



# Getting the Most from a Versatile Platform

The airFiber AF24 is a versatile platform that can be optimized for a variety of conditions. The user interface is simple and intuitive, but there are numerous configuration parameters. The AF24 is a veritable Swiss Army knife when it comes to versatility and options to address different needs.


*airFiber Configuration Interface*

## Configuration for Ultimate Speed and Latency Performance

Typically the best speed and lowest latency will be obtained with the AF24 configured as a full-duplex system using Frequency Division Duplexing (FDD). The data streams generated by the AF24 are simultaneously transferred across the wireless link. The transmitter and receiver are running concurrently in time. Because of the trade-off between bandwidth resources and propagation conditions, this approach is typically reserved for links in areas where installations are in clear line-of-sight conditions and free of reflected energy such as that generated by heavy rain or intermediate objects. Installations that are subject to Fresnel reflections or highly scattered environments may experience some level of degradation at great range.

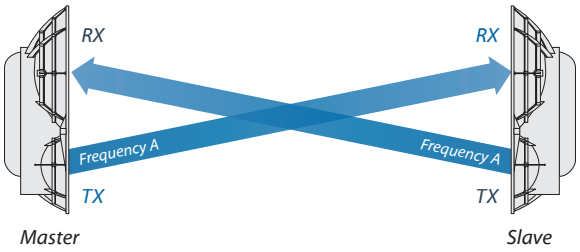
For *Full Duplex* mode, the *TX* and *RX Frequencies* should be different.


*Full-Duplex Diagram*

## Configuration for Highest Possible Availability and Robustness

Links that are installed in environments that are highly reflective or subject to considerable scattering due to heavy rain or foliage loss are typically better suited to half-duplex configurations. In this case the frequency and bandwidth resources are shared on a Time Division Duplexing (TDD) basis, and the system can accept higher levels of propagation distortion. The trade-offs are reduced throughput and slightly higher latency.

For *Half Duplex* mode (default), the *TX* and *RX Frequencies* can be the same or different to suit local interference.




*Half-Duplex Diagram*

The AF24 radio system has the ability to manage time and bandwidth resources, similar to other systems utilizing different modulation schemes that are scaled according to the noise, interference, and quality of the propagation channel. The AF24 system also automatically scales its modulation based on channel quality but has the ability to be reconfigured from a time/bandwidth perspective to allow for best possible performance. In many regards the suitability of the duplexing scheme needs to be taken into account based on the ultimate goals of the user. Just as channel conditions have an effect on the modulation scheme selection, there are effects on duplexing modes to consider as well.

# Alignment

## Tips

- We recommend using a pair of installers in constant communication because in the fine-tuning stage, one installer makes azimuth and elevation adjustments on one airFiber radio while the other installer reports the received signal level at the other airFiber radio. (Fine-tuning is necessary because the main lobe of the receiver is more narrow 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.
- As a safety precaution, ground the airFiber radios to grounded masts, poles, towers, or grounding bars. Use ground wires with a minimum diameter of 8 AWG (10 $mm^2$) and a maximum length of 1 meter. For guidelines about grounding and lightning protection, follow your local electrical regulatory codes.
- For more convenient alignment, you may consider using long-range scopes (not included) temporarily attached to your airFiber radios.
- 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 the airFiber radios.

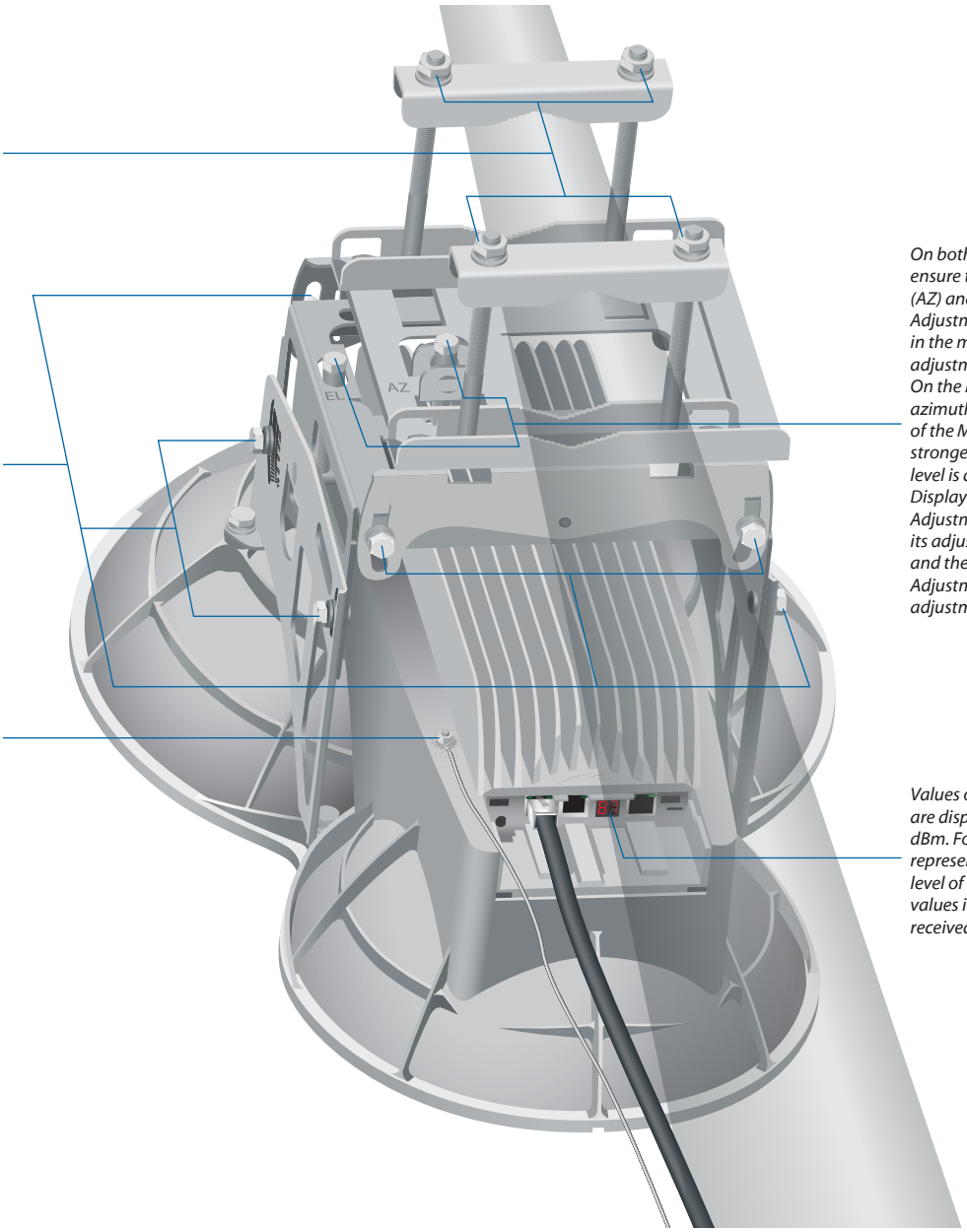
## Establishing a Preliminary Link

Adjust the positions of the airFiber radios to be within a few degrees of the line of sight between them. 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*.

*Aim the Master at the Slave. To adjust the Master's position on the pole, loosen the Hex Nuts, adjust the Pole Mount Bracket and Pole Clamps, and then tighten the Hex Nuts.*
*Repeat on the Slave to achieve the strongest received signal level on its numeric LED Display.*

*For both airFiber radios, ensure ALL EIGHT Lock Bolts (six are shown in the diagram) on the Alignment Bracket are sufficiently loose by spinning each washer by hand.*
WARNING: All EIGHT *Lock Bolts* MUST be loose to avoid damage to the airFiber housing.

*On both airFiber radios, attach a ground wire to the Ground Bonding Point. Secure the other end of the ground wire to the grounded mast, pole, tower, or grounding bar.*




*On both airFiber radios, ensure the Azimuth (AZ) and Elevation (EL) Adjustment Bolts are in the middle of their adjustment ranges.*
*On the Master, adjust the azimuth and elevation of the Master until the strongest received signal level is displayed on its LED Display*. Sweep the AZ Adjustment Bolt through its adjustment range, and then sweep the EL Adjustment Bolt through its adjustment range.*

*Values on the LED Display are displayed in negative (-) dBm. For example, 87 represents a received signal level of -87 dBm. Lower values indicate stronger received signal levels.*

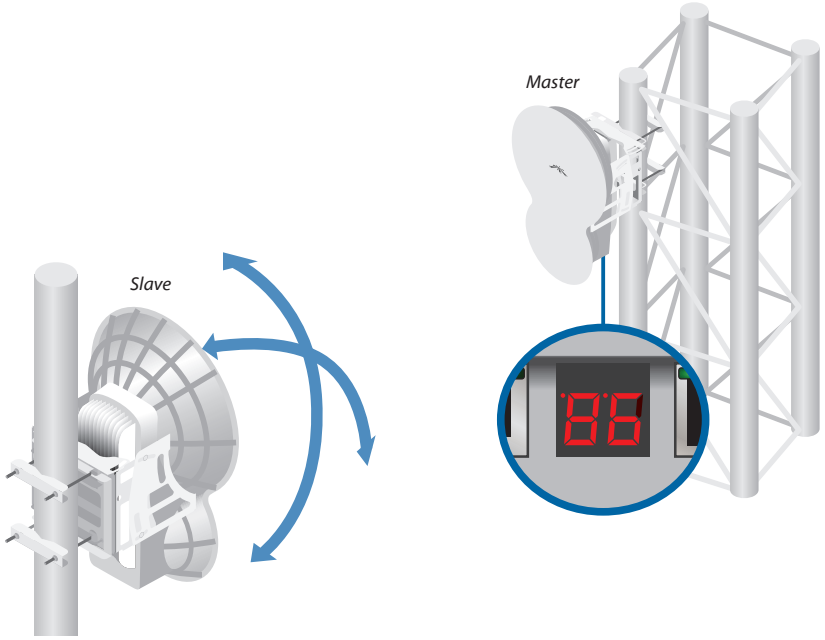
* If the LED Display indicates an overload condition 88, refer to the airFiber AF24 User Guide at: **documentation.ubnt.com** for more information.

## Fine-Tuning the Link

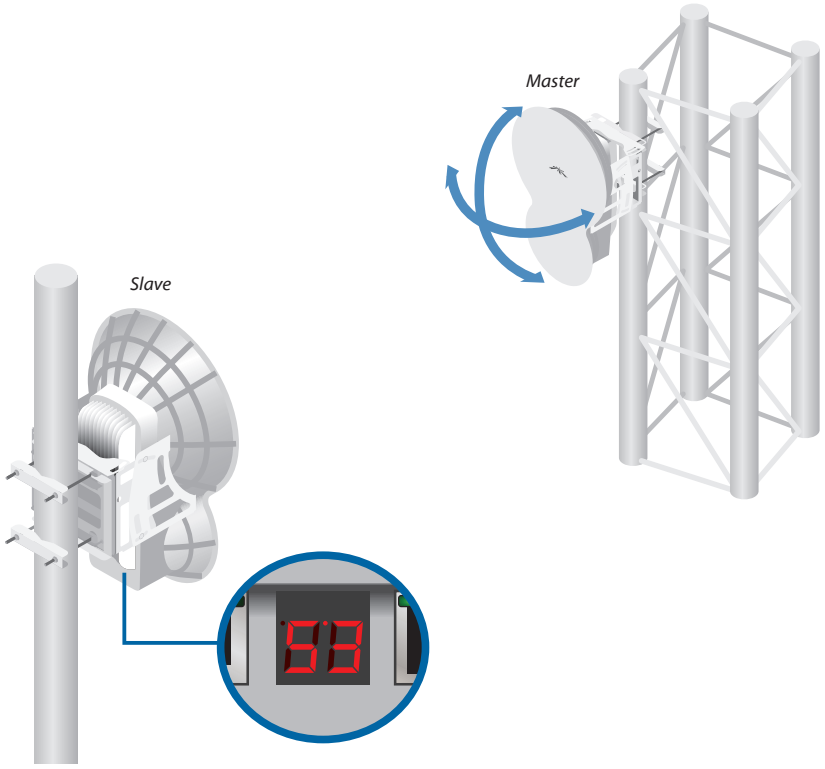
The *Azimuth (AZ)* and *Elevation (EL) Adjustment Bolts* of the *Alignment Bracket* adjust the azimuth and elevation within a range of ±10°. For accurate alignment, make adjustments on one end of the link while the other installer reports the received signal level at the other end of the link.

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

*Starting with the Slave, sweep the AZ Adjustment Bolt and then sweep the EL Adjustment Bolt until the other installer sees the strongest received signal level displayed on the LED Display of the Master.*




*On the Master, sweep the AZ Adjustment Bolt and then sweep the EL Adjustment Bolt until the other installer sees the strongest received signal level displayed on the LED Display of the Slave.*




Alternate adjustments between the airFiber radios, 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.

Lock the alignment on both airFiber radios by tightening all eight *Lock Bolts* on the *Alignment Bracket*. Observe the LED Display on each airFiber AF24 to ensure that the value remains constant. If the LED value changes during the locking process, loosen the *Lock Bolts*, finalize the alignment of each airFiber AF24 again, and retighten the *Lock Bolts*.

# Summary

The following summarizes these guidelines. We have seen installations that greatly deviate from these guidelines yet still work very well. Each installation is different and will need to be optimized based on the conditions present in the field and the goals of the user.

Frequency Division Duplexing (FDD) is best for:

- Maximum possible throughput
- Minimum possible latency
- Installations that are free of reflective and scattering elements
- Areas that see lower amounts of rainfall
- Scenarios with more available spectrum

Time Division Duplexing (TDD) is best for:

- Co-location with other master nodes
- Robustness in areas that see the most rainfall
- Scenarios with less available spectrum
- Less than ideal installations, such as installations near obstructions or scattering elements

These guidelines are only general recommendations. For example, we have successfully co-located FDD links and installed FDD links that work on a single frequency at short range.

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