the strongest received signal level displayed on the LED Display of the Master.
2. Master Adjust the azimuth and elevation of the Master until the other installer sees the strongest received signal level displayed on the LED Display of the Slave.
3. Repeat steps 1 and 2 until you achieve a symmetric link, with the received signal levels within 1 dB of each other. This ensures the best possible data rate between the airFiber radios.
4. Lock the alignment on both airFiber radios by tightening all eight Lock Bolts on the Alignment Bracket.
5. Observe the LED Display of each airFiber AF-24HD to ensure that the value remains constant while tightening the Lock Bolts. If the LED value changes during the locking process, loosen the Lock Bolts, finalize the alignment of each airFiber AF-24HD again, and retighten the Lock Bolts.
6. 

There are three methods for determining the received signal level:

- Audio tone (optional equipment required)

Refer to the airFiber AF-24HD User Guide for instructions on the airFiber Configuration Interface and audio tone methods. The User Guide is available at: ui.com/download/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 Frequencies and Output Power fields are provided to the professional installer to assist in meeting regulatory requirements.

Specifications

airFiber AF-24HD	
Dimensions	593 x 768 x 370 mm (23.35 x 30.24 x 14.57") Not Including Mount
Weight	17.3 kg (38.14 lb) Mount Included
Operating Frequency	24.05 – 24.25 GHz
GPS	GPS Clock Synchronization
EIRP	~33 dBm (FCC/IC), ~20 dBm (CE)
Frequency Accuracy	± 2.5 ppm without GPS Synchronization ± 0.2 ppm with GPS Synchronization
Channel Bandwidth	100 MHz
Max. Power Consumption	< 50W
Power Supply	50V, 1.2A PoE Gigabit Adapter (Included)
Power Method	Passive Power over Ethernet (42-58VDC)
Certifications	CE, FCC, IC
Mounting	Pole Mount Kit (Included)
Operating Temperature	-40 to 55° C (-40 to 131° F)
Integrated Split Antenna	
TX Gain	33 dBi
RX Gain	40 dBi
Beamwidth	< 3.5°
Front-to-Back Ratio	70 dB
Polarity	Dual-Slant Polarization

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Cross-Polarity Isolation	> 25 dB
Networking Interface	
Data Port	(1) 10/100/1000 Ethernet Port
Configuration Port	(1) 10/100 Ethernet Port

Safety Notices

1. Read, follow, and keep these instructions.
2. Heed all warnings.
3. Only use attachments/accessories specified by the manufacturer.

WARNING: Do not use this product in location that can be submerged by water.

WARNING: Avoid using this product during an electrical storm. There may be a remote risk of electric shock from lightning.

Electrical Safety Information

1. Compliance is required with respect to voltage, frequency, and current requirements indicated on the manufacturer's label. Connection to a different power source than those specified may result in improper operation, damage to the equipment or pose a fire hazard if the limitations are not followed.
2. There are no operator serviceable parts inside this equipment. Service should be provided only by a qualified service technician.
3. This equipment is provided with a detachable power cord which has an integral safety ground wire intended for connection to a grounded safety outlet.
   a. Do not substitute the power cord with one that is not the provided approved type. Never use an adapter plug to connect to a 2-wire outlet as this will defeat the continuity of the grounding wire.
   b. The equipment requires the use of the ground wire as a part of the safety certification, modification or misuse can provide a shock hazard that can result in serious injury or death.
   c. Contact a qualified electrician or the manufacturer if there are questions about the installation prior to connecting the equipment.
   d. Protective earthing is provided by Listed AC adapter. Building installation shall provide appropriate short-circuit backup protection.
   e. Protective bonding must be installed in accordance with local national wiring rules and regulations.

Limited Warranty

ui.com/support/warranty

The limited warranty requires the use of arbitration to resolve disputes on an individual basis, and, where applicable, specify arbitration instead of jury trials or class actions.

Compliance

FCC

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions.

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operations of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This radio transmitter (FCC ID: SWX-AF24) has been approved by FCC to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

- Antenna Information: Dish antenna, TX Gain: 33 dBi

ISED Canada

CAN ICES-3(A)/NMB-3(A)

This device complies with ISED Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

This radio transmitter (IC: 6545A-AF24) has been approved by ISED Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

- Antenna Information: Dish antenna, TX Gain: 33 dBi

CAN ICES-3(A)/NMB-3(A)

Le présent appareil est conforme aux CNR d'ISDE Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. l'appareil ne doit pas produire de brouillage;
2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Le présent émetteur radio (IC : 6545A-AF24) a été approuvé par ISDE Canada pour l'exploitation avec l'antenne types énumérés ci-dessous avec le gain maximal admissible et requis l'impédance de l'antenne pour chaque type d'antenne indiqué. Types d'antenne non

- Informations d’antenne : Antenne parabolique, Gain TX : 33 dBi

IMPORTANT NOTE

Radiation Exposure Statement

- This equipment complies with radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum distance 107 cm between the radiator and your body.
- This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

AVIS IMPORTANT

Déclaration sur l’exposition aux rayonnements

- Cet équipement est conforme aux limites prévues pour l’exposition aux rayonnements dans un environnement non contrôlé.
- Lors de l’installation et de la mise en fonctionnement de l’équipement, assurez-vous qu’il y ait une distance minimale de 107 cm entre l’élément rayonnant et vous.
- Cet émetteur ne doit être installé à proximité d’aucune autre antenne ni d’aucun autre émetteur, et ne doit être utilisé conjointement à aucun autre de ces appareils.

Australia and New Zealand

Warning: This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.

Brazil

Nota: Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

CE Marking

CE marking on this product represents the product is in compliance with all directives that are applicable to it.

Country List

AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SE	SI	SK	UK

BFWA (Broadband Fixed Wireless Access) members noted in blue

AF-24HD Quick Start Guide

The following apply to products that operate in the 5 GHz frequency range:

Note: This device is restricted to indoor use only when operating in the 5150 - 5350 MHz frequency range within all member states.

Note: All countries listed may operate at 30 dBm. BFWA member states may operate at 36 dBm.

Note: Operation in the 5.8 GHz frequency band is prohibited in BFWA member states. Other countries listed may use the 5.8 GHz frequency band.

WEEE Compliance Statement

Declaration of Conformity

Online Resources