

SkyPilot

SkyAccess DualBand

Installation



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About This Guide

This guide explains how to install and set up a SkyPilot™ SkyAccess™ DualBand that provides access to a SkyPilot wireless mesh network and serves as an access point for users of 802.1x wireless (Wi-Fi).

This guide assumes administrator-level knowledge of IP networks and a familiarity with configuring wireless devices.

Overview

SkyAccess DualBand is a dual-radio solution that combines SkyPilot's long-range, high-capacity 5.8 GHz mesh backhaul with a high-powered 802.11b/g access point that lets service providers and municipalities offer standard Wi-Fi to subscribers.

Features and benefits

SkyAccess DualBand provides a highly flexible wireless solution that combines scalable Wi-Fi capacity with the seamless coverage of a wireless mesh network.

Each SkyAccess DualBand can support multiple WLANs (wireless local area networks), each with its own VLAN and security policy. One SkyAccess DualBand can support several business models with a single service installation.

<<Illustration?>>

About access point configuration

The SkyAccess DualBand access point is set up to provide Wi-Fi access right out of the box. The access point includes a preconfigured WLAN with the SSID (service set identifier) `SkyAccessDualBand`, providing WPA-PSK (Wi-Fi protected access – pre-shared key) protection. Users attempting to connect to the `SkyAccessDualBand` WLAN must provide a password (`publicpublic` by default). The default configuration is provided for initial management and configuration of the SkyAccess DualBand access point via a wireless connection. You should always

create a unique access point configuration before testing the device or making it available to customers.

NOTE A wireless network protected by WPA-PSK is vulnerable. To provide a more secure level of protection, configure the WLAN for WPA authentication in which each user is authenticated separately.

SkyPilot network topology

SkyPilot Networks™ delivers a wireless, end-to-end broadband solution that seamlessly supports high-capacity, high-coverage mesh networks. Designed for managed-access networks and service providers, the SkyPilot network takes broadband wireless the “last mile” with a cost-effective, robust infrastructure solution.

Based on a high-performance architecture that deploys intelligent antenna arrays, the SkyPilot network delivers a dynamic broadband solution with significant advantages for business and home users.

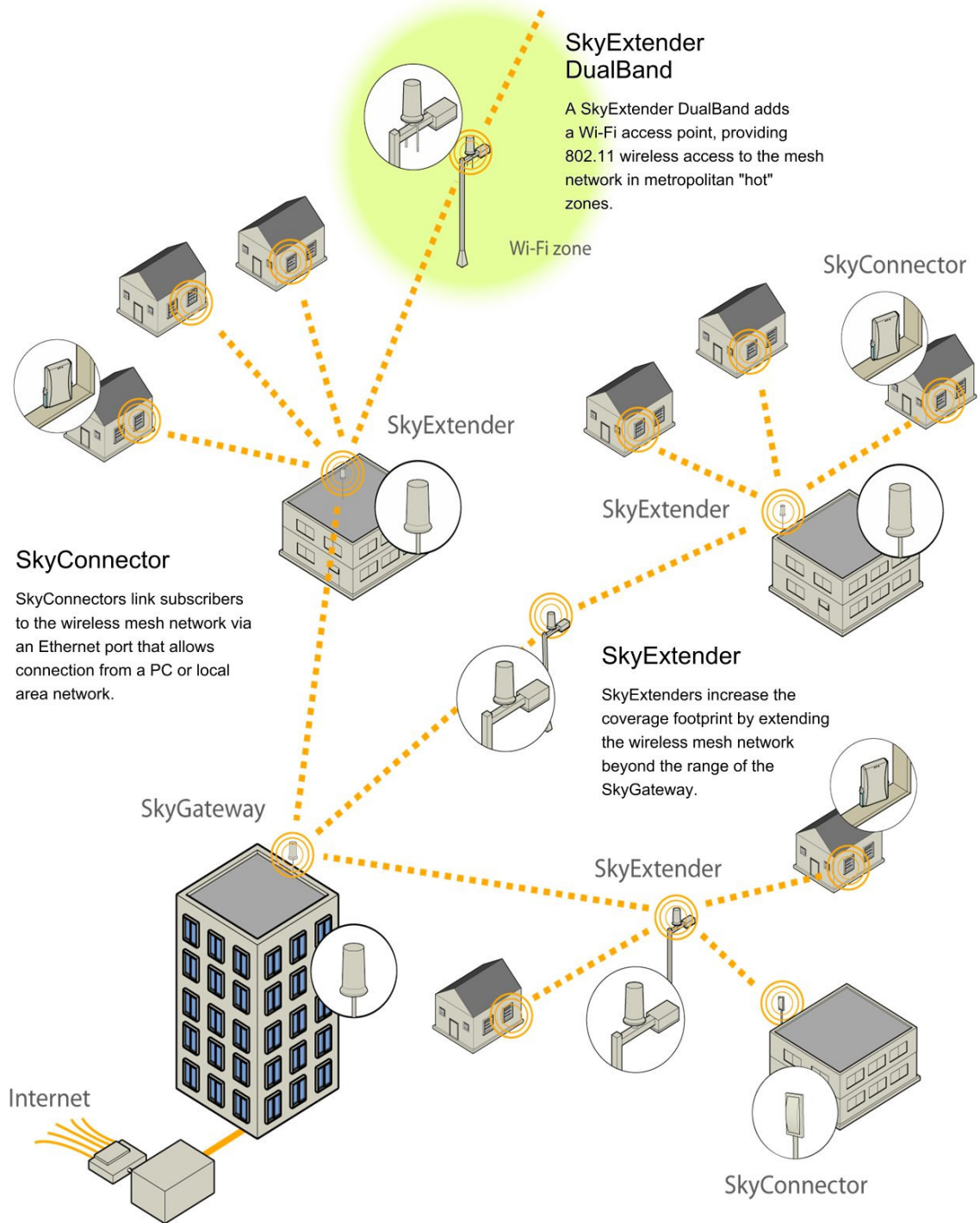
SkyPilot wireless devices are simple to install and easily fit into any type of wireless environment—metropolitan, business, or home.

The auto-discovery and rapid provisioning features of a SkyPilot wireless mesh network greatly reduce deployment and maintenance costs. Support for multiple topologies and high scalability allow attractive options for rapidly expanding a metro Wi-Fi customer base.

A SkyPilot network (as illustrated in Figure 1) may include the following physical components:

- SkyGateway™ (required)
- SkyExtender™
- SkyExtender™ DualBand
- SkyConnector™ Indoor
- SkyConnector™ Outdoor
- SkyAccess™ DualBand

Figure 1. SkyPilot wireless mesh network



SkyGateway

The SkyGateway operates as a base station for a wireless mesh network. It provides an interface between wired infrastructure and a wireless network of subscribers who enjoy secure, high-speed access to the Internet or to wide area networks (WANs).

A SkyPilot wireless network requires at least one SkyGateway for normal operation. If necessary, you can add additional SkyGateways to increase network capacity or provide redundancy.

The SkyGateway typically resides at a location with easy access to wired infrastructure—usually a POP (point of presence) or data center.

For optimal performance, install the SkyGateway on an elevated site such as a cell tower or the top of a tall building.

SkyExtender and SkyExtender DualBand

SkyExtenders and SkyExtender DualBands provide a cost-effective way to add capacity and balance network loads, by operating as “repeaters” to extend the wireless range of a SkyGateway (see Figure 1). You can add these devices to your network to expand your coverage footprint and provide redundancy through SkyPilot’s mesh networking features. (A SkyExtender can also provide subscribers with a direct connection to the wireless network via its Ethernet port.)

In addition, the SkyExtender DualBand serves as a Wi-Fi access point, enabling service providers and municipalities to provide standard 802.11 wireless access across great distances, for targeted hot zones, or for dense coverage patterns.

For optimal performance, install the SkyExtender in an elevated location such as a roof, tower, or utility pole.

SkyConnector and SkyAccess DualBand

SkyConnectors link your subscribers to the SkyPilot wireless network. An Ethernet port on the SkyConnector enables a connection to be established to the subscribers' computers, or to a local area network (LAN) via a data switch or router. For flexibility of installation, SkyPilot offers indoor and outdoor versions of the SkyConnector.

Designed for installation by the service provider, the outdoor version of the SkyConnector attaches to an external structure such as an eave, roof, or pole. Because it provides a better line of sight to the SkyGateway or a SkyExtender, the outdoor SkyConnector generally offers greater range than the indoor unit.

The indoor version of the SkyConnector is a plug-and-play network device that a subscriber can easily install without technical assistance. Service providers should advise subscribers to place the SkyConnector in a location with an optimal sight line to the SkyGateway or a SkyExtender.

SkyAccess DualBand offers the same features as a SkyConnector, plus a Wi-Fi access point that allows service providers and municipalities to provide standard 802.11 wireless access across great distances, for targeted hot zones, or for dense coverage patterns.

The SkyAccess DualBand Installation Kit

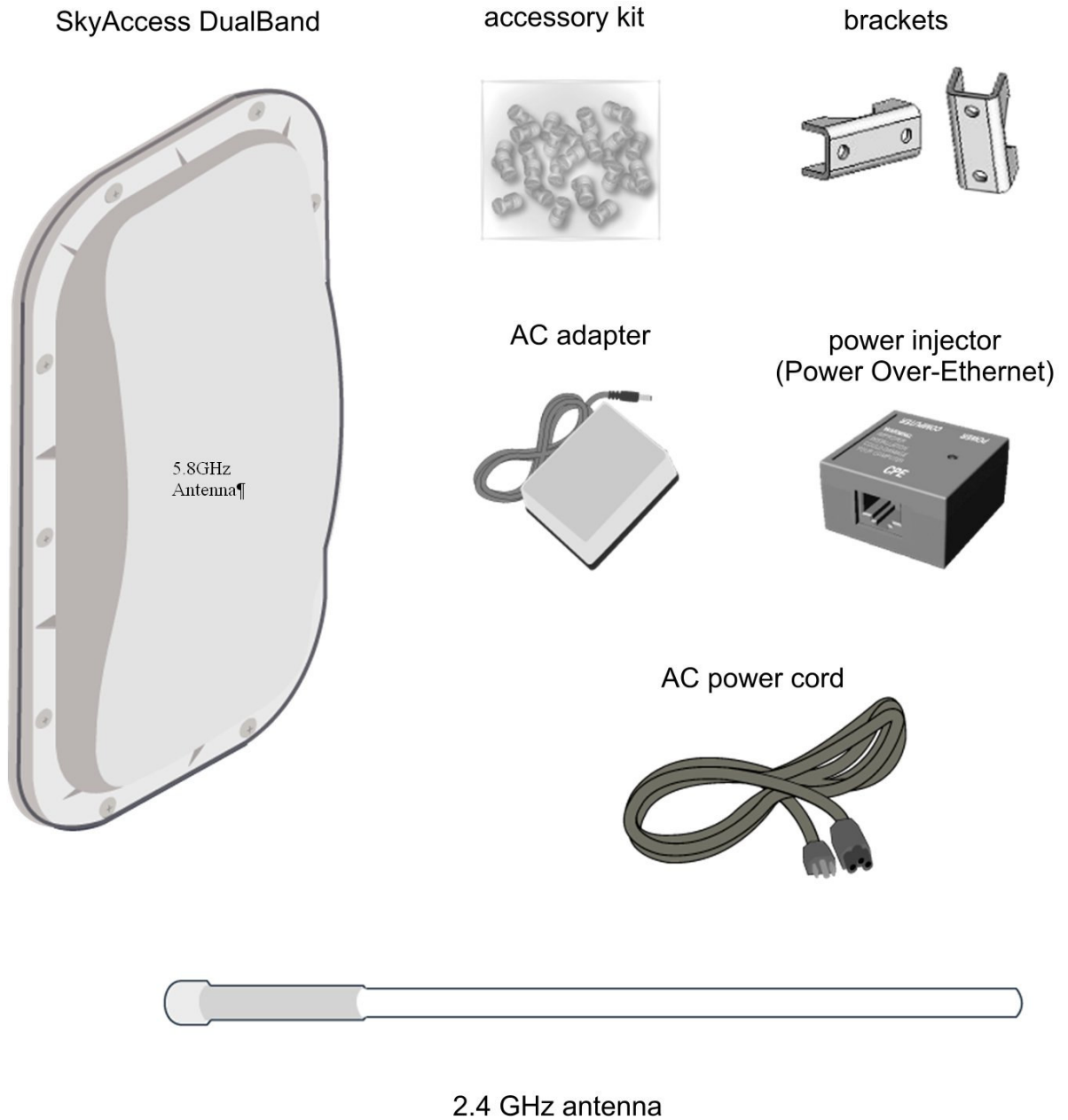
The SkyPilot SkyAccess DualBand kit provides everything you need to install the device and configure it as both a connector to your wireless mesh network and an 802.11b/g Wi-Fi access point.

This chapter reviews that equipment and tells you what else you need to have on hand before starting installation.

NOTE Professional Installation is required for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

What the kit provides

Figure 2. Contents of SkyAccess DualBand installation kit



SkyPilot also offers accessories, including a tilt mount for optimizing your SkyAccess DualBand installation. For more information, contact a SkyPilot sales representative.

NOTE The 5.8 GHz antenna is integrated into the dualband connector housing. The 2.4GHz antenna is the external antenna.

What else you need

Before starting installation, you also need the following:

- For basic mounting: A Phillips screwdriver
- For pole mounting:
 - A magnetic level (optional)
 - A secured steel pole between 1.13" (2.87 cm) and 1.37" (3.48 cm) in diameter
- For network cabling:
 - A spool of CAT5 network cable (shielded cable is recommended)

NOTE Ethernet cabling must comply with the requirements of NEC/CEC codes for outdoor CAT5 cables. The outer jacket of the cabling must be clearly marked as CAT5e per ANSI/TIA/EIA-568-B.2.

Ethernet crossover cable (for connecting to data switch or router)

RJ-45 connectors (connectors without a protective "boot" are recommended)

RJ-45 crimping tool

- For wireless mesh network configuration: A laptop with a Telnet client application and a 10/100bT Ethernet network interface card
- Setup information for the access point:

A (case-sensitive) wireless SSID for each virtual WLAN Wi-Fi network

A unique IP address for the management of the access point if it's not connected to a DHCP server

A default gateway and subnet mask for the management network if the access point is not on the same subnet as your PC

NOTE Plan on configuring the SkyAccess DualBand before mounting it. Some steps are easier if the access point is more accessible.

Getting help

For technical assistance, contact SkyPilot support by logging in to customer support at www.skypilot.com.

Installing a SkyAccess DualBand

This chapter provides instructions for planning and performing the physical installation of a SkyAccess DualBand.

Planning your installation

In a typical wide area wireless mesh network, you'll install a SkyAccess DualBand on a utility pole or the roof of a building. The effective range of the SkyAccess DualBand is usually proportional to the height of the installation.

When choosing a site for the device, consider the radio frequency (RF) environment and physical characteristics of the site.

Trees, buildings, and hills can block a wireless signal. Also keep in mind that the RF environment is dynamic and can deteriorate over time as obstacles appear or are relocated.

Plan on testing potential sites to determine the suitability of the link topology for target applications. Once you've identified a potential site, use a topographic map or path profile software to ensure that terrain or obstacles will not interfere with the links.

Your site survey should include an RF scan to identify available frequencies. You should also check your preferred frequency at all locations; a frequency that's clear at one location may be crowded at another. Frequency planning is a critical factor in planning and implementing a wireless mesh network.

The site survey process should be ongoing. To verify that a site is relatively free of interference, make site audits every 6 to 12 months, scheduling regular maintenance visits to coincide with the site audits.

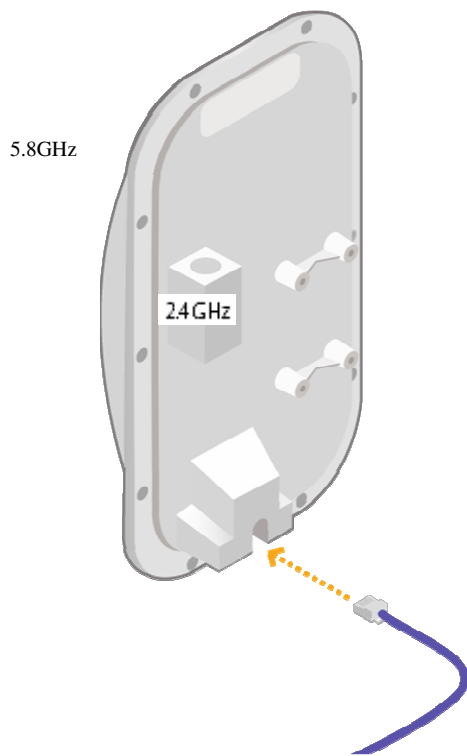
Cabling the SkyAccess DualBand

Ethernet cabling provides both power and data connectivity for the SkyAccess DualBand.

The section provides instructions for attaching CAT5 cable to the device.

- 1 Terminate the appropriate grade and length of CAT5 cable with an RJ-45 connector and plug it into the RJ-45 port on the back of the SkyAccess DualBand.

Figure 3. Connecting CAT5 cable to the SkyAccess DualBand



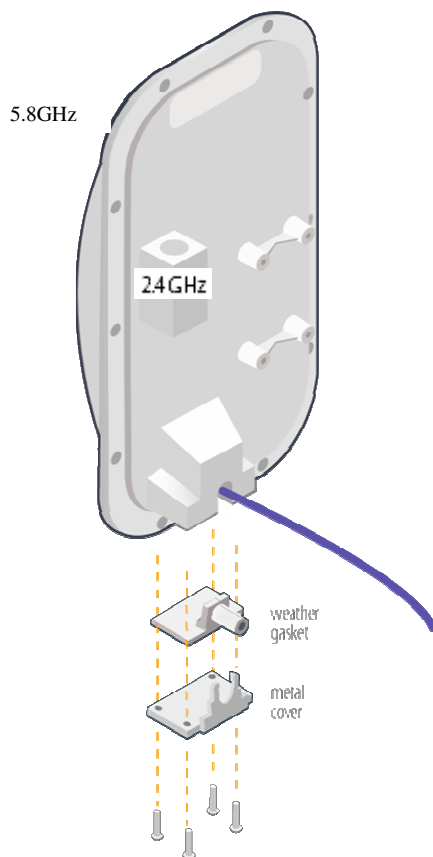
Make sure the fit is snug so that the cable does not interfere with the weather gasket.

- 2 Insert the weather gasket and secure the metal cover.

Press the CAT5 cable into the gasket and insert the gasket into the housing, taking care not to twist or place unnecessary force on the RJ-45 connector.

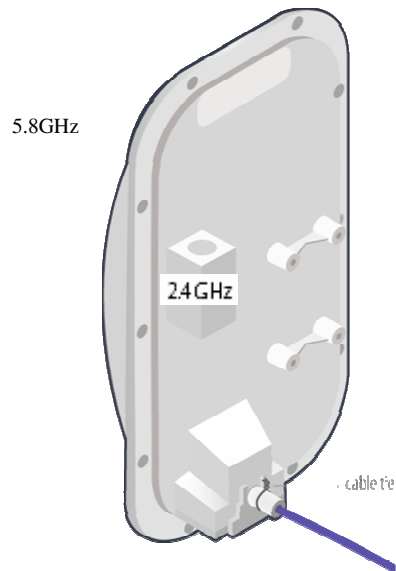
Fit the metal cover over the weather gasket and secure it with the four machine screws supplied in the accessory kit.

Figure 4. Attaching weather gasket and metal cover



- 4 Attach tie wraps to the neck of the weather gasket and tighten them so that they slightly depress the neck.

Figure 5. Attaching tie wraps to the gasket neck



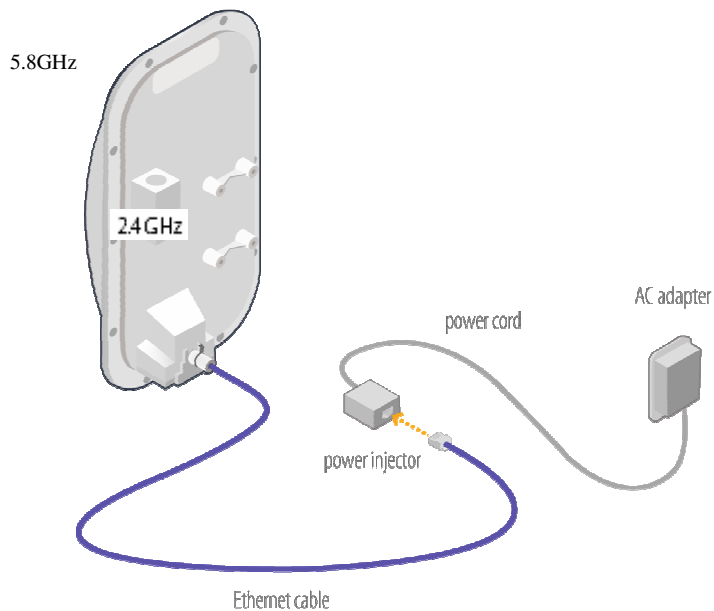
The tie wraps provide relief from cable strain and ensure a fully weatherproof seal.

Powering on the SkyAccess DualBand

Before mounting the SkyAccess DualBand, first power on the unit so that you can use the onboard LEDs to determine optimal placement.

- 1 Connect the SkyAccess DualBand to the power supply, as follows:
 - a. Plug the AC adapter into an AC outlet.
 - b. Connect the Ethernet cable to the port labeled “CPE” on the power injector.
 - c. Plug the AC adapter into the power injector.

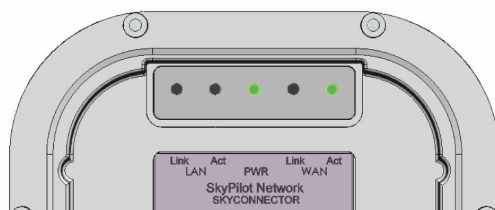
Figure 6. Providing power to the SkyAccess DualBand



2 Check the LEDs on the SkyAccess DualBand.

If the connections are correct, the power LED (labeled “PWR”) and the WAN activity LED (labeled “WAN Act”) on the SkyAccess DualBand will illuminate. The WAN Act LED should blink and turn off, but the PWR LED should remain lit.

Figure 7. Checking the SkyAccess DualBand LEDs



Optimizing location

After powering on the SkyAccess DualBand, use the device's LEDs to identify the optimal location for mounting—a location where it can easily acquire a signal from the wireless mesh network and quickly create links.

Confirm signal acquisition

- Position the SkyAccess DualBand near the intended mounting location and watch the WAN Act LED for activity.

The LED starts to blink when it has acquired a signal from the network and is attempting to set up a connection.

If the WAN Act LED does not start blinking within 30 seconds, try changing the orientation of the SkyAccess DualBand or walk to a new location; then repeat the process until the LED begins blinking.

When the LED starts blinking, make minor adjustments to find the location where the signal is strongest. (The faster the LED blinks, the stronger the signal.)

When the WAN Act LED blinks steadily and at a high rate, you have an optimal signal. Go to the next section to verify the network connection.

Verify network connection

- Watch the WAN Link LED for activity.

Within approximately 90 seconds of locating a signal, the WAN Link LED should start to blink—first slowly, then more quickly.

When the WAN Link LED is solid and the WAN Act LED is blinking, the SkyAccess DualBand has established an authorized connection to the network, indicating that the current location is suitable for mounting

If both the WAN Act LED and the WAN Link LED continuing blinking, a signal is available but is not strong enough for reliable service. Keep trying different locations until you can confirm a network connection.

NOTE To optimize your SkyAccess DualBand installation, ask your network administrator (at the Network Operations Center) to measure signal strength on the node to which the SkyAccess DualBand has established a link.

For more information on LED states, see Table 1.

Table 1. SkyAccess LED states

LED	LED state	Device state
LAN Link	Steady illumination	SkyAccess DualBand is connected to another device via its Ethernet port.
LAN Act	Blinking	Device is transmitting or receiving data via its Ethernet port.
PWR	Steady illumination	Device is powered on.
WAN Link	Blinking (fast blink when device is in standby mode)	Device is attempting to establish an authorized connection on the wireless network. If both WAN Link and WAN Act continue to blink, the signal is not strong enough to support reliable service or there is a provisioning problem that's preventing the device from coming online. Contact your network administrator.
	Steady illumination	Device is connected to the wireless network.
WAN Act	None	Device cannot detect a wireless network.
	Blinking	Device is within the coverage area of a wireless network. Blink rate communicates signal strength: <ul style="list-style-type: none"> • Fast (8x per second) = excellent • Medium (4x per second) = good • Slow (<1x per second) = poor • None = no reception

Mounting the SkyAccess DualBand

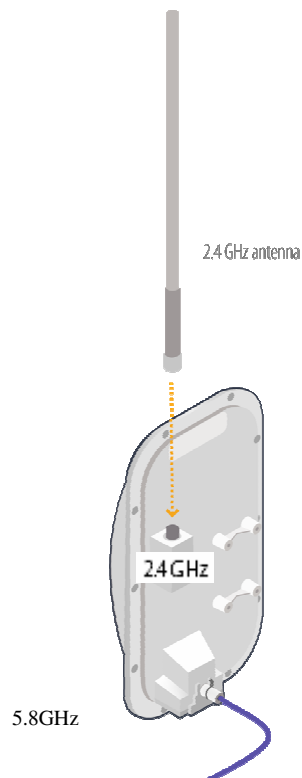
After determining an optimal location for your SkyAccess DualBand, you can mount the device and run the appropriate cables.

Before mounting the device, disconnect the CAT5 cable from the power injector to power down the device.

1 Connect the 2.4 GHz antenna.

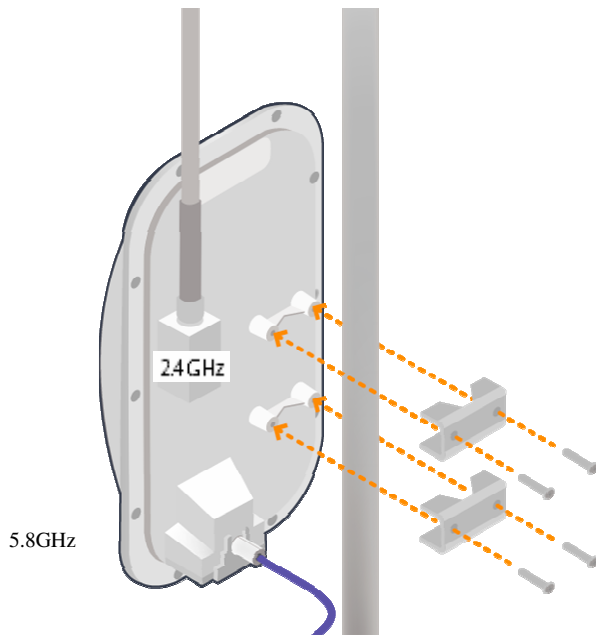
To provide Wi-Fi connectivity, the SkyAccess DualBand requires attachment of the 2.4 GHz antenna included with the device. Screw the antenna onto the standard N connector on the back of the SkyAccess DualBand.

Figure 8. Attaching the 2.4 GHz antenna.



2 Use the supplied clamps to secure the SkyAccess DualBand to the pole; then loop the Ethernet cable around the mounting pole and secure it with tie wraps.

Figure 8. Securing the SkyAccess DualBand



Tighten the bolts securely on the mounting hardware.

- 3 Reconnect the CAT5 cable to the port on the power injector to restore power to the SkyAccess DualBand.

Connecting to the wireless network

After mounting the SkyAccess DualBand, you can set up a connection to the wireless network via a local computer or LAN. Once connected, a subscriber can use the wireless network to gain access to Internet services and applications.

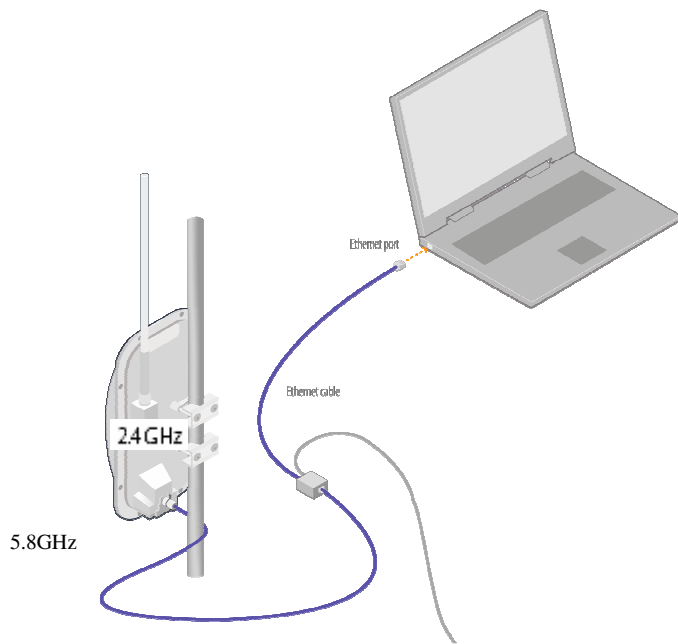
You can connect to the SkyAccess DualBand with Ethernet, or use the onboard access point to establish a wireless connection.

Connect to the wireless network with Ethernet

- Connect the device to a computer or LAN (for a SkyAccess DualBand that's providing Internet/WAN access to the mesh network).

Connect a second Ethernet cable from the power injector port labeled "Computer" to a personal computer or router/data switch providing a connection to a LAN.

Figure 9. Connecting a SkyAccess DualBand to a computer



Connect to the wireless network via a Wi-Fi connection

- 1 From a Wi-Fi/WPA-PSK capable computer within operating range of the access point, open the Network control panel and set up a wireless connection with the IP address 192.168.0.10 and Netmask 255.255.255.0.
- 2 From the Network Connection control panel choose the default SSID provided with the SkyAccess DualBand— SkyAccessDualBand.
- 3 At the password prompt, enter `publicpublic`.

Configuring the SkyAccess DualBand

A SkyAccess DualBand requires two different configurations: a network configuration that allows it to operate on the wireless mesh network, and an access point configuration that allows the device to support local wireless connections via Wi-Fi.

For information about configuring both the device and the access point, see the document *SkyPilot Network Administration*, available in electronic format from the SkyPilot website at www.skypilot.com/support/.

Accessing SkyAccess DualBand Command-Line Interfaces

This appendix describes how to access the command-line interfaces that SkyPilot SkyAccess DualBand provides for provisioning and troubleshooting. You can connect to two different interfaces on the SkyAccess DualBand: an interface with the device that operates as a node on the wireless mesh network, and a separate interface with the access point that extends Wi-Fi connectivity to subscribers.

Connect to the SkyAccess interface

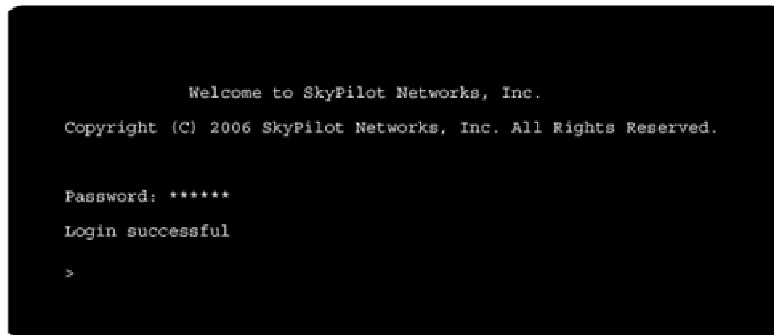
You can connect to a SkyAccess DualBand and access the command-line interface through Telnet over an Ethernet connection. After logging in (by supplying a password), you can enter commands at the command prompt.

- 1 Mount and cable the SkyAccess DualBand according to the instructions in Chapter 3.
- 2 Prepare a PC or laptop.
Open the network settings panel and assign the computer the IP address 192.168.0.3 with a subnet mask of 255.255.255.0.
- 3 Connect the computer to the SkyAccess DualBand according to the instructions in Chapter 3 (see on page **Error! Bookmark not defined.**).
- 4 Start a Telnet session.

Telnet to the default IP address of the SkyAccess DualBand (192.168.0.2).

- 5 Log in by entering the password at the command prompt. (The default is `public`.)

Figure 11. Example Telnet login



```
      Welcome to SkyPilot Networks, Inc.
      Copyright (C) 2006 SkyPilot Networks, Inc. All Rights Reserved.

      Password: *****
      Login successful

      >
```

After making an Ethernet connection to the SkyAccess DualBand, you can manage and troubleshoot the device using a wide range of commands available through the command-line interface. For detailed descriptions of the commands, as well as sample output for many of them, see *SkyPilot Network Administration*.

For comprehensive guidelines to troubleshooting devices on your SkyPilot wireless mesh network, see *Getting Started with the SkyPilot Network*.

Connect to the access point interface

You can connect to the access point command-line interface via Telnet over a wireless network connection. (Typically, you will use this technique to confirm the IP address of the access point component of the SkyPilot DualBand.)

- 1 Prepare a PC or laptop.

You will need a Wi-Fi/WPA-PSK capable computer that's within operating range of the access point and a Telnet application you can use to open a connection between the devices.

The access point component of SkyAccess DualBand ships with the default IP address 192.168.0.3.

- 2 Open the connection to the access point.

From your Telnet application, open a connection to the access point.

- 3 Log in by entering the default user name (admin) and password (public) at the command prompt.

Once you're logged in, you can use the command-line interface to set configuration parameters or retrieve the IP address of the access point

FCC Regulatory Information

FCC Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- 0 Reorient or relocate the receiving antenna.
- 0 Increase the separation between the equipment and receiver.
- 0 Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- 0 Consult the dealer or an experienced radio/TV technician for help.

The user of this product is cautioned that changes or modifications made to the equipment without the approval of the manufacturer void the user's authority to operate the equipment.

FCC Radiation Exposure Limits

To comply with FCC RF exposure requirements in section 1.1307, a minimum separation distance of 40 cm (16 inches) is required between the antenna and all persons.

Specifications

This appendix provides technical specifications for the SkyPilot SkyAccess DualBand.

Wireless Specifications

Frequency bands capable	5.725–5.850 GHz.
US & Canada	Wi-Fi Access: 2.400-2.483.5 GHz
For other countries check with sales representative	
EIRP	42.5 dBm/17.8 W peak, 36 dBm/4 W average, 33 dBm/2 W average, 30 dBm/1 W average, or 36 dBm /4 W peak (EIRP selected for country-specific regulations) Wi-Fi Access: 35.0 dBm / 3.2 W
Media access	Time Division Duplex (TDD)
Modulation technique	OFDM with adaptive modulation Wi-Fi Access: DSSS and OFDM
Modulation rates	6–54 Mbps
Throughput	Up to 20 Mbps UDP, up to 10 Mbps TCP
Latency	8–10 ms roundtrip per hop

Antennas	28° horizontal x 9° vertical panel, 16.5 dBi Wi-Fi Access: omnidirectional 7.4 dBi antenna with diversity
Channel width	20 MHz
Channel resolution	5 MHz frequency control
Receive sensitivity	-90 dBm at 6 Mbps modulation
Connectivity	SkyAccess DualBand connects with SkyGateways, SkyExtenders, and SkyExtender DualBands
Authentication	MD5-based certificates
Encryption	128-bit AES on all wireless links

Product Specifications

Connectors	RJ-45: Ethernet connection (10/100bT) and power (Power-over-Ethernet)
Mounting	Eave, roof, or chimney; outside pole diameter up to 2.0"
Range	7.5 miles (12 km) Wi-Fi Access: Up to 1,200 feet
LEDs	Wireless activity, wireless link, LAN activity, LAN link, and power
Dimensions	12.6" (32 cm) H x 6.6" (16.8 cm) W x 4.2" (10.7 cm) D
Weight	3.8 pounds (1.7 kg)
Operating temperature	-40° to 131° F (-40° to 55° C)
Wind loading	Up to 150 mph (240 km/h)

Enclosure/humidity	NEMA-4X
Power	110–230 VAC, 50–60 Hz input; 8 W
Certifications	FCC Part 15, FCC 47 CFR Part 15, Class B USA; compliance with UL safety standards, CE, C-Tick, IC RSS210 Issue 5
EMI and susceptibility	FCC Part 15.107 and 15.109
Warranty	One-year limited warranty on hardware and software

Security

Authentication	MD5-based certificates
Encryption	AES
Filtering	Based on protocol type, IP port ID, and configurable IP address list
VLAN	Supports 802.1q VLAN tagging; supports a management VLAN for managing traffic and a data VLAN for subscriber traffic

Network Management

Command-line interface	Console via Telnet
NMS integration	SNMP v2c
GUI configuration	SkyProvision™ software and Web interface
GUI EMS	SkyControl™ software
IP address	DHCP or static
Firmware	Multiple versions of firmware stored in nonvolatile memory; updated via FTP

Configuration file

XML over HTTP

Quality of Service

Prioritization	802.1p-based; based on protocol type, IP address, port ID, and configurable IP address list
Traffic shaping	Per-device rate limits upstream and downstream

Monitoring and MIB Support

Supported MIBs	MIB-II (RFC 1213); EtherLike (RFC 2665); Bridge (RFC 1493); SkyPilot private MIB
Local management	RS-232 Serial Console Port
Remote management	Command-line interface via Telnet, SNMP v2c, Web interface

Topology

Configurations	Mesh, point-to-multipoint, point-to-point
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